WATERSHED PROJECT FINAL REPORT
SECTION 319 NON-POINT SOURCE POLLUTION CONTROL PROGRAM

SPRING CREEK WATERSHED MANAGEMENT AND PROJECT IMPLEMENTATION PLAN SEGMENT 2

PROJECT SPONSOR:

PENNINGTON COUNTY
130 KANSAS CITY STREET
SUITE 200
RAPID CITY, SOUTH DAKOTA 57701

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EXECUTIVE SUMMARY

Project Title:	Spring Creek Watershed Management and Project Implementation Plan Segment 2
Project Start Date:	June 2, 2012
Project Completion Date:	July 31, 2015

Funding:

- Total EPA Grant: $575,606.60
- Total Matching Funds Budget: $430,154.00
  - CWSRF Funds $100,000.00
  - Local Match $330,154.00

Total Budget:

- Budget Revisions
  - Removal of Funds CWSRF Funds ($100,000.00)
- June 2012 Award $414,999.40
- Funds Rollover from Segment 1 $160,606.60

Total Expenditures of EPA Funds:	$442,309.43
Total 319 Matching Funds Accrued:	$126,253.83
Total Nonmatching Funds Accrued:	$ 15,704.00
Total Expenditures:	$568,563.26

ACKNOWLEDGEMENTS

Pennington County would like to thank all of those involved with Segment 2 of the Spring Creek Watershed Management and Project Implementation Plan. Without the efforts of individuals involved from the following organizations, this Project segment would not have been possible:

Black Hills Resource Conservation and Development
City of Hill City
Individual Landowners within the Watershed
Pennington Conservation District
South Dakota Department of Environment and Natural Resources
South Dakota Game, Fish, and Parks
South Dakota School of Mines and Technology
Spring Creek Advisory Group
United States Corps of Engineers
United States Environmental Protection Agency
United States Forest Service, Black Hills National Forest
United States Natural Resource Conservation Service

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1.0 INTRODUCTION

1.1 Location

Spring Creek is a perennial mountain stream located in Pennington and Custer Counties in the Black Hills of South Dakota. Spring Creek is a tributary of the Cheyenne River, which flows into the Missouri River. The drainage area of Spring Creek is approximately 425 square miles at the confluence with the Cheyenne River.

The surface area of the watershed that impacts the impaired reach of Spring Creek above Sheridan Lake encompasses approximately 93,124 acres and includes Hydrologic Units 101201090901, 101201090902, 101201090903, 101201090904. Spring Creek flows through Sheridan Lake, which is a man-made reservoir with a surface area of approximately 380 acres. The city of Hill City (population ~950) is the only municipality located in the watershed.

1.2 Project Area

The project area is the Spring Creek Watershed which covers about 93,124 acres or 145 square miles and is defined as the drainage upstream of Sheridan Lake Dam and shown in Figure 1. The watershed or project area terms are used interchangeably throughout this plan. The watershed is about 18 miles long and 11 miles wide.

1.3 Land Use in the Watershed

Land use in the watershed is primarily silviculture, recreation, residential, and grazing. Metamorphic slates and schists, along with granite rock, underlie a large portion of the basin and form the Central Crystalline Area of the Black Hills that covers the majority of the watershed area.

1.4 Soil Types in the Watershed

The watershed's major soil types are Pactola, Buska, Mocmont, and Stovho. The Pactola series of soils, which cover most of the watershed, were formed by the weathering of materials in steeply tilted metamorphic rock. The Buska series descends from micaceous schist, while the Mocmont formed from material weathered from granite. Those two series generally occur in the upper reaches of the watershed in the Harney Peak area. The Stovho series formed from the weathering of limestone and calcareous sandstone and is found in the upper reaches of the watershed in the area underlain by the Madison Limestone Formation.

1.4 Slope

Digital Elevation Models (DEMs) of the area show the average slope to be approximately 20 percent. Much of the land is located within the Black Hills National Forest and is predominantly forested with ponderosa pine; other cover includes grasslands and hardwoods.

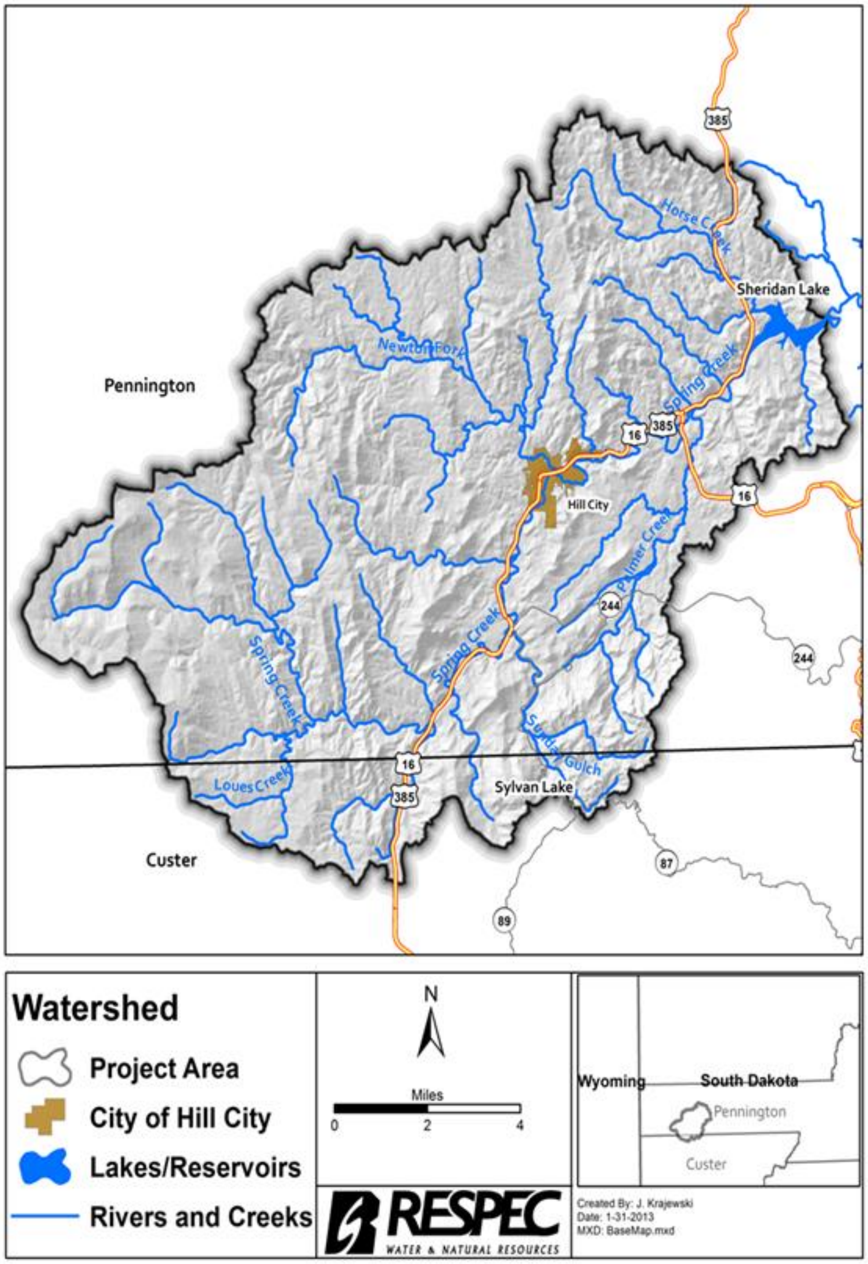

Figure 1. Project Area

1.5 Precipitation

The average annual precipitation in the watershed is 20.8 inches; 80 percent usually falls in April through September. Tornadoes and severe thunderstorms strike occasionally. These storms are local and of short duration and occasionally produce heavy rainfall events. The average seasonal snow pack is 27.3 inches per year.

1.6 Modeling Results

Modeling results of the initial Total Maximum Daily Load (TMDL) assessment estimated that more than half (63.5 percent) of the bacteria load originates from livestock and other agricultural land uses. The remaining load originates from urban runoff (13.7 percent) and other human sources (14.8 percent), including failing septic and leaking sanitary sewer systems (Figure 2). During Segment 1, questions were raised and concerns expressed by the Spring Creek Watershed Advisory Group (SCWAG) members regarding the accuracy of the modeling results so additional data including water-quality monitoring, land use, septic locations and failure rates, livestock and wildlife populations, and installed BMPs within the watershed have been collected to improve the watershed model and its results for future implementation segments.

These modeling results are incorporated and discussed in detail in the Spring Creek Watershed Storm Water Management Plan and the Spring Creek Watershed Strategic Implementation Plan. Critical conditions occur within the watershed during the summer. Typically, greatest numbers of livestock and tourist activities (i.e., trail rides, camping) occur in the watershed during summer months. Combined with the peak in bacteria sources, high-intensity storm events also occur during the spring, summer, and fall and produce a significant amount of fecal coliform load because of bacterial wash-off in the watershed.

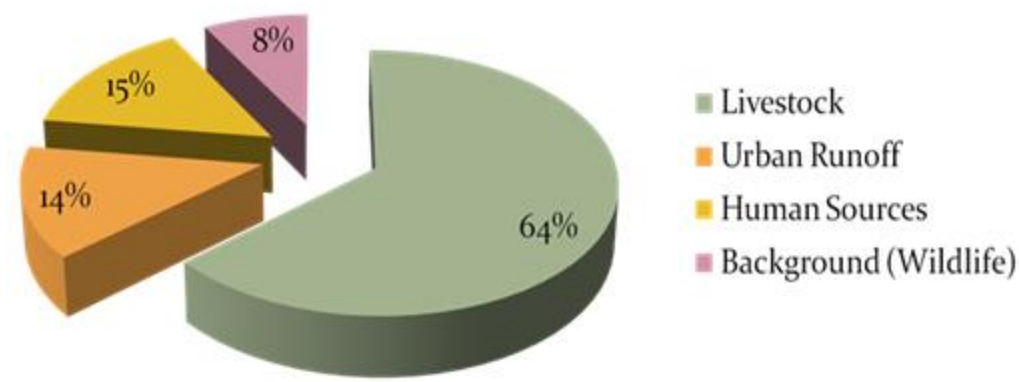

Figure 2. Modeling Results

2.0 STATEMENT OF NEED

2.1 Total Maximum Daily Load (TMDL)

The South Dakota School of Mines & Technology (SDSM&T), along with the South Dakota Department of Environment and Natural Resources (SD DENR), developed and implemented an assessment project to determine the fecal coliform Total Maximum Daily Load (TMDL) for Spring Creek and the Sheridan Lake TMDL for Trophic State Index (TSI). The project started during 2002. The purpose of the assessment was to address rural and urban nutrient, sediment, and fecal coliform problems in the watershed. The overall goal was to produce a TMDL for fecal coliform in Spring Creek and a TSI TMDL in Sheridan Lake to improve water quality by reducing fecal coliform, nutrient, and sediment loading in Spring Creek. The Sheridan Lake TSI TMDL and the Spring Creek fecal coliform bacteria TMDL were approved by the Environmental Protection Agency (EPA) in 2006 and 2008, respectively.

2.2 Beneficial Uses

Spring Creek was assigned the following beneficial uses: coldwater permanent fish life propagation (above Sheridan Lake), cold-water marginal fish life propagation (below Sheridan Lake), immersion recreation, limited contact recreation, fish and wildlife propagation, recreation and stock watering, and irrigation. Sheridan Lake was assigned the following beneficial uses: coldwater permanent fish life propagation, immersion recreation, limited contact recreation, fish and wildlife propagation, and recreation and stock watering. When multiple criteria exist for a particular parameter, the most stringent criterion is used.

In addition to the EPA approved TMDLs on Spring Creek and Sheridan Lake, the SD DENR's 2010 Integrated Report and 303(d) list states that Spring Creek's coldwater permanent fish life beneficial use is impaired because of temperature, Sheridan Lake's coldwater permanent fish life beneficial use is impaired because of dissolved oxygen and temperature, and Sylvan Lake's coldwater permanent fish life beneficial use is impaired because of temperature. Spring Creek, Sheridan Lake, and Sylvan Lake are scheduled for additional TMDL development to address these impairments in 2018, 2020, and 2020, respectively.

2.3 Use Attainability Analysis (2013)

A Use Attainability Analysis (UAA) was performed by DENR on Spring Creek in June 2013. The impaired reach of Spring Creek was analyzed (See Figure 3) utilizing data collected as part of this Project. In addition, DENR visited several Spring Creek monitoring sites, interviewed landowners, took photos, collected water quality samples, measured channel dimensions, recorded flows and calculated stream discharge. Three recommendations were made by DENR from the UAA:

1. Lake Alexander is added under SDAR 74:51:02:54 with the beneficial uses of Permanent Coldwater Fish Life Propagation, Immersion Recreation, and Limited Contact Recreation.
2. The stricter beneficial use of Immersion Recreation be removed from the upper portion of Spring Creek (headwaters to Spring Creek Road West). – *This recommendation was not supported by the Environmental Protection Agency.*

3. The beneficial uses of Immersion Recreation and Limited Contact Recreation will remain for the segment of Spring Creek from Spring Creek Road West to Sheridan Lake.

Figure 3. Impaired Segment of Spring Creek

2.4 Additional Impairments

Individual parameters determine the support of these beneficial uses. South Dakota has narrative standards that may be applied to the undesired eutrophication of lakes and streams. Administrative Rules of South Dakota (ARSD) Article 74:51 contains language that prohibits the presence of materials causing pollutants to form, visible pollutants, taste- and odor-producing materials, and nuisance aquatic life. Reduction of nutrients in Spring Creek, specifically phosphorus, was addressed in the TSI TMDL developed for Sheridan Lake and is included in the scope of this watershed implementation project.

2.5 Water Quality Criteria

The numeric TMDL target established for the beneficial uses for Spring Creek is based on the current daily maximum criteria for fecal coliform bacteria. Water-quality criteria for the immersion recreation beneficial use requires that (1) no sample exceeds 400 colony-forming units (cfu)/100 milliliters (mL) and (2) during a 30-day period, the geometric mean of a minimum of five samples collected during separate 24-hour periods must not exceed 200 cfu/100 mL. This criterion is applicable from May 1st to September 30th.

Of all the assessed parameters for which surface water-quality criteria are established, fecal coliform and water temperature exceed criteria for the cold-water permanent fish life propagation beneficial use on Spring Creek. During the TMDL study, ten samples collected from several sites within the assessed stream segment exceeded the total suspended solids (TSS) criterion. However, TSS was not included as a cause of impairment for this reach in the 2008 Impaired Waterbodies List because less than 10 percent of the TSS samples collected during the period of record considered for the 2008 report (October 1, 2002, to September 30, 2007) exceeded the numeric criterion.

2.6 2014 Integrated Report

The SD DENR 2014 Integrated Report was approved by the EPA in May 2014. Additional parameters were added to the 303(d) list as part of this Integrated Report for Spring Creek. These included E. *coli* and TSS. The BMPs currently being implemented for fecal coliform can reduce E. *coli* and TSS loads. These additional listings should not change the scope and goals of the implementation project.

Water-quality criteria for the immersion recreation beneficial use for E. *coli* requires that (1) no sample exceeds 235 most probable number (mpn)/100 milliliters (mL) and (2) during a 30-day period, the geometric mean of a minimum of five samples collected during separate 24-hour periods must not exceed 126 mpn/100 mL. This criterion is applicable from May 1st to September 30th.

Water-quality criteria for the coldwater permanent fishlife propagation for TSS require that (1) no sample exceeds 53 milligrams (mg)/ liter (L) and (2) during a 30-day period, the average of the samples collected must not exceed 30 mg/L. This criterion is applicable year-round.

2.7 Location of Impairments

The impaired (303(d) listed) segment (Figure 3), for fecal coliform, E. *coli*, Temperature and TSS, of Spring Creek has a length of 31 miles and flows through Mitchell Lake, which has a surface area of about 7 acres. This segment ends where Spring Creek empties into Sheridan Lake, approximately 4 miles downstream of Mitchell Lake. The impaired (303(d) listed) segment, because of temperature, also begins at the headwaters and ends where Spring Creek crosses Highway 79, south of Rapid City. The drainage area of the 303(d) listed segment is approximately 425 square miles.

3.0 PROJECT GOALS AND OBJECTIVES

The project goal is to bring Spring Creek into compliance with state water quality standards for fecal coliform bacteria, E. *coli* and Total Suspended Solids (TSS) by implementing the recommended Best Management Practices (BMPs) by 2021. The goal of this project, as set forth in the Spring Creek and Sheridan Lake Total Maximum Daily Load (TMDL) studies, include the following:

- ✓ Implement riparian, manure management, and on-site wastewater treatment system (OWTS) BMPs in the watershed to reduce fecal coliform bacteria and E. *coli* from the headwaters of Spring Creek to Sheridan Lake.
- ✓ Demonstrate BMP projects for storm water, forestry, and lake rehabilitation that will help encourage BMP implementation and expand public outreach efforts.
- ✓ Conduct significant public education and outreach to stakeholders within the Spring Creek Watershed.
- ✓ Perform water-quality monitoring to aid in tracking watershed conditions that will ensure that the BMPs are effective and the proper BMPs are being implemented.

3.1 Planned and Actual Milestones, Products, and Completion Dates

Objective 1. Implement BMPs Recommended in the Fecal Coliform Bacteria TMDL for Spring Creek.

This objective consisted of two tasks: (1) improving riparian vegetation and manure management techniques, and (2) implementing onsite wastewater treatment system (OWTS) improvement projects. The products of this objective include completing eight riparian vegetation/streambank protection projects, three storm water projects, and one manure/grazing management project. Implementation of these BMPs is discussed in further detail in Chapter 4.0.

Objective 2. Public Outreach and Project Management.

This objective consisted of a single task and the following products were planned:

- Administering three public meetings, two watershed tours, and ten Advisory Group meetings.
- Completing the Grant Reporting and Tracking System (GRTS) Final Report.
- Completing one Final Report.

The completed products of Objective 2 include the following:

- Administered one public meeting and one watershed tour.
- Conducted individual meetings with over 75 property owners.
- Evaluated and ranked 52 cost-share applications requesting over $360,000 of 319 funding.
- Initiated three direct mailings to over 1,000 residents and property owners in the watershed.
- Conducted six Advisory Group meetings.
- Attended and presented Spring Creek information at 18 County Commission Meetings.
- Held two willow harvesting/planting demonstrations.
- Updated Project website as needed.
- Completed the Grant Reporting and Tracking System (GRTS) Final Report.
- Completed one Final Report.

Objective 3. Complete Essential Water-Quality Monitoring

Water-quality monitoring, in conjunction with BMP implementation, is critical in evaluating the progress toward meeting the TMDL. The purpose of the water-quality sampling as part of Segment 2 was to (1) continue to monitor water-quality conditions on Spring Creek and its tributaries, primarily related to fecal coliform bacteria, sediment, temperature, and nutrients; (2) further identify sources of impairments in the watershed; and (3) focus BMP efforts in the future and (4) determine BMP implementation effectiveness.

Sixteen sites were selected for water-quality monitoring in Segment 2. These sites include background sampling sites near the headwaters of Spring Creek and key tributaries, upstream and downstream of Hill City, and upstream/downstream of small impoundments in the watershed that act as effective water-quality BMPs. Many sites were selected based on previous data collection efforts (USGS gaging, SD DENR water-quality monitoring (WQM), and SDSM&T TMDL stations). Constituents to be sampled include: total phosphorus; nitrate nitrogen, total suspended solids, fecal coliform, *E. coli*, and *Enterococcus* (in 2012 only).

From July 2012 to September 2014, Pennington County and their partners conducted monitoring for fecal coliform bacteria, *E. coli*, *Enterococcus (2012),* total suspended solids (TSS), total phosphorus (TP), and nitrate-nitrogen (NO_3-N).

The products for Objective 3 include ambient and geomean water-quality and water-quantity monitoring data. Specifically, Pennington County and watershed consultant staff collected 64 monthly ambient grab samples at 19 sites from July 2012 through September 2012, 400 geomean samples at 19 sites from May 2013 through September 2013, and 200 geomean samples at 8 sites from May 2014 through September 2014.

Table 1 lists the project objectives, their products, the planned milestone completion dates, and the actual milestone completion dates.

Table 1. Planned Versus Actual Milestone Completion Dates

Spring Creek Watershed Implementation	**Planned Completion**	**Actual Completion**
Objective 1. Implement BMPs Recommended in the Fecal Coliform Bacteria TMDL for Spring Creek.		
Product 1. Riparian, Storm water, Grazing, Forest, Lake BMPs.	6/30/2015	6/30/2015
Product 2. Onsite Wastewater Treatment System Improvements.	6/30/2015	6/30/2015
Objective 2. Public Outreach and Project Management.		
Product 3. Public Outreach, Record Keeping, Report/Grant Writing.	6/30/2015	7/31/2015
Objective 3. Complete Essential Water-Quality Monitoring.		
Product 4. Evaluation and Monitoring.	6/30/2015	12/31/2014

3.2 Evaluation of Goal Attainment

The project success was evaluated by comparing project outputs and outcomes with the planned milestones. Two of the objectives established for this project were reached and included the following:

- Completion of three On-site Wastewater Treatment System (OWTS) improvement project and one riparian-vegetation project.
- Evaluation and ranking of 52 cost-share applications requesting over $360,000 of 319 funding.
- Approval of eight OWTS improvement projects agreements totaling $43,000 of 319 funds.
- Approval of seven Riparian Vegetation and Manure Management improvement projects totaling $80,134 of 319 funds.
- Approval of two storm water improvement projects totaling $55,101 of 319 funds.
- Completion of site visits with over 75 property owners to discuss water quality, project goals, and BMP funding by Pennington County, and watershed consultant.
- Presentation of advisory group recommendations, payment applications, and progress updates at 18 public meetings of the County's Board of Commissioners.
- Maintenance of the Spring Creek Watershed 319 Project website (*www.pennco.org/springcreek*) with hits from over 2,250 unique visitors.
- Three direct mailings to over 1,000 residents and property owners in the watershed.
- Completion of 4 ambient monthly water quality monitoring events at 16 watershed sites.
- Completion of 25 geomean water quality monitoring events at 16 watershed sites.
- Completion of 25 geomean water quality monitoring events at 8 watershed sites.
- Completion of the Grant Reporting and Tracking System (GRTS) Final Reports.
- Completion of one Final Report.

4.0 BEST MANAGEMENT PRACTICES

Implementation of the BMPs recommended in *Fecal Coliform Bacteria Total Maximum Daily Load for Spring Creek, Pennington County, South Dakota* was initiated during this Project segment. BMP installations were funded by local property owners, Pennington County, city of Hill City, United States Forest Service – Black Hills National Forest, and Natural Resource Conservation Service. Table 2 provides the BMP projects installed within Segment 2. Table 3 provides the BMP projects approved in Segment 2 but not installed due to challenges encountered. A majority of the approved projects are anticipated to be installed in 2015 and 2016 as part of Segment 3. Locations of the installed/approved BMPs are shown on Figure 4.

Table 2. BMPs Installed in Segment 2.

Best Management Practice	BMP Units
Onsite Wastewater Treatment System	1 each
Onsite Wastewater Treatment System	1 each
Onsite Wastewater Treatment System	1 each
Onsite Wastewater Treatment System	1 each
Onsite Wastewater Treatment System	1 each
Channel Bank Vegetation	105 linear feet
Streambank Protection (Willow Planting)	265 linear feet
Streambank Protection	105 linear feet
Grade Stabilization Structure	1 each
Riparian Forest Buffer	0.2 acres
Channel Bank Vegetation	500 feet

Table 3. BMPs Approved in Segment 2 to be installed in Segment 3.

Best Management Practice	BMP Units
Streambank Protection	760 linear feet
Riparian Forest Buffer	1.3 acres
Grade Stabilization Structure	1 each
Herbaceous Weed Control	0.2 acres
Filter Strip	0.21 acres
Vegetated Swale	7,080 square feet
Bioretention Area	4,750 square feet
Commercial Rain Barrels	2 each
Detention Pond	1 each

5.0 PUBLIC OUTREACH AND PROJECT MANAGEMENT

Multiple outreach activities were completed within Segment 2 and are shown in Figures 5 through 10. The Spring Creek 319 Watershed Project website was maintained throughout the Segment and used to notify the public of any advisories and times and locations of events and meetings in the watershed. Three direct mailings about the implementation project, water-quality monitoring, and BMP cost-share sign-ups sent to over 1,000 watershed residents. Along with these efforts, Pennington County, the Natural Resource Conservation Service, Rural Community Assistance Corporation, and the watershed consultant staff met with over 75 watershed residents and property owners. Two willow planting demonstrations and one watershed tour were held in the watershed, in addition to presentation of recommendations from six Advisory Group meetings at 18 Board of Commissioner's meetings.

5.1 Willow Planting Demonstration May 2014

Figure 5. Willow Cuttings

Figure 4. Willow Planting along Streambank

5.2 Watershed Tour September 2014

Figure 6. Completed Streambank Project

Figure 7. Tour around Mitchell Lake

5.3 Willow Planting Demonstration April/May 2015

Figure 8. Willow Bundling

Figure 9. Willow Soaking

Figure 10. Willow Cuttings

Figure 11. Willow Planting

Figure 12. Willow Planting

Figure 13. Planted Willow Cuttings

6.0 WATER-QUALITY MONITORING RESULTS

Water quality at the watershed level was analyzed by using data collected during the 2012, 2013, and 2014 monitoring seasons. Throughout these years, monitoring included ambient and geomean sampling on Spring Creek and its tributaries (Palmer Creek and Newton Fork). Monitoring commenced in July 2012 through the recreation season and in the 2013 and 2014 recreational seasons.

6.1 Monitoring Site Locations

The monitoring sites used within Segment 2: general locations, year(s) sampled, and types of sampling that occurred are provided in Table 4 and Figures 5 and 6. In addition, the water quality results for these monitoring site locations are graphed in Appendix A.

Table 4. Segment 2 Monitoring Locations

Site	***General Monitoring Site Location***	***Latitude (N)***	***Longitude (W)***	***Year(s)***	***Type****
SPC025	Spring Creek at Bobcat Road	43.8977	-103.7229	2012	A
SPC050	Spring Creek at Spring Creek Road W	43.8636	-103.6268	2012	A
SPC100	Spring Creek at Rafter J Road	43.8891	-103.5908	2012	A
SPC120	Spring Creek below Rafter J Bar Road	43.8963	-103.5917	2013-2014	A
SPC125	Spring Creek above Recreational Resort Area	43.8979	-103.5914	2012, 2013	A
SPC130	Spring Creek below Recreational Resort Area	43.9006	-103.5919	2012, 2013	A
SPC200	Spring Creek upstream of Tracy Park	43.9272	-103.5739	2012-2014	A, S
SPC250	Spring Creek upstream of confluence with Major Lake	43.9346	-103.5686	2012, 2013	A
SPC270	Spring Creek above City Park	43.9324	-103.5634	2013	A
SPC280	Spring Creek below City Park	43.9320	-103.5600	2013	A
SPC290	Spring Creek below Hill City WWTP	43.9371	-103.5599	2012, 2013	A
SPC300	Spring Creek at Hill City Visitor Center	43.9379	-103.5606	2012-2014	A
SPC350	Spring Creek upstream of Mitchell Lake	43.9410	-103.5449	2012-2014	A, S
SPC400	Spring Creek downstream of Mitchell Lake	43.9451	-103.5356	2012-2014	A
SPC450	Spring Creek upstream of confluence with Palmer Creek	43.9447	-103.5138	2012, 2013	A
SPC485	Spring Creek downstream of confluence with Palmer Creek	43.9525	-103.5073	2012-2014	A
SPC500	Spring Creek upstream of Sheridan Lake	43.9612	-103.4881	2012-2014	A, S
NFT340	Newton Fork upstream of Major Lake	43.9364	-103.5714	2012	A
NFT380	Newton Fork above confluence with Spring Creek	43.9346	-103.5680	2012, 2013	A
PCT410	Palmer Creek below Willow Creek Campground	43.8995	-103.5359	2012-2014	A, S
PCT440	Palmer Creek at Old Hill City Road	43.9199	-103.5138	2012	A
PCT470	Palmer Creek upstream of Highway 16	43.9367	-103.5106	2012, 2013	A, S
PCT490	Palmer Creek upstream of confluence with Spring Creek	43.9525	-103.5073	2014	

Storm Sewers - ALG343=Allen Gulch (under Walnut Street) and DFR350=Deerfiled Road (north of E. Main Street)

*A = Ambient *S = Storm

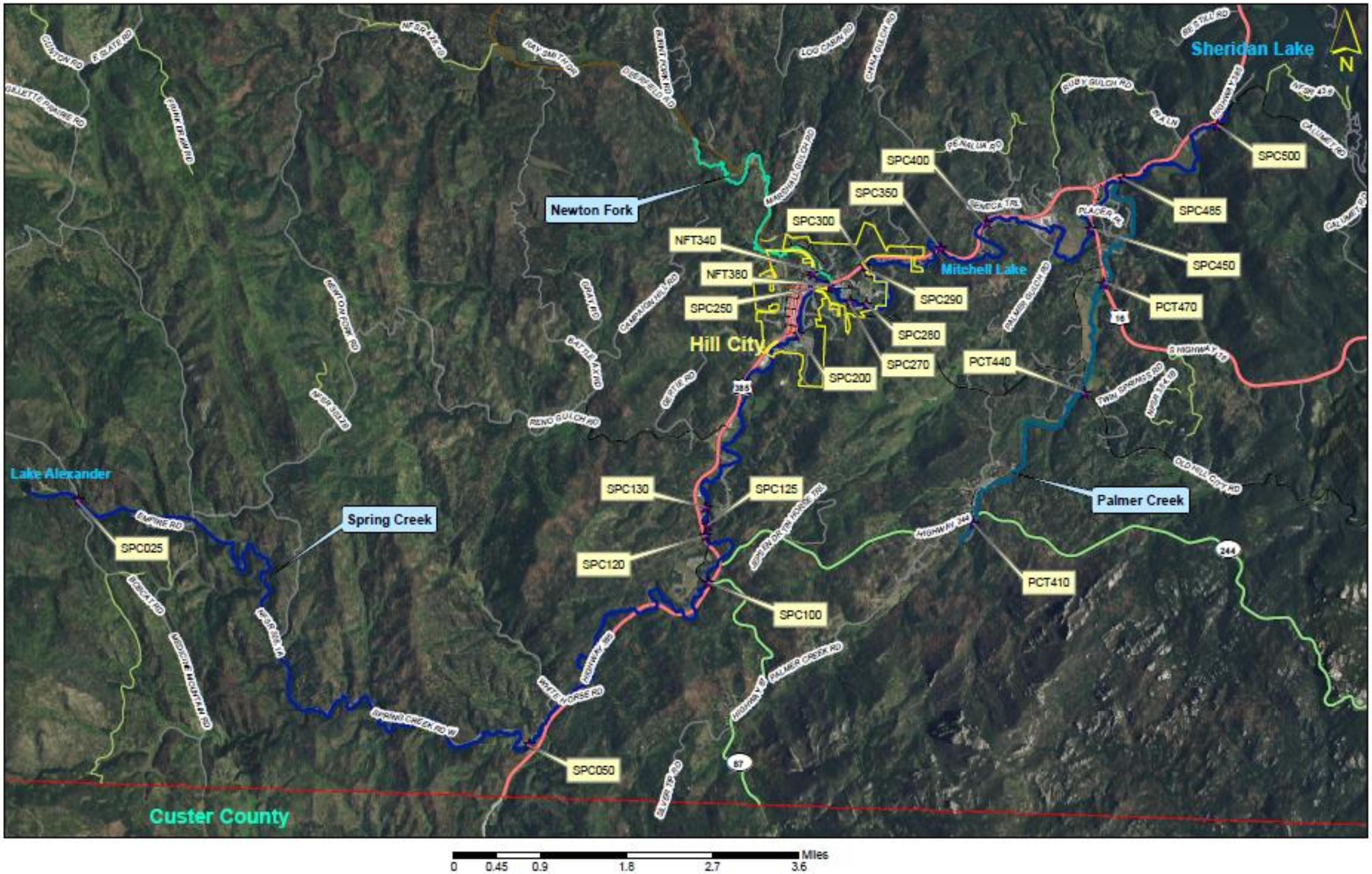

Figure 14. 2012-2013 Monitoring Site Locations

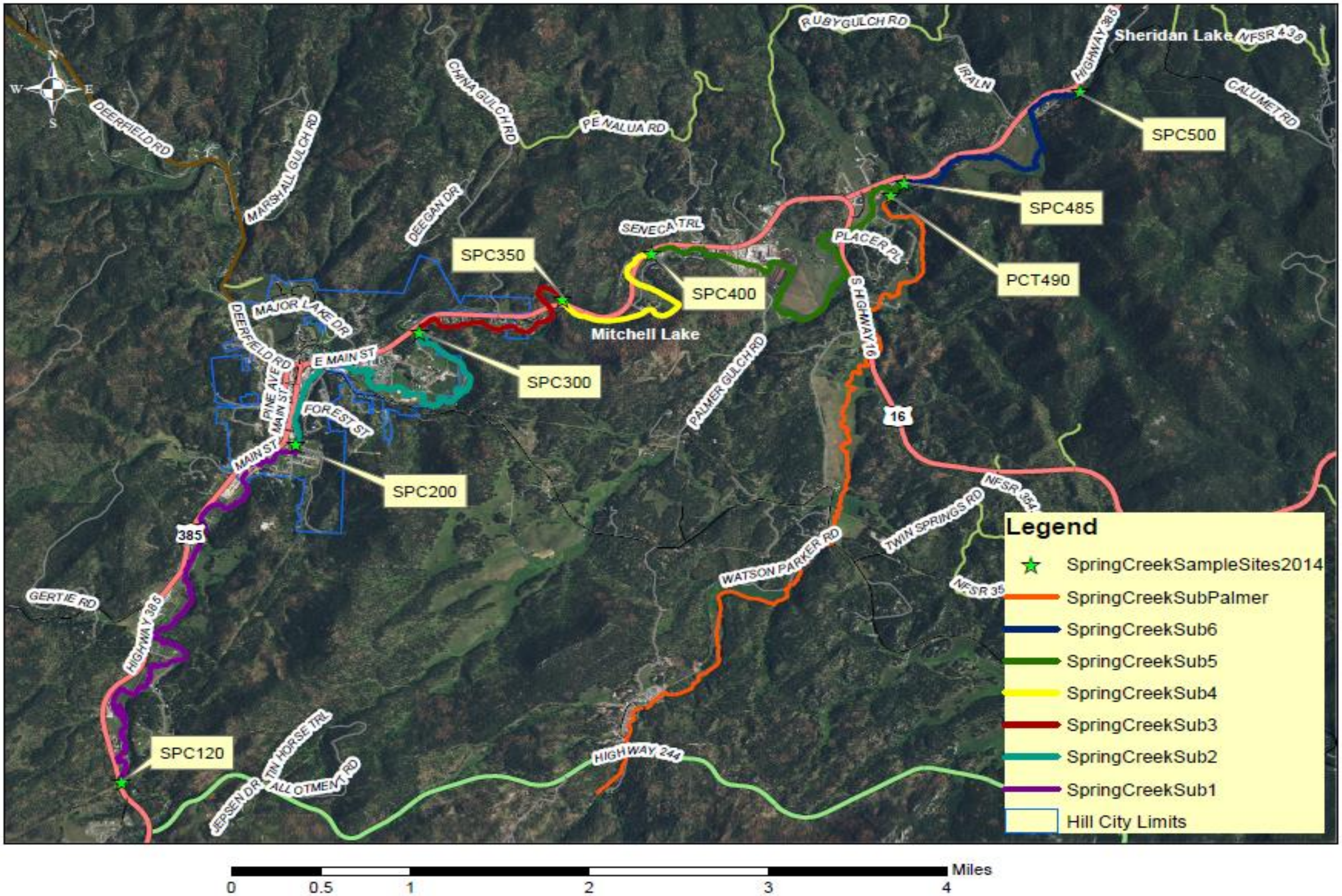

Figure 15. 2014 Monitoring Site Locations

6.2 Total Maximum Daily Load Implementation Effectiveness

BMPs implemented and approved within Segment 2 will contribute to obtaining the goals as set forth in the Spring Creek and Sheridan Lake TMDL studies. BMP installations focused on reducing fecal coliform/E. *coli* bacteria loads to begin attaining the load reductions identified in *Fecal Coliform Bacteria Total Maximum Daily Load for Spring Creek, Pennington County, South Dakota*, and ultimately reducing concentrations to levels that meet the state of South Dakota's water-quality standards. The BMPs that were implemented resulted in an estimated fecal coliform reduction of 2.2 x 10^{10} colony forming units in Spring Creek for this Project segment, based on values from the Bacteria Source Load Calculator (BSLC).

Table 5. Pollutant Load Reductions for BMPs Implemented in Segment 2.

Pollutant Type *	Pollutant Reduction Target	Current Year Pollutant Reduction	Cumulative Pollutant Reduction Achieved (Numerical)	Units	TMDL yes/no
POLLUTANTS:					
Fecal Coliform	400 cfu/100 ml	2012-2015	$2.2x10^{10}$	cfu/100mL	YES
ADDITIONAL POLLUTANTS:					
Total Suspended Solids	53 mg/L	2012-2015	16	tons/yr	NO
Total Phosphorus	10 ug/L	2012-2015	49	lbs/yr	NO
Total Nitrogen	n/a	2012-2015	95	lbs/yr	NO

Streambanks/Shorelines

☒ Streambank and Shoreline Protection
☒ Stream Channel Stabilization

Description	Current Year	Cumulative Total	Units
Streambank and Shoreline Protection	2012-2015	370	Feet
Stream Cannel Stabilization	2012-2015	605	Feet

6.3 Water-Quality Analysis

Segment 2 water-quality monitoring results are discussed in the following sections. Graphs of water-quality monitoring results for Segment 2 are shown in Appendix A.

2012 Monitoring Results Summary

Pennington County and their partners conducted baseline multiparty monitoring in 2012 for fecal coliform, *E. coli*, enterococci, total suspended solids, total phosphorous, and nitrate as nitrogen. From April to October, approximately 130 samples were collected at 19 sites, and ISCO automatic samplers at three mainstem sites, two tributary sites, and two storm sewer outfalls collected 138 storm event samples. Monitoring sites used throughout the 2012 monitoring season are presented in Table 4. During 2012, 2,167 analyses were completed for fecal coliform, *E. coli*, enterococci, total suspended solids, total phosphorous, and nitrate as nitrogen by Energy Laboratories in Rapid City, South Dakota. Additionally, 426 analyses were completed for fecal coliform, *E. coli*, enterococci, total suspended solids, total phosphorous, and nitrate as nitrogen for quality assurance and quality control (QA/QC).

Fecal coliform concentrations from grab samples that were collected during baseflow did not exceed the single-sample criterion of 400 colony forming units per 100 milliliters (cfu/100mL) during the 2012 Segment 2 recreation season (May 1st – September 30th), with the exception of sites SPC450 and SPC500 with percent exceedences of 20% and 50%, respectively. Fecal coliform concentrations during storm events exceeded the single-sample criterion of 400 cfu/100mL in 2012.

Overall for the entire segment, fecal coliform samples collected during baseflow at mainstem sites did not exceed the single-sample criterion of 400 cfu/100mL. The mean concentrations ranged from 6 to 287 cfu/100mL. Samples collected during storm events show fecal coliform concentrations decrease from site SPC200 downstream to site SPC350 and increase from site SPC350 downstream to site SPC500. The mean fecal coliform concentrations during storm events on the mainstem of Spring Creek and tributaries are 2,772 and 10,003 cfu/100mL respectively. The mean concentration of fecal coliform during storm events at storm sewer outfalls was 12,957 cfu/100mL.

E. coli samples collected during baseflow exceeded the single-sample criterion of 235 most probable number per 100 milliliters (mpn/100mL). Samples collected during storm events show *E. coli* concentrations decrease from site SPC200 downstream to site SPC350 and increase from site SPC350 downstream to site SPC500. The mean *E. coli* concentrations during storm events on the mainstem of Spring Creek and tributaries are 1,928 and 2,308 mpn/100 mL respectively. The mean concentration of *E. coli* during storm events at storm sewer outfalls was 2,642 mpn/100 mL.

Total suspended solids concentrations from grab samples that were collected during baseflow did not exceed the single-sample criterion of 53 mg/L during the 2012 Segment 2 recreation season (May 1st – September 30th). Concentrations ranged from <5 to 11 mg/L. Samples collected during storm events show total suspended solids concentrations exceeded the single-sample criterion during all storm events on the tributary sites (mean concentration = 220 mg/L), storm sewer outlet sites (mean concentration = 1,336 mg/L), and exceeded the single-sample criterion on the mainstem of Spring Creek 50 percent of the time (mean concentration = 171 mg/L).

2013 Monitoring Results Summary

Pennington County and their partners conducted baseline multiparty monitoring in 2013 for fecal coliform, *E. coli*, total suspended solids, total phosphorous, and nitrate as nitrogen. From May to September, approximately 352 geomean samples were collected at 18 sites. Monitoring sites used throughout the 2013 monitoring season are presented in Table 4. During 2013, 1,760 analyses were completed for fecal coliform, *E. coli*, total suspended solids, total phosphorous, and nitrate as nitrogen by Energy Laboratories in Rapid City, South Dakota. Additionally, 730 analyses were completed for fecal coliform, *E. coli*, total suspended solids, total phosphorous, and nitrate as nitrogen for quality assurance and quality control (QA/QC).

Fecal coliform concentrations from grab samples that were collected during baseflow exceeded the single-sample criterion of 400 colony forming units per 100 milliliters (cfu/100mL) during the 2013 Segment 2 recreation season (May 1st – September 30th) for sites SPC120 (10%), SPC290 (13%), and SPC400 (15%).

Overall for the entire segment, fecal coliform samples collected during baseflow at mainstem sites did not exceed the single-sample criterion of 400 cfu/100mL (7%). The mean concentrations ranged from 33 to 306 cfu/100mL. In addition, fecal coliform concentrations exceeded the geomean criterion of 200 cfu/100mL (17%). See Appendix B for a table of geomean results.

E. coli samples collected during baseflow exceeded the single-sample criterion of 235 most probable number per 100 milliliters (mpn/100mL) during the 2013 Segment 2 recreation season (May 1 – September 30) for sites SPC120 (12%), SPC125 (18%), SPC130 (18%), SPC250 (24%), SPC270 (21%), SPC290 (20%), SPC300 (16%), SPC350 (20%), SPC400 (24%), SPC450 (28%), SPC485 (36%), and SPC500 (19%).

Overall for the entire segment, *E. coli* samples collected during baseflow at mainstem sites exceeded the single-sample criterion of 235 mpn/100mL (18%). The mean concentrations ranged from 37 to 377 cfu/100mL. In addition, *E. coli* concentrations exceeded the geomean criterion of 126 cfu/100mL (42%). See Appendix B for a table of geomean results.

Total suspended solids concentrations from grab samples that were collected during baseflow did not exceed the single-sample criterion of 53 mg/L during the 2013 Segment 2 recreation season (May 1st – September 30th). Concentrations ranged from <5 to 49 mg/L.

2014 Monitoring Results Summary

Pennington County and their partners conducted baseline multiparty monitoring in 2014 for fecal coliform, *E. coli*, and total suspended solids. From May to September, approximately 167 geomean samples were collected at 9 sites. Monitoring sites used throughout the 2014 monitoring season are presented in Table 4. During 2014, 690 analyses were completed for fecal coliform, *E. coli*, and total suspended solids by Energy Laboratories in Rapid City, South Dakota. Additionally, 130 analyses were completed for fecal coliform, *E. coli*, and total suspended solids for quality assurance and quality control (QA/QC).

Fecal coliform concentrations from grab samples that were collected during baseflow did not exceed the single-sample criterion of 400 colony forming units per 100 milliliters (cfu/100mL) during the 2014 Segment 2 recreation season (May 1 – September 30).

Overall for the entire segment, fecal coliform samples collected during baseflow at mainstem sites did not exceed the single-sample criterion of 400 cfu/100mL (18%). The mean concentrations ranged from 31 to 151 cfu/100mL. In addition, fecal coliform concentrations did not exceed the geomean criterion of 200 cfu/100mL. See Appendix B for a table of geomean results.

E. coli samples collected during baseflow exceeded the single-sample criterion of 235 most probable number per 100 milliliters (mpn/100mL) during the 2014 Segment 2 recreation season (May 1 – September 30) for sites SPC120 (12%), SPC125 (18%), SPC130 (18%), SPC250 (24%), SPC270 (21%), SPC290 (20%), SPC300 (16%), SPC350 (20%), SPC400 (24%), SPC450 (28%), SPC485 (36%), and SPC500 (19%).

Overall for the entire segment, *E. coli* samples collected during baseflow at mainstem sites exceeded the single-sample criterion of 235 mpn/100mL (18%). The mean concentrations ranged from 37 to 377 cfu/100mL. In addition, *E. coli* concentrations exceeded the geomean criterion of 126 cfu/100mL (42%). See Appendix B for a table of geomean results.

Total suspended solids concentrations from grab samples that were collected during baseflow did not exceed the single-sample criterion of 53 mg/L during the 2014 Segment 2 recreation season (May 1st - September 30th). Concentrations ranged from <5 to 63 mg/L.

6.4 Other Monitoring

No other monitoring was conducted in Spring Creek utilizing Environmental Protection Agency and South Dakota Department of Environment and Natural Resources certified methods.

6.5 Quality Assurance Reporting

Water-quality samples obtained over the 2012, 2013, and 2014 monitoring seasons were collected in accordance with SD DENR [2005]. The majority of the water-quality samples were collected by Pennington County and their consultant with the exception of samples collected by landowners. All entities were informed and educated in the Standard Operating Procedures [SD DENR, 2005] and collected samples accordingly.

6.6 Results of Best Management Practices Operation and Maintenance

Pennington County and their consultant were responsible for ensuring that BMPs cost shared with the Clean Water Act Section 319 grant funds were installed. Verification of the BMPs and their performance were photo documented during in 2015.

Figure 16. Streambank Protection Project

Figure 17. Willow Plantings

Figure 18. Streambank Stabilization Project

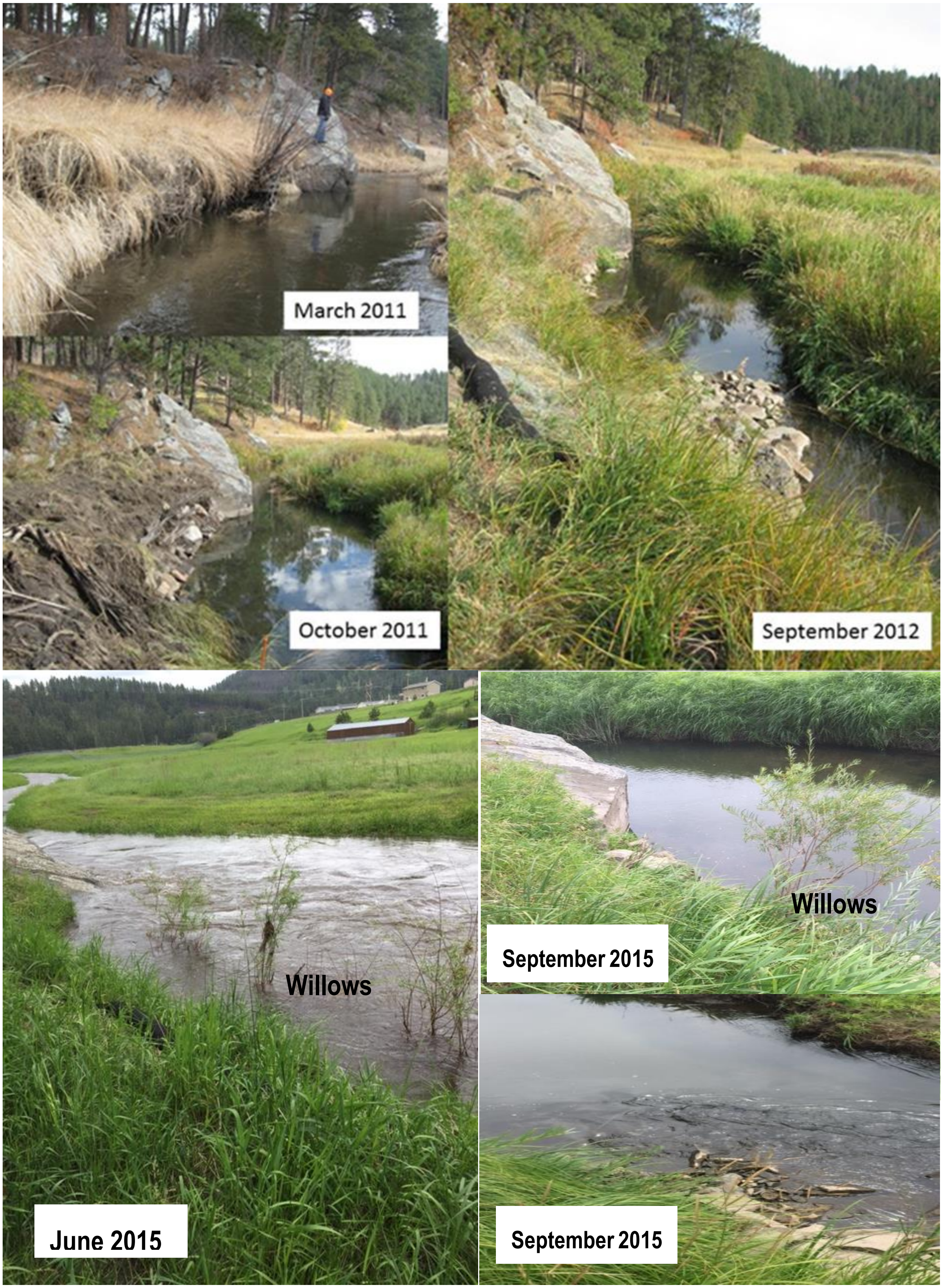

Figure 19. Stream Barb Project

7.0 SUCCESSES AND CHALLENGES OF THE PROJECT

7.1 Public Concern Regarding Implementation of Riparian Best Management Practices

During this Segment of the Project, issues arose regarding best management practices related to riparian improvements along Spring Creek. There was concern that these practices were a "landscaping" practice and not a best management practice to moderate flow, temperature, nutrients, bacteria, and sediment in the watershed. Several Letters to the Editor in the local newspaper, *the Hill City Prevailer*, alleging that local landowners were using the Project to landscape their land. As a result, an informational brochure was developed and sent to property owners in the watershed outlining the project purpose and cost-share opportunities (See Appendix C). In addition, the Spring Creek webpage will be updated with information on the benefits of riparian restoration.

7.2 *E. coli* Advisories

In July 2013, an advisory was placed on several portions of Spring Creek by the Pennington County Emergency Management Department for exceedences of the E. *coli* standard for immersion recreation. In addition, the United States Forest Service also warned the public of the exceedences and to take caution in Mitchell Lake. The advisories were posted on the Pennington County website and in several local newspapers. The advisories continued until September of 2013. Again in 2014, advisories were issued for Spring Creek in the same areas due to exceedences.

7.3 Historic Stream Flows and Flooding in 2015

Historically, the average annual precipitation in the watershed is 20.8 inches. In 2015, to date, the annual precipitation in the watershed is 23.57 inches. The watershed experienced record rainfalls in 2015. This caused flooding throughout the watershed and within Hill City. Spring Creek overtopped banks, flooded public parks and private property, and washed out roads. The flooding was sustained for long periods of time in May and June. Flows, through visual observations, were finally returning to normal conditions in September.

On average, the stream flows in Spring Creek during the recreation season do not exceed 300 cubic feet per second, even during large storm events. During the summer of 2015, Spring Creek experienced record stream flows due to the amount of precipitation in the watershed. Estimates of stream flows during the 2015 recreation season exceeded 1,000 cubic feet per second in many locations along the creek [Hoogestraat, 2015]. Not only did the peak flow exceed 1,000 cubic feet per second, but this flow was sustained for long periods of time.

Due to the significant flows in Spring Creek, there was damage to roads, bridges, and streambanks and many of the scheduled BMPs were not implemented in 2015. These will be put on the schedule for Segment 3. Some of the areas will need to be reassessed and resurveyed and the designs amended accordingly.

Figure 20. City Park, Hill City, May 18, 2015

Figure 21. Palmer Gulch Road and Highway 385, May 18, 2015

Figure 22. Staff gage at inlet to Sheridan Lake, May 28, 2015

Figure 23. Mitchell Lake Dam, May 28, 2015

Figure 24. City Park, Hill City, May 28, 2015

Figure 25. City Park, Hill City, May 28, 2015

Figure 26. Staff Gage at Tracy Park, Hill City, May 28, 2015

Figure 27. Staff Gage at Tracy Park, Hill City, September 10, 2015

8.0 PROJECT BUDGET

Pennington County received a $575,606.60 EPA Section 319 Grant and $100,000 Clean Water State Revolving Funds through the SD DENR to implement BMPs recommended by Kenner and Larson [2008] and to monitor water quality. In May 2015, $100,000 of Clean Water State Revolving Funds (match) were removed from the budget. Table 5 below reflects the updated budget to reflect the overall available funds for Segment 2. Figure 28 and Table 6 reflect the final expenditures for Segment 2.

Table 5. Segment 2 Budget

Project Objectives and Task Descriptions	Year 1	Year 2	Year 3	Total	EPA 319 Total	Total Match	Match			
							Participant	County	Hill City	SDGFP
Objective 1. Implement BMPs in the Spring Creek Watershed										
Task 1. Riparian, Stormwater, Livestock, Grazing, Forest, and Lake Improvements										
Engineering and Cultural Resources		**$34,000**	**$51,000**	**$85,000**	**$85,000**					
Products 1a-1e. Riparian, Stormwater, Grazing, Forest, and Lake BMP Projects										
1a.-Riparian Streambank Protection Projects										
Seven Riparian Streambank Projects	**$15,904**		**$93,806**	**$109,710**	**$60,234**	**$49,476**	**$44,976**	**$4,000**		**$500**
1b.-Stormwater Projects (campground, municipal, commercial or road)										
Two Stormwater Projects			**$92,835**	**$92,835**	**$55,101**	**$37,734**	**$36,734**	**$1,000**		
1c. One Manure/Grazing Project			**$12,000**	**$12,000**	**$6,000**	**$6,000**	**$5,000**	**$750**		**$250**
Task 1 Totals	**$15,904**	**$34,000**	**$249,641**	**$299,545**	**$206,335**	**$93,210**	**$86,710**	**$5,750**		**$750**
Task 2. On-site Wastewater Treatment System Improvements										
Engineering and Cultural Resources			**$4,500**	**$4,500**	**$4,500**					
Product 2. Nine OWTS Projects		$5,122	$64,150	$69,272	$33,436	$35,836	$33,436	$2,400		
Task 2 Totals		**$5,122**	**$68,650**	**$73,772**	**$37,936**	**$35,836**	**$33,436**	**$2,400**		
Objective 2. Public Outreach and Project Management										
Task 3. Public Outreach, Record Keeping, Report/Grant Writing										
Products 3a-3d. Public Outreach/Project Management										
3a. Informational Public Outreach - Two Public Meetings, Two Project Tours, Eight Advisory Group Meetings, Eight County Commission Meetings, and One Project Website	$70,756	$69,041	$7,703	$147,500	$139,500	$8,000		$7,000	$1,000	
3b. Project Management (Participant Conservation Plans and Agreements)	$7,408	$24,000	$24,592	$56,000	$40,000	$16,000		$15,000	$1,000	
3c. Administration	$403	$15,815	$15,597	$31,815	$5,815	$26,000		$25,000	$1,000	
3d. Travel	$288	$2,356	$2,356	$5,000	$2,000	$3,000		$3,000		
Task 3 Totals	**$78,855**	**$111,212**	**$50,248**	**$240,315**	**$187,315**	**$53,000**		**$50,000**	**$3,000**	
Objective 3. Complete Essential Water-Quality Monitoring										
Task 4. Evaluation and Monitoring										
Product 4. Compile Water-Quality Monitoring Data for Three Years	**$86,606**	**$80,000**	**$43,914**	**$210,520**	**$144,020**	**$66,500**		**$56,500**	**$10,000**	
Task 4 Totals	**$86,606**	**$80,000**	**$43,914**	**$210,520**	**$144,020**	**$66,500**		**$56,500**	**$10,000**	
Project Totals	**$181,365**	**$230,334**	**$412,453**	**$824,152**	**$575,606**	**$248,546**	**$120,146**	**$114,650**	**$13,000**	**$750**

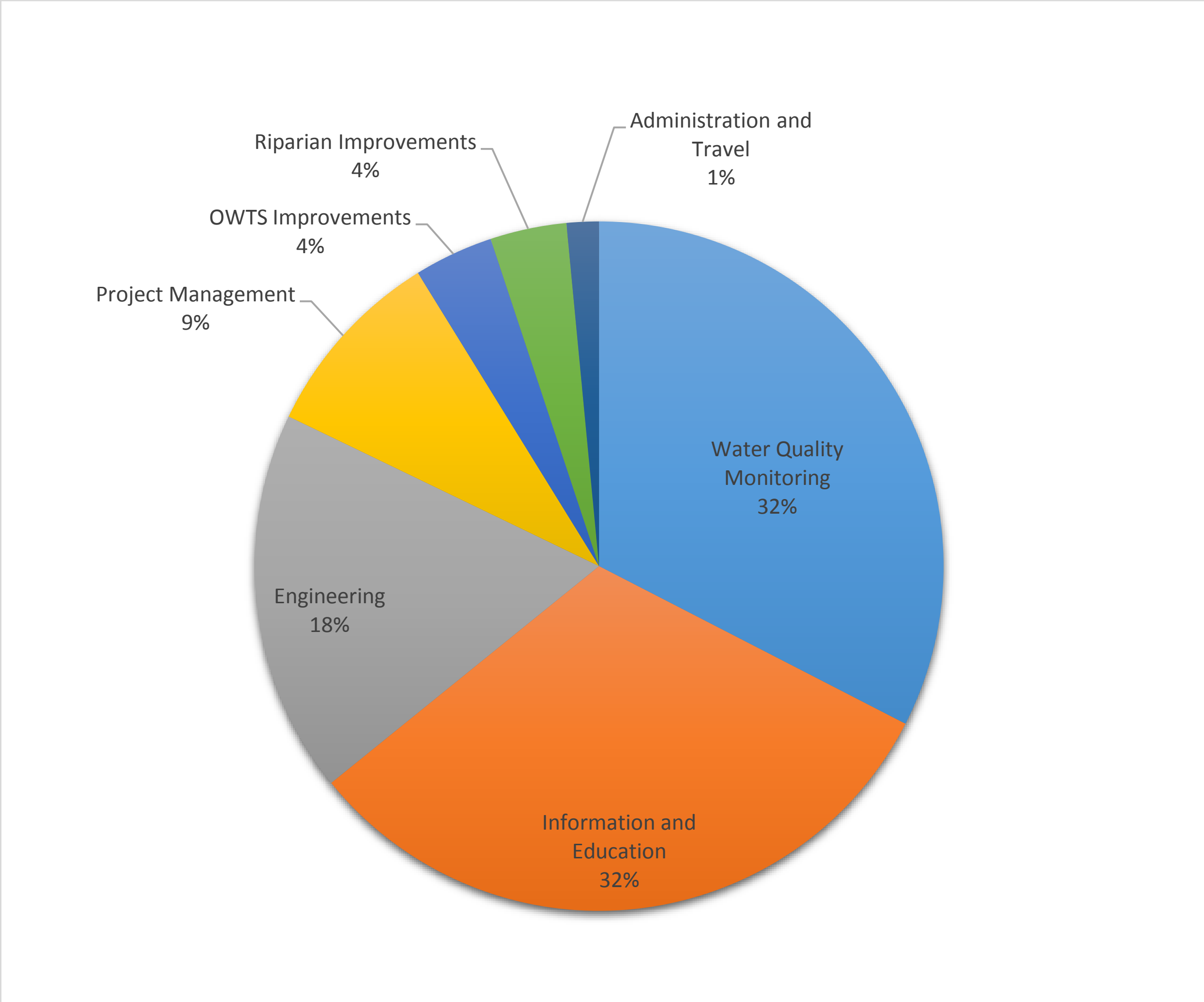

Figure 28. Final Expenditure Percentages

Table 6. Final Expenditure Amounts

Water Quality Monitoring	$ 144,020.40
Information and Education	$ 139,820.00
Engineering	$ 79,500.00
Project Management	$ 40,000.00
OWTS Improvements	$ 16,433.83
Riparian Improvements	$ 15,855.20
Administration and Travel	$ 6,680.00
Total	**$ 442,309.43**

9.0 FUTURE ACTIVITY RECOMMENDATIONS

Four additional project segments are planned in the coming years for the Spring Creek Watershed Management and Project Implementation Plan. The BMPs that are outlined by Kenner and Larson [2008] and Krajewski and Rausch [2014] are planned to be completed throughout the four remaining project segments. Installing the previously outlined BMPs will ensure that the overall goal for the watershed is met, which is to comply with the state of South Dakota water-quality standards.

10.0 REFERENCES

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APPENDIX A

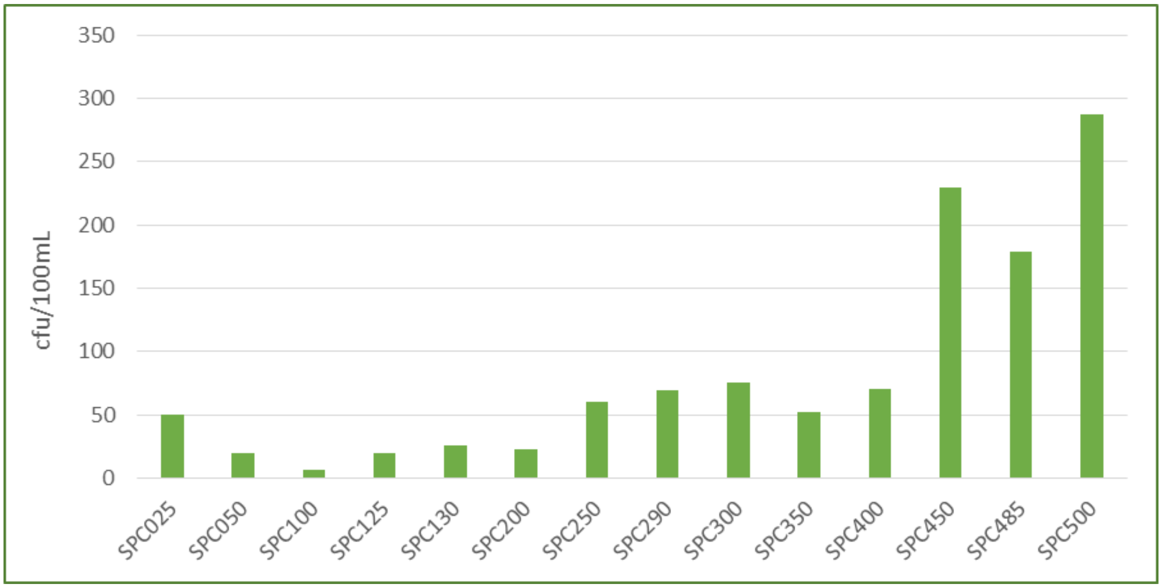
WATER QUALITY RESULTS
AMBIENT AND STORM EVENT GRAPHS

2012

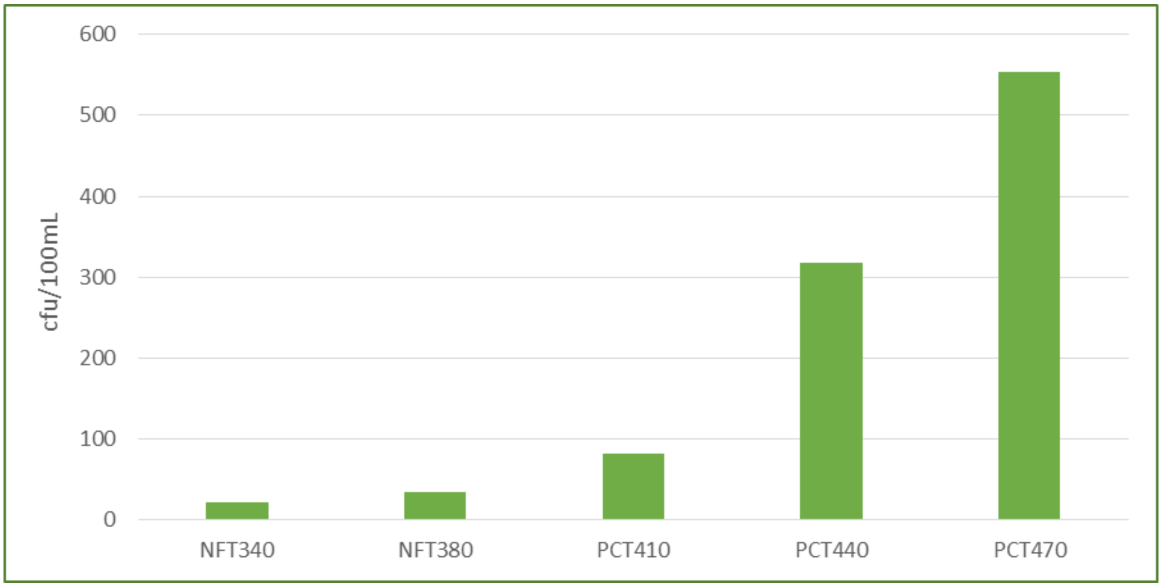
Fecal Coliform

**Single Sample Standard for Immersion Recreation (Spring Creek) = ≤ 400 cfu/100mL
**Single Sample Standard for Limited Contact Recreation (Tributaries) = ≤ 2,000 cfu/100mL

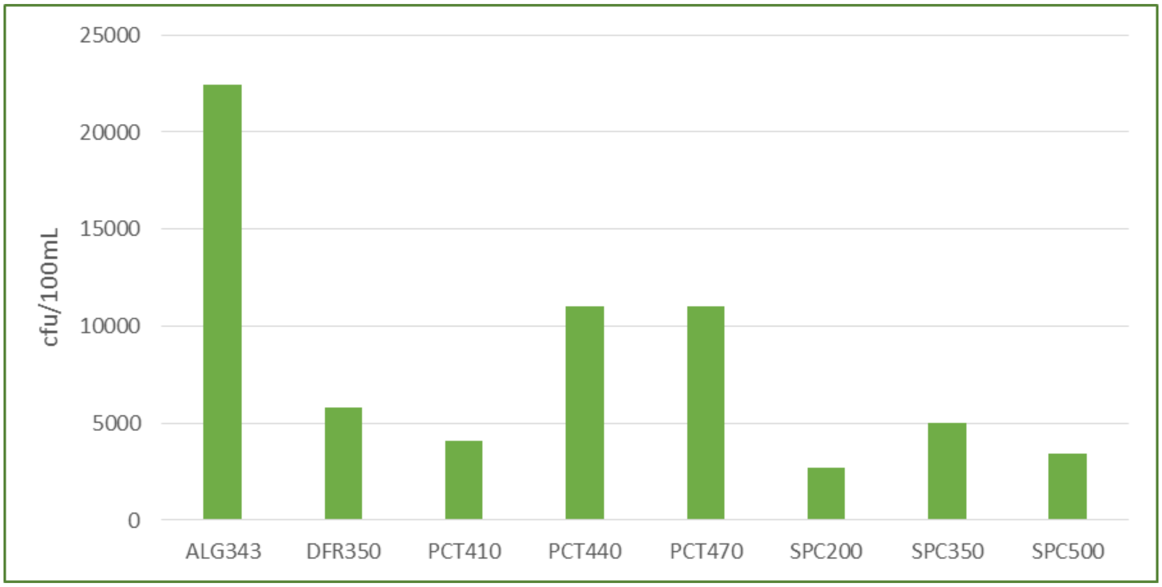
Ambient Means – Spring Creek



Ambient Means – Tributaries



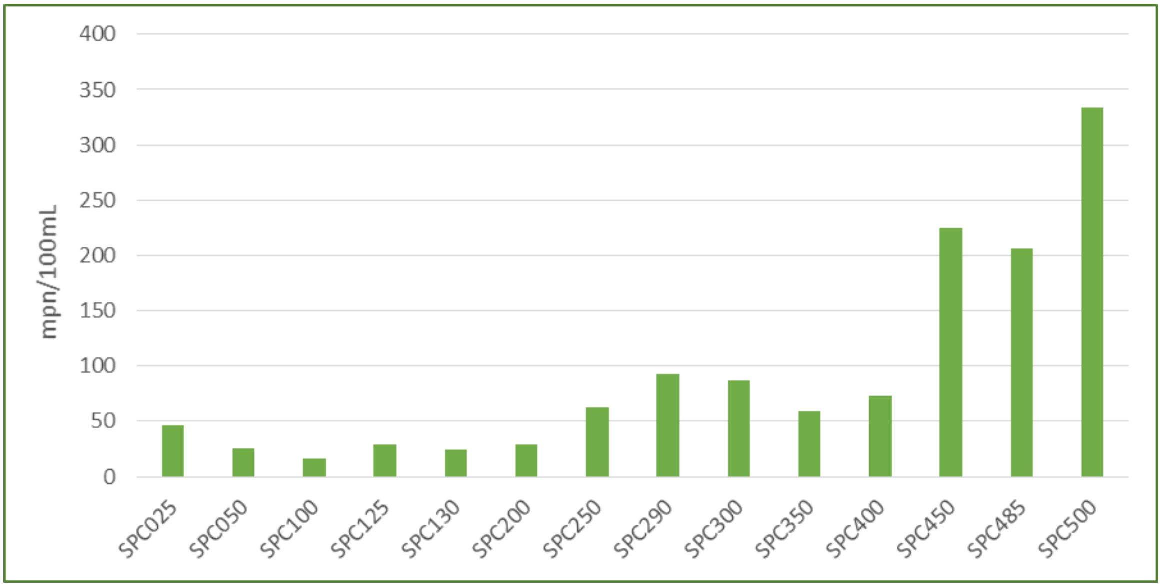
Storm Event Means – All Sites



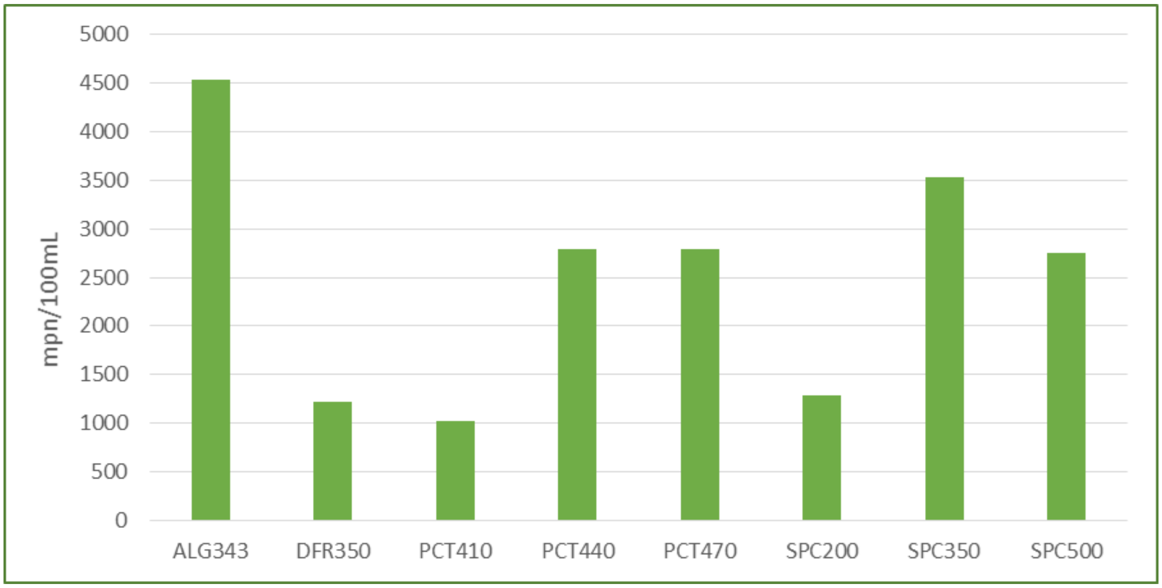
E. coli

**Single Sample Standard for Immersion Recreation (Spring Creek) = ≤ 235 cfu/100mL
**Single Sample Standard for Limited Contact Recreation (Tributaries) = ≤ 1,178 cfu/100mL

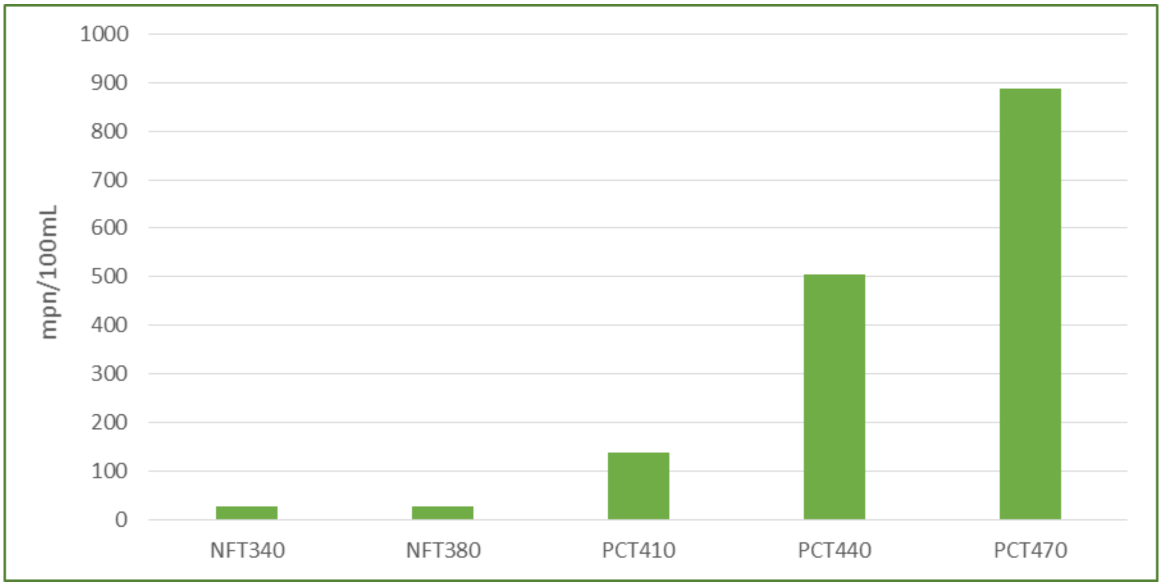
Ambient Means – Spring Creek



Ambient Means – Tributaries and Storm Sewer Outlets



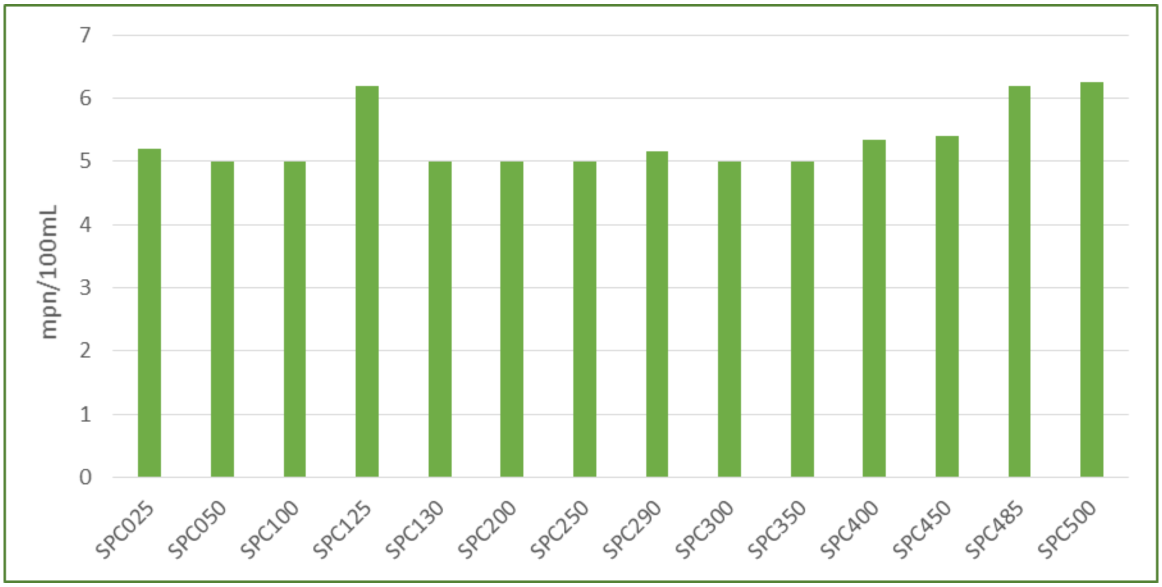
Storm Event Means – All Sites



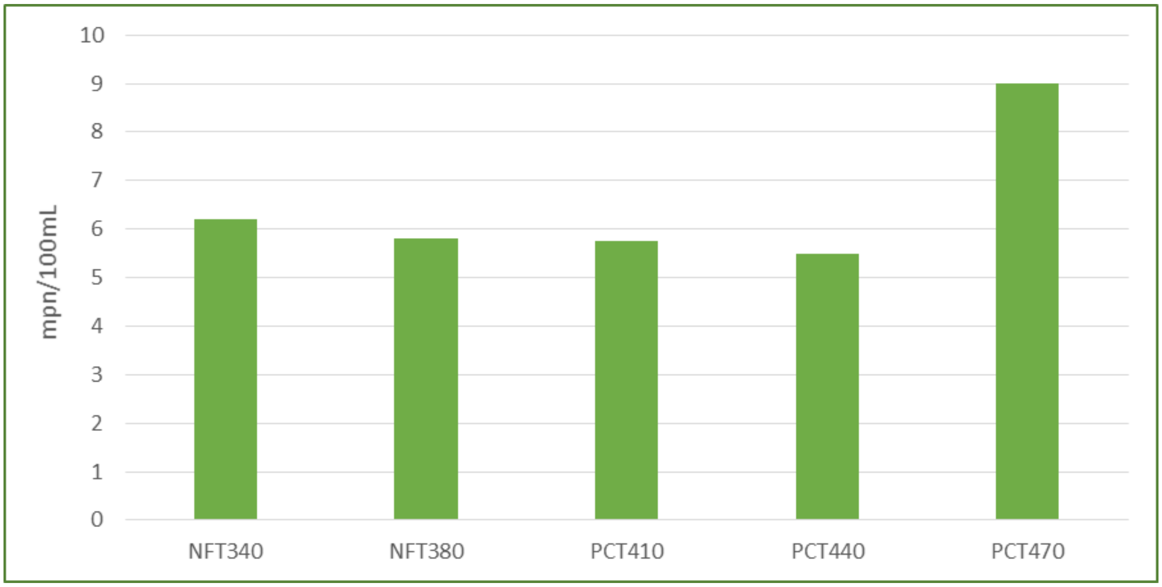
Total Suspended Solids

**Single Sample Standard for Coldwater Permanent Fish Life Propagation = ≤ 53 mg/L

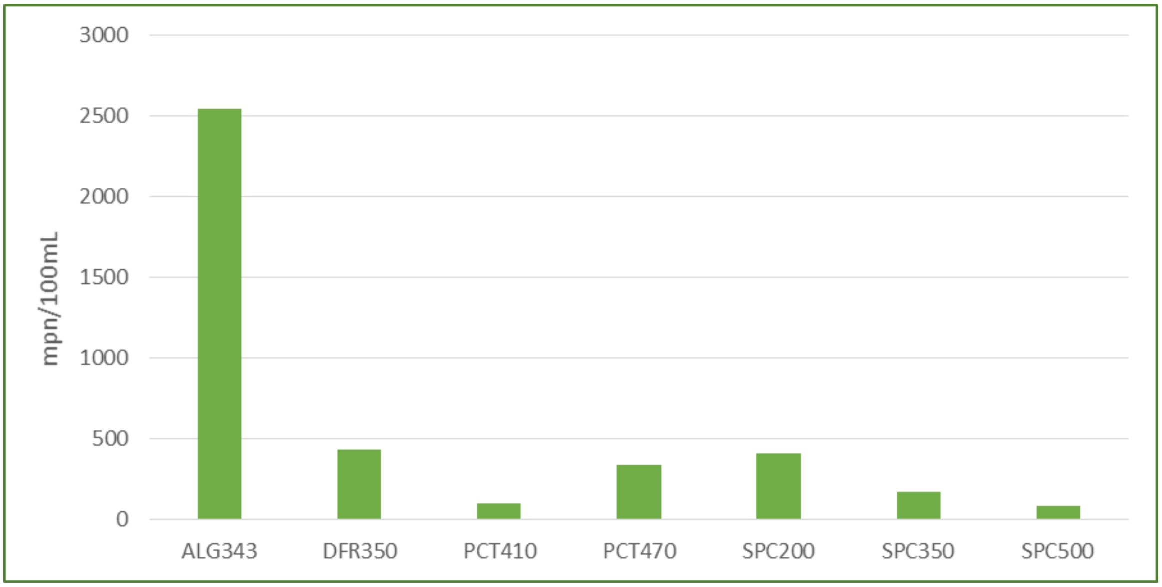
Ambient Means – Spring Creek



Ambient Means – Tributaries



Storm Event Means – All Sites

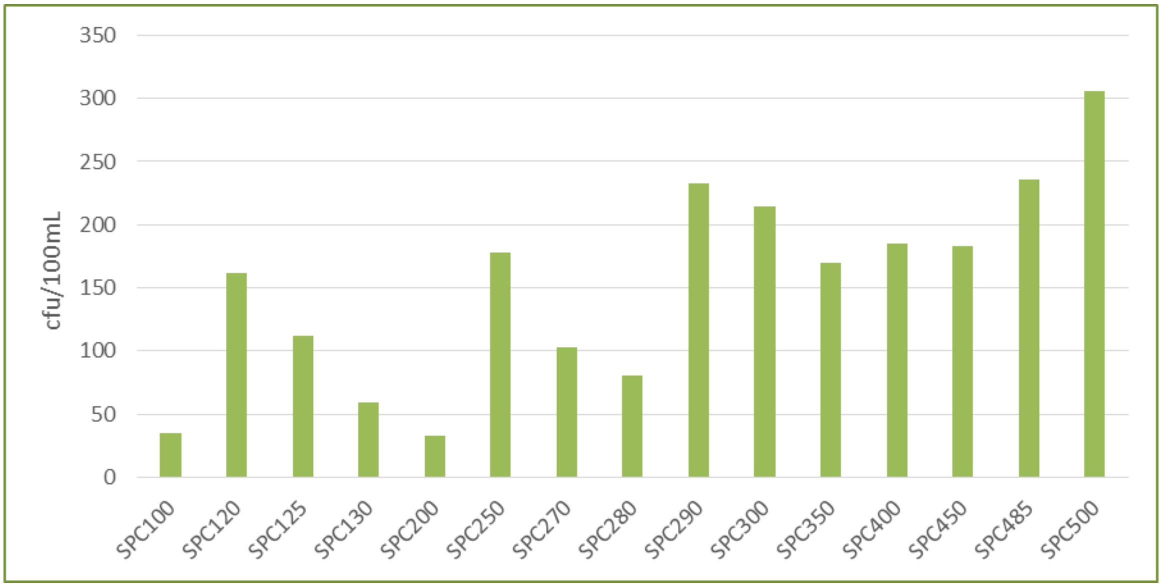


2013

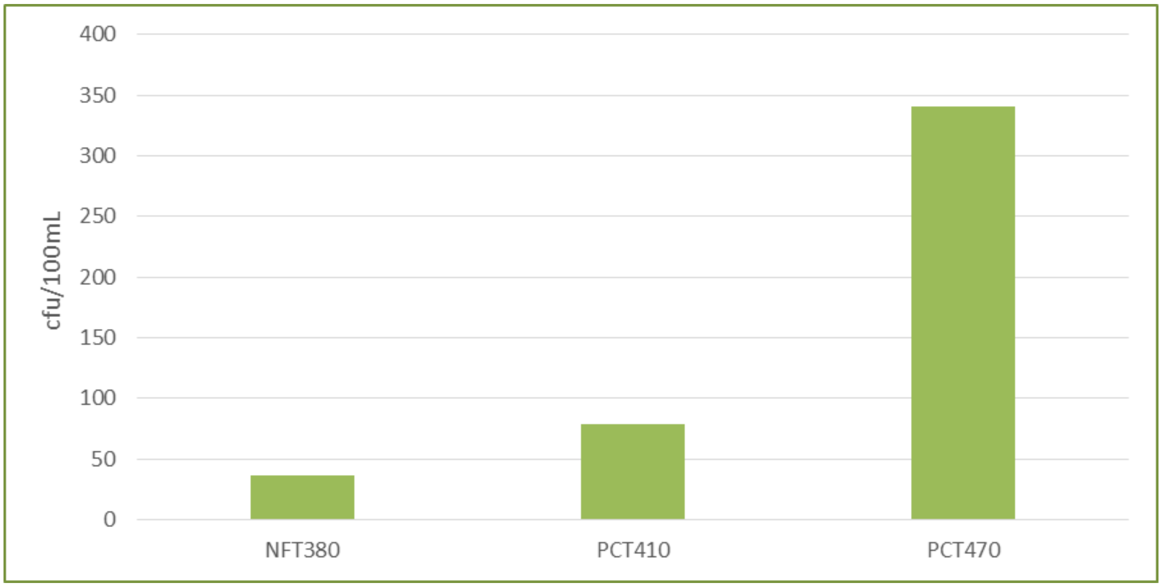
Fecal Coliform

**Single Sample Standard for Immersion Recreation (Spring Creek) = ≤ 400 cfu/100mL
**Single Sample Standard for Limited Contact Recreation (Tributaries) = ≤ 2,000 cfu/100mL

Ambient Means – Spring Creek



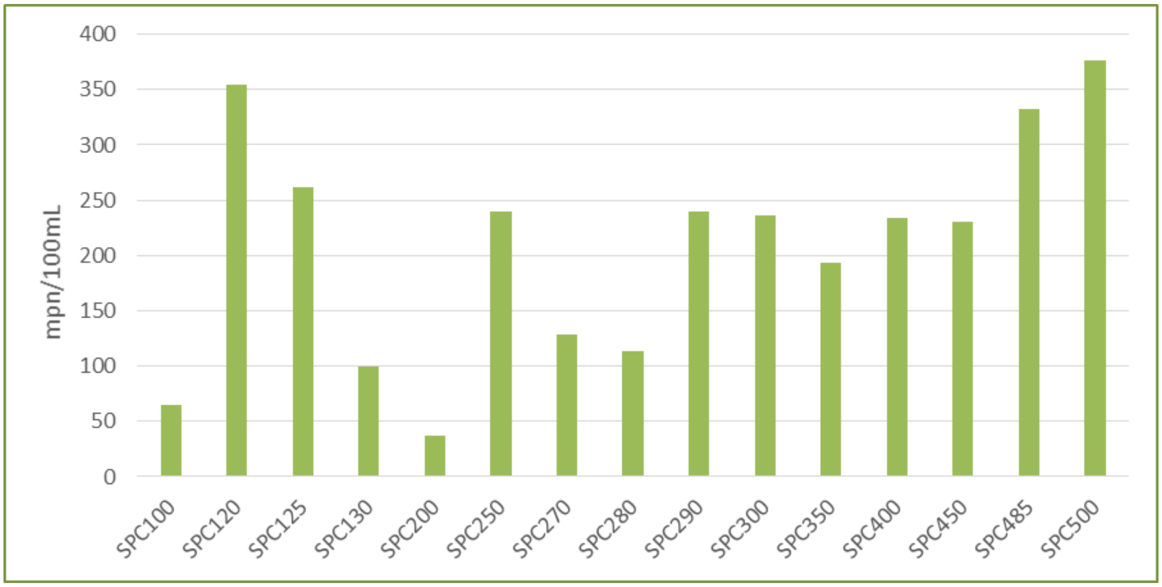
Ambient Means – Tributaries



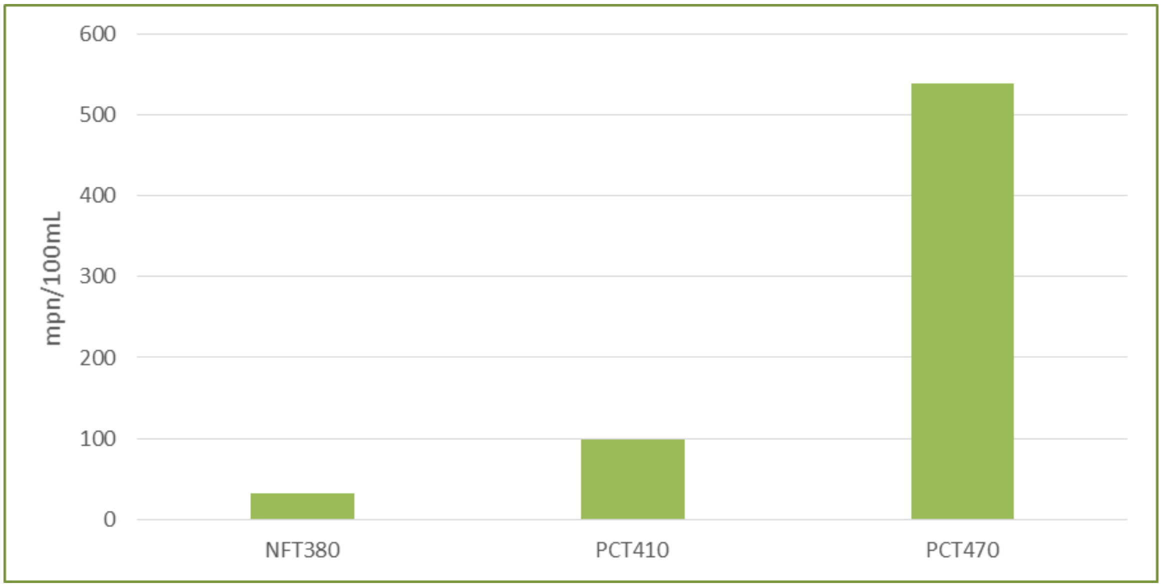
E. coli

**Single Sample Standard for Immersion Recreation (Spring Creek) = ≤ 235 cfu/100mL
**Single Sample Standard for Limited Contact Recreation (Tributaries) = ≤ 1,178 cfu/100mL

Ambient Means – Spring Creek



Ambient Means – Tributaries

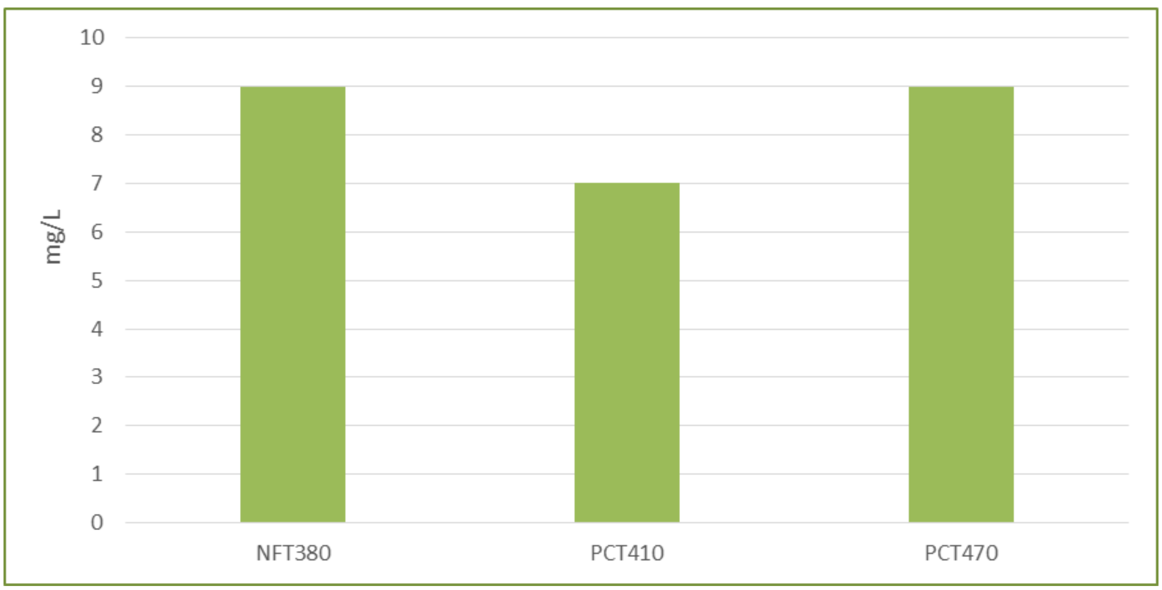


Total Suspended Solids

**Single Sample Standard for Coldwater Permanent Fish Life Propagation = ≤ 53 mg/L

Ambient Means – Spring Creek

Ambient Means – Tributaries

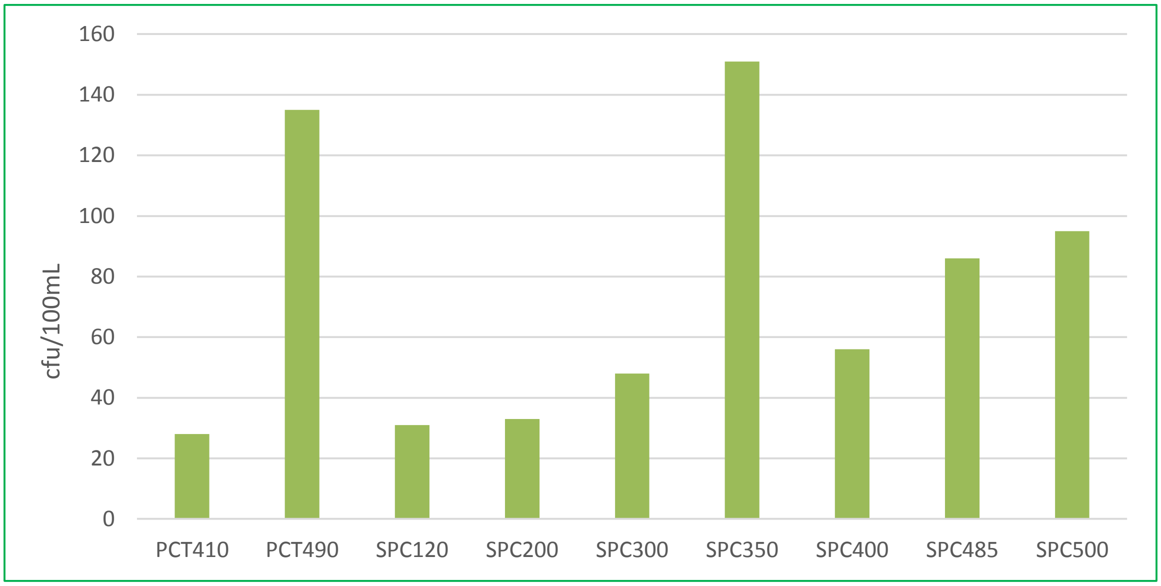


2014

Fecal Coliform

**Single Sample Standard for Immersion Recreation (Spring Creek) = ≤ 400 cfu/100mL
**Single Sample Standard for Limited Contact Recreation (Tributaries) = ≤ 2,000 cfu/100mL

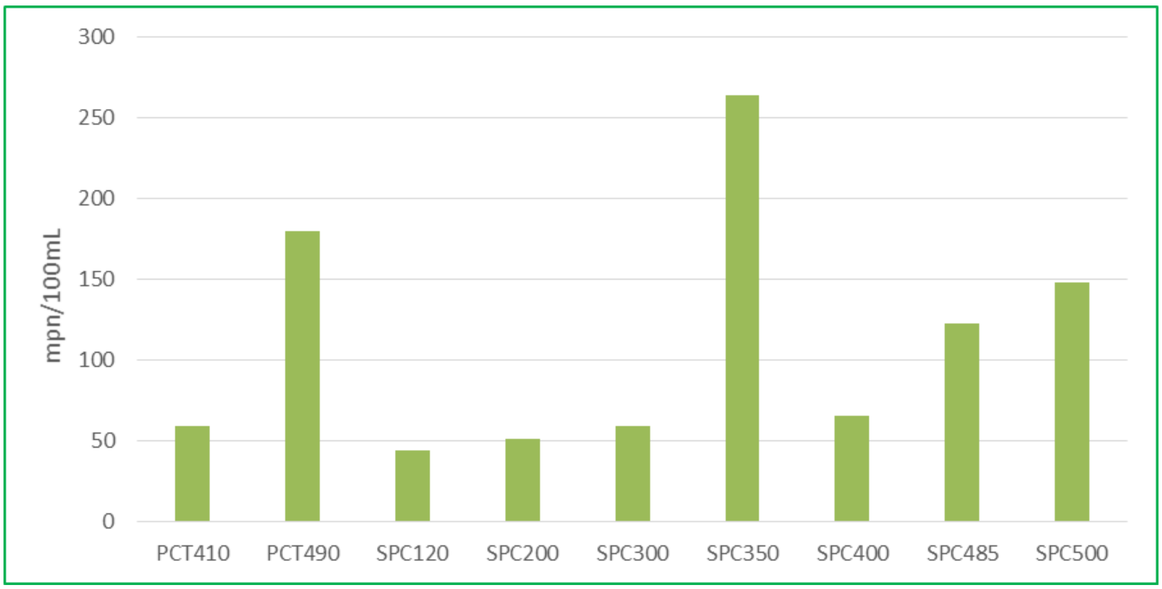
Ambient Means – All Sites



E. coli

**Single Sample Standard for Immersion Recreation (Spring Creek) = ≤ 235 cfu/100mL
**Single Sample Standard for Limited Contact Recreation (Tributaries) = ≤ 1,178 cfu/100mL

Ambient Means – All Sites



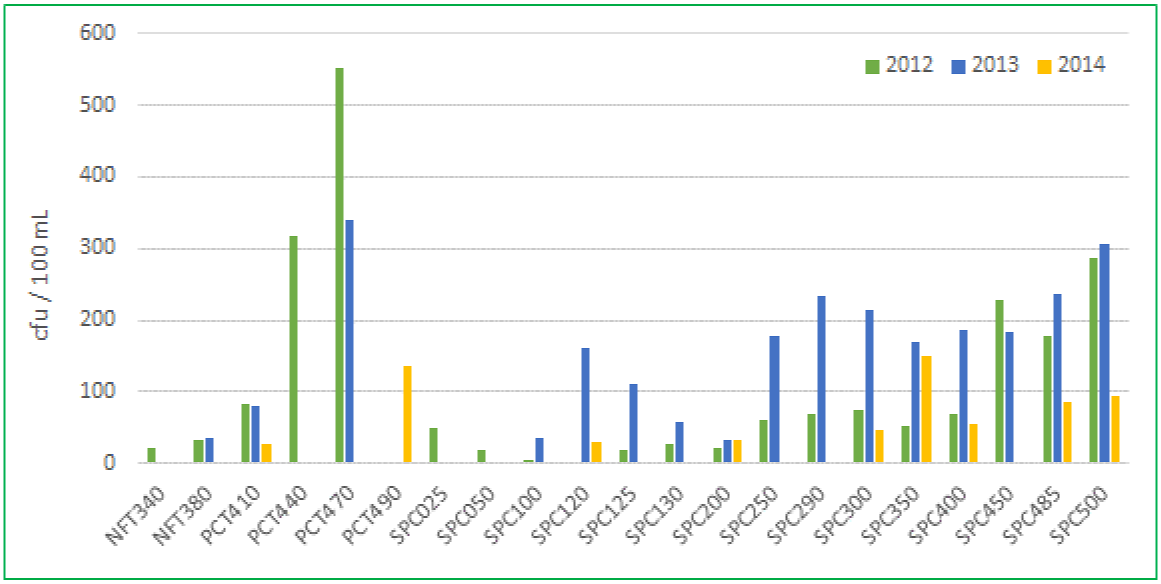
Total Suspended Solids

**Single Sample Standard for Coldwater Permanent Fish Life Propagation = ≤ 53 mg/L

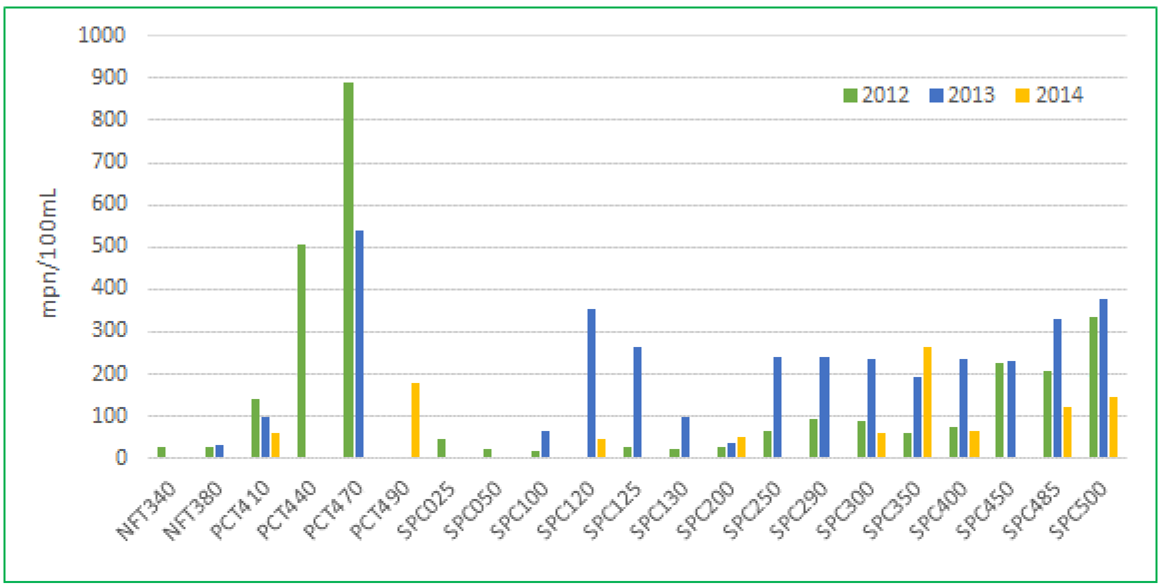
Ambient Means – All Sites

Ambient Mean Comparison by Year

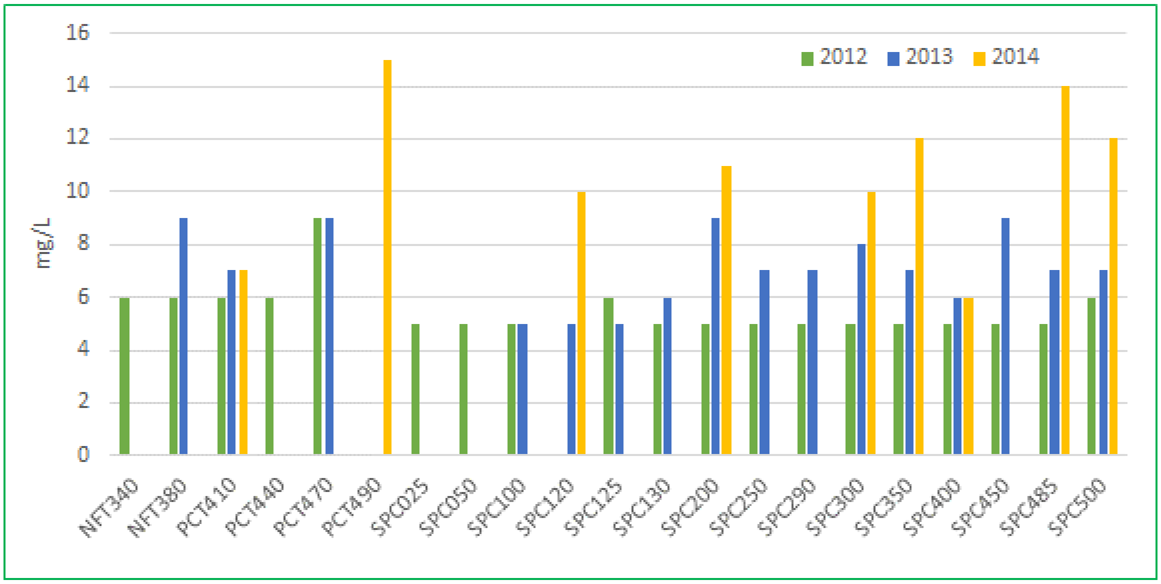
Fecal Coliform



E. coli



Total Suspended Solids



APPENDIX B

WATER QUALITY RESULTS
GEOMEAN TABLES

2013 Geomean Results

Fecal Coliform

Fecal Geomean; Standard = 200 mpn/100ml											
Sample Dates	5/8/2013 5/13/2013 5/16/2013 5/22/2013 5/30/2013 6/4/2013	5/13/2013 5/16/2013 5/22/2013 5/30/2013 6/4/2013	5/16/2013 5/22/2013 5/30/2013 6/4/2013 6/13/2013	5/22/2013 5/30/2013 6/4/2013 6/13/2013 6/17/2013 6/19/2013	5/30/2013 6/4/2013 6/13/2013 6/17/2013 6/19/2013 6/27/2013	6/4/2013 6/13/2013 6/17/2013 6/19/2013 6/27/2013 7/2/2013	6/13/2013 6/17/2013 6/19/2013 6/27/2013 7/2/2013 7/10/2013	6/17/2013 6/19/2013 6/27/2013 7/2/2013 7/10/2013	6/19/2013 6/27/2013 7/2/2013 7/10/2013 7/17/2013	6/27/2013 7/2/2013 7/10/2013 7/17/2013 7/25/2013	7/2/2013 7/10/2013 7/17/2013 7/25/2013 7/29/2013
Span (Days)	28	23	29	29	29	29	28	24	29	29	28
*NFT380	11	17	19	38	48	31	31	31	32	23	28
*PCT410	3	3	4	17	52	78	77	128	125	168	111
*PCT470	4	4	11	44	62	80	133	152	255	331	630
SPC100	3	3	3	4	7	10	19	26	45	82	109
SPC120	6	9	21	132	152	211	271	380	303	116	59
SPC125	6	7	14	61	89	105	104				
SPC130	6	7	13	37	47	78	86				
SPC200	5	6	5	16	26	38	40	40	20	18	19
SPC250	6	7	17	32	64	104	131	155	223	386	430
SPC270											
SPC280											
SPC290	130	299	290	266	253	167	133	124	93	109	189
SPC300	110	246	246	228	264	203	164	161	117	144	175
SPC350	65	156	166	165	185	118	93	83	67	76	120
SPC400	21	37	37	64	133	68	102	102	274	534	199
SPC450	42	42	50	73	81	102	140	190	211	354	322
SPC485	26	48	81	157	150	123	163	168	147	159	256
SPC500	15	19	33	67	67	59	81	79	59	69	179
Exceedances	0	2	2	2	2	2	1	1	4	3	4
% Exceedance	0%	15%	15%	15%	15%	15%	8%	9%	36%	27%	36%

Fecal Geomean, Continued; Standard = 200 mpn/100ml

Sample Dates	7/10/2013 7/17/2013 07/25/13 07/29/13 08/05/13 08/07/13	7/17/2013 7/25/2013 7/29/2013 8/5/2013 8/7/2013	7/25/2013 7/29/2013 8/5/2013 8/7/2013 8/14/2013	7/29/2013 8/5/2013 8/7/2013 08/14/13 08/20/13	8/5/2013 8/7/2013 08/14/13 08/20/13 08/29/13	8/7/2013 08/14/13 08/20/13 08/29/13 09/04/13	08/14/13 08/20/13 08/29/13 09/04/13 09/10/13	08/20/13 08/29/13 09/04/13 09/10/13 09/18/13	08/29/13 09/04/13 09/10/13 09/18/13 09/24/13	09/04/13 09/10/13 09/18/13 09/24/13 09/30/13	Exceed-ances	% Exceed-ance
Span (Days)	29	22	21	23	25	29	28	30	27	27		
*NFT380	37	42	44	54	34	25	25	15	12	11	0	0%
*PCT410	115	126	130	89	87	70	39	27	19	17	0	0%
*PCT470	750	1009	738	575	445	287	140	82	63	60	9	43%
SPC100	82	63	38	35	22	20	15	15	13	11	0	0%
SPC120	66	66	68	54	31	19	17	12	11	14	4	19%
SPC125											0	0%
SPC130											0	0%
SPC200	17	16	35	41	52	68	68	60	41	17	0	0%
SPC250	304	355	288	98	63	45	39	36	38	26	6	29%
SPC270	162	225	179	113	80	51	42	34	31	23	1	10%
SPC280	131	154	154	80	66	51	35	25	27	14	0	0%
SPC290	234	282	207	132	115	85	73	61	50	30	7	33%
SPC300	151	175	158	130	73	75	60	43	35	20	5	24%
SPC350	150	192	217	210	97	88	66	49	61	64	2	10%
SPC400	135	135	75	42	28	22	15	9	9	7	3	14%
SPC450	299	288	213	216	159	144	117	102	58	51	7	33%
SPC485	349	365	354	411	242	238	170	111	59	47	7	33%
SPC500	182	228	352	536	204	170	137	137	92	91	4	19%
Exceedances	4	6	6	4	2	1	0	0	0	0	**46**	**17%**
% Exceedance	31%	46%	46%	31%	15%	8%	0%	0%	0%	0%		

*Note that NFT380 is on Newton Fork Creek; PCT410 & PCT470 are on Palmer Creek. Neither of these water bodies are held to the referenced standards. They are displayed for comparison only and are not included in the bottom line "Exceedance" counts for Spring Creek.

Exceeds Standard - Spring Creek	Exceeds Standard - Reference Only

E. coli

E. coli Geomean; Standard = 126 mpn/100ml											
Sample Dates	5/8/2013 5/13/2013 5/16/2013 5/22/2013 5/30/2013 6/4/2013	5/13/2013 5/16/2013 5/22/2013 5/30/2013 6/4/2013	5/16/2013 5/22/2013 5/30/2013 6/4/2013 6/13/2013	5/22/2013 5/30/2013 6/4/2013 6/13/2013 6/17/2013 6/19/2013	5/30/2013 6/4/2013 6/13/2013 6/17/2013 6/19/2013 6/27/2013	6/4/2013 6/13/2013 6/17/2013 6/19/2013 6/27/2013 7/2/2013	6/13/2013 6/17/2013 6/19/2013 6/27/2013 7/2/2013 7/10/2013	6/17/2013 6/19/2013 6/27/2013 7/2/2013 7/10/2013	6/19/2013 6/27/2013 7/2/2013 7/10/2013 7/17/2013	6/27/2013 7/2/2013 7/10/2013 7/17/2013 7/25/2013	7/2/2013 7/10/2013 7/17/2013 7/25/2013 7/29/2013
Span (Days)	28	23	29	29	29	29	28	24	29	29	28
*NFT380	6	9	20	58	67	42	39	34	24	14	14
*PCT410	3	3	6	18	43	72	118	178	195	254	192
*PCT470	8	10	24	91	117	161	269	331	472	693	1258
SPC100	2	2	3	6	11	19	38	59	82	124	160
SPC120	3	4	9	72	178	295	419	523	366	202	180
SPC125	3	4	11	80	126	168	227				
SPC130	4	5	11	69	101	145	202				
SPC200	6	8	12	26	39	48	57	57	43	40	37
SPC250	7	10	22	48	106	142	177	197	326	564	509
SPC270											
SPC280											
SPC290	55	122	188	289	358	220	179	178	131	153	193
SPC300	50	110	176	299	349	230	170	163	127	147	187
SPC350	37	76	122	192	248	159	120	112	81	92	118
SPC400	10	16	39	73	167	139	246	309	539	705	443
SPC450	28	40	56	99	157	198	297	375	407	547	427
SPC485	27	45	65	115	158	155	207	255	235	235	369
SPC500	19	30	49	99	114	97	111	115	76	81	182
Exceedances	0	0	2	3	7	10	9	7	7	7	9
% Exceedance	0%	0%	15%	23%	54%	77%	69%	64%	64%	64%	82%

E. coli Geomean, Continued; Standard = 126 mpn/100ml

Sample Dates	7/10/2013 7/17/2013 07/25/13 07/29/13 08/05/13 08/07/13	7/17/2013 7/25/2013 7/29/2013 8/5/2013 8/7/2013 8/14/2013	7/25/2013 7/29/2013 8/5/2013 8/7/2013 8/14/2013 8/20/2013	7/29/2013 8/5/2013 8/7/2013 8/14/2013 8/20/2013	8/5/2013 8/7/2013 8/14/2013 8/20/2013 8/29/2013	8/7/2013 8/14/2013 8/20/2013 8/29/2013 9/4/2013	8/14/2013 8/20/2013 8/29/2013 9/4/2013 9/10/2013	8/20/2013 8/29/2013 9/4/2013 9/10/2013 9/18/2013	8/29/2013 9/4/2013 9/10/2013 9/18/2013 9/24/2013	9/4/2013 9/10/2013 9/18/2013 9/24/2013 9/30/2013	Exceed-ances	% Exceed-ance
Span (Days)	29	29	27	23	25	29	28	30	27	27		
*NFT380	21	23	24	31	24	19	19	14	14	12	0	0%
*PCT410	171	168	133	109	79	70	41	28	24	23	7	33%
*PCT470	1292	1410	823	674	304	198	109	70	61	68	12	57%
SPC100	125	82	65	57	41	35	32	23	22	20	1	5%
SPC120	179	156	108	94	64	40	26	18	17	12	9	43%
SPC125											2	29%
SPC130											2	29%
SPC200	37	43	44	43	43	55	48	35	34	23	0	0%
SPC250	375	350	199	126	89	67	54	45	44	31	9	43%
SPC270	209	217	171	140	103	72	53	42	28	18	4	40%
SPC280	193	195	140	108	79	49	40	28	27	15	3	30%
SPC290	178	168	133	106	90	85	78	53	52	33	12	57%
SPC300	183	200	156	129	96	90	77	50	41	32	13	62%
SPC350	140	142	141	119	87	82	63	63	92	90	6	29%
SPC400	220	139	64	46	38	28	20	9	8	5	9	43%
SPC450	318	219	267	208	165	165	149	132	73	61	15	71%
SPC485	353	331	518	568	310	249	198	141	82	59	15	71%
SPC500	204	237	447	516	218	215	153	156	118	151	10	48%
Exceedances	11	11	9	5	3	3	3	3	0	1	**110**	**42%**
% Exceedance	85%	85%	69%	38%	23%	23%	23%	23%	0%	8%		

*Note that NFT380 is on Newton Fork Creek; PCT410 & PCT470 are on Palmer Creek. Neither of these water bodies are held to the referenced standards. They are displayed for comparison only and are not included in the bottom line "Exceedance" counts for Spring Creek.

Exceeds Standard - Spring Creek	Exceeds Standard - Reference Only

2014 Geomean Results

Fecal Coliform

Fecal Geomean; Standard = 200 mpn/100ml								
Sample Dates	5/8/2014 5/9/2014 5/15/2014 5/22/2014 5/29/2014 6/2/2014	5/9/2014 5/15/2014 5/22/2014 5/29/2014 6/2/2014	5/15/2014 5/22/2014 5/29/2014 6/2/2014 6/9/2014	5/22/2014 5/29/2014 6/2/2014 6/9/2014 6/16/2014	5/29/2014 6/2/2014 6/9/2014 6/16/2014 6/23/2014	6/2/2014 6/9/2014 6/16/2014 6/23/2014 7/1/2014	6/9/2014 6/16/2014 6/23/2014 7/1/2014 7/8/2014	7/8/2014 7/15/2014 7/22/2014 7/29/2014 8/4/2014
Span (Days)	26	25	26	26	26	30	30	28
*PCT410	5	5	6	9	26	32	36	35
*PCT490	17	17	17	34	180	293	200	150
SPC120	7	7	7	10	32	43	36	30
SPC200	17	13	13	17	53	44	54	44
SPC300	44	57	57	62	66	48	49	20
SPC350	90	100	100	100	112	70	50	41
SPC400	46	42	42	60	90	88	87	49
SPC485	78	64	64	102	145	119	130	92
SPC500	80	63	63	96	152	137	163	91
Exceedances	0	0	0	0	2	1	0	0
% Exceedance	0%	0%	0%	0%	29%	14%	0%	0%

Fecal Geomean, Continued; Standard = 200 mpn/100ml									
Sample Dates	7/15/2014 7/22/2014 7/29/2014 8/4/2014 08/11/14	7/22/2014 7/29/2014 8/4/2014 08/11/14 8/18/2014	7/29/2014 8/4/2014 08/11/14 8/18/2014 8/25/2014	8/4/2014 08/11/14 8/18/2014 8/25/2014 08/28/14	08/11/14 8/18/2014 8/25/2014 08/28/14 09/08/14	8/18/2014 8/25/2014 08/28/14 09/08/14 09/15/14	8/25/2014 08/28/14 09/08/14 09/15/14 09/22/14	Exceed-ances	% Exceed-ance
Span (Days)	28	28	28	25	29	29	29		
*PCT410	35	31	37	25	20	22	18	0	0%
*PCT490	105	97	144	65	32	32	32	2	13%
SPC120	28	30	49	44	23	23	23	0	0%
SPC200	34	30	41	19	9	9	8	0	0%
SPC300	14	11	15	12	12	12	17	0	0%
SPC350	36	37	61	64	66	82	130	0	0%
SPC400	37	36	46	46	32	36	44	0	0%
SPC485	63	60	54	43	35	33	38	0	0%
SPC500	78	72	63	35	21	12	7	0	0%
Exceedances	0	0	0	0	0	0	0	**0**	**0%**
% Exceedance	0%	0%	0%	0%	0%	0%	0%		

*Note that PCT410 & PCT490 are on Palmer Creek. Neither of these water bodies are held to the referenced standards. They are displayed for comparison only and are not included in the bottom line "Exceedance" counts for Spring Creek.

Exceeds Standard - Spring Creek	Exceeds Standard - Reference Only

E. coli

E. coli Geomean; Standard = 126 mpn/100ml											
Sample Dates	5/8/2014 5/9/2014 5/15/2014 5/22/2014 5/29/2014 6/2/2014	5/9/2014 5/15/2014 5/22/2014 5/29/2014 6/2/2014	5/15/2014 5/22/2014 5/29/2014 6/2/2014 6/9/2014	5/22/2014 5/29/2014 6/2/2014 6/9/2014 6/16/2014	5/29/2014 6/2/2014 6/9/2014 6/16/2014 6/23/2014	6/2/2014 6/9/2014 6/16/2014 6/23/2014 7/1/2014	6/9/2014 6/16/2014 6/23/2014 7/1/2014 7/8/2014	6/16/2014 6/23/2014 7/1/2014 7/8/2014 7/15/2014	6/23/2014 7/1/2014 7/8/2014 7/15/2014 7/22/2014	7/1/2014 7/8/2014 7/15/2014 7/22/2014 7/29/2014	7/8/2014 7/15/2014 7/22/2014 7/29/2014 8/4/2014
Span (Days)	26	25	26	26	26	30	30	30	30	29	28
*PCT410	8	8	12	26	39	49	57	66	61	79	96
*PCT490	16	16	22	73	190	214	214	257	235	292	265
SPC120	5	8	9	27	53	60	55	67	55	57	55
SPC200	22	23	26	55	76	68	75	84	70	63	60
SPC300	46	53	53	75	88	74	75	80	51	39	33
SPC350	130	174	136	82	98	77	77	83	72	68	56
SPC400	63	44	47	76	105	93	91	98	77	59	42
SPC485	107	77	77	120	148	128	129	143	125	141	127
SPC500	129	87	87	145	182	160	161	181	159	154	116
Exceedances	2	1	1	1	2	2	2	2	2	2	1
% Exceedance	29%	14%	14%	14%	29%	29%	29%	29%	29%	29%	14%

E. Coli Geomean, Continued; Standard = 126 mpn/100ml

Sample Dates	7/15/2014 7/22/2014 7/29/2014 8/4/2014 08/11/14	7/22/2014 7/29/2014 8/4/2014 08/11/14 8/18/2014	7/29/2014 8/4/2014 08/11/14 8/18/2014 8/25/2014	8/4/2014 08/11/14 8/18/2014 8/25/2014 08/28/14	08/11/14 8/18/2014 8/25/2014 08/28/14 09/08/14	8/18/2014 8/25/2014 08/28/14 09/08/14 09/15/14	8/25/2014 08/28/14 09/08/14 09/15/14 09/22/14	Exceed-ances	% Exceed-ance
Span (Days)	28	28	28	25	29	29	29		
*PCT410	90	86	86	73	55	61	65	0	0%
*PCT490	171	148	186	115	71	50	48	10	56%
SPC120	43	38	52	43	23	15	13	0	0%
SPC200	44	41	38	25	14	13	12	0	0%
SPC300	25	23	32	32	20	20	22	0	0%
SPC350	48	47	80	68	59	85	125	3	17%
SPC400	33	30	38	31	21	17	17	0	0%
SPC485	102	101	101	67	38	31	29	7	39%
SPC500	112	105	121	74	47	33	29	8	44%
Exceedances	0	0	0	0	0	0	0	**18**	**14%**
% Exceedance	0%	0%	0%	0%	0%	0%	0%		

*Note that PCT410 & PCT490 are on Palmer Creek. Neither of these water bodies are held to the referenced standards. They are displayed for comparison only and are not included in the bottom line "Exceedance" counts for Spring Creek.

Exceeds Standard - Spring Creek	Exceeds Standard - Reference Only

APPENDIX C

Project Sponsors

Project Contractor

Project Partners

- City of Hill City
- USDA, Forest Service
- USDA, Natural Resources Conservation Service
- Black Hills Resource, Conservation and Development
- Pennington Conservation District
- South Dakota Game, Fish, and Parks
- US Geological Survey
- Black Hills Flyfishers (*past)
- South Dakota School of Mines and Technology (*past)
- City of Rapid City (*past)
- West Dakota Water Development District (*past)

Pennington County Planning Department
315 Saint Joseph Street, Suite 118
Rapid City, SD 57701

PENNINGTON COUNTY

"PRIDE IN THE PAST, FAITH IN THE FUTURE"

Spring Creek Watershed Management Project

Project Information

Pennington County
Planning Department

Purpose of the Spring Creek Project

The purpose of the Spring Creek Watershed Management Project is to reduce bacteria, sediment, and nutrients in the watershed by implementing best management practices (BMPs) through voluntary efforts, in order to restore beneficial uses assigned by the State of South Dakota for Spring Creek and Sheridan Lake.


Sheridan Lake

Background

Spring Creek begins as a small, perennial stream in western Pennington County. In 1998, the South Dakota Department of Environment and Natural Resources (SD DENR) listed Spring Creek as impaired due to fecal coliform bacteria and Sheridan Lake impaired because of non-point sources (i.e. stormwater, sediment, and bacteria and nutrients from livestock, pet waste and septic systems). In response to the listings, SD DENR and the South Dakota School of Mines & Technology (SDSM&T) completed a watershed assessment.

In 2010, Pennington County received a Non-point Source Grant for the Spring Creek Watershed to implement BMPs, monitor water quality, and to develop septic, stormwater, and watershed implementation plans. Pennington County formed a watershed advisory group to provide recommendations to the Board of Commissioners about the project and contracted with RESPEC Consulting to assist with project management, engineering, and water quality monitoring.

Project Area

The project area covers over 92,000 acres from the headwaters of Spring Creek downstream to Sheridan Lake Dam. The watershed is 13 miles southwest of Rapid City and includes Spring Creek, Sheridan Lake, Major Lake, and Mitchell Lake. Mining, logging, ranching, recreation, residential and tourism are activities in the watershed. Hill City is the only municipality in the watershed.

Cost Share Opportunities

Pennington County, RESPEC, and other partners assist property owners who install BMPs to reduce fecal coliform bacteria, sediment, and nutrients in the watershed. Clean Water Act (CWA) Section 319(h) and Clean Water State Revolving Fund (CWSRF) funds are available for cost share projects in the project area. Funds can be used by property owners to install BMPs for improving riparian areas, controlling stormwater runoff, improving grazing and forest lands, stabilizing streambanks, and repairing on-site wastewater treatment (or septic) systems (OWTS). If a property owner is interested in participating in the Project, please contact either of the Project Coordinators.


Example of OWTS (septic) project along Spring Creek


Example of stream bank erosion along Spring Creek

Water Quality Monitoring

In order to monitor the progress of the project and to evaluate the effectiveness of installed BMPs, water quality samples are collected from May through September. From 2010 through 2012, more than 600 water quality samples have been collected on Spring Creek and its tributaries and analyzed for bacteria, nutrients, and sediment. Monitoring is continuing into 2013.


Spring Creek above Hill City

Project Sponsor and Duration

Pennington County is the local sponsor for this project, which is in the second of six planned segments. BMP implementation will continue until 2021 as part of future segments of the Project.

For more information:
www.springcreekblackhills.com

Project Coordinators

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