

Instructions

Please download this Word document (available on the Industrial Commission/Outdoor Heritage Fund Program website at <http://www.nd.gov/ndic/outdoor-infopage.htm>) to your computer and provide the information as requested. You are not limited to the spacing provided. After completing the report, save it and attach it to an e-mail and send it to outdoorheritage@nd.gov AND print it and mail it to: North Dakota Industrial Commission, ATTN: Outdoor Heritage Fund Program, State Capitol – Fourteenth Floor, 600 East Boulevard Ave. Dept. 405, Bismarck, ND 58505. If you are unable to scan attachments, mail them with your paper copy of the report. You will be sent a confirmation by e-mail of receipt of your report and attachments.

Outdoor Heritage Fund Status and Final Report Form/Guidelines			
This report is used to show progress of grant projects funded through the Outdoor Heritage Fund. Status Reports and the Final Report must be submitted as required in Contract.			
Contract Number	Report Date	Period Covered by Report (xx/xx/xx to xx/xx/xx)	
001-010	11/30/2019	11/30/2015 to 11/30/2019	
Project Name Antelope Creek; Wild Rice Corridor Watershed Restoration Project			
Project Sponsor Name Richland Soil Conservation District			
Responsible Official (Last, First Middle)		Responsible Official's Title	
Klostreich, Jennifer I		319 Watershed Coordinator	
Project Sponsor Address 1687 Bypass Road			
City	State	Zip Code	Telephone Number
Wahpeton	ND	58075	701-642-5997ext 3
<u>Financial Update</u>			
Please provide the following information regarding the funding for your project based on the contract award:			
<u>Funds Spent this Reporting Period</u>			
(As appropriate please provide copies of receipts for purchases)			
Match Funding: \$0			
In-kind Funding: \$0			
OHF Funding Requested for Reimbursement: \$0			
Total Funding Expended for this Reporting Period: \$0			
<u>Total Funds Spent to Date</u>			
Match Funding: \$56,723.15 - 319 funds, \$12,247.67 - producer match			
In-kind Funding: \$0			
OHF Funding Received and Requested for Reimbursement: \$44,475.48			
Total Funding Expended to Date: \$113,446.80			
<u>Balance of Grant Funds</u>			
Match Funding: \$63,388.92			
In-kind Funding: \$0			
OHF Funding still to be Requested: \$60,524.52			
Total Funding to be Expended on this Project: \$105,000			
Do you anticipate needing to request a grant extension If yes, please explain			
/X/ Yes // No			
Extension was granted in January 2018			

Attached is the Water Quality Monitoring Results for the Antelope Creek Watershed and Riparian Corridor of the Wild Rice River. North Dakota Department of Environmental Quality (NDDEQ) has prepared a report for the Water Quality samples that have been collected from May 2011 – June 2019. Five sites are sampled on a regular basis with three sites showing decreasing amount of Suspended Solids in the samples. The full report is attached.

The Antelope/Wild Rice Corridor grant has not been utilized for the Windbreak replacement. Another Outdoor Heritage Fund (OHF) project that is administered by the North Dakota Conservation Districts has been utilized over the past few years with producers in the county. The OHF grant administered by the Forest Service has also been well received by producers, this program has the ability to assist them with the removal and replacement of trees on their property. It is our goal to use whichever program fits best for our producers.

Work Completed during Period Covered by Report:
(This information will be posted on the Outdoor Heritage Fund/Industrial Commission website)

Photos of work completed are welcome (If appropriate, please submit photos of key elements of the project completed or in progress during reporting period) Do not exceed five photos per project report.

Signature of Responsible Official

Jennifer Klostreich, Watershed Coordinator

The project reports shall be provided to the Commission in both electronic and hard-copy formats with permission for unrestricted distribution. The electronic versions shall be in a suitable format for posting on the Outdoor Heritage Fund/Commission website.

Water Quality Monitoring Results For the Antelope Creek Watershed and the Riparian Corridor of the Wild Rice River Project Phase III

Final: October 2019

Prepared for:

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Water Quality Monitoring Results for the Antelope Creek Watershed and the Riparian Corridor of the Wild Rice River Project Phase III

Doug Burgum, Governor
David Glatt, Director of Environmental Quality



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1.0 Background and Overview

The Wild Rice River watershed is a 1.4 million acre watershed located in Cass, Dickey, Ransom, Richland and Sargent Counties in southeastern North Dakota and Marshall and Roberts Counties in northeastern South Dakota. Antelope Creek is a tributary of the Wild Rice River. The Antelope Creek watershed is a 122,923 acre watershed located in Richland County in southeastern North Dakota (Figure 1 and 2).

The Antelope Creek Watershed and the Riparian Corridor of the Wild Rice River Project Phase III focused on the Antelope Creek watershed approximately 122,923 acres and the riparian corridor of the Wild Rice River both located in Richland County (Figure 1 and 2).

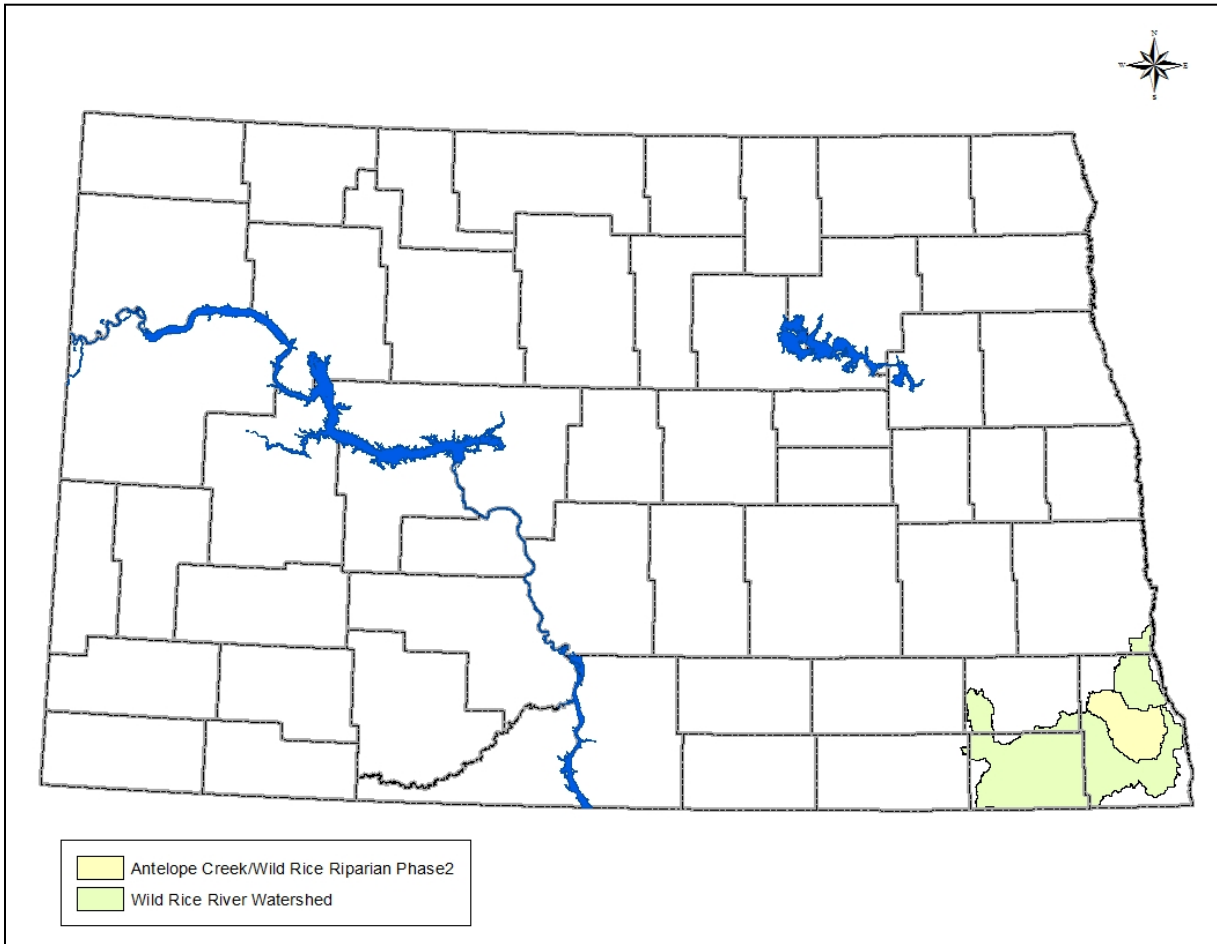


Figure 1. Location of the Wild Rice River and Antelope Creek Watershed

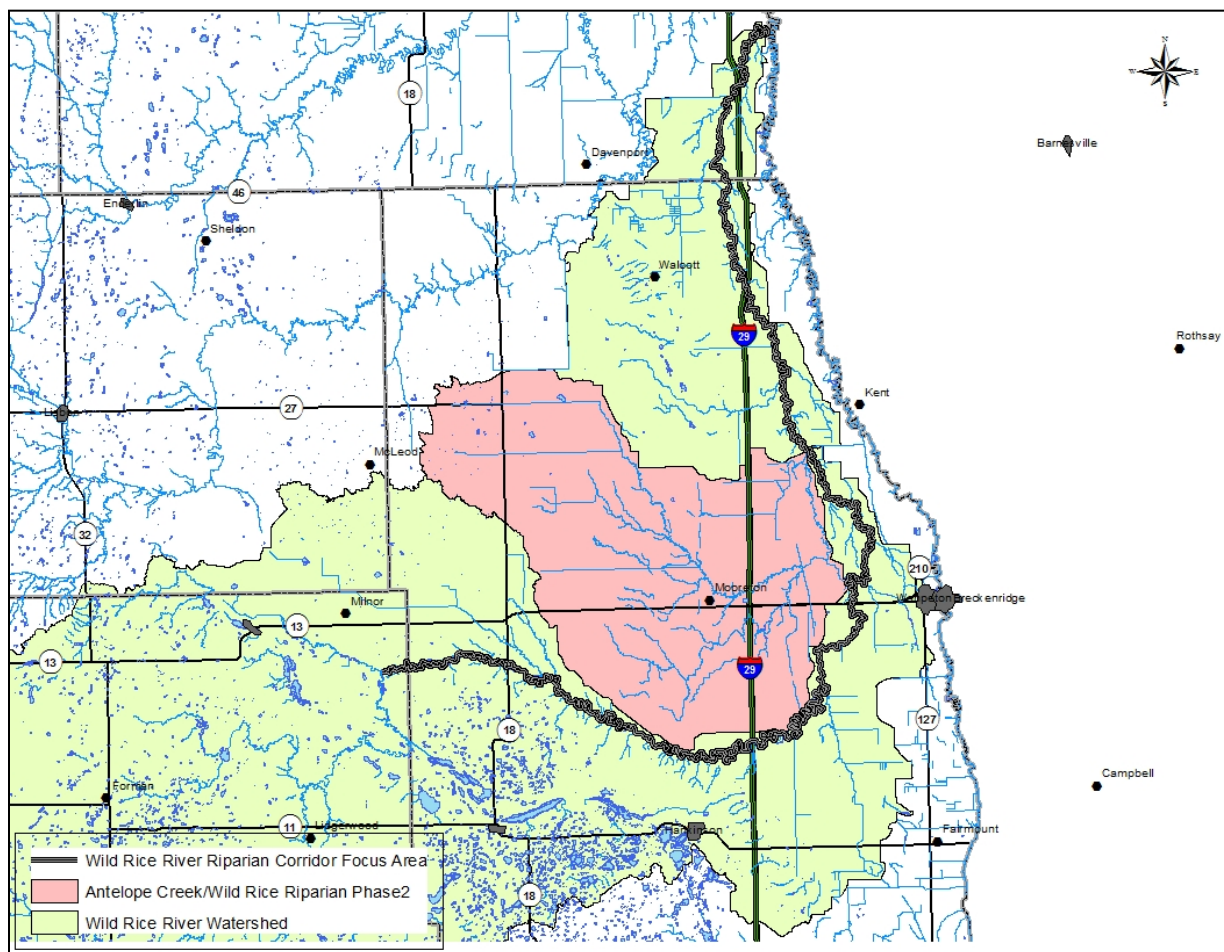


Figure 2. Location of the Implementation Focus Areas for the Wild Rice and Antelope Creek Watershed

1.1 Section 303(d) List of Waters Needing a TMDL

According to the North Dakota 2018 Integrated Section 303(d) List of Waters Needing Total Maximum Daily Loads, the North Dakota Department of Environmental Quality has identified 40.72 miles of Antelope Creek and 185.18 miles of the Wild Rice River in Richland County as impaired waters. The following describes the details of these listings.

The North Dakota Department of Environmental Quality has completed five pathogen TMDLs on the Wild Rice River and Antelope Creek in Richland County, these segments totaling 225.9 river miles. These TMDLs include a loading allocation to improve the water quality to achieve a fully supporting Recreational beneficial use.

A copy of all completed TMDLs can be found at the NDDEQ website: www.deq.nd.gov

A 40.72 mile segment of Antelope Creek (ND-09020105-005-S_00) in Richland County from its headwaters downstream to its confluence with the Wild Rice River as not supporting fish and other aquatic biota due to water temperature, sedimentation/siltation and benthic macroinvertebrate bioassessments and fully supporting but threatened recreational uses due to *Escherichia Coli* (*E. coli* bacteria).

A 47.49 mile segment of the Wild River River (ND-09020105-003-S_00) from its confluence with a tributary about 3.6 miles northeast of Great Bend, ND downstream to its confluence with the Colfax Watershed as not supporting fish and other aquatic biota due to dissolved oxygen, sedimentation/siltation and benthic/fishes bioassessments and fully supporting but threatened recreational uses due to *E. coli* bacteria.

A 53.43 mile segment of the Wild Rice River (ND-09020105-009-S_00) from Elk Creek (ND-09020105-010-S_00) downstream to its confluence with a tributary 3.5 miles northeast of Great Bend, ND (ND-09020105-008-S_00) as not supporting fish and other aquatic biota due to dissolved oxygen and sedimentation/siltation.

A 45.68 mile segment of the Wild Rice River (ND-09020105-012-S_00) from its confluence with Shortfoot Creek (ND-09020105-016-S_00) downstream to its confluence with Elk Creek (ND-09020105-010-S_00) as not supporting fish and other aquatic biota due to sedimentation/siltation and not supporting recreation due to E. coli bacteria.

De-Listed Segments

A segment of the Wild Rice River ND-09020105-001-S_00 has been delisted for pathogens based on applicable water quality standard attainment based on monthly Recreational season E. coli bacteria data for the years of 2010 thru 2013. The sections are described below;

--A 38.58 mile segment of the Wild Rice River (ND-09020105-001-S_00) from its confluence with the Colfax Watershed, downstream to its confluence with the Red River of the North as not supporting fish and other aquatic biota due to dissolved oxygen, sedimentation/siltation and benthic/fishes bioassessments.

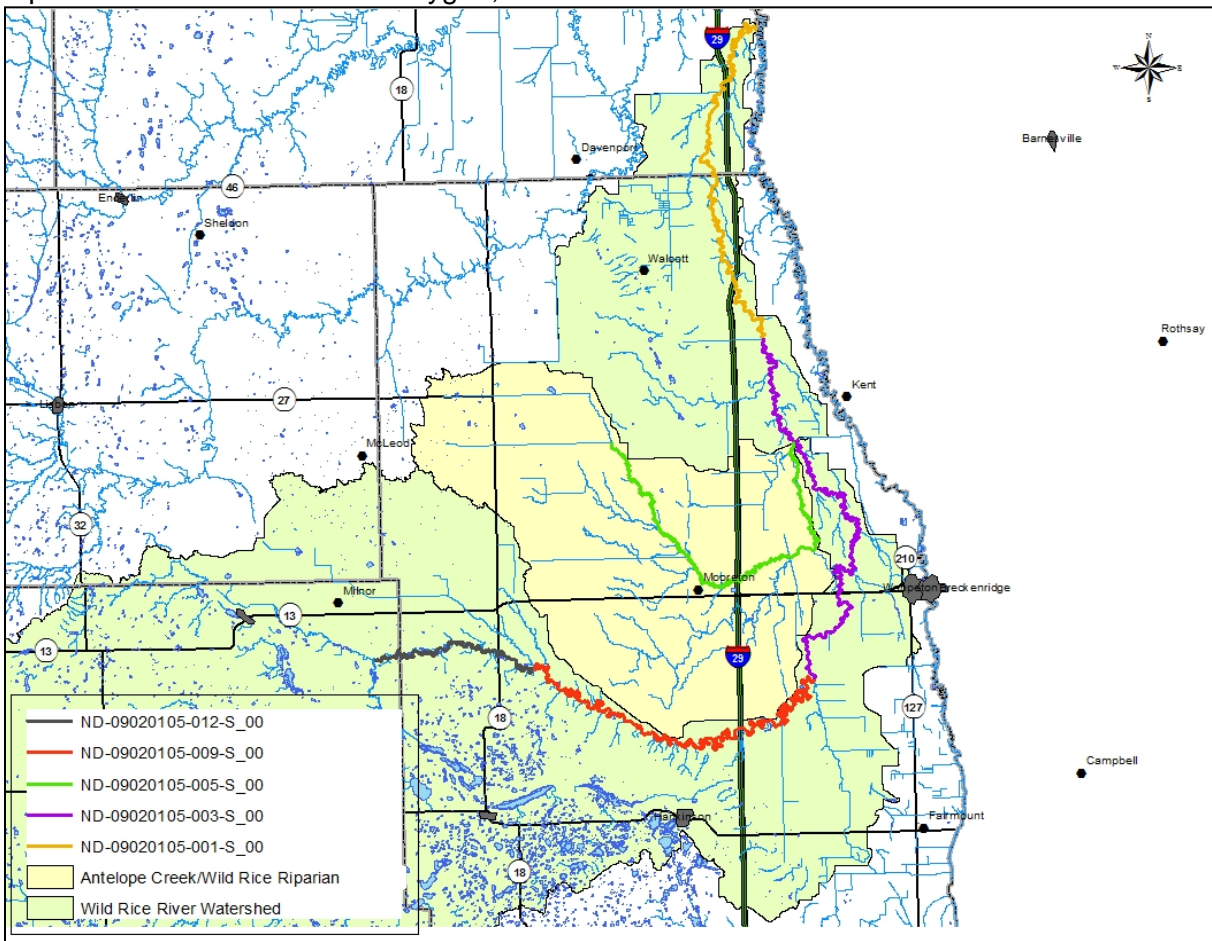


Figure 3. Location of 303(d) Listed Impaired and Delisted Segments in the Antelope Creek and Wild Rice River Watersheds.

1.2 Monitoring Goals

The primary monitoring goals of the project is listed in the Phase III Quality Assurance Project Plan (QAPP). It states, the primary goal of the monitoring component of the project is to determine the effectiveness of accelerated technical assistance and installed best management practices (BMPs) (e.g., repair and/or replacement septic systems, cover crops and vegetative buffers) in improving water quality and restoring beneficial uses within the Antelope Creek watershed in Richland County.

Only the monitoring project's Objectives that are directly related to Water Quality Monitoring Results will be listed below: A complete description of project monitoring goals and objectives can be found in the Phase III QAPP. A copy of the QAPP can be obtained by contacting the NDDEQ, Division of Water Quality.

Objective 2: Collect and analyze E. coli samples from the designated sampling sites in the Antelope Creek watershed and Wild Rice River mainstem riparian corridor to document the effectiveness of installed BMPs at restoring the recreational use of impaired reaches in the watershed and mainstem.

Task 4: Collect and analyze a minimum of five E. coli bacteria samples per month from 3 sites in the Antelope Creek watershed and 3 sites on the Wild Rice River during the recreation season (May 1 – September 30)

Status: Completed: Due to changes in the monitoring approach, only five sites were monitored, all exclusively on the Antelope Creek (Figure 4, Table 2). Five samples per month were not achieved in several of the months due to lower creek flow or completely dry moisture conditions.

Objective 3: Collect and analyze nutrient and total suspended solids (TSS) samples from designated sampling sites in the Antelope Creek watershed and the Wild Rice River mainstem.

Task 6: Collect and analyze water chemistry samples from 3 sites in the Antelope Creek watershed and 3 sites on the Wild Rice River. Water chemistry samples will be collected weekly for nutrients (total nitrogen, total Kjeldahl nitrogen, nitrate-nitrite, ammonia, total phosphorus) and total suspended solids (TSS). Samples will be conducted during the open water ice free period from April-November in 2016-2019.

Status: Completed: Due to changes in the monitoring approach, only five sites were monitored, all exclusively on the Antelope Creek (Figure 4, Table 2). Water chemistry samples were taken at all 5 sites for the duration of the project

1.3 Project Goals

This is the third (Phase III) in a series of Section 319 Projects for the Antelope Creek watershed. The primary goal of the project is to restore the Recreational uses of the impaired reaches of Antelope Creek and the Wild Rice River to fully supporting status. As a secondary goal, the project will also protect and enhance the aquatic life use of Antelope Creek and the Wild Rice River through targeted implementation of BMP within or immediately adjacent to the riparian corridor.

1.4 Numeric Water Quality Standards

Table 1 provides a summary of the current numeric E. coli bacteria criteria which applies to all streams within the state of North Dakota. It should be noted that the E. coli bacteria standard applies only during the recreation season of May 1 thru September 30.

Water Quality Standards for the State of North Dakota can be found at:
https://deq.nd.gov/WQ/3_Watershed_Mgmt/10_WQStand/WQStand.aspx

Table 1. Table of NDDEQ E. Coli Bacteria Numeric Water Quality Standards for all Rivers and Streams

Parameter	Standard	
	Geometric Mean ¹	Maximum ²
E. Coli Bacteria	126 CFU*/100 mL*	409 CFU/100 mL

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

*Colony Forming Units/milliliters

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 thru 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 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

1.5 Water Quality Monitoring Station Locations

Five stream sites were selected for data collection (Figure 4, Table 2). Water quality grab samples were collected for E. coli bacteria, Nutrient Completes and Total Suspended Solids. Sampling for E. coli bacteria occurred exclusively during the Recreational use season (May 1 thru September 30). Sampling for Nutrients Complete and Total Suspended Solids occurred from April thru November.

Water quality samples were collected by the Richland County Soil Conservation District employees. All samples were shipped to the NDDEQ, Chemistry Division Laboratory located in Bismarck, North Dakota, to be analyzed. All E. coli bacteria samples must reach the Laboratory within 48 hours of collection to be considered valid.

E. coli bacteria samples are typically measured as Colony Forming Units (CFU) per 100 mL of solution. After sample data is processed, it is measured against the current NDDEQ's Water Quality Standard (Section 1.4) to determine if it falls above or below statutory limits.

Table 2. Water Quality Monitoring Stations of the Antelope Creek and Wild Rice River Riparian Corridor for Phase II and Phase III Project

Station	Location	Data to be Collected
Up Stream 385238	Antelope Creek	E. coli bacteria, Nutrients, Total Suspended Solids
Mid-Up Stream 385237	Antelope Creek	E. coli bacteria, Nutrients, Total Suspended Solids
Middle Stream 385231	Antelope Creek	E. coli bacteria, Nutrients, Total Suspended Solids
Mid-Down Stream 385232	Antelope Creek	E. coli bacteria, Nutrients, Total Suspended Solids
Down Stream 380030	Antelope Creek	E. coli bacteria, Nutrients, Total Suspended Solids

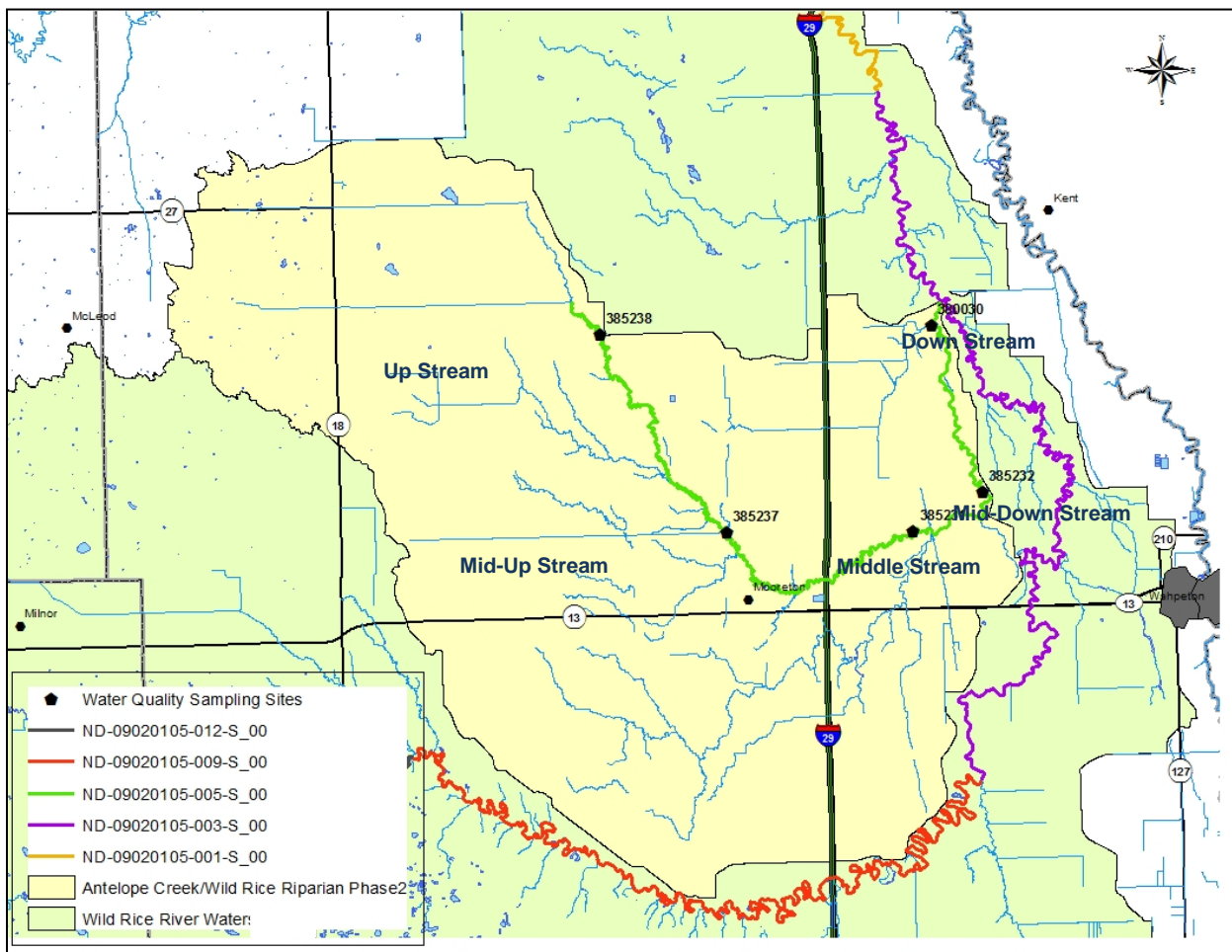


Figure 4. Water Quality Monitoring Station Locations in the Antelope Creek and Wild Rice River Riparian Corridor and Phase III Project

2.0 Water Quality Results by Monitoring Station

All the data used in constructing this report, can be found on the NDDEQ's website at: <https://deq.nd.gov/>, under Surface Water Quality Data.

E. Coli Bacteria

Water quality monitoring station results were analyzed to identify trends in E. coli bacteria counts and the relationship to the Recreational Use status.

Recreation Use includes primary contact activities such as swimming and wading and secondary contact activities such as boating, fishing, and wading.

Recreation use in rivers and streams is considered Fully Supporting where there is little or no risk of illness through either primary or secondary contact with the water. The State's Recreation Use support assessment methodology for rivers and streams is based on the State's numeric water quality standards for E. coli bacteria (Section 1.4).

Analysis of E. coli bacteria for each monitoring site was constructed into one result table for each monitoring site. The table shows the E. coli bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status for individual months in the Recreational period.

The table shows data exclusively from Phase III of the project, for the years 2015 - 2019.

Total Nitrogen

Total Nitrogen (TN) is an essential nutrient for plants and animals. However, an excess amount of nitrogen in a waterway may lead to low levels of dissolved oxygen and negatively alter various plant life and organisms. Sources of nitrogen include: wastewater treatment plants, runoff from fertilized lawns and croplands, failing septic systems, runoff from animal manure and storage areas, and industrial discharges that contain corrosion inhibitors.

There are three forms of nitrogen that are commonly measured in water bodies: ammonia, nitrates and nitrites. Total nitrogen is the sum of total Kjeldahl nitrogen (ammonia, organic and reduced nitrogen) and nitrate-nitrite. It can be derived by monitoring for organic nitrogen compounds, free-ammonia, and nitrate-nitrite individually and adding the components together.

Analysis of Total Nitrogen is grouped in chronological order and a trend line is constructed over the entire project time span; 2015-2019. Outliers were removed -and listed- to provide a better representation of trend over the entire project time span.

Total Phosphorus

Total phosphorus (TP) is an essential nutrient for plants and animals. In waterbodies, phosphorus occurs in two forms, dissolved and particulate. Dissolved phosphorus comes in both soluble reactive and soluble organic (non-reactive) forms. Particulate phosphorus is formed when phosphorus becomes incorporated into particles of soil, algae and small animals that are suspended in the water.

While phosphorus is naturally limiting in most fresh water systems because it is not as abundant as carbon and nitrogen, North Dakota sees elevated concentrations in its waters due to its abundance in most soils and the intensive agriculture land use across the state. Particulate phosphorus naturally bonds to soil particles and as a result can be transported over long distances with eroded soil. Because of this binding property phosphorus often settles with soil particles on the bottom of streams, rivers, and lakes where it becomes unavailable for

use by plants until it is both resuspended and mixed with the appropriate concentrations of nitrogen. Soluble phosphorus remains in the water column, available for plant use. Sources of phosphorus include soil and rock, wastewater treatment plants, leaking septic systems, runoff from cropland, fertilized lawns, animal manure storage areas, disturbed land areas, drained wetlands, water treatment, decomposition of organic matter, storm water runoff, and commercial cleaning preparations.

Analysis of Total Phosphorus is grouped in chronological order and a trend line is constructed over the entire project time span; 2015-2019. Outliers were removed -and listed- to provide a better representation of trend over the entire project time span.

Total Suspended Solids

Total suspended solids (TSS) are organic and inorganic solid materials that are suspended in the water and include silt, plankton, and industrial wastes. If high concentrations of suspended solids exist in the waterbody it can lower water quality by absorbing light. The waterbody then becomes warmer and reduces the ability of the water to hold oxygen necessary for aquatic life. When aquatic plants receive less light, photosynthesis decreases, and less oxygen is produced. The combination of warmer water, less light, and lower oxygen makes it impossible for some forms of life to exist.

Analysis of Total Suspended Solids is grouped in chronological order and a trend line is constructed over the entire project time span; 2015-2019. Outliers were removed -and listed- to provide a better representation of trend over the entire project time span.

**2.1 Station 385238 (Up Stream)
Monitoring Results for Antelope Creek North Branch near Galchutt**

E. coli bacteria

Station 385238 is located seven miles west of Galchutt, N.D. (Figure 4). In total, 99 E. coli bacteria samples were collected and analyzed from 2015 through 2019.

Of the five month-periods for Phase III, May and June resulted in a Fully Supported (Table 3)

	May	June	July	August	September
Phase III	FS	FS	NS	NS	NS

The trend line analysis (Figure 5) shows a significant decrease in E. coli bacteria concentrations.

Outliers removed from the trend analysis include:

- Sample date, 7/11/2016, recording 6600 CFU/100 mL
- Sample date, 8/26/2019, recording 10,000 CFU/100 mL

Total Nitrogen, Total Phosphorus, Total Suspended Solids

(Figure 6-8)

	Total Nitrogen	Total Phosphorus	Total Suspended Solids
Trend Line	↓ Decreasing Amount	↑ Increasing Amount	↑ Increasing Amount

The majority of Nitrogen and Phosphorus samples had concentrations well above NDDEQ'S guidelines. All Suspended Solid samples (except one) were below guidelines.

Exhibit B

Table 3. Monitoring Station 385238- E. Coli Bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status

Monitoring Site 385238

E.Coli Samples taken during the Recreation Period (May - September)

	MAY	JUNE	JULY	AUGUST	SEPTEMBER					
	5/11/15	90	6/1/15	240	7/6/15	170	8/16/17	150	9/4/2019	190
	5/18/15	640	6/8/15	230	7/8/15	270	8/21/17	170	9/9/2019	2100
	5/26/15	60	6/10/15	200	7/13/15	250	8/22/17	90	9/11/2019	280
	5/27/15	90	6/15/15	2000	7/15/15	100	8/28/17	100	9/16/2019	620
	5/2/16	20	6/17/15	1600	7/21/15	420	8/29/17	230	9/23/2019	160
	5/4/16	80	6/24/15	350	7/27/15	370	8/6/18	660		
	5/9/16	70	6/29/15	140	7/29/15	210	8/15/18	1100		
	5/11/16	10	6/5/17	40	7/11/16	6600	8/20/18	470		
	5/16/16	1600	6/14/17	130	7/13/16	60	8/22/18	980		
	5/18/16	20	6/19/17	130	7/18/16	240	8/27/18	910		
	5/23/16	70	6/26/17	40	7/20/16	110	8/5/2019	230		
	5/25/16	150	6/28/17	190	7/25/16	230	8/7/2019	41		
	5/8/17	60	6/4/18	140	7/27/16	1600	8/12/2019	170		
	5/10/17	10	6/6/18	160	7/9/18	110	8/19/2019	130		
	5/15/17	20	6/11/18	31	7/11/18	41	8/21/2019	31		
	5/17/17	200	6/13/18	30	7/16/18	140	8/26/2019	10000		
	5/22/17	20	6/18/18	86	7/23/18	240				
	5/24/17	50	6/20/18	31	7/30/18	63				
	5/30/17	30	6/3/19	51	7/1/19	41				
	5/2/18	10	6/5/19	41	7/10/19	130				
	5/7/18	10	6/11/19	160	7/22/19	180				
	5/9/18	52	6/17/19	370	7/24/19	41				
	5/14/18	63	6/19/19	270	7/31/19	31				
	5/21/18	20								
	5/23/18	63								
	5/6/19	10								
	5/8/19	5								
	5/13/19	5								
	5/15/19	20								
	5/20/19	640								
	5/29/19	31	For Project Years 2015-2018 Phase III							
							se III)			
N		31		23		23		16		5
GeoMean		42.7		86.3		146.5		274.5		406.4
% > 409		9.7		8.7		13.0		37.5		40.0
Recreation Use Assessment		FS		FS		NS		NS		NS

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

Exhibit B

Legend for the following Figures

- Trend Line 
- NDDEQ standard for maximum amount:
E. coli bacteria geo-mean
Maximum is set at 126 CFU / 100mL 
- NDDEQ guidelines for Maximum amounts:
• TN is set at 1.0 mg/L 
- TP is set at 0.10 mg/L
- TSS is set at 35 mg/L

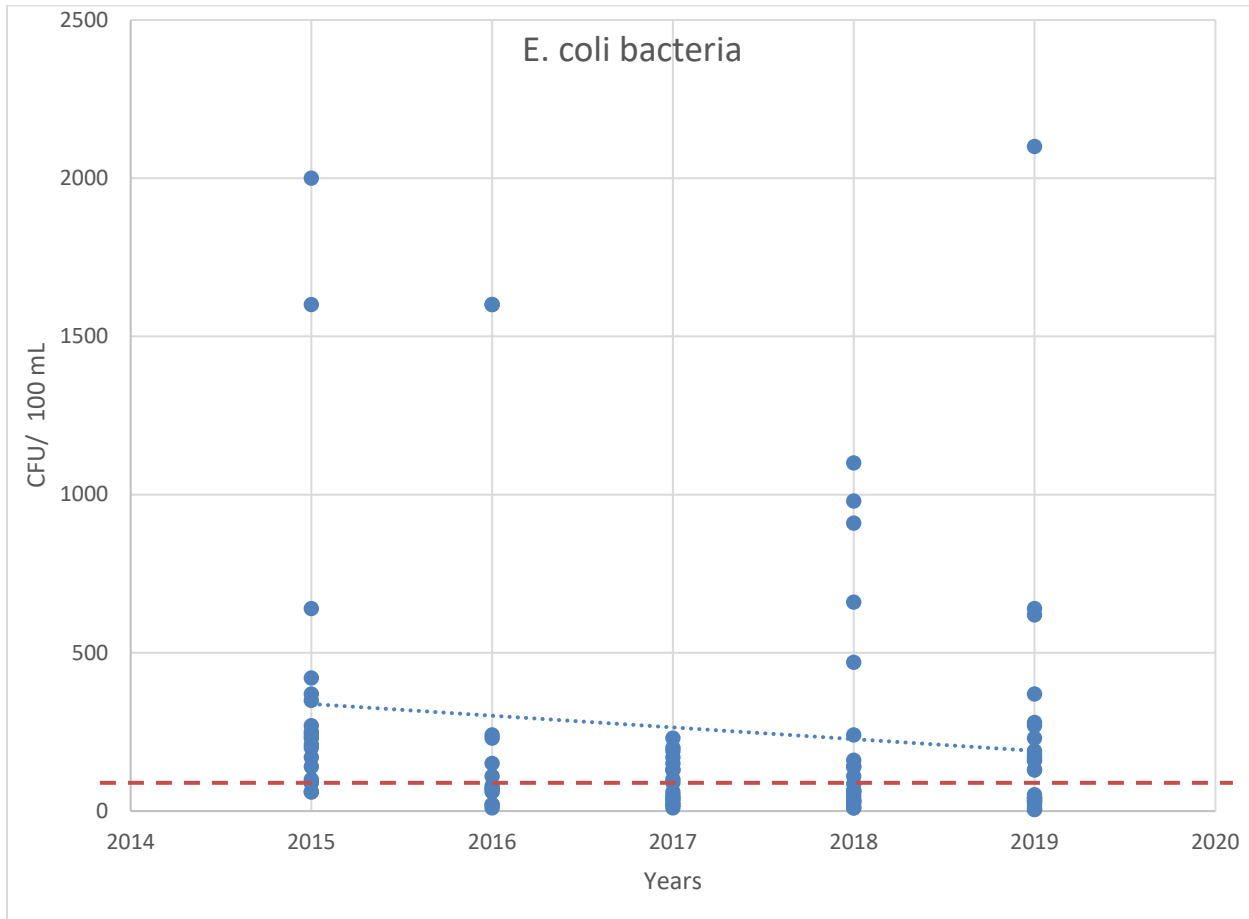


Figure 5. Trends in E. Coli Bacteria at Station 385238

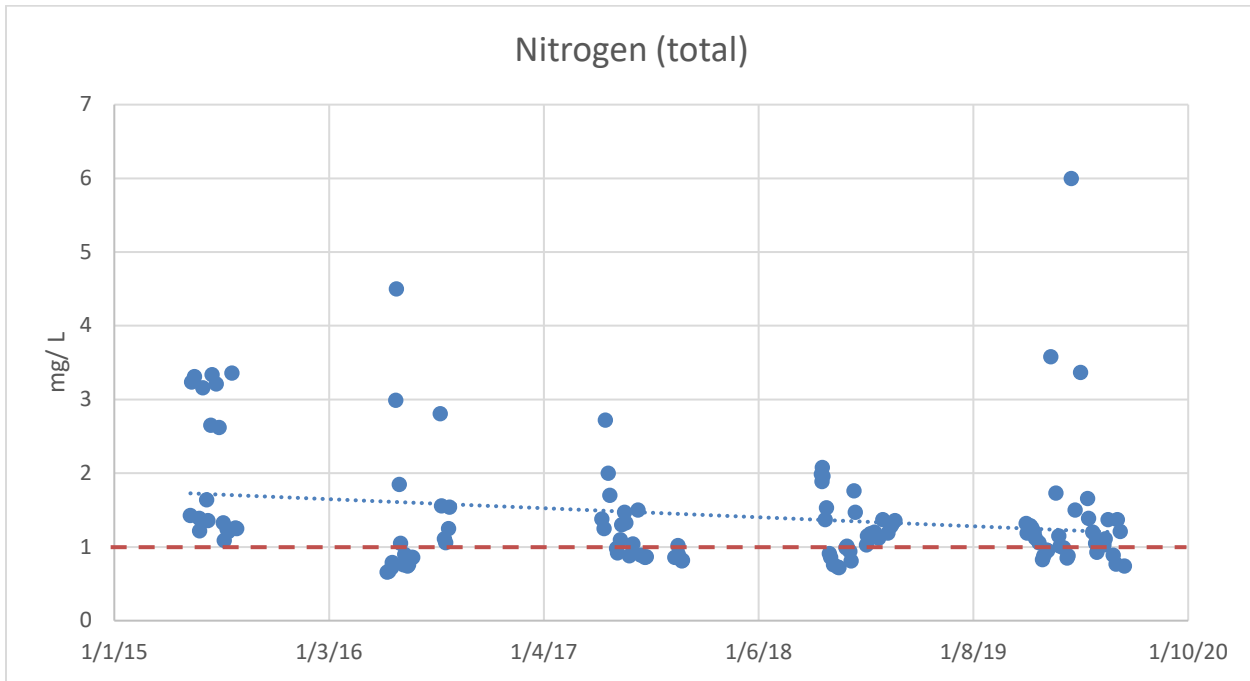


Figure 6. Trends in Total Nitrogen at Station 385238

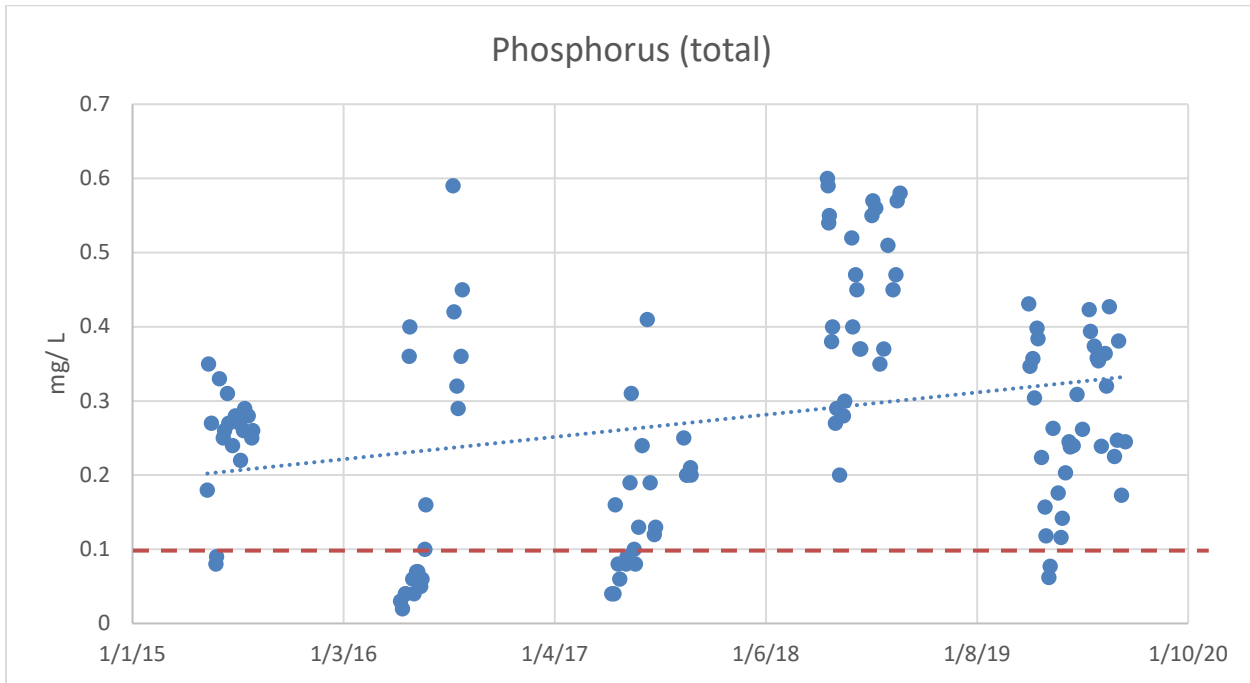


Figure 7. Trends in Total Phosphorus at Station 385238

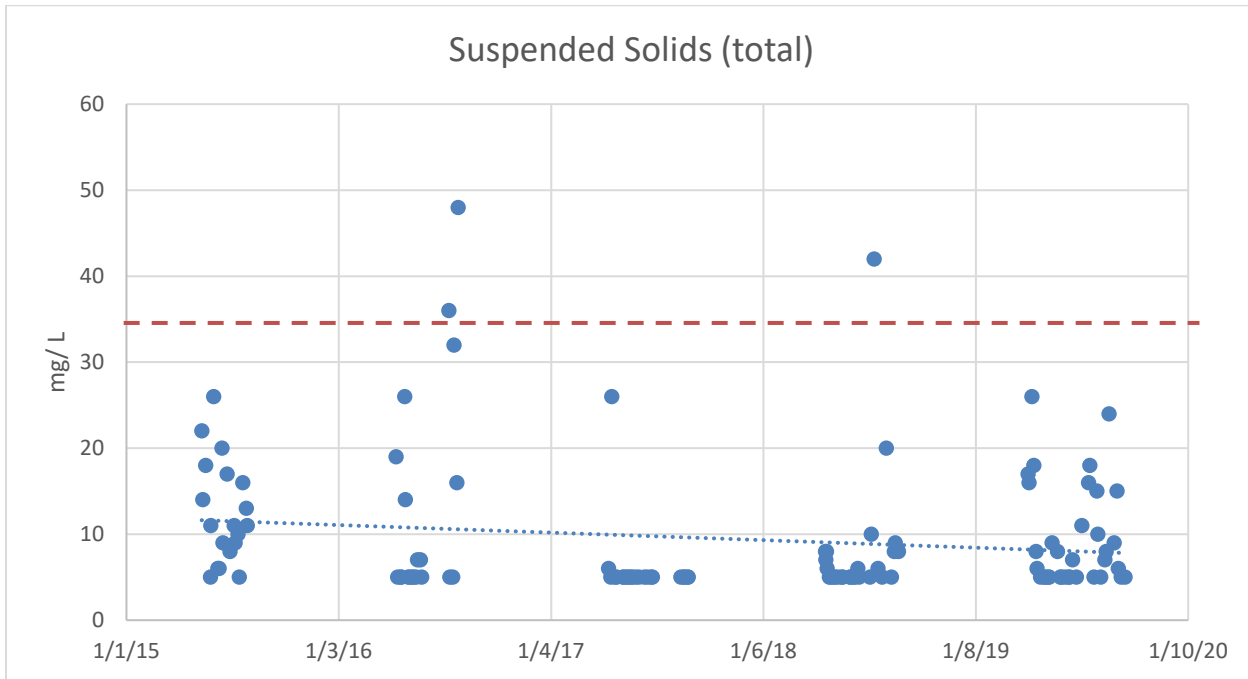


Figure 8. Trends in Total Suspended Solids at Station 385238

**2.2 Station 385237 (Mid-Up Stream)
Monitoring Results for Antelope Creek North Branch north of Mooreton**

E. coli bacteria

Station 385237 is located two miles north and one mile west of Mooreton, N.D. (Figure 4). In total, 101 E. coli bacteria samples were collected and analyzed from 2015 through 2019.

Of the five month-periods for Phase III, one of them resulted in a Fully Supported. (Table 4)

	May	June	July	August	September
Phase III	FS	NS	FSbT	NS	NS

The trend line analysis (Figure 9) shows a significant decrease in E. coli bacteria concentrations.

**Total Nitrogen, Total Phosphorus, Total Suspended Solids
(Figure 10-12)**

	Total Nitrogen	Total Phosphorus	Total Suspended Solids
Trend Line	↓ Decreasing Amount	↑ Increasing Amount	↑ Increasing Amount

The majority of Nitrogen and Phosphorus samples had concentrations well above NDDEQ'S guidelines. The majority of Suspended Solid samples were below guidelines.

Exhibit B

Table 4. Monitoring Station 385237 - E. Coli Bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status

Monitoring Site 385237										
E.Coli Samples taken during the Recreation Period (May - September)										
	MAY		JUNE		JULY		AUGUST		SEPTEMBER	
	5/11/15	1600	6/1/15	250	7/6/15	80	8/16/17	100	9/4/2019	150
	5/13/15	1600	6/8/15	1600	7/8/15	70	8/21/17	240	9/9/2019	160
	5/18/15	1600	6/10/15	130	7/13/15	210	8/22/17	210	9/11/2019	350
	5/26/15	510	6/15/15	600	7/15/15	220	8/28/17	130	9/16/2019	230
	5/27/15	280	6/17/15	1600	7/21/15	1600	8/29/17	50	9/23/2019	170
	5/2/16	70	6/24/15	540	7/27/15	1600	8/6/18	170		
	5/4/16	140	6/29/15	140	7/29/15	150	8/15/18	160		
	5/9/16	30	6/5/17	10	7/11/16	590	8/20/18	1600		
	5/11/16	70	6/14/17	1700	7/13/16	380	8/22/18	220		
	5/16/16	20	6/19/17	220	7/18/16	60	8/27/18	200		
	5/18/16	140	6/26/17	70	7/20/16	110	8/5/2019	120		
	5/23/16	10	6/28/17	60	7/25/16	160	8/7/2019	74		
	5/25/16	60	6/4/18	73	7/27/16	110	8/12/2019	98		
	5/8/17	30	6/6/18	1100	7/9/18	140	8/19/2019	390		
	5/10/17	60	6/11/18	150	7/11/18	160	8/21/2019	200		
	5/15/17	90	6/13/18	51	7/16/18	98	8/26/2019	74		
	5/17/17	950	6/18/18	320	7/23/18	200				
	5/22/17	110	6/20/18	260	7/30/18	130				
	5/24/17	70	6/3/19	20	7/1/19	41				
	5/30/17	80	6/5/19	63	7/10/19	240				
	5/2/18	52	6/11/19	97	7/22/19	5				
	5/7/18	95	6/17/19	220	7/24/19	5				
	5/9/18	190	6/19/19	150	7/31/19	31				
	5/14/18	52	6/24/19	380						
	5/21/18	52								
	5/23/18	74								
	5/6/19	130								
	5/8/19	5								
	5/13/19	5								
	5/15/19	41								
	5/20/19	140								
	5/29/19	41								
For Project Years 2015-2019 (Phase III)										
N		32		24		23		16		5
GeoMean		89.4		132.7		122.8		165.4		201.0
% > 409		15.6		25.0		13.0		6.3		0.0
Recreation Use Assessment		FS		NS		FSbT		NS		NS

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

Legend for the following Figures

- Trend Line
- NDDEQ standard for maximum amount:
E. coli bacteria geo-mean
Maximum is set at 126 CFU / 100mL - - - - -
- NDDEQ guidelines for Maximum amounts:
• TN is set at 1.0 mg/L - - - - -
- TP is set at 0.10 mg/L
- TSS is set at 35 mg/L

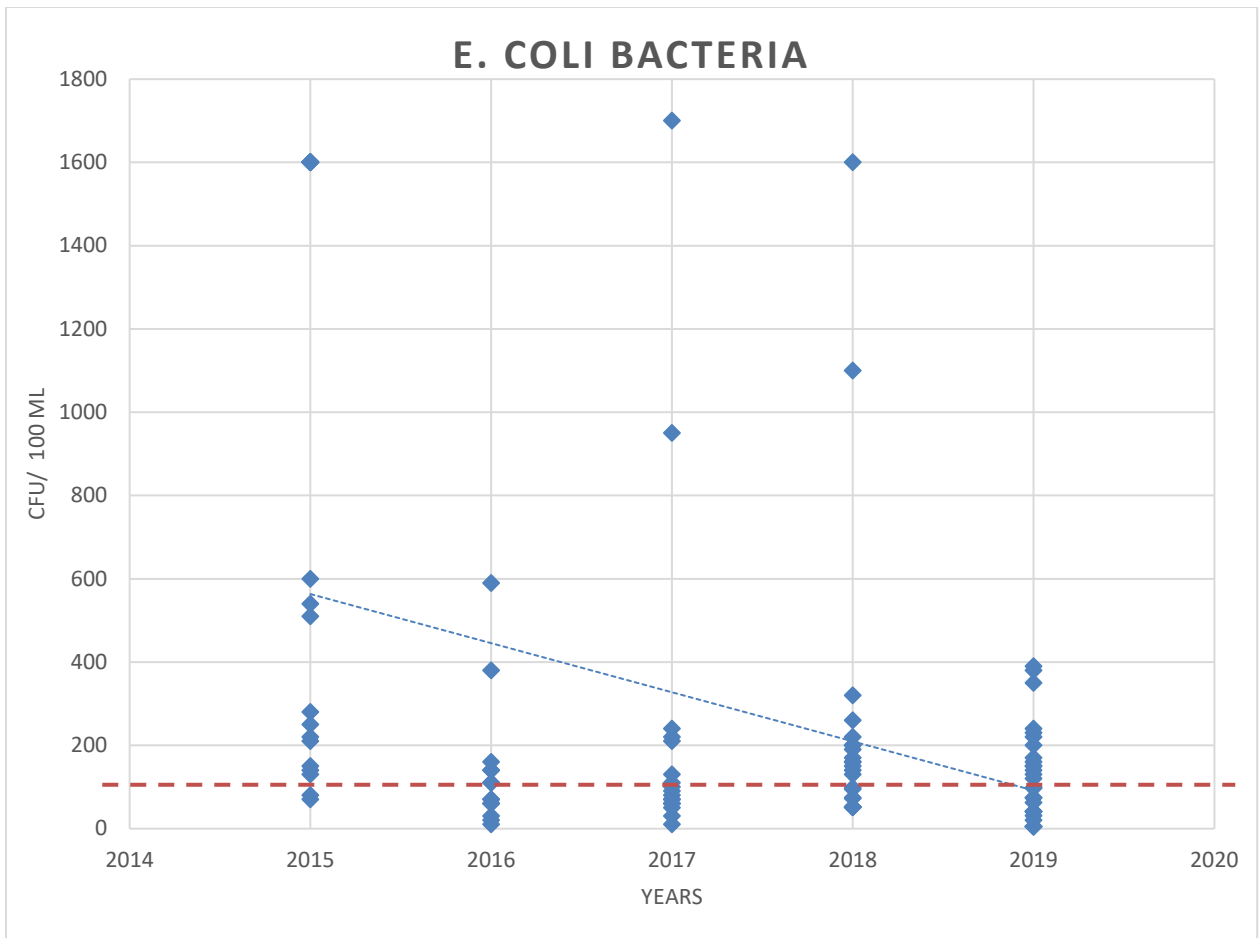


Figure 9. Trends in E. Coli Bacteria at Station 385237

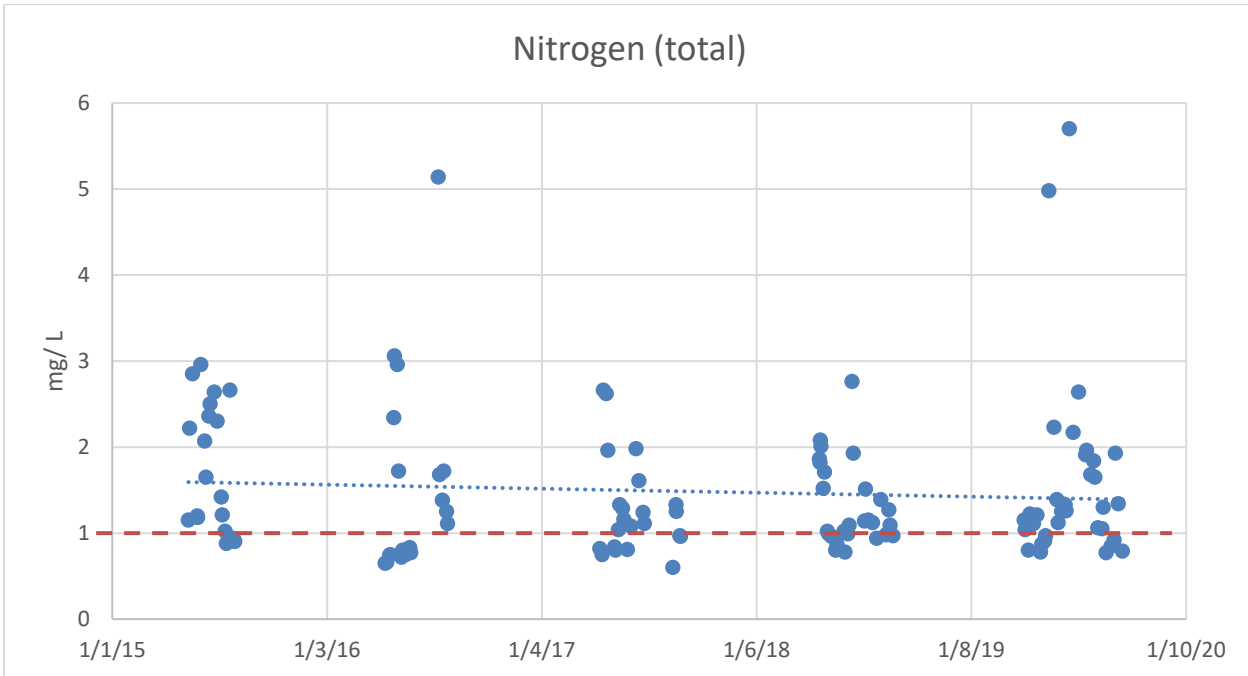


Figure 10. Trends in Total Nitrogen at Station 385237

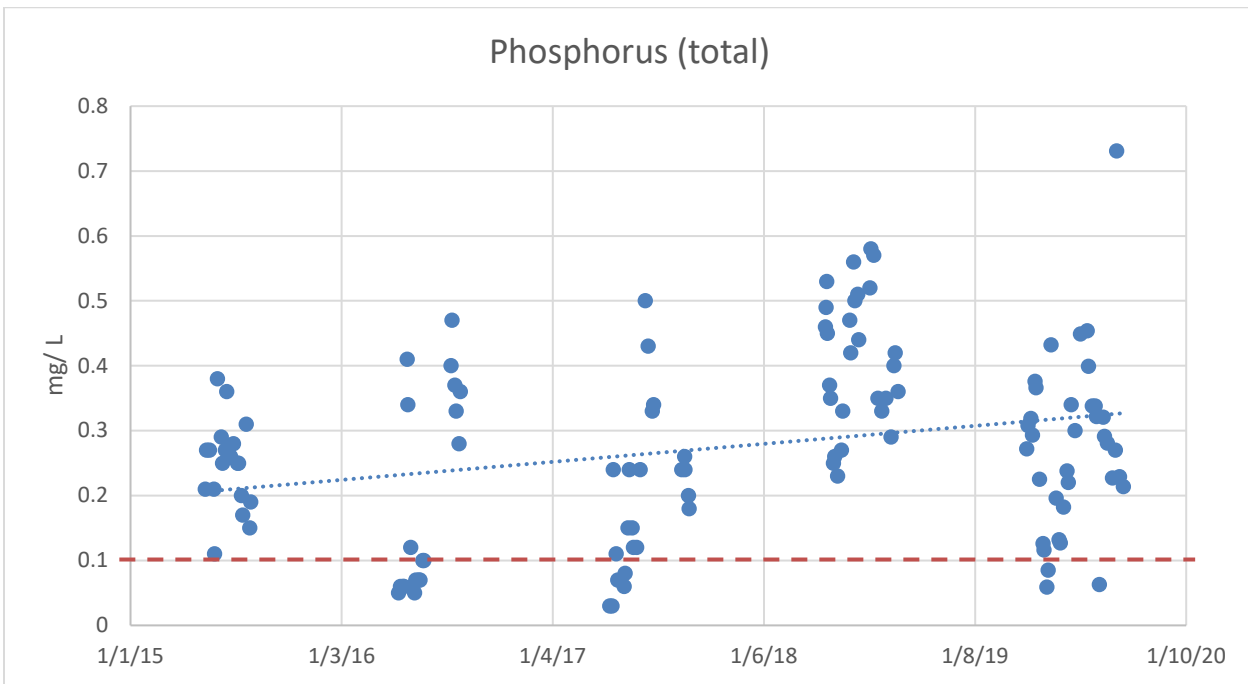


Figure 11. Trends in Total Phosphorus at Station 385237

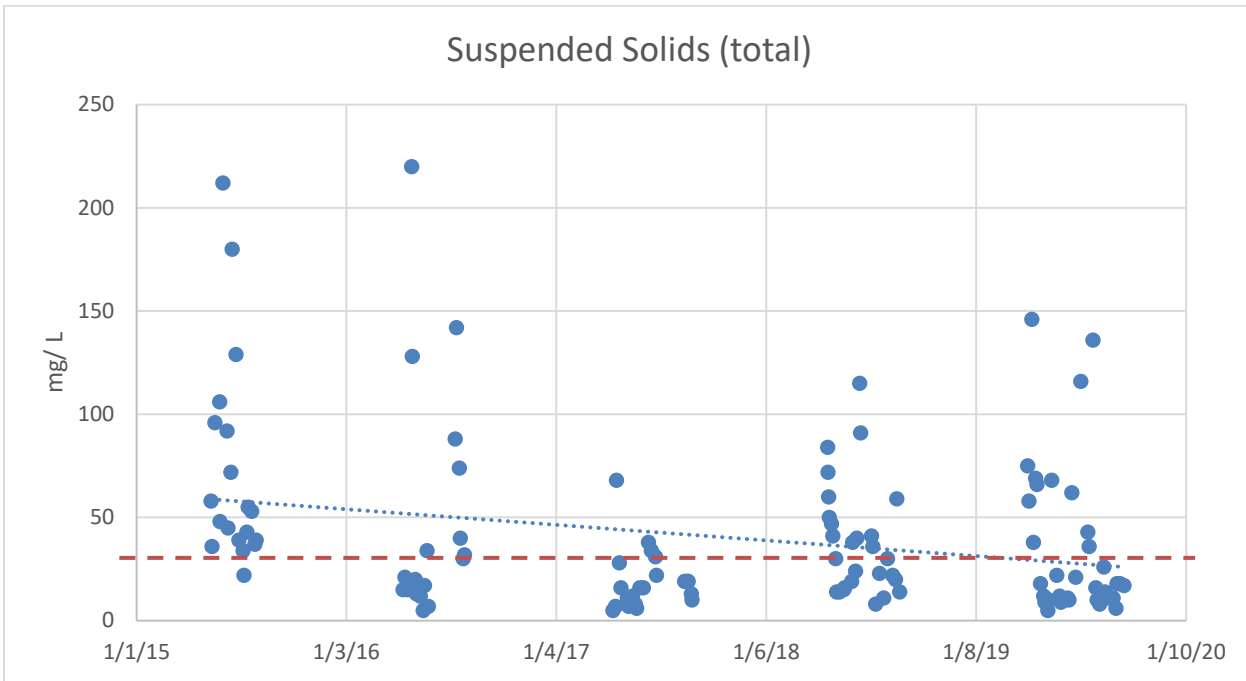


Figure 12. Trends in Total Suspended Solids at Station 385237

**2.3 Station 385231(Middle Stream)
Monitoring Results for Antelope Creek North Branch South of Mooreton**

E. coli bacteria

Station 385231 is located on the North Branch Antelope Creek south of Mooreton, N.D. (Figure 4). In total, 101 E. coli bacteria samples were collected and analyzed from 2015 through 2019.

Of the five month-periods for Phase III, only May resulted in a Fully Supported. (Table 5)

	May	June	July	August	September
Phase III	FS	NS	NS	FSbT	NS

The trend line analysis (Figure 13) shows a moderate decrease in E. coli bacteria concentrations.

Outliers removed from the trend analysis include:

- Sample data, 6/14/2017, recording 6800 CFU/100 mL.

Total Nitrogen, Total Phosphorus, Total Suspended Solids

(Figure 14-16)

	Total Nitrogen	Total Phosphorus	Total Suspended Solids
Trend Line	↑ Increasing Amount	↑ Increasing Amount	↓ Decreasing Amount

The majority of Nitrogen and Phosphorus samples had concentrations well above NDDEQ'S guidelines. The majority of Suspended Solid samples were below guidelines.

Exhibit B

Table 5. Monitoring Station 385231 -- E. Coli Bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status

Monitoring Site 385231

E.Coli Samples taken during the Recreation Period (May - September)

	MAY	JUNE	JULY	AUGUST	SEPTEMBER				
5/11/15	270	6/1/15	250	7/6/15	110	8/16/17	120	9/4/2019	270
5/13/15	1600	6/8/15	80	7/8/15	200	8/21/17	80	9/9/2019	500
5/18/15	460	6/10/15	40	7/13/15	230	8/22/17	40	9/11/2019	180
5/26/15	20	6/15/15	1600	7/15/15	1600	8/28/17	210	9/16/2019	220
5/27/15	10	6/17/15	1600	7/21/15	90	8/29/17	60	9/32/19	130
5/2/16	60	6/24/15	380	7/27/15	190	8/6/18	20		
5/4/16	40	6/29/15	200	7/29/15	1600	8/15/18	74		
5/9/16	50	6/5/17	210	7/11/16	850	8/20/18	860		
5/11/16	100	6/14/17	6800	7/13/16	330	8/22/18	190		
5/16/16	70	6/19/17	320	7/18/16	60	8/27/18	74		
5/18/16	50	6/26/17	250	7/20/16	480	8/5/2019	1200		
5/23/16	20	6/28/17	110	7/25/16	60	8/7/2019	96		
5/25/16	100	6/4/18	41	7/27/16	120	8/12/2019	72		
5/8/17	30	6/6/18	140	7/9/18	140	8/19/2019	180		
5/10/17	40	6/11/18	97	7/11/18	51	8/21/2019	74		
5/15/17	40	6/13/18	30	7/16/18	10	8/26/2019	63		
5/17/17	310	6/18/18	200	7/23/18	150				
5/22/17	60	6/20/18	85	7/30/18	41				
5/24/17	110	6/3/19	31	7/1/2019	86				
5/30/17	40	6/5/19	31	7/10/2019	320				
5/2/18	52	6/11/19	74	7/22/2019	30				
5/7/18	41	6/17/19	73	7/24/2019	63				
5/9/18	86	6/19/19	31	7/31/2019	52				
5/14/18	74	6/24/19	270						
5/21/18	52								
5/23/18	74								
5/6/19	5								
5/8/19	10								
5/13/19	86								
5/15/19	10								
5/20/19	200								
5/29/19	31								
						For Project Years 2015-2019 (Phase III)			
N	32		24		23		16		5
GeoMean	57.3		152.3		137.6		111.9		233.6
% > 409	6.3		12.5		17.4		12.5		20.0
Recreation Use Assessment	FS		NS		NS		FSbT		NS

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

Legend for the following Figures

- Trend Line
- E. coli bacteria geo-mean
Maximum is set at 126 CFU / 100mL -----
- NDDEQ guidelines for Maximum amounts:
 - TN is set at 1.0 mg/L
 - TP is set at 0.10 mg/L
 - TSS is set at 35 mg/L-----

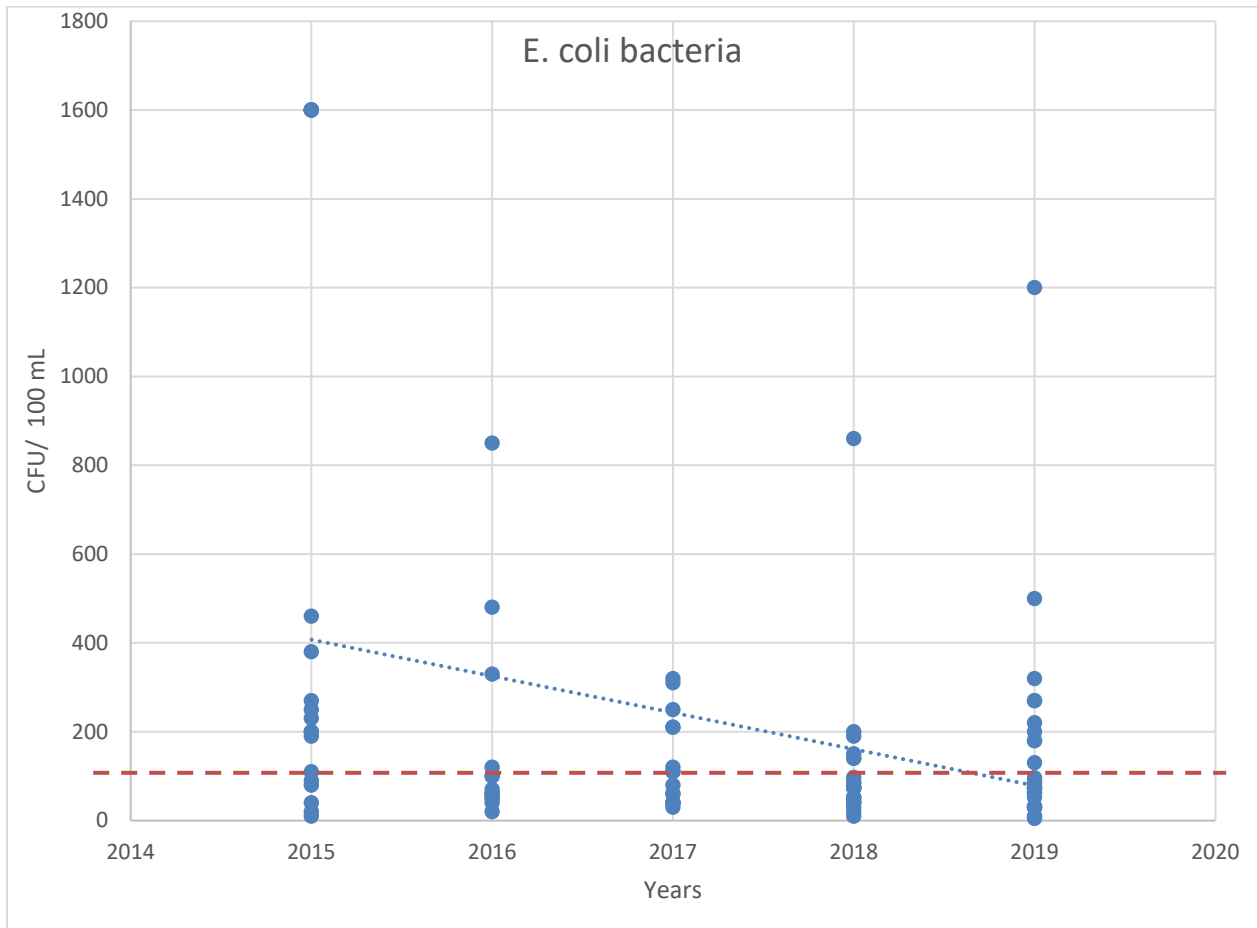


Figure 13. Trends in E. Coli Bacteria at Station 385231

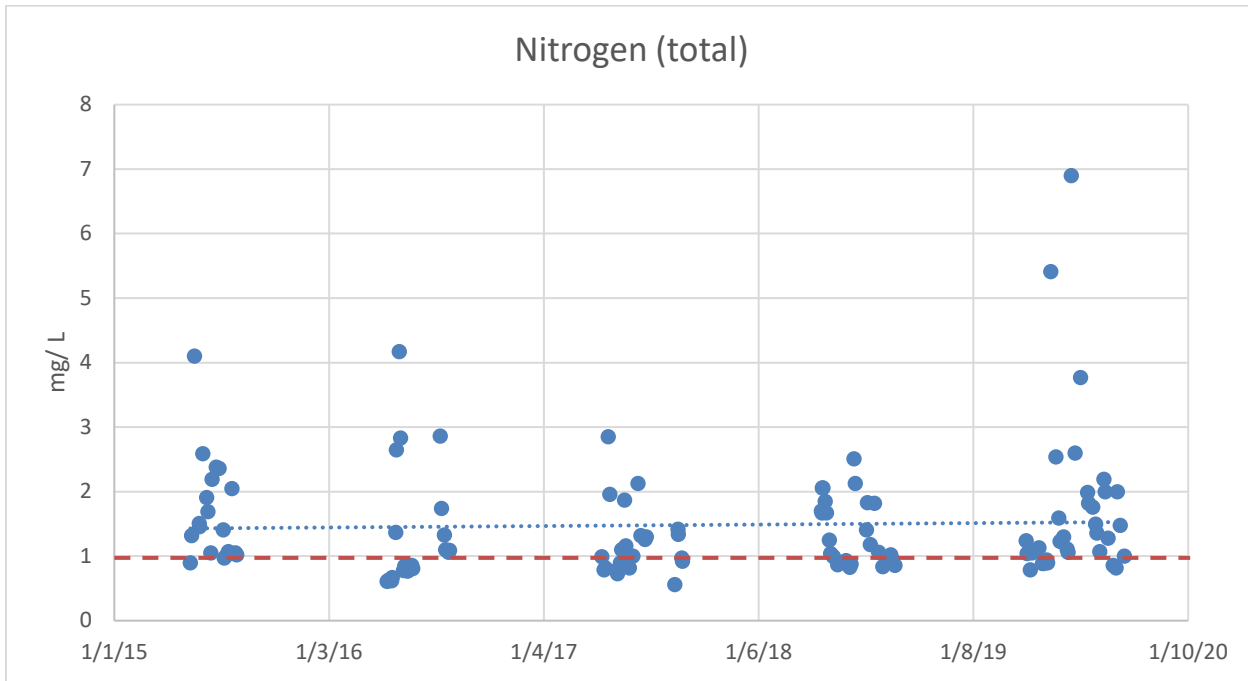


Figure 14. Trends in Total Nitrogen at Station 385231

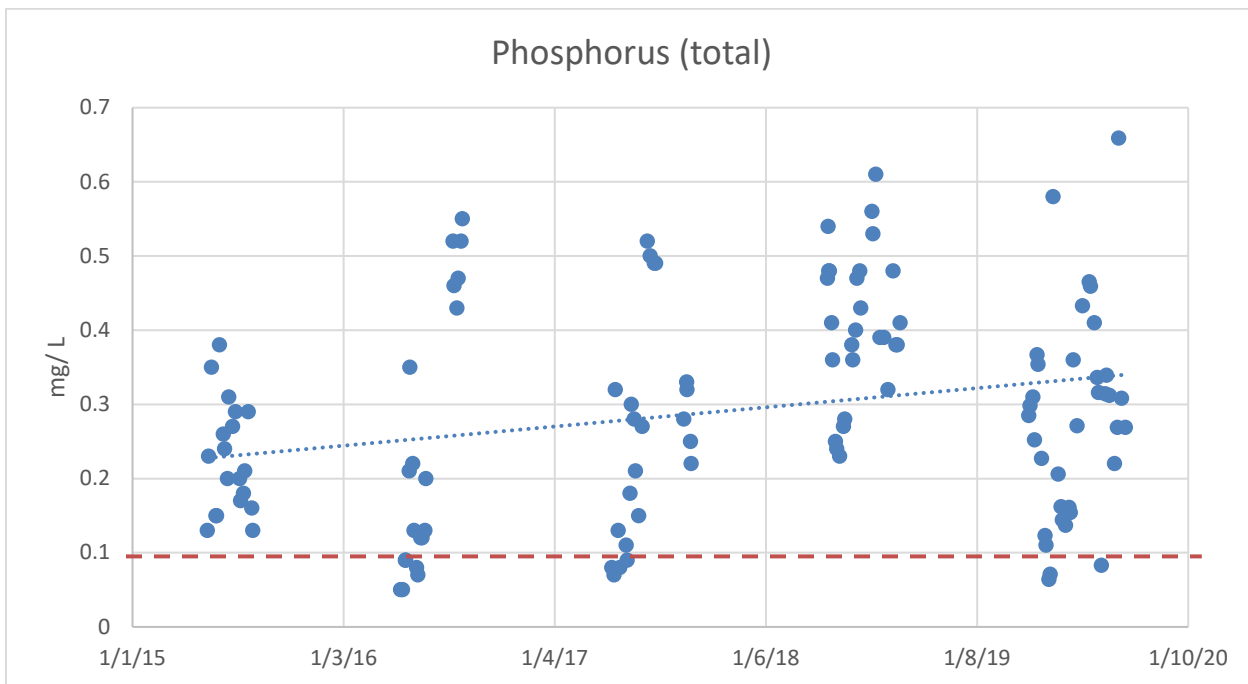


Figure 15. Trends in Total Phosphorus at Station 385231

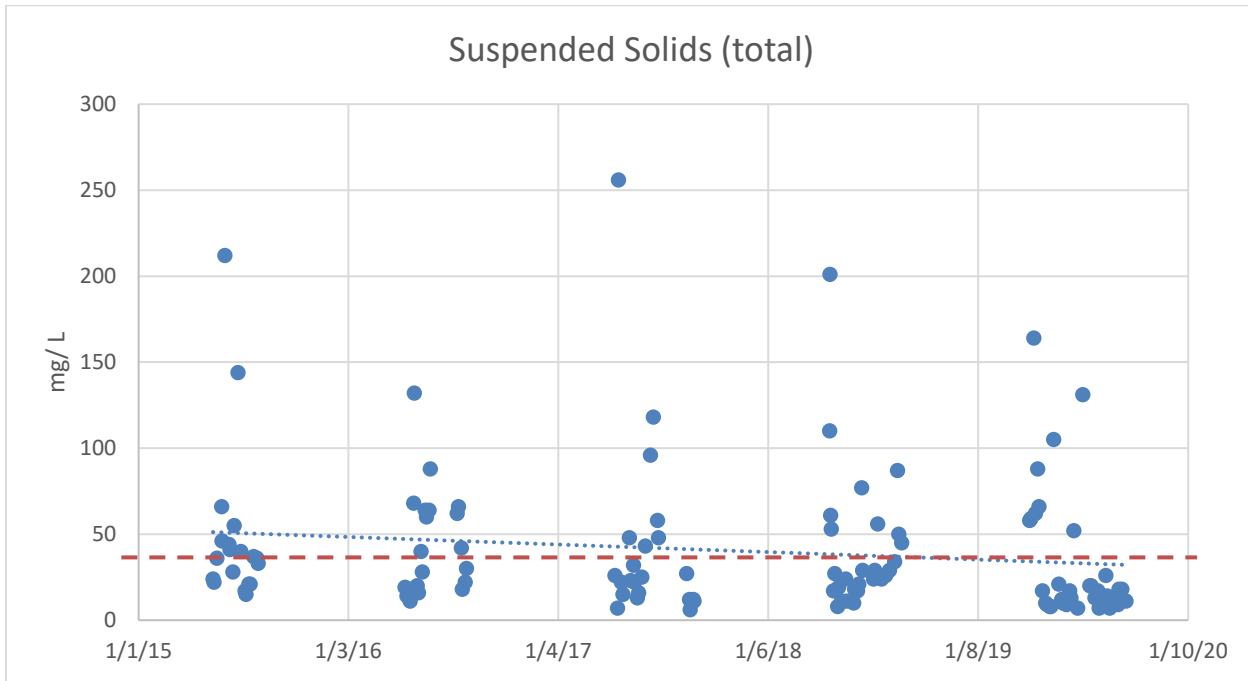


Figure 16. Trends in Total Suspended Solids at Station 385231

**2.4 Station 385232 (Mid-Down Stream)
Monitoring Results for Antelope Creek near Dwight**

E. coli bacteria

Station 385232 is located one half mile north and a quarter of a mile east of Dwight, N.D. (Figure 4). In total, 102 E. coli bacteria samples were collected and analyzed from 2015 through 2019.

Of the five month-periods for Phase III, three of them resulted in a Fully Supported. (Table 6)

	May	June	July	August	September
Phase III	FS	FS	FSbT	FS	NS

The trend line analysis (Figure 17) shows a substantial decrease in E. coli bacteria concentrations.

**Total Nitrogen, Total Phosphorus, Total Suspended Solids
(Figure 18-20)**

	Total Nitrogen	Total Phosphorus	Total Suspended Solids
Trend Line	↓ Decreasing Amount	↑ Increasing Amount	↓ Decreasing Amount

The majority of Nitrogen and Phosphorus samples had concentrations well above NDDEQ'S guidelines. Suspended Solid samples were mixed, about half were below guidelines and about half above.

Outliers removed from the trend analysis include:

- Total Suspended Solid; Sampling date 6/11/2018, recording 128 mg/L

Exhibit B

Table 6. Monitoring Station 385232-- E. Coli Bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status

Monitoring Site 385232

E.Coli Samples taken during the Recreation Period (May - September)

	MAY		JUNE		JULY		AUGUST		SEPTEMBER	
	5/11/15	170	6/1/15	150	7/6/15	30	8/16/17	150	9/4/2019	85
	5/13/15	40	6/8/15	10	7/8/15	90	8/21/17	110	9/9/2019	180
	5/18/15	120	6/10/15	160	7/13/15	30	8/22/17	110	9/11/2019	290
	5/26/15	30	6/15/15	70	7/15/15	50	8/28/17	180	9/16/2019	210
	5/27/15	50	6/17/15	1600	7/21/15	90	8/29/17	320	9/23/2019	52
	5/2/16	140	6/24/15	300	7/27/15	5	8/6/18	52		
	5/4/16	20	6/29/15	280	7/27/15	1600	8/15/18	400		
	5/9/16	100	6/5/17	330	7/29/15	40	8/20/18	200		
	5/11/16	160	6/14/17	1600	7/11/16	1600	8/22/18	61		
	5/16/16	60	6/19/17	210	7/13/16	280	8/27/18	97		
	5/18/16	30	6/26/17	110	7/18/16	250	8/5/2019	130		
	5/23/16	100	6/28/17	170	7/20/16	330	8/7/2019	30		
	5/25/16	120	6/4/18	20	7/25/16	180	8/12/2019	120		
	5/8/17	110	6/6/18	130	7/27/16	770	8/19/2019	51		
	5/10/17	60	6/11/18	110	7/9/18	31	8/21/2019	52		
	5/15/17	40	6/13/18	41	7/11/18	51	8/26/2019	20		
	5/17/17	120	6/18/18	98	7/16/18	20				
	5/22/17	70	6/20/18	120	7/23/18	41				
	5/24/17	60	6/3/19	31	7/30/18	130				
	5/30/17	20	6/5/19	20	7/1/2019	160				
	5/2/18	10	6/11/19	20	7/10/2019	680				
	5/7/18	20	6/17/19	20	7/22/2019	20				
	5/9/18	86	6/19/19	31	7/24/2019	10				
	5/14/18	30	6/24/2019	360	7/31/2019	5				
	5/21/18	20								
	5/23/18	85								
	5/6/19	5								
	5/8/19	20								
	5/13/19	20								
	5/15/19	5								
	5/20/19	330								
	5/29/19	31								
For Project Years 2015-2019 (Phase III)										
N		32		24		24		16		5
GeoMean		46.8		102.4		82.9		97.2		137.1
% > 409		0.0		8.3		16.7		0.0		0.0
Recreation Use Assessment		FS		FS		FSbT		FS		NS

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

Legend for the following Figures

- Trend Line
- E. coli bacteria geo-mean
Maximum is set at 126 CFU / 100mL -----
- NDDEQ guidelines for Maximum amounts:
 - TN is set at 1.0 mg/L
 - TP is set at 0.10 mg/L
 - TSS is set at 35 mg/L-----

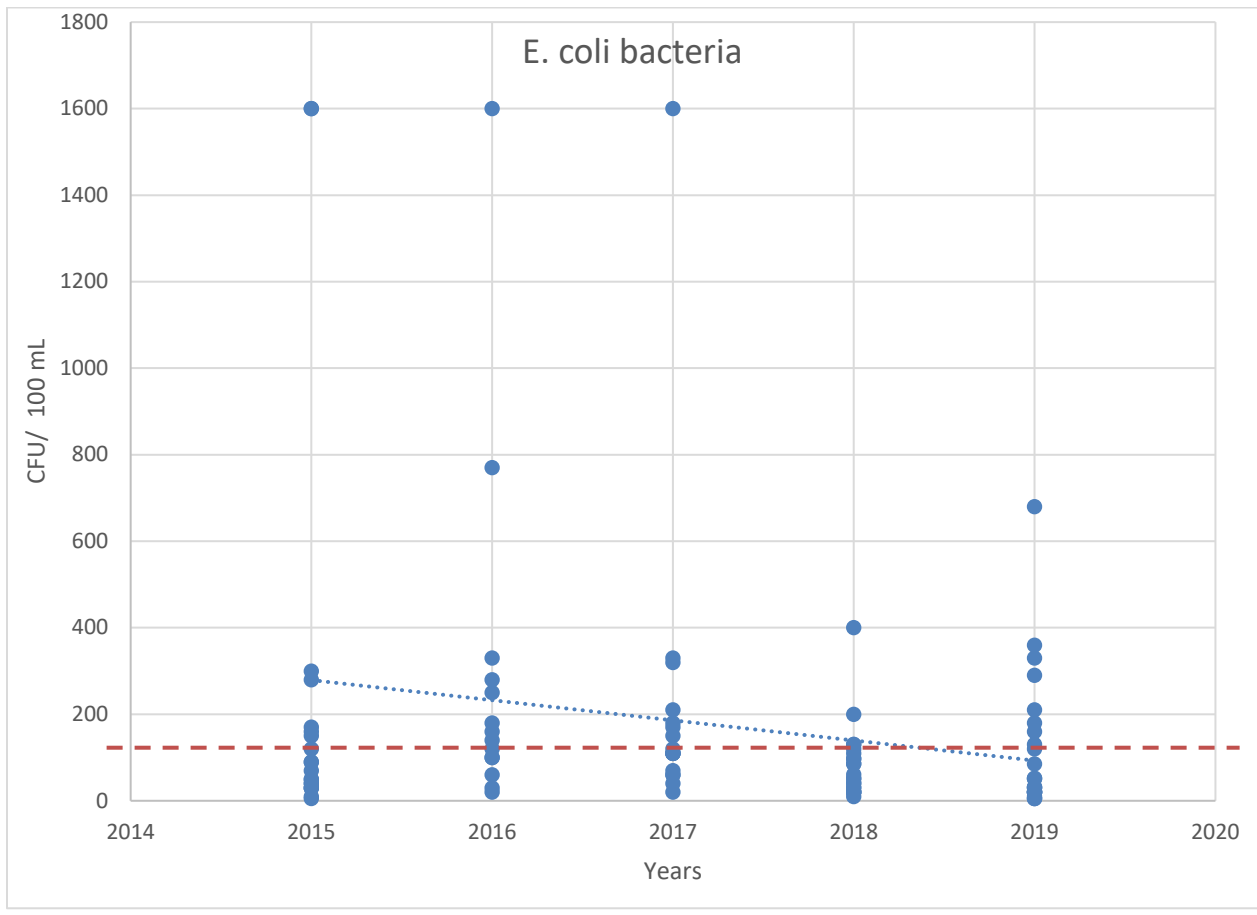


Figure 17. Trends in E. Coli Bacteria at Station 385232

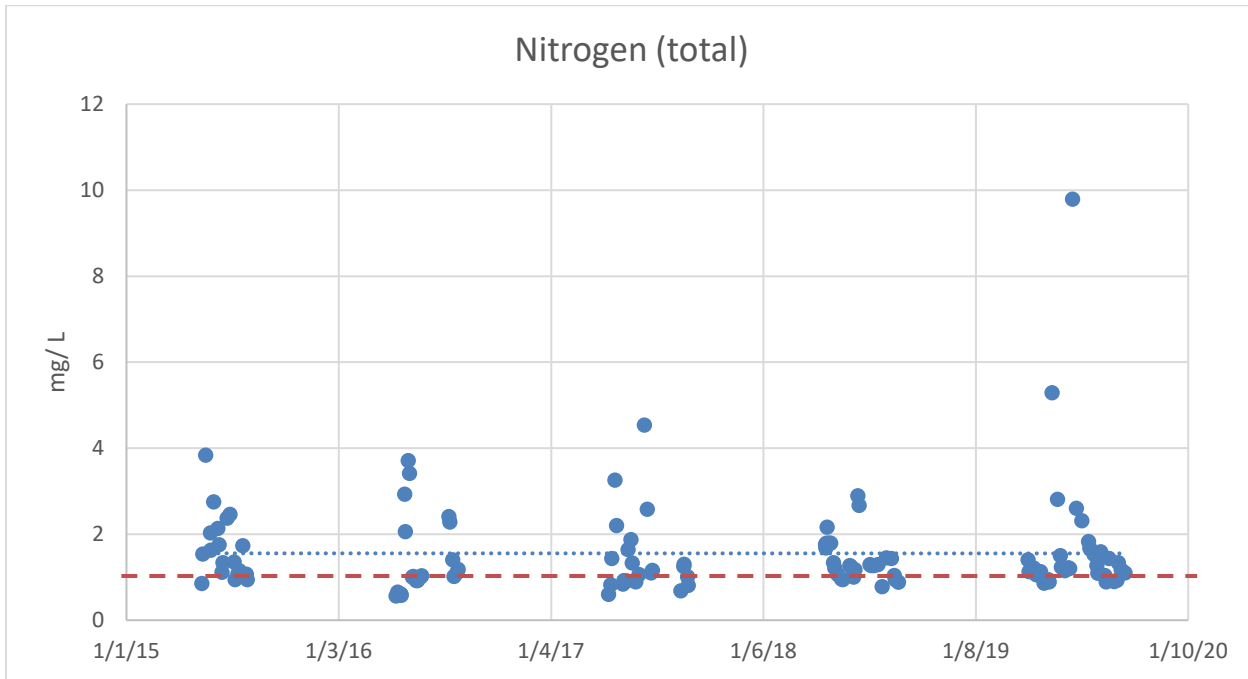


Figure 18. Trends in Total Nitrogen at Station 385232

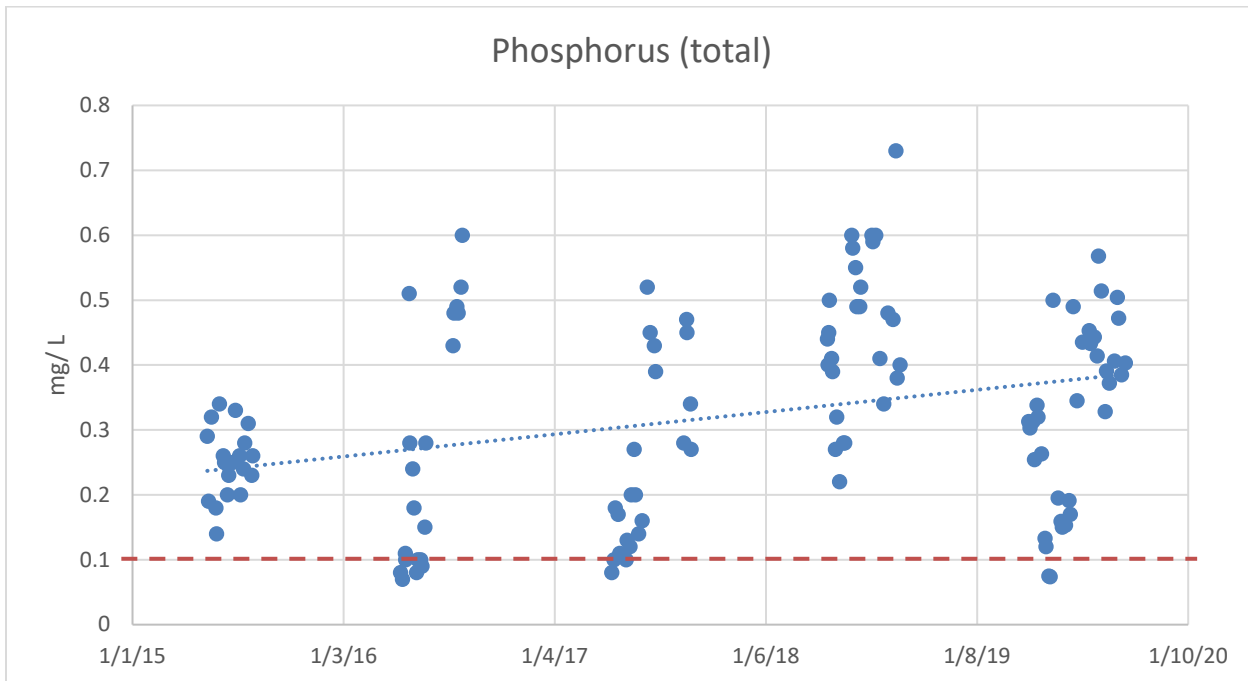


Figure 19. Trends in Total Phosphorus at Station 385232

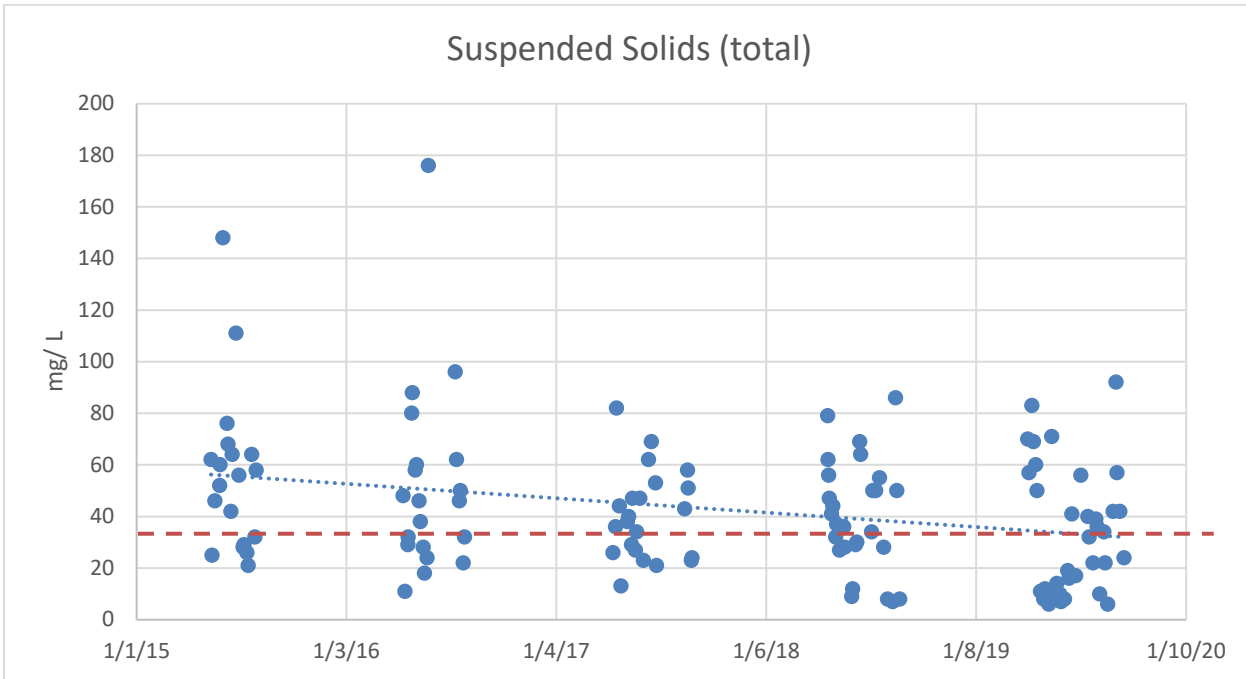


Figure 20. Trends in Total Suspended Solids at Station 385232

**2.5 Station 380030 (Down Stream)
Monitoring Results for Antelope Creek near Abercrombie**

E. coli bacteria

Station 380030 is located on the south side of Abercrombie, N.D. (Figure 4). In total, 161 E. coli bacteria samples were collected and analyzed from 2011 through 2018.

Of the five months for Phase III, two of them resulted in a Fully Supported. (Table 7)

	May	June	July	August	September
Phase III	FS	FSbT	FS	NS	NS

The trend line analysis (Figure 21) shows a slight decrease in E. coli bacteria concentrations.

Outliers removed from the trend analysis include:

- Sample data, 9/9/2019, recording 3900 CFC/100 mL

**Total Nitrogen, Total Phosphorus, Total Suspended Solids
(Figure 22-24)**

	Total Nitrogen	Total Phosphorus	Total Suspended Solids
Trend Line	↓ Decreasing Amount	↑ Increasing Amount	↓ Decreasing Amount

Exhibit B

The majority of Nitrogen and Phosphorus samples had concentrations well above NDDEQ'S guidelines. All Suspended Solid samples (except one) were below guidelines.

Outliers removed from the trend analysis include:

- Total Nitrogen; Sampling date 6/24/2019, recording 10.9 mg/L

Table 7. Monitoring Station 380030 -- E. Coli Bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status

Monitoring Site 380030										
E.Coli Samples taken during the Recreation Period (May - September)										
	MAY		JUNE		JULY		AUGUST		SEPTEMBER	
	5/11/15	360	6/1/15	100	7/6/15	50	8/16/17	110	9/4/2019	700
	5/13/15	80	6/8/15	90	7/8/15	200	8/21/17	210	9/9/2019	3900
	5/18/15	160	6/10/15	180	7/13/15	30	8/22/17	5	9/11/2019	200
	5/26/15	30	6/15/15	100	7/15/15	220	8/28/17	330	9/16/2019	140
	5/27/15	30	6/17/15	800	7/21/15	100	8/29/17	170	9/23/2019	24
	5/2/16	70	6/24/15	390	7/27/15	5	8/6/18	41		
	5/4/16	10	6/29/15	280	7/29/15	10	8/15/18	85		
	5/4/16	100	6/5/17	110	7/11/16	700	8/20/18	700		
	5/9/16	400	6/14/17	600	7/13/16	200	8/22/18	84		
	5/11/16	160	6/19/17	150	7/18/16	140	8/27/18	110		
	5/16/16	80	6/26/17	110	7/20/16	140	8/5/2019	97		
	5/18/16	20	6/28/17	390	7/25/16	50	8/7/2019	41		
	5/23/16	30	6/4/18	74	7/27/16	580	8/12/2019	130		
	5/25/16	1600	6/6/18	400	7/9/18	96	8/19/2019	410		
	5/8/17	70	6/11/18	140	7/11/18	160	8/21/2019	210		
	5/10/17	70	6/13/18	41	7/16/18	52	8/26/2019	1300		
	5/15/17	20	6/18/18	120	7/23/18	110				
	5/17/17	1000	6/20/18	200	7/30/18	30				
	5/22/17	40	6/3/2019	5	7/1/2019	52				
	5/24/17	80	6/5/2019	5	7/10/2019	530				
	5/30/17	110	6/11/2019	20	7/22/2019	20				
	5/2/18	10	6/17/2019	20	7/24/2019	10				
	5/9/18	110	6/19/2019	5	7/31/2019	20				
	5/21/18	220	6/24/2019	410						
	5/23/18	52								
	5/6/2019	5								
	5/8/2019	20								
	5/13/2019	10								
	5/15/2019	5								
	5/20/2019	190								
	5/29/2019	10								
For Project Years 2015-2019 (Phase III)										
N		31		24		23		16		5
GeoMean		58.4		97.2		73.2		132.0		283.6
% > 409		6.5		12.5		13.0		18.8		40.0
Recreation Use Assemesment		FS		FSbT		FS		NS		NS

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

Legend for the following Figures

- Trend Line
- E. coli bacteria geo-mean
Maximum is set at 126 CFU / 100mL - - - - -
- NDDEQ guidelines for Maximum amounts:
 - TN is set at 1.0 mg/L
 - TP is set at 0.10 mg/L
 - TSS is set at 35 mg/L- - - - -

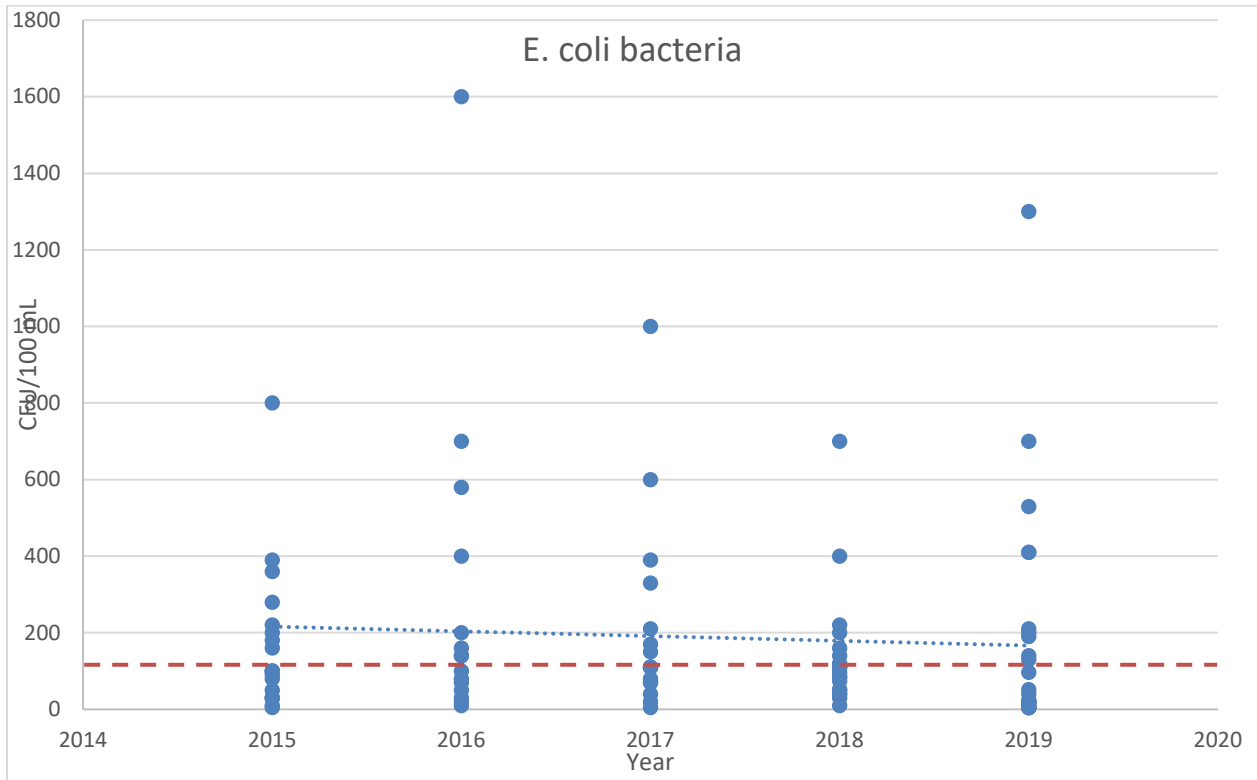


Figure 21. Trends in E. Coli Bacteria at Station 380030

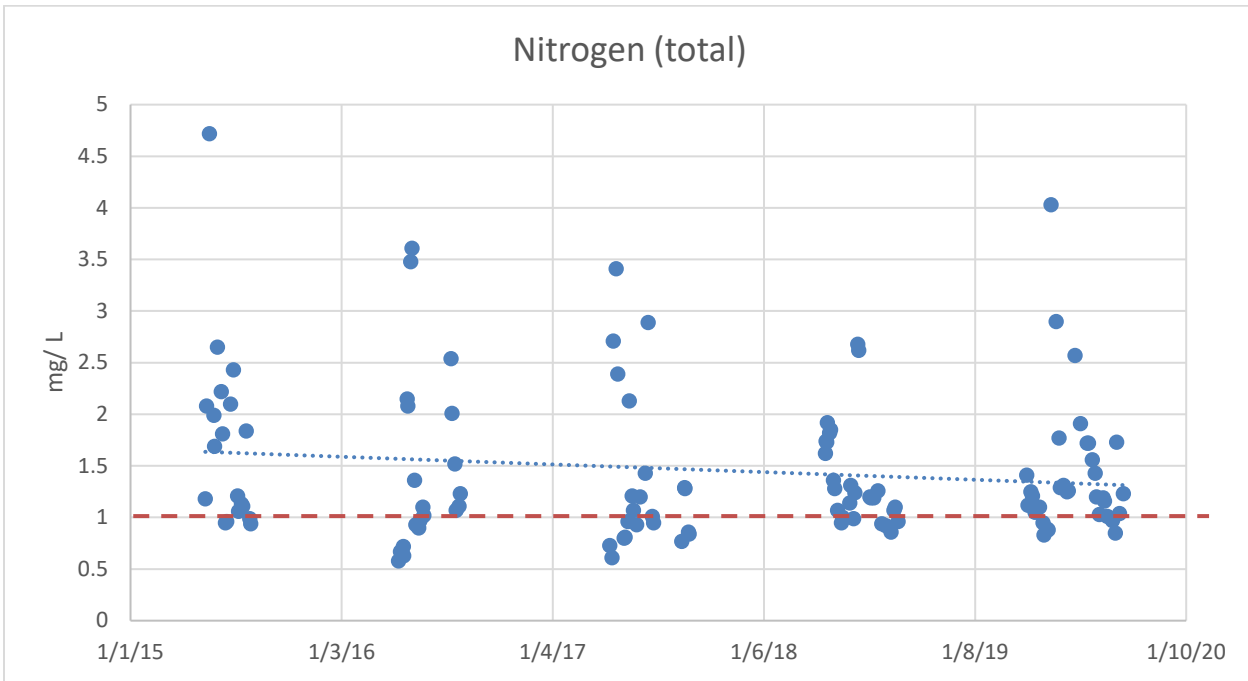


Figure 22. Trends in Total Nitrogen at Station 380030

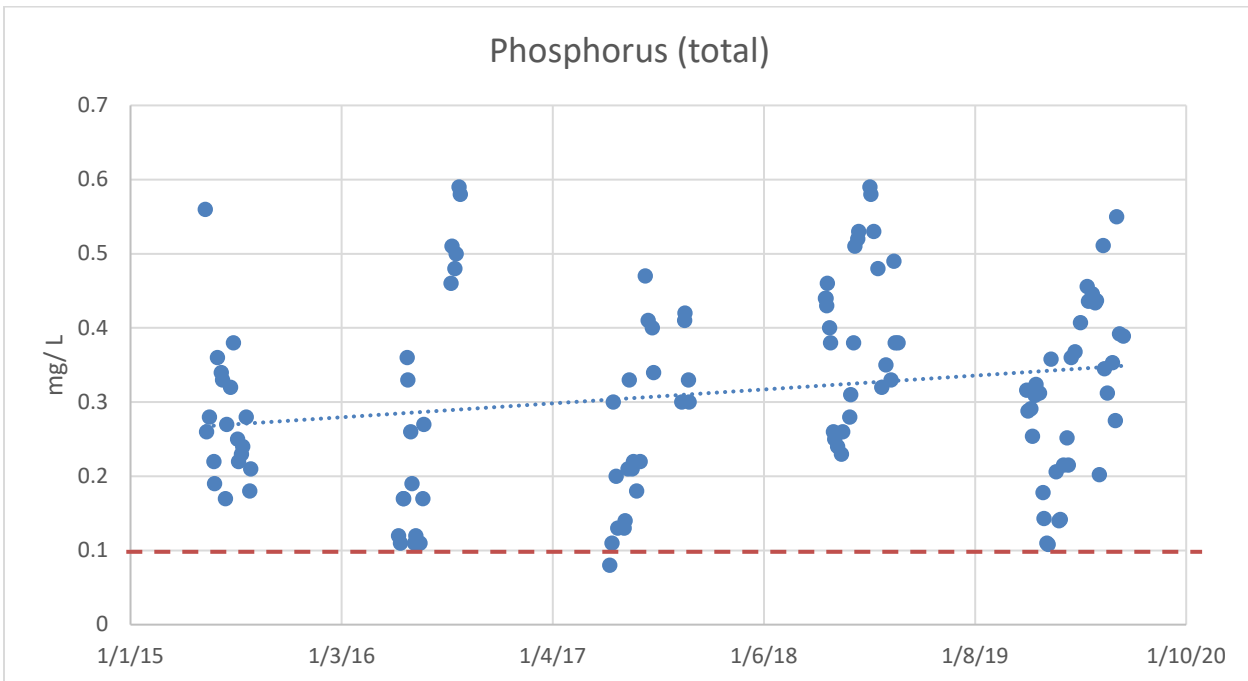


Figure 23. Trends in Total Phosphorus at Station 380030

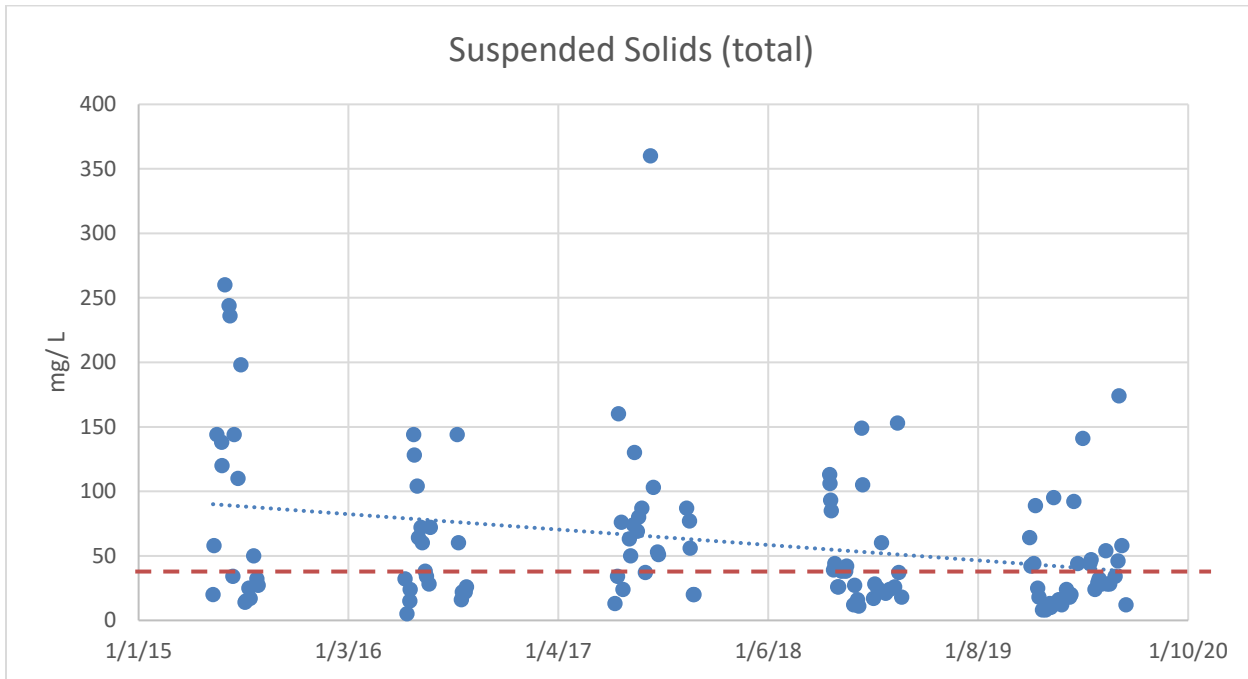


Figure 24. Trends in Total Suspended Solids at Station 380030

3.0 Antelope Creek Macroinvertebrate Data

Although, not listed as a Task in the Phase III Project Implementation Plan (PIP), macroinvertebrate sampling was conducted as detailed in the QAPP and in support of the secondary primary goal of the project: to protect and enhance the aquatic life status of the watershed.

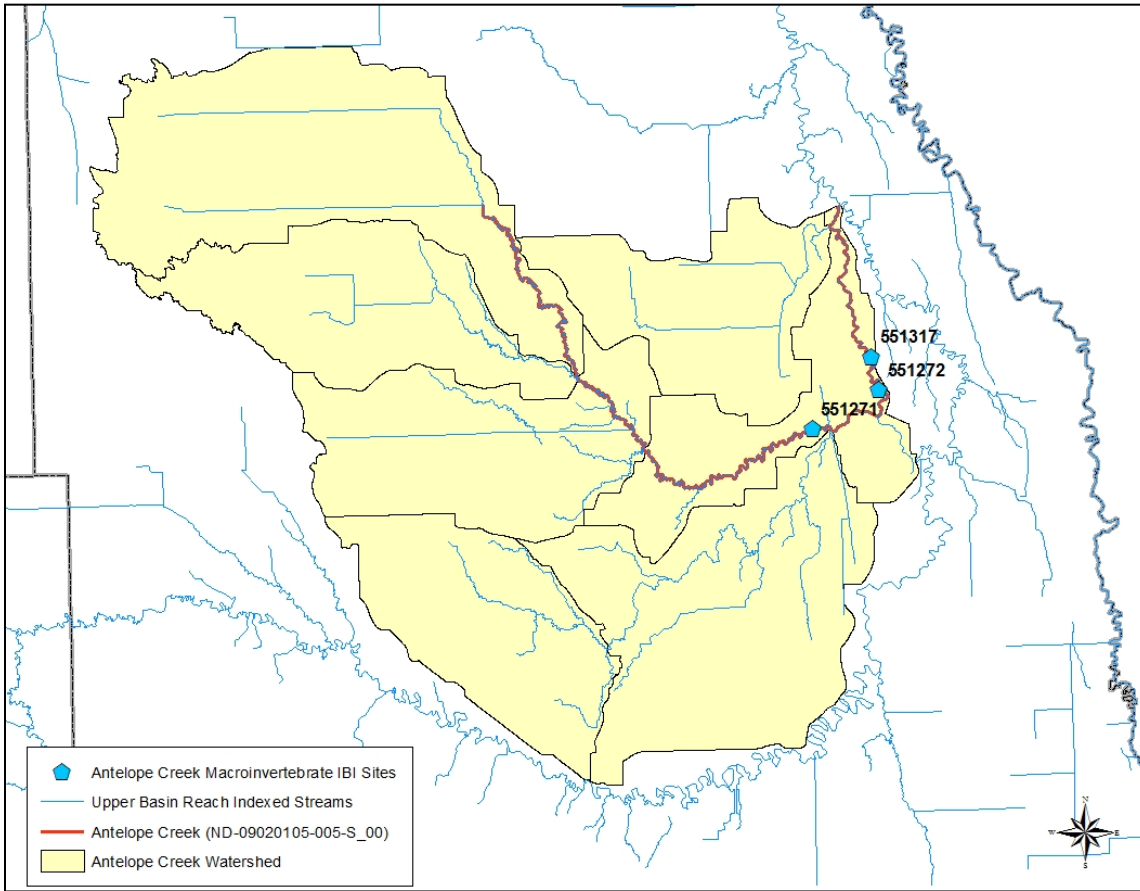


Figure 25. Map of Macroinvertebrate Monitoring Sites

On September 15, 2015, three macroinvertebrate location sites were sampled for biological/ecological health in the Antelope Creek watershed.

All macroinvertebrate data is located in an internal database at the NDDEQ. A request can be made with the NDDEQ to obtain this data.

Table 7.1 IBI Scores from Phase III in the Antelope Creek Watershed

Station	2015 – IBI scores	Change in scores
551271	43	Not Supporting
551272	53	Not Supporting
551317	53	Not Supporting

LEDGEND

Condition Classes for IBI Scores
 0-59 Not Supporting (NS)
 59-70 Fully Supporting but Threatened (FSbT)
 70-100 Fully Supporting (FS)

IBI scores for Phase III are all considered “not supporting”. Previous year IBI macroinvertebrate data is housed at the NDDEQ and can be obtained by a request to the department.

4.0 Attainment of Beneficial Uses and/or Parameter Targets

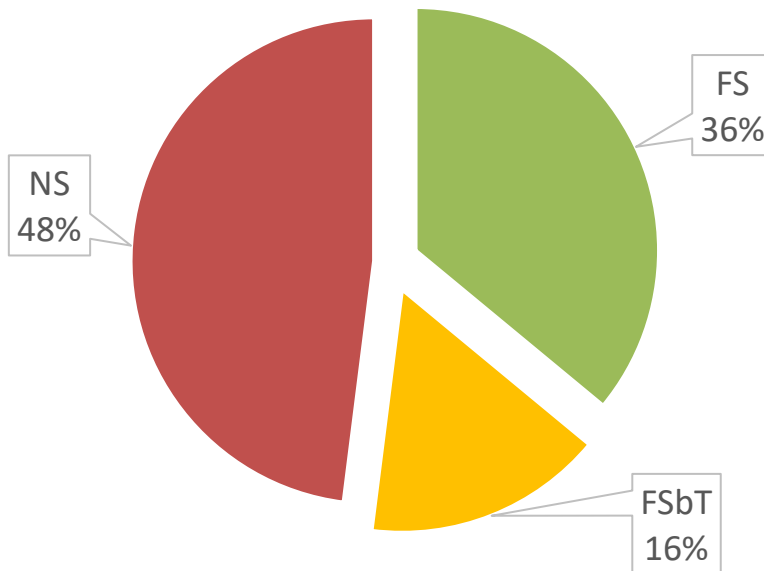
The goal of the Antelope Creek Watershed and Riparian Corridor of the Wild Rice River Phase III was to achieve reductions in E. coli bacteria concentrations within state water quality standards which equates to a “fully supporting” status for Recreational uses on Antelope Creek. To achieve this goal, E. coli bacteria concentration targets at all sites had to be at or below a 30-day geometric mean of 126 CFU/100 mL with less than ten percent of the samples exceeding 409 CFU/100 mL.

Table 8. Supporting Status from All Monitoring Stations for Phase III

Phase III	May	June	July	August	September
Up Stream 385238	FS	FS	NS	NS	NS
Mid-Up Stream 385237	FS	NS	FSbT	NS	NS
Middle Stream 385231	FS	NS	NS	FSbT	NS
Mid-Down Stream 385232	FS	FS	FSbT	FS	NS
Down Stream 380030	FS	FSbT	FS	NS	NS

The Antelope Creek Watershed and Riparian Corridor Phase III is seeing a moderate success at reaching its implementation goal of “Fully-Supporting” recreational uses. Out of the 25 recreational use statuses, (36%) achieved a Fully Supporting Status.

Table 9. Supporting Status from All Monitoring Stations/Months for Phase III



In addition to this success, all five of the five monitoring sites, show long-term reductions in E. coli bacteria.

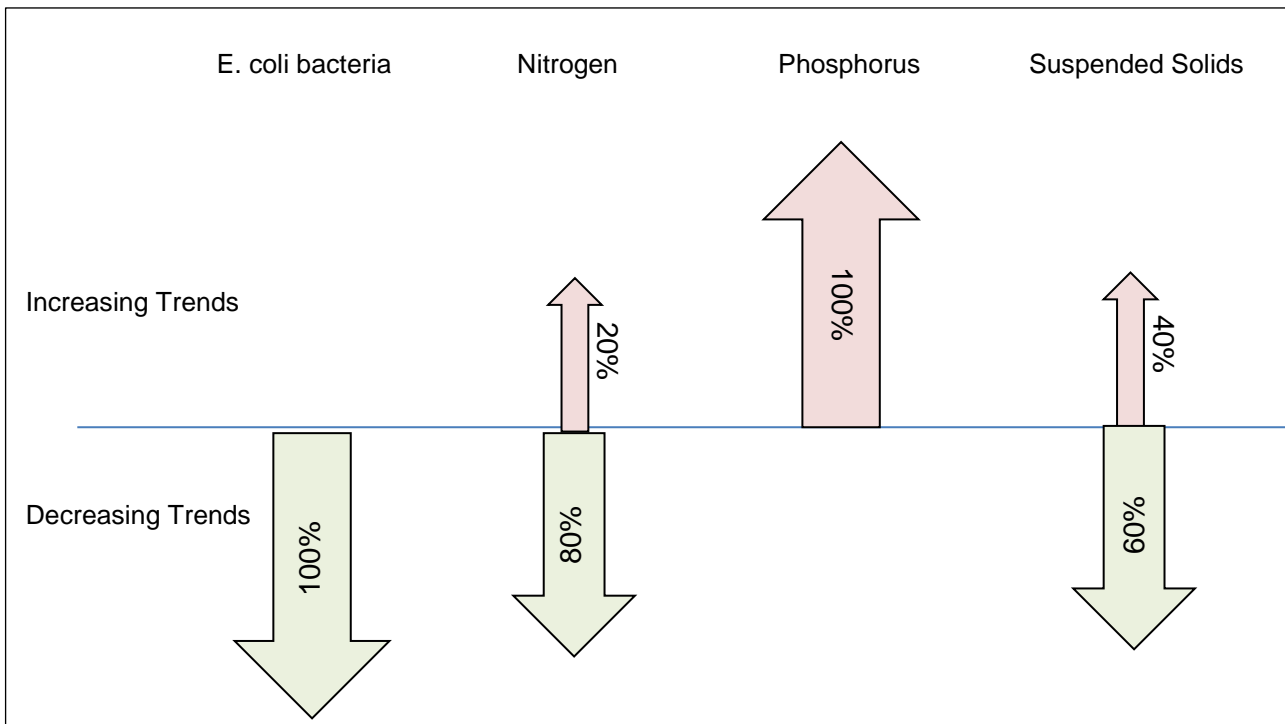
The BMPs applied in the watershed during the project period seem to have a positive effect on water quality in portions of Antelope Creek. Evaluation of effective BMPs in reducing E. coli bacteria should be revised and adjusted to account for any future changes within the watershed. The project is based on voluntary participation from stakeholders, promotion of targeted BMPs should continue to be encouraged allowing for sustained improvement of the Antelope Creek and Wild Rice River watersheds.

Nitrogen, Phosphorus and Sediment trends show a mix result. Nitrogen and Suspended Solids show mixed trends in long-term concentrations, while phosphorus is exclusively showing increasing concentrations.

Table 10. Trends from All Monitoring Stations for Phase III

Station	E. coli bacteria	Nitrogen (total)	Phosphorus (total)	Suspended Solids (total)
Up Stream 385238	↓ Decreasing Amount	↓ Decreasing Amount	↑ Increasing Amount	↑ Increasing Amount
Mid-Up Stream 385237	↓ Decreasing Amount	↓ Decreasing Amount	↑ Increasing Amount	↑ Increasing Amount
Middle Stream 385231	↓ Decreasing Amount	↑ Increasing Amount	↑ Increasing Amount	↓ Decreasing Amount
Mid-Down Stream 385232	↓ Decreasing Amount	↓ Decreasing Amount	↑ Increasing Amount	↓ Decreasing Amount
Down Stream 380030	↓ Decreasing Amount	↓ Decreasing Amount	↑ Increasing Amount	↓ Decreasing Amount

Table 11. Trend Percent from All Monitoring Stations for Phase III



4.1 Discussions and Conclusions

As the data for the Wild Rice River Restoration and Riparian Project demonstrates, it will take a significant amount of time and effort before the recreational use reaches 100% “Fully Supporting.” This is primarily due to the extremely high levels and frequency of existing E. coli bacteria concentrations at certain station/months. If at some time in the future, a single or multiple source(s) can be identified as the major contributors of E. coli bacteria and remedied, then the likelihood of achieving 100% “Fully Supporting” status for recreational uses would be greatly increased.

5.0 Literature Cited

NDDEQ. 2019. *Standards of Quality for Waters of the State*. Chapter 33.1-16-02.1 of the North Dakota Administration Code. North Dakota Department of Environmental Quality, Division of Water Quality. Bismarck, North Dakota.