# SECTION 319 NONPOINT SOURCE POLLUTION CONTROL PROGRAM ENGLISH COULEE PHASE II WATERSHED PROJECT FINAL REPORT

By

Justin Parks, Watershed Coordinator
Grand Forks County Soil Conservation District

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This project was conducted in cooperation with the State of North Dakota and the United States Environmental Protection Agency, Region 8.

Grant Number: C900863319

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## EXECUTIVE SUMMARY

**PROJECT TITLE** **English Coulee Implementation-Phase II**

**PROJECT START DATE** **9/1/2019** **PROJECT COMPLETION DATE** **8/31/2022**

| | | |
|---|---|---|
| **FUNDING:** | **TOTAL BUDGET** | **$289,617** |
| | **ORIGINAL EPA GRANT** | **$173,770** |
| | **EPA GRANT REDUCTION** | **($29,382)** |
| | **REVISED EPA GRANT** | **$144,388** |
| | **ACTUAL EXPENDITURES OF EPA FUNDS** | **$144,388** |
| | **TOTAL SECTION 319 MATCH USED** | **$96,259** |
| | **TOTAL EXPENDITURES** | **$240,646** |

## SUMMARY OF ACCOMPLISHMENTS

The English Coulee Phase II watershed project began September 1, 2019 and finished on August 31, 2022. This project was in the implementation phase, with the goal to improve water quality and provide education on water quality concerns. Phase II was an extension of Phase I of the English Coulee Watershed plan.

The watershed coordinator(s) along with the Grand Forks Soil Conservation District worked with landowners and operators on soil health education through field tours, workshops, and field demonstrations. The education portion of this project was considered just as important as the actual Best Management Practices (BMPs) that were implemented. It is estimated we reached at least 5,500 people through our educational events. With the use of social media, this number is most likely much higher.

During the initial phase of the project, through 319 funding, one producer was able to improve rangeland using a prescribed grazing management plan, which included 16,195 feet of fencing along with a watering facility. Additionally, we were able to help two producers by funding 2 portable windbreak systems to help improve nutrient management and rangeland health. The systems were used to help reduce nutrients entering the waterway and extend the grazing period while moving cattle away from confined feeding operations. The majority of 319 funding during both phase I and II was used to replace septic systems along the English Coulee.

During Phase II, 319 funds were used to install 4 septic systems and utilized $26,708 in 319 dollars. Local homeowner match was $17,806. Installation of these BMP's reduced the amount of nutrients and E. coli bacteria entering the English Coulee. Looking at the attached water quality report, the

data also supports an overall reduction in E.coli. According to the attached water quality report, Appendix A, Section 2.1, "The trend line analysis utilizing E. coli sample results acquired during the respective year in the five-year window (Figure 4) shows a decrease in E. coli bacteria concentrations". This was the most successful BMP during phase II of the project.

**Table 1. Phase I.** BMP Applied per 12-digit Hydrologic Unit.

| HUC Number | BMP | Units | 319 Costs | Match | Total |
|---|---|---|---|---|---|
| | | | | | |
| 090203010601 | Portable Windbreaks (066) | 1 | $5,140 | $3,427 | $8,567 |
| | | | | | |
| 090203010602 | Water Facilities-Stock Pond | 1 | $1,500 | $1,000 | $2,500 |
| | | | | | |
| 090203010602 | Fencing | 16,195 ln. ft | $13,080 | $8,720 | $21,800 |
| | | | | | |
| 090203010603 | Septic System Renovation | 1 | $5,400 | $3,600 | $9,000 |
| | | | | | |
| 090203010603 | Portable Windbreaks (066) | 1 | $5,460 | $3,640 | $9,100 |
| | | | | | |
| 090203010604 | Septic System Renovation | 3 | $24,060 | $16,040 | $40,100 |
| | | | | | |
| **TOTAL** | | | **$54,640** | **$36,427** | **$91,067** |

**Table 2. Phase II**. BMP Applied per 12-digit Hydrologic Unit.

| HUC Number | BMP | Units | 319 Costs | Match | Total |
|---|---|---|---|---|---|
| 090203010603 | Septic System Renovation | 1 | $7,800 | $5,200 | $13,000 |
| 090203010604 | Septic System Renovation | 1 | $9,630 | $6,420 | $16,050 |
| 090203010603 | Septic System Renovation | 1 | $8,250 | $5,500 | $13,750 |
| 090203010602 | Septic System Renovation | 1 | $1,028 | $686 | $1,714 |
| **TOTAL** | | | **$26,708** | **$17,806** | **$44,514** |

Water sampling was a part of this project. Weekly samples were collected throughout the entire phase of the project. During drought periods with no water flow, no samples were taken. Water samples were sent to the ND Health Department Laboratory for analysis. (See monitoring results in Section 2.0, Appendix A).

One of the highlights during Phase I (2016-2020), was the soil health workshops. These workshops were well attended and there was excellent local support. The workshops brought farmers together to talk about sustainable farming practices. The accomplishment during phase I were also addressed in a previous final report. During the entire phase of the project period, we hosted 2 soil health workshops that reached well over 200 people directly and several hundred more using our SCD's YouTube channel. During phase II, no soil health workshops were held due to Covid 19.

Another accomplishment was seeing a reducing trendline for E. coli bacteria between 2017 and 2020 at 4 out of the 5 sampling stations. A reduction in E. coli concentrations was one of the major goals of this project since the start of Phase I. (See monitoring results in section 2.0, Appendix A).

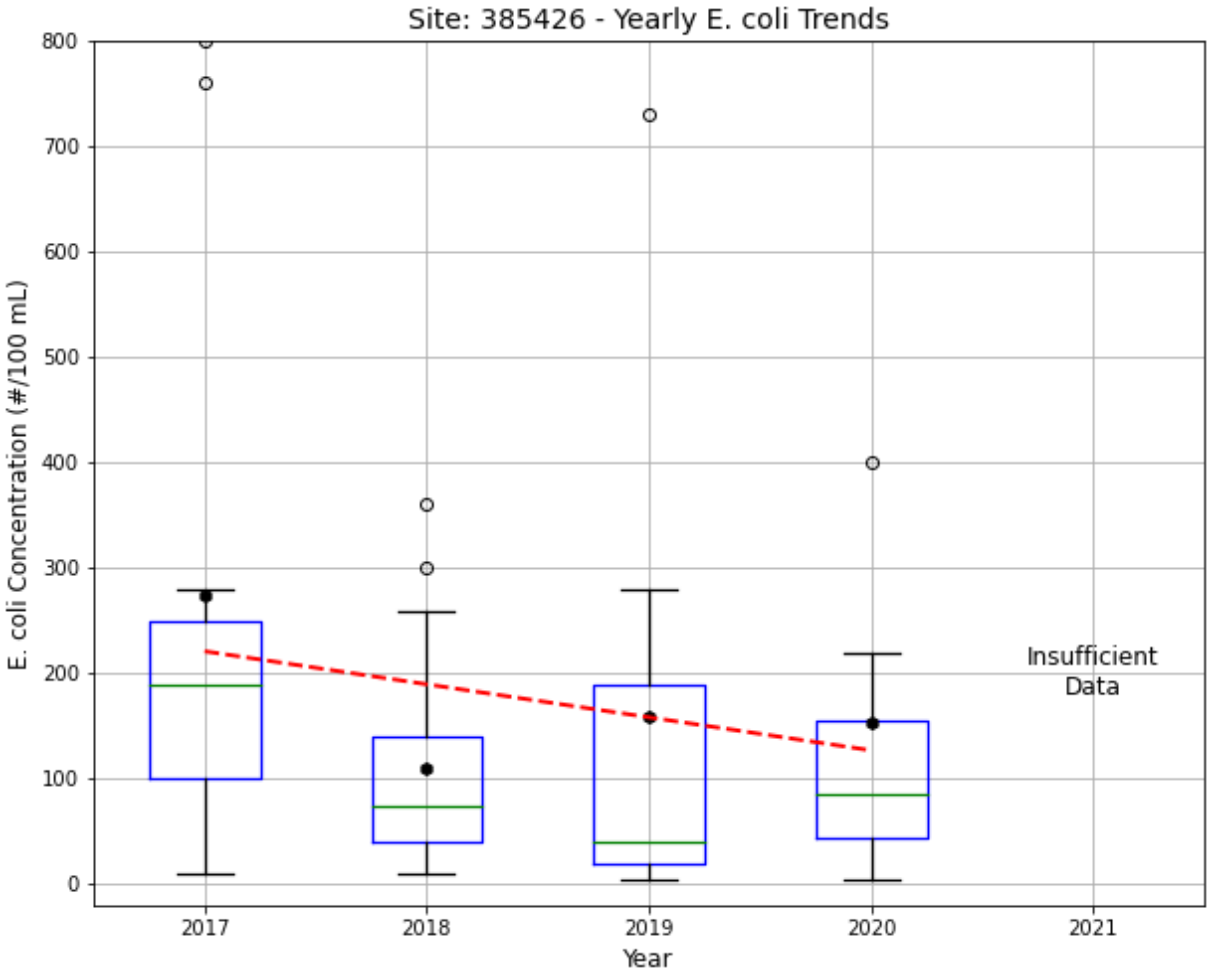


Figure 1. Trends in E. coli bacteria at station 385426.

Nitrogen, phosphorus, and sediment trendlines over the project period showed variable results. Nitrogen and phosphorus show mixed trends in long-term concentrations, while suspended solids are exclusively showing decreasing concentrations throughout the project period.

According to the NRCS, "Over the past 4 years, an increase has been observed in practices such as cover crops, reduced/no-till and variable rate fertilizing that will ultimately improve water quality and soil health across the area." This can be attributed to the efforts of numerous farming publications, crop consultants, social media postings and the constant promotions coming from the field office through field days and workshops.
During this timeframe (2019-2022), the Grand Forks NRCS office has contract agreements between 3 main programs (CSP/EQIP/RCPP) resulting in the following acres planned per practice within the English Coulee Watershed. However, most of their contracts fell outside the watershed area.

**329 No-till** – 3,863 acres
**340 Cover Crops** – 4,782 acres
**345 Mulch-till** – 919 acres
**590 Nutrient Mgt** – 1798 acres
**595 Pest Mgt** – 1393 acres

The positive impacts to water quality in the watershed that come from implementing these BMPs is vast. By holding our soils in place and creating a soil profile that allows natural vertical movement of water, we are quickly altering a system that historically has restricted water movement and left crop fields susceptible to excess moisture, compaction, and of course wind and water erosion. The adoption of precision technology that allows farmers to only apply nutrients where needed, has been a huge addition to the conservation toolkit when targeting water quality. (NRCS, 2022).

## 1.0 INTRODUCTION

The English Coulee watershed totals 85,813 acres. It is found in northeastern North Dakota in Grand Forks County (Figure 2). The primary focus of this project is the mainstem English Coulee and its watershed. Based on the 2016 Section 303(d) List of Impaired Waters Needing TMDLs (NDDEQ, 2016), the following waterbodies and their impairments are in the project area:

An 8.48-mile segment (ND-09020301-002-S_00) of English Coulee from its confluence with a tributary upstream from Grand Forks, ND downstream to its confluence with the Red River (lower reach) as not supporting fish and other aquatic biota due to dissolved oxygen, total dissolved solids, sedimentation/siltation, and selenium and not supporting recreation due to sedimentation/siltation and Escherichia coli.

A 12.1-mile segment (ND-09020301-005-S_00) of the English Coulee from its confluence with a major control structure, downstream to its confluence with a tributary that is upstream from Grand Forks, ND (Middle Reach) as not supporting fish and other aquatic biota due to selenium, dissolved oxygen, and total dissolved solids and not supporting recreation due to E. coli bacteria.

A 18.29-mile segment (ND-09020301-006-00) from its headwaters, downstream to a major control structure as not supporting fish and other aquatic biota due to total dissolved solids, dissolved oxygen, and selenium and not supporting recreation due to E. coli bacteria.

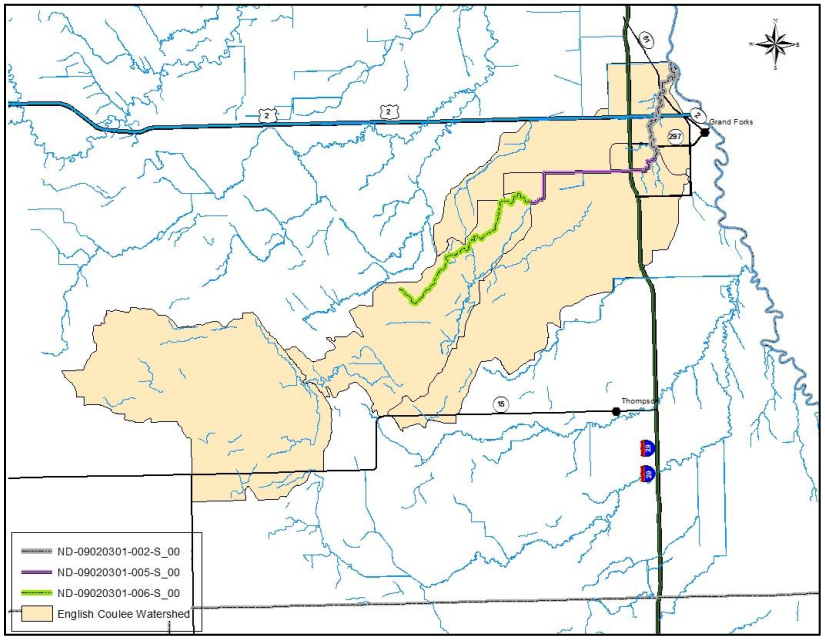
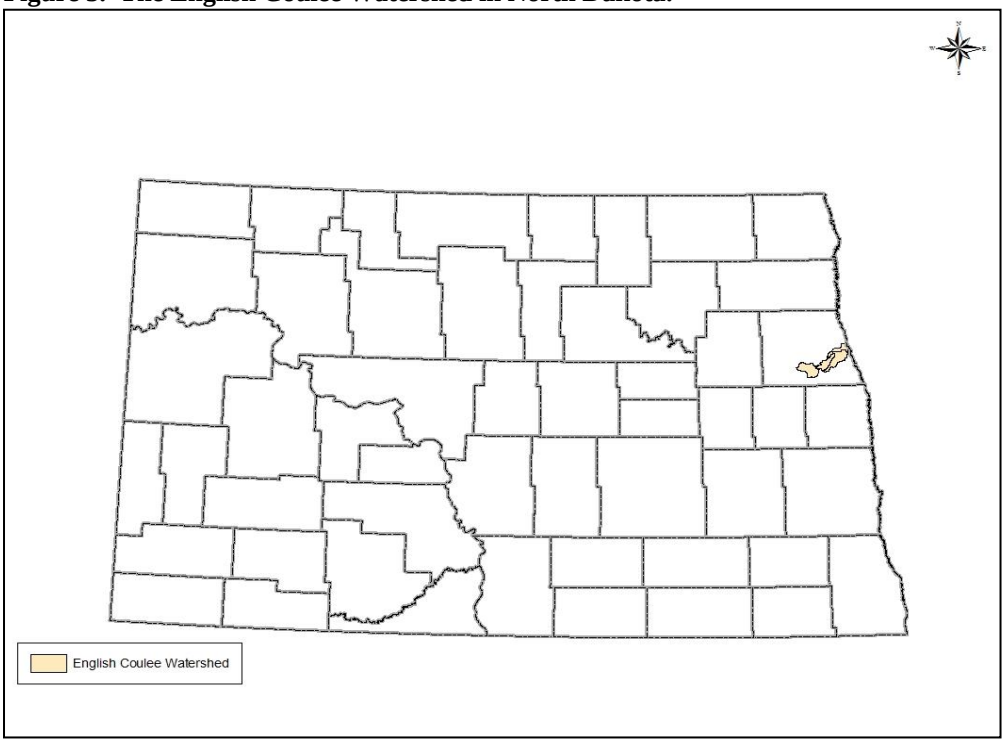



**Figure 2. English Coulee 303(d) Listed Impaired Reaches.**

**Figure 3. The English Coulee Watershed in North Dakota.**



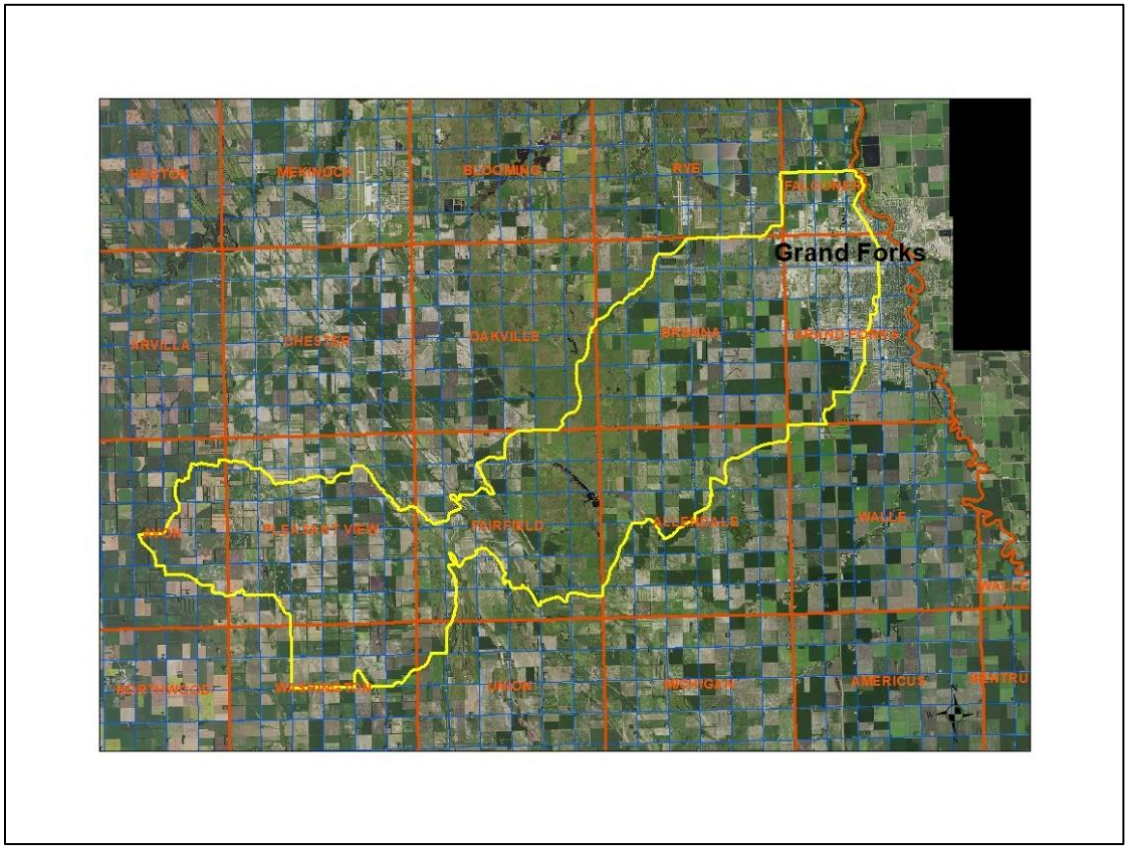



**Figure 4. The English Coulee Watershed near Grand Forks, ND.**

The English Coulee watershed lies within three Level IV ecoregions Glacial Lake Agassiz Basin (48a), Sand Deltas and Beach Ridges (48b) and Saline Areas (48c). Glacial Lake Agassiz Basin ecoregion (48a) is comprised of thick beds of glacial drift overlain by silt and clay lacustrine deposits from glacial Lake Agassiz. The topography of this ecoregion is extremely flat, with sparse lakes and pothole wetlands. Tallgrass prairie was the dominant habitat prior to European settlement and has now been replaced with intensive agriculture. Agricultural production in the southern region consists of corn, soybeans, wheat, and sugar beets.

The Sand Deltas and Beach Ridges ecoregion (48b) disrupts the flat topography of the Red River Valley. The beach ridges are parallel lines of sand and gravel that were formed by wave action of the contracting shoreline levels of Lake Agassiz. The deltas consist of lenses of fine to coarse sand and are blown into dunes.

Saline Area (48c) is characterized by salty artesian groundwater flowing to the surface through glacial till and lacustrine sediments from underlying beds of Cretaceous sandstone. Areas of heavily saline soils are primarily grazed, while moderate salinity soils are planted into sunflowers, sugar beets, and potatoes (USGS, 2006).

Grand Forks County has a subhumid climate characterized by warm summers with frequent hot days and occasional cool days. Average temperatures range from 14º F in winter to 65º F in summer. Precipitation occurs primarily during the warm period and is normally heavy in later spring and early summer. Total annual precipitation is about 18 inches.

The dominant land use in English Coulee watershed is row crop agriculture. According to the 2014 National Agricultural Statistical Service (NASS, 2014) land survey data, approximately 65 percent of the land is cropland, 15 percent is tame/reseeded grasses, 13 percent is bare/roads/developed, 3 percent water/wetlands and the other 4 percent comprised of trees/shrubs, native grassland, and alfalfa. Most of the crops grown consist of soybeans, spring wheat, other hay/non alfalfa, dry beans, and corn.

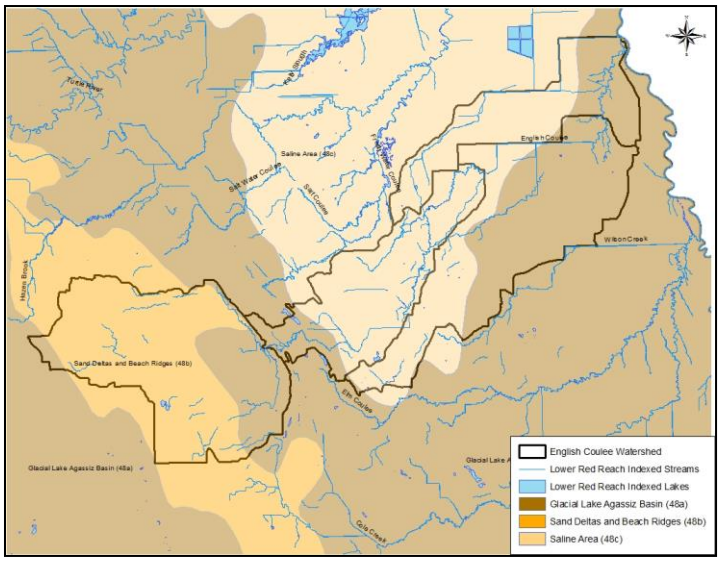



**Figure 5. Level IV Ecoregions in the English Coulee Watershed.**

The English Coulee (09020301) is a Class III stream. The water quality of a Class III stream shall be suitable for agricultural and industrial uses. Streams in this class generally have low average flows with prolonged periods of no flow. During periods of no flow, they are limited value for recreation and fish and aquatic biota. The quality of these waters must be maintained to protect secondary contact recreation uses (e.g., wading), fish and aquatic biota and wildlife uses (NDDEQ, 2014).

The current state numeric standard for Escherichia coli (E. coli) bacteria applies to all streams and water quality stream classifications. The E. coli bacteria standard applies only during the recreational season from May 1 to September 30. The long-term goal for any stream is to reach these standard values. To reach these goals, a combination of long-term water quality monitoring, public awareness, and best management practice are needed.

**Table 2. North Dakota Bacteria Water Quality Standards for 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.

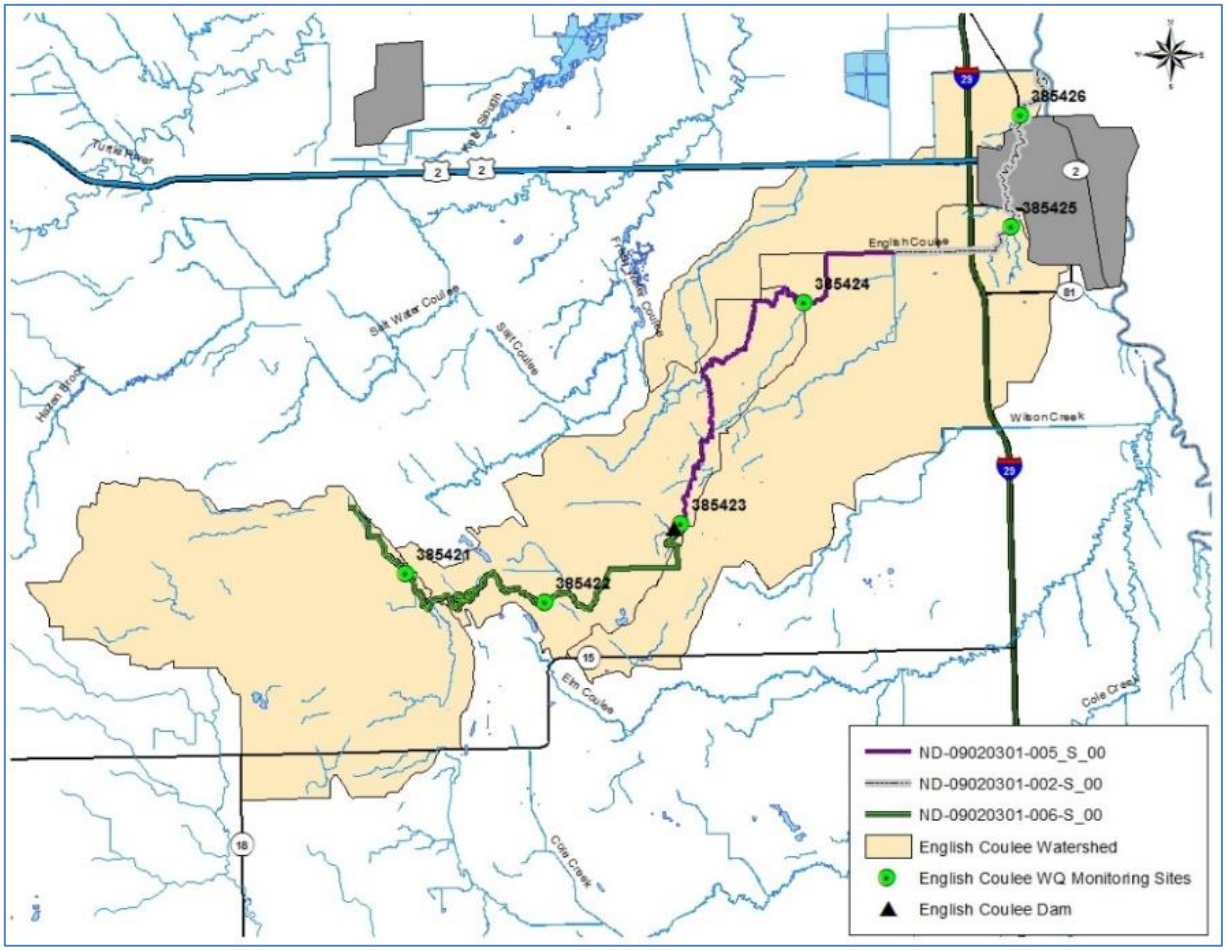



**Figure 6. Water Quality Sampling Sites and Impaired Segments in the English Coulee Watershed.**

## 2.0 PROJECT GOALS, OBJECTIVES, AND ACTIVITIES

Restoring the recreational use and aquatic life of the English Coulee to fully supporting status will always be the overall goal, however, this is hard to accomplish with a short-term project. Fully supporting status is the long-term goal for the English Coulee watershed. With that said, the main goal for this project, and short-term goal for the English Coulee watershed, is to achieve an improving trend for recreational use and aquatic life through implementation of BMPs. Secondly, educate the public on the relationship between healthy soils and water quality through demonstrations of BMPs and outreach events.

Objective 1:

*Manage the implementation of Best Management Practices (BMP's) in the project area and coordinate outreach events in the county.*

This task was accomplished by hiring a Watershed Coordinator who worked directly with landowners in the watershed and helped with conservation planning. The watershed

coordinator was responsible for the overall coordination of the project as well as collecting weekly water samples. The coordinator also was tasked to take the lead on outreach events within the county.

Objective 2:

*Establish an improving trend for E. coli bacteria concentrations at all sampling sites throughout the recreational season.*

Best Management Practices are in place to help reduce E. coli bacteria concentration levels. During phase II, four septic systems have been replaced to reduce E. coli levels within the English Coulee.

Water samples are taken to assess water quality trends. Since the project has started, we have seen spikes in E. coli concentration during spring thaw and after significant rain events. Water sampling results from 2017-2020 showed a downward trend in E.coli concentration at 4 of the 5 sampling stations. The only station with an upward trend was at Station 385423.

It is hard to pinpoint exactly why this is occurring. Replacing septic replacements near the English Coulee can only help reduce the levels of E.coli. These monitoring results can be found in the attached water quality report, Section 2.0 of Appendix A.

Objective 3:

*Provide outreach events to educate producers, landowners, and the public of Grand Forks County on water quality concerns and sustainable land management alternatives for addressing water quality issues and soil resource concerns.*

During Phase I, The Grand Forks SCD, watershed coordinator, and NRCS hosted several field tours, soil health workshops, café talks, and demonstrations sites to accomplish this objective. Public outreach at schools, the University of North Dakota, and other events helped accomplish outreach goals. During Phase II, Covid 19 didn't allow much in person outreach to occur. The main avenues of communication were newsletters, Facebook, and the Soil Conservation Districts website.

## 2.1 PROJECT TASK STATUS AND ACCOMPLISHMENTS

*Task 1: Employ a full-time Watershed Coordinator and provide administrative oversight and support to ensure the completion of project as planned.*

**Planned Product: Hire 1 full-time Watershed Coordinator**

***Status:*** Completed

*Task 2: Strengthen SCD supervisors understanding of watershed management by participating in the ND Soil and Water Conservation Leadership Academy.*

**Planned Product: Attend Level I and Level II courses.**

Soil conservation district supervisors were able to send 4 out of 5 supervisors to Level I training.

***Status:*** Completed for Level I but not completed for Level II.


*Task 3: Implement 500 acres of cover crop seeded on farmland to maintain diversity, cycle nutrients, provide soil protection, and provide extended forage for livestock. Incorporate livestock into at least one cover crop operation and use this as an outreach demonstration site.*

**Planned Product: 500 acres to include 20,000 feet of fencing, 1,000 feet of pipeline, and three watering tanks to have a complete systems approach. Implement 50 acres of access control/use exclusion (livestock only).**

No 319 funding was used on cover crops. Our SCD office has additional grant dollars, but it has been used on a very limited basis. NRCS office has contracted 4,782 acres within the watershed.

Cover crop applications and funding opportunities are well advertised but producers are slow to adapt the idea in the Red River Valley. The Soil Conservation District planted cover crops within the watershed, but no 319 funds were spent. Historically, The SCD awarded 50% cost share to plant cover crops on 375 acres in 2017. In 2018, the district helped plant cover crop on 55 acres of land enrolled in NRCS programs. In 2019, the district assisted financially with 518 acres of cover crops and directly seeded 70 of those acres. The district paid ~$6500 to plant cover crops at a 50% cost share.

**Status:** Incomplete

*Task 4: Implement grazing plans with use exclusions to move cattle away from waterway.*

Utilize Fencing, access control, pipelines, portable windbreaks, and fencing to have a complete systems approach. This will help with nutrient management and erosion along waterway.

One prescribed grazing plan was implemented in 2016. 319 funds were used to fence a pasture which totaled 16,195 linear feet. A pond was dug for a watering facility which was coupled with a prescribed grazing system. Since 2016, it has been difficult to find producers willing to work on prescribed grazing system.

In addition, The Natural Resources Conservation Service (NRCS) installed 18,250 feet of fence, installed a well with solar pump and a watering facility. Prescribed grazing plans

were adopted on 454 acres within the watershed.

**Status:** Completed but behind in Phase II

*Task 5: Replacement of 4 failed septic systems over the next 2.5 years.*

**Planned Product: 4 septic systems**

Septic system replacements have been ongoing during this project. 319 funding helped replace 4 systems during phase II of the project. These systems have helped reduce E. coli and nutrient loading within the coulee.

**Status:** Complete

*Task 6: Establish 100 acres of forage or biomass plantings and move livestock off riparian corridors.*

**Planned Product: 100 acres of established pastureland or hay land.**

We were unable to accomplish this task. Finding this type of planting alongside livestock/grazing management was difficult. Initial interest was there but it didn't develop within Phase II of the project.

**Status:** Incomplete

*Task 7: Host an annual field workshop that showcases BMP's that improve livestock grazing management and establish a long-term salinity and cover crop demonstration site.*

**Planned Product: Field workshops and demonstration site.**

Phase II showcased a cover crop planting that was used as a demonstration site and a field tour was held at a local farm with about 30 people in attendance. Presentations were made on no-till operations and transitioning to no-till. We toured a cover crop field and looked at the equipment that was used for no-till operations.

A long-term cover crop demonstration site was never established during phase II. Cover crops are used but the sites are usually rotated, and tillage is still ongoing. The district put out signs on a cover crop field which was used to showcase cover crop during a single growing season. A salinity site was established for 5 years. This project was set up using another funding source. The saline site was poor cropland converted to perennial vegetation. This site will be available for at least 3 more years.

**Status:** Incomplete

*Task 8: Publish four quarterly newsletters with updated information related to BMPs, maintain the SCD's Facebook page with educational events and news, and maintain the SCD's webpage.*

The watershed coordinator is responsible for writing the newsletters. The newsletter reached several thousand people, including landowners, and provides updates on the 319 program. Our website has a 319 section that was also updated. Facebook was used and a YouTube channel for the SCD was created to help promote our mission. The soil health workshop was recorded and posted to the districts YouTube channel. Our district website can be seen at www.gfscd.org/watershed-projects/.

Examples of some of the topics covered included tree promotions, septic system replacements, conservation partners and their programs, grant opportunities that promote soil health, field tours, and partnering outreach activities such as field tours and workshops.

**Status:** Complete

*Task 9: Coordinate a demonstration plot in partnership with local landowners and the University of North Dakota to showcase no-till practices and cover crop use.*

The district seeded a diverse mix of cover crops in 2019. NRCS and University of North Dakota took soil samples annually and recorded field data throughout the project period. This data will be available and used to compare no-till and cover crop use versus conventional tillage practices. The data is within the University Of North Dakota and hasn't been shared with our agency.

In 2022, the landowner continues to rotate crops and incorporate cover crops when possible. The landowner no long has this field as part of the long term demonstration/research plot.

**Status:** Complete

*Task 10: Participate in outreach activities such as annual township meetings and local workgroup meetings to give progress reports and available technical and financial assistance within the English Coulee watershed.*

**Planned Product: Coordinator will attend annual township meetings and local workgroup meetings.**

The coordinator attended the annual township meeting every year during the project period to provide updates on the English Coulee watershed project and talk about trends in water quality. Local workgroup meetings included café talks and speaking with the University of North Dakota on water quality concerns.

During Phase II, a farmer's day was held at AgVise Laboratories. About 40 people were in attendance. The topic was saving our soil, soil health, and farming during the wet cycle. Producers got to talk about soil sampling which included a tour of the Laboratory. This was one of the last events we hosted prior to Covid 19.

Other outreach activities in the past included soil health workshop, Eco-Ed camps, earth day events, speaking at water festivals, International Crop Expo, and presenting at local High

Schools. Covid 19 pretty much put an end to all outreach activities during phase II.

Outreach events pre-Covid 19 included (Phase I)
Soil Health Workshops: ~200 people (every other year)
Township Meetings: ~ 150 (This was continued during phase II)
Café Talks: ~ 150
Eco-Ed Camps: ~1,800 students
Earth Day events: ~ 75 students
Water Festivals: ~ 160 students
International Crop Expo: ~ 5,000 people
Local High School Presentation: ~ 110 students

**Status:** Complete for phase I, Incomplete for Phase II.

*Task 11: Host biannual winter soil health workshop.*

**Planned Product: Soil health workshop every other year.**

During phase II, no soil health workshop was held due to Covid 19.

**Status:** Incomplete

*Task 12: Conduct surveys to determine absentee landowner awareness and understanding of soil health and water quality issues in the watershed.*

After seeing and researching past survey results and responses, we did not pursue further surveys due to lack of participation in every other survey.

**Status:** Incomplete

## 2.2 EVALUATION OF GOAL ACHIEVEMENT AND RELATIONSHIP TO THE STATE NPS

The goals that were set at the beginning of this project were put in place to reduce NPS pollution within the watershed and provide education and outreach opportunities. The goals were set in cooperation with the State's NPS Management program with the intent to provide education on water quality as well implementing Best Management Practices that reduce NPS pollution. Phase 1 of the project contributed to the state's nutrient reduction strategy by implementing septic system replacements, working with grazing management plans, reducing wind and water erosion through cover crop demonstrations, and providing education to key stakeholders within Grand Forks County. Phase II of the project continued with septic system replacements but had limited outreach activity due to Covid 19.

The objectives of the project was to inform producers and the public as to who we are, what programs the 319 has available, and then implement programs to reduce NPS pollution. The project

used a variety of efforts such as social media, field tours, workshops, table talks, and field demonstrations to accomplish this goal. Although Covid 19 put a long delay on some of the planned activities, we consider this project a success overall because we were still able to reach out to producers and partners in different ways, continued to implements BMP's, and continued putting conservation practices on the ground through partnering agencies and other funding avenues.

### 2.3 SUPPLEMENTAL INFORMATION

Grand Forks County was extremely wet in 2019, extremely dry in 2021 and then extremely wet in 2022. The weather has been extreme and erratic. In 2019, The County was declared a disaster area and producers left an unprecedented number of crops in the ground. Heavy rains that came late in the harvest season made it impossible to get into the fields. Sugar beet harvest was the worst in decades; rain and snow kept farmers in much of the region out of the fields, and then a frost finished them off. Reports show about 1/3 of the sugar beet crop was left in the fields that year. 2022 was a very wet year and a lot of ground was preventative plant.

These extreme weather patterns have producers thinking about soil health resilience and how to farm in the dry/wet extreme conditions. We hope practices that favor soil health and water quality will be a major factor when making future land management decisions. We would like to see more to-till practices, more cover crops on the land, and much less soil erosion during both extreme weather patterns. Until more of these ideas are accepted and practices, getting more BMP's on the ground will always be a slow process.

## 3.0 BEST MANAGEMENT PRACTICES DEVELOPED AND/OR REVISED

| | 319 Program/SCD | NRCS (CSP/EQIP/RCPP) | |
|---|---|---|---|
| **Practices** | Applied (Phase I and II) | Applied/Planned (Phase I and II) | **Total** |
| **Septic System** | 8 | | 8 |
| **Cover Crops** | *948 acres (SCD) | 12,869 acres | 13,817 acres |
| **Livestock Fence** | 16,195 ft. | 18,250 ft. | 34,445 ft. |
| **Watering Facility** | 1 | 1 | 2 |
| **Well & Solar Pump** | | 1 | 1 |
| **Prescribed Grazing** | 160 acres | 454 acres | 614 acres |
| **Portable Windbreak Systems** | 2 | | 2 |
| **Residue Mgt (No-till)** | | 6,465 acres | 6,465 acres |
| **Nutrient Management** | | 14,285 acres | 14,285 acres |
| **Forage & Biomass Planting** | | 129 acres | 129 acres |

*No 319 dollars used

**Fig.7. Installation of a new septic system along the English Coulee.**

**Fig. 8. The Soil Conservation District planting cover crops after small grain harvest.**

## 4.0 MONITORING RESULTS

The final water quality report developed by the ND Department of Environmental Quality is attached in Appendix A.

## 5.0 COORDINATION EFFORTS

### 5.1 COORDINATION FROM OTHER STATE AGENCIES

The North Dakota Department of Environmental Quality (NDDEQ) provided technical assistance in database training and water sampling procedures, administration of the project, and technical guidance. The NDDEQ was responsible for overseeing 319 funding and ensuring proper management and expenditures of the funds.

The Grand Forks Soil Conservation District Board of Supervisors assisted with outreach activities, approved the spending of 319 funds, and provided feedback on all related BMPs and other outreach activities.

Outreach activities were supported by the North Dakota Department of Environmental Quality, ND State Game and Fish Department, NDSU-extension service, ND State Parks and Recreation Department, Red River Retention authority, ND State Forest Service, and the ND Natural Resources Trust.

### 5.2 OTHER STATE ENVIRONMENTAL PROGRAM COORDINATION

Not Applicable

## 5.3 FEDERAL COORDINATION

The program is supported by the Natural Resources Conservation Service (NRCS) through various programs. NRCS is an active player in their role within the watershed. They are active with implementing BMPs and sharing 319 program information with producers. The NRCS provides technical assistance with BMP installation and works closely with the watershed coordinator on outreach activities.

## 5.4 USDA PROGRAMS

Programs such as EQIP, CSP, and RCPP are available to landowners/producers. USDA Farm Service Agency (FSA) also provides cost-share assistance through the current Farm Bill.

EQIP/CSP/RCPP- Practices include cover crops, residue management/no-till operations, livestock fences/rotational grazing, and pesticide and nutrient management.

During phase II (2019-2022), the Grand Forks NRCS office has contracted several agreements between 3 main programs (CSP/EQIP/RCPP) resulting in the following acres planned per practice within the English Coulee Watershed.

**329 No-till** – 3,863 acres
**340 Cover Crops** – 4,782 acres
**345 Mulch-till** – 919 acres
**590 Nutrient Mgt** – 1798 acres
**595 Pest Mgt** – 1393 acres

## 5.5 ACCOMPLISHMENT OF AGENCY COORDINATION MEETINGS

The English Coulee Watershed program was managed by one coordinator during Phase II. The Grand Forks County Soil Conservation Board of Supervisors provided technical support and direction for the project. The board approved all projects and events as part of delivering the program. Monthly board meetings were held to discuss watershed projects, challenges, and progress.

Over the entire course of Phase I and II, field tours, workshops, and educational events were done in coordination with our partners from the NRCS, USFWS, University of North Dakota, ND Dept of Environmental Quality, Red River Retention Authority, and NDSU extension. Other agencies involved include Cass Co. SCD, Walsh Co. SCD, ND Forest Service, ND Game and Fish Dept, and the ND Parks and Recreation. North Dakota Farm Bill Biologist played a key role in our annual Eco-Ed camps.

## 5.6 RESOURCES/COORDINATION FROM FEDERAL LAND MANAGEMENT AGENCIES

Not Applicable

## 5.7 OTHER SOURCES OF FUNDS

Other funding sources were used to support outreach events. These events included the soil health workshops and the annual Eco-Ed camps at Turtle River State Park.

Natural Resources Trust - $2,500 (Soil Health Workshop - Phase I)

Red River Retention Authority - $3,320 (Soil Health Workshop – Phase I)

Grand Forks Convention & Visitors Bureau - $500 (Soil Health Workshop – Phase I)

ND Parks and Recreation – Provided financial assistance to support the Annual Eco-Ed camp held at Turtle River State Park by discounted lodge rental rates.

The Grand Forks County SCD works with the North Dakota Outdoor Heritage Fund which supports tree plantings within the watershed and throughout the county. These funds pay for 50-75% of qualifying tree plantings.

## 6.0 SUMMARY OF PUBLIC PARTICIPATION

The success of any project relies on the participation of those involved. The SCD works very hard to keep the public informed and involved throughout the year using a variety of communication forums. The SCD publishes a quarterly newsletter that includes available assistance, educational material, and upcoming events. It also manages a website where up to date documents can be found about the activities going on in the county as it relates to local resources. A Facebook page was created to get notices and information out to its followers. Staff from both the SCD and NRCS host and participate in locally led meetings involving agriculture and conservation groups. One of the successes for the district has been the annual soil health workshops. Unfortunately, due to Covid 19, the last workshop was held in 2019 and included ~100 participants.

Grand Forks County is also well known for our Eco-Ed camps. Over 400 7$^{th}$ graders participated each year during these multi-day camps. Students learned about natural resources and ways to improve and manage those resources. This program was put on hold during Phase II due to the pandemic.

The field office staff along with the board of supervisors, attended the annual International Crop Expo, which draws in thousands of people. Purchasing a booth space allows the staff and board to visit with producers and landowners about programs and educational topics that are going on throughout the county.

The watershed coordinator has been a guest lecturer on the campus of UND, which provides a whole new target audience to get discussion and feedback about resource concerns. In the past, youth education events attended included water festivals and library education days.

The public has supported the project through involvement at meetings and workshops. Producers donated their time during the initial planning phases of all projects and during the implementation phases. All BMPs installed using 319 dollars have shared a 40% cost with the landowner/producer.

Over the past 4 years, an increase has been observed in practices such as cover crops, reduced/no-till and variable rate fertilizing that will ultimately improve water quality and soil health across the area. This can be attributed, in part, to the efforts of numerous farming publications, crop

consultants, social media postings and the constant promotions coming from the field office through field days and workshops.

**Figure 9. Cover crops growing after small grain harvest.**

## 7.0 ASPECTS OF THE PROJECT THAT DID NOT WORK WELL

Overall, the English Coulee Watershed project should be considered a success. In a landscape dominated by intensive agriculture, the project, along with our partners, were able to get multiple practices on the ground that showed an improving trend for certain water quality parameters within the Coulee.

Covid-19 really hurt the program during Phase II. We are unable to carry out the outreach activities that we normally did. All workshops were cancelled during Phase II.

With all the various programs available to landowners/producers, we would have liked to see more BMPs get implemented within the watershed. The total number of BMPs were considered too low. Cover crop use is slowly catching on within the Red River Valley, but we wanted to support more cover crop projects. It is hard to believe most producers won't take advantage of the cost saving opportunities and the opportunity to work with their local SCD or NRCS field office to improve a resource concern.

The original watershed coordinator resigned in the early phases of this project. This left a learning curve for the new watershed coordinator along with some lost time. It took some time to really get the full understanding of this project, understand land practices of the region, and making those connections which lead to BMP installations.

## 8.0 FUTURE ACTIVITY RECOMMENDATIONS

If this watershed is picked up in the future, the continuation of this project should include more demonstration sites and sharing information on the types of conservation practices that were implemented and what is working well or not so well. The use of social media will play a large part in getting the message out when it comes to water quality and the link to soil health.

At this time, the interest in the watershed seems to have been exhausted, so we have decided to move into the adjacent Turtle River watershed and focus on water quality issues there.

# APPENDIX A: WATER QUALITY REPORT (ATTACHED)

# Water Quality Monitoring Results For the English Coulee Watershed Project Phase II

**Final:** January 2022

**Prepared for:**
Grand Forks County SCD
4775 Technology Circle Ste 1C
Grand Forks, ND 58203

**Prepared by:**
Emilee J. Lachenmeier
N.D. Dept. of Environmental Quality
Division of Water Quality
Normandy Building, 3rd Floor
4201 Normandy Street
Bismarck, ND 58503-1324

NORTH Dakota Be Legendary.™ | Environmental Quality

# Water Quality Monitoring Results for the English Coulee Watershed Project Phase II

Doug Burgum, Governor
David Glatt, Director of Environmental Quality


North Dakota Department of Environmental Quality
Division of Water Quality
Normandy Building, 3rd Floor
4201 Normandy Street
Bismarck, ND 58503-1324
701.328.5210

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# 1.0 Background and Overview

The Sandhill-Wilson River watershed is a 358,000-acre watershed – 8-digit HUC 09020301 – located in Grand Forks and Traill Counties in eastern North Dakota and parts of western Minnesota.

The English Coulee watershed – 10-digit HUC 0902030106 – is a sub-watershed located in the upper Northwest of the Sandhill-Wilson River watershed. The watershed is roughly 85,000 acres and located entirely within Grand Forks County. (Figure 1 and 2).

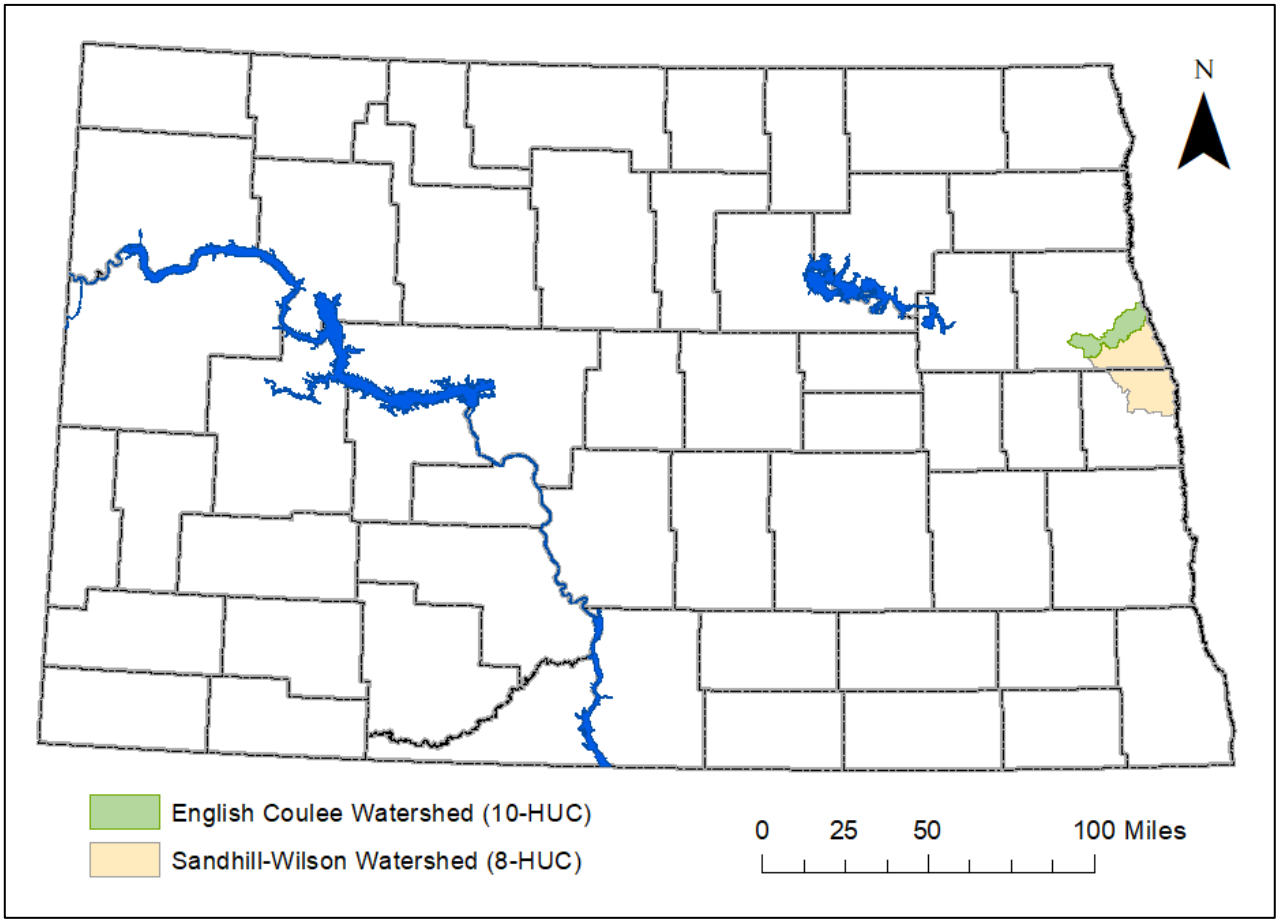


Figure 1. Location of the English Coulee and Sandhill-Wilson River Watershed

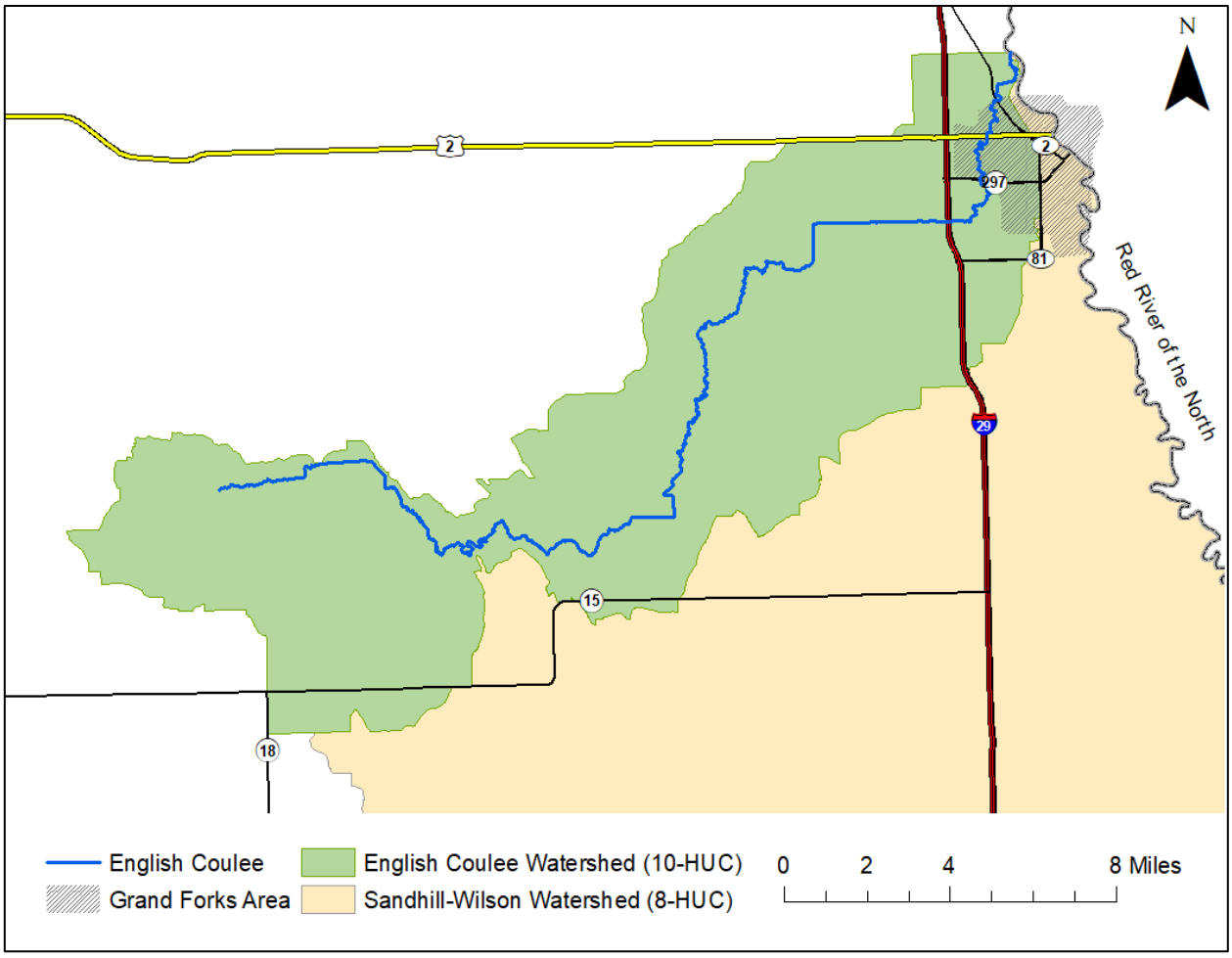


Figure 2. Location of the English Coulee Watershed

## *1.1 Monitoring Goals*

The primary monitoring goals of the project is to restore the recreational use and aquatic life of English Coulee to fully supporting status. The secondary goal is to educate the public on the relationship between healthy soils and water quality through informational resources and demonstrations of Best Management Practices (BMP).

The project's monitoring objectives that are directly related to Water Quality Monitoring Results are listed below. The Phase I Quality Assurance Project Plan (QAPP), Phase II Sampling and Analysis Plan (SAP) and the Project Implementation Plan (PIP) outline the project monitoring goals and objectives. Records requests to obtain the QAPP, SAP or PIP documents can be directed to the NDDEQ, Division of Water Quality.

**Objective 2:** Document water quality trends and applicable field conditions at five (5) NDDEQ monitoring sites on the English Coulee waterway (Figure 1).

> **Task 2:** Collect and transport water chemistry samples from five sites according to applicable SOPs. Water chemistry samples will be collected weekly for nutrients (total nitrogen, total Kjeldahl nitrogen, nitrate-nitrite, ammonia, total phosphorus) and total suspended solids (TSS). All water chemistry parameters will be sampled April 1 – October 31. Responsible entity/individual:

Watershed Coordinator

**Task 3:** Collect and transport E. coli samples from five sites according to appropriate SOPs. E. coli samples will be collected weekly during the recreational season (May 1 – September 30). A minimum of five samples per month must be collected during this time. Responsible entity/individual: Watershed Coordinator

**Status:** Complete. Five samples per week were not achieved in several of the months due to lower flow or completely dry conditions. Virtually no sampling was conducted during 2021 due to drought conditions dominating the watershed. Phase I concluded in the fall of 2019 and no addition samples will be taken for Phase I. Phase II began in May of 2020 and concluded fall of 2021.

**Objective 3:** Document the status of the macroinvertebrate community at ten sites on the English Coulee water way (Figure 2) to evaluate changes in the Index of Biotic Integrity (IBI) scores and aquatic life use conditions.

**Task 4:** Collect benthic macroinvertebrates samples from ten sites. Benthic macroinvertebrate sampling will follow the standard operating procedures outlined in the 7.17 Macroinvertebrate Sample Collection document. Samples will be collected from each site in phase II (2020) of the project. Responsible entity/individual: NDDEQ

**Task 5:** Ship samples to be analyzed utilizing standard operating procedure for sample preservation and packaging. The identification and enumeration of macroinvertebrates will be contracted to Dr. Andre DeLorme, Valley City State University. Responsible entity/individual: NDDEQ (shipping) and VCSU (analysis)

**Status:** NOT complete: Due to a shortage of qualified NDDEQ staff, sampling was not completed in the 2020. 2021 conditions were not conducive for sampling this parameter therefore, Macroinvertebrate sampling will not be included in this report.

**Objective 4:** Evaluate progress toward water quality and beneficial use improvement goals identified in the project implementation plan (PIP).

**Task 6:** Develop a final water quality report at the end of the project to describe trends in the parameters monitored and to evaluate the degree of success in restoring recreational uses at the monitoring sites. Responsible entity/individual: Designated Project Manager.

**Status:** Complete. Five samples per week were not achieved in several of the months due to lower flow or completely dry conditions. Available data was analyzed, and calculations were completed to assess recreational use status based on the numerical water quality standards outlined in section 1.2 of this report. The support statuses of the five sample sites are listed in Table 8 on page 22.

## *1.2 Numeric Water Quality Standards*

Table 1 provides a summary of the current numeric E. coli bacteria criteria which applies to all rivers and streams within the state of North Dakota. It should be noted that the E. coli bacteria standard applies only during the recreational season (May 1 through 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 *North Dakota Administrative Code* 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 |
| [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

For assessment purposes, the 30-day consecutive period shall follow the calendar month. Additionally, data may be pooled by month across multiple years in order to evaluate the above criteria.

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

## *1.3 Water Quality Monitoring Station Locations*

Five stream sites were selected for data collection (Figure 3, Table 2). Water quality grab samples were collected for E. coli bacteria, nutrients complete (i.e., total nitrogen, total Kjeldahl nitrogen, nitrate-nitrite, ammonia, total phosphorus) and total suspended solids. Sampling for E. coli bacteria occurred exclusively during the recreational use season (April 1 through October 31). Sampling for nutrients complete and total suspended solids occurred from April through November.

Table 2. Water Quality Monitoring Stations in the English Coulee Watershed

| Monitoring Site ID | Site Description |
|---|---|
| 385422<br>Up-Stream | 1 mile North, 8.5 miles West of Thompson |
| 385423 | 3 miles North, 5.5 miles West of Thompson |
| 385424<br>Middle-Stream | 2 miles Southwest of Grand Forks |
| 385425 | 11th Avenue South, Bridge, Grand Forks |
| 385426<br>Down-Steam | 27th Avenue North, Bridge, Grand Forks |

Water quality samples were collected by Grand Forks 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 samples are processed, the current NDDEQ's Water Quality Standards (Section 1.2) are used to determine if the sampled levels fall above or below statutory limits.

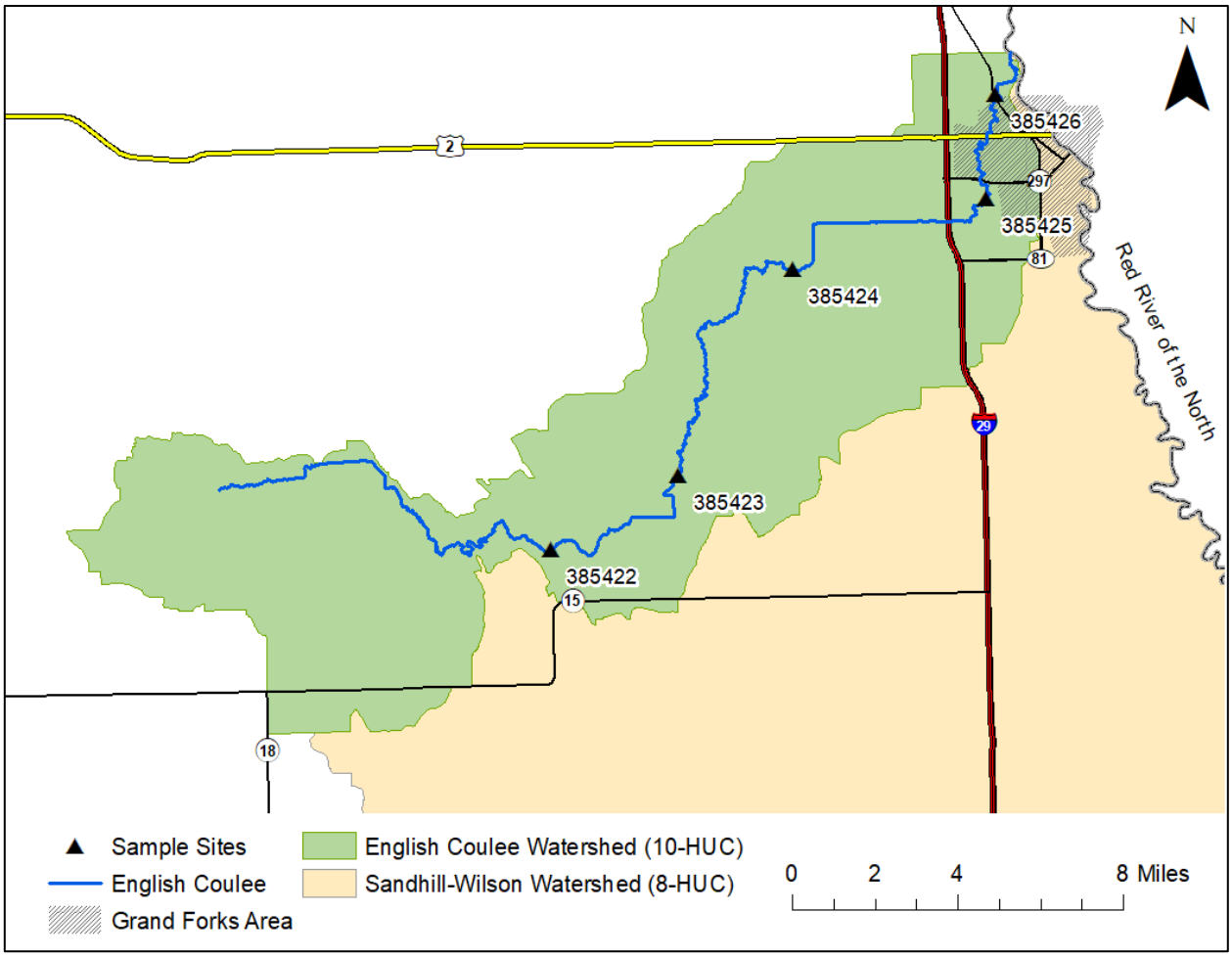


Figure 3. Water Quality Monitoring Station Locations in the English Coulee Watershed Phase I and Phase II

# 2.0 Water Quality Results by Monitoring Station

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

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 diving 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 1.2).

Analysis of E. coli bacteria for each monitoring site is first 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.
For assessment purposes, the 30-day consecutive period shall follow the calendar month. The table shows data from both Phase I and II of the project, 2017 - 2021.

The supplementary box plots depict the distribution of sample results for E. coli organized by sampling year. The blue box portion extends from the first (lower) to the third (upper) quantiles. The green horizontal line within the box is the median of the dataset. The whiskers show the range of the data (extension limited to one and a half times the range of the box) and the hollow circles are the outliers. A trend line is constructed utilizing the arithmetic mean yearly values (indicated by black dots) from 2017 – 2020. Due to drought conditions, minimal sampling requirements were not met in 2021 and therefore, the data was unplottable.

Note, the standard for analyzing E. coli is the geometric mean, therefore, these trend lines are not representative of a numerical value change in E. coli concentration but rather used to illustrate the simplified decreases and increases occurring over the timespan of the project. Graphical analysis utilizing the geometric mean is available through the department upon request.

## *2.1 Station 385422 (Up Stream)*

1 mile North, 8.5 miles West of Thompson – Township 150 N, Range 52 W, Section 21

### E. coli bacteria

In total, 46 E. coli bacteria samples were collected and analyzed from 2017 through 2021. Data was pooled for each month during the recreational season (May through September) to evaluate the recreational use support status at the end of the project. The data was also used to evaluate concentration trends during project period. The monthly pooled data (Table 3) shows a mixed result in the beneficial use support status. The trend line analysis utilizing E. coli sample results acquired during the respective year in the five-year window (Figure 4) shows a decrease in E. coli bacteria concentrations. During 2021, less than 5 samples were taken at this site, therefore, the data was insufficient and excluded from the analysis.

Table 3. Monitoring Station 385422 – E. coli Bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status

| Site 385422 – E. coli Concentrations by Month – 2017 to 2021 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| May | #/100 mL | June | #/100 mL | July | #/100 mL | August | #/100 mL | September | #/100 mL |
| 5/1/2018 | 5 | 6/20/2017 | 200 | 7/10/2017 | 220 | 8/13/2019 | 5 | 9/27/2017 | 50 |
| 5/8/2018 | 5 | 6/26/2017 | 30 | 7/17/2017 | 180 | 8/5/2020 | 150 | 9/24/2019 | 52 |
| 5/16/2018 | 20 | 6/28/2017 | 800 | 7/19/2017 | 110 | | | 9/2/2020 | 110 |
| 5/22/2018 | 20 | 6/5/2018 | 5 | 7/24/2017 | 130 | | | | |
| 5/1/2019 | 41 | 6/12/2018 | 63 | 7/26/2017 | 280 | | | | |
| 5/7/2019 | 5 | 6/20/2018 | 63 | 7/10/2018 | 340 | | | | |
| 5/15/2019 | 10 | 6/5/2019 | 20 | 7/1/2019 | 130 | | | | |
| 5/22/2019 | 20 | 6/11/2019 | 10 | 7/9/2019 | 300 | | | | |
| 5/29/2019 | 10 | 6/19/2019 | 52 | 7/16/2019 | 74 | | | | |
| 5/11/2020 | 10 | 6/26/2019 | 85 | 7/24/2019 | 85 | | | | |
| 5/18/2020 | 30 | 6/3/2020 | 30 | 7/30/2019 | 20 | | | | |
| 5/20/2020 | 10 | 6/9/2020 | 360 | 7/7/2020 | 98 | | | | |
| 5/27/2020 | 120 | | | 7/15/2020 | 52 | | | | |
| 5/25/2021 | 10 | | | 7/22/2020 | 110 | | | | |
| | | | | 7/29/2020 | 74 | | | | |

| Site 385422 Summary | | | | | |
|---|---|---|---|---|---|
| | May | June | July | August | September |
| Number of Samples | 14 | 12 | 15 | 2 | 3 |
| Geometric Mean CFU/100 mL | 14.29 | 55.79 | 117.31 | Insufficient Data for Calculation | Insufficient Data for Calculation |
| % > 409 mg/L | 0 % | 8.3 % | 0 % | 0 % | 0 % |
| Recreational Use Assessment | Fully Supporting | Fully Supporting | Fully Supporting | Undetermined | Undetermined |

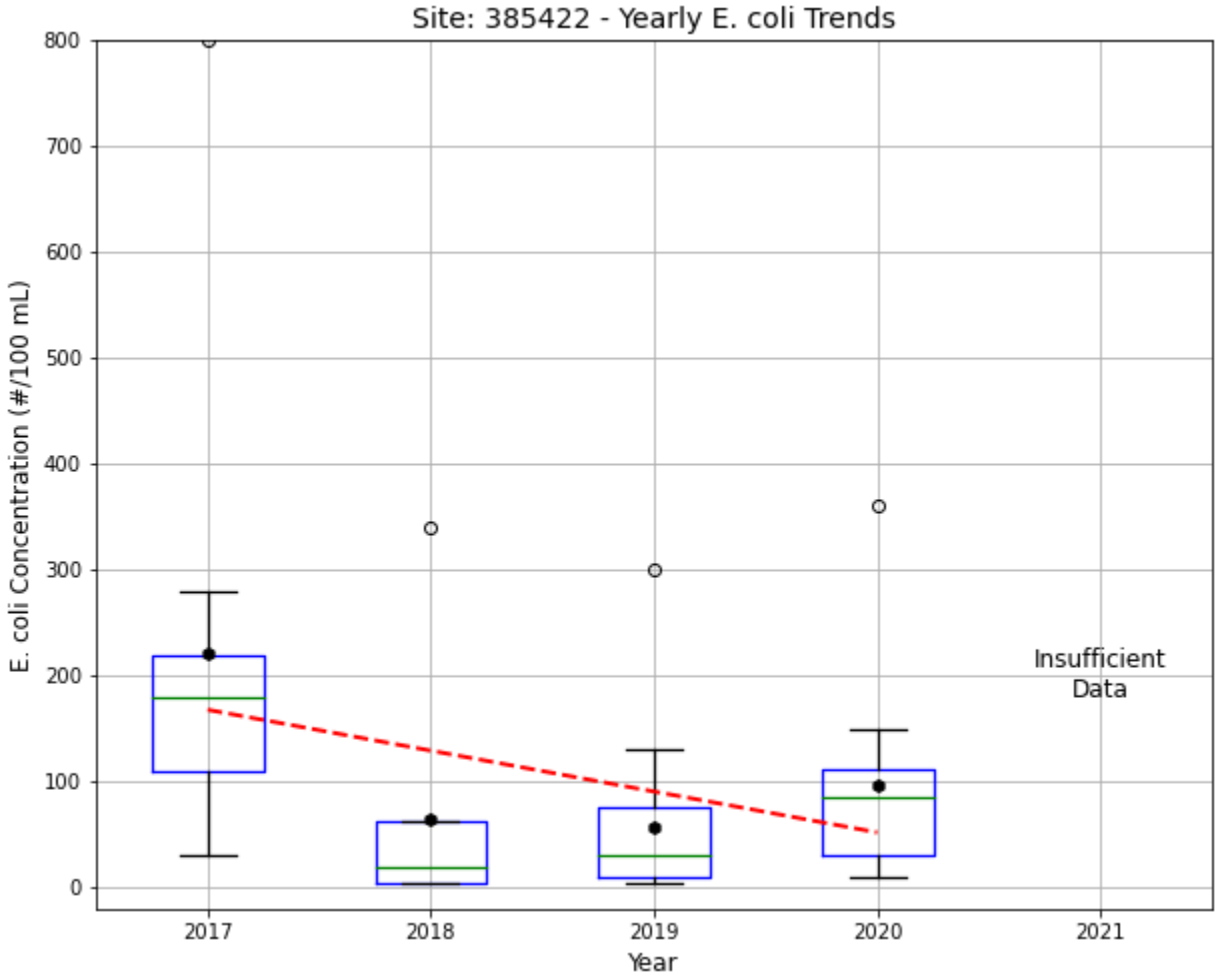


Figure 4. Trends in E. coli bacteria at station 385422.

## *2.2 Station 385423 (Mid-Up Stream)*

3 miles North, 5.5 miles West of Thompson – Township 150 N, Range 51 W, Section 18

### E. coli bacteria

In total, 45 E. coli bacteria samples were collected and analyzed from 2017 through 2021. Data was polled for each month during the recreational season (May through September) to evaluate the recreational use support status at the end of the project. The data was also used to evaluate concentration trends during project period. The monthly pooled data (Table 4) shows a mixed result in the beneficial use support status. The trend line analysis utilizing E. coli sample results acquired during the respective year in the five-year window (Figure 5) shows an increase in E.
coli bacteria concentrations. This trend is not reflected in the geometric mean calculations and instead a decreasing trend was observed. These opposing results are due to an extraneous outlier during the 2019 sample season which was unable to be deemed non-representative and therefore was included in this final analysis. This resulted in a high arithmetic mean for this year and adversely impacted the trend line analysis. During 2021, less than 5 samples were taken at this site, therefore, the data was insufficient and not plotted in the analysis.

Table 4. Monitoring Station 385423 – E. coli Bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status

| Site 385423 – E. coli Concentrations by Month – 2017 to 2021 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| May | #/100 mL | June | #/100 mL | July | #/100 mL | August | #/100 mL | September | #/100 mL |
| 5/1/2018 | 5 | 6/20/2017 | 130 | 7/10/2017 | 60 | 8/5/2020 | 74 | 9/24/2019 | 41 |
| 5/8/2018 | 31 | 6/26/2017 | 5 | 7/17/2017 | 130 | | | | |
| 5/16/2018 | 20 | 6/28/2017 | 800 | 7/19/2017 | 20 | | | | |
| 5/22/2018 | 41 | 6/5/2018 | 410 | 7/24/2017 | 10 | | | | |
| 5/1/2019 | 5 | 6/12/2018 | 52 | 7/26/2017 | 50 | | | | |
| 5/7/2019 | 5 | 6/20/2018 | 110 | 7/31/2017 | 450 | | | | |
| 5/15/2019 | 5 | 6/5/2019 | 10000 | 7/10/2018 | 470 | | | | |
| 5/22/2019 | 5 | 6/11/2019 | 51 | 7/16/2018 | 86 | | | | |
| 5/29/2019 | 31 | 6/19/2019 | 10 | 7/1/2019 | 280 | | | | |
| 5/11/2020 | 5 | 6/26/2019 | 120 | 7/9/2019 | 200 | | | | |
| 5/18/2020 | 10 | 6/3/2020 | 5 | 7/16/2019 | 20 | | | | |
| 5/20/2020 | 5 | 6/9/2020 | 310 | 7/24/2019 | 41 | | | | |
| 5/27/2020 | 5 | 6/23/2020 | 260 | 7/30/2019 | 500 | | | | |
| | | | | 7/7/2020 | 41 | | | | |
| | | | | 7/15/2020 | 62 | | | | |
| | | | | 7/22/2020 | 85 | | | | |
| | | | | 7/29/2020 | 97 | | | | |

| Site 385423 Summary | | | | | |
|---|---|---|---|---|---|
| | May | June | July | August | September |
| Number of Samples | 13 | 13 | 17 | 1 | 1 |
| Geometric Mean CFU/100 mL | 9.13 | 108.84 | 85.39 | Insufficient Data for Calculation | Insufficient Data for Calculation |
| % > 409 mg/L | 0.0 % | 23.1 % | 17.6 % | 0.0 % | 0.0 % |
| Recreational Use Assessment | Fully Supporting | Fully Supported but Threatened | Fully Supported but Threatened | Undetermined | Undetermined |

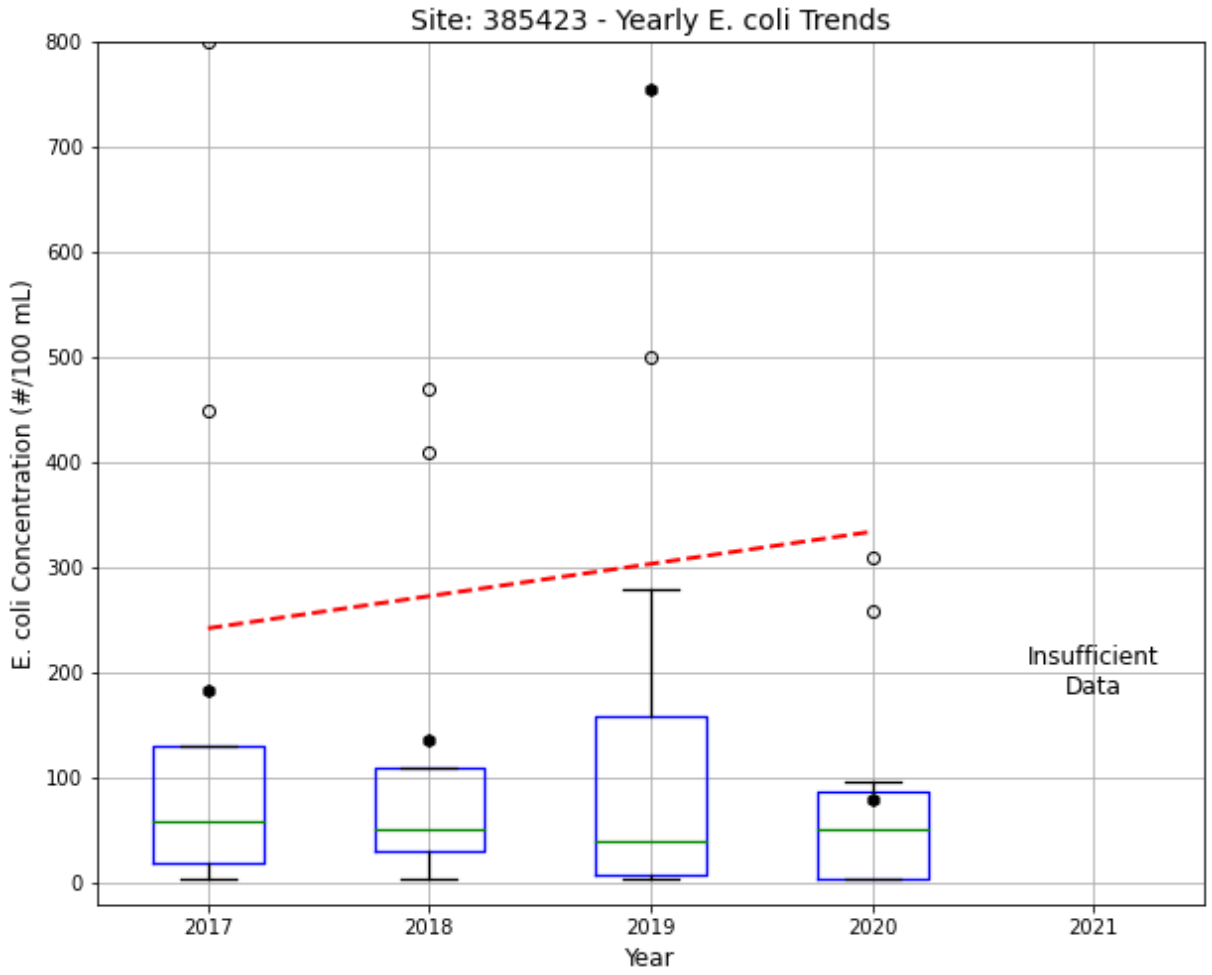


Figure 5. Trends in E. coli bacteria at station 385423.

## *2.3 Station 385424 (Middle Stream)*

2 miles Southwest of Grand Forks – Township 151 N, Range 51 W, Section 22

### E. coli bacteria

In total, 57 E. coli bacteria samples were collected and analyzed from 2017 through 2021. Data was polled for each month during the recreational season (May through September) to evaluate the recreational use support status at the end of the project. The data was also used to evaluate concentration trends during project period. The monthly pooled data (Table 5) shows a mixed result in the beneficial use support status. The trend line analysis utilizing E. coli sample results acquired during the respective year in the five-year window (Figure 6) shows a decrease in E. coli bacteria concentrations. During 2021, less than 5 samples were taken at this site, therefore, the data was insufficient and not plotted in the analysis.

Table 5. Monitoring Station 385424 – E. coli Bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status

| Site 385424 – E. coli Concentrations by Month – 2017 to 2021 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| May | #/100 mL | June | #/100 mL | July | #/100 mL | August | #/100 mL | September | #/100 mL |
| 5/1/2018 | 5 | 6/20/2017 | 30 | 7/10/2017 | 110 | 8/28/2018 | 1200 | 9/18/2017 | 800 |
| 5/8/2018 | 52 | 6/26/2017 | 5 | 7/17/2017 | 510 | 8/7/2019 | 74 | 9/27/2017 | 250 |
| 5/16/2018 | 430 | 6/28/2017 | 330 | 7/19/2017 | 550 | 8/13/2019 | 260 | 9/26/2018 | 41 |
| 5/22/2018 | 20 | 6/5/2018 | 20 | 7/24/2017 | 50 | 8/20/2019 | 260 | 9/4/2019 | 790 |
| 5/1/2019 | 5 | 6/12/2018 | 230 | 7/26/2017 | 40 | 8/27/2019 | 780 | 9/18/2019 | 570 |
| 5/7/2019 | 5 | 6/20/2018 | 41 | 7/31/2017 | 260 | 8/5/2020 | 30 | 9/24/2019 | 41 |
| 5/15/2019 | 10 | 6/5/2019 | 52 | 7/10/2018 | 310 | 8/18/2020 | 63 | | |
| 5/22/2019 | 20 | 6/11/2019 | 41 | 7/16/2018 | 170 | | | | |
| 5/29/2019 | 73 | 6/19/2019 | 210 | 7/24/2018 | 200 | | | | |
| 5/11/2020 | 20 | 6/26/2019 | 120 | 7/1/2019 | 10 | | | | |
| 5/18/2020 | 41 | 6/3/2020 | 120 | 7/9/2019 | 500 | | | | |
| 5/20/2020 | 31 | 6/9/2020 | 30 | 7/16/2019 | 130 | | | | |
| 5/27/2020 | 63 | 6/23/2020 | 5 | 7/24/2019 | 250 | | | | |
| | | | | 7/30/2019 | 160 | | | | |
| | | | | 7/7/2020 | 510 | | | | |
| | | | | 7/15/2020 | 540 | | | | |
| | | | | 7/22/2020 | 63 | | | | |
| | | | | 7/29/2020 | 31 | | | | |

| Site 385424 Summary | | | | | |
|---|---|---|---|---|---|
| | May | June | July | August | September |
| Number of Samples | 13 | 13 | 18 | 7 | 6 |
| Geometric Mean CFU/100 mL | 24.75 | 48.85 | 153.97 | 189.73 | 230.86 |
| % > 409 mg/L | 7.7 % | 0.0 % | 27.8 % | 28.6 % | 50.0 % |
| Recreational Use Assessment | Fully Supporting | Fully Supporting | Not Supporting | Not Supporting | Not Supporting |

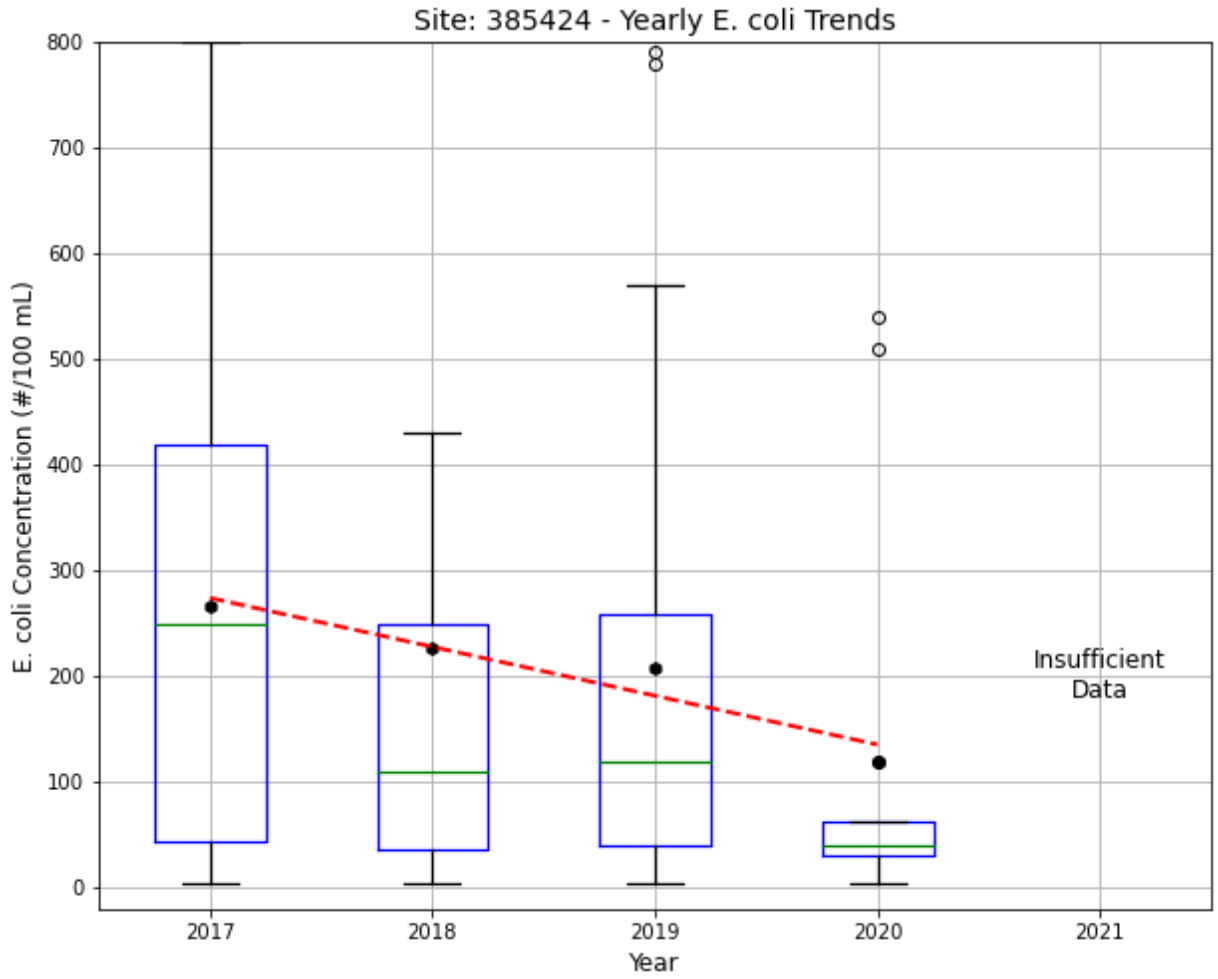


Figure 6. Trends in E. coli bacteria at station 385424.

## *2.4 Station 385425 (Mid-Down Stream)*

11th Avenue South, Bridge, Grand Forks – Township 151 N, Range 50 W, Section 8

### E. coli bacteria

In total, 68 E. coli bacteria samples were collected and analyzed from 2017 through 2021. Data was polled for each month during the recreational season (May through September) to evaluate the recreational use support status at the end of the project. The data was also used to evaluate concentration trends during project period. The monthly pooled data (Table 6) shows a mixed result in the beneficial use support status. The trend line analysis utilizing E. coli sample results acquired during the respective year in the five-year window (Figure 7) shows a decrease in E. coli bacteria concentrations. During 2021, less than 5 samples were taken at this site, therefore, the data was insufficient and not plotted in the analysis.

Table 6. Monitoring Station 385425 – E. coli Bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status

| Site 385425 – E. coli Concentrations by Month – 2017 to 2021 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| May | #/100 mL | June | #/100 mL | July | #/100 mL | August | #/100 mL | September | #/100 mL |
| 5/1/2018 | 41 | 6/20/2017 | 1300 | 7/10/2017 | 190 | 8/8/2017 | 550 | 9/18/2017 | 490 |
| 5/8/2018 | 52 | 6/26/2017 | 10 | 7/17/2017 | 610 | 8/29/2017 | 800 | 9/27/2017 | 390 |
| 5/16/2018 | 230 | 6/28/2017 | 800 | 7/19/2017 | 330 | 8/8/2018 | 3400 | 9/11/2018 | 31 |
| 5/22/2018 | 20 | 6/5/2018 | 120 | 7/24/2017 | 800 | 8/21/2018 | 1300 | 9/26/2018 | 52 |
| 5/1/2019 | 52 | 6/12/2018 | 210 | 7/26/2017 | 590 | 8/28/2018 | 170 | 9/4/2019 | 120 |
| 5/7/2019 | 41 | 6/20/2018 | 74 | 7/31/2017 | 40 | 8/7/2019 | 420 | 9/11/2019 | 170 |
| 5/15/2019 | 130 | 6/5/2019 | 190 | 7/10/2018 | 86 | 8/13/2019 | 310 | 9/18/2019 | 230 |
| 5/22/2019 | 1200 | 6/11/2019 | 160 | 7/16/2018 | 31 | 8/20/2019 | 490 | 9/24/2019 | 97 |
| 5/29/2019 | 150 | 6/19/2019 | 230 | 7/24/2018 | 300 | 8/27/2019 | 230 | 9/2/2020 | 350 |
| 5/11/2020 | 74 | 6/26/2019 | 5 | 7/31/2018 | 170 | 8/5/2020 | 110 | | |
| 5/18/2020 | 110 | 6/3/2020 | 5 | 7/1/2019 | 190 | 8/18/2020 | 310 | | |
| 5/20/2020 | 86 | 6/9/2020 | 330 | 7/9/2019 | 3900 | | | | |
| 5/27/2020 | 150 | 6/23/2020 | 130 | 7/16/2019 | 73 | | | | |
| 5/25/2021 | 83 | | | 7/24/2019 | 110 | | | | |
| | | | | 7/30/2019 | 52 | | | | |
| | | | | 7/7/2020 | 130 | | | | |
| | | | | 7/15/2020 | 130 | | | | |
| | | | | 7/22/2020 | 140 | | | | |
| | | | | 7/29/2020 | 160 | | | | |

| Site 385425 Summary | | | | | |
|---|---|---|---|---|---|
| | May | June | July | August | September |
| Number of Samples | 14 | 13 | 19 | 11 | 9 |
| Geometric Mean CFU/100 mL | 94.09 | 102.92 | 184.65 | 287.58 | 154.12 |
| % > 409 mg/L | 7.1 % | 15.4 % | 21.1 % | 54.5 % | 11.1 % |
| Recreational Use Assessment | Fully Supporting | Fully Supported but Threatened | Not Supporting | Not Supporting | Not Supporting |

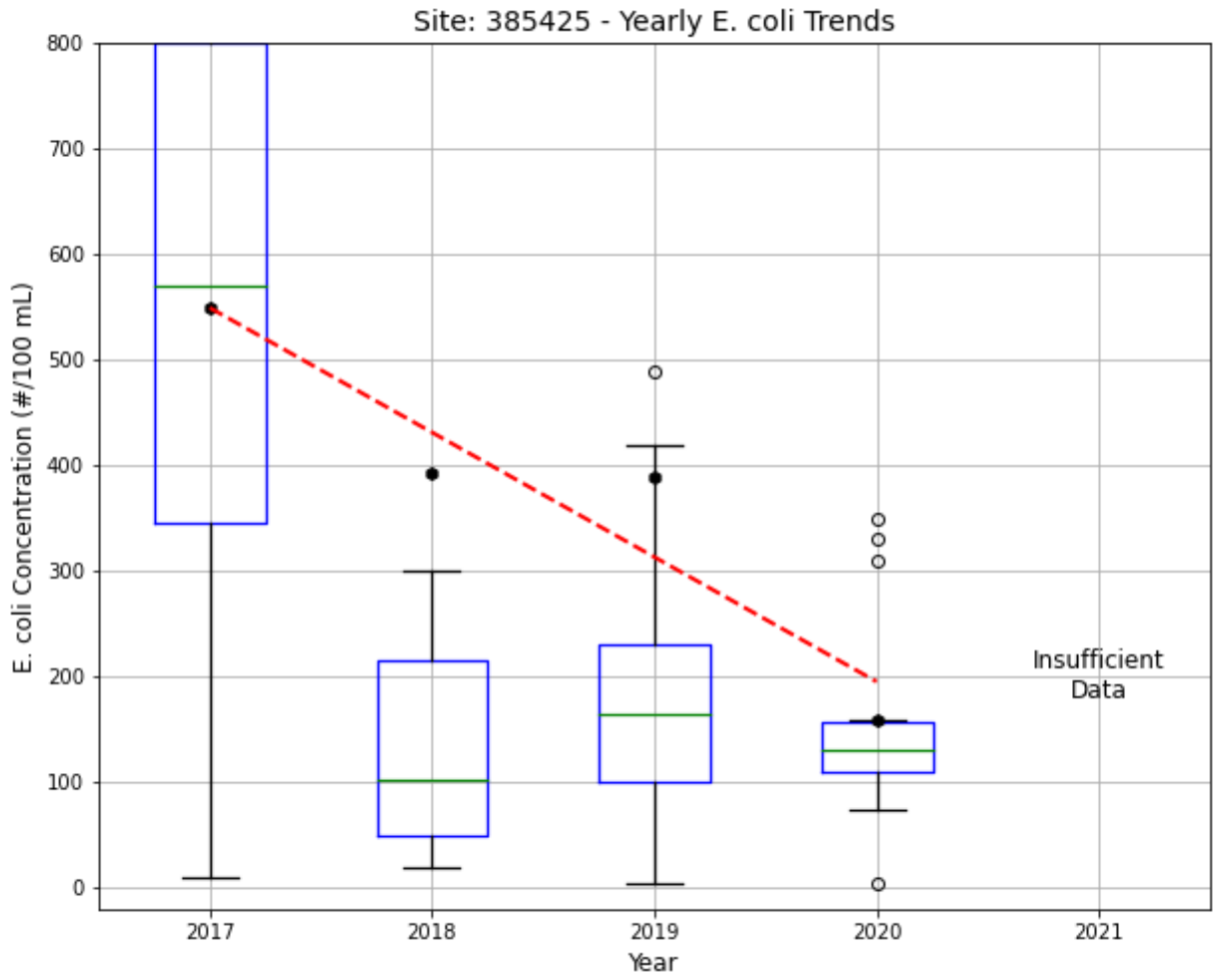


Figure 7. Trends in E. coli bacteria at station 385425.

## *2.5 Station 385426 (Down Stream)*

27th Avenue North, Bridge, Grand Forks – Township 152 N, Range 50 W, Section 32

### E. coli bacteria

In total, 79 E. coli bacteria samples were collected and analyzed from 2017 through 2021. Data was polled for each month during the recreational season (May through September) to evaluate the recreational use support status at the end of the project. The data was also used to evaluate concentration trends during project period. The monthly pooled data (Table 7) shows a mixed result in the beneficial use support status. The trend line analysis utilizing E. coli sample results acquired during the respective year in the five-year window

(Figure 8) shows a decrease in E. coli bacteria concentrations. During 2021, less than 5 samples were taken at this site, therefore, the data was insufficient and not plotted in the analysis.

Table 7. Monitoring Station 385426 – E. coli Bacteria 30-day Geometric Mean, Percent Exceedance of 409 CFU and Support Status

| Site 385426 – E. coli Concentrations by Month – 2017 to 2021 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| May | #/100 ml | June | #/100 ml | July | #/100 ml | August | #/100 ml | September | #/100 ml |
| 5/1/2018 | 300 | 6/20/2017 | 150 | 7/10/2017 | 110 | 8/14/2017 | 250 | 9/5/2017 | 200 |
| 5/8/2018 | 10 | 6/26/2017 | 70 | 7/17/2017 | 190 | 8/18/2017 | 280 | 9/12/2017 | 80 |
| 5/16/2018 | 85 | 6/28/2017 | 800 | 7/19/2017 | 170 | 8/22/2017 | 200 | 9/18/2017 | 760 |
| 5/22/2018 | 31 | 6/5/2018 | 74 | 7/24/2017 | 100 | 8/29/2017 | 70 | 9/27/2017 | 1000 |
| 5/1/2019 | 41 | 6/12/2018 | 360 | 7/26/2017 | 220 | 8/8/2018 | 41 | 9/5/2018 | 180 |
| 5/7/2019 | 20 | 6/20/2018 | 20 | 7/31/2017 | 10 | 8/15/2018 | 74 | 9/11/2018 | 110 |
| 5/15/2019 | 10 | 6/5/2019 | 10 | 7/10/2018 | 41 | 8/21/2018 | 86 | 9/19/2018 | 97 |
| 5/22/2019 | 240 | 6/11/2019 | 52 | 7/16/2018 | 74 | 8/28/2018 | 260 | 9/26/2018 | 52 |
| 5/29/2019 | 20 | 6/19/2019 | 10 | 7/24/2018 | 30 | 8/7/2019 | 63 | 9/4/2019 | 280 |
| 5/11/2020 | 220 | 6/26/2019 | 230 | 7/31/2018 | 170 | 8/20/2019 | 5 | 9/11/2019 | 30 |
| 5/18/2020 | 5 | 6/3/2020 | 30 | 7/1/2019 | 120 | 8/27/2019 | 190 | 9/18/2019 | 30 |
| 5/20/2020 | 20 | 6/9/2020 | 140 | 7/9/2019 | 1100 | 8/5/2020 | 85 | 9/24/2019 | 85 |
| 5/27/2020 | 20 | 6/23/2020 | 74 | 7/16/2019 | 41 | 8/18/2020 | 220 | 9/2/2020 | 400 |
| 5/25/2021 | 10 | | | 7/24/2019 | 730 | 8/26/2020 | 890 | 9/9/2020 | 85 |
| | | | | 7/30/2019 | 20 | | | 9/15/2020 | 74 |
| | | | | 7/7/2020 | 52 | | | 9/23/2020 | 140 |
| | | | | 7/15/2020 | 41 | | | | |
| | | | | 7/22/2020 | 160 | | | | |
| | | | | 7/29/2020 | 110 | | | | |
| | | | | 7/20/2021 | 20000 | | | | |

| Site 385426 Summary | | | | | |
|---|---|---|---|---|---|
| | May | June | July | August | September |
| Number of Samples | 14 | 13 | 20 | 14 | 16 |
| Geometric Mean | 32.34 | 72.97 | 123.82 | 114.46 | 132.63 |
| % > 409 mg/L | 0 % | 7.7 % | 15.0 % | 7.1 % | 12.5 % |
| Recreational Use Assessment | Fully Supporting | Fully Supporting | Fully Supported but Threatened | Fully Supporting | Not Supporting |

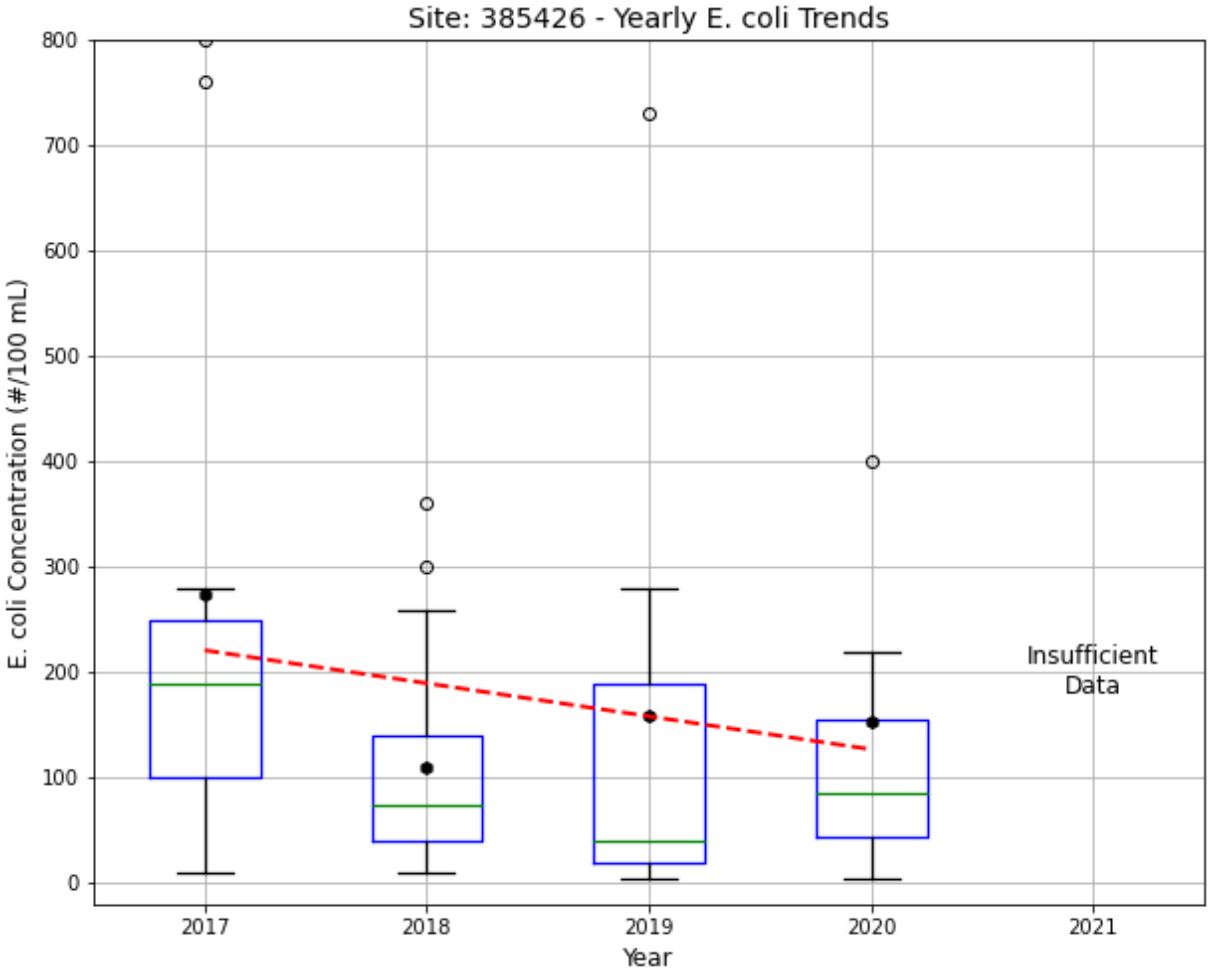


Figure 8. Trends in E. coli bacteria at station 385426.

# 3.0 English Coulee Macroinvertebrate Sampling

Macroinvertebrate sampling was not completed in 2020 due very limited progress toward riparian restoration goals during the project period.

# 4.0 Attainment of Beneficial Uses and/or Parameter Targets

The goal of the English Coulee Watershed Phase II was to achieve reductions in E. coli bacteria concentrations within state water quality standards which equates to a "fully supporting" status for recreational uses. 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 denotes the Support Status by month for the five sample locations. A bolded Support Status classification is used to denote improvements between Phase I and Phase II.

Table 8. Supporting Status from All Monitoring Stations for Phase I and II

| Phase II | May | June | July | August | September |
|---|---|---|---|---|---|
| Up Stream 385422 | FS | FS | **FS** | | |
| Mid-Up Stream 385423 | FS | **FSbT** | FSbT | | |
| Middle Stream 385424 | FS | FS | NS | NS | NS |
| Mid-Down Stream 385425 | FS | **FSbT** | NS | NS | NS |
| Down Stream 385426 | FS | FS | FSbT | FS | NS |

There are a number of sites that are impaired (NS or FSbT) and not meeting recreational uses due to elevated E. coli concentrations. Notably, supporting statuses which have been bolded improved during Phase II. The combined Phase I and Phase II data indicates fully supporting conditions are prominent early in the recreation season (May and June) but as the season progresses, most sites experience a form of impairment.

It is unclear where the elevated levels of E. coli bacteria are coming from. Potential nonpoint sources remain such as livestock grazing in riparian areas or directly upland from the water courses. All five of the monitoring sites, show declining trends in E. coli bacteria concentrations during the project period. Although recreational uses have not been fully restored the trends suggest the project is having some success in the watershed.

The BMPs applied in the watershed during the project period appear to have a positive effect on water quality in portions of English Coulee. 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 in the English Coulee watershed.

## *4.1 Discussions and Conclusions*

As the data for the English Coulee Phase I and II 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 monitoring stations.

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.

# 6.0 Appendix

Total Nitrogen

Three forms of nitrogen that are commonly measured in waterbodies, such as English Coulee: ammonia, nitrates and nitrites. Total nitrogen is the sum of total Kjeldahl nitrogen (ammonia, organic and reduced nitrogen) and nitrate-nitrite. It is 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; 2017-2021.

The NDDEQ's guideline for maximum total nitrogen is set by individual Ecoregion thresholds for chemical stressors. The English Coulee is part of the Lake Agassiz Plain Ecoregion and a "least disturbed' condition class is set at < 0.883 mg/L for total nitrogen.

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.

Analysis of Total Phosphorus is grouped in chronological order and a trend line is constructed over the entire project period; 2017-2021.

The NDDEQ's guideline for maximum Total Phosphorus is set by individual Ecoregion thresholds for chemical stressors. The English Coulee is part of the Lake Agassiz Plain Ecoregion and a "least disturbed' condition class is set at < 0.148 mg/L for Total Phosphorus.

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.

Analysis of Total Suspended Solids is grouped in chronological order and a trend line is constructed over the entire project period; 2017-2021.

The NDDEQ's guideline for maximum Total Suspended Solids is set by the EPA's Code of Federal Registry; Part 133 which sets discharges on a 30-day average at 30 mg/L for Total Suspended Solids.

For these parameters, box plots were used to depict the distribution of the sample results organized by sampling year. The blue box portion extends from the first (lower) to the third (upper) quantiles. The green horizontal line within the box is the median of the dataset. The whiskers show the range of the data (extension limited to one and a half times the range of the box) and the hollow circles are the outliers. A trend line is constructed utilizing the arithmetic mean yearly values (indicated by black dots) from 2017 – 2020. Due to drought conditions, minimal sampling requirements were not met in 2021 and therefore, the data was unplottable.

## *6.1 Station 385422 (Up Stream)*

1 mile North, 8.5 miles West of Thompson – Township 150 N, Range 52 W, Section 21

### Total Nitrogen, Total Phosphorus, Total Suspended Solids

The concentration trends for total nitrogen, total phosphorus and total suspended solids are shown in Figures 9-11. The trend lines indicate decreasing trends in total nitrogen and total suspended solids and increasing trends in total phosphorous concentrations. The majority of total nitrogen and total phosphorus samples had concentrations well above the defined thresholds of 0.883 mg/L and 0.148 mg/L, respectively. The majority of total suspended solid samples were below the defined threshold of 30 mg/L (30-day average).

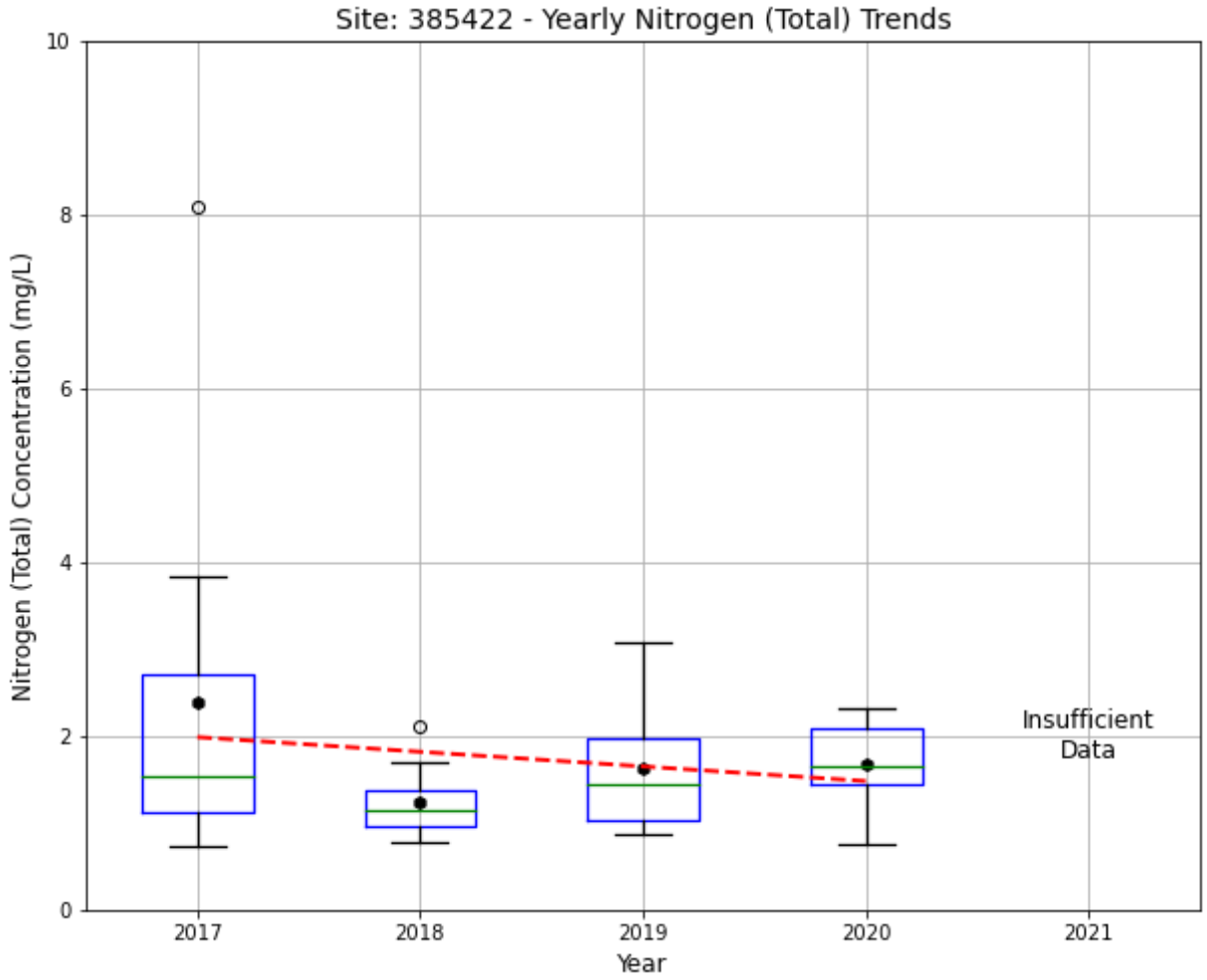


Figure 9. Trends in total nitrogen at station 385422.

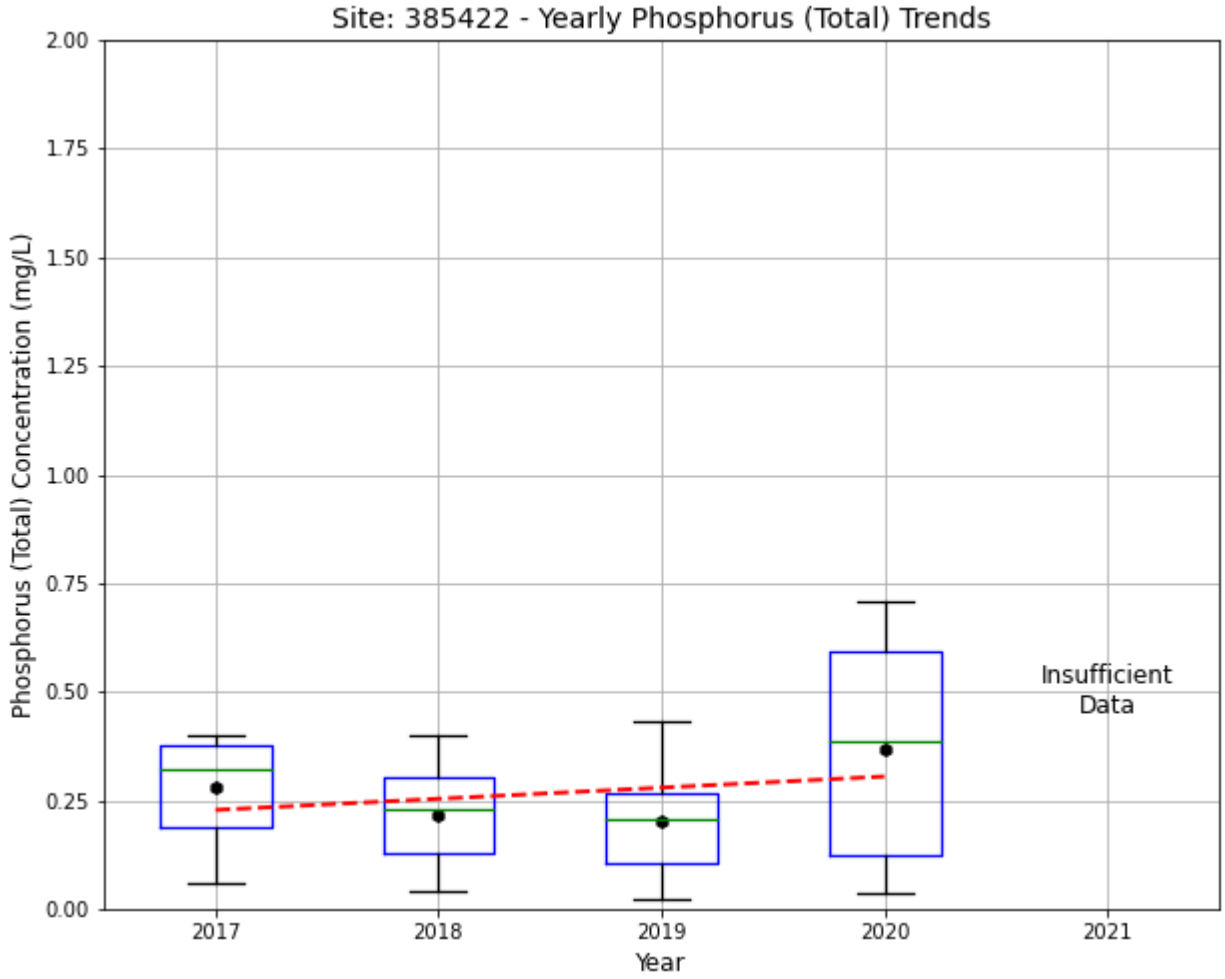


Figure 10. Trends in total phosphorus at station 385422.

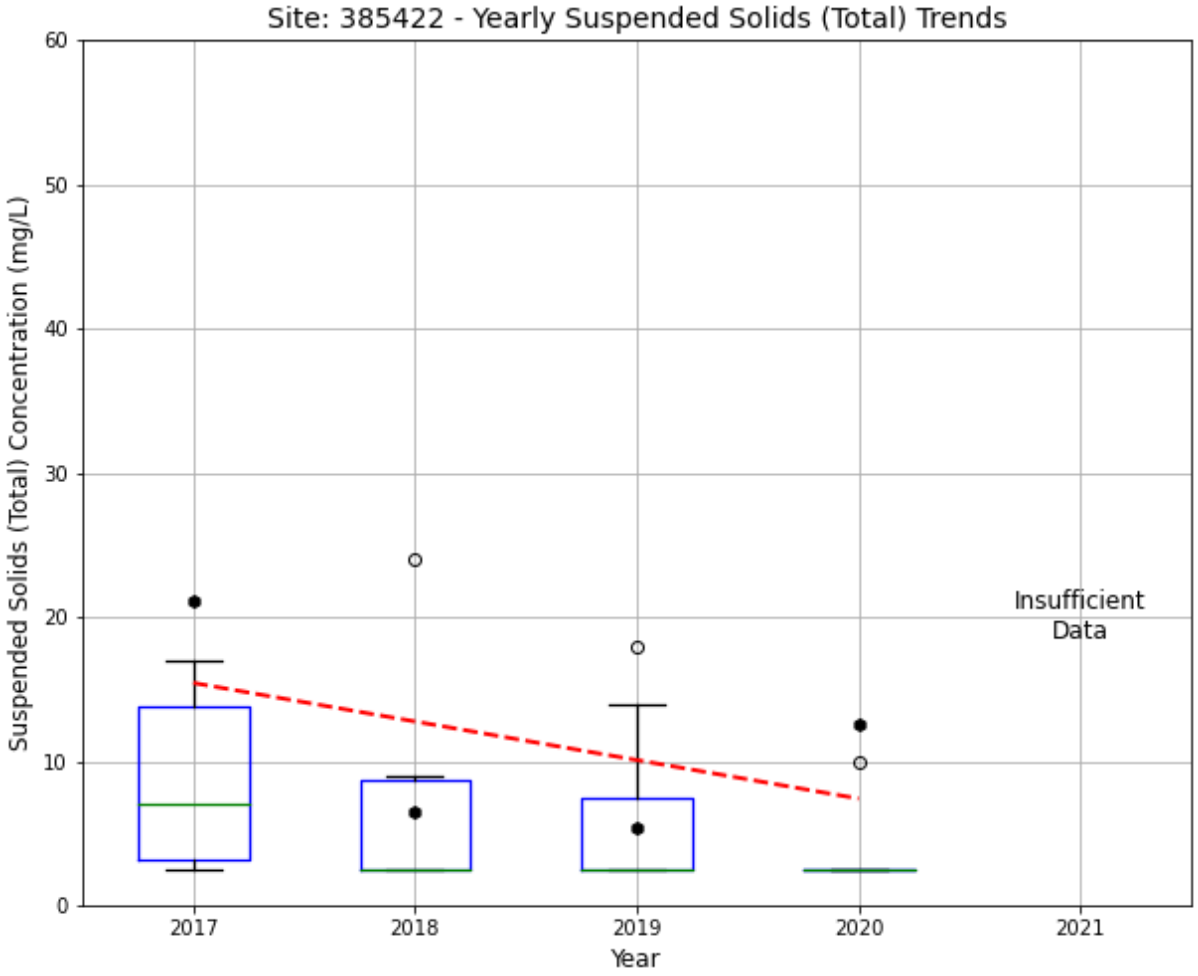


Figure 11. Trends in total suspended solid at station 385422.

## *6.2 Station 385423 (Mid-Up Stream)*

3 miles North, 5.5 miles West of Thompson – Township 150 N, Range 51 W, Section 18

### Total Nitrogen, Total Phosphorus, Total Suspended Solids

The concentration trends for total nitrogen, total phosphorus and total suspended solids are shown in Figures 12-14. The trend lines indicate decreasing trends in total nitrogen and total suspended solids and increasing trends in total phosphorus concentrations. The majority of total nitrogen samples had concentrations above the defined thresholds of 0.883 mg/L. The majority of total phosphorus and all total suspended solid samples were below the defined threshold of 0.148 mg/L and 30 mg/L (30-day average), respectively.

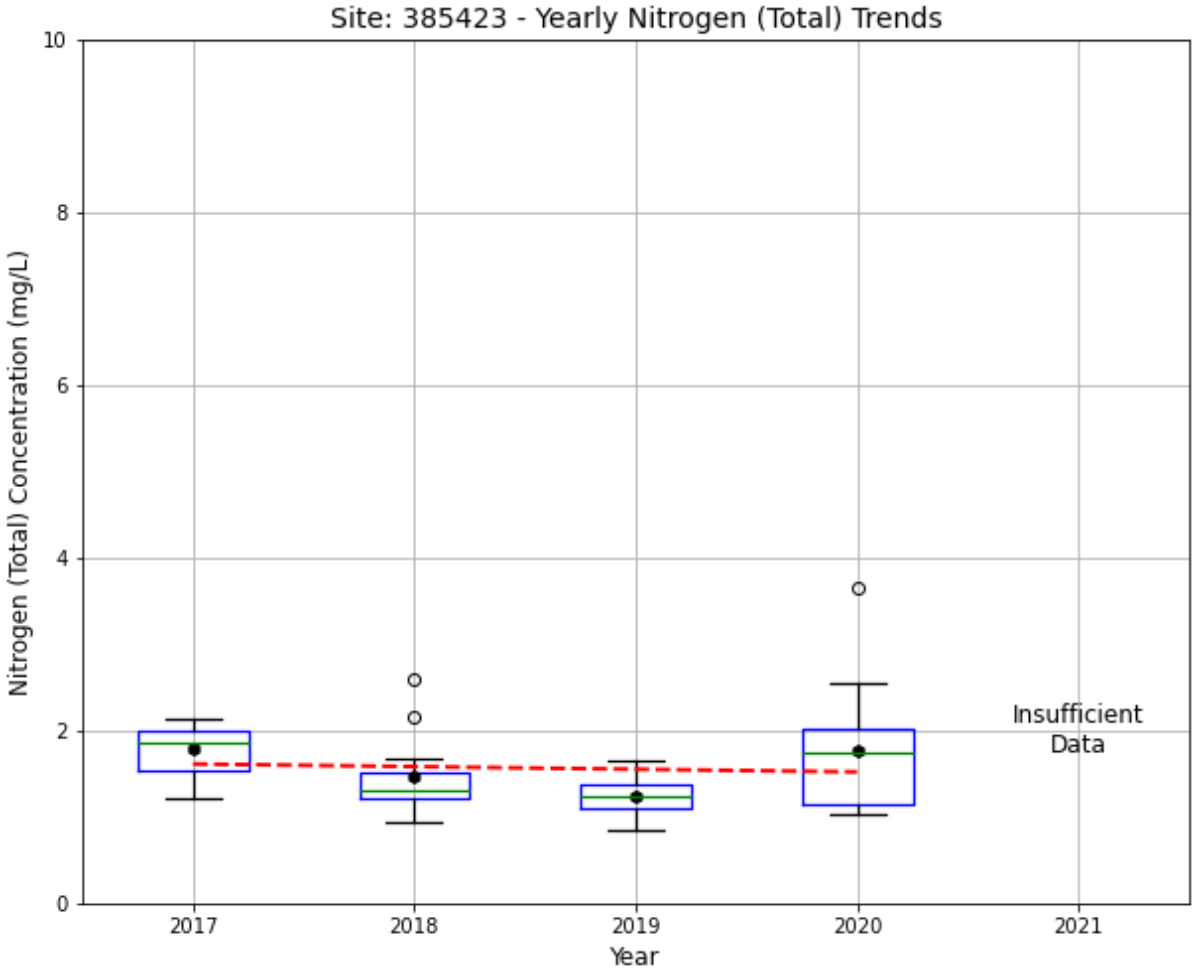


Figure 12. Trends in total nitrogen at station 385423.

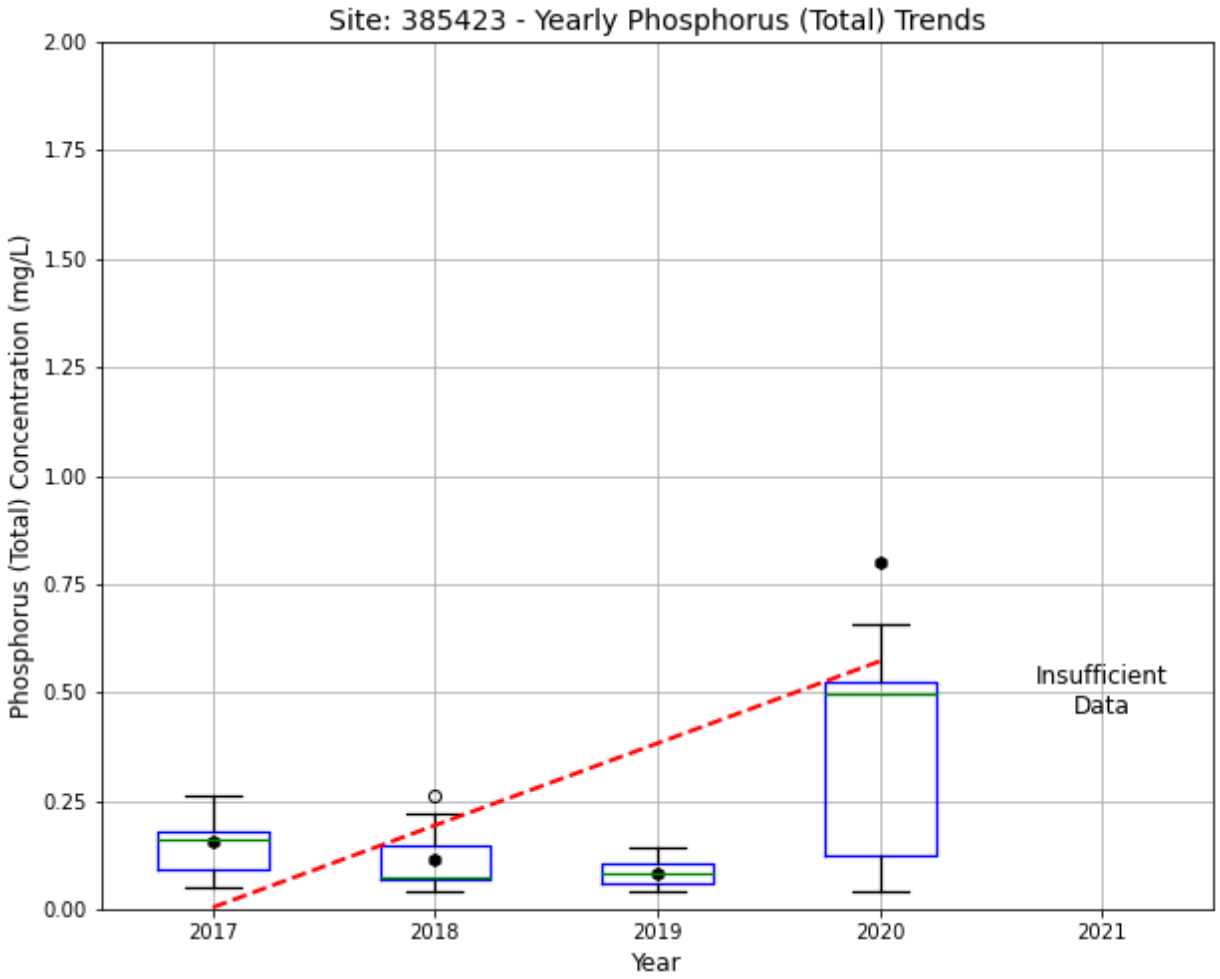


Figure 13. Trends in total phosphorus at station 385423.

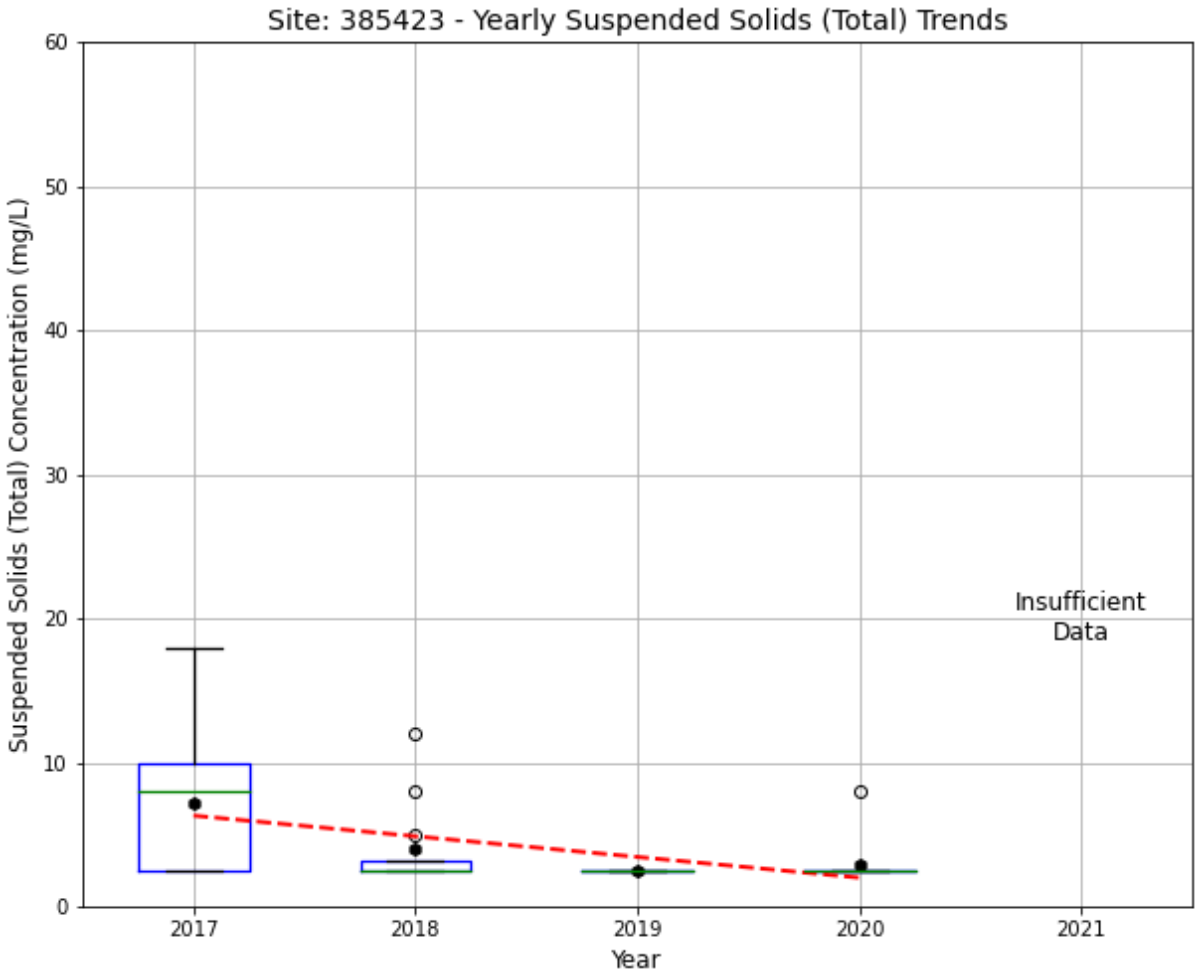


Figure 14. Trends in total suspended solids at station 385423.

## *6.3 Station 385424(Middle Stream)*

2 miles Southwest of Grand Forks – Township 151 N, Range 51 W, Section 22

### Total Nitrogen, Total Phosphorus, Total Suspended Solids

The concentration trends for total nitrogen, total phosphorus and total suspended solids are shown in Figures 15-17. The trend lines indicate decreasing trends in total suspended solids and increasing trends in total phosphorus and total nitrogen concentrations. All total nitrogen samples had concentrations above the defined thresholds of 0.883 mg/L. The majority of total phosphorus and total suspended solid samples were below the defined threshold of 0.148 mg/L and 30 mg/L (30-day average), respectively.

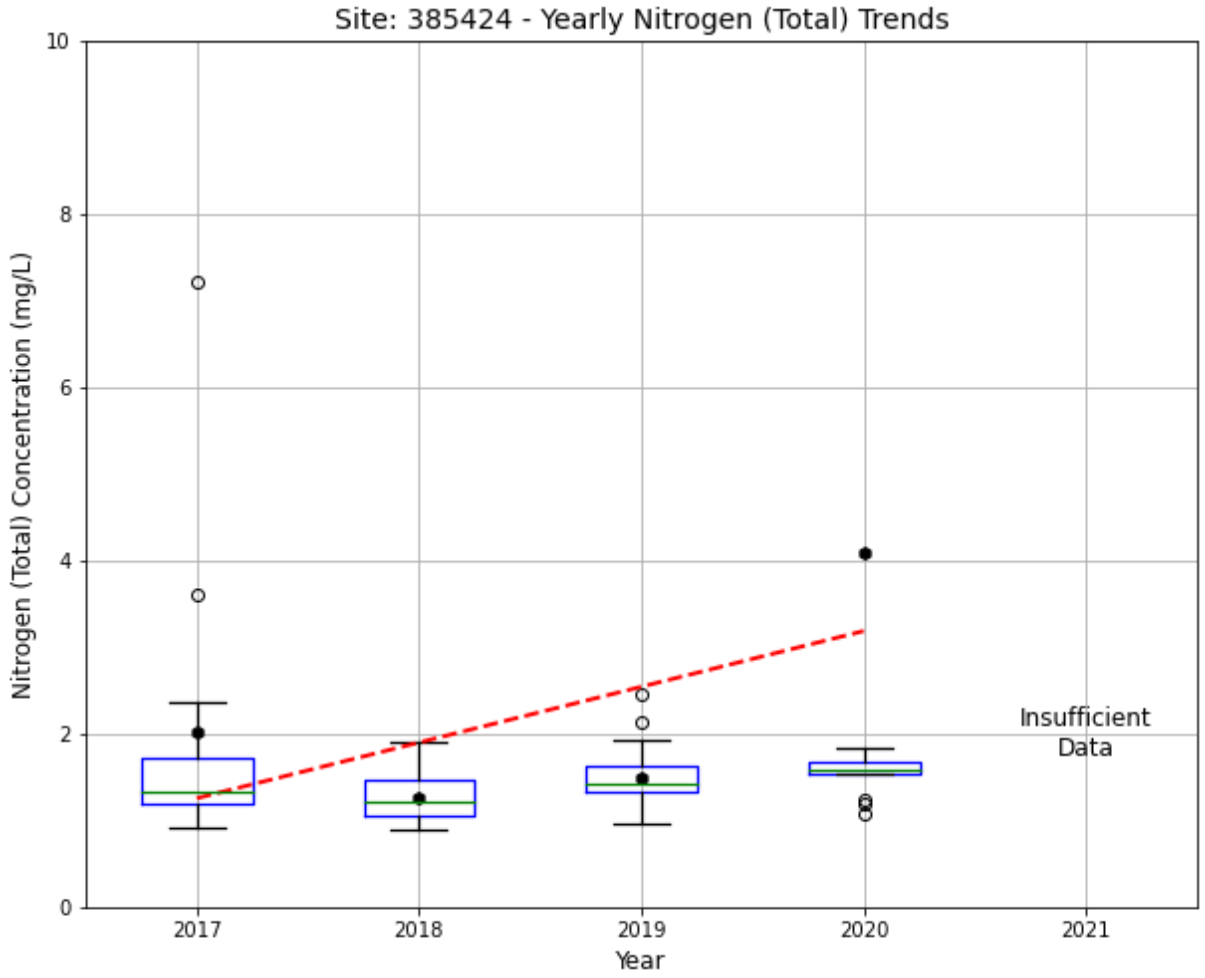


Figure 15. Trends in total nitrogen at station 385424.

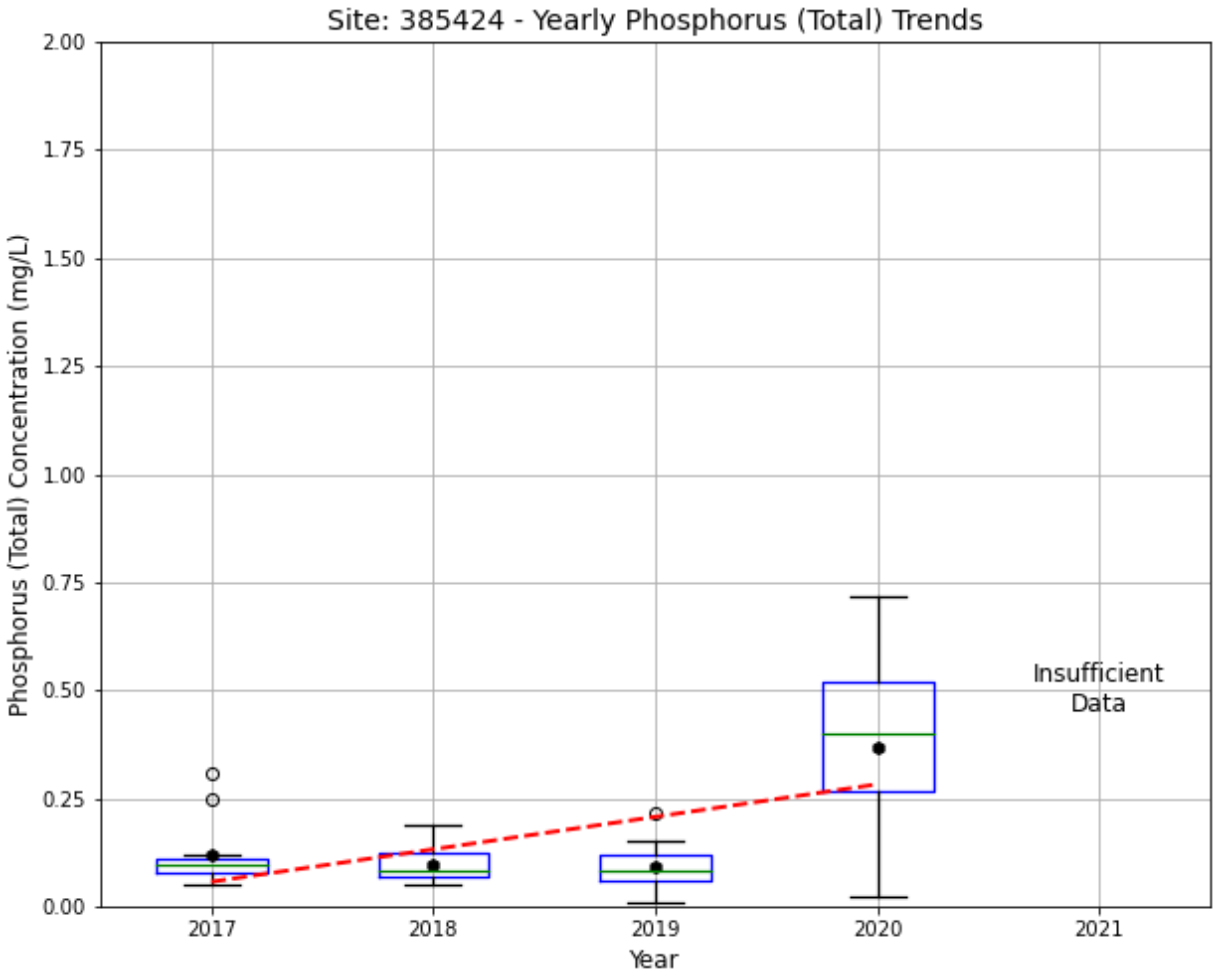


Figure 16. Trends in total phosphorus at station 385424.

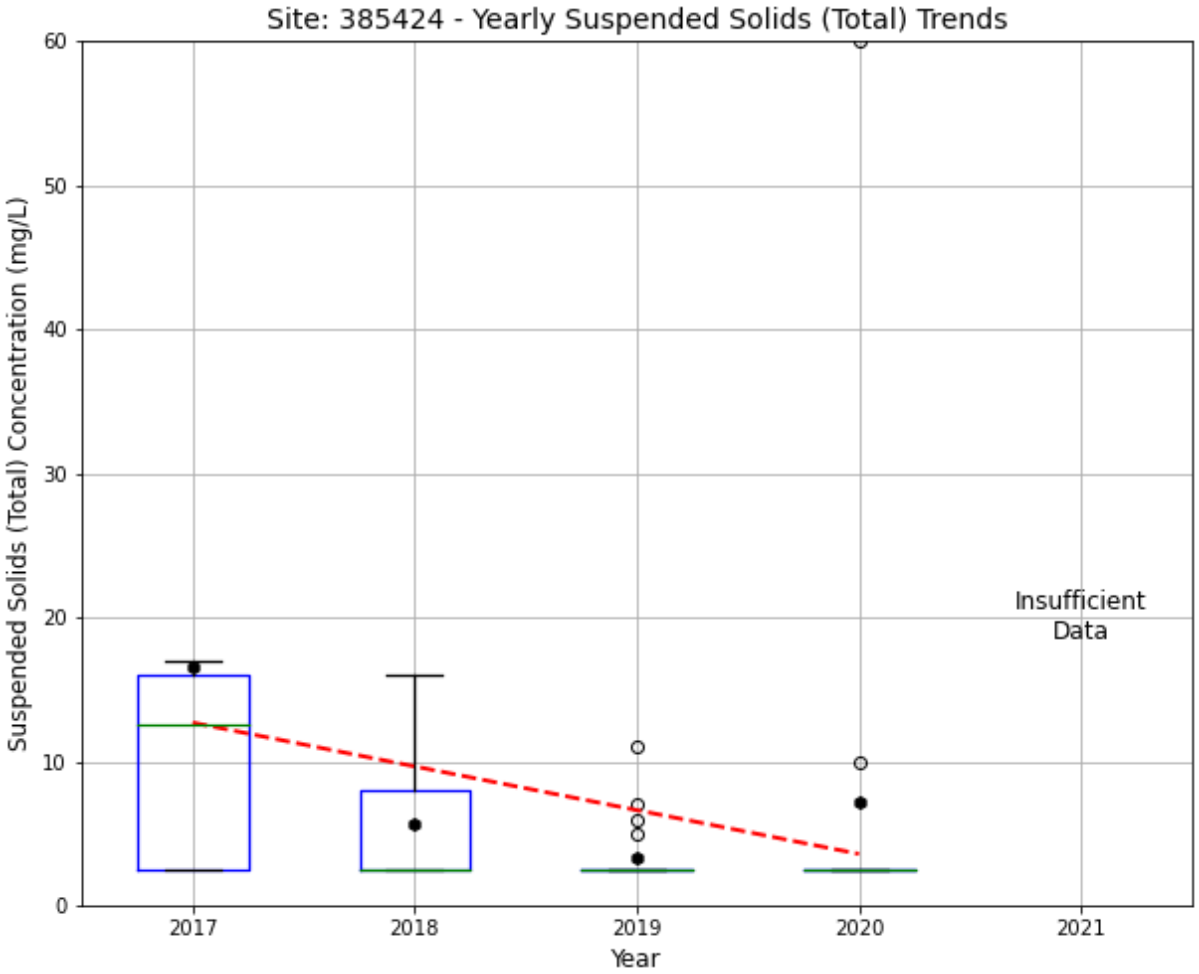


Figure 17. Trends in total suspended solids at station 385424.

## *6.4 Station 385425 (Mid-Down Stream)*

11th Avenue South, Bridge, Grand Forks – Township 151 N, Range 50 W, Section 8

### Total Nitrogen, Total Phosphorus, Total Suspended Solid

The concentration trends for total nitrogen, total phosphorus and total suspended solids are shown in Figures 18-20. The trend lines indicate decreasing trends in total nitrogen and total suspended solids concentrations and increasing trends in total phosphorus. The majority of total nitrogen samples had concentrations above

the defined thresholds of 0.883 mg/L. The majority of total phosphorus and all total suspended solid samples were below the defined threshold of 0.148 mg/L and 30 mg/L (30-day average), respectively.

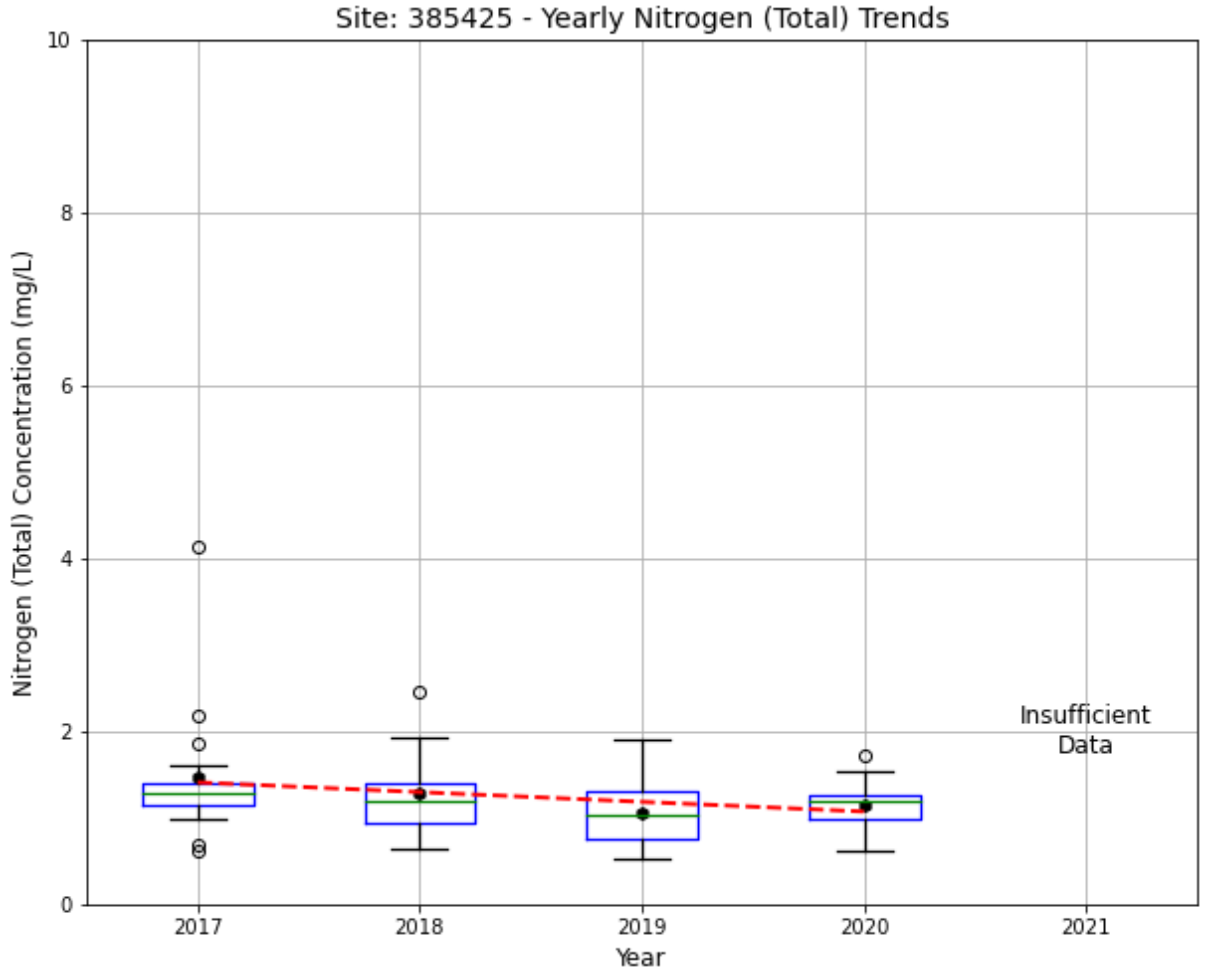


Figure 18. Trends in total nitrogen at station 385425.

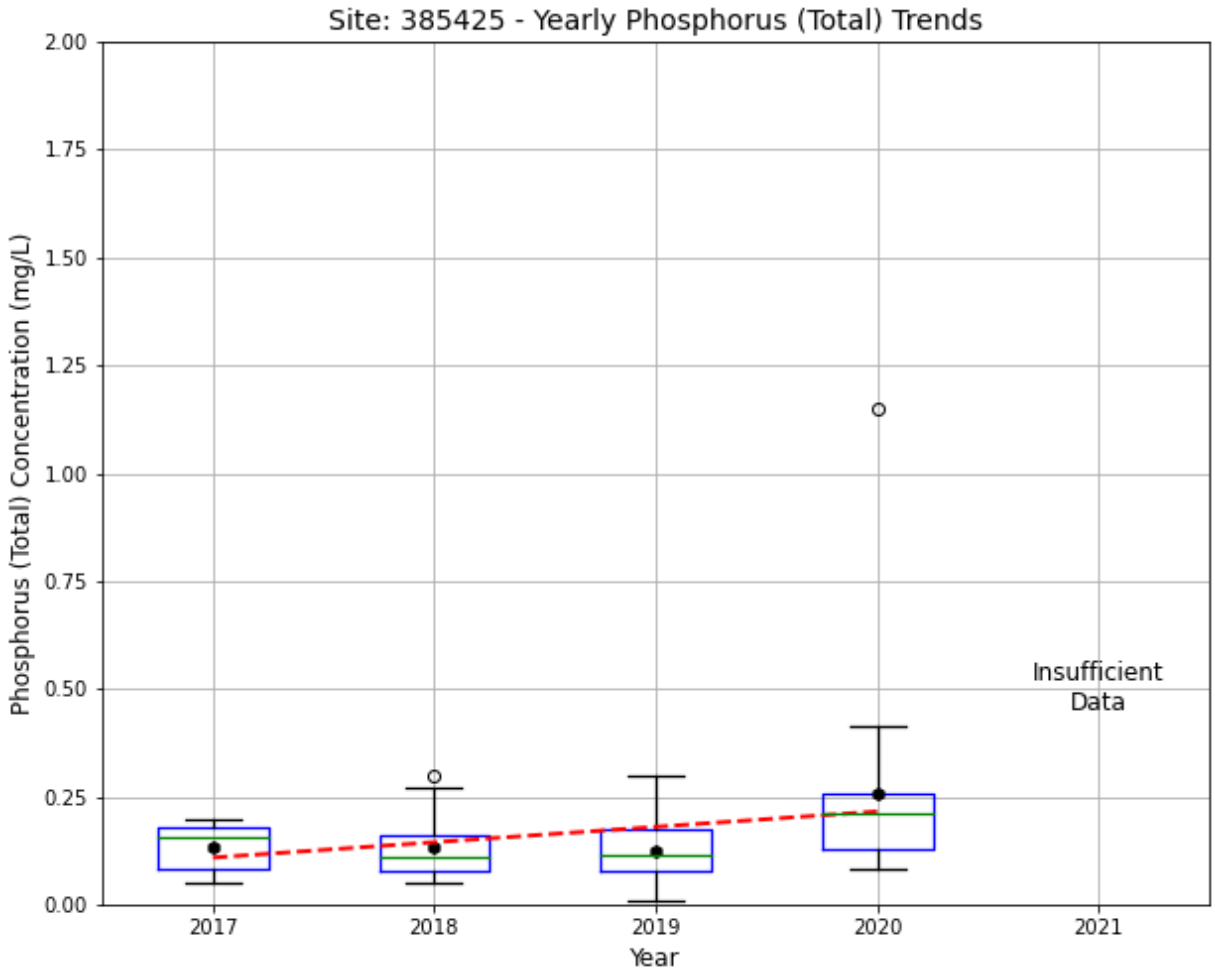


Figure 19. Trends in total phosphorus at station 385425.

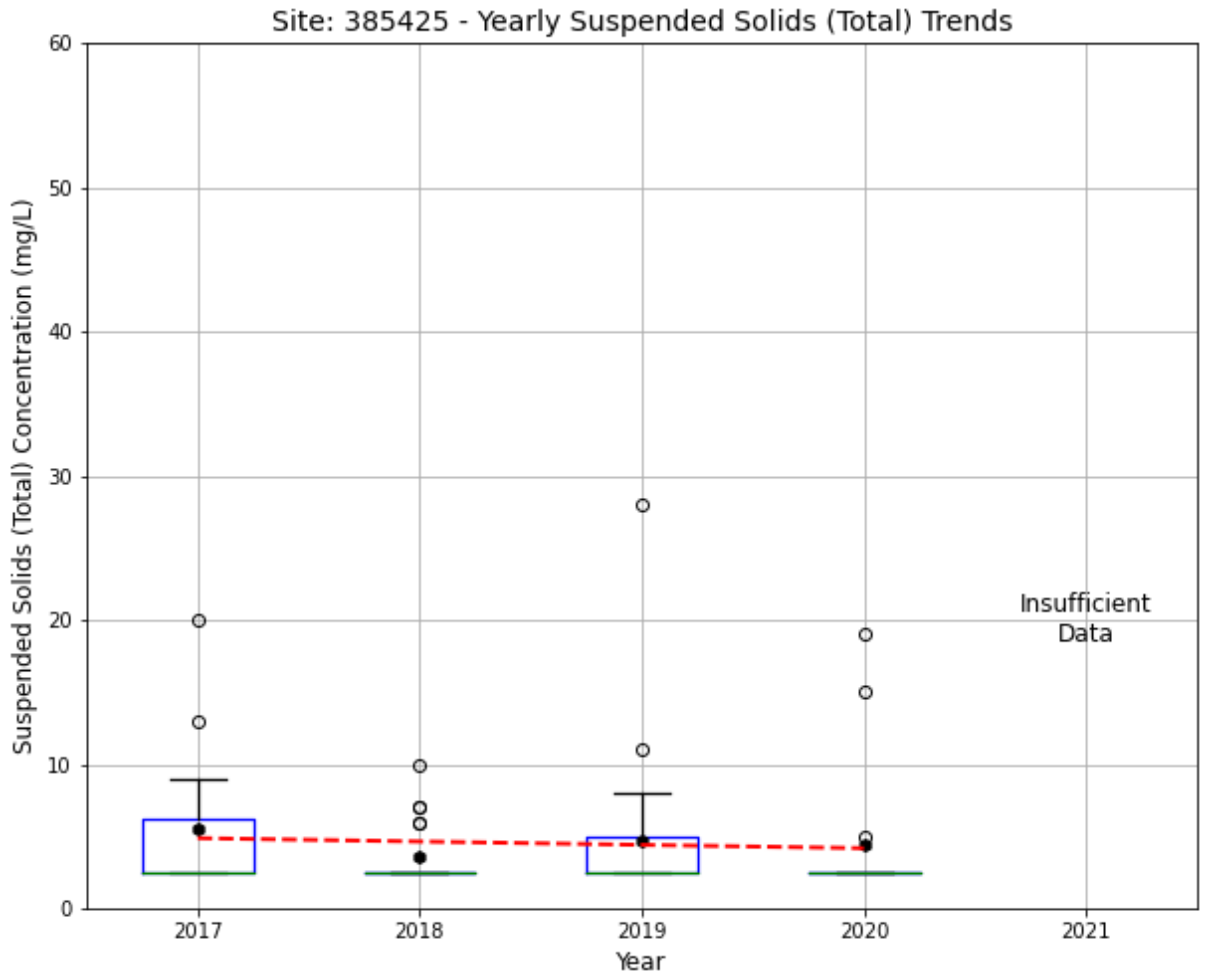


Figure 20. Trends in total suspended solids at station 385425.

## *6.5 Station 385426 (Down Stream)*

27th Avenue North, Bridge, Grand Forks – Township 152 N, Range 50 W, Section 32

### Total Nitrogen, Total Phosphorus, Total Suspended Solids

The concentration trends for total nitrogen, total phosphorus and total suspended solids are shown in Figures 21-23. The trend lines indicate decreasing trends in total suspended solids and increasing trends in total nitrogen and total phosphorus concentrations. The majority of total nitrogen samples had concentrations above the defined thresholds of 0.883 mg/L. An equal number of total phosphorus samples were above and below the threshold of 0.148 mg/. The majority of total suspended solid samples were below the defined L and 30 mg/L (30-day average).

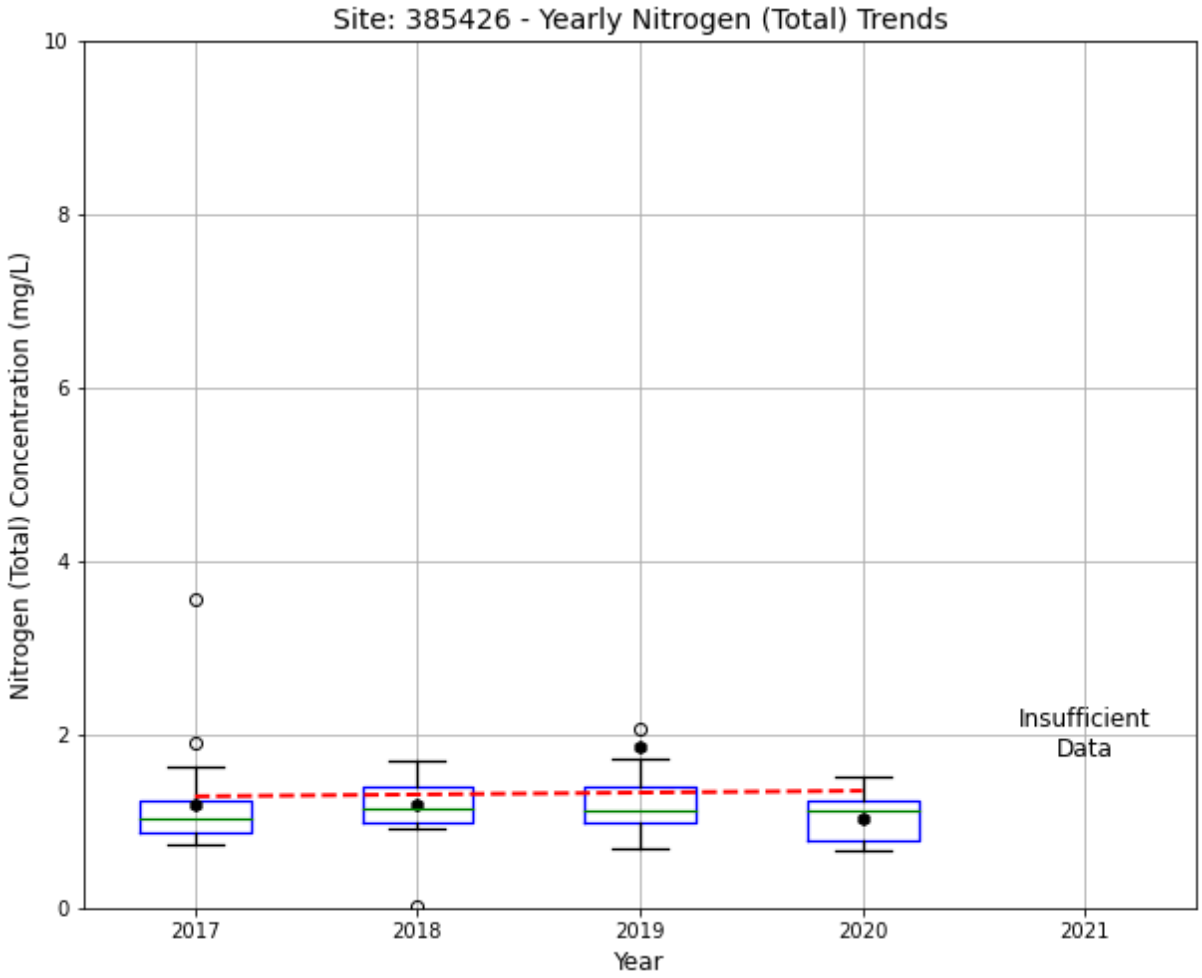


Figure 21. Trends in total nitrogen at station 385426.

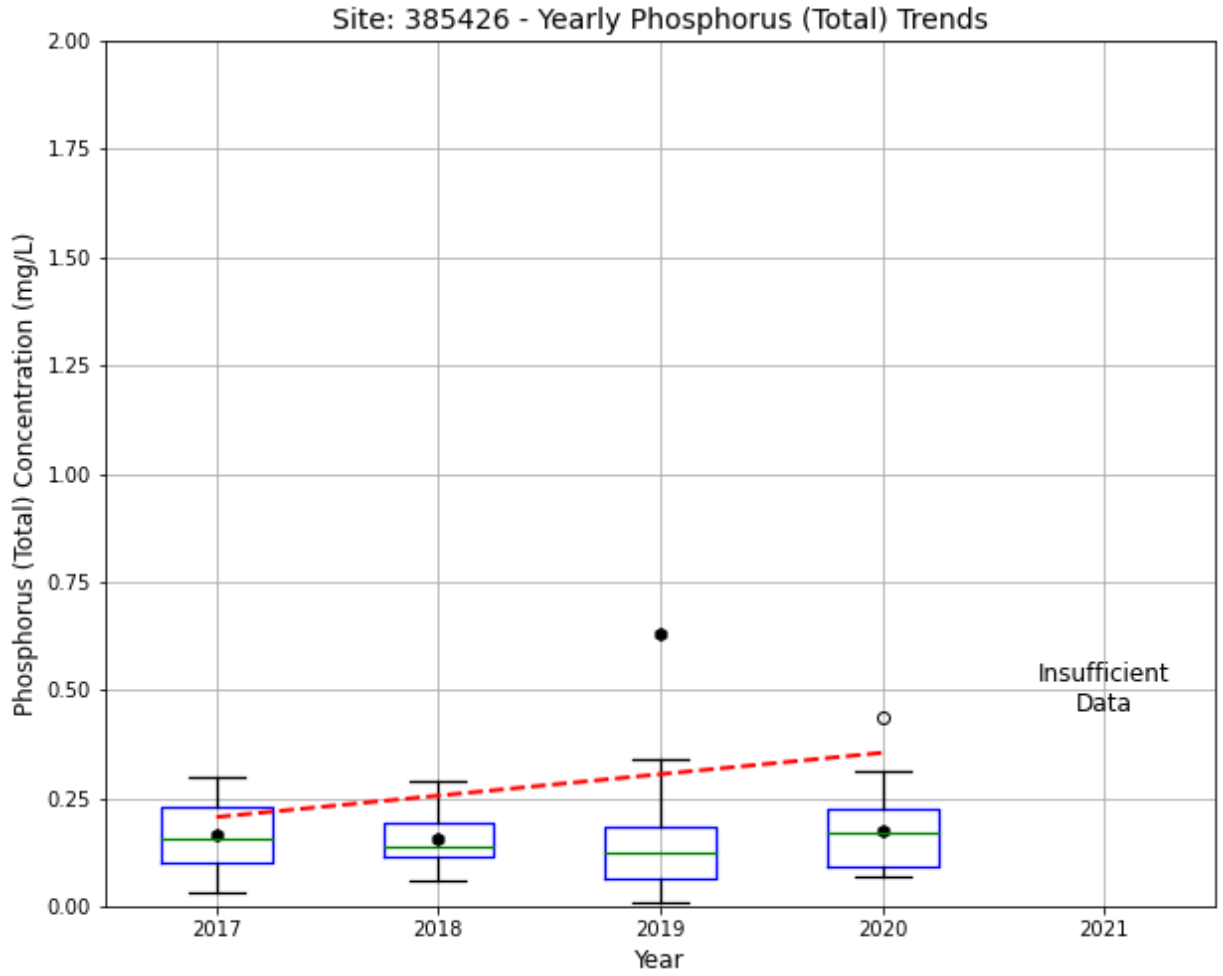


Figure 22. Trends in total phosphorus at station 385426.

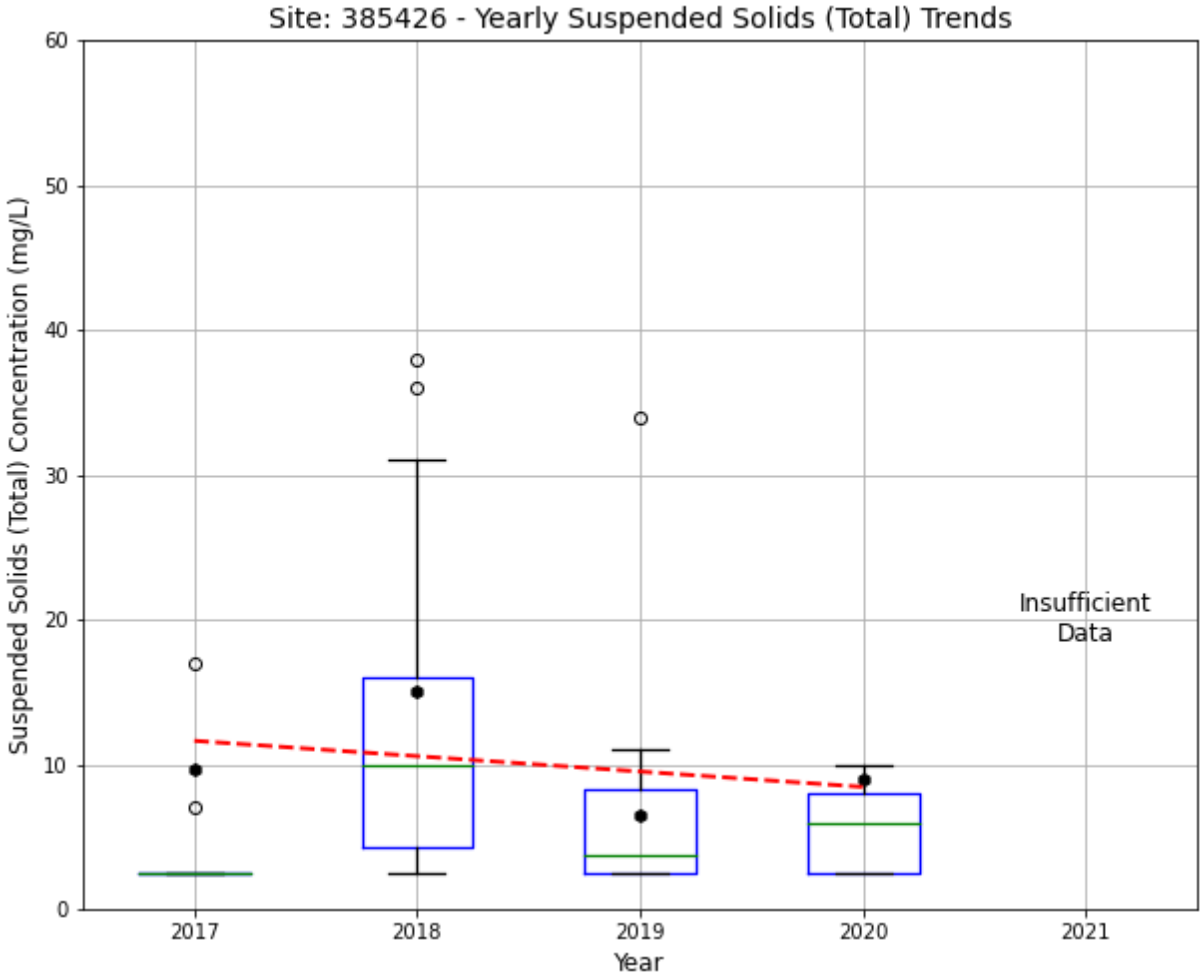


Figure 23. Trends in total suspended solids at station 385426.

Conclusively, nitrogen, phosphorus and sediment trends show variable results. Nitrogen and phosphorus show mixed trends in long-term concentrations, while suspended solids are exclusively showing decreasing concentrations throughout the project period. This signifies improvements have been made, but continued work is necessary for restoring the water body to "fully supporting" quality.