Project Proposal Summary Sheet
Spiritwood Lake Watershed Project Phase 2
City of Spiritwood Lake
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STATE: North Dakota WATERSHED: Spiritwood Lake
HYDROLOGICAL UNIT CODE: 101600030-101 HIGH PRIORITY WATERSHED: No

Project Type	Waterbody Type	NPS Category
Watershed	Lake/Stream	Agriculture

Project Location: Latitude 47 degrees 04 minutes, Longitude -98 degrees 34 minutes

Project Description:
Phase II of the Spiritwood Lake Watershed Improvement Project will be an expansion of Phase I. The first Phase focused on septic systems within the City of Spiritwood Lake. It was a success; 11 failing systems have been replaced and 57 systems have been inspected by a licensed inspector. The city has done a great job working on fixing the excess nutrients entering the lake from their standpoint. Currently, the project coordinator is working with the campground toward replacing and/or have their septic systems inspected

In 2013 the assessment results came back indicating nitrogen and phosphorus levels were elevated and trending high. In 2020 the lake will be resampled to determine what the nitrogen and phosphorus levels are and identify if improvements have occurred.

The project sponsors are also going to work with watershed landowners and target lands that contribute most to adding nutrients to the lake. By using PTMApp and AnnAGNPS we will be able to target the highest contributing lands to the nutrient overload. In addition, project sponsors intend to repair the existing hypolimnetic drawdown system and utilize it to remove excess nutrients that have accumulated.

Major Goal:
The primary goal is to restore and protect the beneficial use of fish and other aquatic biota to fully supporting, for Spiritwood Lake and its tributaries. This will be accomplished through nutrient management, grazing management, riparian improvements, reducing n-lake nutrient cycling and decreasing residence time.

Objectives:
1) Provide technical and financial assistance to producers and landowners, particularly in applying best management practices that protect and enhance riparian areas,
3) Address near lake septic systems and fertilization practices,
4) Reduce in-lake nutrient cycling,
5) Renovate the hypolimnetic drawdown system, and
6) Develop an education/information program that increases public awareness of NPS.

Funding:
FY2020 319 Funds Requested: $259,177 Match: $172,784

Other Federal Funds: $360,500 Total Project Cost: $792,461

319 Funded Part Time Personnel: ½ FTE

2.0 STATEMENT OF NEED

2.1 Project Need and Priority

Water quality sampling completed in 2013-15, indicated elevated levels of phosphorus and nitrogen, which are trending higher. The decomposition of these nutrients and the plant life they feed have resulted in dissolved oxygen levels that fall far below the state guideline of 5mg/L. Additionally, the increased nutrients have resulted in chlorophyll-a levels that exceed the state standard of 20ug/L. Currently, Carlson's Trophic State Index indicate Spiritwood Lake is in the eutrophic range. This is supported by reports from cabin owners and people using the lake for recreation that have noticed an increase in the frequency and severity of algal blooms.

2.2 Waterbody Description

Spiritwood Lake is a natural lake located 10 miles north and 4 miles east of Jamestown, North Dakota (Figure 1). Spiritwood Lake has a surface area of 488.8 acres, a maximum depth of 55.5 ft and an average depth of 31.0 ft (Figure 2). Spiritwood Lake is classified in the state "Standards of Quality for Waters of the State" (NDDEQ, 2014) as a Class III lake or reservoir. Class III lakes or reservoirs are defined as a "warm water fishery" or "waters capable of supporting natural reproduction and growth of warm water fishes (e.g., largemouth bass and bluegill) and associated aquatic biota. Some cool water species may also be present."

2.3 Maps

The attached maps in Appendix B illustrate the Spiritwood Lake watershed and location of monitoring sites (Figures 1-2), high priority areas as determined by the AnnAGNPS model (Figures 3-4) and PTMApp (Prioritize, Target, Measure, Application) map (figures 5-6) these illustrate targeting areas in the watershed. With these maps we can address specific land use and implement BMP's in the land area.

2.4 General Information

Spiritwood Lake's watershed lies within the Northern Glaciated Plains Level III Ecoregion, part of the broader Cultivated Plains region (Figure 1). This region is the transitional zone between tall and mixed grass prairie. The region has numerous wetlands essential for spring and fall migrations of wetland dependent birds. Flood plain slopes and hillsides are usually native grass while the uplands and flood plains proper have mostly been converted to small grains, row crops and alfalfa.

Land use in the Spiritwood Lake watershed is primarily agricultural. According to the 2018 National Agricultural Statistical Service (NASS) land survey data, approximately 66 percent of the contributing watershed is cropland, 20 percent - water, 7 percent - native rangeland 4 percent - developed/roads, 2 percent - tame grasses and 1 percent - woodlands/trees.

2.5 Water Quality

An assessment of water quality within Spiritwood Lake was conducted in 2013-15 by sampling at the deepest site in Spiritwood Lake (Table 1, Appendix A).

Table 1. Water Quality Monitoring Stations in the Spiritwood Lake Watershed.

Station	Description	Parameter	Years	Samples
380060	Deepest Point - Spiritwood Lake	*Water Quality & Clarity	2013-2015	24

* Water Quality includes Nutrients Complete (Temperature, Dissolved oxygen, Total Nitrogen, Total Kjeldahl Nitrogen, Nitrite-Nitrate, Ammonia, And Total Phosphorus, and Chlorophyll-a). Secchi Disk Transparency was also measured during open water periods.

2.5.1 Nutrients

Nitrogen and phosphorus are nutrients necessary for plant growth in a lake, just as in a field or yard. For purposes of this report and comparison with historical data, samples collected at the one-meter depth are displayed (Figures 1 and 2). The amount of nutrients at the one-meter depth help to "feed" the growth of algae, thus affecting water clarity. Both total nitrogen and phosphorus data are showing an increasing trend, which indicates potential water quality concerns for the lake.

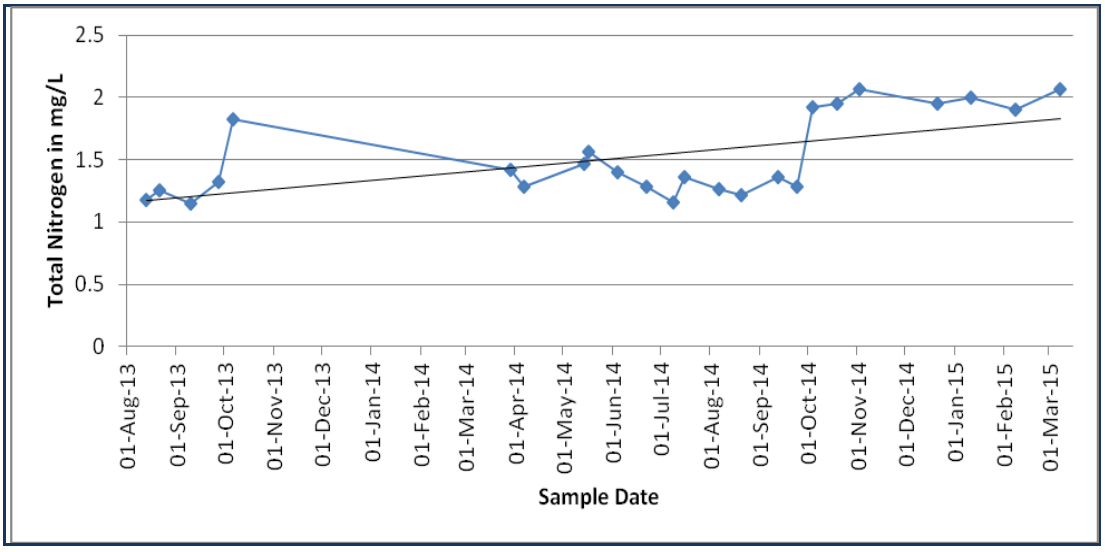

Figure 1. Total Nitrogen Samples and Trendline.

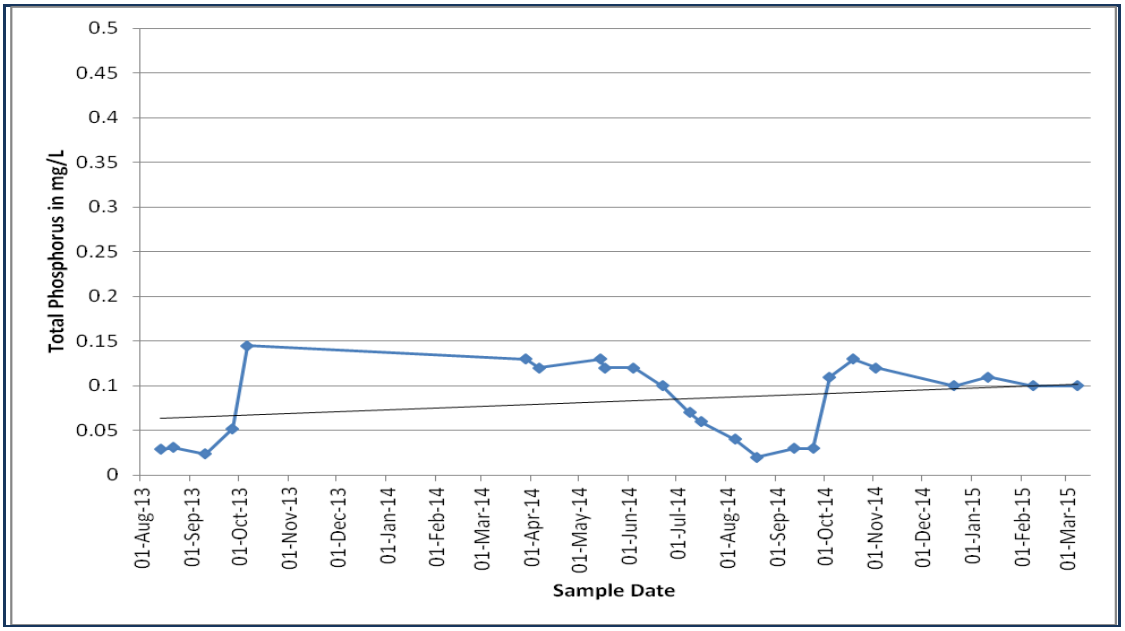

Figure 2. Total Phosphorus Samples and Trendline.

2.5.2 Carlson's Trophic State Index

Trophic status is a measure of the productivity of a lake or reservoir and is directly related to the level of nutrients (i.e., phosphorus and nitrogen) entering the lake or reservoir from its watershed and/or from the internal recycling of nutrients. Highly productive lakes, termed "hypereutrophic," contain excessive phosphorus and are characterized by dense growths of weeds, blue-green algal blooms, low transparency, and low dissolved oxygen (DO) concentrations. These lakes experience frequent fish kills and are generally characterized as having excessive rough fish populations (carp, bullhead, and sucker) and poor sport fisheries. Due to the frequent algal blooms and excessive weed growth, these lakes are also undesirable for recreational uses such as swimming and boating.

Mesotrophic and eutrophic lakes, on the other hand, generally have lower phosphorus concentrations, low to moderate levels of algae and aquatic plant growth, high transparency, and adequate DO concentrations throughout the year. Eutrophic lakes are characterized by the growth of weeds and occasional bluegreen algal blooms. Because of the algal blooms and weed growth, these lakes are can be undesirable for recreational uses such as swimming and boating. Mesotrophic lakes do not experience algal blooms, while eutrophic lakes may occasionally experience algal blooms of short duration, typically a few days to a week.

Due to the relationship between trophic status indicators and the aquatic community (as reflected by the fishery) or between trophic status indicators and the frequency of algal blooms, trophic status is an effective indicator of aquatic life and recreation use support in lakes and reservoirs. The chlorophyll-a trophic status indicator is used by the NDDEQ as the primary means to assess whether a lake or reservoir is meeting the narrative water quality standards (NDDEQ, 2014).

While the three trophic state indicators, chlorophyll-*a*, Secchi disk transparency, and total phosphorus, independently estimate algal biomass and should produce the same

index value for a given combination of variable values, often they do not. Also, while transparency and phosphorus may co-vary with trophic state, many times the changes observed in a lake's transparency are not caused by changes in algal biomass, but may be due to particulate sediment. Total phosphorus may or may not be strongly related to algal biomass due to light limitation and/or nitrogen and carbon limitation. Therefore, neither transparency nor phosphorus is an independent estimator of trophic state (Carlson and Simpson, 1996). For these reasons, the NDDEQ gives priority to chlorophyll-*a* as the primary trophic state indicator because this variable is the most accurate of the three at predicting algal biomass (Carlson, 1980).

In-lake water quality data collected from Spiritwood Lake in 2013 - 2015 showed; an average chlorophyll-a concentration of 21.94 µg/l, an average total phosphorus concentration of 73 ug/l, an average Secchi Depth of 2.83 meters, and an average total nitrogen concentration of 1.40 mg/l. Based on these data and Carlson's TSI calculations, Spiritwood Lake is assessed as a eutrophic lake (Table 2).

Table 2. Carlson's Trophic State Indices for Spiritwood Lake.

Parameter	Relationship	Units	2013-15 TSI Value	Trophic Status
Chlorophyll-a	TSI (Chl-a) = 30.6 + 9.81[ln(Chl-a)]	µg/L	60.90	Eutrophic
Total Phosphorus (TP)	TSI (TP) = 4.15 + 14.42[(ln(TP)]	µg/L	66.02	Eutrophic
Secchi Depth (SD)	TSI (SD) = 60 - 14.41[ln(SD)]	meters	45.01	Mesotrophic
Total Nitrogen (TN)	TSI (TN) = 54.45 + 14.43[ln(TN)]	mg/L	59.31	Eutrophic

TSI < 30 - Oligotrophic (least productive) TSI 30-50 Mesotrophic
TSI 50-65 Eutrophic TSI > 65 - Hypereutrophic (most productive)

2.5.3 Beneficial Use Assessment

Aquatic Life Use

Nutrients

According to the phosphorus TSI value of 66.02, Spiritwood Lake is a very productive lake (hypereutrophic). Eutrophication is defined as the increase in primary productivity resulting from excessive nutrient inputs into rivers and lakes. Sources of excess nutrients include; internal cycling, failed septic systems, runoff from cropland, improper nutrient management and livestock operations. The negative impacts from eutrophication may include the reduction of dissolved oxygen due to algal growth and subsequent decomposition by microbial activity and also alteration of the algal community. The alteration of the algal community can lead to a decrease in food resource quality for aquatic insects and fish and an alteration of the aquatic insect and fish communities to include less intolerant species (e.g., stonecats, mayflies, stoneflies). This is reflected by dissolved oxygen readings that fall below the state guideline of 5mg/L at the depth of 4 meters.

3.0 PROJECT DESCRIPTION

3.1 Goal

The primary goal is to improve and protect the recreational and fish and other aquatic biota uses of the lake by reducing the amount of “store” nutrients (N&P) in the lake and addressing nutrient sources in the watershed.

3.2 Objectives

Objective 1: To improve the dissolved oxygen (DO) concentrations and maintain levels above the state guideline of 5mg/L, from the surface of the lake to a 13-meter depth.

A secondary target is to achieve the state guideline for chlorophyll-a, which is an average of 20ug/L during the growing season.

Task 1 – Cooperate with the local SCD to hire/contract a watershed coordinator to cooperate with other organizations and agencies in providing technical assistance to producers, monitoring water quality, and providing educational materials to the public.

Product – ½% part time watershed employee, including salary, benefits, travel, training, office, and equipment.
Cost – $ 134,711

Objective 2: Eliminate near lake nutrient sources

Task 2 – Conduct an education campaign to limit the use of lawn fertilizers near the lake and eliminate the use of phosphorus.

Product – Educational materials distributed each spring.
Cost – Included in Task 7.

Task 3 – Renovate failing septic systems within the city and campground.

Product – Renovate a potential 5 systems.
Cost – $70,000

Objective 3: Work with producers in the watershed to reduce potential sources of nitrogen and phosphorus.

Task 4 – Improve nutrient management and reduce soil erosion on 1500 cropland acres.

Product – BMP's may include cover crops, critical area plantings, nutrient management, no-till, grassed waterways, and other cropland practices that contribute to the improvement of the lake.
Cost – $63,000

Task 5 –Reduce potential water quality impacts associated with livestock manure by improving management of 1000 grazing acres and 2 livestock winter feeding areas.

Product – 1000 acres of improved grazing and manure management improved in 2 winter feeding areas. BMP's including cross-fence, watering facilities, wells, portable windbreaks, diversions, and manure storage will be utilized.
Cost – $87,750

Objective 4: Reduce the amount of "stored" nutrients in the lake by restoring the functionality of the hypolimnetic drawdown system.

Task 6 – Coordinate with the ND Game & Fish Department to repair and reroute the existing hypolimnetic drawdown system

Product – Functional hypolimnetic drawdown system. Installing pipeline to the outlet and replacing the pump to actual working size.
Cost – $75,000

Task 7 –Coordinate with the ND Game and Fish Department and ND Department of Environmental Quality to develop a long-term management plan for the hypolimnetic drawdown system that is acceptable to lake residents and downstream landowners.

Product – 10-year management plan and agreement for the operation and management of the hypolimnetic system
Cost – $0

Objective 5: Increase the public's understanding and awareness of the impacts of and solutions to NPS pollution and soil erosion.

Task 8 – Coordinate with the soil conservation district to organize and conduct informational/educational events focusing on NPS pollution control.

Product – 2 Public informational meetings 2 tours/demonstrations and workshops.

Cost – $1,500

Task 9 – Prepare newsletters, direct mailings, and other outreach to local land users, the general public, and media to promote the project and disseminate information on water quality and NPS pollution control.

Product – A) Coordinate with the Stutsman County SCD about forward information to the public.
B) 16 – Project updates/newsletters. Topics will include benefits of no-till practices, precision ag and controlling nutrient in a working system.
Cost – $0

Objective 6: Document in-lake water quality trends and quantify the pollutant (N & P) reductions resulting from the operation of the hypolimnetic drawdown system.

Task 10 – Assist the NDDEQ in developing a Quality Assurance Project Plan (QAPP) prior to monitoring.

Product – Completed QAPP for collecting water quality samples from the deepest area of the lake and the hypolimnetic discharge.
Cost – Included in Task 1

Task 11 – Conduct water sampling as identified in the QAPP.

Product – 7-8 in-lake water quality samples (e.g., nitrogen, phosphorus, anion/cations, etc.) collected per year. Sechhi disk measurements and temperature/dissolved oxygen profiles will also be collected from the lake site. 2-3 samples collected weekly while the hypolimnetic system is operating. Estimated discharge will also be calculated for the hypolimnetic system to estimate pollutant load reductions.
Cost – Included in task 1 (sample analysis will be provided by the NDDEQ)

Objective 7: Complete necessary project reports.

Task 12 – Complete annual and final project reports on progress and completion, to be provided to NDDEQ, EPA, sponsors, and other interested parties.

Product – Annual and final project reports.
Cost – Included in Task 1.

3.3 Milestones

See Appendix C

3.4 Permits

All necessary permits, such as; 404/401 certification, NDDH approval to operate "permits" for manure management systems and cultural resource inventories will be acquired. Project personnel will work with NDDEQ to determine if permits are needed.

3.5 Lead sponsor

The City of Spiritwood Lake is sponsoring this water quality project. The City's vision for the lake will help to prioritize and provide guidance to the field service staff. The city has legal authority to employ personnel and receive and expend funds. The City of Spiritwood Lake has credible experience in personnel management.

3.6 Operation and Maintenance

All BMPs cost-shared with 319 funds will be contracted and tracked through the NPS program BMP tracking database. BMPs must be applied according to NRCS standards and specifications or specifications approved by the NPS program. In addition, the project coordinator will inspect the BMP before cost share is issued and periodically during the project period to ensure proper operation and maintenance.

4.0 COORDINATION PLAN

4.1 Cooperating Organizations –

1) The City of Spiritwood Lake will be the signer of the 319 contract and will be the lead agency responsible for project administration. They will provide vehicles, clerical assistance, equipment and supplies, as well as financial support. The city commission will oversee implementation of the scheduled project activities and contract with the Stutsman SCD to secure staff to complete the project. The commission will be the primary supervisor of the watershed coordinator and all Section 319 funded activities.
2) The Spiritwood Lake Association, Inc. will provide assistance in implementing portions of the project and helping to organize and conduct educational events.
3) The Stutsman Soil Conservation District will contract a Watershed Coordinator for 50% of his time and may assist with sign-up and implementation of BMP's and educational events.
4) Natural Resource Conservation Service (NRCS) will provide assistance in conservation planning, plan writing, and technical/engineering assistance for construction and installation of planned BMPs. Many of the standards and specifications for approved BMPs are provided by NRCS personnel from the NRCS Field Office Technical Guide. Funds may also be available to landowners through programs such as the Environmental Quality Incentives Program (EQIP). NRCS will also participate in educational outreach activities.
   - The reginal Conservation Partnership Program (RCPP) have already committed $109,000 for projects including cover crops and critical area plantings.
5) North Dakota Department of Environmental Quality (NDDEQ) will oversee 319 funding as well as develop the Quality Assurance Project Plan (QAPP) for this project. The NDEQ will provide oversight on sample collection, preservation, and

transportation to ensure reliable data is obtained. NDDEQ will provide laboratory analysis of water samples as well as data storage. NDDEQ will assist project staff in development and implementation of the project's I/E activities. NDDEQ will provide sponsor oversight to ensure proper management and expenditures of Section 319 funds. They will assist NRCS and City of Spiritwood Lake personnel in the review of Operation and Maintenance requirements for Section 319 funded BMPs.

6) North Dakota Game & Fish Department will provide financial and technical assistance to design, install and manage the hypolimnetic drawdown system. The Game & Fish Save Our Lake Program, also my be a source of funding for cost sharing practices in the watershed.
7) Farm Service Agency (FSA) will serve as a local resource and may provide assistance to landowners when Conservation Reserve Program (CRP) practices can be applied.
8) Local NDSU Agricultural Extension staff may assist with information and education activities.
9) Stutsman County Water Resource Board will be involved in the planning phase and may also provide input during the implementation of the hypolimnetic system.
10) NDSU Nutrient Management Educational Support Program will be asked to provide technical assistance, as needed, for educational events addressing manure management as well as technical assistance to producers to plan and develop nutrient management plans involving manure management.
11) NPS BMP Team may provide engineering assistance for designing/implementing manure management systems and riparian restoration projects.

4.2 Local Project Support

Appendix F contains letters of support from the City of Spiritwood Lake, the Spiritwood Lake Association, Inc. and the Stutsman Soil Conservation District

4.3 Funding Coordination

The funding of best management practices in the Spiritwood Lake Watershed project area will be coordinated with funding from programs such as EQIP through NRCS and CRP through FSA when those programs offer related practices that enhance or complement practices available through 319 funding. Additional funds will be applied for through the Outdoor Heritage Fund and Save Our Lakes Program.

4.4 Other Watershed Activities

Phase 1 of this project will run out of funding this fall and are moving with forward with this proposal. The city currently sponsors a RCPP (Regional Conservation Program Partnership) grant through the NRCS for the Spiritwood Lake watershed. Currently, the Stutsman Soil Conservation District sponsors watershed projects in Minneapolis Flat and Moon Lake and the Stutsman County Manure Management Program.

5.0 EVALUATION AND MONITORING PLAN

The QAPP will be completed by the NDDEQ after the project is fully approved.

6.0 BUDGET

6.1 Project Budget

See Appendix D.

7.0 PUBLIC INVOLVEMENT

As listed in Objective 5, an important component of this project will be educational efforts and public involvement, including public meetings and tours/workshops. Watershed newsletters will also be used to provide project information to the public, as well as direct mailings and the use of public media.

Appendix A. Water Quality Summary

The water quality report has not been included due to the size of the document. A full copy of the project proposal that includes the water quality report can be obtained from Greg Sandness at gsandnes@nd.gov.

Appendix B. Maps and Figures.

Figure 1. General Location of Spiritwood Lake.

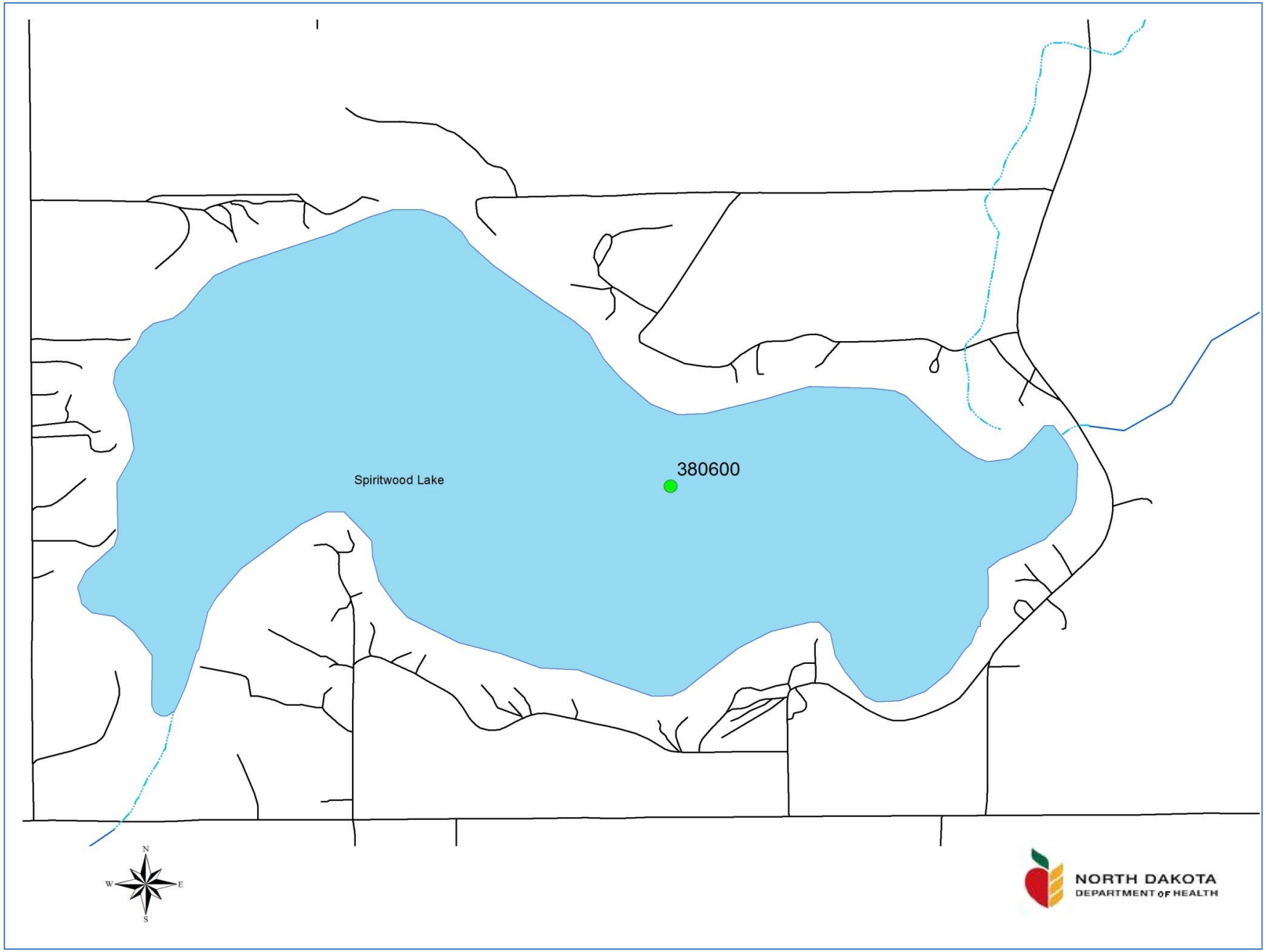

Figure 2. Spiritwood Lake Watershed and Water Quality Sampling Site Location**.**

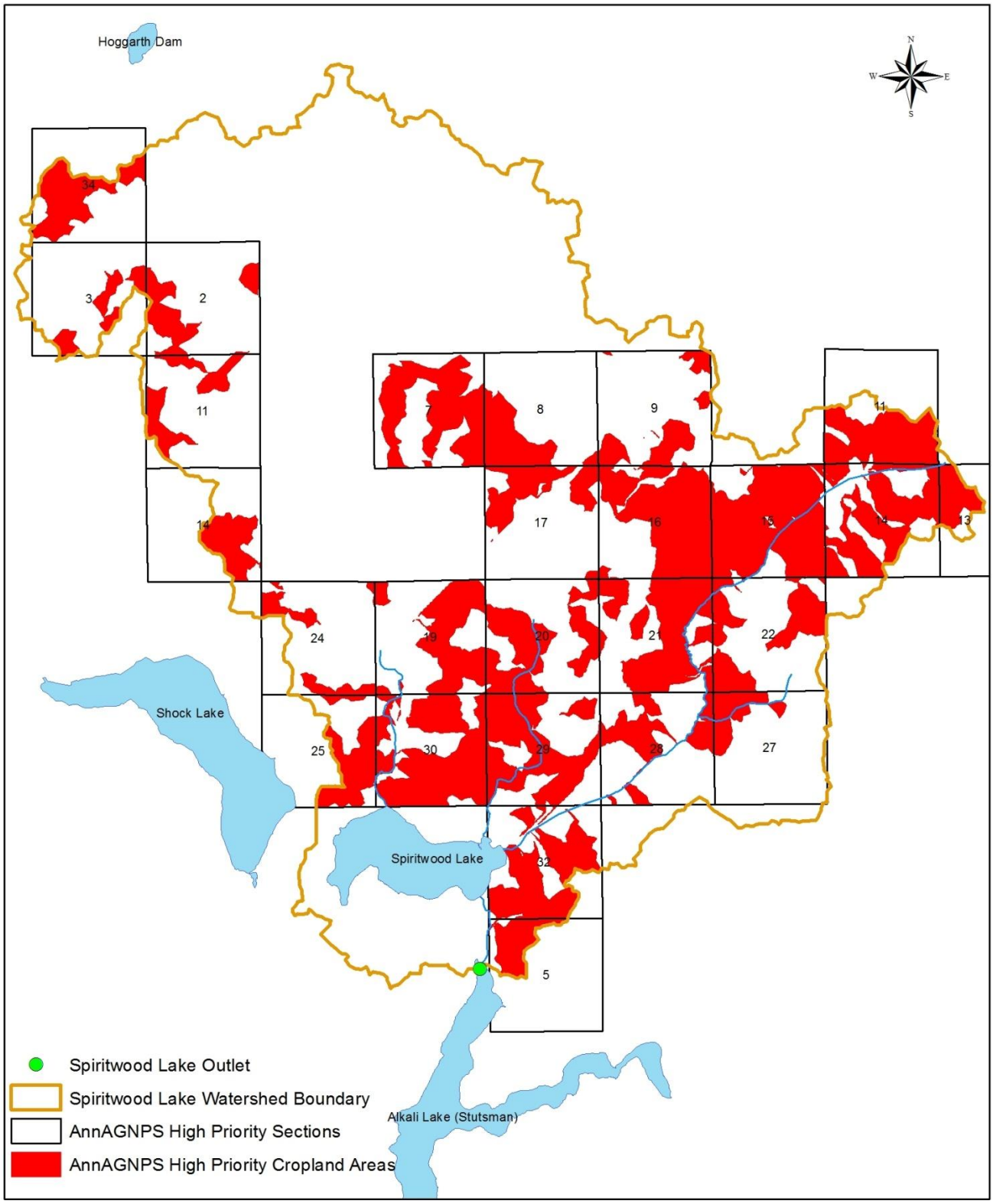

Figure 3. High Priority Cropland Acres Identified by the AnnAGNPS Model.

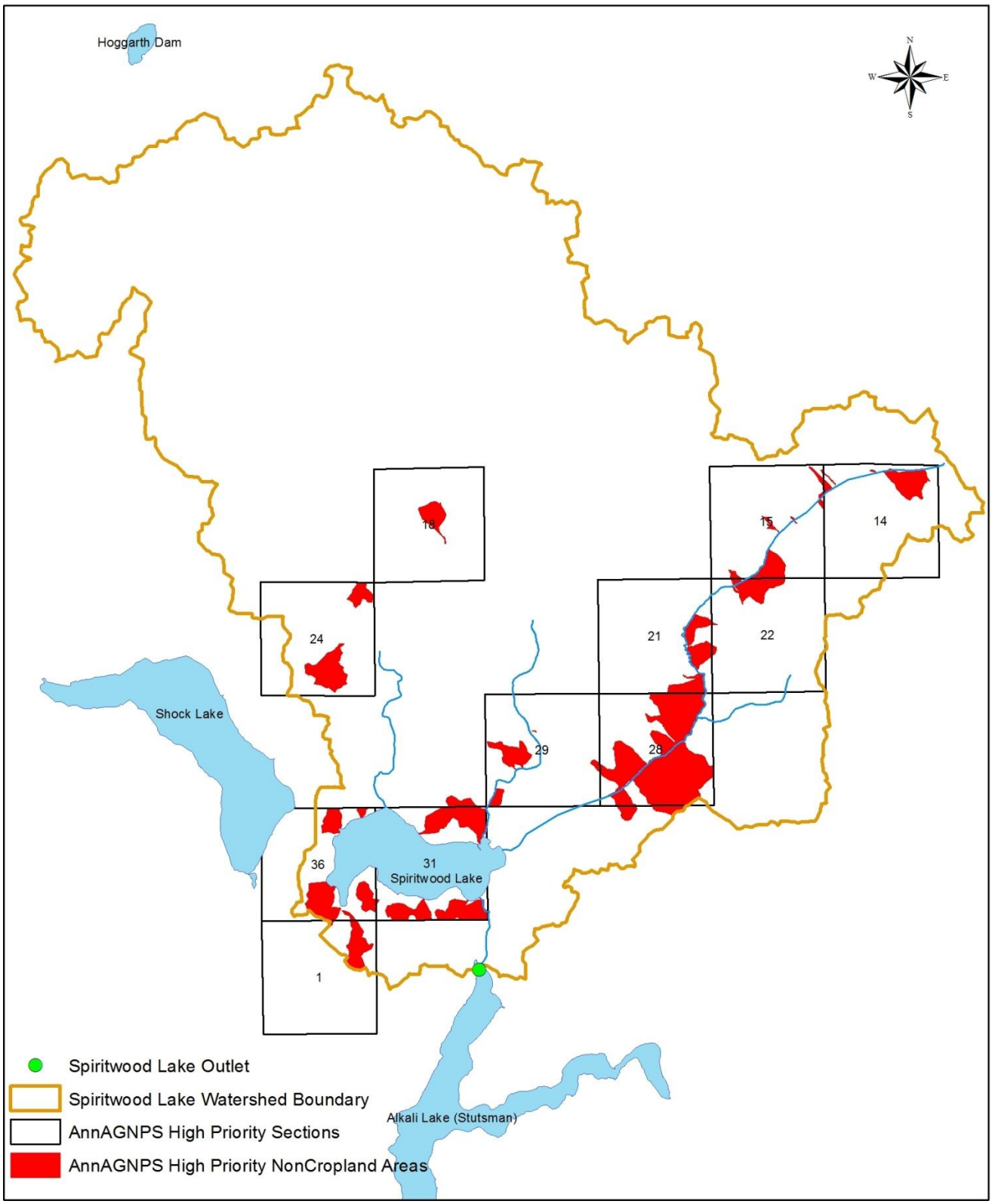

Figure 4. High Priority Non-Cropland Acres Identified by the AnnAGNPS Model.

PTMApp-Web Targeted BMP Action Report

Report Details

PTMApp-Web User: Dustin Krueger

Watershed: James River - James (huc101600)

Location Point Number: 58

Report Generation Date: 2019-07-18

Selection Criteria

Parameter: Total Nitrogen

Treatment Group(s): Source Reduction, Filtration, Infiltration, Storage, Protection

Basis for Practice Selection: Cost-Effectiveness (lowest $/mass)

Scale and Storm Event: Watershed Outlet, 2 - Year

Method Used to Select BMPs: Number of Highest Ranked BMPs

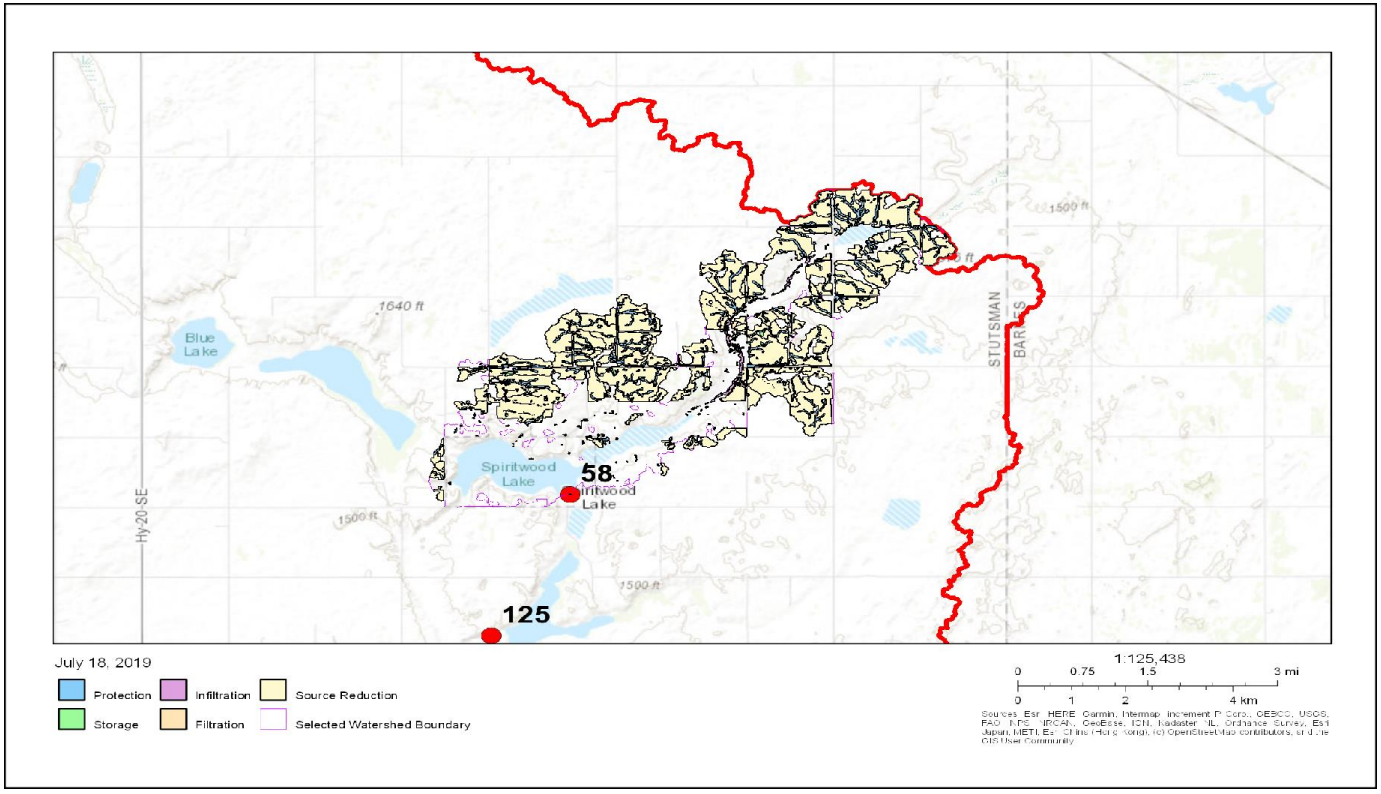

Figure 5. PTMApp map of the top projected areas for cost effectiveness areas to implement BMP's for total nitrogen

PTMApp-Web Targeted BMP Action Report

Report Details

PTMApp-Web User: Dustin Krueger

Watershed: James (huc10160000)

Location Point Number: 58

Report Generation Date: 2020-01-14

Selection Criteria

Parameter: Total Nitrogen

Treatment Group(s): Infiltration

Basis for Practice Selection: Cost-Effectiveness (lowest $/mass)

Scale and Storm Event: Watershed Outlet, 2 - Year

Method Used to Select BMPs: Number of Highest Ranked BMPs

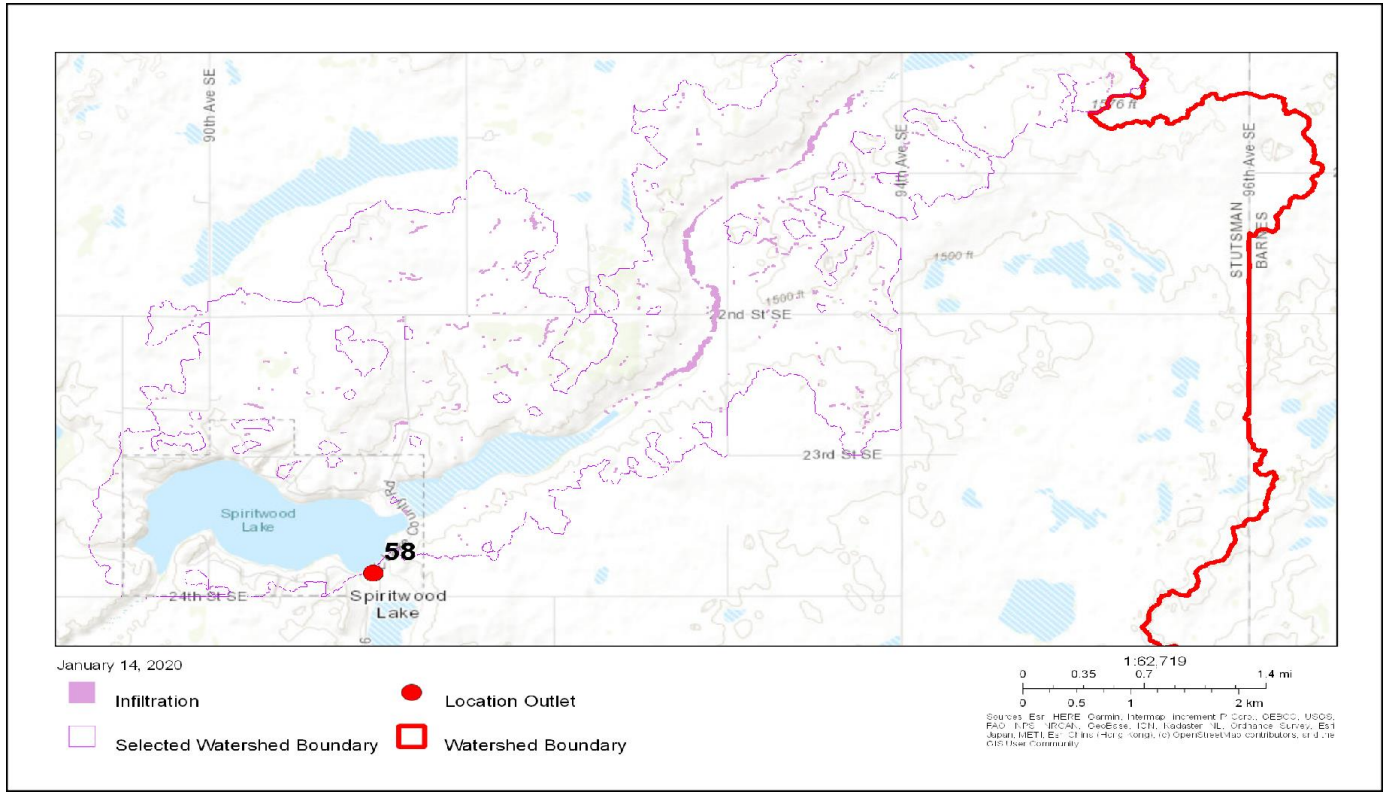

Figure 6. PTMApp map of the top projected areas for cost effectiveness areas to implement BMP's for nitrogen

Appendix C. Milestone Table

Milestone Table for the Spiritwood Lake Watershed Project

Task/Responsible Organizations		Output	Qty.	Year 1 2020	Year 2 2021	Year 3 2022	Year 4 2023	Year 5 2024
Objective 1:								
Task 1: Group 1,5	Hire watershed coordinator ½ FTE	Watershed Coordinator	1	1	1	1	1	1
Objective 2:								
Task 2: Group 1, 2, 5	Conduct fertilizing education	Educational materials in spring	5	1	1	1	1	1
Task 3: Group 1, 5	Renovate failing systems within the city and campground	Completed renovations	5			2	3	
Objective 3:								
Task 4: Group 1,2,3,5	Improve nutrient management on 1500 acres on cropland	Apply BMP's	1500	200	500	500	200	100
Task 5: Group 1,2,3,5	Improve 1000 acres of grazing land and winterfeeding operations	Apply BMP's	1000	200	300	300	100	100
Objective 4:								
Task 6: Group 1,4,5,6	Hypolimnetic drawdown	Install drawdown on the SW outlet	1				1	
Task 7: Group 1,4,5,6	Long-term plan with the ND G&F	Construct 10-year contract for controlling hypolimnetic drawdown	1					1
Objective 5:								
Task 8: Group 1,5	Informational Events	2-public meeting, 2-tours/workshops	4		1	1	1	1
Task 9: Group 1,5	Newsletters and other media	A) Work with SCD on forwarding info B) Quarterly news releases highlighting a resource concern, project success or current water quality topic.	16	2	4	4	4	2
Objective 6:								
Task 10: Group 1,4	Establish a Quality Assurance Project Plan	Approved QAPP	1		1			
Task 11: Group 1,5	Conduct Sampling	40 Water samples	40	89	8	8	8	8
Objective 7:								
Task 12: Group 1, 5	Complete annual and final project reports	Project reports	6	1	1	1	1	6

Group 1 – Spiritwood Lake - Local project manager and sponsor, including responsibilities for project coordination, reimbursement payments, match tracking, and progress reporting to the NDDEQ. Also provides technical assistance to plan, design, and implement BMPs.

Group 2 - Landowners in the Spiritwood Lake watershed - Make land management decisions and provide cash and in-kind match for BMPs.

Group 3 - Natural Resource Conservation Service - Provides technical assistance to plan, design, and implement BMPs. Also provides financial assistance for BMPs to landowners through the EQIP program.

Group 4 - ND Department of Environmental Quality - Statewide section 319 program management including oversight of local 319 planning and expenditures. Also provides technical assistance for water quality analysis and documentation.

Group 5 - Stutsman Soil Conservation District - Provides technical assistance to plan, design, and implement BMPs. Also provides financial assistance for the watershed coordinator and BMPs to landowners through the existing programs.

Group 6 – ND Game and Fish Department – Providing technical and financial support for the hypolimnetic system task.

Appendix D. Budget.

Part 1: Funding Sources						
	2020	2021	2022	2023	2024	Total
EPA SECTION 319 FUNDS						
1)FY 2020 Funds (FA)	$31,096	$44,076	$61,644	$97,141	$25,220	$259,177
STATE/LOCAL MATCH						
1) City of Spiritwood Lake (TA & FA)	$10,350	$10,454	$10,966	$41,090	$11,624	$84,484
2) Landowners (FA)	$10,380	$18,930	$30,130	$23,670	$5,190	$88,300
Subtotals	$20,730	$29,384	$41,096	$64,760	$16,814	$172,784
TOTAL BUDGET						
	$51,826	$73,460	$102,740	$161,901	$42,034	$431,961
OTHER FEDERAL FUNDS						
1) NRCS (TA, EQIP, and other programs)	$133,000	$133,000	$25,000	$25,000	$25,000	$100,000
2) NDDoH	$0	$0	$6,500	$6,500	$6,500	$19,500
TOTAL FEDERAL FUNDS	$133,000	$133,000	$31,500	$31,500	$31,500	$360,500
TOTAL PROJECT COST						$792,461

FA: Financial Assistance
TA: Technical Assistance
SCD: Soil Conservation District
NRCS: Natural Resource Conservation Service
FSA: Farm Service Agency
NDDEQ: North Dakota Department of Environmental Quality

Part 2: Detailed Budget (Section 319/Non-Federal)								
	2020	2021	2022	2023	2024	Total Costs	Cash and In-kind Match	319 Funds
PERSONNEL/SUPPORT/ADMIN								
Contractual services through the Stutsman County SCD FTE 50%	$25,376	$26,135	$26,915	$27,726	$28,559	$134,711	$53,884	$80,827
Subtotals	$25,376	$26,135	$26,915	$27,726	$28,559	$134,711	$53,884	$80,827
Objective 2: Renovation								
Nutrient management near lake education						$0	$0	$0
Renovations of septic systems city and campground			$28,000	$42,000		$70,000	$28,000	$42,000
Subtotals			$28,000	$42,000		$70,000	$28,000	$42,000
Objective 3: Implement BMB's								
Improve nutrient management on cropland	$8,400	$21,000	$21,000	$8,400	$4,200	$63,000	$25,200	$37,800
	$17,550	$26,325	$26,325	$8,775	$8,775	$87,750	$35,100	$52,650
Subtotals	$25,950	$47,325	$47,325	$17,175	$12,975	$150,750	$60,300	$90,450
Objective 4: hypolimnetic Drawdown Inspection/Renovation								
Inspection of pipes and pump				$75,000		$75,000	$30,000	$45,000
Work with partners to create long term plan						$0	$0	$0
Subtotals				$75,000		$75,000	$30,000	$45,000
Objective 5: Public Information Campaign								
Public informational meetings	$500		$500		$500	$15,00	$600	$900
Prepare newsletter and other outreach						$0	$0	$0
Subtotals	$500		$500		$500	$1,500	$600	$900
Objective 6: Water Sampling								
QAPP development						$0	$0	$0
Conduct water sampling						$0	$0	$0
Subtotals						$0	$0	$0
Objective 7: Project Reporting								
Annual project report						$0	$0	$0
Subtotals	$0	$0	$0	$0	$0	$0	$0	$0
Total for all Objectives/Tasks								
Total 319/Non-federal Budget	$51,826	$73,460	$102,740	$161,901	$42,034	$431,961	$172,784	$259,177

Appendix E. Hypolimnetic Discharge Plan.

Hypolimnetic Discharge Plan

One factor contributing to the decline of water quality in the lake is the extended residence time of the water. Residence time is the amount of time water spends in a lake before flowing out. There are two main reasons for the increased residence time of Spiritwood Lake: first, the outlet of the lake is in close proximity to the inlet, allowing for no exchange of “fresher” water. The historical outlet, according to documentation is located in the southwest corner of the lake. Secondly, the operation of the hypolimnetic drawdown was suspended due to high water in the receiving waterbody (Shock Lake). This has resulted in nutrient-rich water remaining in the lake and available for plant growth throughout the water column when the lake turns over. During the recreational season, stratification occurs between four and eleven meters. Results indicate there is less than 5 mg/L dissolved oxygen below these levels, limiting aquatic life habitat. If a functioning hypolimnetic system was employed, it would need to remove 9,537 acre feet of water when the lake stratifies at the four meter level to 1,607 acre feet at the eleven meter level. In the past, the hypolimnetic drawdown system would have removed this pool of water in the fall, allowing spring snowmelt runoff to “freshen” the lake. Without the removal of the nutrient-rich water, the nutrients are constantly being recycled.

This would involve the redirecting of the outlet pipe from Shock Lake to Seven Mile Coulee. Most likely this would require the largest expenditure of funds because of the installation of new pipe and other equipment. Discharges would need to be monitored closely to ensure minimal adverse effect to the water quality of Seven Mile Coulee. The on the discharge into Seven Mile Coulee would have a plunge pool for the water and three rock filters so fish can not pass through into Seven Mile Coulee.

Appendix F. Letters of Support.