

**Belle Fourche River  
Watershed Management and  
Project Implementation Plan  
Segment 8 **Amendment****

**319 Watershed Project  
October 1, 2017**

Sponsored By:

Belle Fourche River Watershed Partnership

Submitted to:

South Dakota Department of  
Environment and Natural Resources  
Pierre, South Dakota 57501

**PROJECT SUMMARY SHEET**

**PROJECT TITLE:** Belle Fourche River Watershed Management and Project Implementation Plan  
Segment 8

**PROJECT PERIOD:** July 2017–July 2019

**PROJECT SPONSOR:**

Belle Fourche River Watershed Partnership  
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**319 NONPOINT-SOURCE FUNDS:** \$650,000 + \$250,000 = \$900,000

**MATCH:** \$438,500 + \$280,000 = \$718,500

**OTHER FEDERAL FUNDS:** \$918,400

**TOTAL PROJECT COST:** \$2,006,900 + \$530,000 = \$2,536,900

**319 FUNDED FULL-TIME PERSONNEL:** 2

**PROJECT TYPES:** [ ] PLANNING [ X ] WATERSHED [ ] I&E [ ] GROUNDWATER

**PROJECT LOCATION**

**WATERSHED:** Belle Fourche River Watershed

**303(d) LISTED STREAM:** Yes. The following streams are 303(d) listed:

Belle Fourche 1: Wyoming to Fruitdale, SD-BF-R-BELLE\_FOURCHE\_01 (*E. coli*)

Belle Fourche 3: Whitewood Cr. to Willow Cr., SD-BF-R-BELLE\_FOURCHE\_03 (*E. coli*,)

Horse Creek, Indian Creek to mouth, SD-BF-R-HORSE\_01\_USGS (*E. coli*, TSS)

Deadwood Creek, Rutabaga Gulch to Whitewood Creek, SD-BF-R-DEADWOOD\_01 (*E. coli*)

Whitewood Creek: Deadwood Creek to Spruce Gulch, SD-BF-R-WHITEWOOD\_04 (*E. coli, fecal coliform*)

Whitewood Creek: Sandy Creek to I-90, SD-BF-R-WHITEWOOD\_05 (pH)

Whitewood Creek: I-90 to Crow Creek, SD-BF-R-WHITEWOOD\_06 (*E. coli*, pH)

Whitewood Creek: Crow Creek to mouth, SD-BF-R-WHITEWOOD\_07 (*E. coli*, TSS)

**HYDROLOGIC UNIT CODE:** 10120201, 10120202, 10120203

**Counties:** Butte, Lawrence, Meade

**Latitude:** 45 N

**Longitude:** -101 W

**NPS CATEGORY**

- AGRICULTURE: 100%
- AFOs
- URBAN RUNOFF
- RESOURCE EXTRACTION
- CONSTRUCTION
- HYDRAULIC MODIFICATION
- SILVICULTURE
- OTHER

**NPS FUNCTIONAL CATEGORY**

- BMP IMPLEMENTATION (78%)
- INFORMATION AND EDUCATION (11%)
- WATERSHED ASSESSMENT
- WATER QUALITY MONITORING (11%)
- TECHNICAL ASSISTANCE
- PLANNING
- GROUNDWATER
- OTHER

**NPS POLLUTANTS TO BE ADDRESSED**

- EXCESS NITROGEN
- EXCESS PHOSPHORUS
- SEDIMENTATION
- PATHOGENS/BACTERIA
- METALS
- LOW DISSOLVED OXYGEN
- PESTICIDES
- OIL AND GREASE
- TEMPERATURE
- pH
- OTHER
- OTHER

**SUMMARY STATEMENT:** The original project goal was to bring the Belle Fourche River into compliance for total suspended solids (TSS) and *Escherichia coli* (*E. coli*) by implementing the recommended best management practices (BMPs) by 2014 and implementing additional BMP recommendations from other Total Maximum Daily Load (TMDL) studies for waterbodies within the watershed as they became available.

This project will exceed the 2014 timeline, and a new 10-year plan is being developed to analyze the effectiveness of BMP implementation, assess the effects of the work done, and focus the efforts of the project on securing the compliance of the Belle Fourche River with its assigned beneficial uses. While progress is being made on affected waterbodies, the continued impairment listing of all segments on the Belle Fourche River and certain tributaries justifies additional work to be done in the area. Further implementation will be prioritized within the Horse Creek Watershed where measurable water quality improvements are likely to be attained.

**PROJECT GOALS:**

The goals of Segment 8, as set forth in the Belle Fourche River Watershed TMDL study, include:

- 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 1–5 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 colony-forming units per 100 milliliter (cfu/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 education and 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.

**PROJECT DESCRIPTION:** The Belle Fourche River Watershed Partnership is the project sponsor for this 2-year project. This is the eighth segment that addresses seven TMDLs. Completed activities planned for this segment will continue implementing BMPs that reduce *E. coli* and advance the BMP implementation for TSS pollutants. These BMPs include: (1) installing irrigation sprinkler systems, (2) implementing grazing management systems, (3) installing riparian vegetation improvements, (4) implementing improved cropping systems, (5) relocating livestock feeding grounds. **The Segment 8 Amendment proposes additional funds to increase BMP installment in the watershed.**

## **2.0 STATEMENT OF NEED**

**2.1** The Belle Fourche River Watershed Partnership (BFRWP) developed and implemented an assessment project to determine the Total Maximum Daily Load (TMDL) for the Belle Fourche River. The project started in April 2001. The purpose of the assessment was to (1) assess the current physical, chemical, and biological integrity of the Belle Fourche River and its tributaries; (2) determine the sources of total suspended solids (TSS) in the Belle Fourche River Watershed; and (3) define management prescriptions for identified nonpoint-source critical areas in the watershed. The draft TMDL was completed during 2003 and approved by the U.S. Environmental Protection Agency (EPA) in 2005. The TMDL report includes the Belle Fourche River and Horse Creek. The TMDL approved by the EPA addresses a cluster of TMDLs.

The Belle Fourche River is identified in the 1998 and 2002 *South Dakota 303(d) Waterbody Lists* and the 2004 and 2006 *Integrated Report for Surface Water Quality Assessment (IR)* as impaired because of elevated TSS concentrations. According to the 2006 IR, the Belle Fourche River from the Wyoming border to the Cheyenne River, South Dakota, failed to support its assigned uses because of high TSS concentrations. In the report, agricultural activities were listed as a probable source of occasional impairment. This report also states that a natural source of TSS may be the erosion of exposed shale beds that lie along the river and its tributaries. The 2008 IR shows that all segments of the Belle Fourche River, with the exception of the segment from the Wyoming border to Fruitdale, were delisted after water quality standards for TSS were met. The 2010 IR reports that four out of the five stream segments are listed as nonsupporting for TSS warm-water permanent fish life assigned beneficial use. The 2012 IR reports that all of the segments are listed for TSS and two segments are listed for fecal coliform and *E. coli*. The 2014 IR reports that all of the segments are listed for TSS and two segments are listed for fecal coliform and *E. coli*. The 2016 Draft Integrated Report has all of the Belle Fourche River segments listed for TSS and Segments 1, 3, and 5 as impaired for *E. coli* (see Table 2-1). Table 2-1 contains a summary of the TMDL segments within the Belle Fourche River Watershed that are listed as impaired for TSS, fecal coliform, *E. coli*, temperature, and pH in the 2016 IR. The table also lists the impaired beneficial use, impairment parameter, water quality data, and possible source.

Horse Creek was listed in the 1998 impaired waterbody list for TSS; this listing was later determined to be an error. The Horse Creek listing was corrected to conductivity during 2002. During this assessment, approximately 10 percent of the samples collected from Horse Creek exceeded the water quality standard for TSS. The 2012 IR lists Horse Creek as nonsupporting for conductivity alone. The 2014 IR does not list Horse Creek as impaired because of the lack of data reporting rather than clean water. In 2016, Horse Creek is listed for *E. coli* and TSS.

The Belle Fourche River from the Wyoming border to the Redwater River was first listed for pathogens in the 2002 South Dakota Report to Congress 305 (b) Water Quality Assessment and continued to be listed for fecal coliform in successive IRs (2004, 2006, 2008, and 2010) as failing to support its immersion recreation beneficial use because of elevated levels of *E. coli*. The South Dakota Department of Environment and Natural Resources (SD DENR) developed a TMDL in 2012 that identified livestock, wildlife, and stormwater from the city of Belle Fourche as potential sources of *E. coli* impairments in the watershed. The Belle Fourche River from Alkali Creek to the mouth was listed as nonsupporting for fecal coliform (2010) and for *E. coli* (2012, 2014, 2016) with 97 percent of the bacterial load attributed to livestock according to the TMDL.

**Table 2-1. Summary of the Belle Fourche River Watershed Exceedance Water Quality Data From 2016 Integrated Report**

Stream	Stream Reach	Beneficial Use	Impairment Parameter	Water Quality Criteria	Source
Belle Fourche River	Wyoming Border to Redwater River, South Dakota	Immersion Recreation	<i>E. coli</i>	126(a)/235(b)	Wildlife, Livestock, Urban Runoff
		Immersion Recreation	Fecal Coliform (per/100 mL)	200 <sup>(a)</sup> /400 <sup>(b)</sup>	Wildlife, Livestock, Urban Runoff
		Limited Contact Recreation	<i>E. coli</i>	126 <sup>(a)</sup> /235 <sup>(b)</sup>	Wildlife, Livestock, Urban Runoff
		Warm-Water Permanent Fish Life	TSS (mg/L)	90 <sup>(a)</sup> /158 <sup>(b)</sup>	Irrigated Crop Production
Belle Fourche River	Redwater River to Whitewood Creek	Warm-Water Permanent Fish Life	TSS (mg/L)	90 <sup>(a)</sup> /158 <sup>(b)</sup>	NA
Belle Fourche River	Whitewood Creek to Willow Creek	Warm-Water Permanent Fish Life	TSS (mg/L)	90 <sup>(a)</sup> /158 <sup>(b)</sup>	NA
		Immersion Recreation	<i>E. coli</i>	126(a)/235(b)	NA
Belle Fourche River	Willow Creek to Alkali Creek	Warm-Water Permanent Fish Life	TSS (mg/L)	90 <sup>(a)</sup> /158 <sup>(b)</sup>	NA
Belle Fourche River	Alkali Creek to Mouth	Immersion Recreation	Fecal Coliform (per/100 mL)	200 <sup>(a)</sup> /400 <sup>(b)</sup>	Livestock
		Immersion Recreation	<i>E. coli</i>	126 <sup>(a)</sup> /235 <sup>(b)</sup>	Livestock
		Limited Contact Recreation	Fecal Coliform (per/100 mL)	1,000 <sup>(a)</sup> /2,000 <sup>(b)</sup>	Livestock
		Limited Contact Recreation	<i>E. coli</i>	630 <sup>(a)</sup> /1,178 <sup>(b)</sup>	Livestock
		Warm-Water Permanent Fish Life	TSS (mg/L)	90 <sup>(a)</sup> /158 <sup>(b)</sup>	NA
Horse Creek	Indian Creek	Limited Contact Recreation	<i>E. coli</i>	126(a)/235(b)	NA
		Warm-Water Permanent Fish Life	TSS (mg/L)	90(a)/158(b)	NA
Deadwood Creek	Rutabaga Gulch to Whitewood Creek	Immersion Recreation	<i>E. coli</i>	126 <sup>(a)</sup> /235 <sup>(b)</sup>	NA
Strawberry Creek	Bear Butte Creek to S5, T4N, R4E	Fish/Wildlife Prop. Rec. Stock Waters	Cadmium (mg/L)	(c)	Mining Impacts
Whitewood Creek	Deadwood Creek to Spruce Gulch	Immersion Recreation	<i>E. coli</i>	126 <sup>(a)</sup> /235 <sup>(b)</sup>	Combined Sewer Overflows
Whitewood Creek	Spruce Gulch to Sandy Creek	Immersion Recreation	<i>E. coli</i>	126 <sup>(a)</sup> /235 <sup>(b)</sup>	NA
Whitewood Creek	Sandy Creek to I-90	Cold-Water Marginal Fish Life	pH	6.5–8.8	Natural Sources
Whitewood Creek	I-90 to Crow Creek	Warm-Water Permanent Fish Life	pH	6.5–9.0	NA
		Limited Contact Recreation	<i>E. coli</i>	126(a)/235(b)	NA
Whitewood Creek	Crow Creek to Mouth	Limited Contact Recreation	<i>E. coli</i>	126(a)/235(b)	NA
		Warm-Water Permanent Fish Life	TSS (mg/L)	90 <sup>(a)</sup> /158 <sup>(b)</sup>	NA

(a) 30-day average.

(b) Daily maximum.

(c) Cadmium concentration  $< (1.136672 - [(\ln(\text{hardness}) \times 0.041838)] \times \exp[1.128 \times (\ln(\text{hardness})] - 3.828)$ .

TSS BMP implementation recommended in the Belle Fourche River TMDL began during 2004. The first year of implementation included funding from local ranchers and farmers, BFRWP, Lawrence County, Belle Fourche Irrigation District (BFID), Wyoming Department of Environmental Quality (WY DEQ), National Resource Conservation Service (NRCS), US Army Corps of Engineers, Bureau of Reclamation (BOR), and the U.S. Geological Survey (USGS). Two products of the project were the *Ten-Year Belle Fourche River Watershed Strategic Implementation Plan* (10-Year Plan) and the *Belle Fourche Irrigation District Water Conservation Plan* (5-Year Plan). These two plans outline the work that has been completed to date. Currently, a new 10-year plan is being developed to guide the project in future years. Table 2-2 list the BMPs installed above and below the reservoir to date. The total planned number of each BMP to be installed in this segment is also shown. Segments 1–6 were completed on schedule and within budget. Segment 7 is on schedule to be completed in June 2017 within the proposed budget.

**Table 2-2. Best Management Practices Installed and Scheduled Above and Below the Belle Fourche Reservoir**

Best Management Practice	Planned for Segment 8	Segment 8 Amended	Amount Implemented October 2016	Total Amount Scheduled From 10-Year Plan
Flow-Automation Units (number)	0		41	42
Upgraded Water Card and Water Order System	Complete		Phase III	Three Phases
Portable Stage/Flow-Measuring Devices (number)	0		6	15
Real-Time Stage Flow-Measuring Devices (number)	0		9	15
Alternative Keyhole Water Delivery Study	0		0	1
Alternative Keyhole Water Supply Method	0		0	1
Line Open Canals and Laterals (feet)	0		2,600	16,000
Replace Open Canals and Laterals With Pipelines (feet)	8,000		14,514	25,000
Nonused Water Storage Pond (number)	0		0	3
Inlet Canal Lining (feet)	0		7,760	10,560
Pipeline Projects Delivering Water to Fields (feet)	8,000		58,082	9,000
Irrigation Sprinkler Systems (number)	7	4	105	36
Managed Riparian Grazing (acres)	1,500	500	33,188	34,000
Public Meetings (number)	6		46	40
Project Tours and Events (number)	6		17	8
Irrigation Scheduling (acres)	300			NA
Cover Crops (acres)	200		200	NA

While the next 10-year plan has not been completed, the SD DENR did evaluate the progress that has been made reducing sediment loads within the watershed. The most direct measure of success is a summary of the BMPs implemented throughout the watershed and associated load reductions (nitrogen, phosphorus and sediment), which are reported annually to the EPA. Grazing and riparian reductions are calculated by using the Spreadsheet Tool for Estimating Pollutant Loads (STEPL)

model. Irrigation reductions are not able to be calculated in STEPL, and so reductions are based on literature values [Dressing, 2002]. While BMPs reduced sediment and other pollutants before 2009, the reductions in Tables 2-3 and 2-4 were reported in the same manner, are stored in the TRACKER database and so are easily comparable.

**Table 2-3. Reported 319 Nonpoint-Source Reductions 2009–2015**

<b>Stream Reach</b>	<b>Nitrogen (lbs/year)</b>	<b>Phosphorous (lbs/year)</b>	<b>Sediment (tons/year)</b>	<b><i>E.coli</i>/Fecal Coliform (mpn)</b>
Belle Fourche 1	185	162	600	32
Belle Fourche 2	2,246	2,127	9,826	129
Belle Fourche 3	1,494	1,281	3,610	11
Belle Fourche 4	1,210	1,075	5,192	161
Belle Fourche 5	170	151	1,290	70
Horse Creek	745	639	1,450	4
Spearfish 6	105	90	200	
Willow Creek	114	101	1,304	49
Crow Creek			1,118	
Redwater			138	
Other	683	653	1,659	21
<b>Total</b>	<b>6,952</b>	<b>6,279</b>	<b>26,387</b>	<b>477</b>

MPN: most probable number

**Table 2-4. Reported 319 Nonpoint-Source Reductions 2009–2015**

<b>Project Implementation Segment</b>	<b>Best Management Practice</b>	<b>Nitrogen (lbs/year)</b>	<b>Phosphorous (lbs/year)</b>	<b>Sediment (tons/year)</b>	<b>Number of Projects</b>
4	Grazing/Riparian	586	793	616	5
5	Grazing/Riparian	528	495	2,140	6
6	Grazing/Riparian	586	793	2,730	19
7	Grazing/Riparian	45	41	225	3
<b>Subtotal</b>	<b>Grazing/Riparian</b>	<b>1,745</b>	<b>2,122</b>	<b>5,711</b>	<b>33</b>
4	Irrigation			7,107	22
5	Irrigation	2,118	1,800	5,327	21
6	Irrigation	3,045	2,610	7,180	29
7	Irrigation	630	540	1,200	5
<b>Subtotal</b>	<b>Irrigation</b>	<b>5,793</b>	<b>4,950</b>	<b>20,814</b>	<b>77</b>
<b>Grand Total</b>		<b>7,538</b>	<b>7,072</b>	<b>26,525</b>	<b>110</b>



In addition to BMPs reported in TRACKER, recent evaluations of the sediment rating transport equations show that, given a flow, less sediment is being transported in post-bmp years (2005–2015) relative to pre-bmp years (1995–2004) both at Horse Creek and WQM 21 (Belle Fourche River, east of Sturgis, downstream of implementation). High flows in recent years still result in exceedances because of the load-flow relationship where higher TSS concentrations are proportional to flows.

**2.2** The Belle Fourche River Watershed is shown in Figure 2-1. The ecoregions in the watershed include the Black Hills Foothills, Black Hills Plateau, Black Hills Core Highlands, River Breaks, Semiarid Pierre Shale Plains, Dense Clay Prairie, and Missouri Plateau. The Belle Fourche River is a tributary to the Cheyenne River. Currently, 13 stream segments in the Belle Fourche River Watershed are listed in the South Dakota 2016 IR as impairment-related TMDL waters. These segments include Bear Butte Creek (two listings), the Belle Fourche River (five listings), Redwater River (one listing), Strawberry Creek (one listing), and Whitewood Creek (five listings).

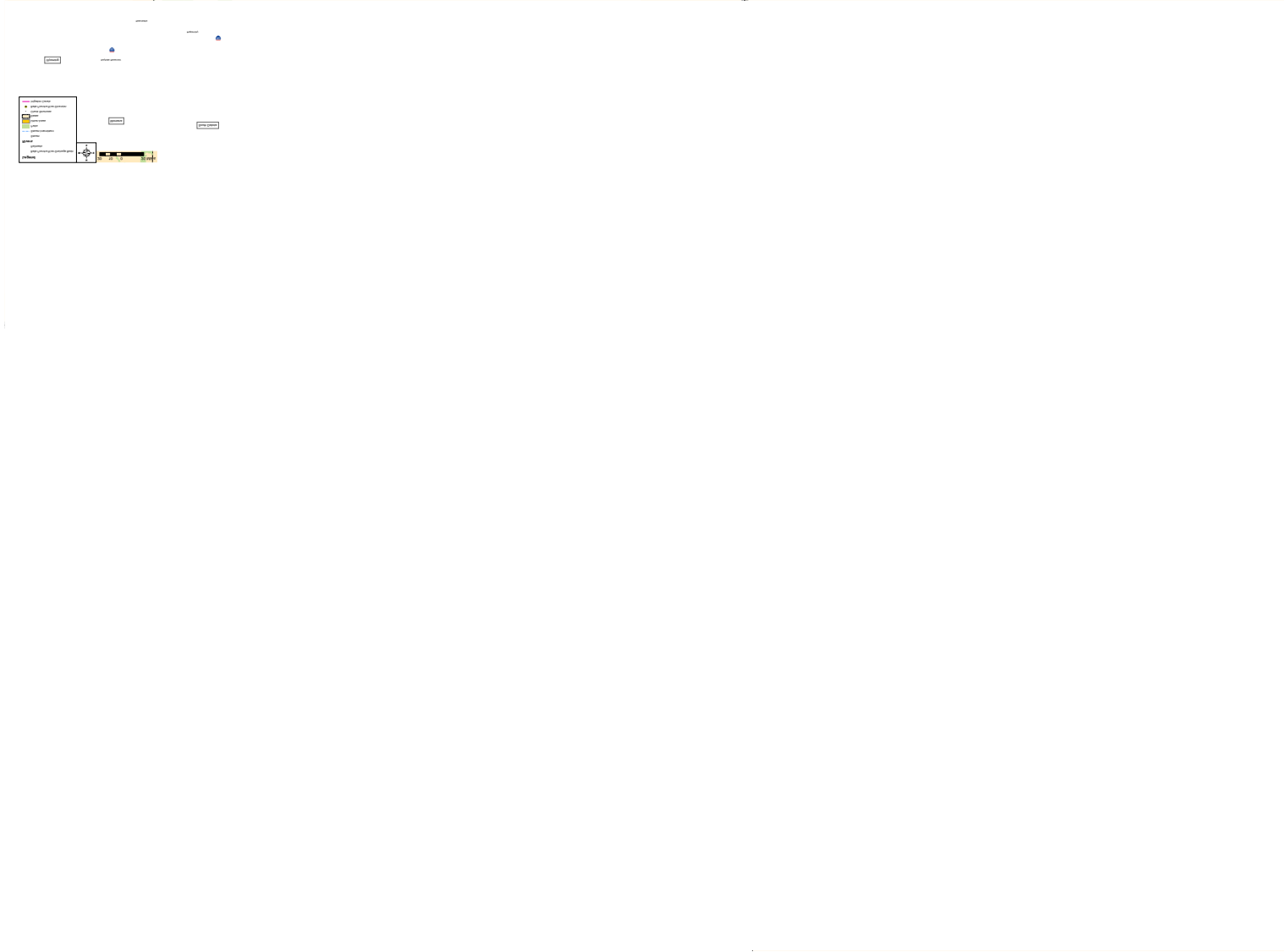
The surface area of the South Dakota portion of the Belle Fourche River encompasses approximately 2,103,040 acres and includes Hydraulic Units 10120201, 10120202, and 10120203. The city of Spearfish (population 10,495) is the largest municipality located in the Belle Fourche River Watershed. Other small communities in the watershed include Belle Fourche (population 4,565), Sturgis (population 4,442), Lead (population 3,027), Deadwood (population 1,380), Newell (population 646), Nisland (population 204), and Fruitdale (population 62).

Land use in the watershed is primarily livestock grazing with some cropland and a few urban and suburban areas. Wheat, alfalfa, native and tame grasses, and hay are the main crops. Corn, wheat, and barley are grown within the BFID. Some winter animal feeding areas are located in the watershed. Gold mining, while reduced in scope from the past, is conducted in some headwater areas of the watershed, and some of the land is used for silviculture. Approximately 11 percent of the watershed is U.S. Forest Service (USFS) land (primarily the Black Hills National Forest), and 4 percent is Bureau of Land Management land.

Major soil associations found in the watershed include Winler-Lismas, Pierre-Kyle, Grummit-Shale, Epsie, Midway-Penrose, Cabbart-Absher, Butche-Colby, Arvada-Stetter, Lohmiller-Glenberg-Haverson, Caputa-Satanta, Delphill-Assinniboine, Nunn-Satanta-Zigweid, Blackpipe-Savo-Manvel, Blackpipe-Assinniboine-Savo, Canyon-Lakoa-Maitland, Tilford-Nevee, St. Onge-Keith, Lohmiller-Glenberg, Winler-Lismas-Swanboy, Kyle-Pierre-Hisle, Samsil-Lismas-Pierre, Nevee-Vale-Tilford, Butche-Satanta-Boneek, Nunn-Kyle-Pierre, Barnum-Swint-St. Onge, Grummit-Snomo-Rock, Paunsaugunt-Rock, Lakoa-Maitland, and Citadel-Vanocker-Grizzly.

The average annual precipitation in the Belle Fourche River Watershed ranges from 15 to 29 inches, 70 percent of which is usually received from April through September. Tornadoes and severe thunderstorms strike occasionally. These storms are local, of short duration, and occasionally produce heavy rainfall events. The average seasonal snowfall ranges from 155 inches in the higher elevations of the western part of the watershed to 23 inches per year in the eastern portion of the watershed. The average water allocation to the BFID is approximately 15 inches. The water added to the fields from irrigation nearly doubles the amount of water available for crop production.

The landscape in the watershed is characterized by prairies with some mountains in the south and west. Land elevation ranges from approximately 2,500 feet above mean sea level (msl) to approximately 7,071 msl. The Black Hills are steep, and the hills near the Cheyenne River are not as steep.



**Figure 2-1.** Location of the Belle Fourche River Watershed.

**2.3** The Belle Fourche River Watershed within South Dakota encompasses over 2 million acres. TSS are contributed from natural, urban, agriculture, forest, and mining sources. The TMDL study identified that the primary contributor of TSS to the Belle Fourche River and Horse Creek are the natural bank sloughing, quantity of nonused irrigation water discharged to the natural waterways, and riparian habitat impairment. Stream entrenchment and bank failure are responsible for approximately 75 percent of the TSS in the Belle Fourche River system (2004 TSS TMDL). Stream energy causes natural bank failure (particularly in the eastern portion of the watershed). These areas are dominated by high banks composed primarily of clay soils that supply suspended solids to the channel. Riparian areas and improper grazing or overgrazing in the uplands facilitate natural bank failure and add to TSS in the watershed. Increased quantities of water resulting from the nonused irrigation flows are the major driving cause of the channel incision and result in additional bank failures and resultant suspended solids.

According to the TSS TMDL, irrigation and return-flow, nonused irrigation water are responsible for approximately 20 percent of the TSS in the Belle Fourche River system. Much of the irrigation in the watershed is flood irrigation. This type of irrigation results in sediments that are mobilized by three processes: (1) tail water/runoff crossing fields, (2) water in the canals and laterals, and (3) water in the intermittent streams carrying tail water/runoff to the perennial streams within the watershed. Rangeland erosion contributes the remaining 5 percent of the TSS load.

The *E. coli* TMDL study identified livestock as the main contributor to excess loading in the lower reach of the Belle Fourche River, with wildlife contributing approximately 3 percent of the load. To meet the standard for immersion recreation, *E. coli* loads need to be reduced 99, 56, 21, 29, and 80 percent during high, moist, midrange, dry, and low flow, respectively.

### **3.0 PROJECT DESCRIPTION**

#### **3.1 GOALS**

The project goal is 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 BMP recommendations from the *E. coli* TMDL in the bacteria-impaired reaches of the Belle Fourche River. The goals of this project segment, as set forth in the Belle Fourche River TSS and *E. coli* TMDL studies, include 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 1–5 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 colony-forming units per 100 milliliter (cfu/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 education and 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.

#### **3.2 OBJECTIVES AND TASKS**

The strategy outlined in the Belle Fourche River Watershed Implementation Plan is to progressively implement BMPs, such as water management and grazing management systems in the riparian areas, within the Belle Fourche River Watershed to reduce TSS in Horse Creek and the Belle Fourche River and continue implementing BMPs to reduce *E. coli*. This project segment focuses on BMPs that reduce the amount of sediment-laden nonused irrigation water that is discharged to the local waterways by the delivery and application of irrigation water as well as riparian vegetation improvement. Baseline and seasonal monitoring will be performed to measure improvement. The project strategy will be reviewed annually to measure overall success to determine adjustments and to obtain funding for the following project segment. Federal, state, and private funding will be used to fund BMPs. A final report will be produced for each 319 project segment that is completed.

Specifically, this project segment will fund the 10<sup>th</sup> and 11<sup>th</sup> years of BMP installation in the Belle Fourche River Watershed to continue TSS reduction as well as continue implementing BMPs that target *E. coli* reduction.

**OBJECTIVE 1: Implement BMPs Recommended in the Belle Fourche River Watershed TMDL to Reduce TSS and *E. coli***

The Belle Fourche River TSS TMDL recommends BMPs that focus on reducing the amount of nonused irrigation water discharged to the waterway from irrigation as well as implementing riparian vegetation improvements. Nonused water reduction activities include water delivery and water application improvement. Nonused water picks up sediment from the irrigation ditches themselves along with sediment from crop fields. The nonused water then returns to the Belle Fourche River and Horse Creek, and hence, increases the sediment loads. Horse Creek has been identified by the SD DENR and the BFRWP as a special focus area. Horse Creek itself is impaired; focusing efforts within a smaller geographic area may allow water quality effects to be more readily observed than in the much larger Belle Fourche Watershed. Suitable irrigation and range improvement projects within Horse Creek will be prioritized whenever possible.

**Task 1**

**Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems**

The BFID maintains and operates irrigation facilities for the BOR. The BFID has an active water-conservation program. Historically, the program included lining the canals, piping, and operational and maintenance procedures to conserve water. Irrigation significantly impacts the Belle Fourche River, Horse Creek, and other streams within the BFID's 57,000 (+) acres (irrigable land). The impact is primarily from the additional water added to the system during the irrigation season (June–September), and the average TSS concentrations at USGS Gaging Station Sites 06430500 (at the South Dakota-Wyoming border) and USGS 06438000 (upstream of the Cheyenne River).

Approximately 64 percent of the water released from the reservoir was delivered to the field. Approximately 32 percent of the water was used by crops, and the rest was lost through evaporation and nonused water was discharged to adjacent waterways. This nonused water also carried TSS from the flood-irrigation water in fields. This task will increase the overall irrigation delivery and application efficiency through sprinkler systems, pipelines, and water control and monitoring structures and equipment. While conservation effects on irrigation within the Belle Fourche Watershed have not been directly measured at the field level, the Conservation Effects Assessment Project in the Upper Snake River/Rock Creek Watershed in Idaho measured 52–97 percent TSS

reductions in nonused water by installing BMPs, including switching irrigation systems from furrow to sprinkler, using polyacrylamide, and installing sediment ponds.

Products:

1. Improved Irrigation Water Delivery and Application.

The goal for this project segment is to reduce the amount of sediment-laden tail water that returns to the Belle Fourche River from inefficient water use in the BFID. This goal will be accomplished by reducing nonused irrigation water from the BFID's delivery system and the producers' application systems. The following is an outline of anticipated activities that will be completed to reach the milestone:

a) Replace open laterals and sublaterals with pipeline within the delivery system (8,000 feet [ft] of pipeline). The BFID, along with the BOR, has actively been replacing approximately 4,000 ft of open laterals with underground pipe for the past several years. Approximately 8,000 ft of open laterals is estimated to be replaced with pipeline over the next 2 years. These projects will reduce the water loss to seepage and evaporation and sediment transport during irrigation water delivery.

- Activity Cost: \$100,000
- Lead Group: BFID
- Other Groups: BOR
- Milestone: June 2019, Conversion of 8,000 feet of open laterals to pipeline (see the timeline on page 18).

b) Convert 7 (+4 = 11) flood-irrigation systems to sprinkler-irrigation systems. The total irrigation acres treated will be approximately 560 (+320 = 880) acres. Convert an additional 4 flood-irrigated systems to sprinkler-irrigation systems on approximately 320 acres totaling 11 pivots and 880 acres.

Sprinkler-irrigation systems are more efficient at applying water for irrigation (i.e., they use less water and reduce nonused water). In addition to improved water efficiency, converting flood-irrigation systems to sprinklers decreases the amount of sediment transported through runoff. A total of 319 funds, along with Environmental Quality Incentives Program (EQIP) funds, would be used to attain this goal. Approximately 7 (+4 = 11) sprinkler-irrigation systems will be installed during this segment. Conversion projects include installing center-pivot sprinkler-irrigation systems and an underground pipeline that services the system on acres that have been using flood irrigation. Cost share is based on a docket price per linear foot of sprinkler system and pipeline that services the sprinkler-irrigation system and typically provides approximately 40 percent of the total cost of the project. The BFRWP designates the docket price annually for consistency with the EQIP docket price. The cost-share amount has been designated to not exceed 50 percent of the total cost of the project. Funds requested in this segment will be used to improve water use efficiency and decrease the amount of sediment transported through runoff on approximately 560 acres (+320 = 880). 319 implementation dollars will be utilized in the Horse Creek Watershed.

- Activity Cost: \$650,000 + \$450,000 = \$1,100,000
- 319 Cost: \$200,000 + \$200,000 = \$400,000
- Lead Group: NRCS, Consultants

- Other Groups: Consultants, Producers
  - Milestone: June 2019, conversion of flood-irrigation to sprinkler-irrigation systems (7 + 4 = 11 sprinkler systems) on approximately 560 acres (+320 = 880) (see the timeline on page 18)
- c) Convert approximately 8,000 ft of open on-farm ditches to buried pipe. Total treated acres would be approximately 150 acres.

The Butte Conservation District received a grant from the South Dakota Department of Ag through their Coordinated Natural Resources Conservation Grants to provide cost share for converting on-farm open ditches to buried underground pipe. Replacing open ditches with buried pipe reduces water loss via seepage and evaporation, which will in turn increase efficiencies and reduce sediment-laden return flows.

- Activity Cost: \$50,000
  - Lead Group: Producers, Watershed Staff, Butte Conservation District
  - Milestone: June 2019, 8,000 feet of open ditch converted to buried pipe treating approximately 150 acres (see timeline on page 16)
- d) The project staff will work with up to 15 producers on 900 acres (600 acres currently under irrigation and 300 acres scheduled to be added) to help optimize the timing and depth of irrigation deliveries through irrigation scheduling. This project, which was initiated during a national-level Conservation Innovation Grant (CIG) funded by the NRCS, will involve assisting producers in installing soil-moisture sensors at  $\frac{1}{2}$  and  $\frac{2}{3}$  of the crop rooting depth at up to two locations per field. A datalogger will record soil moisture readings periodically throughout the day and can be accessed at any time or downloaded periodically to monitor soil-moisture trends. Staff will continue to work with existing producers who have sensors and equipment and provide technical support for producers who are beginning the practice. This practice has been documented to reduce water application and associated sediment-laden tailwater by up to 50 percent. Cost-share dollars are provided by the NRCS for new participants through EQIP's Irrigation Water Management practice.

- Activity Cost: \$10,000
- Lead Group: Producers, Watershed Staff, NRCS
- Milestone: June 2019, 300 additional acres treated with irrigation scheduling (see timeline on page 16)

Total Product Cost: \$910,000 + \$450,000 = \$1,100,000

319 Cost: \$200,000 + \$200,000 = \$400,000

Responsible Groups: NRCS, Consultants, Producers

## Task 2

### **Range and Riparian Area BMP Implementation**

In the Belle Fourche River Watershed, the 2004 TSS TMDL predicted that riparian vegetation improvement will reduce TSS concentrations by 18 percent. Functioning riparian areas intercept runoff and store sediment and associated pollutants. Grazing exclusion and streambank protection would be the main BMPs. The *E. coli* TMDL study identified that reducing livestock access to streams, protecting unstable stream banks, creating filter strips, and waste management should be implemented to reduce *E. coli* in the impaired reaches of the Belle Fourche River and Horse Creek. Suitable

riparian and range improvement projects within Horse Creek will be prioritized whenever possible. The U.S. Department of Agriculture (USDA) cost-share funds will be used to install similar BMPs on upland sites. Installing BMPs in both the riparian and upland sites allows for overall improved grazing management and range condition that will ultimately reduce TSS and *E. coli* concentrations.

#### Products:

2. Implement riparian improvement on 1,500 (+ 500 = 2,000) Acres and Rangeland Improvement on 25,000 Acres. **Implement an additional 500 of riparian improvements, which brings the total to 2,000 acres.**

The focus of this product will be to work with producers who have livestock operations directly impacting riparian areas along the Belle Fourche River or a major tributary. Producers who want to make a change in their grazing or feeding operations to improve their riparian areas and reduce sediment loads will be selected through a ranking process to achieve maximum effectiveness of BMP installation. BMPs used to achieve this goal include livestock deferment, improved grazing systems, livestock watering facilities, fencing, livestock water pipeline, and other facilitating practices. The BFRWP has been successful in working with the NRCS, Game Fish and Parks (SD GF&P), and U.S. Fish and Wildlife Service (USFWS) and will continue to work with these agencies to maximize funding opportunities. In addition, BFRWP consultants will continue to provide technical assistance to producers who work on riparian improvement projects. EPA funds will be used toward riparian acres.

The BFRWP has also teamed up with the Belle Fourche Weed Management Area Group to secure funds to rehabilitate the native plant community after herbicide control of phragmites along the Belle Fourche River. To date, project efforts have effectively treated approximately 550 out of 750 acres along the Belle Fourche River. This project promotes a healthy native plant community along the Belle Fourche River, which can intercept and slow runoff, which will reduce sediment.

- Activity Cost:  $\$584,000 + \$80,000 = \$664,000$
- 319 Cost:  $\$150,000 + \$50,000 = \$200,000$
- Lead Group: NRCS, Consultants, Producers
- Other Groups: NRCS, USFWS, SD GF&P, Conservation Commission, Weed Management Group
- Milestone: June 2019, implement improvements on approximately 1,500 (+ 500 = 2,000) acres and 25,000 acres of rangelands (see the timeline on page 18)

Total Product Cost:  $\$584,000 + \$80,000 = \$664,000$

319 Cost:  $\$150,000 + \$50,000 = \$200,000$

Responsible Groups: NRCS, Consultants, Producers, USFWS, SD GF&P

#### Task 3

##### **Improved Cropping Practices**

Implementing cover crops on farm ground where traditional tillage and fallow practices exist can greatly reduce soil erosion and promote healthy soil. Cover crops produce more vegetation biomass than volunteer plants; these crops do transpire water, increase water infiltration, and decrease surface runoff and runoff velocity. The BFRWP has demonstrated cover-crop practices on approximately 200 acres in the watershed as part of Segment 7. The BFRWP has submitted a cooperative agreement with the NRCS that would provide cost share on approximately 200 additional acres in 2017. The BFRWP will promote successful cover-crop practices throughout the watershed.

Products:

- 3. Implement cover crops on 200 acres in the watershed. The NRCS would be the funding partner for the cost share, and BFRWP staff would be responsible for coordinating with the producers (i.e., planning, contracting, and budgeting the projects). Cost-share rate would be \$25 per acre or approximately 50 percent of the total cost with the producer providing 50 percent of the cost in the form of cash or in-kind match. The projects would be complete by October 2017. Success in the first year of this cooperative agreement would likely lead to extending the cooperative agreement.
  - Activity Cost: \$10,000
  - Lead Group: Producers, Watershed Staff, NRCS
  - Milestone: October 2017, 200 acres of cover crops implemented (see timeline on page 16)

319 Cost: \$0

**OBJECTIVE 2: Conduct Public Outreach and Education, Implementation Record Keeping, Cultural Resources, Project Design, Report Writing, Writing Future Grants, and Annual Audit**

Public outreach and education is an essential part of this project. Public meetings and workshops keep the community informed, encourage involvement with the BFRWP, and promote water quality through personal responsibility. Producer implementation, project planning, and record keeping are important for efficient report writing. Grant writing for future projects that involve water quality issues in the watershed will further assist the BFRWP efforts. Beginning in 2006, an additional \$5,100,000 was funded for the watershed through these grant-writing efforts.

Task 4

**Project Management and Administration**

Products:

- 4. Public Outreach and Education, Implementation Record Keeping, Cultural Resources, Engineering, Irrigation Scheduling, Coordinating Improved Cropping Practices, Audits, Report Writing, and Future Grant Writing.

Six public meetings will be held during the project segment. The meetings will update the status of the project and educate and encourage the producers, landowners, and stakeholders to become involved with implementing BMPs. These meetings will provide an opportunity for input from residents in the area. Meeting notifications will be provided through local agencies, mailings, and newspapers. Additionally, a public website ([www.bellefourchewatershed.com](http://www.bellefourchewatershed.com)) will be maintained to provide the latest available data, an overview of the project, and status of work activities. Public awareness will be further enhanced by tours of the watershed, informational booths at local county fairs, and agriculture-related shows that demonstrate the BFRWP accomplishments. Educational workshops will be sponsored during the project and demonstrate innovative approaches to addressing resource concerns in the watershed. The BFRWP’s Soil-Quality Demonstration Trailer will be used to demonstrate the effects of soil erosion to agriculture producers, students, and the general public. Watershed staff will be responsible for organizing and planning all of the public outreach and education activities.

Riparian, irrigation, and cover-crop implementation projects require collaborating with the producer to complete applications, plan projects, comply with State Historic Preservation Office regulations, conduct engineering, check practices once they are complete, and organize and file applications and producer bills. Consultants will work with the NRCS and the Butte Conservation District to carry out this task.



Grant Reporting and Track System (GRTS) reports will be completed as required by the SD DENR. A final report will be submitted to the EPA at the conclusion of the project. This report will cover all of the work completed during this segment of implementation and the estimated effects that the BMPs will have on the water quality in the Belle Fourche River. Additional grants to assist in resolving water quality issues and support the cost of implementation projects will be written. Over the past several years, the BFRWP has been successful in partnering with the NRCS, SDDA, South Dakota Weed and Pest, Meade County, Butte County, city of Spearfish, and city of Belle Fourche in securing grant funding to further their efforts in water quality improvement.

- Activity Cost: \$261,000 319 Cost: \$,000
- Lead Group: BFRWP
- Other Groups: NRCS, Producers, Consultants, Butte Conservation District
- Milestone: June 2019, two GRTS reports, one final report, two required federal audits, six public meetings, one website, two watershed tours, two workshops, five public information booths, and eight soil-quality demonstrations (see timeline on page 16)

Total Product Cost: \$261,000 319 Cost: \$261,000  
 Responsible Groups: BFRWP, NRCS, Producers, Consultants, Butte Conservation District

**OBJECTIVE 3: Complete Essential Water Quality Monitoring**

Water quality monitoring will continue to use a targeted approach. Water quality data will be collected at sites used during the watershed assessment to formulate the TMDL.

Task 5

**Water Quality Monitoring to Assess BMPs**

Products:

5. Monitor Water Quality Improvement.

Monitoring is necessary to measure water quality within the Belle Fourche Watershed to determine if water quality standards are being met and to ascertain whether implementation activities have had a measurable impact on water quality. Ambient monitoring at fixed locations can be used to evaluate the general state of water quality and assess long-term trends. Water quality monitoring on a smaller scale can more easily detect local changes caused by implementation or other changes within the watershed. Water quality monitoring will be expanded in Segment 8 to include both approaches. The project will take over monitoring at the two abandoned water quality monitoring (WQM) stations: WQM 130 and WQM 83. The TSS TMDL calls for monitoring quarterly at five WQM stations as a minimum for assessing that the TMDL has been reached. The Horse Creek priority area will continue to be monitored at the bottom of the subwatershed to assess effects from irrigation and other BMPs at HC2 and an additional site at HC1 that was added during Segment 7 will serve as a “control” site at the top of the watershed to help account for natural variation in water quality caused by changes in flow and other environmental factors.

Water quality monitoring will use a targeted approach. Water quality data will be collected at sites used during the watershed assessment to formulate the TMDL. Flow impact on the macrowatershed will be analyzed by using the following USGS and watershed project managed stations:

- USGS 06428500 (Belle Fourche River at the South Dakota/Wyoming state line)
- USGS 06436000 (Belle Fourche River near Fruitdale, South Dakota)
- USGS 06437000 (Belle Fourche River near Sturgis, South Dakota)
- USGS 06438000 (Belle Fourche River near Elm Springs, South Dakota)
- USGS 06433000 (Redwater River above Belle Fourche, South Dakota)
- HC01 (Horse Creek above BFID – managed by watershed project)
- HC02 (historically called USGS 06436760 Horse Creek above Vale, South Dakota – currently managed by watershed project).

Several of the stations are long-term flow-measurement sites that are operated, funded, and maintained by the USGS. The practices installed to reduce the amount of nonused water discharging to the waterways within the irrigation district should be detectable at the Belle Fourche River sites near Sturgis and Elm Springs as well as at the Horse Creek site above Vale. The other recommended sites will allow a water-mass balance to be calculated, which will add to the precision of the analysis.

The SD DENR Surface WQM Program has several active monitoring stations within the watershed. In addition, the watershed project will complete *E. coli* and TSS grab sampling at two recently discontinued WQM locations (WQM 130 at Belle Fourche and WQM 83 near Nisland) so the long-term record can be maintained. At these two locations, one sample will be collected before the recreation season (May–September), monthly samples will be collected during the recreation season, and one sample will be collected after the recreation season each year. Comparisons will be performed over time by using applicable sites to measure the large-scale changes in water quality.

The USGS will collect water quality samples from long-term watershed monitoring sites. Biweekly *E. coli* and TSS grab samples as well as continuous flow will be monitored from May through September at HC01 and HC02 to assess monthly variability. These samples will provide a better understanding of the impacts that result from the BFID delivery system and on-farm delivery inefficiencies; these samples will also compare chemical changes over time. A majority of the wastewater from the delivery system and on-farm practices flow directly into Horse Creek. Implementation projects have been and will continue to be prioritized within this region. These stations are necessary to fully understand the impact that implementation projects within the BFID have on flow and water quality in Horse Creek.

- |   |                    |
|---|--------------------|
| – Activity Cost: \$341,900  | 319 Cost: \$39,000 |
| – Lead Group: USGS, consultants   |                    |
| – Milestone: report water quality results (see the timeline on page 18) |                    |
| Total Product Cost: \$341,900   | 319 Cost: \$39,000 |
| Responsible Groups: USGS, Consultants, SD DENR                          |                    |

#### **4.0 SCHEDULE**

The project milestone schedule is shown in Figure 4-1 and is based on work approval by July 2017 and completion by June 2019.

<b>Project Timeline</b>		2017												2018												2019					
		June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun					
<b>OBJECTIVE 1</b>	<i>Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and E. coli</i>																														
Task 1.	Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems																														
Product 1	Improve Irrigation Water Delivery and Application																														
Product 1a	Replace Open Laterals with Pipe																														
Product 1b	Convert Flood Irrigation to Sprinklers																														
Product 1c	Replace Open Ditches to Pipe																														
Product 1d	Irrigation Scheduling																														
Task 2.	Range and Riparian Area BMP Implementation																														
Product 2	Implement Riparian Improvements																														
Task 3	Improved Cropping Practices																														
Product 3	Implement Cover Crops																														
<b>OBJECTIVE 2</b>	<i>Project Management and Administration</i>																														
Task 4	Project Management and Administration																														
Product 4	Public Outreach, Project Management and Administration																														
<b>OBJECTIVE 3</b>	<i>Complete Essential Water-Quality Monitoring</i>																														
Task 5	Water Quality Monitoring to Assess BMPs																														
Product 4.	Water-Quality Monitoring																														

**Figure 4-1.** Timeline of the Project.

#### **4.1 PERMITS**

Before any new construction can begin, required permits will be obtained. An example of a permit that may need to be obtained is the National Environmental Policy Act (NEPA) permit required to perform work on BOR lands. Other required permits may be needed for stormwater or construction work. Additionally, the need for 401 and 404 stream permits will be verified for the riparian work.

#### **4.2 LEAD PROJECT SPONSOR**

The BFRWP is the local sponsor for this implementation project and is a 501C(3) nonprofit group. The leaders of the BFRWP include the conservation districts within the watershed and the BFID. The BFRWP was the recipient of past 319 assessment and implementation grants for the Belle Fourche River TMDL.

#### **4.3 OPERATION AND MAINTENANCE QUALITY ASSURANCE**

Responsibilities for operation and maintenance of 319 funded BMPs will be provided through conservation district/landowner contracts. Contracts developed for BMP installation will specify operation and maintenance needs, procedures for BMP failure or abandonment, and the life span of the BMPs terms agreed upon in the contract. The NRCS and consultants will be responsible for completing operation and maintenance scheduling, on-site evaluations, and follow-up with landowners when actions are necessary to ensure BMP operation for its designated life span.

The NRCS; Farm Service Agency; the Butte, Lawrence, and Elk Creek Conservation Districts; District Supervisors; BOR; and consultants will be responsible for ensuring BMPs cost-shared with the EPA 319 funds are properly installed and maintained. Compliance with BMPs implemented with 319 funds will follow the same rules and regulations as the EQIP (these rules are found in Section 515.113 of the EQIP Program Manual). Landowners and operators who do not maintain practices funded by this project for the length of the agreed contract will be required to repay all cost-share funds and any liquidated damages incurred. Conservation district personnel who are supported by the agent who acts on behalf of the BFRWP will be responsible for landowner contacts, developing a landowner/producer mailing list, maintaining records, submitting vouchers and reports, and recording cash and in-kind matches. Where BOR funds are used, the BOR will be responsible to ensure that the BMPs are operated and maintained properly for the life of the contract.

#### **5.0 COORDINATION PLAN**

##### **5.1 PARTICIPATING GROUPS AND AGENCIES**

The BFRWP has been working together for over 13 years, has completed monitoring and evaluation work, and submitted a TMDL study for approval. Some of the BMPs recommended in the TMDL have been implemented (one flow-automation unit and partial completion of replacing open ditches with pipeline, pipeline projects from BFID to fields, sprinkler systems installation, and riparian vegetation improvement projects). The following groups/agencies have been participating and continue to participate in the Belle Fourche River Watershed implementation project:

- **Butte Conservation District** – Voting member of the BFRWP, provides financial support and EQIP funding.
- **Belle Fourche Irrigation District (BFID)** – Voting member of the BFRWP, implements many BMPs, provides financial support and match funding.
- **Belle Fourche River Watershed Partnership (BFRWP)** – Local project sponsor.

- **Elk Creek Conservation District** – Voting member of the BFRWP, provides financial support and EQIP funding.
- **Lawrence County** – Local support, provides funding.
- **Lawrence Conservation District** – Voting member of the BFRWP, provides financial support and EQIP funding.
- **South Dakota Association of Conservation Districts** – New, active participant of the BFRWP, full-time effort under the 319 grant program titled *303 (d) Watershed Planning and Assistance Project*.
- **South Dakota Conservation Commission** – Provides financial support.
- **South Dakota Department of Environment and Natural Resources (SD DENR)** – Active participation in the BFRWP, provides technical support and financial support.
- **South Dakota Game, Fish and Parks (SD GF&P)** – Participant in the BFRWP, provides technical and financial support.
- **South Dakota Grassland Coalition** – Grassland management project, provides financial support.
- **South Dakota School of Mines and Technology (SDSM&T)** – Active participant in the BFRWP, provides technical support through Dr. Kenner and graduate students (SDSM&T performed the initial TMDL study).
- **South Dakota State University (SDSU)** – Provides technical support, West River Ag Center personnel.
- **U.S. Bureau of Reclamation (BOR)** – Active participation in the BFRWP, provides technical support through drawings and designs as requested by the BFID, provides financial support.
- **U.S. Environmental Protection Agency (EPA)** – Provides 319 and 106 funding and technical guidance.
- **U.S. Geological Survey (USGS)** – Active participant in the BFRWP, fieldwork, and provides technical and financial support.
- **U.S. Fish and Wildlife Service (USFWS)** – Participant in the BFRWP, provides technical and financial support.
- **U.S. Natural Resources Conservation Service (NRCS)** – Participant in the BFRWP, provides technical and financial support.
- **Wyoming Department of Environmental Quality (WY DEQ)** – Provides local and financial support for flow measurements at the South Dakota-Wyoming state line.

## **5.2 COORDINATION WITH OTHER PROGRAMS**

The BFRWP will continue to coordinate activities with state, federal, and local government agencies through frequent personal communication and quarterly partnership meetings. The SD GF&P, USFWS, NRCS, SD DENR, local organizations, and local government agencies will provide input and involvement in this implantation project. Coordination with these agencies will include work related to other grassland improvement projects and other 303(d) assessment work. Extra coordination with local NRCS personnel will be necessary for the riparian vegetation and irrigation improvement projects.

## **5.3 SIMILAR ACTIVITIES IN THE WATERSHED**

All practices within the Belle Fourche River Watershed are included in the funding table.

## **6.0 EVALUATION AND MONITORING PLAN**

### **6.1 QUALITY CONTROL AND ASSURANCE**

Field data will be collected in accordance with the SD DENR's *Standard Operating Procedures for Field Samplers, Tributary and In-Lake Sampling Techniques*. A minimum of 10 percent (one sample) of all samples collected will be quality assurance/quality control (QA/QC) samples. QA/QC samples will consist of field duplicates or field replicate samples.

### **6.2 DATA**

The data will be provided to the SD DENR. The data and analysis for this project will be documented in a final report that the BFRWP will provide for the SD DENR.

Better Assessment Science Integrating Point and Nonpoint Sources (BASINS) and Hydrological Simulation Program - FORTRAN (HSPF) were used to model the Belle Fourche River Watershed when the TMDL was developed. To develop the TMDL and determine the necessary load reductions, several BMPs were modeled in these programs to reduce TSS concentrations in the streams within the Belle Fourche River Watershed. The sources of TSS identified were range erosion, irrigation and on-farm waste, free cattle access to streams, riparian degradation, natural geologic processes, hydraulic alteration by irrigation, and reduced stream miles. To understand the progress made in achieving the goals of the TMDL plan, the BFRWP monitors present progress against planned progress in midyear and annual reports (load reductions are reported annually).

Evaluating the project's success in reaching the objectives and goals will be accomplished by (1) comparing the scheduled versus the actual milestone completion dates; (2) comparing the flow rates and chemistry for irrigation-water application, delivery, and riparian BMPs; (3) measuring the reduction in nonused water from BFID discharged into streams; and (4) developing a sustainable watershed implementation project measured in part by the participation and approval of additional grant money for BMP implementation. Project monitoring will be reviewed by the BFRWP in quarterly meetings to report progress toward the goals and objectives.

### **6.3 LONG-TERM OPERATION AND MAINTENANCE FUNDING**

The long-term Operation and Maintenance (O&M) funding for irrigation delivery improvements will be funded and maintained by the BFID. Stream riparian habitat and on-farm irrigation improvements will be managed and supported financially in part by the NRCS and EQIP funding.

## **7.0 BUDGET**

Table 7-1 defines the acronyms used in Table 7-2. Table 7-2 identifies the funding sources and cash flow during the project. Tables 7-3 and 7-4 present the budget for the 319 funds as well as the matching funds for the project. EPA 319 funds represent less than 30 percent of the total project budget. Table 7-5 shows the total budget, and Table 7-6 summarizes the other funds being spent on the project that cannot be used as matching funds.

**Table 7-1. Table of Acronyms**

<b>Acronym</b>	<b>Definition</b>
SD DENR	South Dakota Department of Environment and Natural Resources
NRCS EQIP	Natural Resources Conservation Service Environmental Quality Incentives Program
COE	Corps of Engineers
BOR	Bureau of Reclamation
USGS	United States Geological Survey
BFID	Belle Fourche Irrigation District
WY DEQ	Wyoming Department of Environmental Quality

**Table 7-2. Cash Flow (Amended in Red)**

<b>Budget</b>	<b>July 2017– June 2018 (\$)</b>	<b>July 2018– June 2019 (\$)</b>	<b>Amendment (\$)</b>	<b>Total (\$)</b>	<b>Total Amendment (\$)</b>
319 Funds	325,000	325,000	250,000	650,000	900,000
<b>Subtotal</b>	<b>325,000</b>	<b>325,000</b>	<b>250,000</b>	<b>650,000</b>	<b>900,000</b>
<b>Nonmatching Funds</b>					
SD DENR (Water Rights)	35,000	35,000	0	70,000	70,000
NRCS EQIP	207,500	207,500	0	415,000	415,000
COE	7,000	7,000	0	14,000	14,000
BOR	53,500	53,500	0	107,000	107,000
USGS	86,700	86,700	0	173,400	173,400
Other Grants	69,500	69,500	0	139,000	139,000
<b>Subtotal</b>	<b>459,200</b>	<b>459,200</b>	<b>0</b>	<b>918,400</b>	<b>918,400</b>
<b>Matching Funds</b>					
Producer	187,500	187,500	280,000	375,000	655,000
Butte Conservation District	25,000	0	0	25,000	25,000
Lawrence County	7,000	7,000	0	14,000	14,000
BFID	5,250	5,250	0	10,500	10,500
WY DEQ	7,000	7,000	0	14,000	14,000
<b>Subtotal</b>	<b>231,750</b>	<b>206,750</b>	<b>0</b>	<b>438,500</b>	<b>718,500</b>
<b>Total Budget</b>	<b>1,015,950</b>	<b>990,950</b>	<b>280,000</b>	<b>2,006,900</b>	<b>2,536,900</b>

**Table 7-3a. Budget of 319 Funds (Amended in Red)**

Project Description	Consultants (\$)	Producer (\$)	Producer Amended (\$)	BFRWP (\$)	Butte Conservation District (\$)	Totals (\$)	Totals Amended (\$)
<b>Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and <i>E. coli</i></b>							
<b>Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems</b>							
<b>Product 1. Improved Irrigation Water Delivery and Application</b>							
1a. Replace Open Laterals with Pipe							
1b. Convert Flood Irrigation to Sprinklers		200,000	200,000			200,000	400,000
1c. Replace Open Ditches to Pipe							
1d. Irrigation Scheduling							
<b>Task 2. Range and Riparian Area BMP Implementation</b>							
Product 2. Implement Riparian Improvements		150,000	50,000			150,000	200,000
<b>Task 3. Improved Cropping System</b>							
Product 3. Implement Cover Crops							
<b>Objective 2. Conduct Public Outreach, Project Management and Administration</b>							
<b>Task 4. Project Management and Administration</b>							
Product 4. Public Outreach, Education and Project Management and Administration	200,000			21,000	40,000	261,000	261,000
<b>Objective 3. Complete Essential Water Quality Monitoring</b>							
<b>Task 5. Water Quality Monitoring to Assess BMPs</b>							
Product 5. Water Quality Monitoring	39,000					39,000	39,000
<b>Total</b>	<b>239,000</b>	<b>350,000</b>	<b>250,000</b>	<b>21,000</b>	<b>40,000</b>	<b>650,000</b>	<b>900,000</b>



**Table 7-3b. Task 3 Explanation of 319 Fund Distribution**

<b>Supplemental Breakdown of 319 Project Management Budget</b>	<b>Hours/ Mileage</b>	<b>Rate</b>	<b>Cost</b>
Financial Audit (Contracted)	NA	Actual Cost	17,000
Information and Education Events (BFRWP)	NA	Actual Cost	4,000
Administrative Assistant (Butte Conservation District)		55% Gross Salary 2 years	40,000
Project Travel Mileage (Consultant)	24,000	0.42/mile	10,080
Travel Expense (Consultant)	NA	Actual Cost	3,000
BMP Project Planning and Certification (Consultant)	1,162	\$80/Hour	93,000
Grant Tracking, Documentation, Proposal Writing (Consultant)	624	\$80/Hour	49,920
Meetings, Technology Transfer, Information and Education Events (Consultant)	343	\$80/Hour	27,440
Archeologist Contracted for State Historic Preservation Office Requirements (Consultant)	NA	Actual Cost (one survey estimated)	1,650
Miscellaneous (Engineer Design, GIS, Geologist, Proposal Writing)	136	\$110/Hour	14,910
<b>Total</b>			<b>261,000</b>

**Table 7-4. Budget of 319 and Matching Funds Budget (Amended in Red)**

EPA 319 and Matching Funds Budget	EPA 319	EPA 319 Amended (\$)	Matching Funds (\$)						Sum of Matching Funds (\$)	Sum of Matching Funds Amended (\$)
			Producer (Cash and In-kind) (\$)	Producer Amended (Cash and In-kind) (\$)	Butte Conservation District (Cash) (\$)	Lawrence County (Cash) (\$)	BFID (Cash and In-kind) (\$)	WY DEQ (Cash)		
<b>Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and E. coli</b>										
<b>Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems</b>										
Product 1. Improved Irrigation Water Delivery and Application										
1a. Replace Open Laterals with Pipe										
1b. Convert Flood Irrigation to Sprinklers	200,000	200,000	300,000	250,000					300,000	550,000
1c. Replace Open Ditches to Pipe			25,000		25,000				50,000	50,000
1b. Irrigation Scheduling										
<b>Task 2. Range and Riparian Area BMP Implementation</b>										
Product 2. Implement Riparian Improvements	150,000	50,000	50,000	30,000					50,000	80,000
<b>Task 3. Improved Cropping Practices</b>										
Product 3. Implement Cover Crops										
<b>Objective 2. Conduct Public Outreach, Project Management and Administration</b>										
<b>Task 4. Project Management and Administration</b>										
Product 4. Public Outreach, Project Management and Administration	261,000									261,000
<b>Objective 3. Complete Essential Water Quality Monitoring</b>										
<b>Task 5. Water Quality Monitoring to Assess BMPs</b>										
Product 5. Water Quality Monitoring	39,000					14,000	10,500	14,000	38,500	
<b>Total</b>	<b>650,000</b>	<b>250,000</b>	<b>375,000</b>	<b>280,000</b>	<b>25,000</b>	<b>14,000</b>	<b>10,500</b>	<b>14,000</b>	<b>438,500</b>	<b>718,500</b>

**Table 7-5. Total Budget (Amended in Red)**

Total Budget	EPA 319 (\$)	EPA 319 Amended (\$)	Matching Funds (\$)	Matching Funds Amended (\$)	Nonmatching Funds (\$)	Line Item Total (\$)	Line Item Total Amended (\$)
<b>Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and <i>E. coli</i></b>							
<b>Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems</b>							
<b>Product 1. Improved Irrigation Water Delivery and Application</b>							
1a. Replace Open Laterals with Pipe					100,000	100,000	100,000
1b. Convert Flood Irrigation to Sprinklers	200,000	200,000	300,000	250,000	150,000	650,000	1,100,000
1c. Replace Open Ditches to Pipe			50,000			50,000	50,000
1b. Irrigation Scheduling					10,000	10,000	10,000
<b>Task 2. Range and Riparian Area BMP Implementation</b>							
Product 2. Implement Riparian Improvements	150,000	50,000	50,000	30,000	384,000	584,000	664,000
<b>Task 3. Improved Cropping Practices</b>							
Product 3. Implement Cover Crops					10,000	10,000	10,000
<b>Objective 2. Conduct Public Outreach, Project Management and Administration</b>							
<b>Task 4. Project Management and Administration</b>							
Product 4. Public Outreach, Project Management and Administration	261,000					261,000	261,000
<b>Objective 3. Complete Essential Water Quality Monitoring</b>							
<b>Task 5. Water Quality Monitoring to Assess BMPs</b>							
Product 5. Water Quality Monitoring	39,000		38,500		264,400	341,900	341,900
<b>Total</b>	<b>650,000</b>	<b>250,000</b>	<b>438,500</b>	<b>280,000</b>	<b>918,400</b>	<b>2,006,900</b>	<b>2,536,900</b>

**Table 7-6. Nonmatching Funds Budget (No Change to this 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, and others)	
<b>Objective 1. Implement BMPs Recommended in the Belle Fourche River TMDL to Reduce TSS and <i>E. coli</i></b>							
<b>Task 1. Reduce Nonused Water Discharged to the Local Waterways From the Delivery and Application Systems</b>							
<b>Product 1. Improved Irrigation Water Delivery and Application</b>							
1a. Replace Open Laterals with Pipe				100,000			100,000
1b. Convert Flood Irrigation to Sprinklers		150,000					150,000
1c. Replace Open Ditches to Pipe							
1b. Irrigation Scheduling		10,000					10,000
<b>Task 2. Range and Riparian Area BMP Implementation</b>							
Product 2. Implement Riparian Improvements		250,000				134,000	384,000
<b>Task 3. Improved Cropping Practices</b>							
Product 3. Implement Cover Crops		5,000				5,000	10,000
<b>Objective 2. Conduct Public Outreach, Project Management and Administration</b>							
<b>Task 4. Project Management and Administration</b>							
Product 4. Public Outreach, Project Management and Administration							
<b>Objective 3. Complete Essential Water Quality Monitoring</b>							
<b>Task 5. Water Quality Monitoring to Assess BMPs</b>							
Product 5. Water Quality Monitoring	70,000		14,000	7,000	173,400		264,400
<b>Total</b>	<b>70,000</b>	<b>415,000</b>	<b>14,000</b>	<b>107,000</b>	<b>173,400</b>	<b>139,000</b>	<b>918,400</b>

## **8.0 PUBLIC INVOLVEMENT**

Communicating with the major stakeholders in this project is critical to its success. Public involvement in the project will continue through public meetings with stakeholders, tours sponsored by the BFRWP, newsletters sent out by conservation districts, radio advertisements, word of mouth, and the website developed by the partnership ([www.bellefourchewatershed.com](http://www.bellefourchewatershed.com)).

## **9.0 THREATENED AND ENDANGERED SPECIES**

The following endangered species are identified by the SD GF&P as located within and/or migrating through the Lawrence, Butte, and Meade Counties: bald eagle, whooping crane, least tern, and the black-footed ferret. Project implementation is not expected to impact any of these species. An Endangered Species Act Compliance Assessment letter dated May 18, 2004, from Mr. Doug Lofstedt (South Dakota Section 319 Project Officer) documents the “no affect” determination for the endangered species in the project area.

The procedure to ensure that threatened and endangered species are not adversely affected by project activities is based on the following three main premises, which are the same as those used for Segments 1–4:

- The managed grazing systems, both planned and implemented, will promote restoring or preserving critical grassland habitat.
- Anticipating many of the grazing systems are anticipated to be planned and implemented within areas that have compliance plans in place.
- The involvement of the NRCS and the USFWS in planning and construction grazing systems ensures that personnel trained for mitigating threatened and endangered species will be involved with designing and implementing project BMPs.

The species that are most likely to be encountered during the project, as well as the procedure to follow should the species be encountered, are included below.

### **9.1 Bald Eagle**

The bald eagle is a threatened species with a known certainty of occurrence in all three counties. According to the USFWS, bald eagles are known to nest in the floodplain forest along the Missouri River in Yankton, Bon Homme, Union, and Gregory Counties; along the James River in Brown, Spink, Sanborn, and Hutchinson Counties; and in forested areas in Meade, Charles Mix, and Brown Counties of South Dakota.

The 319-funded activities will be very low intensity and widely dispersed over the landscape. The activities will not significantly increase or expand the level of human activity. Activities that disturb possible nesting sites or reduce food sources are not anticipated. Therefore, EPA-funded activities are expected to have no effect on the bald eagle, and no consultation with the USFWS is planned.

### **9.2 Whooping Crane**

The whooping crane is an endangered species with a known certainty of occurrence in all three counties. This species is often found in South Dakota during spring and fall migrations. Migration through the state occurs from mid- to late-April and mid- to late-October. Although a variety of habitats are used during migration, a wetland is always used for night roosting and frequently for foraging. While migrating, whooping cranes roost in wide, shallow, open water areas, including

marshes, flooded crop fields, artificial ponds, reservoirs, and rivers. Roosting sites must also be isolated from human disturbances.

The EPA-funded monitoring activities will be of low intensity, will be widely dispersed over the landscape, and will not significantly increase or expand the level of human activity. Additionally, if any cranes are observed at any project work site, “all mechanical activities at the site will be suspended until the bird(s) leave the site under their own volition” (Section 8.1). Thus, the EPA-funded activities are expected to have no effect on the whooping crane, and no consultation with the USFWS is planned.

### **9.3 Least Tern**

The least tern is listed as an endangered species with a known certainty of occurrence in Meade County. This species historically breeds in isolated areas along the Missouri, Mississippi, Ohio, Red, and Rio Grande river systems. The least tern is a local summer resident of the Missouri and Cheyenne Rivers in South Dakota, and can be found migrating through virtually all of South Dakota with the exception of the Black Hills. Least terns usually nest on open expanses of sand or small pebble beaches along shorelines, riverbanks, sandbars, and islands. Least terns typically select nesting sites that are well-drained and away from the water line (usually near a small ridge or piece of driftwood). Their food source consists almost entirely of small fish, and feeding requires shallow water areas with an abundance of fish near the nesting area.

Major losses and alterations of habitat occur from shoreline, bank, and channel modification from the construction of locks, dams, dikes, levees, and reservoirs. Flooding can prevent or destroy nesting and can be a byproduct of habitat alteration. Habitat losses can also result from increased development, recreational uses, natural erosion, human and domestic pet disturbances or harassment, and trampling by cattle. Pollution that affects fish populations can also impact least terns.

The 319-funded monitoring activities will be of low intensity, will be widely dispersed over the landscape, confined to a few isolated stream channel areas, and will not significantly increase or expand the level of human activity. Activities that disturb possible nesting sites or reduce food sources are not anticipated. If any least terns are observed near any project work site, “all mechanical activities at the site will be suspended until the bird(s) leave the site under their own volition” (PIP Section 8.2). Therefore, EPA-funded activities are expected to have no effect on the least tern, and no consultation with the USFWS is planned.

### **9.4 Black-Footed Ferret**

The black-footed ferret is an endangered species with a possible certainty of occurrence in all three counties. This species is a member of the weasel family, and feeds primarily on prairie dogs and uses their burrows for denning and shelter. Their historic range included Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, Wyoming, Alberta, and Saskatchewan. The South Dakota population that disappeared in the wild in 1974 was thought to be the last remaining population. However, a captive propagation program was started from a Meeteetse, Wyoming, population that was discovered in 1981. Reintroductions have since occurred in Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. The South Dakota sites include the Conata Basin, Badlands National Park, and Cheyenne River Sioux tribal land in Dewey and Ziebach Counties.

Primary threats to the black-footed ferret include predation, disease, and loss of habitat. The ferrets can be affected by predators such as coyotes, golden eagles, great-horned owls, prairie falcons,

badgers, bobcats, and foxes. Canine distemper will kill ferrets, and sylvatic plague can eliminate entire prairie dog towns. In South Dakota, sylvatic plague currently poses the biggest threat to ferret populations. However, poisoning prairie dogs and converting native prairie to cropland are main threats to ferret habitats.

The existence of black-footed ferrets is directly linked to the presence of prairie dogs. The sponsor will address the black-footed ferrets by complying with the South Dakota Prairie Dog Management Plan. If any actions are planned that may adversely affect the survival of a native or introduced population of black-footed ferrets, the sponsor will consult with the USFWS.