**Begin here by typing in the year. Then tab or place your cursor in each gray shaded field as desired.**

**Federal Fiscal FY**: 2004 **Today's Date**: 2/2/2004

**Select project type from the drop-down box below:**

**Project Type:** WATERSHEDS

**PROJECT TITLE**: **Okobojo Creek Watershed Assessment Project**

**PROJECT SPONSOR**

**NAME**: Sully County Conservation District

**ADDRESS**: PO Box 203

**ADDRESS**:

**CITY**: Onida **STATE**: SD **ZIP**: 57564-0203

**PHONE**: **EXT**:

**FAX**: **E-MAIL**:

**PRIMARY CONTACT**

**NAME**: Duane Nielsen **PHONE**: 853-2410 **EXT**:

**SIGNATORY NAME**: **PHONE**: **(OPTIONAL)**

**STATE CONTACT PERSON**:

**NAME**: Paul Lorenzen

**PHONE**: 773-4047 **EXT**:

**FAX**:

**E-MAIL**: paul.lorenzen@state.sd.us

**CATEGORY & FUNCTIONAL CATEGORY**

**Drop-down lists. Please select up to 4 categories below**.

**NPS Category and Percent**

The primary category of pollution is intended to identify the principal or main pollutant(s) the project is attempting to correct. The selections are obtained from drop-down list associated with the data element.

| NPS CATEGORY | Percent |
|---|---|
| AGRICULTURE | 100 |

**NPS Functional Category**

These activities are intended to identify the principal or main approach, remedy, or solution to achieve the objective of the project. Selections are obtained from the drop-down list associated with the data element.

| NPS FUNCTIONAL CATEGORY OF ACTIVITY |
|---|
| WATERSHED ASSESSMENTS |

**WATERSHED NAME**: Okobojo Creek

**USGS HYDROLOGICAL UNIT CODE**: 10130105

**LATITUDE/LONGITUDE**

Use degrees and decimals only. Do not put in degrees, minutes, seconds. For example: put in **45.55** rather than 45 deg 30 min 30 sec.

**PROJECT LOCATION** **LATITUDE**: 44.7 **LONGITUDE**: -100.2

**WATERBODY TYPE**

A name indicating the type of waterbody/watershed associated with the NPS project.

LAKES
RIVERS/STREAMS
RESERVOIRS

**TMDL AND CLEAN LAKES INFORMATION**

A field that identifies the relationship of the given nonpoint source project's funding to total maximum daily load (TMDL) activities.

**TMDL PRIORITY: LOW**

**TMDL DEVELOPMENT?: YES**

**TMDL IMPLEMENTATION?: NO**

**CLEAN LAKES PROJECT?: NO**

**POLLUTANT TYPE**

The name of the pollutant that the particular nonpoint source project is attempting to address. Selection of the pollutant is made from drop-down list.

**POLLUTANTS:**

**PHOSPHORUS**

Pollutants not listed in POLLUTANTS box if needed. Selection of the pollutant is made from the drop-down list.

**ADDITIONAL POLLUTANTS:**

**FUNDING**

***PLEASE TAB OUT OF THE FIELD AFTER ENTRY***

**FY§319(h) BUDGET FUNDS:** $39,000

**NON-FEDERAL MATCHING FUNDS:** $27,000

**OTHER FEDERAL FUNDS**:

**STATE FUNDS**: $15,000

**LOCAL FUNDS**: $12,000

**TOTAL BUDGET**: $66,000

**OTHER FUNDS**:

**STATE 319(h) FTE's FUNDED UNDER THIS GRANT**: .75

**GOALS AND PROJECT DESCRIPTION**

**NOTE: To add the GOALS and PROJECT DESCRIPTION just TAB to the shaded area and type or cut/paste text. You may type or cut/paste as much text as you like. The box will expand.**

Narrative fields used to provide the anticipated benefits and goals of the project and the project description.

**GOALS:** The long term goal of the Okobojo Creek Watershed Assessment Project is to locate and document sources of nonpoint source pollution in the watershed and produce feasible restoration alternatives in order to provide adequate background information needed to drive a watershed implementation project to improve sediment and nutrient problems with the creeks and lakes as well as creating a Total Maximum Daily Load Report for each of the 303(d) listed water bodies.

**PROJECT DESCRIPTION:** Okobojo Creek is a natural stream that drains a portion of Sully County and is the primary tributary to Sully Lake and Cottonwood Lake in Sully County. The creek receives runoff from agricultural operations and the lakes have experienced declining water quality. Both watersheds are predominately agricultural in land use with grazing and cropland.

## 2.0 STATEMENT OF NEED

**2.1** The purpose of this pre-implementation assessment is to locate the sources of impairments to Sully Lake and Cottonwood Lake in Sully County, South Dakota, and the tributaries in their watersheds. Each of the watersheds ultimately drains into the Missouri River. The creeks and their small tributaries are streams with loadings of sediment, nutrients and metals related to snowmelt and rainfall events.

**2.2** Okobojo Creek is a tributary to Sully Lake and Cottonwood Lake. This stream drains a combination of grazing and cropland acres. Feeding areas for livestock are present in the watershed. The stream carries sediment loads and nutrient loads, which degrade water quality in the two lakes as well as resulting in increased eutrophication.

**2.3** See map in Figure 1

**2.4** Land use in the watershed is primarily agricultural consisting of corn, wheat, and hay as the principle crops with beef cattle composing the majority of the livestock raised in the region.

The primary soil associations in the region are composed of Durrstein and Egas, Promise silty clay, Onita silt loam, Hurley silt loam, Saline and alkali land, Talmo gravelly loam, and Oahe loam.

The average annual precipitation in the watersheds is 16 inches of which a majority falls in the late spring and early summer. The area is occasionally subject to storms of moderate to severe intensity. They are often short in duration and can produce locally heavy rainfall.

Both lakes have good public access. Sully Lake has access to shore fishing and Cottonwood Lake has a boat ramp as well as shore fishing access.

**2.5** The purpose of this assessment is to develop restoration alternatives for the Sully Lake and Cottonwood Lake Watersheds and serve as the foundation for a Section 319 implementation project.

**2.6** The species listed in the federal list of threatened and endangered species are the bald eagle (Haliaeetus leucocephalus) (threatened), whooping crane (Gras Americana) (endangered), piping plover (Charadrius melodus) (threatened, critical habitat), least stern (Sterna antillaram athallasos) (endangered). The piping plover and the least tern are found on the reservoir and it is unlikely that they will be encountered. The bald eagle and the whooping crane are not likely to be impacted by the assessment work of this project.

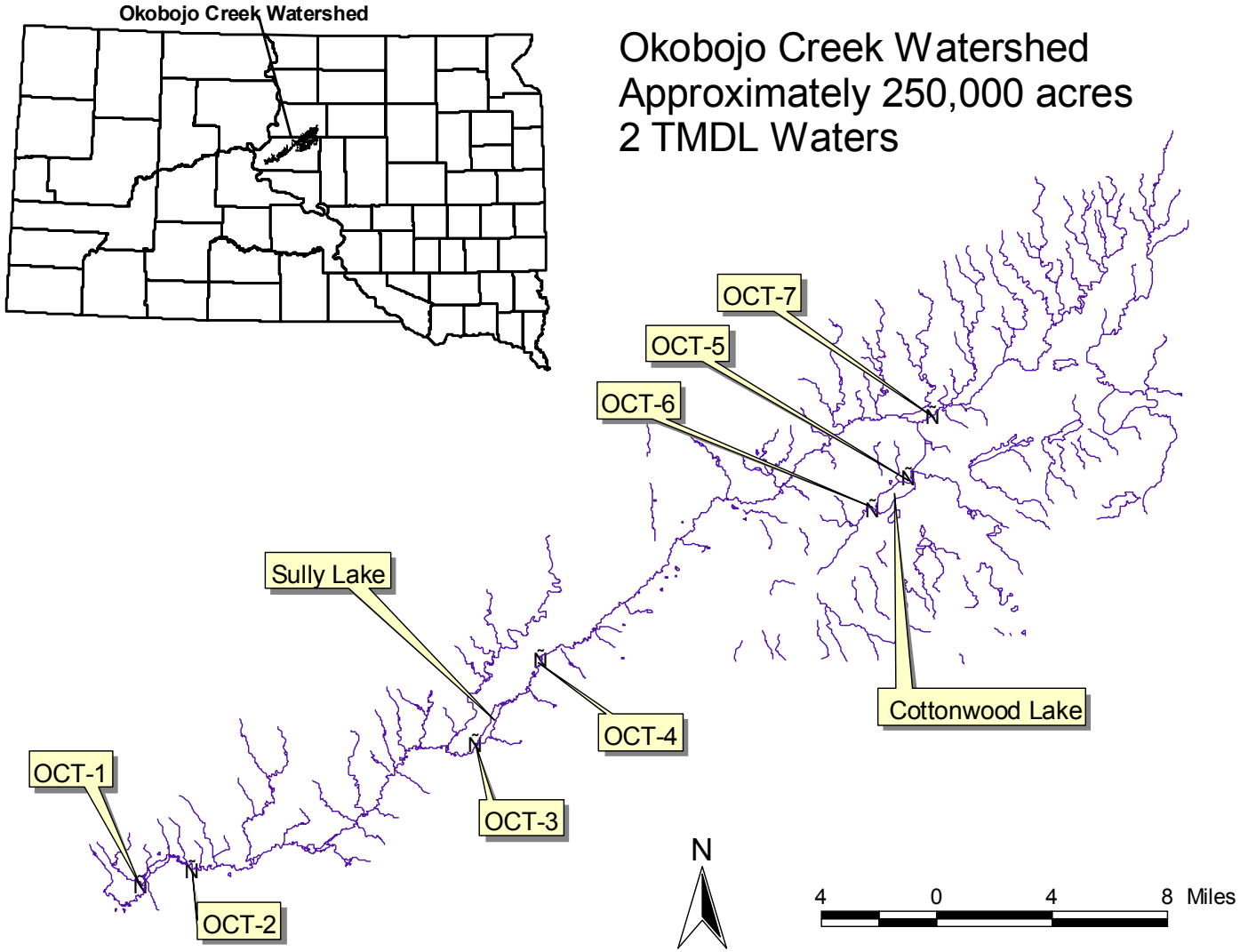



**Figure 1. Okobojo Creek Watershed and Location in the State**



*Revised 2/5/04*

# PROJECT DESCRIPTION

## 3.1 GOALS

The purpose of this project is to locate and document sources of impairments to the Okobojo Creek watershed and to develop feasible alternatives for restoration. From the information gathered for this project, a TMDL will be written for both Sully Lake and Cottonwood Lake. The TMDL will provide sufficient background information to drive a watershed implementation project to improve the water quality.

## 3.2 OBJECTIVES AND TASKS

OBJECTIVE 1: Determine current conditions in the lakes and calculate the trophic state of each lake. This information will be used to determine the total amount of nutrient trapping that is occurring in each of the lakes and the amount of nutrient reduction required to improve the trophic condition of Sully Lake and Cottonwood Lake.

Task 1: Collect water quality data on the lakes in the watershed.

Nutrient and solids parameters will be sampled at two in-lake sites on Cottonwood Lake (Figure 2) and on Sully Lake (Fig 3). Samples will be collected from the surface of both Sully Lake and Cottonwood Lake on a monthly basis for a period of one year, except during periods of unsafe ice cover. During June, July and August samples will be collected bi-monthly. The total number of samples to be collected will be 56 for both lakes in the project area. The South Dakota State Health Laboratory in Pierre will analyze all samples.

The purpose of the in-lake samples is to assess ambient nutrient concentrations in the lake and identify its trophic states. Water column dissolved oxygen as well as temperature profiles will be collected along with the chemical samples. Water samples will be collected with a Van Dorn Sampler and the sample bottles will be shipped to the state health lab by the most rapid means available. The SD State Health Lab in Pierre will analyze fecal coliform samples. Staff from Watershed Protection in the Matthew Training Center Laboratory Pierre, SD, will analyze all other biological samples.

Lake Sampling Locations - Sully Lake

SL-1 This site is located in the southern portion of the lake.

SL-2 This site is located in the northern portion of the lake.

Lake Sampling Locations - Cottonwood Lake

CL-1 This site is located in the southern portion of the lake.

CL-2 This site is located in the northern portion of the lake.

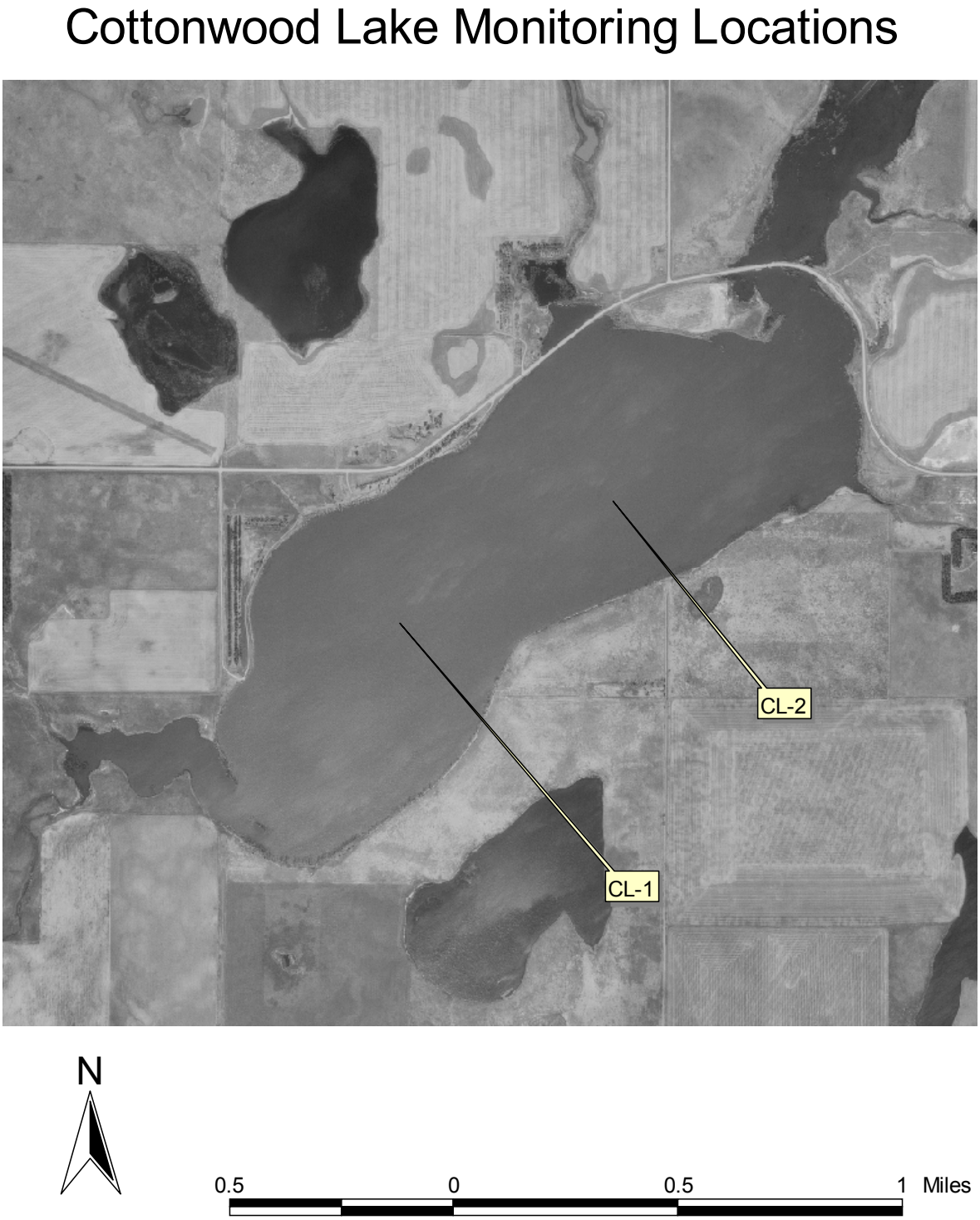
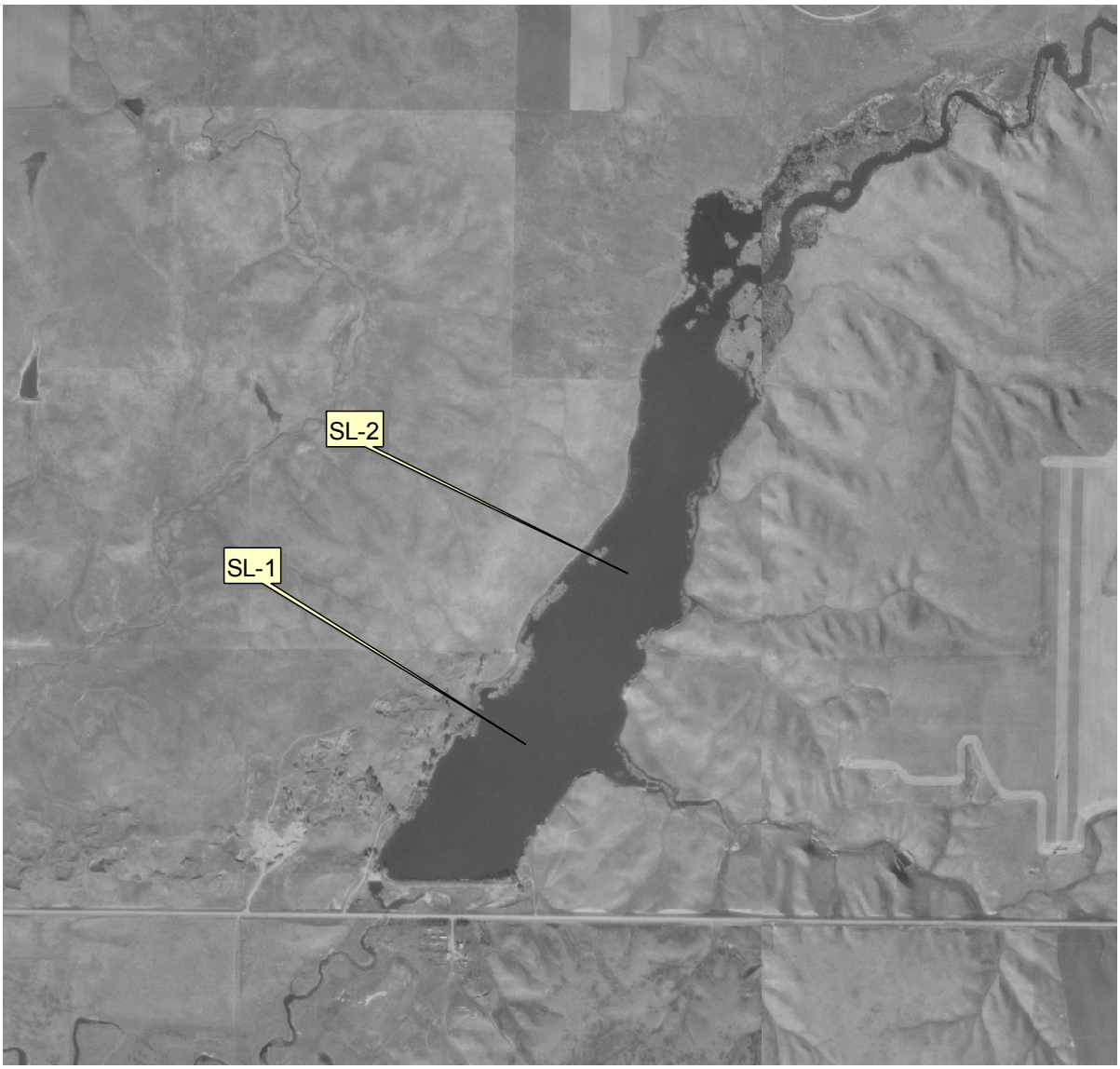



**Figure 2. Cottonwood Lake Monitoring Stations**

# Sully Lake Monitoring Locations



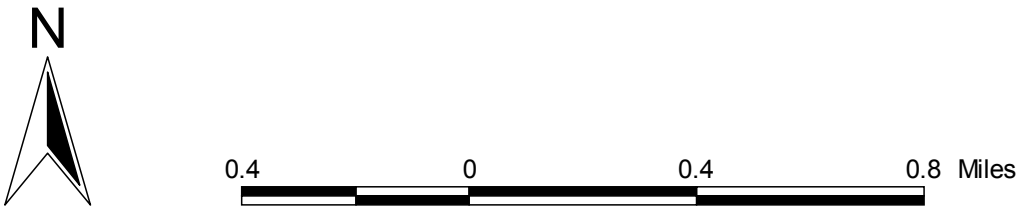



**Figure 3. Sully Lake Monitoring Stations**

PARAMETERS MEASURED

| Physical | Chemical | Biological |
|---|---|---|
| Air Temperature | Total Alkalinity | Fecal Coliform |
| Water Temperature | Field pH | Chlorophyll A |
| Secchi Transparency | Dissolved Oxygen | *E coli* |
| Depth | Total Solids | |
| Visual Observations | Total Dissolved Solids | |
| | Total Suspended Solids | |
| | Ammonia | |
| | Un-ionized Ammonia | |
| | Nitrate-Nitrite | |
| | Total Kjeldahl Nitrogen | |
| | Total Phosphorus | |
| | Total Dissolved Phosphorus | |
| | Conductivity | |

All samples will be collected using the methods described in the Standard Operating Procedures for Field Samplers by the State of South Dakota Watershed Protection Program.

Task 2: Lake Sediment Survey.

Transects will be surveyed on Sully Lake and Cottonwood Lake during ice covered periods. Transects will be in intervals of approximately 200 feet. A depth sounding and sediment probe, using a length of rebar, will be conducted along each transect. The results of the survey will be used to calculate volume of soft sediment in the lakes and to create an accurate bathymetric map of each lake.

An elutriate sample will be collected from a point near the center of each lake to determine the presence or absence of contaminates in the lake bottom sediments.

PRODUCTS:

In-lake water quality report.
A bathymetric map of sediments in the lake basins.

RESPONSIBLE AGENCIES:

Task Prioritization:
Project Coordinator
Project Sponsor

Design and Technical Assistance:
South Dakota Department of Environment and Natural Resources

OBJECTIVE 2: Estimate the sediment and nutrient loadings from Okobojo Creek and the individual tributaries in the sub-watersheds through hydrologic and chemical monitoring. The information will be used to locate critical areas in the watershed to be targeted for implementation.

Task 3: Develop hydrographs for the tributary sites within the project.

Install water level recorders on 7 tributary monitoring sites (Fig 1) and maintain a continuous stage record for the project period, with the exception of winter months after freeze up.

| Site | Location | |
|---|---|---|
| OCT-1 | Lat. | -100.431679 |
| | Long. | 44.634358 |
| OCT-2 | Lat. | -100.395611 |
| | Long. | 44.642741 |
| OCT-3 | Lat. | -100.197753 |
| | Long. | 44.708476 |
| OCT-4 | Lat. | -100.152817 |
| | Long. | 44.751194 |
| OCT-5 | Lat. | -99.894404 |
| | Long. | 44.844983 |
| OCT-6 | Lat. | -99.939047 |
| | Long. | 44.812425 |
| OCT-7 | Lat. | -99.878451 |
| | Long. | 44.875750 |

Discrete discharge measurements will be taken on a regular schedule and during storm surges. Discharge measurements will be taken with a hand held current velocity meter.

Discharge measurements and water level data will be used to calculate a hydrologic budget for the creek system. This information will be used with concentrations of sediment and nutrients to calculate loadings from the watershed.

Task 4: Collect water quality samples

Collect water quality samples from 7 tributary monitoring sites. Samples will be collected during spring runoff, storm events, and monthly base flows. Approximately 10 water samples will be collected at each site.

**PARAMETERS MEASURED FOR TRIBUTARY SAMPLES:**

| PHYSICAL | CHEMICAL | BIOLOGICAL |
|---|---|---|
| air temperature | total solids | fecal coliform |
| water temperature | total susp. Solids | *E coli* |
| discharge | dissolved oxygen | |
| depth | ammonia | |
| visual observations | un-ionized ammonia | |
| water level | TKN | |
| | total phosphorus | |
| | total dis. phosphorus | |

field pH

Samples will be collected twice weekly during the first week of spring snowmelt runoff and once a week thereafter until runoff ceases. Storm events and base flows will be sampled throughout the project period for an estimated total number of 70 samples.

Water samples will be collected with a suspended sediment sampler when possible. All sample bottles will be iced and shipped to the lab and collected using the methods described in the Standard Operating Procedures for Field Samplers by the State of South Dakota Watershed Protection Program. Nutrient and solid parameters will be sampled at seven tributary sites in the Okobojo Creek Watershed. The South Dakota State Health Laboratory in Pierre, SD, will analyze all samples. The watershed water quality data will be integrated together with the hydrologic loadings to provide a complete analysis of the Okobojo Creek hydrologic system.

PRODUCTS:

Tributary water quality report
Hydrologic and nutrient loads will be calculated for the entire watershed.

RESPONSIBLE AGENCIES:

Task Prioritization:
Project Coordinator
Project Sponsor

Design and Technical Assistance:
South Dakota Department of Environment and Natural Resources

OBJECTIVE 3: Ensure that all water quality samples are accurate and defendable through the use of approved Quality Assurance/ Quality Control procedures.

TASK 5: Collect required QA/QC samples.

The collection of all field water quality data will be accomplished in accordance with the Standard Operating Procedures for Field Samplers, South Dakota Watershed Protection Program.

A minimum of 10 percent of all the water quality samples collected will be QA/QC samples. QA/QC samples will consist of field blanks and field duplicate samples. An estimated 12 sample sets will be collected during the project. All QA/QC activities will be conducted in accordance with the Nonpoint Source Program Quality Assurance Project Plan.

PRODUCTS:

A Quality Assurance/ Quality Control monitoring report.

RESPONSIBLE AGENCIES:

Task Prioritization:
Project Coordinator
Project Sponsor

Design and Technical Assistance:
South Dakota Department of Environment and Natural Resources

OBJECTIVE 4: Evaluation of agricultural impacts to the water quality of the watersheds through the use of the Annualized Agricultural Non Point Source (AnnAGNPS) Model.

TASK 6: The Okobojo Creek watershed will be modeled using the AnnAGNPS model. AnnAGNPS is a comprehensive landuse model, which predicts soil erosion and nutrient transport/loading risks for agricultural watersheds.

Required data layers for the execution of this model include landuse, soils, topography, and hydrology. Collection of this data will be determined by the availability and accuracy of available data layers.

PRODUCTS:

Report on land use in the watershed.
Recommendations for remediation of pollution sources in the watershed.

RESPONSIBLE AGENCIES:

Task Prioritization
Project Coordinator
Project Sponsor

Design and Technical Assistance:
South Dakota Department of Environment and Natural Resources

OBJECTIVE 5: Public participation and involvement.

TASK 7: Informational meetings will be held to inform the general public and the involved parties of progress on the study. These meetings will provide an avenue for input from the residents in the area. It is anticipated that the coordinator will be asked to speak at both conservation district meetings as well as water development district meetings.

News releases will be prepared and released to local news media on a quarterly basis. These releases will be provided to local newspapers, radio stations and TV stations.

PRODUCTS:

1 news releases.
6 meetings

RESPONSIBLE AGENCIES:

Task Prioritization
Project Coordinator

Project Sponsor

Design and Technical Assistance:
South Dakota Department of Environment and Natural Resources

OBJECTIVE 6: Reporting

TASK: 8 Progress Reports

Provide reports as part of state and federal grant requirements. Semi-annual progress reports will be completed and presented at the appropriate general public meetings to keep the involved parties up-to-date with work activities and ensure their timely completion.

TASK: 9 Final Report

Develop a comprehensive final report and TMDL (including remediation activites) summary for the parameters included on the 2002 303(d) list and any other parameters that may need a TMDL as found through the study. The final report will include all activites of the project as well as analysis of data collected during the project.

PRODUCTS:

Semi-annual progress reports for GRTS
Final project report and TMDL

RESPONSIBLE AGENCIES:

Task Prioritization

Project Coordinator
Project Sponsor

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources

3.3 MILESTONE TABLE – See-attached milestone.

3.4 No special permits are required to do this assessment project.

3.5 The Sully County Conservation District is an appropriate lead project sponsor for this project. The Sully County Conservation District boundaries encompass most of the involved watershed. The conservation district is important to this project because of their relationship with watershed landowners. The main problems with the Okobojo Creek Watersheds appear to be sediment and nutrient loadings.

## 4.0 COORDINATION PLAN

4.1 The following groups/agencies have agreed through an informal agreement to cooperate in the Okobojo Creek Watershed Assessment Project.

**Sully County Conservation District** – Local Project Sponsor

**Central Plains Water Development District** – Local support, technical and financial assistance

**US Natural Resource Conservation Service** – Local support and technical assistance

**US Environmental Protection Agency** – Support and technical assistance

**South Dakota Department of Environment and Natural Resources** – financial and technical assistance

4.2 This project will coordinate activities with state, federal, and local government agencies through monthly project meetings.

4.3 There currently are no other agencies conducting assessment project activities on the Okobojo Creek Watersheds.

## 5.0 EVALUATION AND MONITORING PLAN

5.1 The monitoring strategy is explained in Section 3. The project will produce Semi-annual progress reports. The sampling and analysis procedures required to complete the tasks within Section 3 can be located in the Standard Operating Procedures for Field Samplers for the South Dakota Nonpoint Source Program (SOP). The specific locations of these sampling methods within SOP as they pertain to each task are documented in Table 4 on the following page.

**Table 1. Location of Sampling and Analysis Procedures for each applicable task involved with the Okobojo Creek Watershed Assessment Project.**

| TASK NUMBER | TASK DESCRIPTION | ACTIVITY | REFERENCE IN SDWRA-2003 SOP |
|---|---|---|---|
| Task 1 | Collect inlake water quality samples. | Water Quality Sampling | Vol I Section 14.0 |
| Task 2 | Conduct a macrophyte and shoreline survey on the lake. | Shoreline Survey | Vol II Section 2.0 |
| Task 3 | Elutriate Sample | Sediment Sample | Vol I Section 18.0 |
| Task 4 | Developing hydropgraphs. | Discharge measurements | Vol I Section 12.0 pages 3-7 |
| Task 5 | Collect stream water quality samples | Water Quality Monitoring | Vol I. Section 12.0 pages 7-15 |
| Task 6 | Collect QA/QC data | Quality Assurance | Vol I Section 8.0 |
| Task 7 | Use of the ANNAGNPS computer model | Watershed Modeling | Vol I Section 13.0 |

5.2 This assessment project consists of a combination of chemical, hydrologic, and land use. Monitoring sites will be maintained and sampled on the Okobojo Creek Watershed. Ambient samples will be collected along with spring runoff and storm events. Stream discharge will be routinely measured and loads will be calculated.

5.3 All water quality monitoring will be done in accordance with the approved South Dakota Nonpoint Source Quality Assurance/ Quality Control Project Plan and the Standard Operating Procedures for Field Samplers for the South Dakota Watershed Protection Program.

5.4 Results from all water quality monitoring efforts under the Okobojo Creek Watershed Assessment Project will be reported in the final project report. Data will be managed by the South Dakota Department of Environment and Natural Resources and maintained in a computer database. All sample data will be entered in the US EPA STORET Program. This data will be used as the foundation of a Section 319 Watershed Implementation Project proposal.

6.0 Budget

**Table 2. Okobojo Creek Budget by Source**

**PART 1 FUNDING SOURCES**

| **OKOBOJO CREEK WATERSHED ASSESSMENT PROJECT BUDGET** | | |
|---|---|---|
| | 2004 | TOTAL |
| EPA SECTION 319 FUNDS | $39,000 | $39,000 |
| OTHER FEDERAL FUNDS | $ 0 | $0 |
| DENR FUNDS | $15,000 | $15,000 |
| CENTRAL PLAINS WATER DEV DIST | $12,000 | $12,000 |
| **TOTAL BUDGET** | **$66,000** | **$66,000** |

**Table 3. Okobojo Creek Watershed Assessment Budget by Task**

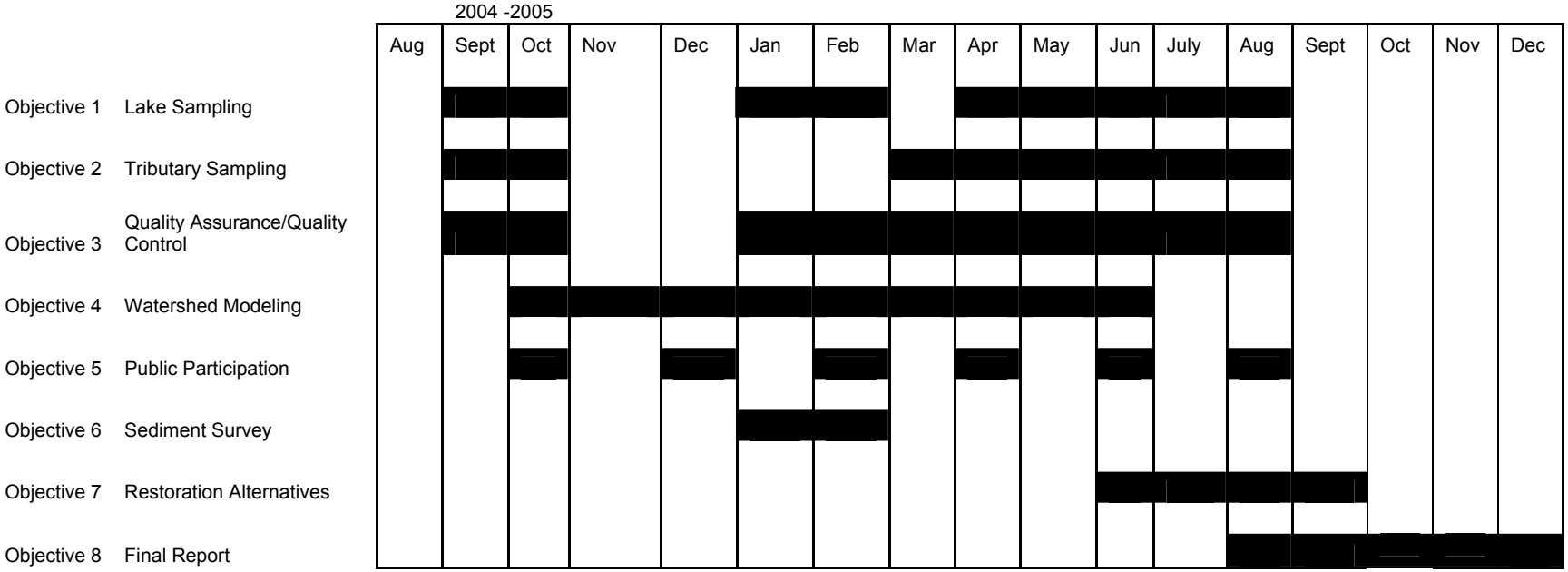
Part 2

| | | 2004 | Total | Cash Match | 319 Funds |
|---|---|---|---|---|---|
| 1) Salary/Benefits | 1 @ $16/ hr | $24,000 | $24,000 | $14,750 | $9,250 |
| 2) Travel | | $5,000 | $5,000 | $5,000 | |
| 3) Equipment | | $10,000 | $10,000 | | $10,000 |
| 4) Shipping and Supplies | | $1,300 | $1,300 | $700 | $600 |
| 5) Contingencies | | $200 | $200 | $200 | |
| Objective 1: Lake Sampling | | | | | |
| Lab Analysis | 56 samples@$150 | $8,400 | $8,400 | $1,000 | $7,400 |
| Elutriate Lab Analysis | 2 @ $1500 | $3,000 | $3,000 | $1,750 | $1,250 |
| Objective 2: Stream Sampling | | | | | |
| Lab Analysis | 70 samples @ $150 | $10,500 | $10,500 | | $10,500 |
| Objective 3: QA/QC | | | | | |
| Lab Analysis | 12 sample sets @ $300 | $3,600 | $3,600 | $3,600 | |
| Objective 4: Land Use Modeling* | | | | | |
| Objective 5: Public Participation* | | | | | |
| Objective 6: Reporting* | | | | | |
| **TOTAL** | | $66,000 | $66,000 | $27,000 | $39,000 |

* Costs for these tasks are included in items 1 – 5 at the top of the table.

**Table 4. Okobojo Creek Milestone Table**

Okobojo Creek Watershed Assessment
Milestone Chart



SOUTH DAKOTA NONPOINT SOURCE PROGRAM
QUALITY ASSURANCE PROJECT PLAN

SUBMITTED BY:

SOUTH DAKOTA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF FINANCIAL AND TECHNICAL ASSISTANCE
WATER RESOURCES ASSISTANCE PROGRAM

Prepared by: Robert Smith
February 2001

Project Title: Okobojo Creek Watershed Assessment Project

APPROVED BY:

| | |
|---|---|
| South Dakota Watershed Protection Program<br>Environmental Senior Scientist, Assessment Section | 2-4-04<br>Date |
| South Dakota Watershed Protection Program<br>Project Officer | 2-4-04<br>Date |
| South Dakota Watershed Protection Program<br>Quality Assurance Coordinator | 2-5-04<br>Date |
| South Dakota DENR<br>Quality Assurance Coordinator | 2-4-04<br>Date |