Watershed Project Final Report

Section 319
Nonpoint Source Pollution Control Program

Buffer Planning and Assistance Project

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This project was conducted in cooperation with the South Dakota Department of Environment and Natural Resources and the United States Environmental Protection Agency, Region VIII.

Grant # 9998185-01

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EXECUTIVE SUMMARY

PROJECT TITLE: **Buffer Planning and Assistance Project**

SECTION GRANT NUMBER(S) 9998185-01

PROJECT START DATE: May 24,2001
PROJECT COMPLETION DATE: December 31, 2004

FUNDING:	TOTAL BUDGET	$639,050
	TOTAL EPA GRANT(S)	$241,550
	TOTAL EXPENDITURES OF EPA FUNDS	$241,550
	TOTAL SECTION 319 MATCH ACCRUED	$713,083.01
	BUDGET REVISIONS	None
	TOTAL EXPENDITURES	$1,568,469.48

Summary of Accomplishments

A total of 1351 producer contacts were made by the team. A cumulative total of 625 plans were written for conservation buffer practices with landowner/operators. Four hundred twelve of the plans have been implemented. The plans installed 1,004,781.2 linear feet of buffers plus 1495.7 acres enrolled in the farmable wetlands and salinity vegetative planting programs for which linear equivalents are not available. More of the plans will be implemented during 2005 after the end of the project period.

A photo log of 25 of the buffer sites was provided to the South Dakota Department of Environment and Natural Resources.

The buffer effort is continuing using non EPA funds.

Angela Ehlers, Executive Director of the South Dakota association of Conservation Districts (project sponsor), received the 2003 NACD Professional Service Award for encouraging conservation district involvement in reviving local watershed work groups and encouraging use of buffers and other conservation practices to improve water quality and enhance wildlife habitat. The award related to efforts under this project.

SUMMARY

The project resulted in the establishment of riparian buffers along streams in eastern South Dakota as well as establishing other buffer conservation practices.

During the project it was found that many landowners are willing and eager to install buffers using the current variety of federal programs. In many cases the landowners were unaware that technical and cost share assistance programs were available, had little information about program details or had not been able to get technical assistance in a timely manner. These practices have been an easy sell, particularly with the improved USDA cost share rates.

Throughout most of the project period, two buffer specialists were employed. Because additional funds were provided by a USDA NRCS partnership contribution agreement, a third buffer specialist was added near the end of the project.

At the close of the project, SDACD continued buffer sales and planning activities using funds provided through a NRCS partnership contribution agreement. These activities will produce more buffer plans and will allow many of the practices planned but not implemented during this project to be installed. Therefore, the ultimate impact of this project on conservation practices installed and NPS pollution reduced will be even greater than described in the following description of project accomplishments.

INTRODUCTION

Buffers are recognized as a highly effective water quality protection practice if properly designed, installed and maintained. Experience gained during the project has shown that many landowners are willing to install buffers especially with the present day funding opportunities, but do not have the information to participate in the available programs. Technical assistance is needed by the landowners to plan the buffer areas and get the proper direction to become eligible for cost-share assistance.

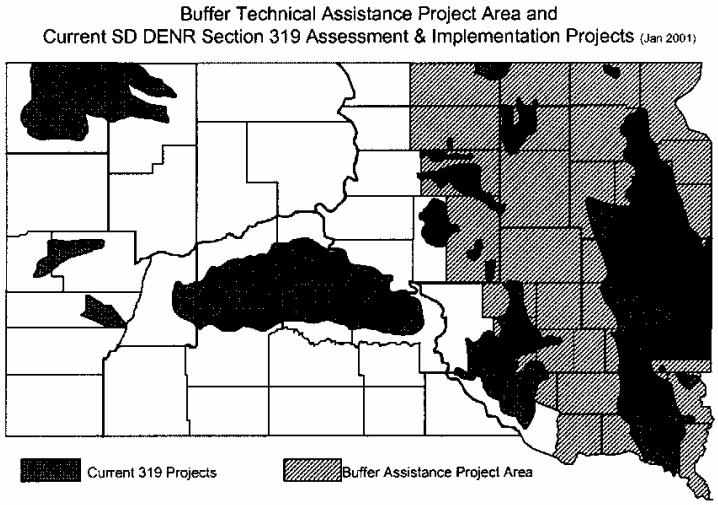
The willingness of landowners to install buffers was proven by the success of a previous 319 funded South Dakota Association of Conservation Districts project (C9998185-98) that started during April, 1999. Additional funding for the project was provided by a South Dakota Coordinated Soil and Water Conservation Fund grant. A systems approach was encouraged; two SDACD technicians planned the buffer practices that have a demonstrable water quality benefit and then provided the landowners with referrals for the additional practices that could be included within a resource system. During that project, the two technicians made 726 producer contacts and developed 228 plans for 170 landowner/operators in 27 counties. The 228 plans included 208 miles of buffers, 105 of which were installed before the end of the first project segment.

The South Dakota Soil and Water Coordinated Plan states that there are 121 lakes and 61 river segments in South Dakota that have been identified by the Nonpoint Source

Pollution Task Force as needing treatment to comply with South Dakota water quality standards. Most of the lakes and several of the river segments exist in the four major watersheds in eastern South Dakota - the Big Sioux, James, Minnesota and Vermillion River Basins. At the start of this project, this area contained 28 river and creek segments and 52 lakes that are in the South Dakota Department of Environment and Natural Resources (DENR) 303(d) list as needing Total Maximum Daily Loads (TMDL) developed so that these waters will meet their designated beneficial uses. Many TMDLs have been developed and implementation plans are in progress. Assessments are in progress or starting to develop TMDLs on several more watersheds with identified water quality problems.

This project was planned as a three year continuation of the previously referenced project that ended in July, 2001. When SDACD received partnership contribution funds from the NRCS, the project period was extended to December 31, 2004. This project continued to plan, design and implementing buffers in the East River area of South Dakota (Figure 1) with emphasis on watersheds that had an active 319 TMDL Water Quality Implementation Project, were in the process of completing a watershed assessment that would result in the development of a TMDL, or was an EQIP priority area. The number one priority for the project was the assistance to the 319 and EQIP projects. The team worked with producers outside the water quality project areas as time was available.

Figure 1. Map of Project Area at Start of Project



PROJECT ACTIVITIES

Project Goal:

The goal of this project was:

> "Provide accelerated planning, design and implementation of various buffer practices, with emphasis on buffers that benefit riparian zones, primarily to landowner and operators located in water quality projects in eastern South Dakota."

The project also provided information and education to local landowners, youth, communities, other agency personnel, consultants and the general public to provide a better understanding of use, function and technical design of buffer practices and their related water quality benefits.

Accomplishments by Objective/Task

Objective 1, Task 1

Provide planning and implementation assistance to landowners/operators.

Planned: 450 miles of buffer strips planned and 300 miles implemented.

Completed: During this project, 190.3 miles of buffer strips plus 1495.7 acres enrolled in the farmable wetlands and salinity vegetative planting programs for which linear equivalents are not available were installed. The two segment project total equals 295.3 miles of buffer strips plus 1495.7 acres enrolled in the farmable wetlands and salinity vegetative planting programs for which linear equivalents are not available.

A total of 1351 producer contacts were made by the team during the grant period.

The producers were provided technical assistance, including planning, staking/layout and application of buffer practices, in the following Section 319 Watershed Assessment and Implementation Projects:

Lake Alice	Bachelor Creek	Lower Big Sioux River
North Central Big Sioux River	South Central Big Sioux	Upper Big Sioux River
Blue Dog Lake	Clear Lake	Cottonwood Lake
Cresbard Lake	Elm Creek	Enemy Swim Lake
Firesteel Creek	Lake Faulkton	Lake Hendricks
Lake Herman	Little Minnesota River	Lake Madison
Mina Lake	Moccasin Creek	Lake Norden
Lake Poinsett	Lake Thompson	Lake Whitewood

A cumulative total of 625 plans were written for conservation buffer practices with landowner/operators. A total of 412 of the plans have been implemented. A summary of conservation buffer practices planned and installed appears in Table 1.

Table 1. Conservation Buffer Practices Planed and Installed.

Buffer Practice	**Planned**		**Installed**[1/]	
	Lin. Ft.	Acres	Lin. Ft.	Acres
Grassed Waterway	39,804	53.5	15,913	39.8
Filter Strip	200,644	595.8	171,776.8	442
Riparian Buffer	378,199	963.2	321,739	771.7
Field Windbreak	275,905	471.9	159,853	380.7
Farmable Wetland Program (FWP)	---	1,654.7	---	1,403.0
Contour Grass Strips	39,768	31.5	39,786	31.5
Other – Terraces	37,500	---	35,645	---
Other – Perm. Veg. Seeding (Salinity)	---	134.1	---	92.7
Living Snow Fence	650	1.7	0	0
Marginal Pastureland	401,713.8	1,841.5	2 59,008.4	1,232.6
Other –	1,060	46.1	1,060	1
Total	1,375,243.8 (= 260.5 miles)	5,794	1,004,781.2 (= 190.3 miles)	4395

1/ Some practices installed are from plans written during the previous project segment.

When combined with the previous project segment, 1,559,271.2 linear feet (295.3 miles) of buffers were installed plus 1495.7 acres enrolled in the farmable wetlands and salinity vegetative planting programs for which linear equivalents are not available. For information regarding NPS reductions, see Monitoring Results, page 10.

Objective 1, Task 2

Record GPS locations of buffer practices implemented.

The locations of installed conservation buffer practices were submitted to DENR for entry into a GIS database.

Objective 2, Task 3

Develop photo points of before and after practice conditions

Planned: 20 photopoints

Completed: 25 photopoints

The Conservation Buffer Team developed photo documentation points at 25 locations of buffers that they planned and implemented. The photo log is too large to include in the main body of this report. A hard copy of the photos along with the appropriate labels has been provided to the South Dakota Department of Environment and Natural Resources for their files and use.

Objective 2, Task 4

Develop news articles, presentations, displays, lead tours and maintain a website that promotes buffer practices

Planned: 30 news articles, 6 tours, 3 displays and 1 web site

Completed: 53 news articles, 4 tours, 10 displays, and 1 web site

The conservation buffer team (CBT):

- participated in riparian buffer field tours conducted by NRCS in Brookings, Hutchinson and Brown Counties in October, 2001. Topics covered included practice design, site preparation and program rules and regulations. They also participated in the June 18, 2003 National Buffer Training Workshop in Brookings South Dakota where their buffer sites were on the tour.

- attended the Second Annual North Dakota/South Dakota Watershed Coordinators Conference held in Bismarck, North Dakota February 26-28, 2002. Participation at the meeting included a (PowerPoint) presentation about the Conservation Buffer Team project in South Dakota. Team members also attended the 2003 South Dakota coordinators' conference in Aberdeen. The project manager presented information about the project at the 2004 SD coordinators' conference held in Pierre.

- trained all SDACD 319 and other staff in buffer planning and sales during July 2003. The training included a PowerPoint presentation. The team continued to provide technical assistance to SDACD 319 and other watershed project staff throughout the project. The other SDACD 319 funded projects include the 303(d) Watershed Planning and Assistance Project, Agricultural Nutrient Management Team, and the Grasslands Management and Planning Project.

- assisted the Minnehaha Water Coalition in promoting buffers along the Big Sioux River from Dell Rapids to Sioux Falls. These activities complemented the SDACD 303(d) Watershed Project's efforts reduce NPS pollution from animal feeding operations in the same area through AFO waste treatment system design.

The CBT participated in the following public relations activities to promote the conservation buffer initiative:

Farm/Home Shows & Exhibits

- Minnehaha Farm Show – Sioux Falls, January, 2002
- Winter Farm Show – Howard, February, 2002
- Winter Farm Show – Watertown, February, 2002
- Minnehaha Farm Show – Sioux Falls, January, 2003

- Winter Farm Show – Watertown, February, 2003
- Farm Show – Iroquois, March, 2003
- Minnehaha County Ag Day, Sioux Falls, Feb 2004
- Minnehaha CD Water Festival Sioux Falls, Feb 2004
- Sioux Empire Fair, Sioux Falls, August 2004

Print Media Coverage

- Article in Buffer Notes – October 2001
- News article in Clark Conservation District newsletter – March, 2003
- News article in Platte newspaper – July 2004
- News article in Armour newspaper – July 2004
- News article in five newspapers – July 2004
- News article in Forty-four conservation district newsletters – December 2004
- Collaborative articles with NRCS (6)

In general, the farm shows, fairs, and news articles generated some interest in buffers and made people more aware of the practices and benefits. They did not generate many productive contacts. Contacts developed through district conservationists, conservation district employees and cold calls on producers were more effective in selling buffers.

Throughout and after the project ended, SDACD has maintained a web page dedicated to buffers at:

http://www.sdconservation.org/cropland/buffers.html.

The site contains information describing buffers, their environmental benefits and economic information as well as how to access technical assistance. The web site also contains links to related buffer sites including Buffer Notes. The site was accessed more than 29,000 times during the project period. Although it is difficult it is difficult to assess the impact of web sites, as phone calls and other contacts referred to the web site, it appears the site had a positive impact.

Evaluation of Goal Achievement and Relationship to the State Management Plan

The project goal was attained. Landowners throughout eastern South Dakota have been provided at least some knowledge of the benefits of buffers and that there is assistance programs available to establish buffers. During the two project segments more than 295 miles were installed as a direct result of the CBT's efforts. While buffers are being integrated into other watershed programs in South Dakota, there remains a definite need for additional targeted assistance to promote and plan buffers. The conservation districts and NRCS staff do not have sufficient time to promote buffers using one-on-one visits with producers, the most effective method for promoting establishment of buffers.

BEST MANAGEMENT PRACTICES DEVELOPED AND/OR REVISED

The development and/or revision of best management practices was not included in or added to the project implementation plan.

MONITORING RESULTS

Water monitoring was not included in the project workplan. However, buffer effectiveness research conducted at Iowa State University found total sediment delivery from overland flow through riparian buffers was reduced by more than 90 percent (Buffer Notes, February 2004). Eight representative sites from this project were selected for analysis using RUSLE2. The analyses are presented in Appendix A located at the end of this report. Assuming a sediment delivery reduction efficiency of 90 percent, the analyses yielded the following results.

Table 3. RUSLE2 Analysis of Sediment Delivery Reduction.

Site Number	**Prebuffer Delivery**	**Postbuffer Delivery**	**Sediment Delivery Reduction**
	Tons/Acre/Year	Tons/Acre/Year	Tons/Acre/Year
One	0.51	0.051	0.459
Two	0.022	0.0022	0.0198
Three	3.4	0.34	3.06
Four	0.46	0.046	0.414
Five	0.049	0.0049	0.0441
Six	0.049	0.0049	0.0441
Seven	0.022	0.0022	0.0198
Eight	0.022	0.0022	0.0198
Average	0.56675	0.056675	0.510075

The average sediment delivery reduction of 1020 pounds per acre per year is significant, particularly if the receiving water flows to a lake or impoundment. In addition, buffers also help reduce sediment from stream bank erosion by promoting bank stabilization.

TMDL Implementation Effectiveness

This project was not designed to develop or implement a TMDL. As reported elsewhere in this report, the project installed buffers within twenty-four 319 funded project areas and thereby supported implementing the TMDLs established for those watershed projects. In addition, buffers installed in watersheds identified as needing a TMDL, initiated activities that would be needed to implement the TMDLs developed. The locations of the buffers developed during the project were submitted to DENR so that they may be used in the AGNPS evaluations to determine load reductions realized from BMPs implemented in watershed project areas.

COORDINATION EFFORTS

Other State Environmental Programs/ Agencies

The South Dakota Department of Agriculture through the Conservation Commission provided a grant of State funds in the amount of $54,000 for this project. The funds were used for staff salaries to extend the project period.

Team employees in some cases worked with South Dakota Game Fish and Parks (GF&P) employees in situations where the producer wanted specific habitat benefits.

Conservation districts published buffer articles in their newsletters, provided field contacts and office space.

USDA Programs

The project worked closely with the USDA Natural Resources Conservation Service (NRCS). The NRCS provided opportunities for project employees to utilize their training system. The project team interacted with county level NRCS staff on a regular basis. NRCS provided leads on prospective clients and technical advice. Team employees often attended NRCS sponsored meetings for updates on Farm Bill programs which could be used to fund buffers. Team members kept NRCS staff appraised of where they were working and clients for whom they were preparing Farm Bill program funding requests. The Farm Services Agency assisted with technical funding questions and certified producer expenditures for match purposes. Team employees worked with all available Farm Bill practices which have changed over the life of this project. As shown in Table 2, Marginal Pastureland, CP-30, was the most popular practice, particularly late in the project due to favorable rates and incentives.

Other Federal Agencies

Team members periodically worked with US Fish and Wildlife Service personnel regarding wildlife habitat and USF&WS funding.

Other Organizations

Team members occasionally coordinated activities with Pheasants Forever staff. The program was sometimes a better choice for a producer who wanted to create or improve habitat for game species.

SUMMARY OF PUBLIC PARTICIPATION

When the first segment of the project was initiated, it was announced, using news releases. Presentations were made before the South Dakota Nonpoint Source Task Force, The South Dakota Board of Water and Natural Resources, The Conservation Commission and the South Dakota Crop Improvement Association. Project information was also presented to the conservation districts at SDSACD area meetings and to the NRCS State Technical Committee. During this project segment, the groups were provided project updates. Additional presentations were made at various farm shows and tours as discussed in Task 4.

ASPECTS OF THE PROJECT THAT DID NOT WORK WELL

The only difficulty encountered completing the project work plan was staff turnover. In the course of this project, the team had five employees. This is common with projects with a fixed duration. Near the end of the project, employees look for work with a longer duration.

Staff turn-over created only minor project disruptions as the sponsor was able to recruit and train qualified employees in a rather short time frame. The project employees who took other positions within SDACD assisted in training the new staff so disruption was minor.

PROJECT BUDGET / EXPENDITURES

The project budget as included in the Project Implementation Plan is displayed below.

Table 3. Original Project Budget by Funding Source.

Year	EPA 319	Other Federal	Local Match	Total
01-02	85,050	62,000	54,600	201,650
02-03	77,000	73,000	65,400	215,400
03-04	79,500	75,000	67,500	222,000
Total	**241,550**	**210,000**	**187,500**	**639,050**

A summary of actual expenditures for the completed project is shown in Table 4. The Conservation Grant is cash from a South Dakota Soil and Water Conservation Grant administered by the South Dakota Department of Agriculture. The USDA cash are funds the sponsor (SDACD) received for Farm Bill related services under several partnership contribution agreements with the NRCS. These two sources allowed leveraging the EPA 319 funds beyond original expectations. The total nonfederal match documented for the project was $713,083.01 versus the $187,500 required by the 319 grant.

Table 4. Buffer Team Final Financial Summary Report.

Item	Total cash and In-Kind	Conservation Grant cash	EPA Cash	USDA Cash	Landowner Cash	Local In-kind*
Vehicle						
Lease/Operation	$32,553.68		$32,553.68			
Insurance	$ 8,136.05		$ 8,136.05			
Operation						
Office supplies/Postage	$ 2,007.94		$ 2,007.94			
Cell Phone	$ 5,387.76		$ 5,387.76			
Administration	$ 14,553.10		$ 14,553.10			
Personnel	$230,324.11	$54,000.00	$176,324.11			
Travel/Per Diem	$ 2,587.36		$ 2,587.36			
Buffer Implementation Planning/Design/Practice Establishment	$1,272,919.48			635,317.97	$659,083.01	
TOTAL	**$1,568,469.48**	**$ 54,000.00**	**$241,550.00**	**$635,317.97**	**$659,083.01**	

*Not reported

RESULTS AND FUTURE ACTIVITY RECOMMENDATIONS

Team members received referrals from conservation district and NRCS staff. The team also utilized news articles and a web site to generate contacts. It was found, however, that the most effective way to locate clients was to locate likely sites for effective buffers and then make cold calls on the owners. There was no substitute for one-on-one sales calls. Most landowners had at least a rudimentary understanding of buffers and their environmental benefits but were unaware of available assistance programs or hadn't taken time to pursue them.

There is a need for continuing a program such as this. The program could be a separate, dedicated program or integrated into the various other watershed projects. Buffers are a relatively inexpensive way to reduce many water pollutants if placed correctly and are a cost effective complement to other watershed BMP.

Appendix A - NACD Service Award

EHLERS RECEIVES NACD SERVICE AWARD

Angela Ehlers, executive director of the South Dakota Association of Conservation Districts, was presented with the 2003 NACD Professional Service Award by Gary Mast, NACD President. Ehlers has worked to encourage conservation district involvement in reviving local watershed work groups and encouraging use of buffers and other conservation practices to improve water quality and enhance wildlife habitat. State Conservationist Janet Oertly credits Ehlers for the partnership savvy she brings as a member of the State Technical Committee and several subcommittees.

For other awards presented at the NACD Annual meeting see **http://nacdnet.org/2004/awards/**.

Appendix B – Beaver Creek, Iowa Research

Research Shows Key Gains With Riparian Buffers

Researchers at Iowa State University have documented major sediment reductions through the use of riparian buffers.

Riparian forest buffers reduced stream bank erosion by about 72 percent along a 6.8-mile stretch of an Iowa stream. That's according to a research paper published in the latest edition of the Journal of Soil and Water Conservation. The authors are George. N. Zaimes, Richard C. Schultz and Thomas M. Isenhart.

They note in their report that work in the same watershed, Bear Creek, has also shown that riparian buffers of 66-foot widths "reduce sediment delivery from overland flow by more than 90 percent."

Combining reductions of overland flow and stream bank erosion, the total stream sediment load "could potentially be reduced by 81 percent by riparian forest buffers, a significant reduction." They add, "With these kinds of reductions, the National Conservation Buffer Initiative goal of buffering 3,218,000 km (2,000,000 mi) of streams could have a significant effect on sediment reduction in streams (Soil and Water Conservation Society, 2001)."

Stream bank soil loss was measured on riparian forests buffers, corn and soybean row crop fields and continuously grazed pastures on the central Iowa stream. Exposed erosion pins were measured to estimate stream bank erosion rates approximately every month from June 1998 to June 1999, except during winter months. Row crop fields had the greatest stream bank erosion rate and total soil losses, followed by the grazed pastures.

Previous assessments of buffer research have said that more information is needed to evaluate stream bank erosion and specifically the impact of riparian livestock grazing on stream bank erosion, channel morphology and the quality of stream water and aquatic habitat.

The riparian forest buffers at Bear Creek include trees that stabilize the stream bank and provide long-term nutrient storage, shrubs that increase habitat diversity and reduce flood water velocities and warm-season grasses and forbs that reduce sediment load and agricultural chemicals in overland flow.

Two ages of riparian forest buffers were considered as one in the research project. Researchers pointed to an interesting trend after data collection. "The riparian forest buffer that was 9 yr old had significantly less (6%) total eroding bank length compared to the 6 yr old buffer," they wrote. "This difference suggests that as a riparian forest buffer becomes more established and trees mature, stream bank stabilization increases."

Multiple rows of trees and shrubs, as well as a native grass strip, combine in a riparian buffer to protect Bear Creek in Story County, Iowa. The buffer is a nationally designated demonstration area for riparian buffers. (NRS photo by Lynn Betts)

In their conclusion, the researchers predict similar results in other areas. "While this paper reports results from a local watershed, we believe that the rankings of the treatments used in our study would remain the same in most landscape settings but that absolute stream bank erosion rates and soil losses might be different." They add, "The goal of sustainable land use management should sustain minimal levels of stream bank erosion. Riparian forest buffers accomplish this goal effectively." They also take note of the combined results of reducing both stream bank and overland flows and say, "By reducing the two major sources of sediment load in the streams, riparian forest buffers provide an alternative land-use for riparian zones that will decrease the major non-point source pollutant, sediment. At the same time, riparian forest buffers also are financially attractive to farmers because the Conservation Reserve Program (USDA NRCS 1997) subsidizes lost income for agricultural land planted in riparian forest buffers."

*Bear Creek is a USDA riparian buffer national research and demonstration area. (See BufferNotes, December 2000 at **www.nacdnet.org/buffer**.) Zaimes is a graduate student, Schultz is a professor and Isenhart is an associate scientist in the Department of Natural Resources Ecology and Management at Iowa State University in Ames.*

Learn more about Bear Creek by visiting: www.buffer.forestry.iastate.edu/HTML/demosites.html.

Appendix C - RUSLE2 CALCULATIONS

RUSLE2 Profile Erosion Calculation Record

Info: Site One - Marginal Pastureland - Brookings Co.

Inputs: **File:** profiles\default
Location: South Dakota\Brookings County
Soil: Brookings, SD soils\Lm LAMOURE-RAUVILLE SILTY CLAY LOAMS, CHANNELED\LAMOURE silty clay loam 65%
T value: 5.0 t/ac/yr
Slope length (horiz): 200 ft
Avg. slope steepness: 1.0 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	0.50000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	0.25000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 senes to yr4 regrowth	tons	0.25000

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss for cons. plan: 0.51 t/ac/yr Sediment delivery: 0.51 t/ac/yr
Net C factor: 0.13
Net K factor: 0.29
Net LS factor: 0.15

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
6/1/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	10
7/15/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	13
9/1/0	Harvest, hay, legume	Alfalfa brome, yr3 senes to yr4 regrowth	11

Soil conditioning index (SCI): -0.1
Wind & irrigation-induced erosion for SCI: 6.5 t/ac/yr
SCI OM subfactor: -0.47
SCI FO subfactor: 1.00
SCI ER subfactor: -1.8
STIR value: 0.4500

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Profile Erosion Calculation Record

Info: Site Two - Marginal Pastureland - Brookings Co.

Inputs: **File:** profiles\default
Location: South Dakota\Brookings County
Soil: Brookings, SD soils\Lm LAMOURE-RAUVILLE SILTY CLAY LOAMS, CHANNELED\LAMOURE silty clay loam 65%
T value: 5.0 t/ac/yr
Slope length (horiz): 200 ft
Avg. slope steepness: 1.0 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	1.8000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	1.4000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 senes to yr4 regrowth	tons	1.2000

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss for cons. plan: 0.022 t/ac/yr Sediment delivery: 0.022 t/ac/yr
Net C factor: 0.0060
Net K factor: 0.29
Net LS factor: 0.14

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
6/1/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	48
7/15/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	48
9/1/0	Harvest, hay, legume	Alfalfa brome, yr3 senes to yr4 regrowth	45

Soil conditioning index (SCI): 0.7
Wind & irrigation-induced erosion for SCI: 6.2 t/ac/yr
SCI OM subfactor: 1.4
SCI FO subfactor: 1.00
SCI ER subfactor: -1.4
STIR value: 0.4500

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Profile Erosion Calculation Record

Info: Site Three - Filter Strip - Minnehaha Co.

Inputs: **File:** profiles\default
Location: South Dakota\Minnehaha County
Soil: Minnehaha, SD soils\MnC MOODY-NORA SILTY CLAY LOAMS, 6 TO 9 PERCENT SLOPES\MOODY silty clay loam 50%
T value: 5.0 t/ac/yr
Slope length (horiz): 150 ft
Avg. slope steepness: 7.0 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 04\c.Other Local Mgt Records\Corn, Fcult; Soybeans, Sdisk, Fcult, z4	Corn, grain	bushels	130.00
CMZ 04\c.Other Local Mgt Records\Corn, Fcult; Soybeans, Sdisk, Fcult, z4	Soybean, mw 30 in rows	bu	35.000

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss for cons. plan: 3.4 t/ac/yr Sediment delivery: 3.4 t/ac/yr
Net C factor: 0.11
Net K factor: 0.28
Net LS factor: 1.0

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
5/10/0	Cultivator, field 6-12 in sweeps		47
5/10/0	planter, double disk opnr	Corn, grain	47
10/20/0	Harvest, killing crop 50pct standing stubble		76
5/5/1	Disk, tandem secondary op.		57
5/15/1	Cultivator, field 6-12 in sweeps		52
5/15/1	planter, double disk opnr	Soybean, mw 30 in rows	52
10/10/1	Harvest, killing crop 50pct standing stubble		76

Soil conditioning index (SCI): 0.2
Wind & irrigation-induced erosion for SCI: 2.4 t/ac/yr
SCI OM subfactor: 0.44
SCI FO subfactor: 0.58
SCI ER subfactor: -1.3
STIR value: 42.24

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a

rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Profile Erosion Calculation Record

Info: Site Four - FWP - Kingsbury Co.

Inputs: **File:** profiles\default
Location: South Dakota\Kingsbury County
Soil: Kingsbury, SD soils\PwB POINSETT-WAUBAY SILTY CLAY LOAMS, 1 TO 6 PERCENT SLOPES\POINSETT silty clay loam 65%
T value: 5.0 t/ac/yr
Slope length (horiz): 130 ft
Avg. slope steepness: 4.0 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 04\c.Other Local Mgt Records\Corn, Bean, Strip Till; Z4	Corn, grain	bushels	140.00
CMZ 04\c.Other Local Mgt Records\Corn, Bean, Strip Till; Z4	Soybean, mw 30 in rows	bu	40.000

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss for cons. plan: 0.46 t/ac/yr Sediment delivery: 0.46 t/ac/yr
Net C factor: 0.037
Net K factor: 0.29
Net LS factor: 0.50

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
5/10/0	Planter, strip till	Corn, grain	73
10/20/0	Harvest, killing crop 50pct standing stubble		82
5/15/1	Planter, strip till	Soybean, mw 30 in rows	80
10/10/1	Harvest, killing crop 50pct standing stubble		87

Soil conditioning index (SCI): 0.8
Wind & irrigation-induced erosion for SCI: 0 t/ac/yr
SCI OM subfactor: 0.72
SCI FO subfactor: 0.95
SCI ER subfactor: 0.82
STIR value: 5.025

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Profile Erosion Calculation Record

Info: Site Five - Marginal Pastureland - Brookings Co.

Inputs: **File:** profiles\default
Location: South Dakota\Brookings County
Soil: Brookings, SD soils\SvA SVEA LOAM, 0 TO 2 PERCENT SLOPES\SVEA loam 90%
T value: 5.0 t/ac/yr
Slope length (horiz): 200 ft
Avg. slope steepness: 1.0 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	2.0000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	1.0000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 senes to yr4 regrowth	tons	0.50000

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss for cons. plan: 0.049 t/ac/yr Sediment delivery: 0.049 t/ac/yr
Net C factor: 0.016
Net K factor: 0.25
Net LS factor: 0.14

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
6/1/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	28
7/15/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	39
9/1/0	Harvest, hay, legume	Alfalfa brome, yr3 senes to yr4 regrowth	36

Soil conditioning index (SCI): 0.6
Wind & irrigation-induced erosion for SCI: 2.7 t/ac/yr
SCI OM subfactor: 0.46
SCI FO subfactor: 1.00
SCI ER subfactor: -0.082
STIR value: 0.4500

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The

kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Profile Erosion Calculation Record

Info: Site Six - Marginal Pastureland - Brookings Co.

Inputs: **File:** profiles\default
Location: South Dakota\Brookings County
Soil: Brookings, SD soils\SvA SVEA LOAM, 0 TO 2 PERCENT SLOPES\SVEA loam 90%
T value: 5.0 t/ac/yr
Slope length (horiz): 200 ft
Avg. slope steepness: 1.0 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	2.0000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	1.0000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 senes to yr4 regrowth	tons	0.50000

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss for cons. plan: 0.049 t/ac/yr Sediment delivery: 0.049 t/ac/yr
Net C factor: 0.016
Net K factor: 0.25
Net LS factor: 0.14

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
6/1/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	28
7/15/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	39
9/1/0	Harvest, hay, legume	Alfalfa brome, yr3 senes to yr4 regrowth	36

Soil conditioning index (SCI): 0.6
Wind & irrigation-induced erosion for SCI: 2.0 t/ac/yr
SCI OM subfactor: 0.46
SCI FO subfactor: 1.00
SCI ER subfactor: 0.19
STIR value: 0.4500
The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Profile Erosion Calculation Record

Info: Site Seven - Marginal Pastureland - Moody County

Inputs: **File:** profiles\default
Location: South Dakota\Moody County
Soil: Moody, SD soils\Bo BON LOAM\BON loam 85%
T value: 5.0 t/ac/yr
Slope length (horiz): 200 ft
Avg. slope steepness: 1.0 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	1.8000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	1.4000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 senes to yr4 regrowth	tons	1.2000

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss for cons. plan: 0.022 t/ac/yr Sediment delivery: 0.022 t/ac/yr
Net C factor: 0.0070
Net K factor: 0.25
Net LS factor: 0.14

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
6/1/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	47
7/15/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	47
9/1/0	Harvest, hay, legume	Alfalfa brome, yr3 senes to yr4 regrowth	45

Soil conditioning index (SCI): 0.7
Wind & irrigation-induced erosion for SCI: 2.8 t/ac/yr
SCI OM subfactor: 0.88
SCI FO subfactor: 1.00
SCI ER subfactor: -0.11
STIR value: 0.4500

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.

RUSLE2 Profile Erosion Calculation Record

Info: Site Eight - Filter Strip - Moody Co.

Inputs: **File:** profiles\default
Location: South Dakota\Moody County
Soil: Moody, SD soils\Bo BON LOAM\BON loam 85%
T value: 5.0 t/ac/yr
Slope length (horiz): 160 ft
Avg. slope steepness: 1.0 %

Management	*Vegetation*	*Yield units*	*Yield (# of units)*
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	1.8000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 regrowth after cut	tons	1.4000
CMZ 04\c.Other Local Mgt Records\Continuous Grass z4	Alfalfa brome, yr3 senes to yr4 regrowth	tons	1.2000

Contouring: a. rows up-and-down hill
Strips/barriers: (none)
Diversion/terrace, sediment basin: (none)
Adjust res. burial level: Normal res. burial

Outputs:
Soil loss for cons. plan: 0.022 t/ac/yr Sediment delivery: 0.022 t/ac/yr
Net C factor: 0.0070
Net K factor: 0.25
Net LS factor: 0.14

Date	*Operation*	*Vegetation*	*Surf. res. cov. after op, %*
6/1/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	47
7/15/0	Harvest, hay, legume	Alfalfa brome, yr3 regrowth after cut	47
9/1/0	Harvest, hay, legume	Alfalfa brome, yr3 senes to yr4 regrowth	45

Soil conditioning index (SCI): 0.7
Wind & irrigation-induced erosion for SCI: 2.7 t/ac/yr
SCI OM subfactor: 0.88
SCI FO subfactor: 1.00
SCI ER subfactor: -0.072
STIR value: 0.4500

The SCI is the Soil Conditioning Index rating. If the calculated index is a negative value, soil organic matter levels are predicted to decline under that production system. If the index is a positive value, soil organic matter levels are predicted to increase under that system.

The STIR value is the Soil Tillage Intensity Rating. It utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or a rotation. STIR ratings tend to show the differences in the degree of soil disturbance between systems. The kind, severity and number of ground disturbing passes are evaluated for the entire cropping rotation as shown in the management description.