

Big Muddy Creek Watershed Project Implementation Plan



Morton County Soil Conservation District
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SPONSOR: Morton County Soil Conservation District

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STATE: North Dakota

WATERSHEDS: Entire Big Muddy Creek Watershed

HYDROLOGIC UNIT CODE: 1013020303, 1013020304

HIGH PRIORITY WATERSHED: YES

PROJECT TYPES

STAFFING & SUPPORT

WATERSHED

GROUNDWATER

I & E

WATERBODY TYPES

GROUNDWATER

LAKES/RESERVOIRS

RIVERS

STREAMS

WETLANDS

OTHER

NPS CATEGORY

AGRICULTURE

URBAN RUNOFF

SILVICULTURE

CONSTRUCTION

RESOURCE

EXTRACTION

STOWAGE/LAND
DISPOSAL

PROJECT LOCATION: Morton County, North Dakota[LEJ1]

MAJOR GOAL: The primary goal is to improve aquatic life and recreational uses of the creek. This will be accomplished by promoting and implementing [Best Management Practices \(BMP's\)](#) that are effective at reducing in-stream concentrations of Ttotal Ssuspended Solid (TSS) and E. coli bacteria. A secondary goal is to also reduce mean annual nitrogen and phosphorus concentrations at STORET site 385078.

PROJECT DESCRIPTION: The project sponsors intend to 1) prioritize technical and financial assistance to lands that have the most impact on water quality, 2) track water quality trends over the life of the project to rectify any concerns as they surface, 3) develop educational programs to heighten public awareness of NPS pollution concerns and solutions, and 4) develop working partnerships in the local community to benefit natural resources.

Other Federal Funds: \$700,000

319 Funds Requested: \$417,975

State/Local Match:

Total project cost:

\$278,650

\$1,396,625

2.0 STATEMENT OF NEED

2.1

The previous project area focused on the watersheds for Danzig Dam, Hailstone Creek, and Sims Creek, which are all part of the Big Muddy Creek watershed. To broaden the extent of the [Soil Conservation Districts \(SCD's\)](#) water quality improvement efforts, the scope of the original project was expanded to include the entire Big Muddy Creek watershed. A Water Quality Monitoring Assessment was compiled in August of 2020 focusing on the recreational and aquatic life use of the Class II Stream. The Big Muddy Creek Plan is addressing recreational use impairments through targeted BMP implementation that will reduce E. coli bacteria concentrations in the creek.

Based on the 2015-2018 assessment data, the mainstem of Big Muddy Creek (Assessment Units ND 10130203-02-S_00 & ND 10130203-032-S_00) is also not supporting recreational uses due to excess E. coli bacteria concentrations. All reaches of the mainstem of Big Muddy Creek are included in the 303(d) list in the 2018 Integrated Report. [Appendix 4; Figures 1; Figures 1 and 2](#) show the Big Muddy Creek watershed.

2.2

Big Muddy Creek Watershed: Big Muddy Creek is in the Lower Heart River watershed. The Big Muddy Creek watershed is about 300 square miles (210,000 acres) mostly in Morton County. Its headwaters are located near Hebron, ND and flows to its confluence with the Heart River south of New Salem. (10-digit HUCs 1013020304 & 1013020303) The creek is used primarily for agricultural purposes including the watering of livestock and wildlife. No local cities obtain drinking water from the creek. There are limited opportunities for recreation on the creek with some fishing in the Glen Ullin Reservoir.

As indicated in Section 2.1, Morton County SCD transitioned into the Big Muddy Creek Watershed in 2018 and has initiated contracts over this time with eleven producers to implement several best management practices (BMP). The BMPs have varied in scope and objective with most relating to converting cropland to perennial grass cover, water developments, grazing infrastructure, and rotational grazing systems. The project has also benefitted local schools with annual educational opportunities such as [Waterfest Water fest](#) and teaching students about water quality at the Living Ag Classroom. [Waterfest Water fest](#) impacts about 225 ~~student~~ 4th and 5th grade students annually. Students learn about the characteristics, properties, and importance of water through several interactive demonstrations. The Living Ag Classroom is an annual event which reaches about 1000 students. Morton County SCD participates annually to provide a demonstration on sources of non-point and point source pollution which impact our water quality and drinking water. These are established and well attended events that work to meet project goals through information and outreach on water quality.

2.3: Maps

See Appendix 1 – Watershed maps, Tables, and Figures.

2.4: General Information

The Big Muddy watershed is a semiarid rolling plain of shale, siltstone and sandstone with occasional buttes and badlands. ~~The dissected topography,~~[The dissected topography](#) wooded draws and uncultivated areas provide a haven for wildlife. Soils in the watershed are formed from rocky, gravelly or sandy glacial till, and are moderately well-drained. In general, soils in the watershed are moderately fertile, easily worked and highly susceptible to wind and water erosion. Soils in the watershed, other than river bottom soils, which can be clayey, are predominately silty or loamy and moderately-well to well-drained.

The average rainfall for the project area is approximately 16 inches per year.

According to the 2019 National Agricultural Statistics Service (NASS), the dominate land use in these watersheds (303,854 acres) is agricultural with 88.11% categorized as either native grassland, cropland, tame grass/reseeded grass, or alfalfa. Developed acres cover 2.70%, water/wetlands cover 1.06%, and the remaining 8.13% is riparian woodlands/tree rows/shrubs. As seen previously, in [Appendix 1](#); Figure 3, cropland is the dominate land use in the northern reaches of the project area, as you head south of Interstate-94, that rapidly changes to grassland dominating the southern portion, especially near riparian areas.

2.5 Water Quality Problem Definition

Based on of the AnnAGNPS modeling, nearly all the areas that were identified as high potential sources for nutrients (N&P) are cropland acres ([Appendix 1](#); Figure 1, 2). Educational programs and BMPs that focus on soil health, nutrient management and reducing erosion on cropland will be critical to achieve the nutrient reduction goals associated with cropland in the revised project area. Where grasslands tend to dominate in the watershed, E. coli numbers and TSS seem to rise. This likely correlates to the higher number of Animal Feeding Operations (AFOs) in the area as well as more livestock within ~~elose-proxclose~~ [imityproximity](#) of the riparian corridor. Educational programs and BMPs that assist in implementing planned grazing systems and manure management systems (full and partial containment) will be necessary to restore the beneficial uses in these areas.

Historically, there has been high ~~interest~~ in BMPs such as: Pasture/Hay land Plantings, Water Developments, Cross-Fencing, Rotational Grazing, and Cover Crops. Morton County Soil Conservation ~~has plans initiated to initiate~~ a survey to evaluate current interest [of 319 projects](#). This will be sent out to landowners and operators in the project area in accordance with Objective 4: Task 7. The Morton County Soil Conservation District office has also had a positive working relationship with some producers in the project area and word-of-mouth is expected to keep interest high in the Big Muddy Watershed.

Water quality data used to complete the Big Muddy Water Quality Assessment Report and describe trends in Big Muddy Creek were collected from sites 385587, 385588, 380065, 385565, and 385078. The data indicates elevated E. coli bacteria concentrations throughout the watershed. All monitoring sites had geometric mean concentrations of E. coli bacteria above the

state water quality standard 126 CFU/100 ml. Also, all five sites exceeded the second criteria for the state water quality standard for E. coli bacteria where more than 10% of the samples exceeded 409 CFU/100 mL. Based on the assessment data, all sites on Big Muddy Creek were not supporting recreational uses due to elevated E. coli bacteria levels. In addition, mean annual concentrations for total nitrogen (i.e., 1.74 mg/l) were typically higher at the “headwaters” site 385587. Mean annual total phosphorous concentrations were also particularly high (i.e., 0.51 mg/l) at site 385587. Below the “headwaters” sampling site, mean annual Total Suspended Solids (TSS) concentrations continued to increase at each of the downstream sampling sites. Sampling sites 385588, 380065, 385565, and 385078 consistently had mean annual TSS concentrations greater than 30 mg/L, which may negatively affect aquatic life.

Average annual concentrations for TN ranged from a low of 0.81 mg/L at site 385565 to a high of 1.74 mg/L at site 385587 ([Appendix 1](#); Figure 7). Average annual TP concentrations showed very little temporal variation at most sites, however there appeared to be elevated levels of TP at site 385587 ([Appendix 1](#); Figure 6). Analysis of the data shows concentrations of TP and TN are highest at the furthest site upstream ([Appendix 1](#); Figures 6, 7 and Table 5). TSS concentrations increase from upstream to downstream ([Appendix 1](#); Figure 5 and Table 5). Site 385078 had the highest TSS average concentration at 43.96 mg/L. The highest concentrations of TN, TP, and TSS were correlated with peak flows and runoff events ([Appendix 1](#); Figures 5, 6, 7 and Table 5).

The Big Muddy Water Quality Assessment Report is available by request through either the ND Department of Environmental Quality or Morton County Soil Conservation District

Potential point sources in the Big Muddy Creek watershed include the city of Glen Ullin and Almont. As of 2020, Glen Ullin has a population is about 716 people and Almont has approximately 132 residents. Discharges from the wastewater treatment systems for both communities are infrequent (i.e., every 5-10 years) and enter directly into the Big Muddy Creek. No permit compliance violations have been recorded for either system. As such, the wastewater systems are not considered significant nutrient and/or E. coli bacteria sources in the watershed.

Information provided by the NDDEQ NDPDES personnel indicates there are two permitted point sources in the Hailstone Creek watershed. The city of New Salem has a permit for their wastewater lagoons to discharge into Cut Bank Creek, which flows into Sims Creek. New Salem had typically discharged approximately three times a year in late fall (Oct-Nov) but has not discharged since 2014. The lagoon system is therefore not considered a significant point source. The North Dakota Department of Transportation also has a discharge permit for a rest area along I-94 for discharges into Hailstone Creek. In the history of the permit, it has only discharged once in 2002 and nothing since then, so it is also not considered a significant source.

A Total Maximum Daily Load (TMDL) report that addresses the aquatic life and recreation impairments caused by low dissolved oxygen and nutrient/eutrophication/biological indicators was approved, in May 2017, for Danzig Dam. This TMDL report is still [active](#), and the Alternative Plan notes are available for reference as seen below.

The Danzig Dam TMDL is available on the ND Department of Environmental Quality website under TMDL by selecting the Danzig Dam under Lower Missouri River Basin

The Hailstone/Sims Creek Alternative Plan is available on the ND Department of Environmental Quality website under Alternative Plan by selecting the Danzig Dam under Lower Missouri River Basin

3.0 PROJECT DESCRIPTION

3.1 GOAL: The primary goal is to improve aquatic life and recreational uses of the creek. This will be accomplished by promoting and implementing BMP that are effective at reducing in-stream concentrations of total suspended solid (TSS) and E. coli bacteria. The state standard for E. coli is a geometric mean of 126 CFU/100 ml for a 30-day period with less than 10% of samples exceeding 409 CFU/100 ml. As a secondary goal the project will also reduce mean annual nitrogen and phosphorous to meet state ~~guidelines standards~~ at STORET site 385078. The state ~~guidelines standard~~ for total Nitrogen is 0.886 mg/L and total phosphorus is 0.07 mg/L.

The reduction of nutrients and sediment will be accomplished through implementing nutrient management plans, reducing erosion and runoff from cropland, addressing the need for stabilizing & revegetating riparian areas, improving soil health by implementing conservation measures that are deemed beneficial to improve water quality. The reduction of E. coli will be accomplished through the implementation of upland and riparian planned grazing systems, full and partial manure management systems and educational programs focusing on the proper handling of animal manure.

Objective 1: Provide direct planning assistance to agricultural producers to assist them with the implementation of BMPs that reduce the transport of TSS, TN, TP, and/or ~~E. coli~~ E. coli bacteria from their land to the creek and its tributaries.

Task 1: Employ one full-time project coordinator and staff to implement the tasks in this project and develop plans for future priority initiatives addressing NPS pollution concerns in the county.

Product: One full-time project coordinator and staff focused on project development and implementation.

Cost: \$241,125

Objective 2: Reduce the mean annual concentrations of total nitrogen and phosphorus at the uppermost monitoring site 385587 on Big Muddy Creek to ~~.886+01~~ mg/l and ~~0.0714~~ mg/l [SGV2], respectively. The target concentrations are based on the draft Index for Biological Integrity moderately disturbed threshold values for Western ND.

Task 2: Work with producers in the upper reaches of Big Muddy Creek watershed to develop conservation plans on 4,000 acres of cropland and implement BMPs such as cover crops, filter strips, grassed waterways, and nutrient management to improve nutrient-use efficiency and/or reduce nutrient movement from cropland.

Product: Conservation plans on 4,000 acres of cropland with associated BMPs

Cost: \$135,000

Objective 3: Reduce E. coli bacteria concentrations to state standard levels and reduce the mean annual concentration of total suspended solids (TSS) at the lowest monitoring site 385078 [SGV3] to 23 mg/l. The project is addressing aquatic life as the beneficial use associated with this objective. Data collected at this monitoring site (385078 [LEJ4]) will evaluate overall watershed-wide progress and

accomplishments. The sites upstream will be used to gauge localized changes and spatial trends in the creek. The target TSS concentration is based on the draft Index for Biological Integrity moderately disturbed threshold values for Western ND.

Task 3: Partner with NRCS and EQIP to design and install 1 full containment manure management systems for 1 high priority livestock feeding operation in the project area.

Product: 1 full containment manure management system.

Cost: \$450,000 in NRCS funding

Task 4: Develop manure management plans and install the appropriate structural practices to complete partial containment systems for 5 AFO's within [20 mile radius of the waterbody will be of top priority the project area.](#) [LEJ5]

Product: 5 partial manure management systems with associated manure management plans.

Cost: \$105,000

Task 5: Work with livestock producers to develop planned grazing systems and/or install vegetative buffers, riparian easements and any other practices that will positively impact water quality throughout the watershed. Coordinate with programs such as EQIP and/or state funded grassland improvement projects, to supplement funding needed.

Product: Planned grazing systems (with associated conservation plans) impacting 5,000 grassland acres.

Cost: \$180,000

Objective 4: Increase information and education on the impacts and solutions to reduce/prevent the delivery of pollutants to surface waters.

Task 6: Coordinate with organizations/agencies, such as NDSU Extension Service Manure Management Specialists and NRCS Specialists, to conduct at least 4 workshops addressing manure management, soil health, soil salinity, range management, cover crops, and/or riparian management.

Product: At least 4 informational workshops. Costs include [staff] [SGV6] ([not including Watershed Coordinators time](#)) [Morton County Soil Conservation District's District Technician, District Clerk, and](#) volunteer time [which would be tracked as in-kind match](#), advertisement, rent for meeting spaces, materials, speaker fees, and transportation.

Cost: \$6,000

Task 7: Utilize radio, newspaper articles, direct mailings, surveys, quarterly newsletter inserts, one-on-one contacts, etc. to disseminate information on conservation and management options using BMP's that can be used to improve water quality in the priority watersheds.

Product: At least 4 news articles/year or 4 quarterly newsletter inserts/year, and 2 direct mailings, one on one contacts with producers. Costs will include materials, postage, and fees.

Cost: \$4,500

Task 8: Work with Morton County schools in educating their students about water quality issues.

Product: Organize an annual Water Festival for 5th graders of Morton County and the surrounding area. [Waterfest](#) ~~Water fest~~ impacts about 225 students annually. Students will learn about the characteristics, properties, and importance of water through several interactive demonstrations. Costs include meeting space rental, chaperones, speakers, and materials.

Cost: \$6,000

Task 9: Establish Saline Soil Demonstration Areas to provide education to agricultural producers on alternative methods including salt tolerant cover crops, salt tolerant crop rotation, and perennial grasses to manage these areas.

Product: A continuing saline soil management program from the current watershed project with no more than 2 sites in the project area. Project will demonstrate alternative management including salt tolerant cover crops and perennial grass cover. Management will reduce the contribution of nutrients and sediment load by reducing fertilizer use and improving cover on sensitive areas. An annual educational tour of selected sites will be held to discuss the management and outcome. Costs will include seed, fuel, labor, and equipment use.

Costs: \$10,000

3.3 **Milestone Table:** See Appendix #3.

3.4 **Permits:** All necessary permits will be acquired. These may include CWA (Clean Water Act) Section 404 permits. The State Historic Preservation Office will be consulted regarding potential impacts to cultural resources associated with BMP implementation. Project sponsors will work with NDDEQ to determine if National Pollution Elimination System permits are needed for the proposed livestock systems.

3.5 **Lead Sponsor:** The Morton County Soil Conservation District is the appropriate entity to coordinate and implement this project. The SCD is a locally elected volunteer conservation organization that serves all the people in the county. They are able to employ the necessary personnel to carry out the project, as well as manage the funds involved.

3.6 **Operation and Maintenance:** The Morton County SCD will be responsible for auditing Operation & Maintenance Agreements (O&M) on BMP²s after completion through yearly status reviews of EPA-319 contracts. The lifespan of each BMP will be listed in the individual contracts to ensure longevity of the practices. The producer signs the “EPA 319 Funding Agreement Provisions” form which explains in detail the consequences of destroying a BMP before the completion of its lifespan.

4.0 COORDINATION PLAN

4.1 Identify Agency Roles:

- 1) The Morton County SCD will be the lead agency liable for project administration, conservation planning, technical assistance, educational campaign, clerical assistance, access to equipment and supplies, and annual financial support. The Watershed Coordinator will serve as a liaison between watershed projects/producers and USDA program participation.
- 2) USDA Natural Resources Conservation Service (NRCS) will provide technical assistance by coordinating project activities, facilitating local involvement, providing technical support, and participating in educational outreach programs during the project. NRCS will also provide cost-share assistance through the USDA conservation programs. Staff will incorporate existing USDA programs (financial and technical) and target resources to enhance efforts within the watershed. Existing office space and office equipment use will be made available to the project. An annual review will be conducted with the Field Office, District Conservationist, and the SCD to reaffirm and acknowledge NRCS's commitment to the project.
- 3) The NDDEQ will administer the Section 319 funding allocations and agreements with the Morton County SCD. Technical assistance will be provided for the development of the necessary quality assurance project plans for the watershed assessment projects and the appropriate training will be provided for the proper water quality sample collection, preservation, and transportation. The NDDEQ will also provide analytical support for water quality samples collected by the project.
- 4) North Dakota Extension Service (EXT) will assist in project information and education activities. These activities will pertain to such topics as specific BMP publications and assistance with workshops and tours. The Extension Service Specialists will also be asked to assist with tours and demonstrations.
- 5) North Dakota Game & Fish Department and US Fish & Wildlife Service will provide technical and financial assistance, as needed.
- 6) Morton County Water Resource District – Share common water quality goals and concerns. Technical and financial support will be requested from the Morton County WRD, when needed.
- 7) The NPS BMP Team is a ready source for engineering services to producers installing manure management systems, streambank stabilization projects, or other structural BMP. These services are supported through another NPS projects and provided at no cost to the producers or watershed project.
- 8) Other potential partners include the County Commission, Stockmen's Association, Burleigh County Soil Conservation District, Oliver County Soil Conservation District, and USDA Northern Great Plains Research Laboratory

- 4.2 **Local support:** Morton County Soil Conservation plans to initiate a survey to evaluate current interest. This will be sent out to landowners and operators in the project area. A good working relationship has been established with many producers in the current Big Muddy Creek project area. These relationships have been built through involvement in NRCS programs, the OMG Grassland Improvement Project and/or one-on-one contact from technical assistance inquiries.
- 4.3 **Coordination:** The Morton County SCD will continue to work closely with the local NRCS field offices to ensure that funds from programs such as EQIP can be used with, or in lieu of, 319 funds, for relevant projects. The project sponsors will also continue to work with other agencies (ND Stockman's, Oliver, and Burleigh County SCD, etc.) to put on information/education events.
- 4.4 **Similar Activities:** The Morton County SCD routinely consults with the North Dakota Stockmen's Association's Environmental Services Program, and the North Dakota Department of Agriculture's Livestock Pollution Prevention Program (LP3) when interest for manure management systems arises. Duplication of effort is often avoided through daily communication with the local NRCS personnel, as well as contacting agencies such as the ND Natural Resources Trust, Oliver County SCD/NRCS and ND Game and Fish when the proper project(s) presents itself. These methods should continue to ensure there is no duplication of efforts.

5.0 EVALUATION AND MONITORING PLAN

The "assessment phase" Sampling and Analysis Plan (SAP) will be updated by the ND Department Environmental Quality to cover the entire project period for the Big Muddy watershed project. Data collection under the revised SAP will be initiated in the spring of 2023.

6.0 BUDGET

See Appendix #2

7.0 PUBLIC INVOLVEMENT

As previously mentioned, educational and informational meetings will continue to be conducted to keep the public informed. Newsletters are published quarterly, and the Morton County SCD's website is updated on a regular basis with any pertinent information. Morton County also maintains several social media accounts which will be utilized to disperse information regarding the program. The project will make use of advertisements in local newspapers to spread word of the project and host informational meetings to recruit interested parties.

Big Muddy Creek Project Implementation Plan

Appendix List

- 1. Morton County Maps, Tables, and Figures**
- 2. Budget Tables**
- 3. Milestone Table**

Appendix #1

Morton County Maps, Tables, and Figures

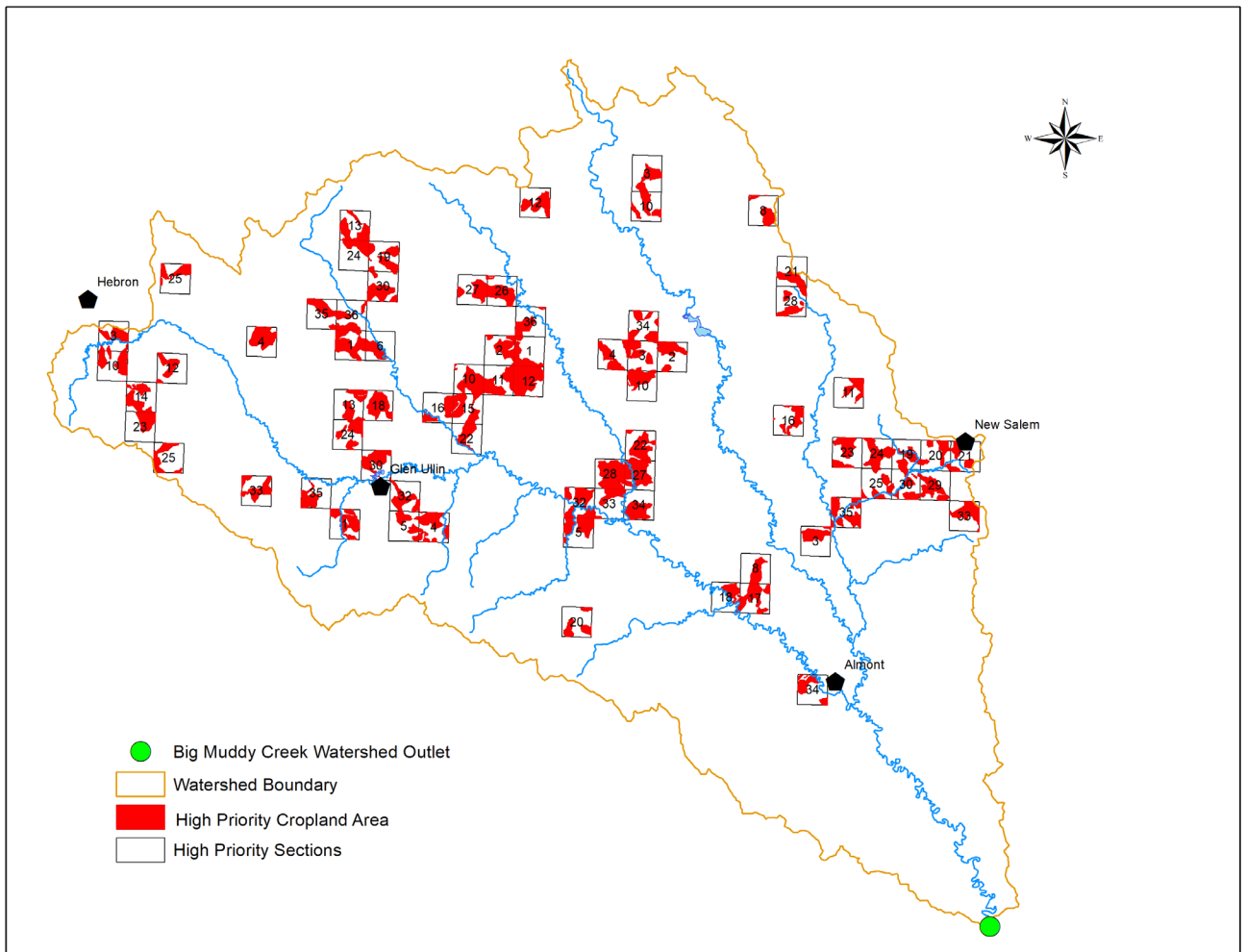


Figure 1. AnnAGNPS Big Muddy High Priority Cropland Areas

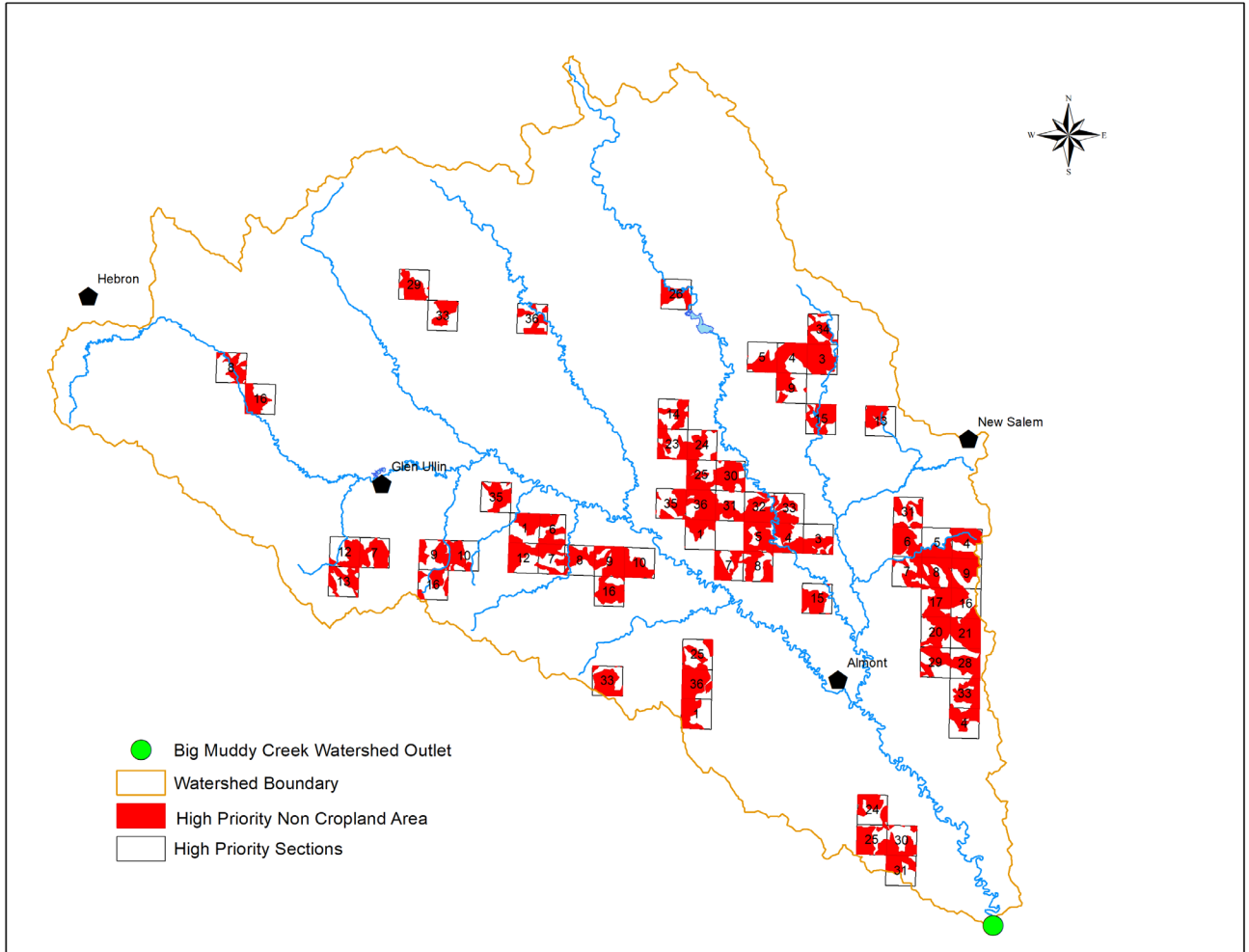


Figure 2. AnnAGNPS Big Muddy High Priority Non-Cropland Areas

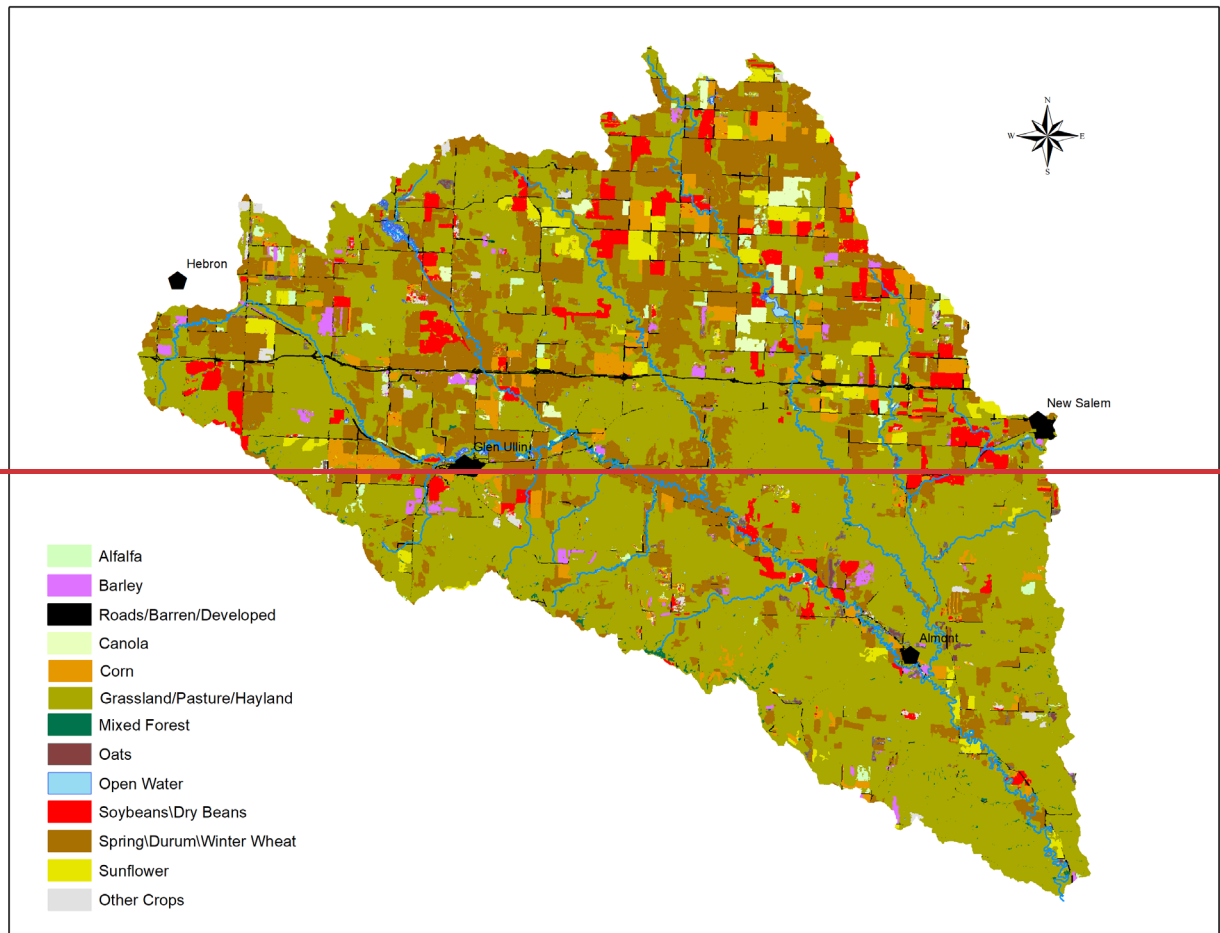


Figure 3. Land Usage in the Big Muddy Creek Watershed

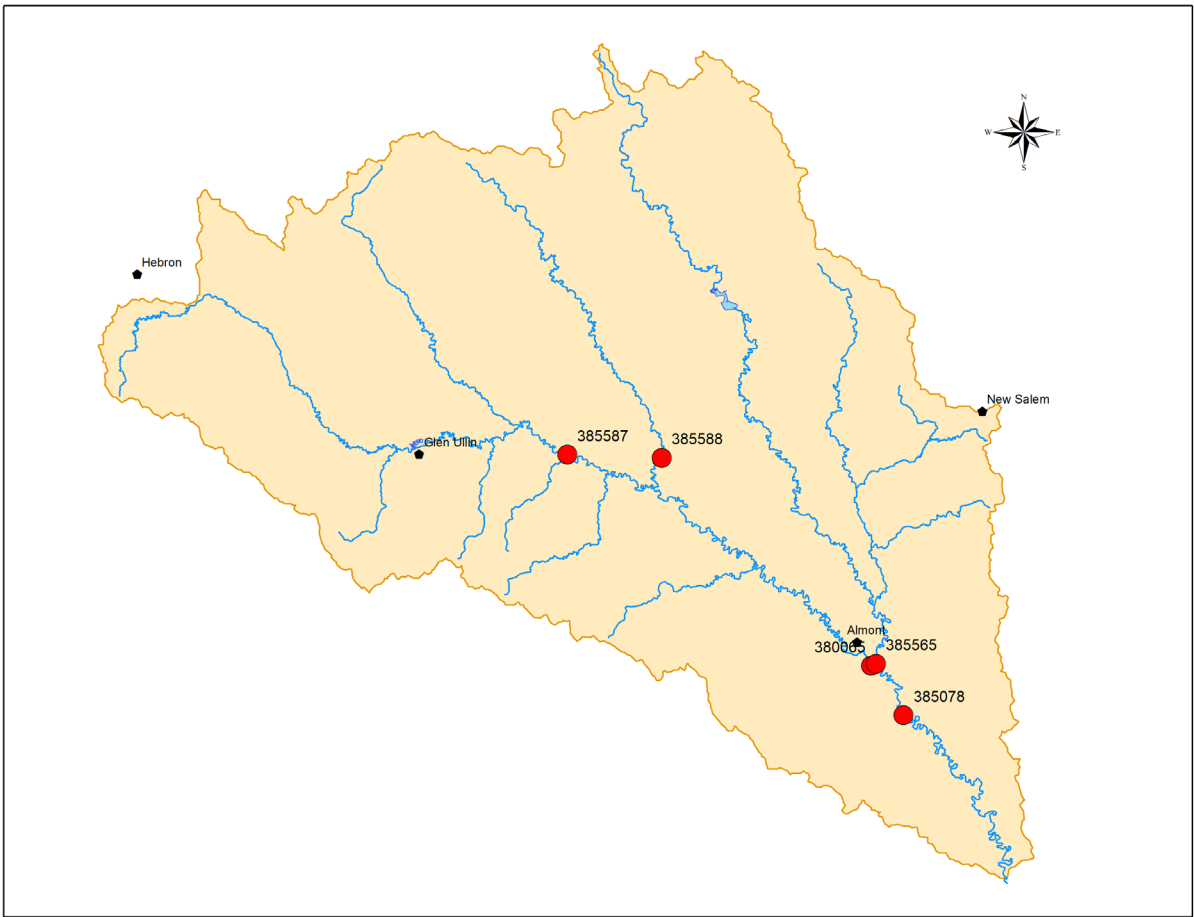


Figure 4. Water Quality Monitoring Locations in the Big Muddy Creek Watershed

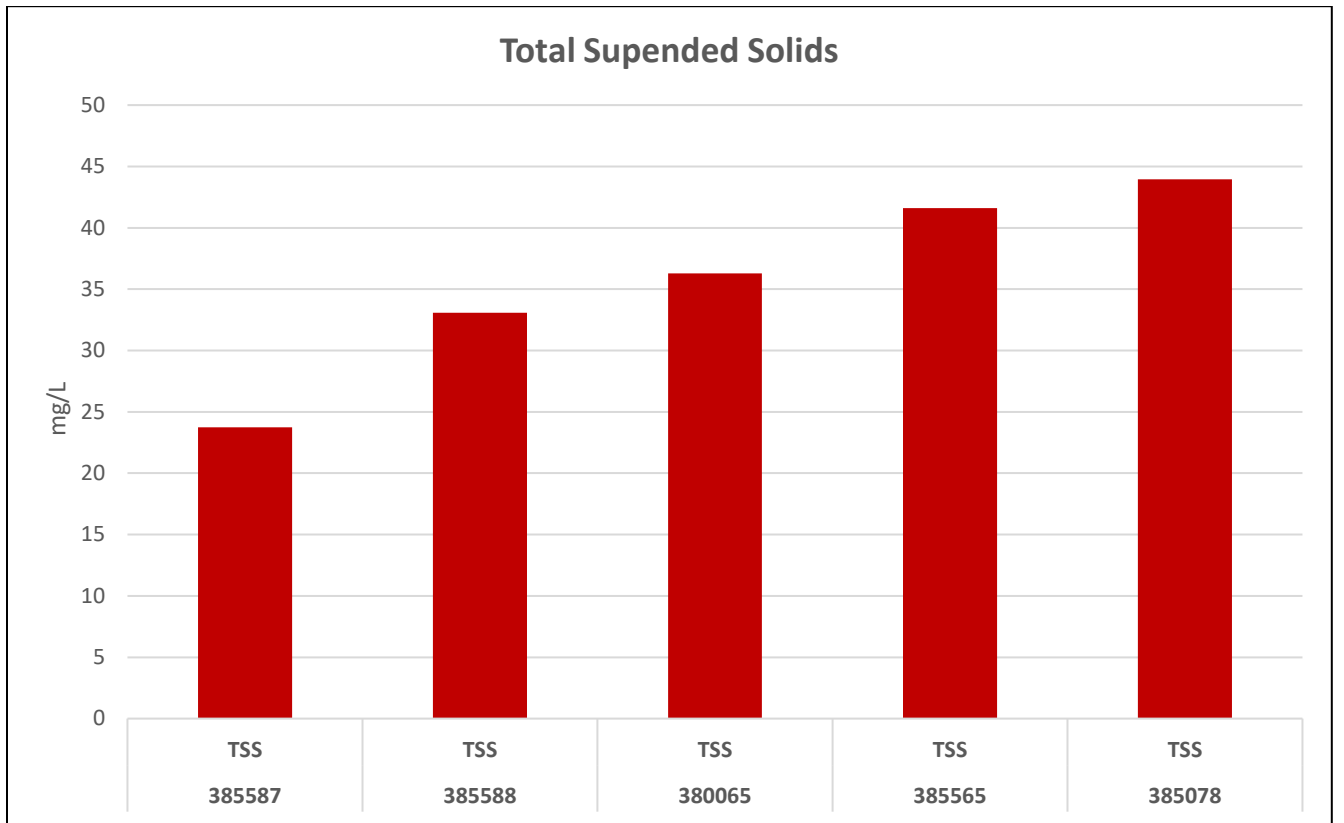


Figure 5. Total Suspended Solids by STORET Site ID

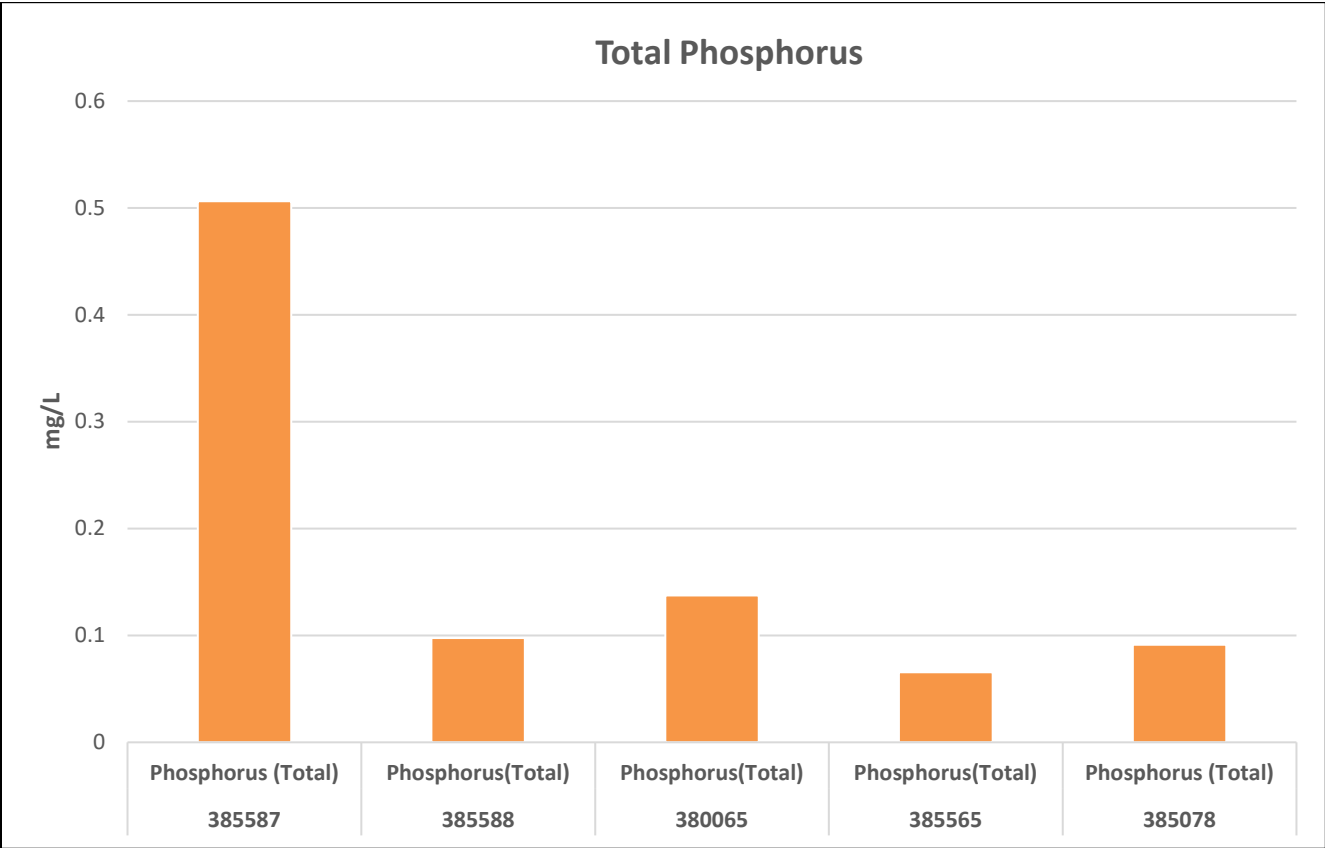


Figure 6. Total Phosphorous by STORET Site ID

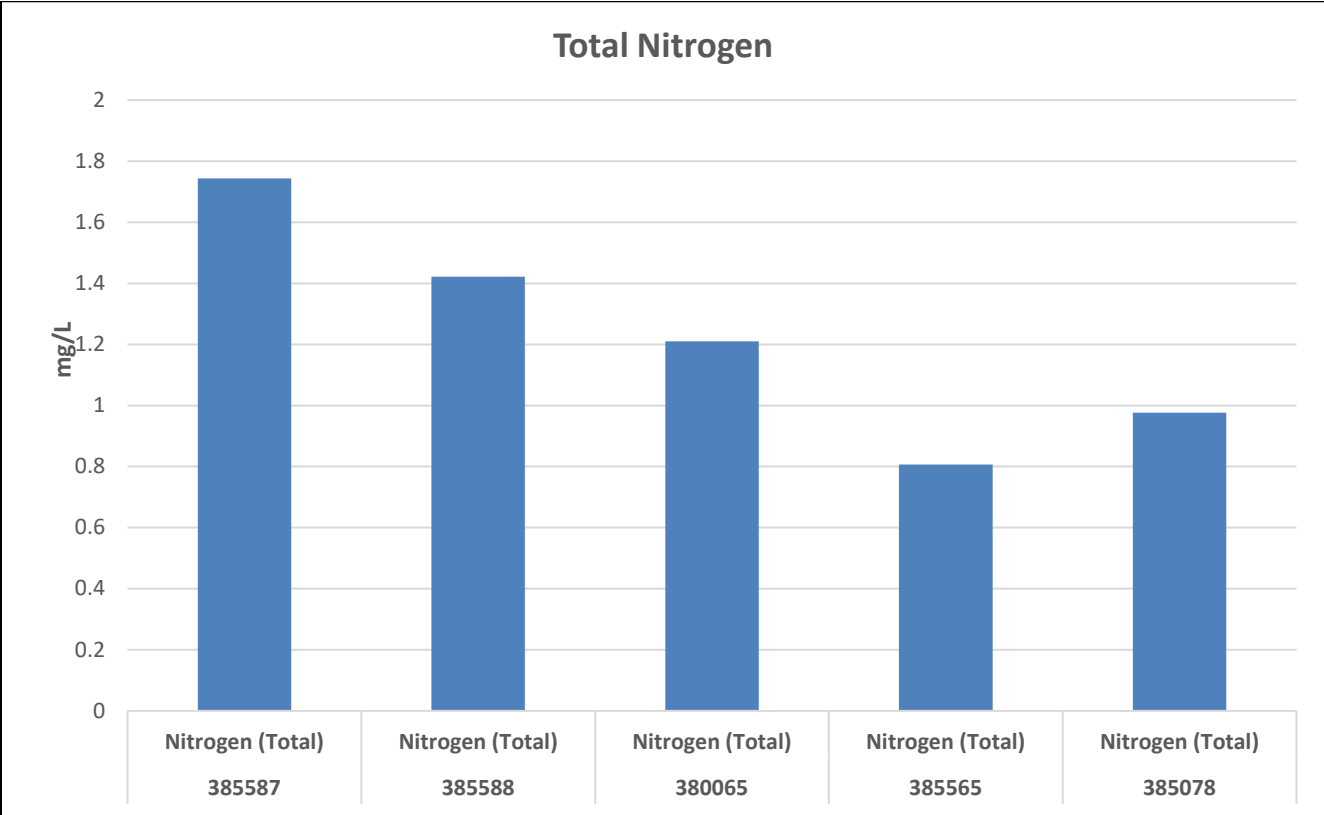


Figure 7. Total Nitrogen by STORET Site ID

Table 1. Summary of E. coli Bacteria Data Calculated at Site 385587

385587										
	May		June		July		August		September	
	5/5/2016	30	6/1/2015	120	7/6/2015	80	8/3/2015	180	9/8/2015	50
	5/10/2016	140	6/3/2015	8000	7/8/2015	290	8/5/2015	3300	9/6/2016	30
	5/16/2016	30	6/8/2015	580	7/13/2015	110	8/10/2015	60	9/12/2016	50
	5/17/2016	60	6/10/2015	140	7/22/2015	60	8/19/2015	190	9/19/2016	70
	5/26/2016	140	6/15/2015	230	7/27/2015	270	8/24/2015	230	9/22/2016	30
	5/31/2016	770	6/18/2015	1200	7/28/2015	60	8/26/2015	120	9/27/2016	40
	5/4/2017	60	6/22/2015	8000	7/5/2016	3500	8/31/2015	40	9/7/2017	300
	5/9/2017	50	6/24/2015	310	7/11/2016	970	8/2/2016	80	9/12/2017	10
	5/17/2017	50	6/29/2015	190	7/18/2016	250	8/8/2016	100	9/21/2017	10
	5/22/2017	30	6/6/2016	180	7/26/2016	80	8/15/2016	20		
	5/30/2017	100	6/13/2016	330	7/5/2017	800	8/17/2016	70		
	5/2/2018	10	6/20/2016	2000	7/10/2017	150	8/22/2016	800		
	5/8/2018	63	6/22/2016	1300	7/5/2018	760	8/30/2016	30		
	5/15/2018	41	6/27/2016	1000	7/9/2018	570	8/3/2017	460		
			6/5/2017	30	7/17/2018	200	8/9/2017	60		
			6/13/2017	840	7/23/2018	52	8/14/2017	50		
			6/22/2017	110			8/16/2017	1300		
			6/29/2017	350			8/24/2017	30		
			6/11/2018	910			8/28/2017	10		
			6/25/2018	8000						
# of Samples	14		20		16		19		9	
Geo Mean	61		597		236		113		39	
% Over 409	7%		50%		31%		21%		0%	
Status	FS		NS		NS		FST		FS	

Table 2. Summary of E. coli Bacteria Data Calculated at Site 385588

385588										
	May		June		July		August		September	
	5/5/2016	20	6/1/2015	320	7/6/2015	390	8/3/2015	3000	9/8/2015	330
	5/10/2016	250	6/3/2015	2700	7/8/2015	100	8/5/2015	3400	9/14/2015	80
	5/16/2016	180	6/8/2015	570	7/13/2015	120	8/10/2015	2100	9/21/2015	360
	5/17/2016	130	6/10/2015	560	7/22/2015	1500	8/19/2015	600	9/23/2015	440
	5/26/2016	490	6/15/2015	420	7/27/2015	600	8/24/2015	1200	9/30/2015	350
	5/31/2016	900	6/18/2015	1300	7/28/2015	3500	8/26/2015	1300	9/6/2016	2900
	5/4/2017	40	6/22/2015	3700	7/5/2016	300	8/31/2015	2400	9/12/2016	1200
	5/9/2017	150	6/24/2015	380	7/11/2016	870	8/2/2016	430	9/19/2016	1000
	5/17/2017	100	6/29/2015	340	7/18/2016	70	8/8/2016	590	9/22/2016	1100
	5/22/2017	20	6/6/2016	1400	7/26/2016	620	8/15/2016	3700	9/12/2017	830
	5/30/2017	2500	6/13/2016	1000	7/5/2018	240	8/17/2016	630	9/21/2017	6000
	5/2/2018	10	6/20/2016	200	7/9/2018	10	8/27/2018	960	9/18/2018	520
	5/8/2018	31	6/22/2016	240	7/17/2018	880			9/24/2018	400
	5/15/2018	85	6/27/2016	280						
			6/5/2017	8000						
			6/13/2017	3700						
			6/11/2018	1500						
			6/25/2018	430						
# of Samples	14		18		13		12		13	
Geo Mean	111		359		319		1317		673	
% Over 409	21%		67%		46%		100%		62%	
Status	FST		NS		NS		NS		NS	

Table 3. Summary of E. coli Bacteria Data Calculated at Site 380065

380065										
	May		June		July		August		September	
	5/5/2016	50	6/1/2015	240	7/6/2015	450	8/3/2015	40	9/8/2015	20
	5/10/2016	40	6/3/2015	430	7/8/2015	400	8/5/2015	1200	9/14/2015	10
	5/16/2016	60	6/8/2015	160	7/13/2015	210	8/10/2015	100	9/21/2015	40
	5/17/2016	160	6/10/2015	220	7/22/2015	80	8/19/2015	60	9/23/2015	10
	5/26/2016	680	6/15/2015	90	7/27/2015	90	8/24/2015	240	9/30/2015	10
	5/31/2016	580	6/18/2015	520	7/28/2015	100	8/26/2015	80	9/6/2016	150
	5/4/2017	460	6/22/2015	1200	7/5/2016	260	8/31/2015	50	9/12/2016	250
	5/9/2017	240	6/24/2015	490	7/11/2016	730	8/2/2016	220	9/19/2016	320
	5/17/2017	430	6/29/2015	1200	7/18/2016	80	8/8/2016	40	9/22/2016	520
	5/22/2017	240	6/6/2016	300	7/26/2016	170	8/15/2016	40	9/27/2016	50
	5/30/2017	60	6/13/2016	90	7/5/2017	180	8/17/2016	40	9/7/2017	400
	5/2/2018	41	6/20/2016	550	7/10/2017	230	8/22/2016	200	9/12/2017	20
	5/8/2018	63	6/22/2016	760	7/24/2017	40	8/30/2016	30	9/21/2017	30
	5/15/2018	63	6/27/2016	360	7/5/2018	1400	8/3/2017	290	9/11/2018	84
			6/5/2017	190	7/9/2018	120	8/9/2017	40	9/18/2018	10
			6/13/2017	750	7/17/2018	280	8/14/2017	450	9/24/2018	110
			6/22/2017	160	7/23/2018	110	8/16/2017	950		
			6/29/2017	180			8/24/2017	90		
			6/11/2018	390			8/28/2017	50		
			6/25/2018	400			8/7/2018	63		
							8/15/2018	41		
							8/21/2018	130		
							8/27/2018	41		
# of Samples	14		20		17		23		16	
Geo Mean	137		335		191		99		54	
% Over 409	29%		35%		18%		13%		6%	
Status	NS		NS		NS		FST		FS	

Table 4. Summary of E. coli Bacteria Data Calculated at Site 385565

385565										
	May		June		July		August		September	
	5/5/2016	60	6/1/2015	80	7/6/2015	300	8/3/2015	110	9/8/2015	50
	5/10/2016	40	6/3/2015	8000	7/8/2015	220	8/5/2015	400	9/14/2015	10
	5/16/2016	40	6/8/2015	2100	7/13/2015	300	8/10/2015	80	9/21/2015	50
	5/17/2016	60	6/10/2015	900	7/22/2015	120	8/19/2015	60	9/23/2015	60
	5/26/2016	790	6/15/2015	410	7/27/2015	340	8/20/2015	290	9/30/2015	20
	5/31/2016	320	6/18/2015	1100	7/28/2015	140	8/26/2015	160	9/6/2016	170
	5/4/2017	70	6/22/2015	8000	7/5/2016	1500	8/31/2015	110	9/12/2016	40
	5/9/2017	30	6/24/2015	340	7/11/2016	1400	8/2/2016	130	9/19/2016	70
	5/17/2017	70	6/29/2015	220	7/18/2016	140	8/8/2016	90	9/22/2016	110
	5/22/2017	120	6/6/2016	410	7/26/2016	100	8/15/2016	160	9/27/2016	170
	5/30/2017	10	6/13/2016	140	7/5/2017	160	8/17/2016	190	9/7/2017	110
	5/2/2018	20	6/20/2016	580	7/10/2017	110	8/22/2016	800	9/12/2017	10
	5/8/2018	31	6/22/2016	1100	7/24/2017	150	8/30/2016	270	9/21/2017	10
	5/15/2018	74	6/27/2016	2300	7/9/2018	260	8/3/2017	180	9/11/2018	41
			6/5/2017	250	7/17/2018	200	8/9/2017	10	9/18/2018	31
			6/13/2017	580	7/23/2018	110	8/14/2017	900	9/24/2018	20
			6/22/2017	270			8/16/2017	1100		
			6/29/2017	350			8/24/2017	70		
			6/11/2018	1400			8/28/2017	10		
			6/25/2018	1600			8/7/2018	200		
							8/15/2018	10		
							8/21/2018	74		
							8/27/2018	150		
# of Samples	14		20		16		23		16	
Geo Mean	62		702		227		127		41	
% Over 409	7%		65%		13%		13%		0%	
Status	FS		NS		NS		NS		FS	

Table 5. Summary of Descriptive Statistics for Nutrients Calculated at Each Site

2015-2018					
	385587	385588	380065	385565	385078
#Samples	96	90	118	118	118
Total Nitrogen (mg/L)					
Mean	1.74	1.42	1.21	0.81	0.98
Maximum	4.6	3.49	3.25	2.13	2.47
Median	1.65	1.37	1.11	0.71	0.86
Total Phosphorus (mg/L)					
Mean	0.51	0.10	0.14	0.07	0.09
Maximum	1.13	0.66	0.61	0.92	0.68
Median	0.51	0.08	0.1	0.04	0.06
Total Suspended Solids (mg/L)					
Mean	23.74	33.09	36.28	41.61	43.96
Maximum	340	652	236	1010	730
Median	12	13	28	19	28

Table 6. Guideline Concentrations

Nitrogen	Phosphorus	TSS
0.886	0.07	30-day average: 90 Daily maximum: 158 _[SGV7]

Appendix #2
Budget Tables

Big Muddy Creek Watershed Project									
Budget Table-Part 1									
Part 1: FUNDING SOURCES	2024	2025	2026	2027	TOTAL	2027	TOTAL		
Part 1: FUNDING SOURCES	August of 2024	August of 2025	2026	2027	TOTAL	2027	TOTAL		
EPA SECTION 319 FUNDS	EPA SECTION 319 FUNDS								
1) FY2023 FUNDS	\$87,450.00	\$87,450.00	\$97,050.00	\$97,650.00	\$98,250.00	\$97,650.00	\$98,250.00	\$417,975.00	\$417,975.00
Subtotal	\$87,450.00	\$87,450.00	\$97,050.00	\$97,650.00	\$98,250.00	\$97,650.00	\$98,250.00	\$417,975.00	\$417,975.00
STATE/LOCAL MATCH	STATE/LOCAL MATCH								
1) Landowner 40% Cash Match	\$14,000.00	\$34,000.00	\$40,000.00	\$40,000.00	\$40,000.00	\$40,000.00	\$40,000.00	\$168,000.00	\$168,000.00
2) Local SCD Match (FA)	\$11,050.00	\$24,300.00	\$22,700.00	\$25,100.00	\$24,750.00	\$25,200.00	\$25,500.00	\$110,650.00	\$110,650.00
Subtotal	\$25,050.00	\$58,300.00	\$62,700.00	\$65,100.00	\$64,750.00	\$65,200.00	\$65,500.00	\$278,650.00	\$278,650.00
OTHER FEDERAL FUNDS	OTHER FEDERAL FUNDS								
1) NRCS (TA & FA)	\$50,000.00	\$50,000.00	\$50,000.00	\$50,000.00	\$50,000.00	\$50,000.00	\$50,000.00	\$700,000.00	\$700,000.00
TOTAL	\$112,625.00	\$195,750.00	\$661,750.00	\$212,750.00	\$212,750.00	\$212,750.00	\$213,750.00	\$1,396,625.00	\$1,396,625.00

[SGV9]*Includes match from both State and Local sources

**Eligible BMPs include but are not limited to, livestock fencing, wells, pipeline, tanks, septic systems, dikes, diversions, nutrient management, windbreak panels, cover crop, grassed waterways, riparian easements, rural water taps, winterized tanks, holding ponds.

\$450,000 in cost-share for full containment systems is planned to be funded through EQIP.

PART 2- Funding Big Muddy Creek Project Implementation Plan								
Section 319/Non-federal Budget								
	August of 2023	2024	2025	2026	2027	TOTAL	CASH/INKIND*	319
						COSTS	MATCH	FUNDS
PERSONNEL/SUPPORT								
1) Salary/Fringe (75% of time)	\$22,500.0	\$45,000.0	\$46,000.0	\$47,000.0	\$48,000.0	\$208,500.0	\$83,400.0	\$125,100.0
2) Travel	\$2,500.0	\$5,000.0	\$5,000.0	\$5,000.0	\$5,000.0	\$22,500.0	\$9,000.0	\$13,500.0
3) Equipment/Supplies	\$500.0	\$1,000.0	\$1,000.0	\$1,000.0	\$1,000.0	\$4,500.0	\$1,800.0	\$2,700.0
4) Training	\$375.0	\$750.0	\$750.0	\$750.0	\$750.0	\$3,375.0	\$1,350.0	\$2,025.0
5) Telephone/Postage	\$250.0	\$500.0	\$500.0	\$500.0	\$500.0	\$2,250.0	\$900.0	\$1,350.0
<i>Subtotals</i>	<i>\$26,125.0</i>	<i>\$52,250.0</i>	<i>\$53,250.0</i>	<i>\$54,250.0</i>	<i>\$55,250.0</i>	<i>\$241,125.0</i>	<i>\$96,450.0</i>	<i>\$144,675.0</i>
APPLYING BMP'S***								
1) Full Containment Systems (Task 3)	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
2) Partial Containment Systems (Task 4)	\$0.0	\$15,000.0	\$30,000.0	\$30,000.0	\$30,000.0	\$105,000.0	\$42,000.0	\$63,000.0
3) Pasture and Range** (Task 5)	\$20,000.0	\$40,000.0	\$40,000.0	\$40,000.0	\$40,000.0	\$180,000.0	\$72,000.0	\$108,000.0
4) Cropland (Task 2)	\$15,000.0	\$30,000.0	\$30,000.0	\$30,000.0	\$30,000.0	\$135,000.0	\$54,000.0	\$81,000.0
<i>Subtotals</i>	<i>\$35,000.0</i>	<i>\$85,000.0</i>	<i>\$100,000.0</i>	<i>\$100,000.0</i>	<i>\$100,000.0</i>	<i>\$420,000.0</i>	<i>\$168,000.0</i>	<i>\$252,000.0</i>
INFORMATION/EDUCATION								
1) Tours/Workshops (Task 6)	\$0.0	\$1,500.0	\$1,500.0	\$1,500.0	\$1,500.0	\$6,000.0	\$2,400.0	\$3,600.0
2) Newsletter (Task 7)	\$500.0	\$1,000.0	\$1,000.0	\$1,000.0	\$1,000.0	\$4,500.0	\$1,800.0	\$2,700.0
3) Water Festival (Task 8)	\$0.0	\$1,500.0	\$1,500.0	\$1,500.0	\$1,500.0	\$6,000.0	\$2,400.0	\$3,600.0
4) Saline Soil Demonstration (Task 9)	\$0.0	\$2,500.0	\$2,500.0	\$2,500.0	\$2,500.0	\$10,000.0	\$4,000.0	\$6,000.0
<i>Subtotals</i>	<i>\$500.0</i>	<i>\$6,500.0</i>	<i>\$6,500.0</i>	<i>\$6,500.0</i>	<i>\$6,500.0</i>	<i>\$26,500.0</i>	<i>\$10,600.0</i>	<i>\$15,900.0</i>
ADMINISTRATIVE								
1) Secretary	\$500.0	\$1,000.0	\$1,000.0	\$1,000.0	\$1,000.0	\$4,500.0	\$1,800.0	\$2,700.0
2) SCD/Coordination Meetings	\$500.0	\$1,000.0	\$1,000.0	\$1,000.0	\$1,000.0	\$4,500.0	\$1,800.0	\$2,700.0
<i>Subtotals</i>	<i>\$1,000.0</i>	<i>\$2,000.0</i>	<i>\$2,000.0</i>	<i>\$2,000.0</i>	<i>\$2,000.0</i>	<i>\$9,000.0</i>	<i>\$3,600.0</i>	<i>\$5,400.0</i>
TOTAL 319/NON-FEDERAL BUDGET	\$62,625.0	\$145,750.0	\$161,750.0	\$162,750.0	\$163,750.0	\$696,625.0	\$278,650.0	\$417,975.0

Appendix #3

Milestone Table

Milestone Table for the Big Muddy Creek Watershed Project

TASK/RESPONSIBLE ORGANIZATION	OUTPUT	QTY	2023				2023				2024				2025				2026			
			1-Aug				1-Oct				1-Oct				1-Oct				1-Oct			
Task 1 - Employ Coordinator - 3	Employee	1																				
Task 3 - Install 1 Livestock Manure Management Systems - 1, 2, 3	Manure System	1																				
Task 4 - Install 5 Partial Manure Management Systems - 1, 2, 3	Manure Systems	5																				
Task 5 - Develop and Install Planned Grazing Systems - 1, 2, 3	Grazing Systems	5,000 acres	500 acres impacted				1,250 acres impacted				1,250 acres impacted				1,000 acres impacted				1,000 acres impacted			
Task 2 - Develop Conservation Plans on Cropland - 1, 2, 3	Conservation Plans	4,000 acres	500 acres impacted				500 acres impacted				1,000 acres impacted				1,000 acres impacted				1,000 acres impacted			
Task 6 - Conduct I/E Events - 1, 2, 3, 4	Tours	4+																				
Task 7 - Send Educational Materials to Operators in the Watershed - 1, 2, 3	Mailings/ Newsletters	18	2 direct mailing				4 mailings				4 mailing				4 mailings				4 mailings			
Task 8 - Host Waterfest - 1, 3	Waterfest	4																				
Task 9 - Develop Saline Soil Demonstration Plots - 1, 2, 3	Site	1																				

- Group 1 - Natural Resources Conservation Service or similar partners - Provide technical assistance to plan, design, and implement BMPs
- Group 2 - Producers in Morton County - Make land management decisions and provide match (cash or in-kind) for BMP implementation
- Group 3 - Morton County SCD - Be responsible for overseeing the project coordination
- Group 4 - ND Department of Environmental Quality - Statewide Section 319 program management including oversight of 319 planning and expenditure
- Group 5 - Custer Health District - County Agency Responsible for Overseeing Proper Installation of Septic Systems