

**PROJECT SUMMARY SHEET**

**PROJECT TITLE:** Big Sioux River Watershed Project – Segment 4 **Amendment 2**

**NAME, ADDRESS, PHONE AND E-MAIL OF LEAD PROJECT SPONSOR/SUBGRANTEE:**

Minnehaha Conservation District  
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**STATE:** South Dakota  
**HYDROLOGIC UNIT CODE:** 10170202 & 10170203  
**HIGH PRIORITY WATERSHED:** Yes - 303(d) List

**TMDL Development** \_\_\_ **and/or Implementation** X

<b>PROJECT TYPES</b>	<b>WATERBODY TYPES</b>	<b>NPS CATEGORY</b>
<input checked="" type="checkbox"/> Staffing & Support	<input type="checkbox"/> Groundwater	<input checked="" type="checkbox"/> Agriculture <input type="checkbox"/> Hydro Modification
<input checked="" type="checkbox"/> Watershed	<input type="checkbox"/> Lakes/Reservoirs	<input checked="" type="checkbox"/> Urban Runoff <input type="checkbox"/> Other
<input type="checkbox"/> Groundwater	<input checked="" type="checkbox"/> Rivers	<input type="checkbox"/> Silviculture
<input checked="" type="checkbox"/> I & E	<input checked="" type="checkbox"/> Streams	<input checked="" type="checkbox"/> Construction
	<input checked="" type="checkbox"/> Wetlands	<input type="checkbox"/> Resource Extraction
	<input type="checkbox"/> Other	<input type="checkbox"/> Stowage/Land Disposal

**PROJECT LOCATION:** Latitude North 44° 00' 00" Longitude West 096° 45' 00"

**SUMMARIZATION OF MAJOR GOALS:**

Restore and protect the beneficial uses of the portion of the Big Sioux River and its tributaries (in South Dakota) between the Brookings/Hamlin County line and its mouth at Sioux City, Iowa by implementing and promoting best management practices (BMPs) that reduce sediment loading and prevent bacterial contamination. Attaining the goal will reduce the total suspended solids (TSS) and/or bacteria (fecal or E. coli) levels and meet the Total Maximum Daily Loads (TMDLs) developed for the various waterbodies in the Big Sioux River Watershed.

**PROJECT DESCRIPTION:**

The Big Sioux River Watershed Project is a multiyear TMDL implementation strategy that will be completed in multiple segments. The project will restore and/or maintain the water quality of the Big Sioux River and its tributaries to meet the designated beneficial uses. The Lower Big Sioux River, Central Big Sioux River and the North-Central Big Sioux River/Oakwood Lakes Watershed Assessments identified various segments of the Big Sioux River and certain tributaries between Estelline, South Dakota and Sioux City, Iowa as failing to meet designated uses due to impairments from TSS, dissolved oxygen and/or bacteria. The current project (Segment 4) is focused on further reducing loadings from soil erosion, animal feeding operations, damaged riparian areas, and expanding ongoing project activities. It also extends water quality monitoring through 2025.

<b>319 (FY20) Funds Requested:</b>	\$ 900,000
<b>319 (FY23) Funds Requested:</b>	\$ 830,000
<b>USDA:</b>	\$ 588,000
<b>RCPP:</b>	\$ 2,597,403
<b>Local Match:</b>	\$ 3,495,775
<b>SRF-NPS Match:</b>	\$ 4,569,500

**Total Project Cost:** **\$ 12,980,678**

## **2.0 STATEMENT OF NEED**

**2.1** The Big Sioux River Watershed Project is a multi-segment, multi-year TMDL implementation strategy designed to restore and/or maintain water quality in the Big Sioux River basin in eastern South Dakota. Through the application of best management practices (BMPs) targeting soil erosion and animal waste management, this project will restore water quality of the Big Sioux River and its tributaries to support the designated beneficial uses and reach the TMDLs established for each waterbody. The project addresses the needs identified in the Lower Big Sioux River/Central Big Sioux River Watershed Assessment (2004); the North-Central Big Sioux River/Oakwood Lakes Watershed Assessment (2005); the 37 approved TMDLs and the Big Sioux River Watershed Strategic Plan (2016). This proposal is the fourth of several successive implementation project segments designed to achieve the overall project goals. Impairments to the beneficial uses of the Big Sioux River and its tributaries are shown in Table 2.1. Additional sub-watersheds and intermittent streams, not recognized as named waterbodies, were also found to be contributing impairments to downstream water bodies. In some instances, addressing pollution sources in those areas not technically impaired (due to a lack of designated beneficial uses) may be necessary to meet the TMDLs.

The Central Big Sioux River basin is in northwest Iowa, southeastern South Dakota, and southwest Minnesota (Figure 2.1). The lower portion of the Big Sioux River forms the border between Iowa and South Dakota from the Iowa/Minnesota border to the Missouri River. Since a major portion of the Central Big Sioux River Watershed is in both Minnesota and Iowa, TMDLs were based in part on data from those portions of the watershed that have been assessed by the respective states. Implementation projects in both Minnesota and Iowa will need to address impairments to their contributing watersheds and apply BMPs based on respective loadings to attain the TMDLs that have been developed. This project will focus on the South Dakota portion of the watershed (Figure 2.2).

Several waterbodies are impaired within the Central Big Sioux River watershed (Figure 2.3). The impairments impact the use of the river and streams and lakes for boating, fishing, swimming, and other recreational uses. Further, while the impairments have not yet affected use of the river as a domestic water supply the increased loading may require more extensive purification in the future. As the City of Sioux Falls relies on the Big Sioux River Aquifer for a portion of its drinking water, correcting these problems may have a future impact well beyond the current recreational and aesthetic problems.

The Central Big Sioux River and North-Central Big Sioux River/Oakwood Lakes Watershed Assessment Projects identified several sources of TSS and bacteria (fecal and *E. coli*) that constitute the primary impairments in the area. Excessive total suspended solids, i.e., fine sediment suspended in the waters of the river and its tributaries, are found primarily in the Big Sioux River. Segments not technically exceeding the applicable standard still have levels that contribute to impairments downstream. Consequently, BMPs aimed at sediment reduction were focused on the Central Big Sioux River Mainstem and major tributary sub-basins. Animal waste management systems, riparian area management, terrace systems, grazing systems, and bank stabilization were identified as the principle BMPs.

Bacteria (fecal and *E. coli*) impairments were encountered throughout the study area, although the highest levels were detected in the southern end of the watershed. The source of the bacteria is believed to be primarily domestic livestock, although human and wildlife sources might contribute a portion of the total load encountered. Bacteria (fecal and *E. coli*) levels were analyzed at several river/stream flow conditions to determine the timing of major loadings. The most significant loadings were measured during high flow events, which were concurrent with either rainstorms or spring snow melt. Elevated levels of bacteria persisting during high flow events were most likely caused by overland runoff of manure from animal feeding operations. The initial watershed assessments identified 1,525 animal feeding operations throughout the watershed that were analyzed using the AGNPS Feedlot Subroutine. The data indicated that 492 of the feedlots had an AGNPS rating of 50 or higher, suggesting a high potential for surface water contamination. However, elevated levels of bacteria (fecal and *E. coli*) were also encountered during periods of low flow, often many weeks after a runoff event. Under those conditions, animal feeding operations would not be expected to contribute so the source was likely animals grazing adjacent to the river and tributaries. BMPs to address the bacterial impairments may include installation of animal waste management systems at existing feedlots that lack containment and restricting access to the water bodies by grazing animals.

**Table 2.1: Beneficial Use Impairments Identified in the Big Sioux River Watershed (2018 South Dakota Integrated Report for Surface Water Quality)**

<b>Impaired Water Body</b>	<b>Impaired Beneficial Use</b>	<b>Cause</b>
Alvin, Lake (Minnehaha County)	Full Support	
Brant Lake (Lake County)	Full Support	
Brush Lake (Brookings County)	Fish/Wildlife Prop	Hg
Diamond Lake (Minnehaha County)	Fish/Wildlife Prop, WWMFL	Hg
East Oakwood Lake (Brookings County)	IR, LCR, WWPFL	pH, Chlorophyll-a
Goldsmith Lake (Brookings County)	Fish/Wildlife Prop, WWMFL	Hg
Herman, Lake (Lake County)	Fish/Wildlife Prop, IR, LCR, WWPFL	Hg, Chlorophyll-a
Madison, Lake (Lake County)	IR, LCR, WWPFL	Chlorophyll-a
North Island Lake (Minnehaha/McCook Counties)	Fish/Wildlife Prop, WWSFL	Hg
Sinai, Lake (Brookings County)	Fish/Wildlife Prop, WWMFL	Hg
Twin Lake (Kingsbury County)	Fish/Wildlife Prop	Hg
Twin Lakes (Minnehaha County)	Fish/Wildlife Prop, WWPFL	Hg
West Oakwood Lake (Brookings County)	IR, LCR, WWSFL	Hg
Beaver Creek 2 (Minnehaha County)	LCR, WWMFS	FCB & EC, TSS
<b>Big Sioux River</b>		
Stray Horse Creek to near Volga	WWSFL	TSS
Near Volga to Brookings	WWSFL	TSS
Brookings to Brookings/Moody County Line	WWSFL	TSS
Brookings/Moody County Line to S2	LCR, WWSFL	EC, TSS
S2-104N-49W to I-90	IR, LCR, WWSFL	EC, TSS
I-90 to Diversion return	IR, LCR, WWSFL	EC, TSS
Diversion return to SF WWTF	IR, LCR, WWSFL	EC, TSS
SF WWTF to above Brandon	IR, WWSFL	EC, TSS
Above Brandon to Nine Mile Creek	IR, LCR, WWSFL	EC, TSS
Nine Mile Creek to near Fairview	IR, WWSFL	EC, TSS
Fairview to Alcester	IR, LCR, WWSFL	EC, TSS
Near Alcester to Indian Creek	IR, LCR, WWSFL	EC, TSS
Indian Creek to Mouth	IR, WWSFL	EC, TSS
Brule Creek	LCR, WWMFL	EC, TSS
East Brule Creek	WWMFL	TSS
Flandreau Creek	LCR	EC
Peg Munky Run	LCR	FCB
Pipestone Creek	IR	EC
Six Mile Creek	LCR	EC
Skunk Creek	LCR	EC
Split Rock Creek	IR, LCR	EC
Union Creek	WWMFL	TSS
Willow Creek	LCR, WWMFL	EC, DO

Chlorophyll-a - Algae.

DO - dissolved oxygen.

EC - *E. coli* bacteria.

FCB - fecal coliform bacteria.

Hg - Mercury

IR - immersion recreation standard = 400 colonies per 100 milliliters of water.

LCR - limited contact recreation standard = 2,000 colonies per 100 milliliters of water.

pH - High pH.

TSS - total suspended solids.

WWSFL - warm water semi-permanent fish life - applicable standard varies with water body.

WWMFL - warm water marginal fish life - applicable standard varies with water body.

WWPFL - warm water permanent fish life - applicable standard varies with water body.

Details and additional information of the results of the Central Big Sioux River Watershed Assessment Project can be found in the Final Report and associated TMDL reports. Visit the Department of Natural Resources webpage at the following address: <https://danr.sd.gov/Conservation/WatershedProtection/ReportsPublications.aspx> for additional information.

**2.2** The Big Sioux River Watershed Project encompasses the Big Sioux River (in South Dakota) between Estelline, South Dakota in the north and Sioux City, Iowa in the south. The project watershed area is approximately 2,107,000 acres (Table 2.2).

**Table 2.2: Big Sioux River and its Basin Features.**

<b>Waterbody Name:</b>	Big Sioux River, 24 impaired stream segments and 11 impaired lakes
<b>Hydrologic Unit Code:</b>	Big Sioux River – 10170202, 10170203
<b>SD DENR Waterbody ID:</b>	SD-BS-R-BIG_SIOUX_04-17
<b>Location:</b>	S27, T113N, R51W to S30, T89N, R47W
<b>Impaired Beneficial Use and Cause:</b>	See Table 2.1
<b>Major Tributaries (South Dakota):</b>	Peg Munky Run, North Deer Creek, Six Mile Creek, Skunk Creek, Split Rock Creek, Beaver Creek, Brule Creek
<b>Major Tributaries (Minnesota):</b>	Beaver Creek, Pipestone Creek, Split Rock Creek, Rock River
<b>Major Tributaries (Iowa):</b>	Rock River, Sixmile Creek, Indian Creek, Broken Kettle Creek
<b>Receiving Waterbody:</b>	Missouri River
<b>Big Sioux River Segment Length:</b>	311 miles
<b>Watershed Area</b>	
<b>South Dakota</b>	2,107,000 acres
<b>Minnesota</b>	937,000 acres
<b>Iowa</b>	877,000 acres
<b>Total</b>	3,921,000 acres

The BSR and major tributaries are permanent water courses within the project area. There are also numerous intermittent tributaries which carry water mainly during spring snow melt or rainfall events. The BSR ultimately drains to the Missouri River at Sioux City, Iowa. The river also receives storm sewer discharges or otherwise enhanced runoff from several communities along its course in South Dakota including the cities of Brookings, Flandreau, Dell Rapids, Sioux Falls, Brandon, Canton, and Hudson. Cities along the River on the Iowa side include Hawarden and Akron. Sections of the stream have been impacted by channelization (straightening and/or artificial stabilization) and numerous road crossings over the river and tributaries.

Many segments of the river do not fully support the designated uses, particularly related to limited contact or immersion recreation (Table 2.1). The 1998 South Dakota 303(d) Waterbody List, and subsequent versions identified this portion of the Big Sioux River watershed as impaired and a priority for TMDL development. Fifteen impairments were known at the start of the studies: seven for TSS; six for bacteria (fecal and E. coli); one for nitrate and one for trophic state index (East Oakwood Lake). With the completion of the Lower, Central and North-Central Big Sioux River Watershed Assessment Projects, a total of 35 stream segments and lakes were identified as impaired for: Bacteria, TSS, Mercury, Chlorophyll-a, Dissolved Oxygen and pH. A total of 49 TMDL reports have been approved within the watershed. These reports and the Big Sioux River Strategic Plan form the basis of this proposal.

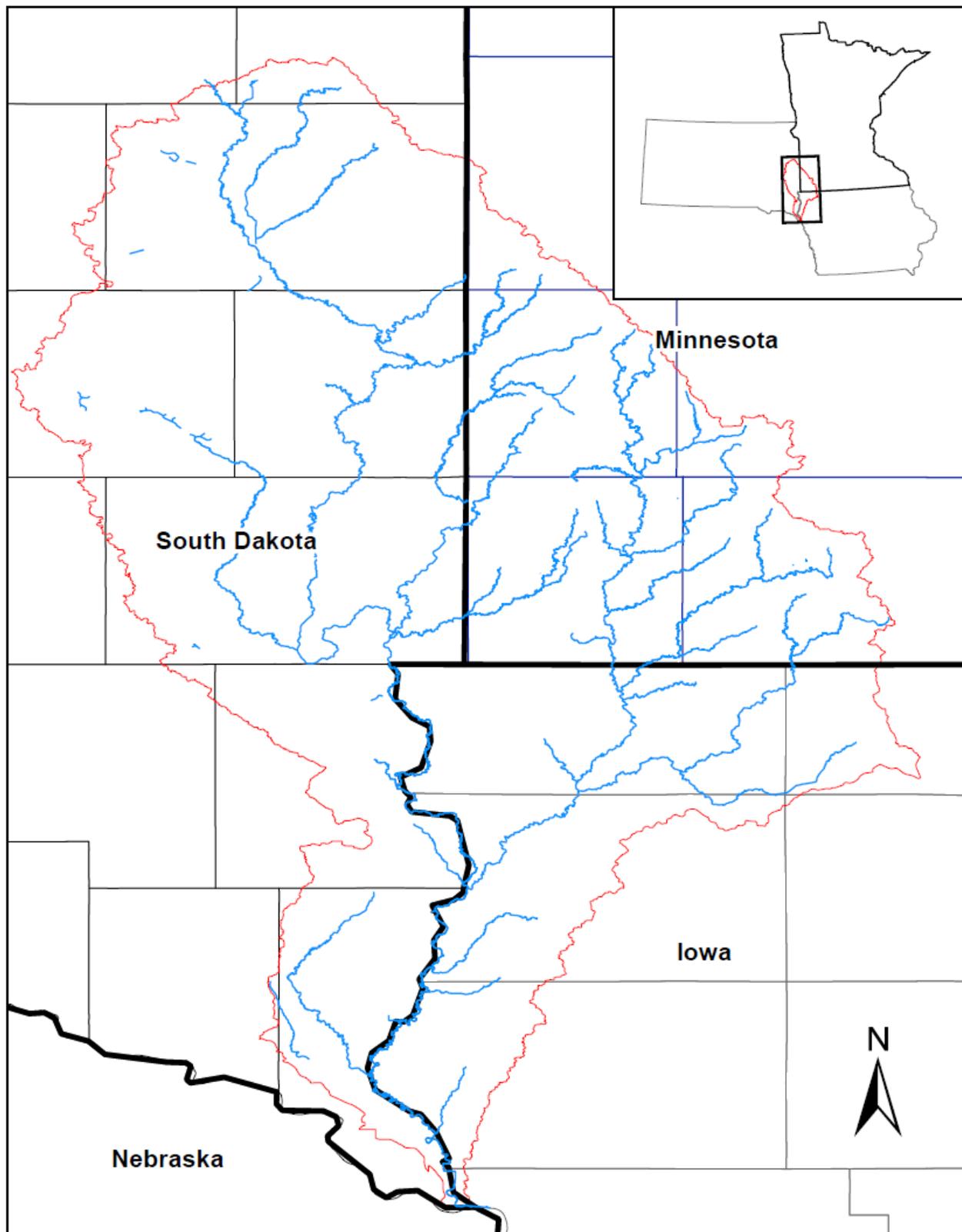
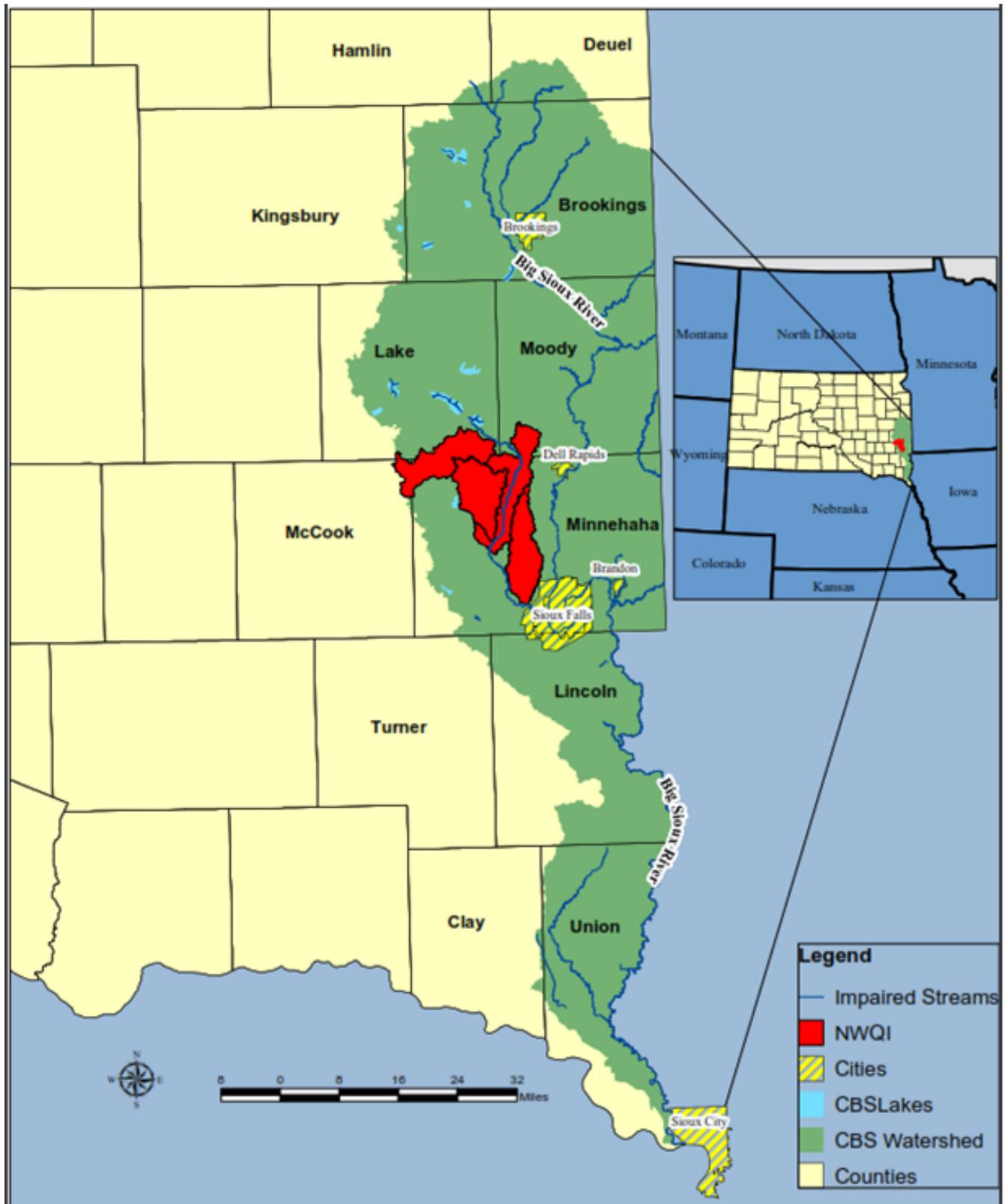


Figure 2.1: Entire Big Sioux Basin.



2.2: Big Sioux River Watershed Project Area.

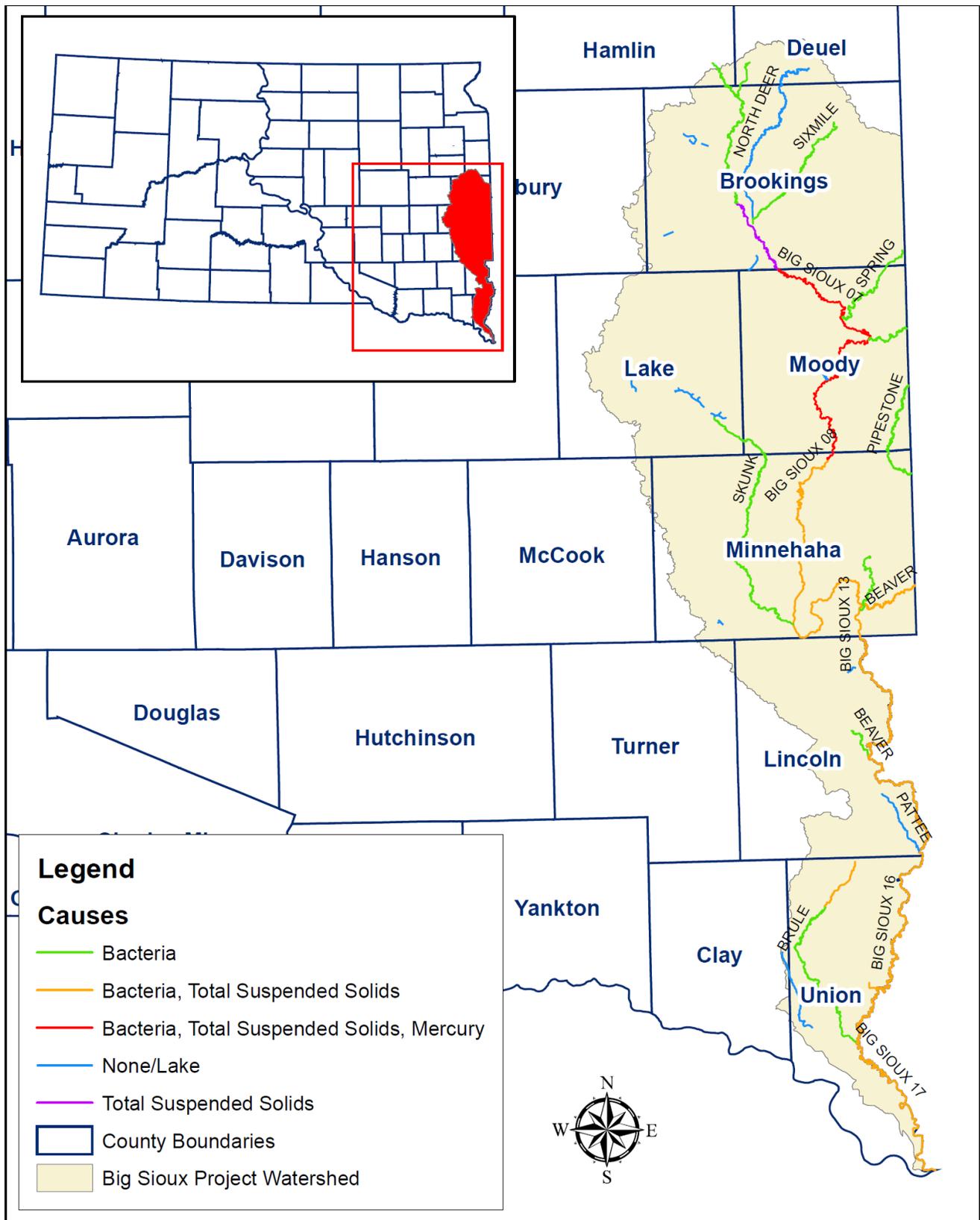


Figure 2.3 Big Sioux River Watershed Project Impaired Streams.

## 2.4 General Watershed Characteristics

Land use in the watershed is primarily agricultural. Row crops, such as corn and soybeans, dominate, but significant tracts are also in grass and/or pastureland. The watershed assessments identified approximately 1,525 animal feeding operations located within the confines of the project area. Significant residential development has taken place around the cities of Sioux Falls, and Brookings, and smaller communities in the region are experiencing similar growth. Total population in the project area is roughly 250,000.

The average annual precipitation in the central BSR watershed is 23.2 inches, of which 76% typically falls April through September. Tornadoes and severe thunderstorms strike occasionally. These storms are often of only local extent and duration, and occasionally produce heavy rainfall events. The average seasonal snowfall is 36.5 inches per year.

The surficial character of the watershed can be divided into two parts, relating to the relative age of the landscape. Along the BSR valley, and the eastern tributaries, drainage is well developed, and undrained depressions are rare. To the west of the river, where drainage is poor, there are numerous potholes, sloughs, and lakes. The relief in the area is moderate. Land elevation ranges from nearly 2,000 feet above mean sea level in the northeastern part of the watershed to about 1,265 feet in the southern edge of the project area.

Soils within the watershed area are derived from a range of parent materials. Uplands soils are relatively fine-grained and developed over glacial till or thin eolian (loess) deposits. Coarse-grained soils, derived from glacial outwash or alluvial sediments, are found along present or former water courses. In central and eastern Minnehaha County, in the southern part of the project area, the loess deposits are thick, often more than 20 to 30 feet, and the resulting soils are highly erodible. When combined with the relatively high relief, these areas are susceptible to erosion, regardless of land-use practices.

## 2.5 Water Quality Impairments

The Central Big Sioux River and the North-Central Big Sioux River/Oakwood Lakes Watershed Assessment Projects were initiated at the request of local organizations and citizens concerned about water quality problems in the Big Sioux River between the communities of Watertown and Brandon. The main issues were related to high suspended sediment loads that adversely affected fish populations (both numbers and diversity) and high bacterial loads that limited water use for swimming and boating.

The watershed assessments included:

- River and tributary water monitoring from 1999 through 2003.
- Quality assurance/quality control for water quality samples.
- River and tributary stage and discharge determinations.
- Biological monitoring (fish and insects).
- Watershed modeling using a sediment delivery model; and
- Review of previous water quality data collected for the watershed.

The assessment projects confirmed that most segments of the Big Sioux River, and many of the tributaries, were impaired due to high levels of bacteria (fecal and *E. coli*). The limited contact standard of 2,000 colonies per 100 ml of water, which is applicable to the entire river stretch, was most often exceeded during high flow events, suggesting runoff from feed lots as a source. However, high *E. coli* counts at low flow rates suggest that animal grazing in or near the river and its tributaries is a significant influence. The *E. coli* problem becomes particularly acute below the community of Dell Rapids, where the more stringent immersion recreation standard (400 colonies per 100 ml) is also applicable. For most of the watershed below this point, reductions more than 75% to 95% are needed to meet the beneficial use standards. In this area, both feedlots and riparian area grazing are known problems (Table 2.3).

**Table 2.3: Fecal and E. coli Bacteria Reductions Needed by TMDL Segment.**

Site ID	High Flow Reduction Needed (cfu/day)		Moist Flow Reduction Needed (cfu/day)		Mid Flow Reduction Needed (cfu/day)		Dry Flow Reduction Needed (cfu/day)	
	FCB	EC	FCB	EC	FCB	EC	FCB	EC
R-1 (Beaver Creek 01) **	8.74E+13	None	1.48E+12	None	None	None	6.30E+10	None
R-2 (Beaver Creek 02) **	3.12E+13	None	None	None	None	None	None	None
R-12 (Big Sioux 08) *	6.22E+12	None	2.12E+12	None	2.77E+12	None	2.48E+12	None
R-13 (Big Sioux 10) *	1.06E+13	None	1.82E+13	None	2.09E+12	None	9.17E+11	None
R-14 (Big Sioux 11) *	3.18E+13	None	1.28E+13	None	3.21E+12	None	1.54E+12	None
R-15 (Big Sioux 12) *	4.15E+13	None	1.59E+13	None	3.20E+12	None	1.29E+12	None
R-16 (Big Sioux 13) *	8.85E+12	5.20E+12	None	None	None	None	None	None
R-17 (Big Sioux 14) *	2.61E+13	1.53E+13	None	None	None	None	None	None
R-18 (Big Sioux 15) *	2.18E+14	1.28E+14	1.92E+13	1.13E+13	None	None	None	None
R-19 (Big Sioux 16) *	9.05E+13	5.31E+13	6.96E+12	4.09E+12	None	None	None	None
R-20 (Big Sioux 17) *	7.45E+14	4.38E+14	None	None	None	None	None	None
R-22 (East Brule Creek 01) *	7.98E+14	None	1.09E+13	None	1.12E+12	None	4.56E+11	None
R-29 (Peg Munkey Run 01) *	1.76E+15	None	None	None	6.79E+10	None	1.77E+09	None
R-30 (Pipestone Creek 01) **	5.31E+12	None	None	None	6.87E+11	None	None	None
R-31 (Six Mile Creek 01) **	1.10E+10	None	None	None	None	None	None	None
R-32 (Skunk Creek 01) **	4.12E+14	None	None	None	None	None	None	None
R-33 (Split Rock Creek 01) **	1.28E+14	None	3.62E+12	None	5.67E+11	None	None	None
R-36 (Union Creek 01) *	5.84E+15	None	4.00E+16	None	4.70E+15	None	5.50E+12	None

\* margin of safety included in calculation

\*\* margin of safety not included in calculation

Total suspended solid impairments are limited to the Big Sioux River below Brookings. Excessive TSS levels in the tributaries only occur in the lower part of Skunk Creek and the Pipestone Creek/Split Rock Creek system. Degraded riparian areas and stream bank erosion are believed to be the primary source of sediment, along with remobilization of in-stream sediment. Low sediment inputs from most tributaries indicate current land-use practices are successfully limiting erosion. High sediment levels found in the tributaries that span eastern and central Minnehaha County are attributed to the relatively high erosion potential of the soils in the area (Table 2.4).

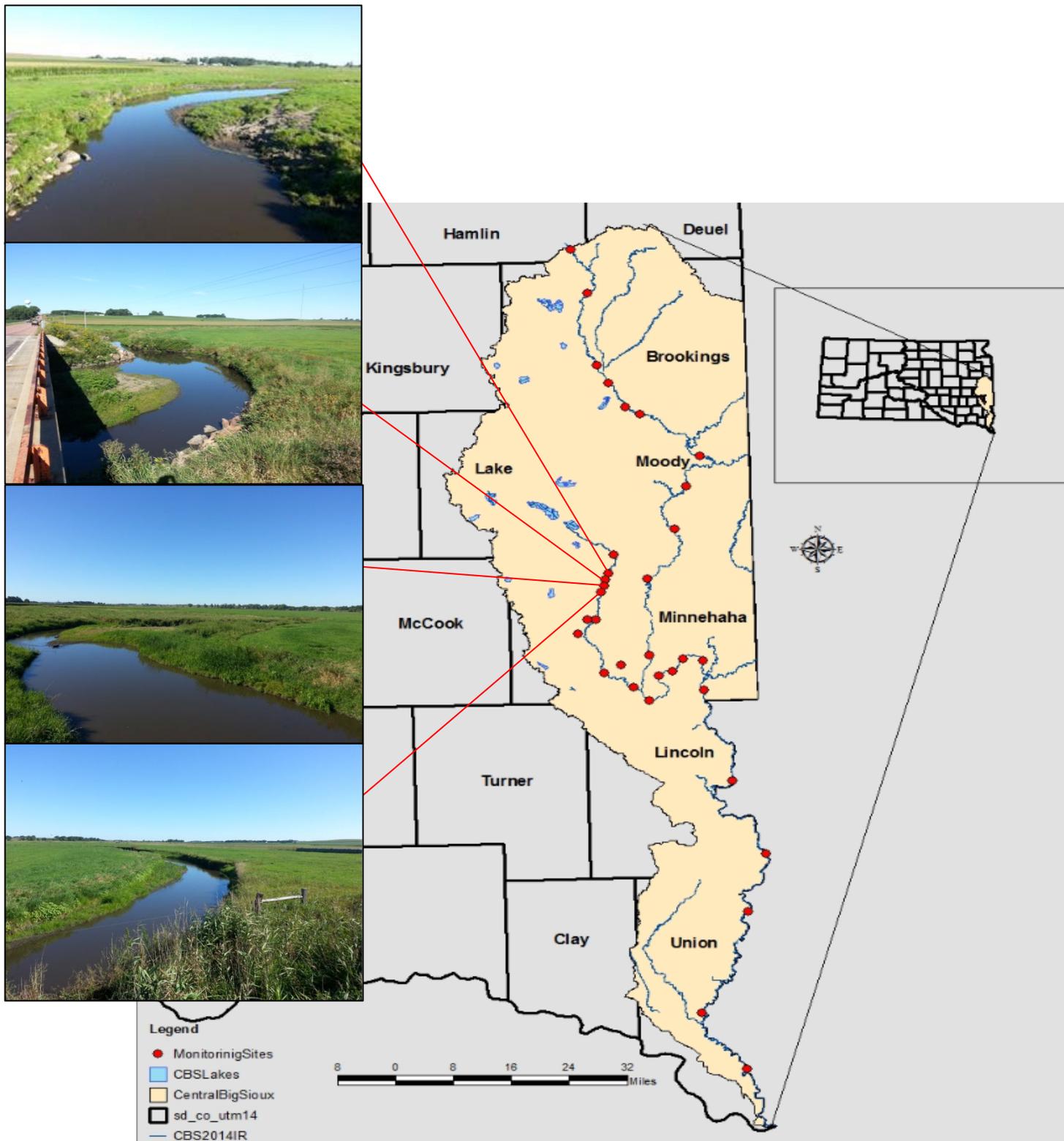
**Table 2.4: TSS Reductions Needed by TMDL Segment.**

Site ID	High Flow Reduction Needed	Moist Flow Reduction Needed	Mid Flow Reduction Needed	Dry Flow Reduction Needed
	TSS (tons/year)	TSS (tons/year)	TSS (tons/year)	TSS (tons/year)
<b>R-1 (Beaver Creek 01)</b>	None	None	None	None
<b>R-2 (Beaver Creek 02)</b>	TMDL Reduction Met	TMDL Reduction Met	TMDL Reduction Met	TMDL Reduction Met
<b>R-12 (Big Sioux 08)</b>	25039	None	None	None
<b>R-13 (Big Sioux 10)</b>	None	8,505	None	None
<b>R-14 (Big Sioux 11)</b>	871,218	None	None	None
<b>R-15 (Big Sioux 12)</b>	237,652	None	None	None
<b>R-16 (Big Sioux 13)</b>	Assessment Initiated	Assessment Initiated	Assessment Initiated	Assessment Initiated
<b>R-17 (Big Sioux 14)</b>	Assessment Initiated	Assessment Initiated	Assessment Initiated	Assessment Initiated
<b>R-18 (Big Sioux 15)</b>	556,880	239,257	1,095	621
<b>R-19 (Big Sioux 16)</b>	1,448,576	273,568	13,322	10,768
<b>R-20 (Big Sioux 17)</b>	5,627,315	147,570	30,843	212,067
<b>R-22 (East Brule Creek 01)</b>	Assessment Initiated	Assessment Initiated	Assessment Initiated	Assessment Initiated
<b>R-29 (Peg Munkey Run 01)</b>	None	None	None	None
<b>R-30 (Pipestone Creek 01)</b>	None	None	None	None
<b>R-31 (Six Mile Creek 01)</b>	None	None	None	None
<b>R-32 (Skunk Creek 01)</b>	Not Initiated	Not Initiated	Not Initiated	Not Initiated
<b>R-33 (Split Rock Creek 01)</b>	TMDL Reduction Met	TMDL Reduction Met	TMDL Reduction Met	TMDL Reduction Met
<b>R-36 (Union Creek 01)</b>	None	None	None	None

In several instances, sub-watersheds assessed during the study had no applicable water quality standard. However, the loadings resulting from these sub-watersheds will need to be addressed if subsequent, down-stream water bodies are to be brought into compliance.

During segment 3 of this project, NRCS selected four HUC 12s for the National Water Quality Initiative (NWQI) within the watershed. Due to NWQI requirements, a more intense monitoring of the HUCs has been incorporated into the project. The 22 Big Sioux River monitoring sites and 11 tributary sites are shown in Figure 2.4. Of the 11 tributary sites, four were added to monitor the impacts of BMPS in the NWQI area. Also shown in Figure 2.4 are the NWQI monitoring sites in relation to their location in the watershed. Data was collected over a five-year period to monitor the effectiveness of BMP implementation in the NWQI area. Results have shown a decline in bacterial and TSS concentration in Skunk Creek which is the major tributary that flows through the NWQI area. It has also been delisted from the 303d list of impaired waterbodies for TSS. A success story has been written and submitted to the Region 8 EPA. Since the delisting, two of the HUC 12s have been moved to Firesteel Creek in the James River Watershed. Implementation and monitoring will continue to target the Skunk Creek Watershed during segment 4 of the watershed project.

# Big Sioux River Watershed Monitoring Sites



**Figure 2.4 Big Sioux River Watershed Monitoring Sites.** (33 Water quality monitoring sites currently used during the Big Sioux River Watershed Project. The 4 monitoring sites pictured on the left are associated with the USDA/NRCS National Water Quality Initiative in the Skunk Creek Basin).

### **3.0 PROJECT DESCRIPTION**

#### **3.1 Project Goal**

The overall project goal is to restore and protect the beneficial uses of the Big Sioux River and its tributaries (in South Dakota) between the Brookings/Hamlin County line and North Sioux City South Dakota by implementing and promoting best management practices (BMPs) in the watershed that reduce sediment loading and lower and/or prevent bacterial contamination. Attaining the sediment goal will require reducing the TSS in the river and selected tributaries by between 20% and 98%. Bacteria (fecal and E. coli) levels found throughout the study area commonly exceed water quality standards, particularly for immersion recreation. Attainment of bacteria TMDLs, in certain areas, require reducing bacterial loads by over 95%. Such targets are beyond the scope of this project segment.

The targets for this part of the project will be measurable and sustainable reductions of bacteria (fecal and E. coli) levels at the completion of the fourth multi-part segment of the restoration project. Restoration of the beneficial uses of the Big Sioux River and its tributaries, through implementation of BMPs described below and those supported through subsequent projects should lead to attainment of TMDL targets.

#### **3.2 Project Objectives, Tasks, Products, Milestones and Responsible Agencies**

**Objective 1: Reduce bacteria (fecal and E. coli) and sediment loadings to the Big Sioux River and its tributaries through the renovation and improvement of existing, high-priority animal feeding operations and limiting the access of livestock to impaired water bodies.**

**Task 1: Animal Waste Management Systems.** Assist livestock producers to install 6 Animal Waste Management Systems (AWMSs) at critical locations within the project area to reduce fecal bacteria and sediment loading. The AWMSs will be a mix of conventional zero-discharge systems, manure pack and deep pit slated floor barns depending on the site conditions and operator preference. Site selection and facility type constructed will be made by the project coordination team, in consultation with the United States Department of Agriculture, Natural Resource Conservation Service (USDA-NRCS) Animal Waste Management Team (AWMT) and private engineering firms that are registered technical service providers in South Dakota. Systems targeted for implementation efforts will be those located in priority area drainages and priority area sections based on GIS maps developed by the SDDENR.

**Products:** Engineering designs and plans for 7 AWMSs and 6 nutrient management plans prepared by third-party engineering firms/technical service providers or (USDA-NRCS) engineers; 6 AWMS installed consisting of conventional and confinement barns for existing high priority feedlots or feeding areas.

**Milestones:** AWMS Design – 7 Designs  
AWMS Construction – 6 systems  
AWMS Nutrient Management Plans – 6 plans

**Total Cost: \$6,193,000**

**FY20 319 Funding: \$ 101,000**  
**FY23 319 Funding: \$ 64,000**  
**SRF Funding: \$ 808,750**

**Responsible Agencies:**

East Dakota Water Development District  
USDA-NRCS  
South Dakota DENR

**Design and Technical Assistance:**

Project Coordinator  
Technical Service Providers  
USDA-NRCS

**Task 2: Riparian Area Protection.** Provide resources to livestock owners to better manage, limit or prevent access to impaired water bodies to reduce direct loading.

Riparian Area Management (RAM) will be enrolled on 350 acres of marginal pastureland immediately adjacent to waterbodies within the watershed. Seasonal Riparian Area Management (SRAM) will be implemented on 1,500 acres of currently grazed marginal pastureland. Enrollment of land immediately adjacent to the Big Sioux River, Skunk Creek, and major tributaries with a minimum buffer distance of 20 feet and maximum distance to the extent of the 100-year flood plain is eligible for the program. BMPs will be implemented targeting critical riparian areas that have been, or have the potential to be, significant sources of bacteria (fecal and E.coli) contamination and TSS loadings due to the degradation of riparian areas from continuous grazing. Emphasis will be on pastures that abut or transect the Big Sioux River, Skunk Creek, and major tributary streams. Livestock producers enrolling pasture into the program will be paid a base rate of \$80 per acre based on average CRP rates for marginal pastureland. A tiered payment system, based on proximity to the confluence of Skunk Creek and Big Sioux River, will be used to incentivize landowners with pastures closer to the City of Sioux Falls. Producers upstream of the city and within 10 miles of the confluence will be paid \$90 per acre. Producers upstream and between 10 and 20 miles of the confluence will be paid \$85 per acre. Producers upstream and between 20 and 30 miles of the confluence will receive \$80 per acre. All other producers outside of 30 miles will receive the \$80 per acre base rate. Eligible pastureland along impaired rivers and streams that flow into the Big Sioux River downstream of the City of Sioux Falls will also be paid the \$70 per acre base rate for enrollment into the SRAM program. The major requirements for eligibility of the SRAM program are:

1. No grazing from April 1<sup>st</sup> through September 30<sup>th</sup> to reduce E. coli and TSS levels during the recreational period to help support the listed beneficial uses associated with the waterbodies of concern.
2. Fall grazing is allowed October 1<sup>st</sup> through March 30<sup>th</sup>. A minimum vegetative stand of 4 to 6 inches with an alternative clean water supply is required to minimize impacts on the riparian area.
3. Haying is allowed from July 1<sup>st</sup> through September 30<sup>th</sup> for the acres enrolled to utilize the forage and maintain the vigor of the vegetative stand.
4. Fencing, pipelines, and tanks will be the financial and technical responsibility of the producer in order to meet eligible requirements for the SRAM program.
5. Grass establishment, tree planting and fabric installation will be eligible for cost share not to exceed \$10,000 per pasture tract.

The program has been piloted and evaluated on Skunk Creek for 2 years during the Central Big Sioux Implementation Project Segment 2 and has shown a considerable amount of success in reduction of E-coli and TSS. Due to the success and acceptance of the SRAM program, it has been expanded to the rest of the project watershed with emphasis still on the major tributaries in the Skunk Creek basin. Water quality data collection and evaluation of the SRAM program continued during Segment 3 of the Big Sioux River Implementation Project and remains consistent in comparison to the first two years of data. Subsequently, Skunk Creek was delisted from the 303d list of impaired waterbodies for TSS in 2016.

Existing bank stabilization sites damaged due to record flooding in 2019 will be repaired in this segment of the project. It is anticipated that 1,000 linear feet will be designed and constructed. Easements will be implemented upstream from the City of Sioux Falls to enhance riparian areas along 100 acres of marginal pastureland. The Easements will be secured through a partnership with Northern Prairies Land Trust using SRF-NPS funds.

**Products:** 250 Acres of Riparian Area Management, 1,500 acres of Seasonal Riparian Area Management, 1,000 linear feet of bank stabilization engineering with rehabilitation and construction of 1,000 feet of existing structures as needed and 100 acres of easements on marginal pastureland. BMPs will be implemented with 319 and SRF-NPS funds.

**Milestones:** Riparian Area Management – 250 acres  
Seasonal Riparian Area Management – 1,500 acres  
Bank Stabilization Engineering – 1,000 linear feet  
Bank Stabilization – 1,000 linear feet  
Easements – 100 acres

**Total Cost: \$2,750,000**

**FY20 319 Funding: \$ 194,000**

**FY23 319 Funding: \$ 288,000**

**SRF Funding: \$2,268,000**

**Responsible Agencies:**

East Dakota Water Development District  
Minnehaha Conservation District  
Conservation Districts  
City of Sioux Falls  
City of Dell Rapids  
South Dakota DENR  
Pheasants Forever

**Design and Technical Assistance:**

Project Coordinator  
Technical Service Providers  
Pheasants Forever  
Minnehaha Conservation District

**Task 3: Cropland BMPs.** Provide technical and financial assistance to landowners with cropland to adopt management strategies that improve water quality.

Provide assistance to restore 10,000 LF of damaged terraces, install 146,000 LF of new terraces, 15,000 LF grassed waterways, 20 acres of filter strips, 2,000 acres of cover crops and 30 acres of easements to landowners/operators to reduce sediment and nutrient loads originating from identified critical areas. Provide assistance to landowners with terrace systems that have exceeded their lifespan or have filled in overtime to restore capacity and functionality reducing sediment delivery to watershed. Terraces that have filled in over time that need capacity restored will be cleaned out and graded to their original design specifications. The project will also work with landowners to repair terrace systems damaged by large rain events and wildlife, that may not be a good fit for the EQIP program, to restore them back to their original state. New terrace systems will be directed towards utilization of the new RCPP Program and existing EQIP program for funding before consideration of watershed project funds. Technical assistance will be provided by the project coordinator and NRCS to determine eligibility of terrace restoration projects.

**Products:** 10,000 linear feet of restored terraces, 146,000 linear feet of new terraces, 15,000 linear feet of grassed waterways, 20 acres of filter strips, 2,000 acres of cover crops and 30 acres of easements. BMPs installed will be funded by the landowner/operator, USDA conservation programs (EQIP, RCPP and CCRP) and by the watershed project.

**Milestones:** Terrace Restoration on cropland – 10,000 linear feet  
Terrace Construction – 146,000 linear feet  
Grassed Waterways – 15,000 linear feet  
Filter Strips – 20 acres  
Cover Crops – 2,000 acres  
Easements – 30 acres

**Total Cost: \$995,500**

**FY20 319 Funding: \$ 64,875**

**FY23 319 Funding: \$ 43,250**

**SRF Funding: \$ 415,000**

**Responsible Agencies:**

East Dakota Water Development District  
Minnehaha Conservation District  
USDA/NRCS  
Conservation Districts  
Private Consultants  
Pheasants Forever  
Fish & Wildlife Service

**Design and Technical Assistance:**

Project Coordinator  
East Dakota Water Development District  
USDA/NRCS  
Private Consultants  
Pheasants Forever

**Task 4: Grazing Systems.** Improve water quality and soil health through grazing land management.

Provide assistance to install 52,800 feet of fence; 20 new alternative clean water source developments and 5 portable shade structures for pastures. Grazing management systems along with 20 water developments and portable shade structures will be implemented to enhance riparian area programs. Portable shade structures will be piloted to reduce time spent by livestock cooling off in streams by providing an alternative location to rest in the shade. These structures will have the ability to be moved around to limit localized pasture damage from repeated use on the same spot during the heat of the day. Due to limited or no shade in grass dominated pastures with temperatures often reaching 90 degrees and higher during summer months, these structures may inadvertently reduce direct loading of E-coli and TSS to the watershed.

**Products:** Implement 52,800 linear feet of Fence, 20 new water developments and 5 portable shade structures. BMPs installed will be funded by the landowner/operator, USDA conservation programs (EQIP, RCPP) and by project funded water quality programs (319, SRF-NPS).

**Milestones:** Fencing – 52,800 linear feet.  
Water Developments – 20 new alternative water source developments.  
Portable Shade Structures – 5 structures.

**Total Cost: \$383,400**

**FY20 319 Funding: \$ 24,000**  
**FY23 319 Funding: \$ 16,000**  
**SRF Funding: \$ 127,750**

**Responsible Agencies:**

East Dakota Water Development District  
Minnehaha Conservation District  
Conservation District Partners  
USDA/NRCS

**Design and Technical Assistance:**

Project Coordinator  
Private Consultants  
USDA/NRCS

**Task 5: Urban BMPs.** Improve urban runoff conditions along the Big Sioux River and its tributaries within the City of Sioux Falls and install a storm water bioreactor on one demonstration site and 2 storm water infiltration basins. Riparian area improvements may include modification of drainage around municipalities that outlet into storm water drains along the Big Sioux River. A change in management of urban riparian areas may be realized with the improvements that will improve filtration of runoff. A demonstration Bioreactor will be installed to provide filtration of storm water before it enters the storm drainage system to reduce phosphorus, nitrates, E-coli, and sediment. This BMP could provide protection of runoff from urban settings and serve as a visual reminder of the need to improve rainwater runoff from urban situations.

**Products:** Two storm water infiltration basins and One Demonstration Urban Bioreactor will be funded through East Dakota Water Development District and the City of Sioux Falls SRF-NPS funds. South Dakota State University will design, oversee construction, monitor the effectiveness of the bioreactor, and report the results. The City of Sioux Falls will use private engineers to design and construct 2 storm water infiltration basins.

**Milestones:** Urban Bioreactor (1 bioreactor, 2 infiltration basins)

**Responsible Agencies:**

EDWDD  
 Project Coordinator  
 City of Sioux Falls  
 South Dakota State University

**Design and Technical Assistance:**

South Dakota State University  
 City of Sioux Falls  
 Private Consultants

**Total Cost: \$900,000**

**FY20 319 Funding: \$ 0**  
**FY23 319 Funding: \$ 0**  
**SRF Funding: \$ 850,000**

**Objective 2: Information, Education and Public Participation. Informing the public on project success to build a positive working relationship between the urban and rural citizens and educating both about how they can make a difference in achieving the project goals.**

**Task 6: Public Outreach.** Increase public awareness of water quality issues in general and project activities and results throughout the Big Sioux River watershed. Promote sound best management practices that best address priority impairments.

**Products:** Attend and present updates to the Minnehaha Conservation District board monthly. Conduct public meetings with shareholders to discuss the project and the activities that will be undertaken. Develop and expand relationships with Conservation Districts, Pheasants Forever, Fish & Wildlife Service, City of Sioux Falls, Dell Rapids, Brookings, and Brandon to provide information to the public on what activities are happening within the watershed. Conduct community meetings and one on one contact with project landowners to discuss the project and activities within the watershed. Maintain quarterly Steering Committee meetings to discuss project accomplishments and future project activities. Attend and participate in the Annual Big Sioux River Summit.

**Milestones:** Public/Informational meetings – 110  
News Releases/Press Releases – 10  
Website

**Total Cost: \$53,050**

**FY20 319 Funding: \$ 23,400**  
**FY23 319 Funding: \$ 18,650**  
**SRF Funding: \$ 0**

**Responsible Agencies:**

Project Coordinator  
Minnehaha Conservation District  
Conservation Districts  
East Dakota Water Development District  
City of Sioux Falls  
City of Dell Rapids

**Design and Technical Assistance:**

East Dakota Water Development District  
Project Coordinator  
Minnehaha Conservation Districts  
Conservation Districts  
City of Sioux Falls  
City of Dell Rapids

**Objective 3: Monitoring and Evaluation. Conduct water quality monitoring to assess project impacts on impaired water bodies and the effectiveness of bioreactor nitrate removal from agricultural drain tile.**

**Task 7: Water quality Monitoring.** Water quality sampling with QA/QC.

Monitor water quality at the 22 river and 11 tributary locations. The measure of the effectiveness of BMPs implemented is the change (improvement or degradation) in the quality of water in the targeted water bodies. The impairments being addressed were defined based on water samples collected at selected points within the project area. Water bodies currently listed as impaired will need to be shown to have had the impairments removed or eliminated. See Section 5.1 below for sample sites and parameters to be monitored. In addition, data from existing State-monitored sites (Tables 5.5 and 5.6) will be assessed and included in the evaluation.

**Products:** 1,000 water quality analyses for TSS and bacteria (fecal and E. coli), and other parameters, from 18 sites in the project area. 100 quality assurance/quality control samples.

**Milestones:** 1,000 water quality samples from 18 sites, plus 100 QA/QC samples.

**Total Cost: \$22,000**

**FY20 319 Funding: \$ 9,900**  
**FY23 319 Funding: \$ 6,600**  
**SRF-NPS Funding: \$ 0**

**Responsible Agencies:**

East Dakota Water Development District & South Dakota DENR

**Task 8: GRTS & Final Reports.** Complete all reports according to grant guidelines and requirements.

**Products:** 5 annual reports and 1 final report

**Milestones:** 5 annual reports, 1 final report

**Total 319 Cost: \$876,325**

**319 Funding: Administrative support**

**Responsible Agencies:**

East Dakota Water Development District  
Minnehaha Conservation District  
South Dakota DENR

**3.3 Milestone Table (See Table 3.5)**

**3.4 Required Permits**

All required permits will be obtained for the installation of BMPs during this proposed project. Permits required may include U.S. Army Corps of Engineers 404, SD DENR General Storm Water Permit for Construction Activities, water rights and local building permits.

**3.5 Project Sponsor**

The Minnehaha Conservation District is a local government entity whose boundaries lie within the study area, the Big Sioux River watershed between the Brookings/Hamlin County line and North Sioux City South Dakota, making it an appropriate lead sponsor for this project. Minnehaha Conservation District has a good working relationship with local governmental entities within the area, including counties, municipalities, and other conservation districts. Cooperation of all will be needed to successfully implement the project. Minnehaha Conservation District has experience in working on watershed projects and has sponsored other watershed activities in the area.

**3.6 Operation and Maintenance Responsibilities**

Responsibilities for the operation and/or maintenance of 319-funded BMPs will be provided through contracts between the landowner and Minnehaha Conservation District, or Minnehaha Conservation District-designated subcontractors. Contracts developed for BMP installation will specify operation and maintenance requirements, lifespan of the BMP and action taken for BMP failure, non-compliance, or breach of contract. Minnehaha Conservation District will be responsible for completing operation and maintenance monitoring, on-site visits, and follow-up with landowners. When actions are needed to address improper operation, maintenance and breach of contract, Minnehaha Conservation District will take appropriate action to ensure compliance.

**Table 3.5: MILESTONE TABLE**

**Big Sioux River Watershed Implementation Project Segment 4**

**5 year Proposal August 1, 2020 to July 31, 2025**

Goal/Objective/Task	Groups	Quantity	Year 1		Year 2		Year 3		Year 4		Year 5	
			2020	2021	2022	2023	2024	2025				
			July-Dec	Jan-June	July-Dec	Jan-June	July-Dec	Jan-June	July-Dec	Jan-June		
<b>Objective 1. BMP Installation</b>												
<b>Task 1: Animal Waste Management Systems</b>												
Product: AWMS Design, Construction and Nutrient Management Plans												
Engineering Services	3,4,5,6	7	1		1		1		2		2	
System Installation	3,4,5,6,	6		1		1		1		1		2
Nutrient Management Plans	3,4,6	6	1		1		1		1		2	
<b>Task 2: Riparian Area Protection</b>												
Product: Contracts, Engineering, Bank Stabilization,												
RAM (acres)	1,2,4,5,7,8	250		50		50		50		50		50
SRAM (acres)	1,2,4,5,7,8	1,500		300		300		300		300		300
Bank Stabilization Engineering Designs (feet)	6,7	1,000							1,000			
Bank Stabilization & Rehabilitation (feet)	6,7	1,000		5,000						1,000		
Easements (acres)	1,2,4,5,6,10,11	100	20		20		20		20		20	
<b>Task 3: Cropland BMPs</b>												
Product: Plans Developed and Systems Implemented												
Terrace Construction (feet)	1,2,3,5,6	146,000	29,200		29,200		29,200		29,200		29,200	
Terrace Restoration (feet)	1,2,3,4,5,6	10,000		2,500		2,500		2,500		2,500		2,500
Grassed Waterways (feet)	1,2,3,4,5,6	10,000		2,000		2,000		2,000		2,000		2,000
Filter Strips (acres)	1,2,4,5,6	20		4		4		4		4		4
Cover Crops (acres)	1,2,3,4,5,6	2,000		400		400		400		400		400
Easements (acres)	1,2,4,5,6,10,11	30					10		10		10	
<b>Task 4: Grazing Systems</b>												
Product: Planning and Development of Systems												
Fencing (feet)	1,2,5,7,8	52,800		13,200		13,200		13,200		13,200		13,200
Water Developments - wells, pumps, pipelines, tanks #	1,2,5,7,8	20		5		5		5		5		5
Portable Shade Structures	1,2,5,7,8	5			1		2		2			
<b>Task 5: Urban BMPs</b>												
Product: Development of Demonstration Site												
Urban Bioreactor/Stormwater Filtration #	5,6,7,9	4		1		2			1			
<b>Objective 2. Information &amp; Education /Public Participation</b>												
<b>Task 6: Public Outreach</b>												
Product: Outreach to Public in Watershed												
Public/Informational Meetings, News Articles, Mailings #	1,2,3,4,5,7,8	50	10		10		10		10		22	
Web site and maintainance (anually)	1,2,4,5	10	2		2		2		2		2	
<b>Objective 3. Monitoring and Evaluation</b>												
<b>Task 7: Water Quality Monitoring</b>												
Product: Water Quality Sampling and Monitoring												
WQ Monitoring samples #	4,5,7	1,000	200		200		200		200		200	
QA/QC samples #	4,5,7	100	20		20		20		20		20	
<b>Task 8: GRTS &amp; Final Reports</b>												
Product: Reports												
Annual Reports #	1,2,4,5	5		1		1		1		1		1
Final Report #	1,2,4,5	1										1

**Groups:**

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>1. Minnehaha Conservation District</li> <li>2. Area Conservation Districts</li> <li>3. USDA - Natural Resources Conservation Service/Farm Service Agency</li> <li>4. SD Department of Environment and Natural Resources</li> <li>5. East Dakota Water Development District</li> </ul> | <ul style="list-style-type: none"> <li>6. Private Consultants</li> <li>7. City of Sioux Falls</li> <li>8. City of Dell Rapids</li> <li>9. South Dakota State University</li> <li>10. Pheasants Forever</li> <li>11. Fish &amp; Wildlife Service</li> </ul> |
|--|--|

## **4.0 COORDINATION PLAN**

### **4.1 Cooperating Organizations**

The lead sponsor for this project is the Minnehaha Conservation District. Minnehaha Conservation District will document cash and in-kind match to this project and is responsible for completion of this project's goal, objectives, tasks, and products. Several other partners have been involved in previous Big Sioux River Watershed Project segments. Their assistance will be requested as appropriate to each project activity. Organizations expected to participate and support the project as requested include:

City of Sioux Falls – Financial and technical assistance for implementation of BMPs targeting bacteria and TSS in the rural watershed. Urban BMPs, bank stabilization/riparian area restoration, bacterial and TSS loading reductions.

City of Dell Rapids – Financial support for Implementation of BMPs targeting bacteria and TSS in the rural watershed. Urban area BMPs reducing bacteria and TSS impacts of municipal storm water drainage.

Brookings, Lake, Moody, Lincoln and Union Conservation Districts – Direction and support through Steering Committee meetings will be given from the conservation districts. They will also be updated at their regularly scheduled meetings by the project coordinator when appropriate or as requested. BMPs planned in these counties will be brought to the respective board's attention so that they will be aware of operation and maintenance agreements as well as contract compliance.

United States Department of Agriculture (USDA) - Natural Resources Conservation Service (NRCS) – Technical assistance from Brookings, Lake, Moody, Minnehaha, Lincoln, and Union County NRCS field office staff and state specialists for programs. Financial assistance from USDA programs (EQIP, RCPP, NWQI and CRP) to landowners for BMP installation.

South Dakota Department of Environment and Natural Resources – Financial and technical assistance for water quality issues, project implementation, administration, sampling, and project management.

East Dakota Water Development District (EDWDD) – Technical and financial assistance for watershed personnel staff to carry out daily watershed activities and water quality monitoring.

Big Sioux River Watershed Steering Committee – Oversee project activities to ensure project goals are being met. The Big Sioux River Watershed Steering Committee will meet on a quarterly basis to discuss project updates and new ideas.

### **4.2 Local Support**

The Big Sioux River and its tributaries between the Brookings/Hamlin County line and North Sioux City, South Dakota are important economic and social assets to the communities in the project area, as well as rural residents and landowners. The Minnehaha Conservation District, East Dakota Water Development District, area conservation districts, City of Sioux Falls, City of Dell Rapids and Brookings have provided leadership for this project.

Community efforts to improve the central portion of the Big Sioux River began during the 1970s with the Lake Herman Clean Water Project and have been ongoing through a range of formal and informal watershed assessment and implementation projects in the intervening years. Through community support, the Lower Big Sioux River, Central Big Sioux River, North-Central Big Sioux River/ Oakwood Lakes Watershed Assessment Projects were initiated during 1999 and completed during 2005. During the assessment process, water development district and conservation district staff visited with key landowners and stakeholder groups in the watershed to inform them of the project and discuss implementation of potential BMPs. This EPA 319 project proposal was developed cooperatively by representatives of the Minnehaha Conservation District, East Dakota Water Development District, City of Sioux

Falls, City of Dell Rapids, Natural Resources Conservation Service, area conservation districts and DENR. The Big Sioux River Watershed Project will utilize a Steering Committee to help the Minnehaha Conservation District coordinate and manage the project. It will be assisted by a project coordination team made up of available local, state, and federal partners (see section 4.1) to maximize technical assistance and funding for successful project implementation.

### **4.3 Project Coordination**

All parts of the Big Sioux River Watershed Project will be coordinated with other available local, state, and federal programs (see Section 4.1) to maximize technical assistance and funding for successful project implementation. In addition, this project will utilize training and other technical assistance available such as:

- Annual 319 project coordinators training workshops.
- Technical and administrative training provided by the SD DENR, and NRCS; and
- Technical assistance from the South Dakota Animal Nutrient Management Team for nutrient management system planning and implementation.

### **4.4 Coordination with Other Projects**

This project will be implemented through coordination and partnership with other organization programs to create complementary activities. Key activities by programs that are similar for this project are as follows:

- Financial Assistance for installation of BMPs on livestock operations, cropland, grassland, and municipalities in this proposal will request funding from federal and state grant programs (319, RCPP) and USDA programs (CRP, Continuous CRP, WHIP, EQIP). Local funding will be provided by: State Revolving Funds Non-Point Source (SRF-NPS) funding, landowners, East Dakota Water Development District and Conservation Districts.
- Technical Assistance for BMP implementation will be provided through a coordinated effort to include delivery by the project coordinator, NRCS field office staff, Conservation District staff, USDA Technical Service Provider (TSP) program, and other state and federal service providers as available (GF&P, US F&WS). Technical Assistance organizations will be invited to participate in the local project steering committee for coordination of services.

## **5.0 EVALUATION AND MONITORING**

### **5.1 Monitoring Strategy**

Monitoring and evaluation efforts will involve:

- Monitoring all project proposed tasks relative to meeting project milestones.
- Evaluating quality and effectiveness of BMPs installed utilizing available tools (such as STEPL, TRACKER) and.
- In-stream monitoring of the Big Sioux River and tributaries at selected sites to assess water quality changes as a result of the project.

Table 5.1 lists the location of water quality monitoring sites established in the Central Big Sioux River Implementation Project Segment1. Note: sites selected were also sampling used during the watershed assessment project.

**Table 5.1 Big Sioux River Watershed Project Water Quality Monitoring Sites.**

<b>Site Name</b>	<b>Site Location</b>
R19	Big Sioux River at SD Hwy 28, Estelline
R20	Big Sioux River at 466th Avenue (S of 201st Street), Bruce
R1	Big Sioux River at 213th Street, Brookings
R2	Big Sioux River at 216th Street, Brookings
R3	Big Sioux River at 471st Avenue (old US 77), Brookings
R4	Big Sioux River at 473rd Avenue, Brookings
R5	Big Sioux River at SD Hwy 13 (FSST Pow Wow Grounds)
R6	Big Sioux River at SD Hwy 34, Egan
R7	Big Sioux River at 240th Street, Trent
R8	Big Sioux River at 248th Street, Dell Rapids
R9	Big Sioux River at I-90 (Ditch Road access), Sioux Falls
R10	Big Sioux River at South Western Avenue, Sioux Falls
WQM 64	Big Sioux River at East Falls Park Drive, Sioux Falls
R11	Big Sioux River at North Bahnson, Sioux Falls
WQM 117	Big Sioux River at North Timberline Road, Sioux Falls
R12	Big Sioux River at West Holly Blvd/East Rice Street, Brandon
R13	Big Sioux River at SD Hwy 42, East Sioux Falls
WQM 65	Big Sioux River at US Hwy 18, Canton
WQM 66	Big Sioux River at 488th Avenue, Hudson
WQM 67	Big Sioux River at 302nd Street/CR 13, Hawarden
WQM 32	Big Sioux River at SD Hwy 50, Richland
LBSM 21	Big Sioux River at North Sioux City
T18	Skunk Creek at 244th Street, Chester
SK-1	Skunk Creek at 247th Street, Colton
SK-2	Skunk Creek at 248th Street, Colton
SK-3	Skunk Creek at 249th Street, Colton
SK-4	Skunk Creek at 250th Street, Colton
T18.5	Skunk Creek at Grand Meadow Street, Lyons
T19	Colton Creek at Grand Meadow Street, Lyons
T20	West Branch Skunk Creek at Van Denmark Avenue, Hartford
T21	Skunk Creek at 467th Avenue, Ellis
T22	Willow Creek at 262nd Street, Sioux Falls
T23	Skunk Creek at Marion Road, Sioux Falls

The parameters that will be measured to assess the water quality at each site is listed in Table 5.2. The South Dakota State Health Laboratory at Pierre, South Dakota, will analyze all water samples. Data collected will be sent to the SD DENR for entry into the STORET database. Other sites sampled during the assessment study are currently monitored by the South Dakota Department of Environment and Natural Resources as a part of their state-wide ambient water quality monitoring network. Data from these sites listed in Tables 5.1 and 5.2 will also be used to assess project impacts.

**Table 5.2 In-stream Parameters to be Measured.**

<b>Physical/Field Parameters</b>	<b>Chemical/Biological Parameters</b>
Water Temperature	Nitrate-Nitrogen
Air Temperature	Total suspended solids
Dissolved oxygen	E.coli bacteria
Field pH	
Specific conductance	

The East Dakota Water Development District with technical support from the SD Department of Environment and Natural Resources, will develop a project-specific Sampling and Analysis Plan (SAP) for this project utilizing existing state standard operating procedures. The Standard Operating Procedures Manual for Field Samplers (SAP), developed by the State of South Dakota Department of Environment and Natural Resources - Water Resource Assistance Program, will be used to guide all sampling and analysis conducted during the Big Sioux River Watershed Project. A copy of this document will be provided to the project coordinator. Training to assure competence in carrying out the procedures set forth in this document that pertain to this project will be provided to the coordinator and any other involved personnel prior to the start of the project.

## 5.2 Sampling and Analysis Plan

EDWDD and MCD will monitor project progress based on project milestones and include progress in an annual project report. Progress to meet milestones will include a financial accounting of funds, and the source of funds expended on each milestone or project task. EDWDD, will monitor, determine, and report on load reductions accomplished as a result of project activities.

The effectiveness of BMPs installed relative to improvements in water quality will be evaluated using tools available from project partners such as:

- Assessment of feedlots for loading (before and after construction).
- Sheet, rill, and gully erosion formulas for soil loss and transport (RUSLE2).
- STEPL model for estimating on site load reductions; and
- GIS modeling for watershed changes in loadings due to BMP installation.

In-stream sampling will be conducted at multiple sites within the Big Sioux River watershed each year (Table 5.1). Proposed water sampling includes the required quality control/quality assurance samples and will be conducted according to procedures identified in the SAP. The samples will include the standard in-stream biological, chemical, and physical measurements to help evaluate useful water quality trend information (Table 5.2).

Local support and partner contributions will be tracked through records of landowner financial contributions, and through attendance records at annual tours, informational meetings, and project coordinator presentations and contacts.

### **5.3 Quality Assurance Project Plan**

A Quality Assurance Project Plan has been compiled by the South Dakota DENR that outlines the basic elements defined by the Environmental Protection Agency for project standardization in the document titled “319 Program Guidelines and Internal Controls”. East Dakota Water Development District, Minnehaha Conservation District and watershed coordinators will be responsible for following procedures outlined in the Document. The 4 main groups of elements are follows:

- Project Management - The elements in this group address the basic area of project management, including the project history and objectives, roles, and responsibilities of the participants, etc. These elements ensure that the project has a defined goal, that the participants understand the goal and the approach to be used, and that the planning outputs have been documented.
- Data Generation and Acquisition - The elements in this group address all aspects of project design and implementation. Implementation of these elements ensure that appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and QC activities are employed and are properly documented.
- Assessment and Oversight - The elements in this group address the activities for assessing the effectiveness of the implementation of the project and associated QA and QC activities. The purpose of assessment is to ensure that the QA Project Plan is implemented as prescribed.
- Data Validation and Usability - The elements in this group address the QA activities that occur after the data collection or generation phase of the project is completed. Implementation of these elements ensures that the data conform to the specified criteria, thus achieving the project objectives.

### **5.4 Data Collection Management and Analysis**

East Dakota Water Development District will be responsible for collecting, storing, and managing data collected during implementation of this project. South Dakota DENR will provide technical assistance and guidance to assist EDWDD to set-up the appropriate record systems and computer software for project data collected. Data collected through the in-stream water sampling will be forwarded to South Dakota DENR for entry into the STORET database.

### **5.4 Models**

East Dakota Water Development District will utilize the South Dakota DENR for technical assistance and training on which models to use and how to use them. It is anticipated that GIS and the STEPL model will be used to evaluate the impact of BMP installation in the watershed.

### **5.6 Operation and Maintenance**

The major activities of this project will involve a contract with landowners for operation and maintenance of all BMPs, to include contracts for the proposed watershed restoration actions. The operation and maintenance section of these contracts will specify the BMPs life span and who is responsible for the operation and maintenance.

The Minnehaha Conservation District is responsible to ensure O&M agreements are implemented. Minnehaha Conservation District, EDWDD, the City of Sioux Falls, City of Dell Rapids, City of Brookings, and other stakeholders will continue to pursue efforts to identify, fund, and implement needed O&M, as well as other additional improvements needed for the Big Sioux River Watershed beyond this proposal’s grant period. This proposal is part of an anticipated multi-segment program to fully implement the necessary measures to meet the TMDL requirements.

## **6.0 PUBLIC INVOLVEMENT (INFORMATION & EDUCATION)**

**6.1** A steering committee (project coordination team) will meet at least quarterly and provide input for project management and coordination of resources to the Minnehaha Conservation District, and will consist of representatives from local, state, and federal stakeholder organizations.

The Minnehaha Conservation District, East Dakota Water Development District and City of Sioux Falls, through completion of Objective 2 (Information and Education) of this proposal, will provide information to the public through progress reports, supplemental reports to existing regional newsletters, tours, news releases, annual informational presentations, public service announcements and meetings with stakeholder groups.

## **7.0 BUDGET (Detailed Project Budget Table 7.2)**

**Table 7.1 Big Sioux River Watershed Project Summarized Budget Funding by Source**

<b>Funding Sources</b>	<b>Funding Source Expenditures</b>	<b>Percentage</b>
EPA Section 319 FY20	\$ 900,000	6.3%
<b>EPA Section 319 FY23</b>	<b>\$ 560,000</b>	<b>3.9%</b>
EDWDD	\$ 141,500	1.0%
City of Dell Rapids SRF-NPS Funds	\$ 400,000	2.8%
City of Sioux Falls SRF-NPS Funds	\$ 5,526,070	38.3%
RCPP	\$ 2,597,403	18.0%
Local Cash & In-kind Services	\$ 3,669,205	25.5%
USDA	\$ 597,500	4.2%
<b>Total</b>	<b>\$ 14,391,678</b>	<b>100%</b>

# RCPP & Big Sioux River Project Budget

5 year Proposal July 1, 2020 to September 30, 2025	3 Year Combined Project Expense						Total Project Funding							
	FY 2023						CURRENT 319-EPA Grant	FY 2023 319-EPA Grant	EDWDD	City of Dell Rapids (SRF-NPS)	City of Sioux Falls (SRF-NPS)	RCPP	Local	USDA
Big Sioux River Watershed Implementation Project Segment 4	Year 1	Year 2	Year 3	Year 4	Year 5	Total								
<b>Project Personnel and Administration</b>														
Project Coordinators (2.5 FTE)	\$144,000	\$146,000	\$148,000	\$201,000	\$208,000	\$847,000	\$394,000	\$338,000	\$75,000	\$10,000	\$30,000			
RCPP Technical Assistance	\$99,480	\$99,480	\$99,480	\$99,480	\$99,483	\$497,403					\$50,000	\$447,403		
USDA Technical Assistance	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000	\$150,000						\$150,000		
Lodging/Meals/Expenses	\$1,200	\$1,200	\$1,225	\$1,350	\$1,350	\$6,325	\$3,625	\$2,700						
Travel	\$19,000	\$20,000	\$20,000	\$20,000	\$20,000	\$99,000	\$54,000	\$40,000	\$5,000					
Computer Support	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$15,000	\$6,000	\$4,000					\$5,000	
Office Supplies/Postage/Telephone	\$1,200	\$1,200	\$1,200	\$2,200	\$2,200	\$8,000	\$3,600	\$4,400						
Office Space	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$20,000	\$3,000	\$2,000					\$15,000	
Project Management (Sponsor & Advisory Board)	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$10,000						\$10,000		
Clerical Assistance - (CDs 200 hrs @ \$30)	\$1,200	\$1,200	\$1,200	\$1,200	\$1,200	\$6,000	\$3,600	\$2,400						
*Contract Management (SECOG)	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$10,000					\$10,000			
Equipment		\$15,000				\$15,000	\$15,000							
<b>Sub-Total</b>	<b>\$307,080</b>	<b>\$325,080</b>	<b>\$312,105</b>	<b>\$366,230</b>	<b>\$373,233</b>	<b>\$1,683,728</b>	<b>\$482,825</b>	<b>\$393,500</b>	<b>\$80,000</b>	<b>\$10,000</b>	<b>\$90,000</b>	<b>\$597,403</b>	<b>\$10,000</b>	<b>\$20,000</b>
<b>Objective 1 - Best Management Practices</b>														
<b>Task 1. Animal Waste Management Systems</b>														
Design of 7 Animal Waste Management Systems (7 Designs@ \$25,000 each)	\$25,000	\$50,000	\$25,000	\$25,000	\$50,000	\$175,000	\$21,000	\$14,000		\$20,000	\$38,750		\$31,250	\$50,000
Construction of 6 Animal Waste Management Systems @ \$1,000,000 each	\$1,200,000	\$1,200,000	\$1,200,000	\$1,200,000	\$1,200,000	\$6,000,000	\$80,000	\$50,000		\$250,000	\$500,000	\$1,518,680	\$3,101,320	\$500,000
Nutrient Management Plan Development (6 @ \$3000)	\$3,000	\$6,000	\$3,000	\$3,000	\$3,000	\$18,000								\$18,000
<b>Sub-Total</b>	<b>\$1,228,000</b>	<b>\$1,256,000</b>	<b>\$1,228,000</b>	<b>\$1,228,000</b>	<b>\$1,253,000</b>	<b>\$6,193,000</b>	<b>\$101,000</b>	<b>\$64,000</b>		<b>\$270,000</b>	<b>\$538,750</b>	<b>\$1,518,680</b>	<b>\$3,132,570</b>	<b>\$568,000</b>
<b>Task 2. Riparian Area Protection</b>														
Riparian Area Management Program, 250 acres @ \$1,200/acre	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$300,000	\$54,000	\$36,000		\$25,000	\$185,000			
Seasonal Riparian Area Management, 1,500 acres @ \$1,200/acre	\$360,000	\$360,000	\$360,000	\$360,000	\$360,000	\$1,800,000	\$140,000	\$252,000		\$100,000	\$1,308,000			
Bank Stabilization Engineering	\$0	\$0	\$0	\$25,000	\$25,000	\$50,000					\$50,000			
Bank Stabilization Construction, 1,000 linear feet @ \$200/ft	\$0	\$0	\$0	\$0	\$200,000	\$200,000					\$200,000			
Easements (100 acres@ \$4,000/acre)	\$80,000	\$80,000	\$80,000	\$80,000	\$80,000	\$400,000					\$400,000			
<b>Sub-Total</b>	<b>\$500,000</b>	<b>\$500,000</b>	<b>\$500,000</b>	<b>\$525,000</b>	<b>\$725,000</b>	<b>\$2,750,000</b>	<b>\$194,000</b>	<b>\$288,000</b>		<b>\$125,000</b>	<b>\$2,143,000</b>			
<b>Task 3. Cropland BMPs</b>														
Terrace, 146,000 feet @ 3.00/ft	\$87,600	\$87,600	\$87,600	\$87,600	\$87,600	\$438,000						\$364,920	\$73,080	
Terrace Restoration 10,000 feet @ \$10/ft	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$100,000	\$45,000	\$30,000					\$25,000	
Grassed Waterways, 15,000 feet @ \$2.50/ft	\$7,500	\$7,500	\$7,500	\$7,500	\$7,500	\$37,500	\$16,875	\$11,250					\$9,375	
Filter Strips (RAM), 20 acres @ \$2,055/acre	\$8,000	\$8,000	\$8,000	\$8,000	\$8,000	\$40,000	\$3,000	\$2,000	\$5,000	\$30,000				
Cover Crops, 2,000 acres @ \$40/acre	\$16,000	\$16,000	\$16,000	\$16,000	\$16,000	\$80,000				\$80,000				
Easements (30 acres @ \$10,000/ac)	\$60,000	\$60,000	\$60,000	\$60,000	\$60,000	\$300,000				\$300,000				
<b>Sub-Total</b>	<b>\$199,100</b>	<b>\$199,100</b>	<b>\$199,100</b>	<b>\$199,100</b>	<b>\$199,100</b>	<b>\$995,500</b>	<b>\$64,875</b>	<b>\$43,250</b>		<b>\$5,000</b>	<b>\$410,000</b>	<b>\$364,920</b>	<b>\$107,455</b>	
<b>Task 4. Grazing Systems</b>														
Fencing 52,800 lf @ \$3.00/lf	\$31,680	\$31,680	\$31,680	\$31,680	\$31,680	\$158,400	\$12,000	\$8,000			\$39,000	\$56,400	\$43,000	
Water developments - wells, pumps, pipe lines, tanks (20 @ \$10,000/development)	\$40,000	\$40,000	\$40,000	\$40,000	\$40,000	\$200,000	\$12,000	\$8,000			\$70,000	\$60,000	\$50,000	
Portable Shade Structure Pilot Program (5 @ \$5,000/structure)	\$5,000	\$10,000	\$10,000			\$25,000					\$18,750		\$6,250	
<b>Sub-Total</b>	<b>\$76,680</b>	<b>\$81,680</b>	<b>\$81,680</b>	<b>\$71,680</b>	<b>\$71,680</b>	<b>\$383,400</b>	<b>\$24,000</b>	<b>\$16,000</b>			<b>\$127,750</b>	<b>\$116,400</b>	<b>\$99,250</b>	
<b>Task 5. Urban BMPs</b>														
Urban Bioreactor/Storm water filtration	\$100,000	\$200,000	\$200,000	\$200,000	\$200,000	\$900,000			\$50,000		\$850,000			
<b>Sub-Total</b>	<b>\$100,000</b>	<b>\$200,000</b>	<b>\$200,000</b>	<b>\$200,000</b>	<b>\$200,000</b>	<b>\$900,000</b>			<b>\$50,000</b>		<b>\$850,000</b>			
<b>Objective 2 - Information &amp; Education/Public Participation</b>														
<b>Task 6. Public Outreach</b>														
News releases, Informational meetings, mailings, pamphlets	\$9,000	\$9,000	\$9,000	\$9,500	\$9,500	\$46,000	\$20,400	\$15,600	\$10,000					
Web Page	\$1,410	\$1,410	\$1,410	\$1,410	\$1,410	\$7,050	\$3,000	\$3,050	\$1,000					
<b>Sub-Total</b>	<b>\$10,410</b>	<b>\$10,410</b>	<b>\$10,410</b>	<b>\$10,910</b>	<b>\$10,910</b>	<b>\$53,050</b>	<b>\$23,400</b>	<b>\$18,650</b>	<b>\$11,000</b>					
<b>Objective 3 - Monitoring and Evaluation</b>														
<b>Task 7. Water Quality Monitoring</b>														
WQ Monitoring 1,000 @ \$20 each	\$4,000	\$4,000	\$4,000	\$4,000	\$4,000	\$20,000	\$9,000	\$6,000	\$5,000					
QA/QC - 100 @ \$20 each	\$400	\$400	\$400	\$400	\$400	\$2,000	\$900	\$600	\$500					
<b>Sub-Total</b>	<b>\$4,400</b>	<b>\$4,400</b>	<b>\$4,400</b>	<b>\$4,400</b>	<b>\$4,400</b>	<b>\$22,000</b>	<b>\$9,900</b>	<b>\$6,600</b>	<b>\$5,500</b>					
<b>Totals</b>	<b>\$2,425,670</b>	<b>\$2,576,670</b>	<b>\$2,536,695</b>	<b>\$2,606,320</b>	<b>\$2,837,323</b>	<b>\$12,980,678</b>	<b>\$900,000</b>	<b>\$830,000</b>	<b>\$146,500</b>	<b>\$410,000</b>	<b>\$4,169,500</b>	<b>\$2,597,403</b>	<b>\$3,349,275</b>	<b>\$588,000</b>
							6.9%	6.4%	1.1%	3.2%	32.0%	20.0%	25.8%	4.5%

## 8.0 THREATENED AND ENDANGERED SPECIES

There are several state and/or federally threatened or endangered species listed as present or potentially present in the Central Big Sioux River watershed. They are listed below in Table 8.1.

**Table 8.1: Threatened & Endangered Species of the BSR Watershed.**

<b>Name</b>	<b>Scientific Name</b>	<b>Listing Status</b>
Whooping Crane	<i>Grus Americana</i>	FE, SE
Piping plover	<i>Charadrius melodus</i>	FT, ST
Topeka shiner*	<i>Notropis topeka</i>	FE
Central mudminnow	<i>Umbra limi</i>	SE
Trout perch*	<i>Percopsis omiscomaycus</i>	ST
Northern redbelly dace*	<i>Hoxinus eos</i>	ST
Banded killifish	<i>Fundulus diaphanus</i>	SE
American burying beetle	<i>Nicrophorus americanus</i>	FE
Western prairie fringed orchid	<i>Platanthera praeclara</i>	FT
Blanding's turtle	<i>Emydoidea blandingii</i>	SE
Spiny softshell turtle	<i>Apalone spinifera</i>	ST
Northern redbelly snake	<i>Storeria occipitomaculata</i>	ST
Lined snake	<i>Tropidclonion lineatum</i>	SE
Black-footed ferret	<i>Mustela nigripes</i>	FE, SE
Northern River Otter	<i>Lontra canadensis</i>	ST
Finescale Dace	<i>Chrosomus neogaeus</i>	SE
Dakota Skipper	<i>Hesperia dacotae</i>	FT
Poweshiek Skipperling	<i>Oarisma Poweshiek</i>	FE
Blacknose Shiner	<i>Notropis heterolepis</i>	SE
FE – Federally Endangered		
SE – State Endangered		
FT – Federally Threatened		
ST – State Threatened		
*Encountered during assessment project		

Three of the threatened or endangered species were encountered during the Central Big Sioux River Assessment Project and care should be taken when implementing best management practices in the Big Sioux River Watershed that habitat for all listed species is not disturbed. The Bald Eagle has been taken off the federal and state threatened species list since the assessment project.

The procedures that will be followed to ensure the project will not adversely affect threatened and endangered species are based on the following premises:

- The best management practices to be implemented will promote the improvement of water quality which will benefit threatened and endangered species that depend on water.
- The occurrence of migratory endangered species is expected to be transitory, and if they are present project activities will cease until they have left the area.

The precautions that will be taken with respect to selected threatened and endangered species that could be found in the area are as follows: Threatened and endangered fish species (Topeka shiner & Trout perch) - No in-stream BMPs are planned for water bodies, primarily tributary streams, in which these species have been found. No in-stream activities will be allowed during the breeding seasons for each species in river reaches near known occurrences. If the species are observed at any project work site, all mechanical activities at the site will be suspended. The South Dakota State Management Plan for Topeka shiners will be followed as required.