1.0 PROJECT SUMMARY SHEET

PROJECT TITLE: Central Big Sioux River Watershed Project - Part 2a/Segment 2

NAME, ADDRESS, PHONE AND E-MAIL OF LEAD PROJECT SPONSOR/SUBGRANTEE:
Moody County Conservation District
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Flandreau, South Dakota 57028
605-997-2949 #3/-5132 FAX
Contact - John Hay, Technician john.hay@sd.nacdnet.net

STATE CONTACT PERSON: Jeremy Schelhaas
PHONE: 605-773-4254 **FAX**: 605-773-4068 **EMAIL**: Jeremy.Schelhaas@state.sd.us
STATE: South Dakota
HYDROLOGIC UNIT CODE: 10170202 & 10170203
HIGH PRIORITY WATERSHED: Yes - 303(d) List
TMDL Development ___ and /or Implementation _X

PROJECT TYPES	**WATERBODY TYPES**	**NPS CATEGORY**	
[X] Staffing & Support	[ ] Groundwater	[X] Agriculture	[ ] Hydro Modification
[X] Watershed	[ ] Lakes/Reservoirs	[X] Urban Runoff	[ ] Other
[ ] Groundwater	[X] Rivers	[ ] Silviculture	
[X] I & E	[X] Streams	[X] Construction	
	[X] Wetlands	[ ] Resource Extraction	
	[ ] Other	[ ] 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 Brandon by implementing and promoting best management practices (BMPs) in the watershed 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 29 separate TMDLs developed for the river, several tributaries and lakes.

PROJECT DESCRIPTION:
The Central Big Sioux River Watershed Project is a 10-year TMDL implementation strategy that will be completed in multiple segments and parts. 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 Central Big Sioux River and the North-Central Big Sioux River/East Oakwood Lake Watershed Assessments identified various segments of the Big Sioux River and certain tributaries between the Brookings/ Hamline County line and Brandon as failing to meet designated uses due to impairments from total suspended solids (TSS), dissolved oxygen and/or bacteria impairments. The current project (Part 2a Segment 2) is focused on further reducing loadings from animal feeding operations, and expand ongoing past project activities (Part 1). It also extends water quality monitoring, begun under Part 1, through 2013.

FY11 319 Funds Requested:	$ 545,588	**Local and State Match:**	$ 659,121
Other Federal Funds:	$ 696,700 (USDA-EQIP)	**Total Project Cost:**	$ 1,901,409

2.0 STATEMENT OF NEED

2.1 The Central Big Sioux River Watershed Project is a 10-year, multi-segment, multi-part 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 sediment 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 TMDL established for each waterbody. The project addresses the needs identified in the Central Big Sioux River (December 2004) and the North-Central Big Sioux River/East Oakwood Lake (December 2005) Watershed Assessment Projects and the 29 total maximum daily loads (TMDLs) that resulted from these studies. This proposal is the second of several successive implementation project segments designed to achieve the ultimate project goal. Impairments to the beneficial uses of the Big Sioux River and its tributaries are shown on Table 2-1.

Table 2-1. Beneficial Use Impairments Identified in the Central Big Sioux River Watershed

Impaired Water Body	Impaired beneficial use	Cause
Big Sioux River		
Brookings to Brookings/Moody Co. Line	WWFLP	TSS
S2-104N-49W to I-90	IR, WWFLP	FCB & EC, TSS
I-90 to Diversion return	IR, LCR, WWFLP	FCB & EC, TSS
Diversion return to SF WWTF	IR, LCR, WWFLP	FCB & EC, TSS
SF WWTF to above Brandon	IR, WWFLP	FCB & EC, TSS
Above Brandon to Nine Mile Creek	IR, WWFLP	FCB & EC, TSS
Beaver Creek	LCR	FCB
Flandreau Creek	LCR	FCB
Jack Moore Creek	LCR	FCB
North Deer Creek	LCR	DO
Pipestone Creek	IR, LCR	FCB & EC
Six Mile Creek	LCR	FCB
Split Rock Creek	IR, LCR	FCB
Spring Creek	LCR	FCB

According to the 2010 Integrated Report, no lakes within the project area are considered to be impaired.

LCR - limited contact recreation standard = 2,000 colonies per 100 milliliters of water;
EC - E. *coli* bacteria;
FCB - fecal coliform bacteria
WWFLP - warm water fish life propagation - applicable standard varies with water body;
TSS - total suspended solids;
IR - immersion recreation standard = 400 colonies per 100 milliliters of water;
DO - dissolved oxygen.

In addition to the river segments, and creeks specifically noted in Table 2-1, additional sub-watersheds were found to be contributing impairments to downstream water bodies. In some instances, addressing pollution sources in areas not technically impaired (due to a lack of a defined beneficial use or uses) may be necessary to meet TMDLs.

Several water bodies, over a substantial geographic area, are impaired within the Central Big Sioux River watershed. The impairments impact the use of the river and streams 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 current water quality problems may eventually result in an impairment. As the City of Sioux Falls current extracts about 65% of its drinking water from the Big Sioux River, correcting these problems will have an impact well beyond the current

recreational and aesthetic problems.

The Central Big Sioux River and North-Central Big Sioux River/East Oakwood Lake Watershed Assessment Projects identified several sources of total suspended solids (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. TSS levels in most tributaries are below beneficial use standards, suggesting that current land-use practices within these areas do not result in sediment loading. The exception is found in southern Minnehaha County, where natural conditions may exacerbate human impacts on sediment loading. Consequently, BMPs aimed at sediment reduction will focus on the immediate river corridor and the lower Skunk Creek, Pipestone/Split Rock Creek and Beaver Creek sub-basins. Bank stabilization and restoration of riparian buffer zones, in both rural and urban settings, were identified as 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 in an effort to determine the timing of major loadings. The most significant loadings were measured during high flow events, which were coincident with either major storms or spring snow melt. The bacteria encountered here are carried into the receiving waters by runoff, most likely from feed lots. Eight hundred twenty seven (827) feedlots were inventoried and assessed using the AGNPS Feedlot Subroutine. Two hundred and fifty-four (254) of the feedlots had AGNPS ratings of 50 or higher, and are candidates for improvement to reduce loadings. 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 these conditions, feedlots would not be expected to contribute, and the source is likely to be animals grazing in close proximity to the river and creeks. BMPs to address the bacteria (fecal and E. coli) impairments include installation of animal waste management systems at existing feedlots and restricting access to the water bodies by grazing animals.

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. Draft reports from the North-Central Big Sioux River/East Oakwood Lake Watershed Assessment Project are available. Contact the East Dakota Water Development District for specific details.

2.2 The Central Big Sioux River Watershed Project encompasses the Big Sioux River (in South Dakota) between the Brookings/Hamlin County Line at the north and Brandon in the south (see Figures 2-1). Excluded from the area are the watersheds of Clear Lake, Lake Campbell/Battle Creek, and Lakes Herman/Madison/Brandt, for which previous watershed projects have been instigated.

The surface area for the central Big Sioux River (BSR) watershed is approximately 1,547,520 acres (626,260 hectares) in size. The BSR and major tributaries are permanent water courses within the project area. There are also numerous intermittent tributaries which carry water only 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, including the cities of Brookings, Flandreau, Dell Rapids and Sioux Falls. Sections of the stream have been impacted by channelization (straightening and/or artificial stabilization) and numerous road crossings of the river and tributaries.

Many segments of the river do not fully support the designated uses, particularly with regard to limited contact or immersion recreation (Table 2-1). The 1998 South Dakota 303(d) Waterbody List, and subsequent versions in 2006 and 2008, identified this portion of the BSR watershed as impaired and a priority for development of TMDL reports. Fifteen impairments were known at the start of the studies, seven for total suspended solids (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 Central and North-Central Big Sioux River Watershed Assessment Project, a total of 34

impairments were identified (22 for bacteria (fecal and E. coli), eight for TSS, and two each for trophic state index (TSI) and dissolved oxygen. More extensive testing found that the previously identified nitrate problem did not rise to the level of a formal impairment.

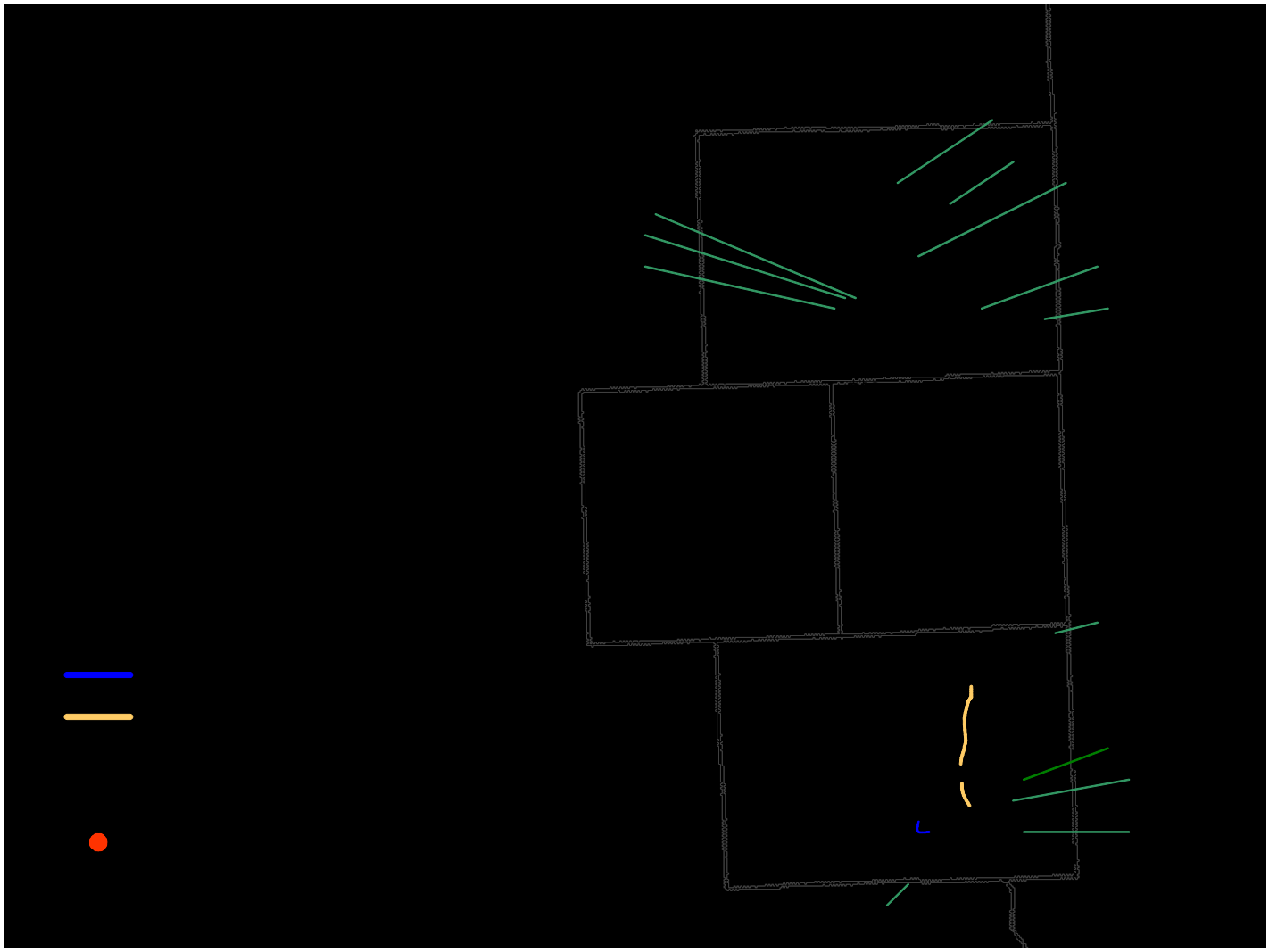
A total of 29 separate TMDL reports that have been, or are being, prepared as a result of the assessment projects. The reports form the basis for the proposed Central Big Sioux River Watershed Project.

2.3 Map of the watershed project area. See Figure 2-1.

2.4 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 pasture land. The watershed assessment identified 827 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 225,000.

Figure 2.1 Watershed Area

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.

Figure 2-1. Location of the Central Big Sioux River Watershed Project. Monitoring sites shown are those used during the Central Big Sioux River Watershed Assessment Project, many of which are to be reused during the current project to assess the impact of various BMPs. (See Section 5.0)

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 in excess of 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 The Central Big Sioux River and the North-Central Big Sioux River/East Oakwood Lake 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 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 project 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 are a significant influence. The E. coli problem becomes particularly acute below the community of Dell Rapids, when the more stringent immersion recreation standard (400 colonies per 100 ml) is also applicable. For most of the watershed below this point, reductions in excess of 75% to 95% are needed to meet the beneficial use standards. In this area, both feedlots and riparian area grazing are known problems.

TSS 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 indicates 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.

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.

3.0 PROJECT DESCRIPTION

3.1 Project Goal - The overall project goal is to 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 Brandon 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 total suspended solids (TSS) in the river and selected tributaries by between 20% and 70%. Bacteria (fecal and E. coli) levels found throughout the study area commonly exceed the water quality standard, particularly in regards to immersion recreation. Attainment of bacteria (fecal and E. coli) TMDLs will, in certain areas, require reducing bacterial loads by over 95%. Such a targets are beyond the scope of this project segment.

The interim targets for this part of the project will be measurable and sustainable reductions of bacteria (fecal and E. coli) (10%) levels, to be met at the completion of the second 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 Objectives and Tasks

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 a total of 8 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 and alternative systems (clean water diversions) 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 DENR Watershed program staff. Systems targeted for implementation efforts will be those with AGNPS ratings of 50 or higher, or those located in close proximity to receiving water bodies.

Products

Feasibility studies on 12 AFO, engineering designs and plans for eight (8) AWMSs, prepared by third-party engineering firms/technical service providers or United States Department of Agriculture, Natural Resource Conservation Service engineers (USDA-NRCS) and six clean water diversions for existing high priority feedlots or feeding areas.

Milestones: Eight AWMSs and six clean water diversions engineering designs and plans over a 2 year project period.

Total Cost: $1,369,400 319 Funds: $136,940 Consolidated Funds: $205,410

Responsible Agencies:

Task Responsibilities: Project Coordinator
Conservation Districts

Design and Technical Assistance: Project Coordinator
Technical Service Providers
SDACD 303(d) Technical Assistance Project
USDA-NRCS
Conservation Districts

Task 2: Reduce livestock access to water bodies. Provide resources to livestock owners to limit or prevent access to impaired water bodies and provide alternative water sources to replace the impaired water bodies.

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 sediment loadings due to the degradation of riparian areas. Emphasis will be on pastures that abut or transect the Big Sioux River or tributary streams.

Products

105 Acres of riparian area management and one prescribed grazing management plan developed.

Milestones: 105 acres of riparian area management and one prescribed grazing management system implemented over the 2 year project period.

Total Cost: $125,000 319 Funds: $81,750 SRF Funding: $0
Responsible Agencies:

Task Responsibilities: Project Coordinator
Conservation Districts

Design and Technical Assistance: Project Coordinator
Technical Service Providers
SDACD 303(d) Technical Assistance Project
USDA-NRCS
Conservation Districts

Task 3: Alternative Water Quality Treatments. Provide demonstration treatment to tile outlets to reduce nitrate levels of tile discharge entering impaired water bodies.

BMPs will be implemented as demonstration projects to provide treatment for agricultural land tile discharge. Emphasis will be tile lines that discharge directly into the Big Sioux River or tributary streams.

Products

Two demonstration projects for treatment of tile outlets that discharge directly into the Big Sioux River or tributary streams.

Milestones: Two tile outlet treatment projects designed and implemented over the 2 year project period.

Total Cost: $16,000 319 Funds: $12,000 SRF Funding: $0

Responsible Agencies:

Task Responsibilities: Project Coordinator
Conservation District

Design and Technical Assistance: Project Coordinator
Technical Service Providers
SDACD 303(d) Technical Assistance Project
USDA-NRCS
Conservation Districts

Objective 2: Increase public awareness of water quality issues in general, and project activities and results in particular, throughout the Big Sioux River watershed. Promote sound best management practices that best address priority impairments.

Task 4: Public information and education outreach. Demonstrate the value of strategically placed watering systems for improved soil and water quality, riparian and bank protection, and cattle gains.

Through the services of East Dakota Water Development District complete a survey of landowners within the project area to determine their concerns and activities that they are willing to undertake. Conduct community meetings and one on one contact with project landowners to discuss the project and their activities within the watershed

Products

Completion of landowner survey within the watershed
Conduct at least one public meeting within each county to discuss the project and the activities that will be undertaken.
Develop web site links to existing web sites of Conservation Districts, East Dakota Water Development District and City of Sioux Falls to provide information to the public on what activities are happening within the watershed.

Milestone: Completion of landowner survey, four public meetings conducted and web site links developed so public can be informed of activities be conducted in the watershed.

Total Cost: $25,000 319 Funds: $15,000 SRF Funding: $ 0

Responsible Agencies:

Task Responsibilities: Project Coordinator
Conservation Districts
East Dakota Water Development District
City of Sioux Falls

Design and Technical Assistance: Technical Service Providers
Conservation Districts
City of Sioux Falls
East Dakota Water Development District

Objective 3: Master Plan development of water quality trading pilot plan.

Task 5: Develop a pilot water quality trading program that can be used by communities such as Sioux Falls to improve water quality conditions within the Central Big Sioux watershed.

Products

A pilot program that can be used by communities to help install BMPs in the watershed that will help them meet TMDL requirements.

Milestone: A pilot program for water quality trading that will be implemented over the 2 year project period. Water quality trading plan will be finalized by May 30, 2012

Total Cost: $76,000 319 Funds: $60,000 SRF Funding: $0

Responsible Agencies:

Task Responsibilities: Project Coordinator
City of Sioux Falls
Conservation Districts

Design and Technical Assistance: Project Coordinator
Consultants/Technical Service Providers

Objective 4: Conduct water quality monitoring to assess project impacts on impaired water bodies.

Task 6: Water quality sampling to monitor project impacts. Monitor water quality at the 10 river and 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 on the basis of 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. The project will collect monthly water samples at 10 sites throughout the project area to monitor water quality changes. See Section 5.1 below for sample sites and parameters to be monitored. In addition, data from existing State-monitored sites (see Tables 5-1 and 5-2) will be assessed and included in the evaluation.

Products

280 water quality analyses for TSS and bacteria (fecal and E. coli), and other parameters, from10 sites in the project area. 56 quality assurance/quality control samples run on replicate or blank water samples.

Milestone: 280 water quality samples from 10 sites, plus 56 QA/QC samples.

Total Cost: $11,760 319 Funds: $0 SRF Funding: $ 0

Responsible Agencies:

Task Responsibilities: Project Coordinator
East Dakota Water Development District

Design and Technical Assistance: SD Department of Environment & Natural Resources
East Dakota Water Development District
Conservation Districts

Milestone: First year of Bachelor Creek Post Assessment to determine present water quality, stream habitat and

invertebrate biotic integrity since the implementation of BMPs installed in the Bachelor Creek watershed. Funding will be for first year of post assessment only. See appendix A (Bachelor Creek Post-Assessment Effort) for additional information.

Total Cost: $79,329 319 Funds: $64,178 SRF Funding: $ 0

Responsible Agencies:

Task Responsibilities: Project Coordinator
Conservation Districts
SDSU

Design and Technical Assistance: SD Department of Environment & Natural Resources
Conservation Districts
SDSU

Objective 5: Reporting

Task 7: GRTS. Prepare and submit semi-annual and annual reports to fulfill GRTS reporting requirements and a final project report, summarizing the results of the project, and the impact of the BMPs on the water quality within the project area.

GRTS semi-annual and annual reports will cover project activities completed to date and status of ongoing efforts. Final report will summarize any post-assessment study re-calculations of bacteria loads to the impaired waters and prepare subsequent proposals for continuing implementation of the TMDLs for the Central Big Sioux River watershed.

Products
Semi-Annual and Annual GRTS reports.
Project (Second Segment) Final Report.

Milestones: Semi-Annual and Annual GRTS reports filed in April and October of each year.
Project Final Report filed by December 2013.

Responsible Agencies:

Task Responsibilities: Project Coordinator

Design and Technical Assistance: SD Department of Environment & Natural Resources

3.3 Milestone Table (See attached Milestone Table)

3.4 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 The Moody County 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 Brandon, making it an

appropriate lead sponsor for this project. Moody County 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. Moody County Conservation District has experience in working on watershed projects, having sponsored other watershed activities in the area.

A project coordination team will be assembled from project stakeholders to oversee long-term project activities and to establish priorities for BMP implementation and application.

3.6 Responsibilities for the operation and/or maintenance of 319-funded BMPs will be provided through contracts between the landowner and Moody County Conservation District, or Moody County Conservation District-designated subcontractors. Contracts developed for BMP installation will specify operation and maintenance needs, procedures for BMP failure or abandonment, and the life-span BMPs will be maintained for the terms agreed upon in the contract. Moody County Conservation District will be responsible for completing operation and maintenance scheduling, on-site visits, and follow-up with landowners when actions need to be taken to ensure BMP operation for its intended lifespan.

4.0 COORDINATION PLAN

4.1 The lead sponsor for this project is the Moody County Conservation District. Moody County Conservation District will document cash and in-kind match to this project and is responsible for completion of this project's goal, objectives, and tasks.

Several other partners have been involved in previous Big Sioux River watershed projects. Their assistance will be requested as appropriate to each project activity. Organizations expected to participate and support the project requested include:

City of Sioux Falls - Financial and technical assistance applied to best management practices (BMPs) targeting TSS reductions through urban area bank stabilization/riparian area restoration, and rural-area bacterial loading reductions (riparian area easements). This effort is described in detail in Part 1 of the overall project.

Brookings, Lake, and Minnehaha County Conservation Districts - Technical assistance and cost-share funds to landowners for implementation of rural BMPs targeting TSS reductions (CRP incentives/buffer strips/grass waterways/etc) and bacterial reductions (animal waste management systems and riparian area restorations). Technical assistance and coordination of urban soil erosion and storm water management BMPs. The project will support hiring of one (1) additional South Dakota Association of Conservation Districts employee who will conduct public outreach and promotion of project activities, and provide technical assistance to landowners and stakeholders as needed.

United States Department of Agriculture (USDA) - Natural Resources Conservation Service - Technical assistance and cost-share funds to landowners for BMP installation.

South Dakota Department of Environment and Natural Resources - Technical assistance for water quality issues, sampling, and project management.

South Dakota Association of Conservation Districts (SDACD) - Technical assistance and contract management.

East Dakota Water Development District - Technical assistance and activity management for water quality monitoring.

South Dakota State University - Technical assistance and coordination of the first year of the Bachelor Creek Post assessment project.

A project coordination team will be assembled from the project stakeholders to oversee long-term project activities and to establish priorities for BMP implementation and application. The project coordination team will meet on a regular basis.

4.2 The Big Sioux River and its tributaries between the Brookings/Hamlin County line and Brandon are important economic and social assets to the communities in the project area, as well as rural residents and landowners. The Moody County Conservation District, East Dakota Water Development District, area conservation districts and the City of Sioux Falls 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 Central Big Sioux River and North-Central Big Sioux River/East Oakwood Lake 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 Moody County Conservation District, East Dakota Water Development District, the City of Sioux Falls, Natural Resources Conservation Service, area conservation districts and DENR. The Central Big Sioux River Watershed Project will be implemented using a local work group to help the Moody County Conservation District coordinate and manage the project.

The Central Big Sioux River Watershed Project will be managed 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 All parts of the Central 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 assistance for grassland management through the Grassland Management and Planning Project;
$ Technical and administrative training provided by the SDACD, SD DENR, and NRCS; and
$ Technical assistance from the SDACD 303(d) Technical Assistance Project for nutrient management system planning and implementation.

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

<u>SDACD 303(d) Technical Assistance Project</u> - The South Dakota Association of Conservation Districts has an ongoing program, funded in part with 319 funds, to provide technical assistance to area landowners to identify appropriate BMPs to reduce adverse water quality impacts. The project provides funding for design and engineering work, but no funds for actual construction of the BMPs. The proposed project includes funds that would be available to willing landowners in critical areas who have utilized the SDACD project for other technical assistance.

<u>On-going Implementation Projects</u> - Some segments of the Big Sioux River watershed have ongoing implementation projects. These areas were assessed as part of earlier TMDL studies, and have been in the implementation phase for several years. Current projects are functioning in the Lake Poinsett watershed in Hamlin County and the Upper Big Sioux and Lower Big Sioux watersheds covering the remaining counties associated with the Big Sioux River.

SD Nonpoint Source Information and Education Project - Resources from this project, sponsored by the South Dakota Discovery Center, will be utilized to further enhance education and outreach efforts for the project. Staff will also seek assistance in developing education programs and activities.

Proposed Riparian Easement Program - A riparian easement program is being proposed by EDWDD within their area of coverage including the Upper Big Sioux Watershed, Lake Poinsett Project and Central Big Sioux Watershed area.

Proposed project for the development of design criteria and citing of Bank-Toe protection on the Big Sioux River - The United States Department of Agriculture-Agricultural Research Service (USDA-ARS) is proposing a project to develop criteria on the type of material and location of the structures that will provide the best bank-toe protection for the Big Sioux River.

5.0 EVALUATION AND MONITORING

5.1 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 AnnAGNPS); 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.

The Moody County Conservation District with technical support from East Dakota Water Development District (EDWDD), the SD Department of Environment and Natural Resources, and South Dakota State University (SDSU), 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 Central 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.

Table 5-1 lists the location of water quality monitoring sites established in Part 1 of this project. Note: all sites selected were also sampling sites used during the watershed assessment project. See Figures 2-1 and 2-2 for locations. Table 5-2 lists the parameters that will be measured to assess the water quality at each site. The South Dakota State Health Laboratory at Pierre, South Dakota, will analyze all water samples. Data collected will be sent to 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 5-1. Central Big Sioux River Watershed Project Water Quality Monitoring Sites (Part 1).

Site Name	Site Location	Site Type
R01	BSR at Brookings	DENR - WQM 62
R04	BSR at Brookings USGS Gage	Project - Mainstem
R06	BSR at Egan	Project - Mainstem

R08	BSR below Dell Rapids	DENR - WQM 3
R09	BSR at Highway 38A	DENR - BS 23
R10	BSR at Western Ave.	Project - Mainstem
R11	BSR at Cliff Avenue	DENR - BS 29
R12	BSR above Brandon	DENR - WQM 31
R13	BSR near Gitchie Manitou	Project - Mainstem
R20	BSR near Bruce USGS Gage	Project - Mainstem

Table 5-2. In-stream Parameters to be Measured.

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

5.2 Moody County Conservation District will monitor project progress based on project milestones and include progress in a semi-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. Moody County Conservation District, in conjunction with EDWDD, will also monitor, determine and report on load reductions accomplished as a result of project activities.

The effectiveness of BMPs installed relative to improvement 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;
$ Buffer and riparian vegetation establishment reductions in sediment and nutrient loading; and
$ AnnAGNPS model for changes in loadings due to BMP installation.

In-stream sampling will be conducted at multiple sites within the Big Sioux River watershed each year (see Tables 5-1), with 14 sets of samples collected each year. Water sampling proposed includes the required quality control and quality assurance samples, and will be conducted according to procedures identified in the SAP, and will include the standard in-stream biological, chemical, and physical attributes. Using previously monitored sites, for which data already exist, will allow data proposed to be collected for this project to evaluate useful water quality trend information.

A post assessment of Bachelor Creek will be completed with assistance of South Dakota State University. See appendix A for additional information on the post assessment.

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

5.3 The Moody County Conservation 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 Moody County Conservation District 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 The Moody County Conservation 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 the AnnAGNPS and FLUX models will be used to evaluate the impact of BMP installation in the watershed.

5.5 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 in-stream restoration actions. The operation and maintenance section of these contracts will specify the BMPs life span for maintenance and who is responsible for maintenance and operation.

The Moody County Conservation District is responsible to ensure O&M agreements are implemented. The Moody County Conservation District, EDWDD, the City of Sioux Falls, 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 Central 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 BUDGET

Table 6-1. Central Big Sioux River Watershed Project Budget (Parts 2a of Segment 2)
Funding By Source

Funding Sources	Funding Source Expenditures	Percentage
EPA Section 319 (***FY 2011 request***)	$545,588	28.7%
Land Owners	$377,600	19.9%
East Dakota Water Development District	$ 21,760	1.1%
South Dakota State University	$ 15,151	0.8%
USDA-EQIP	$696,700	36.6%
City of Sioux Falls	$ 16,000	0.8%
Local Cash & In-kind Services	$ 23,200	1.3%
Consolidated Funds	$205,410	10.8%
Total	$1,901,409	100%

Table 6-2. Central Big Sioux River Watershed Project Budget (Part 2a of Segment 2) - See Appendix B.

7.0 PUBLIC INVOLVEMENT

7.1 A local work group (project coordination team) will meet at least quarterly and provide input for project management and coordination of resources to the Moody County Conservation District, and will consist of representatives from local, state, and federal stakeholder organizations.

The Moody County Conservation District, through completion of Objective 3 (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 and public service announcements to stakeholder groups.

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. Endangered and threatened species of the CBSR watershed.

Name	Scientific Name	Listing Status
Whopping crane	*Grus americana*	Federally endangered (FE), State endangered (SE)
Bald eagle	*Haliaeetus leucocephalus*	Federally threatened (FT), SE
Piping plover	Charadrius melodus	FT, State threatened (ST)
Topeka shiner*	*Notropis topeka*	FE
Central mudminnow	*Umbra limi*	SE
Trout perch*	*Percopis omiscomaycus*	ST
Northern redbelly dace	*hoxinus eos*	ST
Banded killfish	Fundulus diaphanus	SE
American burying beetle	*Nicrophorus americanus*	FE
Western prairie fringed orchid	*Platanthera praeclara*	FT
Blanding's turtle	*Emydoidea blandingii*	SE
Spiny softshell turtle	*Apalone spinifera*	ST
Northern redbelly snake	*Storeria occipitomaculata*	ST
Lined snake	*Tropidclonion lineatum*	SE
Black-footed ferret	*Mustela nigripes*	FE, SE

* - encountered during assessment project.

Only two of the threatened or endangered species were encountered during the Central Big Sioux River Assessment Project; however, care should be taken when implementing best management practices in the Central Big Sioux River watershed that habitat for all listed species is not disturbed.

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

1. 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.
2. 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.

1. 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 activity 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.

2. Bald Eagle - The bald eagle can be found near water, primarily on river systems, large lakes, reservoirs, and coastal areas. Bald eagles typically prefer large trees for perching and roosting. As there were no confirmed sightings of bald eagles within the Central Big Sioux River watershed, little or no impact to the species should occur. Best management practices should avoid the destruction of large trees that may be used as bald eagle perches, particularly if an eagle is observed using a tree as a perch or roost. No project activities are planned that will disturb possible nesting sites or reduce food sources. If any actions become necessary during the project that might impact

bald eagles that are in or visit the area, the sponsor or its agent will contact DENR for approval to complete the action before proceeding. If a bald eagle(s) is observed at any project work site, all mechanical activities at the site will be suspended until the bird(s) leaves the site under its own volition.

Appendix B: Table 6.2 Budget Version Part 2a,Segment 2, 10/1/10
Central Big Sioux River Watershed Implementation Project

Part 2a (2 year Proposal July 1, 2011 to July 1, 2013)	Project Expenses			Project Funding							
	Year 1	Year 2	*Total*	319-EPA Grant	USDA EQIP	Conservation Districts	Land Owners	City of Sioux Falls	Consolidated Funds	SDSU	East Dakota WDD
Project Personnel and Administration											
Project Coordinator	$ 43,744	$ 45,675	***$ 89,419***	$ 89,419							
Lodging/Meals/Expenses	$ 515	$ 536	***$ 1,051***	$ 1,051							
Travel	$ 8,850	$ 9,100	***$ 17,950***	$ 17,950							
Computer Support	$ 4,975	$ 5,025	***$ 10,000***	$ 10,000							
Office Supplies/Postage/Telephone	$ 700	$ 700	***$ 1,400***	$ 1,400							
Office Space	$ 2,250	$ 2,250	***$ 4,500***	$ 4,500							
Contract Management (Moody CD)	$ 1,300	$ 1,300	***$ 2,600***	$ 2,600							
Contract Management (SDACD)	$ 7,000	$ 7,000	***$ 14,000***	$ 14,000							
Project Management (Sponsor & Advisory Board)	$ 2,000	$ 2,000	***$ 4,000***	$ 2,400		$ 1,600					
Clerical Assistance - (CDs 400 hrs @$30)	$ 6,000	$ 6,000	***$ 12,000***	$ 7,200		$ 4,800					
Technical Assistance (CDs 1,200 hrs @ $35)	$ 21,000	$ 21,000	***$ 42,000***	$ 25,200		$ 16,800					
Sub-Total	$ 98,334	$ 100,586	***$ 198,920***	**$ 175,720**	$ 0	$ 23,200					
Objective 1 - Best Management Practices											
Task 1. Livestock Nutrient Management											
Ag. Waste Systems & Nutrient Mgt. Plans											
Feasibility study of 12 Animal Waste Facilities @$1,200 each	$ 9,600	$ 4,800	***$ 14,400***	$ 1,440	$ 7,200		$ 3,600		$ 2,160		
Design of 8 Animal Waste Facilities @$16,000 per	$ 64,000	$ 64,000	***$ 128,000***	$ 12,800	$ 64,000		$ 32,000		$ 19,200		
8 Ag. Waste Systems @ $150,000	$ 450,000	$ 750,000	***$ 1,200,000***	$ 120,000	$ 600,000		$ 300,000		$ 180,000		
6 Clean water diversions (1,500' @ $3/ft)	$ 13,500	$ 13,500	***$ 27,000***	$ 2,700	$ 13,500		$ 6,750		$ 4,050		
Sub-Total	$ 537,100	$ 832,300	***$ 1,369,400***	**$ 136,940**	$ 684,700		$ 342,350		$ 205,410		
Task 2. Riparian Area Protection											
Riparian Area Management Program, 105 acres @ $800/acre	$ 42,000	$ 42,000	***$ 84,000***	$ 63,000			$ 21,000				
Grazing management system (1 @ $16,000)		$ 16,000	***$ 16,000***		$ 12,000		$ 4,000				
Water developments - wells, pumps, pipe lines	$ 10,000	$ 15,000	***$ 25,000***	$ 18,750			$ 6,250				
Sub-Total	$ 52,000	$ 73,000	***$ 125,000***	**$ 81,750**	$ 12,000		$ 31,250				
Task 3. Alternative Water Quality Treatments											
Tile outlet treatment demo (2 @ $8,000 each)	$ 0	$ 16,000	***$ 16,000***	$ 12,000			$ 4,000				
			$ 0								
Sub-Total	$ 0	$ 16,000	***$ 16,000***	**$ 12,000**	$ 0		$ 4,000				
Objective 2 - Information & Education/Public Participation											
Task 4. Public Outreach											
Survey of watershed landowners	$ 10,000	$ 0	***$ 10,000***								$ 10,000
News releases, Informational meetings, mailings	$ 5,000	$ 5,000	***$ 10,000***	$ 10,000							
Create Web site links	$ 3,500	$ 1,500	***$ 5,000***	$ 5,000							
Sub-Total	***$ 18,500***	***$ 6,500***	***$ 25,000***	***$ 15,000***							***$ 10,000***
Objective 3 - Master Plan Development											
Task 5. Develop Pilot WQ Trading Program											
Consultant costs	$ 33,000	$ 33,000	***$ 66,000***	$ 50,000				$ 16,000			
Other expenses	$ 5,000	$ 5,000	***$ 10,000***	$ 10,000							
Sub-Total	$ 38,000	$ 38,000	***$ 76,000***	**$ 60,000**				$ 16,000			
Objective 4 - Monitoring and Evaluation (Section 5.0)											
Task 6. Water Quality Monitoring											
Post Assessment of Bachelor Creek	$ 79,329	$ 0	***$ 79,329***	$ 64,178						$ 15,151	
River WQ Monitoring - 280 @$35 each (10 sites * 14/yr * 2 yr)	$ 4,900	$ 4,900	***$ 9,800***								$ 9,800
QA/QC - 56 @ $35 each	$ 980	$ 980	***$ 1,960***								$ 1,960
Sub-Total	$ 85,209	$ 5,880	***$ 91,089***	**$ 64,178**	$ 0	$ 0				$ 15,151	$ 11,760
Objective 5 - Reporting											
Task 7. GRTS											
Task 8. Final Report											
Sub-Total											
Totals	$ 829,143	$ 1,072,266	***$ 1,901,409***	**$ 545,588**	$ 696,700	$ 23,200	$ 377,600	$ 16,000	$ 205,410	$ 15,151	$ 21,760
				28.7%	36.6%	1.2%	19.9%	0.8%	10.8%	0.8%	1.1%

July 1, 2011 Through June 30, 2013

Goal/Objective/Task	Groups	Quantity	Year 1	2011		2012	Year 2	2012		2013
			July-Sept.	Oct-Dec	Jan-Mar	Apr-June	July-Sept.	Oct-Dec	Jan-Mar	Apr-June
Objective 1. BMP Installation										
Task 1: Livestock Nutrient Management										
Products : Ag Waste Systems, Feasibility studies, Diversions										
Engineering Services	1,2,3,7	12	2	4		2	2	2		
System Installation	1,2,3,7	8		2		2	2	2		
Nutrient Management Plans	1,2,3,7	8	2	2	2	2				
Clean Water Diversions	1,2,3,7	6		2			2	2		
Task 2: Riparian Area Protection										
Products: Plans Developed, Systems designed										
RAM Plans completed	1,2,3,7	21	5	5		5	6			
Grazimg Mgt. System Planned	1,2,3,7	1				1				
Systems installed	1,2,3,7	22		5		6	6	5		
Task 3: Alternative Water Quality Treatments										
Products : Demo Tile Outlet treatment										
Engineering Services	1,2,3,4,7	2			2					
Systems installed	1,2,3,4,7	2					1	1		
Objective 2. Information & Education /Public Participation										
Task 4. Public Outreach										
Product : Outreach to Public in Watershed										
Landowner Survey	1,2,4,5	1	1							
Informational Meetings	1,2,3,4	4		2	2					
News Releases	1,2,3,4	8	1	1	1	1	1	1	1	1
Objective 3: Master Plan Development										
Task 5. Develop Pilot WQ Trading Progam										
Product: Pilot WQ Trading Project										
Consultant Hired	1,2,4,8	1	1							
WQ trading Plan Developed	1,2,4,8	1				1				
Pilot trading project implemented	1,2,4,8	1				1				
Objective 4: Monitoring and Evaluation										
Task 6: Water Quality Monitoring										
Product : Water Samples/Testing	1,2,4,5	280	70			70	70			70
QA/QC for water samples (20%)	1,2,4,5	56	14			14	14			14
Product:** Post assessment Bachelor Cr.	1,4,6	34	17*			17*				
Objective 5: Reporting										
Task 7&8: GRTS & Final Reports										
Product : Reports										
Semi-annual Reports	1,2,4	4		1		1		1		1
Annual Reports	1,2,4	2				1				1
Final Report	1,2,4	1								1***

Groups:

1. Moody County Conservation District
2. Area Conservation Districts
3. USDA - Natural Resources Conservation Service/Farm Service Agency
4. SD Department of Environment and Natural Resources
5. East Dakota Water Development District
6. South Dakota State University
7. Private Consultants
8. City of Sioux Falls

* Includes 2 samples for storm events

** Post assessment only funded for one year (2011)

*** Final report due by December of final year of project.

Appendix A

BACHELOR CREEK POST-ASSESSMENT EFFORT
Proposal Materials
September 22, 2010

1.0 STATEMENT OF NEED

1.1 The purpose of the Bachelor Creek Post Assessment is to determine present water quality, stream habitat and invertebrate biotic integrity since implementation of best management practices supported under the Bachelor Creek Implementation effort. The Bachelor Creek was 303d listed due to high loadings of fecal coliform bacteria, nutrients and sediment to the Big Sioux River. These parameters were found at concentrations below standards but high enough to warrant concern and implementation by the Moody County Conservation District. The district has since implemented five alternative water sources, 3550 linear feet of grassed waterways, three rotational grazing plans, 4803 acres of integrated crop management practices, 434 acres of no-till, installed six riparian rock crossings, installed three animal waste containment systems, planted 296 acres of riparian buffers and established 16 acres of shelterbelts. Most of these practices were directed at reducing sediment, nutrient and fecal coliform levels within Bachelor Creek. However, no post-assessment work has been conducted to evaluate implementation goals.

1.2 The surface area for the Bachelor Creek watershed is approximately 62,000 acres (25,091 hectares) in size. Land enrolled in the Conservation Reserve Program (CRP) totals 182 acres while that listed as Highly Erodible Land totals 1590 acres. Bachelor Creek may be divided into two subwatersheds based upon smaller tributary inputs and assigned beneficial uses. Lower sections through reach 1 (see Figure 1) have been assigned the beneficial uses of irrigation, fish, wildlife and stock watering, warmwater marginal fish life propagation and limited contact recreation. Reaches 2-5 have been assigned the beneficial uses of irrigation and fish, wildlife and stock watering.

1.3 See Figures 1 and 2

1.4 Bachelor Creek is a fourth order tributary to the Big Sioux River within the central Big Sioux watershed (Figure 1). The Bachelor Creek watershed extends across Lake and Moody County with a total drainage area of approximately 62,000 acres (Figure 1) draining glacial till materials. The landscape consists of flat plains with gently undulating hills and large numbers of prairie pothole wetlands. Land cover within the watershed consists primarily of cropland (83%) followed by farms and shelterbelts (7%) and grassland (5%). In 1991, the Moody County Conservation District developed the Bachelor Creek Hydrologic Unit Plan. Priority concerns identified within the plan included drainage of wetlands, lack of crop residue on agricultural fields, shortage of field shelterbelts, overuse of farm chemicals, water erosion, feedlot runoff, municipal sewage, creek litter and flood control. Bachelor Creek was 303d listed as a high priority risk due to nonpoint water quality problems. High sediment and nutrient loading to the Big Sioux River were listed as priority concerns. The Bachelor Creek Phase I Assessment was completed in August 2000 and identified suspended sediment, nutrient enrichment and fecal coliform loadings as concerns for load reduction. Subsequent implementation efforts have included installation of five alternative water sources, 3550 linear feet of grassed waterways, three rotational grazing plans, 4803 acres of integrated crop management practices, 434 acres of no-till, six riparian rock crossings, three animal waste containment systems, 296 acres of riparian buffers and 16 acres of shelterbelts.

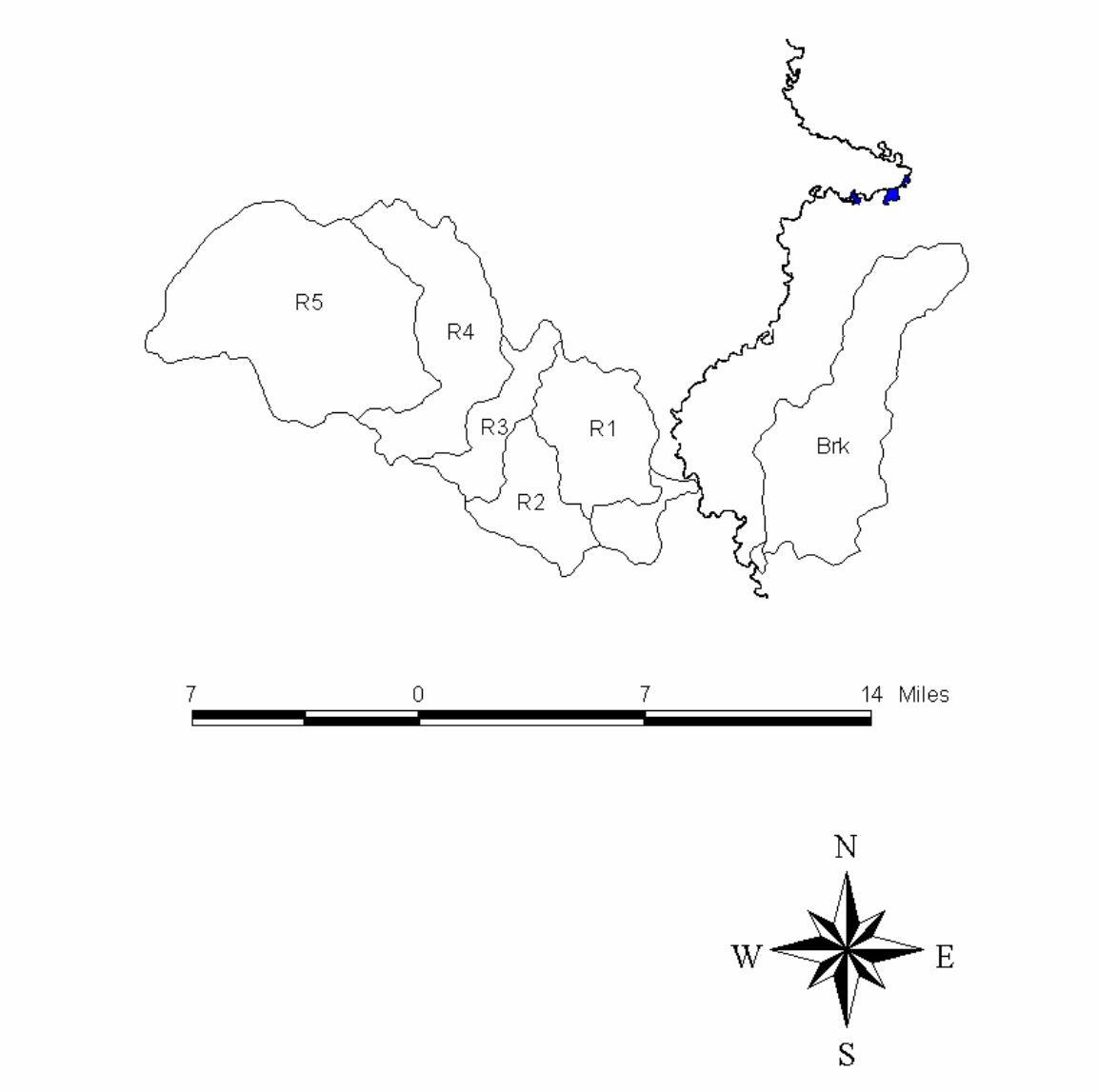


Figure 1. Phase I assessment reaches within the Bachelor Creek watershed and the Brookfield Creek watershed used as a reference watershed.

1.5 Prior to restoration activities, Bachelor Creek was found to be in compliance with water quality standards but a contributor of high nutrient, sediment and fecal coliform loads to the central Big Sioux River. Potential nonpoint sources of pollutants were unspecified agricultural practices.

2.0 PROJECT DESCRIPTION

2.1 GOALS

The goals of the Bachelor Creek Assessment are to (1) provide current estimates of sediment and nutrient loading through five reaches and to the Big Sioux River, (2) assess attainment of stream load reductions through implementation efforts and (3) assess attainment of stream habitat and biotic integrity goals since implementation of best management practices.

2.2 OBJECTIVES AND TASKS

OBJECTIVE 1: Evaluate changes in water quality conditions and reach loadings along Bachelor Creek since implementation of best management practices.

TASK 1: Water Quality Sampling/Analyses: Collect water quality samples from five monitoring sites monthly over two full growing seasons and to include 10 event-based samples (Figure 2, Table 2). Samples will be collected monthly July – September 2011, April – September 2012 and April – June 2013 for a total of 77 samples (including event-based and QA/QC).

Field measurements of dissolved oxygen, pH, conductivity, turbidity, air temperature and water temperature will be taken at the time of sample collection. Grab samples will be collected during rainfall/snowmelt runoff events and monthly to estimate solids, nitrogen, phosphorus and fecal coliform bacteria as these parameters were listed as concerns driving TMDL assessment. The South Dakota State Health Lab will analyze fecal coliform and nutrient water samples. Samples for dissolved and suspended solids will be processed in the environmental biology laboratory at SDSU.

TASK 2: Tributary Gauging: Install water stage recorders at five tributary monitoring sites (Figure 1, Table 2) and maintain a continuous stage record while water quality samples are being collected, with the exception of winter months during freeze up. Discrete discharge and tributary stage measurements will be taken on a regular schedule and during high-flow events. Discharge measurements will be taken with a hand-held current velocity meter.

TASK 3: Load Estimation: Discharge measurements, water-level data and stream chemistries will be used to estimate annual sediment and nutrient loads to each reach using the FLUX model. This model was used to estimate similar loads in the original TMDL assessment (Troelstrup et al. 2000). Percent change in annual FLUX sediment and nutrient loads will be calculated.

OBJECTIVE 2: Evaluate changes in stream habitat and biotic integrity since implementation of best management practices within the Bachelor Creek watershed.

TASK 4: Stream Habitat Conditions: Stream channel and riparian condition will be evaluated using the habitat methodology of Plafkin et al. (1989). We will focus on stream width, thalweg depth, mean current velocity, bank slope, riparian vegetative cover, linear meters of bank eroding and substrate particle size. While this is not the current stream habitat method in use by SD DENR, it was the method in use at the time of the original TMDL assessment project and will ensure comparable data for change detection along Bachelor Creek (Troelstrup et al. 2000). Stream habitat will be assessed from each of the 15 original sampling sites during July of 2011 and 2012 (Figure 2, Table 2).

TASK 5: Invertebrate Biotic Integrity: Stream invertebrates will be sampled from all 15 of the original assessment sampling sites during July 2011 and 2012 (Figure 2, Table2). While the original assessment results included monthly samples, it was determined that a mid-summer sample was best for discriminating among sites which varied in water quality and habitat conditions. Thus, post-assessment samples will be collected only during July. Invertebrate samples will be processed and optimal metrics calculated as per the original assessment (Troelstrup et al. 2000). This will facilitate comparison of invertebrate biotic integrity with data collected during the earlier assessment.

QUALITY ASSURANCE/QUALITY CONTROL:

Approved QA/QC procedures will be utilized on all sampling and field data collection on the Bachelor Creek assessment. Refer to the South Dakota Watershed Protection Program Quality Assurance Project Plan, the Standard Operating Procedures for Field Samplers for the State of South Dakota Clean Lakes program and the Bachelor Creek Phase I Watershed Assessment Report (Troelstrup et al. 2000) for the details of the procedures to be followed.

Table 1: Stream parameters to be measured as part of the Bachelor Creek Post Assessment.

Physical	Chemical	Biological
Air Temperature	Conductivity	Fecal Coliform Bacteria
Water Temperature	Field pH	Benthic Invertebrates
Discharge	Dissolved Oxygen	
Channel Habitat	Total Solids	
Riparian Condition	Total Dissolved Solids	
	Total Suspended Solids	
	Nitrate+Nitrite Nitrogen	
	Total Kjeldahl Nitrogen	
	Total Phosphorus	

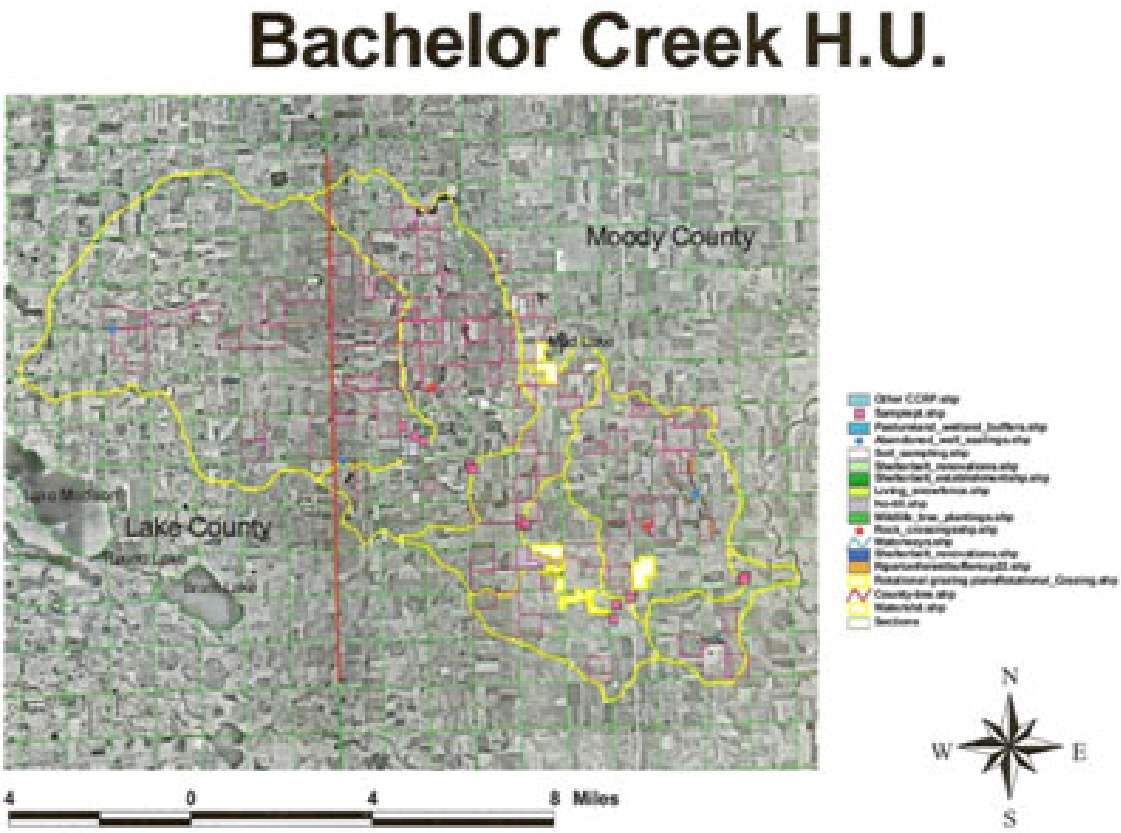


Figure 1. BMP implementation sites and sampling sites along the profile of Bachelor Creek, Moody County, SD. Note that water chemistries, discharge and loadings will be assessed at the lowest most site in each reach while physical habitat and bioassessment samples will be taken from all 15 of the original assessment sites.

Table 2. Locations of reach sampling sites along the profile of Bachelor Creek, Moody County, SD.

Site	Latitude	Longitude	Effort Summary
R1a	43 55.505	-96 42.476	Gauge, Chemistries, Habitat, Invertebrates

R1b	43 55.504	-96 42.559	Habitat, Invertebrates
R1c	43 55.489	-96 42.603	Habitat, Invertebrates
R2a	43 54.800	-96 46.102	Gauge, Chemistries, Habitat, Invertebrates
R2b	43 55.057	-96 45.973	Habitat, Invertebrates
R2c	43 54.774	-96 46.053	Habitat, Invertebrates
R3a	43 56.679	-96 48.517	Gauge, Chemistries, Habitat, Invertebrates
R3b	43 56.721	-96 48.416	Habitat, Invertebrates
R3c	43 56.630	-96 48.441	Habitat, Invertebrates
R4a	43 57.751	-96 49.726	Gauge, Chemistries, Habitat, Invertebrates
R4b	43 57.750	-96 49.727	Habitat, Invertebrates
R4c	43 57.823	-96 49.749	Habitat, Invertebrates
R5a	43 57.880	-96 50.907	Gauge, Chemistries, Habitat, Invertebrates
R5b	43 58.377	-96 51.176	Habitat, Invertebrates
R5c	43 58.546	-96 51.465	Habitat, Invertebrates

PRODUCTS:

- A watershed water quality report will involve a comparative analysis between previous water quality studies conducted prior to implementation and data obtained from this post-assessment effort
- Summary of water quality, discharge and load data collected from reach endpoints
- Summary of current stream habitat and invertebrate IBI conditions from 15 sampling sites along Bachelor Creek
- Comparison of current loads, habitat and IBI conditions relative to implementation goals and Phase I assessment data

RESPONSIBLE AGENCIES:

Task Prioritization: Project Personnel/South Dakota State University
Design/Technical Assistance: SD Department of Environment and Natural Resources

COST: $235,474 (**319 Funds** = $177,654)

2.4 A collection permit for sampling aquatic invertebrates will be obtained from South Dakota Department of Game, Fish and Parks.

3.0 EVALUATION AND MONITORING PLAN

3.1 The monitoring strategy is explained under section 3. All water quality monitoring will be done in accordance with assessment methods used in the original Bachelor Creek Phase I Assessment, the approved South Dakota Nonpoint Source Quality Assurance/Quality Control Project Plan and the Standard Operating Procedures for Field Samplers for the South Dakota Watershed Protection Program. The project will produce bi-annual progress reports.

3.2 This assessment project consists of a combination of chemical, biological, hydrologic, and stream habitat analyses. Monitoring sites will be maintained and sampled on Bachelor Creek. Ambient

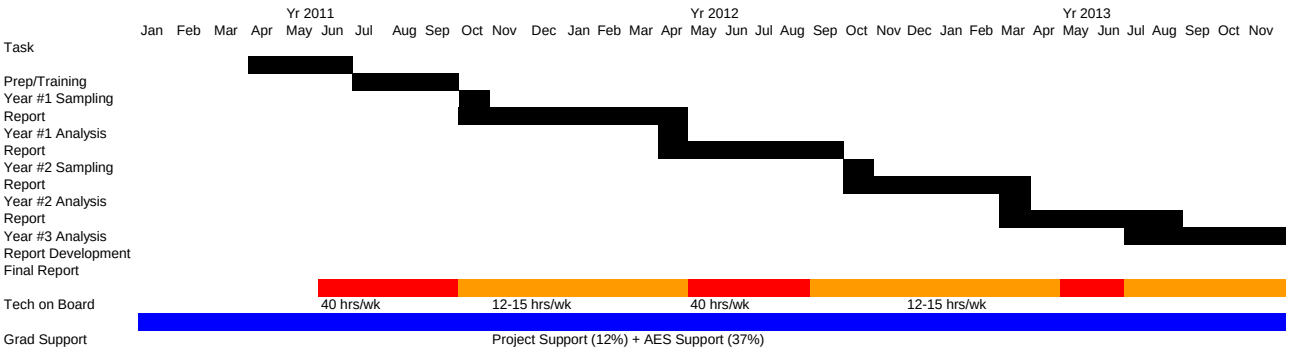
samples will be collected along with spring runoff and storm events. Stream discharge will be routinely measured. Loads will be calculated based on the samples and data collected with the approved methods identified in section 3.1. The physical, chemical and biological parameters to be sampled during this project are listed in Table 1.

3.3 Results from all water quality monitoring efforts will be documented in the final project report. Data will be managed by the South Dakota State University and maintained in a computer database. All sample data will be submitted for entry into the US EPA STORET program.

3.4 Planned modeling efforts are explained under Objective 1, Task 3.

4.0 Budget

BACHELOR CREEK POST-ASSESSMENT BUDGET (Attachment #1 Appendix A)											
		319 Federal Funding					SDSU Matching Funds				
Personnel	**Year 1**	**Year 2**	**Year 3**	**Total**		**Year 1**	**Year 2**	**Year 3**	**Total**		**Comments**
PI Time on Project	$5,209	$5,469	$11,485	$22,163		$5,209	$6,563	$11,485	$23,257		Figured 5% during years 1 and 2 and 10% of my time yea
Benefits	$322	$338	$710	$1,370		322	406	$710	$1,438		Health and Life ($6442/yr and increases by 5%/yr) based
Fringe	$781	$820	$1,723	$3,324		781	984	$1,723	$3,488		Fringe on time (15%)
Graduate Student	$17,211	$17,727	$18,259	$53,197							1 M.S. Student 49% time
Fringe	$344	$355	$365	$1,064							Fringe on graduate student time
Tuition Remisson	$2,400	$2,600	$2,800	$7,800							Tuition remission for graduate student
Lab/Field Tech (hourly)	$8,840	$9,110	$0	$17,950							Undergrad tech @ 15 hrs during school year and 40 hrs
Fringe	$177	$182	$0	$359							Fringe on undergrad tech
Supplies	$4,152	$4,707	$1,000	$9,859							Jars, preservatives, vials, slides, mounting media, vouch
Equipment	$10,000	$0	$0	$10,000							Hydrolab multiparameter probe
Travel	$2,500	$4,500	$4,000	$11,000							Travel to and from field and meetings, incl 5 sampling da
Contractual	$1,234	$2,898	$1,451	$5,583							Chemistries for 5 sitesx6dates/yr+10 Events+QA to DOH
Total Direct	$53,170	$48,707	$41,793	$143,670							Total direct costs
Indirect	$11,008	$12,449	$10,528	$33,985		$1,704	$2,147	$3,758	$7,609		Indirect calculated on 27% of modified total direct costs (
											SDSU has agreed to charge state agencies at a reduced
Unrecovered indirect						$7,135	$8,069	$6,824	$22,027		Unrecovered indirect (modified direct costs*17.5%)
Total	**$64,178**	**$61,155**	**$52,321**	**$177,654**		**$15,151**	**$18,169**	**$24,500**	**$57,820**		**Total project cost**
											$235,474
											Match percent
											24.55

5.0 Timeline

Timeline for Bachelor Creek Post assessment (Attachment #2 to Appendix A)