SECTION 319 NONPOINT POLLUTION CONTROL PROGRAM

WATERSHED PROJECT FINAL REPORT

VERMILLION RIVER BASIN WATERSHED IMPLEMENTATION PROJECT SEGMENT II

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DISTRICT SECRETARIES

July
2015

This project was completed in cooperation with the South Dakota Department of Environment and Natural Resources and the United States Environmental Protection Agency, Region 8.

Grant # 9998185-11 and 9998185-12

EXECUTIVE SUMMARY

PROJECT TITLE: Vermillion River Basin Watershed Project

PROJECT START DATE: June 18, 2008

PROJECT COMPLETION DATE: July 31, 2015

FUNDING:

Section 319 Grants:	9998185-11	$100,000
	9998185-12	$202,800
Total Section 319 Grants		$302,800

Funding Sources	**Original Budget**	**Amount Used**
Section 319 Grants	$202,800	$225,009.83
Consolidated	$83,000	$0.00
CW SRF-Water Quality	$50,000	$14,860.03
Other State	$22,033	0.00
USDA	$407,398	$277,414.20
Other Federal	$35,846	0.00
Local and In-Kind	$276,166	$296,513.52
Totals:	**$1,077,243**	**$813,797.58**

The project goal was to "Restore the beneficial uses of the Vermillion River through the implementation of Best Management Practices (BMPs) in the watershed that targeted sources of fecal coliform bacteria and suspended solids in the river".

This project was an expansion of the locally planned Turkey Ridge Creek Watershed Implementation Project. The project BMPs were based on impairment information identified during the Vermillion River Watershed Assessment Project. The project included a fecal coliform and total suspended solids (TSS) Total Maximum Daily Load (TMDL) for the Vermillion River. The final report and establishment of the TMDL was completed in 2012.

During the watershed assessment study, nearly 2,000 animal feeding operations were identified in the project area. Each were evaluated and assigned a priority ranking using the Agricultural Nonpoint Source (AGNPS) Feedlot Rating Module. Animal feeding operations assigned ratings above 50 were subject to further evaluation. At a later time, a new ranking system was formed for development of a tier one list. Operations on the tier1 list were investigated and additional information was gathered to further assist in targeting feedlot priorities.

The majority of the first year's work was completion of projects that were carried over from the Turkey Ridge Creek Watershed Implementation Project. Information and Education efforts were implemented throughout the watershed using information pamphlets, news releases, presentations, and personal contacts with producers. News releases and pamphlets can be found in Appendix A of this report.

A total of 13 feasibility studies, 13 cultural resources reviews, and 9 waste storage facilities were designed and completed during Segment 1 of the project. During the second Segment there were 7 waste storage facilities constructed, all with nutrient management plans covering 4,610 acres. Nutrient Management Plans were written for all 16 of the systems constructed with conservation tillage being adapted on 11440 acres by these operations to comply with the NRCS 329 standard for erosion.

Cropland BMPs were mainly applied using Conservation Reserve Program (CRP). Practices installed in Segment 1 consisted of 9,017acres and in this Segment two 9,394 acres of native grass seeding, filter strips, riparian buffers, and 20,180 linear feet of grassed waterways.

Planned grazing systems were applied on 4,609 acres in Segment 1 and 1,585 acres in Segment 2. The main practices used to make the systems functional were pipelines and tanks and cross fencing to allow the livestock to be rotated between a varying number of paddocks.

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INTRODUCTION

Watershed Basin

The Vermillion River is formed at the confluence of the East and West Forks of the Vermillion River near Parker, South Dakota. Headwaters of the East Fork, approximately 103 miles long, begin at Lake Whitewood in Kingsbury County. Headwaters of the West Fork, approximately 108 miles long, begin in Miner County. The combined river flows south 96 miles to its confluence with the Missouri River five miles South of Vermillion, South Dakota.

The TMDL watershed project area is shown in Figures 3 and 4. Major perennial tributaries to the Vermillion River include: Ash Creek -drainage area of 23 square miles, Clay Creek - drainage area of 72 square miles, Frog Creek - drainage area of 28 square miles, Little Vermillion River - drainage area of 86 square miles, Spirit Mound Creek - drainage area of 22 square miles, and Turkey Ridge Creek - drainage area of 176 square miles. The meandering nature of the river creates a diversity of aquatic habitats. Agriculture, specifically row crops and livestock feeding operations with mostly open feedlots, are the main land uses in the watershed.

Table 1: Vermillion River and its Basin Features.

Water body Name	**Vermillion River and 6 impaired segments**
Hydrologic Unit Code:	10170102 and 10170103
Location:	S31-T110N-R54W To S5-T91N-R51W
Water Quality Standards and Designated Uses:	See Table 2 and Table 3
Major Perennial Tributaries:	Ash Creek, Clay Creek, Frog Creek, Little Vermillion
	River, Spirit Mound Creek, Turkey Ridge Creek
Receiving Water body:	Missouri River
Stream Segment Length:	96 Miles
Watershed Area:	2673 Sq. Miles

Water Body Description

The Vermillion River drains approximately 1.43 million acres (2,233 Sq. Miles) covering portions of fourteen eastern South Dakota counties (Figure 3). The basin is nearly 150 miles north to south and varies in width from 12 miles in the north to 36 miles in the south. The majority of the lower 22 miles of the river are channelized.

An estimated 96 percent of the total surface area is devoted to agriculture (Figure 1) and cropland accounts for sixty-seven percent of the land use. The primary crops grown are corn, soybeans, alfalfa, and small grains. The basin has 330,000 acres (23 percent) of grasslands which are used primarily for livestock grazing. Grasslands are mostly concentrated on steeper sloping lands adjacent to the Vermillion River and its tributaries.

Wetlands in the watershed comprise 2 to 3 percent of the project area including small potholes, many of which have been drained, and other larger semi-permanent wetlands in addition to Swan Lake and Silver Lake. Wildlife that inhabit the area include Whitetail Deer, Coyotes, Red Fox, Mountain Lion, Beaver, Raccoons, Wild Turkey, Ring-Necked Pheasants, numerous song birds, reptiles, waterfowl, and amphibians. The average annual precipitation in the Vermillion River Basin ranges from 22 to 26 inches. Approximately 74 percent of the precipitation is received in the form of rain during the months of April through September. Summer temperatures average about 69.8 degrees F; while the winter temperatures, about 22 degrees F. Tornadoes and severe thunderstorms strike occasionally. These storms are local and of short duration, and occasionally produce heavy rainfall events. The average annual snowfall is 30 inches (USDA, 1977). During the course of the watershed assessment study, the Vermillion River maintained continuous flow, including during the 2002 and 2003 drought, even though the majority of the discharge to the river occurs during the spring snow melt and after heavy rainfall events.

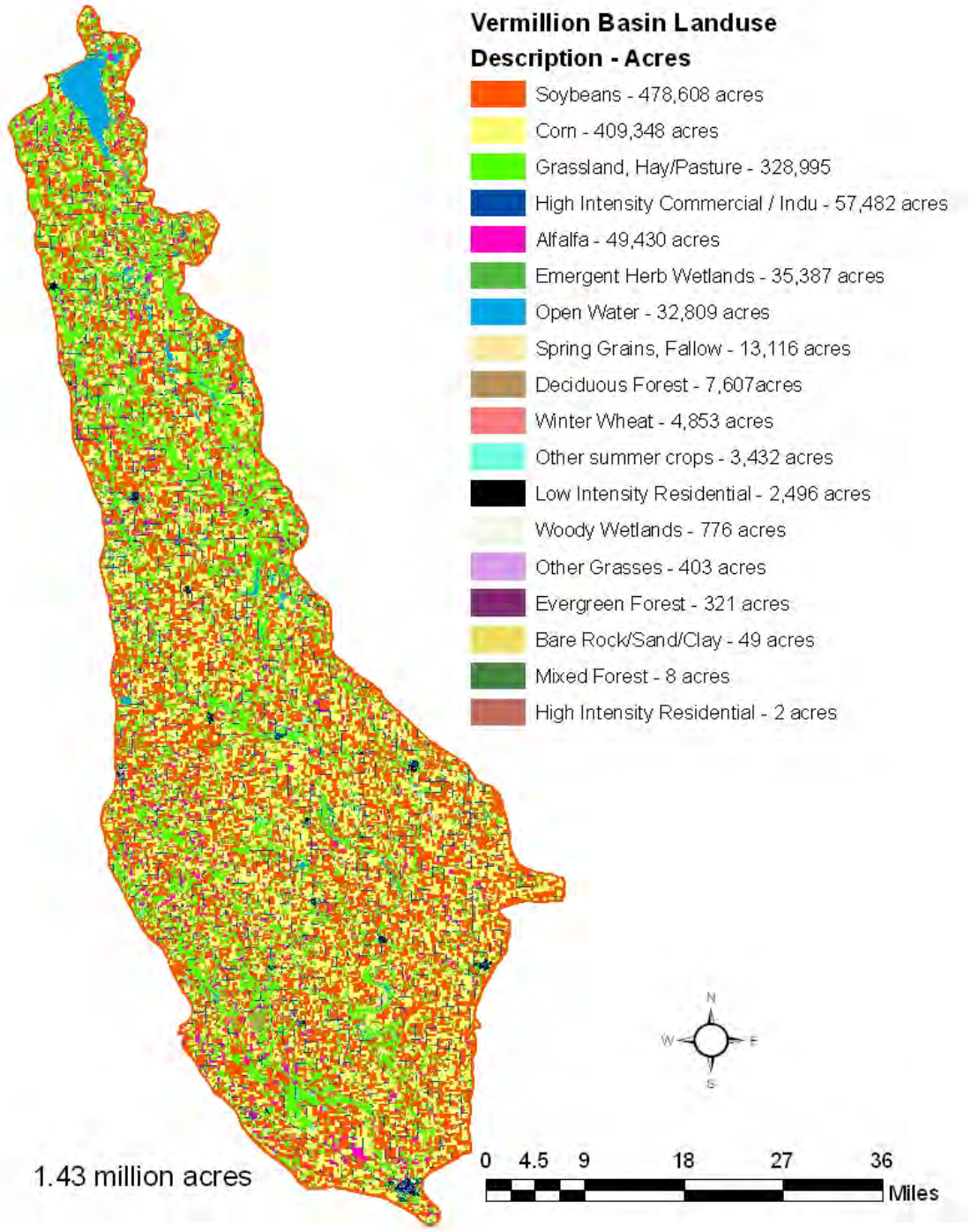

Figure 1: Vermillion River Basin Land Uses.

The Vermillion River watershed area starts at the overflow from Lake Whitewood in east central Kingsbury County and extends to the confluence of the Missouri River south of Vermillion, South Dakota large percentage of the project area is dominated by a rolling landscape used for row crop farming and livestock operations. The southern border of the project area is at the Missouri River floodplain which is also dominated by row crop farming. The Vermillion River watershed area is comprised of 1,430,000 acres of which 67% is cropland and 23% grasslands and residential development (Figure 1).

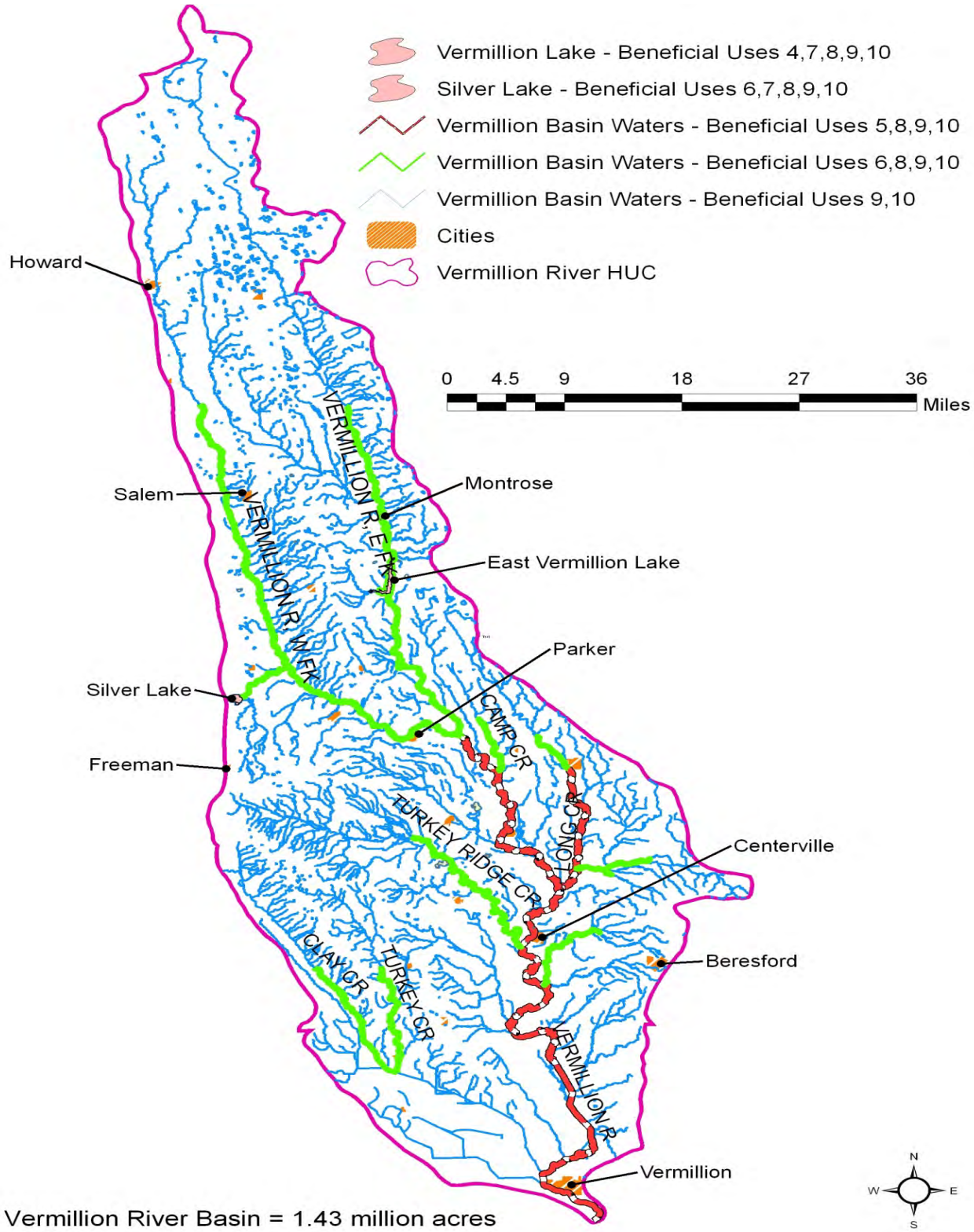

Figure 2: Vermillion River Beneficial Use Map

The Vermillion River Basin Implementation Project is divided into nine river reaches from Whitewood Lake to the Missouri River near Vermillion, SD. Figure 3 shows the location of these nine reaches, and Table 2 lists each of the segments' beneficial uses and impairments as reported in the SD DENR 2014 Integrated Report (IR).

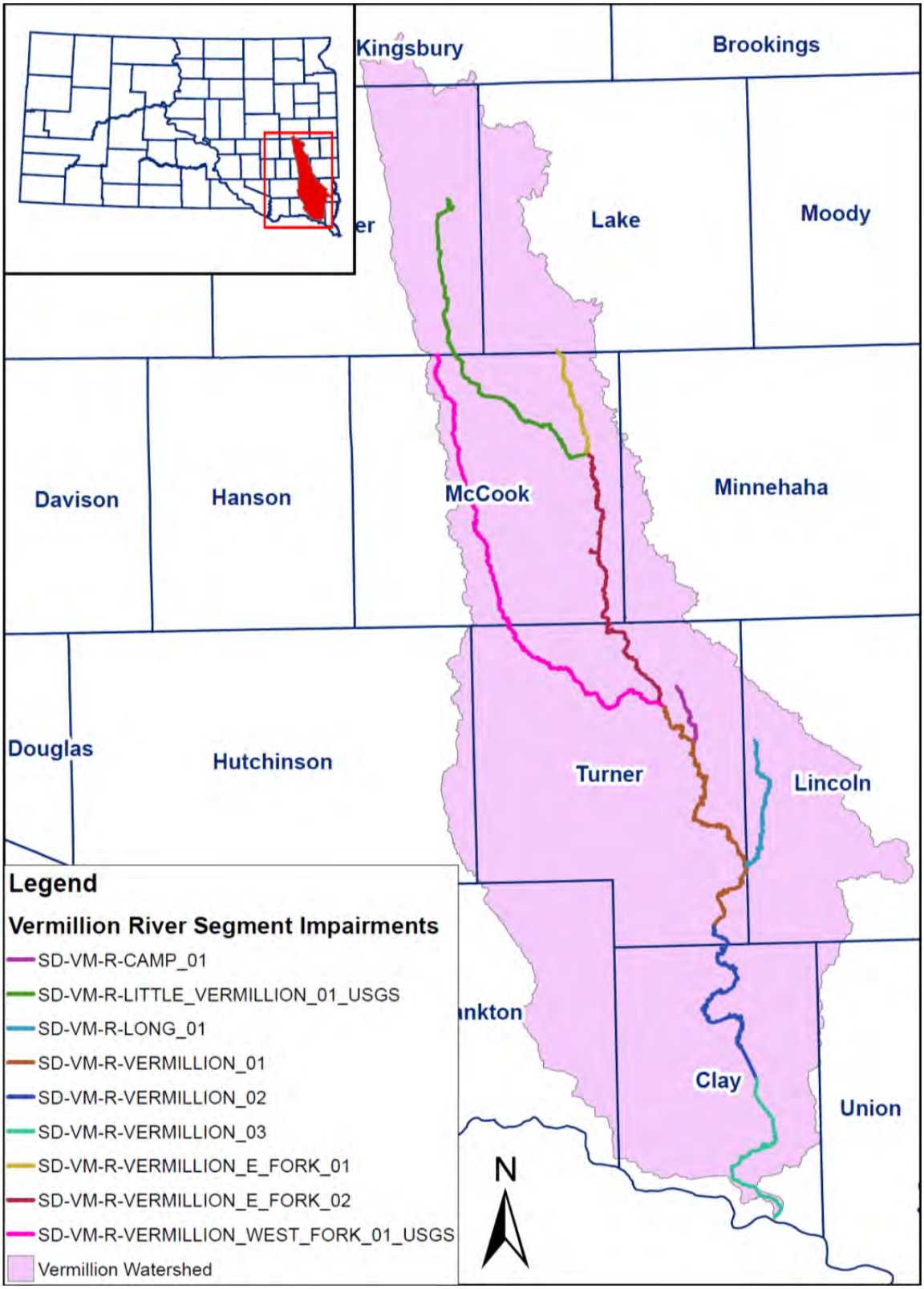

Figure 3: Vermillion River Basin Segments for TMDL

Table 2: Beneficial Uses and Impairments for Targeted Project Water Bodies.

Vermillion River/Streams	From	To	Beneficial Uses	Impaired Uses	Impairment Cause
Vermillion River (SD-VM-R-Vermillion_03)	Missouri River	Baptist Creek	5, 8, 9, 10	5	TSS, E-coli
Vermillion River (SD-VM-R-Vermillion_02)	Baptist Creek	Turkey Ridge Creek	5,8,9,10	5	TSS
Vermillion River (SD-VM-R-Vermillion_01)	Turkey Ridge Creek	Headwaters	5,8,9,10		
West Fork Vermillion River (SD-VM-R-Vermillion_West_Fork_01_USGS)	West Vermillion River Headwaters	Near Parker, SD.	6, 8, 9, 10	8	Fecal, E-coli
East Fork Vermillion River (SD-VM-R-Vermillion_E_Fork_02)	Mouth with West Fork	Little Vermillion River Mouth	6,8,9,10	8	E-coli
East Fork Vermillion River (SD-VM-R-Vermillion_E_Fork_01)	Little Vermillion Mouth	McCook County Line	6,8,9,10	8	Fecal
Little Vermillion River (SD-VM-R-Little_Vermillion_01_USGS)	Headwaters	Near Salem, McCook County	9,10	8	
Camp Creek (SD-VM-R-Camp_01)	Section 56, T99N, R52W	Vermillion River	6,8,9,10		
Long Creek (SD-VM-R-Long_01)	Highway 44, Lincoln Co.	Vermillion River	6,8,9,10	8	Fecal, E-coli
Lakes: Vermillion Watershed					
East Vermillion Lake (SD-VM-L-E_Vermillion_01)	McCook Co.		4, 7, 8, 9	4,7,8,9	Chlorophyll-a Temperature
Lake Henry (SD-VM-L-Henry_01)	Kingsbury Co.		6, 7, 8, 9		
Marindahl Lake (SD-VM-L-Marindahl_01)	Yankton Co.		4, 7, 8, 9		
Silver Lake Creek (SD-VM-L-Silver_01)	Hutchinson Co.		6, 7,8,9	6	pH (high)
Swan Lake (SD-VM-L-Swan_01)	Turner Co.		5,7,8,9		
Lake Thompson (SD-VM-L-Thopson_01)	Kingsbury Co.		4, 7, 8, 9		Chlorophyll-a
Whitewood Lake (SD-VM-L-Whitewood_01)	Kingsbury Co.		6, 7, 8, 9		
North Island Lake	Minnehaha Co.		5,7,8,9		

Numerical Key to Beneficial Uses listed in Table 2:

(1) Domestic water supply waters;
(2) Coldwater permanent fish life propagation waters;
(3) Coldwater marginal fish life propagation waters;
(4) Warm water permanent fish life propagation waters;
(5) Warm water semi-permanent fish life propagation waters;
(6) Warm water marginal fish life propagation waters;
(7) Immersion recreation waters;
(8) Limited contact recreation waters;
(9) Fish and wildlife propagation, recreation, and stock watering waters;
(10) Irrigation waters; and
(11) Commerce and industry waters.

There is a difference of 74,000 acres between the TMDL watershed area and the implementation project watershed area due to the shared area of the Kingsbury Lakes Watershed Implementation Project. Since the Kingsbury Lakes Project addressed the overlapping land in its implementation project, it was not included in the Vermillion River Basin Implementation Project. BMPs completed in this area after the completion of the Kingsbury Lakes Project were tracked for the two segments of the Vermillion Basin Project. The Extended Drainage Area (Figure 4) illustrates the Kingsbury Lakes Watershed Project portion of the Vermillion Basin.

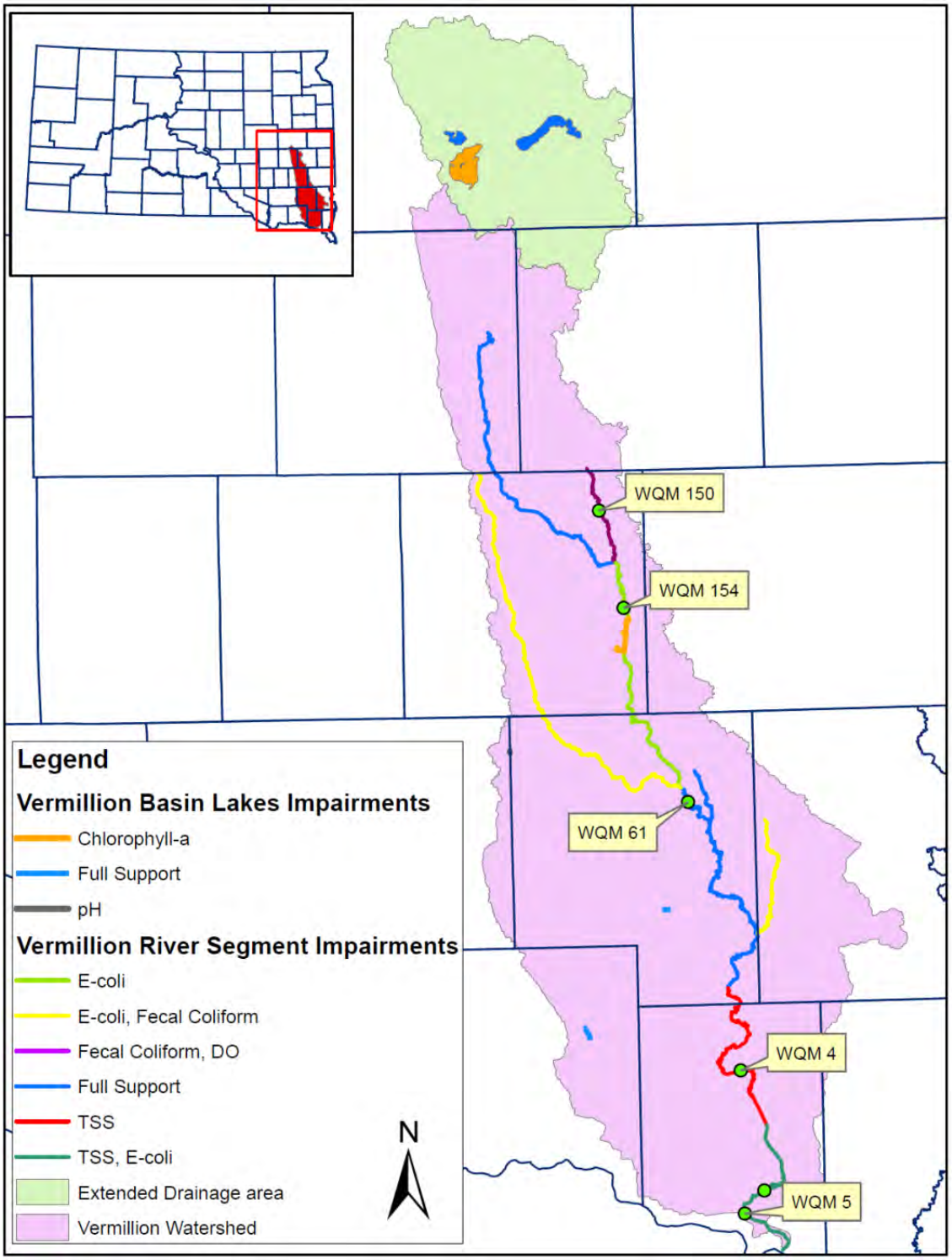

Figure 4: Vermillion River Basin Impairments

Nonpoint Source Pollutants

The load reduction goals for TMDLs of several segments are listed in Table 3. The TMDLs are categorized by flow regimes. The flows for each reach segment are different, but represent the described regime.

Table 3: Vermillion River Basin Implementation Project TMDL Reaches Reductions Needed.

	Flow Regimes									
Fecal/E-coli TMDLS Segments	Extreme		High Range		Mid Range		Low		Dry	
	CFUs/day	Percent	CFUs/day	Percent	CFUs/day	Percent	CFUs/day	Percent	CFUs/day	Percent
Long Creek	5.78E+13	90.1%	3.40E+13	97.3%	2.47	38.4%	0	0.0%	0	0.0%
West Fork Vermillion River	0	0.0%	2.10E+11	12.4%	0	0.0%	1.77E+10	52.3%	0	0.0%
East Fork Vermillion River-01	0	0.0%	0	0.0%	1.32E+13	93.8%	2.35E+13	98.7%	1.39E+11	67.5%
TSS TMDL Segments	Extreme		High Range		Mid Range		Low		Dry	
	t/day	Percent	t/day	Percent	t/day	Percent	t/day	Percent	t/day	Percent
Vermillion River-02	35.82	8.7%	14.83	21.2%	0	0.0%	0	0.0%	0	0.0%
Vermillion River-03	900.98	59.0%	91.02	53.0%	0	0.0%	0	0.0%	0	0.0%

The most likely sources of impairments were identified as runoff from:

Confined animal feedlots
Feeding areas in close proximity to drainages
Grazing livestock standing in, crossing, or heavily grazed riparian areas
Improper application and handling of manure
Intense row cropping practices

This project was developed to plan and install BMPs to reduce pollution loading to the Vermillion River. The list of BMPs to included:

Animal waste management system feasibility studies
Animal waste management system designs
Nutrient management plans
Conservation tillage
Cropland BMPs
Grazing management
Riparian restoration

During the watershed assessment study, over 2,000 animal feeding operations were identified in the project area. Each was evaluated and assigned a priority ranking using the AGNPS Feedlot Rating Module. Geographic Information System Arc-Map was used to further refine the list of operations to target that were located on, or near major tributaries in the watershed. This generated a "Tier One" list that was used as a "look here first" approach for determining which producers to visit first.

Cost-share funds for installing the practices were provided by the United States Environmental Protection Agency (U.S.EPA) Section 319 Nonpoint Source Pollution Control Grant, the United States Department of Agriculture (USDA) Continuous Conservation Reserve Program (CCRP), Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP), and the SD Coordinated Soil and Water Grant (SDCWSRF).

Watershed awareness was accomplished through information and education (I&E) activities during the project. News articles, newsletters, posters, information pamphlets, and public meetings were used to inform producers about the project and how it could help them with future BMP planning.

Project Segment 1 Accomplishments

Project Segment 1 was completed December 31, 2012. A summary of the BMPs completed in the project are shown in Table 4.

Table 4: Segment 1 Completed BMPs.

Best Management Practices	Completed
Conservation Tillage	4,662 Ac.
Seeding	2,568 Ac.
Filter Strips/Grassed Waterways	1,991 Ac.
Rotational Grazing Systems	4,405 Ac.
Riparian Rotational Grazing Systems	204 Ac.
Animal Waste Management System Construction	9
Animal Waste Management System Designs	9

PROJECT GOALS, OBJECTIVES, TASKS, AND ACTIVITIES

Objective 1: Install best management practices in critical areas to reduce sediment, nutrient, and fecal coliform bacteria loading to the Vermillion River.

Task 1: Provide assistance to landowners for installation of BMPs on 1,250 acres of grassland.

Product 1: Grassland Management - Riparian Area Management (RAM) Program (250 ac.)

Milestones:	**Planned**	**Completed**
Conservation Reserve Program	100 Ac	317 Ac
Easement- 30years/Permanent	30 Ac	0 Ac
Riparian Area Management	120 Ac	128 Ac

Accomplishments:
In Segment 2 there were 317 acres of CRP applied. The CCRP could better match the rental rates producers were actually getting for pasture rent. With the addition of SRAM late in the project, 128 acres of RAM/SRAM were applied and the RAM milestone was accomplished. Since a large percentage of the land use is intensive row crop production the small riparian areas that exist are highly sought after by cow calf operations. Due to the geographic nature of the watershed, those areas tend to be slender tracts of undeveloped rangeland and are highly utilized for grazing. In many cases buffering out the stream would essentially remove the majority of the grazing acres for their livestock. The easement portion of this program was especially unpopular.

Figure 5: Riparian Buffers.

Product 2: Grassland Management – Rotation Grazing Systems (1000ac.)

The implementation of rotational grazing systems on grasslands requires the installation of practices that support the landowner grazing management changes which include water development (pipelines, tanks, rural water hook-ups, wells, ponds, etc.) and fencing. Practices installed will be funded by the landowner with financial assistance from South Dakota and Federal conservation and wildlife programs such as Soil and Water Conservation Grants, Partners for Wildlife programs, and USDA conservation programs such as EQIP.

Milestones:	**Planned**	**Completed**
Fencing	0 LF	1,320 LF
Grazing Management	1,000 Ac	1,585 Ac

Accomplishments:
In this segment there were 1584.6 acers within the watershed of Planned Grazing Systems applied using 1,320 linear feet of fencing to get the system up and running. This practice was applied using partner contributions and technical assistance. EQIP was very beneficial to the project due to the fact that when larger amounts of grass are left in the paddocks, run off and erosion from the paddocks is greatly reduced. This helped with sedimentation and fecal coliform levels along with providing more grazing for the animals.

Task 2: Cropland Management BMPs

Provide assistance to landowners with installation of BMPs on cultivated cropland and grassland BMPs in the watershed that reduce fecal coliform bacteria, nutrient, and sediment loadings. Technical Assistance for practice installation will be provided by partnering watershed conservation districts, NRCS Field Office staff, and the project coordinator. Funding for practice installation will be from the NRCS Conservation Programs (CCRP, EQIP), Wildlife Programs (GF&P and US F&WS), Soil and Water Conservation Program and Landowners.

Product 3: Installation of Cropland BMPs

Provide technical assistance to landowners for the installation of BMPs on 250 acres of cropland to reduce sediment and nutrient loads from critical areas identified during the watershed assessment. The BMPs are expected to include but are not limited to filter strips, grassed waterways, conservation tillage, grass seeding, terraces, and wetland restoration.

Milestones:	**Planned**	**Completed**
Grass Seeding	200 Ac	8287 Ac
Filter Strips	25 Ac	1107 Ac
Grassed Waterways	27,000 LF	20,180 LF

Accomplishment:
These cropland conservation practices were all successfully applied by using CCRP.

Figure 6: Cropland BMPs.

Technical assistance provided for adoption of conservation tillage, no-till, reduced-till, etc., was provided to landowners through educational and outreach activities. The assistance was provided by the project coordinator in partnership with NRCS, SDSU Cooperative Extension Service, farmers in the area who have adopted the practice, and conservation districts within the watershed. The Farmed Wetland Program within CCRP was the main program that provided many acres of Filter Strips placed around wetland areas to protect the wetlands. Another practice within CCRP that was used on cropland acres to provide acres of Filter Strips was CP-21 which is actually called Filter Strip. Most of the Grass Seeding acres were accounted for by the CP-25 – Rare and declining Habitat, CP-37 – Duck Nesting Habitat, and CP-38E SAFE Wildlife Habitat for Pheasants. The Grassed Waterway Practice – CP-8A were mainly applied within the Counties of Lincoln and Minnehaha just because they are the only areas that could support the practice.

Task 3: Animal Waste Management Systems. Provide assistance to landowners to complete three (3) animal waste feasibility studies and install two (2) new animal waste storage systems that reduce fecal coliform, nutrient loading, and complement the producer's operational needs.

Product 4: Installation of Animal Waste Management Systems

The Animal Waste Management Systems (AWMS) constructed include Nutrient Management Plans, and Cultural resources studies. Technical Assistance to landowners for AWMS installation was provided using the services of private consultants and/or the Ag Nutrient Management Team (NRCS). Funding for AWMS will be from the NRCS (EQIP), Consolidated Water Facilities Construction Fund, Landowners, and this 319 Project.

Milestones:	**Planned**	**Completed**
AWMS Feasibility Studies	3	7
AWMS Constructed	2	7
Nutrient Management Plans	2	4609.5

Figure 7: Feedlot Site Reclamation.

Accomplishment:
The producers that applied these systems were all producers who had existing systems but needed to improve retention and use of the animal waste to reduce fecal coliform, nutrient loading, and complement the producer's operational needs. The systems the project assisted included 2 different Monoslope barns that were located in McCook county and both within 2 miles of the West Fork of the Vermillion River. One of these was within 10 feet off the river bank.

Figure 8: Mono Slope and Hoop Barns.

Table 5: Feedlot Information.

Feedlot Type	Animal		Distance to Water Network
	Type	Number	
Open Lot – Monoslope/Hoop Barn (3)	Beef	999	2.0 miles average
Open Lot – VTA (2)	Dairy/Beef	250	2.0 miles average
Open Lot – Stacking Pads (2)	Beef	Beef	2.0 miles average.

Objective 2: Provide BMP and project information to watershed residents, landowners, and members of stakeholder organizations to inform them of project activities and BMP installation, and to maintain local support and involvement.

Task 4: Conduct outreach and information campaigns to reach 9,000 watershed landowners and residents.

Products 5: Newsletters, Press Releases, web site maintenance, and presentations to stakeholder groups.

Assistance will be provided to the McCook Conservation District and project partners to develop and implement an outreach/information campaign that informs project residents of opportunities for involvement in and progress of the project.

Milestones:	**Planned**	**Completed**
News Letters	3	3
Presentations	2	3
Press Release	3	3

Accomplishment:
The accomplishment of these Milestones was largely due to the efforts of the Turner County Conservation District's District Secretary. There were three news releases and three press releases of the completed news letters that were written and forwarded by a Turner County Conservation District employee to all 14 Conservation Districts in the watershed for distribution. There were 3 more presentations to the Conservation Districts in this watershed. The News Letters were distributed to every producer in the EQIP Priority Areas in Turner, Lincoln, and Clay Counties. News letters were also sent out to every producer within the RAM/SRAM Priority Areas within 2 miles of the Waterbodies. The Press Releases covered the same portions of the project and were published slightly after the News letters were sent. The Presentations were given at the Clay, Turner, and McCook County Fairs to all producers that stopped at the booth and wanted to hear what the project was promoting.
Objective 3: Prepare and submit project progress reports using the prescribed format(s) as required by the project sponsor and Partners.

Task 5: Monitor, evaluate and report project progress.

Product 6: Semi-annual, annual, final project reports and Vermillion River Basin Watershed Segment III PIP.

Milestones:	**Planned**	**Completed**
Annual GRTS reports	3	3
Final Report	1	1

Accomplishment:
All required/mandatory reports were submitted in a timely manner. There were three (3) GRTS reports in submitted for this project. This report fulfills the Final Report requirement for this project.

Summary of Project Goals and Objectives

Table 6: Planned Versus Completed Project Milestones.

OBJECTIVES/TASKS/PRODUCTS	PLANNED MILESTONES	COMPLETED MILESTONES
OBJECTIVE 1: Best Management Practice Implementation		
Task 1: Grassland Management		
Product 1: RAM Program Implementation		
CCRP	100 Ac.	316.6 Ac.
RAM/SRAM	120 Ac.	118.1 Ac.
Easement-30 years/Permanent	30 Ac.	0
Product 2: Rotational Grazing	2,000 Ac.	5,989.6 Ac.
Rural Water Hook-up	0	0
Pipeline	0	0
Fencing	0	1,320 LF
Task 2: Cropland BMPs		
Product 3: Cropland BMPs		
Filter Strips	125 Ac.	3,0983.3 Ac
Grassed Waterways	27,000 LF	20,180 LF
Seeding (Re-Venation)	500 Ac.	10,650.8 Ac.
Task 3: Animal Waste -Management Systems		
Product 4: Animal Waste -Management Systems		
Feasibility Studies	8	19
AWMS Construction	6	15
Nutrient Management	10	16
Objective 2: Information Outreach		
Task 4: Information Campaign		
- Newsletter	8	8
- Presentations	5	8
- Press Releases	7	9

MONITORING AND EVALUATION

Monitoring:

Financial information, milestones, and load reductions were monitored using SD DENR's Tracker Database system through the internet. Water quality monitoring was conducted on the East Fork of the Vermillion, and Vermillion River, through SD DENR's ambient water quality monitoring stations. Stream segments and water quality monitoring sites can be seen in Figure 9 below. Water Quality samples collected between 2003 and 2008 are considered "Pre-Implementation" samples and those taken from 2009-2014 as "During Implementation" samples for comparison purposes for each of the segments identified in Figure 9.

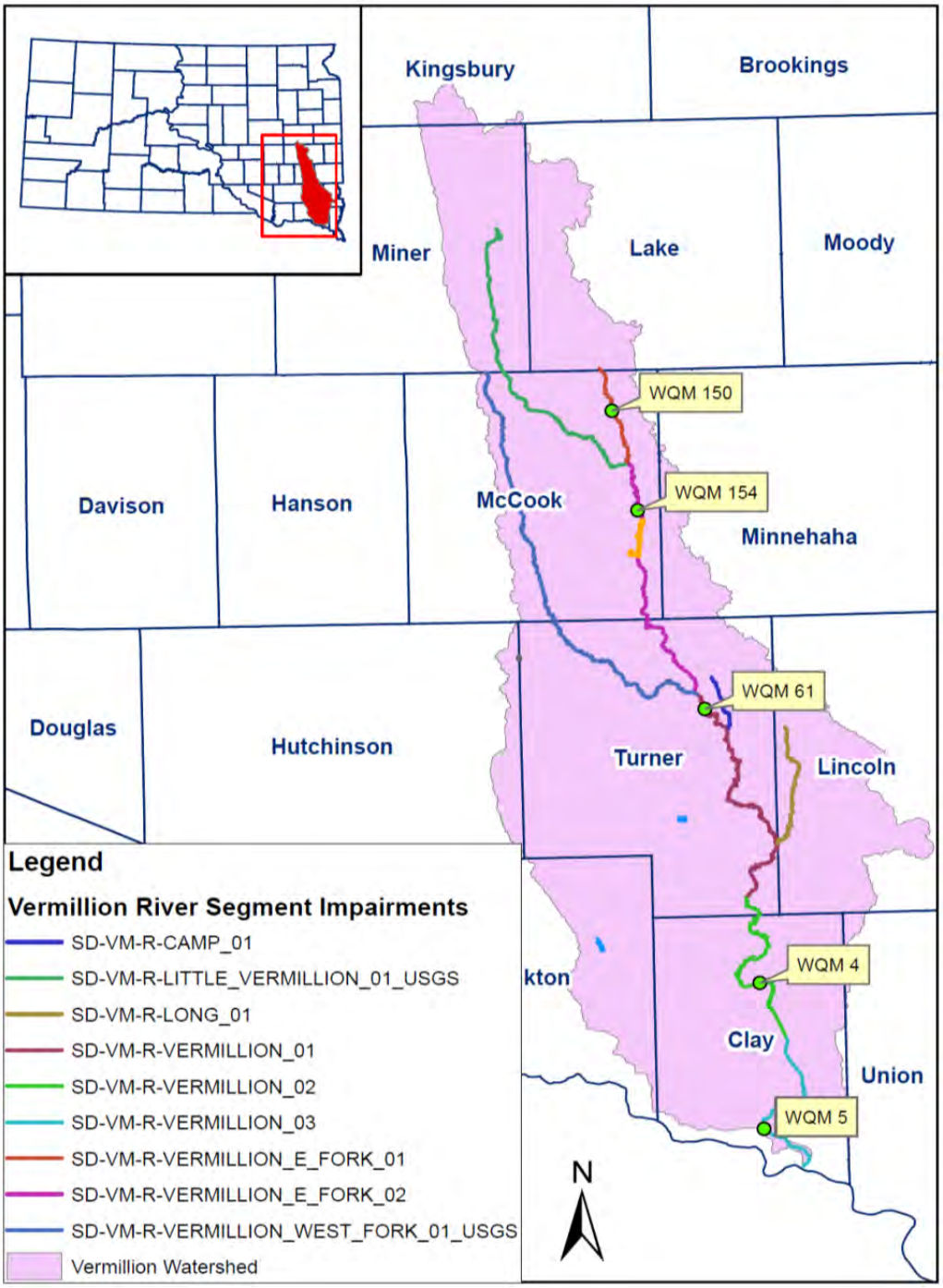

Figure 9: Vermillion Basin Water Quality Monitoring Site.

East Fork Vermilion River WQM 150:
East Fork Vermillion River Segment-01 (SD-VM-R-VERMILLION_E_FORK_01) was listed as impaired for Fecal Coliform in SD DENR's 2010 Integrated Report (IR). The segment currently is listed as threatened for Fecal Coliform in the 2014 IR. Results comparing Fecal Coliform samples are shown in Figure 10. The median value was reduced from 660 Colony Forming Units (CFU) to 190 CFU during the Pre-Implementaiton to During Implmentation sampling period. The Fecal Colifom water quality standard for the East Fork Vermillion River is 2,000 CFU.

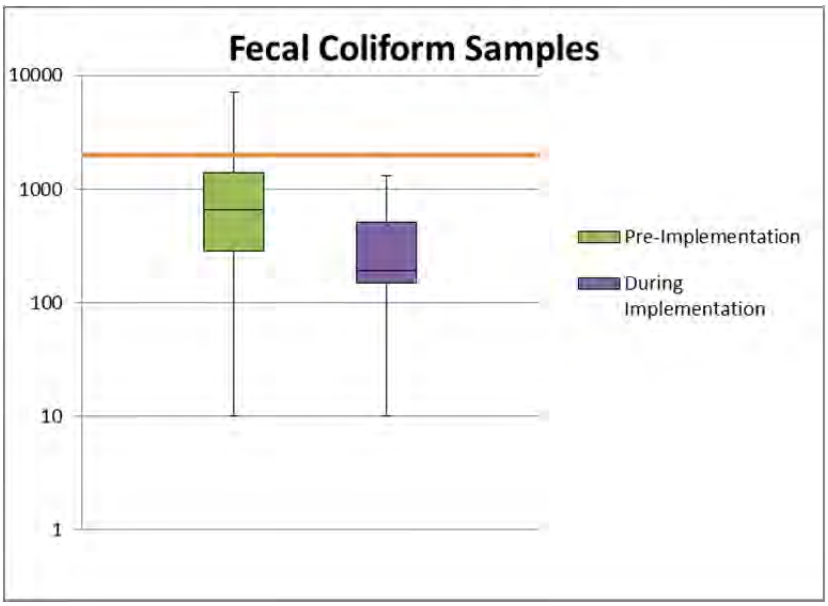

Figure 10: East Fork Vermillion Segment-01 Fecal Coliform Pre vs During Implementation.

All Fecal Coliform samples collected from 2004 through August of 2014 at the East Fork Vermillion WQM 150 site are displayed below in Figure 11.

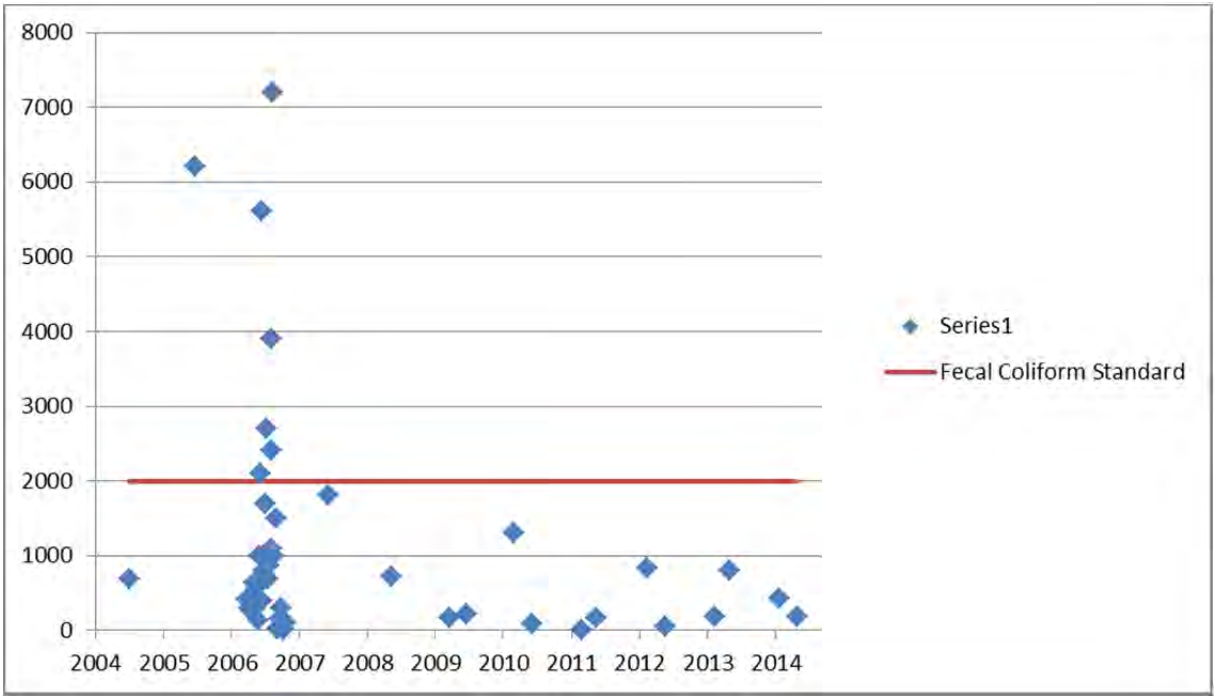

Figure 11: East Fork Vermillion River Segment-01 Fecal Coliform Samples.

The East Fork Vermillion River WQM 150 site contained one E-coli sample for the Pre-Implementation period, but was monitored on a regular basis in the During Implementation sampling period. The results of the E-coli samples can be seen in Figure 12. The median value is 206 CFU.

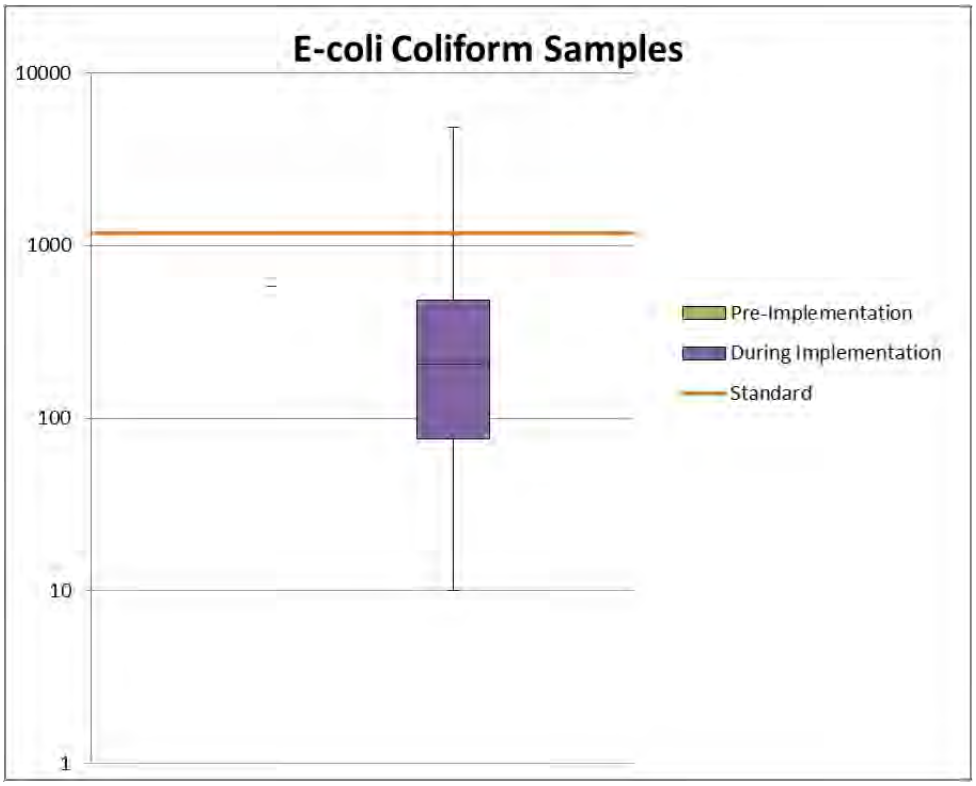

Figure 12: East Fork Vermillion River Segment-01 E-coli Pre vs During Implementation.

All E-coli samples collected from 2006 through August of 2014 at the East Fork Vermillion River WQM 150 site are displayed below in Figure 13. The water quality standard for Fecal Colifom for the East Fork Vermillion River is 1,178 CFU.

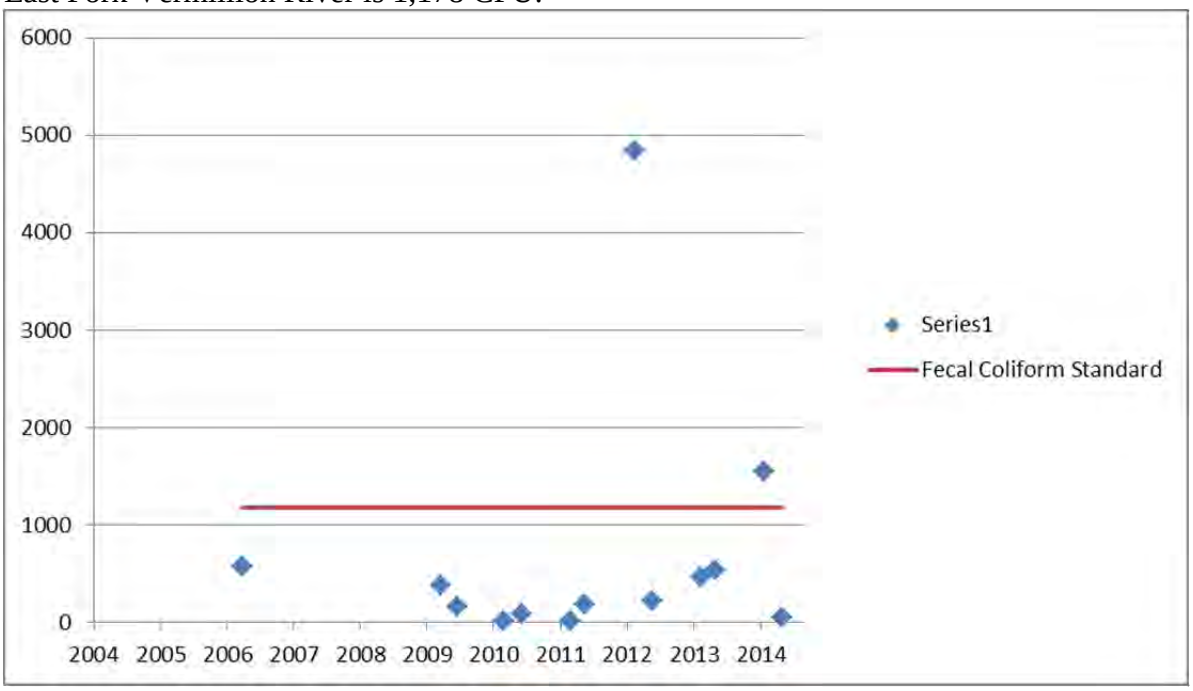

Figure 13: East Fork Vermillion River Segment-01 E-coli Samples.

East Fork Vermilion River WQM 154:
East Fork Vermillion River Segment-02 (SD-VM-R-VERMILLION_E_FORK_02) was listed as impaired for E-coli in SD DENR's 2010 Integrated Report. Currently it is listed as threatened for E-coli in the 2014 IR. Results comparing E-coli samples are shown in Figure 14. The median bacteria value was reduced from 660 CFU to 190 CFU during the Pre-Implementaiton to During Implmentation sampling period. The water quality standard for Fecal Colifom on the East Fork Vermillion River is 1,178 CFU.

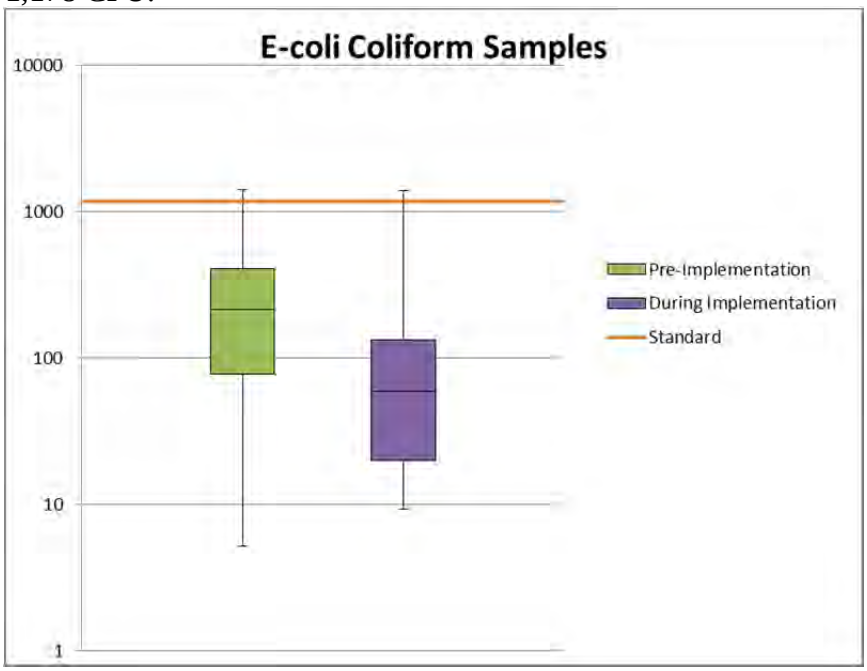

Figure 14: East Fork Vermillion River Segment-02 E-coli Pre vs During Implementation.

All E-coli samples collected from 2005 through August of 2014 at the East Fork Vermillion WQM 154 site are displayed below in Figure 15.

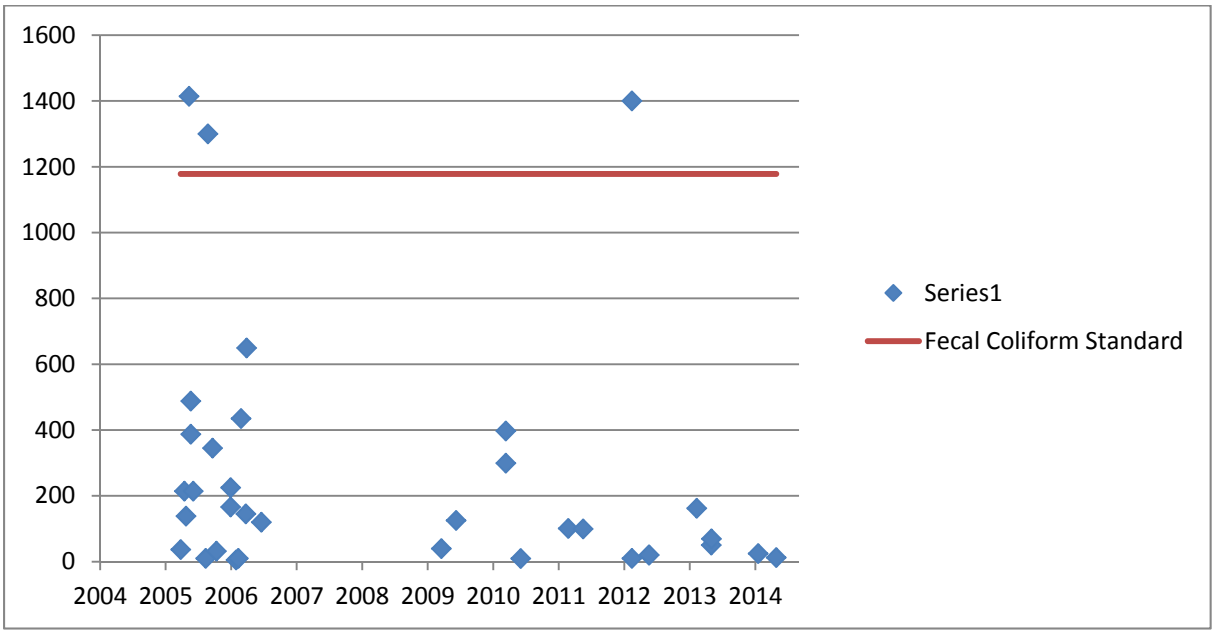

Figure 15: East Fork Vermillion River Segment-02 E-coli Samples.

Vermilion River WQM 4:
Vermillion River Segment-02 (SD-VM-R-VERMILLION_02) was listed as impaired for TSS in SD DENR's 2010 IR. Results comparing TSS samples are shown in Figure 16. The 62 mg/l median remained the same throughout the entire sampling period. The TSS water quality standard on the Vermillioin River is 158 mg/l.

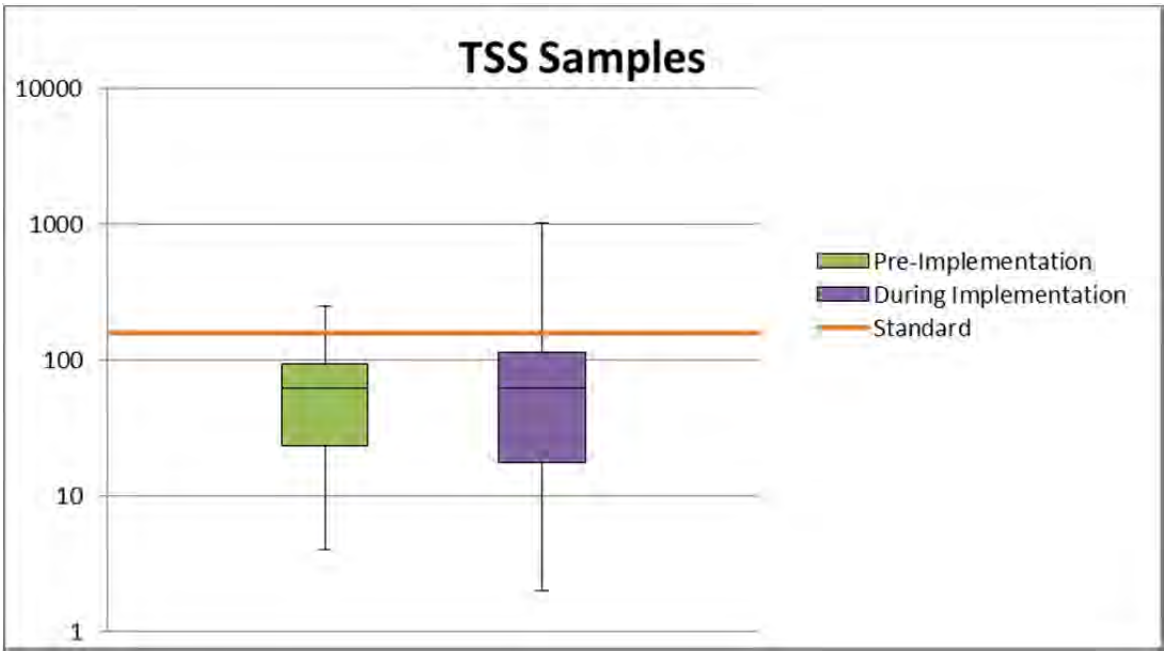

Figure 16: Vermillion River Segment-02 TSS Pre vs During Implementation.

All TSS samples from 2004 through December of 2014 collected at the Vermillion River WQM 4 site are displayed below in Figure 17.

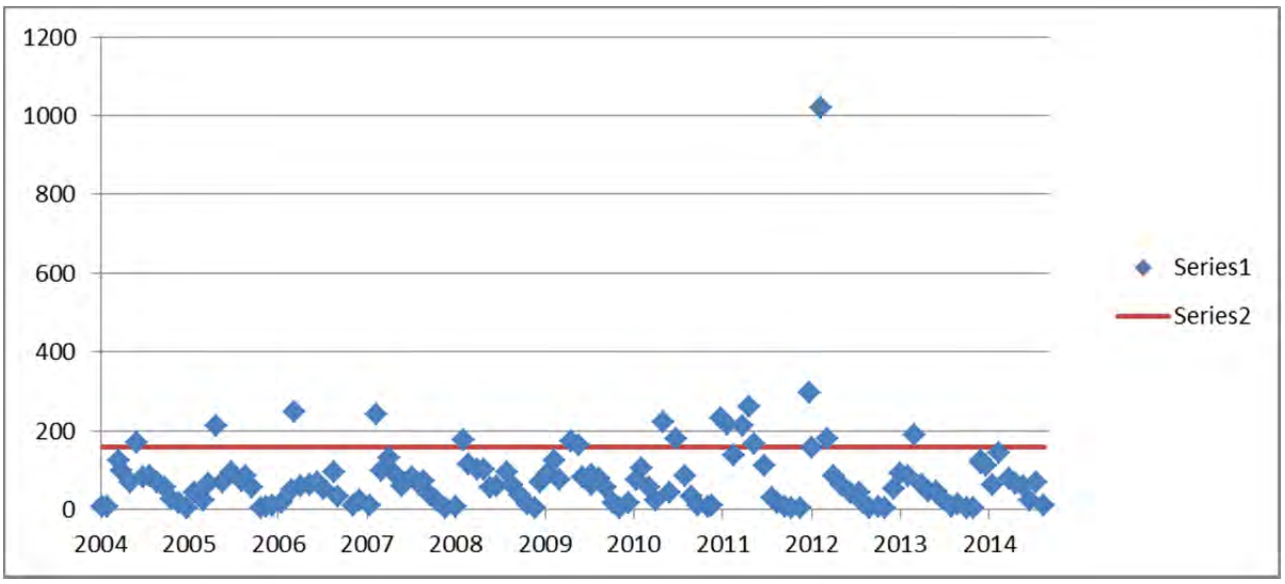

Figure 17: Vermillion River Segment-02 TSS Samples.

The Vermillion River Segment-02 was listed in the 2010 SD DENR IR for E-coli, and was delisted in the 2014 IR. WQM 4 only had one E-coli sample collected during the Pre-Implementation period, but was monitored on a regular basis in the During Implementation period. The results of the E-coli samples can be seen in Figure 18. The median bacteria value is 90 CFU and the water quality standard for E-coli for the Vermillioin River Segment 2 is 1,178 CFU.

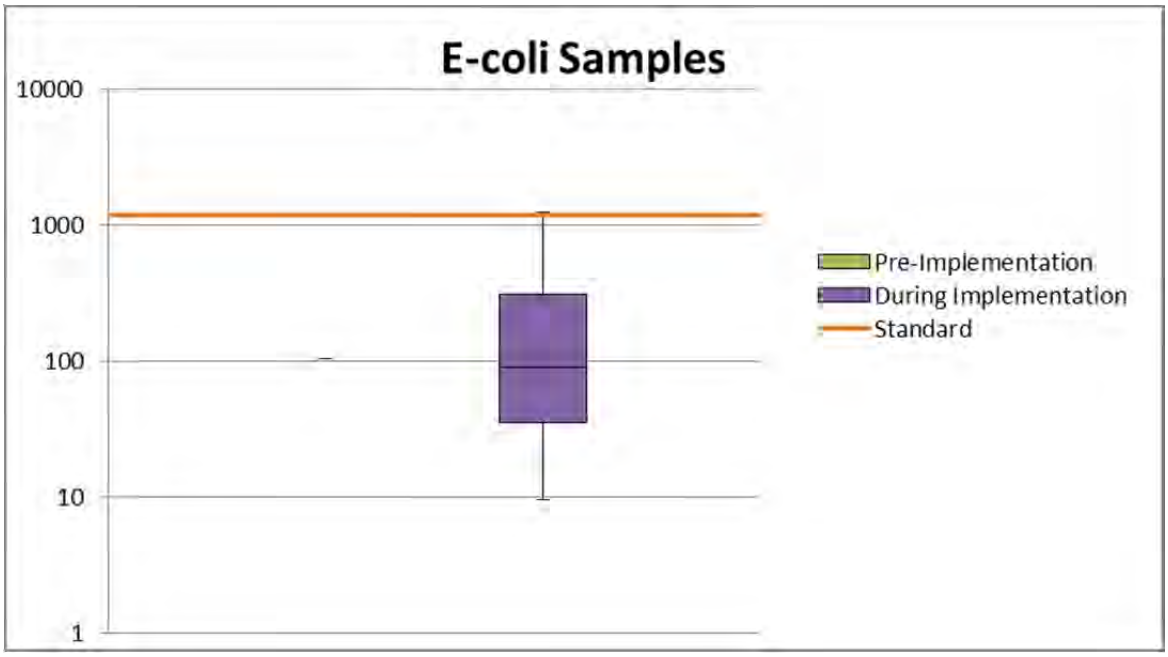

Figure 18: Vermillion River Segment-02 E-coli Pre vs During Implementation.

All E-coli samples collected from 2006 through August of 2014 from the East Fork Vermillion River WQM 4 site are displayed below in Figure 19.

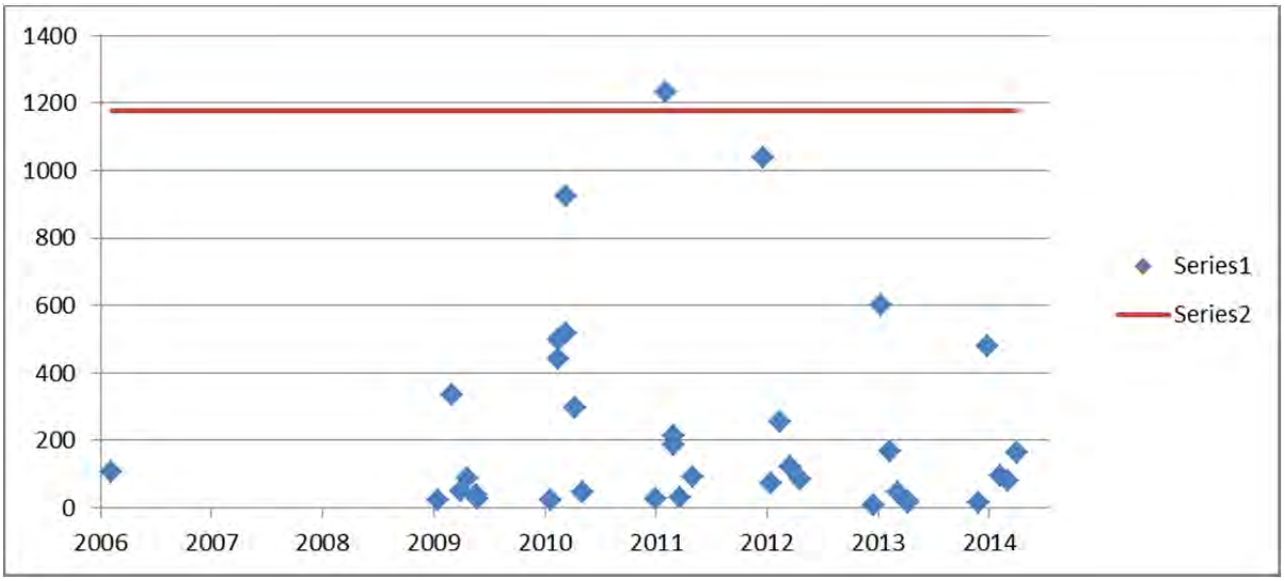

Figure 19: Vermillion River Segment-02 E-coli Samples.

Vermilion River WQM 5:
Vermillion River Segment-03 (SD-VM-R-VERMILLION_03) was listed as impaired for TSS in SD DENR's 2008IR. Results comparing TSS sampling are shown in Figure 20. The median value increased from 76 mg/l to 84 mg/l during the Pre-Implementaiton to During Implmentation sampling period. The TSS standard for the Vermillion River Segment 3 is 158 mg/l.

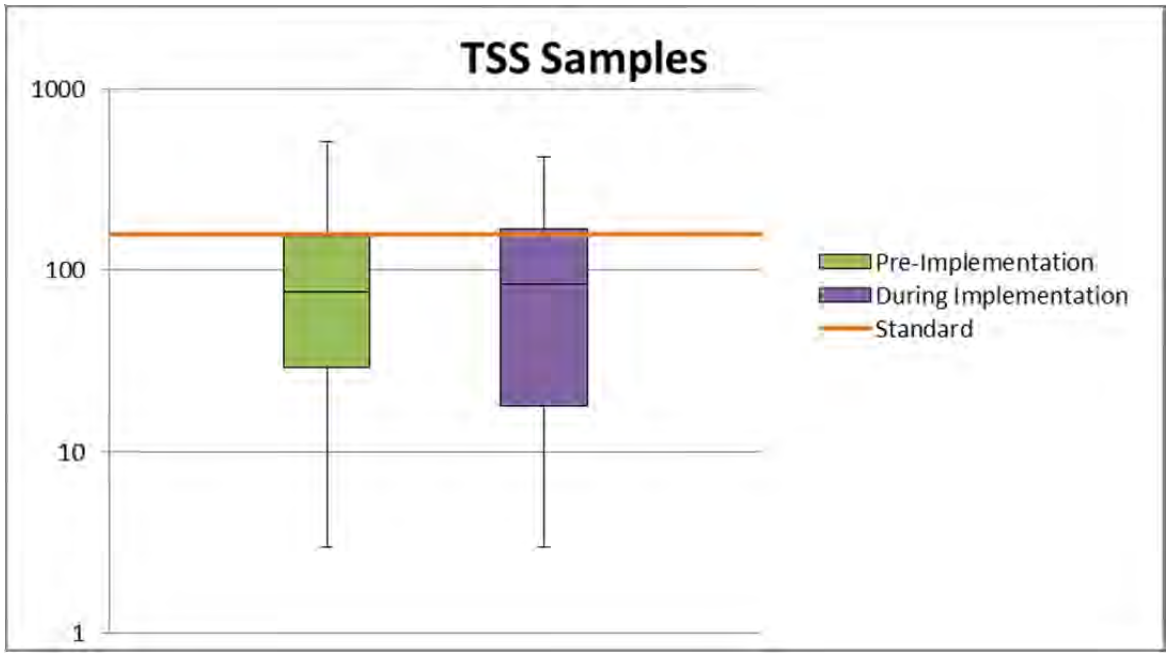

Figure 20: Vermillion River Segment-03 TSS Pre vs During Implementation.

All TSS samples from 2004 through December of 2014 taken at the Vermillion River WQM site 5 are displayed below in Figure 21.

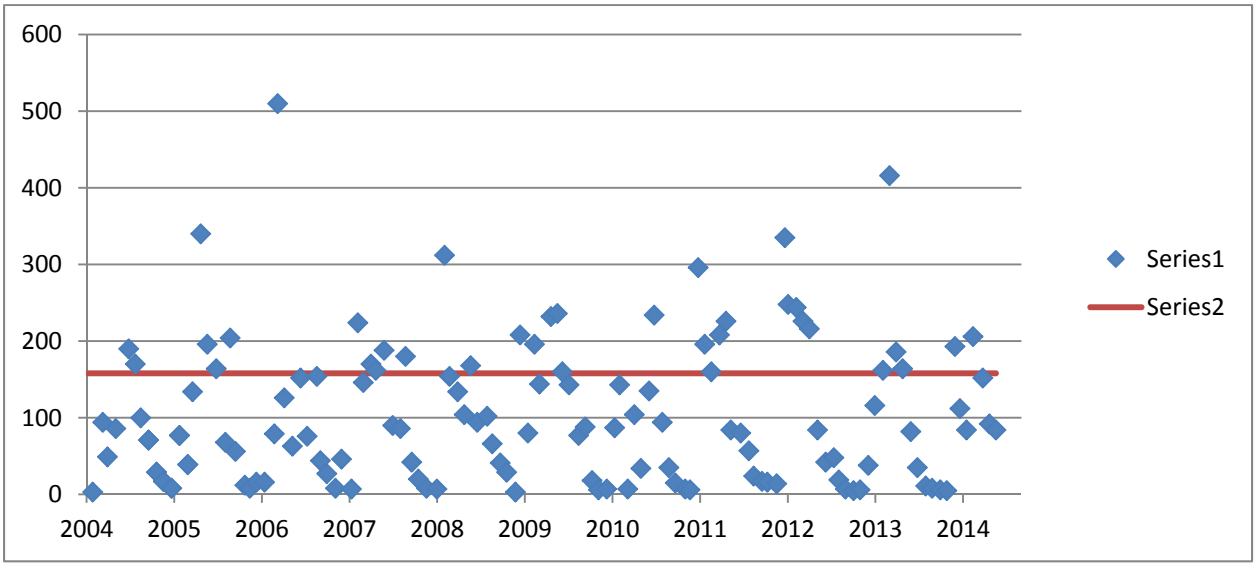

Figure 21: Vermillion River Segment-03 TSS Samples.

The Vermillion River Segment-03 was recently listed in the 2014 SD DENR IR for E-coli. Results comparing E-coli sampling are shown in Figure 22. The median value decreased from 82 mg/l to 76 mg/l during the Pre-Implementaiton to During Implmentation sampling period, but there were samples exceeding water quality standards in the During Implmentation period sampling period. The water quality standard for E-coli on the Vermillioin River is 1,178 CFU.

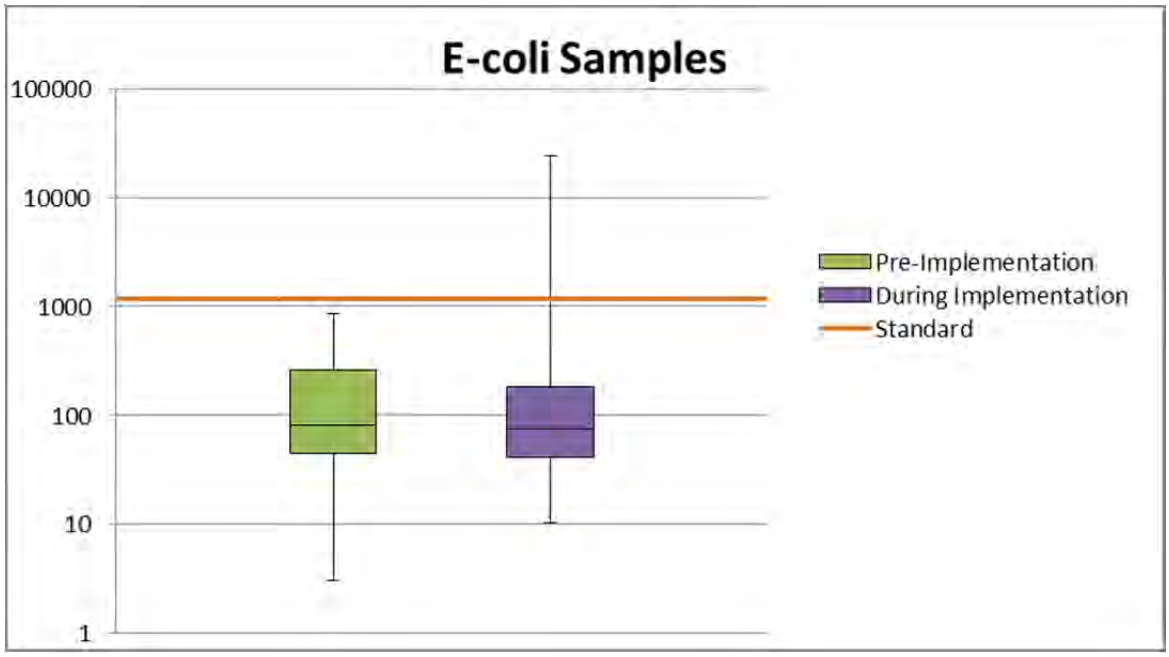

Figure 22: Vermillion River Segment-03 E-coli Pre vs During Implementation.

All E-coli samples collected from 2004 through September of 2014 at the Vermillion WQM 5 site are displayed below in Figure 23.

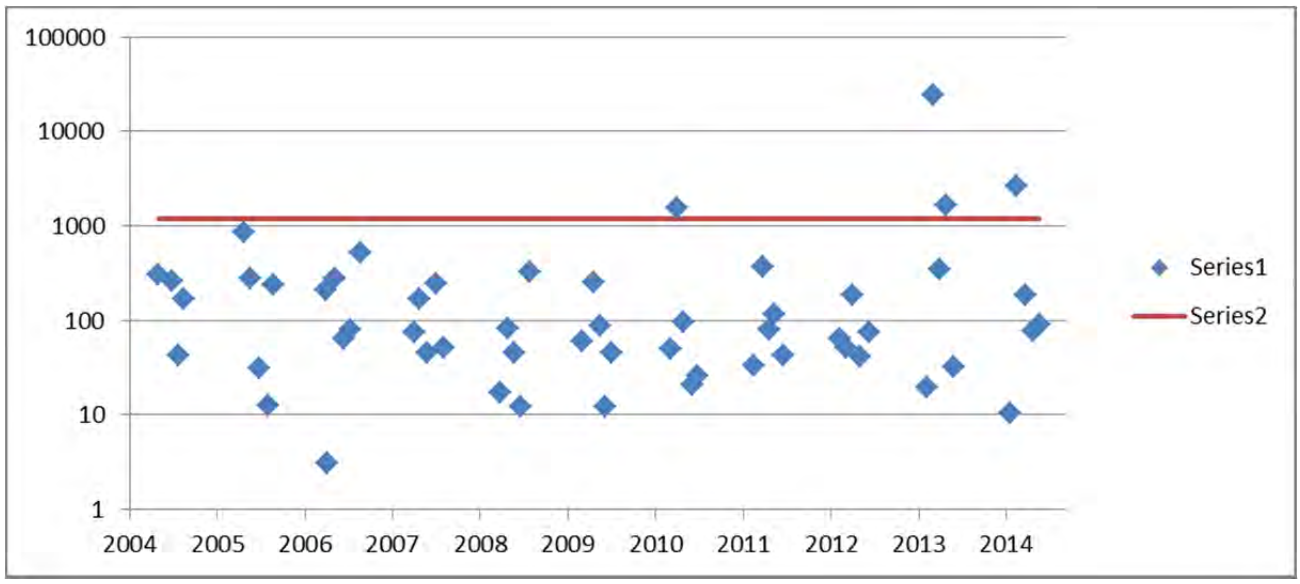

Figure 23: Vermillion River Segment-03 E-coli Samples.

Evaluation tools were utilized to measure reductions of non-point sources of pollution for various BMPs implemented. Models such as AnnAGNPS and STEPL were used to measure the effectiveness of the BMPs, and to calculate load reductions in relation to their location in the watershed.

The AnnAGNPS model output gives a prediction of a load at selected points in a watershed. An AnnAGNPS model was created for the Vermillion Basin, not including the extended area seen in Figure 4. The model was calibrated for the water and sediment load near the outlet during the assessment years of 2005-2006. The results were then compared to different locations in the watershed that were sampled during the assessments.

Table 7 shows the results of sediment, phosphorus (P), and nitrogen (N) loadings from Water WQM sites vs. loadings predicted by AGNPS. The WQM sites listed here can be found in Figure 9 of this report. The loadings at the northern sites deviate greater from the sampling data than the southern sites. The WQM samples and AGNPS predictions for P and N for the sites calculated in Table 7 are within 10%.

Table 7: WQM Samples vs AGNPS Predictions for 2005-2006

WQM Sample Site	Sediment Loading		P Loads		N loads	
	Samples	AGNPS	Samples	ANPS	Samples	ANPS
5	67,956	69,520	349,874.0	377,472.7	807,803.8	790,746.6
4	54,051	49,892	345,651.0	332,505.4	748,102.8	710,907.5
61	12,055	18,343	131,337.1	127,070.1	277,965.1	300,143.3
154	11,322	15,057				
150	3,809	6,433				

Instead of a delivered reduction, the STEPL model was used as a prediction of what may be seen at the site of the installed BMP. With these different modeling approaches, it is expected that the STEPL load reductions will be significantly higher than the AnnAGNPS reductions at the outlet. A summary of the STEPL reductions are shown in Table 8.

Table 8: Vermillion Project STEPL Annual Load Reductions by BMPs.

Best Management Practices	BMPs completed	N (Pounds)	P (Pounds)	Sediment (Tons)
CRP, RAM, SRAM-Buffers -ac	7	186	59	39
Waste Management System-units	3	16,704	3,873	477
Total	10	16,890	3,932	516

This project area received a lot of assistance from project partners. STEPL load reduction results for this project, and other participants in the two segments of this project, are shown in Table 9.

Table 9: STEPL Annual Load Reductions by BMPs.

Best Management Practices	BMPs completed			N (Pounds)			P (Pounds)			Sediment (Tons)		
	Seg. 1	Seg. 2	Sum	Seg. 1	Seg. 2	Total	Seg. 1	Seg. 2	Total	Seg. 1	Seg. 2	Total
Cropland BMPs-ac	9,017	26,424	35,441	62,223	66,281	128,504	19,888	20,035	39,923	13,509	12,941	26,450
CRP, RAM, SRAM-Buffers -ac	204	405	609	724	804	1,528	319	139	458	264	73	337
Grazing Planned Systems-ac	4,405	1,585	5,990	6,488	5,820	12,308	3,253	1,242	4,495	4,006	78	4,084
Waste Management System-units	9	5	14	103,093	51,719	154,812	22,888	9,895	32,783	2,427	1,754	4,181
Total				172,528	2,972	175,500	46,348	2,688	49,036	20,206	711	20,917

Another approach used to track BMPs was by their proximity to a water body or stream reach. STEPL reductions were summed for the nearest stream reach or water body. These reductions are only taken into account at the first stream or water body encountered and not transferred downstream for the STEPL reductions in Table 10. The AGNPS reductions are also shown in this table for comparison as reductions delivered to the given location. The location of each BMP can be found in Figure 25.

Table 10: Annual Load Reductions by River Segment/Lake.

Vermillion River Segments/Lakes	Sediment (Tons)		N (Pounds)		P (Pounds)	
	STEPL	AGNPS	STEPL	AGNPS	STEPL	AGNPS
SD-VM-L-HENRY_01	639		14,823		3,029	
SD-VM-L-SILVER_01	16		83		25	
SD-VM-L-SWAN_01	383		11,586		2,777	
SD-VM-L-WHITEWOOD_01	360		2,986		871	
SD-VM-R-CAMP_01	108	0.0	526	0	156	0
SD-VM-R-LITTLE_VERMILLION_01_USGS	266	69.4	2,461	268	713	112
SD-VM-R-LONG_01	3,006	3,094.8	13,693	5,417	4,313	1,920
SD-VM-R-VERMILLION_01	1,281	11,739.8	23,288	21,551	3,947	7,714
SD-VM-R-VERMILLION_02	1,297	8,402.2	10,658	15,738	2,915	5,672
SD-VM-R-VERMILLION_03	7,373	6,797.1	27,997	12,755	9,401	4,618
SD-VM-R-VERMILLION_E_FORK_01	721	750.0	3,487	1,129	1,094	422
SD-VM-R-VERMILLION_E_FORK_02	451	1,427.1	2,291	2,577	699	947
SD-VM-R-VERMILLION_WEST_FORK_01_USGS	3,307	1,813.8	23,904	3,610	5,989	1,349

SD DENR IR impaired reach status changes during the project:

East Fork Vermillion River Segment 1 – Non-support to full support but threatened for Fecal Coliform
East Fork Vermillion River Segment 2 –Non-support to full support but threatened for E-coli
Vermillion River Segment 2 – Delisted for E-coli
West Fork Vermillion River – Non-support to insufficient data but threatened for Fecal and E-coli
Vermillion River Segment 3 – Recently listed in the SD DENR 2014 IR report for E-coli

BMPs installed and at least partially funded by this project are shown in the map below.

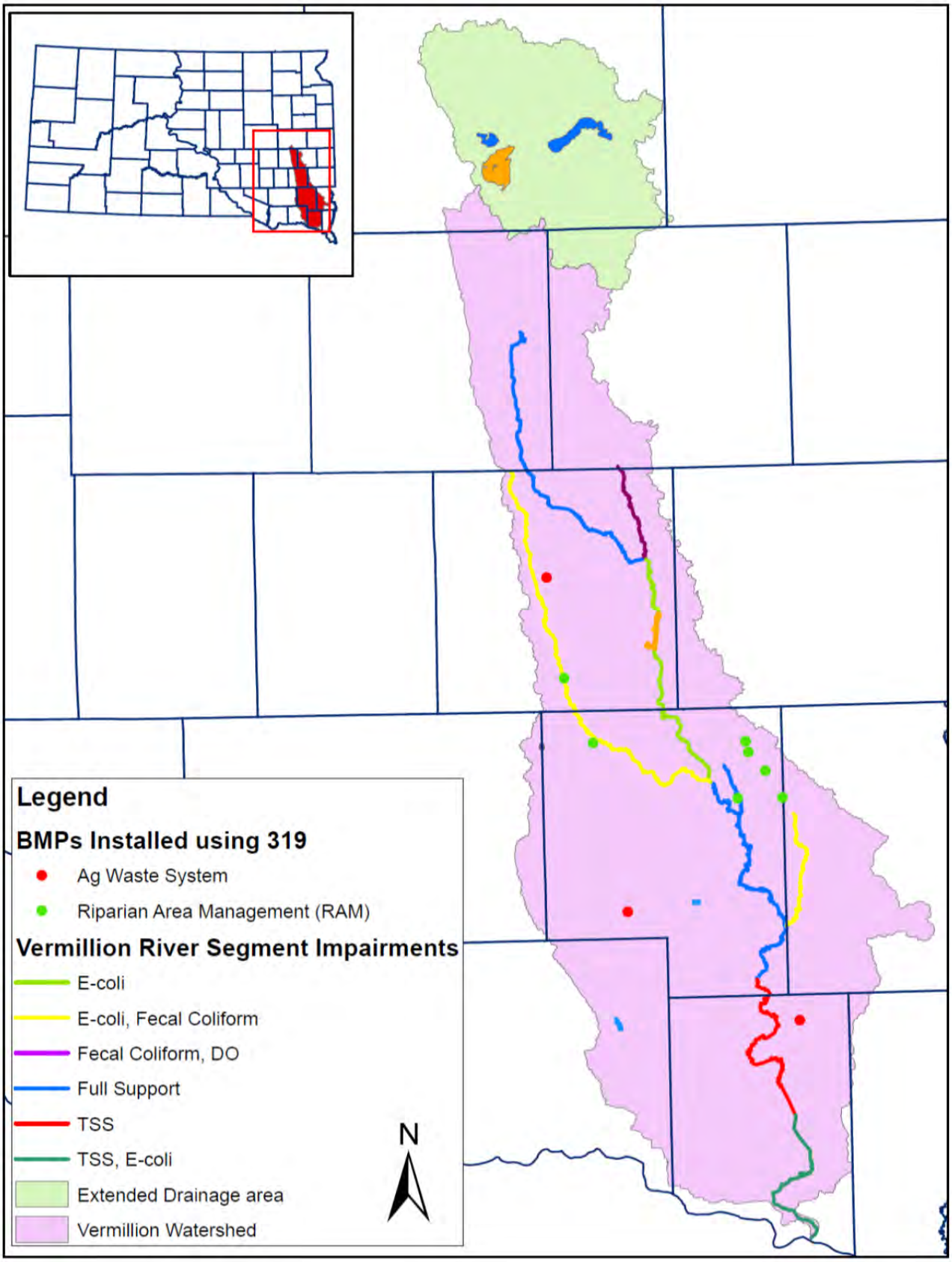

Figure 24: Location of Vermillion River Basin Watershed Segment 2 319 Project BMPs.

Several BMPs were installed during this segment of the project by partners of this project. These BMPs helped accomplish goals set for the project. BMPs funded by this project, the 303d project, and other partner projects during this segment of the Vermillion River Basin Watershed Implementation Project are shown in Figure 25 below.

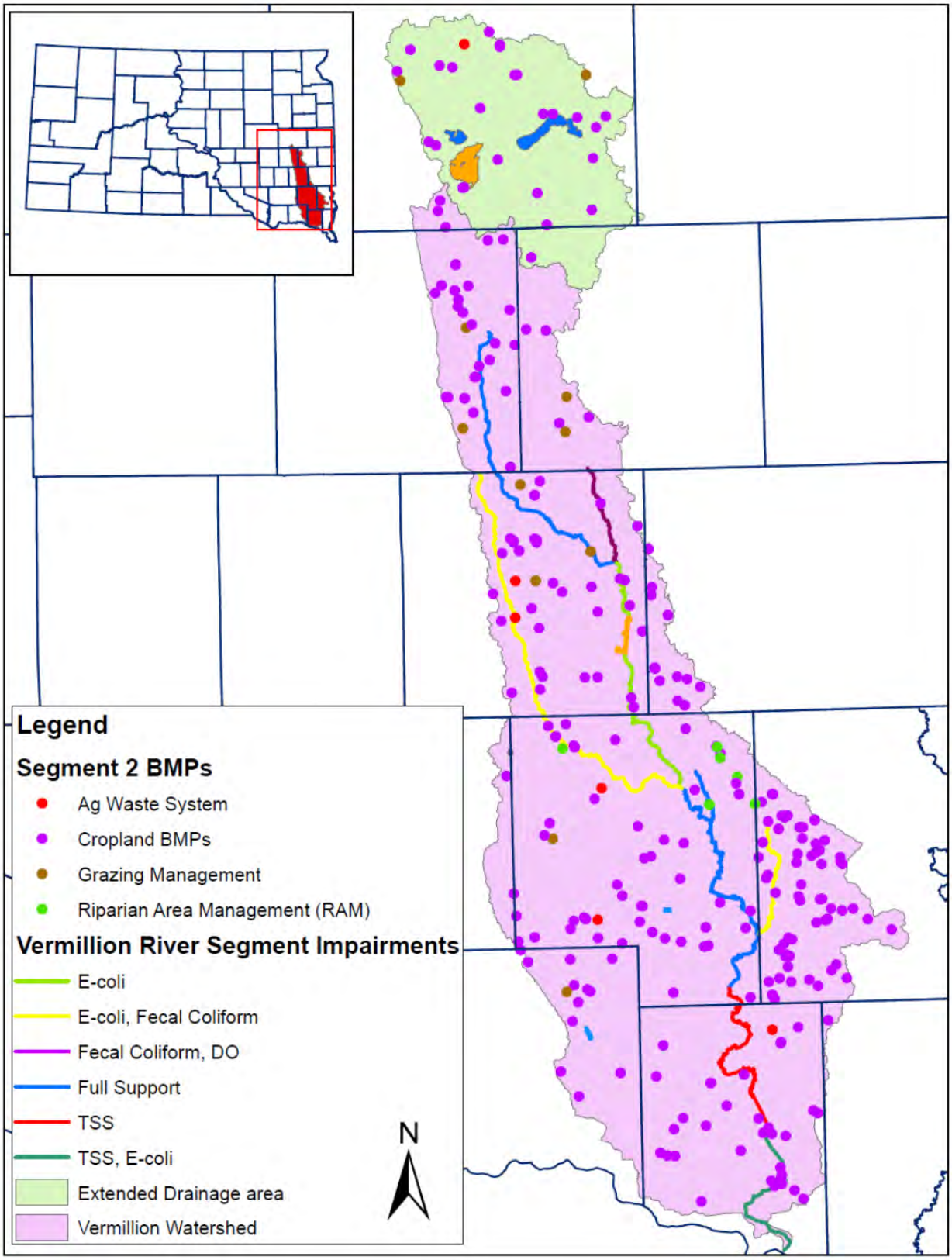

Figure 25: Location of Installed BMPs during Segment 2

BMPs funded by Segment 2 and other project partners for the two segments of the Vermillion River Basin Watershed Implementation Project are shown in Figure 26 below.

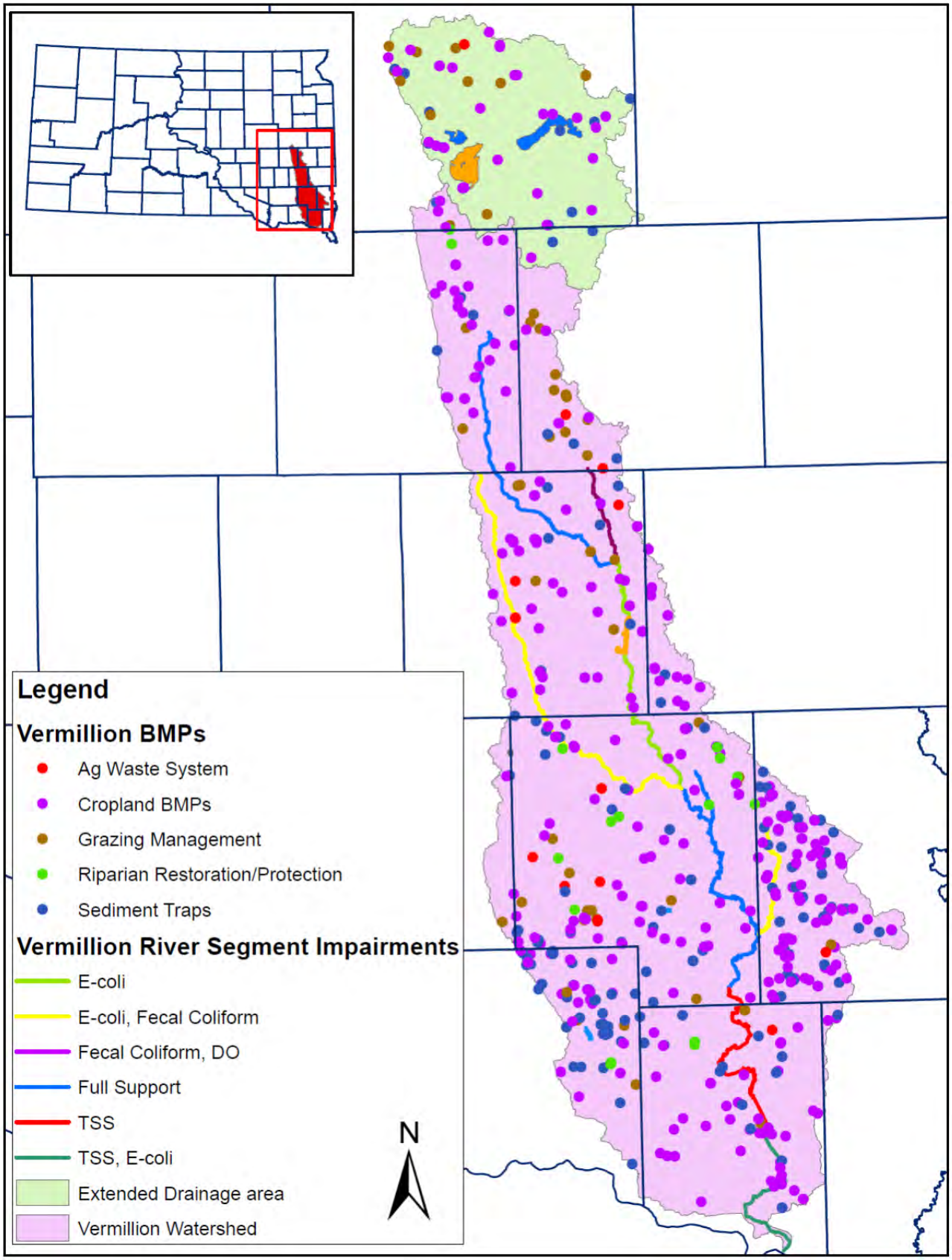

Figure 26: Location of Installed BMPs for Combined Segments

COORDINATION EFFORTS

One fourth of the watershed coordinator's salary was funded through the statewide 303(d) Watershed Planning and Assistance project which allowed more flexibility of available BMPs and funding for producers within, or outside of, the project area. Load reductions and BMPs installed during Segment 2 through the 303(d) Project were entered separately into the SD DENR Tracker database. Some of the 303(d) implementation projects were located within the Vermillion River Basin project area, but most were located outside the watershed and throughout the eastern half of the state.

McCook County Conservation District

The McCook County Conservation District was the lead sponsor of the Vermillion River Basin Watershed Project. The District Secretary and the Conservation District Board provided input and direction for the project through monthly meetings and serving on the steering committee. During monthly meetings, the District approved project implementation activities and funds being spent. The District Secretary assisted the project coordinator with cost-share reimbursement, file maintenance and other financial transactions. Federal, state, local agencies and organizations contributed funds, technical services, cash and in-kind match to accomplish goals of the project (Table 9). The agencies and their roles are summarized below.

South Dakota Department of Environment and Natural Resources

SD DENR administered the U.S. EPA Section 319 grant and provided oversight of all project activities. Project administration included on-site visits, watershed tours, reviews, approval of payment requests, and attendance of steering committee meetings. Training workshops and meetings were sponsored by the SD DENR to keep the watershed coordinator current with implementation activities and funding procedures. A project officer was appointed to the project to assist in managing funds, setting up and maintaining the Tracker Database system and reviewing all implementation activities and reporting.

United States Department of Agriculture – Natural Resources Conservation Service

NRCS provided technical assistance for planning, design and installation of conservation practices. Personnel included: NRCS staff from Clark, Hamlin, Kingsbury, Brookings, Miner, Lake, Minnehaha, Hutchinson, Turner, Lincoln, Yankton, Clay and Union County field offices. Access to the NRCS computer system enabled the watershed coordinator to generate conservation plans, and contracts and maps for BMP implementation activities. Programs utilized, but not limited to, include the USDA's Environmental Quality Incentives Program (EQIP), and Conservation Reserve Program (CRP) administered through the Farm Services Agency (FSA).

South Dakota Association of Conservation Districts

SDACD provided budgetary administration of salary funding for the watershed coordinator. One half of the coordinator salary administered for the project was generated from the statewide 303(d) Watershed Planning and Assistance Project and Farm Bill Implementation Technical Assistance fund. These funds were specifically used for projects either outside of the watershed or projects not listed in the Project Implementation Proposal in order to expand the number of BMP's offered.

United States Environmental Protection Agency

U.S. EPA provided the Section 319 Clean Water Act Grant which was the primary funding source for the project. EPA officials from the Region 8 office in Denver, Colorado participated in one on-site tour and review of the project.

PUBLIC PARTICIPATION

The public was notified of opportunities to participate in the project through press releases, newsletters, and other public events to inform and educate them about the project. Audiences were given a presentation of the project, its goals, and funding opportunities for implementation activities in the watershed. A majority of the attendants were agricultural producers with a few residential property owners and sportsmen. The Vermillion River Basin Development District also promoted the project with funding and press releases and an Information Pamphlet.

ASPECTS OF THE PROJECT THAT DID NOT WORK WELL

A portion of the project that did not work well was the easement portion of the RAM/SRAM milestone. The easements were not used because the producers did not want their land tied up for 30 years and still have to control the weeds and pay the taxes.

A problem was also experienced with the RAM/SRAM practice. Without CRP, the RAM/SRAM practice had a limited distance that was required from the Vermillion River.

FUTURE ACTIVITY RECOMMENDATIONS

With the Vermillion River Watershed assessment showing over 2,000 animal feeding operations in the watershed and increasing USDA EQIP program applications in most counties of the watershed for these systems, it appears that additional attention and funding should be directed towards these Systems.

It is also recommended to continue working with livestock producers throughout the watershed to reduce both bacteria and sediment contamination delivered to the streams by elimination of livestock in the streams that run through their pastures.

PROJECT BUDGET

Table 11: Vermillion River Basin Implementation Project Segment 2 Original Budget.

ITEM	319	CWSRF	Other State	303d	CWFCF	USDA	Local	Total
Personnel Support								
Project Coordinator	$50,890			$25,444		$25,443		$101,777
Travel:	$9,388			$4,694		$4,694		$18,776
Administration:	$9,974			$4,988		$4,988	$7,231	$27,181
Computer Support:	$1,440			$720		$720		$2,880
Personnel Support Total:	**$71,692**			**$35,846**		**$35,845**	**$7,231**	**150614**
Objective 1: Best Management Practice Implementation								
Task 1: Grassland Management (1,250 acres)								
Product 1: RAM Program Implementation (250 acres)								
CCRP @ $100/ac/yr @ 100 acres enrolled @ 15 years						$112,500	$37,500	$150,000
RAM @ $66/ac/year.@ 100 acres enrolled @ 15 years	$86,850						$42,150	$129,000
Monitoring 15-year Agreements: 5 @ 2 yrs. @ $25/yr.							$250	$250
30-year/Permanent Easements with CCRP: (30 acres)	$11,250					$11,250	$7,500	$30,000
Monitoring Easements: 30-year and Permanent @ $4000							$3,999	$3,999
Subtotal	**$98,100**					**$123,750**	**$91,399**	**313249**
Product 2: Rotational Grazing Systems:(1000 ac.)								
Alternative Water Developments: Grassland/Riparian								
Rural Water Hook-up: 1 @ $2,700 each						$2,025	$675	$2,700
Pipeline: Below Ground: 4,000 LF @ $2.95/LF						$8,850	$2,950	$11,800
Tank: 2 each @ $780 each						$1,107	$453	$1,560
Fencing: 5,000 LF @ $1.05/LF			$1,313			$2,625	$1,312	$5,250
Subtotal			**$1,313**			**$14,607**	**$5,390**	**$21,310**
Task 2: Cropland BMPs								
Product 3: Cropland BMPs (250 Acres)								
Seeding: Perennial Vegetation: 200 ac. @ $100/ac.			$3,100			$6,200	$3,100	$12,400
Filter Strips: 25 Ac. @ $100/ac.			$475			$950	$475	$1,900
Grassed Waterways: $27,000LF $1.70/LF			$17,145			$34,290	$17,145	$68,580
Subtotal			**$20,720**			**$41,440**	**$20,720**	**$82,880**
Task 3: Animal Waste Management Systems (AWMS)								
Product 4: Animal Waste Management Systems:								
Feasibility studies: 3 @ $20,000 each	$3,012	$4,907			$10,000	$25,806	$16,275	$60,000
AWMS Construction: 2 @ $200,000 each	$20,077	$39,414			$65,300	$162,841	$112,368	$400,000
Construction -Management 2 @ $18,750 each	$7,058	$5,000			$6,500		$18,942	$37,500
Nutrient Management Plans: 2 @ $3,500 each	$352	$573			$1,000	$3,109	$1,966	$7,000
Cultural Resources Studies: 2 @ $595 each	$509	$106			$200		$375	$1,190
Subtotal	**$31,008**	**$50,000**			**$83,000**	**$191,756**	**$149,926**	**$505,690**
Objective 2: Informational Outreach								
Task 4: Information Campaign (9000 watershed residents)								
Product 5: Newsletters, Press Releases and website								
Web Site: Maintenance	$1,000						$1,000	$2,000
Newsletters: 3 @ 1000 printed/newsletter @ $.50/mailing	$1,000						$500	$1,500
SubTotal: Informational Outreach	**$2,000**						**$1,500**	**$3,500**
Total Project Cost:	**$202,800**	**$50,000**	**$22,033**	**$35,846**	**$83,000**	**$407,398**	**$276,166**	**$1,077,243**
Match:								
Ineligible Match - Federal and/or Project Allocated	$202,800			$35,846		$407,398		
Match: Project Totals For Match		$50,000	$22,033		$83,000		$276,166	
Match Percentages:	**32%**	**8%**	**3%**		**13%**		**44%**	

Table 12: Vermillion River Basin Implementation Project Segment 2 Actual Budget

ITEM	319	CWSRF	USDA	Local	Total
Personnel Support					
Project Coordinator	$72,336				$72,336
Travel:	$16,513				$16,513
Administration:	$14,192				$14,192
Office Supplies/Postage/Phone:	$569				$569
Personnel Support Total:	**$103,610**	**$0**	**$0**	**$0**	**$103,610**
Objective 1: Best Management Practice Implementation					
Task 1: Grassland Management (1,250 acres)					
Product 1: RAM Program Implementation (250 acres)					
CCRP @ $100/ac/yr @ 100 acres enrolled @ 15 years			$45,877		$45,877
RAM @ $66/ac/year.@ 100 acres enrolled @ 15 years	$22,960			$5,561	$28,521
Subtotal	**$22,960**		**$45,877**	**$5,561**	**$74,398**
Product 2: Rotational Grazing Systems:(1000 ac.)					
Alternative Water Developments: Grassland/Riparian					
Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**
Task 2: Cropland BMPs					
Product 3: Cropland BMPs (250 Acres)					
Seeding: Perennial Vegetation: 200 ac. @ $100/ac.			$1,066	$790	$1,856
Filter Strips: 25 Ac. @ $100/ac.					
Grassed Waterways: $27,000LF $1.70/LF					
Subtotal	**$0**	**$0**	**$1,066**	**$790**	**$1,856**
Task 3: Animal Waste Management Systems (AWMS)					
Product 4: Animal Waste Management Systems:					
Feasibility studies: 3 @ $20,000 each					
AWMS Construction: 2 @ $200,000 each	$98,440	$14,860	$230,472	$290,163	$633,934
Subtotal	**$98,440**	**$14,860**	**$230,472**	**$290,163**	**$633,934**
Objective 2: Informational Outreach					
Task 4: Information Campaign (9000 watershed residents)					
Product 5: Newsletters, Press Releases and website					
SubTotal: Informational Outreach	**$0**	**$0**	**$0**	**$0**	**$0**
Total Project Cost:	**$225,010**	**$14,860**	**$277,414**	**$296,514**	**$813,798**
Match:					
Ineligible Match - Federal and/or Project Allocated	$225,010		$277,414		
Match: Project Totals For Match		$14,860		$296,514	
Match Percentages:	**42%**	**3%**		**55%**	

Appendix A

EQIP and the Vermillion River Basin Watershed 319 Project

NRCS's Environmental Quality Incentives Program (EQIP) and the Vermillion River Basin 319 Implementation Project have formed a partnership where persons in the Vermillion River Watershed can receive both technical and financial assistance from both programs after acceptance into EQIP.

Some of the practices included are Riparian Area Management, Rotational Grazing Systems including Rural Water hook-ups, Pipelines, Tanks, and Cross Fencing; Grass Seedings including Filter Strips and Grassed Waterways; and Animal Waste Systems. Several of these practices are tied in with CRP so as soon as the new farm bill allows us we will be available to assist producers with CRP.

Interested landowners should contact their local NRCS/Conservation District office or Elmer Ward the Vermillion River Basin project coordinator at 605-280-8518.

VERMILLION RIVER BASIN IMPLEMENTATION PROJECT

The Vermillion River Basin Implementation Project which covers parts of 14 counties up and down the Vermillion River, in partnership with USDA's Environmental Quality Incentives Program (EQIP), is still providing technical and financial assistance to producers within the Vermillion River Basin.

The financial portion of the Project is a partnership with the EQIP Program and is intended to help clean up the waters of the Vermillion River. The two main conservation practices used by the Project to assist in achieving this goal are Animal Waste Management Systems (AWMS) and Riparian Area Management (RAM). Both of these practices have priority areas established within two miles of the main stem of the River. Individual operators outside the priority area can be evaluated on a case by case basis, and can be determined to be eligible to participate if the benefits to the Project are great enough.

The technical assistance to producers is provided to help implement the programs of the Farm Bill such as CRP, Continuous CRP, Wildlife Habitat Incentives Program (WHIP), Conservation Security Program (CSP).

If you have questions or are interested in participating in the Project contact the Conservation District in your home county or call the Project coordinator – Elmer Ward – at 605-280-8518 and set up an appointment to get your answers.

Elmer Ward
Resource Specialist
2914 Broadway Ave.
Yankton, South Dakota 57078-4836
elmer.ward@sd.nacdnet.net
Phone: 605-280-8518

Dear Landowner,

You are being contacted because you own or operate land along Long Creek, a tributary of the Vermillion River. We have a water quality project in this watershed and one goal of our project is to reduce livestock waste impacts on water quality.

One of the current practices we are using to help reduce sediment and livestock waste in the streams and the Vermillion River is a combination of Continuous CRP (CCRP) and Riparian Area Management (RAM). This combination does not allow any use for the life of the CRP contract - 10 – 15 years. The CCRP payment is $66/ac/yr and a RAM payment of $45/ac/yr in a onetime upfront payment on the additional acres allowed to be entered into the Ram Portion (up to 35% of the CCRP Acres).

A new practice we are adding this fall is called Seasonal Riparian Area Management (SRAM). This practice will allow haying anytime or grazing before April 1st or after October 1st on the SRAM acres. We are offering this practice to reduce livestock access to the creeks during the summer grazing months. Temporary or permanent fencing can be used and alternative water sources can be provided if the entire pasture cannot be put into the program.

Acres fenced off or removed from grazing can qualify for $45/acre/year upfront payment for a 10 to 15 year contract. Financial assistance is available for fencing, water development or other practices needed to complete the conservation plan.

Some landowners in the Skunk Creek watershed are using this program to improve livestock health by improved livestock drinking water, reduction of foot rot, and reduce mud issues.

This program was developed as a way for landowners to voluntarily help the watershed improve water quality and avoid future mandates in how we operate our farms.

If you are interested and would like to review the SRAM program to see if it can work for your farm please contact Elmer Ward at the Yankton County Conservation Office at 605-280-8518.

Sincerely,

Elmer Ward

TLC Watershed Project Coordinator

The two main methods to be used are Riparian Buffers or Filter Strips along the tributaries of, and the Vermillion River, and improving livestock feeding areas.

A public information campaign will also be carried out to help both urban and rural folks do their part in improving the water quality in their own Vermillion River.

Contact Information

Clay County
Name
Address
Phone, e-mail

Yankton County
Name
Address
Phone, e-mail

Other agencies

Vermillion River Basin Watershed Project

An option to cleaner, safer water

Water Quality is everyone's responsibility.

The Vermillion River meanders its way in a Southerly direction through it's watershed, containing portions of 14 counties, from Southern Clark County through Clay County and into the Missouri River at Vermillion, SD.

The lower portion of the watershed, involving parts of 6 counties, is the portion of the watershed that contributes excessive amounts of sediment to the "River" while the remaining 8 counties contribute mainly fecal coli form bacteria. These bacteria make the River unsafe for swimming, fishing and at times even canoeing.

Causes

Poor management practices, both in towns and in the country, along with natural conditions like heavy rains, contribute to water quality problems.

Cures

The McCook Conservation District, along with Clark, Hamlin, Kingsbury, Brookings, Lake, Miner, Minnehaha, Turner, Hutchinson, Lincoln, Yankton, Clay, and Union Conservation Districts are cooperating with Federal and State agencies and local producers to help clean up the Vermillion River.

Solutions

The McCook Conservation District—sponsor—along with the remaining 13 Conservation Districts and the Vermillion River Basin Development District are cooperating with Federal, State, and local producers to help clean up the Vermillion River.

The two main practices selected by the advisory board to help control water quality issues in the Vermillion River mainstem are:

- Grass buffers along the high priority drainages to filter out sediment and nutrients from Wtershed runoff.
- Properly designed animal waste storage facilities with nutrient management plans to properly store and apply the nutrients to cropland and keep nutrients and e-coli out of the River and its tributaries. These facilities are designed to protect both shallow aquifers (ground water) and surface waters throughout the Vermillion River Basin.

A public information campaign is being carried out to help "everyone" do their part in improving the water quality in their own Vermillion River.

Contact Information

Vermillion River Basin Watershed sponsor
McCook County CD/NRCS
605-425-2483 X 3

CD/NRCS Agencies
Brookings County
605-692-8003 X 3

Clark County
605-532-3797 or 605-532-3686 X 3

Clay County
605-624-7060 X 3

Hamlin County
605-783-3353 or 605-783-3642 X 3

Hutchinson County
605-387-5539 or 605-928-7925 X 3

Kingsbury County
605-845-3183 or 605-854-9123 X 3

Lake County
605-256-2571 or 605-256-6674 X 3

Lincoln County
605-987-2624 X 3

Miner County
605-772-5642 X 3

Minnehaha County
605-336-1527 or 605-330-4515 X 3

Turner County
605-297-5564 X 3

Union County
605-356-3308 X 3

Yankton County
605-665-6704 or 605-665-2662 X 3

Vermillion River Basin Watershed Project

Protecting *Water Quality* – It's *Everyone's Responsibility*.

The Vermillion River meanders its way, in a southerly direction, through the watershed. The watershed contains portions of 14 counties, from Southern Clark County through Clay County and into the Missouri River near Vermillion, SD.

The lower portion of the watershed, involving parts of six counties, contributes excessive amounts of sediment and nutrients to the "River" while the remaining eight Northern counties contribute mainly fecal coli form bacteria. These bacteria make the River unsafe for swimming, fishing, and at times even canoeing.

Problems

Poor management practices in both urban and rural areas, such as over fertilization of lawns and cropland fields contribute to water quality issues. Lawn fertilizers are applied and left on sidewalks and in gutters and are eventually washed into storm sewers and into surface waters. Cropland fields are fertilized then over tilled allowing fertilizer and sediments to flush into shallow aquifers and surface waters.

In the past, animal feeding operations were designed to get rid of excess water, which caries fecal coli form bacteria and excessive nutrients directly into surface water, and indirectly into shallow aquifers.

Southeast Farm Installs Vegetative Treatment Area

By John Lentz

The South Dakota State University Southeast Research Farm at Beresford recently installed a vegetative treatment system (VTS) which consists of a diversion, sediment basin, pumping station, pipeline and a vegetated treatment area to manage runoff from its feedlot pens and manure stacking areas.

The farm has open lot pens, an open front shed with attached lot area to house beef cattle and a hoop barn and confinement building for swine research. No management system was in place to collect, store, or manage the solid or liquid waste materials that would leave the open beef pens during rain events.

The Southeast Farm worked with the Natural Resources Conservation Service to make changes to their facilities and develop a Comprehensive Nutrient Management Plan (CNMP).

Justin Bonnema, an NRCS agricultural engineer on the South Dakota Ag Nutrient Management Team, designed the system. The farm increased their number of pens and added a sediment basin system to collect all runoff from the open lots. The basins have a holding capacity sufficient to contain all runoff from a 25-year, 24-hour storm (4.8 inches).

The runoff collected can then be pumped to a series of solid-set sprinklers that cover a vegetated treatment area of approximately 13 acres. The sprinklers are big-gun type sprinklers that distribute approximate 50 gallons per minute of water per sprinkler over a circular area with a radius of 150’-160’ per sprinkler head. The total runoff volume from the 25-year, 24-hour storm can be distributed within three days if the guns are operated continuously. The farm chose the solid-set sprinklers based on that type of system being a fairly unique way of distributing the water which would enable them to conduct vegetation and irrigation research if they desire.

This is the first such vegetative treatment system designed in South Dakota and will hopefully help promote this option for smaller feedlot owners who do not want a holding pond as part of their system.

As part of the CNMP, Jason Gilb, Conservation Agronomist from the South Dakota Ag Nutrient Management Team also worked with Southeast Farm to complete a nutrient management plan that will enable the farm to efficiently manage the manure and waste products from its system based on the fertilizer needs of the cropland. The vegetated treatment area, which is a mixture of perennial grasses and alfalfa, can be harvested as a feed source for the cattle.

The Southeast Farm also built a compost mortality shed and additional stacking area for the waste generated in the hoop building. Deron Ruesch and Jeff Loof, NRCS District Conservationists assisted the farm with obtaining cost share assistance through the USDA Environmental Quality Incentives Program (EQIP). Elmer Ward also worked with the farm to secure funding from the Vermillion River Basin Implementation Project.

Lentz, Mitchell, S.D., is a NRCS resource conservationist and supervisor of the Ag Nutrient Management Team.