NONPOINT SOURCE PIP SUMMARY FORM – PHASE 1

Vermillion Basin Watershed Summary

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**: 4/21/2004

Select project type from the drop-down box below:

Project Type: WATERSHEDS

PROJECT TITLE: Vermillion River Basin Watershed Assessment

PROJECT SPONSOR

NAME: Vermillion Basin Water Development District

ADDRESS: 1111 Railroad St.

ADDRESS:

CITY: Centerville **STATE**: SD **ZIP**: 57014

PHONE: 605-563-2883 **EXT:**

FAX: 605-563-0063 **E-MAIL**: vbwdd@hotmail.com

PRIMARY CONTACT

NAME: Brad Preheim **PHONE**: 605-563-2883 **EXT**:

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

STATE CONTACT PERSON:

NAME: Alan Wittmuss

PHONE: 605-677-6163 **EXT**:

FAX: 605-677-5895

E-MAIL: awittmus@usd.edu

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	50
ANIMAL FEEDING OPERATIONS	45
URBAN RUNOFF/STORMWATER	5

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
WATER QUALITY ASSESSMENT/MONITORING

WATERSHED NAME: Vermillion River Basin

USGS HYDROLOGICAL UNIT CODE: 10170102

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:** 43.1 **LONGITUDE:** -96.9

NONPOINT SOURCE PIP SUMMARY FORM – PHASE 1

WATERBODY TYPE

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

RIVERS/STREAMS
LAKES
RESERVOIRS
STREAMS

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: HIGH

TMDL DEVELOPMENT?: YES

TMDL IMPLEMENTATION?:

CLEAN LAKES PROJECT?: YES

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

POLLUTANTS:

PATHOGENS (COLIFORM)
TURBIDITY
NUTRIENTS

ADDITIONAL POLLUTANTS:

FUNDING

PLEASE TAB OUT OF THE FIELD AFTER ENTRY

FY§319(h) BUDGET FUNDS: $338,400

NON-FEDERAL MATCHING FUNDS: $225,600

OTHER FEDERAL FUNDS:

STATE FUNDS: $133,800

LOCAL FUNDS: $91,800

TOTAL BUDGET: $564,000

OTHER FUNDS:

STATE 319(h) FTE's FUNDED UNDER THIS GRANT: 2.00

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 Vermillion River Watershed Assessment is to locate and document sources of nonpoint source pollution in the watershed and produce feasible restoration recommendations. The project will provide information needed to develop a watershed implementation work plan with the objective of decreasing erosion, sedimentation, and fecal coliform loadings in the river/stream miles and nutrients in the lakes included in the project area. This project will result in a TMDL report for the 303(d) listed segments and lakes of the Vermillion River downstream of Lake Thompson. The parameters of concern in these segments include suspended solids, fecal coliform bacteria and nutrients.

PROJECT DESCRIPTION: The Vermillion River Watershed Assessment includes drainage from approximately 9 counties in southeastern South Dakota. The watershed area is approximately 1.43 million acres or (5,787 km2) (Figure 1). Silver Lake and East Lake Vermillion are included in the Vermillion River basin, and are listed on the 303(d) for TSI values above their ecoregion target.

This assessment is intended to be the initial phase of a watershed-wide restoration project. Through water quality monitoring, stream gaging, stream channel analysis, and land use analysis, the sources of impairment to the stream and the watershed will be documented and feasible alternatives for restoration will be presented in a final project report.

PROJECT SUMMARY SHEET

PROJECT TITLE: Vermillion River Basin Watershed Assessment

NAME AND ADDRESS OF LEAD PROJECT SPONSOR:
Vermillion Basin Water Development District
1111 Railroad St.
Centerville, SD 57014

LOCAL CONTACT:
Brad Preheim
Executive Secretary
Vermillion River Water Development District
1111 Railroad St.
Centerville, SD 57014
PHONE: (605) 563-2883
FAX: (605) 563-0063

STATE CONTACT:
Alan Wittmuss
Akeley-Lawrence Science Center
414 E. Clark
Vermillion, SD 57069-2390
PHONE: (605) 677-6163
FAX: (605) 677-5895

STATE: South Dakota **WATERSHED**: Vermillion River **HUC #** 10170102
PROJECT TYPES: [ ] BASE [x] WATERSHED [ ] GROUNDWATER [ ] I&E

WATERBODY TYPES
[ ] Groundwater
[x] Lakes/Reservoirs
[x] Rivers
[x] Streams
[ ] Wetlands
[ ] Other

NPS CATEGORY
[x] Agriculture
[x] Urban Runoff
[ ] Silviculture
[ ] Construction
[ ] Resource Extraction
[ ] Stowage and Land Disposal
[ ] Hydrologic Modification
[ ] Other

SUMMARIZATION OF MAJOR GOALS:

The long-term goal of the Vermillion River Watershed Assessment is to locate and document sources of nonpoint source pollution in the watershed and produce feasible restoration recommendations. The project will provide information needed to develop a watershed implementation work plan with the objective of decreasing erosion, sedimentation, and fecal coliform loadings in the river/stream miles and nutrients in the lakes included in the project area. This project will result in a TMDL report for the 303(d) listed segments and lakes of the Vermillion River downstream of Lake Thompson. The parameters of concern in these segments include suspended solids, fecal coliform bacteria and nutrients.

PROJECT DESCRIPTION:

The Vermillion River Watershed Assessment includes drainage from approximately 9 counties in southeastern South Dakota. The watershed area is approximately 1.43 million acres or (5,787 km^2) (Figure 1). Silver Lake and East Lake Vermillion are included in the Vermillion River basin, and are listed on the 303(d) for TSI values above their ecoregion target.

This assessment is intended to be the initial phase of a watershed-wide restoration project. Through water quality monitoring, stream gaging, stream channel analysis, and land use analysis, the sources of impairment to the stream and the watershed will be documented and feasible alternatives for restoration will be presented in a final project report.

FY 2004 319 funds requested: $338,400 **Match: $225,600**
Other federal funds: $ 0 **Total project costs: $564,000**
319 Funded Full Time Personnel: 2

2.0 STATEMENT OF NEED

2.1 The purpose of the Vermillion River Watershed Assessment is to determine the sources of impairments, develop a TMDL, and to serve as the foundation of an implementation project. The Vermillion River was listed in the South Dakota 2002 303(d) list. The segments listed were the mainstem of the Vermillion River from the confluence of the Turkey Ridge Creek and main stem to the Missouri River and the East Fork of the Vermillion River from the McCook/Lake County line to the Little Vermillion River. Two lakes, East Lake Vermillion and Silver Lake were also listed in the 2002 303(d) and will be included in this assessment.

The study watershed drains into the Missouri River at Vermillion, South Dakota. The streams in the study watershed contribute loadings of pathogens, nutrients and suspended solids related to snowmelt or rainfall events.

2.2 The Vermillion River watershed proposed to be assessed in this study is approximately 1.43 million acres. Located in southeastern South Dakota, the Vermillion River is one of the most important rivers in the state. The Basin is home to many small and vibrant communities. The Vermillion River is a perennial stream and the tributaries range from perennial to intermittent.

East Vermillion Lake is reservoir on the East Fork of the Vermillion River near the town of Canistota, SD. The reservoir has a surface area of approximately 223 ha (550 acres) with a watershed of approximately 107,000 ha (265,000 acres). The maximum depth is approximately 7 meters (23 feet). The TSI values of East Lake Vermillion vary from 65 to 70.

Silver Lake is located on the northern border of Turner and Hutchinson Counties. The lake has a surface area of approximately 160 ha (395 acres) and lies with in a 16,700 acre watershed. The watershed has very little relief and as a result there is very little flow to the lake. Silver Lake is a shallow lake, approximately 2.1 meters deep (7 feet). The TSI value for the lake varies from 70 to 80.

The species listed in the federal list of threatened and endangered species are the bald eagle (*Haliaeetus leucocephalus*), Topeka Shiner (*Notropis topeka*), Interior Least Tern (*Sterna antillarum athalassos*), Piping Plover (*Charadrius melodius*)(SDGFP, 2003). These species will not be impacted by the assessment work of this project.

2.3 The location of the Vermillion River Watershed assessment Project can be found in Figure 1. The watersheds for East Lake Vermillion and Silver Lake follow in Figures 2 and 3, respectively.

2.4 The Vermillion Basin watershed lies entirely within the Level III Ecoregion of the Northern Glaciated Plains. Land elevation ranges from approximately 1,150 to 1,600 feet above mean sea level (MSL).

Vermillion River Watershed

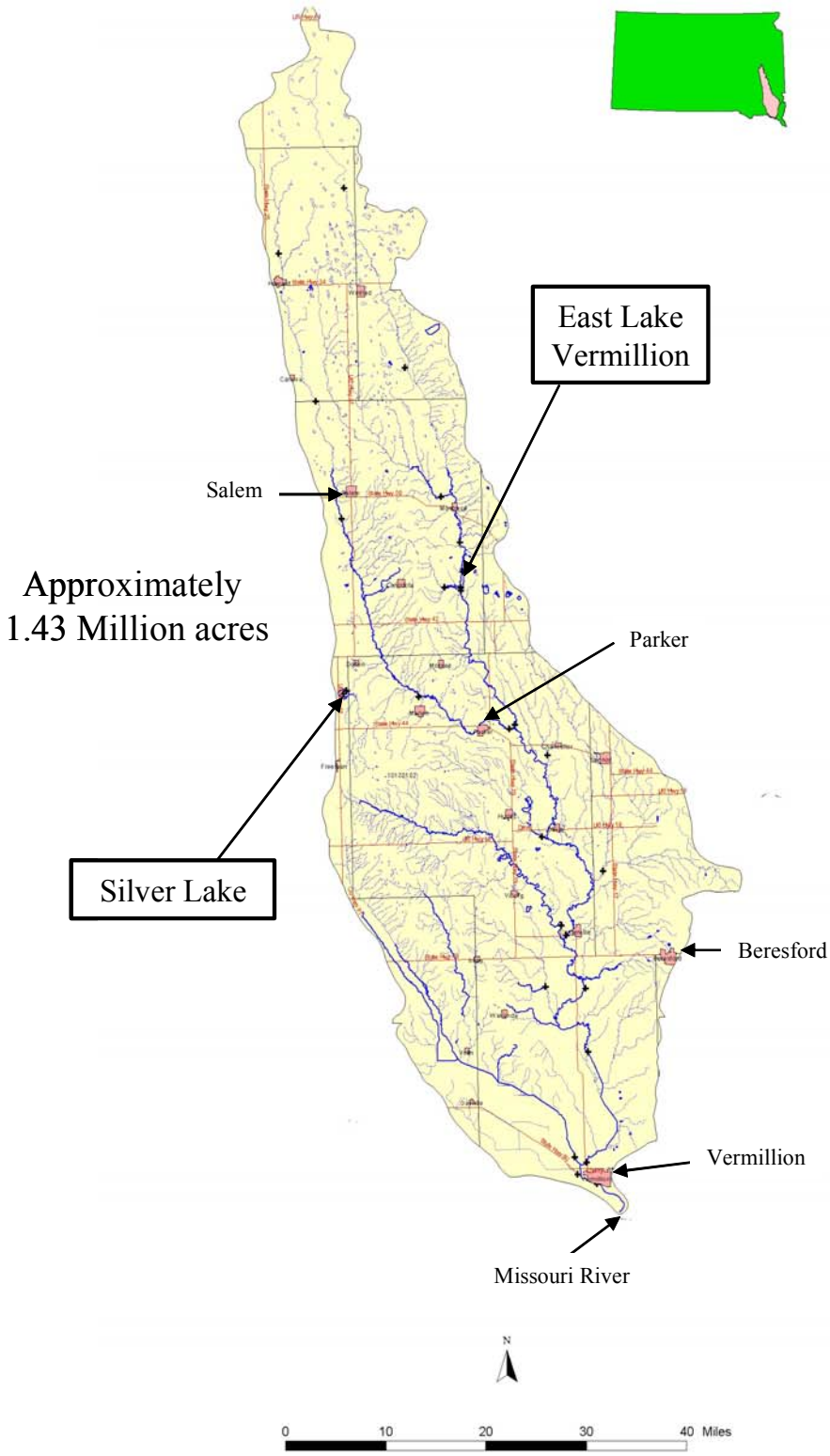


Figure 1. Location of the Vermillion River Watershed Assessment study area.

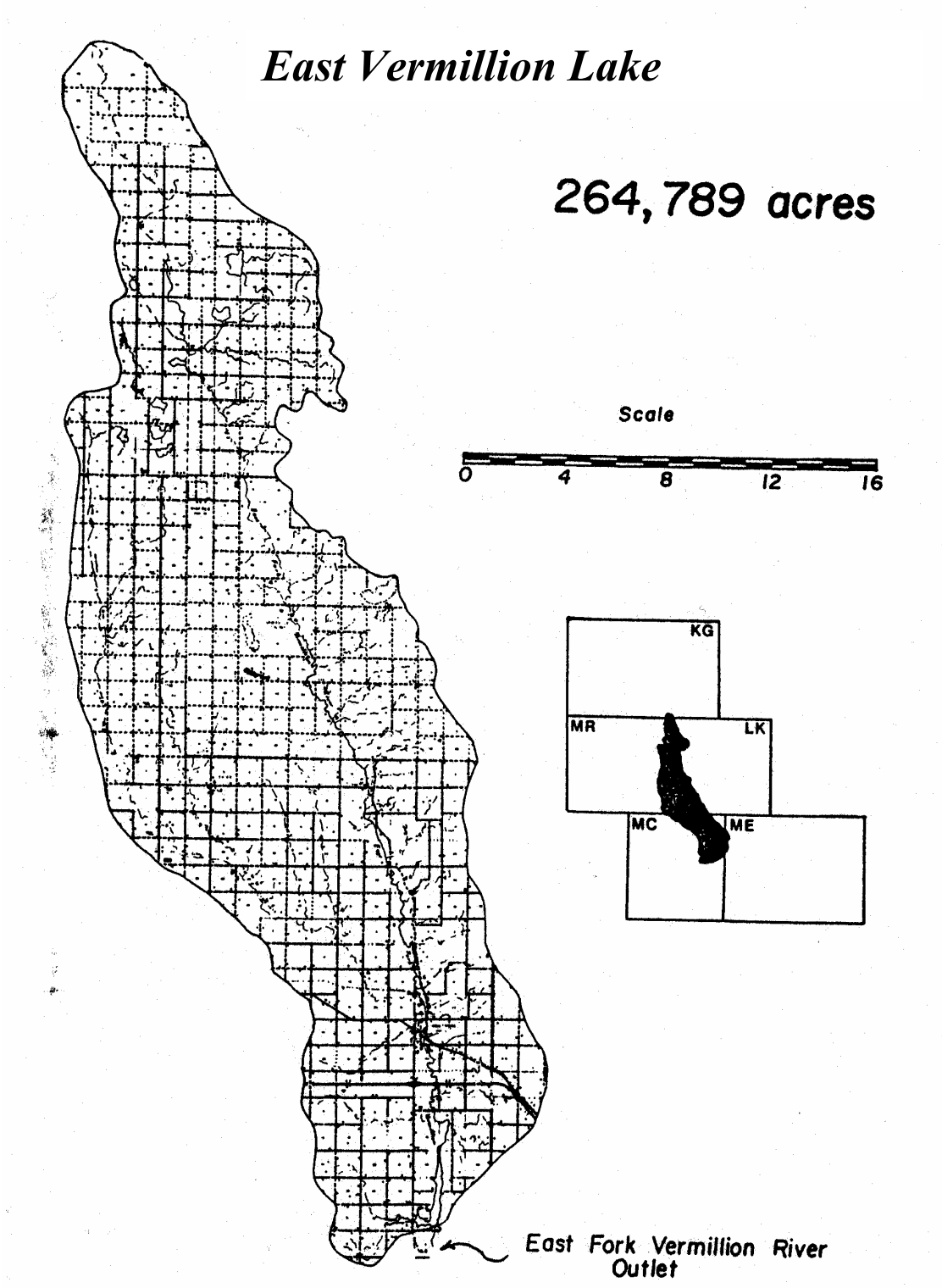


Figure 2. Location of the East Lake Vermillion Watershed Area.

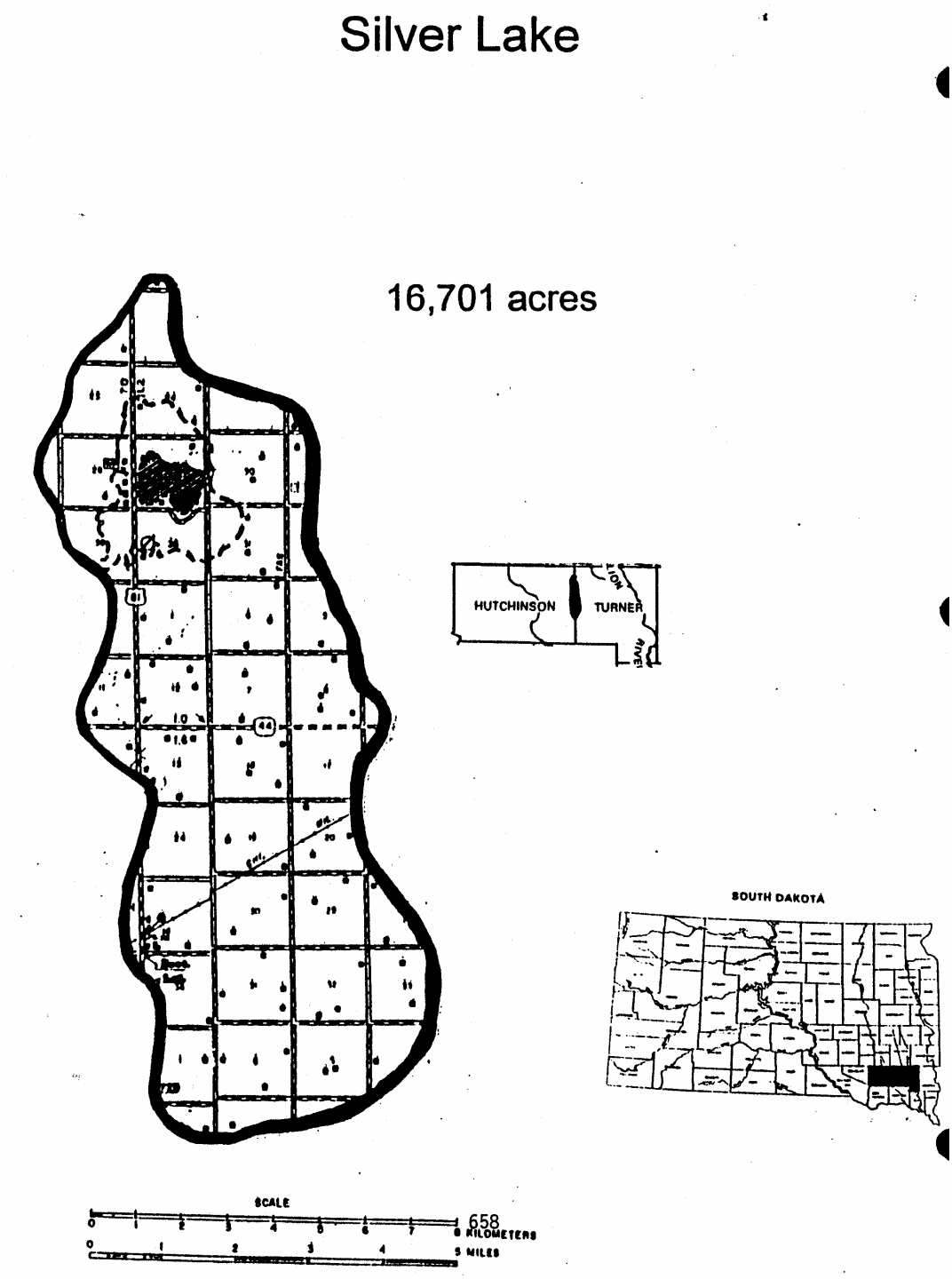


Figure 3. Location of Silver Lake Watershed Area.

Little detailed information is available on the land use for this project area. During the assessment this information will be gathered and included in the final report. It is known that the watershed is dotted with small communities surrounded by primarily row crop agriculture. There is some pasture and hay ground in areas not suitable for row crop farming. There are also a large number of animal feeding areas in the watershed. Detailed information will be gathered during the assessment project. Being a large basin that touches 9 counties, the soils range from well drained to poorly drained, and level to steep. There is a large mix of uplands, swales, and wetland depressions. Erosion rates will be determined by the assessment project.

There are approximately 20 communities within the project area. The populations range from less than 100 as in the city of Dolton to approximately 10,000 in Vermillion. Many of these municipalities have discharge permits. The information from these will be included in the final assessment report.

The Vermillion River basin has a subhumid, continental climate characterized by pronounced seasonal differences in temperature, precipitation, and other climatic variables. Temperature varies slightly from the northern to the southern end of the basin. Annual temperatures are slightly cooler at the northern parts of the basin. January is typically the coldest month (13°F in the north and 19°F in the south). July is typically the warmest month (73°F in the north and 75°F in the south).

The frost free days at the northern end of the basin are typically from May 17th to September 21st, while the southern frost free days are from May 4th to October 5th. The average annual precipitation in the watershed is somewhat variable, both spatially and temporally, ranging from 22 to 26 inches Generally, average annual precipitation decreases as you move north within the study watershed. Average seasonal snowfall for this region is approximately 30 inches.

2.5 The Vermillion basin was listed on the 303(d) list for suspended solids and fecal coliform. The lakes were listed for TSI values higher than their ecoregion targets. The sources for these listings will be determined during the assessment project. Most likely the sources are agricultural, however point sources in the area will be assessed and all results will be included in the final assessment report.

3.0 PROJECT DESCRIPTION

3.1 GOALS

The goal of this assessment project is to determine and document sources of impairments to the Vermillion River basin watershed with specific reports being generated for East Vermillion Lake and Silver Lake. After the assessment TMDLs will be written that will establish the water quality target and the methods needed to accomplish each TMDL. Critical areas of the watershed will be identified for implementation activities.

3.2 OBJECTIVES AND TASKS

Objective 1: Stream Sampling

Collect discharge measurements and water quality samples/measurements from the Vermillion River and tributaries necessary to estimate water quality parameter loadings.

TASK 1 <u>Develop stage discharge tables for all stream sites</u>.

Water-level recorders will be installed at DENR-gaged sites (Figure 4), Maintenance of continuous stage recorders will continue for two years with exception of winter months if the water freezes. Four United States Geological Survey (USGS) stream gaging stations (USGS06478540 – Little Vermillion near Salem, USGS06478600 – East Fork of the Vermillion River near Parker, USGS06478690 – West Fork Vermillion River near Parker, and USGS06479010 – Vermillion River near Vermillion) are currently active within the project area at sites. Project stations VREF14, VRWF13, and VR03 are located at the same location as the gaging station. The information for Little Vermillion near Salem will be used to help develop stage discharged curves in the area. Current and historical USGS gage data will be used, where possible.

Discrete discharge measurements will be taken on a regular schedule (monthly) and during storm events for all DENR-gaged sites. Discharge measurements will be taken with either a hand-held current velocity meter under wadeable conditions or with a bridge crane during high flows using methods adapted by the USGS. Continuous records of stage will be obtained with digital recorders. Discharge measurements and stage records will be used to generate stage-discharge relationships.

Discharge measurements and water level data will be analyzed to develop flows for all water quality sampling times. Stage and discharge measurements will be used to update existing gaging station rating curves and develop relationships at new gaging locations. This information will be combined with concentrations of sediment and nutrients to calculate loadings from the watershed.

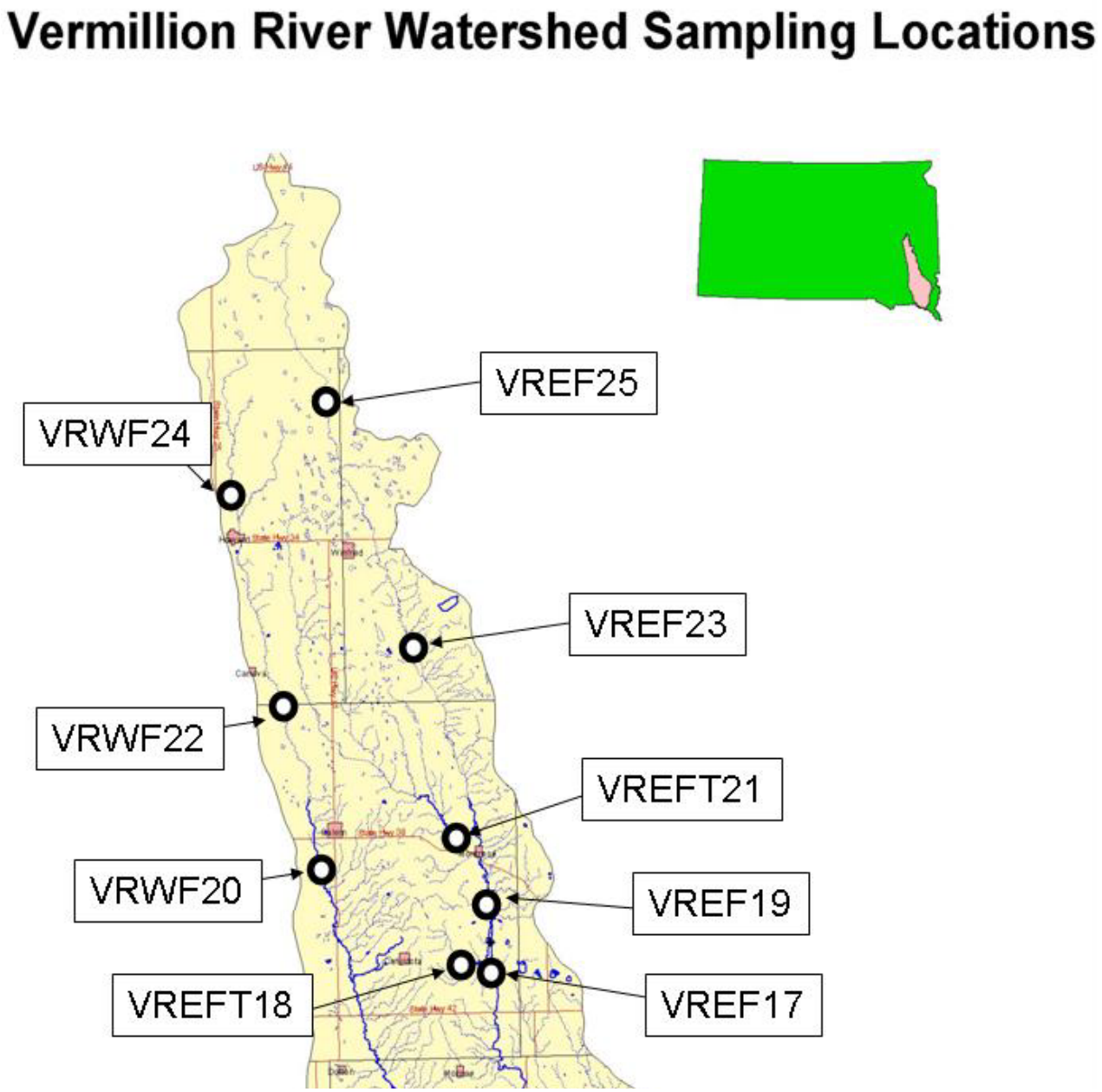
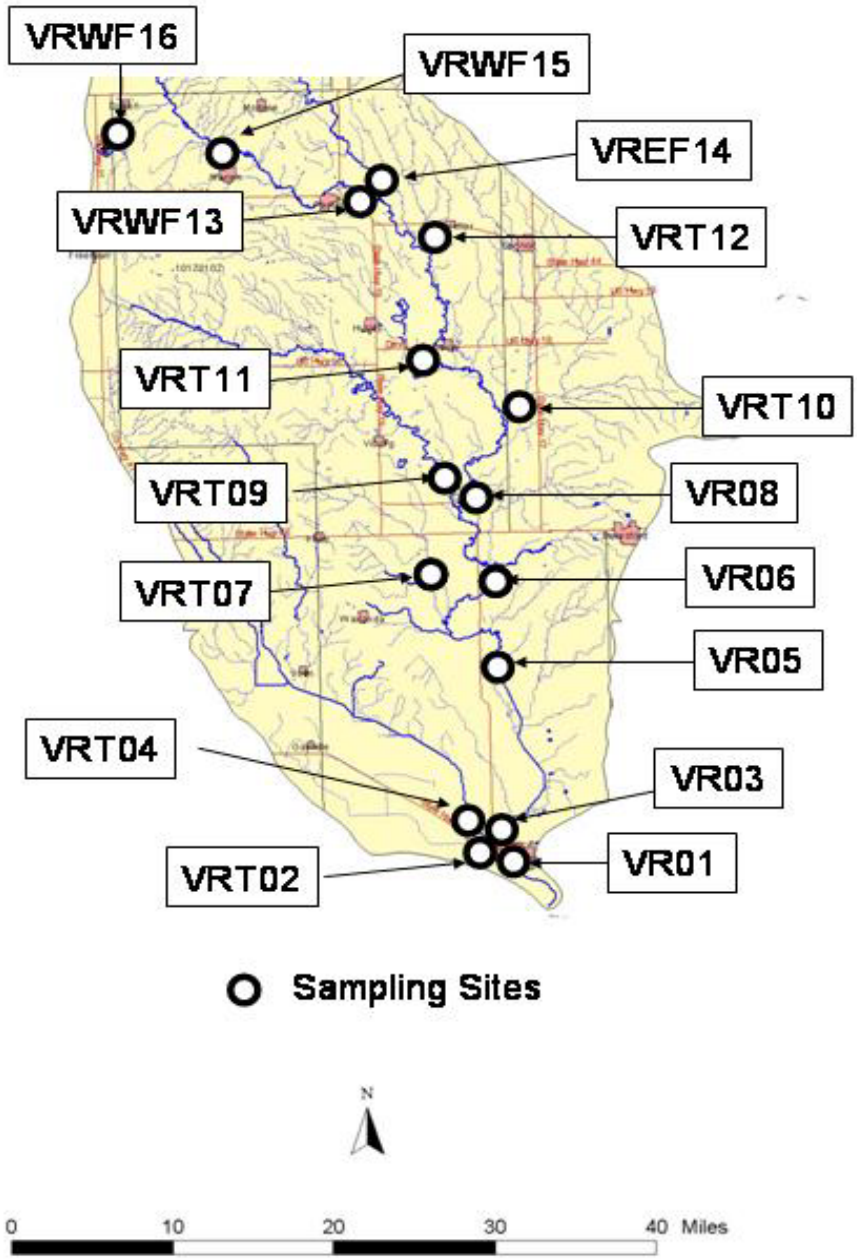


Figure 2. Locations of proposed stream sampling and gaging sites for the Vermillion River Watershed Assessment – Continued on the next page.

Figure 4 continued.



TASK 2 Collect water Quality Samples

Water-quality samples will be collected from stream sites as described in Table 1. Twenty-five tributary sites will be sampled monthly for two years to collect base-flow data. Nine base-flow samples will be collected each year from each site. A total of 450 base-flow samples will be collected during the project period. Additional samples will be collected during spring runoff and select storm events. Annually, 4 spring runoff and 4 storm samples will be collected at each site for a total of 400 during the project period. Two samples will be collected during the first week of spring snowmelt runoff and once a week thereafter, until runoff ceases, for a maximum of four supplemental spring runoff samples each year. The total number of baseflow and run-off samples at stream sites for the two year project period is estimated to be 850. The location of proposed stream monitoring sites may be found in Figure 2, and parameters to be collected are presented in Table 2.

Table 1. Proposed gaging sites for the Vermillion River Watershed Assessment.

Site ID	Name and Location Description	DENR Gaging	USGS Gaging
VR01	Vermillion River Below Vermillion	X	
VRT02	Vermillion River Tributary Yankton Clay Ditch	X	
VR03	Vermillion River Above Vermillion		X
VRT04	Vermillion River Tributary Clay Creek Ditch	X	
VR05	Vermillion River Near Hub City	X	
VR06	Vermillion River East of Colfax Corner	X	
VRT07	Vermillion River Tributary Frog Creek	X	
VR08	Vermillion River Near Centerville	X	
VRT09	Vermillion River Tributary Turkey Ridge Creek	X	
VRT10	Vermillion River Tributary Long Creek	X	
VRT11	Vermillion River Tributary Hurley Creek	X	
VRT12	Vermillion River Tributary Camp Creek	X	
VRWF13	West Fork Vermillion River Near Parker		X
VREF14	East Fork Vermillion River Near Parker		X
VRWF15	West Fork Vermillion River Near Marion	X	
VRWFT16	West Fork Vermillion River Outlet to Silver Lake	X	
VREF17	East Fork Vermillion River Outlet to East Lake	X	
VREFT18	East Fork Vermillion River Tributary Un-named	X	
VREF19	East Fork Vermillion River Near East Lake Vermillion	X	
VRWF20	West Fork Vermillion River Near Salem	X	

Table 1. Continued.

VREFT21	East Fork Vermillion River Tributary Little Vermillion	X	
VRWF22	West Fork Vermillion River Near Canova	X	
VREF23	East Fork Vermillion River South of Winfred	X	
VRWF24	West Fork Vermillion River Near Howard	X	
VREF25	East Fork Vermillion River Outlet to Lake Thompson	X	

Three reference sites that represent the best attainable condition in the watershed will be established. Nine baseflow samples per site per year and eight run-off samples per site per year will be collected. A total of 102 reference samples will be collected during the two-year project.

Water samples will be collected with an isokinetic sampler to ensure a depth-integrated sample along the stream cross-section. When a depth-integrated sample cannot be collected (i.e. water depth < 1ft.), then grab sampling methods should be used. All samples will be collected using approved methods described in the State of South Dakota Water Resource Assistance Program Standard Operating Procedures for Field Samplers (WRAP SOP). After collection, sample bottles will be iced and delivered to the SD State Health Laboratory for analysis.

Table 2. Parameters to be measured at stream sampling sites.

Biological Parameters	Physical/Field Parameters	Chemical Parameters
Fecal coliform bacteria	Water temperature	Alkalinity
E. coli	Air temperature	Ammonia as N
Macroinvertebrate communities	Dissolved oxygen	Nitrate + Nitrite as N
Periphyton communities	Field pH	Nitrogen, Total Kjeldahl (TKN)
Chlorophyll a (periphyton)	Specific conductance	Total dissolved phosphorus
Ash-free dry mass (periphyton)	Turbidity	Total phosphorus
Bacterial Source Tracking	Stage	Total solids
	Flow	Total dissolved solids**
	Visual observations	Total suspended solids
	Habitat assessment	Total volatile suspended solids

** Calculated Value

Task 3 <u>Collect samples for bacterial source tracking</u>

To help identify the source of the fecal coliform with in the watershed, bacterial samples will be analyzed to determine if the source is animal or human. If possible the source of the coliform samples will be analyzed to species. Approximately 45 samples will be collected each year. Sites will

be selected based on data from ambient monitoring sites throughout the watershed.

PRODUCTS:

Installation of twenty-two gaging stations (Three tributary sites are already being gaged by USGS).

Monthly discharge measurements will be collected at each site and stage discharge curves developed.

Eight hundred and fifty tributary water quality samples will be collected.

One hundred-two reference sites samples will be collected

Ninety bacterial source tracking samples

A water quality report will be produced, which will include a description of the relationship between chemical and physical data and the influence of the measured parameters on water quality.

COST: $180,300 319: $150,900
Sample analysis is based on $150 per sample

RESPONSIBLE AGENCIES:

Task Responsibilities:
Project Sponsor
SD DENR

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

Objective 2: **Biological Sampling**

Characterize the biological communities within the Vermillion River watershed. This information will be used to develop a biological index to supplement assessment of water quality characteristics of the Vermillion River watershed. The data will help determine if the water is meeting its beneficial use. Samples will be collected at sites with sufficient water to be sampled during the index. It is assumed approximately 15 tributary sites and the 3 reference sites will have sufficient flow for biological samples.

TASK 4 Biological sampling

Benthic macroinvertebrate samples will be collected twice at each stream monitoring site and at three reference sites each year using methods described in the WRAP SOP. Reference sites will be selected that represent best attainable stream habitat and water quality within the study watershed. A total of 72 benthic macroinvertebrate samples will be collected.

Biological samples will be sent to an independent laboratory for taxonomic identification to the lowest level of taxonomic resolution.

A multimetric index will be used to analyze the macroinvertebrate community data. A suite of candidate metrics will be calibrated and a biological index will be developed to compare study sites to reference sites.

Periphyton samples will be collected twice at each stream monitoring site and at three reference sites each year. Reference sites will be selected that represent best attainable stream habitat and water quality within the study watershed. Seventy-two periphyton samples will be collected during the project period.

Natural substrates will be sampled, where possible, for both community composition and estimates of algal biomass using methods described in the WRAP SOP.

Identification/enumeration samples will be sent to an independent laboratory for taxonomic identification to the genus level. Chlorophyll *a* samples will be analyzed by SD DENR in the Floyd L. Matthew Environmental Education and Training Center Laboratory, Pierre, SD.

TASK 5 Stream Habitat Assessments

Stream habitats will be assessed at study sites and reference sites using the WRAP SOP habitat assessment protocols. This assessment should occur in conjunction with the biological sampling (benthic macroinvertebrates and periphyton).

Stream habitat data will be compiled according to the WRAP SOP, and a stream habitat condition index will be developed to quantify overall stream habitat condition.

The project sponsor will also conduct a field reconnaissance to identify obvious impairments to stream channels and riparian zones within the Vermillion River watershed.

PRODUCTS:

A total of 72 benthic macroinvertebrate samples collected, identified, and counted. Metrics will be developed for these samples.

A total of 72 periphyton, chlorophyll *a* and ash-free dry weight samples collected.

Stream habitat condition assessed at study and reference sites (18 sites).

COST: $37,440 319: $36,000
Macroinvertebrate and periphyton analysis is based on $250 per sample
Ash Free Dry Weight analysis is estimated at $20 per sample.
Chlorophyll *a* analysis will be done at no cost

RESPONSIBLE AGENCIES:

Task Responsibilities:
Project Sponsor

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

Objective 3: Lake Assessment

Assess the current water quality of East Lake Vermillion and Silver Lake. This information will be used to (1) determine whether or not water quality standards are being maintained, (2) estimate nutrient and sediment trapping, and (3) examine productivity levels (i.e. trophic state) for the lakes.

TASK 6 Collect inlake water quality samples.

Water quality parameters will be sampled at 1 location in Silver Lake and 2 locations in East Lake Vermillion (Figure 3). Table 3 lists the parameters to be measured at reservoir sites. Samples will be collected from surface at all sites and a bottom sample will be collected if the depth is greater that 3 meters. The sample site on Silver Lake will only have a surface sample while the sites at East Lake Vermillion will have sufficient depth for both a surface and bottom sample.

Samples will be collected for a period of two years (excluding periods with unsafe ice cover). During June, July, and August, samples will be collected twice each month. Samples in East Lake Vermillion will not be composited in order to assess spatial variability within the reservoir. A total of 65 samples will be collected from the waterbodies each year.

Ambient nutrient concentrations and trophic state will be assessed for the lakes. Water column dissolved oxygen and temperature profiles will also be collected at each site on a monthly basis except during June, July, and August, when samples/measurements will be collected twice a month. All samples/measurements will be collected using methods described in the WRAP SOP.

Table 3. Parameters to be measured at the lake sampling sites.

Biological Parameters	Physical/Field Parameters	Chemical Parameters
Fecal coliform bacteria	Water temperature	Alkalinity
E. coli	Air temperature	Ammonia as N
Phytoplankton communities	Dissolved oxygen	Nitrate + Nitrite as N
Chlorophyll *a* (phytoplankton)	Field pH	Nitrogen, Total Kjeldahl (TKN)
Ash-free dry mass (phytoplankton)	Specific conductance	Total dissolved phosphorus
Submerged macrophytes	Turbidity*	Total phosphorus
	Secchi depth	Total solids
	Water Depth	Total dissolved solids**
	Visual observations	Total suspended solids
		Total volatile suspended solids

* If probe is available on sampling sonde

** Calculated Value

TASK 7 Conduct a macrophyte and shoreline survey of the lakes.

This task will be completed only once during the late summer months (July or August). Macrophytes will be sampled from the reservoir with a plant grapple/rake. A depth finder will be used to locate macrophyte beds and determine the area of coverage of submerged vegetation. Macrophyte density and species composition will be recorded.

A sediment survey will be conducted on both East Lake Vermillion and Silver Lake. The sediment surveys will document past sedimentation into the lakes.

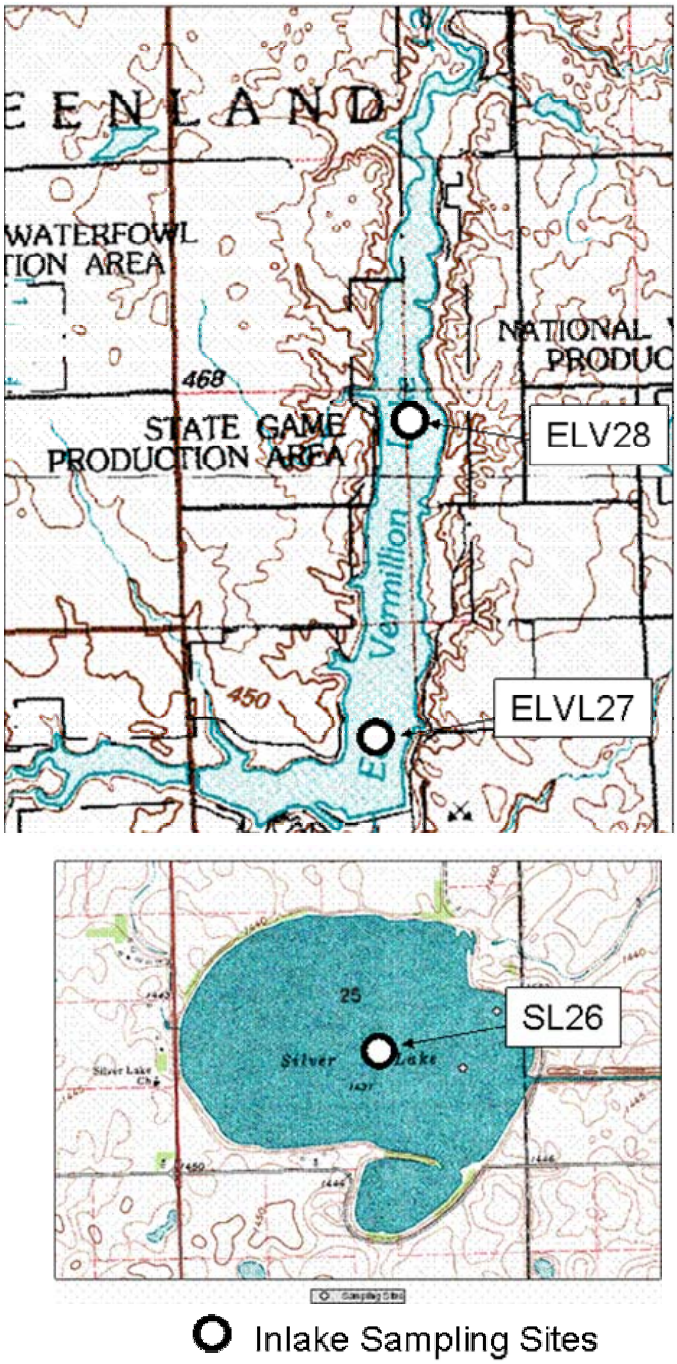


Figure 5. Proposed sampling locations for the assessment of Silver Lake and East Lake Vermillion.

PRODUCTS:

A total of 130 reservoir samples will be collected.

A macrophyte and shoreline survey will be conducted once during the project.

COST: $19,500 319: $19,500
Based on 130 samples @$150 per sample.

RESPONSIBLE AGENCIES:

Task Responsibilities:
Project Coordinator
Project Sponsor

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

Objective 4: **Quality Assurance/Quality Control**

Approved Quality Assurance/Quality Control (QA/QC) procedures will be used to ensure that all samples are accurate and defendable.

TASK 8 A minimum of 10 percent of the total water quality and biological samples will be collected for QA/QC purposes. QA/QC samples will consist of field blanks and field replicate samples. An estimated 108 water quality QA/QC samples (95 stream samples and 13 reservoir samples) and 14 biological QA/QC samples (seven macroinvertebrate samples and seven periphyton samples) will be collected during the project. The collection of all field data will be accomplished in accordance with the WRAP SOP.

All QA/QC activities will be conducted in accordance with the Nonpoint Source Program Quality Assurance Project Plan.

The activities involved with QA/QC procedures and the results of QA/QC monitoring will be compiled and reported on in a section of the final project report and in all project quarterly progress reports.

PRODUCTS:

An estimated 190 (95 replicate and 95 blank sample) QA/QC samples collected for tributary sites.

An estimated 10 bacterial tracking QA/QA samples

An estimated 26 (13 replicate and 13 blank sample) QA/QC samples collected for reservoir sites.

An estimated 7 QA/QC samples each will be collected for macroinvertebrates, periphyton, ash-free dry weight, and chlorophyll *a*.

COSTS: $37,560 319: $900

RESPONSIBLE AGENCIES:

Task Responsibilities:
Project Coordinator
Project Sponsor

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

Objective 5: **Landuse Modeling**

Potential impacts of agricultural land uses on the water quality within the Vermillion River watershed will be evaluated using the Annualized Agricultural Non-Point Source (AGNPS) model, a landuse simulation computer model.

TASK 9 Determine run-off from the AGNPS model

Information will be gathered to define the physical characteristics of the watershed (topography, soils, geology, hydrology, etc.). Landuse information will also be collected via LANSAT imagery if available.

AGNPS model will be used to identify and prioritize critical areas of non-point source pollution within the study watershed and to estimate soil and nutrient loss and delivery from these critical areas.

The CONCEPTS model, or Conservational Channel Evolution and Pollutant Transport System model, may be used to simulate the stream channel and to evaluate the long-term impact of rehabilitation measures to stabilize the stream system and reduce sediment yield.

PRODUCTS:

Landuse data collected and analyzed for the prioritization of critical cells in the watershed.

COSTS: $0 319: $0

RESPONSIBLE AGENCIES:

Task Responsibilities:
Project Coordinator
Project Sponsor

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

Objective 6: Public Participation and Involvement

TASK 10 Disseminate project information to the public.

Informational meetings will be held on a quarterly basis for the public and to inform the involved parties of progress on the study. Public participation and involvement will be encouraged. These meetings will provide an avenue for input from the residents in the area. Notification of meetings will be made to local agencies and newspapers. In addition, a public web page will be maintained to provide the public with the latest available data as well as an overview of the project and status of work activities.

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:

10 Quarterly public meetings
10 News releases
Biannual progress reports for GRTS
Involvement and/or input from the public will be documented

COSTS: $0 319: $0

RESPONSIBLE AGENCIES:

Task Responsibilities:
Project Coordinator
Project Sponsor

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

Objective 7: **Reporting**

TASK 11 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 12 Develop final reports and TMDL summaries for each waterbody (river and lakes). Specific TMDL summaries for the parameters included on the 2002 303(d) list and any other parameters that may need a TMDL as found through the study will also be developed.

Document discharge measurements, water quality data, and methods used to calculate hydrologic budgets and pollutant loadings. Using the results of the landuse modeling, hydrologic and water quality budgets, and biological information, identify areas in the watershed that would require management practices.

Write a summary of historical water quality and landuse information and compare with project data to determine any possible trends. Write a summary report of all QA/QC activities conducted during the project and include in the final project report.

Write a description of feasible restoration recommendations for use in planning a watershed nonpoint source implementation project, and develop a TMDL for the listed segments of the Vermillion River and Silver and East Vermillion Lakes.

Based on the data and information compiled for the project, prepare a description of the physical, chemical, and biological condition of the river and its tributaries.

The final report and TMDL summaries, drafted by the project sponsor, will be reviewed by SD DENR and the U.S. Environmental Protection Agency.

PRODUCTS:

Biannual progress reports for GRTS

A final project report incorporating all previously described objectives

COSTS: $0 319: $0

RESPONSIBLE AGENCIES:

Task Prioritization:
Project Coordinator
Project Sponsor (Report published by South Dakota Department of Environment and Natural Resources)

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 perform this assessment project.

3.5 The Vermillion Basin Water Development District (VBWDD) is a local governmental entity that manages water quantity and quality issues within Clay and Turner Counties in South Dakota. A majority of the study area is within the boundaries of this district making it the appropriate lead project sponsor for the project.

4.0 COORDINATION PLAN

4.1 The following groups/agencies have agreed, through an informal agreement, to cooperate in the Vermillion River Watershed Assessment Project. These agencies are members of the assessment steering committee formed to advance the project and make project-related decisions.

SD Department of Environment and Natural Resources
Financial and Technical Assistance
Project Oversight with a minimum of monthly on-site visits that will include data reviews and progress evaluations.

SD Game Fish and Parks
Technical Assistance with fisheries and endangered species or other field data collection activities
Local Support

USGS
Technical Assistance with flow data and other field data collection activities

US Fish and Wildlife Service
Technical Assistance with endangered species

Natural Resource Conservation Service
Technical Assistance with Ann-AGNPS landuse data collection and/or other data collection requiring local support

East Dakota Water Development District
Financial Assistance

James River Water Development District
Financial Assistance

Lincoln and McCook Counties
Financial Assistance

South Dakota Association of Conservation Districts
Local Support

Clay, Kingsbury, Lake, Lincoln, McCook, Miner, Minnehaha, and Turner Conservation Districts
Technical Assistance and local support with landowners and Ann-AGNPS data collection needs

4.2 Project activities will be coordinated with state, federal, and local government agencies through frequent personal communication and monthly meetings.

4.3 All pertinent water quality, water quantity and land use data will be gathered from all agencies.

4.4 No known monitoring efforts are taking place in the project area at this time.

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 State of South Dakota Water Resource Assistance Program Standard Operating Procedures for Field Samplers (WRAP SOP).

TABLE 4. Location of Sampling and Analysis Procedures for each applicable task involved with the Burke Lake Assessment Project.

TASK NUMBER	TASK DESCRIPTION	ACTIVITY	REFERENCE IN SDWRA-2003 SOP
Task 1	Developing hydropgraphs.	Discharge measurements	Vol I Section 12.0 pages 3-7
Task 2	Collect stream water quality samples	Water Quality Monitoring	Vol I. Section 12.0 pages 7-15
Task 3	Collect benthic macroinvertebrate samples.	Biological Sampling	Vol II Section 6.0
Task 4	Collect periphyton samples.	Biological Sampling	Vol II Section 5.0
Task 5	Collect stream habitat surveys	Habitat Surveys	Vol II Section 9.0
Task 6	Collect inlake water quality samples.	Water Quality Sampling	Vol I Section 14.0
Task 7	Conduct a macrophyte and shoreline survey on the lakes.	Shoreline Survey	Vol II Section 2.0
Task 8	The collection of all field water quality data will be accomplished in accordance with the Standard Operating Procedures for Field Samplers, South Dakota Nonpoint Source Program.	Quality Assurance	Vol I Section 8.0
Task 9	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, land use and biological analyses. Monitoring sites will be maintained and sampled on the Vermillion River and selected tributary watersheds. Ambient samples will be collected along with spring runoff and storm events. Stream discharge will be routinely measured. The chemical, physical, and biological parameters to be sampled during this project can be located in Tables 2 and 3. Loads will be calculated based on the samples and data collected with the approved methods identified in Section 5.1. A TMDL summary report will be produced for the portion of the Vermillion River from the outlet of Lake Thompson to the Missouri River. A TMDL will also be calculated for East Lake Vermillion and Silver Lake

5.3 All water quality monitoring will be done in accordance with the approved South Dakota Non-point Source Program Quality Assurance/Quality Control Project Plan and the (WRAP SOP). Results from all water-quality monitoring efforts from the Vermillion River Watershed Assessment Project will be reported in the final project report. Data will be managed by the local project sponsor and the South Dakota Department of Environment and Natural Resources and maintained

in a computer database. All sample data will ultimately be entered in the U.S. EPA STORET Program by the South Dakota Department of Environment and Natural Resources. This data will be used as the foundation of a Watershed Implementation Project proposal.

5.4 During the study staff will be using the AnnAGNPS Model to target critical cells and develop load reductions for the watershed. Staff will use the FLUX model to develop annual loads and to stratify the data for analysis if needed. Staff will use the Bathtub model to predict the water quality response to reduced loadings.

5.5 It is hoped that this assessment effort will lead to one or more implementation plans to improve water quality in the Vermillion River watershed.

6.0 BUDGET

Part 1

Funding Sources	**Year**				
	2004	2005	2006	2007	**TOTAL**
EPA Section 319 Funds	$43,072	$144,157	$144,157	$7,014	$338,400
State/Local Match					
1) State of South Dakota (WEF)	$21,503	$52,690	$52,540	$7,067	$133,800
2) Local - Other		$6,000	$6,000		$12,000
3) Vermillion WDD	$2,420	$37,789	$37,638	$1,954	$79,801
Subtotal	$23,923	$96,478	$96,177	$9,021	$225,599
Total Budget	$66,995	$240,636	$240,335	$16,035	$564,000

Salary estimates were based on two employees for 2.5 years at $17.00 per hour

Part 2 – See page 27.

7.0 PUBLIC INVOLVEMENT

See Section 3.2, Objective 6.

8.0 REFERENCES CITED

South Dakota Department of Environment and Natural Resources (SDDENR). 2002. The 2002 South Dakota Report to Congress. SDDENR, Pierre, SD.

SD Department of Environment and Natural Resources. 2003. Standard Operating Procedures for Field Samplers Volume I – Tributary and Inlake Sampling Techniques.

SD Department of Environment and Natural Resources. 2003. Standard Operating Procedures for Field Samplers Volume II – Biological and Habitat Sampling. (Draft Version).

SD Department of Game, Fish, and Parks. 2003. South Dakota Natural Heritage Program.

Table 4. Vermillion River Watershed Assessment Milestone Chart

Project Schedule - Milestone Chart	2004				2005												2006												2007					
	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Objective 1: Stream Water Quality Sampling	■	■			■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
Objective 2: Biological Sampling (see below)																																		
Macroinvertebrate Sampling											■		■										■		■									
Periphyton Sampling											■		■										■		■									
Habitat Assessment											■												■											
Objective 3: Lake Assessment					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
Objective 4: Quality Assurance/Quality Control					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
Objective 5: Landuse Modeling	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■												
Objective 6: Public Participation				■			■			■			■			■			■			■			■			■		■				
Objective 7: Final Report														■	■	■	■								■	■	■	■	■	■				
TMDL Review and Approval																															■	■	■	■

Part 2 Funding - Section 319 Federal Budget	2004	2005	2006	2007	Total Costs	Cash Match	In-Kind Match	319 Funds
1) Salary and Fringe	$23,575	$70,725	$70,725	$11,775	$176,800	$95,700		$81,100
2) Office Rent/Utilities	$800	$2,400	$2,400	$400	$6,000		$6,000	
3) Travel	$1,000	$15,000	$15,000	$1,000	$32,000	$16,000	$16,000	
4) Euipment and Supplies	$40,000	$10,000	$10,000	$2,000	$62,000	$12,000		$50,000
5) Telephone	$320	$960	$960	$160	$2,400	$2,400		
Subtotals	*$65,695*	*$99,085*	*$99,085*	*$15,335*	*$279,200*	*$126,100*	*$22,000*	*$131,100*
Objective 1: Stream Sampling								
Water Quality Analysis		$83,400	$83,400		$166,800	$24,000		$142,800
Bacterial Source Tracking		$6,750	$6,750		$13,500	$5,400		$8,100
Subtotal		*$90,150*	*$90,150*		*$180,300*	*$29,400*		*$150,900*
Objective 2: Biological Monitoring								
Macroinvertebrate Sampling		$9,000	$9,000		$18,000			$18,000
Periphyton Sampling		$9,000	$9,000		$18,000			$18,000
Biomass (Ash Free Dry Weight)		$720	$720		$1,440	$1,440		
Subtotal		*$18,720*	*$18,720*		*$37,440*	*$1,440*		*$36,000*
Objective 3: Lake Sampling								
Water Quality Analysis		$9,750	$9,750		$19,500			$19,500
Objective 4: QA/QC								
Water Quality Analysis		$16,200	$16,200		$32,400	$32,400		
Bacterial Source Tracking		$750	$750		$1,500	$600		$900
Macroinvertebrate Sampling		$950	$800		$1,750	$1,750		
Periphyton Sampling		$950	$800		$1,750	$1,750		
Biomass (Ash Free Dry Weight)		$80	$80		$160	$160		
Subtotals		*$18,930*	*$18,630*		*$37,560*	*$36,660*	*$0*	*$900*
Objective 5: Landuse Modeling								
Objective 6: Public Participation								
Objective 7: Reporting								
Administrative								
Executive Director	$1,300	$4,000	$4,000	$700	$10,000	$10,000		
TOTAL 319/NONFEDERAL BUDGET	**$66,995**	**$240,635**	**$240,335**	**$16,035**	**$564,000**	$203,600	$22,000	$338,400

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: Vermillion River Basin Watershed Assessment

APPROVED BY:

South Dakota Watershed Protection Program Environmental Senior Scientist, Assessment Section	Date
South Dakota Watershed Protection Program Project Officer	Date
South Dakota Watershed Protection Program Quality Assurance Coordinator	Date
South Dakota DENR Quality Assurance Officer	Date