BELLE FOURCHE RIVER WATERSHED MANAGEMENT AND PROJECT IMPLEMENTATION PLAN SEGMENT 9 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 2022

RESPEC

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PREPARED BY

Morghan Hurst
Justin Krajewski

RESPEC
3824 Jet Drive
Rapid City, South Dakota 57703

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

OCTOBER 2022

Project Number 3734/W0235.21001

EXECUTIVE SUMMARY

Project Title:	Belle Fourche River Watershed Management and Project Implementation Plan Segment 9
Grant Number(s):	99818519, 99818520; 99818521
Project Start Date:	July 31, 2019
Project Completion Date:	August 31, 2022
Funding:	
Total EPA 319 Grant Budget:	$1,312,000
Total Matching Funds Budget:	$893,000
Total Agreement Amount:	$2,205,000
Total Nonmatching Funds Budget:	$1,997,000
Total Budget:	**$4,202,000**
Budget Revisions:	
May 2020	
319 Award	$283,000
July 2021	
319 Award	$213,000
Total Expenditures of EPA Funds:	$1,264,655
Total 319 Matching Funds Accrued:	$847,999
Total Nonmatching Funds Accrued:	$1,521,369
Total Expenditures:	**$3,634,023**

The Belle Fourche River Watershed Management and Project Implementation Plan Segment 9 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. The goals of Segment 9 included the following:

- Continue implementing BMPs in the watershed to reduce TSS and working toward the goal of 158 milligrams per liter (mg/L) in impaired reaches, which currently include all Segments 1–8 of the Belle Fourche River and the priority impaired Horse Creek Watershed.
- Continue implementing BMPs to reduce *E. coli* in the Belle Fourche River and the priority Horse Creek Watershed to not exceed 1,178 most probable number per 100 milliliters (mpn/100 mL). Currently, Belle Fourche River Reaches 1 (Wyoming to Fruitdale), 3 (Whitewood to Willow Creek) and 5 (Alkali Creek to Mouth) are impaired for bacteria.
- Continue public outreach programs to stakeholders within the Belle Fourche River Watershed.
- Continue tracking the progress made toward reaching the goals of the TMDL to ensure that the BMPs are effective and that the proper BMPs are implemented.

The BFRWP is a 501c3 organization that has been committed to conservation within the Belle Fourche Watershed for more than 20 years. During Segment 9, several activities were completed to decrease sediment runoff by improving irrigation water management on irrigated fields in the Belle Fourche River Watershed. A total of 12 center-pivot sprinkler systems on 460 acres were installed with 319 funding to replace existing surface-irrigated fields. There were 12 producers that completed irrigation scheduling to optimize irrigation application on an estimated 460 acres.

Riparian-rangeland areas were improved in the watershed with 14 producers participating in 16 riparian-rangeland improvement projects during this segment. These projects included 15 water developments with pipelines, tanks, and waterers. There were three of these projects that installed riparian and pasture cross fences. In addition, a riparian fencing and streambank stabilization project on the Belle Fourche River was completed. The projects involved over 920 riparian acres in the watershed.

In addition to 319 projects, another 7,920 feet of on-farm earthen ditches were replaced with buried pipelines funded by the Butte CD with grants from the State Conservation Commission along with another 30,000 feet of laterals replaced with pipelines by the BFID. Additionally, the Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program (CSP) projects installed many irrigation and riparian-rangeland conservation practices within the watershed. Producers used NRCS funding to install 12,590 feet of irrigation pipelines, 2 sprinkler systems, 697 acres of irrigation water management along with installing more than 23 miles of fencing, 79 miles of livestock water pipelines, and 130 livestock watering facilities.

Approximately 31 public education and outreach events were completed during this project segment, including public meetings, informational booths, website maintenance, radio sound bites, rainfall simulator demonstrations, three virtual irrigation webinars, and a watershed irrigation tour. A bulk mailing to more than 500 producers about the BFRWP cost-share funding opportunities was also completed. Several informative sound bites were broadcasted on local radio to increase public awareness of water quality issues and to promote project involvement.

Since 2019, the BFRWP's Soil-Quality/Rainfall Simulator Trailer (https://www.rainfallsimulator.com) was used to demonstrate the effects of soil erosion to agricultural producers, students, and the public at over 20 public outreach events reaching over 300 people. The BFRWP hosted 13 quarterly meetings with partner organizations to provide updates on project work and progress being made. The BFRWP website (www.bellefourchewatershed.org) continues to be updated with information. Outreach activities have increased producer participation with BFRWP activities and resulted in several producers requesting assistance with BMP installation. The BFRWP's outreach and education efforts have reached at least 12,000 people during this project segment.

Also, during Segment 9, the BFRWP and SD DANR monitored water quality at five sites on the Belle Fourche River, three sites on Horse Creek and one site on Indian Creek from May through September. These water quality sampling results were analyzed to determine BMP effectiveness and beneficial use attainment on the river and creek. Preliminary estimates based on BMP installation on BFRWP projects indicate that TSS was reduced by 2,605 tons per year, in this segment. The amount brings the cumulative TSS load reduction to 181,640 tons per year. In addition to TSS, the installed BMPs are estimated to reduced nitrogen by 1,141 pounds per year, and phosphorus by 966 pounds per year.

ACKNOWLEDGEMENTS

The BFRWP would like to thank those who were involved with this segment of implementing BMPs and conservation practices within the Belle Fourche River Watershed. The efforts of the following individuals and organizations are greatly appreciated and were essential to the success of this project:

- Individual ranchers, farmers, and landowners within the watershed
- Irrigation and livestock water products suppliers, dealers, and contractors within the watershed
- South Dakota Department of Agriculture and Natural Resources
- Butte Conservation District
- Natural Resources Conservation Service
- Belle Fourche Irrigation District
- Bird Conservancy of the Rockies
- Bureau of Land Management
- Elk Creek Conservation District
- Lawrence County Conservation District
- Lawrence County
- Pheasants Forever, Inc. and Quail Forever
- South Dakota Association of Conservation Districts
- South Dakota Conservation Commission
- South Dakota Game Fish and Parks
- South Dakota Grassland Coalition
- South Dakota School of Mines & Technology
- South Dakota Soil Health Coalition
- South Dakota State University
- South Dakota State Historical Society – Archaeological Research Center
- The Nature Conservancy
- US Army Corp of Engineers
- US Bureau of Reclamation
- US Environmental Protection Agency
- US Fish and Wildlife Service
- US Geological Survey.

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1.0 INTRODUCTION

The Belle Fourche River in South Dakota flows east from the Wyoming-South Dakota state line just west of Belle Fourche. 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 river flows southeast through Belle Fourche then flows east past Nisland and Vale then flows southeast past Hereford and then flows east into the Cheyenne River northeast of Elm Springs. 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 2-1. The watershed drains portions of Butte, Lawrence, and Meade Counties and includes portions of two 8-digit Hydrologic Units (HUC): Lower Belle Fourche (10120202) and Redwater (10120203). Communities in the watershed include Belle Fourche, Deadwood, Elm Springs, Fruitdale, Lead, Newell, Nisland, Spearfish, Sturgis, Union Center, and Vale. The U.S Census Bureau 2021 population estimates indicate that Spearfish is the largest community (12,358) in the watershed followed by Sturgis (7,107) and Belle Fourche (5,699) [U.S. Census Bureau, 2021].

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 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 determined as impaired in South Dakota's 2022 Integrated Report (2022 IR) because of elevated total suspended solids (TSS) and *Escherichia coli* (*E. coli*) concentrations. However, the Belle Fourche River from the Redwater River to Alkali Creek is currently only listed for *E. coli*. In the 2022 IR, Horse Creek was listed for TSS and delisted for *E. coli*. A reach on Elm Creek was listed for TSS, specific conductivity, and *E. coli*. Also in the 2022 IR, two reaches on Whitewood Creek were listed for pH and two reaches were listed for *E. coli*. Table 2-1 is a summary of the 2022 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 2-2.

The Belle Fourche River Watershed Partnership (BFRWP) is a 501c3 organization that has been committed to conservation within the Belle Fourche Watershed for more than 20 years. Voting board members include the District Chairs from the Butte, Lawrence, and Elk Creek Conservation Districts, and the BFID. Other active members include state and federal natural resource agencies, agricultural producers, and the public. 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 from the South Dakota Department of Agriculture and Natural Resources (SD DANR) to begin implementing recommended BMPs within the watershed.

Currently, the BFRWP is in its 19th year of implementing BMPs in the watershed and has been funded into 2025 with the Segment 10 Project. Funding and support for the project is provided by the local ranchers and farmers, SD DANR, Natural Resources Conservation Service (NRCS), BFID, Butte Conservation District, Lawrence County Conservation District, Elk Creek Conservation District, Wyoming Department of Environmental Quality (WDEQ), South Dakota State University (SDSU), and the South Dakota School of Mines & Technology (SDSM&T), 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.

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 have been accomplished and that are likely to be attained. The project goal was to bring the Belle Fourche River into compliance for its warm-water permanent fish life and immersion recreation beneficial uses by implementing the BMPs included in the 10-year implementation plan and by implementing additional BMPs recommended from the *E. coli* TMDL in the bacteria-impaired reaches of the Belle Fourche River. The goals of Segment 9 included the following:

- Continue implementing BMPs in the watershed to reduce TSS and working toward the goal of 158 milligrams per liter (mg/L) in impaired reaches, which included Segment 1 (Wyoming border to Redwater River), Segment 4 (Willow Creek to Alkali Creek), and Segment 5 (Alkali Creek to mouth) of the Belle Fourche River and the priority impaired Horse Creek Watershed.
- Continue implementing BMPs in the watershed to reduce *E. coli* in the Belle Fourche River which included all Segments 1–8 of the Belle Fourche River and the priority impaired Horse Creek Watershed.
- Continue public outreach programs to stakeholders within the Belle Fourche River Watershed.
- Continue tracking the progress made toward reaching the goals of the TMDL to ensure that the BMPs are effective and that the proper BMPs are implemented.

The BFRWP was the project sponsor for this 3-year Segment 9 project that implemented BMPs to reduce *E. coli* and TSS pollutants. These BMPs included: (1) installing irrigation sprinkler systems, (2) implementing grazing management systems, (3) installing riparian/bank stability improvements, (4) implementing improved cropping systems, and (5) improving livestock feeding areas.

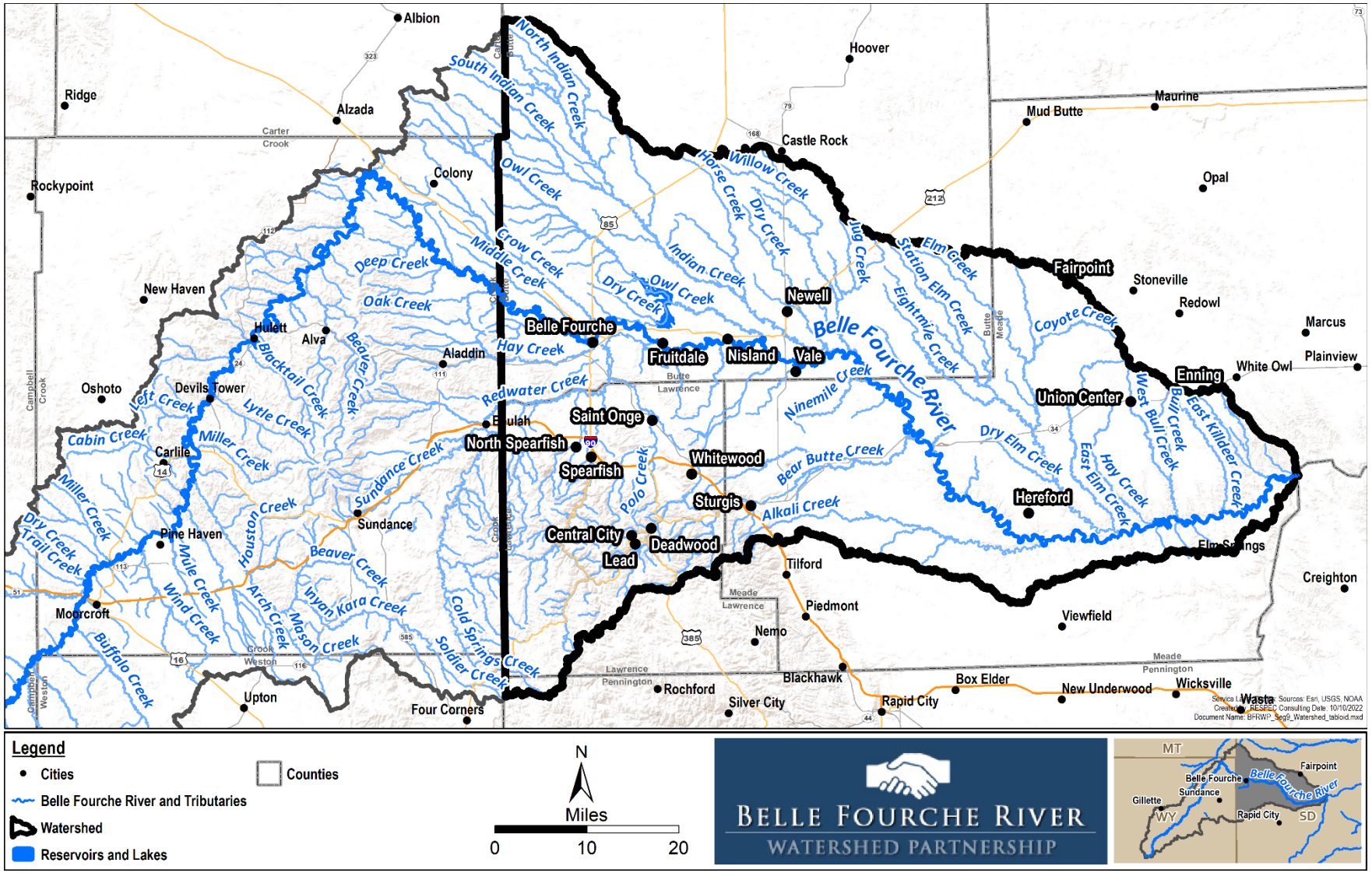

Figure 2-1. Location of the Belle Fourche River Watershed within South Dakota.

Table 2-1. Summary for Impaired Streams Approved TMDLs within the Belle Fourche River Watershed included in the South Dakota 2022 Integrated Report

Stream	Segment Descriptions (Assessment Unit Identifier – AUID)	Beneficial Use	Impairment Parameter	Water Quality Criteria
Belle Fourche River	Wyoming to Fruitdale	Warmwater Permanent Fish Life	TSS (mg/L)	90[1]/158[2]
Belle Fourche River	Fruitdale to Whitewood Creek	Warmwater Permanent Fish Life	TSS (mg/L)	90[1]/158[2]
Bear Butte Creek	Strawberry Cr. to near Bear Den Mtn (SD-BF-R- BEAR_BUTTE_02)	Warmwater Permanent Fish Life	TSS (mg/L)	90[1]/158[2]
Belle Fourche River	Wyoming Border to Redwater River (SD-BF-R-BELLE_FOURCHE_01)	Immersion Recreation	Fecal coliform, *E. coli* (per 100mL)[4]	126[6]/235[2]
		Warmwater Permanent Fish Life	TSS (mg/L)	90[1]/158[2]
Belle Fourche River	Whitewood Creek to Willow Creek (SD-BF-R-BELLE_FOURCHE_03)	Warmwater Permanent Fish Life	TSS (mg/L)	90[1]/158[2]
Belle Fourche River	Willow Creek to Alkali Creek (SD-BF-R-BELLE_FOURCHE_04)	Warmwater Permanent Fish Life	TSS (mg/L)	90[1]/158[2]
Belle Fourche River	Alkali Creek to Mouth (SD-BF-R-BELLE_FOURCHE_05)	Warmwater Permanent Fish Life	TSS (mg/L)	90[1]/158[2]
		Immersion Recreation	Fecal coliform/*E. coli* (per 100mL)[4]	126[6]/235[2]
Deadwood Creek	Rutabaga Gulch to Whitewood Creek (SD-BF-R-DEADWOOD_01)	Immersion Recreation	*E. coli* (per 100mL)[4]	126[6]/235[2]
Horse Creek	Indian Creek to Mouth (SD-BF-R-HORSE_01_USGS)	Warmwater Semipermanent Fish Life	TSS (mg/L)	90[1]/158[2]
Strawberry Creek	Bear Butte Creek to S5, T4N, R4E (SD-BF-R-STRAWBERRY_01)	Coldwater Marginal Fish Life Fish and Wildlife Prop. Rec. Stock	Cadmium[2]	2[7]/0.25[7]
West Strawberry Creek	Headwaters to mouth (SD-BF-R-W_STRAWBERRY_01)	Limited Contact Recreation	Fecal coliform/*E. coli* (per 100mL)[4]	630[6]/1,178[2]
Whitewood Creek	Deadwood Creek to Spruce Gulch (SD-BF-R-WHITEWOOD_03)	Immersion Recreation	Fecal coliform/*E. coli* (per 100mL)[4]	126[6]/235[2]

(1) 30-day average as defined in ARSD 74:51:01:01(60); (2) daily maximum; (4) May 1 through September 30; (5) Refer to Appendix A of Chapter 74:51:01; (6) Geometric mean as defined in ARSD 74:51:01:01(24) and 74:51:01:50-51; (7) Refer to Standards for Toxic Pollutants Table of Chapter 74:51:01; (10) See 74:51:01:07; For a complete list of WQS refer to ARSD 74:51.

Table 2-2. Summary for Delisted Impaired Streams within the Belle Fourche River Watershed included in the South Dakota 2022 Integrated Report

Stream	Segment Descriptions (Assessment Unit Identifier – AUID)	Beneficial Use	Impairment Parameter	Delisting Reason
Horse Creek	Indian Creek to Mouth (SD-BF-R-HORSE_01_USGS)	Limited Contact Recreation	*E. coli* (per 100mL)[4]	WQS attained; based on new data
Whitewood Creek	Gold Run Creek to Deadwood Creek (SD-BF-R-WHITEWOOD_02)	Immersion Recreation	*E. coli* (per 100mL)[4]	WQS attained; based on new data
Whitewood Creek	Crow Creek to Mouth (SD-BF-R-WHITEWOOD_07)	Limited Contact Recreation	*E. coli* (per 100mL)[4]	WQS attained; based on new data
Belle Fourche River	Redwater River to Whitewood Cr (SD-BF-R-BELLE_FOURCHE_02)	Warmwater Permanent Fish Life	TSS (mg/L)	WQS attained; based on new data
Belle Fourche River	Whitewood Cr to Willow Cr (SD-BF-R-BELLE_FOURCHE_03)	Warmwater Permanent Fish Life	TSS (mg/L)	WQS attained; based on new data

(4) May 1 through September 30.

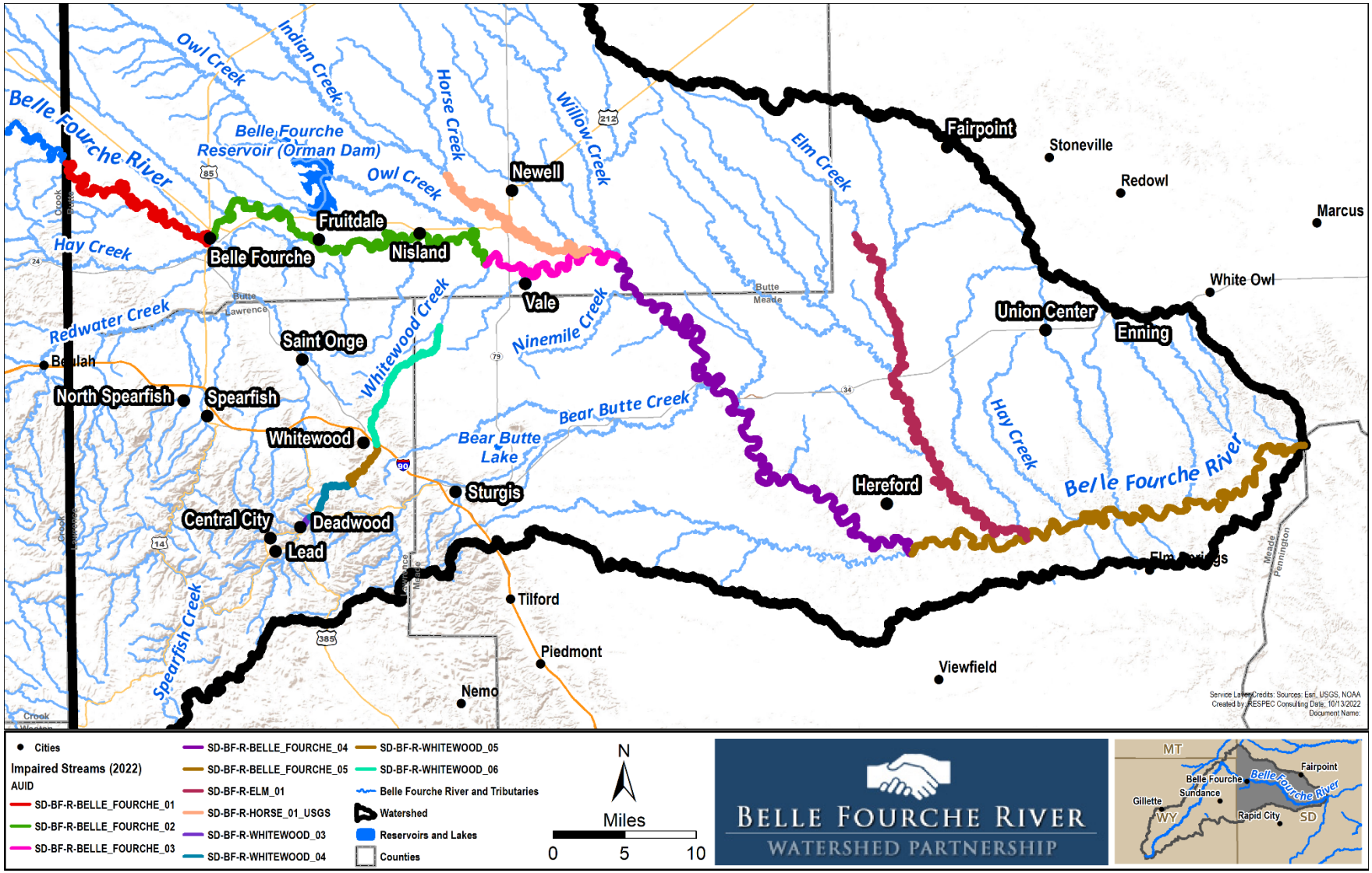

Figure 2-2. Impaired Stream Reaches on the Belle Fourche River, Elm Creek, Horse Creek, and Whitewood Creek in South Dakota.

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.

During Segment 9, there were 12 irrigation conversion projects completed that included 12 sprinkler systems on 460 acres, irrigation scheduling on 460 acres, 31,869 feet of on-farm earthen field ditches replaced with 8,068 feet of pipelines, 7,290 feet of on-farm earthen ditches replaced with pipelines, and approximately 30,000 feet of laterals replaced with pipelines by the BFID.

Additionally, there were 16 riparian/range projects completed that included 43,723 feet of fencing, 48,124 feet of livestock water pipelines, 31,287 gallons in 35 livestock tanks and 24 waterers (59 total) on approximately 920 acres of riparian and 10,740 acres of rangeland areas. Also, a riparian fencing and streambank stabilization project on the Belle Fourche River was completed during Segment 9.

Objective 2. Conduct Public Outreach and Education, Implementation Record Keeping, Cultural Resources, Engineering, Audits, Report Writing, and Future Grants Writing.

Approximately 31 outreach activities were conducted and reached over 12,000 people. The BFRWP hosted 13 quarterly meetings with partner organizations to coordinate on project work and progress. The BFRWP website (www.bellefourchewatershed.org) continues to be updated with information. Also, there were 6 informational booths, radio sound bites, rainfall simulator demonstrations, and a watershed irrigation tour. A bulk mailing to over 500 producers about cost-share opportunities was performed. Several informative sound bites were broadcast on local radio to increase awareness of water quality issues and to promote project involvement. Three virtual webinars for irrigation water management and soil health were held online with more than 20 attendees.

The BFRWP's Soil-Quality/Rainfall Simulator Demonstration Trailer (https://www.rainfallsimulator.com) was purchased by the BFRWP in 2009 to demonstrate the effects of erosion on soils and how they relate to water quality in the watershed. Since 2019, the BFRWP's trailer was used to demonstrate the effects of soil erosion to agricultural producers, students, and the public at over 20 public outreach events reaching over 300 people. Additionally, two Grant Tracking and Reporting System (GRTS) reports and this final report were written. These activities are discussed in Chapter 4.0 of this report.

Objective 3. Complete Essential Water Quality Monitoring and TMDL Development.

During Segment 9, water quality samples were collected by the SD DANR at three WQM stations, 460681 (WQM81), 460880 (WQM21), 460676 (WQM76). Also, the BFRWP's consultant, RESPEC LLC, sampled seven sites, 460130 (WQM130), 460683 (WQM83), 460681 (WQM81), ICR03, HCR02, HCR10, and HCR11 from May through September in 2020, 2021, and 2022. Water quality data is discussed in Chapter 5.0 of this report.

Table 2-3 lists the project objectives along with their products, planned milestone completion dates, and actual milestone completion dates. **All BMPs were completed by the August 2022 deadline.**

Table 2-3. 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 *E. coli*				
Product 1. Improve Irrigation Delivery/Application 1a. Replace BFID Open Laterals with Pipe 1b. Convert Flood Irrigation to Sprinklers 1c. Replace Open On-Farm Ditches to Pipe	15,000 feet 1,500 acres (19 pivots) 6,000 feet	30,000 feet 457 acres (12 pivots) 39,160 feet	July 2022 July 2022 July 2022 July 2022	August 2022 August 2022 August 2022 August 2022
Product 2. Implement Riparian and Range BMPs	4,000 riparian acres 2,000 range acres	920 riparian acres 10,740 range acres	July 2022	August 2022
Product 3. Implement Cover Crops	200 acres	230 acres	July 2022	August 2022
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	13 meetings, 1 website, 1 tour, 3 webinars, 6 booths, and >20 soil health/rainfall demos	July 2022	August 2022
Objective 3. Complete Water Quality Monitoring				
Product 5. Water Quality Monitoring - Collect samples and measure flow	5 USGS gage stations 5 WQM stations 3 Horse Creek sites 1 Indian Creek site	5 USGS gage stations 5 WQM stations 3 Horse Creek sites 1 Indian Creek site	July 2022	August 2022

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 31 educational and outreach activities, which led to more project participation, completion of annual GRTS reports and this final report, and three 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 2,605 tons per year. Table 2-4 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 2-4. 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	460	2,162	1,141	966
Managed Grazing	11,660	443	700	175
Totals	**12,120**	**2,605**	**1,840**	**1,141**

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, and NRCS along with the EPA's 319 program. The following BMPs were installed:

- Eleven (12) irrigation sprinkler systems to replace flood irrigation on 460 acres
- BFID converted 30,000 feet open, earthen laterals to underground pipelines
- Ten (10) producers converted 31,869 feet on-farm earthen ditches to underground pipelines
- Sixteen (16) riparian/rangeland projects with 59 livestock tanks/waterers, 48,124 feet of pipelines, 34,539 feet of riparian fencing, 9,184 of pasture cross-fencing were installed
- Fifteen (15) producers improved 920 riparian acres and 10,740 rangeland acres
- Improved cropping systems on over 230 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 9.

Table 3-1. Best Management Practices Implemented

Best Management Practice	Planned This Segment	Installed This Segment	Installed to Date
Sprinkler Irrigation Systems	19 on 1,500 acres	12 on 460 acres	145
Managed Riparian Grazing	4,000 acres	920 acres	5,920
Managed Upland Grazing	2,000 acres	10,740 acres	64,140
Improved Cropping Practices	200 acres	230 acres	630
Complete Essential Water Quality	14 sites	14 sites	N/A
Information and Education Events	24	31	N/A

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	12 projects on 460 acres	$532,379 (44%)	$664,911 (56%)	$1,197,290
Managed Riparian Grazing	16 projects on 920 riparian acres and 10,740 range acres	$293,207 (66%)	$147,809 (34%)	$441,016
Total		**$825,586 (50%)**	**$812,720 (50%)**	**$1,638,306**

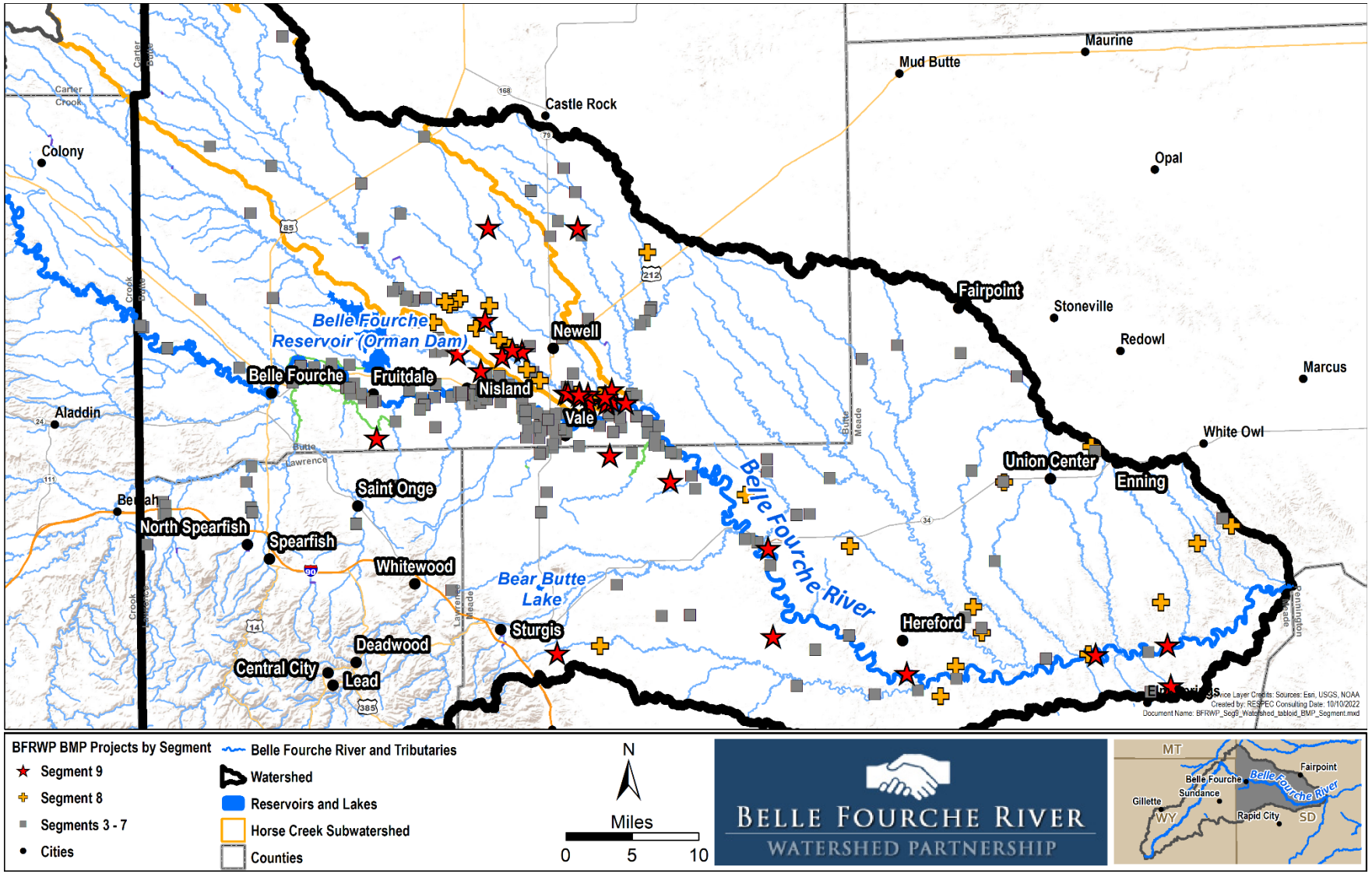

Figure 3-1. General Location of Completed Best Management Practices by Project Segment within the Belle Fourche River Watershed.

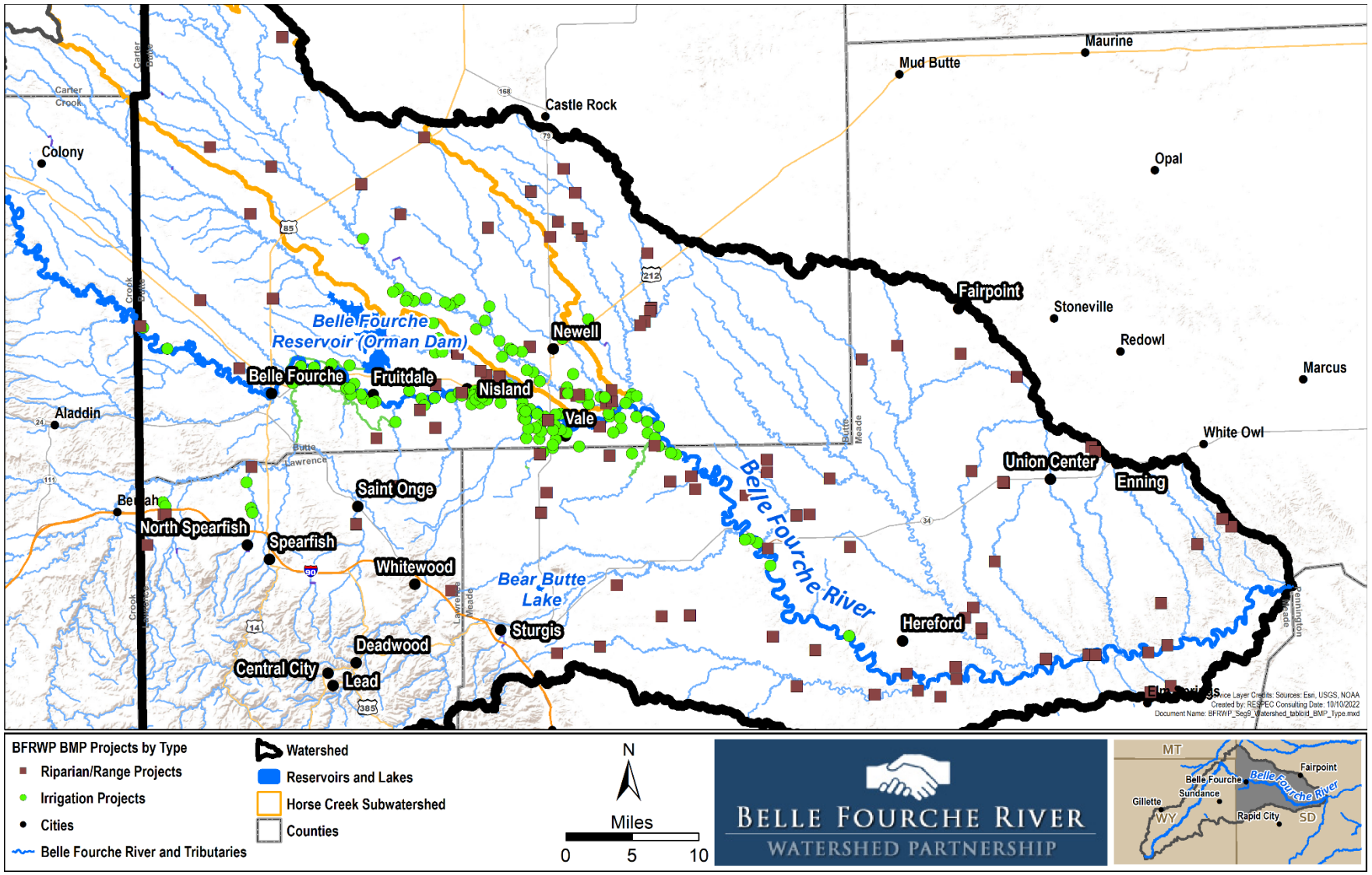

Figure 3-2. General Location of All Completed Producer-Irrigation and Riparian/Range Best Management Practices within the Belle Fourche River Watershed.

3.1 REDUCING NONUSED IRRIGATION WATER AND IMPROVING EFFICIENCY

Twelve center-pivot sprinklers were installed to replace flood irrigation on 460 acres during Segment 9. Figure 3-3 shows a flood-irrigated field and inefficient water use that leads to increased sediment runoff. Figure 3-4 shows a cost-share funded center-pivot irrigation system that reduces soil and water runoff from the field. Figure 3-5 shows a typical on-farm earthen irrigation ditch before conversion to buried underground pipe to prevent sediment and water runoff. Figure 3-6 shows a cost-share funded irrigation pipeline conversion from earthen ditch that reduces soil and water runoff from the field. There have been 254 center-pivot sprinklers on 20,390 acres installed in the watershed. The BFRWP has partnered on 145 of 254 sprinklers with the other 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 26 percent (20,390 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. During this segment, 12 producers scheduled irrigation application on 460 acres. Also, during Segment 9 there were 31,869 feet on-farm earthen ditches that were replaced with 8,068 feet of underground pipelines. Another 7,920 feet of on-farm earthen ditches were replaced with buried pipelines funded by the Butte CD with grants from the State Conservation Commission along with another 30,000 feet of laterals replaced with pipelines by the BFID. In addition to 319 projects, producers used NRCS EQIP funds to install many several irrigation conservation practices, including 12,590 feet of irrigation pipelines, 2 sprinkler systems, and 697 acres of irrigation water management in Butte and Meade counties.

3.2 RIPARIAN AND RANGELAND IMPROVEMENTS

There were 16 riparian/range projects completed that included 43,723 feet of fencing, 48,124 feet of livestock water pipelines, 31,287 gallons in 35 livestock tanks and 24 waterers (59 total) on approximately 920 acres of riparian and 10,740 acres of rangeland areas. Also, a riparian fencing and streambank stabilization project on the Belle Fourche River was completed during Segment 9. The location of the riparian/range projects completed before and during Segment 9 are shown in Figure 3-2. Figure 3-7 shows a riparian fence installed along Horse Creek. Figure 3-8 shows a livestock watering facility installed in the riparian-upland interface to replace watering on the Belle Fourche River. In addition to 319 projects, producers used NRCS EQIP funds to install many several riparian-rangeland conservation practices, including more than 23 miles of fencing, 79 miles of livestock water pipelines, and 130 livestock watering facilities in Butte and Meade counties.

3.3 IMPROVED CROPPING PRACTICES

The BFRWP continued to promote cover crops in coordination with the South Dakota Soil Health Coalition (SD SHC) and NRCS throughout the watershed during Segment 9. The SD SHC and NRCS provided funding to producers for implementing cover crops and were accounted for in SD SHC's Soil Health Planning and Improvement Project and the NRCS EQIP and RCPP program reporting.

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.

Figure 3-5. Typical On-Farm Earthen Irrigation Ditch Before Conversion to Underground Pipeline to Prevent Sediment Runoff.

Figure 3-6. On-Farm Earthen Irrigation Ditch Conversion to Underground Pipeline to Prevent Sediment and Water Loss.

Figure 3-7. Riparian Fence Installed to Improve Riparian Grazing along Horse Creek in the Belle Fourche River Watershed.

Figure 3-8. Livestock Watering Facility Installed in the Riparian/Upland Area to Replace Watering on the Belle Fourche River.

4.0 SUMMARY OF PUBLIC PARTICIPATION AND OUTREACH

Approximately 31 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 over 12,000 people. A summary of the events is listed in Table 4-1. These outreach activities helped increase participation and support for the BFRWP and gave the BFRWP several contacts for BMP installation.

The BFRWP hosted 13 meetings to provide updates on project work and progress. The BFRWP website was updated with events and project status (www.bellefourchewatershed.org). There were info booths, radio sound bites, rainfall simulator demonstrations, and a watershed irrigation tour. A bulk mailing to over 500 producers about cost-share opportunities was performed. Several informative sound bites were broadcast on local radio to increase awareness of water quality issues. The BFRWP's Soil-Quality/Rainfall Simulator Demonstration Trailer (https://www.rainfallsimulator.com) was purchased by the BFRWP in 2009 to demonstrate the effects of erosion on soils and how they relate to water quality in the watershed. Since 2019, the BFRWP's trailer was used to demonstrate the effects of soil erosion to agricultural producers, students, and the public at over 20 public outreach events reaching over 300 people. Three virtual webinars for irrigation water management and soil health were held online.

Table 4-1. Summary of Public Outreach and Education During Segment 9

Type of Education and Outreach	Date	Number of Participants
BFRWP Meetings (13 Meetings)	July 2019 – August 2022	100
BFRWP Rainfall Simulator Demos	2020, 2021, 2022	300
Booths at the Vale Ag Show	2020, 2022	200
Booth at the Rancher Round-Up in Union Center	2020, 2021, 2022	150
South Dakota Youth Agricultural Education	2021	30
Soil Health Bus Tour	2019	50
Irrigation and Soil Health Webinars	2021	25
Irrigation and Soil Health Projects Tour	2021	50
Informational Radio Sound Bites	2019, 2020	10,000
BFRWP Website	2020, 2021, 2022	1,200

The BFRWP sponsored or cosponsored two tours in the watershed during Segment 9. 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 local producers, BFID, Butte, Lawrence, and Elk Creek Conservation Districts; NRCS; the South Dakota Association of Conservation Districts; SDSU Cooperative Extension; South Dakota Society for Range Management, and the SD SHC. These tours showcased projects that were sponsored by the BFRWP that included irrigation and soil health project visits within the BFID, rangeland demonstrations on ranches, and a cover crop system demonstration site in the watershed. The BFRWP Irrigation and Soil Health Tour in the BFID visited installed center-pivot systems as shown in Figure 4-1. Figure 4-2 shows a NRCS and BFRWP Booth at the Cammack Rancher Round-Up Event in Union Center.

Figure 4-1. BFRWP Irrigation and Soil Health Projects Tour in the Belle Fourche Irrigation District.

Figure 4-2. NRCS and BFRWP Booth at the Cammack Rancher Round-Up Event in Union Center.

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 2022 IR because of elevated TSS and *E. coli* concentrations. In the 2022 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 2022 IR was listed in Table 2-1. 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 WATER QUALITY SAMPLING

Since January 1995, the BFRWP in cooperation with the SD DANR 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 9, five sites on the Belle Fourche River; 460130 (WQM130), 460683 (WQM83), 460681 (WQM81), 460880 (WQM21), and 460676 (WQM76) were sampled from May through September in 2019, 2020, and 2021. The SD DANR 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 460681 (WQM81). RESPEC also collected samples at three sites on Horse Creek (HCR10, HCR11, and HCR02) 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 results are summarized in Sections 5.2.1. and 5.2.2.

- 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 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 miles 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 HCR10 site is located on Horse Creek about 9 miles northwest of Newell and US Highway 212 and 1/4 -quarter mile north of Hanson Road along Winkler Road. The site is situated to monitor middle to upper Horse Creek.
- The HCR11 site is located on Horse Creek about 4 miles west of Newell and US Highway 79 on Orman Road. The site is situated to monitor middle Horse 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.

5.2.1 BELLE FOURCHE RIVER WATER QUALITY DATA

The BFRWP *E. coli* and TSS sample results for three sites (WQM130, WQM83, and WQM81) on the river are summarized in Table 5-1 and 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* standard of 235 mpn/100 mL and the Warm-Water Permanent Fish Life single-sample TSS daily maximum standard of 158 mg/L. These three sites had exceedances of the *E. coli* and the TSS standards as shown in Table 5-1. Figure 5-2 through Figure 5-7 displays the *E. coli* and TSS sample results at these three sites on the river. The WQM81 site had the highest percentage (52%) of the *E. coli* standard exceedances and the WQM130 site had the highest percentage (12%) of TSS standard exceedances.

The SD DANR *E. coli* and TSS sample results for three sites (WQM81, WQM21, and WQM76) on the river 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 Immersion Recreation single-sample *E. coli* standard of 235 mpn/100 mL and the Warm-Water Permanent Fish Life single-sample TSS daily maximum standard of 158 mg/L. The WQM21 site had exceedances of the *E. coli* standard and the WQM76 had exceedances of the TSS standard as shown in Table 5-2. Figure 5-8 through Figure 5-13 displays the *E. coli* and TSS sample results at these three sites.

5.2.2 HORSE CREEK AND INDIAN CREEK WATER QUALITY DATA

The BFRWP *E. coli* and TSS sample results for one site on Indian Creek (ICR03) and three sites on Horse Creek (HCR10, HCR11, and HCR02) are summarized in Table 5-3 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* standard of 1,178 mpn/100 mL and the Warm-Water Semi-permanent Fish Life single-sample TSS daily maximum standard of 158 mg/L. Figure 5-14 through Figure 5-21 displays the *E. coli* and TSS sample results at sites on Indian Creek and Horse Creek. The ICR03, HCR10, and HCR02 sites had exceedances of the *E. coli bacteria* standard while the ICR03, HCR11, and HCR02 sites had exceedances of the TSS standard as shown in Table 5-3. The ICR03 site had the highest percentage (21%) of the *E. coli bacteria* standard exceedances. The HCR11 and HCR02 sites had the highest percentage (6%) of the TSS standard exceedances.

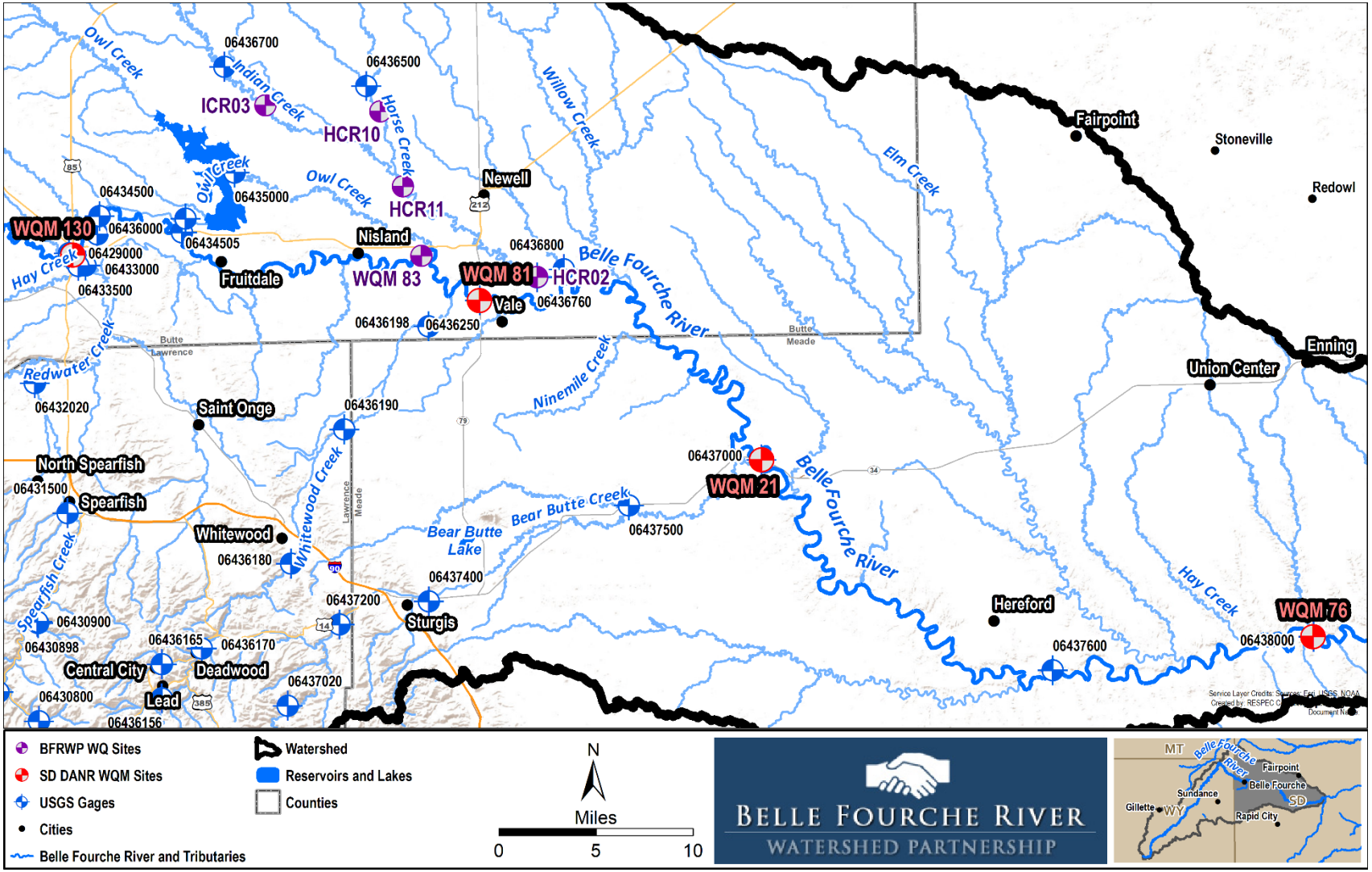

Figure 5-1. Water Quality Monitoring Sites located on the Belle Fourche River, Horse Creek, and Indian Creek Sampled During the BFRWP's Segment 9 Project.

Table 5-1. BFRWP *E. coli* and TSS Sample Results (Exceedances) for WQM130, WQM83, WQM81 during Segment 9

	WQM130		WQM83		WQM81	
Sample Date	*E. coli* (mpn/100mL)	TSS (mg/L)	*E. coli* (mpn/100mL)	TSS (mg/L)	*E. coli* (mpn/100mL)	TSS (mg/L)
5/13/2020	45	106.0	119	28.0	461	63.6
5/28/2020	231	99.0	135	43.6	241	39.6
6/11/2020	173	78.2	109	22.8	73	20.4
6/23/2020	93	44.4	36	42.8	615	32.8
7/8/2020	99	137.0	82	59.6	579	66.8
7/21/2020	37	52.0	36	44.8	152	16.8
8/5/2020	58	79.6	42	34.4	105	14.0
8/18/2020	155	4.8	47	34.4	78	18.0
9/1/2020	35	133.0	25	52.8	70	23.2
9/15/2020	28	38.8	34	46.0	163	24.8
9/29/2020	41	4.0	81	21.6	222	9.6
5/5/2021	75	4.4	140	47.6	687	57.5
5/18/2021	162	14.0	461	54.8	249	33.6
6/2/2021	53	16.0	120	49.4	387	61.8
6/16/2021	270	5.6	16	51.6	261	76.1
7/1/2021	115	6.4	172	48.6	185	42.0
7/15/2021	980	476.0	167	52.2	1,550	52.2
7/30/2021	517	130.0	1,300	36.4	461	38.4
8/10/2021	11	67.0	10	47.2	115	54.4
8/24/2021	816	85.0	72	56.6	104	64.7
9/9/2021	135	4.0	44	28.4	249	21.6
9/22/2021	72	4.0	59	14.8	326	16.4
5/6/2022	108	194.0	261	58.8	150	92.8
5/20/2022	115	105.0	980	52.2	1,300	24.8
6/2/2022	2,420	500.0	132	44.0	1,300	229.0
6/17/2022	670	366.0	980	331.0	548	255.0
6/30/2022	74	37.2	48	46.7	323	30.0
7/14/2022	49	7.0	27	50.0	44	23.6
7/29/2022	228	5.0	46	38.8	99	22.0
8/11/2022	50	34.0	109	49.2	104	64.4
8/25/2022	106	51.0	228	46.8	365	40.0
9/8/2022	150	19.2	61	33.6	184	13.2
9/22/2022	148	4.0	83	18.0	143	5.6
Exceedances (#)	6	4	5	1	17	2
Exceedances (%)	18%	12%	15%	3%	52%	6%

Table 5-2. SD DANR *E. coli* and TSS Sample Results (Exceedances) for WQM81, WQM21, and WQM76 during Segment 9

	WQM81		WQM21		WQM76	
Sample Date	*E. coli* (mpn/100mL)	TSS (mg/L)	*E. coli* (mpn/100mL)	TSS (mg/L)	*E. coli* (mpn/100mL)	TSS (mg/L)
1/7/2020						0.0
2/5/2020						126.0
3/5/2020						2,190.0
4/7/2020						223.0
5/6/2020	76	82.0	88	102.0	60.9	168.0
6/15/2020					45.7	27.0
7/21/2020					18.9	15.0
8/20/2020	50	12.0	6	0.0	6.2	19.0
9/21/2020					18.5	0.0
10/13/2020						0.0
11/16/2020						0.0
12/8/2020						0.0
1/12/2021						0.0
2/18/2021						0.0
3/9/2021						79.0
4/1/2021						0.0
5/6/2021	64	25.0	13	18.0	8.5	25.0
6/2/2021	72	30.0			13.2	43.0
7/7/2021					130.0	55.0
8/18/2021			39	56	23.5	48.0
9/14/2021					30.1	22.0
10/6/2021						0.0
11/8/2021						20.0
12/1/2021						0.0
1/4/2022						0.0
2/10/2022						0.0
3/2/2022						0.0
4/8/2022						0.0
5/5/2022	45	93.0	60	912.0	122.0	1,520.0
6/7/2022					137.0	101.0
7/5/2022					90.8	53.0
8/1/2022	13	13.0	8	1,300.0	2.0	18.0
Exceedances (#)	0	0	0	2	0	4
Exceedances (%)	0%	0%	0%	33%	0%	13%

Table 5-3. BFRWP *E. coli* and TSS Sample Results (Exceedances) for ICR03, HCR10, HCR11, and HCR02 during Segment 9

	ICR03		HCR10		HCR11		HCR02	
Sample Date	*E. coli* (mpn/100mL)	TSS (mg/L)	*E. coli* (mpn/100mL)	TSS (mg/L)	*E. coli* (mpn/100mL)	TSS (mg/L)	*E. coli* (mpn/100mL)	TSS (mg/L)
5/13/2020	162	20.0	2,590	66.0	579	60.0	108	30.4
5/28/2020	216	66.7	301	35.0	187	52.5	298	25.2
6/11/2020	110	47.2	161	22.4	41	32.0	96	45.6
6/23/2020	730	36.4	281	20.8	230	63.2	142	40.4
7/8/2020	238	41.6	166	21.6	1,120	83.1	687	56.8
7/21/2020	49	28.8	77	7.6	61	60.4	291	55.6
8/5/2020	1,300	15.6	1,300	8.4	74	61.0	72	62.7
8/18/2020	54	31.2	28	6.0	35	58.8	461	63.6
9/1/2020	1,200	88.0	11	4.0	104	38.0	194	48.0
9/15/2020	29	7.2	179	5.2	167	31.2	214	40.0
9/29/2020	47	4.0	81	6.4	14	19.2	66	34.4
5/5/2021	238	22.0	32	15.2	326	30.8	117	39.2
5/18/2021	79	19.6	1,410	31.6	261	45.6	107	54.8
6/2/2021	133	27.2	115	4.0	219	66.8	249	58.0
6/16/2021	238	8.4	130	4.8	178	65.8	457	62.4
7/1/2021	345	10.0	613	6.4	411	68.8	358	74.8
7/15/2021	488	36.8	130	10.8	139	77.9	687	83.8
7/30/2021	1,730	17.2	1,410	14.8	921	68.3	1,990	156.0
8/10/2021	102	17.6	34	14.0	72	61.2	308	104.0
8/24/2021	231	18.4	11	6.8	130	75.7	84	80.0
9/9/2021	37	18.4	26	7.2	387	50.8	397	57.2
9/22/2021	299	6.4	1,550	7.6	276	33.6	1,730	32.8
5/6/2022	461	277.0	144	16.8	29	311.0	411	462.0
5/20/2022	93	62.8	51	15.6	225	69.2	54	34.4
6/2/2022	104	53.6	39	11.2	43	51.2	1,990	60.0
6/17/2022	649	249.0	579	150.0	687	299.0	3,260	488.0
6/30/2022	326	50.0	93	50.0	75	52.7	495	61.0
7/14/2022	1,120	72.5	866	49.2	125	102.0	770	72.4
7/29/2022	2,420	48.8	435	16.4	1,050	55.6	326	40.8
8/11/2022	1,410	51.6	2,420	11.6	47	38.8	345	62.0
8/25/2022	2,420	36.8	461	27.6	61	33.3	345	34.4
9/8/2022	488	38.0	167	10.8	260	34.8	461	37.6
9/22/2022	1,410	26.4	32	15.6	228	52.0	99	26.8
Exceedances (#)	7	2	6	0	0	2	4	2
Exceedances (%)	21%	6%	18%	0%	0%	6%	12%	6%

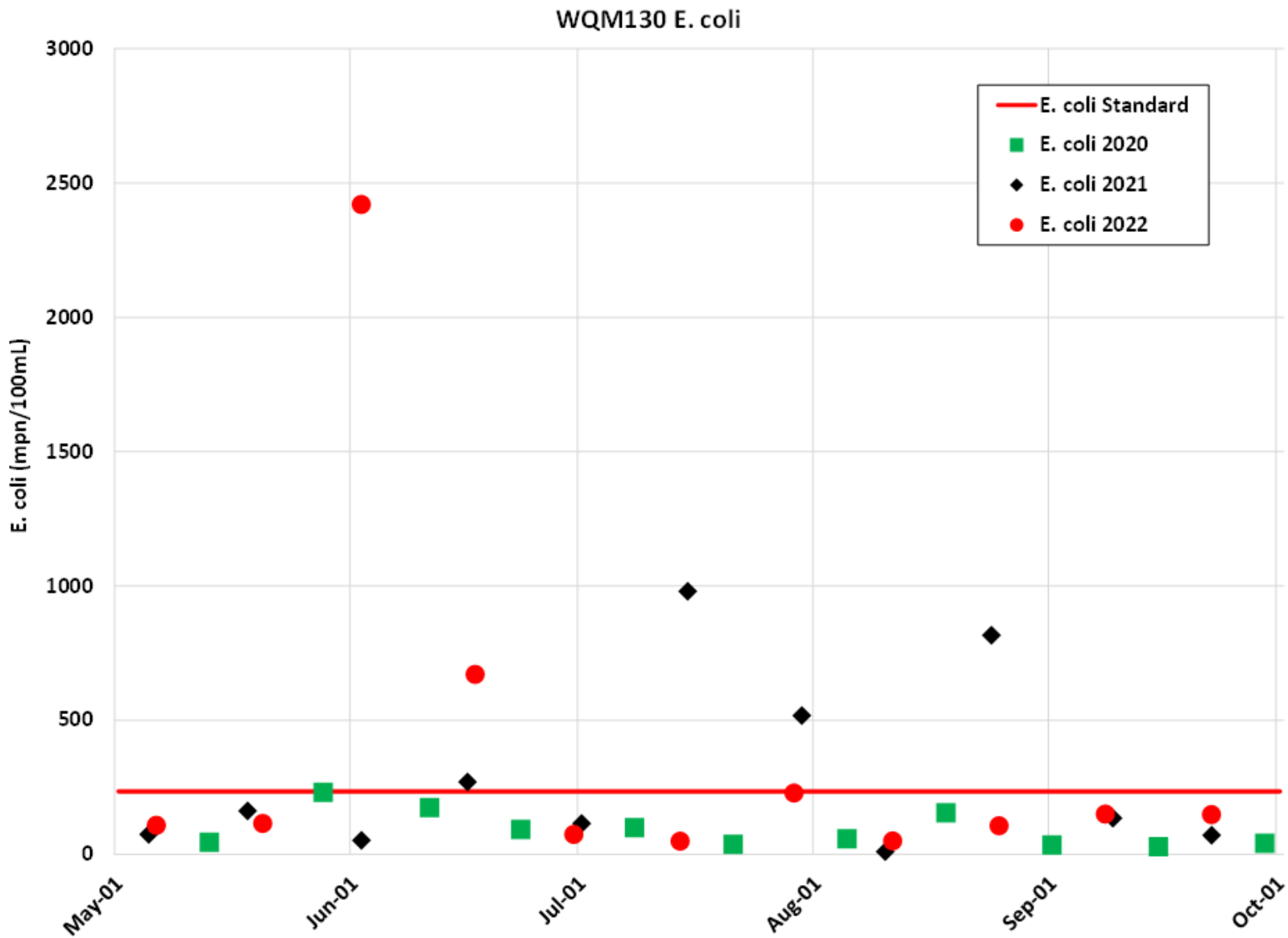

Figure 5-2. BFRWP *E. coli* Water Quality Sampling Results at Site WQM130 (460130) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

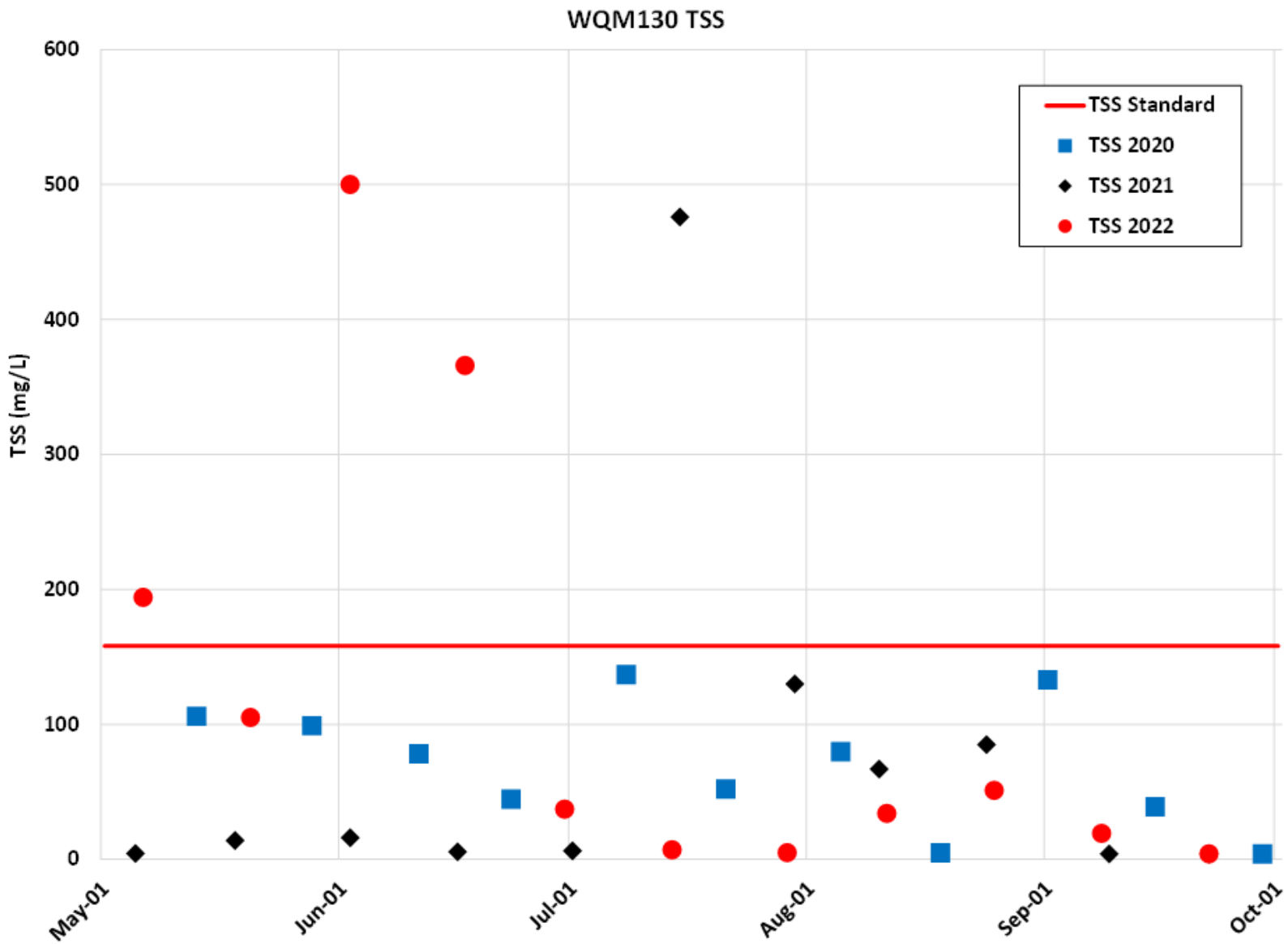

Figure 5-3. BFRWP Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM130 (460130) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

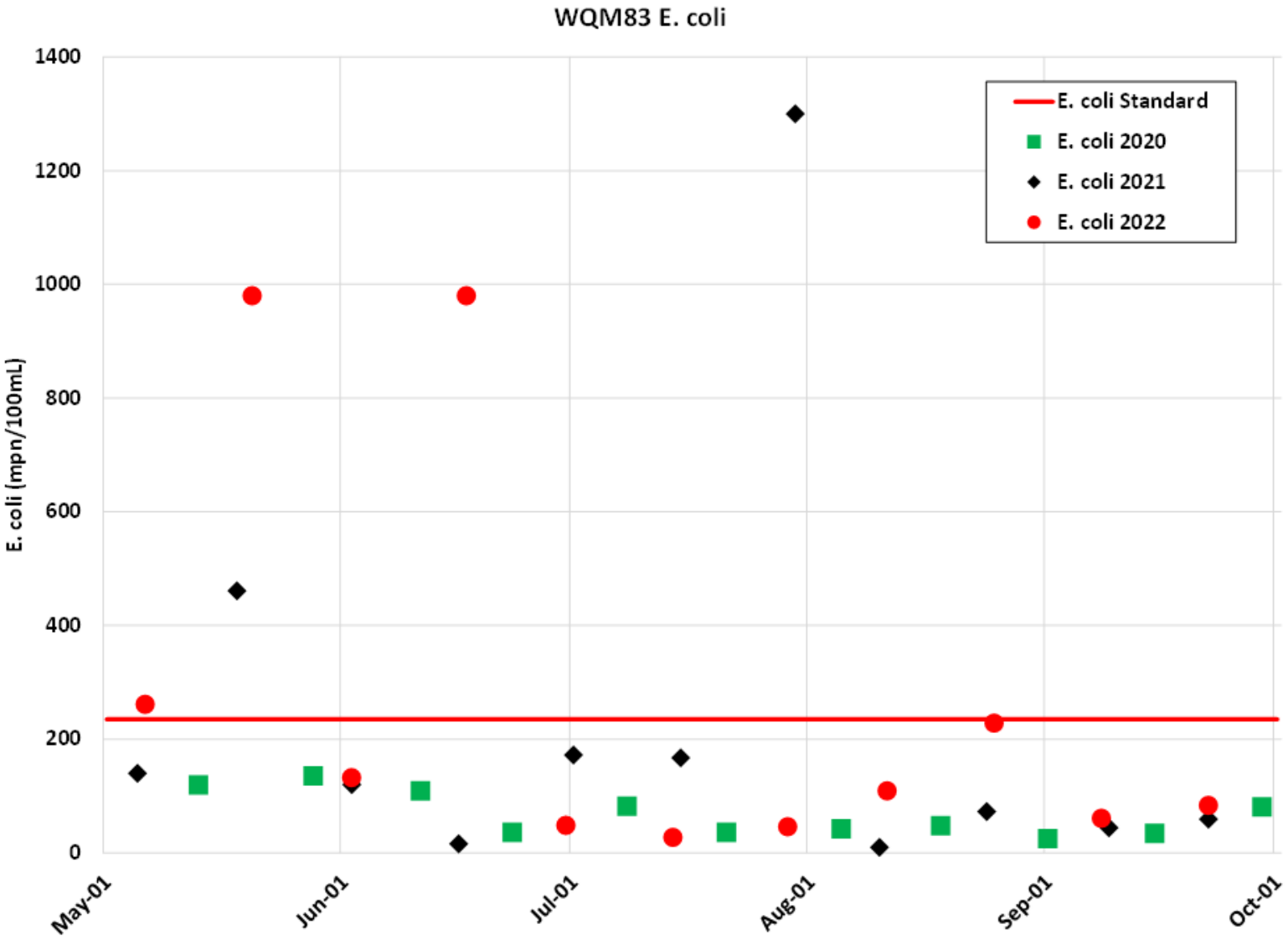

Figure 5-4. BFRWP *E. coli* Sampling Results at Monitoring Site WQM83 (460683) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

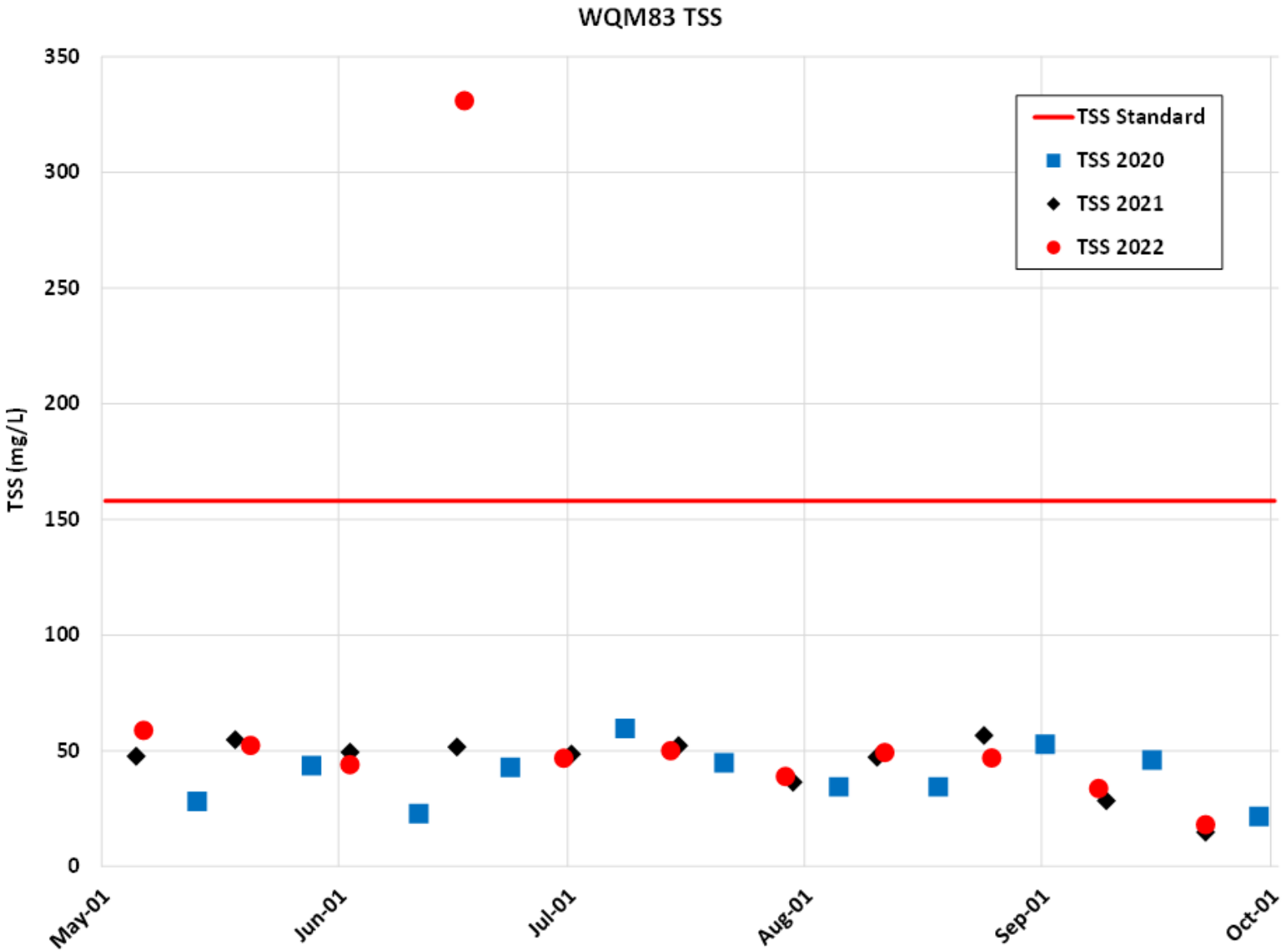

Figure 5-5. BFRWP Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM83 (460683) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

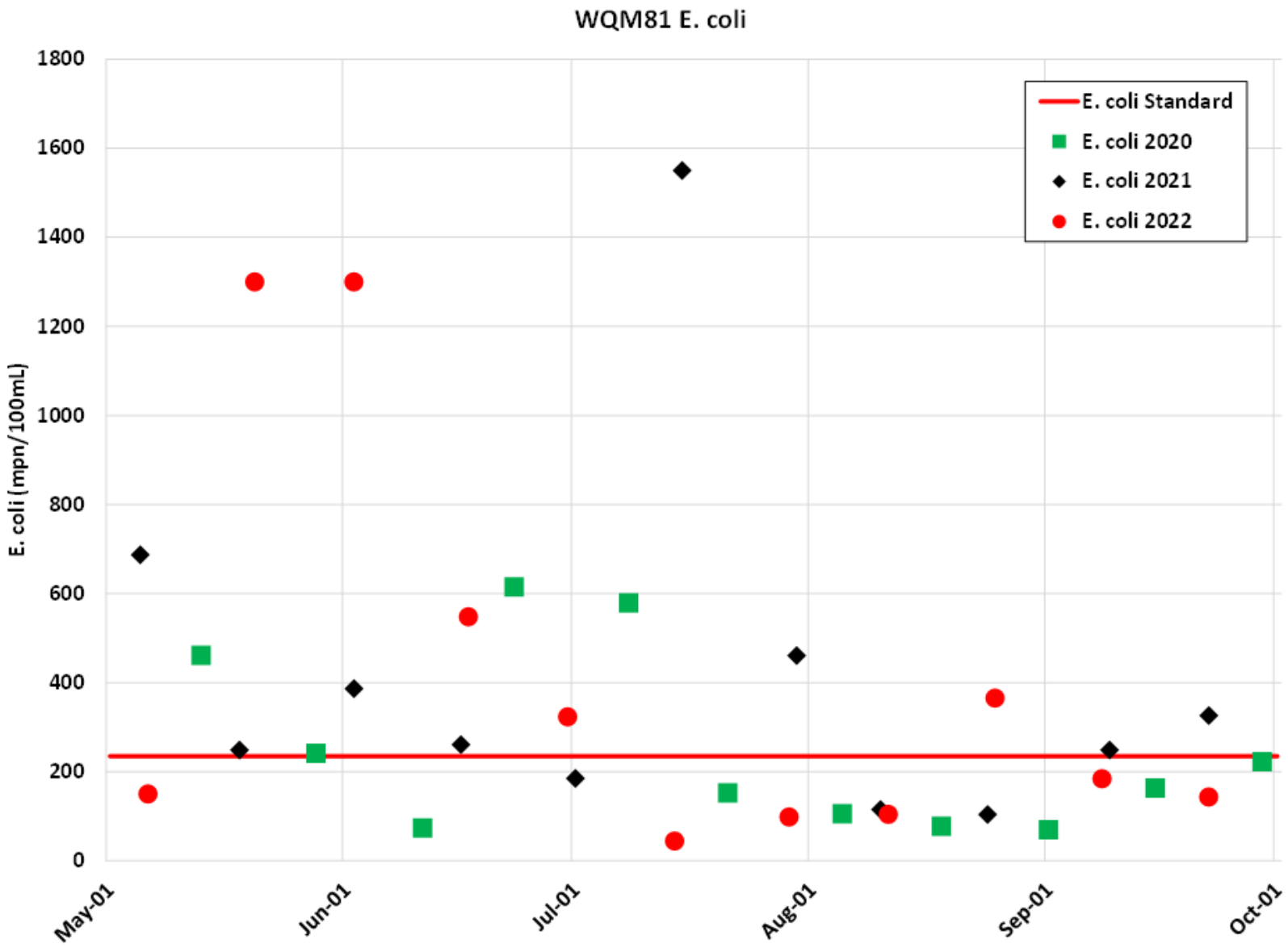

Figure 5-6. BFRWP *E. coli* Sampling Results at Monitoring Site WQM81 (460681) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

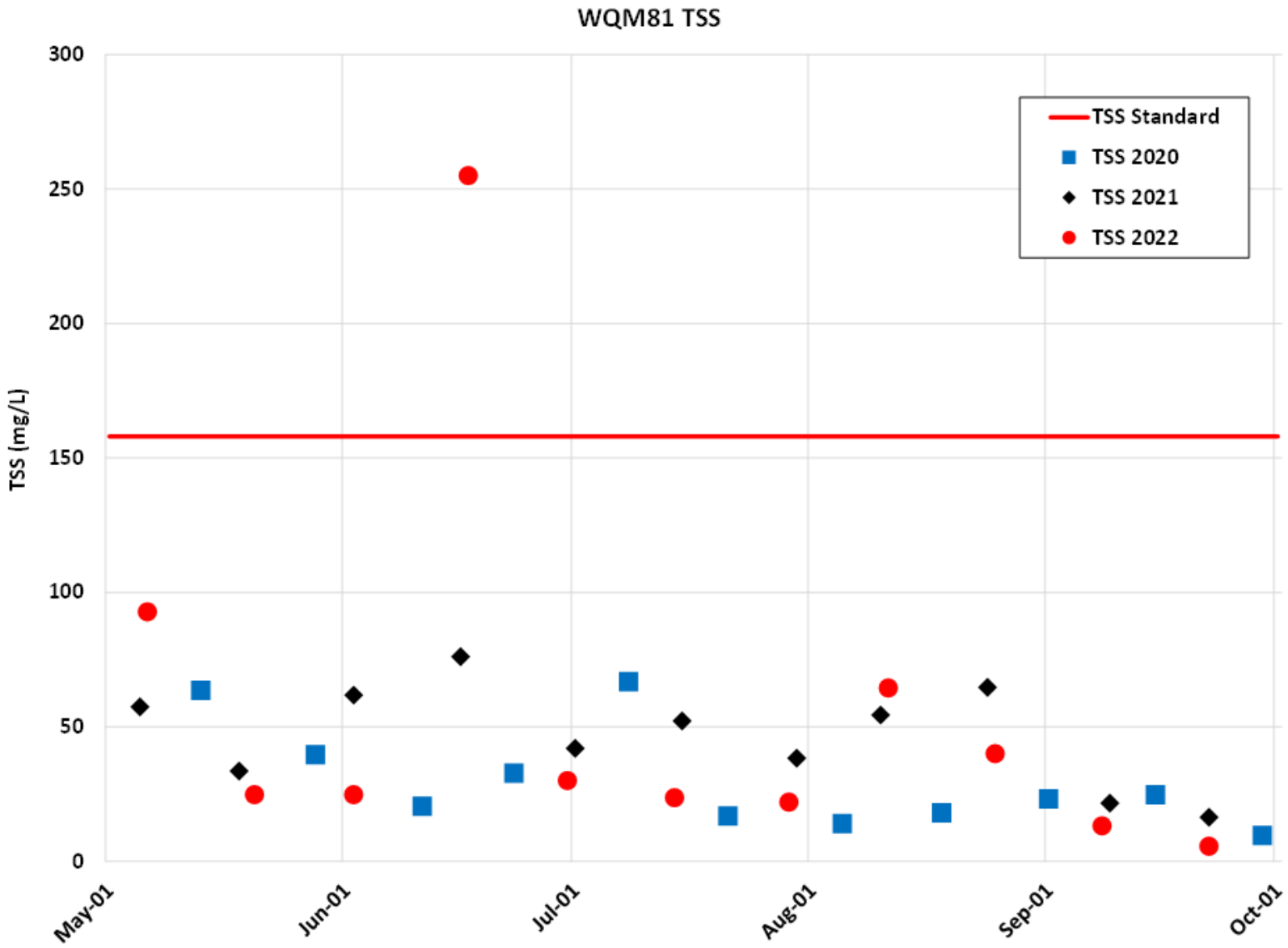

Figure 5-7. BFRWP Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM81 (460681) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

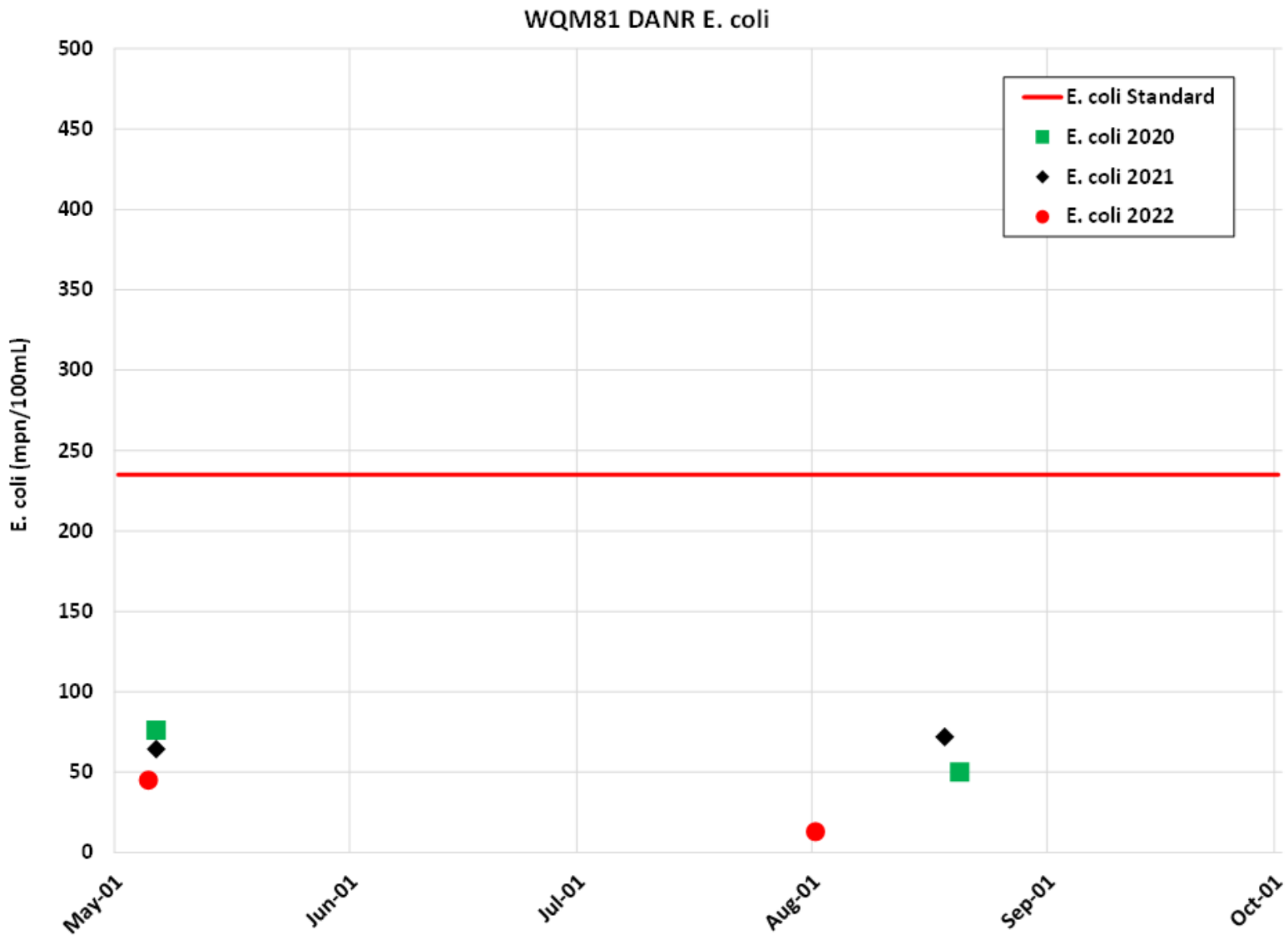

Figure 5-8. SD DANR *E. coli* Sampling Results at Monitoring Site WQM81 (460681) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

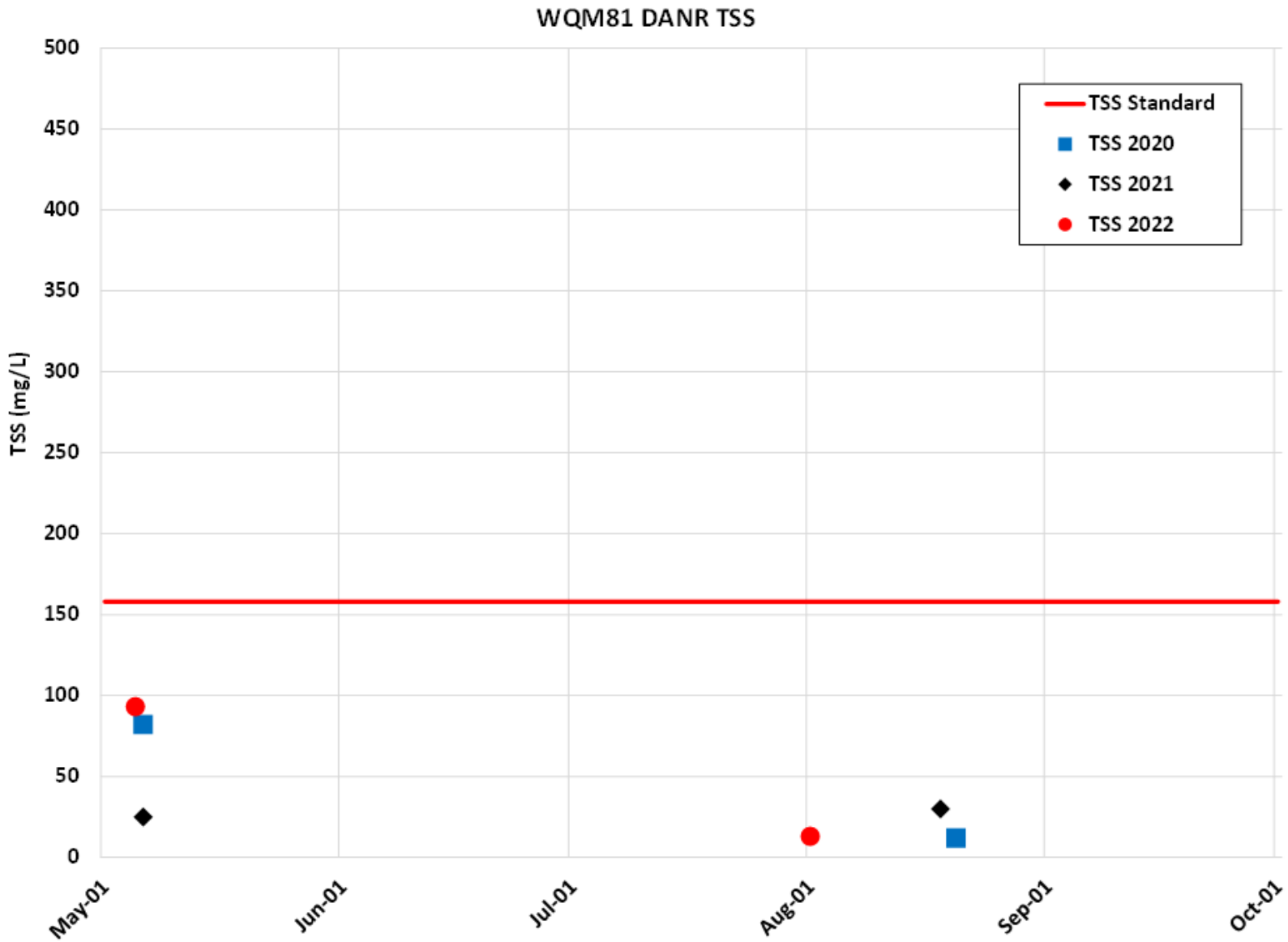

Figure 5-9. SD DANR Total Suspended Sediment (TSS) Sampling Results at Monitoring Site WQM81 (460681) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

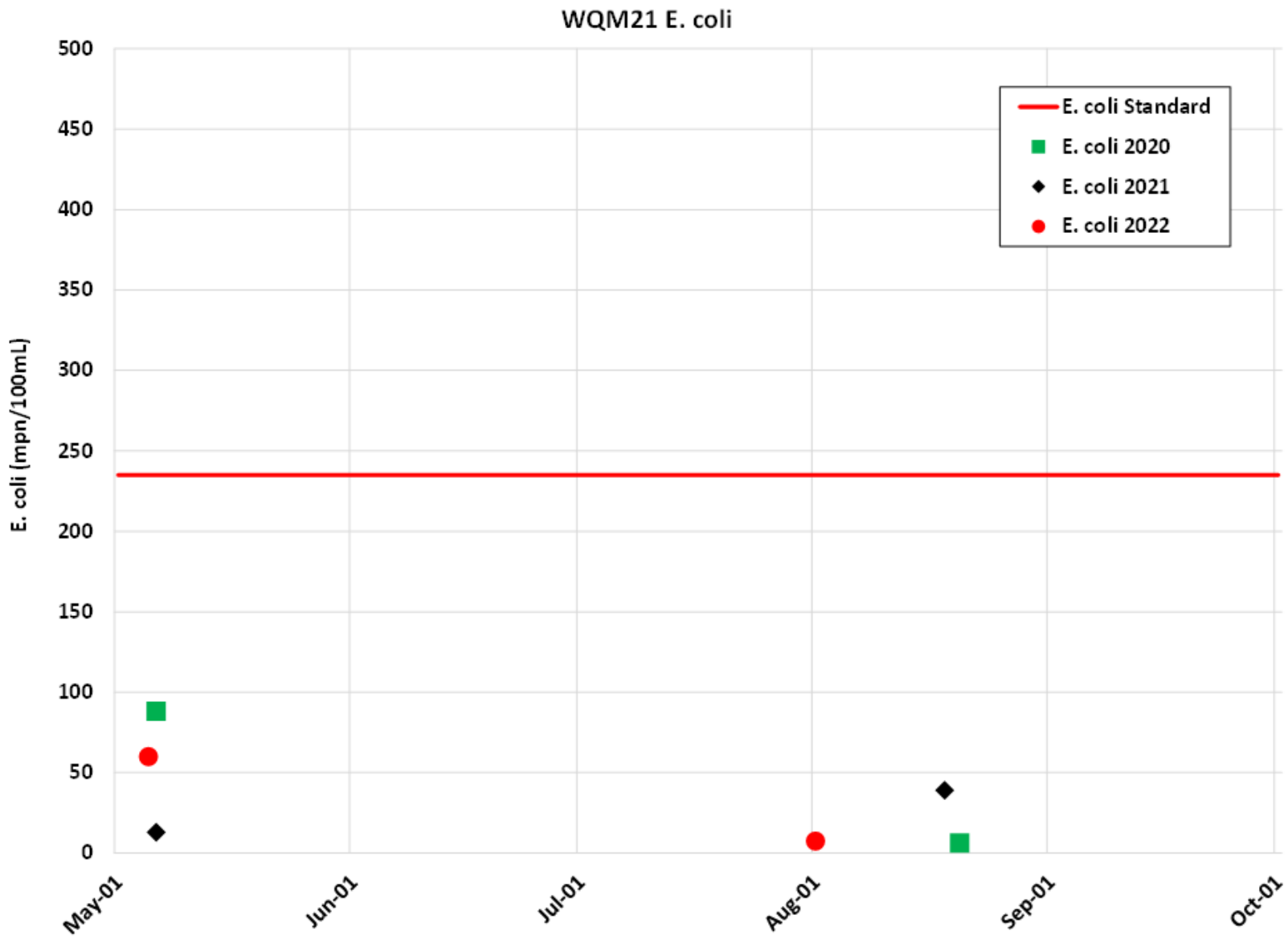

Figure 5-10. SD DANR *E. coli* Sampling Results at Monitoring Site WQM21 (460880) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

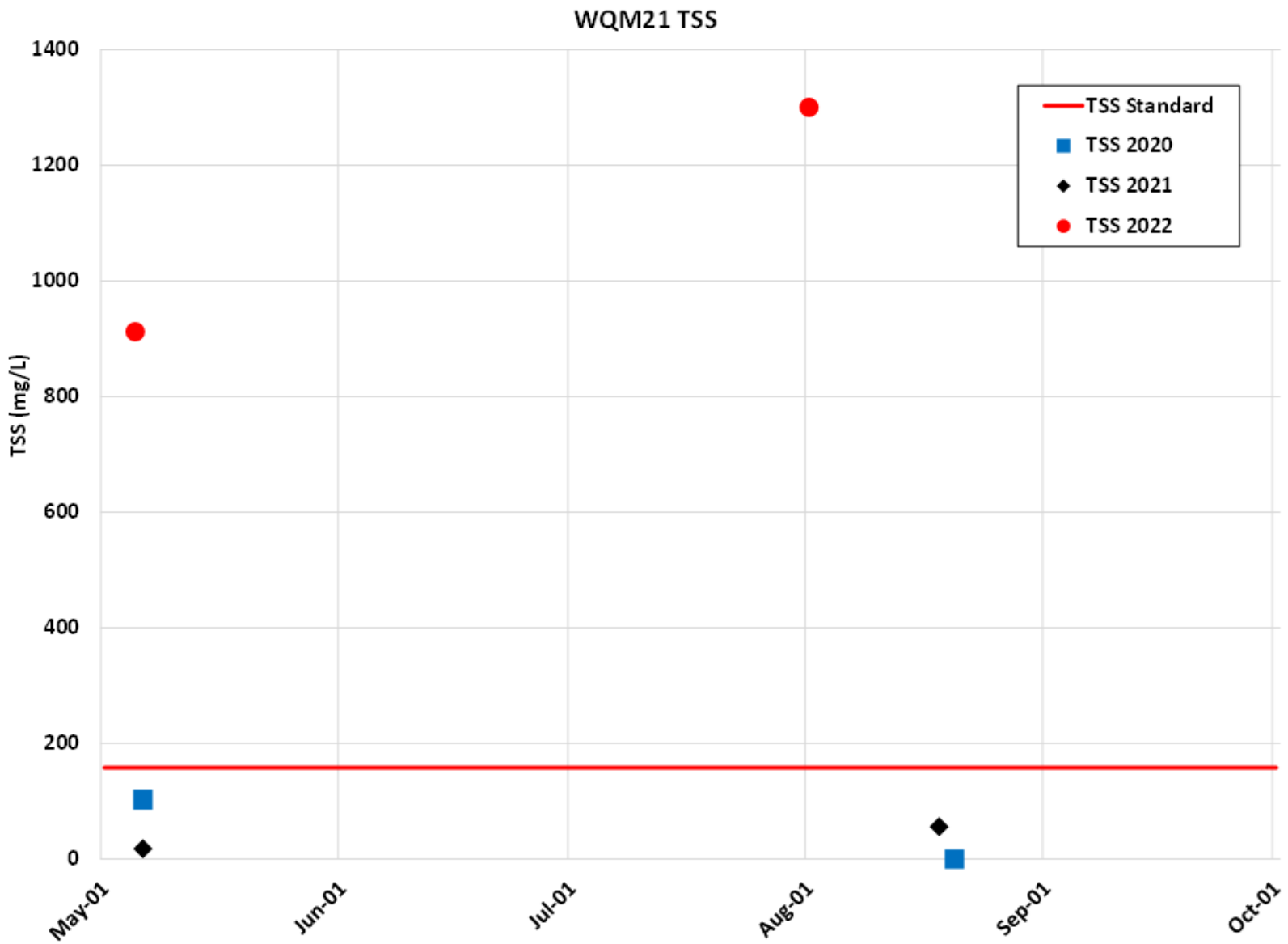

Figure 5-11. SD DANR Total Suspended Sediment (TSS) Sampling Results at Site WQM21 (460880) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

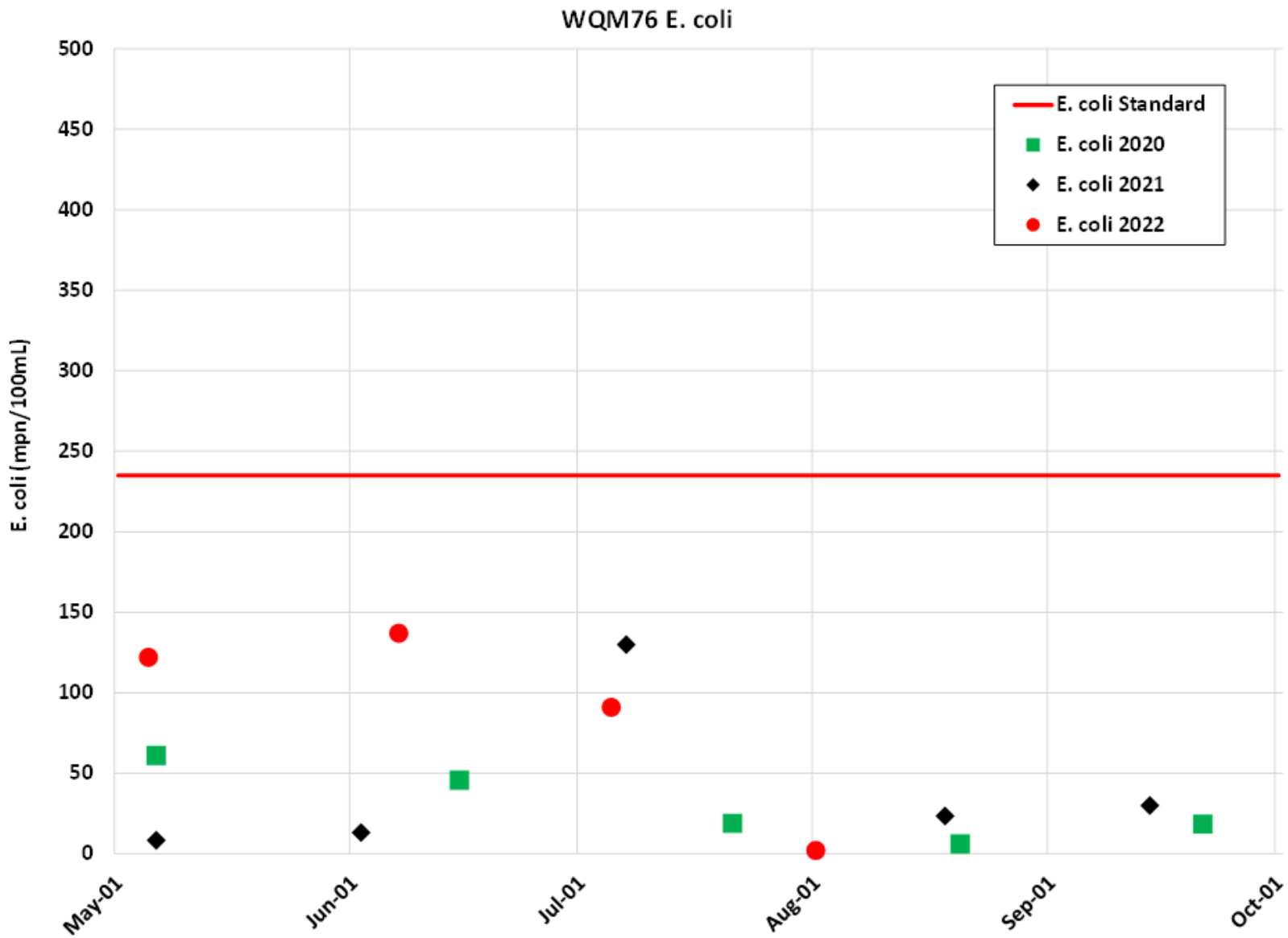

Figure 5-12. SD DANR *E. coli* Sampling Results at Monitoring Site WQM76 (460676) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

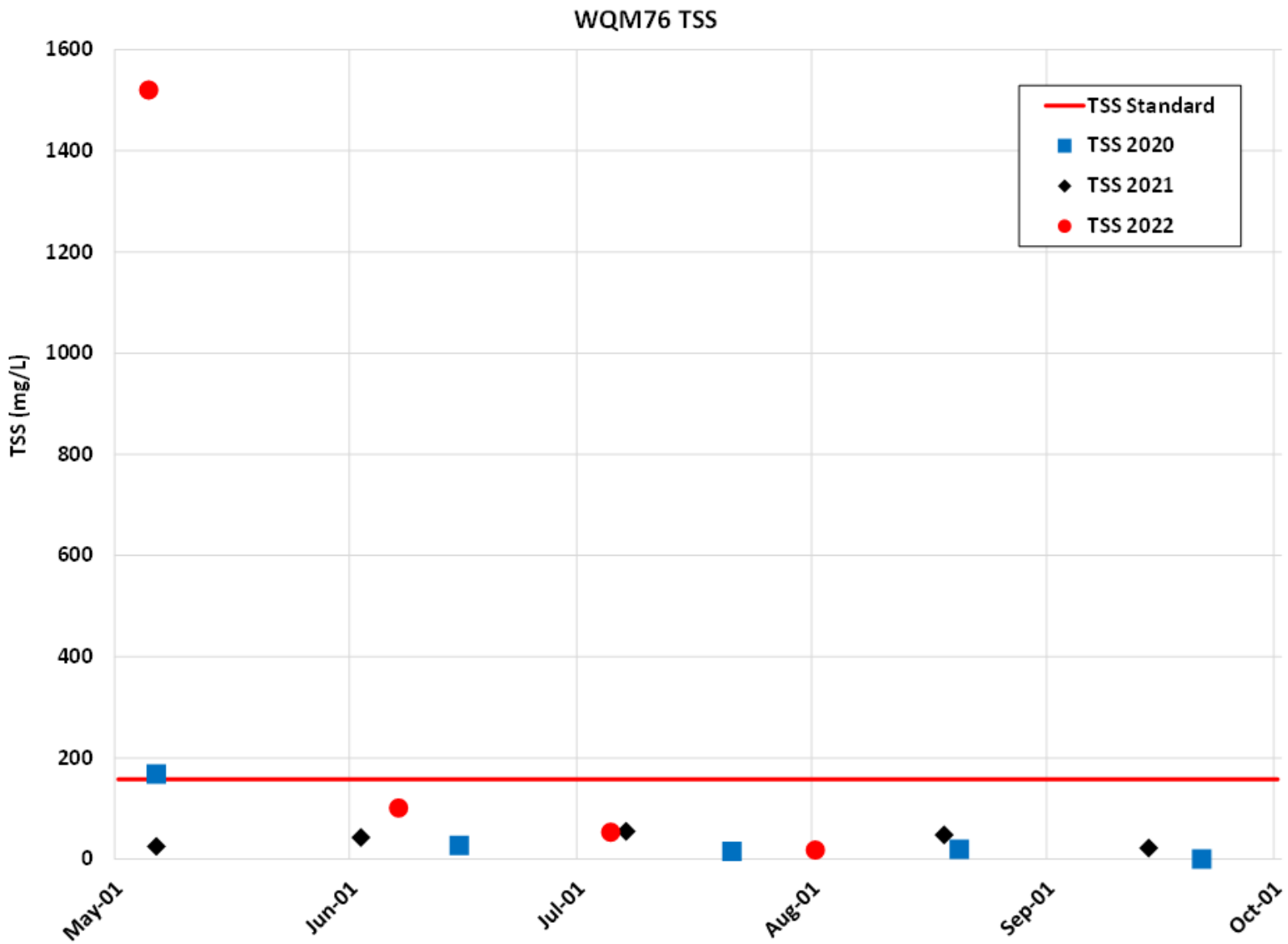

Figure 5-13. SD DANR Total Suspended Sediment (TSS) Sampling Results at Site WQM76 (460676) on the Belle Fourche River from May–September during 2020, 2021, and 2022.

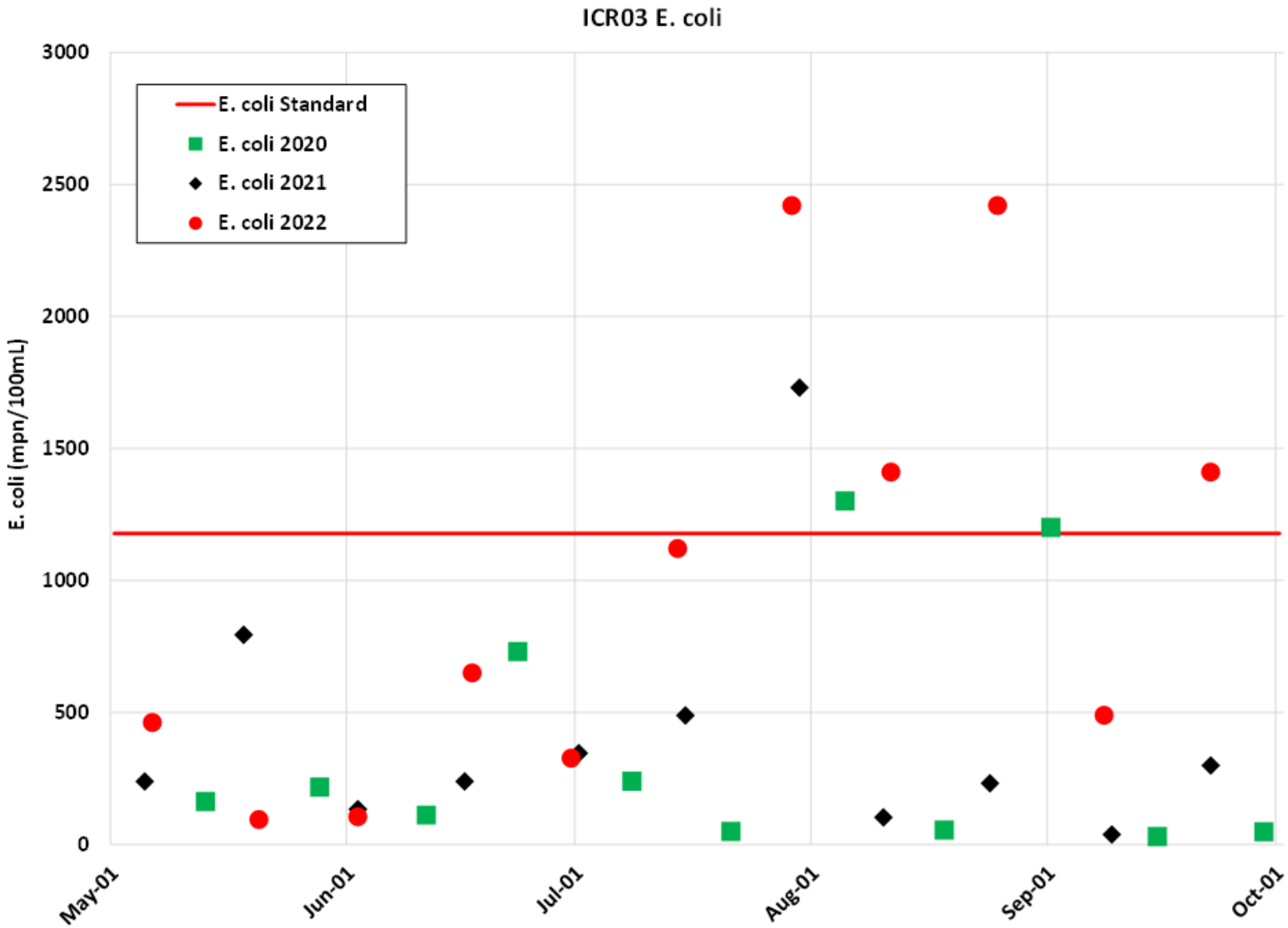

Figure 5-14. BFRWP *E. coli* Sampling Results at Monitoring Site ICR03 on Indian Creek from May–September during 2020, 2021, and 2022.

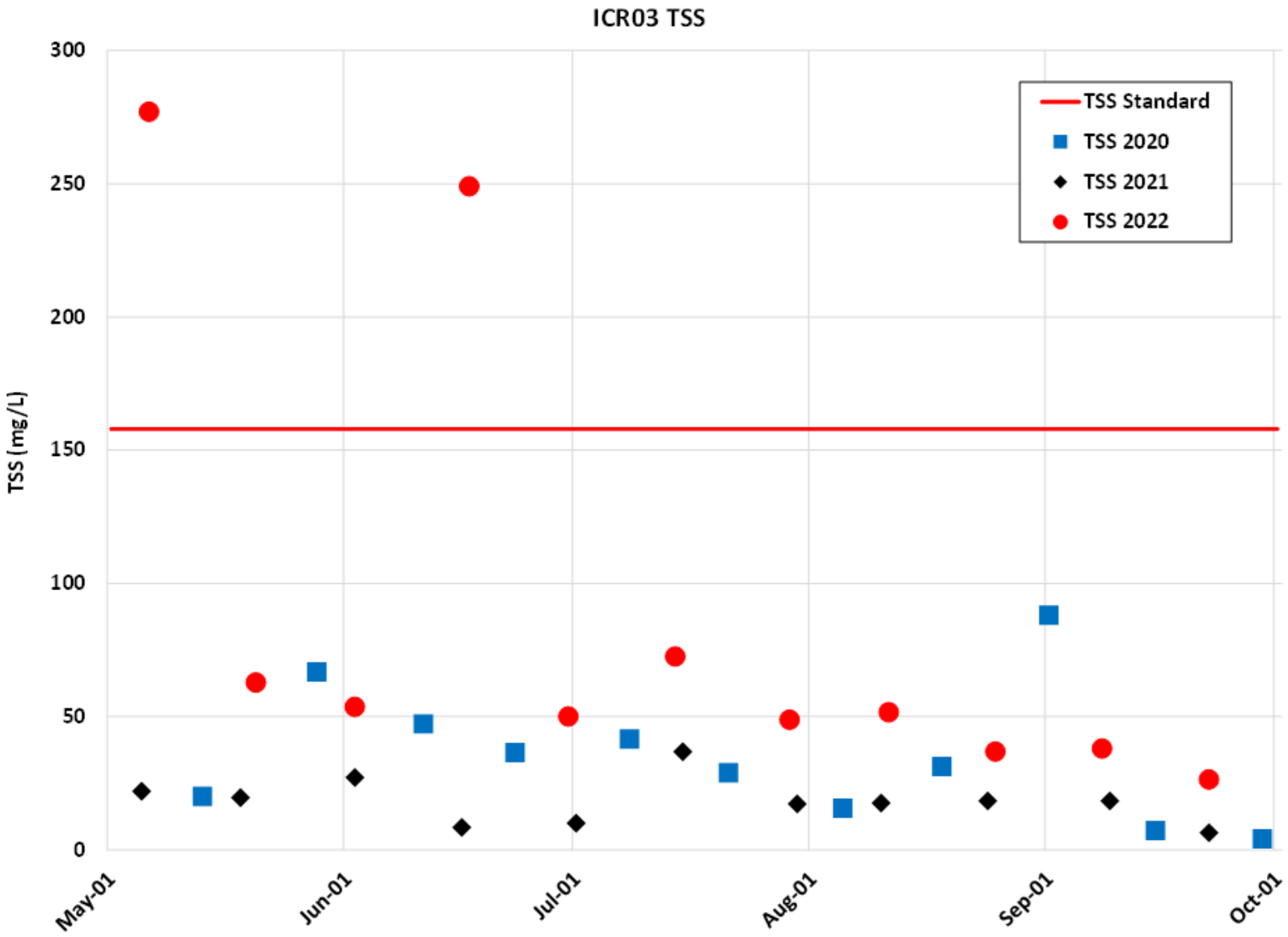

Figure 5-15. BFRWP Total Suspended Sediment (TSS) Sampling Results at Monitoring Site ICR03 on Indian Creek from May–September during 2020, 2021, and 2022.

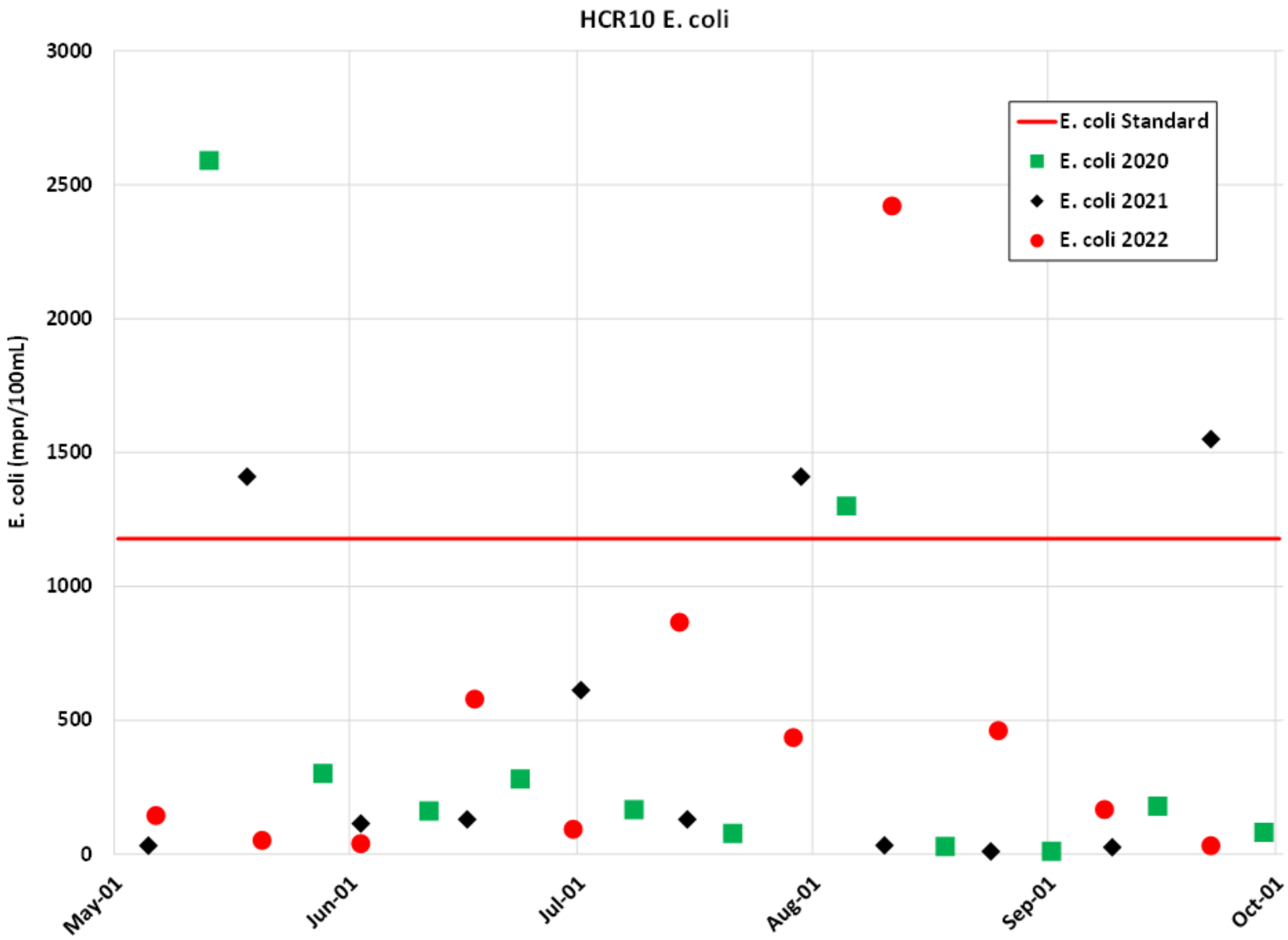

Figure 5-16. BFRWP *E. coli* Sampling Results at Monitoring Site HCR10 on Horse Creek from May–September during 2020, 2021, and 2022.

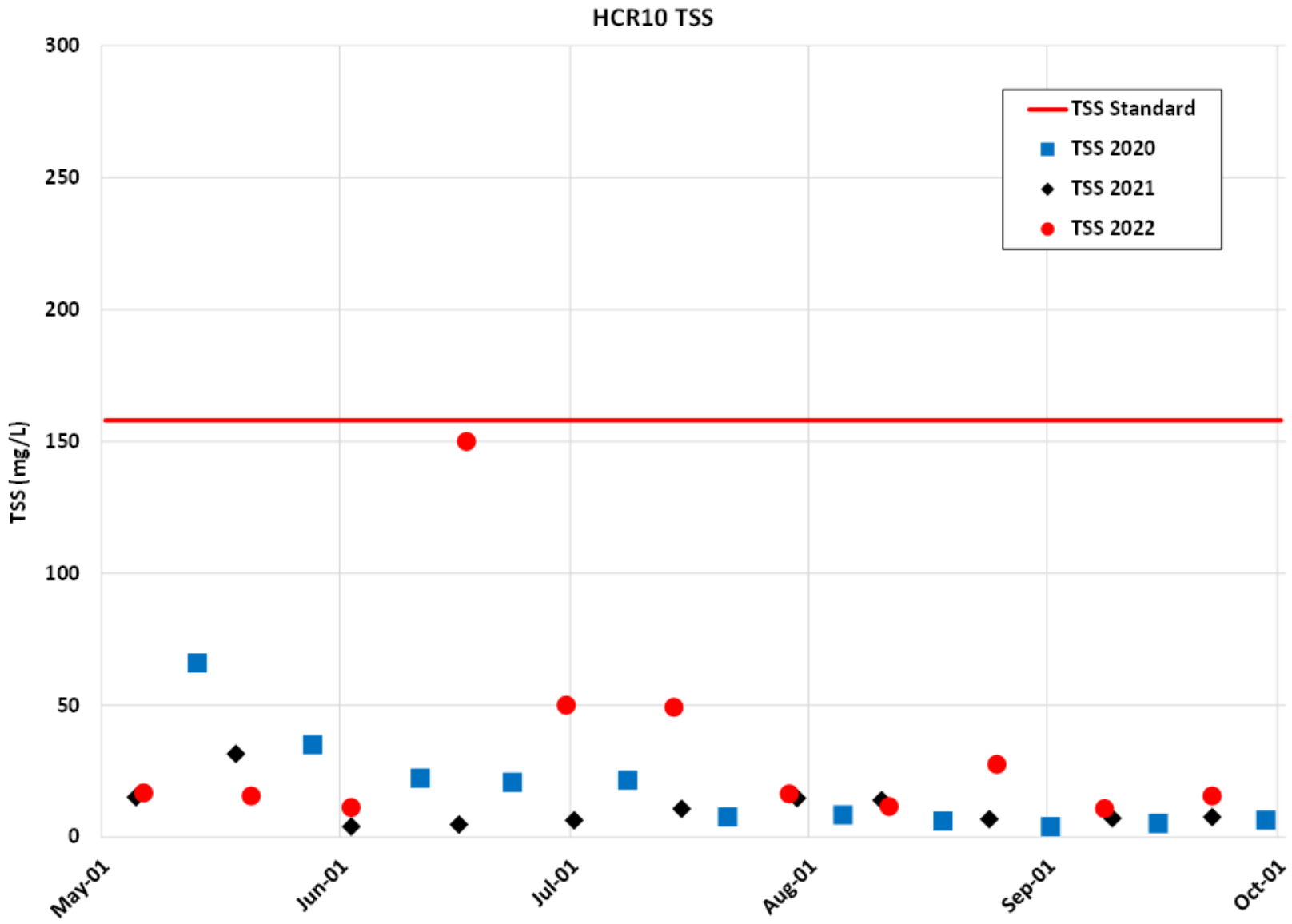

Figure 5-17. BFRWP Total Suspended Sediment (TSS) Sampling Results at Monitoring Site HCR10 on Horse Creek from May–September during 2020, 2021, and 2022.

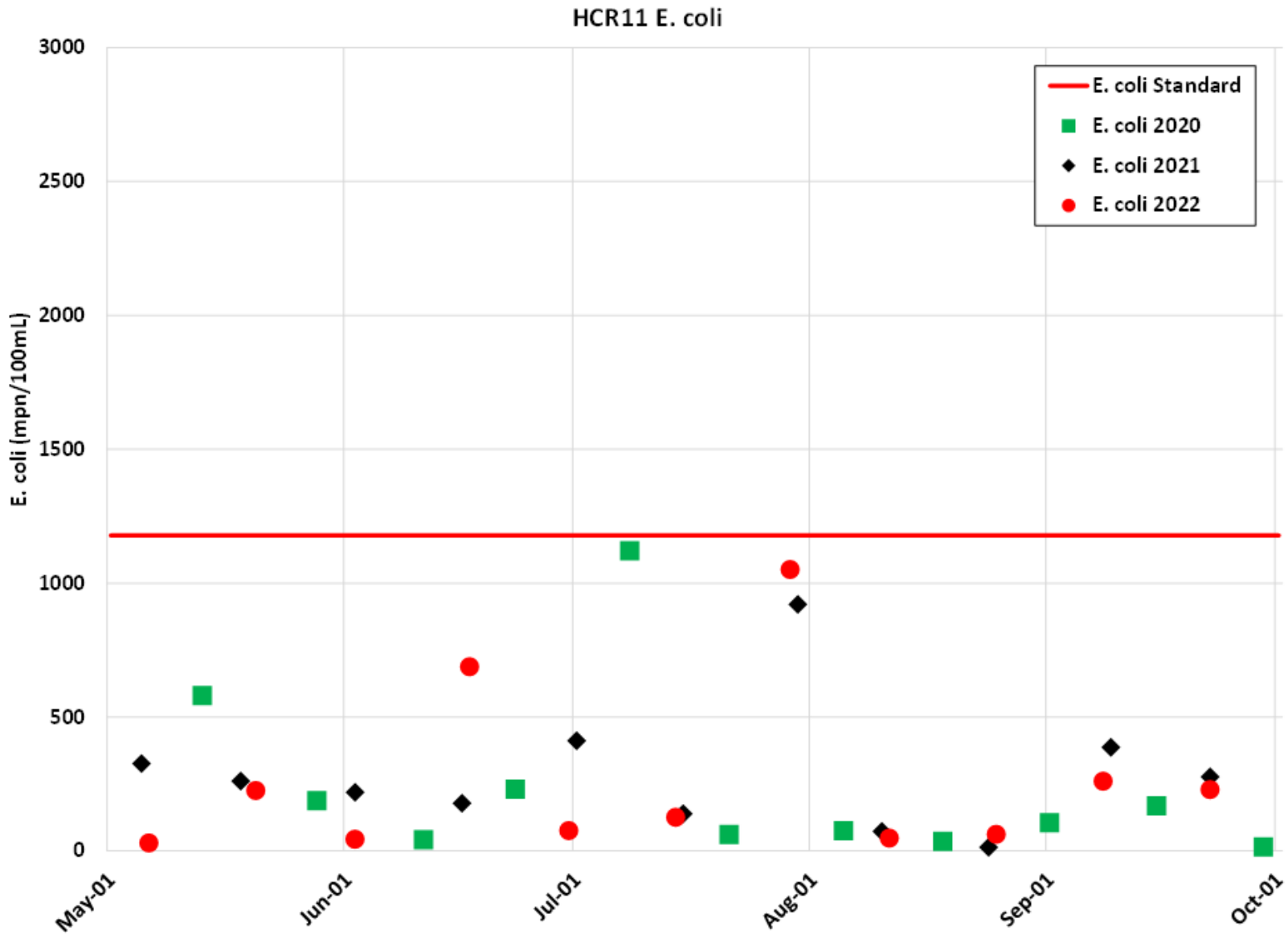

Figure 5-18. BFRWP *E. coli* Sampling Results at Monitoring Site HCR11 on Horse Creek from May–September during 2020, 2021, and 2022.

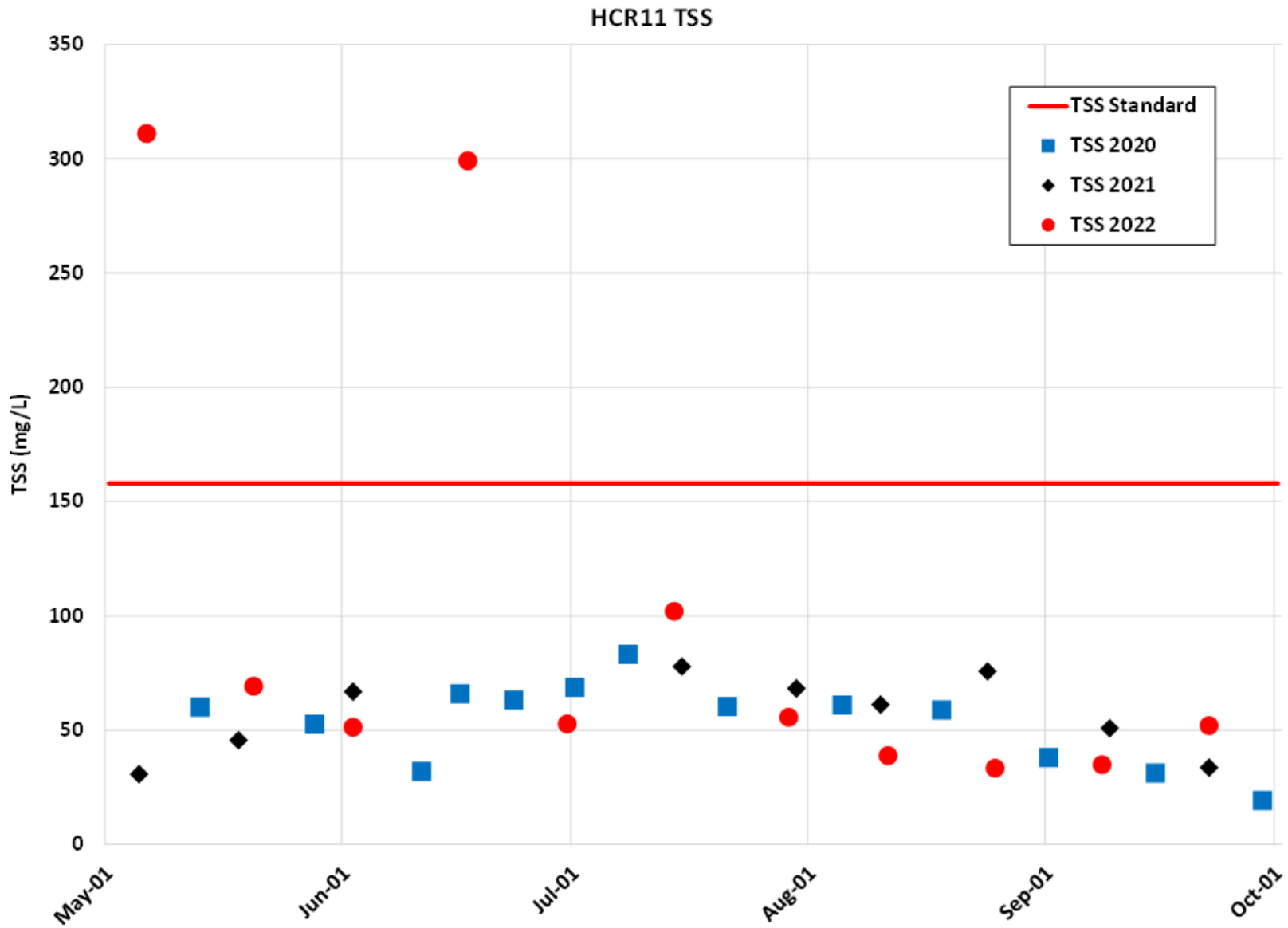

Figure 5-19. BFRWP Total Suspended Sediment (TSS) Sampling Results at Monitoring Site HCR11 on Horse Creek from May–September during 2020, 2021, and 2022.

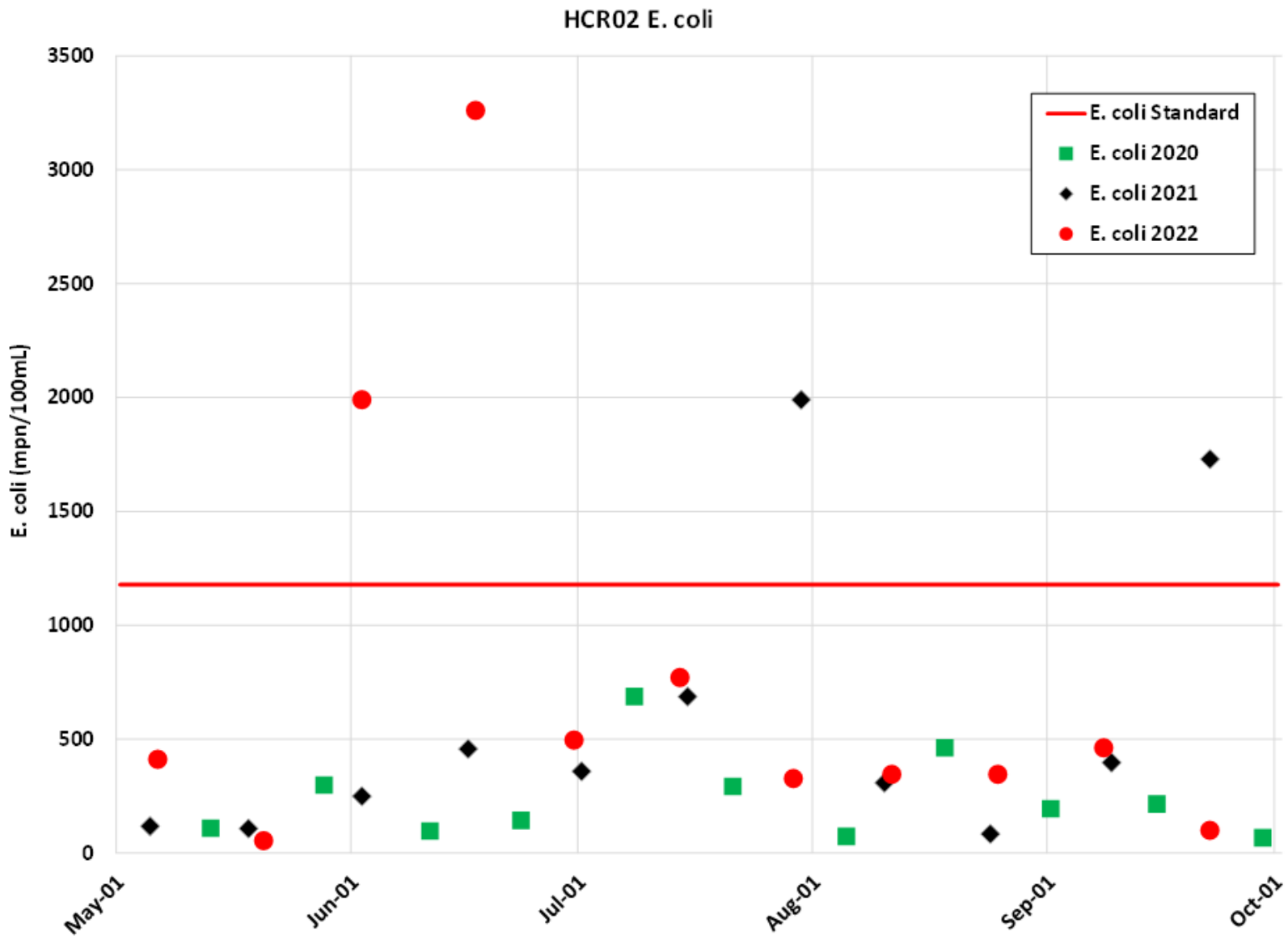

Figure 5-20. BFRWP *E. coli* Sampling Results at Monitoring Site HCR02 on Horse Creek from May –September during 2020, 2021, and 2022.

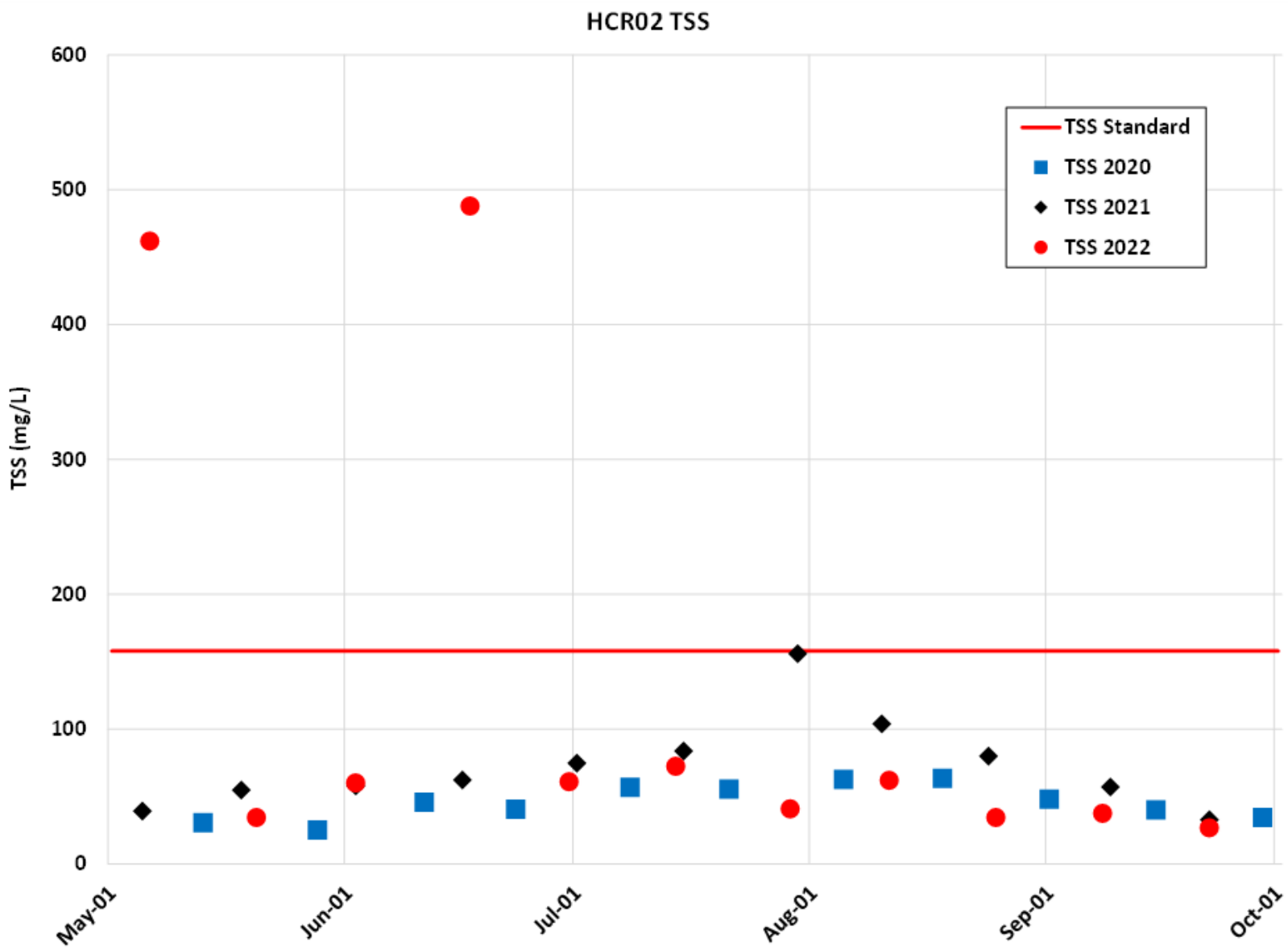

Figure 5-21. BFRWP Total Suspended Sediment (TSS) Sampling Results at Monitoring Site HCR02 on Horse Creek from May–September during 2020, 2021, and 2022.

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 direct mailings, radio sound bites, booths, tours, the BFRWP website, and the soil-quality demonstration trailer were successful during this segment. There were many comments received from the public who heard about the BFRWP from radio sound bites. This approach has increased public awareness about the watershed and spurred project participation with 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 riparian-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 rangeland 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. For this reason, the BFRWP, in partnership with the SD DANR, BFID, and NRCS obtained Regional Conservation Partnership Program (RCPP) funding for the BFRWP Irrigation Efficiency and Soil Health Project that will provide financial and technical assistance funding to install irrigation application and conveyance and soil health conservation practices from August 2022 through August 2024.

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. The water quality sampling results from the monitoring conducted by the BFRWP and SD DANR are indicating decreased levels of *E. coli* and TSS in the Belle Fourche River and Horse Creek.

The BFRWP promotes cover crops in coordination with the South Dakota Soil Health Coalition (SD SHC) and NRCS throughout the watershed. The SD SHC and NRCS provides cost share funding to producers while BFRWP staff assist SD SHC and NRCS staff to develop producer contracts for implementing cover crops within the watershed. These projects would be accounted for in the South Dakota Soil Health Coalition (SD SHC) Soil Health Planning and Improvement Project. 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 $1,312,000 EPA Section 319 Grant from the SD DANR 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.

7.3 NONMATCHING FEDERAL FUNDS BUDGET

Federal nonmatching dollars included NRCS EQIP funds, but other federal match amounts were not available at the time of this final report but will be updated when information is made available.

8.0 FUTURE ACTIVITY RECOMMENDATIONS

Segment 10 will continue over the next 3 years and will install the BMPs that were outlined in the TMDL. Details for Segment 10 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 Agriculture and Natural Resources, 2022. *The 2022 South Dakota Integrated Report for Surface Water Quality Assessment*, prepared by the South Dakota Department of Agriculture and Natural Resources, Pierre, SD. Retrieved from https://danr.sd.gov/OfficeOfWater/SurfaceWaterQuality/docs/DANR_2022_IR_approved.pdf.

South Dakota Legislature Administrative Rules, 2021. "Article 74:51 Surface Water Quality," accessed July 2, 2021, from https://sdlegislature.gov/Rules/Administrative/28396.

U.S. Census Bureau, 2021. Population Estimates, July 1, 2021 (V2021). Retrieved from https://www.census.gov/quickfacts/fact/table/US/PST045221.

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 *E. coli*					
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 Flood-Irrigated Systems to Sprinkler Irrigation Systems		567,000			567,000
1c. Replace Open Ditches to Pipe					
Task 2. Range and Riparian Area BMP Implementation					
Product 2. Implement Riparian/Rangeland BMPs					
2a. Implement Riparian Improvements		288,000			288,000
2b. Seasonal Riparian Area Management (SRAM)		25,000			25,000
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	272,500		61,000	26,332	359,832
Objective 3. Complete Essential Water Quality Monitoring					
Task 5. Water Quality Monitoring to Assess BMPs					
Product 5. Water Quality Monitoring	73,000				73,000
Total	**345,500**	**880,000**	**61,000**	**25,500**	**1,312,000**

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 *E. coli*					
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 Flood-Irrigated Systems to Sprinklers		529,399			529,399
1c. Replace Open Ditches to Pipe					
Task 2. Range and Riparian Area BMP Implementation					
Product 2. Implement Riparian/Rangeland BMPs					
2a. Implement Riparian Improvements		297,849			297,849
2b. Seasonal Riparian Area Management (SRAM)					
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	272,500		61,000	30,907	364,407
Objective 3. Complete Essential Water Quality Monitoring					
Task 5. Water Quality Monitoring to Assess BMPs					
Product 5. Water Quality Monitoring	73,000				73,000
Total	**345,500**	**827,248**	**61,000**	**30,907**	**1,264,655**

Table 7-2a. Planned 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 *E. coli*							
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 Flood-Irrigated Systems to Sprinklers	567,000	604,000					604,000
1c. Replace Open Ditches to Pipe		25,000	25,000				50,000
Task 2. Range and Riparian Area BMP Implementation and Improved Cropping Systems							
Product 2. Implement Riparian/Rangeland BMPs							
2a. Implement Riparian Improvements	288,000	114,000					114,000
2b. Seasonal Riparian Area Management (SRAM)	25,000						
Task 3. Improved Cropping Systems							
Product 3. Implement Cover Crops		25,000					25,000
Objective 2. Conduct Public Outreach, Project Management and Administration							
Task 4. Project Management and Administration							
Product 4. Public Outreach, Project Management and Administration	364,407						
Objective 3. Complete Essential Water Quality Monitoring							
Task 5. Water Quality Monitoring to Assess BMPs							
Product 5. Water Quality Monitoring	73,000						
Total	**1,312,000**	**768,000**	**25,000**		**100,000**		**893,000**

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 *E. coli*							
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 Flood-Irrigated Systems to Sprinkler Systems	529,399	684,423					684,423
1c. Replace Open Ditches to Pipe		12,359	4,997				17,356
Task 2. Range and Riparian Area BMP Implementation and Improved Cropping Systems							
Product 2. Implement Riparian/Rangeland BMPs							
2a. Implement Riparian Improvements	297,849	146,220					146,220
2b. Seasonal Riparian Area Management (SRAM)							
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	364,407						
Objective 3. Complete Essential Water Quality Monitoring							
Task 5. Water Quality Monitoring to Assess BMPs							
Product 5. Water Quality Monitoring	73,000						
Total	**1,264,655**	**843,002**	**4,997**				**847,999**

Table 7-3a. Planned Nonmatching Funds Budget

EPA 319 and Nonmatching Funds Budget	Nonmatching Funds						Sum of Nonmatching Funds ($)
	NRCS RCPP (Federal) ($)	NRCS EQIP (Federal) ($)	USACE (Federal) ($)	USBR (Federal) ($)	USGS (Federal) ($)	Other Grants	
Objective 1. Implement BMPs Recommended in the Belle Fourche River Watershed TMDL to Reduce TSS and *E. coli*							
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	230,000			100,000			330,000
1b. Convert Flood-Irrigated Systems to Sprinkler Systems	997,000	250,000					1,247,000
1c. Replace Open Ditches to Pipe							
Task 2. Range and Riparian Area BMP Implementation							
Product 2. Implement Riparian/Rangeland BMPs							
2a. Implement Riparian Improvements		200,000					200,000
2b. Seasonal Riparian Area Management (SRAM)							
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							
Objective 3. Complete Essential Water Quality Monitoring							
Task 5. Water Quality Monitoring to Assess BMPs							
Product 5. Water Quality Monitoring					200,000		200,000
Total	**1,227,000**	**450,000**		**100,000**	**200,000**		**1,977,000**

Table 7-3b. Actual Nonmatching Funds Budget

EPA 319 and Nonmatching Funds Budget	Nonmatching Funds						Sum of Nonmatching Funds ($)
	NRCS RCPP (Federal) ($)	NRCS EQIP (Federal) ($)	USACE (Federal) ($)	USBR (Federal) ($)	USGS (Federal) ($)	Other Grants	
Objective 1. Implement BMPs Recommended in the Belle Fourche River Watershed TMDL to Reduce TSS and *E. coli*							
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 Flood-Irrigated Systems to Sprinkler Systems		77,684					77,684
1c. Replace Open Ditches to Pipe		216,206					216,206
Task 2. Range and Riparian Area BMP Implementation							
Product 2. Implement Riparian/Rangeland BMPs		1,227,479					1,227,479
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							
Objective 3. Complete Essential Water Quality Monitoring							
Task 5. Water Quality Monitoring to Assess BMPs							
Product 5. Water Quality Monitoring							
Total		**1,521,368**					**1,521,368**

Table 7-4a. Planned Total Budget

Total Budget	EPA 319 ($)	Matching Funds ($)	Nonmatching Funds ($)	Total Funds ($)
Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and *E. coli*				
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	330,000	430,000
1b. Convert Flood-Irrigated Systems to Sprinkler Irrigation Systems	567,000	604,000	1,247,000	2,418,000
1c. Replace Open Ditches to Pipe		50,000		50,000
Task 2. Range and Riparian Area BMP Implementation				
Product 2. Implement Range/Rangeland BMPs				
2a. Implement Riparian Improvements	288,000	114,000	200,000	602,000
2b. Seasonal Riparian Area Management (SRAM)	25,000			25,000
Task 3. Improved Cropping Systems				
Product 3. Implement Cover Crops		25,000		25,000
Objective 2. Conduct Public Outreach, Project Management and Administration				
Task 4. Project Management and Administration				
Product 4. Public Outreach, Project Management and Administration	359,000			359,000
Objective 3. Complete Essential Water Quality Monitoring				
Task 5. Water Quality Monitoring to Assess BMPs				
Product 5. Water Quality Monitoring	73,000		200,000	273,000
Total	**1,312,000**	**893,000**	**1,977,000**	**4,182,000**

Table 7-4b. Actual Total Budget

Total Budget	EPA 319 ($)	Matching Funds ($)	Nonmatching Funds ($)	Total Funds ($)
Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and *E. coli*				
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 Flood-Irrigated Systems to Sprinkler Irrigation Systems	529,399 (41.0%)	684,423 (53.0%)	77,684 (6.0%)	**1,291,506 (100.0%)**
1c. Replace Open Ditches to Pipe		17,356 (7.4%)	216,206 (92.6%)	**233,562 (100.0%)**
Task 2. Range and Riparian Area BMP Implementation				
Product 2. Implement Range/Rangeland BMPs	297,849 (17.8%)	146,220 (8.8%)	1,227,479 (73.4%)	**1,671,548 (100.0%)**
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	364,407 (100%)			**364,407 (100.0%)**
Objective 3. Complete Essential Water Quality Monitoring				
Task 5. Water Quality Monitoring to Assess BMPs				
Product 5. Water Quality Monitoring	73,000 (100.0%)			**73,000 (100.0%)**
Total	**1,264,655 (34.8%)**	**847,999 (23.3%)**	**1,521,369 (41.9%)**	**3,634,023 (100.0%)**