WATERSHED PROJECT FINAL REPORT

SECTION 319 NONPOINT SOURCE POLLUTION CONTROL PROGRAM

LAKE HERMAN / LAKE MADISON / BRANT LAKE WATERSHED PROJECT

LAKE COUNTY WATERSHED IMPROVEMENT PROJECT
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This project was conducted in cooperation with the State of South Dakota and the United States Environmental Protection Agency, Region VIII.

Grant #:C9998185-00, C99988185-03, and C9998185-04

EXECUTIVE SUMMARY

PROJECT TITLE: LAKE HERMAN / LAKE MADISON / BRANT LAKE WATERSHED PROJECT

GRANT NUMBER(S) C9998185-00
C9998185-03
C9998185-04

PROJECT START DATE MAY 1, 2000
PROJECT COMPLETION DATE February 28, 2006

FUNDING:

	BUDGET	
	INITIAL	AMMENDED
	$1,358,399	$2,135,694
*EPA GRANT # C9998185-00	$ 660,245	$ 660,245
*EPA GRANT # C9998185-03		$ 263,256
*EPA GRANT # C9998185-04		$ 180,744
TOTALOF EPA FUNDS	$ 660,245	$1,104,245
OTHER FEDERAL	$ 190,000	$ 291,656
LOCAL MATCH	$ 508,154	$ 674,901
TOTAL MATCH	$ 698,154	$ 996,557
319 FUND EXPENDITURES		$ 927,398
OTHER FEDERAL EXPENDITURES		$ 300,583
STATE FUND EXPENDITURES		$ 247,600
LOCAL FUND EXPENDITURES		$ 348,394
TOTAL EXPENDITURES		$1,823,975

The project goal was:

> "Decrease the phosphorous loading of Lake Herman/Lake Madison/Brant Lake by 50 percent in compliance with the Total Maximum Daily Load (TMDL)."

To achieve the reduction, nutrient and sediment loads originating from critical areas were reduced by installing best management practices (BMPs). Critical areas were those identified during the Lake Madison/Brant Lake Watershed Assessment and Lake Herman Post Implementation Investigation and in-field assessments completed as part of this project.

Activities selected to attain the project goal were divided among four objectives: Reduce Phosphorus Loading, Erosion Control, Storm Sewer Mitigation, and an Education Program. The Project Implementation Plan was amended during 2004 to achieve a better balance between the milestones and the needs of the producer.

Activities completed to reduce Phosphorus loading included construction of eight animal waste management systems and tests to determine the effectiveness of the septic systems located around Lake Herman. The tests were not able to show that there was a need to make alteration in the current practices.

Erosion control practices installed included 11 grassed waterways, 4 terraces, 6multi-purpose dams and 1 bank stabilization. The practices installed equaled 50, approximately 15, 100, and approximately 30 percent of the waterway, terrace, multipurpose and bank stabilization milestones respectively.

The workplan was amended to include several additional practices to address the needs communicated by project area producers. Among the practices added were managed grazing systems. A comparison of the number practices and activities planned, versus installed/completed by objective is shown in Table 13 on page 44.

Estimates of the Phosphorus loading reductions achieved using modeling indicate a 6.03, 3.82, and 26.65 percent loading reduction for Lakes Herman, Madison and Brant respectively. A summary of the load reductions is shown on Table 14 found on page 45. The reductions are below the 50 percent goal. The principle reason for not attaining the goal is project to be related to the voluntary nature of 319 projects. Not everyone that was approached chose to invest financial resources and land to install nonpoint source reduction practices.

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INTRODUCTION

Lakes Herman, Madison, and Brant have been the subject of several water quality studies during the past several years. The data collected during the studies was used to develop recommendations for the reduction of sediment and nutrient loads entering the three lakes from their respective and shared watersheds. The current project was completed to implement the recommendations outlined in the studies and summarized below.

A watershed assessment of Lake Madison and Brant Lake was completed during October 1998. The tributary water quality portions of the study each included collection of 204 samples. Analysis of the tributary data detected nine exceedences of the pH standard, three exceedences of the tributary fecal coliform standard, and one ammonia exceedence. The 204 in-lake samples detected a total of 19 un-ionized ammonia and 29 pH exceedences and 19 dissolved oxygen observations below the 5.00 mg/L standard. The study identified 41 animal feeding areas in the combined watershed. Twenty-four of the areas had an Agricultural Nonpoint Source Model (AGNPS) feedlot rating of 30 or greater with three of the lots rating 50 or greater.

The "Phase III Post Implementation Investigation Final Report - Lake Herman" dated October, 1994 contains eleven restoration recommendations (page 91). The recommendations were based on data collected during the Model Implementation Program (MIP), AGNPS Model of the watershed, and the Phase III Post Implementation Investigation. (See Appendix A for acronym key). A summary of the recommendations follows.

1. Construct at least two animal waste management systems with nutrient management plans and conduct follow-up monitoring to ensure proper manure application. There were 13 feedlots identified which contribute to sediment and nutrient runoff. The two highest ranked should receive top priority.

2. Reevaluate best management practices (BMPs) and /or increase the number of BMPs and determine the farming practices within the identified critical cells which are contributing nitrogen and phosphorus to the lake. The Agricultural; Nonpoint Source (AGNPS) model indicates there are a number of 40 acre cells which receive excessive amounts of fertilizer. Minimum till practices should continue to be stressed as a preferred method of crop residue management in the watershed.

3. Continue promotion of BMPs by providing both technical and financial assistance in areas with extensive erosion.

4. Stabilization of streambank areas damaged by the 1993 flood using rip rap and increase the grassed waterways and the amount of riparian vegetation which may have been reduced by the flood. The northern tributaries of the Lake Herman watershed and the area above and below sediment control structure, MIP #3 are the priority areas for this activity.

5. The sediment control structures should be operated to provide a longer retention period (7-14 days) after a rainfall event to allow clay particles to settle out. After the retention period, the valves should be operated similar to the present procedures. However, in the event of flooding such as occurred during 1993, this procedure must be modified to reduce the damaging effects of the excessive amount of water. This procedure would be more convenient for the local individuals and organizations responsible for opening and closing the valves.

6. If possible, install additional terracing in subwatershed site 3B to prevent erosion. The terraces located in subwatershed site 3B were fairly efficient at preventing erosion during 1993. This was attributed to the soil type. Soils in the area contain larger particles. Site 3B is on the North tributary to Lake Herman. The tributary crosses Highway 34 and the Country Club.

7. Grassed waterways should either be re-established or upgraded in areas that undergo intensive tillage practices. The priority locations are several areas above sediment control structures 2 and 3 in which ephemeral erosion was documented.

8. Establish a series of check dams to reduce the velocity of water which will in turn decrease delivery rate. This practice should be located in the subwatershed sites 3A and 3B. Some solids will be deposited by detaining stormwater runoff for minutes or hours (McComas, 1993). Site 3A is on the North tributary to Lake Herman that crosses the Country Club from the West.

9. Continually monitor and maintain the 4,200 feet of shoreline stabilized during the Model Implementation Program. Areas that were riprapped may begin to degrade.

10. In addition to shoreline maintenance, an educational program should be implemented to reduce the use of lawn fertilizers which contain phosphorus.

11. Planned grazing systems should be installed in the immediate area drained by the four tributaries to prevent overgrazing and associated damage which may occur to streambanks when riparian vegetation is reduced.

The *Phase I Watershed Assessment Final Report – Lake Madison / Brant Lake, Lake County, South Dakota*, dated October, 1998, identified pollutants entering the lakes and source areas and advanced several recommendations to for reduce loading.

The study found that during 1995 the following took place:

- Silver Creek contributed 91 percent of the total sediment load discharged into Lake Madison.

- Lake Madison and Brant Lake accumulated 2,315 and 180.9 tons of sediment, respectively during 1995.
- Silver Creek contributes over 92 percent of the overall Lake Madison phosphorus budget whereas groundwater contributes only 0.4 percent.
- Lake Madison accumulated 9,828.2 lbs of phosphorus during 1995.
- Brant Lake accumulated 3,951.9 lbs of phosphorus during 1995.
- The discharge from Round Lake constituted 88 percent of the overall phosphorus load entering Brant Lake.
- Round Lake discharged more phosphorus than was delivered to it from Lake Madison during 1995.
- Using the EPA Simple Method for calculating pollutant loading from urban areas it was determined that The City of Madison (2,214.5 acres) contributed approximately 2,951 lbs of Phosphorus/year to Lake Madison. During 1995, P loading attributed to the city was estimated at 2,915 lbs (=13 percent of the total load delivered to Lake Madison from Silver Creek."
- The predominant algal species in both lakes was *Aphanizomenon flos-aquae*. This blue green algae favors high concentrations of phosphorus. The mean concentration of phosphorus in surface samples from Lake Madison and Brant Lake were 0.27 mg/l and 0.170 mg/l, respectively. This is higher than the 0.02 mg/l needed to initiate an intense blue-green algal bloom. The fraction of dissolved phosphorus in both lakes averaged between 63 and 64 percent.

Data from the water quality assessments indicate that a 50 per cent phosphorus loading reduction is necessary to implement the total maximum daily loads developed for Lake Madison and Brant Lake. To realize reduction, the following BMPs were recommended:

- Install BMPs in critical cells, identified using the AGNPS model, that have an erosion rate greater than 7.0 tons per acre, and at all animal feeding areas that are contributing nutrients to the lakes to reduce total phosphorus loading of 32.5% and 40.0% for Lake Madison and Brant Lake, respectively.

- Reroute, reduce or eliminate storm sewers that contribute nutrients to the Silver Creek to reduce phosphorus loading an additional 10 – 13 percent.

- Reduce phosphorus loads originating from applying lawn fertilizer through the use of natural buffers or filter strips between the lake and managed lawns especially lawns with steep slopes.

- Conduct a sediment survey to determine the volume and distribution of sediment in Bourne Slough and determine the feasibility of removing sediment from the slough. Increasing the depth of Bourne Slough may increase its ability to retain a greater amount of the phosphorus load received from Silver Creek.

DESCRIPTION OF THE PROJECT AREA

Lakes Herman, Madison, and Brant are located in Lake County, South Dakota (Figure 1).

Lake County is located in the Central Lowlands Province of the western section of the Prairie Coteau. The Prairie Coteau is a massive, hilly, lake-dotted highland lying along the eastern border of the state and is drained by the Big Sioux River and its tributaries.

Land use in the watershed is primarily agricultural. Agricultural land use is approximately 84% cropland and 15% grass or pasture. Beef, swine, and poultry animal feeding operations for are scattered throughout the watershed. The major soil associations include Egan-Viborg, Egan-Wentworth, and Dempster.

The community of Madison, population 6,257, is located in the watershed. The City has some light industrial business and storm sewers, which drain directly into Silver Creek. Agricultural businesses involved with the sale and storage of fertilizers and pesticides are located within the city.

Lake Herman, Lake Madison, and Brant Lake all host South Dakota Parks or Recreational Area facilities.

The assigned beneficial uses of the three lakes and Silver Creek are shown in Table 1.

Table 1. Designated Beneficial Uses of Lakes Herman, Madison, Brant, and Silver Creek.

Beneficial Use	**Lake Herman**	**Lake Madison**	**Brant Lake**	**Silver Creek**
Warmwater Marginal Fish Life Propagation				X
Warmwater Semi-Permanent Fish Life Propagation	X	X		
Warmwater Permanent Fish Life Propagation		X	X	
Immersion Recreation	X	X	X	
Limited Contact Recreation	X	X	X	X
Wildlife Propagation and Stock Watering	X	X	X	X
Irrigation Waters	X	X	X	X

Table 2 contains a description of the physical attributes of each lake. The table also indicates the trophic state of each waterbody.

Table 2. Physical Attributes and Trophic State of Lakes Herman, Madison and Brant.

Physical Attribute	Lake		
	Herman	**Madison**	**Brant**
Origin	Glacial	Glacial	Glacial
Size	1350 acres	2,799 acres	1,037 acres
Maximum Depth	13 feet	15.5 feet	14 feet
Mean Depth	4.7 feet	9.7 feet	9.5 feet
Watershed Size	44,000 acres	29,191 acres	7,658 acres
Watershed size	17,806.8 ha	11,813.6 ha	3,099.2 ha
Mean Trophic index	72.33	74.15	70.73
Classification	Hypereutrophic	Hypereutrophic	Hypereutrophic
Hydrologic Unit Code	10170203	10170203	10170203

The three lakes form a chain connected by Silver Creek. Silver Creek flows from Lake Herman, through the City of Madison and into Lake Madison. Round Lake then connects Lake Madison with Brant Lake. Water flow through the watershed is illustrated in Figure 2.

Lake Herman is the first in the chain three lake Herman, Madison, Brant chain. Lake Herman, located two miles west of the City of Madison, has a highly developed shoreline with permanent homes and Lake Herman State Park. The Lake Herman Sanitary District recently completed a wastewater facility plan. The study determined that a central collection and treatment facility was not cost effective. Currently wastewater treatment around Lake Herman consists of older, privately owned septic systems. Further evaluation of the systems is needed as the systems have been tabbed as possible contributors to the elevated total phosphorous in the watershed.

Lake Madison, located three miles southeast of the city of Madison, has a heavily developed shoreline which includes both cabins and permanent homes. An established sanitary district encompasses the entire shoreline. The wastewater treatment system consists of a central collection facility and infiltration-percolation basins.

Public access to the lake is excellent. According to 1990 census figures, the population within a 65-mile radius is 270,159. As a result, the lake has very high use.

Lake Madison has been included in the South Dakota Lake Water Quality Assessment program since 1989.

Brant Lake, the last lake in the chain, is located 1.5 miles northwest of the town of Chester. Like Lakes Herman and Madison, the lake also has a highly developed shoreline with cabins and permanent homes. Lake water quality data has been collected through the South Dakota Lake Water Quality Assessment Sampling Program since 1989. Waste water treatment around the lakeshore currently consists of privately owned septic systems.

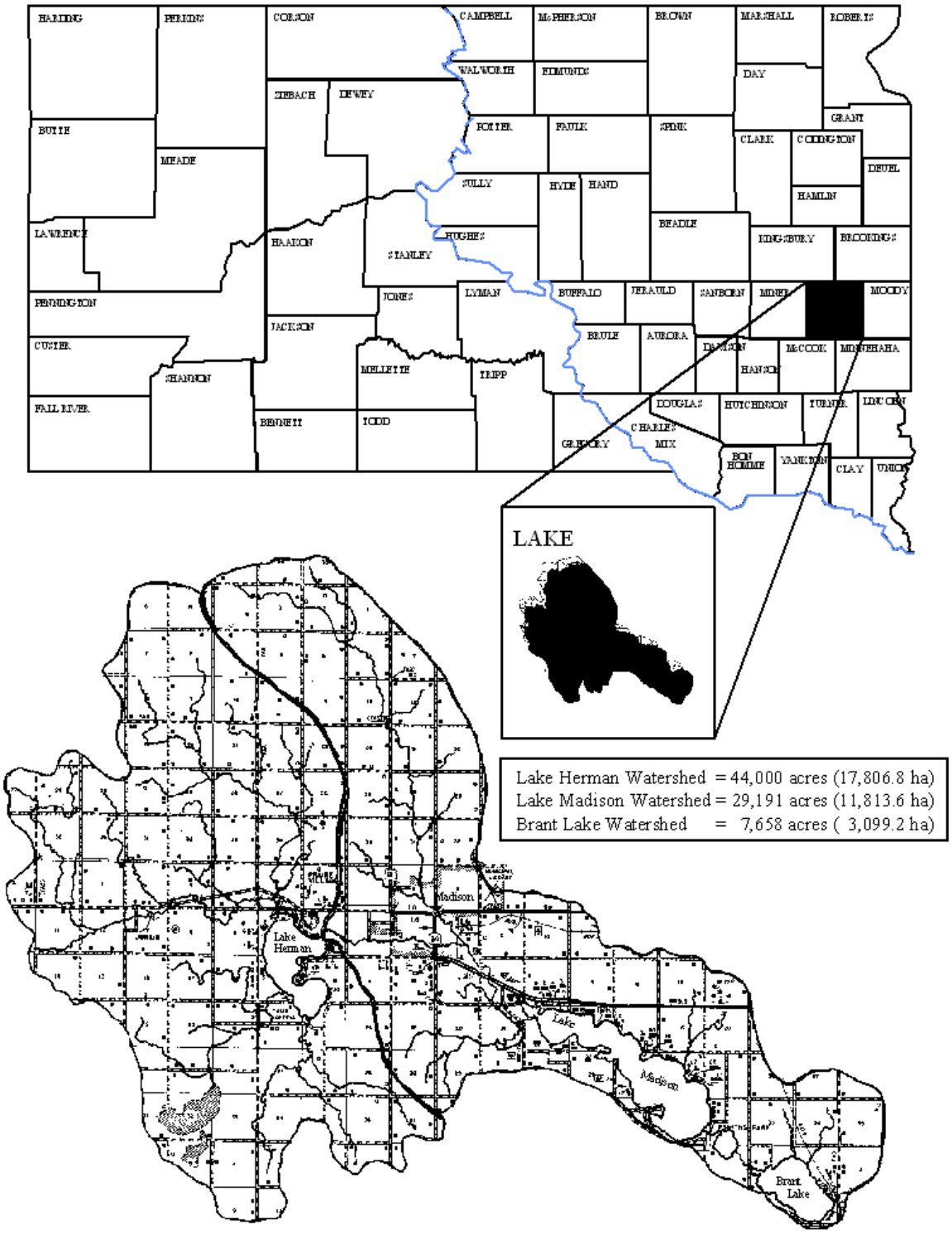

Figure 1. Lake Herman / Lake Madison / Brant Lake Watershed Location.

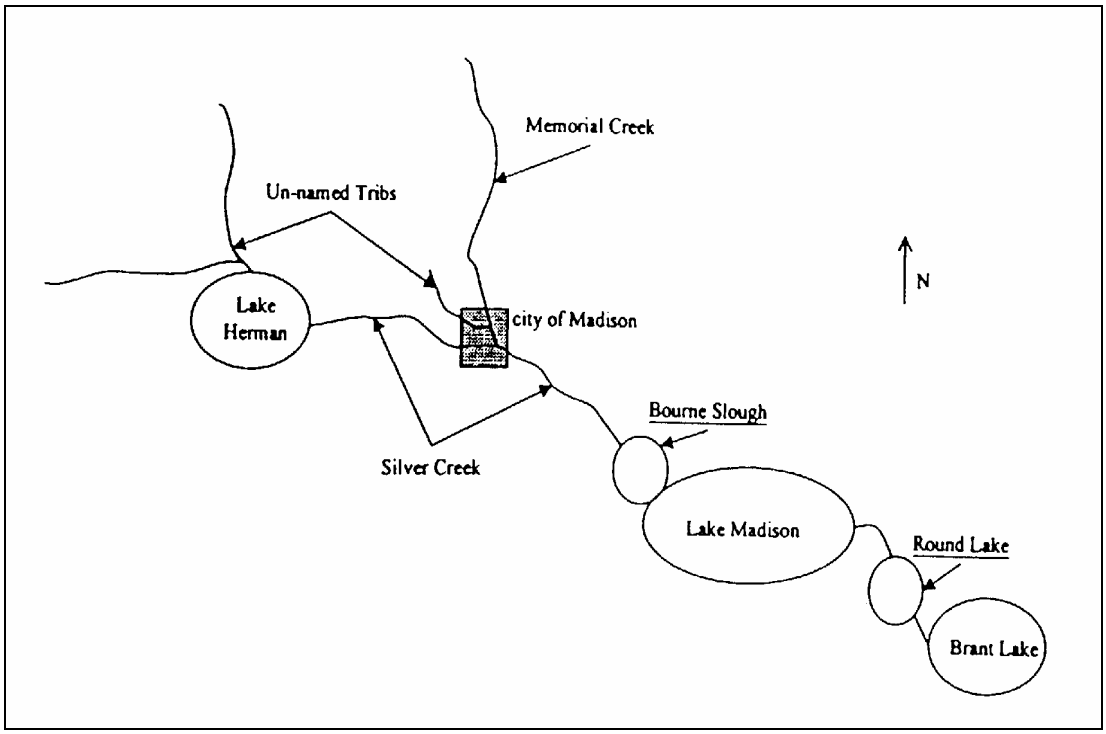

Figure 2. Water Flow through the Herman, Madison, and Brant Chain.

Watershed Water Quality Problems

The watershed assessment of Lake Madison/Brant Lake included water quality monitoring, algal sampling, tributary monitoring, storm sewer monitoring, groundwater monitoring, and land use assessment, (see Monitoring Sites Map page 13). The primary pollutant of concern identified during the study was phosphorous. The assessment determined that source water supplies for public consumption were not impeded by any of the pollutants detected. A 50 percent reduction in total phosphorus was established as the TMDL goal for the watershed.

Silver Creek was found to account for 92 percent of the overall Lake Madison phosphorus budget. The City of Madison contributed 13 percent of the total load delivered to Lake Madison by Silver Creek during 1995.

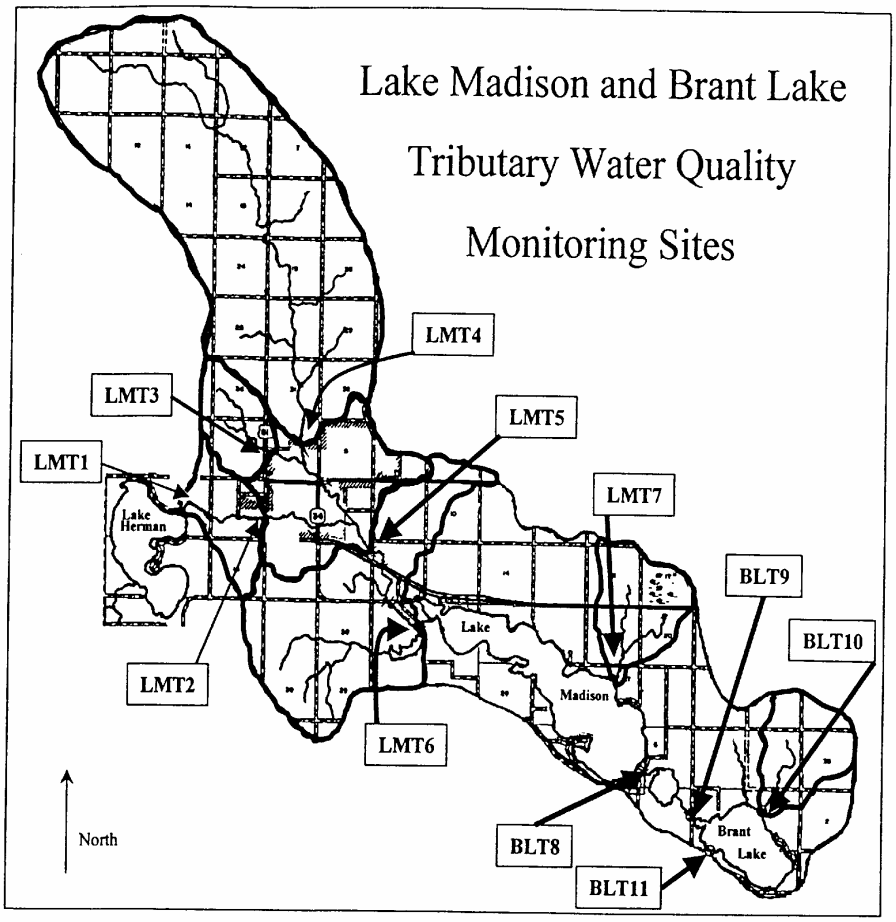

Figure 3. Monitoring Site Map.

The primary component of the hydrologic budget for Brant Lake is outflow from Lake Madison through Round Lake. The discharge from Round Lake constituted 88 percent of the overall phosphorus load to Brant Lake. During 1995, Round Lake discharged more phosphorus into Brant Lake than it received from Lake Madison. The following sources have been identified as contributing to the phosphorus load:

- Feedlots
- Storm Sewers
- Lawn and Golf Course Fertilizers.

An evaluation of Lake Herman completed during 1994 as a part of a study conducted by DENR determined water quality status of the lake. A comparison of the parameter evaluated to the water quality standard appears in Table 3.

Table 3. Lake Herman Water Quality Impairments.

Parameter	Standard	Lake Herman
Total Phosphorus TSI (TSI-TP)	79.02	87.15
Chlorophyll-a TSI (TSI Chl a)	68.05	68.16
Secchi TSI (TSI-Zsd)	73.93	75.81
Full Support Status (TSI)	65	

Data from the Total Maximum Daily Load Evaluation for Total Phosphorus in Lake Herman, March, 2004 (Wittmuss, 1994).

Project Goal, Objectives and Activities

The project goal was:

> "Decrease the phosphorous loading of Lake Herman/Lake Madison/Brant Lake by 50 percent in compliance with the Total Maximum Daily Load (TMDL)."

To achieve the reduction, nutrient and sediment loads were decreased from identified critical areas by installing best management practices (BMPs), consistent with NRCS Technical Field Office guidelines or other appropriate standards, Critical areas were identified and prioritized using AGNPS data from the Lake Madison/Brant Lake Watershed Assessment and Lake Herman Post Implementation Investigation and in-field assessments completed as part of this project.

Early in the project, it was determined that project success was closely linked to the support of an informed public. The first year Lake County Watershed Improvement Association (LCWIA) hired a coordinator who initiated a community-wide outreach program that included information about the project goal, and assistance available. LCWIA consisted of and was supported by the Brant Lake Association, City of Madison, Lake County, Lake County Conservation District, East Dakota Water Development District, and Lake Madison Association. Another information related activity completed during the early stages of the project was the erection of four signs along the major highways marking the watershed boundary in the county.

The Project Implementation Plan (PIP) was revised when it was determined that operator interest was not consistent with projected levels of participation. Other factors contributing to the revision included the consideration of the practical application and compatibility of the landscape to the suggested practices. When it was found that producer interest was primarily in one or two BMPs, the project budget and milestones were amended to address the actual need. In addition, other planned BMPs were being implemented through complementary conservation programs. These BMPs replaced those originally planned using project funds and support to attain the project goal.

A description of the activities completed to attain the project goal follows.

Project Accomplishments by Objective

Objective 1: Best Management Practices

> Reduce the phosphorus loadings from agricultural and lakeshore sources by 50 percent. Project funding was targeted to sites, which will provide the greatest phosphorous reductions.

Task 1: Install Best Management Practices (BMPs) and innovative phosphate mitigation strategies, consistent with NRCS field office technical guidelines or other appropriate

standards, in the watershed to reduce nutrient and sediment loading from identified critical areas. Recipients of grant funds were required to sign a maintenance agreement for the anticipated life span (10 years) of the BMP.

Milestone: Ten Animal Waste Management Systems (AWMS) installed.

During 2004 the product milestone was amended to ten animal feeding operations (AFOs) modified or impacted by constructing eight Animal Waste Management Systems (AWMS).

Accomplishment: While it would be ideal if the owners of the ten priority systems identified using AGNPS were interested in making improvements to their operations and had the ability to finance the cost of the improvement or relocation to a more suitable site, this was usually not the case. The producers with the ranking of 1, 2, and 9 serve as an example. When the family operation expressed interest with the program and the district worked with the animal nutrient management team to survey sites 2 and 9. A preliminary design was completed and rejected by the owners. A second designed was developed and again rejected by the landowners. At this point communications broke down and no additional work was undertaken on the systems.

While several challenges had to be overcome relative to ANMS construction, a number of feedlots with a revised rating of 44 or greater were successfully addressed. Three sites have had changes in ownership and /or significantly reduced capacity which lowered the phosphorus loading potential. The project constructed eight systems. Two of the sites that now have systems are a result of the consolidation of two lots, one each owned by a father and a son into one system. A description of the systems constructed follows. Producers receiving assistance were required to develop and follow a nutrient management plan.

Tables 4, 5 and 6 provide load reduction, animal unit and cost data respectively for each of the systems constructed.

System one is within one half mile of Lake Herman. A revised AGNPS feedlot rating of 64 placed it in the top ten sites needing remedial action in the Lake Herman watershed. An animal waste management system (AWMS) was designed and built to accommodate 300 Animal Units (AUs) at a total of $135,918.71. Figure 4 shows the wind fence located in one of the feed cells.

Figure 4. AWM System One – Feedlot.

The system 2 is located north of the City of Madison and is adjacent to the Lake County Ground Water Protection zone in an area designated as a "Shallow Aquifer Boundaries and Areas Contributing Drainage to Zone A". Zone A is the "Wellhead Protection Area". The area drains to the Lake Madison Watershed. The feedlot had an AGNPS feedlot rating of 51. A total system was designed and built to accommodate 625 AUs at a cost of $168,184.87.

Systems three and eight are co-located in the Lake Madison Watershed. The first, system three, was built during fall 2002 to address a 500 AU dairy operation at a cost of $219,393.28. The site had a revised AGNPS feedlot rating of 61. Because system did not adequately address the operation's calves and dry cows that were previously housed on the site and the off site location for the cows caused the producer to experience higher animal mortality and economic losses, the construction of eighth system to accommodate 143 AUs were necessary. Cost of the system totaled $198,579.67

The fourth system, located in the Lake Herman Watershed, had an AGNPS feedlot rating of 79. A total containment system was designed and built to accommodate 900 AUs at a total cost of $199,051.12. The system was designed to accommodate the animals that were displaced by the abandonment of a portion of the former feedlot. Figure 5 shows the layout of the system constructed.

Figure 5. AWM System Four – Overview.

System five, located in the Lake Herman Watershed, had an AGNPS feedlot rating of 60. The system is unique because it was designed to catch the runoff from an existing lot and the addition of others lots to handle the animals displaced from the abandoned lot location. Water from the farmstead was excluded through the use of berm and waterway. Cost of constructing The 329 AUs capacity system was constructed at cost of $117,702.81 with the landowner picking up about 23.4 percent of the total.

The sixth system, located in the Lake Madison Watershed, replaced two existing feedlots that had AGNPS feedlot rating of 51and 44. A bunker silo locate at a third site on the property was not rated. This site was important to the project because of it is located just south of Madison on banks of Silver Creek The potential for a citizen complaint concerned the operator and influenced his decision to become a permitted system even though the size of the operation did not require him so to do. The system was developed to handle 470 AUs at a total cost of $192,939.51. Figure 6 shows the construction of the system's evaporation pond.

Figure 6. AWM System Six – Excavation of Evaporation Pond.

The seventh system, also located in the Lake Madison Watershed, also addressed two feedlots, one with a revised feedlot rating of 50; the second a rating of 26. The system was designed to accommodate 100 AUs at total cost of $57,760.24

System eight was addressed with system three.

System nine was not constructed. The landowner, located in the Brant Lake Watershed, has a cow/calf operation that holds a large number of animals in limited space for a few months. The project provided the operator with financial assistance for a design. The limited space and the desire to maintain the ability to maintain continuous observation of the entire herd during critical periods were some of the reasons given by the producer for declining the offer of assistance to relocate a portion of his operation and limit the numbers of animals at the current farmstead location.

Four of the systems with high feedlot ratings no longer hold livestock. The producers with systems ranked 3rd and 7th in terms of priority, AGNPS feedlot ratings 61 and 49 respectively, did not qualify for cost share funds from the project because of the size of the operations. They are classed as concentrated animal feeding operations. CAFOs are

required permit coverage. At one point the operations had 8,000 AUs that produce 99,902 pounds of phosphorus at the discharge point each year. The producers choose to end the poultry operations at both sites. Currently there are no animals at either site. The load reductions to Lake Madison realized from the closure equals 67.0 pounds of phosphorus.

The two rated sites in section 32 of Lakeview Township, priorities 4 and 5, are no longer part of a livestock feeding operation. The area is now used as a golf course and a housing development. This golf course is using zero phosphorus fertilizer and has established excellent turf. The load reduction at the discharge point equals 172.0 pounds.

Table 4. ANM Status of the Top Nineteen AGNPS rated Feedlots.

Ranking	AGNPS Rating	Location	Status	"P Reduction in Lbs/Yr.	System Number
1	71	S17 T107 R53	Declined Assistance	NA	
2	67	S33 T107 R53	Declined Assistance	NA	
3	61	S13 T106 R53	Permit/Abandoned	67	
4	52	S32 T106 R51	Replaced with Golf Course	Included with number 5	
5	50	S32 T106 R53	Replaced with Golf Course	172	
6	49/61	S35 T108 R53	Constructed	92.86	3 and 8
7	49	S12 T106 R53	Permit/Abandoned	Include w. 3	
8	45	S9 T107 R53	Declined Assistance	NA	
9	43	S34 T107 R53	Declined Assistance	NA	
10	43	S30 T106 R52	Reduced Usage	NA	
11	42	S29 T107 R53	Reduced Usage	NA	
12	42	S13 T107 R53	Reduced Usage	NA	
13	39/79	S33 T107 R53	Constructed	593.05	4
14	4/51	S31 T107 R52	Constructed	110.73	2
15	64	S22 T106 R53	Constructed	218.00	1
16	60	S36 T107 R54	Constructed	181.65	5
17	22/50	S25 T107 R53	Constructed	90.97	7
18	34/51	S17 T106 R52	Relocated to # 19	113.48	
19	20/44	S21 T106 R52	Constructed	66.30	6
	Total Phosphorus Reductions in pounds/year			**1,706.04**	

Table 5 Number of Animal Units (AU) Housed in the Eight AWMS Constructed.

System Number	Animal				Number Days
	Type	Number	Weight	Units (AU)	
1	Beef Cows Beef Calves	150 150	1200 900	300	120 270
2	Beef Cattle Beef Cattle Beef Cows	500 125 125	850 500 1200	625	365 120 120
3	Dairy Cows	350	1200	500	365
4	Beef Cattle	900	850	900	300
5	Beef Cows Beef Calves Bulls	85 85 5 20 200	1250 750 1800 450 175	329	210 180 270 365 365
6	Beef Cattle	470	1000	470	275
7	Beef Cattle	100	1183	100	365
8	Dairy Cows	100	1200	143	365

Table 6. Cost by Source for the Eight AWMS Constructed.

SYSTEM	EPA-319	EQIP	CG	CCG	Landowner	Total
1	$ 50,569	$ 42,259	$ 29,958		$ 13,133	$ 135,919
2	$ 81,454	$ 44,357	$ 23,281		$ 18,913	$ 168,185
3	$ 82,372	$ 81,235	$ 33,094	$ 761	$ 21,931	$ 219,393
4	$149,299		$ 29,851		$ 19,901	$ 199,051
5	$ 34,300	$ 34,246	$ 14,731	$ 6,865	$ 27,561	$ 117,703
6	$ 93,274	$ 26,000	$ 24,356	$27,104	$ 22,203	$ 192,937
7	$ 41,298		$ 8,280	$ 2,406	$ 5,776	$ 57,760
8	$ 113877	$ 14.237	$ 28,662		$ 41,802	$ 198,579
9*	$ 3,721		$ 1,271		$ 3,484	$ 8,476
TOTALS	**$650,351**	**$242,514**	**$193,484**	**$ 37,135**	**$175,771**	**$1,299,256**
PERCENT	**50 %**	**19 %**	**15 %**	**3 %**	**13 %**	

*Not constructed.

The total cost of constructing the eight animal waste management systems and associated cost equaled $1,299,255.84. The average cost of the completed systems was $161,347.48.

319 Budget:	$180,000	Amended Budget	$685,700

The project expended $650,351 or ninety seven (95%) percent of the amended budget for AWMS.

Project partners involved with the planning and or construction of the AWMS during the project included:

US Department of Agriculture, NRCS - EQIP
DENR – CG (SD Consolidated Grant)
SD Department of Agriculture - CCG (= Soil and Water Conservation Grant)
Lake County Conservation District
Landowner

Product 2: Sixteen alternative phosphorous mitigation structures were to be built, such as grass buffer areas, minor structural changes, and other methods to control runoff at secondary livestock areas.

During 2004 the product milestone was amended to "Two alternative phosphorous mitigation structures". Represents 10% of the 22 sites identified during a recent assessment.

Milestone: Sixteen producers during 2004, the milestone for number of farmers participating was reduced to two.

Accomplishments: This activity was not well received by area producers. It appears that producers did not feel that they would gain enough to justify the loss of tillable farm land. One producer that did not feel that a complete AWMS was needed expressed interest. The producer later decided against constructing a system. At the end of the project no systems were built.

Project partners were to have included:

EQIP-Administered by US Department of Agriculture, NRCS
Lake County Conservation District
Cooperative Extension Service – Education Programs

Product 3: Implement an integrated crop management (ICM) program in accordance with the NRCS Field Office Technical Guide that includes cost-share for soil testing on agricultural land.

Milestone: Sixty farmers. During 2004, the milestone for number of farmers participating was reduced to six.

Accomplishments: The project identified certified crop consultants in the area, distributed a fact sheet with practice information, and published a newspaper article that included information on the ICM program. Producers were not interested at the 75 percent cost share rate offered. Beginning June 30th, 2004, the cost share was reduced to 50 percent to coincide with the expiration of the State Soil and Water Conservation Grant which included funds for the program. There was no participation in this activity.

Project partners that were included:

EQIP-Administered by US Department of Agriculture, NRCS
Lake County Conservation District

Product 4: Complete a study to assess and determine the effects of septic tank products on the water quality of Lake Herman. The data collected was to be used to identify problem areas and develop a remedial plan of action.

Milestone: One test to detect the presence of caffeine. This indicator was to be the basis for the remediation plan to make improvements to the sanitary system.

Accomplishments: The first portion of the study was completed during September 2000. Additional tests were conducted during July 2001. During September 2001, the coordinator completed a dye test of the Isaac Walton League's septic system. No detectable leaks into the lake were found.

The three tests that were completed during the Lake Herman septic study failed to prove that the septic tanks are leaking into the lake. Because the tests were inconclusive, there was no justification to develop a remedial plan of action. The project coordinator has met with the Lake Herman Sanitary District to discuss alternate sewage treatment options for the lake. No action has been taken by the sanitary district at the time this report was written.

Project partners included:

East Dakota Water Development District
Lake County Conservation District

Objective 2: Reduce sediment loading.

Task 2: Install grassed waterways, multi-purpose dams, terraces and/or contour buffer strips, and stream bank stabilization to reduce soil erosion and sediment loading. Recipients of grant funds were to be required to sign a maintenance agreement for the anticipated life span of the BMP.

Product 5: Install 22 grassed waterways totaling 24,000 linear feet in critical areas to reduce soil erosion and sediment loading.

Milestones: During 2004 the milestone was amended to install seven grassed waterways totaling 8,000 linear feet in critical areas to reduce soil erosion and sediment loading.

Accomplishments: During the project, a total of 10,361 linear feet of grass waterways were constructed at thirteen sites in the watershed. Most were installed using the United States Department of Agriculture Farm Services Agency (USDA FSA) Conservation Reserve Program (CRP) continuous sign-up option (CCRP). In most instances, it was to the landowner's advantage to enroll in the CCRP because the program provides cost-share, an incentive payment for enrolling in the program and lease payments for ten years. Grass waterways were constructed at two sites using project funds because the sites did not have the necessary cropping history to meet the minimum requirements for CCRP. The cost of constructing the waterways totaled $15,968.78 with the project contributing $3,768.00 and the landowners $12,200.78. A summary of the waterways constructed and load reductions realized are shown in Table 7.

Table 7. Waterways Constructed and Phosphorus Load Reductions Achieved.

Waterway Number	Length in Linear Feet	Funding Source	Total Reductions (ton/yr)	Phosphorus Load Reductions (lbs/yr)
1	540	CCRP	113.4	5.21
2	545	CCRP	108	2.48
3	745	CCRP	135	2.07
4	850	CCRP	216	4.96
5A	1056	CCRP	63	2.89
5B	720			
5C	395			
6	1900	Owner Funded	166.4	3.83
7	540	CCRP	207	3.18
8	2100	EPA	192	8.82
9	900	CCRP	333	15.29
10	543	EPA	111	5.10
11	1650	Owner Funded	149.4	3.42
TOTAL	**12,484**		**1794.2**	**57.25**

Project partners included:

CRP and CCRP-Administered by US Department of Agriculture, FSA
EQIP & Technical Services: Administered by US Department of Agriculture, NRCS
CCG-SD Conservation Commission- Administered by SD Department of Agriculture
Lake County Conservation District
Landowner

Product 6: Install terraces and/or contour buffer strips to reduce soil erosion and sediment loading.

Milestone: 57,666 linear feet terraces and/or contour buffer strips to reduce soil erosion and sediment loading at 28 sites. During 2004, the product milestone was amended to 30,000 linear feet total at seven sites. This represents 13 percent of the 55 sites identified in the watershed but only lowered the linear feet goal by 48 percent.

Accomplishments: While terraces are an important tool for protecting the land from erosion, for operators the space needed for the large pieces of machinery in use was a drawback to installation. There was fourth site that the project constructed terraces. The project partnered with the USDA FSA to install buffers using CCRP (CP 28 Farmable Wetlands Pilot Buffer and CP 21 Filter Strips) programs. The partnership resulted in eight operators developing 90.4 acres of buffers and four operators developing 12.2 acres of filter strips. See table 8 for a combined load reduction achieved for all CCRP Practices.

The Lake County Conservation District conducted educational programs to promote installation of the practices. Tables 8-11 address the practices and the phosphorus load reductions achieved.

Table 8. Terraces Constructed and Phosphorus Load Reductions Achieved.

Terrace Number	Linear Feet	Funding Sources	Total Sediment Reductions	Phosphorus Load Reductions lb/yr
1	3180	EPA & CCG	182.4	2.8
2	1584	EPA & CCG	40.8	0.63
3	900	EPA & CCG	20.8	0.48
4	3,567	EPA & CCG	86.0	1.97
TOTAL	**9,231**		**330.0**	**5.88**

The terrace shown in Figure 7 was installed in the lake Herman sub-watershed.

Figure 7. Terrace used in Cropland to Prevent Water Erosion.

Project partners included:

CCRP –USDA FSA
EQIP-Administered by US Department of Agriculture, NRCS
CCG-SD Conservation Commission- Administered by SD Department of Agriculture
Lake County Conservation District
Landowner

Product 7: Construct six multipurpose dams in coordination with implementing of rotational grazing and riparian management systems.

Milestone: Amended to include construction of six multi-purpose dams or alternate water sources to provide water for livestock when installing either a rotational grazing or riparian management systems. This represents 50 percent of the 12 potential sites identified.

Accomplishments: The US Fish and Wildlife Service (FWS) assisted area landowners with plugging drains to create shallow water impoundments. One such project was completed on the west side of Lake Herman where a dam was constructed to backup water over a two acre area. The project impacted a 125 acre drainage area which contained 100 acres of crop land and 25 acres of hay land. The landowner paid 25 percent of the cost ($1,062.50). A North American Wetland Conservation Act (NAWCA) grant obtained

through FWS paid $1,157.02, East Dakota Water Development District (EDWDD) $800.00, and Ducks Unlimited (DU) $1,230.48 Total cost of the project was $4,250.00.

During October 2004, FWS constructed a small dam that created a two acre wetland by containing water from a 175 acre drainage area. Eighteen of the acres were grassland; the 147 acre balance cropped using a corn/bean crop rotation. Total cost of construction was $2,152.50 with the landowner paying $538.13, the Tall Grass Grant (TGG). Contributions from the SD Conservation Commission paid $1,162.34, SD GFP $365.93 and DU $86.10.

FWS personnel and equipment were used to restore/create two additional wetlands with the $3,200 cost being paid by the service. The assistance resulted in the construction of two, one acre restoration / small dams north of Madison along the highway 81 and two ponds south of Junius that totaled 19.9 acres and drained 150 acres of cropland. The six dams that were built are listed in Table 9.

Table 9. Multipurpose Dams and Phosphorus Load Reductions Achieved.

Dam Number	Impoundment Size	Drainage Area	Total Sediment Reductions T/Yr	Phosphorus Delivery lb/yr
1 Dam	2 Acres	125 Acres	363	16.67
1 Dam	2 Acres	165 Acres	337.5	15.50
2 Dams	1 Acre each	120 Acres	396	18.18
2 Dams	19.9 Acre Total	150 Acres	555	25.48
TOTAL	**25.9 Acres**	**560 Acres**	**1,651.5 Tons/yr**	**75.83 lb/yr**

During the project, several grazing systems were developed using the different sources of funds to match landowner dollars. Two systems, funded by this Section 319 Grant, resulted in improved management of 171 acres of pasture. Two systems funded by the Tall Grass Prairie Project placed 224 acres of pasture under improved management. Five systems funded using EQIP resulted in the management of 522 acres of pasture. The load reductions achieved by the implementation of the systems is shown in Table 10.

Table 10. Grazing System and Phosphorus Load Reductions Achieved.

System Number	Size in Acres	Funding Source	Total Reductions	"P" Delivered
1	96	319 Grant	28.8	0.44
2	75	319 Grant	15.0	0.35
3	64	TGPP	19.2	0.30
4	160	TGPP	48	0.72
5	54	EQIP	10.8	0.24
6	185	EQIP	37.0	0.84
7	87	EQIP	17.5	0.40
8	143	EQIP	57.2	0.64
9	53	EQIP	26.5	0.25
TOTAL	**917 Acres**		**260**	**4.18**

Project partners include:

USDA FSA
- Conservation Reserve Program (CRP)

USDA NRCS
- Environmental Quality Incentive Program (EQIP)

US Fish and Wildlife Service (FWS)
- North American Wetlands Conservation Act (NAWCA)
- Tall Grass Prairie Project (TGPP)

State Conservation Commission Grant (CCG)
SD Game, Fish and Parks (SD GFP)
East Dakota Water Development District (EDWDD)
Ducks Unlimited (DU)
Landowners

Figure 8. Dugout Constructed as Water Source for a Grazing System.

Table 11 includes activities that were included in Products 6 and 7. As it was difficult to separate load reduction by practice within the same cell, the reductions for practices installed in the same cell were combined (see Table 14 and 15).

Table 11. Continuous Conservation Reserve Practices and Phosphorus Load Reductions Achieved

Practice Code	PRACTICE	ACRES	"P" LOAD REDUCTION
CP 5A	Field Windbreak Establishment	38.0	Load reductions calculated by AGNPS cell, not practice
CP 21	Filter Strips	22.2	
CP 23	Wetland Restoration	36.2	
CP 27	Farmable Wetland Pilot-Wetland	50.6	
CP 28	Farmable Wetlands Pilot Buffer	92.4	
CP 30	Wetland Buffer	6.4	
	Total	**245.8**	**9.45**

Product 8: Install 2,087 linear feet of bank stabilization on Silver Creek with limited or no use grazing restrictions. Primary areas along Silver Creek have been identified for stabilization, due to the extensive degrading of the channel condition. "Hard" stabilization practices were to be used on the most extensively damaged areas where "soft" stabilization would not be effective.

Milestones: During 2004, the milestone was revised to 625 linear feet of bank stabilization. The practice was installed on Silver Creek with limited and no use grazing restrictions.

Accomplishments: The outlet channel was reshaped and protected using hard stabilization for four hundred feet on both sides to protect the outlet channel without altering the water carrying capacity. Water flow was controlled using box culverts that were installed by the county. Installation of the practice protected 650 feet of shoreline. Figure 9 shows the preconstruction condition of Lake Madison outlet; Figure 10 shows the outlet after completion of the stabilization.

Figure 9. Lake Madison Outlet Pre-construction.

Figure 10. Lake Madison Outlet Post-construction.

Partners: Conservation Reserve Program (CRP)
State Consolidated Grant-Administered by DENR
Landowners

Objective 3: Develop and implement a plan to minimize phosphorus loading into Lake Madison and Brant Lake from the City of Madison.

Task 3: Conduct an engineering study, and develop and implement a plan on potential means of mitigating the impacts of the City of Madison's storm sewer and use of Bourne Slough as a settling basin.

Product 9: A feasibility study identifying potential methods mitigating the City of Madison's storm water sewer and a sediment survey of Bourne Slough and Round Lake will be conducted.

Milestone: This was completed in the initial phase of the Implementation Plan.

Accomplishments: Barr Engineering was hired during 2002 to complete the study. The report was received spring 2003. A copy of the Executive summary for the study findings follow.

Introduction

This report describes the purpose, methods, and results of a study of phosphorus and suspended solids from the city of Madison storm sewers and phosphorus concentrations in the sediments and water of Bourne Slough. The study was a contribution to the overall goal of the Lake County Watershed Improvement Project (LCWIP), which is to reduce phosphorus loading to Lake Herman/Lake Madison/Brant Lake watershed by 50 percent. The objectives of this study are: (1) to measure and evaluate phosphorus loading from the City of Madison storm sewers during spring snowmelt and storm events, and (2) evaluate the Bourne Slough sediments for potential benefit of dredging of the slough. The City of Madison is the county seat for Lake County. Bourne Slough receives the inflow from Silver Creek and then drains directly into Lake Madison.

Stormwater Runoff in Madison

For this study, the urban area of Madison was delineated into 30 catchments (i.e., drainage areas) and 25 monitoring stations (11 storm sewer outlets; 14 in-stream) were sampled during a spring snowmelt and three storm events. Water samples were analyzed for total phosphorus, dissolved phosphorus, soluble reactive phosphorus, and total suspended solids. The spring snowmelt runoff contained primarily dissolved phosphorus, whereas the larger the storm event, the greater the proportion of particulate phosphorus. Overall, total phosphorus was highly correlated with total suspended solids.

The average total phosphorus concentration was 0.585 mg/L for all sites. The mean concentrations for each catchment ranged from 0.278 mg/L to 0.877 mg/L. Phosphorus concentrations from the storm sewer outlets were not significantly different from the concentrations in the receiving water, but the storm sewers did contribute a disproportionate amount of particulate phosphorus and suspended solids. The estimated phosphorus load from all catchments for a normal year of precipitation (24 inches) is 1445 pounds of phosphorus. On a per acre basis, the catchments with the greatest phosphorus were in the central part of the city, but are relatively small catchments.

Best management practices (BMPs) should be selected based on the site-specific conditions where phosphorus loads have been shown to be high. The city of Madison should also consider runoff pollution prevention measures, such as pavement management to reduce the runoff of solids that carry particulate phosphorus and other pollutants. Street sweeping and other reductions of particulate materials entering Silver and Memorial Creek can substantially reduce the phosphorus loading from the city.

Bourne Slough Phosphorus

Survey results from Bourne Slough show a surface area of 92 acres. A map of the Bourne Slough sediments was created that shows 410,000 cubic yards of sediment in the slough. Results from sediment core samples indicated the Bourne Slough sediments have high total phosphorus concentrations. Only about five percent of the phosphorus could potentially be released as dissolved phosphorus, although the remaining 95 percent could enter the water column as suspended sediments. The high proportion of particulate phosphorus in the water column is most likely a result of input from Silver Creek.

Excavating a portion of the sediments and rerouting the flow in the slough could potentially improve sedimentation in the basin, thereby reducing phosphorus entering Lake Madison. The flow path within the slough would need to be increased, most likely by building a barrier within the slough that would route the flow around the perimeter of the slough. Additional hydraulic modeling and engineering design would be needed to estimate the phosphorus removal efficiency with the adjusted slough depth and water flow.

Figure 11 was taken from the Bourne Slough Report.

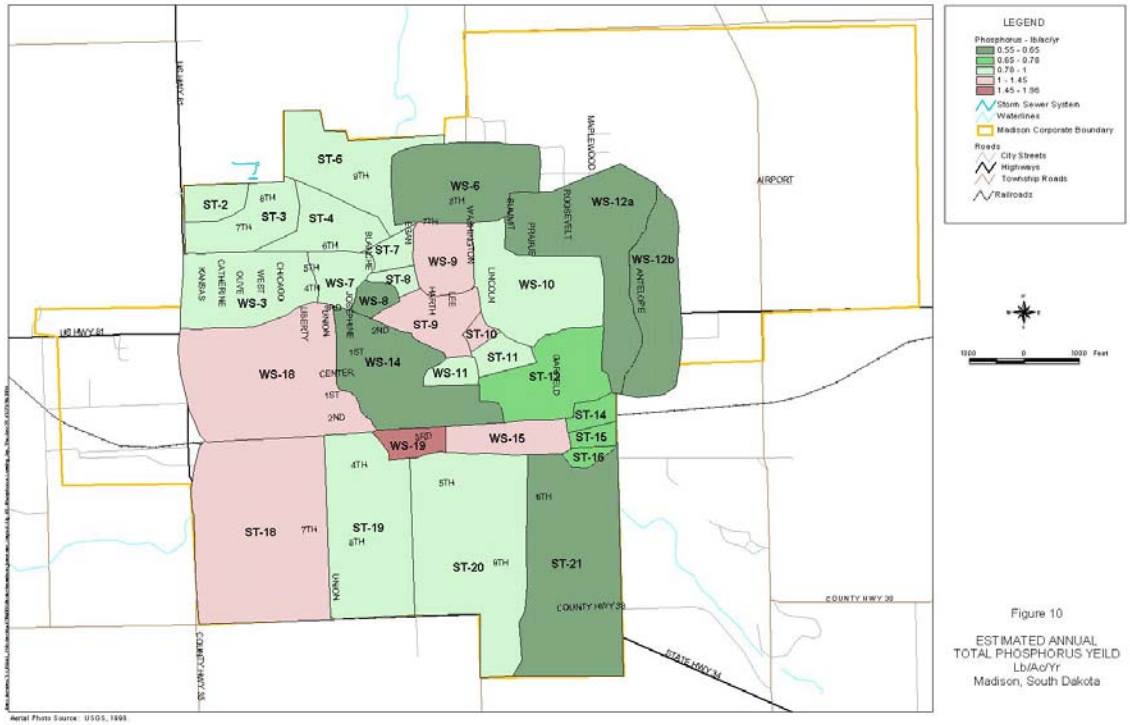

Figure 11. Estimated Annual Total Phosphorus Yield.

A copy of the complete report titled, "Water Quality and Sediment Composition Study of the Lake Madison and Bourne Slough", is located at:

http://www.state.sd.us/denr/DFTA/WatershedProtection/WQInfo.htm#Project%20Reports

It was determined that some specific information about the berm was lacking. The project secured the services of the engineering firm of Schmitz, Kalda & Associates (See Product 10).

Project Partners Include:

City of Madison (COM)
East Dakota Water Development District (EDWDD)

Product 10: A restoration of the berm was to be completed on 1,700 feet of the berm. The first six hundred linear feet were to be set at the 100 year flood elevation (AMC III) and the next 1,100 feet at the 25 year flood elevation (AMC II).

> NOTE: This restoration was not an activity designed to implement a Phase II National Pollutant Discharge Elimination System (NPDES) Storm Water Permit for the City of Madison.

The $192,000 was secured for the restoration that was designed the engineer firm of Schmitz Kalda and Associates. The plan was rejected by South Dakota Game Fish and Parks because of the amount of hard bank stabilization included in the project. All parties

agreed to the need for hard stabilization on the first four hundred feet of the berm to achieve the 100 year flood elevation (AMC III) protection. This course of action would force all the water from Silver creek to enter Bourne Slough and be retained there for a period of time. Reducing the water velocity is expected to allow soil particles to settle out of the water column.

Figure 12 shows the berm where the breach allowed the stream flows from Silver Creek to enter directly into Lake Madison rather than entering Bourne Slough. Figure 13 shows a similar site after restoration so that all the water from Silver Creek is directed into Bourne Slough. The restored area of the berm was designed to with stand a one hundred year peak rainfall event.

Figure 12. Pre-construction view of the Bourne Slough Berm.

319 Budget $ 0.00 Amended 319 Budget $ 115,000

Expended:

319 Funds	$21,301.91	53%
US Fish and Wildlife	$ 200.00	
SD Game Fish and Parks	$ 3,873.08	
SD Department of Environment and Natural Resources	$ 3,873.08	
City Of Madison	$ 1,900.00	
Lake County	$ 1,900.00	
Lake Madison Association	$ 1,500.00	
Brant Lake Association	$ 392.68	
East Dakota Water Development District	$ 790.00	
Whitecaps Foundation	$ 3,000.00	
Local Match	$19,236.16	(47%)

Figure 13. Post-construction view of the Bourne Slough Berm.

Project Partners Include:

US Fish and Wildlife
SD Game Fish and Parks
SD Department of Environment and Natural Resources Consolidated Grant
City Of Madison
Lake County

Lake Madison Association (LMA)
Brant Lake Association
Whitecaps Foundation
East Dakota Water Development District

Objective 4: Implementation of pollution prevention based public awareness program to ensure protection of the designated uses of Lake Herman/Lake Madison/Brant Lake.

Task 4: Develop and implement a water quality and watershed management education and information program.

Product 11: Implement a zero phosphorous fertilizer promotion program. This was to include meeting with golf course personnel to encourage the use of zero phosphorous fertilizers and working with local businesses, lake associations and volunteer organizations to implement a zero phosphorous fertilizer program. The project underwrites a portion of the cost of zero phosphorous fertilizer for Madison and lakeshore residents.

Milestones: During 2004, the Zero Phosphorus Fertilizer Promotion was expanded to cover the additional years of the project.

Accomplishments:

2001 Zero "Phosphorus" Fertilizer Campaign

The first year the projects effort was directed to education of the homeowners and the two golf course managers. Coupons were printed and mailed directly to the non-farm homeowners for use at the five local businesses in the watershed that sold zero phosphorus fertilizer. Additional coupons were provided to the commercial businesses that provides lawn care for the owners. Other expenses included promotional items that were used to create awareness. It was determined that coupon redemptions could not be used as a measure of success. Thirty (30) coupons were redeemed but over 220 bags of zero phosphate fertilizer were sold. Therefore it can be concluded the coupons, while not used, were an effective way to reach homeowners.

2002 Zero "Phosphorus" Fertilizer Campaign

The 2002 campaign continued with coupons being printed and sent to the homeowners, along with advertisements in the local newspaper. The project incurred the expense of printing of the coupons and postage. A significant portion of the "Clean Water Chronicle", a watershed publication funded by the project, was devoted to the zero phosphorus fertilizer education. The project disturbed an average of 4,000 copies for each of the first four editions. There were 250 bags of zero phosphorus fertilizer sold during 2002.

An agreement was made with the golf courses to try the zero phosphorus fertilizer on a few holes. The holes selected were near the drainages to evaluate if the use of zero phosphorus

fertilizer impacted the quality of the turf. The project paid a portion of the fertilizer cost for selected holes. Lakes Golf course has continued the use of zero phosphorus fertilizer, but the Country Club has returned to their original turf care methods.

2004 Zero "Phosphorus" Fertilizer Campaign

For the 2004 campaign, a number of news articles and the coupon were printed in the newspaper. This eliminated the cost and time of printing and mailing the coupons the homeowners while achieving the goal of effectively reaching the public. In addition, a number of people indicated that they had seen the coupon but forgot to bring it to the store. Increasing the coupon value to $2.00 did not stimulate an increase in use of the coupons. A similar coupon was used for the 2005 campaign. The coupon can be seen in Figure 14.

Save Money on Zero-Phosphorus Fertilizer + Save the Lakes =
WE ALL WIN!

Cooperating Stores In The Watershed:
• Chester Farm Service, Chester
• Jones Ace Hardware, Madison
• Domestic Seed & Supply, Madison
• Pamida, Madison

Phosphorus causes our lakes to turn green and smell bad, and it hurts game fish populations. Using zero-phosphorus fertilizer is one way you can help. Look for a "0" as the middle number in your fertilizer rating - such as - "18-0-18."
This means you are buying zero-phosphorus fertilizer.

Present the Coupon When You Buy the Zero-Phosphorus Fertilizer, You Get
$2 Off Each Bag
(limit 5 bags)
Expiration Date: 9/15/2004

Date: _____
Name: _____
Product: _____
No. Bags: _____

Thank you from the Lake County Watershed Improvement Project.

Figure 14. Zero Phosphorus Fertilizer Coupon.

2005 Zero "Phosphorus" Fertilizer Campaign

The 2005 campaign began with the project coordinator being interviewed several times by the Madison Daily leader. The March 21 interview resulted in an article entitled "A Little Phosphorus creates a Lot of Algae". The next interview, March 30, resulted in an article entitled "Watershed Project Concludes at end of 2005. This article covered watershed project activities. The article, written based on the last interview conducted April 6, was entitled "Aquatic Vegetation serves a purpose for lakes". The first two articles were in the Madison Daily Leader and the third article was published used in the paper's spring 2005 insert tab called "Lawn & Garden".

"The Lake News" is the publication for the Lake Madison and the Brant Lake members. Lake News is available at a number of business in Madison and businesses around the lakes. The paper reproduced the articles that were published in the Madison Daily Leader.

Coupons were available in all three editions of the "Lakes News". The coupon was added to the lake directories for both Lake Madison and Brant Lake. One hundred ninety-six coupons were sent to the president of the Brant Lake Association for distribution to association members. The coupons were in the Madison Daily Leader starting Monday, March 28, April 4 and April 11, 2005. The coupons were also printed in the Leader Land for three weeks starting March 29. The end of April there will be a special insert tab in the Madison paper entitled "LAWN AND GARDEN". A quarter page was devoted to the coupon. The coupons were good till 9-15-2005. The cost of the coupon program is outlined below.

Madison Daily Leader	$ 42.00 / week plus tax for 3 weeks
Leader Land	$ 23.20 / week plus tax for 3 weeks
Madison Tab	$ 70.00 for quarter page plus tax
Lake News & Directory	$165.00
Total Advertising Cost is:	$443.88

The homeowners redeemed 13 coupons for fertilizer during 2005 for a project cost of $26.00.

A brochure titled "Keep the Green Out of the Lakes- Use ZERO Phosphorus Fertilizer" was developed. One hundred copies were distributed to fertilizer vendors.

During the 2005 campaign, one vendor indicated that he sold six thousand pounds of fertilizer and another vendor sold two thousand pounds and placed an additional order for four thousand pounds half of which was sold to a local landscape dealer that was custom applying fertilizer to the lake residents. By increasing the availability of the coupons we made the people aware of the zero phosphorus fertilizer and where it could be purchased. From the information provided by vendors, it is apparent watershed residents are using the fertilizer without redeeming the coupons.

Because of the results of the program, the Lake Madison Association is considering continuing the activity after the project is completed.

Budget	$10,000	Amended Budget	$5,500

Expended:

319 Funds		**$ 1,855.92**	**24%**
Lake Madison Associations	$ 4,491.79		
Brant Lake Association	$ 1,257.70		
Total Local Match		**$ 5,749.49**	**76%**
Total		**$ 7,605.41**	

Product 12: Produce and distribute 3,000 copies of a project brochure.

Milestone: This activity was not completed as described in the project implementation plan.

First the coordinator shifted the emphasis to produce and distribute the bulk of the publications during the first year of the project. The cost of the brochures was assigned to the area of emphasis and not to this section. Seven editions of the Clean Water Chronicle were published with 33,500 copies printed and distributed. During the project six inserts were placed in the Madison Daily Leader and the Leaderland publication and reached an average of 3,600 readers. Over ten thousand copies of eight brochures were published and distributed. In all there was over sixty five thousand pieces of material produced and distributed to the public.

There were no costs for this activity.

Product 13: Conduct five information sessions on public water quality.

Milestone: 5 Tours.

The project hosted a five number of tours to a variety of groups to inform and education the interested individuals about project activities and successes. The five tours hosted are listed below.

January 2001 - Tour and workshop for farms to promote project- 34 attendees.
October 2002 - Madison Environmental Chemistry Class.
November 2002 - Tour was of completed sites for local business men and local residents to show case Project accomplishments. There were 50 people participating.
March 2004 - Kingsbury county watershed coordinator and area producers.
September 2004 - Tour for EPA Region VIII Project officer DENR and district personnel. There were six people in attendance.

Product 14: Place twenty project awareness signs in high use areas.

Milestone: Four project awareness signs in high use areas.

Original Cost: 20 @ $200 each = $4,000
Amended 4 signs for $500

Accomplishments: Two were placed along Highway 34 at the east and west edges of the watershed. The other two were placed along Highway 81 at the North edge and Highway 19 on the south edge of the watershed. The four signs cost $245.33; the support posts cost $224.00 for a total of $469.33.

Figure 15 shows one of the signs.

Figure 15. Project Awareness Sign at Entrance to Project Area.

Early in the project, it was determined that project awareness needed to be more then just placing signs in high use areas. To address the need several public outreach activities were completed. Table 12 contains a list of selected activities by project year. Copies of items referenced are contained in Appendix B which is available electronically by visiting:

http://www.state.sd.us/denr/DFTA/WatershedProtection/WQInfo.htm#Project%20Reports

Another consideration was that funds for these activities musts be used early in the project when there is still time for residents to participate. A brochure developed for the visitors to the state parks and recreational access area in the project area. The brochures were distributed by seventh grade students and park staff in subsequent years.

Table 12: Project Awareness Promotional Activities.

DATE	Title/Organization	Publication/Activity
2000	"Be A Clean Water Partner"	Brochure
9-22-00	Project coordinator hired	Madison Daily Leader
9-29-00	Cleaning Area Lakes	Madison Daily Leader
10-12-00	Watershed Promotion Begins	Madison Daily Leader
2000	"Cost-Share Programs	Brochure
10-26-00	Presentation to 7th Grade Class	Madison Daily Leader
2001	"Clean Water Partners" Material	Calendars
2001	Watershed Websites	Brochure
2001	Crop Management Consultants	Brochure
2001	"How your can Save the Lake"	Brochure
2001	"How your Business can a Clean Water Partner"	Brochure

Table 12. (Cont'd)

DATE	Title or Organization	Publication or Activity
2001	"Clean Water Pledge"	Brochure
2001	"Clean Water Certificates"	
2001	"Request for Proposal" Study Lake	Advertisement
1-10-2001	"Livestock Waste Management	Workshop
2001	Presentation to 4th Grade at Lincoln School	21 Individuals
2001	Art Contest Entry Form	
2001	Presentation to Science Class	20 Individuals
1-5-2001	Clean Water Partner-Dakota State U	Madison Daily Leader
1-9-2001	Kiwanis Club	Presentation
1-11-01	Producers Learn about Watershed Project	Madison Daily Leader
Jan, 2001	"Clean Water Chronicle"	Watershed Publication
1-11-01	Editorial Watershed Opportunity	Madison Daily Leader
1-22-01	Madison Lions Club	Presentation
	Speaker at Madison Lions Club	Madison Daily Leader
1-23-01	Cost-Share Deadline	Madison Daily Leader
Feb, 2001	Art Contest Winners	Poster
2-9-01	Producer Applications Received	Madison Daily Leader
2-9-01	Art Contest Winners	Madison Daily Leader
2-15-01	Firms Hired for Engineer Study	Madison Daily Leader
Feb, 2001	Madison Home Show- 2 days	Booth
3-01-01	Sediment Testing	Madison Daily Leader
3-01-01	Zero "P" Fertilizer Coupons	Mailed coupons to Residents
3-01-01	Rebate Coupons for com. applicator	Provided to Applicator
Mar, 2001	Project seeks to Improve Lake	Sioux Valley Coop Connections
3-7-01	Zero "P" promotion	Madison Daily Leader
3-01-01	Notice to use Zero "P" Fertilizer	Advertisement
3-9-01	Water Project Coordinator Moving	Madison Daily Leader
Summer 2001	"Save Our Lakes"	Brochures / State Park Users
3-2-01	How your Yard can Save the Lakes	Madison Daily Leader
2001 & 2002	"Gone Fishin?"	Posters / State Park System
2001 & 2002	"Having Fun?"	Posters / State Park System
3-21-01	Editorial-"Hidden pollution-push	Madison Daily Leader
May, 2001	Watershed project receives Grant	Madison Daily Leader
5-2-01	"New watershed project Coordinator"	Madison Daily Leader
May, 2001	"Big Sioux Water Festival"	Brookings event-4th graders
July, 2001	Clean Water Chronicle	Watershed Publication
7-19-2001	"Report: Bourne Slough is half full of Sediment	Madison Daily Leader
July, 2001	What's Happening with the Watershed Project	The Lake News

Table 12. (Cont'd)

Date	Title or Organization	Publication or Activity
8-9-01	Lake Madison Development receives $5,000	Madison Daily Leader
1-16-02	Water Quality, Sediment Study disc.	Madison Daily Leader
3-01-01	"Clean – Not Green"	Brochures
3-11-02	Watershed Committee Seeks Info.	Madison Daily Leader
3-8-02	Color Contest Winners	Madison Daily Leader
4-30-02	"Buy Zero-Phosphorus Fertilizer"	Madison Daily Leader-Advertising
May, 2002	"Big Sioux Water Festival"	Brookings event-4th graders
6-12-02	Waste Management Plan Essential	Madison Daily Leader
7-25-02	Watershed Project Makes Progress, seeks involvement	Madison Daily Leader
July 2002	Wanted: Citizen to Help Monitor Water Quality	Poster
July	Fertilizing Water	Poster
July	Washing Car in Lake	Poster
July, 2002	Clean Water Chronicle	Watershed Publication
9-30-02	Editorial: Newly Constructed System	Madison Daily Leader
9-30-02	Watershed Projects improve some Systems	Madison Daily Leader
10-25-02	Madison Cattle Farmer Makes Improvements to his Operation	Madison Daily Leader
October, 2002	Science Class-Madison Environmental Chemistry Class	Tour
11-1-02	Watershed Tour-Politicians & member of Lake Madison Associations	Tour
October, 2002	Clean Water Chronicle	Watershed Publication
1-29-03	Notice to Producers-AWMS	Tour
3-12-03	Watershed Project seek extension	Madison Daily Leader
4-30-03	Funds awarded to Watershed Project	Madison Daily Leader
4-28-03	Watershed Project has New Coordinator	Madison Daily Leader
7-23-03	Watershed Project seeks Funds	Madison Daily Leader
June, 2003	Watershed Project has New Coordinator	The Lake News
7-15-03	Lake County Conservation District Watershed committee Joint meeting	Presentation
8-4-03	Watershed project applies for $444,000 in EPA funding	Madison Daily Leader
9-9-03	Lake County Conservation District	Presentation to Board
10-21-03	Lake County Conservation District	Presentation to Board
11-18-03	Lake County Conservation District	Presentation to Board

Table 12. (Cont'd)

Date	Title or Organization	Publication or Activity
11-24-03	Watershed project continuous work with two producers	Madison Daily Leader
12-4-03	Editorial: Reminder about lakes	Madison Daily Leader
12-2-03	Commissions hear request…	Madison Daily Leader
12-16-03	Lake County Conservation District	Presentation to Board
12-29-03	Watershed Project Seeking funding	Madison Daily Leader
1-06-04	Lake County Commission OKs Watershed funding	Madison Daily Leader
1-20-04	Lake County Conservation District	Presentation to Board
2004	Watershed Improvement Project	Madison Visitor's Guide
2-13-04	Madison Home Show 2 day event	Booth
Feb, 2004	Watershed IQ Quiz	100+ participants
2-17-04	Lake County Conservation District	Presentation to Board
3-04-04	Lake County Conservation District Watershed committee Joint meeting	Presentation
3-11-04	Watershed project raises needed local support	Madison Daily Leader
3-16-04	Kingsbury County Producers	Tour
3-16-04	Lake Herman Association Meeting	Presentation
3-24-04	Water Board funds 25 environmental projects	Argus Leader
3-25-04	Board of Water & Natural Resources	Presentation – Pierre, SD
April, 2004	Money saving coupon: zero p fertilizer	Madison Daily Leader
3-30-04	Bourne Slough restoration project to proceed	Madison Daily Leader
4-7-04	Letter to Editor-Local Support	Madison Daily Leader
April, 2004	Waste Management makes progress	Madison Daily Leader
April, 2004	Editorial –Even city resident can do something to help the lakes	Madison Daily Leader
4-20-04	Lake County Conservation District	Presentation to Board
4-23-04	SD Lake & Stream annual meeting	Presentation
5-18-04	Lake County Conservation District	Presentation to Board
5-21-04	Lake County Conservation District	Presentation to Board
6-15-04	Lake County Conservation District	Presentation to Board
7-13-04	Lake County Conservation District	Presentation to Board
8-17-04	Lake County Conservation District	Presentation to Board
9-14-04	Lake County Conservation District	Presentation to Board
9-10-04	Work begins on Lake Madison Outlet	Madison Daily Leader
10-19-04	Lake County Conservation District	Presentation to Board
11-5-04	Bourne Slough bids approved	Madison Daily Leader
11-9-04	Lake County Conservation District	Presentation to Board

Table 12. (Cont'd)

Date	Title or Organization	Publication or Activity
11-10-04	Lake Madison Association-Board	Presentation to Board
11-16-04	Lake County Commission meeting	Presentation to commissioners
11-17	Legislative Forum	Presentation
11-22-04	City of Madison-Commission meeting	Presentation
12-14-04	Lake County Conservation District	Presentation to Board
1-18-05	Lake County Conservation District	Presentation to Board
2-5 & 6-05	Madison Home Show	Booth
Feb, 2005	Watershed IQ Quiz	100+ participants
2-08-05	Lake County Conservation District	Presentation to Board
3-15-05	Lake County Conservation District Watershed committee Joint meeting	Presentation
3-30-05	Watershed project concludes at end of 2005	Madison Daily Leader
April, 05	Keep the Green out of the LAKE	Brochure
4-5-05	Rotary Club	Presentation - Madison
4-5-05	Use of zero phosphorus fertilizer …	Madison Daily Leader
4-12-05	Lake County Conservation District	Presentation to Board
4-13-05	Bourne Slough Project	Coordination Meeting
May, 05	Shoreland Buffer	Brochure
5-10-05	Lake County Conservation District	Presentation to Board
5-17-05	Editorial: Watershed has improved…	Madison Daily Leader
June, 2005	Protecting the Shoreline with Plants	Brochure
5-23-05	Lake Herman Algae, smell concerns residents	Madison Daily Leader
Vol 2 Issue 22	Lake Herman Development	Splash: SD Lakes & Streams
5-26-05	Shoreline work affects quality of water in area lakes	Madison Daily Leader
6-14-05	Lake County Conservation District	Presentation to Board
7-12-05	Lake County Conservation District	Presentation to Board
8-16-05	Lake County Conservation District	Presentation to Board
9-13-05	Lake County Conservation District	Presentation to Board
Nov, 2005	Project continue in effect to improve Lake Madison Watershed	Madison Daily Leader
2005 1st Ed.	Several articles on Project	The Lake News
10-11-05	Lake County Conservation District	Presentation to Board
11-8-05	Lake County Conservation District	Presentation to Board
12-13-05	Lake County Conservation District	Presentation to Board
1-17-06	Lake County Conservation District Watershed committee Joint meeting	Presentation

PLANNED Versus ACTUAL MILESTONES and PRODUCTS

A summary of the project achievements is shown in Table 13. The table includes a comparison of accomplished to planned Milestones.

Table 13. Milestone Comparison Table.

TASK / OUTPUT	INITIAL MILESTONES	AMENDED MILESTONES	NUMBER COMPLETED
Objective 1-Reduce "P" loading			
AWMS	10	8	8
Phosphorus Mitigation Structure	16	2	0
Integrated Crop Management	60	6	0
Septic Tank Study	1	1	1
Objective 2-Erosion Control			
Grassed Waterways Sites / LF	22 / 24,000	7 / 8,000	11/ 12,484
Terraces # / LF	28 / 57,666	7 / 30,000	4 / 9,231
Buffer Strips # / LF			9 / 96.8
Filter Strips # / LF			4 / 22.2
Multi-purpose Dams	6	6	6
Grazing Systems # / Acres			9 / 917
Windbreaks Acres			38
Wetland Restoration Acres			36.2
Wetland Creation Acres			50.6
Bank Stabilization LF	2087	625	650
Objective 3-Storm Sewer Mitigation			
Storm Sewer Study	1	1	1
Sediment Study	1	1	1
Bourne Slough Berm Restoration	1	1	1
Objective 4- Education Program			
Zero Phosphorus Program	1	1	1
Brochures	3,000	3,000	10,170
Public Information Session	5	5	5
Public Awareness Signs	20	4	4
Public Awareness Activities		110	140
Evaluation & Monitoring			
Monitoring Wells	2	2	0
Lake Water Quality Testing	6	6	0
Reporting			
Semi annual Reports	5	11	11
Final Report	1	1	1

PHOSPHORUS LOAD REDUCTION

Phosphorus load reduction achieved by best management practices are summarized in Tables 14 and 15. The data was derived using the ANNAGNPS model.

Table 14. Load Reductions Achieved through BMPs Installed.

Best Management Practice's	Total Reduction	Phosphorus Reduction	Delivered		
			Brant	Madison	Herman
Animal Waste Management		1,705.00	982.87	882.51	899.52
Grassed Waterways	1,794.20	57.22	26.93	29.22	50.97
Terraces	330.00	5.87	2.93	3.17	5.40
Multi-purpose Dams	1,651.50	75.83	35.41	38.45	47.81
Grazing Systems	259.90	4.21	2.21	1.69	3.00
Conservation Reserve Prog.	526.35	9.45	4.40	4.78	7.42
Total	**4,561.95**	**1,857.58**	**1,054.75**	**959.82**	**1,014.12**

Table 15. Phosphorus Load Reductions Achieved.

	Delivered to		
	Lake Herman	**Lake Madison**	**Brant Lake**
Total Reduction	1014.12	959.82	1054.75
Load Level	16,779	25,181	3,951
% Reduction	6.044%	3.812%	26.696%
Algae Production*	**505,500 lbs**	**479,010 lbs**	**526,550 lbs**

*Based on reported potential growth of 500 pounds of algae per pound of available phosphorus.

COORDINATION EFFORTS

The Lake County Watershed Improvement Committee consisted of interested entities in the project area. These groups that played an active role in the project are listed below.

- **Lake County Conservation District:** Served as the project sponsor. The district staff made up of the district manager, project coordinator, and the District Board of Supervisors. Project staff addressed all facets of the 319 project including coordinating project activities, reporting project progress, processing requests for reimbursement of grant funds, record keeping, planning, information and education activities, inventory, and technical assistance for BMP implementation.
- **Lake County:** Assisted with local permitting and funding for the Bourne Slough Berm Restoration.
- **City of Madison:** Design and implementation of the storm sewer study and implementation. The City was also be involved in Bourne Slough Berm Restoration Funding.
- **Lake Madison Association:** Assistance with information and education activities and cost share funds.

- **Brant Lake Association:** Assistance with information and education activities and cost share funds.
- **East Dakota Water Development District:** Assistance with information and education activities, monitoring and evaluation, and cost share funds.

STATE AGENCIES

- **Department of Environment & Natural Resources:** Administered the project grant and provide technical assistance on matters pertaining to water quality.
- **South Dakota Game Fish and Parks:** Assistance with activities impacting the state parks in the project area.
- **Dakota State University:** Assistance with information and education activities and project monitoring and evaluation.
- **South Dakota State Extension Service:** Assisted with prioritization of information and education for Integrated Crop Management. The service was involved with AWMS design.
- **319 Animal Nutrient Management Assistance Team:** Provided AWMS designs and construction oversight.

FEDERAL AGENCIES

- **US Fish and Wildlife Service:** Technical assistance for project activities in their area of expertise. The service provided in-kind work for the Bourne Slough restoration and was active in the development of small dams and grazing systems.
- **Natural Resource Conservation Service:** The Lake County service office: provided engineering and technical assistance for design and construction of BMPs. The NRCS state office provided cost-share funds for installation of several BMPs to included AWMS.

BUDGET:

The project received funds from many different state and federals sources. Among these were:

- Environmental Protection Agency Clean Water Act Section 319 Grant funds through DENR.
- Consolidated Water Facilities Construction Program (Consolidated Grant) overseen by Board of Water and Natural Resources and administered by South Dakota Department of Environment and Natural Resources, and
- Coordinated Soil and Water Conservation Grant Fund (Conservation Commission Grant) overseen by State Conservation Commission and administered by South Dakota Department of Agriculture.

Other funding was received for special purposes. Sources of funds are listed in Tables 16 and 17. Tables 18 – 25 show project expenditures by funding source for project activities.

Table 16. State and Federal Grant Funding and Expenditures.

EPA 319 Grant			
FISCAL YEAR	**GRANT AMOUNT**	**EXPENDED**	**AVAILABLE**
FY 2000	$ 660,245.00	$ 660,245.00	$ -
FY 2003	$ 263,256.00	$ 263,256.00	$ -
FY 2004	$ 180,744.00	$3,896.70	$ -
TOTAL	$ 1,104,245.00	$ 927,397.70	$ -
CONSOLIDATED GRANT			
GRANT NUMBER	**GRANT AMOUNT**	**EXPENDED**	**AVAILABLE**
2002G-108	$ 135,000.00	$ 134,112.12	$ 887.64
2004G-106	$ 82,500.00	$ 59,378.52	$ 23,121.48
2005G-109	$ 19,200.00	$ 6,962.90	$ 12,237.10
Total	$ 236,700.00	$ 200,453.54	$ 36,246.22
COORDINATED SOIL AND WATER CONSERVATION GRANT			
GRANT NUMBER	**GRANT AMOUNT**	**EXPENDED**	**AVAILABLE**
2000-0007	$ 105,250.00	$ 40,358.17	$ 64,891.83

Table 17. Summary of Project Funds Received From all Sources.

Source	Initial Budget	Amended Budget	Total Received
Federal			
319 Funds Awarded through DENR	660,245	1,104,245	927,397.70
Conservation Reserve Program	0	41,656	34,867.00
Fish & Wildlife Service	0	0	3,400.00
USDA-EQIP	190,000	250,000	260,931.72
USDA-NRCS	0		226.95
NAWCA **			1,157.02
Total Federal	**850,245**	**1,395,901**	**1,227,980.39**
State			
Consolidated Grants	135,000	236,700	200,453.78
Soil and Water Conservation Grants	105,250	40,358	40,358.17
Game Fish and Parks	0	19,200	4,896.61
SD Association of Conservation District			1,892.14
Total State	**240,250**	**296,258**	**247,600.70**
Local			
Lake Co. Conservation Dist. In-kind	34,254	58,000	46,994.06
Landowner Match	185,250	237,500	247,906.40
E. Dak. Water Development Dist.	12,500	13,643	10,233.21
City of Madison	20,000	30,000	21,900.00
Lake County	0	10,000	1,900.00
Whitecaps Foundation	0	3,000	3,000.00
Lake Madison Association	10,000	19,000	10,292.20
Brant Lake Assn.	2,800	4,400	2,608.28
Lake Herman Assn.	3,100	3,100	0.00
Hamlin Conservation District			2,088.85
Ducks Unlimited			1,471.31
Total Local	**267,904**	**378,643**	**348,394.31**
Total Project	**1,358,399**	**2,070,802**	**1,823,975.40**

**NAWCA - North American Wetland Conservation Act

Table 18. Total Project Expenditures.

EXPENSES	Initial Budget	Revised Budget	Amount Expended
Personnel / Support			
Salary / Fringe	140,045	185,545	181,731.00
Office / Rent / Utilities	10,800	10,800	10,775.00
Travel	10,800	4,300	3,403.80
Equipment / Supplies	6,000	6,000	5,665.68
Training	1,500	1,500	753.00
Telephone	1,800	1,800	56.69
Subtotal	**170,945**	**209,945**	**202,385.17**
Objective 1 - BMP			
Animal Waste Management Sys.	500,000	1,342,041	1,299,265.86
Livestock Mitigation Structures	80,000	9,000	0.00
Integraded Crop Management	24,000	2,000	0.00
Septic Tank Study	7,200	6,173	5,227.00
Subtotal	**611,200**	**1,359,214**	**1,304,492.86**
Objective 2 - Erosion Control			
Grassed Waterways	60,000	34,500	19,657.46
Terraces / Buffer Strips	173,000	45,223	26,680.05
Dams / Grazing Systems	104,000	44,750	111,724.27
Bank Stabilization	125,000	50,000	20,638.09
Subtotal	**462,000**	**174,473**	**178,699.87**
Objective 3 - Madison Storm Sewer			
Engineer & Sediment Study	50,000	51,027	50,999.99
Bourne Slough Berm Restoration		192,000	38,730.75
Subtotal	**50,000**	**243,027**	**89,730.74**
Objective 4 - Education			
Zero Phosphorus Fertilizer Promotion	15,000	10,500	7,605.41
Educational Brochures	900	900	0.00
Public Information Session	1,000	3,000	838.71
Project Awareness	4,000	6,500	3,492.71
Subtotal	**20,900**	**20,900**	**11,936.83**
Evaluation and Monitoring			
Pizometers and Wells	4,000	4,000	0.00
Sample Analysis	3,000	1,500	163.95
Watershed / Photo Pt. Monitoring	4,800	2,443	0.00
Subtotal	**11,800**	**7,943**	**163.95**
Administrative /LCCD* Manager			
Administrative / Coordination	22,254	46,000	36,565.98
Year Summary / Reports	4,500	4,500	0.00
Audit	3,600	3,600	0.00
Coordination Meeting	1,200	1,200	0.00
Subtotal	**31,554**	**55,300**	**36,565.98**
TOTAL	**1,358,399**	**1,104,245**	**1,823,975.40**

Table 19. EPA 319 Expenditures.

Budget Category	Initial Budget	Revised Budget	Funds Expended
Personnel / Support			
Salary / Fringe	140,045	179,045	181,731
Office / Rent / Utilities	0	0	0
Travel	10,800	10,800	3,404
Equipment / Supplies	3,000	3,000	2,666
Training	1,500	1,500	753
Telephone	1,800	1,800	57
Subtotal	**157,145**	**196,145**	**188,610**
Objective 1 - BMP			
Animal Waste Management Sys.	180,000	685,750	650,361
Livestock Mitigation Structures	37,500	0	0
Integraded Crop Management	12,000	0	0
Septic Tank Study	3,600	3,600	2,614
Subtotal	**233,100**	**689,350**	**652,974**
Objective 2 - Erosion Control			
Grassed Waterways	27,500	3,000	5,082
Terraces / Buffer Strips	84,000	22,000	10,191
Dams / Grazing Systems	49,500	9,750	7,673
Bank Stabilization	60,000	20,000	12,383
Subtotal	**221,000**	**54,750**	**35,329**
Objective 3 - Madison Storm Sewer			
Engineer & Sediment Study	25,000	25,000	24,970
Bourne Slough Berm Restoration		115,000	21,302
Subtotal	**25,000**	**140,000**	**46,272**
Objective 4 - Education			
Zero Phosphorus Fertilizer Promotion	10,000	5,500	2,605
Educational Brochures	0	0	0
Public Information Session	0	2,000	383
Project Awareness	0	2,500	941
Subtotal	**10,000**	**10,000**	**3,930**
Evaluation and Monitoring			
Pizometers and Wells	2,000	2,000	0
Sample Analysis	1,500	1,500	164
Watershed / Photo Pt. Monitoring	2,400	2,400	0
Subtotal	**5,900**	**5,900**	**164**
Administrative /LCCD* Manager			
Administrative / Coordination	0	0	119
Year Summary / Reports	4,500	4,500	0
Audit	3,600	3,600	0
Coordination Meeting	0	0	0
Subtotal	**8,100**	**8,100**	**119**
TOTAL	**660,245**	**1,104,245**	**927,398**

Table 20. Coordinated Soil and Water Conservation Grant Fund.

Budget Category	Initial Budget	Revised Budget	Expended
Personnel / Support			
Salary / Fringe	0	0	0
Office / Rent / Utilities	0	0	0
Travel	0	0	0
Equipment / Supplies	0	0	0
Training	0	0	0
Telephone	0	0	0
Subtotal	**0**	**0**	**0**
Objective 1 - BMP			
Animal Waste Management Sys.	0	45,000	37,135
Livestock Mitigation Structures	18,750	0	0
Integraded Crop Management	6,000	1,000	0
Septic Tank Study	0	0	0
Subtotal	**24,750**	**46,000**	**37,135**
Objective 2 - Erosion Control			
Grassed Waterways	13,750	6,500	0
Terraces / Buffer Strips	42,000	28,000	3,223
Dams / Grazing Systems	24,750	24,750	0
Bank Stabilization	0	0	0
Subtotal	**80,500**	**59,250**	**3,223**
Objective 3 - Madison Storm Sewer			
Engineer & Sediment Study	0	0	0
Bourne Slough Berm Restoration		0	0
Subtotal	**0**	**0**	**0**
Objective 4 - Education			
Zero Phosphorus Fertilizer Promotion	0	0	0
Educational Brochures	0	0	0
Public Information Session	0	0	0
Project Awareness	0	0	0
Subtotal	**0**	**0**	**0**
Evaluation and Monitoring			
Pizometers and Wells	0	0	0
Sample Analysis	0	0	0
Watershed / Photo Pt. Monitoring	0	0	0
Subtotal	**0**	**0**	**0**
Administrative /LCCD* Manager			
Administrative / Coordination	0	0	0
Year Summary / Reports	0	0	0
Audit	0	0	0
Coordination Meeting	0	0	0
Subtotal	**0**	**0**	**0**
TOTAL	**105,250**	**105,250**	**40,358**

Table 21. Consolidated Grant Expenses.

Budget Category	Initial Budget	Revised Budget	Expended
Personnel / Support			
Salary / Fringe	0	0	0
Office / Rent / Utilities	0	0	0
Travel	0	0	0
Equipment / Supplies	0	0	0
Training	0	0	0
Telephone	0	0	0
Subtotal	**0**	**0**	**0**
Objective 1 - BMP			
Animal Waste Management Sys.	105,000	202,500	193,485
Livestock Mitigation Structures	0	0	0
Integraded Crop Management	0	0	0
Septic Tank Study	0	0	0
Subtotal	**105,000**	**202,500**	**193,485**
Objective 2 - Erosion Control			
Grassed Waterways	0	0	0
Terraces / Buffer Strips	0	0	0
Dams / Grazing Systems	0	0	0
Bank Stabilization	30,000	15,000	3,096
Subtotal	**30,000**	**15,000**	**3,096**
Objective 3 - Madison Storm Sewer			
Engineer & Sediment Study	0	0	0
Bourne Slough Berm Restoration		19,200	3,873
Subtotal	**0**	**19,200**	**3,873**
Objective 4 - Education			
Zero Phosphorus Fertilizer Promotion	0	0	0
Educational Brochures	0	0	0
Public Information Session	0	0	0
Project Awareness	0	0	0
Subtotal	**0**	**0**	**0**
Evaluation and Monitoring			
Pizometers and Wells	0	0	0
Sample Analysis	0	0	0
Watershed / Photo Pt. Monitoring	0	0	0
Subtotal	**0**	**0**	**0**
Administrative /LCCD* Manager			
Administrative / Coordination	0	0	0
Year Summary / Reports	0	0	0
Audit	0	0	0
Coordination Meeting	0	0	0
Subtotal	**0**	**0**	**0**
TOTAL	**135,000**	**236,700**	**200,454**

Table 22. Game Fish and Parks Expenditures.

Budget Category	Initial Budget	Revised Budget	Expended
Personnel / Support			
Salary / Fringe	0	0	0.00
Office / Rent / Utilities	0	0	0.00
Travel	0	0	0.00
Equipment / Supplies	0	0	0.00
Training	0	0	0.00
Telephone	0	0	0.00
Subtotal	**0**	**0**	**0.00**
Objective 1 - BMP			
Animal Waste Management Sys.	0	0	0.00
Livestock Mitigation Structures	0	0	0.00
Integraded Crop Management	0	0	0.00
Septic Tank Study	0	0	0.00
Subtotal	**0**	**0**	**0.00**
Objective 2 - Erosion Control			
Grassed Waterways	0	0	0.00
Terraces / Buffer Strips	0	0	0.00
Dams / Grazing Systems	0	0	1,023.53
Bank Stabilization	0	0	0.00
Subtotal	**0**	**0**	**1,023.53**
Objective 3 - Madison Storm Sewer			
Engineer & Sediment Study	0	0	0.00
Bourne Slough Berm Restoration	0	19,200	3,873.08
Subtotal	**0**	**19,200**	**3,873.08**
Objective 4 - Education			
Zero Phosphorus Fertilizer Promotion	0	0	0.00
Educational Brochures	0	0	0.00
Public Information Session	0	0	0.00
Project Awareness	0	0	0.00
Subtotal	**0**	**0**	**0.00**
Evaluation and Monitoring			
Pizometers and Wells	0	0	0.00
Sample Analysis	0	0	0.00
Watershed / Photo Pt. Monitoring	0	0	0.00
Subtotal	**0**	**0**	**0.00**
Administrative /LCCD* Manager			
Administrative / Coordination	0	0	0.00
Year Summary / Reports	0	0	0.00
Audit	0	0	0.00
Coordination Meeting	0	0	0.00
Subtotal	**0**	**0**	**0.00**
TOTAL	**0**	**19,200**	**4,896.61**

Table 23. Other Federal Funds.*

Personnel / Support			
Salary / Fringe	0	0	0
Office / Rent / Utilities	0	0	0
Travel	0	0	0
Equipment / Supplies	0	0	227
Training	0	0	0
Telephone	0	0	0
Subtotal	**0**	**0**	**227**
Objective 1 - BMP			
Animal Waste Management Sys.	165,000	231,656	242,514
Livestock Mitigation Structures	5,000	5,000	0
Integraded Crop Management	0	0	0
Septic Tank Study	0	0	0
Subtotal	**170,000**	**236,656**	**242,514**
Objective 2 - Erosion Control			
Grassed Waterways	5,000	25,000	2,680
Terraces / Buffer Strips	5,000	5,000	4,126
Dams / Grazing Systems	5,000	20,000	50,836
Bank Stabilization	5,000	5,000	0
Subtotal	**20,000**	**55,000**	**57,642**
Objective 3 - Madison Storm Sewer			
Engineer & Sediment Study	0	0	0
Bourne Slough Berm Restoration	0	0	200
Subtotal	**0**	**0**	**200**
Objective 4 - Education			
Zero Phosphorus Fertilizer Promotion	0	0	0
Educational Brochures	0	0	0
Public Information Session	0	0	0
Project Awareness	0	0	0
Subtotal	**0**	**0**	**0**
Evaluation and Monitoring			
Pizometers and Wells	0	0	0
Sample Analysis	0	0	0
Watershed / Photo Pt. Monitoring	0	0	0
Subtotal	**0**	**0**	**0**
Administrative /LCCD* Manager			
Administrative / Coordination	0	0	0
Year Summary / Reports	0	0	0
Audit	0	0	0
Coordination Meeting	0	0	0
Subtotal	**0**	**0**	**0**
TOTAL	**190,000**	**291,656**	**300,583**

*Includes Conservation Reserve Program, CRP, Environmental Quality Incentives Program, EQIP, US Fish & Wildlife Service, and Natural Resource Conservation Services
CRP-USDA administered by Farm Service Agency
EQIP-USDA administered by Natural Resource Conservation Service

Table 24. Landowner Expenses.

Budget Category	Initial Budget	Revised Budget	Expended
Personnel / Support			
Salary / Fringe	0	0	0.00
Office / Rent / Utilities	0	0	0.00
Travel	0	0	0.00
Equipment / Supplies	0	0	0.00
Training	0	0	0.00
Telephone	0	0	0.00
Subtotal	**0**	**0**	**0.00**
Objective 1 - BMP			
Animal Waste Management Sys.	50,000	185,000	175,771.35
Livestock Mitigation Structures	18,750	5,000	0.00
Integraded Crop Management	6,000	1,000	0.00
Septic Tank Study	0	0	0.00
Subtotal	**74,750**	**191,000**	**175,771.35**
Objective 2 - Erosion Control			
Grassed Waterways	13,750	6,500	11,895.41
Terraces / Buffer Strips	42,000	15,000	9,140.27
Dams / Grazing Systems	24,750	15,000	45,939.58
Bank Stabilization	30,000	10,000	5,159.53
Subtotal	**110,500**	**46,500**	**72,134.79**
Objective 3 - Madison Storm Sewer			
Engineer & Sediment Study	0	0	0.00
Bourne Slough Berm Restoration		0	0.00
Subtotal	**0**	**0**	**0.00**
Objective 4 - Education			
Zero Phosphorus Fertilizer Promotion	0	0	0.00
Educational Brochures	0	0	0.00
Public Information Session	0	0	0.00
Project Awareness	0	0	0.00
Subtotal	**0**	**0**	**0.00**
Evaluation and Monitoring			
Pizometers and Wells	0	0	0.00
Sample Analysis	0	0	0.00
Watershed / Photo Pt. Monitoring	0	0	0.00
Subtotal	**0**	**0**	**0.00**
Administrative /LCCD* Manager			
Administrative / Coordination	0	0	0.00
Year Summary / Reports	0	0	0.00
Audit	0	0	0.00
Coordination Meeting	0	0	0.00
Subtotal	**0**	**0**	**0.00**
TOTAL	**185,250**	**237,500**	**247,906.14**

Table 25. Local Expenses.*

Budget Category	Initial Budget	Revised Budget	Expended
Personnel / Support			
Salary / Fringe	0	0	0
Office / Rent / Utilities	10,800	10,800	10,775
Travel	0	0	0
Equipment / Supplies	3,000	3,000	3,000
Training	0	0	0
Telephone	0	0	0
Subtotal	**13,800**	**13,800**	**13,775**
Objective 1 - BMP			
Animal Waste Management Sys.	0	0	0
Livestock Mitigation Structures	0	0	0
Integraded Crop Management	0	0	0
Septic Tank Study	3,600	2,573	2,614
Subtotal	**3,600**	**2,573**	**2,614**
Objective 2 - Erosion Control			
Grassed Waterways	0	0	0
Terraces / Buffer Strips	0	0	0
Dams / Grazing Systems	0	0	4,360
Bank Stabilization	0	0	0
Subtotal	**0**	**0**	**4,360**
Objective 3 - Madison Storm Sewer			
Engineer & Sediment Study	25,000	26,027	26,030
Bourne Slough Berm Restoration	0	38,600	9,483
Subtotal	**25,000**	**64,627**	**35,512**
Objective 4 - Education			
Zero Phosphorus Fertilizer Promotion	5,000	5,000	5,000
Educational Brochures	900	900	0
Public Information Session	1,000	1,000	455
Project Awareness	4,000	4,000	2,551
Subtotal	**10,900**	**10,900**	**8,007**
Evaluation and Monitoring			
Pizometers and Wells	2,000	2,000	0
Sample Analysis	1,500	0	0
Watershed / Photo Pt. Monitoring	2,400	43	0
Subtotal	**5,900**	**2,043**	**0**
Administrative /LCCD* Manager			
Administrative / Coordination	22,254	46,000	36,219
Year Summary / Reports	0	0	0
Audit	0	0	0
Coordination Meeting	1,200	0	0
Subtotal	**23,454**	**46,000**	**36,219**
TOTAL	**82,654**	**139,943**	**100,487**

*Sources include City of Madison, Lake County, Lake Madison Association, Brant Lake Association, Whitecaps Foundation, East Dakota Water Development District, and Lake County Conservation District.

ASPECTS OF THE PROJECT THAT DID NOT WORK WELL

In general, there were more positives then negatives aspects to the watershed project.

The lack of participation in the animal nutrient management phosphorus mitigation structures was disappointing. When a project is working with an incentive based program. There needs to be an economic incentive or people will not become involved. Possibly the landowners did not feel that they were going to receive sufficient benefits to warrant the loss of productive cropland. The concern expressed was what assurance or guarantee did they have that if they did a partial system rather than a total containment system that they would not be faced with liability issues and potential closure at a later date.

The integrated Crop management was another project activity that was not well received. Many of the producers are working with a local agribusiness firm. The firm tests the top six inches of soil at no charge and the farmer buys his fertilizer from the firm. At this time it appears many producers have not come to the realization that there is more to crop production recommendations then a partial soil test. The seven producers that have installed animal nutrient management systems are working with crop consultants to implement their required nutrient management plans. High fertilizer and fuel costs may be an added incentive for people become more efficient in their operations in the future.

The inconclusive results of the tests used to determine if there were failures in septic systems were disappointing. Many of the homes around Lake Herman are getting old and have septic systems that are in need of replacement. Property owners would have welcomed financial assistance to upgrade of their systems. This was not possible without the proverbial “Smoking gun” to indicate the need.

A Number of property owners expressed disappointment in the recommendations provided in the Barr Engineering report. They felt there was a lack of solid, definitive recommendations that the City of Madison should follow.

FUTURE ACTIVITY RECOMMENDATIONS

It would be beneficial to go to the same sites that were used in the assessment and determine if BMP installation had the desired results. This assessment should be initiated in about two years, after the soil has an opportunity to stabilize and cover vegetation is reestablished. The load reductions listed in this report are based on the ANNAGNPS Model. Collection of data in the field would provide data to validate the numbers generated by the model.

The Conservation Reserve Program was a valuable tool in motivating landowners / operators to install BMPs. Provide more local control or flexibility in the implementation of the practices may stimulate even greater participation. A prime example is CP 22, “Riparian Buffer”:

- The buffer area needs to be flexible as to size and configuration. A number of producers rejected the offer because they would be left with a small non-usable tract of land.

- Rental rates needs to be competitive with the current market values.

Maintaining the water quality gains realized during the project will require maintaining the level of awareness developed during the project. It is suggested that information and education programs initiated during the project should be continued.

APPENDIX A

KEY TO ACRONYMS

KEY TO ACRONYMS

AFO-	Animal Feeding Operation
AGNPS-	Agricultural Nonpoint Source Computer Model
ANMP-	Animal Nutrient Management Plan
ANMT-	Animal Nutrient Management Team
ANN AGNPS-	Annualized Agricultural Nonpoint Source Computer Model
BMP-	Best Management Practices
CAFO	Concentrated Animal Feeding Operation
CCG-	Soil and Water Conservation Grant
CCRP	Continuous Conservation Reserve Program
CNMP-	Comprehensive Nutrient Management Plan
COE-	Army Corps of Engineers
CRP-	Conservation Reserve Program
CWA-	Clean Water Act
DENR-	Department of Environment and Natural Resources-
DO-	Dissolved Oxygen
EQIP-	Environmental Quality Incentive Program
EPA-	Environmental Protection Agency
GF&P-	SD Department of Game Fish and Parks
HUC-	Hydrologic Unit Code
LCCD-	Lake County Conservation District
LCWIA-	Lake County Watershed Improvement Association
LCWIP-	Lake County Watershed Improvement Project
MIP-	Model Implementation Program
NAWCA-	North American Wetlands Conservation Act
NPDES-	National Pollutant Discharge Elimination System
NPS-	Nonpoint Source
NRI-	Natural Resources Inventory
NRCS-	Natural Resources Conservation Service
QA-	Quality Assurance
QC-	Quality Control
SD-	South Dakota
SDSWQS-	South Dakota Surface Water Quality Standards
STORET-	EPA Computer Data Storage and Retrieval System
SWD-	Surface Water Discharge Program
TDS-	Total Dissolved Solids
TGPC-	Tall Grass Prairie Conservation Initiative
TMDL-	Total Maximum Daily Load
TSI-	Carlson (1977) Trophic State Indices or Trophic State Index
TSS-	Total Suspended Solids
USGS-	United States Geological Survey
WQM-	Water Quality Monitoring
WQS-	Water Quality Standards

APPENDIX B

Public Outreach/Promotional Materials

Available Electronically at:

http://www.state.sd.us/denr/DFTA/WatershedProtection/WQInfo.htm#Project%20Reports