

Gully Erosion Reparation Project

Project Summary Sheet

PROJECT TITLE: **Gully Erosion Reparation Project**

NAME, ADDRESS, PHONE AND E-MAIL OF LEAD PROJECT SPONSOR/SUBGRANTEE:

Stutsman County Soil Conservation District

1301 Business Loop E

Jamestown, ND 58401

STATE CONTACT PERSON: **Greg Sandness**

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STATE: **North Dakota**

WATERSHED: **Stutsman County**

HYDROLOGIC UNIT CODE: **101600030502 and 101600020505**

HIGH PRIORITY WATERSHED (yes/no): **Yes**

PROJECT TYPE

WATERBODY TYPE

NPS CATEGORY

Watershed

Lakes/Reservoirs, Rivers

Agriculture

Streams, Wetlands

PROJECT LOCATION: **Stutsman County: 46.896155N 98.69025W**

SUMMARY OF MAJOR GOALS: **The primary goal of this project is to improve water quality on a localized (12 digit HUC) area. This will be accomplished by focusing on gully erosion best management practices primarily on cropland and secondly on rangeland in Moon Lake and Minneapolis Flats Creek 12 digit HUC areas.**

PROJECT DESCRIPTION: **The Gully Erosion Reparation Project aims to provide very site specific planning and BMP implementation to address field runoff erosion. Using the stream power index and eventually through PTMApp the Stutsman SCD will visit with producers on each identified site to provide erosion repair and a future management plan. This will occur on two 12 digit HUC areas in Stutsman County, Moon Lake (26,336 acres) and Minneapolis Flats Creek (46,917 acres).**

FY 2017 319 Funds Requested \$325,600

Match: \$217,067

Other Federal Funds: \$200,000

Total Project Cost: \$742,667

319 Funded Full Time Personnel: 0.7

2.0 STATEMENT OF NEED

- 2.1** Soil erosion, including gully erosion, is major land use and water quality concern in Stutsman County and North Dakota. Poorly managed cropland and rangeland can contain many erosional gullies especially in higher sloped locations with a higher stream power index. The stream power index is a measure of erosive power associated with flowing water based on the assumption that discharge is proportional to the specific catchment area. It predicts net erosion in areas of flow acceleration and convergence zones (Wilson and Lorang, 2000). LiDAR based Digital Elevation Modeling (DEM) is a high resolution data set (as small as one meter) which allows predictions of erosion without the need of lengthy volume calculations.

Currently, staff from the International Water Institute are developing a desktop toolbar, the Prioritize, Target and Measure Application (PTMApp). The PTMApp will allow users to generate advanced geospatial water quality data in order to prioritize resources and issues impacting them, target specific fields to place conservation practices and best management practices, and measure water quality improvement by tracking expected nutrient and sediment load reduction to priority resources. This application is projected to be available by the spring of 2017 for the entire James River Basin. PTMApp utilizes LiDAR based DEM data to quickly calculate and display different products such as the Stream Power Index. Essentially areas of water quality concern, such as gully erosion, can be quickly identified by SCD personnel and connections can be made with local producers to work on conservation planning.

As a first step toward this type of planning process two 12 digit Hydrologic Units, Moon Lake and Minneapolis Flats Creek are being used as demonstration sites for gully erosion projects. The projects involve utilizing some of these tools to identify erosion problems and work with producers to use best management practices in a very site specific manner. These watershed areas are ones which are known to have significant erosion sites on both cropland and rangeland, based on experience from SCD field staff.

- 2.2 Project Location:** Stutsman County (shown in Figure 1) is located in southeastern North Dakota and contains watershed areas of three main basins: the James River, the Sheyenne River, and the Apple Creek/Long Lake. The project area focuses on two 12 digit Hydrologic Units, Moon Lake and Minneapolis Flats Creek. The Moon Lake hydrologic unit is the headwaters area for Beaver Creek located entirely along the Missouri Couteau Escarpment adjacent and south of Interstate 94. The watershed size for Moon Lake is approximately 26,350 acres of which 19,000 ac. is cropland, 4,150 ac. is rangeland, and 3,200 ac. is other land uses. The Minneapolis Flats Creek hydrologic unit contains an entire tributary area to the Pipestem Creek. The area again includes mostly the Missouri Couteau Escarpment adjacent and north of Interstate 94. The watershed size for Minneapolis Flats Creek is approximately 47,000 acres of which 35,000 is cropland, 7,000 is rangeland, and 5,000 is other land uses. Both of these hydrologic units are located between Windsor, ND and Eldridge, ND, See Figures 1 – 3.

Major Land Resource Area (MLRA) is the Central Dark Brown Glaciated Plains (53B).

2.3 Maps

See Figures 1-3

2.4 General Information

Stutsman County has an area of approximately 2,298 square miles or approximately 1,470,720 acres. The topographic relief in Stutsman County is lower in the eastern side of the county with the Drift Prairie. The elevation is much lower with a low point of approximately 1,340 feet in the James River Valley in the southeastern part of the county. The western side of the county has much higher topographic relief in the Missouri Couteau and west of the Missouri Escarpment. This area has much higher elevation with the escarpment itself rising an average of 300 feet within a short distance. The highest point in Stutsman County is located northwest of Woodworth, in Section 10 of Gerber Township, with an elevation of approximately 2,140 feet.

The climate of Stutsman County is characterized as humid continental. Typically, it is warm to hot and often humid in the summer and has cold to sometimes severely cold winters. Mean average temperatures range from 70 degrees F in July (warmest month) to 9 degrees F in January (coldest month). On average there are about 136 frost free days in Stutsman County.

Precipitation mainly occurs in the summer months with the month of June averaging 3.46 inches of moisture for the highest total. Winter months are generally much drier with December averaging only 0.43 inches and February averaging 0.41 inches of moisture. The yearly average for snowfall from 1951 to 2010 is 39 inches. The average precipitation is approximately 19 inches annually.

Soils in Stutsman County include: a) level to very steep loamy soils on glacial till plains and moraines (84% of soils); b) level to undulating, silty soils on lake plains (1% of soils); c) level to undulating, loamy and sandy soils on mantled till plains and outwash plains (3% of soils); d) level to steep, loamy soils on outwash plains (5% of soils); e) level to very steep, loamy and silty soils in stream valleys (7% of soils).

Land use in Stutsman County is dominated by agriculture. Land uses include: cropland 45.45%, rangeland and grasses 38.93%, water areas 7.21%, developed 4.28%, hayland 3.68%, and trees/shrubs 0.45%.

Stutsman County geology is dominated by two distinctly different groups of glacial landforms. The first is the Missouri Couteau that resulted mainly from glacial stagnation. During the Wisconsin Era of glaciation, the Missouri Escarpment was largely responsible for restricting the southward and westward movement of the glacier. This 300 foot rise in elevation has been and is the single greatest influence on the drainage patterns in Stutsman County.

Landforms within the Missouri Couteau include: the Streeter end moraine, hummocky stagnation moraine, perched lacustrine (lake) plains, a large pitted outwash plain, ice restricted outwash plains, and an ice-walled gravel train (extending from southwest of

Woodworth to near Goldwin). The large pitted outwash plain, which is located to the southwest of Woodworth, and the ice-restricted outwash plains, near Medina and Streeter, developed because of glacial meltwater flowing west to the Missouri River. The Marstonmoor and Medina aquifers underlie a large portion of this area in western Stutsman County.

The hummocky moraines of the Missouri Couteau are characterized by multiple closed basin drainages. This area is often termed the Prairie Pothole Region of North Dakota. The actual area of the Missouri Couteau and the associated Missouri Escarpment extends from Iowa all the way into Canada.

The second group of glacial landforms in Stutsman County is the Drift Prairie. Actively retreating and advancing ice planed the landscape east of the Missouri Escarpment, resulting in ground moraines with low relief. Except for areas with glacial landforms, such as recessional moraines, kames or eskers, this low relief created large areas of poorly drained soils.

With the retreat of the glacial ice sheet to the north and east, melt-water flowing to the south created the Pipestem Creek, Minneapolis Flats Creek, Beaver Creek, Seven Mile Coulee, Streamen Coulee and the James River valleys. Spiritwood Lake and associated drainage-path lakes such as Rudolph and Blue Lakes also exist in these outwash valleys.

Several “shallow” aquifers in Stutsman County consist of sands and gravel (glaciofluvial sediments) which are exposed at the surface and recharge through precipitation. The aquifers classified in this category include: the Medina North and South Aquifers, the much larger Central Dakota Aquifer, the Pipestem Creek Aquifer, the Seven Mile Coulee Aquifer, among others. These two hydrologic units overlie the buried Windsor aquifer, which is glacial drift that covered an existing fluvial layer. Many wells in this area, when drilled to depths of 250 to 350 feet actually have enough head pressure to produce flowing water.

According to the 2011 North Dakota Agriculture Statistics, in 2010 there are 1,043 farms in Stutsman County with an average size of 1,144 acres. The watershed size for Moon Lake is approximately 26,350 acres of which 19,000 ac. is cropland, 4,150 ac. is rangeland, and 3,200 ac. is other land uses. The watershed size for Minneapolis Flats Creek is approximately 47,000 acres of which 35,000 is cropland, 7,000 is rangeland, and 5,000 is other land uses.

2.5 Water Quality Problem Definition

Runoff from precipitation primarily on cropland and secondly on rangeland coupled with poor management practices contributes to increased development of gully erosion areas. During these periods the erosion sites contribute large amounts of sediment to streams such as Beaver Creek and reservoirs such as the Pipestem Reservoir. The primary pollutant concerns are sediment and associated nutrients particularly phosphorus. See Figures 2, 3, and 4 to see the scope and of gully concerns in these watershed areas. Typical ephemeral or classic gully erosion of 100 feet in length yields anywhere from 20 to 50 tons of sediment per year. Best

management practices are needed at very specific locations to address this problem. They will be prioritized through the stream power index scale shown on Figures 2 and 3.

3.0 Project Description

3.1 Goals

The goal of the project is to protect aquatic life habitat in the creeks by reducing the potential for sediment to be delivered to the creeks. This will be accomplished by focusing on gully erosion best management practices primarily on cropland and secondly on rangeland in Moon Lake and Minneapolis Flats Creek 12 digit watershed areas.

3.2 Tasks

Objective 1: Address gully erosion areas through application of best management practices. By the end of the project period apply up to 800 acres (approximately 424,000 linear feet) of critical area seeding and grassed waterways. Also by the end of the project period address field and rangeland areas surrounding gully erosion sites by establishing up to 1,000 acres of pasture and hayland planting and 2,000 acres of rotational grazing planning.

Task 1: Prioritize erosion areas using the Stream Power Index, enabling targeting of the most critical gully erosion sites. See Figures 2 and 3 for reference.

Product: Prioritized list of erosion sites.

Cost: Included in Personnel/Support in Part 2 of Funding Tables.

Task 2: Provide assistance to producers for installation of 800 acres of critical area seeding and grassed waterways.

Product: 800 acres of critical area seeding at \$300 per acre.

Cost: \$240,000

Task 3: Provide assistance to producers for installation of 1,000 acres of pasture and hayland planting and 1,500 acres of cover crops.

Product: 1,000 acres of pasture and hayland planting at \$52 per acre and 1,500 acres of cover crops at \$20 per acre.

Cost: \$82,000

Task 4: Provide assistance to producers for rotational grazing management on up to 2,000 acres of rangeland.

Product: 2,000 acres of established rotational grazing plans including 75,000 ft. of fencing, 15 water tanks, 3 wells and 4,000 ft. of pipeline.

Cost: \$199,500

Task 5: Conduct follow-up contacts to assist with conservation plan updates and monitor Operation and Maintenance of cost-shared practices.

Product: Database of applied BMP's.

Cost: Included in Personnel/Support in Part 2 of Funding Tables.

Objective 2: Increase the publics' understanding of the impacts and solutions to NPS pollution and soil erosion. Increase understanding of herbicide overspraying on field erosion.

Task 6: Organize and conduct scheduled I/E events focusing on field erosion management and NPS pollution control within cropping systems and coordinate them with other state/federal/privately sponsored I/E programs.

Product: 4 tours/demonstrations, 4 informational meetings and workshops.

Cost: \$2,500

Task 7: Prepare newsletters and direct mailings to local land users, the general public, and media to promote the project and disseminate information on water quality and soil erosion management.

Product: Minimum of 5 newsletters and 5 direct mailings.

Cost: \$3,500

Task 8: Provide education efforts to stress the importance of using precision mapping for herbicide spraying equipment.

Product: Increased knowledge of herbicide applications.

Cost: Included in Personnel/Support in Part 2 of Funding Tables.

Task 9: Complete annual and final project reports to update the project progress and completion. These will be provided to NDDH, EPA, sponsors, and all other interested organizations and individuals.

Product: Annual and final project reports.

Cost: Included in Personnel/Support in Part 2 of Funding Tables.

Objective 3: Document the estimated suspended sediment, total nitrogen and total phosphorus load reductions associated with installed practices.

Task 10: Coordinate with the NDDH to utilize the STEPL model and/or PTMAApp to estimate the sediment, nitrogen and phosphorus load reductions associated with applied BMP.

Product: Annual sediment, nitrogen and phosphorus load reduction data per applied BMP for updating the EPA GRTS

Cost: Included in Personnel/Support in Part 2 of Funding Tables.

3.3 Milestone Table: See Figure 6.

3.4 Permits

All necessary permits will be acquired. Project will work with NDDH to determine if permits are needed. State and County permits will be obtained if necessary. Cultural Resource concerns and issues will be addressed by following the procedures outlined by NDDH and the North Dakota State Historical Society.

3.5 Appropriateness of Lead Sponsor

The Stutsman County SCD is sponsoring this water quality project. The Stutsman SCD board will oversee the Gully Erosion Reparation Project. The Stutsman County SCD's annual and long range plans help to prioritize and provide guidance to the field service staff. The Stutsman County SCD board has legal authority to employ personnel and receive and expend funds. The Stutsman County SCD has credible experience in personnel management and conservation leadership.

4.0 Coordination Plan

4.1 Lead Project Sponsor and Cooperating Organizations:

- 1) The Stutsman SCD will be the signer of the Section 319 contract and will be the lead agency responsible for project administration. They will provide office space, clerical assistance, access to equipment and supplies as well as any necessary financial support. The Stutsman County Board will oversee implementation of the scheduled project activities and provide for staff time if feasible. The board will be the primary supervisor of the watershed conservationists and all Section 319 funded activities.
- 2) The Natural Resources Conservation Service (NRCS) will provide assistance in conservation planning, plan writing, and technical/engineering assistance for construction and installation of planned BMP's. NRCS will also provide cooperating project funds through the Environmental Quality Incentives Program (EQIP). This partnership is operated through MOU.
- 3) NDDH will assist project staff in development and implementation of the projects' I/E activities. NDDH will provide sponsor oversight to ensure proper management and expenditures of Section 319 funds. They will assist NRCS and the Stutsman County SCD personnel in the review of Operation and Maintenance requirements for Section 319 cost shared BMP's.
- 4) The NPS BMP Team, administered by the Barnes Co. SCD, will provide engineering service to develop construction designs for the restoration of priority gully erosion sites.
- 5) The International Water Institute is completing the PTMApp for the James River Basin. Once completed, these tools will be utilized for assistance in BMP identification and implementation.

4.2 Local Support

The Stutsman County SCD has already received 3 requests for assistance from landowners in this project area and there has already been erosion repair projects in Moon Lake watershed associated with the Beaver Creek Watershed Project.

4.3 Coordination with Other Pertinent Programs

Other programs in the project area include:

- 1) NRCS Environmental Quality Incentives Program (EQIP) will be used by the NRCS Jamestown Field Office and project 319 staff to plan relevant erosion control projects.

- 2) The NPS BMP Team will be utilized for project engineering design and construction. Project in-kind will be used to assist with engineering costs associated with these projects.

4.4 Similar Watershed Activities

As mentioned in item #1 of Section 4.3, the EQIP program will be used in coordination with this program as has been previously demonstrated by other conservation efforts in Stutsman County. The EQIP program is currently based on a county wide scale and is used cooperatively with 319 efforts.

5.0 Evaluation and Monitoring Plan

Due to the intermittent nature of the creeks, STEPL model and/or PTMApp (when available) will be used to estimate the annual sediment, nitrogen and phosphorus load reductions associated with the applied BMP. When possible, engineering calculations may also be used to determine the amount of sediment lost at the gully erosion sites. The load reduction estimates will be used to update the EPA GRTS, annually.

6.0 BUDGET

6.1 See Budget Tables Section.

7.0 PUBLIC INVOLVEMENT

As mentioned in objective 3, an important part of this project will be educational efforts and public involvement. Through other 319 projects the Stutsman County SCD and NRCS Jamestown Field Office have an established track record of good public involvement. This includes well attended tours of established conservation practices, well attended workshops in cooperation with the NDSU Extension, Farmers Union, and the Stutsman County Agricultural Improvement Association. This tradition will continue with the Gully Erosion Reparation Project.

Newsletters are regularly published by the Stutsman County SCD and will continue to provide project information to the general public. The Stutsman County SCD has a website, www.stutsmanscd.org, which provides 319 project information plus links and publications.

Progressive and involved producers as mentioned in Section 4.2 will continue to provide “word of mouth” information to others in the watershed areas.

BMP Budget Table

Erosion Control Projects

Practice:

Critical Area Seeding/Grassed Waterway	650 acres @\$300/ac.	\$195,000
	40% Producer Share	\$78,000
	60% 319 Share	\$117,000

Rangeland Practices

Practice:

Fencing	20,000 ft. @ \$1.80/ft.	\$36,000
Trough/Tank	4 tanks @ \$1500/tank	\$6,000
Wells	1 well @ \$10,000/well	\$10,000
Pipeline	2,000 ft. @\$3.00/ft.	\$6,000
	40% Producer Share	\$23,200
	60% 319 Share	\$34,800

Cropland Practices

Practice:

Pasture and Hayland Planting	600 ac. @ \$52/ac.	\$31,200
Cover Crops	978.35 ac. @ \$20/ac.	\$19,567
	40% Producer Share	\$20,307
	60% 319 Share	\$30,460

Total BMP Costs \$303,767

**PART 1: FUNDING
SOURCES**

	2017	2018	2019	2020	2021	TOTAL
EPA SECTION 319 FUNDS						
1)FY 2017 FUNDS	52,832	68,192	68,192	68,192	68,192	325,600
Subtotal	52,832	68,192	68,192	68,192	68,192	325,600
STATE/LOCAL MATCH						
1) Landowners 40% Practice Match(FA)	24,301	24,302	24,301	24,302	24,301	121,507
2) Landowners In- kind (FA)	5,460	10,580	10,580	10,580	10,580	47,780
3) Soil Conservation District Match (TA)	5,460	10,580	10,580	10,580	10,580	47,780
Subtotal	35,221	45,462	45,461	45,462	45,461	217,067
TOTAL	88,053	113,654	113,653	113,654	113,653	542,667

FA: Financial
Assistance
TA: Technical
Assistance

Part 1.5 OTHER
FEDERAL FUND
SOURCES

	2017	2018	2019	2020	2021	Total
1) Natural Resources Conservation Service (TA)	10,000	10,000	10,000	10,000	10,000	50,000
2) Environmental Quality Incentives Program,	30,000	30,000	30,000	30,000	30,000	150,000
Total	40,000	40,000	40,000	40,000	40,000	200,000
TA: Technical Assistance						

Part 2: Funding

Section 319/Non-Federal

Budget	2017	2018	2019	2020	2021	Total Costs	Cash/In-Kind Match	319 Funds
Personnel/Support								
1) Salary/Fringe WC (50% of time for project)	18,750	37,500	37,500	37,500	37,500	168,750	67,500	101,250
2) Salary/Fringe WT (20% of time for project)	5,000	10,000	10,000	10,000	10,000	45,000	18,000	27,000
3) Vehicle	1,000	2,000	2,000	2,000	2,000	9,000	3,600	5,400
4) Travel	250	500	500	500	500	2,250	900	1,350
5) Equipment/Supplies	250	500	500	500	500	2,250	900	1,350
6) Training	150	300	300	300	300	1,350	540	810
7) Telephone/Post.	200	400	400	400	400	1,800	720	1,080
Subtotals	25,600	51,200	51,200	51,200	51,200	230,400	92,160	138,240
OBJECTIVE 1: APPLYING BEST MANAGEMENT PRACTICES								
Critical Area Seedings/Waterways	39,000	39,000	39,000	39,000	39,000	195,000	78,000	117,000
Biomass and Cover Crops	10,153	10,154	10,153	10,154	10,153	50,767	20,307	30,460
Rangeland Practices	11,600	11,600	11,600	11,600	11,600	58,000	23,200	34,800
Subtotals	60,753	60,754	60,753	60,754	60,753	303,767	121,507	182,260
OBJECTIVE 2: INFORMATION/EDUCATION								
Newsletter/Video	700	700	700	700	700	3,500	1,400	2,100
Tours	500	500	500	500	500	2,500	1,000	1,500
Subtotals	1,200	1,200	1,200	1,200	1,200	6,000	2,400	3,600
ADMINISTRATIVE								
SCD/Coordinator Meetings	500	500	500	500	500	2,500	1,000	1,500
Subtotals	500	500	500	500	500	2,500	1,000	1,500
TOTAL 319/NON-FED.	88,053	113,654	113,653	113,654	113,653	542,667	217,067	325,600



Figure 1.—Location of Stutsman County in North Dakota.

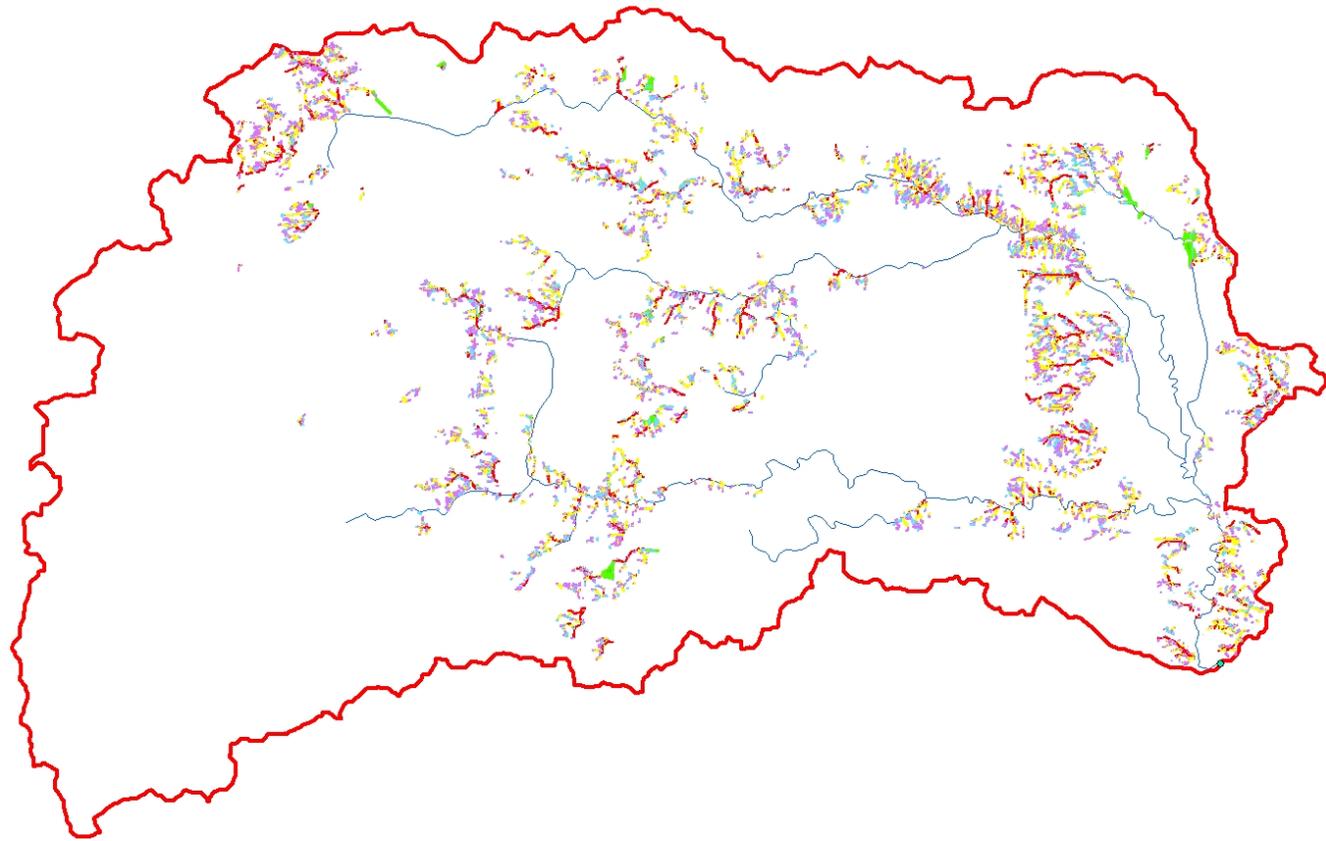


Figure 2: Moon Lake Watershed Area with Stream Power Index Ratings

.01 - .02	Green (low priority)
.2 - .4	Blue
.4 - .6	Purple
.6 - .8	Yellow
.8 - 1	Red (high priority)

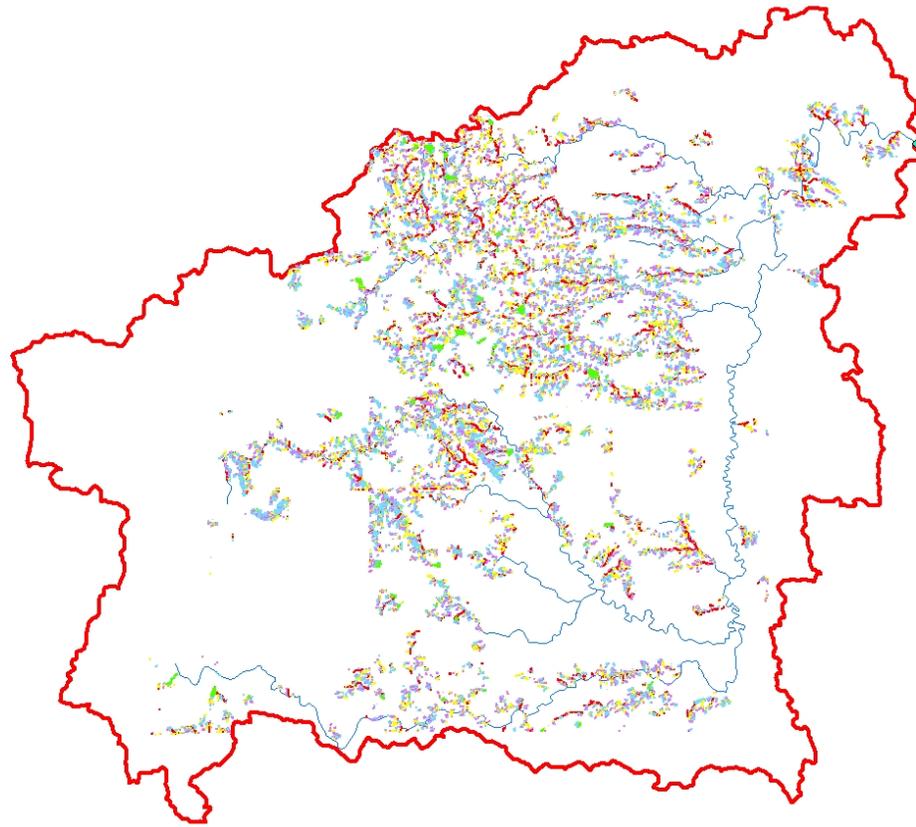


Figure 3: Minneapolis Flats Creek Watershed Area with Stream Power Index Ratings

.01 - .02	Green (low priority)
.2 - .4	Blue
.4 - .6	Purple
.6 - .8	Yellow
.8 - 1	Red (high priority)



Figure 4: Section view of the Stream Power Index Ratings

See legend on Figure 3 for color explanations.

Figure 5

Milestone table Gully Erosion Reparation project for Objectives 1,2,3

TASK / RESPONSIBLE ORGANIZATIONS	OUTPUT	Qty	2017		2018		2019		2020		2021	
			07/17	06/18	07/18	06/19	07/19	06/20	07/20	06/21	07/21	06/22
Task 1 – Prioritize erosion areas using the SPI, enabling targeting of the most critical sites. Group 3	Prioritized List	1										
Task 2 – Install 650 acres of critical area seeding and grassed waterways Group 1,2,3	Critical area seeding's	650										
Task 3 – Install 600 acres of pasture/hayland and 979 acres of cover crops Group 1,2,3	Pasture, hayland and cover crop seeding	600/ 979										
Task 4 – Provide assistance in rotational grazing management on 1,000 acres Group 1,2,3	Rotational grazing management	1000										
Task 5 – Follow-up contacts and monitor O&M agreements Group 1,2,3,4	Updates	N/A										
Task 6 – Conduct I/E events on Gully Erosion with other agencies. Group 2,3	Tours	4										
Task 7 – Educate land users, media and the public on water quality and Gully Erosion Group 3,4	News-letters/ mailings	10										
Task 8 – Provide assistance for sprayer equipment using GPS and field mapping Group 1,2,3	GPS/field mapping sprayer	1										
Task 9 – Complete the annual/final project reports and provide them to the necessary agencies and all other interested parties Group 3	Completed annual reports	5										
Task 9 – Coordinate with NDDH to utilize PTMApp to estimate sediment and nutrient load reductions associated with applied BMP Group 3	database	1										

Group 1 – Natural Resources Conservation Service or similar partners (i.e. NDSU Extension, etc.) - Provide technical assistance to plan, design, and implement BMP's.

Group 2 – Landowners in Moon Lake and Minneapolis Flats watersheds – Make land management decisions and provide cash and in-kind match for BMP's.

Group 3 – Stutsman County Soil Conservation District – Local project manager and sponsor, including responsibilities for project coordination.

Group 4 – ND Department of Health – Statewide Section 319 program management including oversight of local 319 planning and expenditures.