E. coli Bacteria TMDL for the Little Missouri River in Billings, Golden Valley and Slope Counties, North Dakota

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ND-10110203-025-S_00

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ABBREVIATIONS AND ACRONYMS

AFO	Animal Feeding Operation
AU	Animal Unit
BMP	Best Management Practices
CAFO	Confined Animal Feeding Operation
cfs	Cubic Feet per Second
cfu	Colony Forming Units
DMR	Discharge Monitoring Report
EPA	U.S. Environmental Protection Agency
FDC	Flow Duration Curve
GIS	Geographic Information System
HUC	Hydrologic Unit Code
LA	Load Allocation
LDC	Load Duration Curve
mL	Milliliter
MOS	Margin of Safety
MGD	Million Gallons per Day
mpn	Most Probable Number
NRCS	Natural Resource Conservation Service
NDDEQ	North Dakota Department of Environmental Quality
NWIS	National Water Information System
NDPDES	North Dakota Pollutant Discharge Elimination System
NDAWN	North Dakota Agriculture Weather Network
POTW	Publicly Owned Treatment Works
TMDL	Total Maximum Daily Load
USGS	U.S. Geological Survey
WLA	Wasteload Allocation
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION AND DESCRIPTION OF THE WATERSHED

The Little Missouri River watershed associated with this Total Maximum Daily Load (TMDL) is a 434,494-acre watershed in Billings and portions of Slope and Golden Valley counties in southwest North Dakota. For the purposes of this TMDL, the impaired segment (ND-10110203-025-S_00) is located solely in Billings and Slope counties (Figure 1 and Table 1).

Table 1. General Characteristics of the Listed TMDL Segment.

Legal Name	Little Missouri River
Stream Classification	Class II
Major Drainage Basin	Little Missouri
8-Digit Hydrologic Unit	Within 10110203 (Middle Little Missouri River)
Counties	Billings, Golden Valley and Slope Counties
Level IV Ecoregions	Missouri Plateau (43a) and Little Missouri Badlands (43b)
Watershed Area (acres)	434,494

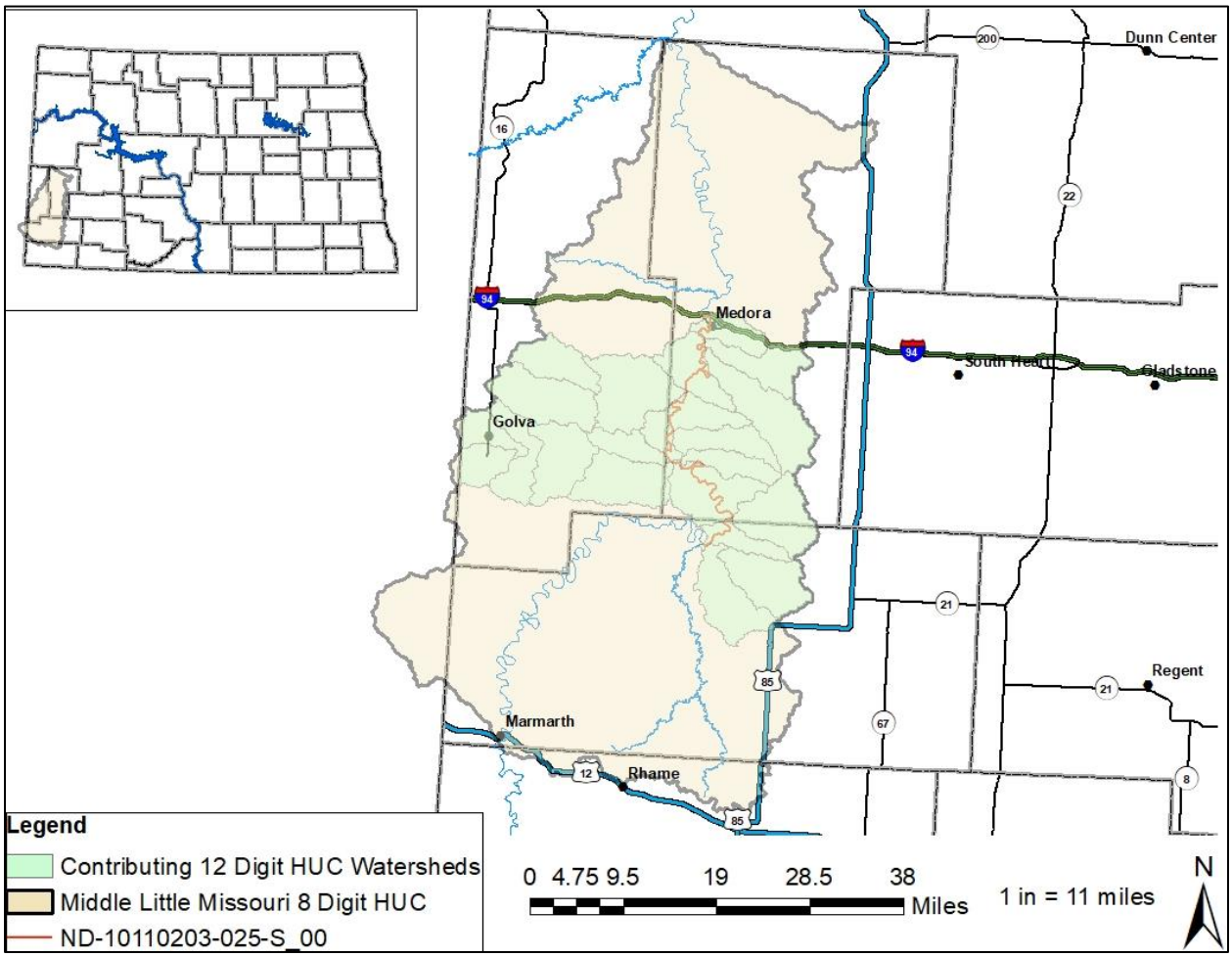


Figure 1. Middle Little Missouri River Watershed and Contributing 12-Digit Watersheds of Listed TMDL Segment.

1.1 Clean Water Act Section 303(d) Listing Information

Based on the North Dakota 2018 Section 303(d) List of Waters Needing Total Maximum Daily Loads (NDDEQ, 2019), the North Dakota Department of Environmental Quality (NDDEQ), has identified a 48.85- mile segment, assessment unit ID ND-10110203-025-S_00 of the Little Missouri River for TMDL development (Figure 2 and Table 2). This segment, which flows north from its confluence with Deep Creek downstream to its confluence with Andrews Creek, is listed as not supporting for recreational uses due to Escherichia coli (E. coli) bacteria.

Table 2. Little Missouri River Section 303(d) Listing Information for Assessment Unit ID ND-10110203-025-S_00.

Assessment Unit ID	ND-10110203-025-S_00
Waterbody Description	Little Missouri River from its confluence with Deep Creek downstream to its confluence with Andrews Creek. Located in Billings and Slope Counties.
Size	48.85 miles
Designated Use	Recreation
Use Support	Not Supporting
Impairment	E. coli bacteria
TMDL Priority	High

Currently, one existing EPA approved TMDL is located up-stream to the impaired segment. That TMDL addresses Deep Creek for fecal coliform bacteria, and can be found on the NDDEQ website at the following link: Deep Creek TMDL (visit deq.nd.gov and enter search criteria “Deep Creek TMDL”).

1.2 Ecoregions

The watershed of the impaired reach of the Little Missouri River lies within the Missouri Plateau (43a) and Little Missouri Badlands (43b) level IV ecoregions (Figure 2).

The Missouri Plateau (43a) ecoregion is characterized by moderately dissected level to rolling plains with isolated sandstone buttes. Elevation ranges from 1,750 – 3,300 ft. Precipitation for this region is 15-17 inch per year. Soil orders include Mollisols and Entisols, with soil series including Vebar, Chama, Amor, Williams, Golva and Zahl (EPA, 2006).

The Little Missouri Badlands (43b) ecoregion is characterized as a highly dissected erosional landscape of conical hills, with widespread mass wasting and slumping. Most streams are ephemeral and flowing streams carry heavy sediment loads. Elevation ranges from 1,850 – 3,000 ft. Precipitation for this region is 14-16 inches per year. Soil orders include Entisols and Mollisols, with soil series including Cabbart, Fleak, Zeona, Boxwell, Patent and Wolfpont (EPA, 2006).

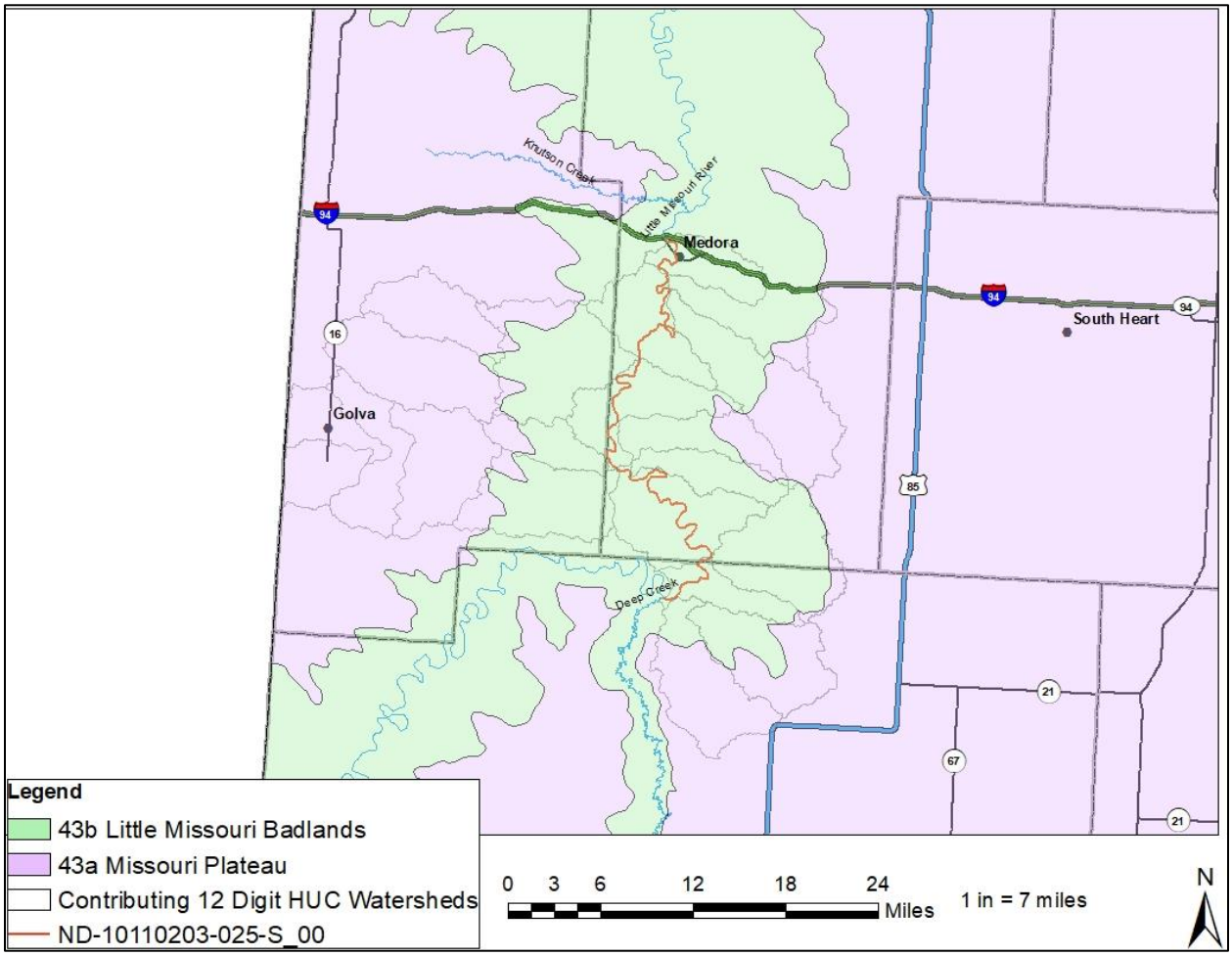


Figure 2. Level IV Ecoregions along the Little Missouri River and TMDL Listed Segment.

1.3 Land Use

The dominant land use in the contributing watershed for the listed segment of the Little Missouri River is grasslands. According to the 2018 National Agricultural Statistical Service (NASS, 2018) Cropland Data Layer, approximately 80 percent of the land is native and non-native grasslands, 17 percent is cropland including alfalfa or tilled acres, and two percent includes wetlands, water, woods, and urban development. Most of the crops grown consists of wheat, lentils, and hay other than alfalfa (Figure 3). Further, according to Conservation Technology Information Center's Crop Residue Management survey in Golden Valley County, ND in 2011, 87% of the cropland is seeded using no-till practices, which can minimize runoff and increase water holding capacity.

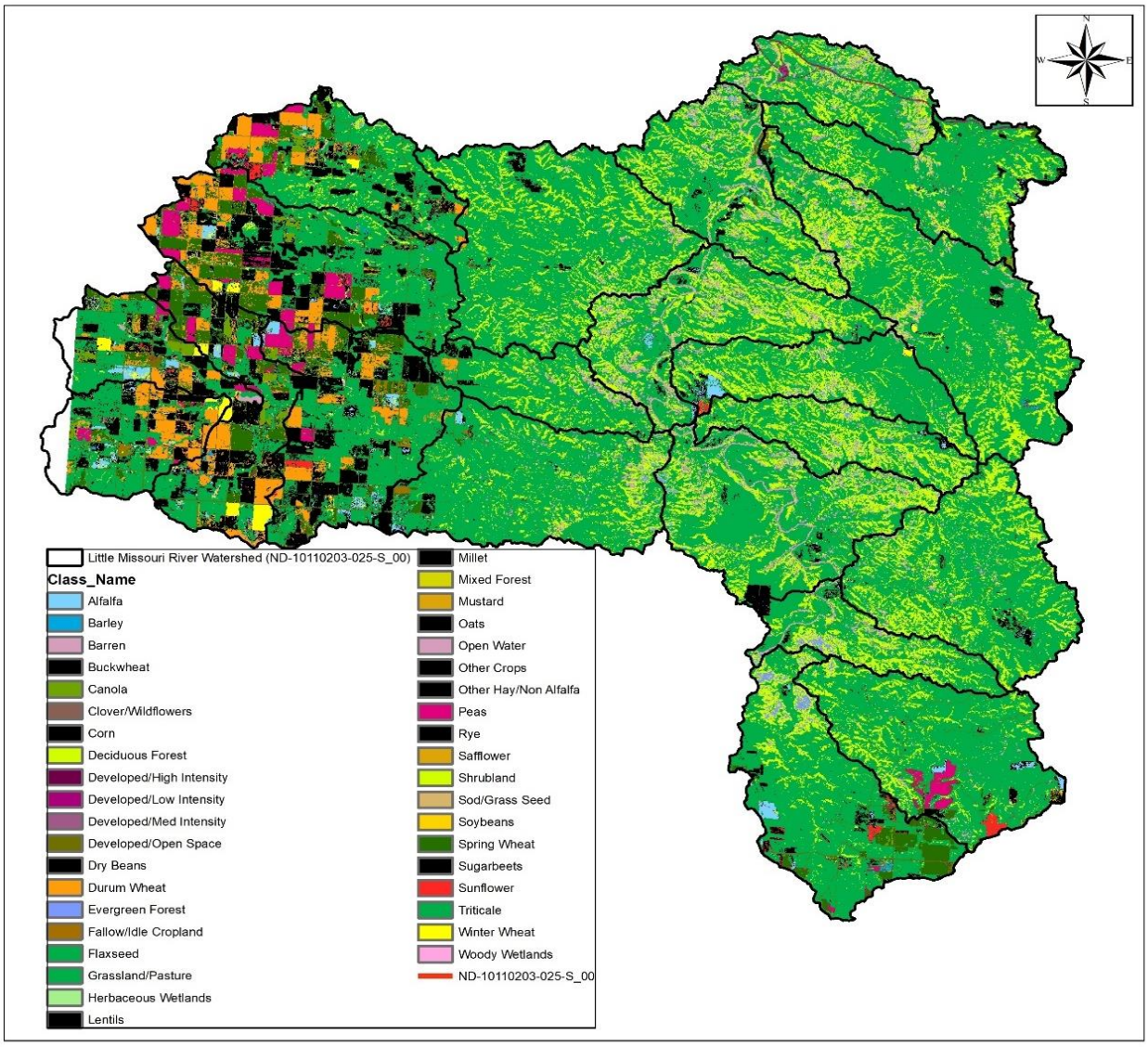


Figure 3. Land Use in the Middle Little Missouri River Watershed (NASS, 2018).

1.4 Land Ownership

Primary ownership of the dominant land use (grassland) in the watershed is Federal. However, a GIS exercise conducted by the US Forest Service determined that in the area immediately adjacent (within 30 meters) to the listed segment, 71 percent of the land ownership is private, 26 percent is US Forest Service land, 3 percent is state land, and 1 percent is National Park Service land (M. Hays, US Forest Service, personal communication Aug 19, 2020).

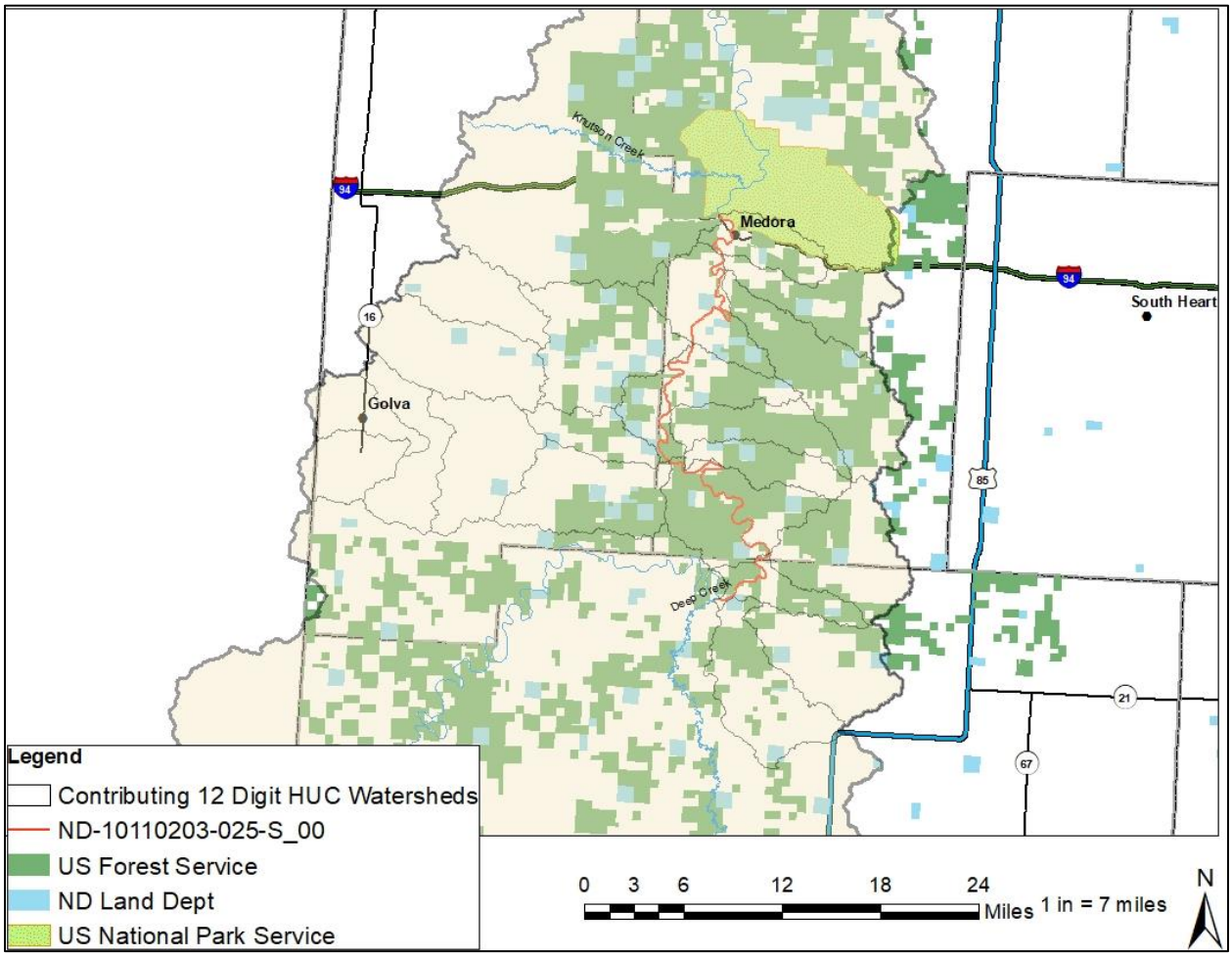


Figure 4. Map of Land Ownership Adjacent to the Listed Segment of the Little Missouri River.

1.5 Climate and Precipitation

Figures 5 and 6 show the average monthly precipitation and temperature for the Beach, ND (Golden Valley County), North Dakota Agriculture Weather Network (NDAWN) station from 1994-2018. The Beach station was chosen because it is the closest station available to the listed TMDL segment – located roughly 23 miles west. Source data can be found at the NDAWN website: https://www.ndawn.ndsu.nodak.edu/

Golden Valley County has a sub-humid climate characterized by warm summers with frequent hot days and occasional cool days. Average temperatures range from 18º F in winter to about 70º F in summer. Precipitation occurs primarily during the warm period and is normally heavy in late spring/early summer. Precipitation data is collected from April through October, average annual precipitation during this period is approximately 15.25 inches (NDAWN, 2019).

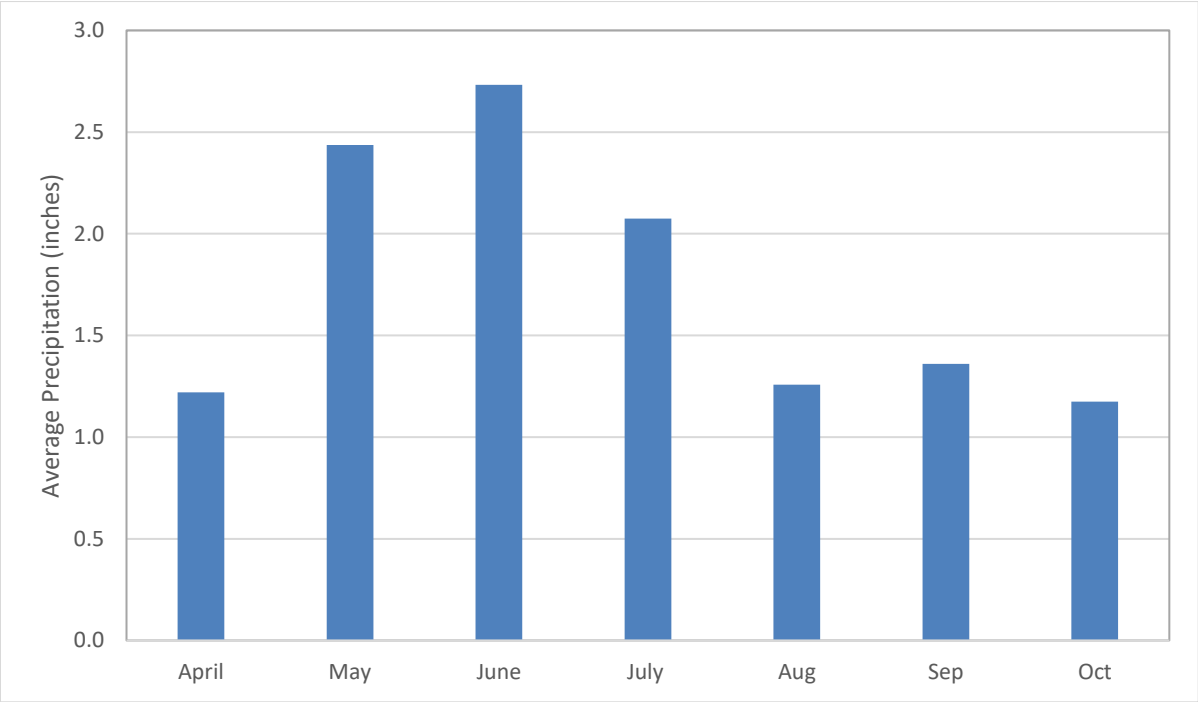


Figure 5. Average Monthly Precipitation at Beach, North Dakota from 1994-2018 (NDAWN, 2019).

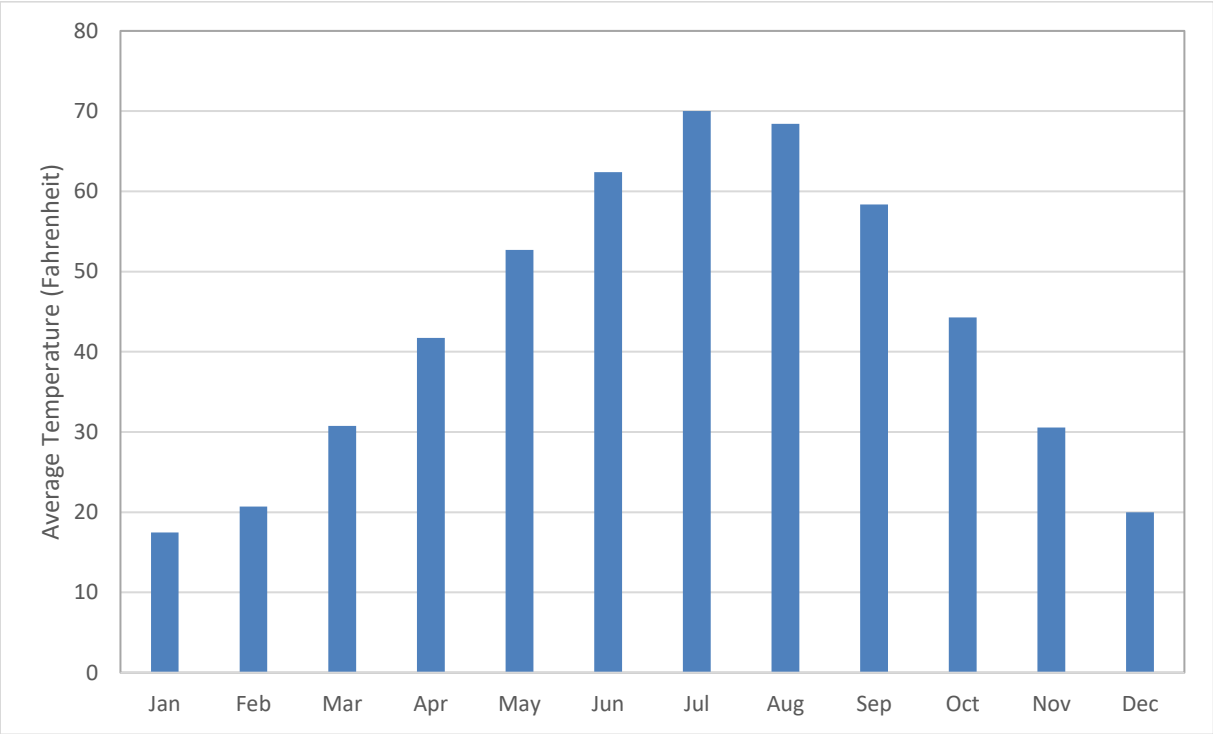


Figure 6. Monthly Average Air Temperature at Beach, North Dakota from 1994-2018 (NDAWN, 2019).

1.6 Available Data

1.6.1 E. Coli Bacteria Data

Samples for E. coli bacteria were collected monthly, when flow conditions were present during the recreation season (May 1 – September 30), at NDDEQ Monitoring Site 380022. Data for the years 2001 – 2018 were used for this report. This monitoring site is sampled by the NDDEQ as part of its on-going Ambient River and Stream Water Quality Monitoring Program.

Samples were collected and then analyzed by the NDDEQ, Chemistry Division Laboratory located in Bismarck, North Dakota. E. coli bacteria samples are typically measured as Colony Forming Units (CFU) per 100 mL of solution. In 2018, the Chemistry Division Laboratory switched to the Quanti-Tray method where results are measured in Most Probable Number (MPN). EPA has determined that MPN and CFU data are equitable (EPA, 2001). These units are also equitable to the Num/100 mL reported in the Discharge Monitoring Reports (DMR) of the NDDEQ North Dakota Pollutant Discharge Elimination System (NDPDES) Program. After sample data is processed and grouped by month, it is measured against NDDEQ's E. coli water quality standard (Section 2.0).

Monthly E. coli data, with corresponding water quality standard metric and use attainment is described in Table 3. These metrics are defined in section 2.0 of this report. Source data for E. coli. can be found in Appendix A and in the water quality data portal at https://deq.nd.gov/.

Table 3. Summary of E. coli Bacteria Data for Site 380022 from 2001 – 2018.

Month	N	Geometric Mean Concentration (CFU/100mL)	Percentage of Samples Exceeding 409 (CFU/100mL)	Recreational Use Assessment
May	18	77	11%	Fully Supporting but Threatened
June	16	155	25%	Not Supporting
July	10	96	30%	Fully Supporting but Threatened
August	15	218	40%	Not Supporting
September	9	66	22%	Fully Supporting but Threatened

1.6.2 Hydraulic Discharge

Daily stream discharge data, measured as average cubic feet per second (CFS) per day, for the listed TMDL segment was obtained from the United States Geological Survey (USGS) gaging station 06336000, which is co-located with the NDDEQ monitoring site 380022 (Figure 7). Source data can be found at the USGS website: https://waterdata.usgs.gov/nwis/rt. Daily stream discharge data between 2001-2018 (a total of 6,000+ days) was used to correlate with available E. coli bacteria data.

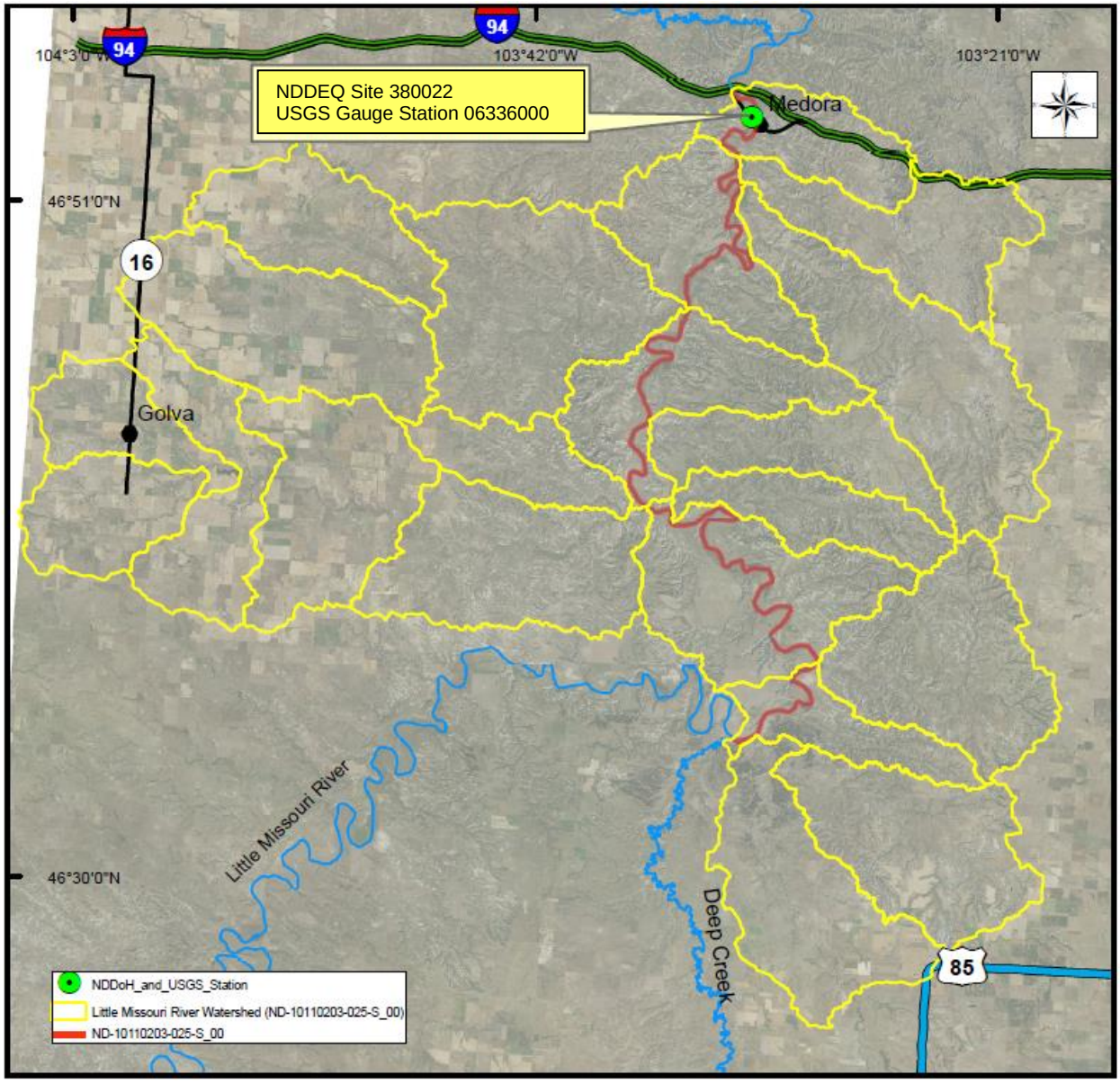


Figure 7. E. coli Bacteria NDDEQ Monitoring Site 380022 and USGS Gaging Station 06336000 on the TMDL Listed Segment of the Little Missouri River.

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 nonpoint 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 state water quality standards. TMDLs are developed with seasonal variations and must include a margin of safety that addresses the uncertainty in the analysis.

2.1 Narrative Water Quality Standards

The NDDEQ has set narrative water quality standards that apply to all surface waters in the State. The narrative general water quality standards are listed below (NDAC, 2019).

- 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.

Since the above narrative is not fully inclusive, a complete list of narrative water quality standards can be found under NDAC 33.1-16-02.1-08(1). In addition to the narrative standards, the NDDEQ has set a 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” (NDAC, 2019).

2.2 Numeric Water Quality Standards

The Little Missouri River is a Class II stream. The NDDEQ definition of a Class II stream is:

> 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.

Table 4 provides a summary of the current numeric E. coli bacteria criteria which applies to all streams. It should be noted that the E. coli bacteria standard applies only during the recreation season of May 1 through September 30. Water Quality Standards for the State of North Dakota can be found at: North Dakota Water Quality Standards (visit deq.nd.gov and enter search criteria “Water Quality Standards”).

Table 4. NDDEQ E. Coli Bacteria Water Quality Standards for all Streams.

Parameter	Standard	
	Geometric Mean[1]	Maximum[2]
E. Coli Bacteria	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.

*Colony Forming Units

The NDDEQ has established a recreational use assessment for E. coli bacteria, which can be determined by following the guidance in *Chapter 33.1-16-02.1 of the North Dakota Administrative Code*, *Standards of Quality for Waters of the State*, 2019, which is summarized as BOTH:

1. A 30-day geometric mean concentration of 126 CFU/100 mL or less, based on samples collected during the recreation season of May 1 through September 30.

2. No more than 10 percent of samples collected during any consecutive 30-day period being above 409 CFU/100 mL.

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

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

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. The following TMDL targets for the Little Missouri River are based on the ND water quality standard for E. coli bacteria.

3.1 Little Missouri River Target Reductions in E. Coli Bacteria Concentrations

Reach ND-10110203-025-S_00 listed in this TMDL is impaired because of E. coli bacteria and listed as not supporting for recreational beneficial use, due to E. coli bacteria counts exceeding the ND water quality standard.

The TMDL target used to develop the load duration curve is 126 CFU/100 mL. By using the monthly geometric mean criterion as a daily target, this ensures both E. coli criteria (the monthly geometric mean and no more than 10% of samples exceeding 409 CFU/100 mL during any consecutive 30-day period) are met.

4.0 SIGNIFICANT POLLUTION SOURCES

4.1 Point-Source Pollution

Within the watershed of the TMDL listed reach of the Little Missouri River there are two wastewater treatment systems permitted through the NDDEQ North Dakota Pollutant Discharge

Elimination System (NDPDES) Program. The first is the City of Medora, located within city limits, and the second is The Burning Hills Amphitheater Wastewater Treatment Plant (WWTP), located 1 mile west of the City of Medora. Both point sources are located 1000 feet upstream from NDDEQ sampling site 380022 (Figure 8).

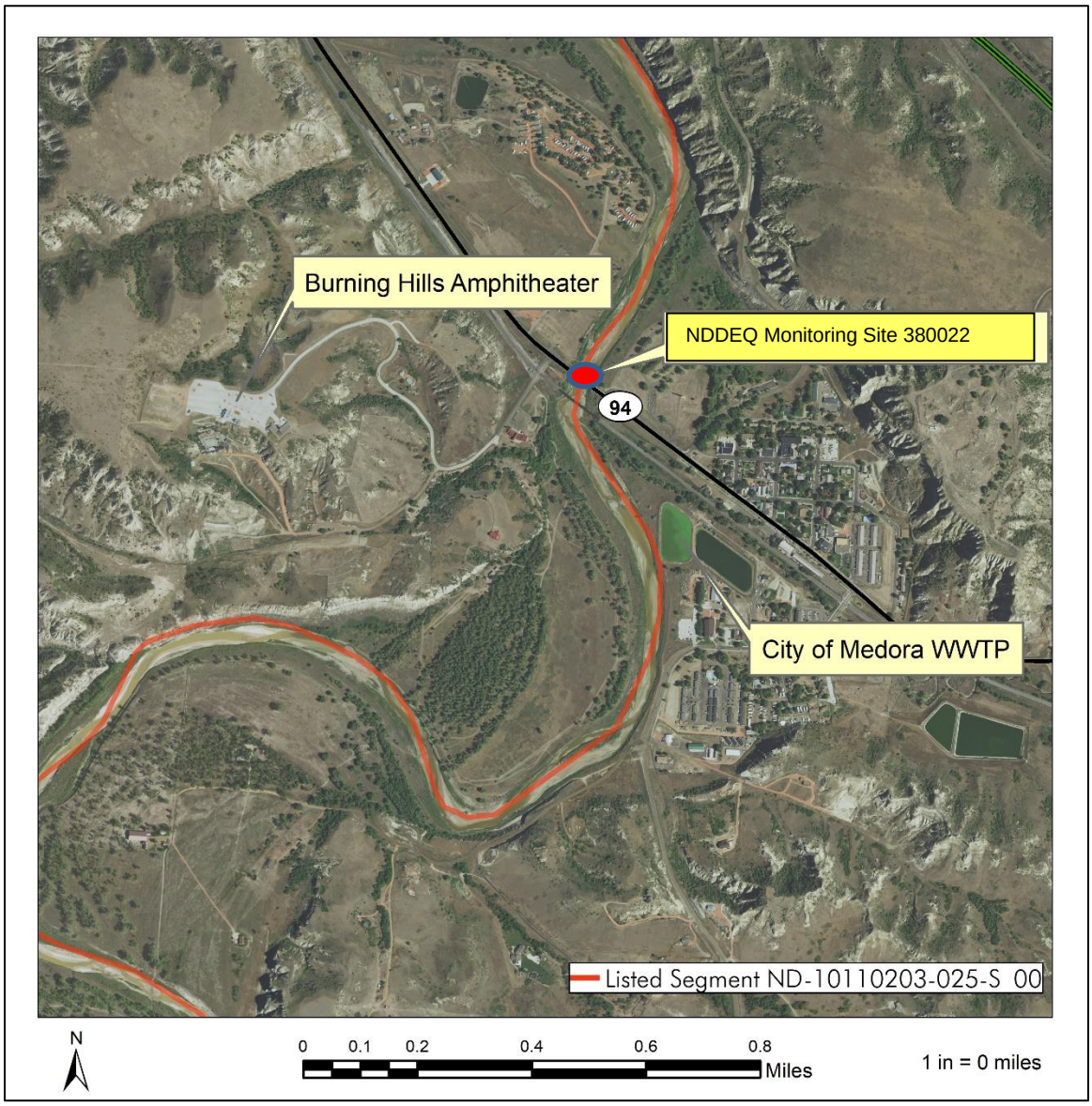


Figure 8. Point-Source Pollution Sources Near the City of Medora.

The City of Medora has a brief record of E. coli bacteria discharge data between the years 2013 and 2018. Of the seven samples submitted during this period, none were above the 409 CFU/100 mL NDDEQ limit and their geomean as not above 126 CFU/100 mL. Discharge sample data can be found in Appendix C.

The Burning Hills Amphitheater WWTP was constructed in the spring of 2018, therefore only a single E. coli bacteria sample was taken in July of 2018. Discharge sample data can be found in Appendix D. This single sample revealed an E. coli bacteria level of 2,420 Num/100 mL. According to the Discharge Monitoring Report (DMR), there were several issues with the new system not operating correctly that could have caused the exceptionally high reading. According to the NDPDES Program, an ultraviolet (UV) lighting system is being utilized to disinfect E. coli bacteria but has had issues with the light source not penetrating deeply enough into the treatment pond. A second UV light was added in 2019 to address this deficiency. A

follow up sample collected in July 2020 had an E. coli concentration of only 8.6 Num/100 mL, confirming that the deficiency has been addressed.

Four permitted Concentrated Animal Feeding Operations/Animal Feeding Operations (CAFO/AFO) are located within the TMDL watershed. Three of them are classified as Large (1,000+ Animal Units (AUs)) and one as Medium (300-999 AUs). These four facilities do not discharge into any part of the watershed, as specified by their state issued CAFO/AFO permits. Additionally, Appendix E outlines seven other NDPDES permitted facilities in the area adjacent to the listed segment. All these facilities have been assigned a wasteload allocation of zero since they either do not discharge the pollutant of concern, do not (or have not) discharged at all, or have not had a discharge event in nine or more years.

4.2 Nonpoint Source Pollution

The most likely source of excess E. coli bacteria is from nonpoint sources in the watershed, as is the case throughout much of North Dakota. Through the analysis of land use data, water quality sample results, recreational use assessment and through the development of a load duration curve, potential nonpoint pollution sources in the contributing watershed of the listed segment in the Little Missouri River were determined and are discussed below.

Additional sources of E. coli include the Little Missouri River mainstem upstream of the listed segment, and Deep Creek, a tributary which has an EPA approved fecal coliform TMDL (NDDEQ, 2012). E. coli loads from these upstream waterbodies are expected to enter the listed segment at the criteria concentration (i.e., at or below State water quality standards). Source reduction efforts related to this TMDL are focused on the 12-digit HUC contributing watershed (Figure 1). The Upper Little Missouri watershed also includes portions of three other jurisdictions: Montana, Wyoming, and South Dakota.

4.2.1 Livestock Grazing

Land use data indicates roughly 80 percent of the watershed is pasture/grassland acres. This would indicate cattle production to be a dominant economic activity within the Little Missouri River watershed.

As indicated by Figure 4, much land directly adjacent to the listed segment of the Little Missouri River is owned by the US Forest Service (USFS). According to the 2006, *Livestock Grazing Record of Decision*, (USFS, 2006), the USFS issues grazing permits (i.e., grazing agreements) on the Little Missouri Dakota Prairie Grasslands/Dakota Prairie Grasslands. These permits allow private cattle and livestock owners to graze lands in the Little Missouri Dakota Prairie Grasslands/Dakota Prairie Grassland as governed by set rules and regulations of the USFS. Herd size and grazing duration are administered in each permit based on land condition, vegetation types and soils.

According to the USFS, City of Medora Field Office, the total leased allotment in the TMDL section of the Little Missouri River may contain up to a maximum of 2,454 Animal Units (AU) per month between the date of May 1 and December 31. A Large amount of livestock grazing also takes place on lands owned by private entities. Typical private cattle grazing rotations for the southwestern portion of North Dakota are outlined below.

Spring and summer are the prime grazing seasons, beginning in late April when complete snowmelt has taken place and vegetation starts growing. It is during this time that riparian and upland areas are important for water quality protection. A common practice on USFS managed lands is to avoid riparian areas, however, this depends on the availability of reliable water in nearby pasture lands. Riparian areas provide cattle with prolific vegetative growth and easy

access for daily water consumption, so are frequently used by ranchers in the spring and summer grazing seasons.

During the fall, cattle can be rotated off open land and into post-harvested cropland fields for grazing. Grazing from highly vegetative-rich fields allow for the cattle herd to utilize a valuable energy source to assist with the brutally cold winters in North Dakota.

As temperatures drop and cropland fields or pastures have been fully grazed, cattle are relocated to a confined feeding area typically close to a ranchers' home or operation. This allows ranchers better access to provide adequate feed during the winter months. Winter feeding is commonly done with hay-bales and nutrient rich silage.

During fall and winter-feeding, manure is either left in place or collected in a pile to be spread on cropland or hay fields the following spring or summer. If manure is not incorporated into the ground, the potential for E. coli contributions during spring runoff or heavy precipitation events increases.

During all seasons, contamination of surface waters by pollutants such as E. coli bacteria remain high. The NDDEQ water quality sample data and recreational use assessment indicated that the primary months that E. coli bacteria levels were exceeding State water quality standards for the listed TMDL segment were during the months of June through August.

Intensive grazing can significantly reduce upland vegetative biomass and fecal matter can build up in these areas. When spring melt or rain events occur, the reduced biomass of the riparian and upland areas decreases their ability to filter fecal matter in the runoff, which can result in accumulation in the river. Fecal matter is also directly deposited in the stream channel while cattle are drinking and wallowing in the water.

Fall and winter feeding can also contribute to E. coli bacteria concentrations in surface water during the spring and summer seasons. A study by the University of Regina, *Survival and Overland Transport of Fecal Coliform under Canadian Prairie Conditions* (Baker-Ismail, et al., 2016), looked at winter grazing and fall manure application and their impact on water quality. The study found that fecal bacteria found within cow dung can survive harsh winters. This is accomplished by fecal bacteria entering a stationary phase once deposited outside of the host body until conditions or environments become favorable for growth and propagation.

4.2.1.1 Livestock Grazing in Cropland

The majority and concentration of cropland is in the westernmost part of the contributing watersheds (Figure 3). Spring and fall are the prime grazing seasons for cropland. In spring, farmers sometimes graze their animals on fields before spring cultivation and planting to lessen residue burdens with the hopes of increasing soil temperatures. During this rotation, livestock deposit manure indirectly and directly into small waterways which can contribute E. coli bacteria to the Little Missouri River. E. coli bacteria is also directly deposited in the stream channel by cattle drinking and wallowing if these croplands are immediately adjacent to waterbodies.

A majority of land management in this area consists of no-till farming combined with crop rotations which, in combination, should minimize the risk of E. coli contributions to the Little Missouri River. Although there is a relatively large area of cropland within the contributing watershed, grazing on cropland is considered low risk due to the large distance from the listed segment, compared to grassland grazing adjacent to the segment.

4.2.2 Septic Systems

Septic system failure may also contribute to the E. coli bacteria impairment. Failures can occur for several reasons, although the most common reason is improper maintenance (e.g., 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 due to backup and surfacing (EPA, 2002). Septic system standards and specifications are governed by each individual county's zoning and building regulations.

It is assumed that there are less than 20 septic systems located within a ¼ mile buffer of the Little Missouri River for the listed segment. Septic system locations are assumed to be associated with homes and were identified and quantified by reviewing aerial imagery in Google (2014. Landsat Imagery).

4.2.3 Recreation

Although not generally considered a significant source of E. coli bacteria, recreational use along the Little Missouri River for the listed segment is relatively high. Recreational use in this area includes fishing, hunting, horseback riding, back country camping, canoeing, kayaking, biking and hiking. The northern border of the watershed is the South Unit of the Theodore Roosevelt National Park, which attracts thousands of visitors yearly (Figure 4).

The Maah Daah Hey National Recreation Trail travels 144 miles across the Little Missouri National Grassland, private property, and State lands connecting all three units of the Theodore Roosevelt National Park. There are eight USFS developed campgrounds along the Maah Daah Hey Trail System including CCC, Bennett, Magpie, Elkhorn, Wannagan, Buffalo Gap, Coal Creek, and Burning Coal Vein. Coal Creek and Burning Coal Vein are the only campgrounds located upstream of sampling site 380022.

4.2.4 Ranch Facilities

There are several small to medium ranch operations located directly adjacent to the listed segment. Some ranches in this area cater to the recreational tourist industry by providing over-night accommodations, food, tours, etc. These ranches typically maintain a horse herd for tourists' activities. Since these small operations are not required to obtain a formal NDDEQ permit, improperly designed and/or failing holding facilities have the potential to contribute E. coli bacteria into the listed segment.

4.2.5 Other Minor Sources

Other potential nonpoint source pollution may include wildlife, but most likely at a level similar to background. Wildlife likely contributes to the E. coli bacteria found in the water quality samples 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.

Table 5. Select Nonpoint Sources of Pollution and Their Potential to Pollute at a Given Flow Regime (Cleland 2003).

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

(H: High; M: Medium; L: Low)

5.0 TECHNICAL ANALYSIS

The loading capacity or Total Maximum Daily Load (TMDL) is the amount of a pollutant (e.g., E. coli bacteria) a waterbody can receive and still meet and maintain water quality standards and beneficial uses. In TMDL development, the goal is to define the linkage between the water quality target and the identified source or sources of the pollutant and 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 (LDC) methodology was applied. The following technical analysis addresses the reductions necessary to achieve the TMDL target for E. coli bacteria of 126 CFU/100 mL with a margin of safety.

5.1 Mean Daily Stream Flow

In southwestern North Dakota, rain events are variable, generally occurring during the months of April through September. Rain events can be sporadic and heavy or light, occurring over a short duration. Precipitation events of large magnitude and occurring at a faster rate than absorption can contribute to high runoff events.

Mean daily discharge for TMDL segment ND-10110203-025-S_00 was developed using stage and discharge data obtained from USGS gaging station 06336000 for the years of 2001 to 2018. Over 6,000+ days of data was available for use. Source data for all USGS gaging stations can be found at the USGS National Water Information System (NWIS) website: https://waterdata.usgs.gov/nwis/rt.

5.2 Flow Duration Curve Analysis

The Flow Duration Curve (FDC) serves as the foundation for the Load Duration Curve (LDC) used in the TMDL. FDC analysis looks at the cumulative frequency of historic flow data over a specified time period. A FDC 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 (EPA, 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 9). 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 one hundred (100) to the lowest flows in the record (i.e., drought).

Once the FDC 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 E. coli impairment (EPA, 2007).

As depicted in Figure 9, the FDC for NDDEQ Monitoring Site 380022 (co-located with USGS gaging station 06336000), representing TMDL segment ND-10110203-025-S_00, was divided into four zones: high flows (0-15 percent), moist conditions (15-40 percent), dry conditions (40-75 percent) and low flows (75-99 percent). Based on the FDC analysis, no flow occurred one percent of the time (99-100 percent).

These flow intervals were defined by examining the range of flows for the period of record and then looking for natural breaks in the flow record based on the FDC data analysis (Appendix B). When possible, breaks were adjusted to try and include E. coli bacteria observations above the criterion in every flow regime.

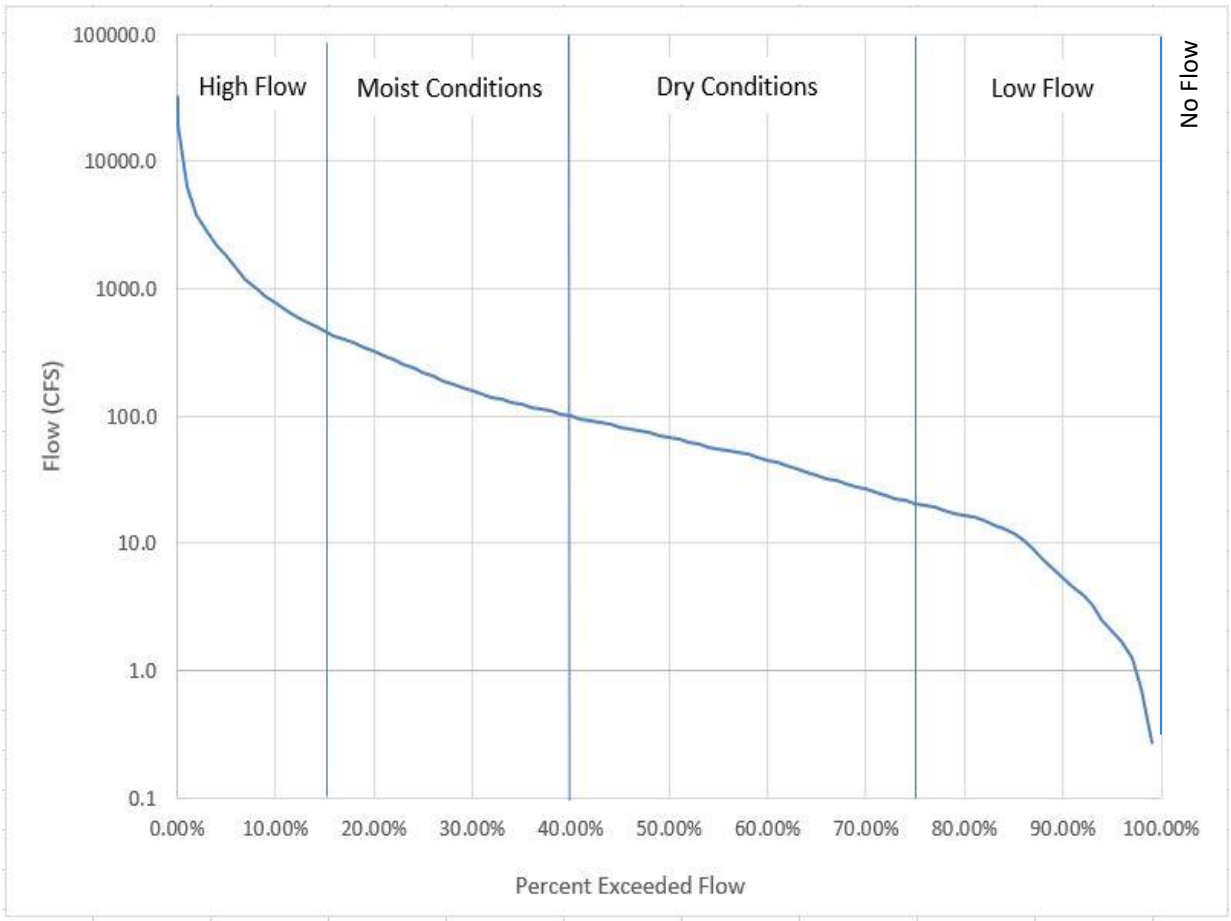


Figure 9. Flow Duration Curve for the Little Missouri River NDDEQ Monitoring Site 380022 (co-located with USGS gauge station 06336000) Near Medora, North Dakota.

5.3 Load Duration Analysis

An important factor in determining nonpoint source pollution loads is the variability in stream flows and loads associated with these flows. To better correlate the relationship between the pollutant of concern and the hydrology of the listed segment, a Load Duration Curve was developed. The LDC was derived using the E. coli bacteria target of 126 CFU/100 mL and the flows generated as described in Sections 5.1 and 5.2.

Observed in-stream E. coli bacteria data obtained from NDDEQ monitoring site 380022 in 2001 to 2018 (Appendix A) were converted to a pollutant load by multiplying E. coli bacteria concentrations by the mean daily flow and a conversion factor. These loads are plotted against the percent of flow exceeded on the day of sample collection (Figure 10). Points plotted above the 126 CFU/100 mL target curve exceed the State water quality standard. Points plotted below the curve are meeting the State water quality standard of 126 CFU/100 mL.

For each flow interval or zone, a regression relationship was developed between the samples which occur above the TMDL target (126 CFU/100 mL) curve, and a corresponding 50% percent exceeded flow was identified. The regression lines for the high, moist, dry, and low zone for site 380022 were then used with the midpoint of 50% exceeded for that interval to calculate the existing E. coli bacteria load.

In the example provided in Figure 10, the regression relationship between observed E. coli bacteria loading and percent exceeded flow for the high flow, moist conditions, dry conditions and low flow interval is expanded below.

<u>High Flow</u>

E. coli bacteria load (expressed as 10^7 CFUs/day) = antilog (Intercept + (Slope*Percent Exceeded Flow))

Where the midpoint of the high flow interval from, 0 to 15 percent, is 7.5 percent, the intercept is 6.49 and the slope is -4.51; the existing E. coli bacteria load is:

E. coli bacteria load (10^7 CFUs/day) = antilog (6.49 + (-4.51*0.075))
= 1,406,382 x 10^7 CFUs/day

<u>Moist Conditions</u>

E. coli bacteria load (expressed as 10^7 CFUs/day) = antilog (Intercept + (Slope*Percent Exceeded Flow))

Where the midpoint of the moist flow interval from, 15 to 40 percent, is 27.5 percent, the intercept is 6.18 and the slope is -2.49 the existing E. coli bacteria load is:

E. coli bacteria load (10^7 CFUs/day) = antilog (6.18 + (-2.49*0.275))
= 310,553 x 10^7 CFUs/day

Dry Conditions

E. coli bacteria load (expressed as 10^7 CFUs/day) = antilog (Intercept + (Slope*Percent Exceeded Flow))

Where the midpoint of the dry flow interval from, 40 to 75 percent, is 57.5 percent, the intercept is 6.60 and the slope is -3.33; the existing E. coli bacteria load is:

E. coli bacteria load (10^7 CFUs/day) = antilog (6.60 + (-3.33*0.575))
= 48,006 x 10^7 CFUs/day

Low Flow

E. coli bacteria load (expressed as 10^7 CFUs/day) = antilog (Intercept + (Slope*Percent Exceeded Flow))

Where the midpoint of the low flow interval from, 75 to 99 percent, is 87 percent, the intercept is 5.29 and the slope is -1.64; the existing E. coli bacteria load is:

E. coli bacteria load (10^7 CFUs/day) = antilog (5.29 + (-1.64*0.87))
= 7,391 x 10^7 CFUs/day

As stated above, the midpoint for the 50 percent flow intervals are used to estimate the TMDL target load. The TMDL target load for the midpoint of each flow regime is displayed in Table 6. The LDC analysis of the listed reach indicates that there had been exceedances of the State water quality standard for E. coli bacteria in all four of the flow and condition regimes.

Table 6. Load Duration Curve Results.

	Load (CFU x 10^7 /Day)		
	Median Percentile	**Existing**	**TMDL**
High	7.50%	1,406,382	336,442
Moist	27.50%	310,553	56,420
Dry	57.50%	48,006	15,477
Low	87.00%	7,391	2,772

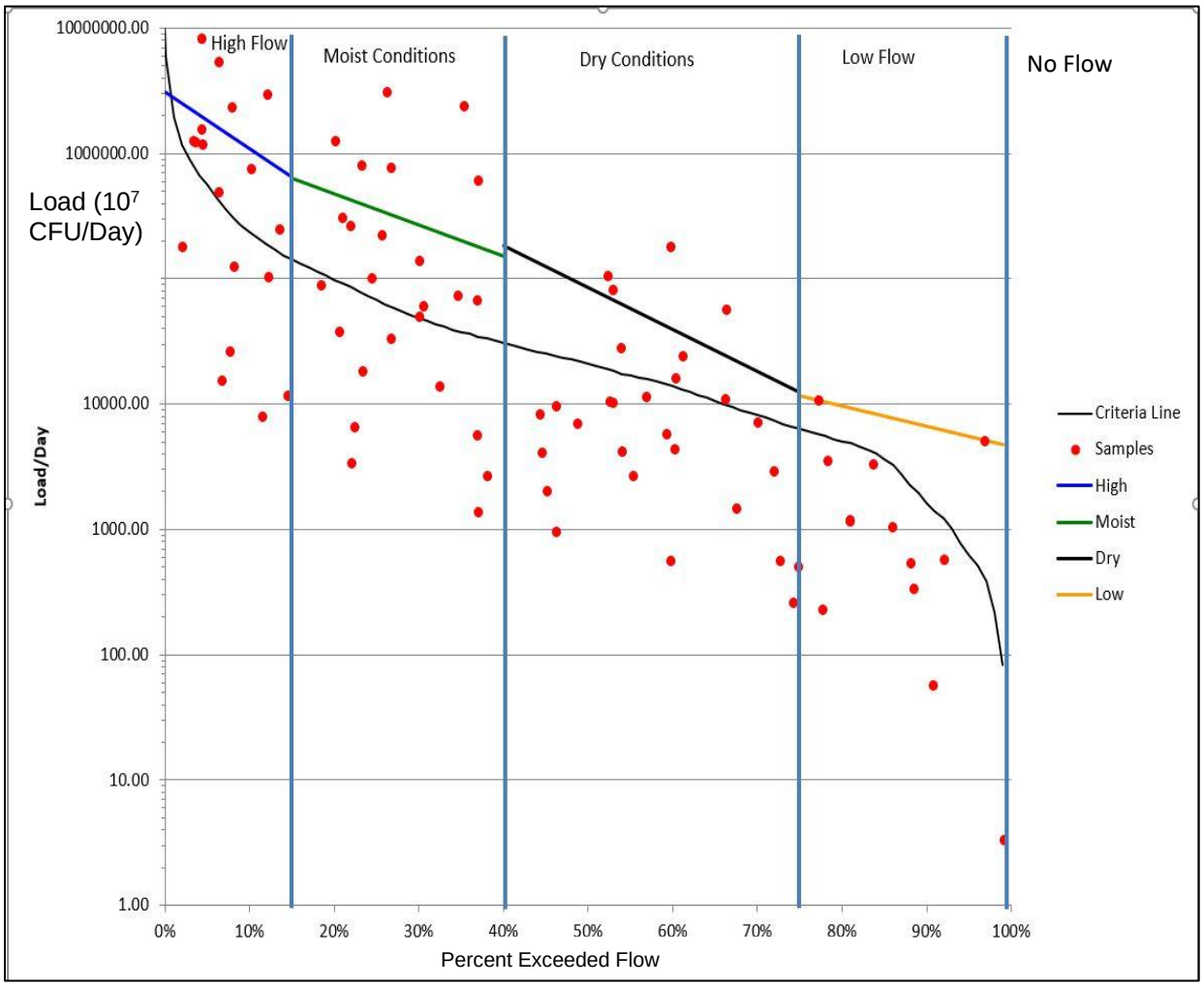


Figure 10. E. Coli Bacteria Load Duration Curve for the Little Missouri River NDDEQ Monitoring Station 380022. Curve Reflects Flows Collected from 2001-2018.

5.4 Wasteload Allocation (WLA) Analysis

Wasteload allocation calculations for the City of Medora and The Burning Hills Amphitheater WWTP will be calculated based on the following criteria:

1) The computed average daily discharge, during the recreational period, will be used in wasteload allocation calculations. This value was chosen because it represents the average discharge volume during the recreational season and will allow for flexibility due to the variability of the facilities discharge volumes and durations.

2) Although E. coli bacteria data has been collected for both point sources, the systems are assigned the water quality standards value of 126 CFU/100mL for this TMDL. This value was chosen because it is the State water quality standard, and because dischargers throughout the state are required by their permit to meet this value in discharge samples.

5.4.1 City of Medora, ND Wastewater Treatment Plant

According to NDPDES permit ND0022799, the City of Medora, N.D., has two wastewater discharge points which are fed from the same storage cells. Discharges occur typically during the recreation season (May 1-September 30). Discharge records are available for 2001 through 2018. Because both discharge points are fed from the same group of storage cells, both points

will be considered from the same source. Only one discharge point will be designated for the City of Medora.

The NDPDES Discharge Monitoring Report (DMR) summarizes discharge amounts by the number of days and the total MGAL (Million Gallons) for all the days of discharge. To convert the loading data into a daily discharge amount, the total MGAL is divided by the number of days in the discharge event. Discharge amounts between the months of May through September, for all years on record, were grouped and averaged (Appendix C). The calculated average is 0.5 MGAL per day.

The wasteload allocation for the City of Medora was determined by taking the calculated average daily discharge volume, during the recreational period, of 0.5 million gallons per day (MGD) multiplied by an E. coli bacteria concentration of 126 CFUs/100 mL, times appropriate conversion factors (calculations shown below).

City of Medora

= 0.5 million gallons/day * 3.7854 L/gal*1000mL/L* 126 CFU/100mL

= 238.4 x 10^7 CFUs/day

5.4.2 The Burning Hills Amphitheater Wastewater Treatment Plant

According to NDPDES permit NDG426905, The Burning Hills Amphitheater has one wastewater discharge point. The facility was permitted in 2018 and only has a single record available for discharge and E. coli bacteria sample for the year 2018.

Due to a misunderstanding in the required reporting procedures, The Burning Hills Amphitheater WWTP did not report their discharge amount for July of 2018 in their DMR (Appendix D). To obtain an estimated discharge amount for the purpose of WLA, The Burning Hills Amphitheater WWTP operator was contacted in January of 2019 and asked what their maximum possible daily discharge amount was, which was reported as 12,000 gallons per day.

Due to the limited availability of discharge data, average daily flow could not be calculated. Instead, the wasteload allocation for The Burning Hills Amphitheater WWTP was determined by using the maximum daily discharge volume of 12,000 gallons per day and then multiplied by an E. coli bacteria concentration of 126 CFUs/100 mL, times an appropriate conversion factor (calculations shown below). Using the maximum daily discharge volume will allow flexibility for the facility.

The Burning Hills Amphitheater

= 12,000 gallons/day (0.012 million gallons/day) * 3.7854 L/gal * 1000mL/L* 126 CFU/100mL

= 5.723 x 10^7 CFUs/day

5.5 Loading Reduction Analysis

Most load reductions can generally be allotted to nonpoint sources. However, to account for uncertainty due to periodic discharges from permitted municipal facilities, (e.g., City of Medora) WLAs for all point-sources are included for the calculation of this TMDL.

As previously described, exceedances of the E. coli bacteria standard were observed in all flow regimes (i.e., high flow, moist conditions, dry conditions, low flow) at NDDEQ monitoring site 380022. 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).

Sources most likely to contribute to E. coli bacteria loading are identified by relating runoff characteristics to each flow regime (Table 5). Animals grazing in the riparian area can contribute E. coli bacteria by depositing manure where it has an immediate impact on water quality. Due to the 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.

In contrast, intensive grazing of livestock in the upland and not in the riparian area has high potential to impact water quality at high flows and medium potential under moist conditions. Intensive grazing in the upland creates the potential for manure accumulation and availability for runoff at high flows. Exclusion of livestock from the riparian area eliminates the potential of direct manure deposition and, therefore, is of high importance at all flows.

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 126 CFU/100 mL, a ten percent explicit margin of safety was used. The MOS was calculated as ten percent of the total TMDL.

Additionally, the water quality analysis and LDC analyzes observed exceedances of water quality criteria over the recreation season and during all flow regimes (e.g., high, moist, dry and low). It was determined that water quality criteria exceedances occur throughout each month of the recreation season and during all flow regimes. Reductions required to meet water quality standards across the four flow regimes were similar (estimated reductions for high – 76%, moist – 82%, dry – 68%, low – 62%). By evaluating exceedances by flow regime, season, and assigning reductions by flow regime, critical conditions are considered in establishing the TMDL.

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. This TMDL addresses seasonality because the Flow Duration Curve for the Little Missouri River (ND-10110203-025-S_00) was developed using 17 years of data, between 2001 and 2018, and includes 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 E. coli bacteria loads during the seasons covered by the standard.

7.0 TMDL

Table 7 provides an outline of the critical elements of the E. coli bacteria TMDL for the listed segment. The TMDL for the Little Missouri River segment (ND-10110203-025-S_00) is summarized in Table 8. It provides an estimate of the existing daily load and target average daily load, by flow regime, necessary to meet North Dakota water quality standards. The TMDL

also includes a load allocation from known point-sources and a ten percent Margin of Safety. Appendix E provides a summary of additional point sources with an assigned wasteload allocation of zero.

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 7. Critical Elements for the Listed Segment of the Little Missouri River.

Category	Description	Explanation
Beneficial Use Impaired	Recreation	Contact Recreation (i.e., swimming, fishing)
Pollutants	E. Coli Bacteria	See Section 2.0
E. Coli Bacteria TMDL Target	126 CFU/100 mL	Based on the current state water quality standard for E. coli bacteria. Monitoring will be conducted to determine compliance with the current water quality standard of 126 CFU/100 mL.
Significant Sources	Nonpoint and Point Sources	Includes nonpoint sources (e.g., unpermitted AFOs and riparian grazing) and point sources for the City of Medora and The Burning Hills Amphitheater WWTP.
Margin of Safety	Explicit	Ten percent (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 8. E. Coli Bacteria TMDL (CFU x 107 day) for the Little Missouri River Listed Segment ND-10110203-025-S_00 as represented by NDDEQ Monitoring Site 380022.

	Flow Regime			
	High Flow	Moist Conditions	Dry Conditions	Low Flow
Existing Load	1,406,382	310,553	48,006	7,391
TMDL	336,442	56,420	15,477	2,772
WLA-City of Medora	238.4	238.4	238.4	238.4
WLA-Burning Hills Amphitheater	5.723	5.723	5.723	5.723
LA	302,554	50,534	13,685	2,251
MOS	33,644.20	5,642.00	1,547.70	277.20
Percent Reduction Needed	76%	82%	68%	62%

7.1 Allocation

The City of Medora and the Burning Hills Amphitheater produce only short duration discharges into an extremely small portion of the TMDL watershed. Their contribution and overall emphasis on the total watershed load are likely to be minimal.

The permitted facility in the City of Medora with discharge points into segment ND-10110203-025-S_00, will have a portion of the TMDL, 238.4 x 10^7 CFUs/day. The Burning Hills Amphitheater WWTP will be set at 5.723 x 10^7 CFUs/day.

The wasteload allocations (WLA) for the City of Medora and the Burning Hills Amphitheater are set at a constant load throughout the entire flow regime of high, moist, dry and low. The remaining load (LA) for all four flow regimes has been allocated to nonpoint sources in the watershed and the MOS.

8.0 POLLUTION REDUCTION RECOMMENDATIONS

Nonpoint source pollution may be the largest contributor to elevated E. coli bacteria levels in the listed segment of the Little Missouri River watershed. To achieve the TMDL targets identified in the report, it will require the widespread 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 (BMPs) through non-regulatory approaches. BMPs are methods, measures, or practices that are determined to be a reasonable and cost-effective means for a landowner to meet nonpoint source pollution control needs (EPA, 2001).

The Natural Resource Conservation Service (NRCS) is a leading agency in the development and implementation of BMPs. The agency has cataloged and described in detail over 100 BMPs to protect water quality. NRCS BMPs are recommended for mitigation, due to their creditability and the thorough designs produced by their department. It should be noted that this does not exclude the use of other recognized BMPs as a means for mitigation.

To reduce nonpoint source pollution for all the flow regimes, specific BMPs are described in Sections 8.1 and 8.2 which can mitigate the effects of E. coli bacteria loading to the impaired reach. Controlling nonpoint sources is an immense undertaking requiring extensive financial and technical support. Provided that technical/financial assistance is available to stakeholders, BMPs have the potential to significantly reduce total E. coli bacteria loading to the Little Missouri River (Table 9). Water quality monitoring should continue in order to measure BMP effectiveness and determine, through adaptive management, if loading allocation recommendations need to be adjusted.

Table 9. Management Practices, Flow Regimes and Expected Reduction of E. Coli Bacteria by the Implementation of BMPs (Cleland, 2003).

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 riparian areas and improve water quality through management of livestock and associated grazing land. Fecal matter from livestock, along with streambank erosion can be a significant source of E. coli bacteria to surface water.

Precipitation, plant cover, number of animals, and soils are factors that affect the amount of bacteria delivered to a waterbody. The BMPs listed below are known to reduce nonpoint source pollution from livestock. Landowner participation in the following BMPs is completely voluntary and the information provided are merely options for consideration.

Livestock Exclusion from Riparian Areas- (NRCS Practice Specification 382 & 472)
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.

Fencing, Water Well and Tank Development- (NRCS Practice Specification 587)
Fencing animals from stream access requires an 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- (NRCS Practice Specification 528)
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 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.

Waste Management System- (NRCS Practice Specification 313)
Waste management systems can be effective in controlling up to 90 percent of E. coli bacteria loading originating from confined animal feeding areas. 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.

Vegetative Filter Strip- (NRCS Practice Specification 393)
Vegetated filter strips are used to reduce the amount of sediment, particulate organics, dissolved contaminants, nutrients, and in the case of this TMDL, E. coli bacteria to streams.

Results from a study by Pennsylvania State University (1992a) as presented by EPA (1993), suggest that vegetative filter strips can remove up to 55 percent of E. coli bacteria loading to rivers and streams. 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.

8.2 Cropland Management Recommendations

Vegetative Barrier – (NRCS Practice Specification 601)
Vegetative barriers are used to reduce sheet and rill erosion, reduce ephemeral gully erosion, manage water flow, stabilize steep slopes, and trap sediment. This practice applies to all eroding areas, including cropland, grazing land, forest land, farmsteads, mined land, and construction sites. By reducing erosion any accumulated amount of fecal matter will less likely be moved off site and into an adjacent waterway.

Cover Crop – (NRCS Practice Specification 380)
Cover crops are crops which are not usually grown for harvest, but which serve multiple functions in crop rotation systems. Cover crops are typically grown to prevent soil erosion or for improvement of soil quality, however, other important roles include the enhancement of soil structure, improvement of soil fertility, enhancement, or preservation of environmental quality, and in the management of weeds, insect pests, and plant pathogens.

8.3 Area Wide Septic System Analysis

In the absence of an existing analysis, an area-wide septic system analysis is recommended to identify possible E. coli bacteria discharges from failing or improperly functioning septic systems.

8.4 E. Coli Bacteria Source Tracking Analysis

Source tracking analysis provides a clear understanding of sources and their points of entry into a watershed. Over the last decade, technology and widespread use has decreased the cost of Source Tracking Analysis and made it more available for local watershed agency partners to incorporate into their water quality monitoring programs.

8.5 Other Recommendations

Another goal is to promote and encourage the attendance of informational and educational opportunities and venues for landowners and watershed users. Programs such as these create a community of watershed actors to network and share ideas and technologies that work in a local setting. Several agencies and organizations host a wide variety of these opportunities and venues throughout North Dakota. Additional information on some of these opportunities are listed below.

a) The state funded Water Education Foundation – Water Tours – is an exceptional opportunity for all interested parties to learn more about local water usage, water quality and sustainability. https://ndwater.org/nd-water-education-foundation/

b) Soil Conservation District sponsored multi-day workshops/summits that bring in speakers on a wide range of ecological topics and include participant involved learning.

c) Soil Conservation District sponsored field day demonstrations.

d) North Dakota State University and NDDEQ sponsored “Leadership Academy”, which focuses on watershed restoration and resource conservation activities.

e) NDDEQ annually sponsored “Water Quality Certification” workshop. Participants use a hands-on approach to better understand water quality sampling procedures and techniques.

f) River Keepers annually sponsored river educational activities. Activities include canoeing, excursions, and fishing. All events are designed with an educational theme and include participant involvement. https://www.riverkeepers.org/

9.0 PUBLIC PARTICIPATION

To satisfy the public participation requirement of this TMDL, a hard copy of the TMDL for the listed segments of the Little Missouri River and a request for comment will be mailed to participating agencies, partners, and to those who request a copy. Those included in the mailing of a hard copy are as follows:

- Golden Valley County Soil Conservation District
- Slope-Hettinger County Soil Conservation District
- Bowman-Slope County Soil Conservation District
- Maah Daah Hey Trail Association
- U.S. Forest Service; Dakota Prairie National Grasslands
- Natural Resource Conservation Service (State Office)
- U.S. Environmental Protection Agency, Region VIII

In addition to mailing copies of this TMDL report to interested parties, the TMDL will be posted on the North Dakota Department of Environmental Quality web site at https://deq.nd.gov/PublicNotice.aspx.

A 30-day public notice soliciting comment and participation was published in the Bismarck Tribune Newspaper, Dickinson Press, Bowman County Pioneer, Billings County Pioneer, and Golden Valley News.

The initial 30-day public notice for this TMDL occurred in July 2020. This document was not submitted to EPA for final approval so that the comments received could be addressed. Because of the changes from these comments, along with changes to the City of Medora wasteload allocation, a second 30-day public notice was issued from December 29, 2021, through January 31, 2022.

10.0 FUTURE MONITORING

As stated previously, 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.

Monitoring of the listed segment will continue through the NDDEQ Ambient River and Stream Water Quality Monitoring Network. The network includes over 30 level 1 sampling sites located throughout the state of North Dakota. Surface water samples are taken eight times per year and include parameters such as: total suspended solids, dissolved oxygen, nutrients, and E. coli bacteria. E. coli bacteria data will continue to be collected at NDDEQ monitoring site 380022 in

the future. Future data will be compared to current TMDL levels to determine progress towards E. coli bacteria reduction.

With the assistance of Soil Conservation Districts and local partners, Watershed Restoration Plans (i.e., Section 319 projects) for the Little Missouri River watershed can be developed will be sought after in the future. Section 319 projects typically provide funding for additional sampling sites within the watershed and listed segment.

Currently, there are no Section 319 projects directly addressing the Little Missouri River. However, there is an approved TMDL for Deep Creek, which confluences with the Little Missouri River upstream of this TMDL segment. This TMDL report can be used in conjunction with future monitoring to gain better insights in E. coli bacteria loading amounts and sources.

11.0 TMDL IMPLEMENTATION STRATEGY

Implementation of TMDLs is dependent upon the availability of Section 319 funds or other watershed restoration programs (e.g., NRCS Environmental Quality Incentives Program), as well as securing a local project sponsor and the 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 North Dakota Nonpoint Source Pollution Task Force for approval. The implementation of the BMPs contained in the NPS PIP is voluntary. Therefore, success of any TMDL implementation project is ultimately dependent on the ability of the local project sponsor to find cooperating producers.

Monitoring is important and a required component of any PIP. As a part of the PIP, data is 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 is gathered and analyzed, watershed restoration tasks are adapted to place BMPs where they will have the greatest benefit to water quality. Additional information regarding nonpoint source controls and reasonable assurance can be found in Section 8.0 Mitigation.

12.0 REFERENCES

Baker-Ismail, S., Cade-Menun, B., McMartin, D.W. 2016.*Survival and Overland Transport of Fecal Coliform Under Canadian Prairie Conditions.* University of Regina, Environmental Systems Engineering, Regina, Saskatchewan, Canada.

Conservation Technology Information Center, Crop Residue Management Survey. 2011. https://www.ctic.org/CRM

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.

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

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

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

EPA. 2006. Ecoregions of North and South Dakota. PRINCIPAL AUTHORS: Sandra A. Bryce (Dynamac Corporation), James M. Omernik (USEPA), David E. Pater (Dynamac Corporation), Michael Ulmer, Jerome Schaar (USDA, NRCS), Jerry Freeouf (USFS), Rex, Johnson (SDSU), Pat Kuck (DENR/NRSC Liaison), and Sandra H. Azevedo (OAO Corporation). https://www.epa.gov/eco-research/ecoregion-download-files-state-region-8#pane-32

EPA. 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 https://www.epa.gov/sites/default/files/2015-07/documents/2007_08_23_tmdl_duration_curve_guide_aug2007.pdf

Google Earth™. 2014. Landsat Imagery via U.S. Geological Survey.

NASS. 2018. *USDA-National Agricultural Statistics Service*- Cropland Data Layer https://www.nass.usda.gov/

NDAWN. 2019. Beach 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

NDAC. 2019. *Standards of Quality for Waters of the State.* Chapter 33.1-16-02.1 of the North Dakota Administrative Code. North Dakota Department of Environmental Quality. Bismarck, North Dakota.

NDDEQ. (previously NDDoH). 2012. Bacteria TMDL for Deep Creek and West Branch Deep Creek in Bowman and Slope Counties, North Dakota. North Dakota Department of Environmental Quality. Bismarck, ND. https://deq.nd.gov

NDDEQ (previously NDDoH). 2019. *North Dakota 2018 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads.* North Dakota Department of Environmental Quality. Bismarck, North Dakota. https://deq.nd.gov

NRCS. 2016. Natural Resources Conservation Service Practice [Online]. USDA – Natural Resources Conservation Service, North Dakota. Available at https://efotg.sc.egov.usda.gov/#/
Practice Specification 528 (Prescribed Grazing)
Practice Specification 393 (Filter Strip)
Practice Specification 313 (Waste Storage Facility)
Practice Specification 362 (Diversion)
Practice Specification 587 (Structure for Water Control)
Practice Specification 382 (Fence)
Practice Specification 472 (Access Control)
Practice Specification 380 (Cover Crop)
Practice Specification 601 (Vegetative Barrier)

US. Forest Service. 2006. The livestock Grazing Record of Decision for Dakota Prairie Grasslands Final Environmental Impact Statement and Land Resource Management Plan. USDA-USFS, North Dakota.

Pennsylvania State University. 1992a. Nonpoint Source Database. Pennsylvania State University, Department of Agricultural and Biological Engineering, University Park, PA.

Ries, K. G., III and P.J. Friesz. 2000. *Methods for Estimating Low-Flow Statistics for Massachusetts Streams.* U.S. Geological Survey Water Resources Investigations Report 00-4135. U.S. Geological Survey, Reston, VA.

Appendix A: E. Coli Bacteria Data Collected for NDDEQ monitoring site 380022 from 2001-2018

NDDEQ Monitoring site 380022 on Little Missouri River near the City of Medora, ND

	MAY		JUNE		JULY		AUGUST		SEPTEMBER	
	08-May-01	20	19-Jun-01	240	19-Jul-04	200	04-Aug-03	1600	11-Sep-01	50
	21-May-02	10	25-Jun-03	240	17-Jul-07	20	08-Aug-05	40	04-Sep-02	30
	15-May-03	5	14-Jun-04	230	14-Jul-09	420	08-Aug-06	60	15-Sep-03	1600
	03-May-04	20	27-Jun-05	240	06-Jul-11	5	20-Aug-07	560	19-Sep-05	5
	16-May-05	200	26-Jun-06	40	09-Jul-13	390	11-Aug-08	70	18-Sep-06	230
	17-May-06	30	12-Jun-07	200	07-Jul-14	920	24-Aug-09	50	22-Sep-08	40
	08-May-07	2000	30-Jun-08	10	21-Jul-15	10	03-Aug-10	160	13-Sep-10	2200
	19-May-08	10	03-Jun-09	10	25-Jul-16	80	16-Aug-11	50	28-Sep-11	5
	12-May-10	310	22-Jun-10	1600	19-Jul-17	720	08-Aug-12	10	18-Sep-12	20
	16-May-12	70	26-Jun-12	140	17-Jul-18	41	13-Aug-13	1300		
	07-May-13	90	11-Jun-13	150			12-Aug-14	1600		
	21-May-13	1600	10-Jun-14	410			25-Aug-15	8000		
	13-May-14	70	09-Jun-15	100			22-Aug-16	50		
	12-May-15	40	08-Jun-16	700			14-Aug-17	1600		
	17-May-16	130	14-Jun-17	110			21-Aug-18	150		
	15-May-17	360	05-Jun-18	430						
	01-May-18	52								
	22-May-18	180								
N		18		16		10		15		9
GeoMean		77		155		97		218		66
% > 409		11		25		30		40		22
Recreation Use Assemesment		FSbT		NS		FSbT		NS		FSbT

Legend

FSbt = Fully Supporting but Threatened
NS = Non-Supporting
FS = Fully Supporting

Results are reported in Colony Forming Units (CFU) per 100 milliliters

Cells highlighted in Green is the threshold value of the lower detection limit (i.e., non-detect)
These results get assigned a value of 5
Cells highlighted in Yellow is the threshold value of the upper detection limit (i.e., detection is too high to count)
These results get assigned a value of 1600

Appendix B: Flow Intervals for FDC and LDC Analysis for NDDEQ Sampling Site 380022

All E. Coli Samples above the
126 cfu / 100 mL standard

High Flow

	PercentRank	PercentRank				**Slope**	-4.51			
High	>0	<0.15				**Intercept**	6.49			
	PercentRank	PercentRank				**X**	**Y**			
Moist	>0.15	<0.4				0.00%	3062892			
	PercentRank	PercentRank				15.00%	645765			
Dry	>0.4	<0.75				**Median**	**Existing Load/day**	**TMDL Load/day**	**Days**	
	PercentRank	PercentRank				7.50%	1406382	336442	55	
Low	>0.75	<0.99								

Date	C	Q	PercentRank	Load(CFUx10^7/Day)		Date	C	Q	PercentRank	Load(CFUx10^7/Day)
19-Jun-01	240	2000	4.5%	1174511		19-Jun-01	240	2000	4.5%	1174511
25-Jun-03	240	114	36.9%	66947		16-May-05	200	2580	3.4%	1262600
04-Aug-03	1600	1.3	96.9%	5090		04-Apr-07	190	527	13.6%	245008
15-Sep-03	1600	318	20.1%	1244982		08-May-07	2000	601	12.1%	2941172
14-Jun-04	230	42.4	61.2%	23862		12-Jun-07	200	2490	3.6%	1218556
19-Jul-04	200	56.7	53.9%	27748		12-May-10	310	2070	4.4%	1570175
16-May-05	200	2580	3.4%	1262600		22-Jun-10	1600	1360	6.4%	5324452
27-Jun-05	240	125	34.6%	73407		21-May-13	1600	2080	4.4%	8143279
18-Sep-06	230	19	77.2%	10693		11-Jun-13	150	1350	6.4%	495497
04-Apr-07	190	527	13.6%	245008		10-Jun-14	410	745	10.2%	747405
08-May-07	2000	601	12.1%	2941172		07-Jul-14	920	1030	7.9%	2318681
12-Jun-07	200	2490	3.6%	1218556						
20-Aug-07	560	59.6	53.0%	81668						
14-Jul-09	420	297	21.0%	305226						
07-Oct-09	6200	202	26.2%	3064496						
12-May-10	310	2070	4.4%	1570175						
22-Jun-10	1600	1360	6.4%	5324452						
03-Aug-10	160	154	30.6%	60292						
13-Sep-10	2200	113	37.0%	608299						
26-Jun-12	140	32.1	66.2%	10996						
21-May-13	1600	2080	4.4%	8143279						
11-Jun-13	150	1350	6.4%	495497						
09-Jul-13	390	278	22.0%	265293						
13-Aug-13	1300	250	23.3%	795242						
10-Jun-14	410	745	10.2%	747405						
07-Jul-14	920	1030	7.9%	2318681						
12-Aug-14	1600	195	26.7%	763432						
25-Aug-15	8000	122	35.3%	2388173						
17-May-16	130	157	30.1%	49941						
08-Jun-16	700	61.3	52.4%	104996						
15-May-17	360	157	30.1%	138299						
19-Jul-17	720	31.9	66.4%	56200						
14-Aug-17	1600	45.6	59.8%	178526						
22-May-18	180	230	24.4%	101302						
05-Jun-18	430	211	25.6%	222007						
21-Aug-18	150	44.2	60.4%	16223						

Moist Conditions

Slope	-2.49			
Intercept	6.18			
X	**Y**			
15.00%	635702			
40.00%	151712			
Median	**Existing Load/day**	**TMDL Load/day**	**Days**	
27.50%	310554	56421	91	

Date	C	Q	PercentRank	Load(CFUx10^7/Day)
25-Jun-03	240	114	36.9%	66947
15-Sep-03	1600	318	20.1%	1244982
27-Jun-05	240	125	34.6%	73407
14-Jul-09	420	297	21.0%	305226
07-Oct-09	6200	202	26.2%	3064496
03-Aug-10	160	154	30.6%	60292
13-Sep-10	2200	113	37.0%	608299
09-Jul-13	390	278	22.0%	265293
13-Aug-13	1300	250	23.3%	795242
12-Aug-14	1600	195	26.7%	763432
25-Aug-15	8000	122	35.3%	2388173
17-May-16	130	157	30.1%	49941
15-May-17	360	157	30.1%	138299
22-May-18	180	230	24.4%	101302
05-Jun-18	430	211	25.6%	222007

Dry Conditions

Slope	-3.33			
Intercept	6.60			
X	**Y**			
40.00%	183965			
75.00%	12527			
Median	**Existing Load/day**	**TMDL Load/day**	**Days**	
57.50%	48006	15477	128	

Date	C	Q	PercentRank	Load(CFUx10^7/Day)
14-Jun-04	230	42.4	61.2%	23862
19-Jul-04	200	56.7	53.9%	27748
20-Aug-07	560	59.6	53.0%	81668
26-Jun-12	140	32.1	66.2%	10996
08-Jun-16	700	61.3	52.4%	104996
19-Jul-17	720	31.9	66.4%	56200
14-Aug-17	1600	45.6	59.8%	178526
21-Aug-18	150	44.2	60.4%	16223

Low Flow

Slope	-1.64			
Intercept	5.29			
X	**Y**			
75.00%	11617			
99.00%	4702			
Median	**Existing Load/day**	**TMDL Load/day**	**Days**	
87.00%	7391	2772	88	

Date	C	Q	PercentRank	Load(CFUx10^7/Day)
04-Aug-03	1600	1.3	96.9%	5090
18-Sep-06	230	19	77.2%	10693

Appendix C: North Dakota Department of Environmental Quality, Division of Water Quality, NDPDES DMR Data for the City of Medora, North Dakota

Date Printed: 12/13/2018

ND Dept of Health Water Quality NDPDES DMR Data Report

Discharge Start between '1/13/2001' AND '12/12/2018' AND Discharge End BETWEEN '1/13/2001' AND '12/12/2018'

Environmental Interest: Medora City Of Permit: ND0022799
Discharge Point: 001 A Parameter: Drain MG

Disch	Discharge Dates		Treat		Concentration Data				Loading Data				No Di	
Type	Start	End	Struct	Duration	Min	Avg	Max	Units	Avg	Max	Units	No. Exc.	Code	Freq/Type
Effluent	5/1/2001	5/4/2001	Cell 2	4						1.764	MGAL	0		Monthly/Calculated
Effluent	7/24/2001	7/28/2001	Cell 4	5						0.98	MGAL	0		Monthly/Calculated
Effluent	7/24/2001	7/28/2001	Cell 5	5						0.718	MGAL	0		Monthly/Calculated
Effluent	4/10/2002	4/15/2002	Cell 1	6						3.593	MGAL	0		Monthly/Calculated
Effluent	4/10/2002	4/15/2002	Cell 3	6						2.156	MGAL	0		Monthly/Calculated
Effluent	4/10/2002	4/15/2002	Cell 4	6						0.98	MGAL	0		Monthly/Calculated
Effluent	4/10/2002	4/15/2002	Cell 5	6						0.718	MGAL	0		Monthly/Calculated
Effluent	9/12/2003	9/14/2003	Cell 4	2						0.735	MGAL	0		Monthly/Calculated
Effluent	9/12/2003	9/14/2003	Cell 5	2						0.539	MGAL	0		Monthly/Calculated
Effluent	3/18/2004	3/24/2004	Cell 1	6						3.593	MGAL	0		Monthly/Calculated
Effluent	3/18/2004	3/25/2004	Cell 3	7						2.156	MGAL	0		Monthly/Calculated
Effluent	3/18/2004	3/25/2004	Cell 4	7						2.45	MGAL	0		Monthly/Calculated
Effluent	3/18/2004	3/25/2004	Cell 5	7						1.796	MGAL	0		Monthly/Calculated
Effluent	4/11/2005	4/18/2005	Cell 1	8						0.449	MGAL	0		Monthly/Calculated
Effluent	4/20/2005	4/25/2005	Cell 4A	6						0.294	MGAL	0		Monthly/Calculated
Effluent	7/19/2005	7/26/2005	Cell 4A	8						0.196	MGAL	0		Monthly/Calculated
Effluent	10/13/2005	10/19/2005	Cell 4A	7						2.94	MGAL	0		Monthly/Calculated
Effluent	5/29/2009	6/3/2009	Cell 1	6						2.69	MGAL	0		Monthly/Calculated
Effluent	4/8/2010	4/15/2010	Cell 1	8						4.04	MGAL	0		Monthly/Calculated
Effluent	4/9/2010	4/16/2010	Cell 4A	8						2.45	MGAL	0		Monthly/Calculated
Effluent	10/4/2011	10/10/2011	Cell 1	7						5.39	MGAL	0		Monthly/Calculated
Effluent	10/10/2011	10/16/2011	Cell 1	7						2.94	MGAL	0		Monthly/Calculated
Effluent	3/21/2012	3/27/2012	Cell 1	7						6.288	MGAL	0		Monthly/Calculated
Effluent	3/30/2012	4/4/2012	Cell 4A	6						3.43	MGAL	0		Monthly/Calculated
Effluent	9/5/2012	9/11/2012	Cell 1	7						6.288	Mgal	0		Monthly/Calculated
Effluent	9/5/2012	9/11/2012	Cell 2	7						2.058	Mgal	0		Monthly/Calculated
Effluent	5/8/2013	5/14/2013	Cell 4A	7						2.94	Mgal	0		Monthly/Calculated

Date Printed: 12/13/2018

ND Dept of Health Water Quality NDPDES DMR Data Report

Discharge Start between '1/13/2001' AND '12/12/2018' AND Discharge End BETWEEN '1/13/2001' AND '12/12/2018'

Disch	Discharge Dates		Treat		Concentration Data				Loading Data				No Di	
Type	Start	End	Struct	Duration	Min	Avg	Max	Units	Avg	Max	Units	No. Exc.	Code	Freq/Type
Effluent	9/19/2013	9/23/2013	Cell 3	5						4.312	Mgal	0		Monthly/Calculated
Effluent	5/8/2014	5/14/2014	Cell 1	7						8.984	Mgal	0		Monthly/Calculated
Effluent	10/14/2014	10/20/2014	Cell 3	7						3.8	Mgal	0		Monthly/Calculated
Effluent	9/5/2015	9/10/2015	Cell 1	6						6.3	Mgal	0		Monthly/Calculated
Effluent	5/18/2017	5/31/2017	Cell 2	14						5.39	Mgal	0		Monthly/Calculated
Effluent	4/2/2018	4/6/2018	Cell 2	5						1.6	Mgal	0		Monthly/Calculated
Effluent	5/21/2018	5/23/2018	Cell 2	3						1.3	Mgal	0		Monthly/Calculated

Table to Determine Average Discharge Amounts per Day -During the Recreational Period (May – September)

Permit#	EI Name	Parameter	Start	End	Days	Lmax (MGD)	Daily Discharge in MGAL
ND0022799	Medora City Of	Drain MG	5/1/2001	5/4/2001	4	1.764	0.44
ND0022799	Medora City Of	Drain MG	7/24/2001	7/28/2001	5	0.98	0.20
ND0022799	Medora City Of	Drain MG	7/24/2001	7/28/2001	5	0.718	0.14
ND0022799	Medora City Of	Drain MG	9/12/2003	9/14/2003	2	0.735	0.37
ND0022799	Medora City Of	Drain MG	9/12/2003	9/14/2003	2	0.539	0.27
ND0022799	Medora City Of	Drain MG	3/18/2004	3/24/2004	6	3.593	0.60
ND0022799	Medora City Of	Drain MG	7/19/2005	7/26/2005	8	0.196	0.02
ND0022799	Medora City Of	Drain MG	10/13/2005	10/19/2005	7	2.94	0.42
ND0022799	Medora City Of	Drain MG	5/29/2009	6/3/2009	6	2.69	0.45
ND0022799	Medora City Of	Drain MG	9/5/2012	9/11/2012	7	6.288	0.90
ND0022799	Medora City Of	Drain MG	9/5/2012	9/11/2012	7	2.058	0.29
ND0022799	Medora City Of	Drain MG	5/8/2013	5/14/2013	7	2.94	0.42
ND0022799	Medora City Of	Drain MG	9/19/2013	9/23/2013	5	4.312	0.86
ND0022799	Medora City Of	Drain MG	5/8/2014	5/14/2014	7	8.984	1.28
ND0022799	Medora City Of	Drain MG	9/5/2015	9/10/2015	6	6.3	1.05
ND0022799	Medora City Of	Drain MG	5/18/2017	5/31/2017	14	5.39	0.39
ND0022799	Medora City Of	Drain MG	5/21/2018	5/23/2018	3	1.3	0.43
						Average	0.50

Date Printed: 12/13/2018

ND Dept of Health Water Quality NDPDES DMR Data Report

Discharge Start between '1/13/2001' AND '12/12/2018' AND Discharge End BETWEEN '1/13/2001' AND '12/12/2018'

Environmental Interest: Medora City Of Permit: ND0022799
Discharge Point: 001 A Parameter: E Coli Geo Mean

Disch	Discharge Dates		Treat		Concentration Data				Loading Data			No Di		
Type	Start	End	Struct	Duration	Min	Avg	Max	Units	Avg	Max	Units	No. Exc.	Code	Freq/Type
Effluent	9/19/2013	9/23/2013	Cell 3	5								0	9	/
Effluent	5/8/2014	5/14/2014	Cell 1	7				Num/100 mL				2		Weekly/Grab
Effluent	10/14/2014	10/20/2014	Cell 3	7	3	3	3	Num/100 mL				0		Weekly/Grab
Effluent	9/5/2015	9/10/2015	Cell 1	6	21	21	21	Num/100 mL				0		Weekly/Grab
Effluent	5/18/2017	5/31/2017	Cell 2	14	3	32	61	Num/100 mL				0		Weekly/Grab
Effluent	4/2/2018	4/6/2018	Cell 2	5								0	E	/
Effluent	5/21/2018	5/23/2018	Cell 2	3	1	1	1	Num/100 mL				0		Weekly/Grab

Appendix D: North Dakota Department of Environmental Quality, Division of Water Quality, DMR Data for The Burning Hills Amphitheater, WWTP

ND Dept of Health Water Quality NDPDES DMR Data Report

Discharge Start between '7/16/2018' AND '7/16/2018'

facilityName	permitNumber	DischargePoint	dischargeStart	ParameterCode	meterMin	meterMax	meterAvg	ConcentrationUnits	LoadAvg	LoadMax	LoadUnits
Burning Hills Ampitheater WWTP	NDG426905	1	7/16/2018	Drain MG	NULL	NULL	NULL	Num/100 mL	NULL	NULL	
Burning Hills Ampitheater WWTP	NDG426905	1	7/16/2018	E Coli	35.5	2420	NULL		NULL	NULL	MGAL

Appendix E: NDPDES Permitted Facilities Adjacent to the Listed Segment of the Little Missouri River

NDPDES Permitted Facilities Adjacent to the Listed Segment of the Little Missouri River with Zero Wasteload Allocation along with Rationale.

Permit #	Description	Zero Wasteload Allocation Rationale
NDG126409	Teddy Roosevelt Medora Foundation	No discharge event since 2011
NDR050676	Hild Scoria Pit	Industrial stormwater permit, no E. coli discharge
NDG326425	Teddy Roosevelt NP – Painted Canyon	No discharge event since 2012
NDX000049	Billings County – Medora Shop	No exposure facility, exempt from discharge
NDX000048	Billings County – Fryburg Shop	No exposure facility, exempt from discharge
NDG325461	Sentinel Butte, City of	No discharge event since 2007
ND0024651	Home on the Range	No discharge event since 2011
NDG322047	Golva, City of	No discharge event since 2011

Appendix F: North Dakota Department of Environmental Quality Response to Public and EPA Region 8 Comments

Responses to public comments given for the Little Missouri River TMDL addressing E. Coli Bacteria.

Four organizations provided public comments during the comment period including The Maah Daah Hey Trail Association, United States Forest Service, Dakota Prairie Grasslands, and Billings County Planning and Zoning Department. The US EPA – Region 8 office provided additional comments following the public comment period.

The Maah Daah Hey Trail Association

Page 12, 1.3 Land Use
Comment: You should note that most producers operating on cropland within the listed segment of the watershed utilize no-till. The Conservation Technology Information Center (CTIC) last Crop Residue Management (CRM) survey of Golden Valley County, ND in 2011 indicates 87 percent of the cropland is seeded using no-tillage practices. No-till is known to increase soil permeability, increase water holding capacity, and reduce runoff. No-till in combination with diverse crop rotations, cover crops and other soil conserving practices minimizes runoff and contamination of surface and ground water.

NDDEQ Response:
Thank you for the comment. Additional no-till information has been added to section 1.3.

Page 13, 1.4 Land Ownership
Comment: It would appear in Figure 6 that private landownership immediately adjacent to the Little Missouri River in the listed segment is predominate though overall the US Forest Service has major ownership of land within the listed segment.

NDDEQ Response:
Thank you for the comment. Additional information was added to Section 1.4 to reflect this.

Page 14 and Page 15 Climate and Precipitation
Comment: This document uses two different time periods for weather data, 1991 — 2017 for precipitation and 2001 — 2018 for temperature. At this point it isn't apparent why the author chose two different time periods when I believe the data is present from this station when it was installed to this current day. If the time period selected for NDAWN data is to coincide with the time period E. Coli Bacteria were collected then precipitation data used to develop this background information should be the same. NDAWN doesn't record precipitation from November through March as these automated stations do not have the ability to measure frozen precipitation in the winter. However, winter precipitation estimates are available through NDAWN website for these locations.

A statement is made about NDAWN, "The Dickinson station was chosen because it is the closest station available to the listed TMDL segment — located roughly 30 miles east of the City of Medora." Dickinson (46.895, -102.813), is not the closest NDAWN site. The closest NDAWN station to Medora, about 23 miles, is located within or close to the western boundary of the listed segment is the Beach station (46.789, -103.966) located about 9 miles south east of Beach, ND on Oech's. This station was first operational in 1993.

A statement is made, "Total annual precipitation is about 12 inches." I think this is in reference to the NDAWN station at Dickinson. Actually, the NWS - NDAWN Dickinson station annual precipitation average is 16.73 inches. NWS — NDAWN Beach station annual precipitation is 15.25 inches.

The data plot shown in Figure 7 indicates precipitation at Dickinson to be under three inches for the month of June when it is about 3.6 inches. Also, the Figure shows more precipitation in May

than in July when NDAWN at Dickinson shows more precipitation in July (2.58) than May (2.32). If you use the Beach location the opposite is true, July has 2.11 inches and May is 2.19 inches — not much of a difference.

There are also differences between the Beach site and the Dickinson site for monthly average temperature. I believe the NDAWN Beach site is within the listed segment.
We believe you should consider the use of the NDAWN Beach site and revise data plots and paragraphs used in this part of your draft document to reflect the data.

NDDEQ Response:
After further research, it was determined that he Beach site is more accurate and better represents the Listed Segment of the TMDL. Average rain fall data and temperature will now use data from the Beach site (no-longer the Dickinson site).

Page 24, 4.2.1 Livestock Grazing in Cropland
Comment: Farmers are using no-till so cultivation is nearly zero. Properly managed residue at the time of harvest eliminates need for postharvest residue reduction. Farmers graze cows on crop aftermath because they need the feed. Figure 5 indicates most cropland is well away from the Little Missouri River. A combination of no-till, diverse crop rotations, and distance away from water bodies possesses little risk of E. Coli from these grazed crop fields.

NDDEQ Response:
Thank you for the comment. Additional language has been added to the section to illustrate the minimal risk of E. coli contributions to the listed segment.

Page 24, 4.2.2 Septic Systems
Questions: Are current septic systems designed with soils at the location they are used in mind? Does the Health Department do on-site inspection on new systems during design, installation, and completion of installation to ensure that short cuts are not used? Are inspections made of current systems or when property transfers with septic systems? Need more information as to what the current regulations are with regard to septic systems and how the Department of Health manages this area.

NDDEQ Response:
In the state of North Dakota, septic system standards and specifications are governed by each individual county's zoning and building regulations. Each county has a different range of standards and specifications, some specific to soils types and locations.

In partnership, the North Dakota Department of Health's, Local Public Health Units (LPHU), are charged with enforcing, permitting, inspection and administrating all on-site inspections, design approvals and installation support of septic system. Each LPHU has different rules and regulations.

In North Dakota there are 28 LPHUs. The Southwestern District Health Unit is made up of eight different counties; including the counties in the listed segment of this TMDL - Golden Valley, Billings and Slope. The Southwestern District Health Unit mandates that all septic systems after 2010 have a permitted construction plan prior to construction. But this health district does NOT mandate that each septic system get an inspection. It is highly encouraged by each contractor to have their system inspected, but is NOT mandated. If an inspection is requested, then staff from the LPHU will inspect the construction of the system.

During the transfer of property (selling or buying), if a lending agency or bank require the inspection of the septic system prior to the approval of funding, then one will be conducted by the LPHU. Otherwise, there is no requirement of inspections.

Page 25, 4.2.3 Recreation
Comment: Paragraph on the Maah Daah Hey National Recreation Trail. Some data should be changed in this paragraph. See a proposed wording for this paragraph.
The Maah Daah Hey (MDH) National Recreation Trail travels 144 miles across the Little Missouri National Grassland, private property, and State lands connecting all three units of the Theodore Roosevelt National Park. The entire MDH Trail meanders along the Little Missouri River with the portion of the Trail south of Medora found within the listed segment. The Trail crosses the Little Missouri River at two locations, at Sully Creek State Park and at Elkhorn Crossing. In addition to the MDH trail, but part of the MDH trail system, there are 49.2 miles of associated trails that lie outside of the listed segment. There are 10 developed US Forest Service campgrounds, one developed National Park campground, and one developed campground at Sully Creek State Park along the trail. Additionally, trail users can camp in undeveloped areas on US Forest Service, permit is not required, and National Park Service, permit required, managed land.

NDDEQ Response:
The proposed wording has been considered and was found to be more accurate and descriptive then the original wording. This paragraph was amended.

The United States Forest Service -Dakota Prairie Grasslands

p. 13, 1.4 Land Ownership and p. 22- The report says that considerable amount of land ownership is held by the USFS, specifically, adjacent to the LMR (Figure 6). A GIS exercise buffering this stretch of the LMR 30-feet on both sides then clipping ownership with this buffer, calculates that 71% of ownership is private land, 26% is NFS, 3% is State and less than 1% is NPS. The report should acknowledge that the dominant land ownership is private land adjacent to the LMR rather than NFS land. The report also references this again on Pg. 22, 4.2.1 Livestock Grazing in the 2nd paragraph. If they're talking about the whole watershed, NFS land may be the dominant land ownership; however, immediately adjacent to the LMR this is an incorrect portrayal.

NDDEQ Response:
Wording will be corrected to accurately describe 1) landownership immediately adjacent to the Little Missouri River and 2) Dominant land ownership within the Listed Segment watershed.

p. 22, 4.2. I-Livestock Grazing, 2nd paragraph, 2nd sentence — The USFS issues grazing permits, i.e. grazing agreements, not grazing management leases to grazing associations. The grazing associations then in turn issue association grazing permits to their individual members. Any time this report refers to a lease it should be corrected as indicated above. Also, they've combined the Dakota Prairie Grasslands with the Little Missouri National Grassland into one title.

NDDEQ Response:
The proposed wording has been considered and was found to be more accurate and descriptive then the original wording. The paragraph has been amended.

p. 23, 1 st paragraph-often it is the practice on USFS managed lands to avoid riparian areas in spring/summer when the banks are typically wet, and more susceptible to livestock trampling. However, this practice is dependent on reliable water within each pasture.

NDDEQ Response:
Thank you for the comment. Additional narrative has been added.

p. 25, 2nd paragraph-The Maah Daah Hey Trail stretches 144 miles across the ND Little Missouri National Grassland connecting all three units of Theodore Roosevelt National Park. There are eight Forest Service developed campgrounds along the Maah Daah Hey
Trail System: CCC, Bennett, Magpie, Elkhorn, Wannagan, Buffalo Gap, Coal Creek, and Burning Coal Vein. Coal Creek and Burning Coal Vein are the only campgrounds upstream of NDDEQ sampling site 380022.

NDDEQ Response:
Thank you for the comment. The appropriate Maah Daah Hey Trail miles have been updated along with additional campground information.

The Billings County Planning and Zoning Department

The following conservation practices that improve the quality of the watershed and limit erosion are preferred by the county as long as they fit into the operations of the landowners and are administered voluntarily without hardship. Many of these methods are already used by farmers and ranchers or are becoming more common through programs administered by the Natural Resource Conservation Service. These include the recommendations of:

- Prescribed grazing;
- Waste management systems;
- Vegetative filter strips;
- Vegetative barriers; and
- Cover crops
- Educational opportunities

However, a couple of recommendations proposed by the NDDEQ are inconsistent with Billings County's Comprehensive Plan and Land Use Plan and may negatively affect the custom and culture of ranching along the Little Missouri River and its tributaries if mandated. These include the recommendations of:

- Livestock exclusion from riparian areas; and
- Fencing, water well, and tank development

Cattle ranching is a 140+ year old tradition in Billings County. The above recommendations will hinder the riparian property rights of the landowners and the enjoyment and beneficial use of the river for watering livestock, which currently and historically has been the primary use of the river. The Little Missouri and its tributaries are essential to the agricultural industry, which is a main economic base of Billings County. The county opposes the recommendation to exclude livestock from riparian areas.

In general, additional fencing, water well, and tank development are favorable improvements – but in this context they are unacceptable because they are built at the expense of excluding access from the natural, reliable water sources of creeks and rivers. Besides recreation, May 1st to September 30th is the season of cow/calf pairs. To fence-out livestock from a natural source of water will put undue stress on the herds during the heat of the summer. Fencing-out should be the sole decision of the operator. Ranching operations may choose to use the river as a water source or may choose to keep their cattle off the river. River grazing may be beneficial during certain times of the year or times of drought, but may be detrimental like times of high water levels in the spring. Fencing and water wells are also considerably more expensive and not often feasible to build within this watershed due to the rough terrain, depth to water, and limited access to electricity.

NDDEQ Response:
The listed conservation practices in question – livestock exclusion from riparian areas, fencing, water well and tank development are strictly recommendations of the NDDEQ. The NDDEQ is required to make recommendations that focus on the reduction of E. coli bacteria concentrations so that the river will meet water quality standards and tries to

include a variety of options that are in line with the NRCS best management practices. There are no mandated requirements being asked of private or public landowners in this TMDL. Any participation from private landowners is completely voluntary.

The Billings County Planning and Zoning Department continued

The county must ensure adequate rural and community fire protections. The Little Missouri River is essential for wildland fire suppression in remote areas of Billings County. Additional fencing along the river and tributaries will limit access to water for fire trucks when timing is critical for public safety.

Even though the City of Medora's lagoon system was ruled out as a source of E coli, I can't help but wonder if increased development and activity between 2013-2016 impacted the water quality of the river more so than the livestock industry. The amount of livestock in the watershed remains fairly steady since the carrying capacity of the land doesn't drastically change from year to year and many ranches rely on allocated AUMs with their federal grazing permits. In 2013, the City of Medora recognized the need for an expansion or relocation of the city's wastewater treatment plant. During this time the city experienced a greater year-round population. The lagoon system was analyzed again in 2017, bids for a lagoon expansion were advertised, and the project was completed in 2019. Growth also occurred in rural areas between 2011-2016. Septic tank and drain field construction in this watershed are more susceptible for failure. Many soil types in the badlands are limited for septic system use due to erosion, slope, or permeability. These systems have to be closely monitored and may need to be replaced sooner than other areas. The county would support the recommendation of area wide septic system analysis as long as assistance is available for landowners where failing or improperly functioning systems are found. The county would also suggest a recommendation to provide educational opportunities or materials on proper installation and maintenance of septic systems.

The county studied the water quality data for monitoring site 380022. The chart below depicts the geometric means of 3-year increments from 2001 to 2020. The data analysis only included the months from May-September like the TMDL report. The geoMeans from 2001-2012 are showing to be within tolerance of Criteria 1. The spike in E coli readings coincide with the population surge that the Medora area experienced with the Bakken oil boom. And now the geoMean is almost back to the pre-2013 levels for 2019-2020 - this may be due to the updated wastewater treatment plant or from the reduced population during the off-season (see figure 1).

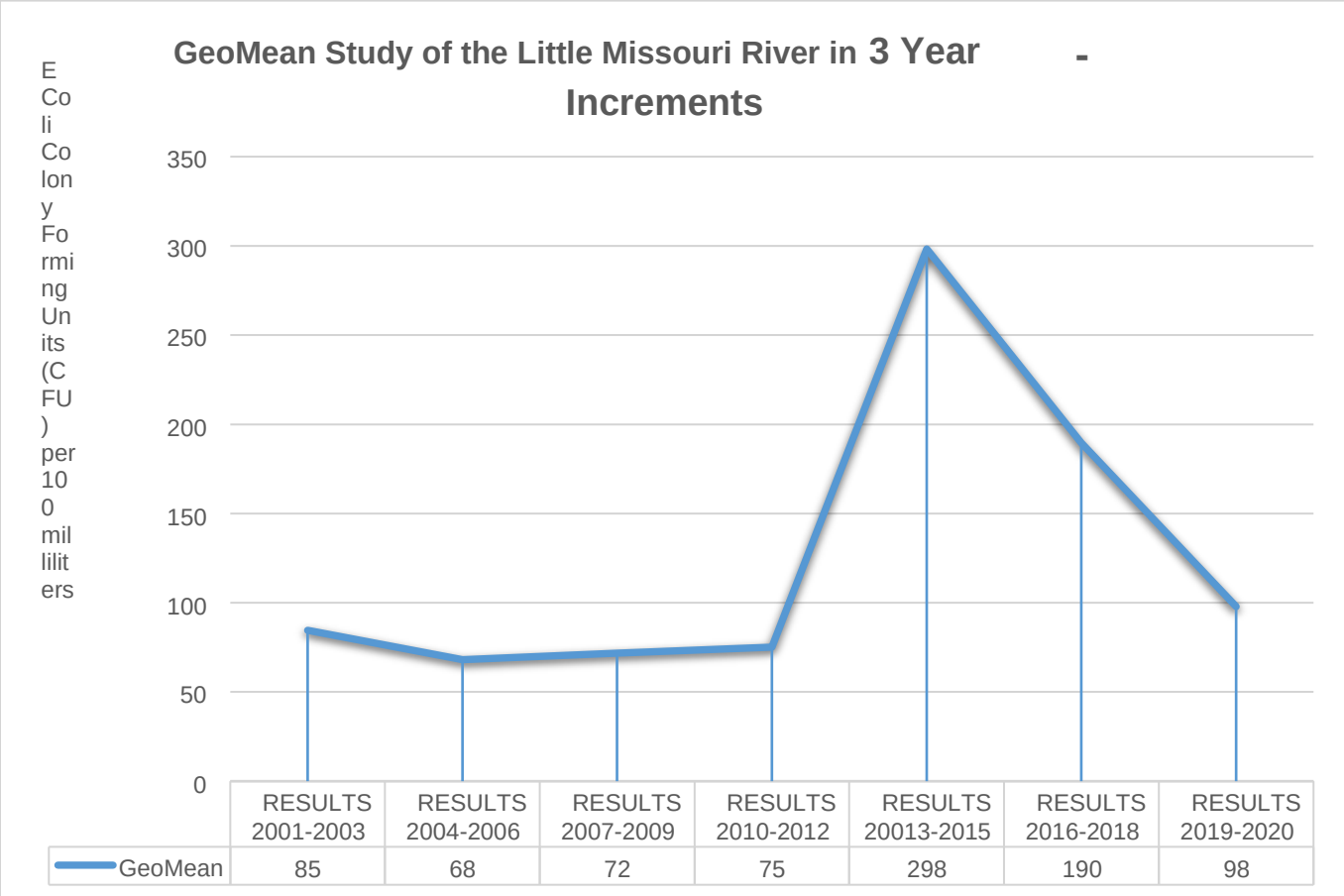
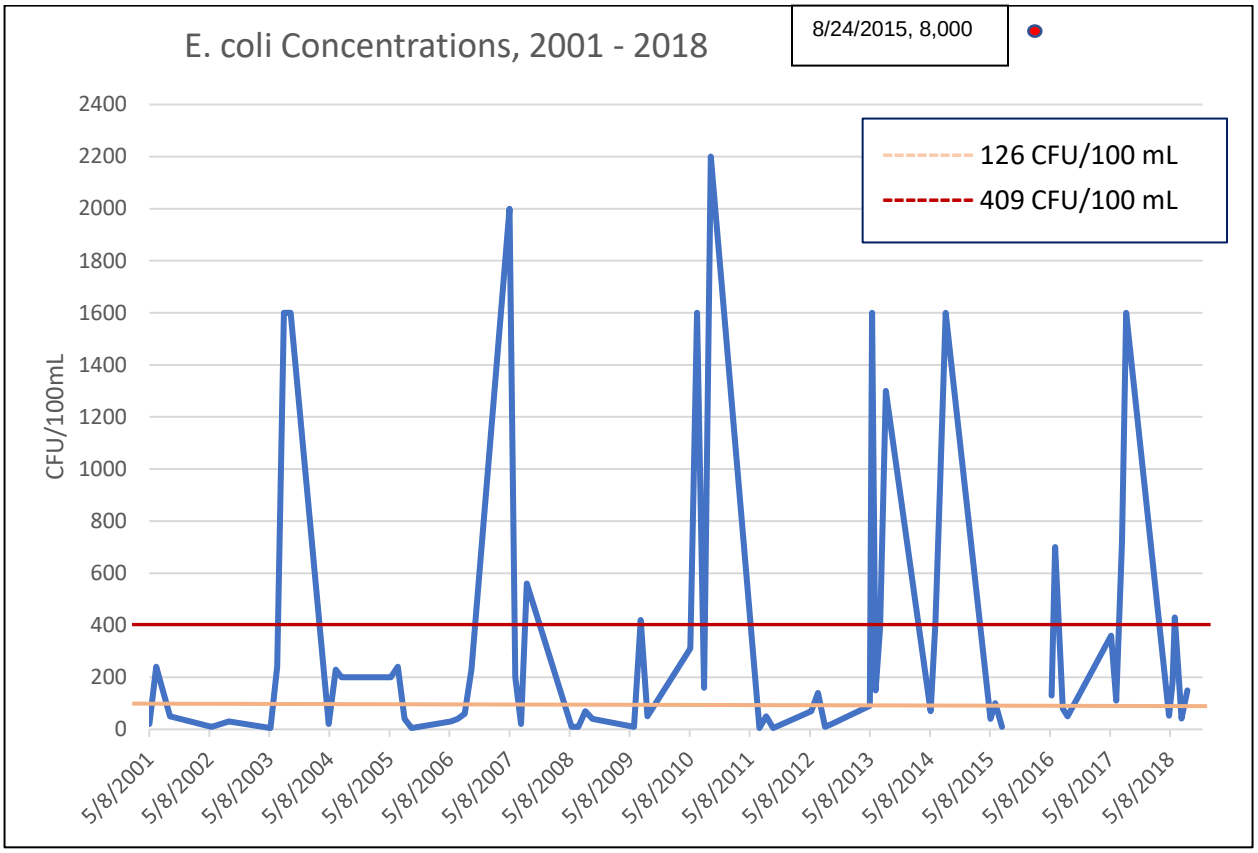


Figure 1.

Yes, some days are definitely showing unhealthy levels of E coli; however, with only 68 samples over 17 years, there is not enough data to indicate that most days are impaired to the extent to limit agricultural use in favor of recreational use.

NDDEQ Response:
The NDDEQ does not use a three-year running Geomean to calculate E. coli concentrations. Averages are calculated based on monthly trends. Monthly data is gathered and pooled among years in the study and then calculated for a Geomean. To find load allocations and TMDL limits, daily E. coli concentrations are compared to daily flow values, as can be seen in the following graph.



The Billings County Planning and Zoning Department continued

Recreational use of the Little Missouri River is seasonal and minimal from May to September. Most years, there is only a short 2-3 week period in the spring when the water level and flow is feasible for kayaking, canoeing, or tubing. The time frame varies from year to year depending on the spring thaw and rain, but in general would begin in early May and last until the first or second week of June. The North Dakota Department of Tourism only lists the month of May when promoting canoeing and kayaking on the Little Missouri River (https://www.ndtourism.com/articles/paddle-north-dakotas-riversand-lakes). During the spring runoff, even if the river is high enough for recreational use, it can be dangerous due to high speeds, ice chunks and floating debris. High water levels in July are unusual and typically occur in years with major spring flood events. High water levels in August and September are even more unusual. Severe summer storm events may raise water levels, but these occurrences are short-lived and unpredictable. Motor boat access and use is non-existent on the river. Local residents are aware of these recreational limitations of the Little Missouri River. Instead of putting additional regulations on the agricultural industry, recreationists should be held responsible for their own actions.

The Little Missouri River is non-navigable and land is privately owned along most segments of the river. Recreationists on the river are seen as both guests and interlopers. Landowners adjacent to the river often have permanent and temporary fences along and across the river to keep cattle from roaming. These fences are considered obstructions by recreationists and frequently taken down and not put back into place once the kayaks or canoes have crossed. Encouraging recreational use will further this conflict. The state could lessen this conflict by designating public access points to the river for recreationists since most property is privately owned and permission to cross a person's land is required.
In most areas with water recreational resources near a community, the market has responded to fulfill the needs of tourists. The City of Medora accommodates around three hundred thousand tourists every year yet lacks typical infrastructure and businesses for water recreation like boat

ramps, marinas, watercraft rentals, bait shops, or bars/restaurants accessible from the water. The absence of these types of businesses indicates recreational use of the Little Missouri River is minimal to nonexistent. The lack of recreational use isn't from a potential of E coli present in the river, it's due to overall low, muddy water conditions that are not feasible to sustain or draw activity to the river for recreation.

NDDEQ Response:
Recreationists are responsible for their own actions. 'Recreational Use' is a beneficial use assigned to state waterbodies. In this case, 'Recreational Use' is designed to provide protection by maintaining a level of water quality safe for human contact. Contact through boating, fishing, or wading is applicable and the assessment methodology for rivers, streams, lakes, and reservoirs is based on the state's water quality standard for E. coli bacteria. Primary recreational waterbodies are suitable for direct human contact, such as swimming, and secondary recreational activities including boating, fishing, or wading.

Since this TMDL will affect private land management along the Little Missouri River and within its watershed, additional public notifications from the state should have been made. The county is not aware of any private landowners that received a public comment notice. The public comment period should be extended and individual landowners should be notified. Billings, Slope, and Golden Valley County all have rural parcels in GIS and this landowner dataset should be used by the state for notifying affected landowners. In addition to notifying the local landowners, the Little Missouri River Commission should also be included whenever water quality management policies, like this TMDL, affect the watershed of the Little Missouri River. The Little Missouri River Commission is scheduled to meet on September 1, 2020 and the agenda posted as of today does not mention the NDDEQ's TMDL report as an item of business or discussion (https://www.parkrec.nd.gov/business/little-missouri-scenic-rivercommission).

NDDEQ Response:
Public notices were published in the Billings County Pioneer, Bismarck Tribune, Bowman County Pioneer, and Dickinson Press. Hard copies were also sent to Soil Conservation Districts within the watershed as the entity that directly works with ag producers in the area. Also, at the request of Billings County, NDDEQ sent a letter (Attachment A) and also tried to coordinate a face-to-face meeting on several occasions. A TMDL is not a policy document and does not regulate private landowners, so notification of individual landowners was not conducted. Landowner participation in best management practices is voluntary, and any land management practices listed in the report are recommendations.

Billings County appreciates the NDDEQ's consideration of these comments and would like to continue to be involved in the project. The County also reserves the right to provide additional comments if necessary.

NDDEQ Response:
The Department appreciates the comments provided and we look forward to continued collaboration with Billings County. Comments are always welcome and accepted during the public comment period.

Region 8 EPA

Thank you for the opportunity to provide comments and feedback on the Little Missouri River *E. coli* TMDL (Billings, Golden Valley, and Slope counties, North Dakota). Below are EPA staff comments, and I would be happy to discuss or provide more information to clarify.

Section 3.0 – TMDL Targets:

This section identifies the TMDL Target as "the NDDEQ water quality standard, or better." The monthly geomean criterion of 126 CFU/100 mL is used as the daily *E. coli* concentration target to develop the Load Duration Curve for this TMDL. To explicitly state that the TMDL Load Duration Curve target is protective of all WQS, the following modification to this section is suggested:
"~~Therefore, the TMDL target for this report is the NDDEQ water quality standard, or better.~~ The TMDL target for this report used to develop the load duration curve is 126 CFU/100 mL. By using the NDDEQ monthly geometric mean water quality criterion as a daily target, this ensures both *E. coli* criteria (the monthly geometric mean and no more than 10% of samples exceeding 409 CFU/100 mL during any consecutive 30-day period) are met."

NDDEQ Response:
Thank you for the comment. The proposed wording has been changed to reflect the narrative above.

Section 4.0 Significant Sources of Pollution
Table 6 in Section 5.5 might be better presented the end of Section 4. Also, it would be helpful to include additional rows in this table to discuss failing septic systems, and potential point source loading under various flow conditions, as these are potential sources that are discussed in sections 4.1 and 4.2.

NDDEQ Response:
Thank you for the comment. Table 6 will be moved to the end of Section 4. The source the table was derived from did not include septic systems or point source loadings. The table description was modified.

Section 4.1 Point-Source Pollution (Page 21):
Using the EPA ECHO database search tool, there appear to be more NPDES-regulated point sources within the Little Missouri River watershed, including from the contributing 12-Digit HUC watersheds identified on Figure 2 (Page 8). Please identify, discuss in the TMDL document, and explain for each facility whether a wasteload allocation will be assigned.
EPA Region 8's decision rationale for approving TMDLs states "the TMDL submittal must include . . . an identification of the point and nonpoint sources of the pollutant of concern…[and]… facility names and NPDES permit numbers for point sources within the watershed. This information is necessary for EPA's review of the load and wasteload allocations, which are required by regulation." 40 C.F.R. §130.7(c)(1); 40 C.F.R. §130.2. Once all NPDES permits within the watershed are identified in the TMDL report, there are options or explanations that can be included for not assigning a wasteload allocation to a facility such as: the facility does not discharge the pollutant of concern; the contribution of the pollutant of concern is expected to be minimal/negligible based on [justification]; as long as the facility complies with the general no discharge permit (e.g., other) requirements ensuring their discharges are unlikely and indirect loading events, the TMDL assumes their *E. coli* contribution is minimal based on [justification]; etc. This information can be helpful to NPDES permit writers issuing/reissuing NPDES permits in TMDL watersheds.

- NDG126409 - TEDDY ROOSEVELT MEDORA FDATION
- NDR050676 - HILD SCORIA PIT
- NDG326425 - TEDDY ROOSEVELT NP PAINT CANYN
- NDX000049 - BILLINGS COUNTY-MEDORA SHOP
- NDG325461 - SENTINEL BUTTE CITY OF (Discharges to Andrews Creek watershed, which confluences with Little Missouri outside of TMDL?)
- ND0024651 – HOME ON THE RANGE (Discharges to Andrews Creek watershed, which confluences with Little Missouri outside of TMDL?)

- NDG322047 - GOLVA CITY OF

NDDEQ Response:
Thank you for the comment. All permits referenced above either do not discharge the pollutant of concern or have not had a discharge event for several years.
NDG126409 – TEDDY ROOSEVELT MEDORA FOUNDATION has not had a discharge event since 2011.
NDR050676 – HILD SCORIA PIT has an industrial stormwater permit with no E. coli discharge.
NDG326425 – TEDDY ROOSEVELT NP PAINT CANYN has not had a discharge event since 2012.
NDX000049 – BILLINGS COUNTY – MEDORA SHOP is a no exposure facility, exempt from an industrial stormwater discharge permit.
NDG325461 – SENTINEL BUTTE CITY OF has not had a discharge event since 2007.
ND0024651 – HOME ON THE RANGE has not had a discharge event since 2011.
NDG322047 – GOLVA CITY OF has not had a discharge event since 2007.

In addition, the TMDL report states "All four operations are prohibited from discharging into any part of the watershed as specified by their NDPDES permits." My understanding is that ND's CAFO/AFO permits are issued under ND's non-NPDES permitting authorities, and that there are no NPDES CAFO permits in ND. Please verify. If so, please clarify the sentence to say "**"**All four operations are prohibited from discharging into any part of the watershed as specified by their non-NPDES state CAFO/AFO permits." If these were NPDES permits, we would expect the TMDL to include a discussion about assigning or not assigning a wasteload allocation.

NDDEQ Response:
Thank you for the comment. Clarification will be added to this section and the permits listed will be included in a table in Appendix E, showing a zero wasteload allocation.

Section 4.2 Nonpoint Source Pollution:
Additional sources of *E. coli* include mainstem Little Missouri River upstream of the impaired-segment boundary, and Deep Creek, a tributary which has an EPA-approved fecal coliform TMDL. Please include a discussion regarding *E. coli* loading from these segments (e.g., the *E. coli* loads from these upstream waterbodies are expected to enter the listed segments at the criteria concentration. Source reduction efforts related to this TMDL are focused on the 12-digit HUC contributing watersheds (Figure 4).

The discussion should also acknowledge the upper Little Missouri River watershed (upstream of the Middle Little Missouri 8-Digit HUC highlighted in the TMDL) spans at least three other jurisdictions: Montana, Wyoming, South Dakota, and any tribal lands.
To help illustrate or further parse out reductions that are required in just the contributing watersheds to this impaired segment (i.e., 12-digit HUCs in Figure 4), states will frequently assign a separate load allocation to the upstream waterbodies outside of this TMDL sub-watershed. This load allocation could assume the load entering at the boundary of the impaired segment/TMDL sub-watershed is equal to ND's WQS. The required reductions for the other nonpoint source load allocations would then reflect only assigned loads and associated reductions from the contributing watersheds in this TMDL. I anticipate this would be helpful to guide implementation efforts and I look forward to working on this concept with ND in the future.

NDDEQ Response:
Thank you for the comment. The Upper Little Missouri 8-digit HUC located in North Dakota is not currently on the 303d list for E. coli and is currently meeting water quality standards. Also, the upstream segment in South Dakota is not on their 303d list for E. coli. Since standards are being met upstream of the listed segment, a load allocation was not calculated. With regard to Montana, Wyoming, South Dakota and tribal

jurisdictions, the NDDEQ will work with those jurisdictions in the future if/when needed. Additionally, contributions from Deep Creek, which has an EPA approved fecal TMDL, are expected to enter the listed segment at the state water quality standard. This section has been amended to include suggestions from this comment.

Section 6 MOS and Seasonality
TMDL submittals must describe the critical conditions and related physical conditions in the waterbody as part of the analysis of loading capacity:
Determinations of TMDLs shall take into account critical conditions for stream flow, loading, and water quality parameters. (40 C.F.R. §130.7(c)(1)).
Please include a discussion of critical conditions in this section. Suggested language: "The water quality analysis and LDC curve method analyze observed exceedances of water quality criteria over the recreation season and various flow conditions (e.g., high, moist, dry, low). It was determined that water quality criteria exceedances occur throughout each month of the recreation season and during all flow regimes. Reductions required to meet WQS across the four flow regimes were similar (e.g., estimated reductions for high-76%, moist-81%, dry-67%, low-62%). By evaluating exceedances by flow regime and season and assigning reductions by flow regime, critical conditions are considered in establish the TMDL."

NDDEQ Response:
Thank you for the comment. The proposed discussion has been added to the document.
Section 7.0 TMDL
Table 8: In order to help guide implementation, I suggest adding a percent reduction to this table to illustrate which flow regime requires the greatest percent load reductions.

NDDEQ Response:
Thank you for the comment. The percent reductions at each flow regime have been added.

Section 7.1 Allocation:
What is meant by "All four flow regimes are set at the same amount."? Is this supposed to indicate the WLAs are set as a constant load throughout the entire flow regime? Please clarify.

NDDEQ Response:
Thank you for the comment. The paragraph has been updated to state that the wasteload allocations for the City of Medora and the Burning Hills Amphitheater are set at a constant load throughout the entire flow regime.

Section 8.0 Mitigation
This section contains a lot of great implementation for implementing nonpoint source controls and reasonable assurance. I suggest combining this section into Section 11.0 TMDL Implementation Strategy to recognize mitigation is a part of implementation.

NDDEQ Response:
Thank you for the comment. A reference to Section 8.0 Mitigation will be added to Section 11.0 TMDL Implementation Strategy.

Badlands Conservation Alliance (BCA) – January 2022

Thank you for the opportunity to submit comment on "E. coli Bacteria TMDL for the Little Missouri River in Billings, Golden Valley and Slope Counties, North Dakota." Badlands Conservation Alliance (BCA) is a non-profit organization based in western North Dakota that is dedicated to the wise stewardship of public lands, in particular the Dakota Prairie Grasslands (DPG) and Little Missouri National Grasslands (LMNG). Many of our members live in or originated in the small communities and rural landscapes surrounding these public lands. Members hold significant familiarity with these lands and value them for a host of ecological, heritage and personal reasons, frequently through multiple generations. Many of our members regularly use the Little Missouri State Scenic River for canoeing and kayaking, and frequently hike near and cross the river while hiking in the Badlands.

Though we do not have specific comments on the details of this plan, we would like to express our support that the department seeks to control E. coli levels in the Little Missouri State Scenic River. We agree with the assessment that nonpoint sources are the largest contributor to heavy E. coli loads in the river, in particular the intensive grazing of livestock in both the upland adjacent to the river, in the riparian areas, and in the river itself. We are pleased to see the effort of NDDEQ in thoroughly quantifying the issue, which we believe is a good first steep at improving the water quality of the river.

We agree that the BMPs outlined in the report are potentially effective ways to decrease E. coli pollution in the river. However, we are concerned that the pollution of the Little Missouri State Scenic River is a classic example of "tragedy of the commons" as first described by Garret Hardin in 1968, and that merely relying on voluntary participation by landowners and those leasing land for grazing cattle will not result in a significant reduction of pollution. Individuals grazing cattle in the upland adjacent to the river, in riparian areas, and in the river itself benefit from their use of the river as they currently use it, regardless of any impacts on E. coli levels. We worry that there will be low voluntary participation where cost and convenience will be factors. To gain participation and win support of landowners for improving water quality, we encourage the department to actively engage individual ranchers grazing cattle along this stretch of the river to invite them to participate in BMPs aimed at improving water quality of the river. Such efforts would likely substantially increase participation and result in improved water quality of the river.

As a conservation organization dedicated to preserving the Badlands and the Little Missouri State Scenic River, we suggest that conservation organizations be invited to discussions about cleaning up the river beyond invitations to submit public comments.

NDDEQ Response:
Thank you for the comment. The NDDEQ also recognizes the importance of including as many conservation organizations as possible when it comes to management efforts on the Little Missouri River. We will continue our outreach efforts to gain as many collaborative partners as possible.

Attachment A – Letter to Billings County, ND.

9/23/2020

Tax & Zoning Director
9-1-1 Coordinator
Billings County
PO Box 247
Medora, ND 58645

RE: Public Comment for Little Missouri River TMDL addressing E. coli bacteria

To whom it may concern,

Thank you for the comments received August 27, 2020, regarding the draft document of the Little Missouri River Total Maximum Daily Load (TMDL) addressing E. coli Bacteria. The North Dakota Department of Environmental Quality (NDDEQ) strives to partner with local and regional agencies and greatly appreciates feedback from our stakeholders.

This letter is to address the general concerns of Billings County as it relates to the TMDL report process. Specifically, to provide background on the TMDL process and how the report is used to improve water quality. We also want to clearly define any regulatory impacts a TMDL may have on local businesses and landowners.

Section 303(d) of the Clean Water Act authorizes EPA to assist states, territories and authorized tribes in listing impaired waters and developing TMDLs. A TMDL report establishes the maximum amount of a pollutant allowed in a waterbody and serves as the starting point or planning tool for restoring water quality. A TMDL includes a calculation of the maximum amount of a pollutant (loading capacity) that can be present in a waterbody and still meet state water quality standards.

Within the TMDL, the state allocates this loading capacity among the various point sources and non-point sources. Point sources, such as water treatment facilities and/or large industries are permitted through EPA's National Pollutant Discharge Elimination System, or NDPDES program, which is also administered by the NDDEQ. Point source permits are regulatory and set maximum limits on discharge amounts that enter waters of the state. If a TMDL is approved, there may be permitting implications to the City of Medora and Burning Hills Amphitheater wastewater treatment facilities.

Non-point sources, such as agricultural lands, grazing lands and riparian zones, are not permitted or regulated. As far as non-point sources are concerned, a TMDL serves as the starting point or planning tool for restoring water quality. Section 8.0, Mitigation, provides a framework of recommendations that set a path towards obtaining water quality standards. It

should also be emphasized that any involvement from local landowners, etc. is voluntary**.** The NDDEQ welcomes the opportunity to discuss these voluntary opportunities with any interested party.

Controlling non-point sources is an immense undertaking requiring extensive financial and technical support. Financial and technical support is available to local entities such as counties and soil conservation districts through our 319, Non-Point Source Pollution Management Program (NPS Program) (see attached). The NPS Program administers cost-sharing opportunities through local sponsors (SCD's, NGO's, etc). The formation of strong partnerships provide the financial, technical and local expertise needed for a successful project.

In summary, we want to make clear that non-point source pollution is not a permitted or regulated activity in the State of North Dakota. TMDL reports serve as the starting point or planning tool for restoring water quality and any involvement from local landowners is completely voluntary.

The NDDEQ appreciates the involvement of Billings County. We look forward to working with all interested stakeholders in this ongoing project.

Sincerely,

Watershed Management Program, NDDEQ

Attached: Non-Point Source Pollution Management Program Fact Sheet