



BELLE FOURCHE RIVER WATERSHED MANAGEMENT AND PROJECT IMPLEMENTATION PLAN SEGMENT 8 WATERSHED PROJECT FINAL REPORT SECTION 319 NONPOINT SOURCE POLLUTION CONTROL PROGRAM



PREPARED FOR

Belle Fourche River Watershed Partnership
1837 5th Avenue South
Belle Fourche, South Dakota 57717

OCTOBER 2019





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Project Number 3124



EXECUTIVE SUMMARY

Project Title:	Belle Fourche River Watershed Management and Project Implementation Plan Segment 8
Grant Number(s):	C9-99818517, C9-99818518
Project Start Date:	July 24, 2017
Project Completion Date:	July 25, 2019
Funding:	
Total EPA 319 Grant Budget:	\$900,000
Total Matching Funds Budget:	\$718,500
Total Nonmatching Funds Budget:	\$918,400
Total Budget:	\$2,536,900
Budget Revisions:	
July 2017	
319 Award	\$650,000
June 2018	
319 Award	\$250,000
Total Expenditures of EPA Funds:	\$839,255
Total 319 Matching Funds Accrued:	\$1,001,086
Total Nonmatching Funds Accrued:	\$256,480
Total Expenditures:	\$2,096,821

The Belle Fourche River Watershed Management and Project Implementation Plan Segment 8 was sponsored by the Belle Fourche River Watershed Partnership (BFRWP) with support from agricultural organizations, federal and state agencies, and local governments. This project continued implementing the best management practices (BMPs) that were identified in the Total Maximum Daily Load (TMDL) report for the Belle Fourche River. This project segment had the following objectives:

- / Continue implementing BMPs in the watershed to reduce total suspended solids (TSS) to 19 milligrams per liter (mg/L) below the Belle Fourche Reservoir and 11 mg/L above the Belle Fourche Reservoir
- / Continue implementing BMPs to reduce E. coli in the Belle Fourche River
- / Continue providing public education and outreach to stakeholders within the Belle Fourche River Watershed
- / Continue tracking the progress made toward reaching the goals of the TMDL to ensure that BMPs are effective and that the proper BMPs are implemented

Several activities were completed to improve irrigation efficiencies after water was delivered to irrigated fields in the Belle Fourche River Watershed. A total of 11 center-pivot sprinkler systems on 888 acres were installed to replace existing surface-irrigated fields. Eight farmers participated in an irrigation scheduling project to optimize irrigation application on an estimated 1,800 acres

Grazing/riparian areas were improved in the watershed, and 17 producers participated in 20 range/riparian improvement projects during this segment. These projects include 13 water development projects, 3 water development and riparian fencing projects, 3 cross-fencing projects, and 1 creek crossing project that impacted over 2,000 riparian acres in the watershed. In addition to 319 projects, the Natural Resources Conservation Service (NRCS) funded Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program (CSP) projects in the watershed.

Approximately 23 public education and outreach events were completed during this project segment, including public meetings, informational booths, website maintenance, radio sound bites, rainfall simulator demonstrations, and watershed tours. Outreach and education efforts reached at least 9,500 people. A soil-quality demonstration trailer was purchased by the BFRWP in 2009 to demonstrate the effects of erosion on soils and how they relate to TSS. The trailer was used at several events that were sponsored by the BFRWP. The BFRWP hosted six meetings to provide updates on project work and progress being made. The BFRWP website continues to be updated with events and project status (www.bellefourchewatershed.org). Outreach activities have helped to increase participation and support for the BFRWP and also gave the BFRWP several contacts for BMP installation. Several informative sound bites were broadcasted on local radio to increase public awareness of water quality issues and to promote project involvement.

Preliminary estimates based on BMP installation indicate that TSS was reduced by 5,558 tons per year, in this segment. The amount brings the cumulative TSS load reduction to 179,035 tons per year. In addition to TSS, the installed BMPs are estimated to reduced nitrogen by 4,559 pounds per year, and phosphorus by 2,617 pounds per year.

ACKNOWLEDGEMENTS

The BFRWP would like to thank those who were involved with this segment of implementing practices recommended by from the Belle Fourche River Watershed TMDL. The efforts of all those involved from the following organizations are greatly appreciated and have been essential to the success of this project:

- / Belle Fourche Irrigation District
- / Bureau of Land Management
- / Butte Conservation District
- / Elk Creek Conservation District
- / Lawrence County Conservation District
- / Individual ranchers, farmers, and landowners within the watershed
- / Lawrence County
- / Natural Resources Conservation Service
- / South Dakota Association of Conservation Districts
- / South Dakota Conservation Commission
- / South Dakota Department of Agriculture
- / South Dakota Department of Environment and Natural Resources
- / South Dakota Game Fish and Parks
- / South Dakota Grassland Coalition
- / South Dakota School of Mines & Technology
- / South Dakota State University
- / US Army Corp of Engineers
- / US Bureau of Reclamation
- / US Environmental Protection Agency
- / US Fish and Wildlife Service
- / US Geological Survey
- / Wyoming Department of Environmental Quality .

TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 PROJECT GOALS AND OBJECTIVES.....	5
2.1 PLANNED AND ACTUAL MILESTONES, PRODUCTS, AND COMPLETION DATES.....	5
2.2 EVALUATION OF GOAL ATTAINMENT	6
3.0 BEST MANAGEMENT PRACTICES.....	7
3.1 REDUCING NONUSED IRRIGATION WATER AND IMPROVING EFFICIENCY	10
3.1.1 On-Farm Irrigation Improvements	10
3.1.2 Irrigation Scheduling	10
3.2 RANGE RIPARIAN IMPROVEMENTS	12
3.3 IMPROVED CROPPING PRACTICES.....	12
4.0 SUMMARY OF PUBLIC PARTICIPATION AND OUTREACH	14
5.0 MONITORING RESULTS.....	16
5.1 IMPAIRED WATERBODIES AND APPROVED TOTAL MAXIMUM DAILY LOADS	16
5.2 BELLE FOURCHE RIVER WATERSHED RAPID GEOMORPHIC ASSESSMENT	16
5.3 WATER QUALITY Sampling	18
5.3.1 Belle Fourche River Water Quality Data	19
5.3.2 Horse Creek and Indian Creek Water Quality Data	19
6.0 RESULTS AND CONCLUSIONS.....	41
7.0 PROJECT BUDGET/EXPENDITURES	42
7.1 319 BUDGET	42
7.2 MATCHING FUNDS BUDGET	42
7.3 NONMATCHING FEDERAL FUNDS BUDGET	42
8.0 FUTURE ACTIVITY RECOMMENDATIONS.....	42
9.0 REFERENCES.....	42

LIST OF TABLES

TABLE	PAGE
Table 1-1. Summary for Impaired Streams within the Watershed included in the South Dakota 2018 Integrated Report.....	3
Table 2-1. Planned Versus Actual Milestones and Completion Dates	6
Table 2-2. Pollutant Reduction Achieved by Each Best Management Practice Implemented	7
Table 3-1. Best Management Practices Implemented.....	7
Table 3-2. Best Management Practices Implemented with 319 Funding and Local Match	10
Table 4-1. Summary of Public Outreach and Education During Segment 8	14
Table 5-1. <i>E. coli</i> and TSS Sample Results for WQM130, WQM83, WQM81, WQM80, and WQM76 during Segment 8	21
Table 5-2. <i>E. coli</i> and TSS Sample Results for HCR02, HCR04, and ICR03 during Segment 8.....	22
Table 7-1a. Planned Budget of 319 Funds	43
Table 7-2a. Planned EPA 319 and Matching Funds Budget	45
Table 7-3a. Planned Nonmatching Funds Budget	47
Table 7-4a. Planned Total Budget	49
Table 7-4b. Actual Total Budget	50

LIST OF FIGURES

FIGURE	PAGE
Figure 1-1. Location of the Belle Fourche River Watershed within South Dakota.....	2
Figure 1-2. Impaired Stream Reaches on the Belle Fourche River and Horse Creek in South Dakota.	4
Figure 3-1. General Location of Completed Best Management Practices by Project Segment within the Watershed.	8
Figure 3-2. General Location of Completed Irrigation and Riparian/Range Best Management Practices in the Watershed	9
Figure 3-3. Flood-Irrigated Field Demonstrating Inefficient Water Use That Leads to Sediment Runoff.	11
Figure 3-4. Center-Pivot Irrigation System Installed in the Belle Fourche River Watershed.....	11
Figure 3-5. Cross Fence Installed to Improved Grazing Management within the Belle Fourche River Watershed.....	12
Figure 3-6. Livestock Watering Facility Installed in the Uplands to Replace Watering on the Belle Fourche River.....	13
Figure 3-7. Buried Pipeline Installed to Supply Livestock Watering Facilities within the Belle Fourche River Watershed	13
Figure 4-1. Elk Creek Conservation District Range and Soil Health Tour in the Belle Fourche River Watershed.....	15
Figure 4-2. Belle Fourche River Watershed Partnership Soil Health and Rainfall Simulator Demonstration.....	15
Figure 5-1. Bank Cover, Boulder/Cobble Substrate, and Bank Protection on the River Above the Fruitdale Road Bridge.	16
Figure 5-2. Eroded Banks, Silt Substrate, and Channel Widening on the River Above the US Highway 212 Bridge.	17
Figure 5-3. Eroded Banks, Silt Substrate, and Downcut Channel on Horse Creek Above the Eichler Road Bridge.....	17
Figure 5-4. Eroded Banks, Channel Deposition and Widening on the Belle Fourche River Below the Elm Springs Road Bridge.	18

Figure 5-5. Water Quality Monitoring Sites located on the Belle Fourche River, Horse Creek, and Indian Creek Sampled During the BFRWP's Segment 8 Project.	20
Figure 5-6. <i>E. coli</i> Water Quality Sampling Results at Site WQM130 (460130) on the Belle Fourche River from May–September during 2017, 2018, and 2019.	23
Figure 5-7. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM130 (460130) on the Belle Fourche River from May–September during 2017, 2018, and 2019.	24
Figure 5-8. <i>E. coli</i> Sampling Results at Monitoring Site WQM83 (460683) on the Belle Fourche River from May–September during 2017, 2018, and 2019.	25
Figure 5-9. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM83 (460683) on the Belle Fourche River from May–September during 2017, 2018, and 2019.	26
Figure 5-10. <i>E. coli</i> Sampling Results at Monitoring Site WQM81 (460681) on the Belle Fourche River from May–September during 2017, 2018, and 2019.	27
Figure 5-11. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM81 (460681) on the Belle Fourche River from May–September during 2017, 2018, and 2019.	28
Figure 5-12. <i>E. coli</i> Sampling Results at Monitoring Site BF6 on the Belle Fourche River from May–September during 2017, 2018, and 2019.	29
Figure 5-13. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site BF6 on the Belle Fourche River from May–September during 2017, 2018, and 2019.	30
Figure 5-14. <i>E. coli</i> Sampling Results at Monitoring Site WQM21 (460880) on the Belle Fourche River from May–September during 2017, 2018, and 2019.	31
Figure 5-15. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM21 (460880) on the Belle Fourche River from May–September during 2017, 2018, and 2019.	32
Figure 5-16. <i>E. coli</i> Sampling Results at Monitoring Site WQM76 (460676) on the Belle Fourche River from May–September during 2017, 2018, and 2019.	33
Figure 5-17. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM76 (460676) on the Belle Fourche River from May–September during 2017, 2018, and 2019.	34
Figure 5-18. <i>E. coli</i> Sampling Results at Monitoring Site ICR03 on Indian Creek from May–September during 2017, 2018, and 2019.	35
Figure 5-19. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site ICR03 on Indian Creek from May–September during 2017, 2018, and 2019.	36
Figure 5-20. <i>E. coli</i> Sampling Results at Monitoring Site HCR04 on Horse Creek from May–September during 2017, 2018, and 2019.	37
Figure 5-21. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site HCR04 on Horse Creek from May–September during 2017, 2018, and 2019.	38
Figure 5-22. <i>E. coli</i> Sampling Results at Monitoring Site HCR02 on Horse Creek from May–September during 2017, 2018, and 2019.	39
Figure 5-23. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site HCR02 on Horse Creek from May–September during 2017, 2018, and 2019.	40

1.0 INTRODUCTION

The Belle Fourche River in South Dakota flows east from west of Belle Fourche at the Wyoming-South Dakota state line and drains portions of Butte, Lawrence, and Meade Counties in South Dakota. The river begins southwest of Wright, Wyoming and flows northeast into Keyhole Reservoir, and continues to flow northeast to west of Colony, Wyoming where the river turns and flows southeast into South Dakota. The Belle Fourche River flows southeast to near Hereford and then flows east into the Cheyenne River in southern Meade County. For the purposes of this report, the Belle Fourche River Watershed only includes the drainage areas that are located within the state of South Dakota.

The Belle Fourche River Watershed encompasses approximately 2,089,200 acres (3,264 square miles) in South Dakota as shown in Figure 1-1. The watershed encompasses portions of two 8-digit Hydrologic Units (HUC): Lower Belle Fourche (10120202) and Redwater (10120203). Communities in the watershed include Belle Fourche, Deadwood, Fruitdale, Lead, Newell, Nisland, Spearfish, Sturgis, and Vale. The city of Spearfish with a population of 10,718 is the largest municipality in the watershed.

Land is used primarily for livestock grazing and crop production with logging, mining, recreation, and tourism uses occurring within the watershed. Grasslands cover more than 68 percent (1,442,400 acres) of the watershed with forestland occurring on 15.1 percent (316,500 acres). Hay/pasture lands cover 9.9 percent (208,600 acres) while cropland covers more than 3.3 percent (69,800 acres) in the watershed. Also, there is more than 78,000 acres of irrigated lands throughout the entire watershed including approximately 57,000 acres of irrigated cropland within the Belle Fourche Irrigation District (BFID). Commercial, industrial, and residential areas including roads cover more than 41,000 acres (2.0 percent) in the watershed. Approximately 83 percent of the watershed is private with 14 percent managed by federal agencies, and 2.5 percent owned by South Dakota.

The Belle Fourche River from the Wyoming-South Dakota state line to the Cheyenne River is identified as impaired in South Dakota's 2018 Integrated Report (2018 IR) because of elevated total suspended solids (TSS) and *Escherichia coli* (*E. coli*) concentrations. In the 2018 IR, Horse Creek, Deadwood Creek, and Whitewood Creek were listed for TSS and *E. coli*. Table 1-1 is a summary of the 2018 IR's TMDLs in the watershed. The table also lists the stream reach, impaired beneficial use, impairment parameter, and water-quality criteria. The impaired segments within the watershed are shown on Figure 1-2.

In 2001, the BFRWP completed a watershed assessment project that led to the approval of six TMDLs for the Belle Fourche River and Horse Creek. Also, a 10-year plan was developed to implement the TMDL recommendations by installing irrigation, riparian, and grazing BMPs in the watershed. In 2004, the BFRWP obtained a Clean Water Act Section 319 Grant to begin implementing recommended BMPs. Currently, the BFRWP is in its 15th year of implementing BMPs in the watershed and has been funded into 2021 with the Segment 9 Project. Funding and support for the project is provided by local ranchers and farmers, the BFRWP, BFID, Butte, Lawrence, and Meade Counties, SD DENR, Wyoming Department of Environmental Quality (WDEQ), South Dakota State University (SDSU), and the South Dakota School of Mines & Technology (SDSM&T), Natural Resources Conservation Service (NRCS), US Bureau of Reclamation (USBR), US Fish and Wildlife Service (USFWS), US Geological Survey (USGS), and the US Environmental Protection Agency's (EPA) Clean Water Act Section 319 Grant.

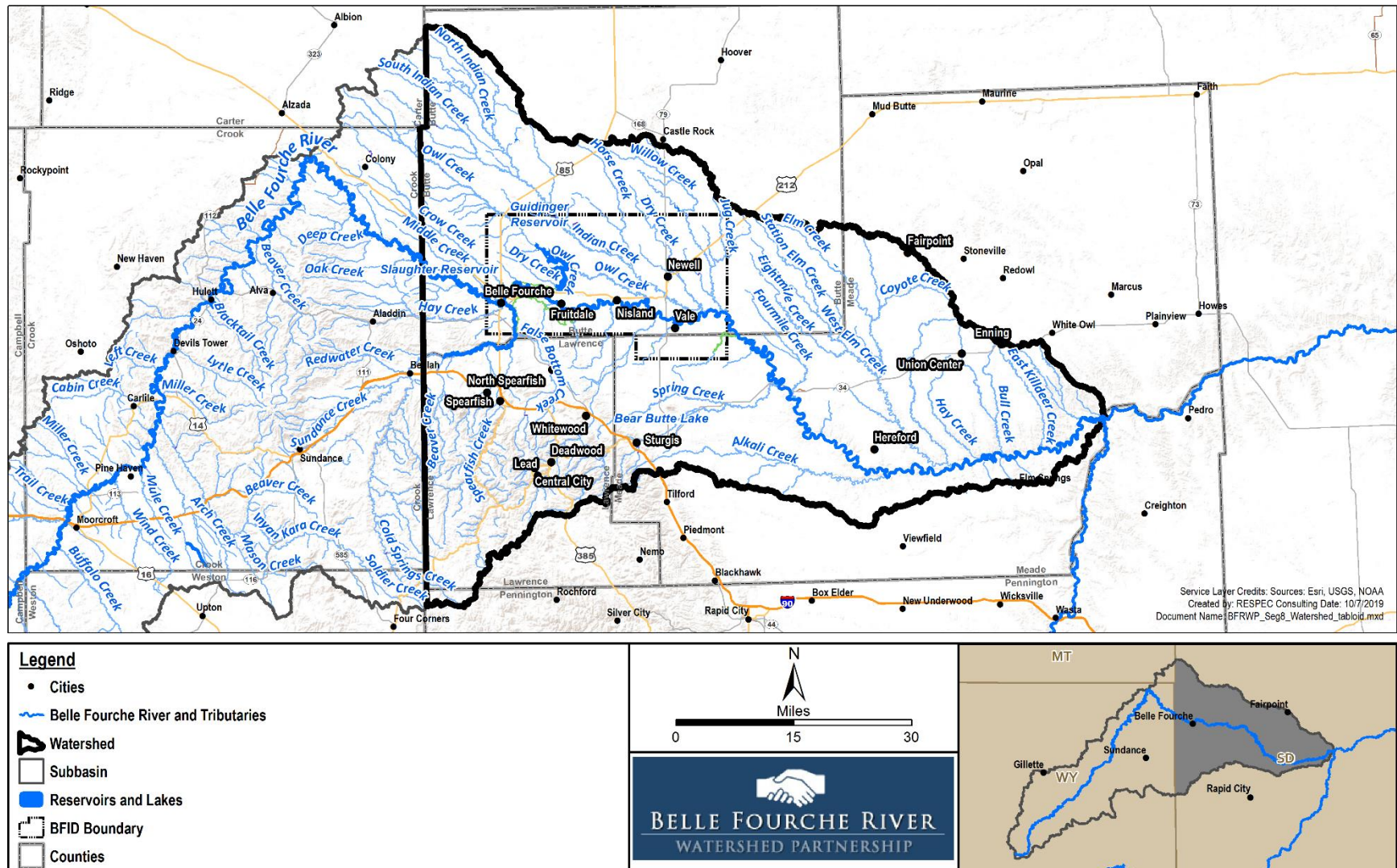


Figure 1-1. Location of the Belle Fourche River Watershed within South Dakota.

Table 1-1. Summary for Impaired Streams within the Belle Fourche River Watershed included in the South Dakota 2018 Integrated Report

Stream	Segment Descriptions (Assessment Unit Identifier – AUID)	Beneficial Use	Impairment Parameter	Water Quality Criteria
Belle Fourche River	Wyoming Border to Redwater River (SD-BF-R-BELLE_FOURCHE_01)	Immersion Recreation	<i>E. coli</i>	126 ^(a) /235 ^(b)
		Limited Contact Recreation	<i>E. coli</i>	630 ^(a) /1,178 ^(b)
		Warm-Water Permanent Fish Life	TSS (mg/L)	90 ^(a) /158 ^(b)
Belle Fourche River	Redwater River to Whitewood Creek (SD-BF-R-BELLE_FOURCHE_02)	Warm-Water Permanent Fish Life	TSS (mg/L)	90 ^(a) /158 ^(b)
Belle Fourche River	Whitewood Creek to Willow Creek (SD-BF-R-BELLE_FOURCHE_03)	Warm-Water Permanent Fish Life	TSS (mg/L)	90 ^(a) /158 ^(b)
		Immersion Recreation	<i>E. coli</i>	126 ^(a) /235 ^(b)
Belle Fourche River	Willow Creek to Alkali Creek (SD-BF-R-BELLE_FOURCHE_04)	Warm-Water Permanent Fish Life	TSS (mg/L)	90 ^(a) /158 ^(b)
Belle Fourche River	Alkali Creek to Mouth (SD-BF-R-BELLE_FOURCHE_05)	Immersion Recreation	<i>E. coli</i>	126 ^(a) /235 ^(b)
		Limited Contact Recreation	<i>E. coli</i>	630 ^(a) /1,178 ^(b)
		Warm-Water Permanent Fish Life	TSS (mg/L)	90 ^(a) /158 ^(b)
Horse Creek	Indian Creek to Mouth (SD-BF-R-HORSE_01_USGS)	Limited Contact Recreation	<i>E. coli</i>	630 ^(a) /1,178 ^(b)
		Warm-Water Permanent Fish Life	TSS (mg/L)	90 ^(a) /158 ^(b)
Deadwood Creek	Rutabaga Gulch to Whitewood Creek (SD-BF-R-DEADWOOD_01)	Immersion Recreation	<i>E. coli</i>	126 ^(a) /235 ^(b)
Strawberry Creek	Bear Butte Creek to S5, T4N, R4E (SD-BF-R-STRAWBERRY_01)	Coldwater Marginal Fish Life Fish/Wildlife Prop, Rec, Stock	Dissolved Cadmium (mg/L)	Equal to or less than the result from Equation 9 in Appendix A of Surface Water Quality Standards
Whitewood Creek	Gold Run Creek to Deadwood Creek (SD-BF-R-WHITEWOOD_02)	Immersion Recreation	<i>E. coli</i>	126 ^(a) /235 ^(b)
Whitewood Creek	Deadwood Creek to Spruce Gulch (SD-BF-R-WHITEWOOD_03)	Immersion Recreation	<i>E. coli</i>	126 ^(a) /235 ^(b)
Whitewood Creek	Spruce Gulch to Sandy Creek (SD-BF-R-WHITEWOOD_04)	Immersion Recreation	<i>E. coli</i>	126 ^(a) /235 ^(b)
Whitewood Creek	Sandy Creek to I-90 (SD-BF-R-WHITEWOOD_05)	Cold-Water Marginal Fish Life	pH	6.5–8.8
Whitewood Creek	I-90 to Crow Creek (SD-BF-R-WHITEWOOD_06)	Warm-Water Permanent Fish Life	pH	6.5–9.0
		Limited Contact Recreation	<i>E. coli</i>	630 ^(a) /1,178 ^(b)
Whitewood Creek	Crow Creek to Mouth (SD-BF-R-WHITEWOOD_07)	Limited Contact Recreation	<i>E. coli</i>	630 ^(a) /1,178 ^(b)
		Warm-Water Permanent Fish Life	TSS (mg/L)	90 ^(a) /158 ^(b)

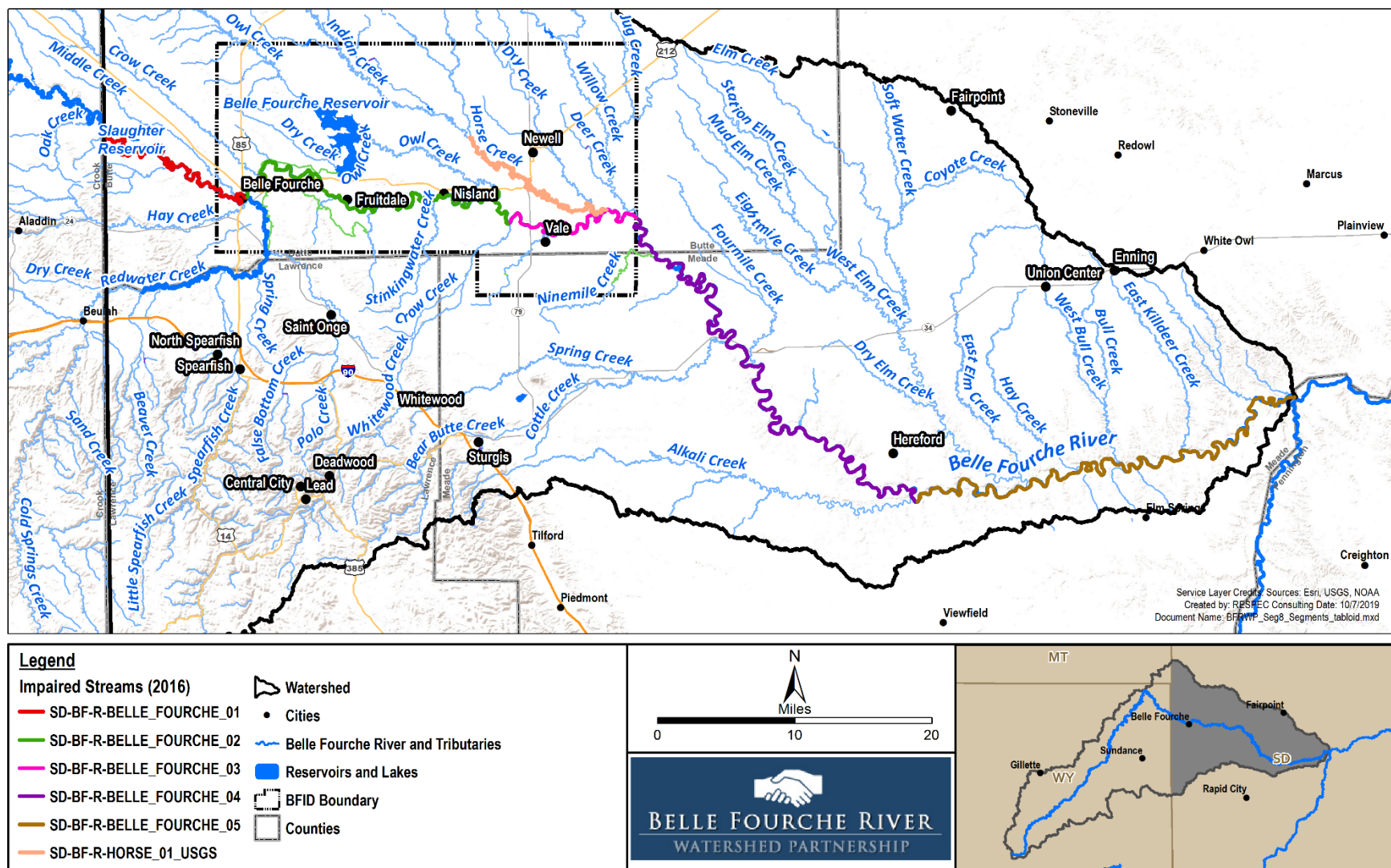


Figure 1-2. Impaired Stream Reaches on the Belle Fourche River and Horse Creek in South Dakota.

2.0 PROJECT GOALS AND OBJECTIVES

The original project goal was to bring the Belle Fourche River into compliance for TSS and *E. coli* by implementing the recommended BMPs by 2014. This project has exceeded that timeframe; however, progress has been made on impaired waterbodies, and further implementation will be prioritized on the Belle Fourche River and Horse Creek where measurable water quality improvements are likely to be attained. In this project segment, the TSS concentration reduction goal is 30 mg/L. To accomplish this goal, this project segment had the following three objectives:

1. Implement BMPs Recommended to Reduce TSS
2. Conduct Public Outreach and Education, Implementation Record Keeping, Cultural Resources, Engineering, Audits, Report Writing, and Future Grants Writing
3. Complete Essential Water Quality Monitoring and TMDL Development.

Progress toward reaching the goals of the TMDL will continue to be tracked to ensure that the BMPs are effective and that the proper BMPs are being implemented.

2.1 PLANNED AND ACTUAL MILESTONES, PRODUCTS, AND COMPLETION DATES

Objective 1. Implement BMPs Recommended to Reduce TSS. This objective consisted of two tasks: (1) improving irrigation management and (2) implementing riparian improvements and improved cropping systems, which are discussed further in Chapter 3.0. The products included: 11 sprinkler systems on 888 acres; 8 producers scheduling irrigation on 1,800 acres; 5,300 feet of laterals replaced with pipelines by the BFID; 6,780 feet of on-farm earthen ditches replaced with pipelines; improvements on 2,000 riparian acres and 22,000 rangeland acres; and cover crops planted on over 100 acres.

Objective 2. Conduct Public Outreach and Education, Implementation Record Keeping, Cultural Resources, Engineering, Audits, Report Writing, and Future Grants Writing. Approximately 25 outreach activities were conducted and involved approximately 10,000 participants. Also, there were six public meetings, one website, two watershed tours, two workshops, five public information booths, and eight soil-quality demonstrations conducted during the segment. Additionally, two Grant Tracking and Reporting System (GRTS) reports and this final report were written. These activities are further discussed in Chapter 4.0 of this report.

Objective 3. Complete Essential Water Quality Monitoring and TMDL Development. Water quality samples were collected by the USGS at gaging stations, by the SD DENR at WQM stations, and by the BFRWP at six sites within the watershed. Water quality data is discussed in Chapter 5.0 of this report.

Table 2-1 lists the project objectives along with their products, planned milestone completion dates, and actual milestone completion dates. All BMPs were completed by the July 2019 deadline.

Table 2-1. Planned Versus Actual Milestones and Completion Dates

Objectives and Products	Planned Milestone	Actual Milestone	Planned Completion	Actual Completion
Objective 1. Implement Recommended BMPs to Reduce TSS and <i>E. coli</i>				
Product 1. Improve Irrigation Delivery/Application				
1a. Replace BFID Open Laterals with Pipe	8,000 feet	5,300 feet	July 2019	July 2019
1b. Convert Flood Irrigation to Sprinklers	880 acres (11 pivots)	888 acres (11 pivots)	July 2019	July 2019
1c. Replace Open On-Farm Ditches to Pipe	8,000 feet	6,780 feet	July 2019	July 2019
1d. Irrigation Scheduling	1,000 acres	1,800 acres	July 2019	July 2019
Product 2. Implement Riparian and Range BMPs	3,000 riparian acres 25,000 range acres	2,000 riparian acres 22,000 range acres	July 2019	July 2019
Product 3. Implement Cover Crops	200 acres	100 acres	July 2019	July 2019
Objective 2. Conduct Public Outreach, Record Keeping, Cultural Resources, Report Writing, and Annual Audits				
Product 4. Public Outreach, Record Keeping, Cultural Resources, Audits, Report Writing	6 meetings, 1 website, 2 tours, 2 workshops, 5 booths, and 8 soil health demos	6 meetings, 1 website, 2 tours, 2 workshops, 5 booths, and 8 soil health demos	July 2019	July 2019
Objective 3. Complete Water Quality Monitoring				
Product 5. Water Quality Monitoring - Collect samples and measure flow	5 USGS gage stations 5 WQM stations 2 Horse Creek sites 1 Indian Creek site	5 USGS gage stations 5 WQM stations 2 Horse Creek sites 1 Indian Creek site	July 2019	July 2019

2.2 EVALUATION OF GOAL ATTAINMENT

Project success was evaluated by comparing project outcomes with the planned milestones. Sediment reduction goals were met for this segment, and BMP accomplishments were close to the goals outlined in the project implementation plan. Some goals were not completely met, and others were higher than expected, which resulted in sediment reductions higher than expected. Further explanations of these changes are shown in Section 3.1 of this report. The following milestones were obtained:

- / Implemented several recommended BMPs from the approved TMDLs
- / Completed approximately 25 educational and outreach activities, which led to more project participation, completion of annual GRTS reports and this final report, and two federal audits.

This project successfully implemented BMPs to reduce sediment. BMPs were implemented and are estimated to reduce TSS in the Belle Fourche River by approximately 5,558 tons per year. Table 2-2 shows pollutant reductions that were achieved by each implemented BMP. Sediment reductions reported in tons per year and nitrogen and phosphorous in pounds per year were derived from combining Spreadsheet Tool for Pollutant Load (STEPL) and available reference (book) values.

Table 2-2. Pollutant Reduction Achieved by Each Best Management Practice Implemented

Best Management Practice	Treated Acres	StepL/Book Value Sediment Reductions (tons/year)	StepL/Book Value Nitrogen Reductions (lbs/yr)	StepL/Book Value Phosphorous Reductions (lbs/yr)
Sprinkler Irrigation Systems	888	4,174	2,202	1,883
Irrigation Scheduling	1,800	252	104	90
Managed Grazing	24,000	912	1,440	360
Improved Cropping	100	220	812	300
Totals	26,788	5,558	4,559	2,617

3.0 BEST MANAGEMENT PRACTICES

Installing the recommended BMPs in the Belle Fourche River TMDL continued during this project segment and included funding from local ranchers and farmers, the BFID, USFWS, and NRCS along with the EPA's 319 program. The following BMPs were installed:

- / Eleven (11) irrigation sprinkler systems to replace flood irrigation on 888 acres
- / Seven (7) producers completed irrigation scheduling on approximately 1,800 acres
- / BFID converted 5,300 feet open, earthen laterals to underground pipelines
- / Eight (8) producers converted 6,780 feet on-farm earthen ditches to underground pipelines
- / Thirteen (13) water development projects, three water development and riparian fencing projects, three pasture cross-fencing projects, and a creek crossing were installed
- / Seventeen (17) producers improved 2,000 riparian acres and 22,000 rangeland acres
- / Improved cropping systems on over 100 acres of cropland.

Table 3-1 provides a status of the BMP implementation planned and implemented to date. The general locations of all BMPs implemented to date by project segment are shown in Figure 3-1. Figure 3-2 shows the irrigation and riparian/range BMPs implemented to date in the watershed. Table 3-2 lists the BMP installed and the 319 funding, local match, and total funds expended during Segment 8.

Table 3-1. Best Management Practices Implemented

Best Management Practice	Planned This Segment	Installed This Segment	Installed to Date
Sprinkler Irrigation Systems	11 on 880 acres	11 on 888 acres	133
Irrigation Scheduling	20 producers on 1,000 acres	7 producers on 1,800 acres	N/A
Managed Riparian Grazing	3,000 acres	2,000 acres	5,000
Managed Upland Grazing	25,000 acres	22,000 acres	53,400
Improved Cropping Practices	200 acres	100 acres	400
Complete Essential Water Quality	13 sites	13 sites	N/A
Information and Education Events	20	23	N/A

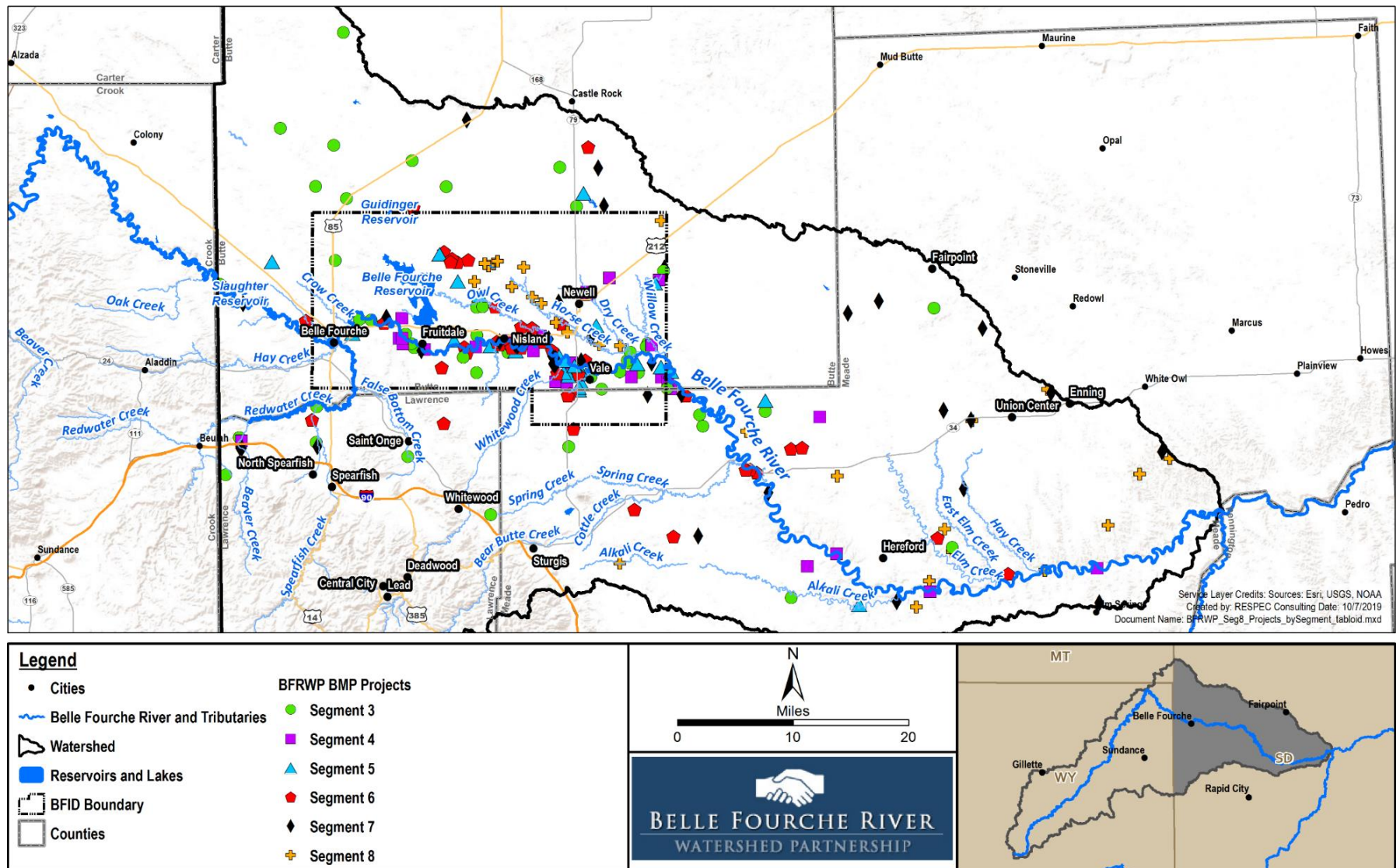


Figure 3-1. General Location of Completed Best Management Practices by Project Segment within the Belle Fourche River Watershed.

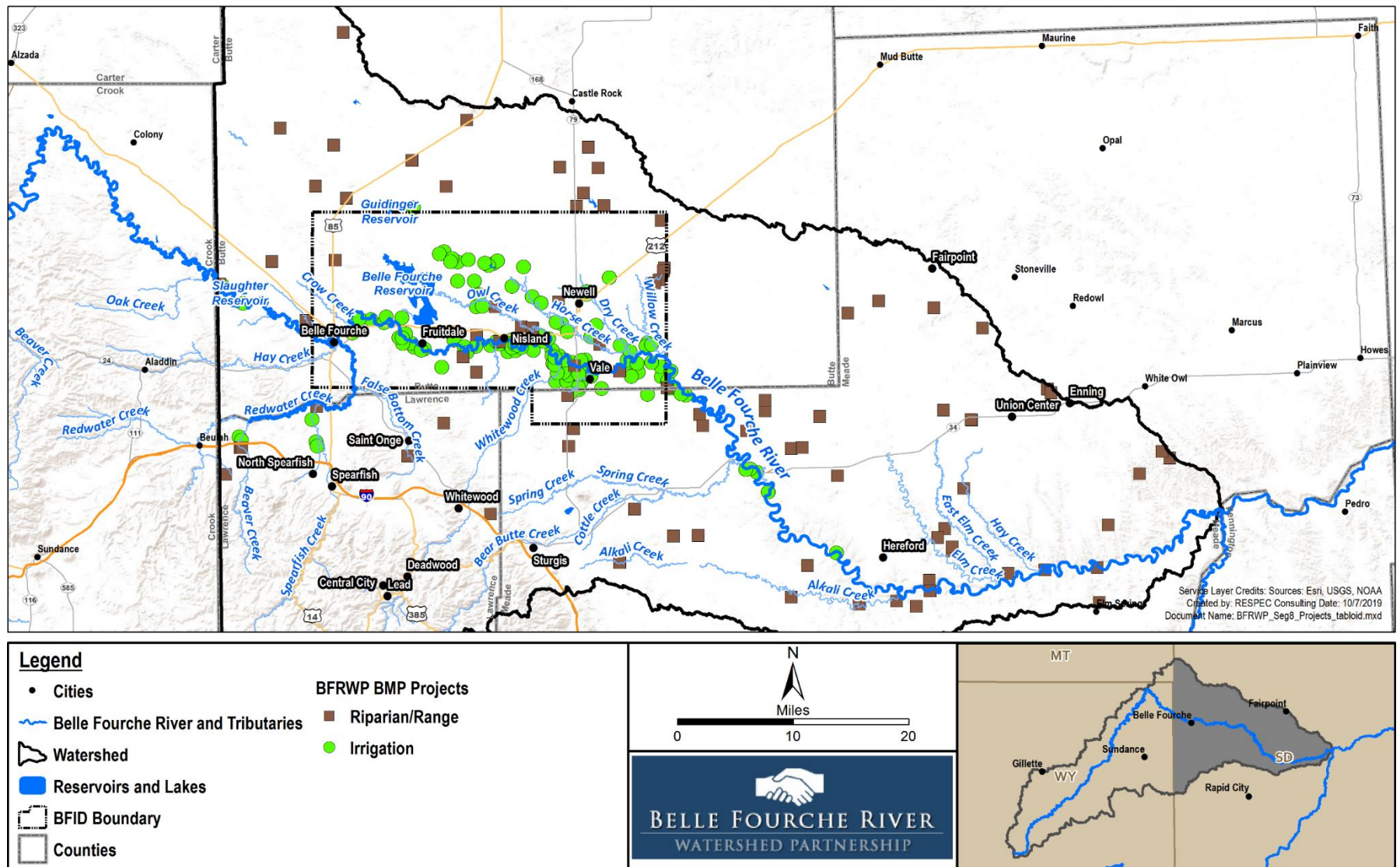


Figure 3-2. General Location of All Completed Producer-Irrigation and Riparian/Range Best Management Practices within the Belle Fourche River Watershed.

Table 3-2. Best Management Practices Implemented with 319 Funding and Local Match

Best Management Practice	Installed This Segment	319 \$ and (%)	Local \$ and (%)	Total (\$)
Sprinkler Irrigation Systems	11 projects on 888 acres	\$346,623 (30%)	\$815,744 (70%)	\$1,162,367
Irrigation Scheduling	7 projects on 1,800 acres	\$0	\$10,000 (100%)	\$10,000
Managed Riparian Grazing	20 projects on 2,000 riparian acres and 22,000 rangeland acres	\$195,351 (58%)	\$138,822 (42%)	\$334,173
Improved Cropping Practices	2 projects on 100 acres	\$0	\$10,000 (100%)	\$10,000
Total		\$541,974 (36%)	\$974,566 (64%)	\$1,516,540

3.1 REDUCING NONUSED IRRIGATION WATER AND IMPROVING EFFICIENCY

3.1.1 ON-FARM IRRIGATION IMPROVEMENTS

Eleven center-pivot sprinklers were installed to replace flood irrigation on 888 acres during Segment 8. Figure 3-3 shows a flood-irrigated field and inefficient water use that leads to an increased sediment load in the river. Figure 3-4 shows a Segment 8 partially-funded center-pivot irrigation system that greatly reduces runoff of excess water. There have been 242 center-pivot sprinklers on approximately 19,930 acres installed in the watershed. The BFRWP has partnered on 133 of those 242 sprinklers systems with the remaining systems funded by NRCS or by individual producers.

Overall, there is an estimated 78,500 irrigated acres within the watershed. Of these irrigated acres, there are approximately 57,000 acres irrigated by water delivered by the Belle Fourche Irrigation District (BFID). Also, there are approximately 9,300 irrigated acres in the Spearfish Creek and Redwater River drainages. The remaining 12,200 acres are irrigated using surface water and groundwater sources in Butte and Meade counties. Approximately 25 percent (19,930 acres) of these irrigated fields have been converted to sprinkler systems, which include center-pivots and siderolls or wheel lines, during the BFRWP's implementation segments. In Segment 8, there were approximately 16,000 surface flood irrigated acres identified that use gated pipe, furrows, or corrugations which could be converted to sprinkler systems because of their soil conditions and field dimensions. If these acres were converted, implementation efforts would reach more than 45 percent of the total potential conversion from flood irrigation to sprinklers irrigation. In comparison, there is 25,227 irrigated acres within the Horse Creek drainage. About 14 percent (3,427 acres) of these irrigated fields have been converted to sprinklers. The remaining 86 percent (21,800 acres) within the Horse Creek drainage is flood irrigated with approximately 5,075 acres that have favorable soil properties and could be converted to sprinklers.

3.1.2 IRRIGATION SCHEDULING

Sprinkler irrigation improves application efficiencies and reduces field runoff that decreases sediment in receiving waters. Proper timing of irrigation is imperative to maximize these benefits. The BFRWP has partnered with local participating producers to continue adopting this conservation technology. During this funding segment, technical assistance was provided to 7 producers on approximately 1,800 acres. The participating irrigators were provided sensors and a datalogger to record soil moisture and technical assistance from BFRWP staff to schedule irrigation applications based on soil saturation which greatly increased water efficiencies and reduced excess field runoff.



Figure 3-3. Flood-Irrigated Field Demonstrating Inefficient Water Use That Leads to Sediment Runoff.



Figure 3-4. Center-Pivot Irrigation System Installed in the Belle Fourche River Watershed.

3.2 RANGE RIPARIAN IMPROVEMENTS

Improved grazing distribution improves the integrity of the riparian corridor of the watershed. Healthy riparian areas are integral to trapping sediment from runoff and reducing TSS entering the Belle Fourche River. After installing riparian/grazing BMPs, riparian areas improved within the watershed.

Seventeen producers participated in range/riparian improvement projects during this segment. These producers installed 13 water development projects, 3 water development and riparian fencing projects, 3 pasture cross-fencing projects, and 1 creek crossing project. These projects improved 2,000 riparian acres and 22,000 rangeland acres within the watershed. The location of the riparian/range improvement projects completed before and during Segment 8 are shown in Figure 3-2. In addition to 319 projects, the NRCS EQIP and CSP-funded projects in the watershed. Figure 3-5 shows a cross fence installation for improving grazing management. Figure 3-6 shows a livestock watering facility installed in the uplands to replace watering on the Belle Fourche River and Figure 3-7 is a photograph buried pipe being installed for livestock water development.



Figure 3-5. Cross Fence Installed in the Uplands to Improved Grazing Management within the Belle Fourche River Watershed.

3.3 IMPROVED CROPPING PRACTICES

The BFRWP funded two cover-crop demonstration sites that provided a stipend to the willing participants and demonstrated cover-crop and no-till farming practices on approximately 100 acres. In the fall of 2017, the BFRWP partnered with SDSU, NRCS, and the South Dakota Soil Health Coalition to conduct a field day that showcased these sites. The event was well attended by local producers and producers from outside of the watershed. The event provided an excellent platform to transfer knowledge. In addition to this field day, the BFRWP cosponsored two soil health workshops in Belle Fourche to further promote trends toward improved cropping practices in the watershed.



Figure 3-6. Livestock Watering Facility Installed in the Uplands to Replace Watering on the Belle Fourche River.



Figure 3-7. Buried Pipeline Installed to Supply Livestock Watering Facilities within the Belle Fourche River Watershed

4.0 SUMMARY OF PUBLIC PARTICIPATION AND OUTREACH

Approximately 23 public outreach events were completed during this segment. These events included public meetings, informational booths, website maintenance, radio sound bites, rainfall simulator demonstrations, and watershed tours. Outreach efforts reached an estimated 9,500 people. A summary of the events are listed in Table 4-1. The BFRWP purchased a soil-quality demonstration trailer in 2009 to demonstrate the effects of erosion on soils and how they relate to TSS. The trailer was used at several events sponsored by the BFRWP. The BFRWP hosted six meetings to provide updates on project work and progress. The BFRWP website continues to be updated with events and project status (www.bellefourchewatershed.org). Outreach activities have helped to increase participation and support for the BFRWP and also gave the BFRWP several contacts for BMP installation. Several informative sound bites were broadcasted on the local radio to increase public awareness of water quality issues and to promote project involvement

Table 4-1. Summary of Public Outreach and Education During Segment 8

Type of Education and Outreach	Date	Number of Participants
BFRWP Meetings (6 Meetings)	July 2017 – July 2019	100
Society for Range Management Range Tour and Rainfall Simulator Demo	2017, 2018, 2019	100
Booth at the Vale Ag Show	2018, 2019	400
No-Till/Cover-Crop Tour Demonstration Site Tour	2018	50
Booth at the Ranchers Roundup in Union Center	2017, 2018	400
South Dakota Adult and Youth Range Camp	2018, 2019	150
South Dakota Leopold Award Sponsorship	2018, 2019	NA
Butte County Range and Soil Health Tour	2018, 2019	50
Meade County Range and Soil Health Tour	2018, 2019	50
Informational Radio Sound Bites	2017, 2018, 2019	7,000
BFRWP Website	2017, 2018, 2019	1,200

The BFRWP sponsored or cosponsored eight tours in the watershed during Segment 8. These tours included local producers; state and federal agency staff; local, state, and federal government officials; and the public. Partners in these tours included the Butte, Lawrence, and Elk Creek Conservation Districts; the South Dakota Association of Conservation Districts; SDSU Cooperative Extension; South Dakota Society for Range Management; NRCS; and US Bureau of Reclamation.

These tours showcased projects that were sponsored by the BFRWP that included irrigation demonstrations in the BFID, rangeland demonstrations on ranches in the watershed, and an improved cropping system demonstration site tour. These outreach activities helped increase participation and support for the BFRWP and also gave the BFRWP several contacts for BMP installation. The Elk Creek Conservation District's Range and Soil Health Tour in the Belle Fourche River Watershed demonstrates accomplishments is illustrated in Figure 4-1. Figure 4-2 shows a Belle Fourche River Watershed Partnership Soil Health and Rainfall Simulator Demonstration during a watershed tour.



Figure 4-1. Elk Creek Conservation District Range and Soil Health Tour in the Belle Fourche River Watershed.



Figure 4-2. Belle Fourche River Watershed Partnership Soil Health and Rainfall Simulator Demonstration.

5.0 MONITORING RESULTS

5.1 IMPAIRED WATERBODIES AND APPROVED TOTAL MAXIMUM DAILY LOADS

The Belle Fourche River from the Wyoming-South Dakota state line to the Cheyenne River is identified as impaired in South Dakota's 2018 IR because of elevated TSS and *E. coli* concentrations. In the 2018 IR, Horse Creek, Deadwood Creek, and Whitewood Creek were listed as having TSS and *E. coli* approved TMDLs. A summary of the TMDL streams within the watershed that are included in the 2018 IR was listed in Table 1-1. The impaired segments within the watershed were also shown on Figure 1-2. There are other impaired waterbodies occurring within the watershed; however, they are not currently the primary focus of the BFRWP project implementation plan.

5.2 BELLE FOURCHE RIVER WATERSHED RAPID GEOMORPHIC ASSESSMENT

In March 2017, SD DENR staff evaluated 25 sites along the Belle Fourche River, Horse Creek, and Indian Creek using a Rapid Geomorphic Assessment (RGA). Channels near public bridges were assessed using the RGA's metrics for bed material bed, bank protection, incision, constriction, erosion, bank instability, riparian cover, accretion, and channel evolution stage. Some channels have stable bank profiles as shown in Figure 5-1. Also, there were no channels observed that occurred directly downstream of tributaries or irrigation returns entering the river. Other channels observed had conditions similar to those shown in Figure 5-2, Figure 5-3, and Figure 5-4.



Figure 5-1. Bank Cover, Boulder/Cobble Substrate, and Bank Protection on the Belle Fourche River Above the Fruitdale Road Bridge.

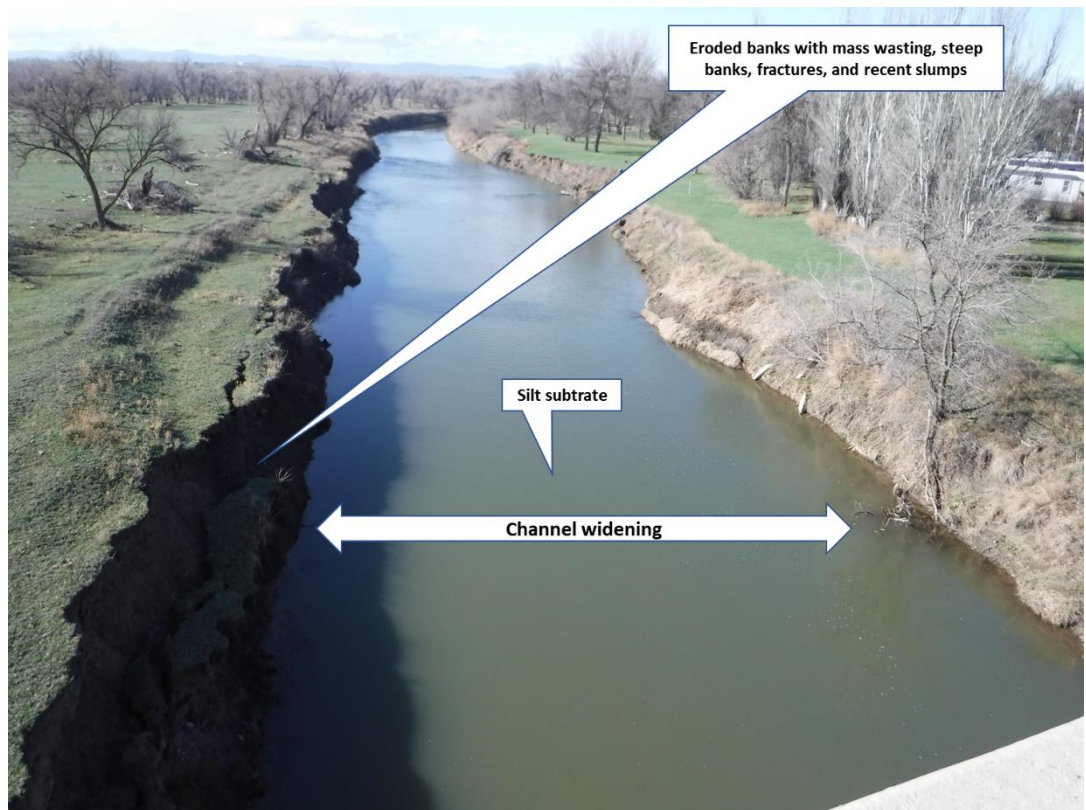


Figure 5-2. Eroded Banks, Silt Substrate, and Channel Widening on the Belle Fourche River Above the US Highway 212 Bridge.



Figure 5-3. Eroded Banks, Silt Substrate, and Downcut Channel on Horse Creek Above the Eichler Road Bridge.

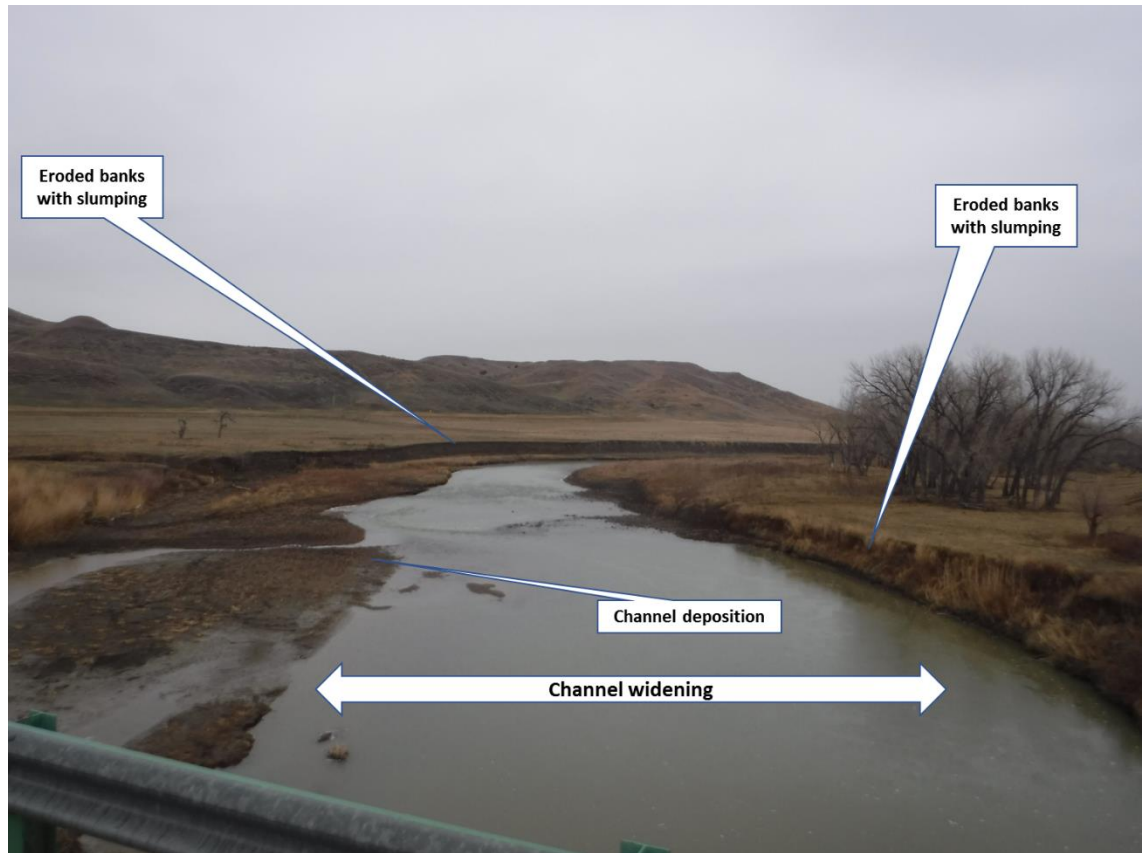


Figure 5-4. Eroded Banks, Channel Deposition and Widening on the Belle Fourche River Below the Elm Springs Road Bridge.

5.3 WATER QUALITY SAMPLING

Since January 1995, the BFRWP in cooperation with the SD DENR and USGS have collected water quality samples at various sites on the Belle Fourche River and its tributaries to evaluate levels of *E. coli* and TSS. During Segment 8, six sites on the Belle Fourche River; 460130 (WQM130), 460683 (WQM83), 460681 (WQM81), BF6, 460880 (WQM21), and 460676 (WQM76) were sampled from May through September in 2017, 2018, and 2019. The SD DENR sampled the Belle Fourche River at WQM stations 460681 (WQM81), 460880 (WQM21), and 460676 (WQM76) and the BFRWP's consultant, RESPEC, collected samples on the Belle Fourche River at WQM stations 460130 (WQM130), 460683 (WQM83), and BF6. RESPEC also collected samples at two sites on Horse Creek (HCR02 and HCR04) and one site on Indian Creek (ICR03) during this segment. These sites are shown in Figure 5-5, described below, and the *E. coli* and TSS sampling results from these sites are summarized in Sections 5.3.1. and 5.3.2.

- / The 460130 (WQM130) site is located on the river in Belle Fourche below the bridge on US Highway 85 and monitors the river above where the Redwater River enters and the BFID diverts water into the Belle Fourche Reservoir (Orman Dam) via the Inlet Canal.
- / The 460683 (WQM83) site is located on the river about 0.5 miles south of US Highway 212 on the Vale Cut Off Road. This site is situated to monitor any irrigation returns contributed to the river from the Johnson, Korwelt, Mawer, and Sorenson laterals.

- / The 460681 (WQM81) site is located on the river about 5 miles south of Newell on US Highway 79 and 1.5 miles northwest of Vale. This site is situated to monitor contributions from Whitewood Creek and return water from the Baldwin, Indian Creek, Shaw, and Wilson laterals.
- / The BF6 site is located on the river about 7.5 miles east of Vale on the Valley Township Road (Bismarck Branch Road). This site is situated to monitor contributions from Horse Creek, Willow Creek, and irrigation return water from the Perry, Richard, Vale, and Wood laterals.
- / The 460880 (WQM21) site is located on the river about 20 miles east of Sturgis on US Highway 34 and is situated above where the Bear Butte Creek enters the river and monitor contributions to the river from Ninemile Creek and irrigation return water from the South Canal.
- / The 460676 (WQM76) site is located on the river about 24 miles north of Wasta or 5 miles north of Elm Spring on Elm Springs Road and is approximately 15 mile upstream of where the river enters the Cheyenne River. This site is the furthest downstream station and monitors contributions to the river from Bear Butte Creek, Alkali Creek, Elm Creek, and Hay Creek.
- / The ICR03 site is located on Indian Creek about 7 miles north of US Highway 212 on Arpan Road. The site is situated to monitor the upper Indian Creek drainage and any return water from some portions of the North Canal and Arpan Lateral.
- / The HCR04 site is located on Horse Creek about 9 miles north of Nisland and US Highway 212 on Riley Road. The site is situated to monitor upper Horse Creek and Lonetree Creek.
- / The HCR02 site is located on Horse Creek about 3 miles east of US Highway 79 on Wilson Cemetery Road and 0.3 miles north on Youngberg Road. HCR02 is 5 miles southeast of Newell and 3 miles northeast of Vale. This site is situated to monitor contributions to Horse Creek from Indian Creek and irrigation return water from the Beresford, Indian Creek, and McLung laterals.

5.3.1 BELLE FOURCHE RIVER WATER QUALITY DATA

The *E. coli* and TSS sample results are summarized in Table 5-1 and are listed from upstream to downstream in the table. Data results were used to calculate the percent exceedance of the Immersion Recreation single-sample *E. coli* bacteria criterion of 235 mpn/100 mL and the Warm-Water Permanent Fish Life single-sample TSS daily maximum criterion of 158 mg/L. All six sites had at least one exceedance of the *E. coli* bacteria and the TSS criteria as shown in Table 5-1. Figure 5-6 through Figure 5-17 displays the *E. coli* and TSS sample results at sites on the river. The WQM130, WQM83, and WQM76 sites had the highest percentages of the *E. coli* bacteria and TSS criteria exceedances. BF6 also had high percentages of the *E. coli* bacteria and the TSS criteria but was only sampled in 2019.

5.3.2 HORSE CREEK AND INDIAN CREEK WATER QUALITY DATA

The *E. coli* and TSS sample results are summarized in Table 5-2 and are listed from upstream to downstream in the table. Data results were used to calculate the percent exceedance of the Limited Contact Recreation single-sample *E. coli* bacteria criterion of 1,178 mpn/100 mL and the Warm-Water Semi-permanent Fish Life single-sample TSS daily maximum criterion of 158 mg/L. Figure 5-18 through Figure 5-23 displays the *E. coli* and TSS sample results at sites on the Horse Creek and Indian Creek. All three sites had at least two exceedances of the *E. coli* bacteria criterion and at least one exceedance of the TSS criterion. The ICR03 site had the highest percentage of the *E. coli* bacteria criterion exceedances. The HCR02 site had the highest percentage of the TSS criterion exceedances.

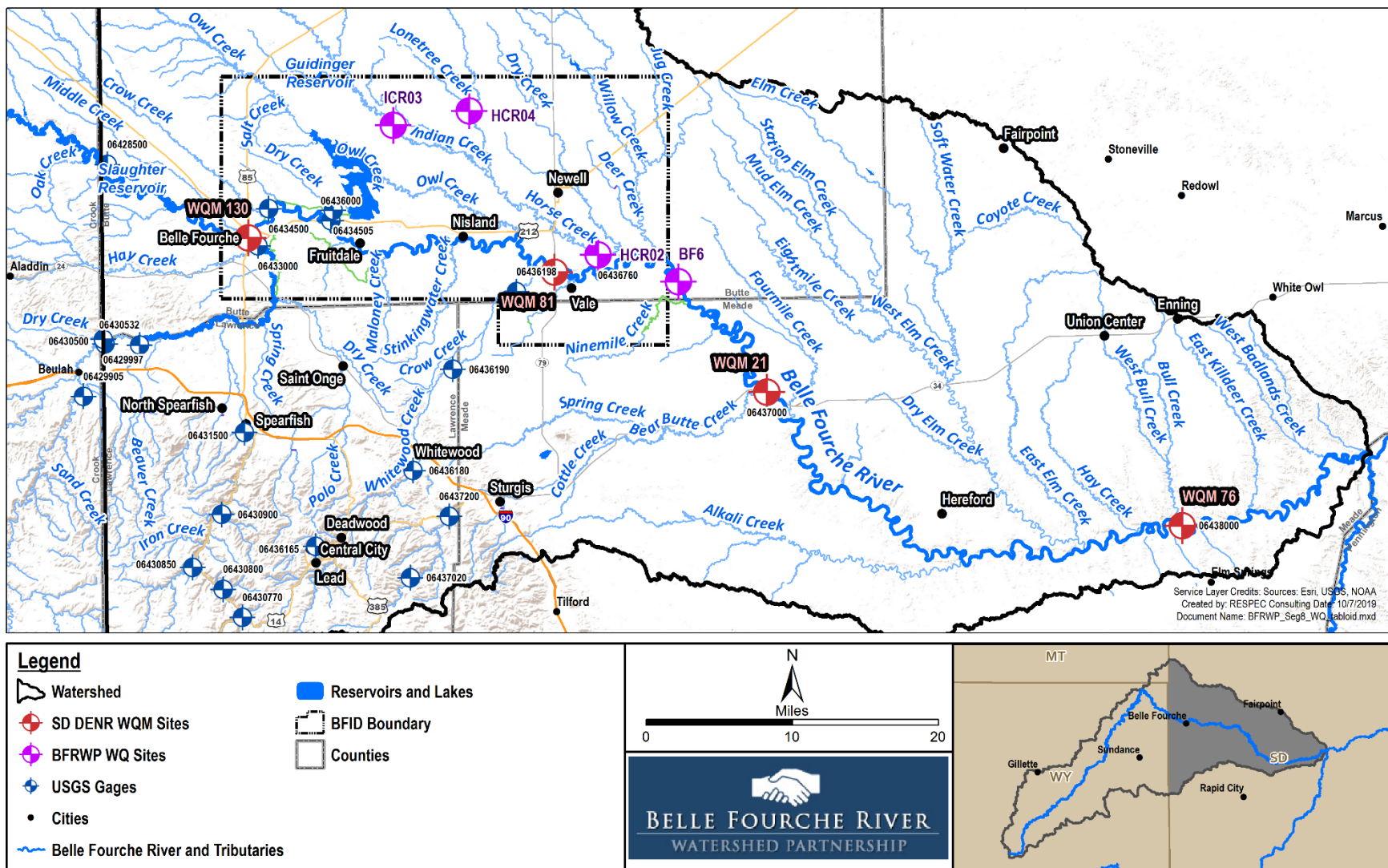


Figure 5-5. Water Quality Monitoring Sites located on the Belle Fourche River, Horse Creek, and Indian Creek Sampled During the BFRWP's Segment 8 Project.

Table 5-1. *E. coli* and TSS Sample Results (Exceedances) for WQM130, WQM83, WQM81, WQM80, and WQM76 during Segment 8

	WQM130		WQM83		WQM81		BF6		WQM21		WQM76	
Sample Date	<i>E. coli</i> (mpn/100mL)	TSS (mg/L)	<i>E. coli</i> (mpn/100mL)	TSS (mg/L)	<i>E. coli</i> (mpn/100mL)	TSS (mg/L)	<i>E. coli</i> (mpn/100mL)	TSS (mg/L)	<i>E. coli</i> (mpn/100mL)	TSS (mg/L)	<i>E. coli</i> (mpn/100mL)	TSS (mg/L)
5/9/17	199	106.0	6,930	64.0	NA	NA	NA	NA	NA	NA	NA	NA
5/24/17	NA	NA	NA	NA	178	68.0	NA	NA	178	68.0	16	55.0
6/8/17	6,870	4,790.0	108	83.6	NA	NA	NA	NA	NA	NA	NA	NA
6/19/17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	25	87.0
7/12/17	110	5.2	88	48.8	NA	NA	NA	NA	NA	NA	NA	NA
7/18/17	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11	44.0
8/3/17	148	52.4	30	54.8	NA	NA	NA	NA	NA	NA	NA	NA
8/28/17	NA	NA	NA	NA	32	23.0	NA	NA	32	23.0	47	68.0
8/30/17	151	216.0	52	45.0	NA	NA	NA	NA	NA	NA	110	44.0
9/28/17	79	151.0	35	23.2	NA	NA	NA	NA	NA	NA	NA	NA
5/10/18	488	63.2	63	76.4	NA	NA	NA	NA	NA	NA	NA	NA
5/15/18	NA	NA	NA	NA	126	46.0	NA	NA	126	46.0	579	310.0
6/5/18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	551	633.0
6/7/18	271	80.4	50	69.6	NA	NA	NA	NA	NA	NA	NA	NA
7/6/18	457	132.0	109	44.4	NA	NA	NA	NA	NA	NA	NA	NA
7/12/18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	49	49.0
8/2/18	98	16.8	62	50.0	NA	NA	NA	NA	NA	NA	NA	NA
8/14/18	NA	NA	NA	NA	61	16.0	NA	NA	61	16.0	113	20.0
8/28/18	114	28.0	132	50.4	NA	NA	NA	NA	NA	NA	NA	NA
9/25/18	579	70.4	102	47.6	NA	NA	NA	NA	NA	NA	55	14.0
5/16/19	NA	NA	NA	NA	32	97.0	613	110.0	32	97.0	68	136.0
5/17/19	138	166.0	365	114.0	126	104.0	NA	NA	126	104.0	NA	NA
6/6/19	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	153	588.0
6/14/19	449	366.0	242	166.0	182	131.0	387	129.0	182	131.0	NA	NA
7/9/19	365	345.0	435	285.0	1,120	372.0	435	330.0	1,120	372.0	727	692.0
8/7/19	49	191.0	70	38.0	141	26.0	44	14.0	141	26.0	40	202.0
9/5/19	19	88.8	1	25.6	52	29.2	62	14.4	52	29.2	5	27.0
Exceedances (#)	7	6	4	2	1	1	3	1	1	1	3	5
Exceedances (%)	41	35	24	12	10	10	60	20	10	10	20	33

Table 5-2. *E. coli* and TSS Sample Results (**Exceedances**) for HCR02, HCR04, and ICR03 during Segment 8

	HCR04		ICR03		HCR02	
Sample Date	<i>E. coli</i> (mpn/100 mL)	TSS (mg/L)	<i>E. coli</i> (mpn/100 mL)	TSS (mg/L)	<i>E. coli</i> (mpn/100 mL)	TSS (mg/L)
5/9/17	NA	NA	1,540	270.0	102	87.6
5/25/17	NA	NA	216	75.2	260	51.2
6/8/17	236	10.8	201	116.0	816	79.2
6/23/17	2,420	133.0	866	57.2	326	103.0
7/12/17	1,050	10.8	158	81.2	185	63.6
7/20/17	NA	NA	1,730	125.0	1,730	90.0
8/3/17	3	24.0	4,110	39.6	121	83.2
8/17/17	12	34.4	727	82.8	261	80.8
8/30/17	NA	NA	1,550	48.8	93	87.2
9/21/17	NA	NA	613	28.0	72	25.2
9/28/17	NA	NA	101	13.6	276	19.6
5/10/18	29	18.8	549	92.0	1,730	241.0
6/7/18	11	4.0	249	55.6	445	242.0
6/21/18	24,200	802.0	15,500	427.0	24,200	2,610.0
7/6/18	504	22.4	233	51.2	231	84.4
7/19/18	56	29.6	44	68.4	866	133.0
8/2/18	37	20.0	108	46.4	397	49.6
8/17/18	20	12.4	91	33.6	411	30.8
8/28/18	1	21.6	1,200	43.6	179	39.6
9/11/18	6	23.2	1,410	26.0	179	18.8
9/25/18	326	14.8	166	32.0	687	49.6
5/17/19	NA	NA	816	135.0	121	80.4
5/30/19	20	14.4	52	110.0	317	598.0
6/14/19	NA	NA	1,450	28.0	237	38.0
6/25/19	33	10.4	71	30.4	517	68.4
7/9/19	387	33.6	291	115.0	210	325.0
7/25/19	687	55.6	613	258.0	816	523.0
8/7/19	127	20.8	80	60.0	182	46.4
8/20/19	131	16.0	50	64.8	240	37.2
9/5/19	411	20.0	31	21.2	344	4.0
Exceedances (#)	2	1	8	3	3	6
Exceedances (%)	9	5	27	10	10	20

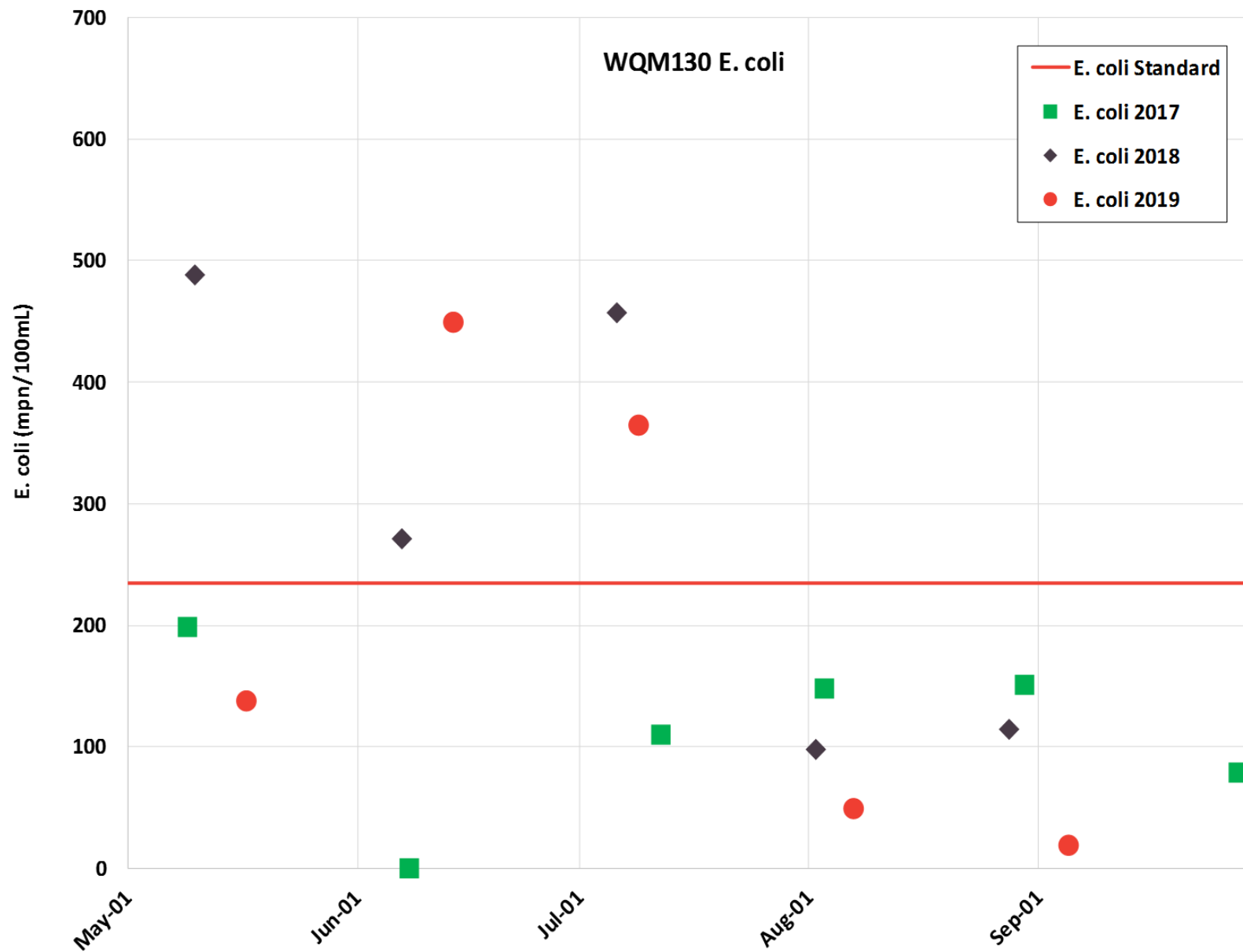


Figure 5-6. *E. coli* Water Quality Sampling Results at Site WQM130 (460130) on the Belle Fourche River from May–September during 2017, 2018, and 2019.

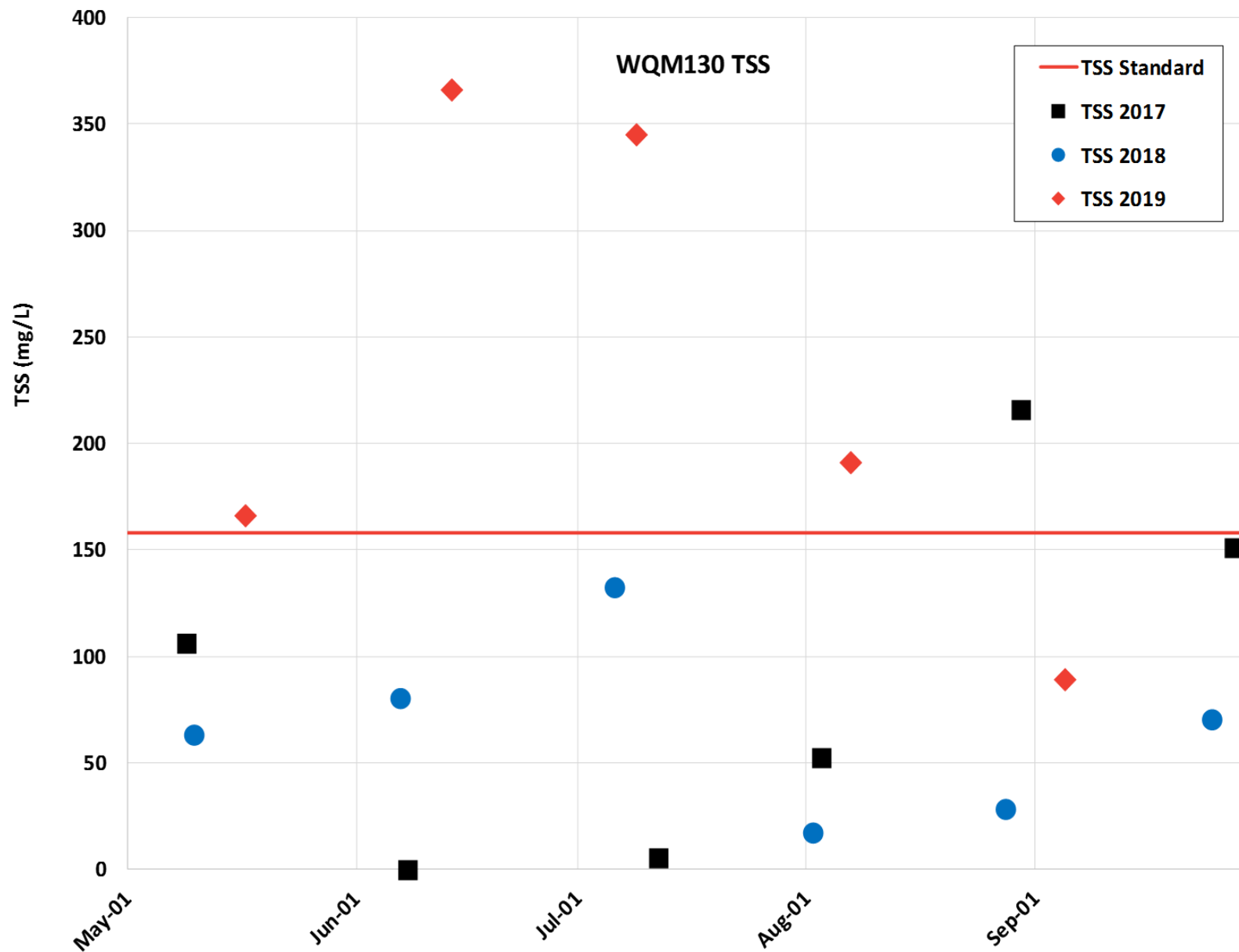


Figure 5-7. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM130 (460130) on the Belle Fourche River from May–September during 2017, 2018, and 2019.

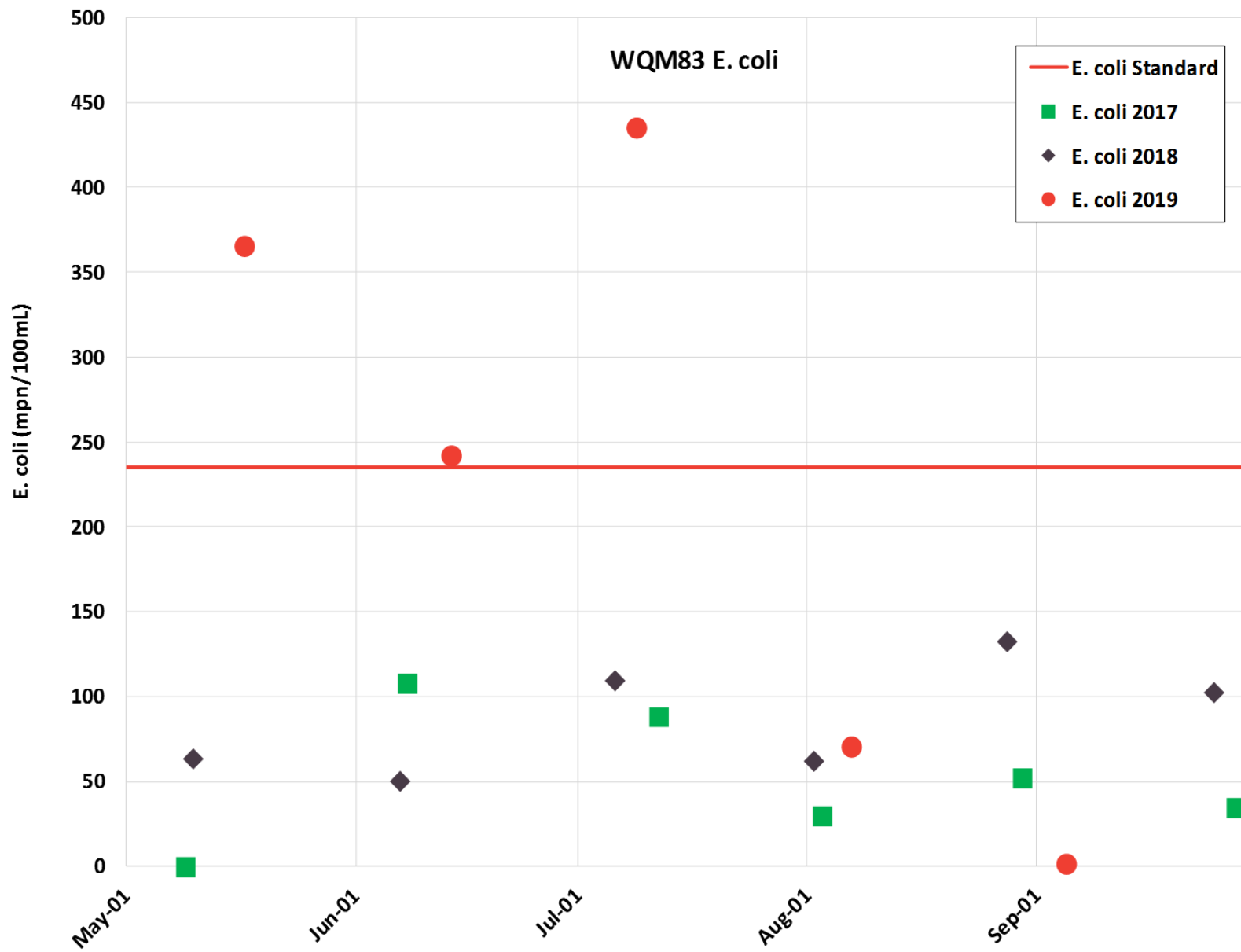


Figure 5-8. *E. coli* Sampling Results at Monitoring Site WQM83 (460683) on the Belle Fourche River from May–September during 2017, 2018, and 2019.

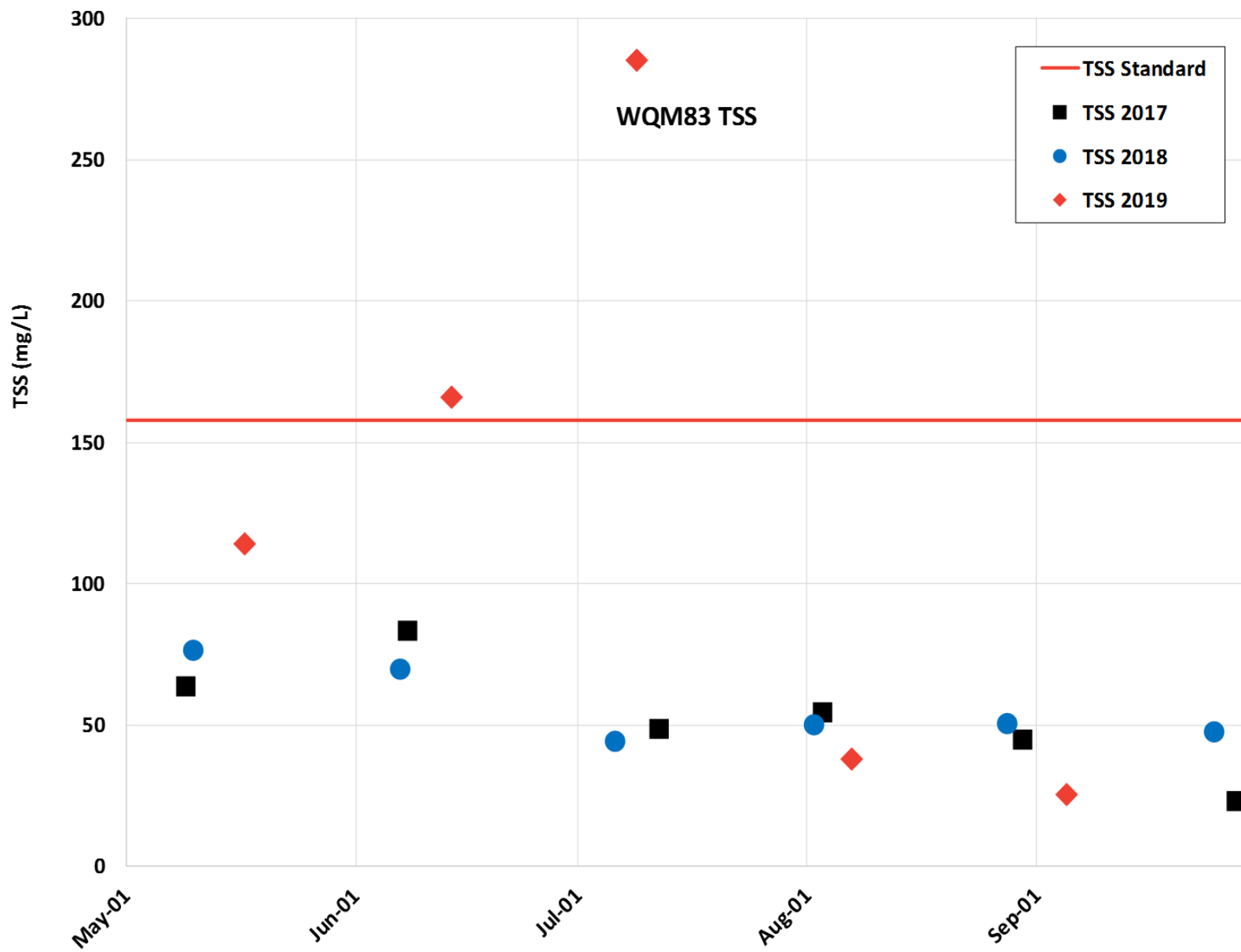


Figure 5-9. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM83 (460683) on the Belle Fourche River from May–September during 2017, 2018, and 2019.

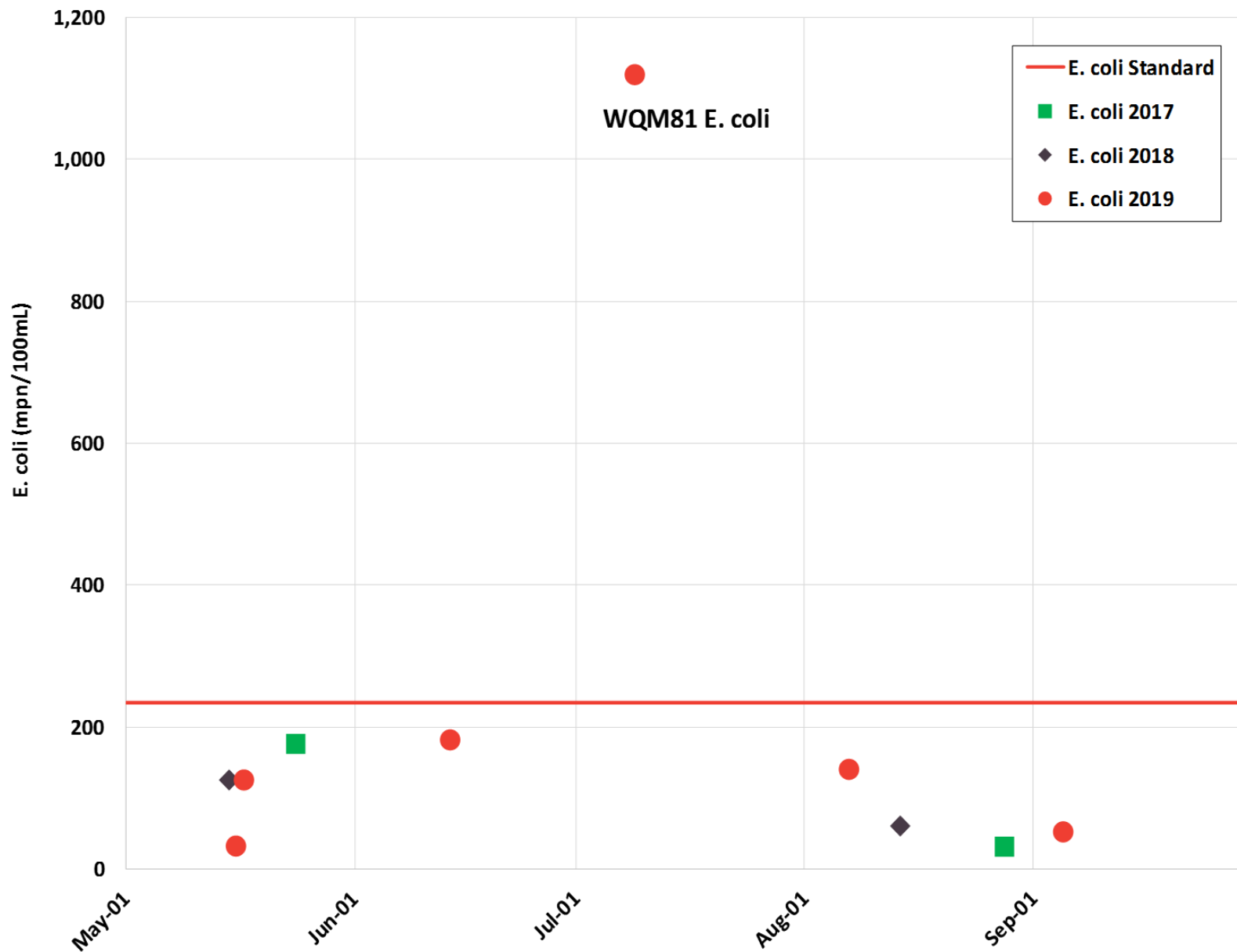


Figure 5-10. *E. coli* Sampling Results at Monitoring Site WQM81 (460681) on the Belle Fourche River from May–September during 2017, 2018, and 2019.

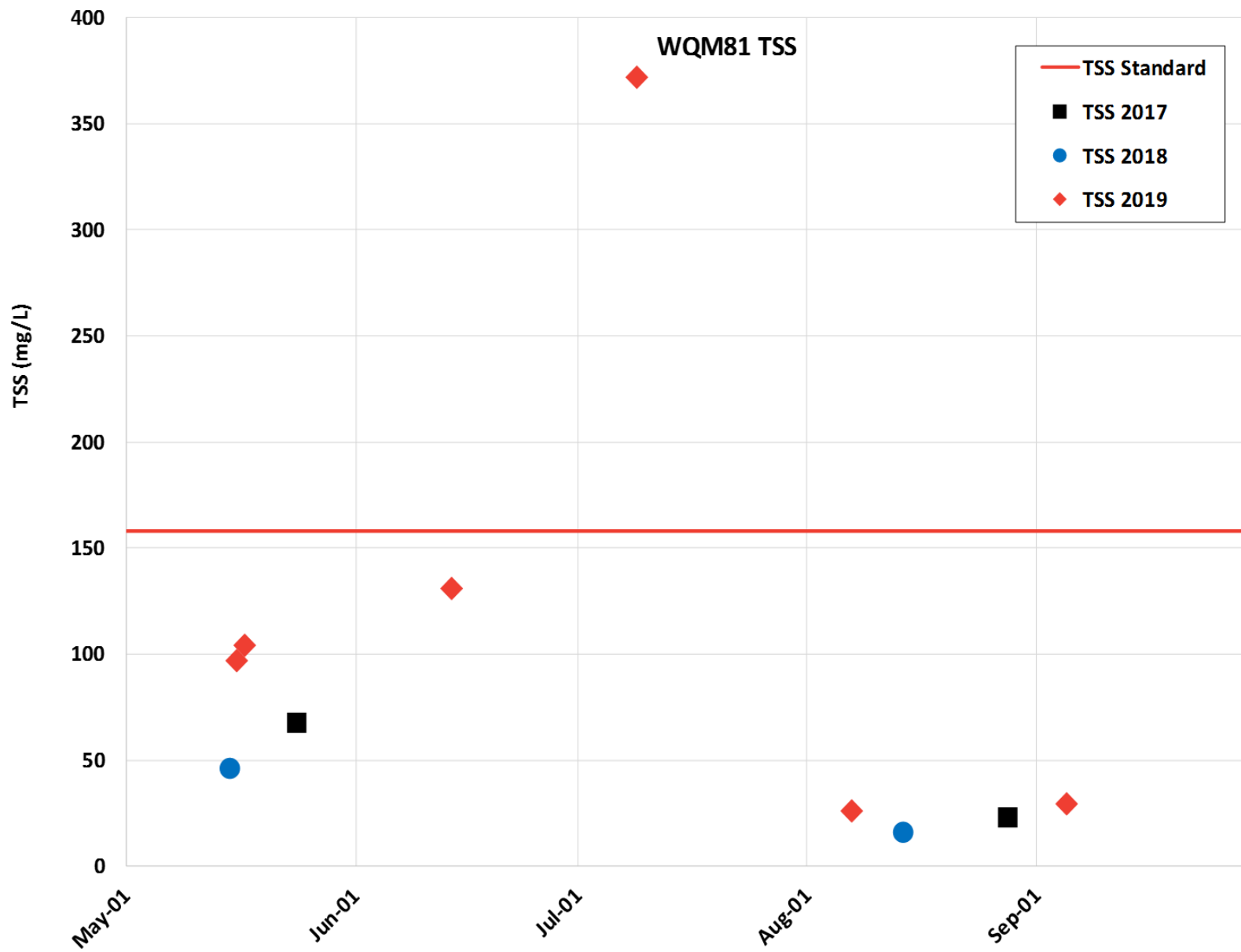


Figure 5-11. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM81 (460681) on the Belle Fourche River from May–September during 2017, 2018, and 2019.

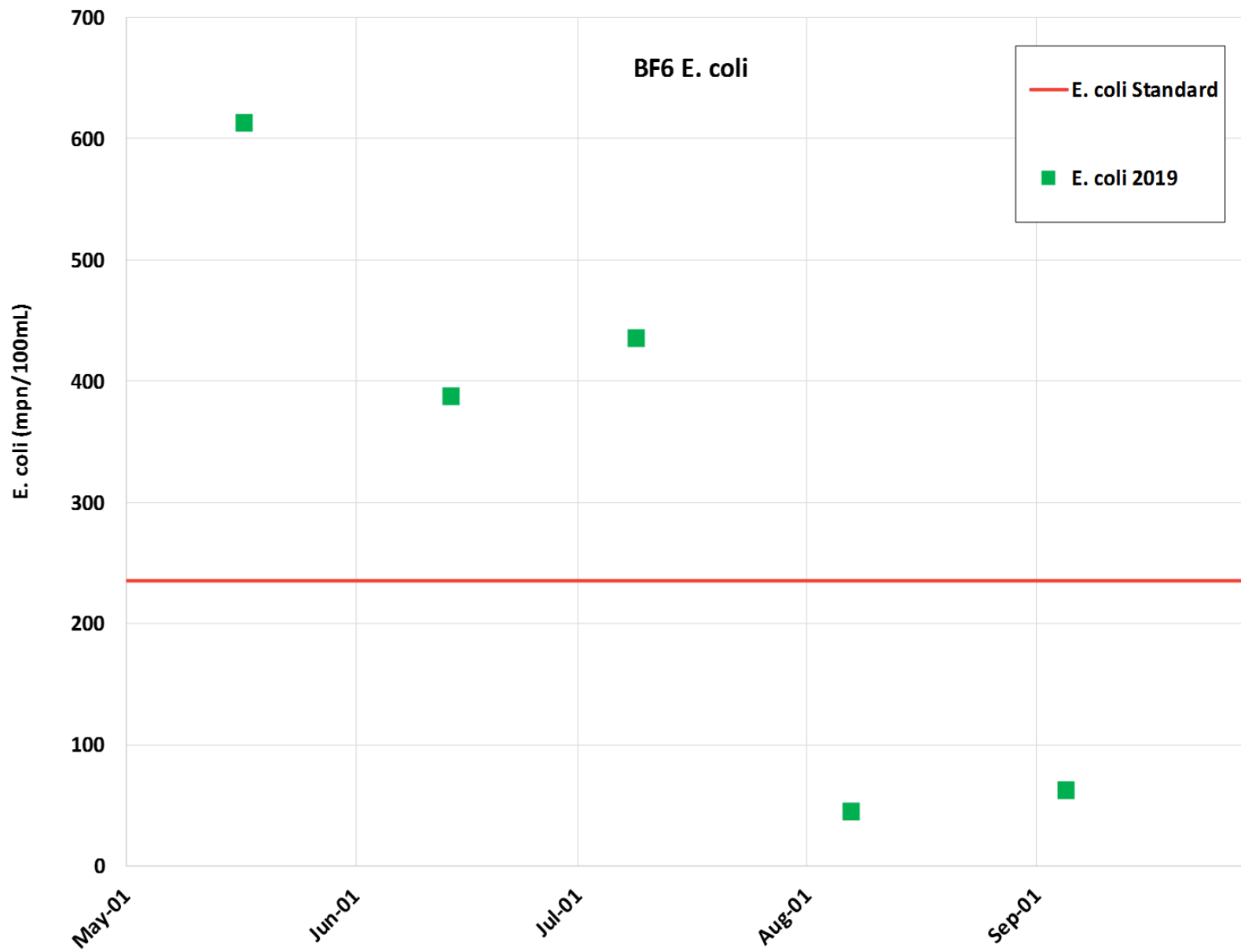


Figure 5-12. *E. coli* Sampling Results at Monitoring Site BF6 on the Belle Fourche River from May–September during 2017, 2018, and 2019

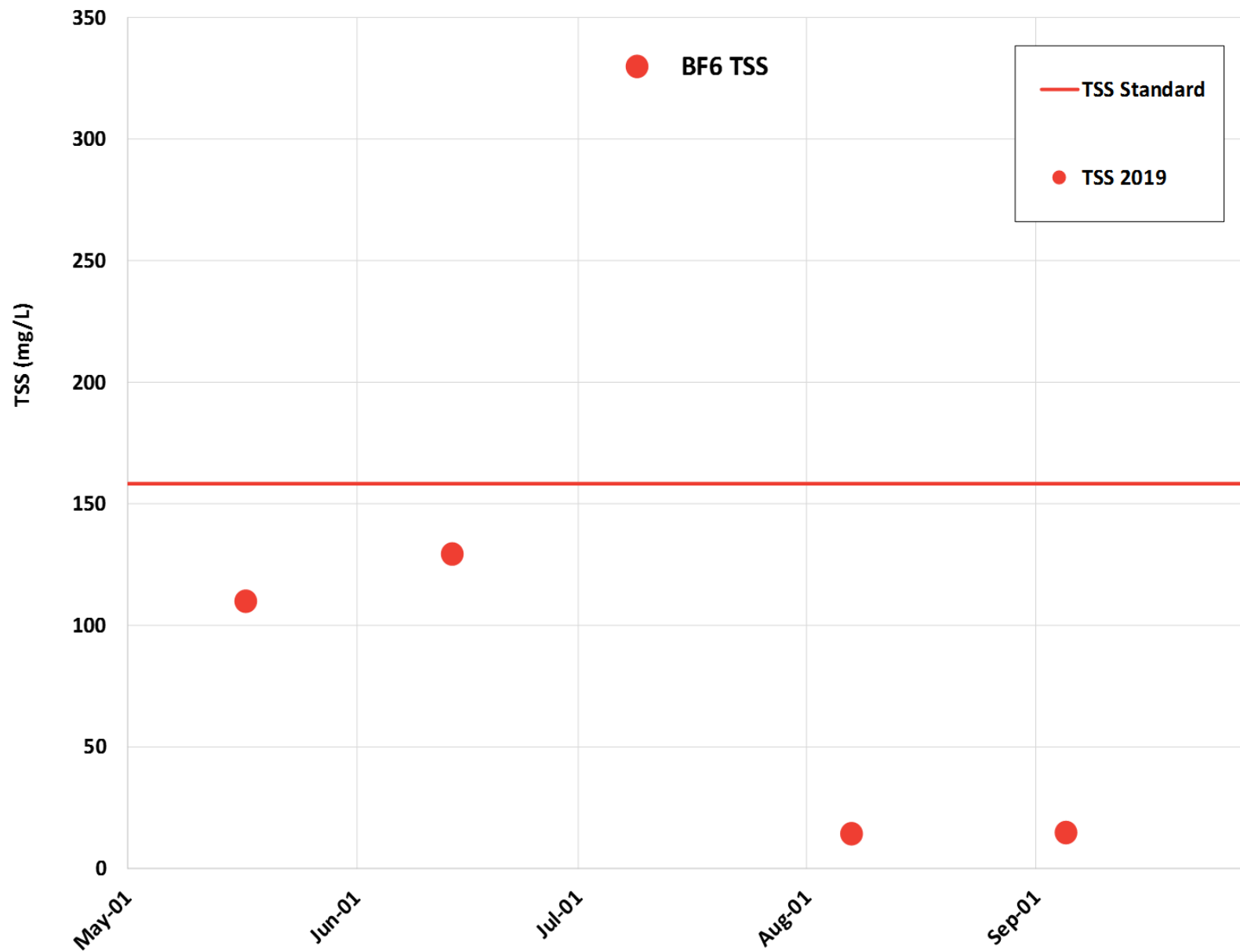


Figure 5-13. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site BF6 on the Belle Fourche River from May–September during 2017, 2018, and 2019.

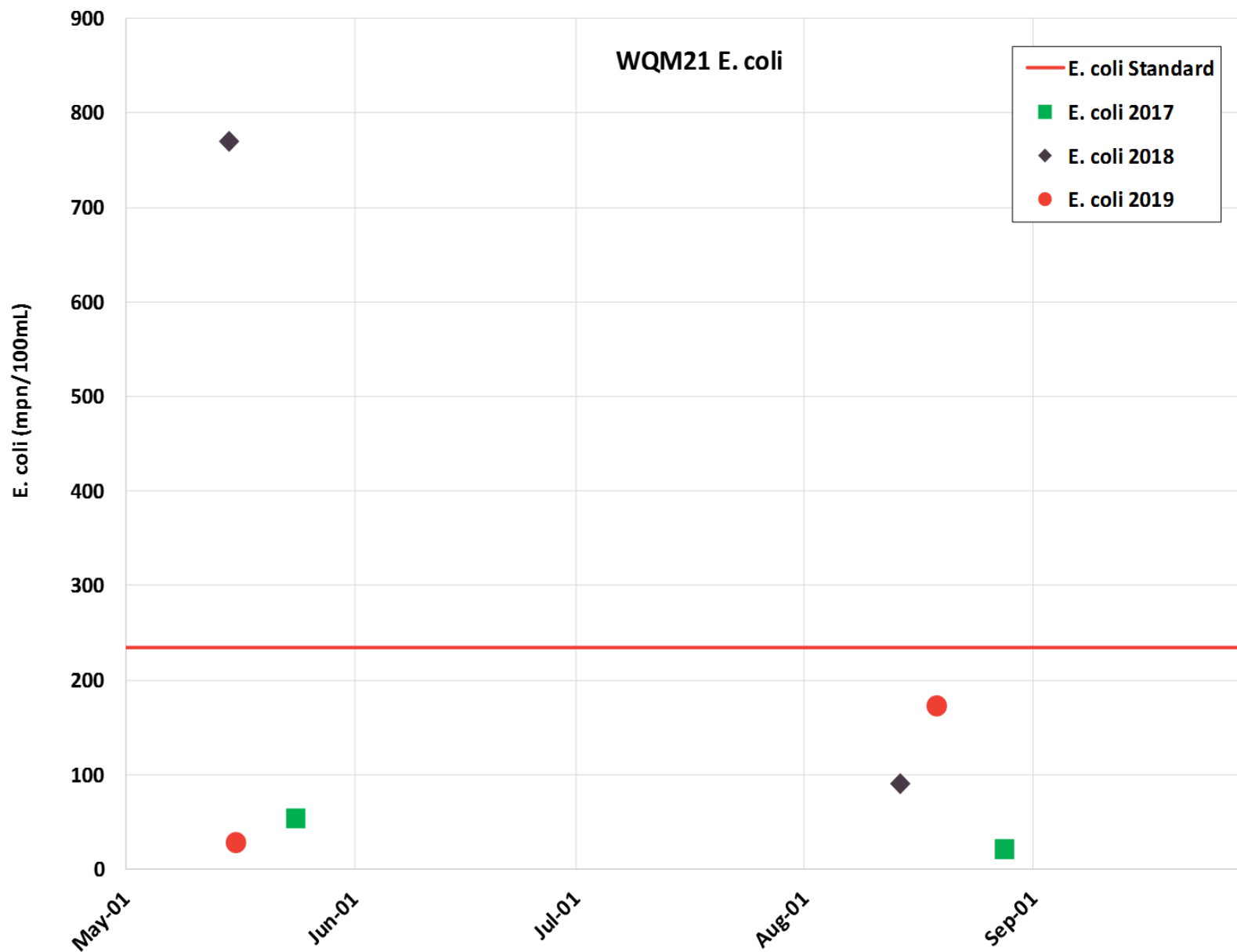


Figure 5-14. *E. coli* Sampling Results at Monitoring Site WQM21 (460880) on the Belle Fourche River from May–September during 2017, 2018, and 2019.

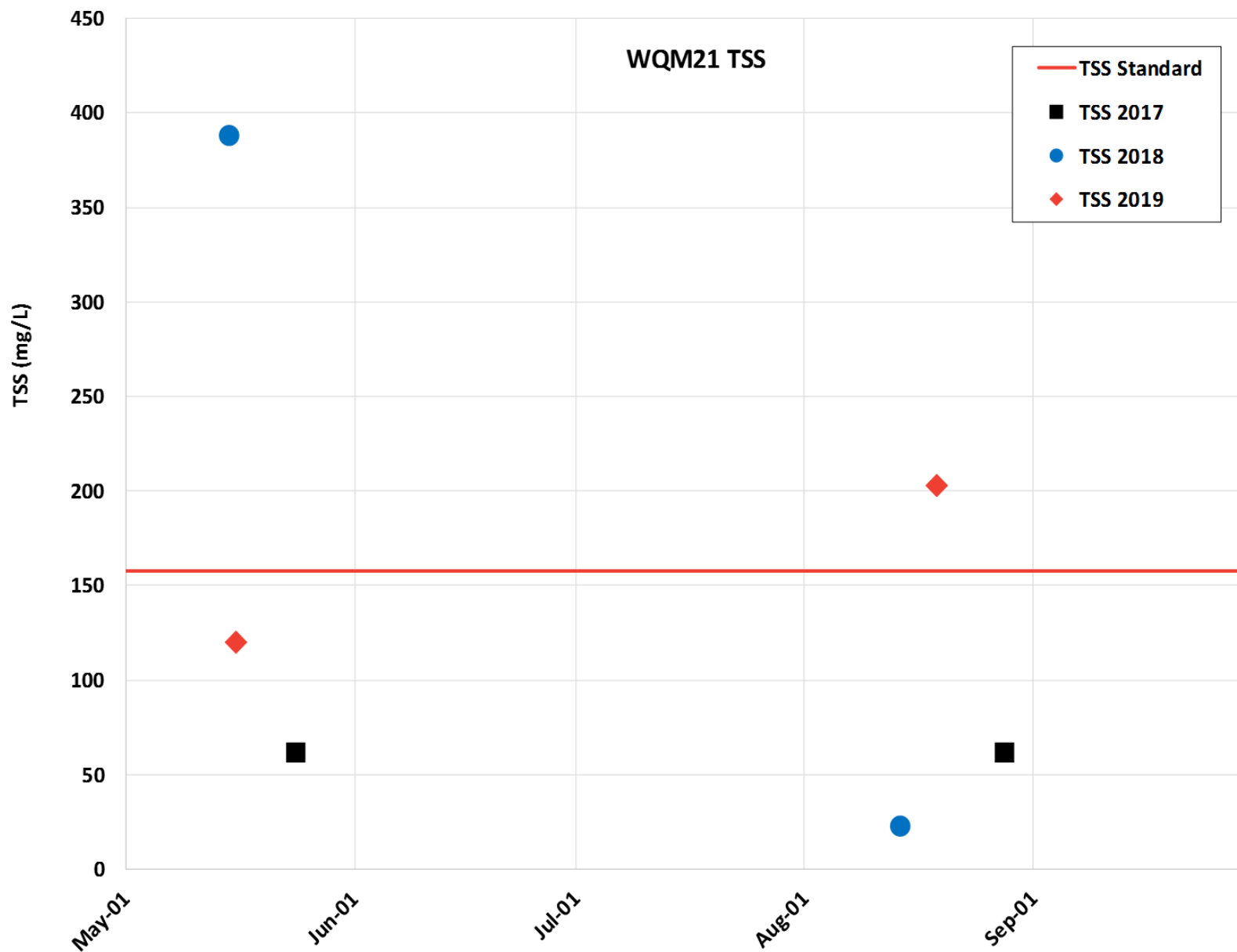


Figure 5-15. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM21 (460880) on the Belle Fourche River from May–September during 2017, 2018, and 2019.

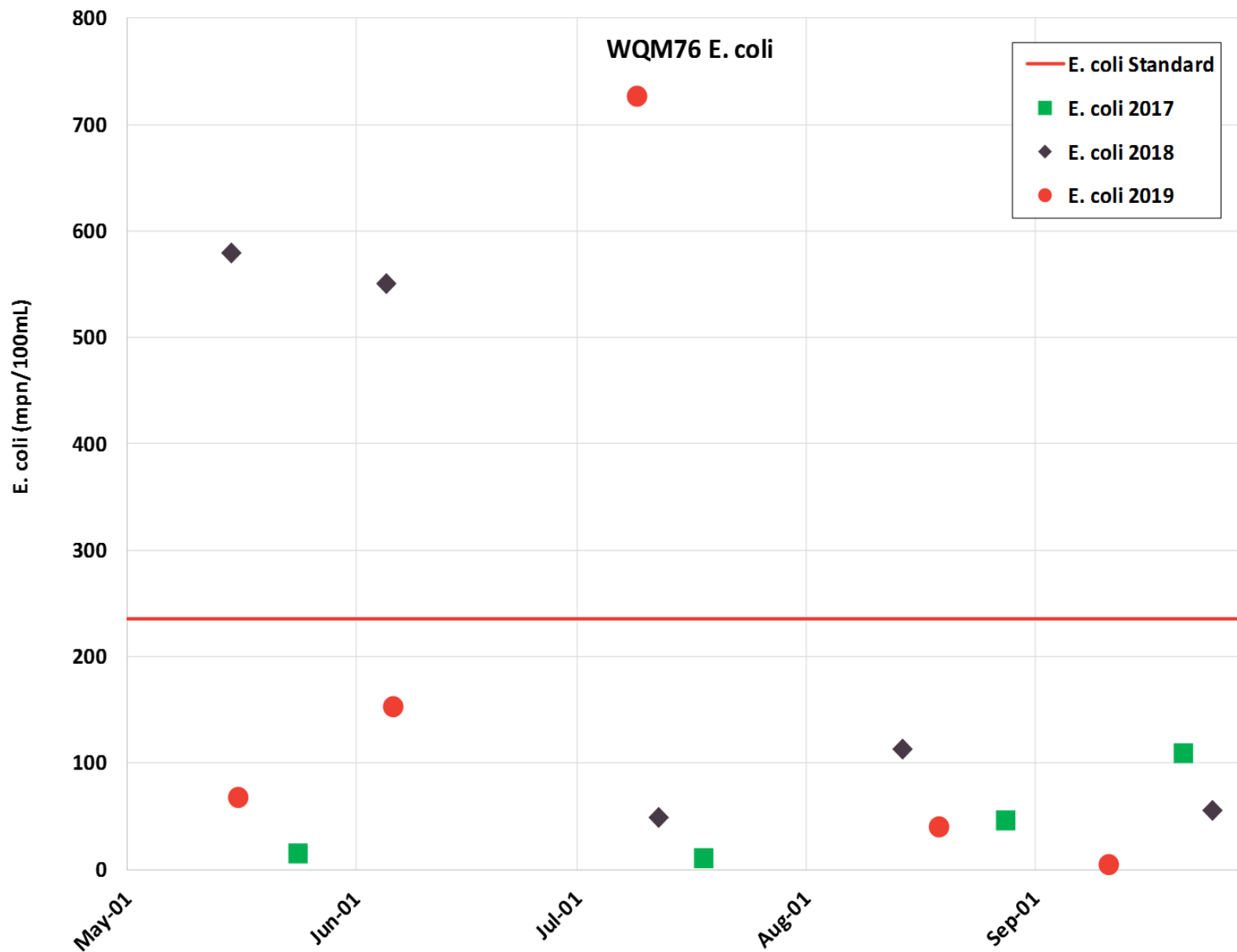


Figure 5-16. *E. coli* Sampling Results at Monitoring Site WQM76 (460676) on the Belle Fourche River from May–September during 2017, 2018, and 2019.

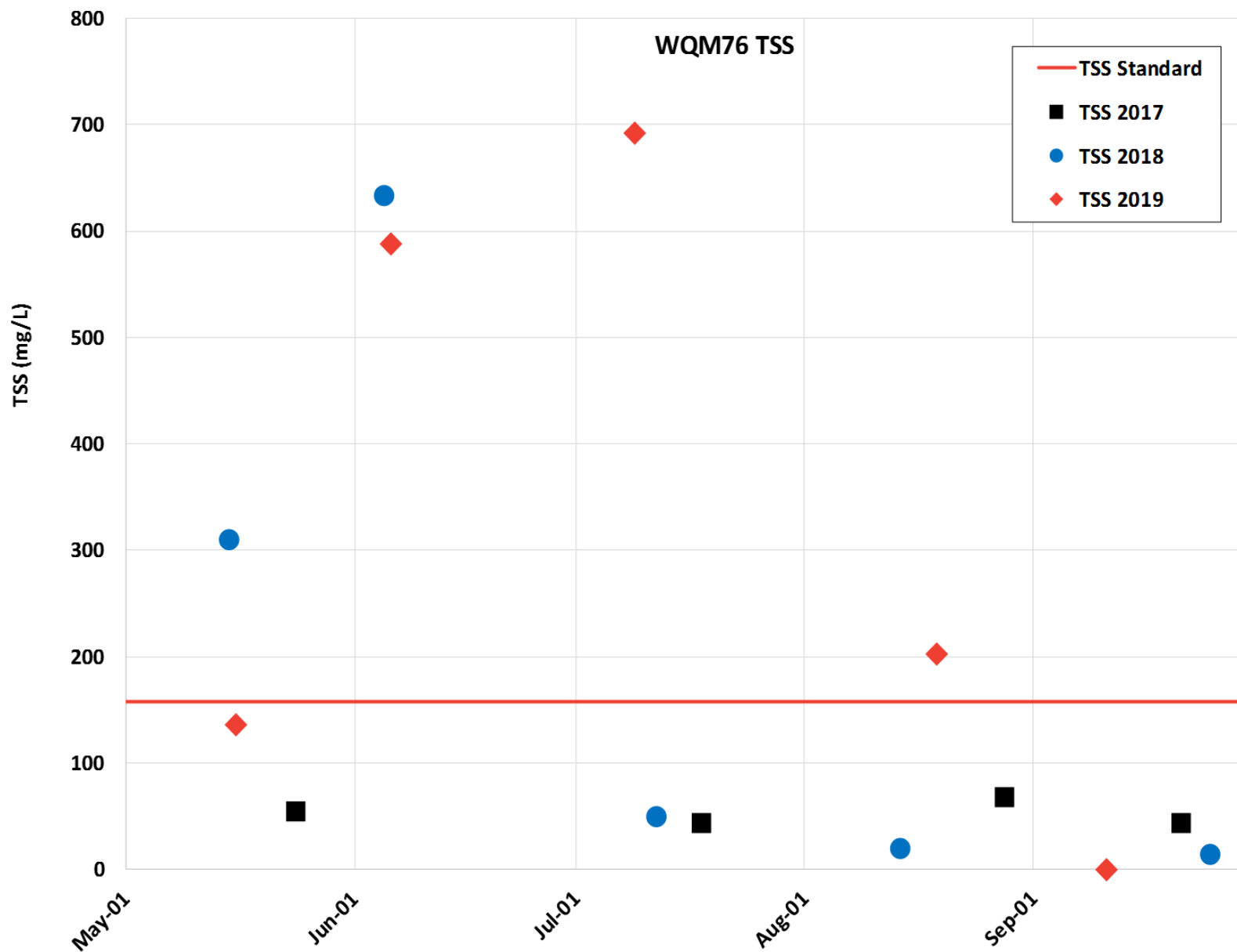


Figure 5-17. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM76 (460676) on the Belle Fourche River from May–September during 2017, 2018, and 2019.

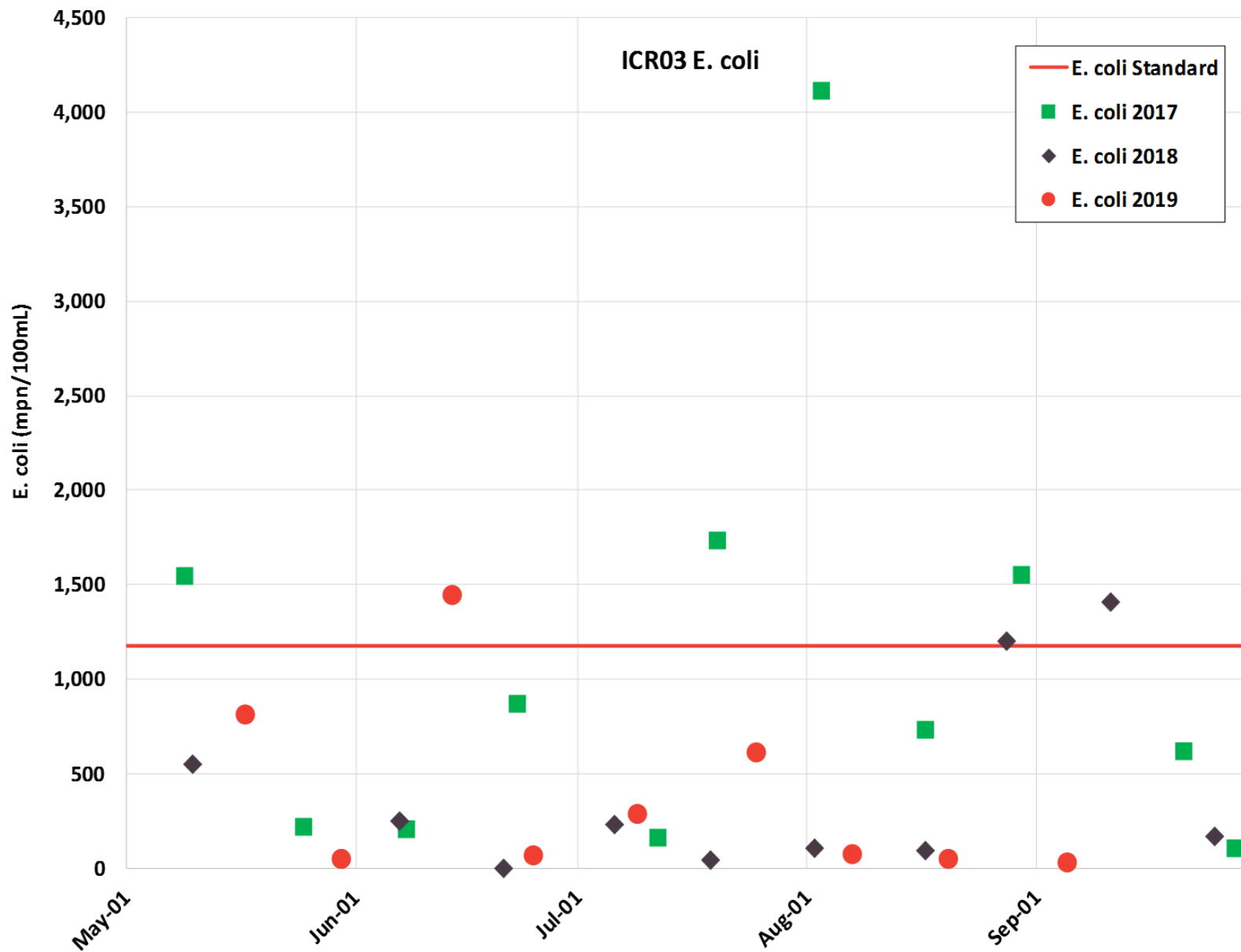


Figure 5-18. *E. coli* Sampling Results at Monitoring Site ICR03 on Indian Creek from May–September during 2017, 2018, and 2019.

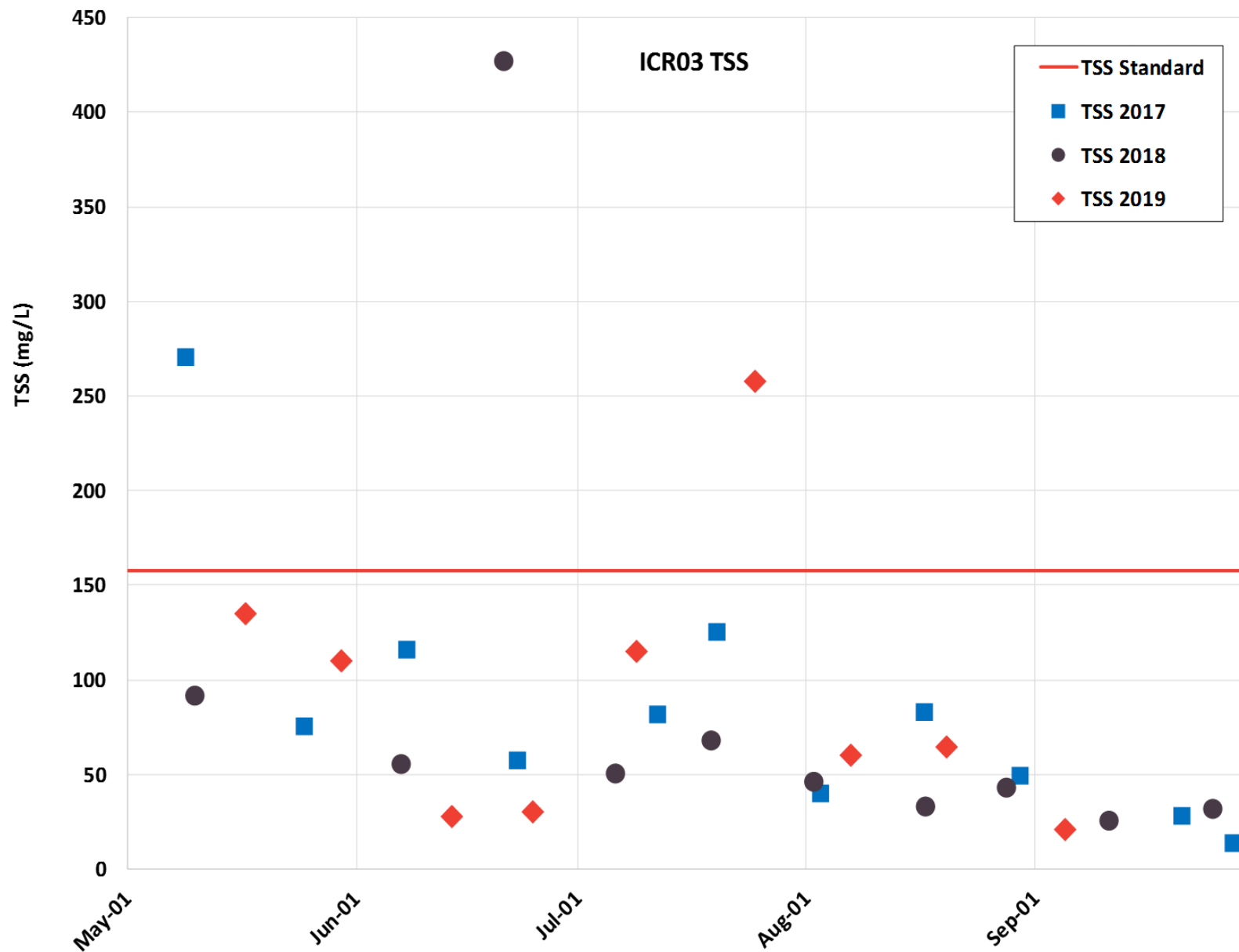


Figure 5-19. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site ICR03 on Indian Creek from May–September during 2017, 2018, and 2019.

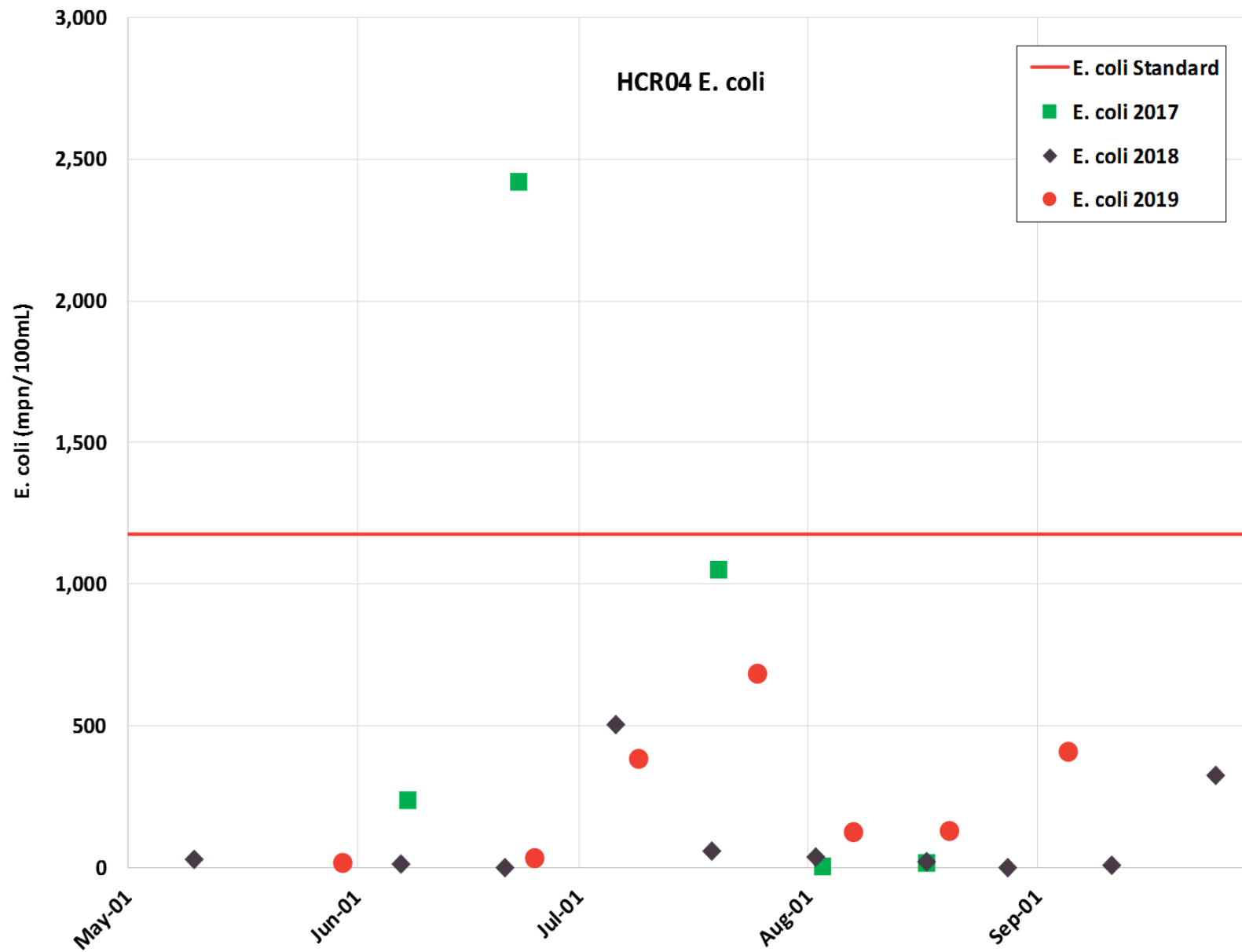


Figure 5-20. *E. coli* Sampling Results at Monitoring Site HCR04 on Horse Creek from May–September during 2017, 2018, and 2019.

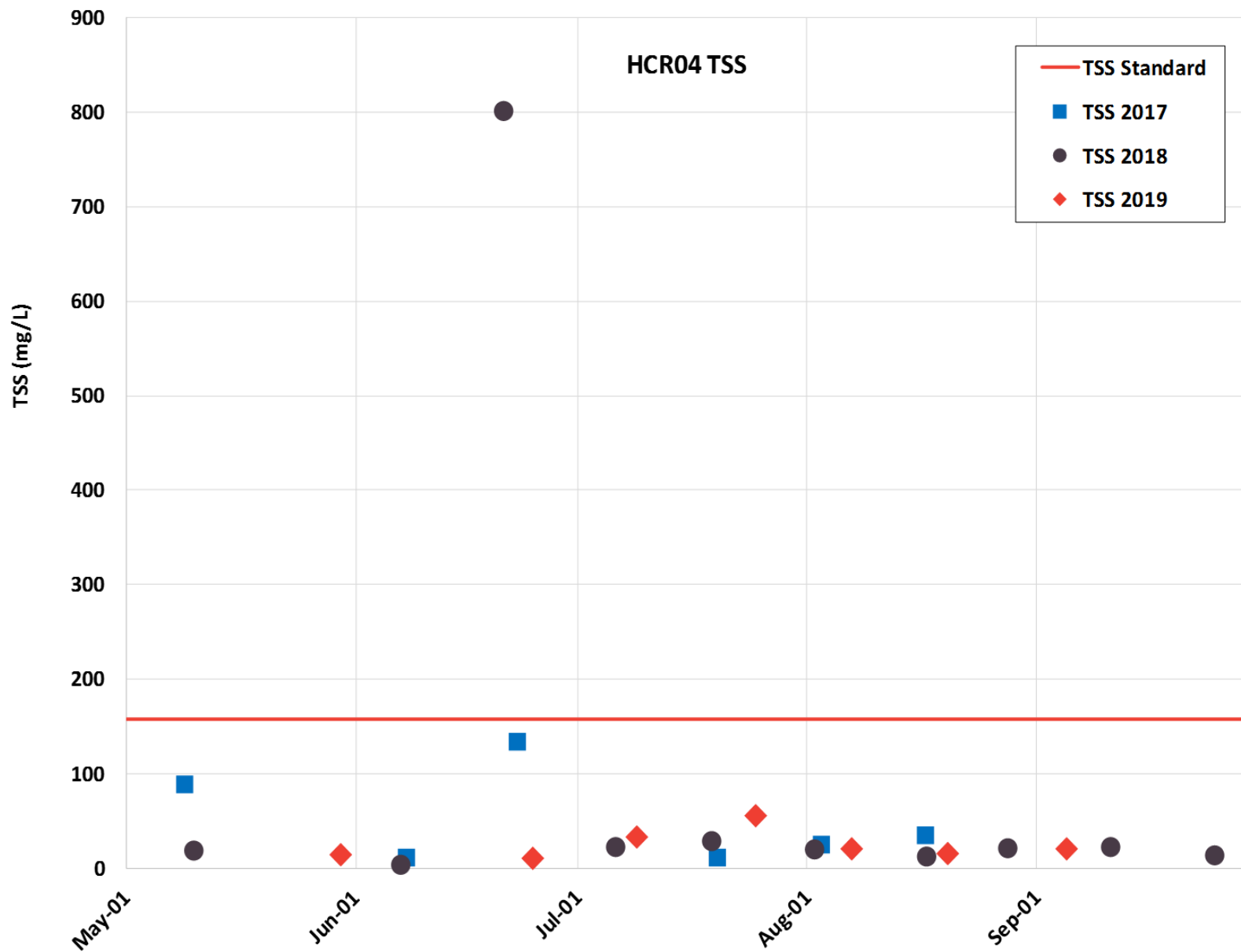


Figure 5-21. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site HCR04 on Horse Creek from May–September during 2017, 2018, and 2019.

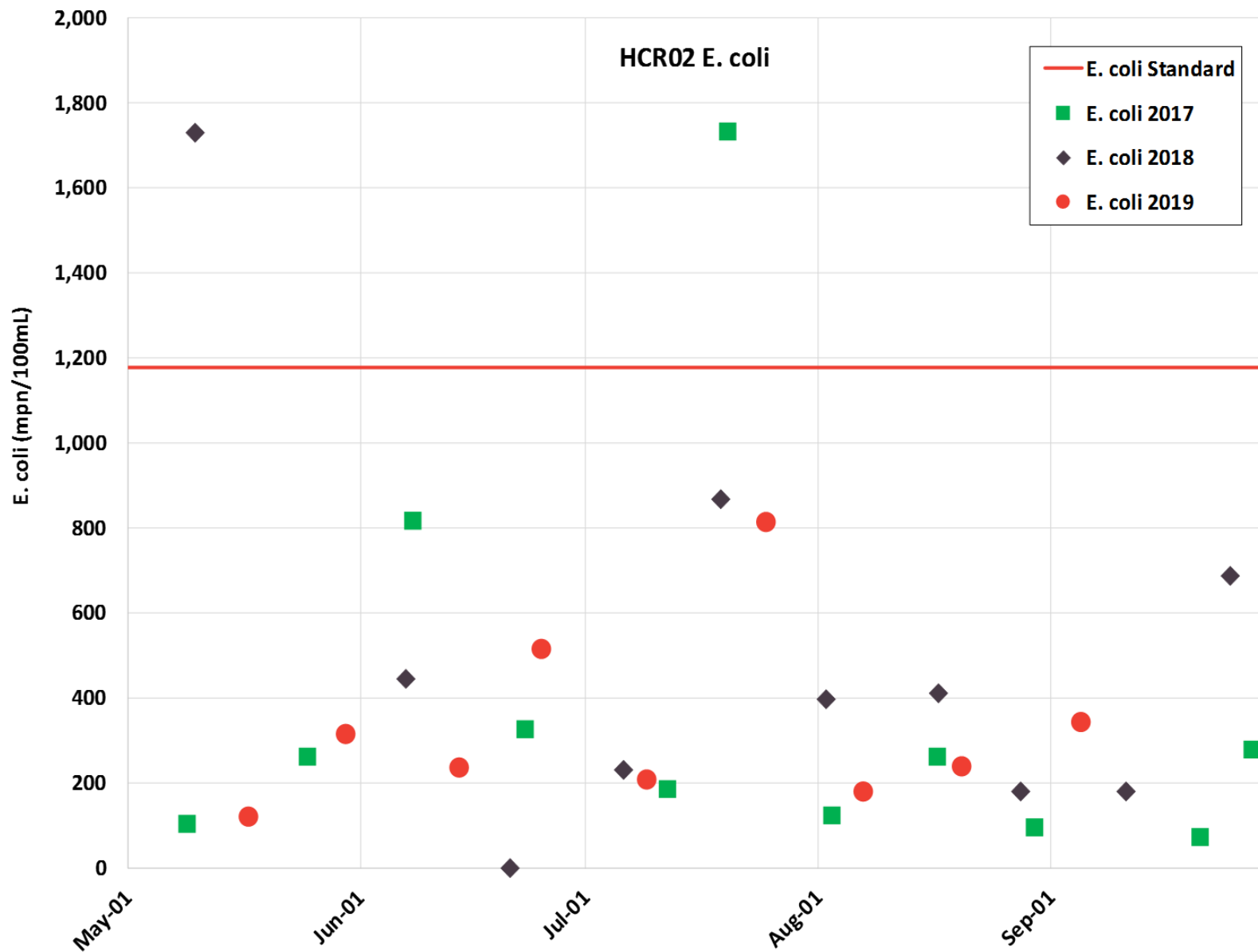


Figure 5-22. *E. coli* Sampling Results at Monitoring Site HCR02 on Horse Creek from May–September during 2017, 2018, and 2019.

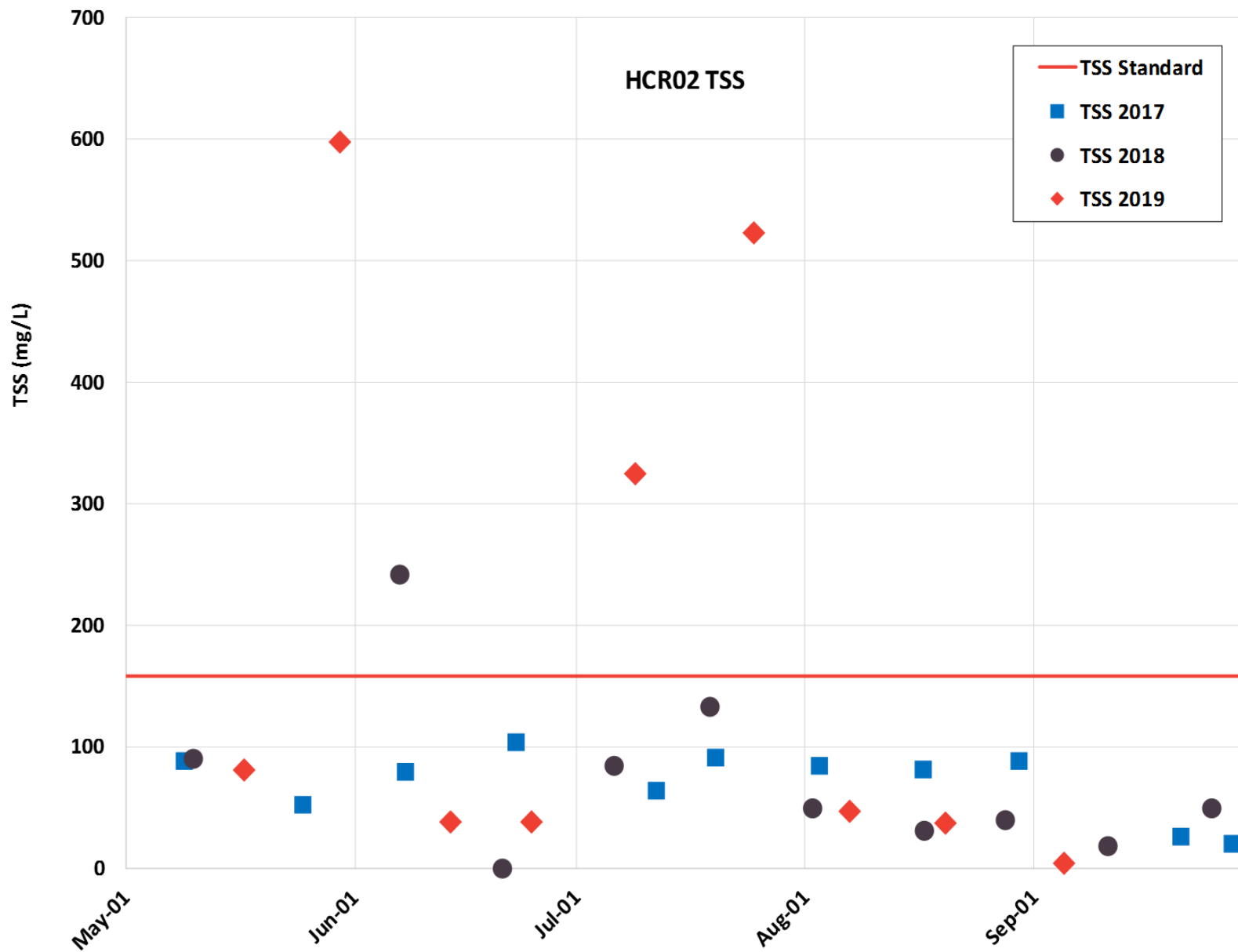


Figure 5-23. Total Suspended Sediment (TSS) Sampling Results at Monitoring Site HCR02 on Horse Creek from May–September during 2017, 2018, and 2019.

6.0 RESULTS AND CONCLUSIONS

The BFRWP's continuing outreach efforts have enhanced public awareness about improving water quality in the watershed. The combination of radio advertisements, brochures, outreach booths, tours, the BFRWP website, and the soil-quality demonstration trailer were successful during this ongoing project. There were many comments received from the public who heard about the BFRWP from radio advertisements. This approach has increased awareness about the watershed amongst the public and spurred project participation amongst ranchers, farmers, irrigators, and landowners. The public's acceptance and support are huge assets when making watershed-wide improvements in water quality.

Producers throughout the watershed have continued to express interest and participate in the BFRWP's project because available technical assistance and financial incentives for irrigation and rangeland BMPs. These BMPs can help make land more productive while restoring water quality, conserving irrigation water, and improving rangeland and soil health. The BFRWP's position is that the financial incentives offered as cost-share is a good balance that enhances the relationships between the BFRWP and agricultural producers. These relationships ensure that the BMP is maintained and continues to improve water quality and provide other natural resource benefits.

Annually, applications submitted to the BFRWP exceed the available funding and a backlog of applications exists which requires a prioritization for funding only projects that directly benefit water quality. However, the consequence to this funding dilemma is that some excellent projects are unfunded because of their location or distance from the impaired waterbody. Also, there continues to be an abundance of local interest to convert flood irrigation to sprinkler systems and to improve riparian and range health. In South Dakota, EQIP funding has increased over the last decade but it has been relatively level since 2016 and more competitive. Therefore, less irrigated acres are being converted and less riparian acres are being improved than estimated for this segment.

Finally, there is growing interest in no-till farming and cover-crop practices to improve overall soil health occurring within the watershed. These conservation practices in combination with sprinkler systems and irrigation water management directly affect water quality in the Belle Fourche River. Continued support of these practices through public and producer outreach efforts are beneficial to the BFRWP's goals of reducing sediment and bacteria in the Belle Fourche River and its tributaries.

7.0 PROJECT BUDGET/EXPENDITURES

The BFRWP received a \$900,000 EPA Section 319 Grant from the SD DENR to continue installing the BMPs that were recommended in the TMDL. The following Tables 7-1a, 7-1b, 7-2a, 7-2b, 7-3a, 7-3b, 7-4a, and 7-4b show the planned and actual budgets of 319, 319/matching funds, nonmatching funds, and combined funds, respectively.

7.1 319 BUDGET

There were no changes to the total 319 budget.

7.2 MATCHING FUNDS BUDGET

All federal-match requirements were met in this project. However, the amount of final match dollars were higher than originally estimated because additional irrigation sprinkler systems were cost-shared at a lower percentage than initially planned.

7.3 NONMATCHING FEDERAL FUNDS BUDGET

Federal nonmatching dollars, including NRCS EQIP, were not available at the time of this final report but will be updated when that information is made available.

8.0 FUTURE ACTIVITY RECOMMENDATIONS

Segment 9 will continue over the next 2 years and will install the BMPs that were outlined in the TMDL. Details for Segment 9 can be found in the BFRWP's project implementation plan. Additional segments will ensure that the overall goal of bringing the Belle Fourche River and other impaired waterbodies within the watershed into compliance with state TSS and bacteria criteria are met. As additional TMDLs are completed for other lakes and tributaries in the watershed, implementing TMDLs that have been developed will be added to the Belle Fourche River Watershed Project.

9.0 REFERENCES

South Dakota Department of Environment and Natural Resources, 2018. *The 2018 South Dakota Integrated Report for Surface Water-Quality Assessment*, prepared by the South Dakota Department of Environment and Natural Resources, Pierre, SD.

Table 7-1a. Planned Budget of 319 Funds

Project Description	Consultants (\$)	Producer (\$)	BFRWP (\$)	Butte Conservation District (\$)	Totals (\$)
Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and <i>E. coli</i>					
Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems					
Product 1. Improved Irrigation Water Delivery and Application					
1a. Replace Open Laterals with Pipe					
1b. Convert 11 Flood-Irrigated Systems to Sprinkler Irrigation Systems		400,000			400,000
1c. Replace Open Ditches to Pipe					
1d. Irrigation Scheduling					
Task 2. Range and Riparian Area BMP Implementation					
Product 2. Implement Riparian/Rangeland BMPs		200,000			200,000
Task 3. Improved Cropping Systems					
Product 3. Implement Cover Crops		200,000			200,000
Objective 2. Conduct Public Outreach, Project Management and Administration					
Task 4. Project Management and Administration					
Product 4. Public Outreach, Project Management and Administration	200,000		21,000	40,000	261,000
Objective 3. Complete Essential Water Quality Monitoring					
Task 5. Water Quality Monitoring to Assess BMPs					
Product 5. Water Quality Monitoring	39,000				39,000
Total	239,000	600,000	21,000	40,000	900,000

Table 7-1b. Actual Budget of 319 Funds

Project Description	Consultants (\$)	Producer (\$)	BFRWP (\$)	Butte Conservation District (\$)	Totals (\$)
Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and <i>E. coli</i>					
Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems					
Product 1. Improved Irrigation Water Delivery and Application					
1a. Replace Open Laterals with Pipe					
1b. Convert 11 Flood-Irrigated Systems to Sprinkler Irrigation Systems		346,623			346,623
1c. Replace Open Ditches to Pipe					
1d. Irrigation Scheduling					
Task 2. Range and Riparian Area BMP Implementation					
Product 2. Implement Riparian/Rangeland BMPs		195,351			195,351
Task 3. Improved Cropping Systems					
Product 3. Implement Cover Crops					
Objective 2. Conduct Public Outreach, Project Management and Administration					
Task 4. Project Management and Administration					
Product 4. Public Outreach, Project Management and Administration	200,000		18,281	40,000	258,281
Objective 3. Complete Essential Water Quality Monitoring					
Task 5. Water Quality Monitoring to Assess BMPs					
Product 5. Water Quality Monitoring	39,000				39,000
Total	239,000	541,974	18,281	40,000	839,255

Table 7-2a. Planned EPA 319 and Matching Funds Budget

EPA 319 and Matching Funds Budget	EPA 319 (\$)	Matching Funds (\$)				WY DEQ (Cash) (\$)	Sum of Matching Funds (\$)
		Producer (Cash and In-kind) (\$)	Butte CD (Cash) (\$)	Lawrence County (Cash) (\$)	BFID (Cash and In- kind) (\$)		
Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and <i>E. coli</i>							
Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems							
Product 1. Improved Irrigation Water Delivery and Application							
1a. Replace Open Laterals with Pipe							
1b. Convert 11 Flood-Irrigated Systems to Sprinkler Irrigation Systems	400,000	550,000					550,000
1c. Replace Open Ditches to Pipe		25,000	25,000				50,000
1d. Irrigation Scheduling							
Task 2. Range and Riparian Area BMP Implementation and Improved Cropping Systems							
Product 2. Implement Riparian/Rangeland BMPs	200,000	80,000					80,000
Task 3. Improved Cropping Systems							
Product 3. Implement Cover Crops							
Objective 2. Conduct Public Outreach, Project Management and Administration							
Task 4. Project Management and Administration							
Product 4. Public Outreach, Project Management and Administration	261,000						
Objective 3. Complete Essential Water Quality Monitoring							
Task 5. Water Quality Monitoring to Assess BMPs							
Product 5. Water Quality Monitoring	39,000			14,000	10,500	14,000	38,500
Total	900,000	655,000	25,000	14,000	10,500	14,000	718,500

Table 7-2b. Actual EPA 319 and Matching Funds Budget

EPA 319 and Matching Funds Budget	EPA 319 (\$)	Matching Funds (\$)					Sum of Matching Funds (\$)
		Producer (Cash and In-kind) (\$)	Butte CD (Cash) (\$)	Lawrence County (Cash) (\$)	BFID (Cash and In-kind) (\$)	WY DEQ (Cash)	
Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and <i>E. coli</i>							
Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems							
Product 1. Improved Irrigation Water Delivery and Application							
1a. Replace Open Laterals with Pipe							
1b. Convert 11 Flood-Irrigated Systems to Sprinkler Irrigation Systems	346,623	815,744					815,744
1c. Replace Open Ditches to Pipe							
1b. Irrigation Scheduling							
Task 2. Range and Riparian Area BMP Implementation and Improved Cropping Systems							
Product 2. Implement Riparian/Rangeland BMPs	195,351	138,822					138,822
Task 3. Improved Cropping Systems							
Product 3. Implement Cover Crops							
Objective 2. Conduct Public Outreach, Project Management and Administration							
Task 4. Project Management and Administration							
Product 4. Public Outreach, Project Management and Administration	258,281						
Objective 3. Complete Essential Water Quality Monitoring							
Task 5. Water Quality Monitoring to Assess BMPs							
Product 5. Water Quality Monitoring	39,000			16,900	12,720	16,900	46,520
Total	839,255	954,566	0	16,900	12,720	16,900	1,001,086

Table 7-3a. Planned Nonmatching Funds Budget

EPA 319 and Nonmatching Funds Budget	Nonmatching Funds						Sum of Nonmatching Funds (\$)
	SD DENR (Federal) (\$)	NRCS EQIP (Federal) (\$)	COE (Federal) (\$)	BOR (Federal) (\$)	USGS (Federal) (\$)	Other Grants (Conservation Commission)	
Objective 1. Implement BMPs Recommended in the Belle Fourche River Watershed TMDL to Reduce TSS and <i>E. coli</i>							
Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems							
Product 1. Improved Irrigation Water Delivery and Application							
1a. Replace Open Laterals with Pipe				100,000			100,000
1b. Convert 21 Flood-Irrigated Systems to Sprinkler Irrigation Systems		150,000					150,000
1c. Replace Open Ditches to Pipe							
1d. Irrigation Scheduling		10,000					10,000
Task 2. Range and Riparian Area BMP Implementation							
Product 2. Implement Riparian/Rangeland BMPs		250,000				134,000	384,000
Task 3. Improved Cropping Systems							
Product 3. Implement Cover Crops		5,000				5,000	10,000
Objective 2. Conduct Public Outreach, Project Management and Administration							
Task 4. Project Management and Administration							
Product 4. Public Outreach, Project Management and Administration							
Objective 3. Complete Essential Water Quality Monitoring							
Task 5. Water Quality Monitoring to Assess BMPs							
Product 5. Water Quality Monitoring	70,000		14,000	7,000	173,400		264,400
Total	70,000	415,000	14,000	107,000	173,400	139,000	918,400

Table 7-3b. Actual Nonmatching Funds Budget

EPA 319 and Nonmatching Funds Budget	Nonmatching Funds						Sum of Nonmatching Funds (\$)
	SD DENR (Federal) (\$)	NRCS EQIP (Federal) (\$)	COE (Federal) (\$)	BOR (Federal) (\$)	USGS (Federal) (\$)	Other Grants (Conservation Commission)	
Objective 1. Implement BMPs Recommended in the Belle Fourche River Watershed TMDL to Reduce TSS and <i>E. coli</i>							
Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems							
Product 1. Improved Irrigation Water Delivery and Application							
1a. Replace Open Laterals with Pipe		NA					NA
1b. Convert 11 Flood-Irrigated Systems to Sprinkler Irrigation Systems		NA					NA
1c. Replace Open Ditches to Pipe		NA					NA
1d. Irrigation Scheduling		NA					NA
Task 2. Range and Riparian Area BMP Implementation							
Product 2. Implement Riparian/Rangeland BMPs		NA					NA
Task 3. Improved Cropping Systems							
Product 3. Implement Cover Crops		NA					NA
Objective 2. Conduct Public Outreach, Project Management and Administration							
Task 4. Project Management and Administration							
Product 4. Public Outreach, Project Management and Administration							
Objective 3. Complete Essential Water Quality Monitoring							
Task 5. Water Quality Monitoring to Assess BMPs							
Product 5. Water Quality Monitoring	84,500			7,580	164,400		256,480
Total	84,500			7,580	164,400		256,480

Table 7-4a. Planned Total Budget

Total Budget	EPA 319 (\$)	Matching Funds (\$)	Nonmatching Funds (\$)	Line Item Total (\$)
Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and <i>E. coli</i>				
Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems				
Product 1. Improved Irrigation Water Delivery and Application				
1a. Replace Open Laterals with Pipe			100,000	100,000
1b. Convert 11 Flood-Irrigated Systems to Sprinkler Irrigation Systems	400,000	550,000	150,000	1,100,000
1c. Replace Open Ditches to Pipe		50,000		50,000
1d. Irrigation Scheduling			10,000	10,000
Task 2. Range and Riparian Area BMP Implementation				
Product 2. Implement Range/Rangeland BMPs	200,000	80,000	384,000	664,000
Task 3. Improved Cropping Systems				
Product 3. Implement Cover Crops			10,000	10,000
Objective 2. Conduct Public Outreach, Project Management and Administration				
Task 4. Project Management and Administration				
Product 4. Public Outreach, Project Management and Administration	261,000			261,000
Objective 3. Complete Essential Water Quality Monitoring				
Task 5. Water Quality Monitoring to Assess BMPs				
Product 5. Water Quality Monitoring	39,000	38,500	264,400	341,900
Total	900,000	718,500	918,400	2,536,900

Table 7-4b. Actual Total Budget

Total Budget	EPA 319 (\$)	Matching Funds (\$)	Nonmatching Funds (\$)	Line Item Total (\$)
Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and <i>E. coli</i>				
Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems				
Product 1. Improved Irrigation Water Delivery and Application				
1a. Replace Open Laterals with Pipe				
1b. Convert 11 Flood-Irrigated Systems to Sprinkler Irrigation Systems	346,623 (29.8%)	815,744 (70.2%)	NA	1,162,367 (55.4%)
1c. Replace Open Ditches to Pipe				
1d. Irrigation Scheduling			NA	
Task 2. Range and Riparian Area BMP Implementation				
Product 2. Implement Range/Rangeland BMPs	195,351 (58.5%)	138,822 (41.5%)	NA	334,173 (15.9%)
Task 3. Improved Cropping Systems				
Product 3. Implement Cover Crops			NA	
Objective 2. Conduct Public Outreach, Project Management and Administration				
Task 4. Project Management and Administration				
Product 4. Public Outreach, Project Management and Administration	258,281 (100%)			258,281 (12.3%)
Objective 3. Complete Essential Water Quality Monitoring				
Task 5. Water Quality Monitoring to Assess BMPs				
Product 5. Water Quality Monitoring	39,000 (11.4%)	46,520 (13.6%)	256,480 (75.0%)	342,000 (16.3%)
Total	839,255 (40.0%)	1,001,086 (47.7%)	256,480 (12.2%)	2,096,821 (100.0%)