# Fecal Coliform Bacteria TMDL for the Wild Rice River in Sargent and Richland Counties, North Dakota

**Final:** September 2010

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**North Dakota Department of Health**
**Division of Water Quality**

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## 1.0 INTRODUCTION AND DESCRIPTION OF THE WATERSHED

The Wild Rice River watershed is a 1.4 million acre watershed located in Cass, Dickey, Ransom, Richland and Sargent Counties in southeastern North Dakota and Marshall and Roberts Counties in northeastern South Dakota (Figure 1). For the purposes of this TMDL, the impaired watershed segments are located in Sargent and Richland Counties and comprise approximately 363,071 acres. The Wild Rice River impaired watershed segments lies within the Level III Northern Glaciated Plains (46) and Lake Agassiz Plain (48) Ecoregions.

**Table 1. General Characteristics of the Wild Rice River Watershed.**

| | |
|---|---|
| **Legal Name** | Wild Rice River |
| **Stream Classification** | Class II |
| **Major Drainage Basin** | Red River |
| **8-Digit Hydrologic Unit** | 09020105 |
| **Counties** | Sargent and Richland |
| **Level III Ecoregions** | Northern Glaciated Plains (46) and Lake Agassiz Plain (48) |
| **Watershed Area (acres)** | 363,071 |

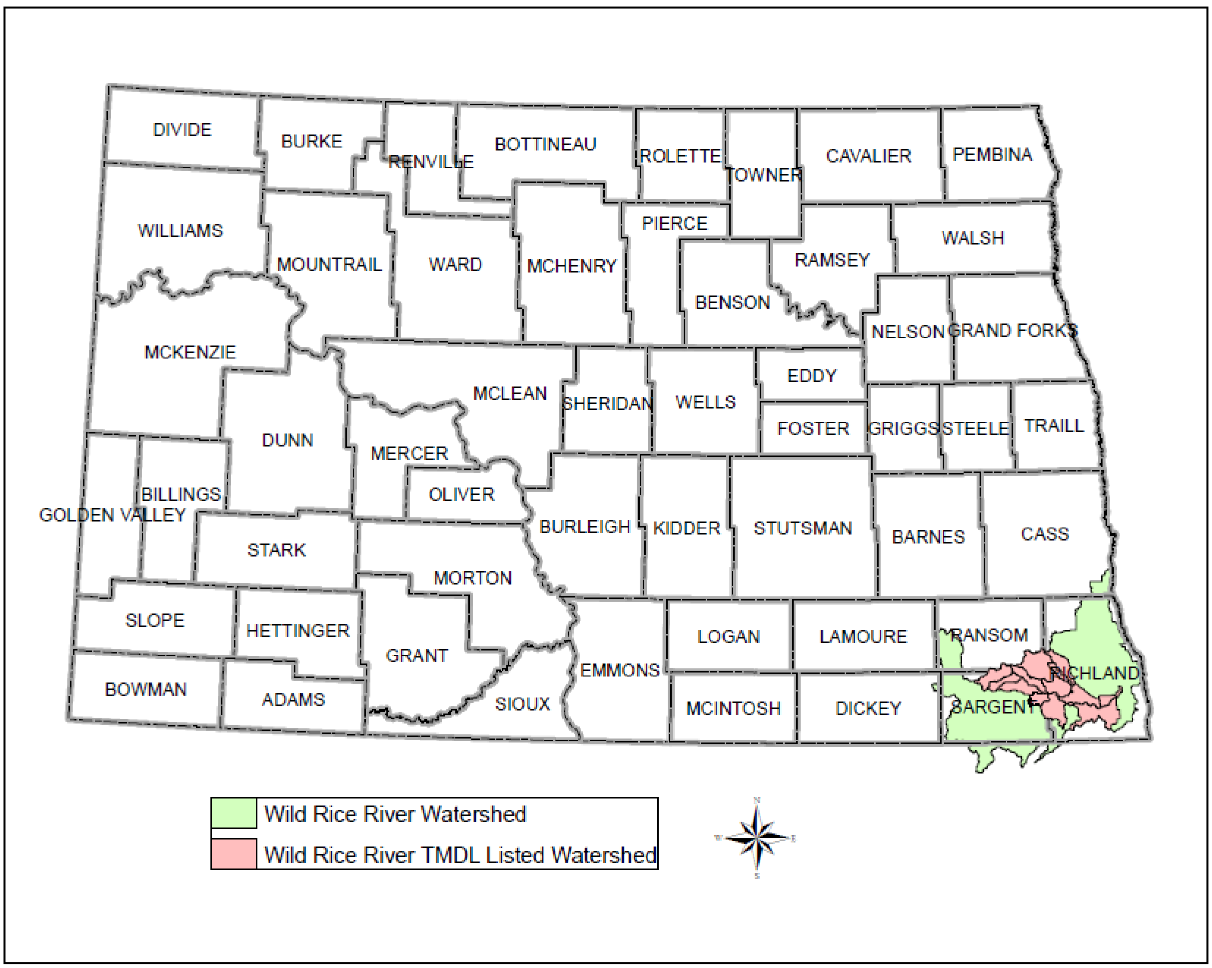



**Figure 1. Wild Rice River Watershed and TMDL Listed Watershed in North Dakota.**

### 1.1 Clean Water Act Section 303(d) Listing Information

Based on the 2010 Section 303 (d) List of Impaired Waters Needing TMDLs (NDDoH, 2010), the North Dakota Department of Health has identified a 43.68 mile segment (ND-09020105-012-S_00) of the 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) as not supporting recreational use, and a 53.4 mile segment (ND-09020105-009-S_00) of the Wild Rice 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). Each segment is not supporting recreational uses, because the impairments are due to fecal coliform bacteria (Tables 2, 3, and Figure 2).

**Table 2. Wild Rice River Section 303(d) Listing Information for Assessment Unit ND-09020105-012-S_00 (NDDoH, 2010).**

| | |
|---|---|
| **Assessment Unit ID** | ND-09020105-012-S_00 |
| **Waterbody Description** | 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) |
| **Size** | 45.68 miles |
| **Designated Use** | Recreation |
| **Use Support** | Not Supporting |
| **Impairment** | Fecal Coliform Bacteria |
| **TMDL Priority** | High |

**Table 3. Wild Rice River Section 303(d) Listing Information for Assessment Unit ND-09020105-009-S_00 (NDDoH, 2010).**

| | |
|---|---|
| **Assessment Unit ID** | ND-09020105-009-S_00 |
| **Waterbody Description** | 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. |
| **Size** | 53.4 miles |
| **Designated Use** | Recreation |
| **Use Support** | Not Supporting |
| **Impairment** | Fecal Coliform Bacteria |
| **TMDL Priority** | High |

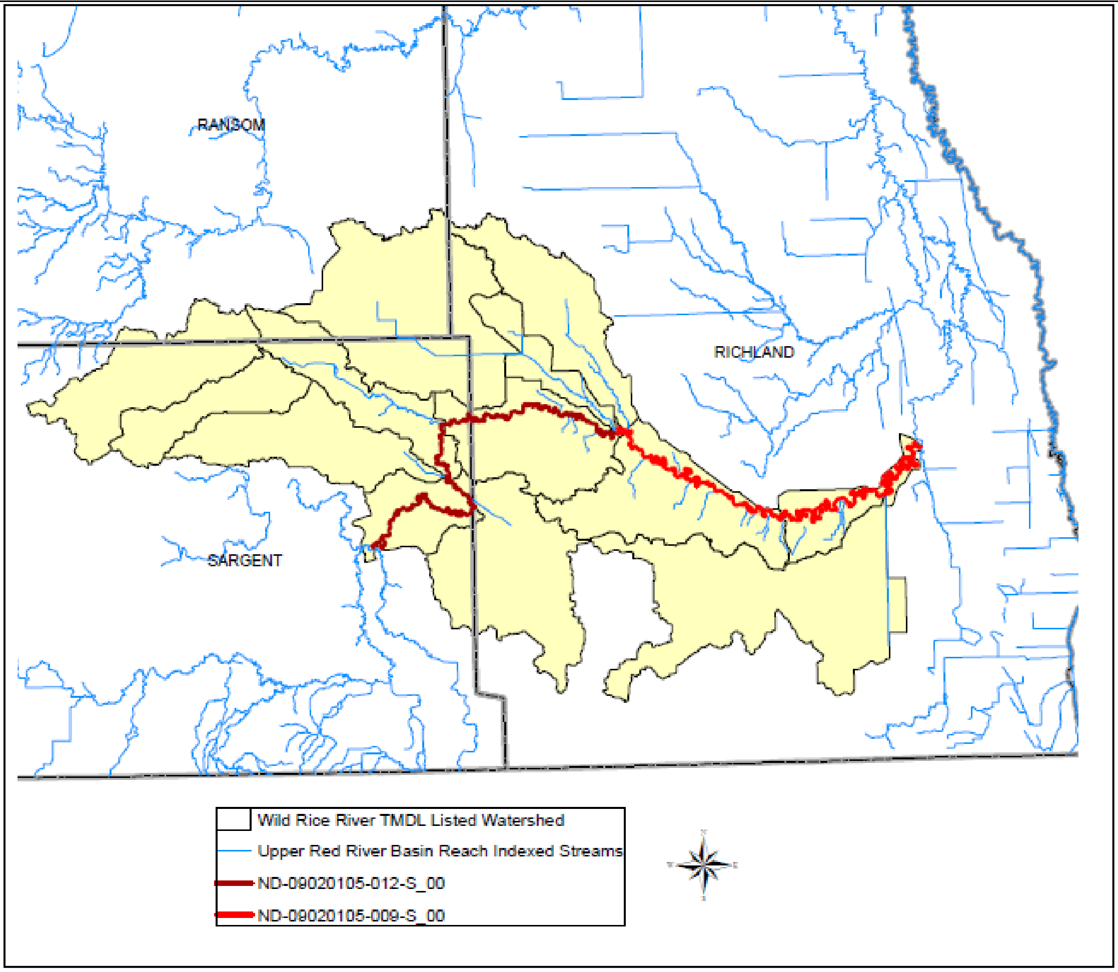



**Figure 2. Wild Rice River TMDL Listed Segments.**

### 1.2 Topography

The watershed for the Section 303(d) listed segment highlighted in this TMDL lies within the Level IV Tewaukon Dead Ice Moraine (46e), Drift Plains (46i), Glacial Lake Agassiz Plain (48a), and Sand Deltas and Beach Ridges (48b) ecoregions (Figure 3). The Tewaukon Dead Ice Moraine (46e) ecoregion is a continuation of the Prairie Coteau extending below the Prairie Coteau Escarpment. A large density of semi permanent wetlands provides feeding and nesting habitat for many species of waterfowl, with the remaining upland areas under cultivation. The Drift Plains (46i) ecoregion was formed by the retreating Wisconsinan glacier that left a thick mantle of glacial till. The landscape consists of temporary and seasonal wetlands. Due to the productive soil of this ecoregion almost all of the area is under cultivation. The Glacial Lake Agassiz Plain ecoregion (48a) is comprised of thick beds of glacial drift overlain by silt and clay lacustrine deposits from glacial Lake Agassiz. The topography of this ecoregion is extremely flat, with sparse lakes and pothole wetlands. Tallgrass prairie was the dominant habitat prior to European settlement and has now been replaced with intensive agriculture. Agricultural production in the southern region consists of corn, soybeans, wheat, and sugar beets. The Sand Deltas and Beach Ridges (48b) ecoregion disrupts the flat topography of the Red River Valley. The beach ridges are parallel lines of sand and gravel that were formed by wave action of the contrasting shoreline levels of Lake Agassiz. The deltas consist of lenses of fine to coarse sand and are blown into dunes (USGS, 2006).

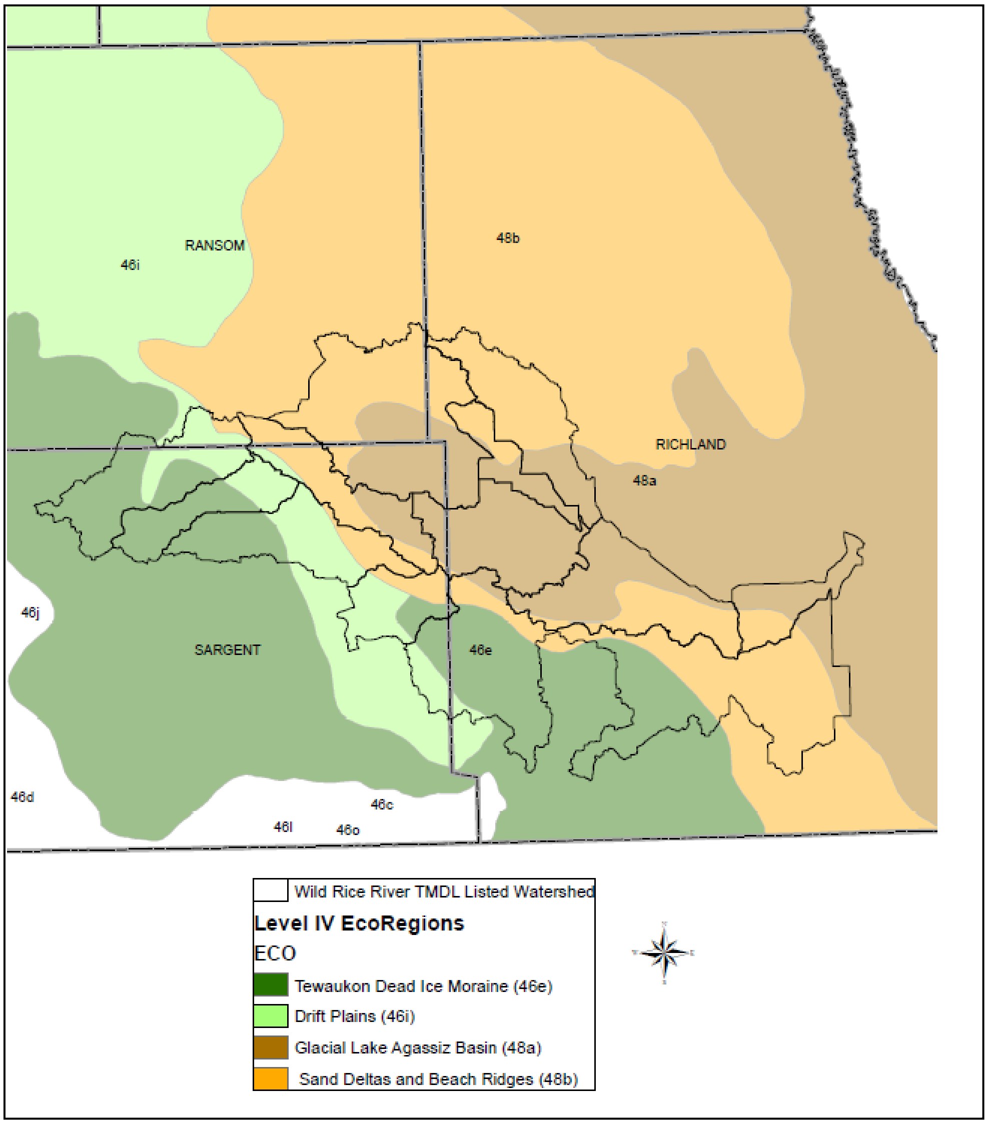



**Figure 3. Level IV Ecoregions in the Wild Rice River TMDL Listed Watersheds.**

## 1.3 Land Use

The dominant land use in the Wild Rice River TMDL Listed watersheds is row crop agriculture. According to the 2006 National Agricultural Statistical Service (NASS) land survey data, approximately 59 percent of the land is cropland, 16 percent in grassland, and 11 percent is in wetlands, the remaining 14 percent is either developed space, water, woods, barren, pasture, or in the conservation reserve program (CRP). The majority of the crops grown consist of corn, soybeans, spring wheat, alfalfa, winter wheat, sunflowers, and dry beans (Figure 4). Unpermitted animal feeding operations and "hobby farms" are also present in the Wild Rice River watershed, but their number and location are unknown.

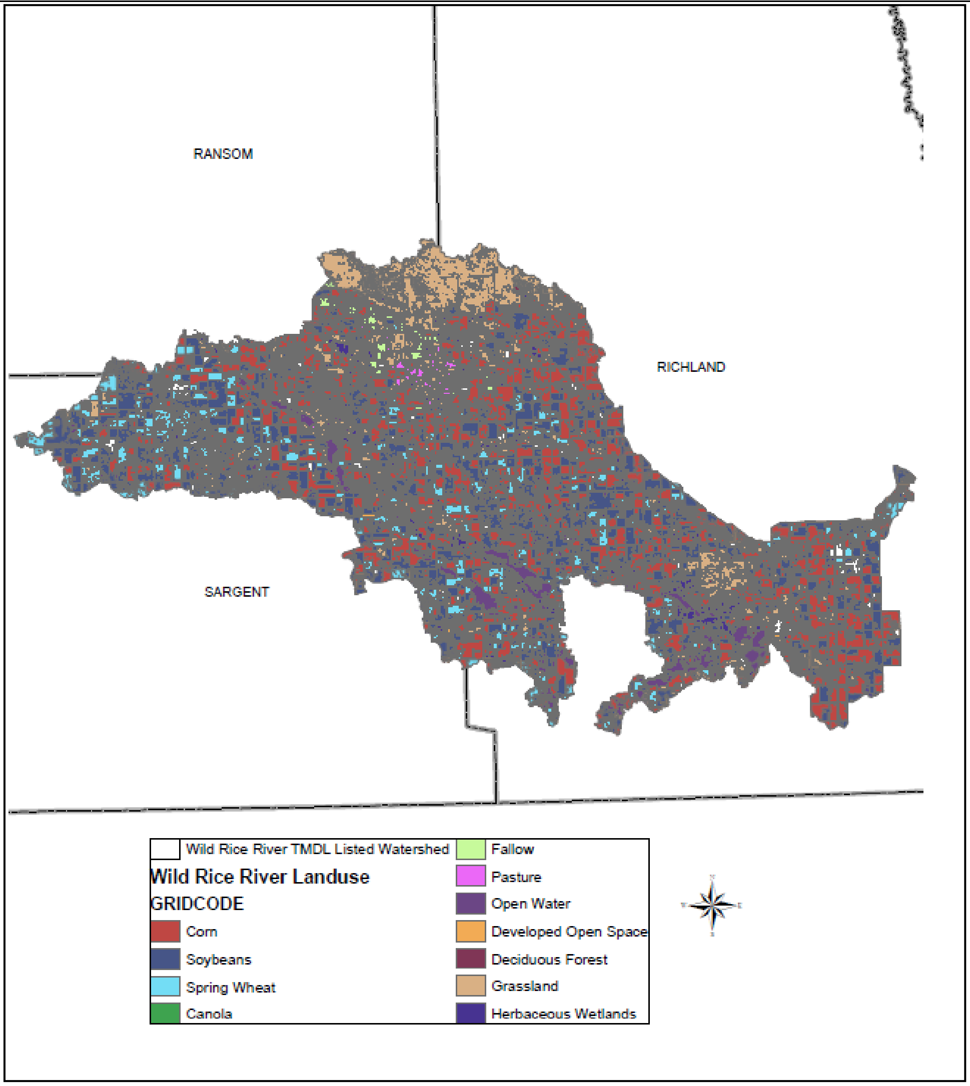



**Figure 4. Land Use in the Wild Rice River TMDL Listed Watersheds (NASS, 2006).**

## 1.4 Climate and Precipitation

Figures 5 and 6 show the annual precipitation and average temperature for the period 1991-2008 for the North Dakota Agriculture Weather Network (NDAWN) site located near Wyndmere, ND which is located near the Wild Rice River watershed. Sargent and Richland Counties have a subhumid climate characterized by warm summers with frequent hot days and occasional cool days. Average temperatures range from 12º F in winter to 60º F in summer. Precipitation occurs primarily during the warm period and is normally heavy in later spring and early summer. Total annual precipitation is about 20 inches.

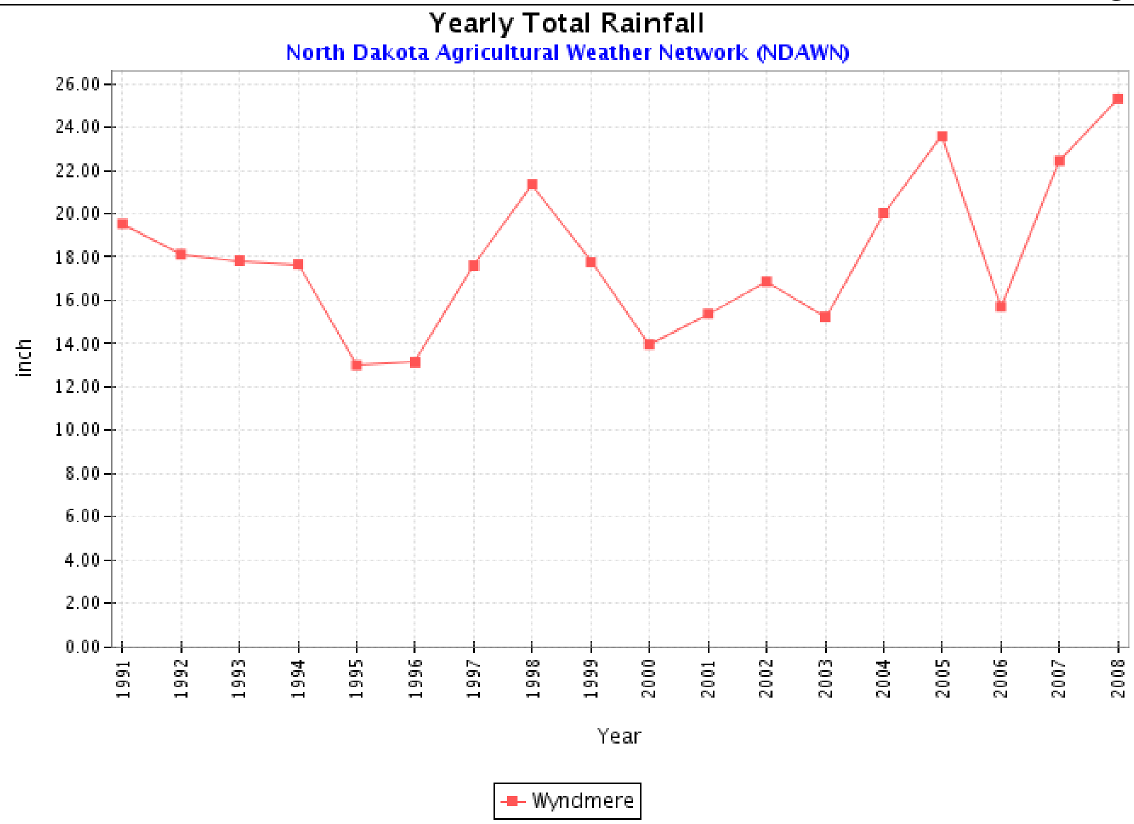



**Figure 5. Annual Total Precipitation at Wyndmere, North Dakota from 1991-2008 (NDAWN, 2009).**

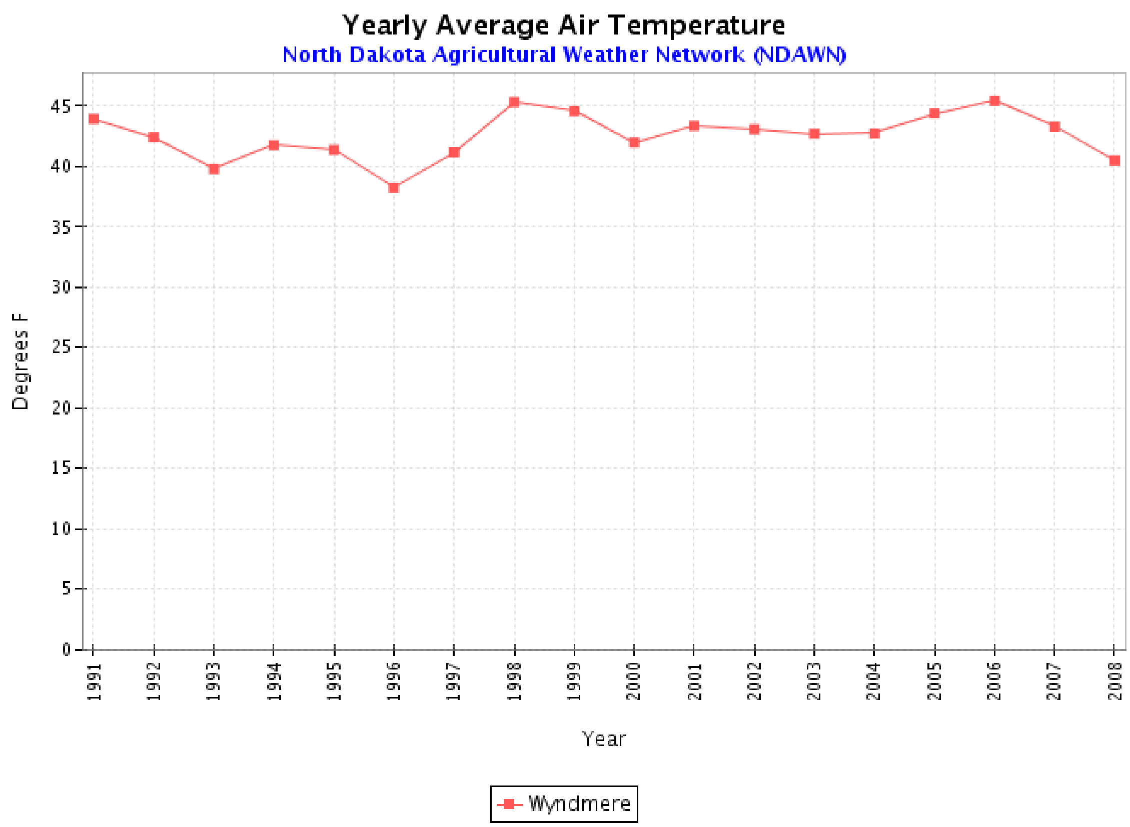



**Figure 6. Annual Average Air Temperature at Wyndmere, North Dakota from 1991-2008 (NDAWN, 2009).**

## 1.5 Available Data

### 1.5.1 Fecal Coliform Bacteria Data

Fecal coliform bacteria samples were collected at one location within each TMDL listed watershed (Figure 7). The monitoring site 385234 is located six miles west and three miles south of Wyndmere, ND. Site 385234 was monitored weekly or when flow conditions were present during the recreation season of 2003 and 2004. Monitoring site 384072 is located at Great Bend, ND on the bridge at the edge of town. Site 384072 was monitored weekly or when flow conditions were present during the recreation season of 1996 and 2003-2004. Each monitoring station was sampled by the Richland County Soil Conservation District.
While the state of North Dakota has an E. coli bacteria standard (see Section 2.0), no E. coli data are available for the TMDL reaches.

Table 3 and 4 provides a summary of fecal coliform geometric mean concentrations, the percentage of samples exceeding 400 CFU/100mL for each month and the recreational use assessment by month. The geometric mean fecal coliform bacteria concentration and the percent of samples over 400 CFU/100ml was calculated for each month (May-September) using those samples collected during each month in 1996, and 2003-2004.

**Table 4. Summary of Fecal Coliform Data for Site 385234 Data Collected in 2003-2004.**

| Month | N | Geometric Mean Concentration (CFU/100mL) | Percentage of Samples Exceeding 400 CFU/100mL | Recreational Use Assessment |
|---|---|---|---|---|
| May | 10 | 141 | 20% | Fully Supporting but Threatened |
| June | 12 | 210 | 25% | Not Supporting |
| July | 9 | 249 | 33% | Not Supporting |
| August | 2 | NA | NA | NA |
| September | 1 | NA | NA | NA |

**Table 5. Summary of Fecal Coliform Data for Site 384072 Data Collected in 1996 and 2003-2004.**

| Month | N | Geometric Mean Concentration (CFU/100mL) | Percentage of Samples Exceeding 400 CFU/100mL | Recreational Use Assessment |
|---|---|---|---|---|
| May | 15 | 132 | 33% | Fully Supporting but Threatened |
| June | 14 | 290 | 29% | Not Supporting |
| July | 9 | 354 | 44% | Not Supporting |
| August | 2 | NA | NA | NA |
| September | 1 | NA | NA | NA |

Based on the data collected in 1996 and 2003-2004, geometric mean and percent exceeded calculations determined that during the months of June and July, the TMDL listed segments of the Wild Rice River are not supporting recreational beneficial use. Although the months of August and September did not have enough samples taken to calculate a geometric mean and percent exceeded they did indicate elevated concentrations of fecal coliform bacteria (Appendix A).

1.5.2 Hydraulic Discharge

A discharge record was constructed for the listed segments using the Drainage Area Ratio Method (Ries et al., 2000) and the historical discharge measurements collected by the USGS at gauging station 05053000 from 1989-2009.

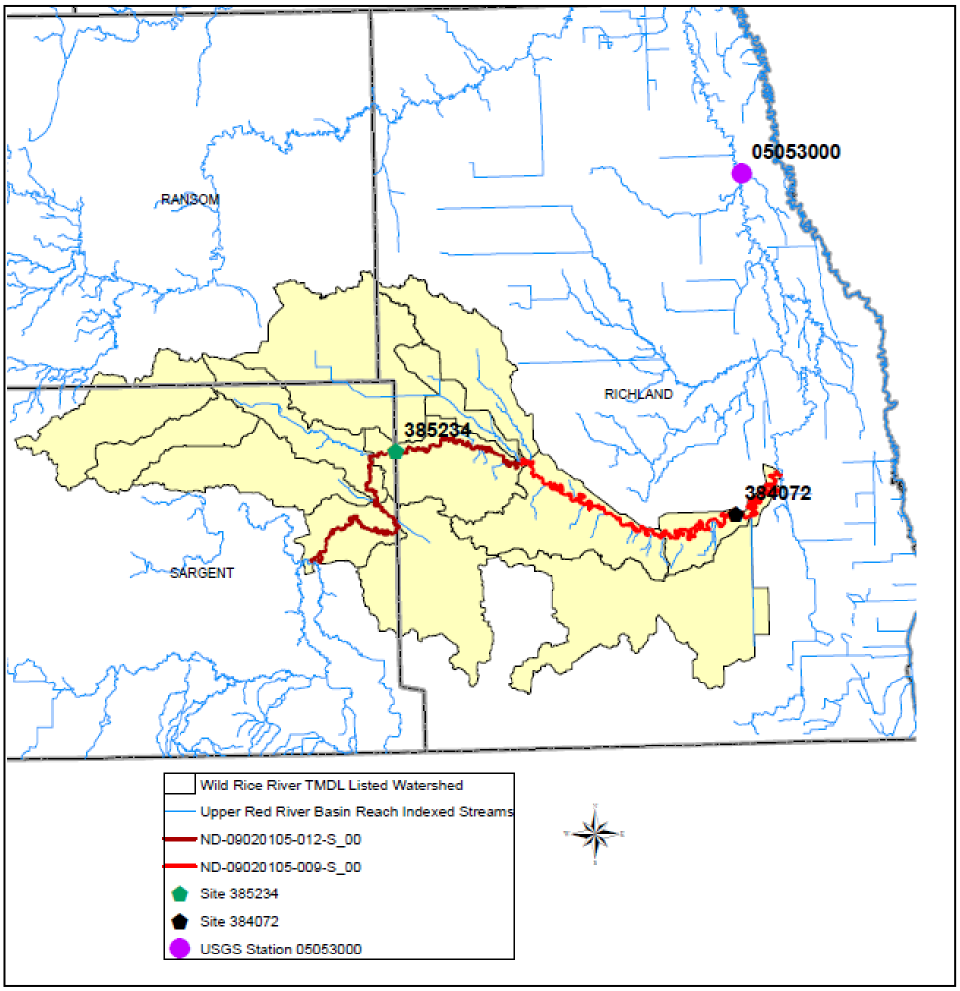



**Figure 7. Fecal Coliform Bacteria Sample Sites and USGS Gauge Station (05053000) on the TMDL Listed Segments of the Wild Rice River.**

## 2.0 WATER QUALITY STANDARDS

The Clean Water Act requires that Total Maximum Daily Loads (TMDLs) be developed for waters on a state's Section 303(d) list. A TMDL is defined as "the sum of the individual wasteload allocations for point sources and load allocations for non point sources and natural background" such that the capacity of the waterbody to assimilate pollutant loadings is not exceeded. The purpose of a TMDL is to identify the pollutant load reductions or other actions that should be taken so that impaired waters will be able to attain water quality standards.

TMDLs are required to be developed with seasonal variations and must include a margin of safety that addresses the uncertainty in the analysis. Separate TMDLs are required to address each pollutant or cause of impairment, which in this case is fecal coliform bacteria.

### 2.1 Narrative Water Quality Standards

The North Dakota Department of Health has set narrative water quality standards that apply to all surface waters in the State. The narrative general water quality standards are listed below (NDDoH, 2006).

- All waters of the State shall be free from substances attributable to municipal, industrial, or other discharges or agricultural practices in concentrations or combinations that are toxic or harmful to humans, animals, plants, or resident aquatic biota.

- No discharge of pollutants, which alone or in combination with other substances shall:

  a. Cause a public health hazard or injury to environmental resources;
  b. Impair existing or reasonable beneficial uses of the receiving water; or
  c. Directly or indirectly cause concentrations of pollutants to exceed applicable standards of the receiving waters.

In addition to the narrative standards, the NDDoH has set biological goal for all surface waters in the state. The goal states “the biological condition of surface waters shall be similar to that of sites or waterbodies determined by the department to be regional reference sites” (NDDoH, 2006).

### 2.2 Numeric Water Quality Standards

The Wild Rice River is a Class II stream. The NDDoH definition of a Class II stream is shown below (NDDoH, 2006).

**Class II-** 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.

Numeric criteria have been developed for Class II streams for both fecal coliform bacteria and E. coli (Table 5). Both bacteria standards apply only during the recreation season from May 1 to September 30.

**Table 6. North Dakota Fecal Coliform Bacteria Standards for Class II Streams.**

| Parameter | Standard | |
|---|---|---|
| | Geometric Mean[1] | Maximum[2] |
| Fecal Coliform Bacteria | 200 CFU/100 mL | 400 CFU/100 mL |
| E. coli | 126 CFU/100 mL | 409 CFU/100 mL |

[1] Expressed as a geometric mean of representative samples collected during any consecutive 30-day period.
[2] No more than 10 percent of samples collected during any consecutive 30-day period shall individually exceed the standard.

## 3.0 TMDL TARGETS

A TMDL target is the value that is measured to judge the success of the TMDL effort. TMDL targets must be based on state water quality standards, but can also include site specific values when no numeric criteria are specified in the standard. The following TMDL target for Wild Rice River is based on the NDDoH water quality standard for fecal coliform bacteria.

### 3.1 Wild Rice River Target Reductions in Fecal Coliform Concentrations

The Wild Rice River is impaired because of fecal coliform bacteria. The Wild Rice River is not supporting, for recreational beneficial uses because of fecal coliform bacteria counts exceeding the North Dakota water quality standard. The North Dakota water quality standard for fecal coliform bacteria is a geometric mean concentration of 200 CFU/100 mL during the recreation season from May 1 to September 30. Thus, the TMDL target for this report is 200 CFU/100 mL. In addition, no more than ten percent of samples collected for fecal coliform should exceed 400 CFU/100 mL. While the standard is intended to be expressed as the 30-day geometric mean, the target is based on the 200 CFU/100 mL geometric mean standard. Expressing the target in this way will ensure the TMDL will result in both components of the standard being met and recreational uses are restored.

Currently, the state of North Dakota has both a fecal coliform bacteria standard and an E. coli bacteria standard. During the current triennial water quality standards review period, the Department will be eliminating the fecal coliform bacteria standard and will only have the E. coli standard for bacteria. This standards change is recommended by the US EPA as E. coli is believed to be a better indicator of recreational use risk (i.e., incidence of gastrointestinal disease). During this transition period to an E. coli only bacteria standard, the fecal coliform bacteria target for this TMDL and the resulting load allocation is believe to be protective of the E. coli standard as well. This conclusion is based on the assumption that the ratio of E. coli to fecal coliform in the environment is equal to or less that the ratio of the E. coli bacteria standard to the fecal coliform bacteria standard, which is 63% (126:200). If the ratio of E. coli to fecal coliform in the environment is greater than 63%, then it is unlikely that the current TMDL will result in attainment of the E. coli standard. The department will assess attainment of the E. coli standard through additional monitoring consistent with the state’s water quality standards and beneficial use assessment methodology.

## 4.0 SIGNIFICANT SOURCES

### 4.1 Point Source Pollution Sources

Within the watersheds of the TMDL listed reaches of the Wild Rice River there are three wastewater treatment systems permitted through the North Dakota Pollutant Discharge Elimination System (NDPDES) Program. They are located in Gwinner, Milnor, and Wyndmere, North Dakota. Each system is allowed to discharge on an “as needed” basis, which averages about once per year (Appendix C). No fecal coliform or E. coli monitoring is required in any of the NDPDES permits, so no bacteria data are available. Wasteload allocations are given to the Milnor and Wyndmere facilities as described later in Section 5.5. The Gwinner facility will not be given a wasteload allocation because the facility is not part of the contributing drainage system and located over 20 miles from the impaired reach ND-09020105-012-S_00.

There are eighteen permitted animal feeding operations (AFOs) in the TMDL Listed watersheds of the Wild Rice River. The NDDoH has permitted two large (1,000 + animal units (AUs)) AFOs to operate. Nine small (0-300 AUs) and seven medium (301-999 AUs) AFOs are currently in the permitting process. All eighteen AFOs are zero discharge facilities and are not deemed a significant point source of fecal coliform loadings to the Wild Rice River.

### 4.2 Nonpoint Source Pollution Sources

The TMDL listed segment on the Wild Rice River is experiencing fecal coliform bacteria pollution from non-point sources in the watershed. Livestock production is not the dominant agricultural practice in the watershed but unpermitted animal feeding operations (AFOs) and "hobby farms" with fewer than 100 animals and livestock grazing and watering in proximity to the Wild Rice River are common along the TMDL listed segment. The southeast section of North Dakota typically experiences long duration or intense precipitation during the early summer months. These storms can cause overland flooding and rising river levels. Due to the close proximity of these unpermitted AFOs and "hobby farms" and livestock grazing and watering to the river, it is likely that this contributes fecal coliform bacteria to the Wild Rice River.

This assessment is also supported by the load duration curve analysis (Section 5.3) which shows all of the exceedences of the fecal coliform bacteria standard occurring during high, moist, and dry condition flows.

Wildlife may also contribute to the fecal coliform bacteria found in the water quality samples, but most likely in a lower concentration. Wildlife are nomadic with fewer numbers concentrating in a specific area, thus decreasing the probability of their contribution of fecal matter in significant quantities.

Septic system failure might contribute to the fecal coliform bacteria in the water quality samples. Failures can occur for several reasons, although the most common reason is improper maintenance (e.g. age, inadequate pumping). Other reasons for failure include improper installation, location, and choice of system. Harmful household chemicals can also cause failure by killing the bacteria that digest the waste. While the number of systems that are not functioning properly is unknown, it is estimated that 28 percent of the systems in North Dakota are failing (USEPA, 2002).

## 5.0 TECHNICAL ANALYSIS

In TMDL development, the goal is to define the linkage between the water quality target and the identified source or sources of the pollutant (i.e. fecal coliform bacteria) to determine the load reduction needed to meet the TMDL target. To determine the cause and effect relationship between the water quality target and the identified source, the "load duration curve" methodology was used.

The loading capacity or total maximum daily load (TMDL) is the amount of a pollutant (e.g. fecal coliform bacteria) a waterbody can receive and still meet and maintain water quality standards and beneficial uses. The following technical analysis addresses the fecal coliform bacteria reductions necessary to achieve the water quality standards target for fecal coliform bacteria of 200 CFU/100 mL with a margin of safety.

### 5.1 Mean Daily Stream Flow

In southeastern North Dakota, rain events are variable occurring during the months of April through August. Rain events can be sporadic and heavy or light, occurring over a short duration. Precipitation events of large magnitude, occurring at a faster rate than absorption, contribute to high runoff events. These events are represented by runoff in the high flow regime. The medium flow regime is represented by runoff that contributes to the stream over a longer duration. The low flow regime is characteristic of drought or precipitation events of small magnitude and do not contribute to runoff.

Flows for the watershed were determined by utilizing the Drainage-Area Ratio Method developed by the USGS (Ries et. al, 2000). The Drainage-Area Ratio Method assumes that the streamflow at the ungauged site is hydrologically similar (same per unit area) to the stream gauging station used as an index. This assumption is justified since the two ungauged sites are nested on the same reach as the index station. Drainage area and landuse for the ungauged sites (385234 and 384072) and index station (05053000) were determined through GIS using digital elevation models (DEMs) and the 2006 NASS landuse database. Streamflow data for the index station (05053000) was obtained from the USGS Water Science Center website. The index station (05053000) streamflow data were then divided by the drainage area to determine streamflows per unit area at the index station. Those values are then multiplied by the drainage area for each ungauged site to obtain estimated flow statistics for the ungauged sites.

### 5.2 Flow Duration Curve Analysis

The flow duration curve serves as the foundation for the load duration curve used in the TMDL. Flow duration curve analysis looks at the cumulative frequency of historic flow data over a specified time period. A flow duration curve relates flow (expressed as mean daily discharge) to the percent of time those mean daily flow values have been met or exceeded. The use of *"percent of time exceeded"* (i.e., duration) provides a uniform scale ranging from 0 to 100 percent, thus accounting for the full range of stream flows for the period of record. Low flows are exceeded most of the time, while flood flows are exceeded infrequently (USEPA, 2007).

A basic flow duration curve runs from high to low (0 to 100 percent) along the x-axis with the corresponding flow value on the y-axis (Figure 8). Using this approach, flow duration intervals are expressed as a percentage, with zero corresponding to the highest flows in the record (i.e., flood conditions) and 100 to the lowest flows in the record (i.e., drought). Therefore, as depicted in Figure 8, a flow duration interval of twenty five (25) percent, associated with a stream flow of 23.6 cfs, implies that 25 percent of all observed mean daily discharge values equal or exceed 23.6 cfs.

Once the flow duration curve is developed for the stream site, flow duration intervals can be defined which can be used as a general indicator of hydrologic condition (i.e. wet vs dry conditions and to what degree). These intervals (or zones) provide additional insight about conditions and patterns associated with the impairment (fecal coliform bacteria in this case) (USEPA, 2007). As depicted in Figure 8, the flow duration curve was divided into four zones, one representing high flows (0-10 percent), another for moist conditions (10-40 percent), one for dry conditions (40-70 percent) and one for low flows (70-88 percent). Based on the flow duration curve analysis, no flow occurred 12 percent of the time (88-100 percent). These flows intervals were defined by examining the range of flows for the site for the period of record and then by looking for natural breaks in the flow record based on the flow duration curve plot (Figure 8). A secondary factor in determining the flow intervals used in the analysis is the number of fecal coliform observations available for each flow interval.

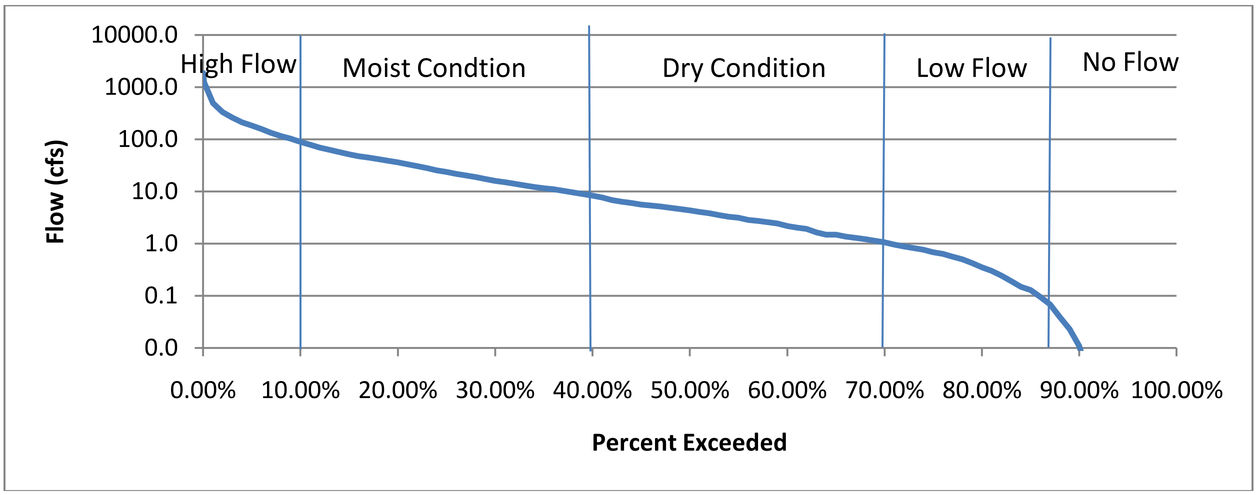



**Figure 8. Flow Duration Curve for the Wild Rice River Monitoring Station 385234 at Wyndmere, North Dakota and USGS Station 0505300 near Abercrombie, North Dakota.**

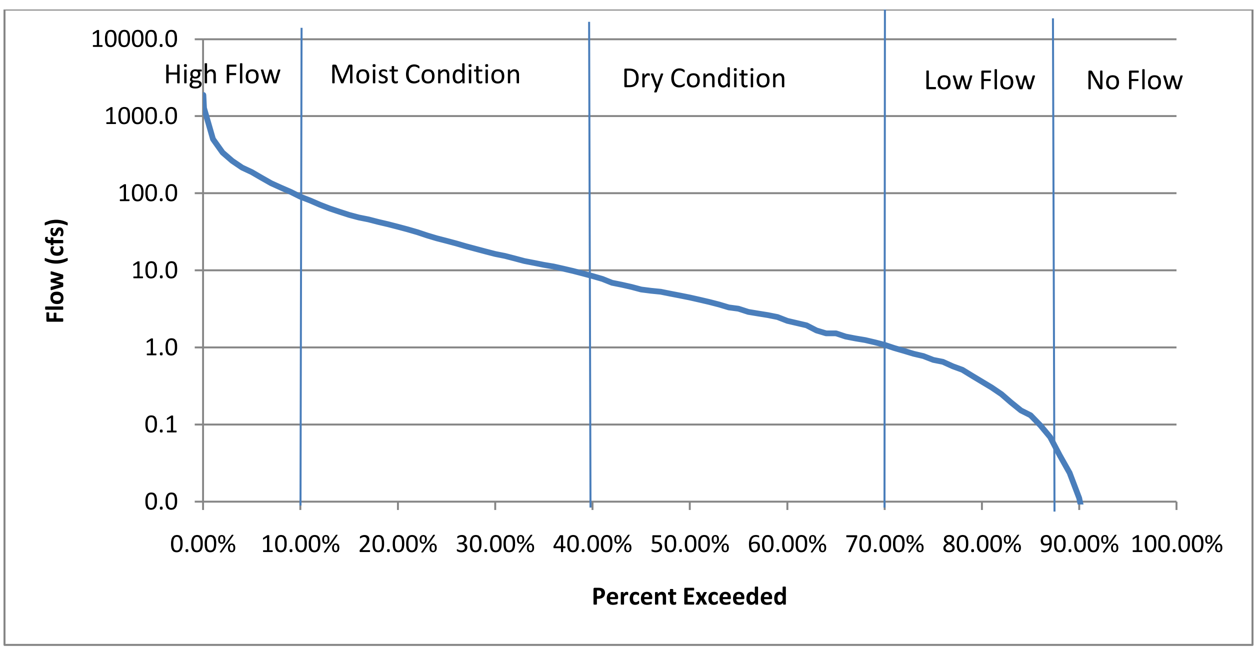



**Figure 9. Flow Duration Curve for the Wild Rice River Monitoring Station 384072 at Great Bend, North Dakota and USGS Station 05053000 near Abercrombie, North Dakota.**

### 5.3 Load Duration Analysis

An important factor in determining NPS pollution loads is variability in stream flows and loads associated with high and low flow. To better correlate the relationship between the pollutant of concern and the hydrology of the Section 303(d) TMDL listed segments, a load duration curve was developed for the Wild Rice River. The load duration curve was derived using the 200 CFU/100 mL State water quality standard and the flows generated as described in Sections 5.1 and 5.2.

Observed in-stream total fecal coliform bacteria data obtained from monitoring site 385234 from 2003 and 2004 and 384072 from 1996 and 2003-2004 (Appendix A) were converted to a pollutant load by multiplying total fecal coliform bacteria concentrations by the mean daily flow and a conversion factor. These loads are plotted against the percent exceeded of the flow on the day of sample collection (Figure 9). Points plotted above the 200 CFU/100 mL target curve exceed the water quality target. Points plotted below the curve are meeting the water quality target of 200 CFU/100 mL.

For each flow interval or zone, a regression relationship was developed between the samples which occur above the TMDL target (200 CFU/100 mL) curve and the corresponding percent exceeded flow. The load duration curves for sites 385234 and 384072 depicting a regression relationship for each flow interval are provided in Figure 10 and 11. As there were no fecal coliform bacteria concentrations above the TMDL target in the low flow regime for this site, a regression relationship and existing load could not be calculated for this flow regime.

The regression lines for the high, moist condition, and dry condition flows were then used with the midpoint of the percent exceeded flow for that interval to calculate the existing total fecal coliform bacteria load for that flow interval. For example, in the example provided in Figure 10, the regression relationship between observed fecal coliform bacteria loading and percent exceeded flow for the high flow (0-10 percent), moist condition (10-40 percent), and dry condition (40-70 percent) flow interval are:

Fecal coliform load (expressed as $10^7$ CFUs/day) = antilog (Intercept + (Slope*Percent Exceeded Flow))

Where the midpoint of the high flow interval from 0 to 10 percent is 5 percent, the existing fecal coliform load is:

Fecal coliform load ($10^7$ CFUs/day) = antilog (6.28 + (-8.11*0.0500))
= 751,487 x $10^7$ CFUs/day

Where the midpoint of the moist condition interval from 10 to 40 percent is 25 percent, the existing fecal coliform load is:

Fecal coliform load ($10^7$ CFUs/day) = antilog (5.36+ (-3.41*0.25))
= 32,150 x $10^7$ CFUs/day

Where the midpoint of the dry condition interval from 40 to 70 percent is 55 percent, the existing fecal coliform load is:

Fecal coliform load ($10^7$ CFUs/day) = antilog (5.05 + (-3.27*0.55))
= 1,801 x $10^7$ CFUs/day

The midpoint for the flow intervals is also used to estimate the TMDL target load. In the case of the previous examples, the TMDL target load for the midpoints or 5, 25, and 55 percent exceeded flow derived from the 200 CFU/100 mL TMDL target curves are 89,830 x $10^7$ CFUs/day, 11,559 x $10^7$ CFUs/day, and 1,519 x $10^7$ CFUs/day, respectively.

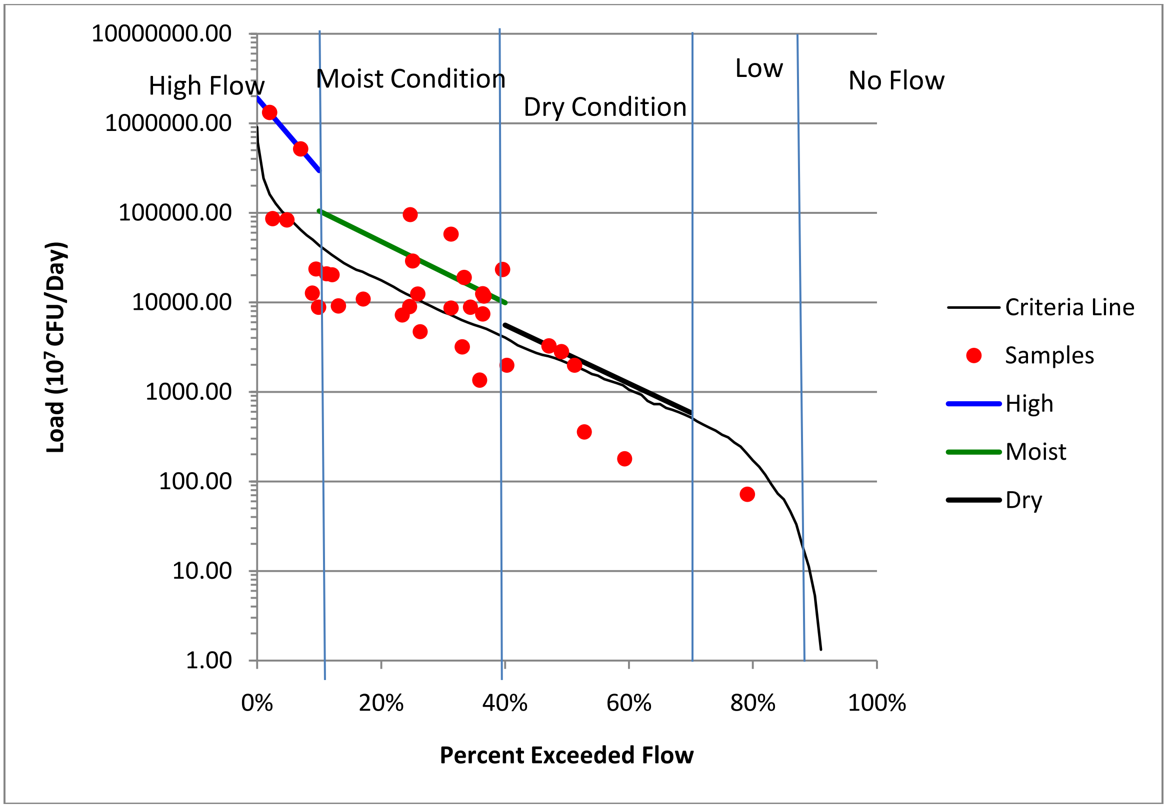



**Figure 10. Load Duration Curve for the Wild Rice River Monitoring Station 385234; (The curve reflects flows collected from 1989-2009).**

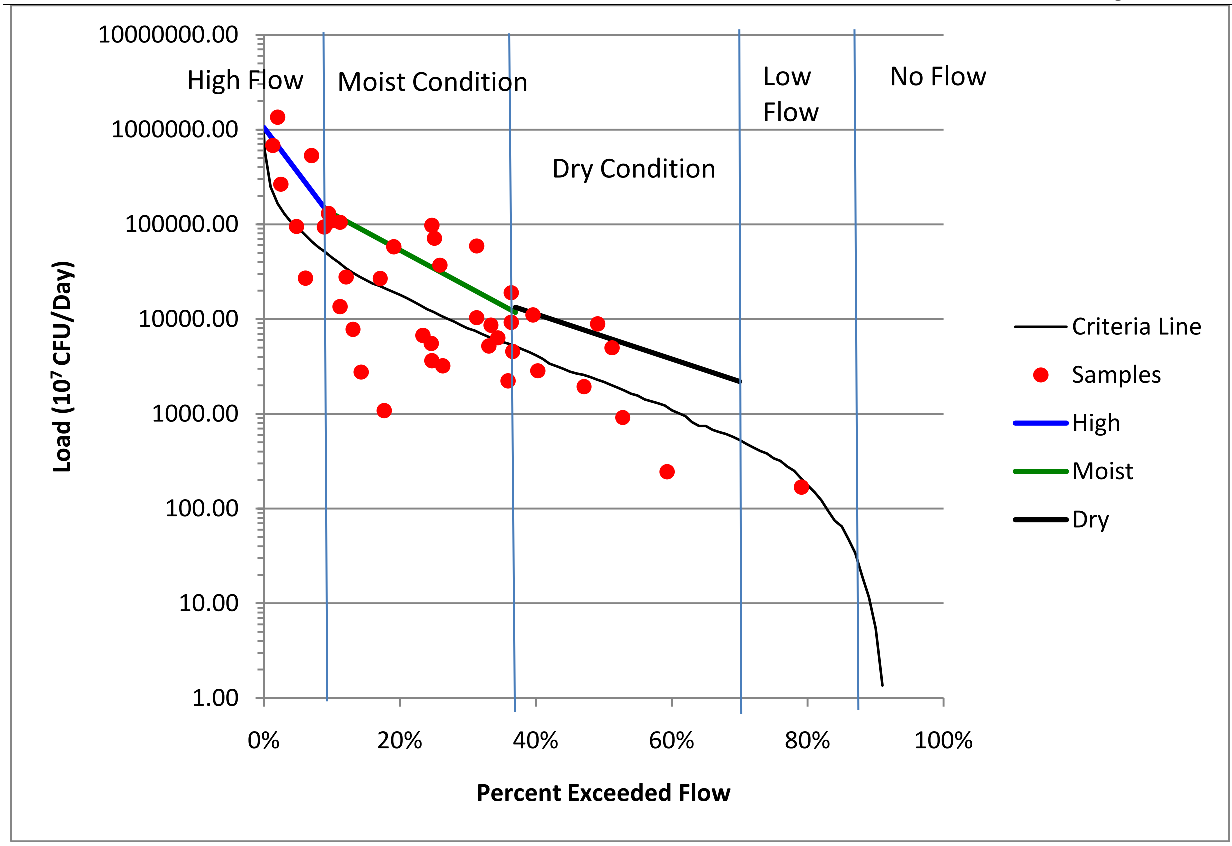



**Figure 11. Load Duration Curve for the Wild Rice River Monitoring Station 384072; (The curve reflects flows collected from 1989-2009).**

### 5.4 Wasteload Allocation Analysis

5.4.1 Milnor, ND Wastewater Treatment System

According to the NDPDES permit for Milnor, ND the facility is allowed to discharge on an "as needed" basis. The DMR indicates this wastewater treatment system averages discharges once per year.

Based on DMR data, median daily discharge during the recreation season (May 1 – September 30) for the years 2004 to present is 0.12 million gallons per day during the intermittent discharge (Appendix D). Since no fecal coliform or E. coli bacteria data are collected for this site, the system is also assigned the water quality standards value of 200 CFU/100mL for this TMDL.

Wasteload allocation for Milnor, ND was determined by taking the median discharge and multiplying by the assumed fecal coliform bacteria concentration of 200 CFUs/100mL, times appropriate conversion factors.

WLA = 0.12 million gallons/ day * 200 CFUs/100mL

= 0.12 million gallons/day * 3.7854 L/gal*1000mL/L* 200CFUs/100mL

= 97.3 x $10^7$ CFUs/day

5.4.2 Wyndmere, ND Wastewater Treatment System

According to the NDPEDS permit for Wyndmere, ND, a wastewater discharge is allowed on an "as needed" basis. Discharge monitoring reports (DMRs) indicate this wastewater treatment system averages one discharge per year. Based on the DMR data, average daily discharge during the recreation season (May 1 – September 30) for the years 2005 to present is 2.28 million gallons per day (MGD) during the intermittent discharge (Appendix C). Typically this is a combined discharge from two cells. Assuming they discharged from each cell separately for 14-16 days rather than the typical 7-8 days, their average daily discharge would be reduced to 1.19 MGD (Appendix C).

Since no fecal coliform or E. coli bacteria data are collected as a permit requirement, a fecal coliform bacteria concentration of 200 CFUs/100 mL is assumed for the wasteload allocation calculation. Since no fecal coliform or E. coli bacteria data are collected, the system is assigned the water quality standards value of 200 CFU/100mL for this TMDL. This value was chosen both because it is the North Dakota water quality standard, and because those dischargers throughout the state that are required to sample for bacteria are assigned this same value in their permit. While these facilities have a permit limit of 200 CFU/100mL for this TMDL, their discharge is typically much less. The average fecal value for 755 discharges from January 1, 2000 through August 1, 2010 for the general permit covered facilities (NDG12 and NDG22) with fecal coliform bacteria monitoring requirements in their permits is 84 CFUs/100 ml. The wasteload allocation for Wyndmere, ND was determined by taking an average daily discharge volume of 1.19 MGD multiplied by a fecal coliform bacteria concentration of 200 CFUs/100 mL, times appropriate conversion factors.

WLA = 1.19 million gallons/ day * 200 CFUs/100mL

= 1.19 million gallons/day * 3.7854 L/gal*1000mL/L* 200 CFU/100mL

= 906.1 x $10^7$ CFUs/day

## 5.5 Loading Sources

The majority of load reductions can generally be allotted to nonpoint sources. However, to account for uncertainty due to periodic discharges from permitted municipal facilities (e.g. Milnor and Wyndmere, ND), wasteload allocations (WLAs) are included for the impaired segments ND-09020105-012-S_00 and ND-09020105-009-S_00, respectively.

The most significant sources of total fecal coliform bacteria loading were defined as nonpoint source pollution originating from livestock. Based on the data available, the general focus of BMP's and load reductions for the listed segments should be on unpermitted animal feeding operations and "hobby farms" in close proximity of the Wild Rice River. One of the more important concerns regarding nonpoint sources is variability in stream flows. Variable stream flows often cause different source areas and loading mechanisms to dominate (Cleland, 2003). As previously described, three flow regimes (i.e., High Flow and Moist and Dry Conditions) were selected to represent the hydrology of the listed segments when applicable (Figure 7). The three flow regimes were used for site 385234 and 384072 because samples indicated exceedences of the water quality standard during periods of high, moist and dry flows.

By relating runoff characteristics to each flow regime one can infer which sources are most likely to contribute to fecal coliform bacteria loading. Animals grazing in the riparian area contribute fecal coliform bacteria by depositing manure where it has an immediate impact on water quality. Due to the close proximity of manure to the stream or by direct deposition in the stream, riparian grazing impacts water quality at high flow or under moist and dry conditions (Table 5). In contrast, intensive grazing of livestock in the upland and not in the riparian area has a high potential to impact water quality at high flows and under moist conditions impact at moderate flows (Table 5). Exclusion of livestock from the riparian area eliminates the potential of direct manure deposit and therefore is considered to be of high importance at all flows. However, intensive grazing in the upland creates the potential for manure accumulation and availability for runoff at high flows and a high potential for total fecal coliform bacteria contamination.

**Table 7. Nonpoint Sources of Pollution and Their Potential to Pollute at a Given Flow Regime**.

| Nonpoint Sources | Flow Regime | | |
|---|---|---|---|
| | **High Flow** | **Moist Conditions** | **Dry Conditions** |
| Riparian Area Grazing (Livestock) | H | H | H |
| Animal Feeding Operations | H | M | L |
| Manure Application to Crop and Range Land | H | M | L |
| Intensive Upland Grazing (Livestock) | H | M | L |

Note: Potential importance of nonpoint source area to contribute fecal coliform bacteria loads under a given flow regime. (H: High; M: Medium; L: Low)

# 6.0 MARGIN OF SAFETY AND SEASONALITY

## 6.1 Margin of Safety

Section 303(d) of the Clean Water Act and the U.S. Environmental Protection Agency (EPA) regulations require that "TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality." The margin of safety (MOS) can be either incorporated into conservative assumptions used to develop the TMDL (implicit) or added to a separate component of the TMDL (explicit).

To account for the uncertainty associated with known sources and the load reductions necessary to reach the TMDL target of 200 CFU/100 mL, a ten percent explicit margin of safety was used for this TMDL. The MOS was calculated as ten percent of the TMDL. In other words ten percent of the TMDL is set aside from the load allocation as a MOS. The ten percent MOS was derived by taking the difference between the points on the load duration curve using the 200 CFU/100 mL standard and the curve using the 180 CFU/100 mL.

### 6.2 Seasonality

Section 303(d)(1)(C) of the Clean Water Act and associated regulations require that a TMDL be established with seasonal variations. The Wild Rice River TMDL addresses seasonality because the flow duration curve was developed using 20 years of USGS gauge data encompassing all 12 months of the year. Additionally, the water quality standard is seasonally based on the recreation season from May 1 to September 30 and controls will be designed to reduce fecal coliform bacteria loads during the seasons covered by the standard.

## 7.0 TMDL

Table 6 provides an outline of the critical elements of the fecal coliform bacteria TMDL. A TMDL for the Wild Rice River (waterbody ND-09020105-012-S_00 and ND-09020105-009-S_00) is represented in Table 7 and 8. The TMDL provides a summary of average daily loads necessary to meet the water quality target (i.e. TMDL). The TMDL summary provides an estimate of the existing daily load, an estimate of the average daily loads necessary to meet the water quality target (i.e. TMDL load). This TMDL load includes a load allocation from known nonpoint sources and a 10 percent margin of safety. It should be noted that the TMDL loads, load allocations, and the MOS are estimated based on available data and reasonable assumptions and are to be used as a guide for implementation. The actual reduction needed to meet the applicable water quality standards may be higher or lower depending on the results of future monitoring.

**Table 8. TMDL Summary for the Wild Rice River.**

| Category | Description | Explanation |
|---|---|---|
| Beneficial Use Impaired | Recreation | Contact Recreation (i.e. swimming, fishing) |
| Pollutant | Fecal Coliform Bacteria | See Section 2.1 |
| TMDL Target | 200 CFU/100 ml | Based on North Dakota water quality standards |
| Significant Sources | Nonpoint Sources | No contributing Point Sources in Subwatershed |
| Margin of Safety (MOS) | Explicit | 10% |

TMDL = LC = WLA + LA + MOS

where

LC = loading capacity, or the greatest loading a waterbody can receive without violating water quality standards;

WLA = wasteload allocation, or the portion of the TMDL allocated to existing or future point sources;

LA = load allocation, or the portion of the TMDL allocated to existing or future non-point sources;

MOS = margin of safety, or an accounting of the uncertainty about the relationship between pollutant loads and receiving water quality. The margin of safety can be provided implicitly through analytical assumptions or explicitly by reserving a portion of the loading capacity.

**Table 9. Fecal Coliform Bacteria TMDL ($10^7$ CFU/day) for the Wild Rice River Waterbody ND-09020105-012-S_00 as represented by Site 385234.**

| | Flow Regime | | | |
|---|---|---|---|---|
| | High Flow | Moist Conditions | Dry Conditions | Low Flow |
| **Existing Load** | 751,487 | 32,150 | 1,801 | |
| **TMDL** | 89,829 | 11,559 | 1,519 | 370[1] |
| **WLA (Milnor)** | 97.3 | 97.3 | 97.3 | No Reduction Necessary |
| **LA** | 80,746 | 10,306 | 1,270 | |
| **MOS** | 8,982 | 1,155 | 151 | |

**[1]TMDL load is provided as a guideline for watershed management and BMP implementation.**

**Table 10. Fecal Coliform Bacteria TMDL ($10^7$ CFU/day) for the Wild Rice River Waterbody ND-09020105-009-S_00 as represented by Site 384072.**

| | Flow Regime | | | |
|---|---|---|---|---|
| | High Flow | Moist Conditions | Dry Conditions | Low Flow |
| **Existing Load** | 350,500 | 39,020 | 5,405 | |
| **TMDL** | 92,141 | 13,144 | 1,694 | 318[1] |
| **WLA** | 906.1 | 906.1 | 906.1 | No Reduction Necessary |
| **LA** | 81,993 | 10,923 | 618 | |
| **MOS** | 9,241 | 1,314 | 169 | |

**[1]TMDL load is provided as a guideline for watershed management and BMP implementation.**

## 8.0 ALLOCATION

The two permitted municipal facilities in Milnor, ND which discharges to segment ND-09020105-012-S_00 and Wyndmere, ND which discharges to segment ND-09020105-009-S_00, will have a portion of the TMDL, 97.3 x $10^7$ CFUs/day and 906.1 x $10^7$ CFUs/day, respectively have been allocated to these point sources. The remaining load has been allocated to nonpoint sources in the watersheds.

Nonpoint source pollution is a contributor to elevated total fecal coliform bacteria levels in the Wild Rice River watersheds. The fecal coliform bacteria samples and load duration curve analysis of the impaired reaches identified the high, moist condition and dry condition flow regimes as the time of fecal coliform bacteria exceedences of the 200 CFU/100 mL target. To reduce NPS pollution for the high, moist and dry condition flow regimes, specific BMPs are described in Section 8.1 that will mitigate the effects of total fecal coliform bacteria loading to the impaired reaches.

To achieve the TMDL targets identified in the report, it will require the wide spread support and voluntary participation of landowners and residents in the watershed. The TMDLs described in this report are a plan to improve water quality by implementing best management practices through non-regulatory approaches. "Best management practices" (BMPs) are methods, measures, or practices that are determined to be a reasonable and cost effective means for a land owner to meet nonpoint source pollution control needs," (USEPA, 2001). This TMDL plan is put forth as a recommendation for what needs to be accomplished for the Wild Rice River and associated watershed to restore and maintain its recreational uses. Water quality monitoring should continue in order to measure BMP effectiveness and determine through adaptive management if loading allocation recommendations need to be adjusted.

Controlling nonpoint sources is an immense undertaking requiring extensive financial and technical support. Provided that technical/financial assistance is available to stakeholders, these BMPs have the potential to significantly reduce total fecal coliform bacteria loading to the Wild Rice River.

**Table 11. Management Practices and Flow Regimes Affected by Implementation of BMPs.**

| Management Practice | Flow Regime and Expected Reduction | | |
|---|---|---|---|
| | High Flow-70% | Moderate Flow-80% | Low Flow-74% |
| Livestock Exclusion From Riparian Area | X | X | X |
| Water Well and Tank Development | X | X | X |
| Prescribed Grazing | X | X | X |
| Waste Management System | X | X | |
| Vegetative Filter Strip | | X | |
| Septic System Repair | | X | X |

### 8.1 Livestock Management Recommendations

Livestock management BMPs are designed to promote healthy water quality and riparian areas through management of livestock and associated grazing land. Fecal matter from livestock, erosion from poorly managed grazing, land and riparian areas can be a significant source of fecal coliform bacteria loading to surface water. Precipitation, plant cover, number of animals, and soils are factors that affect the amount of bacteria delivered to a waterbody because of livestock. These specific BMPs are known to reduce nonpoint source pollution from livestock. These BMPs include:

Livestock exclusion from riparian areas- This practice is established to remove livestock from grazing riparian areas and watering in the stream. Livestock exclusion is accomplished through fencing. A reduction in stream bank erosion can be expected by minimizing or eliminating hoof trampling. A stable stream bank will support vegetation that will hold banks in place and serve a secondary function as a filter from nonpoint source runoff. Added vegetation will create aquatic habitat and shading for macroinvertebrates and fish. Direct deposit of fecal matter into the stream and stream banks will be eliminated as a result of livestock exclusion by fencing.

Water well and tank development- Fencing animals from stream access requires and alternative water source. Installing water wells and tanks satisfies this need. Installing water tanks provides a quality water source and keeps animals from wading and defecating in streams. This will reduce the probability of pathogenic infections to livestock and the public.

Prescribed grazing- This practice is used to increase ground cover and ground stability by rotating livestock throughout multiple fields. Grazing with a specified rotation minimizes overgrazing and resulting erosion. The Natural Resource Conservation Service (NRCS) recommends grazing systems to improve and maintain water quality and quantity. Duration, intensity, frequency, and season of grazing can be managed to enhance vegetation cover and litter, resulting in reduced runoff, improved infiltration, increased quantity of soil water for plant growth, and better manure distribution and increased rate of decomposition, (NRCS, 1998). In a study by Tiedemann et al. (1988), as presented by USEPA (1993), the effects of four grazing strategies on bacteria levels in thirteen watersheds in Oregon were studied during the summer of 1984. Results of the study (Table 10) showed that when livestock are managed at a stocking rate of 19 acres per animal unit month, with water developments and fencing, bacteria levels were reduced significantly.

Waste management system- Waste management systems can be effective in controlling up to 90 percent of fecal coliform bacteria loading originating from confined animal feeding areas (Table 11). A waste management system is made up of various components designed to control nonpoint source pollution from concentrated animal feeding operations (CAFOs) and animal feeding operations (AFOs). Diverting clean water from the feeding area and containing dirty water from the feeding area in a pond are typical practices of a waste management system. Manure handling and application of manure is designed to be adaptive to environmental, soil, and plant conditions to minimize the probability of contamination of surface water.

**Table 12. Bacterial Water Quality Response to Four Grazing Strategies (Tiedemann et al., 1988).**

| Grazing Strategy | | Geometric Mean Fecal Coliform Count |
|---|---|---|
| Strategy A: | Ungrazed | 40/L |
| Strategy B: | Grazing without management for livestock distribution; 20.3 ac/AUM. | 150/L |
| Strategy C: | Grazing with management for livestock distribution: fencing and water developments; 19.0 ac/AUM | 90/L |
| Strategy D: | Intensive grazing management, including practices to attain uniform livestock distribution and improve forage production with cultural practices such as seeding, fertilizing, and forest thinning; 6.9 ac/AUM | 950/L |

### 8.2 Other Recommendations

Vegetative filter strip- Vegetated filter strips are used to reduce the amount of sediment, particulate organics, dissolved contaminants, nutrients, and in the case of this TMDL, fecal coliform bacteria to streams. The effectiveness of filter strips and other BMPs in removing fecal coliform bacteria is quite successful. Results from a study by Pennsylvania State University (1992a) as presented by USEPA (1993) (Table 11), suggest that vegetative filter strips are capable of removing up to 55 percent of fecal coliform loading to rivers and streams (Table 11). The ability of the filter strip to remove contaminants is dependent on field slope, filter strip slope, erosion rate, amount and particulate size distribution of sediment delivered to the filter strip, density and height of vegetation, and runoff volume associated with erosion producing events (NRCS, 2001).

**Table 13. Relative Gross Effectiveness[a] of Confined Livestock Control Measures (Pennsylvania State University, 1992a).**

| Practice[b] Category | Runoff[c] Volume | Total[d] Phosphorus (%) | Total[d] Nitrogen (%) | Sediment (%) | Fecal Coliform (%) |
|---|---|---|---|---|---|
| Animal Waste System[e] | - | 90 | 80 | 60 | 85 |
| Diversion System[f] | - | 70 | 45 | NA | NA |
| Filter Strips[g] | - | 85 | NA | 60 | 55 |
| Terrace System | - | 85 | 55 | 80 | NA |
| Containment Structures[h] | - | 60 | 65 | 70 | 90 |

**NA** = Not Available.
**a** Actual effectiveness depends on site-specific conditions. Values are not cumulative between practice categories.
**b** Each category includes several specific types of practices.
**c** - = reduction; + = increase; 0 = no change in surface runoff.
**d** Total phosphorus includes total and dissolved phosphorus; total nitrogen includes organic-N, ammonia-N, and nitrate-N.
**e** Includes methods for collecting, storing, and disposing of runoff and process-generated wastewater.
**f** Specific practices include diversion of uncontaminated water from confinement facilities.
**g** Includes all practices that reduce contaminant losses using vegetative control measures.
**h** Includes such practices as waste storage ponds, waste storage structures, waste treatment lagoons.

Septic System – Septic systems provide an economically feasible way of disposing of household wastes where other means of waste treatment are unavailable (e.g., public or private treatment facilities). The basis for most septic systems involves the treatment and distribution of household wastes through a series of steps involving the following:

1. A sewer line connecting the house to a septic tank
2. A septic tank that allows solids to settle out of the effluent
3. A distribution system that dispenses the effluent to a leach field
4. A leaching system that allows the effluent to enter the soil

Septic system failure exists when one or more components of the septic system do not work properly and untreated waste or wastewater leaves the system. Wastes may pond in the leach field and ultimately run off directly into nearby streams or percolate into groundwater. Untreated septic system waste is a potential source of nutrients (nitrogen and phosphorus), organic matter, suspended solids, and fecal coliform bacteria. Land application of septic system sludge, although unlikely, may also be a source of contamination.

Septic system failure can occur for several reasons, although the most common reason is improper maintenance (e.g. age, inadequate pumping). Other reasons for failure include improper installation, location, and choice of system. Harmful household chemicals can also cause failure by killing the bacteria that digest the waste. While the number of systems that are not functioning properly is unknown, it is estimated that 28 percent of the systems in North Dakota are failing (USEPA, 2002).

## 9.0 PUBLIC PARTICIPATION

To satisfy the public participation requirement of this TMDL, a hard copy of the TMDL for The Wild Rice River and a request for comment was mailed to participating agencies, partners, and to those who request a copy. Those included in the mailing of a hard copy were as follows:

- Richland County Soil Conservation District;
- Richland County Water Resource Board;
- Sargent County Soil Conservation District;

- Sargent County Water Resource Board;
- Natural Resource Conservation Service (State Office); and
- U.S. Environmental Protection Agency, Region VIII

In addition to mailing copies of this TMDL for the Wild Rice River to interested parties, the TMDL was posted on the North Dakota Department of Health, Division of Water Quality web site at http://www.ndhealth.gov./WQ/SW/Z2 TMDL/TMDLs Under PublicComment/B Under Public Commment.html . A 30 day public notice soliciting comment and participation was also published in the following newspapers:

- The Daily News (Richland County); and
- Sargent County Teller.

Comments were only received from US EPA Region 8, which were provided as part of their normal public notice review (Appendix E). The NDDoH's response to these comments are provided in Appendix F.

## 10.0 MONITORING

As stated previously, it should be noted that the TMDL loads, waste load allocations, load allocations, and the MOS are estimated based on available data and reasonable assumptions and are to be used as a guide for implementation. The actual reduction needed to meet the applicable water quality standards may be higher or lower depending on the results of future monitoring.

To ensure that the implementation of BMPs will reduce fecal coliform, as well as E. coli bacteria levels necessary to meet water quality standards, water quality monitoring will be conducted in accordance with an approved Quality Assurance Project Plan (QAPP).

Specifically, monitoring will be conducted for all variables that are currently causing impairments to the beneficial uses of the waterbody. These include, but are not limited to fecal coliform bacteria and E. coli bacteria. Once a watershed restoration plan (e.g. Section 319 Non point Source Project Implementation Plan [PIP]) is implemented, monitoring will be conducted in the watershed beginning two years after implementation and extending five years after the implementation project is complete.

In regards to the two point sources, as NDPDES permits are renewed, fecal coliform and /or E. coli bacteria limits will be established in their permits and discharge monitoring will be implemented to ensure both the permit limits and their discharge volumes are consistent with their wasteload allocations and therefore, water quality standards.

## 11.0 TMDL IMPLEMENTATION STRATEGY

Implementation of TMDLs is dependent upon the availability of Section 319 NPS funds or other watershed restoration programs (e.g. USDA Environmental Quality Incentive Program), as well as securing a local project sponsor and required matching funds. Provided these three requirements are in place, a project implementation plan (PIP) is developed in accordance with the TMDL and submitted to the ND Nonpoint Source Pollution Task Force and US EPA for approval. The implementation of the BMPs contained in the NPS PIP is voluntary. Therefore, success of any TMDL implementation project is ultimately dependant on the ability of the local project sponsor to find cooperating producers.

Monitoring is an important and required component of any PIP. As a part of the PIP, data are collected to monitor and track the effects of BMP implementation as well as to judge overall project success. Quality Assurance Project Plans (QAPPs) detail the strategy of how, when, and where monitoring will be conducted to gather the data needed to document the TMDL implementation goal(s). As data are gathered and analyzed, watershed restoration tasks are adapted to place BMPs where they will have the greatest benefit to water quality.

## 12.0 REFERENCES

Cleland. 2003. *TMDL Development from the "Bottom Up" – Part III: Duration Curves and Wet Weather Assessmen*t. America's Clean Water Foundation, Washington, D.C.

NDAWN. 2009. Wyndmere, North Dakota Weather Station. North Dakota Agriculture Weather Network. North Dakota State University, Fargo, North Dakota. Available at http://ndawn.ndsu.nodak.edu/index.html

NDDoH. 2005. Quality Assurance Project Plan for the Richland County Antelope Creek and Wild Rice Riparian Corridor Project in North Dakota. North Dakota Department of Health, Division of Water Quality. Bismarck, North Dakota.

NDDoH. 2006. *Standards of Quality for Waters of the State.* Chapter 33-16-02 of the North Dakota Century Code. North Dakota Department of Health, Division of Water Quality. Bismarck, North Dakota.

NDDoH. 2008. *North Dakota 2004 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads.* North Dakota Department of Health, Division of Water Quality. Bismarck, North Dakota.

NRCS. 1998. *Natural Resources Conservation Service Practice Specification* 528. USDA-Natural Resources Conservation Service, North Dakota. Available at http://efotg.nrcs.usda.gov

NRCS. 2001. *Natural Resources Conservation Service Practice Specification 393* – Filter Strip (Acres) [Online]. USDA – Natural Resources Conservation Service, North Dakota. Available at http://www.nd.nrcs.usda.gov/resources/section4/standards/Section4.html.

Pennsylvania State University. 1992. NonpointSource Database. Pennsylvania State University, Department of Agricultural and Biological Engineering, University Park, PA.

Tiedemann, A.R., D.A. Higgins, T.M. Quigley, H.R. Sanderson, and C. C. Bohn.1988. *Bacterial Water Quality Responses to Four Grazing Strategies – Comparison with Oregon Standards*.

U.S. Census Bureau. 2001. North Dakota Quick Facts. United States Census Bureau, USA Quickfacts. Available at http://quickfacts.census.gov/qfd/states/38/38037.html.

USDA, SCS. 1975 . Soil Survey of Richland County, North Dakota. United States Department of Agriculture, Soil Conservation Service.

USEPA. 1993. Guidance Specifying Management Measures for Sources of NonpointPollution in Coastal Waters. EPA 840-B-92-002. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

USEPA. 2001. Protocol for Developing Pathogen TMDLs. EPA 841-R-00-002. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

USEPA. 2002. Onsite Wastewater Treatment Systems Manual. EPA/625/R-00/008. U. S. Environmental Protection Agency. Office of Water, Office of Research and Development.

USEPA. 2007. An Approach for Using Load Duration Curves in the Development of TMDLs. EPA-841-B-07-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. Available at http://www.epa.gov/owow/tmdl/techsupp.html

USGS. 2006. *Ecoregions of North Dakota and South Dakota*. United States Geological Survey. Available at http://www.npwrc.usgs.gov/resource/habitat/ndsdeco/nodak.html.

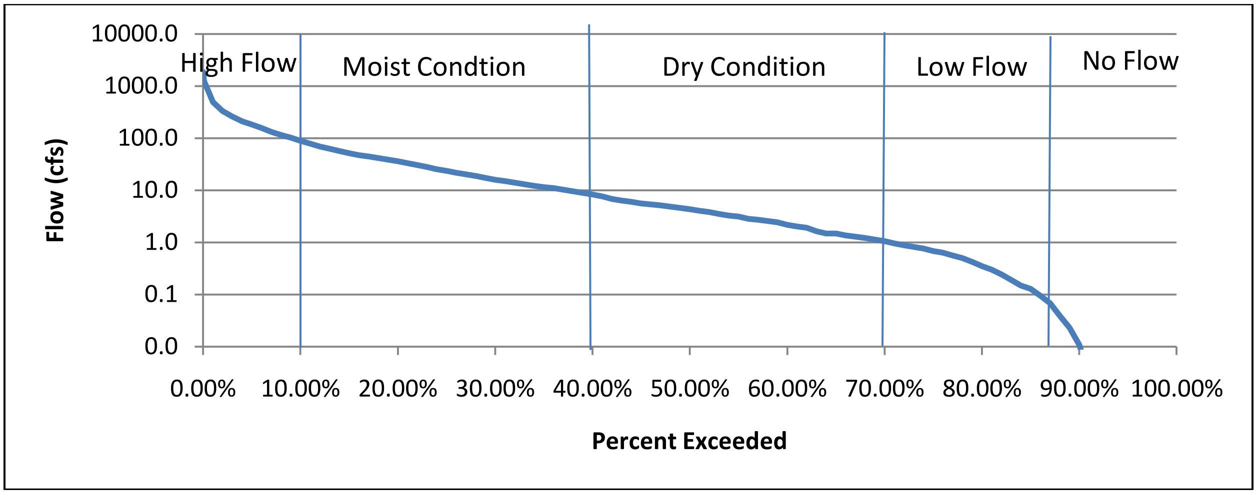
# Appendix A
# Fecal Coliform Bacteria Data Collected for Sites 385234 (2003-2004) and 384072 (1996 and 2003-2004)

| 385234 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| May | | June | | July | | August | | September | |
| 07-May-03 | 40 | 03-Jun-03 | 100 | 01-Jul-03 | 180 | 14-Aug-03 | 200 | 27-Sep-04 | 470 |
| 12-May-03 | 50 | 10-Jun-03 | 300 | 10-Jul-03 | 40 | 24-Aug-04 | 70 | | |
| 15-May-03 | 500 | 17-Jun-03 | 450 | 15-Jul-03 | 60 | | | | |
| 19-May-03 | 150 | 25-Jun-03 | 1600 | 23-Jul-03 | 1600 | | | | |
| 22-May-03 | 110 | 01-Jun-04 | 1600 | 29-Jul-03 | 610 | | | | |
| 28-May-03 | 90 | 03-Jun-04 | 120 | 07-Jul-04 | 1600 | | | | |
| 05-May-04 | 30 | 07-Jun-04 | 50 | 13-Jul-04 | 230 | | | | |
| 12-May-04 | 1100 | 09-Jun-04 | 110 | 22-Jul-04 | 240 | | | | |
| 17-May-04 | 250 | 14-Jun-04 | 100 | 27-Jul-04 | 100 | | | | |
| 26-May-04 | 260 | 17-Jun-04 | 120 | | | | | | |
| | | 22-Jun-04 | 100 | | | | | | |
| | | 29-Jun-04 | 280 | | | | | | |
| | | | | | | | | | |
| **Geometric Mean** | 141 | | 211 | | 249 | | NA | | NA |
| **% Exceeded 400 CFU/100 mL** | 20% | | 25% | | 33% | | NA | | NA |
| **Use Assessment** | Fully Support but Threatened | Not Supporting | | Not Supporting | | NA | | NA | |
| **Number of Samples** | 10 | | 12 | | 9 | | 2 | | 1 |

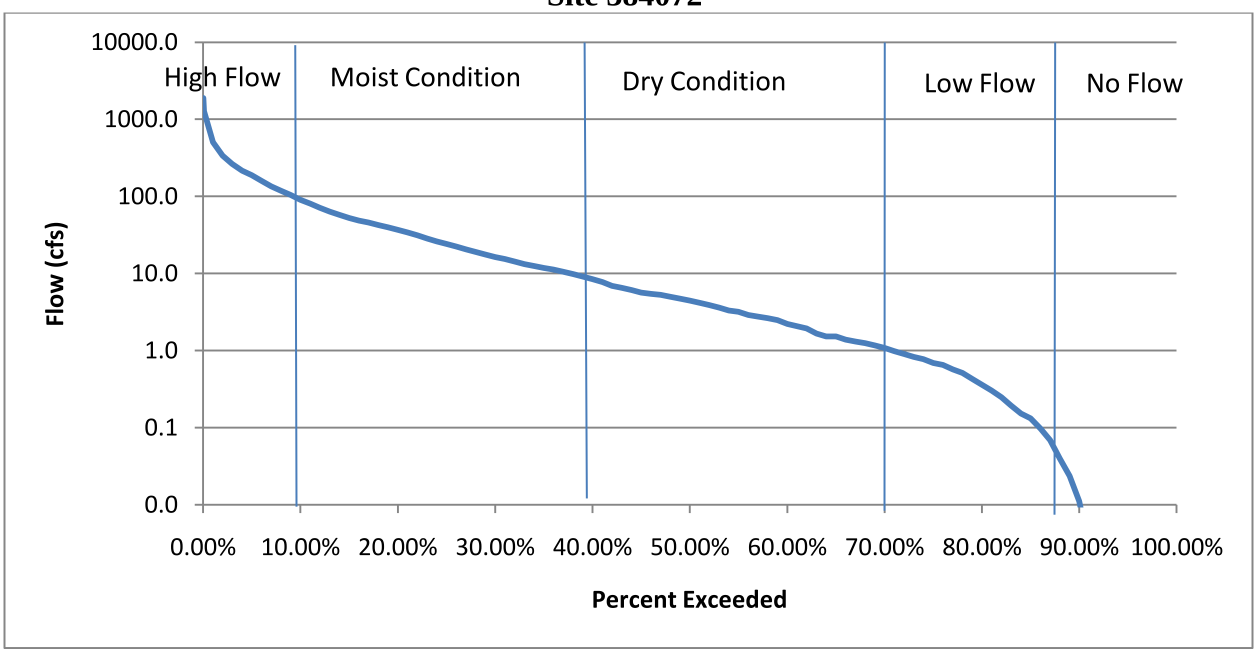
| 384072 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| May | | June | | July | | August | | September | |
| 01-May-96 | 20 | 03-Jun-96 | 70 | 01-Jul-03 | 200 | 14-Aug-03 | 490 | 27-Sep-04 | 700 |
| 06-May-96 | 10 | 26-Jun-96 | 60 | 10-Jul-03 | 480 | 24-Aug-04 | 160 | | |
| 15-May-96 | 600 | 03-Jun-03 | 160 | 15-Jul-03 | 50 | | | | |
| 20-May-96 | 620 | 10-Jun-03 | 210 | 23-Jul-03 | 1600 | | | | |
| 29-May-96 | 70 | 17-Jun-03 | 170 | 29-Jul-03 | 270 | | | | |
| 07-May-03 | 100 | 25-Jun-03 | 1600 | 07-Jul-04 | 1600 | | | | |
| 12-May-03 | 80 | 01-Jun-04 | 1600 | 13-Jul-04 | 670 | | | | |
| 15-May-03 | 1200 | 03-Jun-04 | 360 | 22-Jul-04 | 280 | | | | |
| 19-May-03 | 90 | 07-Jun-04 | 360 | 27-Jul-04 | 140 | | | | |
| 22-May-03 | 100 | 09-Jun-04 | 540 | | | | | | |
| 28-May-03 | 60 | 14-Jun-04 | 540 | | | | | | |
| 05-May-04 | 40 | 17-Jun-04 | 160 | | | | | | |
| 12-May-04 | 510 | 22-Jun-04 | 240 | | | | | | |
| 17-May-04 | 770 | 29-Jun-04 | 340 | | | | | | |
| 26-May-04 | 150 | | | | | | | | |
| | | | | | | | | | |
| **Geometric Mean** | 132 | | 290 | | 354 | | NA | | NA |
| **% Exceed 400 CFU/100 mL** | 33% | | 29% | | 44% | | NA | | NA |
| **Use Assessment** | Fully Supporting but Threatened | Not Supporting | | Not Supporting | | NA | | NA | |
| **Number of Samples** | 15 | | 14 | | 9 | | 2 | | 1 |

# Appendix B
# Flow Duration Curves for Sites 385234 and 384072

**Site 385234**



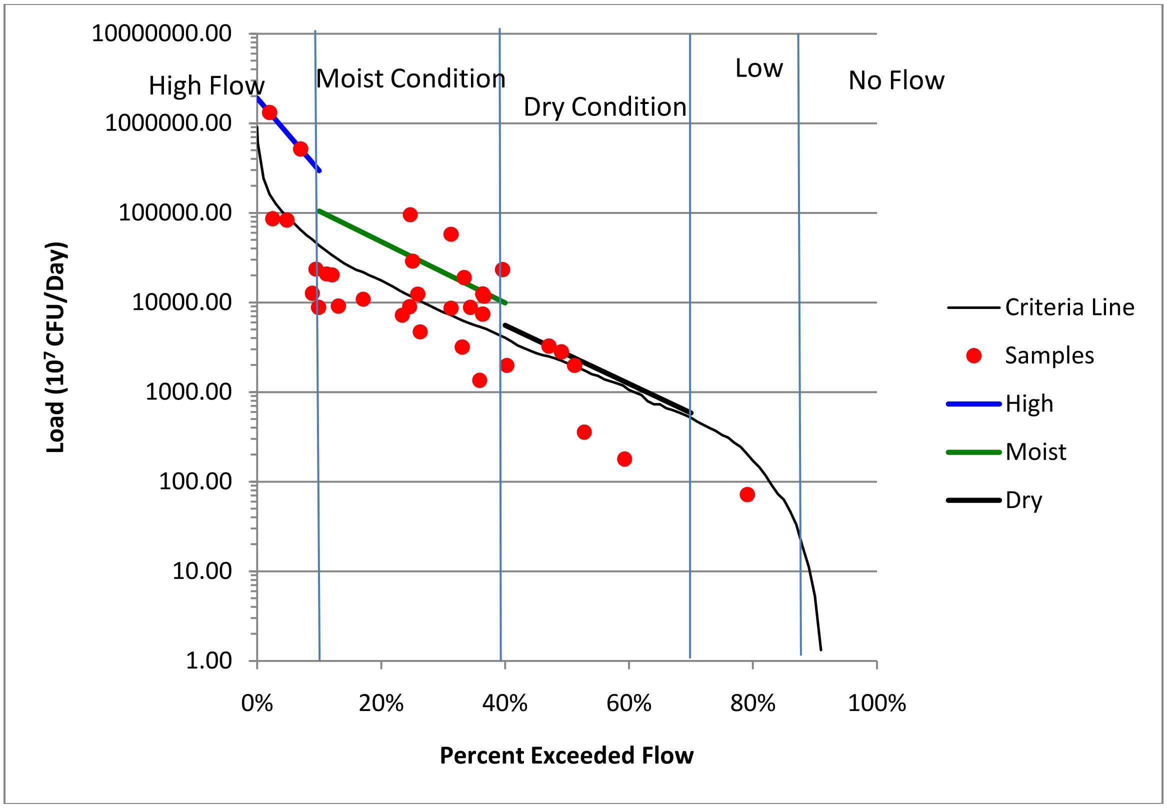

**Site 384072**



# Appendix C
# Load Duration Curves, Estimated Loads, TMDL Targets, and Percentage of Reduction Required for Sites 385234 and 384072

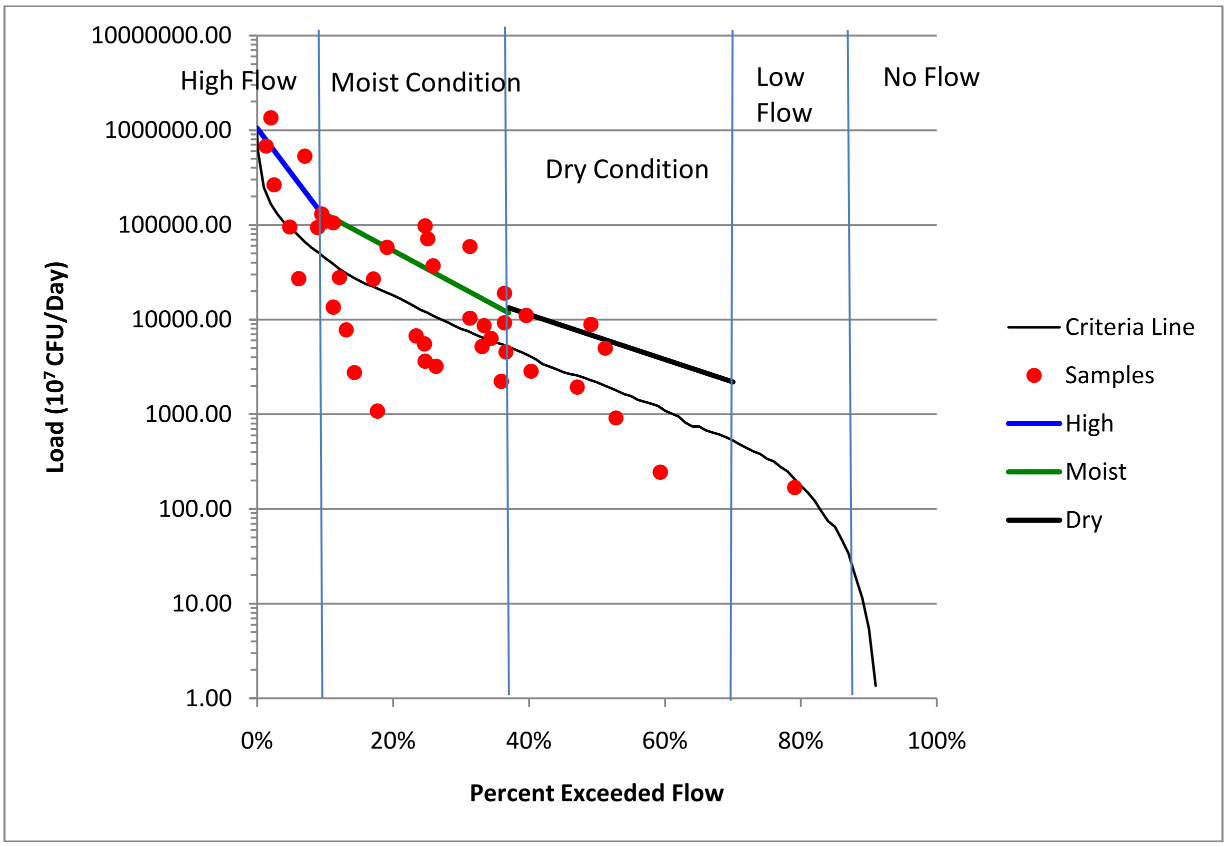
### 385234 Wild Rice River near Wyndmere, ND

| | Load ($10^7$ CFUs/Day) | | | Load ($10^7$ CFUs/Period) | | | |
|---|---|---|---|---|---|---|---|
| | Median Percentile | Existing | TMDL | Days | Existing | TMDL | Percent Reduction |
| High | 5.00% | 751487.00 | 89829.93 | 36.50 | 27429275.37 | 3278792.27 | 88.05% |
| Moist | 25.00% | 32150.30 | 11559.00 | 109.50 | 3520458.25 | 1265710.25 | 64.05% |
| Dry | 55.00% | 1801.04 | 1519.18 | 109.50 | 197214.13 | 166350.49 | 15.65% |
| | | | Total | 256 | 31146948 | 4710853 | 84.88% |



## 384072 Wild Rice River at Great Bend, ND

| | Load ($10^7$ CFUs/Day) | | | | Load ($10^7$ CFUs/Period) | | |
|---|---|---|---|---|---|---|---|
| | Median Percentile | Existing | TMDL | Days | Existing | TMDL | Percent Reduction |
| High | 5.00% | 350499.67 | 92141.93 | 36.50 | 12793237.91 | 3363180.36 | 73.71% |
| Moist | 23.50% | 39019.74 | 13143.77 | 98.55 | 3845395.77 | 1295319.02 | 66.32% |
| Dry | 53.50% | 5405.34 | 1693.79 | 120.45 | 651073.67 | 204016.46 | 68.66% |
| | | | Total | 256 | 17289707 | 4862516 | 71.88% |



# Appendix D
# North Dakota Department of Health Water Quality NDPDES DMR Data for Milnor and Wyndmere, North Dakota

## Milnor DMR Data

| Permit # | Facility Name | Trt Name | Start | End | Days | Total Discharged | Units | Discharge/Day |
|---|---|---|---|---|---|---|---|---|
| NDG320338 | Milnor City Of | Cell 3 | 5/28/2004 | 6/3/2004 | 6 | 1.029 | MGAL | 0.1715 |
| NDG320338 | Milnor City Of | Cell 3 | 5/1/2005 | 5/3/2005 | 3 | 0.385875 | MGAL | 0.128625 |
| NDG320338 | Milnor City Of | Cell 3 | 5/7/2007 | 5/14/2007 | 8 | 1.029 | MGAL | 0.128625 |
| NDG320338 | Milnor City Of | Cell 3 | 7/8/2008 | 7/15/2008 | 8 | 1.029 | MGAL | 0.128625 |
| NDG320338 | Milnor City Of | Cell 3 | 5/5/2009 | 5/12/2009 | 8 | 12.349 | MGAL | 1.543625 |

| | |
|---|---|
| Median per day (MGAL): | 0.12 |

## Wyndmere DMR Data

| Permit # | Facility Name | Trt Name | Start | End | Days | Total Discharged | Units | Discharge/Day |
|---|---|---|---|---|---|---|---|---|
| NDG320044 | Wyndmere City Of | Cell 2 North | 6/27/2005 | 7/4/2005 | 8 | 9.14 | MGAL | 1.14 |
| NDG320044 | Wyndmere City Of | Cell 2 North | 9/9/2008 | 9/16/2008 | 8 | 9.14 | MGAL | 1.14 |
| NDG320044 | Wyndmere City Of | Cell 2 North | 6/30/2009 | 7/6/2009 | 7 | 9.14 | MGAL | 1.3 |
| NDG320044 | Wyndmere City Of | Cell 3 South | 6/27/2005 | 7/4/2005 | 8 | 9.14 | MGAL | 1.14 |
| NDG320044 | Wyndmere City Of | Cell 3 South | 9/9/2008 | 9/16/2008 | 8 | 9.14 | MGAL | 1.14 |
| NDG320044 | Wyndmere City Of | Cell 3 South | 6/30/2009 | 7/6/2009 | 7 | 9.14 | MGAL | 1.3 |

| | |
|---|---|
| Average per day (MGAL): | 1.196904 |

# Appendix E
# US EPA Region 8 Public Notice Review and Comments

# EPA REGION VIII TMDL REVIEW

TMDL Document Info:

| | |
|---|---|
| **Document Name:** | **Fecal Coliform Bacteria TMDL for the Wild Rice River in Sargent and Richland Counties, North Dakota** |
| **Submitted by:** | **Mike Ell, North Dakota Department of Health** |
| **Date Received:** | **August 13, 2010** |
| **Review Date:** | **August 20, 2010** |
| **Reviewer:** | **Vern Berry, EPA** |
| **Rough Draft / Public Notice / Final?** | **Public Notice** |
| **Notes:** | |

Reviewers Final Recommendation(s) to EPA Administrator (used for final review only):

☐ Approve
☐ Partial Approval
☐ Disapprove
☐ Insufficient Information

**Approval Notes to Administrator:**

This document provides a standard format for EPA Region 8 to provide comments to state TMDL programs on TMDL documents submitted to EPA for either formal or informal review. All TMDL documents are evaluated against the minimum submission requirements and TMDL elements identified in the following 8 sections:

1. Problem Description
   a. ... TMDL Document Submittal Letter
   b. Identification of the Waterbody, Impairments, and Study Boundaries
   c. Water Quality Standards
2. Water Quality Target
3. Pollutant Source Analysis
4. TMDL Technical Analysis
   a. Data Set Description
   b. Waste Load Allocations (WLA)
   c. Load Allocations (LA)
   d. Margin of Safety (MOS)
   e. Seasonality and variations in assimilative capacity
5. Public Participation
6. Monitoring Strategy
7. Restoration Strategy
8. Daily Loading Expression

Under Section 303(d) of the Clean Water Act, waterbodies that are not attaining one or more water quality standard (WQS) are considered "impaired." When the cause of the impairment is determined to be a pollutant, a TMDL analysis is required to assess the appropriate maximum allowable pollutant loading rate. A TMDL document consists of a technical analysis conducted to: (1) assess the maximum pollutant loading rate that a waterbody is able to assimilate while maintaining water quality standards; and (2) allocate that assimilative capacity among the known sources of that pollutant**.** A well written TMDL document will describe a path forward that may be used by those who implement the TMDL recommendations to attain and maintain WQS.

Each of the following eight sections describes the factors that EPA Region 8 staff considers when reviewing TMDL documents.  Also included in each section is a list of EPA's minimum submission requirements relative to that section, a brief summary of the EPA reviewer's findings, and the reviewer's comments and/or suggestions.  Use of the verb "must" in the minimum submission requirements denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation. Use of the term "should" below denotes information that is generally necessary for EPA to determine if a submitted TMDL is approvable.

This review template is intended to ensure compliance with the Clean Water Act and that the reviewed documents are technically sound and the conclusions are technically defensible.

# 1. Problem Description

A TMDL document needs to provide a clear explanation of the problem it is intended to address. Included in that description should be a definitive portrayal of the physical boundaries to which the TMDL applies, as well as a clear description of the impairments that the TMDL intends to address and the associated pollutant(s) causing those impairments.  While the existence of one or more impairment and stressor may be known, it is important that a comprehensive evaluation of the water quality be conducted prior to development of the TMDL to ensure that all water quality problems and associated stressors are identified.  Typically, this step is conducted prior to the 303(d) listing of a waterbody through the monitoring and assessment program.  The designated uses and water quality criteria for the waterbody should be examined against available data to provide an evaluation of the water quality relative to all applicable water quality standards.  If, as part of this exercise, additional WQS problems are discovered and additional stressor pollutants are identified, consideration should be given to concurrently evaluating TMDLs for those additional pollutants.  If it is determined that insufficient data is available to make such an evaluation, this should be noted in the TMDL document.

## 1.1 TMDL Document Submittal Letter

When a TMDL document is submitted to EPA requesting formal comments or a final review and approval, the submittal package should include a letter identifying the document being submitted and the purpose of the submission.

Minimum Submission Requirements.

☒ A TMDL submittal letter should be included with each TMDL document submitted to EPA requesting a formal review.

☒ The submittal letter should specify whether the TMDL document is being submitted for initial review and comments, public review and comments, or final review and approval.

☐ Each TMDL document submitted to EPA for final review and approval should be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State's/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute**.** The submittal letter should contain such identifying information as the name and location of the waterbody and the pollutant(s) of concern, which matches similar identifying information in the TMDL document for which a review is being requested.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The public notice draft Wild Rice River fecal coliform TMDL was submitted to EPA for review via an email from Mike Ell, NDDoH on August 13, 2010.  The email included the draft TMDL document and a request to review and comment on the TMDL document.

**COMMENTS:** None.

## 1.2 Identification of the Waterbody, Impairments, and Study Boundaries

The TMDL document should provide an unambiguous description of the waterbody to which the TMDL is intended to apply and the impairments the TMDL is intended to address. The document should also clearly delineate the physical boundaries of the waterbody and the geographical extent of the watershed area studied. Any additional information needed to tie the TMDL document back to a current 303(d) listing should also be included.

Minimum Submission Requirements:

☒ The TMDL document should clearly identify the pollutant and waterbody segment(s) for which the TMDL is being established. If the TMDL document is submitted to fulfill a TMDL development requirement for a waterbody on the state's current EPA approved 303(d) list, the TMDL document submittal should clearly identify the waterbody and associated impairment(s) as they appear on the State's/Tribe's current EPA approved 303(d) list, including a full waterbody description, assessment unit/waterbody ID, and the priority ranking of the waterbody. This information is necessary to ensure that the administrative record and the national TMDL tracking database properly link the TMDL document to the 303(d) listed waterbody and impairment(s).

☒ One or more maps should be included in the TMDL document showing the general location of the waterbody and, to the maximum extent practical, any other features necessary and/or relevant to the understanding of the TMDL analysis, including but not limited to: watershed boundaries, locations of major pollutant sources, major tributaries included in the analysis, location of sampling points, location of discharge gauges, land use patterns, and the location of nearby waterbodies used to provide surrogate information or reference conditions. Clear and concise descriptions of all key features and their relationship to the waterbody and water quality data should be provided for all key and/or relevant features not represented on the map

☐ If information is available, the waterbody segment to which the TMDL applies should be identified/geo-referenced using the National Hydrography Dataset (NHD). If the boundaries of the TMDL do not correspond to the Waterbody ID(s) (WBID), Entity_ID information or reach code (RCH_Code) information should be provided. If NHD data is not available for the waterbody, an alternative geographical referencing system that unambiguously identifies the physical boundaries to which the TMDL applies may be substituted.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wild Rice River watershed is a 1.4 million acre watershed located in Cass, Dickey, Ransom, Richland and Sargent Counties in south eastern North Dakota. The impaired segments of the Wild Rice River are located in Sargent and Richland Counties and drain approximately 363,071 acres. The two listed segments are: 1) from its confluence with the Shortfoot Creek downstream to its confluence with Elk Creek (45.68 miles; ND-09020105-012-S_00); and 2) from Elk Creek downstream to its confluence with a tributary 3.5 miles NE of Great Bend, ND (53.4 miles; ND-09020105-009-S_00). It is part of the larger Red River basin in the Western Wild Rice sub-basin (HUC 09020105). These segments are listed as impaired for fecal coliform bacteria.

The designated uses for these segments of the Wild Rice River are based on the Class II stream classification in the ND water quality standards (NDCC 33-15-02.1-09).

**COMMENTS:** None.

## 1.3 Water Quality Standards

TMDL documents should provide a complete description of the water quality standards for the waterbodies addressed, including a listing of the designated uses and an indication of whether the uses are being met, not being met, or not assessed. If a designated use was not assessed as part of the TMDL analysis (or not otherwise recently assessed), the documents should provide a reason for the lack of assessment (e.g., sufficient data was not available at this time to assess whether or not this designated use was being met).

Water quality criteria (WQC) are established as a component of water quality standard at levels considered necessary to protect the designated uses assigned to that waterbody. WQC identify quantifiable targets and/or qualitative water quality goals which, if attained and maintained, are intended to ensure that the designated uses for the waterbody are protected. TMDLs result in maintaining and attaining water quality standards by determining the appropriate maximum pollutant loading rate to meet water quality criteria, either directly, or through a surrogate measurable target. The TMDL document should include a description of all applicable water quality criteria for the impaired designated uses and address whether or not the criteria are being attained, not attained, or not evaluated as part of the analysis. If the criteria were not evaluated as part of the analysis, a reason should be cited ( e.g. insufficient data were available to determine if this water quality criterion is being attained).

Minimum Submission Requirements:

☒ The TMDL must include a description of the applicable State/Tribal water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the anti-degradation policy. (40 C.F.R. §130.7(c)(1)).

☒ The purpose of a TMDL analysis is to determine the assimilative capacity of the waterbody that corresponds to the existing water quality standards for that waterbody, and to allocate that assimilative capacity between the significant sources. Therefore, all TMDL documents must be written to meet the existing water quality standards for that waterbody (CWA §303(d)(1)(C)).

*Note: In some circumstances, the load reductions determined to be necessary by the TMDL analysis may prove to be infeasible and may possibly indicate that the existing water quality standards and/or assessment methodologies may be erroneous. However, the TMDL must still be determined based on existing water quality standards. Adjustments to water quality standards and/or assessment methodologies may be evaluated separately, from the TMDL.*

☒ The TMDL document should describe the relationship between the pollutant of concern and the water quality standard the pollutant load is intended to meet. This information is necessary for EPA to evaluate whether or not attainment of the prescribed pollutant loadings will result in attainment of the water quality standard in question.

☒ If a standard includes multiple criteria for the pollutant of concern, the document should demonstrate that the TMDL value will result in attainment of all related criteria for the pollutant. For example, both acute and chronic values (if present in the WQS) should be addressed in the document, including consideration of magnitude, frequency and duration requirements.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wild Rice River segments addressed by this TMDL document are impaired based on fecal coliform concentrations for recreational uses. The Wild Rice River is a Class II stream. 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. Numeric criteria for fecal coliforms and E. coli in North Dakota, Class II streams have been established and are presented in the excerpted Table 5 shown below. Both bacteria standards apply only during the recreation season from May 1 to September 30. Discussion of additional applicable water quality standards for the Wild Rice River can be found on pages 8 – 9 of the TMDL.

**Table 5. North Dakota Fecal Coliform Bacteria Standards for Class II Streams.**

| Parameter | Standard | |
|---|---|---|
| | Geometric Mean[1] | Maximum[2] |
| Fecal Coliform Bacteria | 200 CFU/100 mL | 400 CFU/100 mL |
| E. coli | 126 CFU/100 mL | 409 CFU/100 mL |

[1] Expressed as a geometric mean of representative samples collected during any consecutive 30-day period.
[2] No more than 10 percent of samples collected during any consecutive 30-day period shall individually exceed the standard.

**COMMENTS:** None.

# 2. Water Quality Targets

TMDL analyses establish numeric targets that are used to determine whether water quality standards are being achieved. Quantified water quality targets or endpoints should be provided to evaluate each listed pollutant/water body combination addressed by the TMDL, and should represent achievement of applicable water quality standards and support of associated beneficial uses. For pollutants with numeric water quality standards, the numeric criteria are generally used as the water quality target. For pollutants with narrative standards, the narrative standard should be translated into a measurable value. At a minimum, one target is required for each pollutant/water body combination. It is generally desirable, however, to include several targets that represent achievement of the standard and support of beneficial uses (e.g., for a sediment impairment issue it may be appropriate to include a variety of targets representing water column sediment such as TSS, embeddeness, stream morphology, up-slope conditions and a measure of biota).

Minimum Submission Requirements:

☒ The TMDL should identify a numeric water quality target(s) for each waterbody pollutant combination. The TMDL target is a quantitative value used to measure whether or not the applicable water quality standard is attained.

*Generally, the pollutant of concern and the numeric water quality target are, respectively, the chemical causing the impairment and the numeric criteria for that chemical (e.g., chromium) contained in the water quality standard. Occasionally, the pollutant of concern is different from the parameter that is the subject of the numeric water quality target (e.g., when the pollutant of concern is phosphorus and the numeric water quality target is expressed as a numerical dissolved oxygen criterion). In such cases, the TMDL should explain the linkage between the pollutant(s) of concern, and express the quantitative relationship between the TMDL target and pollutant of concern. In all cases, TMDL targets must represent the attainment of current water quality standards.*

☐ When a numeric TMDL target is established to ensure the attainment of a narrative water quality criterion, the numeric target, the methodology used to determine the numeric target, and the link between the pollutant of concern and the narrative water quality criterion should all be described in the TMDL document. Any additional information supporting the numeric target and linkage should also be included in the document.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The water quality targets for these TMDLs are based on the numeric water quality standards for fecal coliform bacteria based on the recreational beneficial use for the Wild Rice River. The target for the Wild Rice River segments included in the TMDL document is the fecal coliform standard expressed as the 30-day geometric mean of 200 CFU/100 mL during the recreation season from May 1 to September 30. While the standard is intended to be expressed as the 30-day geometric mean, the target was used to compare to values from single grab samples. This ensures that the reductions necessary to achieve the target will be protective of both the acute (single sample value) and chronic (geometric mean of 5 samples) standard.

North Dakota currently has both a fecal coliform bacteria standard and an E. coli bacteria standard. During the next triennial water quality standards review period, the Department will be eliminating the fecal coliform bacteria standard and will only have the E. coli standard for bacteria. During this transition period to an E. coli only bacteria standard, the fecal coliform bacteria target for this TMDL and the resulting load allocation is believed to be protective of the E. coli standard as well. The department will assess attainment of the E. coli standard through additional monitoring consistent with the State's water quality standards and beneficial use assessment methodology.

**COMMENTS:** None.

# 3. Pollutant Source Analysis

A TMDL analysis is conducted when a pollutant load is known or suspected to be exceeding the loading capacity of the waterbody. Logically then, a TMDL analysis should consider all sources of the pollutant of concern in some manner. The detail provided in the source assessment step drives the rigor of the pollutant load allocation. In other words, it is only possible to specifically allocate quantifiable loads or load reductions to each significant source (or source category) when the relative load contribution from each source has been estimated. Therefore, the pollutant load from each significant source (or source category) should be identified and quantified to the maximum practical extent. This may be accomplished using site-specific monitoring data, modeling, or application of other assessment techniques. If insufficient time or resources are available to accomplish this step, a phased/adaptive management approach may be appropriate. The approach should be clearly defined in the document.

Minimum Submission Requirements:

☒ The TMDL should include an identification of all potentially significant point and nonpoint sources of the pollutant of concern, including the geographical location of the source(s) and the quantity of the loading, e.g., lbs/per day. This information is necessary for EPA to evaluate the WLA, LA and MOS components of the TMDL.

☒ The level of detail provided in the source assessment should be commensurate with the nature of the watershed and the nature of the pollutant being studied. Where it is possible to separate natural background from nonpoint sources, the TMDL should include a description of both the natural background loads and the nonpoint source loads.

☒ Natural background loads should not be assumed to be the difference between the sum of known and quantified anthropogenic sources and the existing *in situ* loads (e.g. measured in stream) unless it can be demonstrated that all significant anthropogenic sources of the pollutant of concern have been identified, characterized, and properly quantified.

☒ The sampling data relied upon to discover, characterize, and quantify the pollutant sources should be included in the document (e.g. a data appendix) along with a description of how the data were analyzed to characterize and quantify the pollutant sources. A discussion of the known deficiencies and/or gaps in the data set and their potential implications should also be included.

Recommendation:
☐ Approve ☒ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The TMDL document includes the landuse breakdown for the watershed based on the 2006 National Agricultural Statistics Service data. The dominant land use in the Wild Rice River watershed is row crop agriculture. Approximately 59 percent of the land is active cropland, 11 percent is wetlands, 16 percent grassland, and 14 percent is either CRP, pasture, woods, or open space. The majority of the crops grown consist of corn, soybeans, spring wheat, alfalfa, winter wheat, sunflowers, and dry beans. Unpermitted animal feeding operations and "hobby farms" are also present in the Wild Rice River watershed, but their number and location are unknown.

Within the listed segments of the Wild Rice River watershed there are three municipal point sources. They are located in Gwinner, Wyndmere and Milnor, North Dakota and are permitted through the North Dakota Pollutant Discharge Elimination System (NDPDES) Program. There are eighteen permitted animal feeding operations (AFOs) in the TMDL listed segments of the Wild Rice River. The NDDoH has permitted two large (1,000 + animal units (AUs)) AFOs to operate in the watershed. Also, nine small (0-300 AUs) and seven medium (301-999 AUs) AFOs are currently in the permitting process. All eighteen AFOs are zero discharge facilities and are not deemed a significant point source of fecal coliform loadings to the Wild Rice River.

The listed segment of The Wild Rice River is experiencing fecal coliform bacteria pollution from non point sources in the watershed. Livestock production ***is not*** the dominant agricultural practice in the watershed. However, unpermitted animal feeding operations (AFOs), "hobby farms" with fewer than 100 animals and livestock grazing and watering in proximity to the Wild Rice River are common along the TMDL listed segments. The southeast section of North Dakota typically experiences long duration or intense precipitation during the early summer months. These storms can cause overland flooding and rising river levels. Due to the close proximity of these unpermitted AFOs and "hobby farms" and livestock grazing and watering to the river, it is likely that this contributes fecal coliform bacteria to the Wild Rice River.

Wildlife may also contribute to the fecal coliform bacteria found in the water quality samples, but most likely in a lower concentration. Wildlife is nomadic with fewer numbers concentrating in a specific area, thus decreasing the probability of their contribution of fecal matter in significant quantities.

Septic system failure might also contribute to the fecal coliform bacteria in the water quality samples. Failures can occur for several reasons, although the most common reason is improper maintenance (e.g. age, inadequate pumping). Other reasons for failure include improper installation, location, and choice of system. Harmful household chemicals can also cause failure by killing the bacteria that digest the waste. While the number of systems that are not functioning properly is unknown, it is estimated that 28 percent of the systems in North Dakota are failing.

**COMMENTS:** The Point Source Pollutant Sources Section says that "There are no fecal coliform bacteria data associated with their discharges; therefore no waste load allocation (WLA) will be provided to the cities in the TMDL." It is not clear what is meant by the statement that no fecal data is associated with their discharges. Does this mean that these facilities do not discharge, or that there is no fecal coliform data from these facilities, or that they don't have any fecal coliform bacteria in their discharge?

If the discharge from these facilities contains fecal coliform bacteria then they need to be given a WLA. If the WLA is zero, as indicated by the current TMDL, then the permits would need to be modified to say that they cannot discharge any fecal coliform bacteria. We recommend estimating an average daily fecal coliform bacteria load based on the discharge concentration and flow rate allowed during the period(s) they have discharged in the past 5 years. The analysis and calculations could be limited to those discharges that occurred during the recreation season.

# 4. TMDL Technical Analysis

TMDL determinations should be supported by a robust data set and an appropriate level of technical analysis**.** This applies to **all** of the components of a TMDL document. It is vitally important that the technical basis for **all** conclusions be articulated in a manner that is easily understandable and readily apparent to the reader.

A TMDL analysis determines the maximum pollutant loading rate that may be allowed to a waterbody without violating water quality standards. The TMDL analysis should demonstrate an understanding of the relationship between the rate of pollutant loading into the waterbody and the resultant water quality impacts. This stressor → response relationship between the pollutant and impairment and between the selected targets, sources, TMDLs, and load allocations needs to be clearly articulated and supported by an appropriate level of technical analysis. Every effort should be made to be as detailed as possible, and to base all conclusions on the best available scientific principles.

The pollutant loading allocation is at the heart of the TMDL analysis. TMDLs apportion responsibility for taking actions by allocating the available assimilative capacity among the various point, nonpoint, and natural pollutant sources. Allocations may be expressed in a variety of ways, such as by individual discharger, by tributary watershed, by source or land use category, by land parcel, or other appropriate scale or division of responsibility.

The pollutant loading allocation that will result in achievement of the water quality target is expressed in the form of the standard TMDL equation:

$$TMDL = \sum LAs + \sum WLAs + MOS$$

Where:

TMDL = Total Pollutant Loading Capacity of the waterbody

LAs = Pollutant Load Allocations

WLAs = Pollutant Wasteload Allocations

MOS = The portion of the Load Capacity allocated to the Margin of safety.

Minimum Submission Requirements:

☒ A TMDL must identify the loading capacity of a waterbody for the applicable pollutant, taking into consideration temporal variations in that capacity. EPA regulations define loading capacity as the greatest amount of a pollutant that a water can receive without violating water quality standards (40 C.F.R. §130.2(f)).

☒ The total loading capacity of the waterbody should be clearly demonstrated to equate back to the pollutant load allocations through a balanced TMDL equation. In instances where numerous LA, WLA and seasonal TMDL capacities make expression in the form of an equation cumbersome, a table may be substituted as long as it is clear that the total TMDL capacity equates to the sum of the allocations.

☒ The TMDL document should describe the methodology and technical analysis used to establish and quantify the cause-and-effect relationship between the numeric target and the identified pollutant sources. In many instances, this method will be a water quality model.

☒ It is necessary for EPA staff to be aware of any assumptions used in the technical analysis to understand and evaluate the methodology used to derive the TMDL value and associated loading allocations. Therefore, the TMDL document should contain a description of any important assumptions (including the basis for those assumptions) made in developing the TMDL, including but not limited to:

(1) the spatial extent of the watershed in which the impaired waterbody is located and the spatial extent of the TMDL technical analysis;
(2) the distribution of land use in the watershed (e.g., urban, forested, agriculture);
(3) a presentation of relevant information affecting the characterization of the pollutant of concern and its allocation to sources such as population characteristics, wildlife resources, industrial activities etc…;
(4) present and future growth trends, if taken into consideration in determining the TMDL and preparing the TMDL document (e.g., the TMDL could include the design capacity of an existing or planned wastewater treatment facility);
(5) an explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments; chlorophyll *a* and phosphorus loadings for excess algae; length of riparian buffer; or number of acres of best management practices.

☒ The TMDL document should contain documentation supporting the TMDL analysis, including an inventory of the data set used, a description of the methodology used to analyze the data, a discussion of strengths and weaknesses in the analytical process, and the results from any water quality modeling used. This information is necessary for EPA to review the loading capacity determination, and the associated load, wasteload, and margin of safety allocations.

☒ TMDLs must take critical conditions (e.g., steam flow, loading, and water quality parameters, seasonality, etc…) into account as part of the analysis of loading capacity (40 C.F.R. §130.7(c)(1) ). TMDLs should define applicable critical conditions and describe the approach used to determine both point and nonpoint source loadings under such critical conditions. In particular, the document should discuss the approach used to compute and allocate nonpoint source loadings, e.g., meteorological conditions and land use distribution.

☐ Where both nonpoint sources and NPDES permitted point sources are included in the TMDL loading allocation, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL document must include a demonstration that nonpoint source loading reductions needed to implement the load allocations are actually practicable [40 CFR 130.2(i) and 122.44(d)].

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The technical analysis should describe the cause and effect relationship between the identified pollutant sources, the numeric targets, and achievement of water quality standards. It should also include a description of the analytical processes used, results from water quality modeling, assumptions and other pertinent information. The technical analysis for the Wild Rice River watershed TMDL describes how the fecal coliform loads were derived in order to meet the applicable water quality standards for the 303(d) impaired stream segments.

The TMDL loads and loading capacities were derived using the load duration curve (LDC) approach. To better correlate the relationship between the pollutant of concern and the hydrology of the Section 303(d) listed segments, LDCs were developed for monitoring sites 385234 and 384072. The LDCs were derived using the 200 CFU/100 mL TMDL target (i.e., state water quality standard), a daily flow record recorded synthesized from a nearby USGS flow gage, and the observed fecal coliform data collected from the sites (see Figure 7 of the TMDL document) from 1996 and 2003-2004.

A discharge record for the listed segments of the Wild Rice River was constructed using the Drainage Area Ratio Method (Ries et al., 2000) and the historical discharge measurements collected by the USGS at gauging station 05053000 from 1989-2009. The Drainage-Area Ratio Method assumes that the streamflow at the ungauged site is hydrologically similar (same per unit area) to the stream gauging station used as an index. This assumption is justified since the two ungauged sites are nested on the same reach as the index station. Drainage area and landuse for the ungauged sites (385234 and 384072) and index station (05053000) were determined through GIS using digital elevation models (DEMs) and the 2006 NASS landuse database. The index station (05053000) streamflow data were then divided by the drainage area to determine streamflows per unit area at the index station. Those values are then multiplied by the drainage area for each ungauged site to obtain estimated flow statistics for the ungauged sites.

The load duration curve plots the allowable fecal coliform load (using the 200 CFU/100 mL standard) across the four flow regimes. Single grab sample fecal coliform concentrations were converted to loads by multiplying by flow and a conversion factor to produce CFU/day values. Each value was plotted individually on the load duration curve. Values falling above the curve indicate exceedance of the TMDL at that flow value while values falling below the curve indicate attainment of the TMDL at that flow.

To estimate the required percent reductions in loading needed to achieve the TMDL, a linear regression line through the fecal coliform load data above the TMDL curve in each flow regime was plotted. The required percent reductions needed under the three flow regimes were determined using the linear regression line.

The LDC represents flow-variable TMDL targets across the flow regimes shown in the TMDL document. For the Wild Rice River segments covered by the TMDL document, the LDCs are a dynamic expression of the allowable load for any given daily flow. Loading capacities were derived from this approach for both listed segments at each flow regime. Tables 7 and 8 show the loading capacity load (i.e., TMDL load) for each of the listed segments of the Wild Rice River.

**COMMENTS:** None.

## 4.1 Data Set Description

TMDL documents should include a thorough description and summary of all available water quality data that are relevant to the water quality assessment and TMDL analysis. An inventory of the data used for the TMDL analysis should be provided to document, for the record, the data used in decision making. This also provides the reader with the opportunity to independently review the data. The TMDL analysis should make use of all readily available data for the waterbody under analysis unless the TMDL writer determines that the data are not relevant or appropriate. For relevant data that were known but rejected, an explanation of why the data were not utilized should be provided (e.g., samples exceeded holding times, data collected prior to a specific date were not considered timely, etc…).

Minimum Submission Requirements:

☒ TMDL documents should include a thorough description and summary of all available water quality data that are relevant to the water quality assessment and TMDL analysis such that the water quality impairments are clearly defined and linked to the impaired beneficial uses and appropriate water quality criteria.

☒ The TMDL document submitted should be accompanied by the data set utilized during the TMDL analysis. If possible, it is preferred that the data set be provided in an electronic format and referenced in the document. If electronic submission of the data is not possible, the data set may be included as an appendix to the document.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wild Rice River TMDL data description and summary are included tables throughout the document and in the data tables in Appendix A. Recent water quality monitoring was conducted over the period from 2003-2004 and included 34 fecal coliform samples at station 385234 and 41 samples at station 384072. The data set also includes approximately 20 years of flow record using the USGS gauging site data (05053000). The flow data, along with the TMDL target, were used to develop the fecal coliform load duration curves for the listed segments of the Wild Rice River.

**COMMENTS:** None.

## 4.2 Waste Load Allocations (WLA):

Waste Load Allocations represent point source pollutant loads to the waterbody. Point source loads are typically better understood and more easily monitored and quantified than nonpoint source loads. Whenever practical, each point source should be given a separate waste load allocation. All NPDES permitted dischargers that discharge the pollutant under analysis directly to the waterbody should be identified and given separate waste load allocations. The finalized WLAs are required to be incorporated into future NPDES permit renewals.

Minimum Submission Requirements:

☒ EPA regulations require that a TMDL include WLAs for all significant and/or NPDES permitted point sources of the pollutant. TMDLs must identify the portion of the loading capacity allocated to individual existing and/or future point source(s) (40 C.F.R. §130.2(h), 40 C.F.R. §130.2(i)). In some cases, WLAs may cover more than one discharger, e.g., if the source is contained within a general permit. If no allocations are to be made to point sources, then the TMDL should include a value of zero for the WLA.

☒ All NPDES permitted dischargers given WLA as part of the TMDL should be identified in the TMDL, including the specific NPDES permit numbers, their geographical locations, and their associated waste load allocations.

Recommendation:
☐ Approve ☒ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** Within the listed segments of the Wild Rice River watershed there are three municipal point sources. They are located in Gwinner, Wyndmere and Milnor, North Dakota and are permitted through the North Dakota Pollutant Discharge Elimination System (NDPDES) Program. The current TMDL document proposes to give these facilities a zero WLA.

There are eighteen permitted animal feeding operations (AFOs) in the TMDL listed segments of the Wild Rice River. The NDDoH has permitted two large (1,000 + animal units (AUs)) AFOs to operate in the watershed. Also, nine small (0-300 AUs) and seven medium (301-999 AUs) AFOs are currently in the permitting process. All eighteen AFOs are zero discharge facilities and are not deemed a significant point source of fecal coliform loadings to the Wild Rice River.

**COMMENTS:** As noted in the comments to the Pollutant Source Analysis section above, if the three municipal point sources are given a WLA of zero in the TMDL, then their permits would need to be modified to ensure that they don't discharge any fecal coliform load to the listed segments of the Wild

Rice River.  As an alternative, we recommend estimating fecal coliform loading from each facility and including an appropriate WLA along with a permit number for each municipality.

## 4.3 Load Allocations (LA):

Load allocations include the nonpoint source, natural, and background loads.  These types of loads are typically more difficult to quantify than point source loads, and may include a significant degree of uncertainty.  Often it is necessary to group these loads into larger categories and estimate the loading rates based on limited monitoring data and/or modeling results.  The background load represents a composite of all upstream pollutant loads into the waterbody.  In addition to the upstream nonpoint and upstream natural load, the background load often includes upstream point source loads that are not given specific waste load allocations in this particular TMDL analysis.  In instances where nonpoint source loading rates are particularly difficult to quantify, a performance-based allocation approach, in which a detailed monitoring plan and adaptive management strategy are employed for the application of BMPs, may be appropriate.

Minimum Submission Requirements:

☒ EPA regulations require that TMDL expressions include LAs which identify the portion of the loading capacity attributed to nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. §130.2(g)).  Load allocations may be included for both existing and future nonpoint source loads.  Where possible, load allocations should be described separately for natural background and nonpoint sources.

☒ Load allocations assigned to natural background loads should not be assumed to be the difference between the sum of known and quantified anthropogenic sources and the existing *in situ* loads (e.g., measured in stream) unless it can be demonstrated that all significant anthropogenic sources of the pollutant of concern have been identified and given proper load or waste load allocations.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The TMDL document includes the landuse breakdown for the North Dakota portion of the watershed based on the 2006 National Agricultural Statistics Service data.  Approximately 59 percent of the land is active cropland, 11 percent is wetlands, 16 percent grassland, and 14 percent is either CRP, pasture, woods, or open space.  The majority of the crops grown consist of corn, soybeans, spring wheat, alfalfa, winter wheat, sunflowers, and dry beans.  Unpermitted animal feeding operations and “hobby farms” are also present in the Wild Rice River watershed, but their number and location are unknown. The point source discharges in the watershed are thought to be a minor contributor of fecal coliform loading to the listed segments.  Therefore, the entire TMDL loading in each segment has been allocated to nonpoint sources as a load allocation, and to the margin of safety.  Source specific data are limited so aggregate LAs are assigned to nonpoint sources with a ranking of important contributors under various flow regimes provided as seen in the following excerpted table.

**Table 5. Nonpoint Sources of Pollution and Their Potential to Pollute at a Given Flow Regime.**

| Nonpoint Sources | Flow Regime | | |
|---|---|---|---|
| | High Flow | Moist Conditions | Dry Conditions |
| Riparian Area Grazing (Livestock) | H | H | H |
| Animal Feeding Operations | H | M | L |
| Manure Application to Crop and Range Land | H | M | L |
| Intensive Upland Grazing (Livestock) | H | M | L |

Note: Potential importance of nonpoint source area to contribute fecal coliform bacteria loads under a given flow regime. (H: High; M: Medium; L: Low)

**COMMENTS:** None.

## 4.4 Margin of Safety (MOS):

Natural systems are inherently complex. Any mathematical relationship used to quantify the stressor → response relationship between pollutant loading rates and the resultant water quality impacts, no matter how rigorous, will include some level of uncertainty and error. To compensate for this uncertainty and ensure water quality standards will be attained, a margin of safety is required as a component of each TMDL. The MOS may take the form of a explicit load allocation (e.g., 10 lbs/day), or may be implicitly built into the TMDL analysis through the use of conservative assumptions and values for the various factors that determine the TMDL pollutant load → water quality effect relationship. Whether explicit or implicit, the MOS should be supported by an appropriate level of discussion that addresses the level of uncertainty in the various components of the TMDL technical analysis, the assumptions used in that analysis, and the relative effect of those assumptions on the final TMDL. The discussion should demonstrate that the MOS used is sufficient to ensure that the water quality standards would be attained if the TMDL pollutant loading rates are met. In cases where there is substantial uncertainty regarding the linkage between the proposed allocations and achievement of water quality standards, it may be necessary to employ a phased or adaptive management approach (e.g., establish a monitoring plan to determine if the proposed allocations are, in fact, leading to the desired water quality improvements).

Minimum Submission Requirements:

☒ TMDLs must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1) ). EPA's 1991 TMDL Guidance explains that the MOS may be implicit (i.e., incorporated into the TMDL through conservative assumptions in the analysis) or explicit (i.e., expressed in the TMDL as loadings set aside for the MOS).

- ☐ If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS should be identified and described. The document should discuss why the assumptions are considered conservative and the effect of the assumption on the final TMDL value determined.
- ☒ If the MOS is explicit, the loading set aside for the MOS should be identified. The document should discuss how the explicit MOS chosen is related to the uncertainty and/or potential error in the linkage analysis between the WQS, the TMDL target, and the TMDL loading rate.
- ☐ If, rather than an explicit or implicit MOS, the TMDL relies upon a phased approach to deal with large and/or unquantifiable uncertainties in the linkage analysis, the document should include a description of the planned phases for the TMDL as well as a monitoring plan and adaptive management strategy.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wild Rice River TMDLs include explicit margins of safety for each of the listed segments which were derived by calculating 10 percent of the loading capacity. The explicit MOSs for the Wild Rice River segments are included in Tables 7 and 8 of the TMDL document.

**COMMENTS:** None.

### 4.5 Seasonality and variations in assimilative capacity:

The TMDL relationship is a factor of both the loading rate of the pollutant to the waterbody and the amount of pollutant the waterbody can assimilate and still attain water quality standards. Water quality standards often vary based on seasonal considerations. Therefore, it is appropriate that the TMDL analysis consider seasonal variations, such as critical flow periods (high flow, low flow), when establishing TMDLs, targets, and allocations.

Minimum Submission Requirements:

☒ The statute and regulations require that a TMDL be established with consideration of seasonal variations. The TMDL must describe the method chosen for including seasonal variability as a factor. (CWA §303(d)(1)(C), 40 C.F.R. §130.7(c)(1) ).

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** By using the load duration curve approach to develop the TMDL allocations, seasonal variability in fecal coliform loads are taken into account. Highest steam flows typically occur during late spring, and the lowest stream flows occur during the winter months. Also, the TMDLs are seasonal since the fecal coliform criteria are in effect from May 1 to September 30, therefore the TMDLs are only applicable during that period.

**COMMENTS:** None.

## 5. Public Participation

EPA regulations require that the establishment of TMDLs be conducted in a process open to the public, and that the public be afforded an opportunity to participate. To meaningfully participate in the TMDL process it is necessary that stakeholders, including members of the general public, be able to understand the problem and the proposed solution. TMDL documents should include language that explains the issues to the general public in understandable terms, as well as provides additional detailed technical information for the scientific community. Notifications or solicitations for comments regarding the TMDL should be made available to the general public, widely circulated, and clearly identify the product as a TMDL and the fact that it will be submitted to EPA for review. When the final TMDL is submitted to EPA for approval, a copy of the comments received by the state and the state responses to those comments should be included with the document.

Minimum Submission Requirements:

☒ The TMDL must include a description of the public participation process used during the development of the TMDL (40 C.F.R. §130.7(c)(1)(ii) ).

☐ TMDLs submitted to EPA for review and approval should include a summary of significant comments and the State's/Tribe's responses to those comments.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The TMDL document includes a summary of the public participation process that has occurred. It describes the opportunities the public had to be involved in the TMDL development process. Copies of the draft TMDL document were mailed to stakeholders in the watershed during public comment. Also, the draft TMDL document was posted on NDoDH's Water Quality Division website, and a public notice for comment was published in local newspapers.

**COMMENTS:** None.

# 6. Monitoring Strategy

TMDLs may have significant uncertainty associated with the selection of appropriate numeric targets and estimates of source loadings and assimilative capacity. In these cases, a phased TMDL approach may be necessary. For Phased TMDLs, it is EPA's expectation that a monitoring plan will be included as a component of the TMDL document to articulate the means by which the TMDL will be evaluated in the field, and to provide for future supplemental data that will address any uncertainties that may exist when the document is prepared.

Minimum Submission Requirements:

☒ When a TMDL involves both NPDES permitted point source(s) and nonpoint source(s) allocations, and attainment of the TMDL target depends on reductions in the nonpoint source loads, the TMDL document should include a monitoring plan that describes the additional data to be collected to determine if the load reductions provided for in the TMDL are occurring.

☒ Under certain circumstances, a phased TMDL approach may be utilized when limited existing data are relied upon to develop a TMDL, and the State believes that the use of additional data or data based on better analytical techniques would likely increase the accuracy of the TMDL load calculation and merit development of a second phase TMDL. EPA recommends that a phased TMDL document or its implementation plan include a monitoring plan and a scheduled timeframe for revision of the TMDL. These elements would not be an intrinsic part of the TMDL and would not be approved by EPA, but may be necessary to support a rationale for approving the TMDL. http://www.epa.gov/owow/tmdl/tmdl_clarification_letter.pdf

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wild Rice River segments will be monitored according to an approved quality assurance project plan. Once a watershed restoration plan is developed and implemented (e.g., a Section 319 Project Implementation Plan), monitoring will be conducted on the Wild Rice River according to a future Quality Assurance Project Plan.

**COMMENTS:** None.

# 7. Restoration Strategy

The overall purpose of the TMDL analysis is to determine what actions are necessary to ensure that the pollutant load in a waterbody does not result in water quality impairment. Adding additional detail regarding the proposed approach for the restoration of water quality is not currently a regulatory requirement, but is considered a value added component of a TMDL document. During the TMDL analytical process, information is often gained that may serve to point restoration efforts in the right direction and help ensure that resources are spent in the most efficient manner possible. For example, watershed models used to analyze the linkage between the pollutant loading rates and resultant water quality impacts might also be used to conduct "what if" scenarios to help direct BMP installations to locations that provide the greatest pollutant reductions. Once a TMDL has been written and approved, it is often the responsibility of other water quality programs to see that it is implemented. The level of quality and detail provided in the restoration strategy will greatly influence the future success in achieving the needed pollutant load reductions.

Minimum Submission Requirements:

☒ EPA is not required to and does not approve TMDL implementation plans. However, in cases where a WLA is dependent upon the achievement of a LA, "reasonable assurance" is required to demonstrate the necessary LA called for in the document is practicable). A discussion of the BMPs (or other load reduction measures) that are to be relied upon to achieve the LA(s), and programs and funding sources that will be relied upon to implement the load reductions called for in the document, may be included in the implementation/restoration section of the TMDL document to support a demonstration of "reasonable assurance".

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The TMDL Allocation section of the TMDL document includes a list of BMPs that are recommended to meet the TMDL loads. NDDoH typically works with local conservation districts or other cooperators to develop and implement Watershed Restoration Projects after the TMDL has been developed and approved. Detailed project implementation plans are developed as part of this process if Section 319 money is used.

The permitted point sources in the watershed are thought to be minor contributors of fecal coliform loading in the listed segments of the Wild Rice River. It may necessary to document reasonable assurance demonstrating that the nonpoint source loadings are practicable, if future EPA guidance requires it.

**COMMENTS:** None.

# 8. Daily Loading Expression

The goal of a TMDL analysis is to determine what actions are necessary to attain and maintain WQS. The appropriate averaging period that corresponds to this goal will vary depending on the pollutant and the nature of the waterbody under analysis. When selecting an appropriate averaging period for a TMDL analysis, primary concern should be given to the nature of the pollutant in question and the achievement of the underlying WQS. However, recent federal appeals court decisions have pointed out that the title TMDL implies a "daily" loading rate. While the most appropriate averaging period to be used for developing a TMDL analysis may vary according to the pollutant, a daily loading rate can provide a more practical indication of whether or not the overall needed load reductions are being achieved. When limited monitoring resources are available, a daily loading target that takes into account the natural variability of the system can serve as a useful indicator for whether or not the overall load reductions are likely to be met. Therefore, a daily expression of the required pollutant loading rate is a required element in all TMDLs, in addition to any other load averaging periods that may have been used to conduct the TMDL analysis. The level of effort spent to develop the daily load indicator should be based on the overall utility it can provide as an indicator for the total load reductions needed.

Minimum Submission Requirements:

☒ The document should include an expression of the TMDL in terms of a daily load. However, the TMDL may also be expressed in temporal terms other than daily (e.g., an annual or monthly load). If the document expresses the TMDL in additional "non-daily" terms the document should explain why it is appropriate or advantageous to express the TMDL in the additional unit of measurement chosen.

Recommendation:
☒ Approve ☐ Partial Approval ☐ Disapprove ☐ Insufficient Information

**SUMMARY:** The Wild Rice River fecal coliform TMDL document includes daily loads expressed as colonies per day for the listed segments of the river. The daily TMDL loads are included in TMDL section (Section 7.0) of the document.

**COMMENTS:** None.

# Appendix F
# NDDoH's Response to Comments Received from US EPA Region 8

**US EPA Region VIII Comments:** The Point Source Pollutant Sources Section says that "There are no fecal coliform bacteria data associated with their discharges; therefore no waste load allocation (WLA) will be provided to the cities in the TMDL." It is not clear what is meant by the statement that no fecal data is associated with their discharges. Does this mean that these facilities do not discharge, or that there is no fecal coliform data from these facilities, or that they don't have any fecal coliform bacteria in their discharge?

If the discharge from these facilities contains fecal coliform bacteria then they need to be given a WLA. If the WLA is zero, as indicated by the current TMDL, then the permits would need to be modified to say that they cannot discharge any fecal coliform bacteria. We recommend estimating an average daily fecal coliform bacteria load based on the discharge concentration and flow rate allowed during the period(s) they have discharged in the past 5 years. The analysis and calculations could be limited to those discharges that occurred during the recreation season.

**NDDoH Response to Comments:** Language as been added to Section 4.1, Point Sources, describing the three wastewater treatment systems located in the watersheds of the two impaired Wild Rice River reaches. It has been determined that the Gwinner facility is not likely to contribute bacteria loading the impaired reaches. Upon further analysis, the other two facilities, however, were deemed a potential contributor of bacteria loading. These two facilities have been been given a WLA allocation in the TMDL, Section 7.0. A wasteload allocation analiysis for the city of Milnor has been provided in Section 5.4.1 as well as one for Wyndmere in Section 5.4.2.

Additional language has also been added to Sections 5.5. Loading Sources; Section 8.0, Allocation; and Section 10.0, Monitoring, to reflect these wasteload allocations.

**US EPA Region VIII Comment:** As noted in the comments to the Pollutant Source Analysis section above, if the three municipal point sources are given a WLA of zero in the TMDL, then their permits would need to be modified to ensure that they don't discharge any fecal coliform load to the listed segments of the Wild Rice River. As an alternative, we recommend estimating fecal coliform loading from each facility and including an appropriate WLA along with a permit number for each municipality.

**NDDoH Response to Comments:** See response to previous comment.