WATERSHED PROJECT FINAL REPORT

SECTION 319
NONPOINT SOURCE POLLUTION CONTROL PROGRAM

LAKE COCHRANE/LAKE OLIVER
WATERSHED IMPROVEMENT PROJECT

By

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

Grant # 9998185-99 and 9998185-02

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EXECUTIVE SUMMARY

PROJECT TITLE **Lake Cochrane/Lake Oliver Watershed Improvement Project**

SECTION GRANT NUMBER(S) 9998185-99 9998185-02

PROJECT START DATE **08/05/02** PROJECT COMPETION DATE **06/30/05**

FUNDING:	TOTAL BUDGET	**154,873.00**
	TOTAL EPA GRANT(S)	**92,973.00**
	TOTAL EXPENDITURES OF EPA FUNDS	**92,973.00**
	TOTAL SECTION 319 MATCH ACCRUED	**61,430.00**
	TOTAL EXPENDITURES	**154,403.00**

SUMMARY OF ACCOMPLISHMENTS

The Total Daily Maximum Load (TMDL) implemented by this project was the Trophic State Index (TSI) TMDL for Lake Oliver. The project goal for Lake Oliver was to reduce in-lake phosphorus for Lake Oliver by 50 percent to a point where the phosphorus TSI would be eutrophic. An in-lake phosphorus reduction in Lake Oliver will also reduce phosphorus loading to Lake Cochrane. Because Lake Cochrane maintains a high level of water quality, the project goal for Lake Cochrane was to initiate practices that will maintain the current low level of nutrient and sediment loading.

The Lake Oliver Goal was attained. Data collected during the summer of 2003 showed a 50 percent reduction in total phosphorus and improved mean TSI of 54.2 which indicated full support of beneficial uses. The 2004 results were not as impressive as the 2003. The results suggest a 34 percent TP reduction and a slightly improved mean TSI of 65.5 which indicated borderline full support of beneficial uses.

The project goal for Lake Cochrane was to initiate practices to maintain the current low level of nutrient and sediment inputs. The Lake Cochrane Goal was attained. There were seventeen critical cells in the Lake Cochrane watershed. Of the seventeen cells, all but one is seeded to grass or is in Conservation Reserve Program (CRP). The two sediment traps west of Lake Cochrane were cleaned. The sediment trap south of Lake Cochrane was fenced to exclude livestock.

INTRODUCTION

Formal local support for the project began during 1998, with a request by the Lake Cochrane Improvement Association (LCIA) to the Deuel County Conservation District. The association requested that the district sponsor a watershed assessment study of the Lake Oliver and Lake Cochrane watersheds. The request was a result of public concern about potentially deteriorating water quality in Lake Cochrane.

Controversy over the outflow of Lake Oliver to Lake Cochrane has existed between state entities and Lake Cochrane residents for several years. Despite local preference that Lake Oliver should be diverted around Lake Cochrane in the event of flooding, the state determined that the historic natural outflow of Lake Oliver was to Lake Cochrane. During 1998, a flood control structure and weir was installed to regulate Lake Oliver flow to Lake Cochrane. The purpose of the control structure is to restrict Lake Oliver water from entering Lake Cochrane during months when algal blooms are most likely to occur.

The South Dakota Department of Game Fish & Parks (SDGFP) manages the outlet structure. The outlet is designed to bypass the wetlands that diverted water straight from Lake Oliver to Lake Cochrane. The structure is open from October 16th through June 14th each year to allow Lake Oliver to maintain the established 1,683.6 mls outlet elevation. During closure, Lake Oliver is allowed to store water to an elevation of 1685.0 msl. Whenever an elevation of 1685.0 msl occurs, water spills uncontrolled over the weir. If a precipitation event causes flow over the weir (1685.3 msl), the control structure is re-opened until Lake Oliver attains an elevation of 1684.3 msl.

A project coordinator was hired during March 1999 to complete the watershed study. Funding from a Clean Water Act Section 319 grant awarded through the South Dakota Department of Environment and Natural Resources (DENR) and local sources was used to assess both lakes and the Lake Cochrane watershed. The purpose of the study was to identify sources of nutrient and/or sediment nonpoint source pollution entering the lake from the watershed and develop restoration alternatives to improve the water quality in both lakes. Because of the small size of the watershed and the intermittent flow of the tributaries, a one-year water quality assessment was initiated. The assessment began during March 1999 and proceeded until March 2000. The watershed assessment final report was published during October 2000.

LCIA hosted a meeting of its membership October 23, 2000 to review the results of the study. Following the meeting, representatives from a majority of the organizations and agencies present formed a local planning committee. The group met several times between March and July 2001 to review and prioritize resource concerns and needs in Lake Cochrane and Lake Oliver. The implementation project that resulted is based on the assessment and continuing local support.

Letters of support for the project were received from the Lake Cochrane Improvement Association, US Fish and Wildlife Service, East Dakota Water Development District, South Dakota Department of Game, Fish and Parks, Deuel County Commission, NRCS and Lake Cochrane Sanitary District.

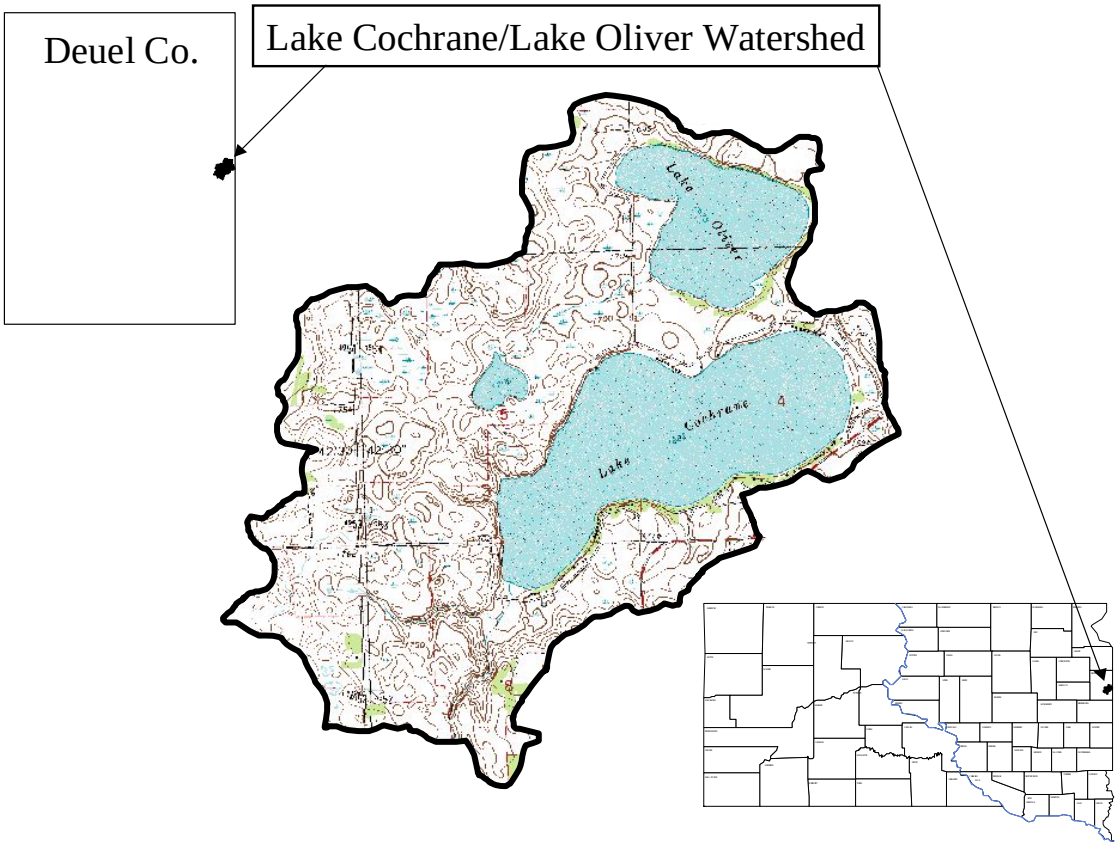
PROJECT AREA

Lake Cochrane and Lake Oliver are located near the Minnesota border in the southeast corner of Deuel County, South Dakota (Figure 1). Deuel County is located in Northeastern South Dakota. Both Lake Cochrane and Lake Oliver are glacial lakes. The lakes are located within the upper portion of the Lac Qui Parle River watershed (Hydrologic Unit Code 07020003), a major tributary to the Minnesota River.

The combined watershed area for Lakes Oliver and Cochrane is approximately 1,900 acres. The entire watershed is located within Deuel County, South Dakota. Predominant land use in the project area is agriculture, with a mixture of cropland, rangeland, hay/CRP and a few small animal feeding operations. The major soil association found in the watershed is Forman-Aastad-Parnell.

Nearly 200 permanent and seasonal homes have been built around Lake Cochrane. All structures are connected to a central sewer collection and treatment system. No such development is found around Lake Oliver. A State Recreation Area includes portions of the shorelines at both lakes.

Figure 1. Lake Cochrane/Lake Oliver Watershed Location.



Beneficial uses, water quality impairments, and NPS pollutants of Lakes Oliver and Cochrane are described below.

The State of South Dakota has assigned the following beneficial uses to Lake Cochrane:

- Warm water permanent fish life propagation;
- Immersion recreation;
- Limited contact recreation; and
- Wildlife propagation and stock watering.

Lake Cochrane was listed in the 1998 South Dakota 303(d) Waterbody List for non-support of some of its designated uses. Immersion recreation was the primary use impairment identified. The impairment was attributed to fecal coliform bacteria. Water quality monitoring conducted during 1999 found detectable bacteria levels (detection limit = 10 colonies/100 mL) in 2 of 48 samples. As a result of the 1999 monitoring, Lake Cochrane was not listed in the 2002 report. Although the monitoring also identified some sediment and nutrient loadings, the levels were not sufficient to result in impairment of designated uses.

Lake Oliver is assigned the following beneficial uses:

- Warm water marginal fish life propagation;
- Immersion recreation;
- Limited contact recreation; and
- Wildlife propagation and stock watering.

Lake Oliver was listed in both the 1998 South Dakota 303(d) Waterbody List and the 2000 South Dakota report to Congress – 305(b) Water Quality Assessment and as hypereutrophic and non-supporting of all designated uses based on Tropic State Index (TSI). Excess nutrients, siltation and noxious aquatic plants were the primary NPS pollutants identified.

According to the 1999 - 2000 watershed study, the lake had an average total phosphorus TSI of 64.04, chlorophyll-a TSI of 72.16, a Secchi TSI of 65.20, and a mean TSI of 67.03, which is indicative of high levels of primary productivity. Water quality monitoring indicated that the primary cause of high productivity is total phosphorus loads originating from internal loading. This project reduced the TSI level to the fully supporting level (TSI<65.00).

PROJECT OBJECTIVES AND TASKS

The project goal established to implement the TMDL for Lake Oliver and protect the water quality of Lake Cochrane was:

> "The Total Daily Maximum Load (TMDL) implemented by this project was the Trophic State Index (TSI) TMDL for Lake Oliver. The project goal for Lake Oliver was to reduce in-lake phosphorus for Lake Oliver by 50 percent to a point where the phosphorus TSI would be eutrophic. In-lake phosphorus reduction in Lake Oliver will also reduce phosphorus loading to Lake Cochrane because Lake Cochrane maintains a high level of water quality, the project goal for Lake Cochrane was to initiate practices that will maintain the current low level of nutrient and sediment loading."

Project activities completed to attain the goal are described in this section of the report. A comparison of the milestones planned and accomplished for each activity appears in Table 1 on page 12 of this report.

Objective 1: Reduce nutrient and sediment loads from the watershed

Task 1: Provide cost-share funding for the planning, design, and implementation of animal nutrient management systems and/or clean water diversions.

Product 1: Livestock mitigation structures.
Milestone: One livestock mitigation structure constructed during 2002-2004.

Accomplishments: Producers were interested in installing the practice. There is only one producer with livestock. The farmstead is located one mile from Lake Cochrane. The livestock are in the lots only during the winter months. The fields between the farmstead and lake are seeded to grass. The funds were used transferred to Task 2, Product 3 three to construct a new dugout to replace the water supply to the pastureland for livestock.

Task 2: Provide cost-share funding for the planning, design, and implementation of best management practices designed to reduce nutrient and sediment runoff for Lake Cochrane, written by NRCS. Nutrient management plans will be part of a whole farm conservation plan implemented for a period of five to ten years under NRCS guidelines.

Product 1: Crop rotation and management plans.

Milestone: Sixteen crop rotation and management plans during 2002-2004.

Accomplishments: Seventeen critical cells were identified in the watershed during the assessment. Sixteen of the critical cells have been seeded to grass since the completion of the study.

Product 2: Grazing management systems.

Milestone: One grazing management system during 2002-2004.

Accomplishments: Producers were not interested in installing the practice. There is very little pasture in the watershed. The funds allocated for the activity were transferred to Task 2, Product 3 - Alternate Watering System.

Product 3: Alternate watering systems.

Milestone: One alternate watering system during 2002-2004.

Accomplishments: A six acre wetland which served as the water supply for a pasture was fenced to exclude livestock (Figure 2.). A new dugout was installed to replace the water supply.

Soil and Water Conservation Grant funds awarded through the South Dakota Commission Conservation Commission were used for practices in Objective One. The table of actual project expenditures (Table 4, page 16) lists the practices. Conservation Commission funds that were not used were transferred to Pond Reclamation.

Figure 2, Fenced Out Wetland.

Objective 2: Reduce Sediment Loading from Watershed Pasture, Rangeland, and Cropland

Task 3: Provide technical assistance and cost-share funding to landowners and operators to implement best management practices that reduce sediment (and nutrient) loading and sedimentation to Lake Cochrane and Lake Oliver. Targeted acres were identified by AGNPS modeling and are included in the final report of the watershed assessment. AGNPS was not rerun to document load reduction at the end of the Lake Cochrane and Lake Oliver project.

Product 1: Grassed waterways.

Milestone: Promote and provided technical assistance and cost share funds for the installation of Grassed waterways during 2002-2004.

Accomplishment: Producers were not interested in this practice because the majority of the crop land in the project area is in CRP and therefore is under permanent cover. No EPA funds were allocated for this practice. The Conservation Commission funds budgeted were used in Task 3, Product 2.

Product 2: Wetland/riparian restoration.

Milestone: Promote provided technical assistance and cost share funds for wetland/riparian area restoration during 2002-2004.

Accomplishment: A total of 2118 linear feet of fence was installed to exclude livestock from a six acre wetland that drains into Lake Cochrane.

Task 4: Rehabilitate sediment retention ponds located along the western edge of Lake Cochrane. The ponds, constructed in the late 1970's, require cleanout in order to continue to function as sediment traps and other maintenance. A long-term maintenance program will be developed for these structures as well. Care will be taken so no sediment will re-enter the lake.

Product 1: Stand pipe replacement on the south pond.

Milestone: Replace the stand pipes on sediment ponds west of Lake Cochrane during 2002- 2003.

Accomplishments: Two new outlet structures (Figure 3.) were installed in the sediment ponds west of Lake Cochrane to replace the old pipes which were leaking. The new outlets release water from the top of the ponds thus reducing the amount of sediment entering Lake Cochrane. The South Dakota Game Fish and Parks (SDGF&P) paid for half of the cost of the outlets.

Figure 3. Outlet Structures Installed In Sediment Ponds West Of Lake Cochrane.

Product 2: Pond clean out and maintenance.

Milestone: Complete sediment pond clean out and maintenance at both ponds during 2002-2003.

Accomplishments: The bid was let June 24, 2003, for the dredging the sediment basins and the construction of a sediment holding pond. The bid also included the cost of reclaiming the holding pond. The land for the holding pond was donated by a local farmer. A total of 2,412 cubic yards of sediment were removed from the two ponds by SD Lakes and Streams (SDLS). The dredging went slowly because of equipment breakdowns, logs from beaver cuttings and rock piles. SDLS estimated that 77 percent of silt was removed from the ponds. Two permits were required to complete the project; for storm water discharges and the second for a temporary permit to use public waters. With the majority of the watershed seeded to grass, very little sediment is expected to enter the ponds.

Objective 3: Lake Oliver In-Lake Phosphorus Stabilization

Task 5: Application of alum (a non-toxic aluminum sulfate slurry) to Lake Oliver to remove phosphorus from the water column and hold it in sediment at the lake bottom. Alum treatment is a federally and state approved restoration technique. There are no nutrients entering Lake Oliver so no watershed work is needed. The local sponsor will be monitoring the land use in the watershed to ensure no changes take place in the watershed.

Product: Alum treatment of Lake Oliver.

Milestone: Complete the alum treatment of Lake Oliver during 2002.

Accomplishments: Sweet Water Technology of Aitkin, MN applied alum to Lake Oliver (Figure 4.). A total of 75,121 gallons was applied October 15 – 17, 2002 at a cost of $70,606.00.

Figure 4. Applicator Barge.

Task 6: Establishment of aquatic macrophytes in Lake Oliver. The intent is to replace the current, undesirable algae-dominated plant community with aquatic macrophytes as the principal consumer of remaining in-lake nutrients. This should improve clarity and reduce nuisance algal blooms. Since the response of macrophytes will be unknown, the sponsor will

monitor the growth in the lake and if needed, macrophytes will be "planted" in Lake Oliver.

Product 1: Establishment and management of macrophyte populations at several sites within Lake Oliver.

Milestone: Establish and initiate management of macrophyte populations at several sites within Lake Oliver during 2002.

Accomplishments: The activity was discontinued because of lack of cooperator interest. The funds budgeted for the activity were transferred to Task 5.

Objective 4: Implement an Information and Education Program

Task 7: Provide information and education on project goals, objectives, progress, and best management practices to the general public, lakeshore and watershed property owners and operators.

Product 1: Zero phosphorus fertilizer promotion.

Milestone: Promote zero phosphorus fertilizer use during 2002-2004.

Accomplishments: The Deuel County Conservation District and Lake Cochrane Improvement Association, promoted a program wherein lake shore property owners would get reimbursed for fertilizer cost if they used zero phosphorus fertilizer. A total of 1620 pounds of zero phosphorus fertilizer was used over a two year period. Two special workshops were held to educate the public on the consequences of over-fertilizing lawns, but the turn-out was always low and disappointing. To address this challenge, the Project Coordinator attended other organization's meetings and gave a short presentation on the lawn fertilizer program. This turned out to be an innovative and successful way to reach more people.

Product 2: Zero phosphorus fertilizer promotion.

Milestone: Promote lakeshore property soil testing during 2002-2004.

Accomplishments: Thirty soil tests taken samples taken on property around Lake Cochrane during 2003 and 2004. On average, phosphorus levels were found to be high. The analysis of sixteen of the samples indicated phosphorous fertilizer was not needed. The Lake Cochrane Improvement Association paid for the lake shore homeowners share of the soil test costs.

Product 3: Public information meetings and project awareness signs.

Milestone: Conduct 10 public information meetings and place two project awareness signs during 2002-2004 and 2002 respectively.

Accomplishments: The Lake Cochrane Improvement Association held quarterly meetings. The

Deuel Conservation District held monthly meetings. The project coordinator attended the meetings report on project activities. Public meetings were held in Clear Lake and at Lake Cochrane to inform producers and lake shore home owners about project goals and the types of cost share assistance available.

News releases and news articles (Appendix 1) about the project and available programs were published in local papers.

BMPs installed were documented with photo points at several locations.

Two project awareness signs were installed with one on the south side of Lake Oliver, by the South Dakota Game Fish and Parks (SDGFP) public access and one on the west side of Lake Cochrane by the SDGFP public access.

Table 1 summarizes the products planned versus installed and lists the status and/or date the product was completed if applicable.

Table 1. Products Planned Versus Installed Comparison.

PRODUCT	PLANNED	COMPLETED	DATE COMPLETED
Livestock Mitigation Structures	1	0	Discontinued
Crop Rotation Management Plans	16	16	Complete 5/10/2003
Grazing Management Systems	1	0	Discontinued
Alternate Watering Systems	1	1	Complete 9/20/2003
Stand-pipe replacement on Sediment ponds	2	2	Complete 6/10/2004
Grassed Waterways	0	0	Discontinued
Wetland/Riparian Area Restoration	0	6 acres	Complete
Pond Clean out and Maintenance	2	2 (2,412 cu. yds.)	Complete 10/25/2004
Alum Treatment of Lake Oliver	1	1	Complete 10/18/2002
Macrophyte Management	0	0	Discontinued
Zero Phosphorous Fertilizer Program	0	1620 #	Complete 8/15/2004
Lakeshore Property Soil Testing	0	30	Complete 8/9/2004
Public Information Meetings	10	8	Complete 12/31/2004
Project Awareness Signs	2	2	Complete 4/26/2003
Semi Annual GRTS Reporting	4	7	Complete 4/2005
Final Report	1	1	Complete 6/2005

EVALUATION AND MONITORING

The evaluation and monitoring plan consisted of documentation of project activities and BMP implementation. Water quality sampling was not included in the project implementation plan. However, after the alum application to Lake Oliver was completed, water quality samples were taken to determine the effect of the treatment on water quality. The results of are discussed in the Lake Oliver Total Phosphorous Reduction section of this report.

Seven GRTS reports on the progress of all project activities on the Lake Cochrane and Lake Oliver Project Implementation Plan (PIP) were submitted to DENR.

The project coordinator attended eight meetings of the Lake Cochrane Improvement Association (LCIA) and gave reports on the Lake Cochrane/Lake Oliver Watershed Project.

Actual project expenses are shown in Table 4. Tables 2 and 3 show the original and revised respectively. The budget was revised twice to provide additional funds needed to complete the sediment ponds clean out and alum treatment portions of the workplan and shift funds to where needed as the project evolved.

The goal for Lake Oliver was attained. See next section for phosphorous reduction in Lake Oliver.

The goal for Lake Cochrane was attained by the implementation of BMPs in targeted areas of the watershed and rehabilitation of the sediment retention ponds. See Table 1 for a comparison of BMPs planned versus installed.

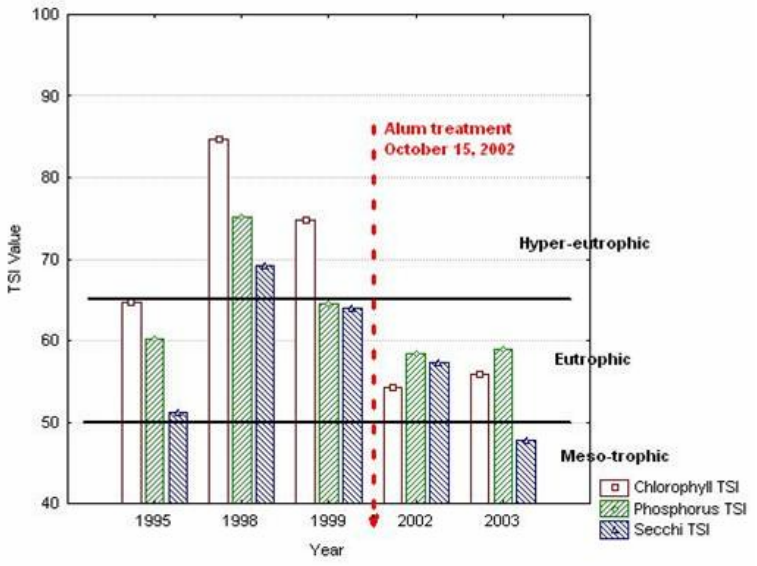
Monitoring Results: Lake Oliver Total Phosphorus Reduction

Prior to the Lake Oliver alum treatment, the mean total phosphorus (TP) concentration was 0.069 mg/L. To meet a 50 percent (TP) reduction, the mean concentration should be reduced to an estimated 0.035 mg/L. This is a difference of 0.034 mg/L indicating that an estimated 138.7 pounds (lbs.) or 0.069 tons must be "locked" up by the alum in order to meet the 50 percent reduction target. The estimate is based on reductions recommended in the 2000 TMDL report (page 128).

Total phosphorus samples were collected during the 2003 growing season (June, July and August) following the alum treatment which took place during October 2002. The mean TP concentration post alum was 0.045 mg/L. The concentration equates to a 34.8 percent reduction in TP. Since the alum was applied during 2002, an estimated 97.9 lbs (0.049 tons) of phosphorus was tied up or made unavailable to primary producers. The removal of an additional 40.8 lbs. (0.020 tons) remained to be tied up to meet the 50 percent reduction target.

The reduction (34.8 percent) of total phosphorus in Lake Oliver had a positive impact on the chlorophyll a. According to long-term data, chlorophyll a strongly correlates with ($r = .96$), the in-lake total phosphorus concentration (Figure 4.). The TSI calculated from available 2003 data indicates a mean growing season TSI of 54.2 (reduced from 67.03 listed in the 1999 TMDL report). The land is under the target of 65 for fully supporting its beneficial uses.

Figure 5. Lake Oliver TSI Trends.



The reduction was based on the 1999 lake volume. Upon further investigation, it was discovered that Lake Oliver lost volume due to dry conditions the three years following the study (SDDENR). By re-calculating the reduction estimate using a 2 foot volume loss and the 2003 mean TP concentration (0.045 mg/L), reduction estimates changed from the previously reported value.

If Lake Oliver lost 2 ft. of depth over the entire surface area, it would reduce the volume from 1500 acre/feet (1999) to 1140 acre/feet in 2003. It was estimated that Lake Oliver had approximately 281.4 pounds of internal phosphorus load at a mean growing season concentration of 0.069 mg/L during 1999. At a mean growing season concentration of 0.045 mg/L during 2003 with an estimated volume of 1140 acre/feet, Lake Oliver internal TP load was estimated at 139.4 pounds**.** This equates (139.4/281.4 = .50 & 1-.50=50%) to a 50 percent reduction in total phosphorus. The data from both calculations indicate the 50 percent reduction in TP target was reached. The reduction in TP- post alum had dropped the mean growing season TSI from partially supporting (67.03) to fully supporting (54.2) its beneficial uses.

Total Phosphorus samples were also collected during the growing season of 2004. The mean TP concentration post alum was 0.065 mg/L. This post alum concentration equates to a 6 percent reduction in TP using 1999 lake volume estimates. By 2004, the elevation of Lake Oliver was estimated to have dropped 2.5 ft (SDDENR) from that of 1999, equating to approximately 450 acre/feet of water volume. During 1999, it was estimated that Lake Oliver had approximately 281.4 pounds of internal phosphorus load at a mean growing season concentration of 0.069 mg/L. At a mean growing season concentration of 0/065 mg/L in 2004 with an estimated volume of 1050 acre/feet, Lake Oliver internal TP load was estimated at 185.5 pounds. This equates (185.5/281.4 = .66 & 1-.66=34%) to a 34 percent reduction in total phosphorus. In conclusion, TP reduction in 2004 was not as prominent as in 2003 despite still showing a positive reduction. The mean growing season TSI calculated from 2004 data was 65.5 borderline indicating partial/full support. It is difficult to determine why there was an increase in TP between years. Limited data can be quite variable and at this time no conclusions will be drawn. DENR will continue to monitor TP, Secchi and Chlorophyll-a during the summer 2005.

COORDINATION WITH OTHER PROGRAMS

The Lake Cochrane/Lake Oliver Watershed Improvement Project coordinated efforts with several other programs and funding sources. The coordination took place during meetings held with the project partners.

The installation of agricultural BMPs was cost-shared with funds from a South Dakota Coordinated Soil and Water Conservation Grant awarded by the South Dakota Conservation Commission through the SD Department of Agriculture.

Project Sponsors & Supporting Agencies

Deuel County Conservation District – Local sponsor, district staff included the project coordinator and district manager supervised by the board of supervisors. The district coordinated project activities, reported on project activities and progress, vouched for grant funds, and provided record keeping. The project was audited. Use of funds was found to be correct.

Natural Resources Conservation Service (NRCS) - Technical assistance with the fencing out of the wetland and construction of a dugout to replace a water supply.

South Dakota Game, Fish & Parks (SDGFP) – Funding for the outlet structures on the retention ponds.

South Dakota Conservation Commission/South Dakota Department of Agriculture (SDDA) - Funding for the best management practices in the watershed.

East Dakota Water Development (EDWD) - Information and education for the project. EDWD also provided funding for the alum treatment of Lake Oliver and the retention ponds by Lake Cochrane.

SD Department of Environment and Natural Resources - Financial support and technical assistance. Provided the Lake Oliver and Lake Cochrane assessment report, administered the EPA 319 grant funds, provided a for administrative and technical assistance.

Lake Cochrane Improvement Association - Funding for the retention ponds, alum treatment of Lake Oliver, and education and outreach. The association also provided funding for salary and travel.

PROJECT BUDGET/EXPENITURES

The approved project implementation plan budget is shown in Table 2. An additional $17,973 in Section 319 funds was awarded to the project during September 2003. The additional funds were needed to complete the sediment ponds clean out and alum treatment portions of the workplan a second budget revision, approved during December 2004, was necessary to provide funds to complete retention pond related activities. The revised budget is shown in Table 3. State and local match sources and the amount anticipated from each entity are listed following the tables.

Table 4 contains a summary of the actual expenditures. Water quality monitoring costs were paid by DENR

Table 2 Lake Cochrane/Lake Oliver Watershed Project - Original Budget.

Objective/Task/Item	**Funding Source ($)**		
	Local	**Federal (319)**	**Total**
Objective 1			
Task 1 – Livestock BMPs (1,6)	4,000.00	0.00	4,000.00
Task 2 – Nutrient BMPs (1,6)	2,000.00	0.00	2,000.00
Objective 2			
Task 3 – Erosion BMPs (1,6)	2,500.00	0.00	2,500.00
Task 4 – Retention Ponds (3,5)	22,500.00	17,500.00	40,000.00
Objective 3			
Task 5 Lake Oliver Alum Treatment (3,4)	6,650.00	48,350.00	55,000.00
Task 6 – Macrophyte Management (3,4)	4,000.00	1,000.00	5,000.00
Objective 4			
Task 7 – Education/Outreach (2,3,4)	3,250.00	1,250.00	4,500.00
Objective/Task Total	**44,900.00**	**68,100.00**	**113,000.00**
Personnel/Support			
Salary/Fringe (3)	3,900.00	3,900.00	7,800.00
Office Rent (2)	1,200.00	0.00	1,200.00
Travel (3)	1,000.00	0.00	1,000.00
Supplies/Materials (2)	250.00	0.00	250.00
Telephone (2)	250.00	0.00	250.00
Total Personnel/Support	**6,600.00**	**3,900.00**	**10,500.00**
Administration			
Project Oversight	0.00	3,000.00	3,000.00
Coordination Meetings (2)	400.00	0.00	400.00
Total Administration	**400.00**	**3,000.00**	**3,400.00**
Project Total	**51,900.00**	**75,000.00**	**126,900.00**

1. – Landowner ……..$ 1,275
2 – Deuel County Conservation District…….$ 2,350
3 – Lake Cochrane Improvement Association……...$15,400
4 – East Dakota Water Development District…….. .$ 5,650
5 – SD Consolidated Water Facilities Construction Grant…$20,000
6 – S D Soil and Water Conservation Grant…….$ 7,225

Table 3. Lake Cochrane/Lake Oliver Watershed Project– Revised Budget (12/8/04).

Objective/Task/Item	Funding Source ($)		
	Local	Federal (319)	Total
Objective 1			
Task 1 – Livestock BMPs (1,6)	4,000.00	0.00	4,000.00
Task 2 – Nutrient BMPs (1,6)	2,000.00	0.00	2,000.00
Objective 2			
Task 3 – Erosion BMPs (1,6)	2,500.00	0.00	2,500.00
Task 4 – Retention Ponds (3,5)	34,160.00	17,477.00	51,637.00
Objective 3			
Task 5 Lake Oliver Alum Treatment (3,4)	8,543.00	62,063.00	70,606.00
Task 6 – Macrophyte Management (3,4)	2,107.00	0.00	2,107.00
Objective 4			
Task 7 – Education/Outreach (2,3,4)	2,550.00	1,250.00	3,800.00
Task 8 – Water Quality Monitoring (4)	240.00	360.00	600.00
Objective/Task Total	**56,100.00**	**81,150.00**	**137,250.00**
Personnel/Support			
Salary/Fringe (3)	3,900.00	8,823.00	12,723.00
Travel (3)	1,000.00	0.00	1,000.00
Supplies/Materials (2)	250.00	0.00	250.00
Telephone (2)	250.00	0.00	250.00
Total Personnel/Support	**5,400.00**	**8,823.00**	**14,223.00**
Administration			
Project Oversight	0.00	3,000.00	3,000.00
Coordination Meetings (2)	400.00	0.00	400.00
Total Administration	**400;.00**	**3,000.00**	**3,400.00**
Project Total	**61,900.00**	**92,973.00**	**154,873.00**

1 – Landowner …….$ 1,275
2 – Deuel County Conservation District…….$ 900
3 – Lake Cochrane Improvement Association…… $19,110
4 – East Dakota Water Development District . . . . . $ 9,590
5 – SD Consolidated Water Facilities Construction Grant . . $23,800
6 – SD Soil and Water Conservation Grant . . . . . $ 7,225

Table 4. Lake Cochrane/Lake Oliver Watershed Project Actual Expenditures.

Objective/Task/Item	Funding Source ($)								
	Federal (319)	Local							Total
		CWFCG	SWCG	EDWDD	LCIA	CD	LO	SDGFP	
Objective 1									
Task 1 – Livestock BMPs	0.00	0.00	3,400.00	0.00	333.00	0.00	0.00	0.00	3,733.00
Task 2 – Nutrient BMPs	0.00	0.00	1,700.00	230.00	535.00	0.00	0.00	0.00	2,465.00
Objective 2									
Task 3 – Erosion BMPs	0.00	0.00	2,125.00	0.00	0.00	0.00	49.00	0.00	2,174.00
Task 4 – Retention Ponds	16,085.00	23,800.00	0.00	2,400.00	8,189.00	0.00	0.00	1,069.00	51,543.00
Objective 3									
Task 5 Lake Oliver Alum Treatment	62,063.00	0.00	0.00	4,271.00	4,272.00	0.00	0.00	0.00	70,606.00
Task 6 – Macrophyte Management	0.00	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Objective 4									
Task 7 – Education/Outreach	76.00	0.00	0.00	1,011.00	435.00	0.00	76.00	0.00	1,598.00
Task 8 – Water Quality Monitoring	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Objective/Task Total	**78,224.00**	**23,800.00**	**7,225.00**	**7,912.00**	**13,764.00**	**0.00**	**125.00**	**1,069.00**	**132,119.00**
Personnel/Support									
Salary/Fringe	9,249.00	0.00	0.00	0.00	4,092.00	0.00	0.00	0.00	13,341.00
Travel and Misc.	0.00	0.00	0.00	0.00	1,193.00	0.00	0.00	0.00	1,000.00
Total Personnel/Support	**8,823.00**	**0.00**	**0.00**	**0.00**	**5,285.00**	**0.00**	**0.00**	**0.00**	**14,534.00**
Administration									
Project Oversight/Coordination	5,500.00	0.00	0.00	0.00	0.00	2,250.00	0.00	0.00	7,750.00
Total Administration	**5,500.00**	**0.00**	**0.00**	**0.00**	**0.00**	**2,250.00**	**0.00**	**0.00**	**7,750.00**
Project Total	**92,973.00**	**23,800.00**	**7,225.00**	**7,912.00**	**19,049.00**	**2,250.00**	**125.00**	**1,069.00**	**154,403.00**

CWFCG Consolidated Water Facilities Construction Grant SWCG– SD Soil and Water Conservation Grant
EDWDD – East Dakota Water Development District LCIA – Lake Cochrane Improvement Association CD – Conservation District
LO – Land Owner SD GFP – SD Dept. of Game, Fish, and Parks

SUMMARY OF ACCOMPLISHMENTS

Aspects of the Project that Did Not Work Well

Because of the small size of the watershed and the limited number of producers, it was difficult to find willing producers and projects for every line item and conservation practice in the work plan.

Livestock Mitigation Structures

Because of the limited size of the watershed and small farm size, a producer interested in constructing an animal nutrient management system was not identified.

Grazing Management Systems

Producers were not interested in this practice. The pastures are small. There is very little pasture land in the water shed.

Grassed Waterways

Producers were not interested in this practice because the majority of the crop ground is in CRP.

Macrophyte Management

This practice was discontinued because of lack of cooperator interest.

Future Activity Recommendations

The retention ponds will be monitored by the Lake Cochrane Improvement Association (LCIA) and the South Dakota Game, Fish & Parks (SDGFP). The Natural Resources Conservation Service, Farm Service Agency, Deuel County Conservation District, District Supervisors and County Office Committees will be responsible for ensuring the BMPs installed with Section 319, SD Soil and Water Conservation, and SD Consolidated funds operated and maintained properly for the duration of each contract. Follow up compliance spot checks will be conducted by the local sponsor and NRCS.

APPENDIX A

10/17/01
Courier

DENR Water Board Recommends Cochrane Watershed Projects to EPA

The state Board of Water and Natural Resources recommended that the U.S. Environmental Protection Agency (EPA) approve four watershed projects and provide $722,000 in grant funding assistance when the board met Thursday, October 11th over the Digital Dakota Network.

The recommendations will now be forwarded to the EPA for approval under its Section 319 Nonpoint Source grant program. Nonpoint source refers to the polluted runoff from urban, agricultural, and forest lands. The South Dakota Department of Environment and Natural Resources (DENR) administers nonpoint source grants funded by EPA in the state.

Included in the recommendations is a total maximum daily load (TMDL), implementation project for the Lake Cochrane/Lake Oliver watersheds.

A total maximum daily load is the calculated amount of specific pollutants that a waterbody can receive and still meet water quality standards. The TMDL implementation project is designed to reduce pollutants entering waterbodies to meet established TMDL goals set during earlier assessments.

"Completing total maximum daily loads is a requirement of the Clean Water Act," said DENR Secretary Steve Pirner," and if EPA helps fund these projects, the end result will be better water quality in South Dakota."

The projects recommended for funding include:

Lake Cochrane/Lake Oliver Watershed Improvement Project, $75,000.00 grant recommended for a watershed implementation project, sponsored by the Deuel Conservation District, to reduce phosphorus levels in Lake Oliver and Lake Cochrane.

10/16/02
Courier

Lake Oliver Alum Treatment To Improve Water Quality

The South Dakota Department of Environment and Natural Resources (DENR), is inviting area residents to Lake Oliver on Wednesday, October 16, to observe the lake being treated with alum. Activities will be held at the boat dock on the south side of Lake Oliver beginning at 9:00 a.m.

State staff and a professional alum applicator will be on hand to answer questions about the alum treatment process.

The alum will be applied to the surface of the lake where depths are greater than five feet. Alum or aluminum sulfate, is a nontoxic material used to control algae by reducing the amount of phosphorus in the water. As the alum settles to the bottom, it collects suspended particles and traps nutrients at the bottom of the lake.

Alum is used regularly in municipal water treatment plants to help treat water for human consumption. It is also harmless to fish and aquatic plants.

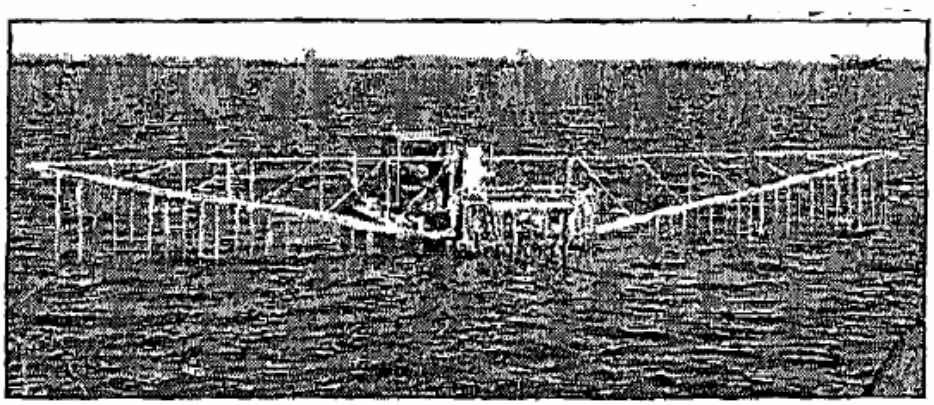
The alum treatment is expected to take three days to treat the entire lake. The alum treatment is part of a larger project designed to improve water quality on both Lake Cochrane and Lake Oliver.

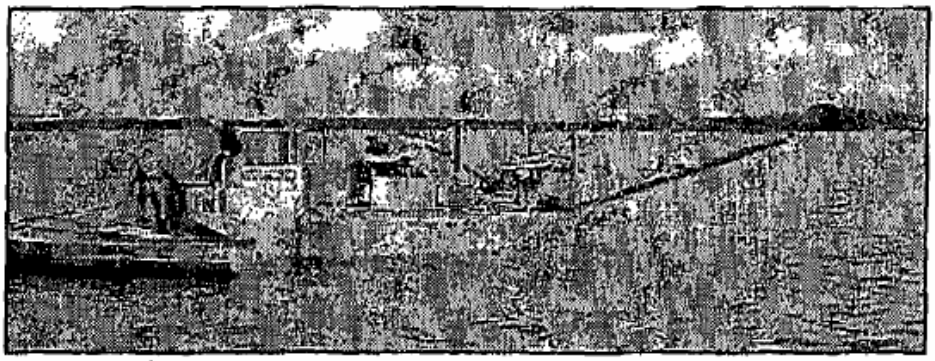
Governor Bill Janklow secured sufficient federal and state funding to complete the Lake Cochrane/Lake Oliver Watershed Improvement Project, which will cost an estimated $125,000.00. Grants include $75,000.00 from the U.S. Environmental Protection Agency through the 319 Nonpoint Pollution Control Program, $20,000.00 from the state's Consolidated Program, and $7,225.00 from the state's Coordinated Soil and Water Conservation Program. The remaining funds will come from the Deuel County Conservation District, Lake Cochrane Improvement Association, East Dakota Water Development District, and local landowners participating in the watershed project.

The Deuel County Conservation District is the project sponsor.

Lake Oliver is a shallow, 180-acre lake located east of Clear Lake just off Highway 22 near the South Dakota-Minnesota border. The lake has experienced water quality problems in recent years and was placed on the state's 1998 303(d) Waterbody List of impaired waters along with neighboring Lake Cochrane. Lake Oliver was placed on the list because of excessive nutrients, siltation, and noxious aquatic plants. Lake Cochrane was placed on the list because of the presence of fecal coliform bacteria; however, subsequent assessment monitoring in 1999 found low numbers of fecal coliform.

The Deuel County Conservation District completed a total maximum daily load (TMDL) in 1999. The TMDL concluded that the major problem for the two lakes was excessive nutrients in Lake Oliver that lead to the growth of noxious aquatic plants including algae. Sediment in Lake Oliver is the primary source of nutrients within the lake, and that only minimal nutrients reach the lake from the watershed. Treating Lake





Alum was placed in Lake Oliver last week by the barge machine pictured above. The hoses on the long beams work much like a boom sprayer in a field, with the nozzles under water releasing the alum which will help clear up the lake of weeds.

Lake Oliver Treated With Alum To Improve Water Quality

An alum treatment project completed last week should produce noticeable water quality improvements in Lake Oliver. The project was carried out by the Deuel County Conservation District under a water quality project approved by the Department of Environment and Natural Resources (DENR).

A specially-designed barge with attached booms was used to apply more than 70,000 gallons of alum to the surface of Lake Oliver. Sweetwater Technology Corporation of Aitkin, Minnesota owns the barge. Treatment of the lake began Tuesday, October 15, and was completed Thursday, October 17.

Alum, or aluminum sulfate, is a nontoxic material used to control algae by reducing the amount of phosphorus in the water. As the alum is applied and settles to the bottom, it collects suspended particles and traps nutrients at the bottom of the lake.

Alum treatment has been used successfully to improve water quality in several Minnesota lakes. DENR is not aware of its use on any lakes in South Dakota, although the city of Mitchell is considering alum treatment of Lake Mitchell.

Alum is used regularly in municipal water treatment plants to help treat water for human consumption. It is also harmless to fish and aquatic plants.

"Completing the first alum treatment of a lake in South Dakota was exciting," said DENR Secretary Steve Pirner. "DENR is proud to be able to work with the Deuel County Conservation District and their local sponsors that include the Lake Cochrane Improvement Association, East Dakota Water Development District, and local landowners to complete this water quality improvement project."

Lake Oliver is a shallow, 180-acre lake located east of Clear Lake just off Highway 22 near the South Dakota-Minnesota border. The lake has experienced water quality problems in recent years and was placed on the state's 1998 303(d) Waterbody List of impaired waters along with the neighboring Lake Cochrane. Lake Oliver was placed on the list because of excessive nutrients. Lake Cochrane was placed on the list because of the presence of fecal coliform bacteria; however, subsequent assessment monitoring in 1999 found low numbers of fecal coliform.

The alum treatment on Lake Oliver is part of a larger project designed to improve water quality on both Lake Cochrane and Lake Oliver. Sediment retention ponds adjacent to Lake Cochrane will also be cleaned out to ensure that sediment loadings to Lake Cochrane remain at a low level.

The Deuel County Conservation District completed a total maximum daily load (TMDL) in 1999. The TMDL concluded that the major problem for the two lakes was excessive nutrients in Lake Oliver that lead to the growth of noxious aquatic plants including algae. Sediment in Lake Oliver is the primary source of nutrients within the lake, and that only minimal nutrients reach the lake from the watershed. The goal of the project is to reduce the phosphorus concentrations in Lake Oliver by 50 percent.

Governor Bill Janklow helped secure sufficient federal and state funding to complete the Lake Cochrane/Lake Oliver Watershed Improvement Project. The overall estimated cost of the project is $125,000.00. Grants include $75,000.00 from the U.S. Environmental Protection Agency through the 319 Nonpoint Pollution Control Program, $20,000.00 from the state's Consolidated Program, and $7,225.00 from the state's Coordinated Soil and Water Conservation Program. The remaining funds will come from the Deuel County Conservation District, Lake Cochrane Improvement Association, East Dakota Water Development District, and local landowners participating in the watershed project.

The Deuel County Conservation District is the project sponsor.

For more information on the TMDL conducted at Lake Oliver and Lake Cochrane, visit www.state.sd.us/denr/DFTA/Watershed Protection/TMDL/TMDL CochraneOliver.pdf or contact Rich Hanson, DENR, at 605-773-4216.

10/23/02 Courier

Public Opinion Photo by Wayne Hammond

Department of Environment and Natural Resources project officer Gene Stueven presented the department's assessment findings for Lake Cochrane and Lake Oliver at a two-hour meeting attended by about 50 local residents Monday night in Clear Lake. The high presence of carp is a problem for both lakes.

High carp presence is a key problem for Deuel County lakes

■ State looks at Lake Cochrane, Lake Oliver.

By Wayne Hammond
Public Opinion Staff Writer

LAKE COCHRANE — The results of a 1999 Department of Environment and Natural Resources assessment of Lake Cochrane and Lake Oliver released Monday night show a high prevalence of carp in the eastern Deuel County lakes has played a major role in their at times questionable water quality.

"Carp play a larger role in these two lakes, not because of an excess of the fish themselves but because there is so little sedimentation in the lakes," said Gene Stueven, DENR project officer, who made the two-hour presentation of the office's findings at Lake Cochrane's Shady Beach Resort. "The sediment loads are so small that when the carp are there it makes a larger impact."

Stueven said he was not surprised by the results of the assessment, which showed that Lake Oliver contained significantly more algae than Lake Cochrane.

Lake Oliver had spilled into Lake Cochrane for six years before the start of the assessment, prior to this wet cycle it had been about 20 years since Oliver had reached water levels that ran into Cochrane. Thus far this year the lakes have not flowed into one another.

"We expected Oliver to have more algae than Cochrane," he said. "What is surprising is the small amount of nutrients coming into the lakes relative to other lakes in the state."

Lake Cochrane was listed on the 1998 S.D. Waterbody List for fecal coliform impairment based on public beach monitoring information, a fact which helped spur on public support for the assessment. However, no fecal coliform concerns were substantiated by the study.

Where the lake association, Deuel County Conservation District and East Dakota Water Development District go from here will likely be determined sometime in the next year. It is up to these agencies to determine which of the DENR recommendations — if any — to attempt to implement. From there, funding the projects becomes the first priority.

Options suggested included a Lake Oliver fish kill to remove the carp which would be followed by placing a barrier between the lakes to prevent fish migration between the lakes and dredging Lake Oliver — an unlikely option based on the substantial cost of dredging.

Another option presented by Stueven — which he said he would favor strongly — is to give Lake Oliver an alum treatment. Alum, a non-toxic aluminum sulfate slurry, forms an aluminum hydroxide film as it is sprayed on the water. Upon application, it removes phosphorus and suspended solids — including algae — from the water and settles at the lake bottom. If left undisturbed at the bottom, it will not release the phosphorus, thereby nullifying the ability of algae to grow.

Though he believes Oliver's 180-acres would be an ideal candidate for such a procedure, Stueven said a major drawback of the alum treatment is the fact that it can be easily disturbed by boat motors, offsetting its purpose.

"Our work here is not done," Stueven concluded. "We will now help the local agencies develop a plan based on the goals we showed them and go from there with finding funds with which to move forward."