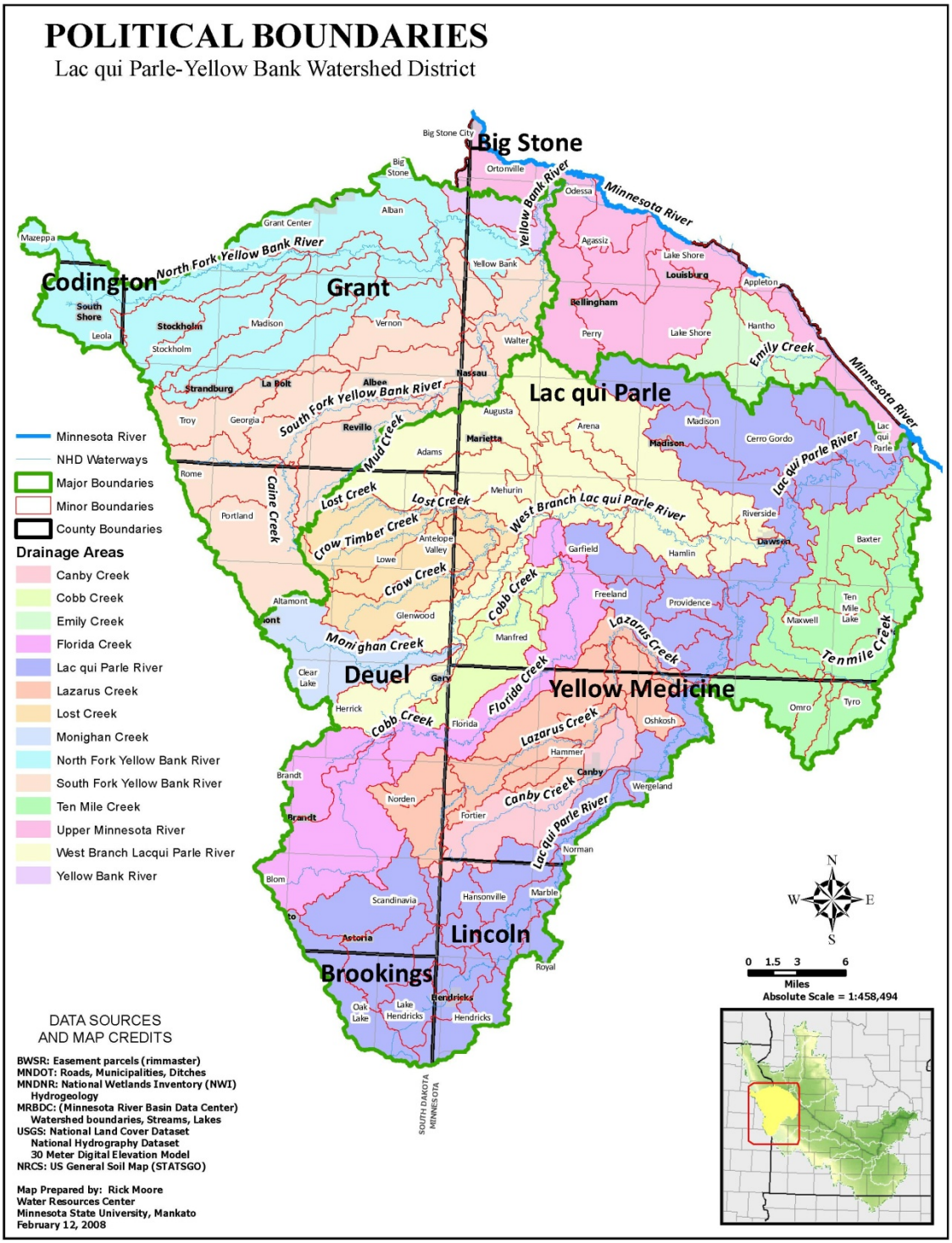
Lac qui Parle – Yellow Bank Watershed District

Watershed Management Plan



2009 through 2019

Prepared by Lac qui Parle – Yellow Bank Watershed District and Bayerl Water Resources

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ACKNOWLEDGEMENTS

The following were involved in the preparation and development of this document. The Lac qui Parle – Yellow Bank Watershed District appreciates the time and dedication of these individuals.

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Lac qui Parle County Soil and Water Conservation District

Yellow Medicine County Soil and Water Conservation District

Lincoln County Soil and Water Conservation District

Lac qui Parle County Water Plan

Yellow Medicine County Water Plan

Lincoln County Water Plan

Yellow Medicine County

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Area II Minnesota River Basin Projects, Inc.

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Lac qui Parle – Yellow Bank Watershed District
Watershed Management Plan

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C	LAKES WITHIN THE WATERSHED DISTRICT
D	EXISTING WATER MANAGEMENT STRUCTURES
E	STATEWIDE CONSERVATION LANDS SUMMARY

SUPPORT DOCUMENTS LISTING:

Available at the Watershed District Office:

Lac qui Parle – Yellow Bank Watershed Diagnostic Study Report and Implementation Plan

Upper Minnesota River Subbasins Study (Public Law 87-639) Interim Feasibility Report Yellow Bank and Lac qui Parle Subbasins

Large sized copies of all maps included in this Plan

Upper Minnesota River Basin Regional Hydrogeologic Assessment

Available Website Links:

Lac qui Parle – Yellow Bank Watershed: www.lqpybwatershed.org

NRCS Rapid Watershed Assessment: http://www.mn.nrcs.usda.gov/technical/rwa/index.html

DNR Regional Hydrogeologic Assessment: http://www.dnr.state.mn.us/waters/programs/gw_section/mapping/platesum/umrbrha.html.

COMMON ACRONYMS

AU	Animal Units
Area II	Minnesota River Basin Projects, Inc.
BMPs	Best Management Practices
BWSR	Board of Water and Soil Resources
CRM	Crop Residue Management
CRP	Conservation Reserve Program
CWP	Clean Water Partnership
DNR	Department of Natural Resources
EDWDD	East Dakota Water Development District
EPA	Environmental Protection Agency
EQB	Environmental Quality Board
FSA	Farm Services Association
FWMC	Flow Weighted Mean Concentration
GIS	Geographic Information Systems
LqP-YB WD	Lac qui Parle – Yellow Bank Watershed District
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MGS	Minnesota Geological Survey
MGY	Million Gallons per Year
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MS4	Municipal Separate Storm Sewer System
NGP	Northern Glaciated Plains
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NTU	Nephelometric Turbidity Units
NWI	National Wetlands Inventory
OHW	Ordinary High Water Level
RIM	Reinvest in Minnesota
SSTS	Sub Surface Sewage Treatment System
SWCD	Soil and Water Conservation District
TEAM (CWP)	Together Everyone Achieves More
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSI	Trophic State Index
TSS	Total Suspended Solids
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
WMA	Wildlife Management Area
WP	Local Water Management Plan
WPA	Waterfowl Production Area

Executive Summary:

Ecosystems and water resources are managed to sustain their long-term health and integrity to enhance the well-being of the citizens within the Lac qui Parle-Yellow Bank watershed. Through the identification of water quality and quantity issues in the watersheds, the Lac qui Parle-Yellow Bank Watershed District developed goals to guide their water resources management activities. Management strategies and policies for each goal were developed based on the District's goals for resolving watershed issues and a review of existing programs. Water management strategies and District policies become the management framework for the Lac qui Parle-Yellow Bank Watershed District's 10-year master plan to achieve its goals. The Plan was developed to both continue and expand existing activities and to establish new activities. A holistic watershed management plan is needed to protect the people, water quality and the economic welfare of this District. The overall goal of the Board is to make the wisest water management decision possible for the water resources within the District. This revised overall plan is intended to be the guide for the accomplishment of this goal.

The lakes, ponds, streams, ditches and wetlands in the Lac qui Parle-Yellow Bank Watershed District are important community assets, supplying recreational and aesthetic benefits, wildlife habitat, and fishery resources as well as provide for a strong economic growth for the local residents. However, maintaining good water quality in these water resources is a challenge, particularly considering the intensive agricultural industry which makes up the vast majority of the Lac qui Parle-Yellow Bank watershed. Water quality is closely linked to land use and conditions in the surrounding watershed. Storm water runoff can carry significant amounts of sediment and phosphorus from the watershed into these water bodies, along with other pollutants.

This Third Generation Plan will prioritize water resources and develop management plans for those resources by priority or as opportunity provides. This plan includes goals for maintaining or improving water quality and quantity management based on practical use, funding and implementation strategies.

Introduction:

The Watershed Act

In 1955, the Minnesota Legislature passed the Watershed Act in order to better address water related issues and concerns at a watershed level. Watershed districts are special purpose units of government created to solve water resource issues on a watershed basis. The Lac qui Parle-Yellow Bank Watershed District is one of forty-six watershed districts established in Minnesota since 1955. The area of these watershed districts range from as small as 59 square miles to well over 5,000 square miles. The established Chapter 103D of the Minnesota State Statutes, (the Watershed Law) is the framework each watershed district bases their unique authority to manage and protect water resources, both surface and groundwater. Under state statute 103D, each watershed district must prepare a Watershed Management Plan and must be updated every 10 years. The Watershed Management Plan is designed to outline the district's goals and objectives and to define resource management programs of the district. Watershed law also requires that each district must incorporate into its plan watershed inventories, assess issues, and develop policies and strategies based on the conditions and needs of each district. Watershed Law states that each management plan must develop programs that balance the resources against social, economic, and political factors of the region. Through the development of this generation of the Lac qui Parle – Yellow Bank Watershed District Management Plan the Board of Managers has committed to improving water resources in the watershed through proper planning and implementation.

Summarization of Plan Content

The 2009-2019 Lac qui Parle – Yellow Bank Watershed District's 10-year Watershed Management Plan is organized into a five-part format which complies with the Board of Water and Soil Resources (BWSR) framework and compliments the strategic method of the District's planning process.

Section One: District Profile – Provides an in depth description of the Lac qui Parle- Yellow Bank Watershed. It includes a detailed historical overview of the District plus a comprehensive inventory of the water and land resources within the District. It also provides a view of the resource management efforts currently in place.

Section Two: Assessment and Issue Identification – Provides a detailed description of the natural resources of the Lac qui Parle- Yellow Bank Watershed. It includes assessments of the natural resources and their current status regarding state water quality standards

Section Three: Goals, Objectives and Desired Outcomes –Provides a detailed framework of goals, objectives and actions items to attain desired outcomes.

Section Four: Implementation – defines the District's implementation strategy to support the goals, objectives and action items identified in Section Three.

Section Five: Plan Administration

Description of Planning Process

Planning is a continuous process that requires collaborative efforts and thinking to approach water resources management issues in a logical manner. Watershed planning is the primary tool to assist watershed districts, local and state agencies and the general public in focusing their efforts on using water and land resources wisely. The watershed planning process includes several steps:

1. Gather citizens and stakeholders input.
2. Assess the resources within the District.
3. Using good science and knowledge of resource concerns develop a policy framework.
4. Develop goals and objectives and management strategies to address identified issues.
5. Prioritize action items needed to properly manage the natural resources of concern.

Public and Agency input process and issues

Public and agency input is an important part of the planning process. Feedback from the actual stakeholders, local government units and state agencies provide different perceptions of the watershed and the management needs. It was attempted by the watershed district to provide the opportunity to all these groups. A full listing of attendees to the public input meetings and written feedback is provided in ***Appendix A.***

A series of public meetings were held on March 18th, 2008 in Madison, Canby and Hendricks. The meetings were attended by local property owners, local Soil and Water Conservation District (SWCD), Local Water Management Planners (WP), East Dakota Watershed District and state agencies. From these meetings, it was determined that the following top five issues, in order of priority, were of concern to the attendees:

1. Water quality (declining water clarity)
2. Shoreline buffers
3. Too many regulations
4. Water quantity (too much water when it rains)
5. Failing septic systems

Technical committee meetings were held in August and November to obtain input from the Natural Resources Conservation Service (NRCS), SWCD, WP, Minnesota Pollution Control Agency (MPCA), Department of Natural Resources (DNR), BWSR and other local experts.

A stakeholder committee was formed and meetings were held in November of 2008 and January of 2009 to provide comment on the content of this plan and feedback on the management strategies.

A written request for feedback was sent to all state and local government units with regional authority within the watershed. Feedback was obtained from BWSR and Lac qui Parle SWCD.

Utilizing this feedback, the Board has set the following goals:

1. Protect and enhance surface water quality;
2. Protect groundwater quality:
3. Ensure an adequate supply of surface and groundwater for drinking water, agricultural, commercial, industrial, natural resources and recreational purposes, while minimizing flood related damage;
4. Promote and maximize water-based recreational activities; and
5. Ensure protection of unique water and natural resources.

These goals will direct the actions of the Watershed District over the next ten years. Management strategies have been developed and will be implemented as funding becomes available.

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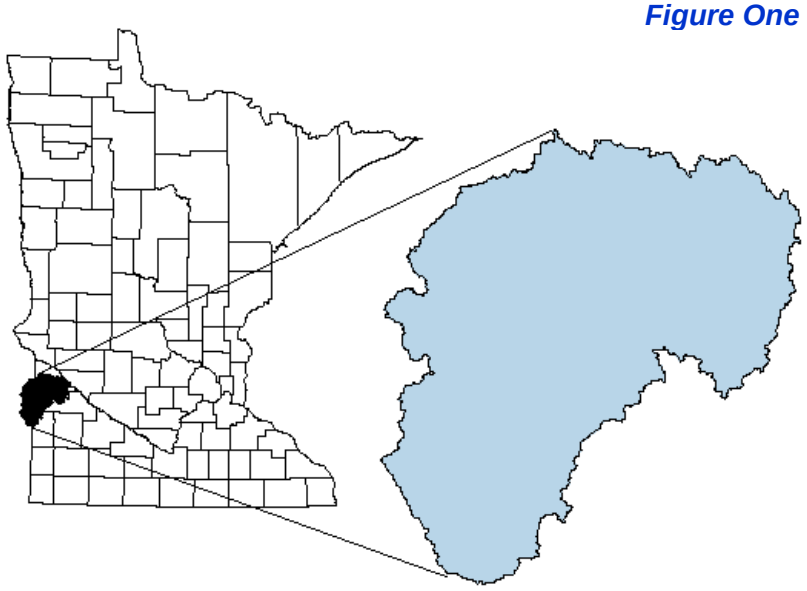
Section One: District Profile

Location

The Lac qui Parle – Yellow Bank Watershed District is located in west central Minnesota, on the southwest side of the Minnesota River. As shown in ***Table One*** and ***Figures One and Two,*** the western boundary of the District is 57 miles long and is formed by the Minnesota – South Dakota border from 1 mile south of Ortonville to 3 miles south of Lake Hendricks. The northern District boundary adjoins the Upper Minnesota River Watershed District, commencing on the northeast corner of Section 4, Township 121 North, Range 45 West, thence in a general northwesterly direction to the northwest corner of Section 28, Township 121 North, Range 46 West. On the northeast, the Minnesota River forms the boundary from the Marsh Lake Dam to near the Lac qui Parle Dam. From the Lac qui Parle Dam the boundary extends almost due south to the Yellow Medicine County Line, then extends southwesterly to join the Yellow Medicine River Watershed District on the western edge of Section 36, Township 115 North, Range 43 West. These two districts share a common boundary from that point, continuing in a southwesterly direction to the South Dakota border in Section 1, Township 111 North, Range 47 West.

Figure One



The watershed district boundary contains about 988 square miles of land. Approximately 74 % of the land surface is located in Lac qui Parle County, 19 % in Yellow Medicine County, and 7 % in Lincoln County. The total land area drained by the two rivers is approximately 1,708 square miles, of which 719 miles are located in South Dakota.

Distribution of Watershed Area — ***Table One***

County	Acres within Watershed District	Square Miles within Watershed District	Percent of Watershed District within County	Percent of County within Watershed District
Lac qui Parle	470,472.5	734.9	74	100
Yellow Medicine	118,834.3	185.6	19	26
Lincoln	43,009.6	67.2	7	7
Total	**632,316.5**	**987.7**	**100**	
Other (Big Stone, Swift, Chippewa Counties)	1,031.1	1.6		
South Dakota	460,079.8	718.6		

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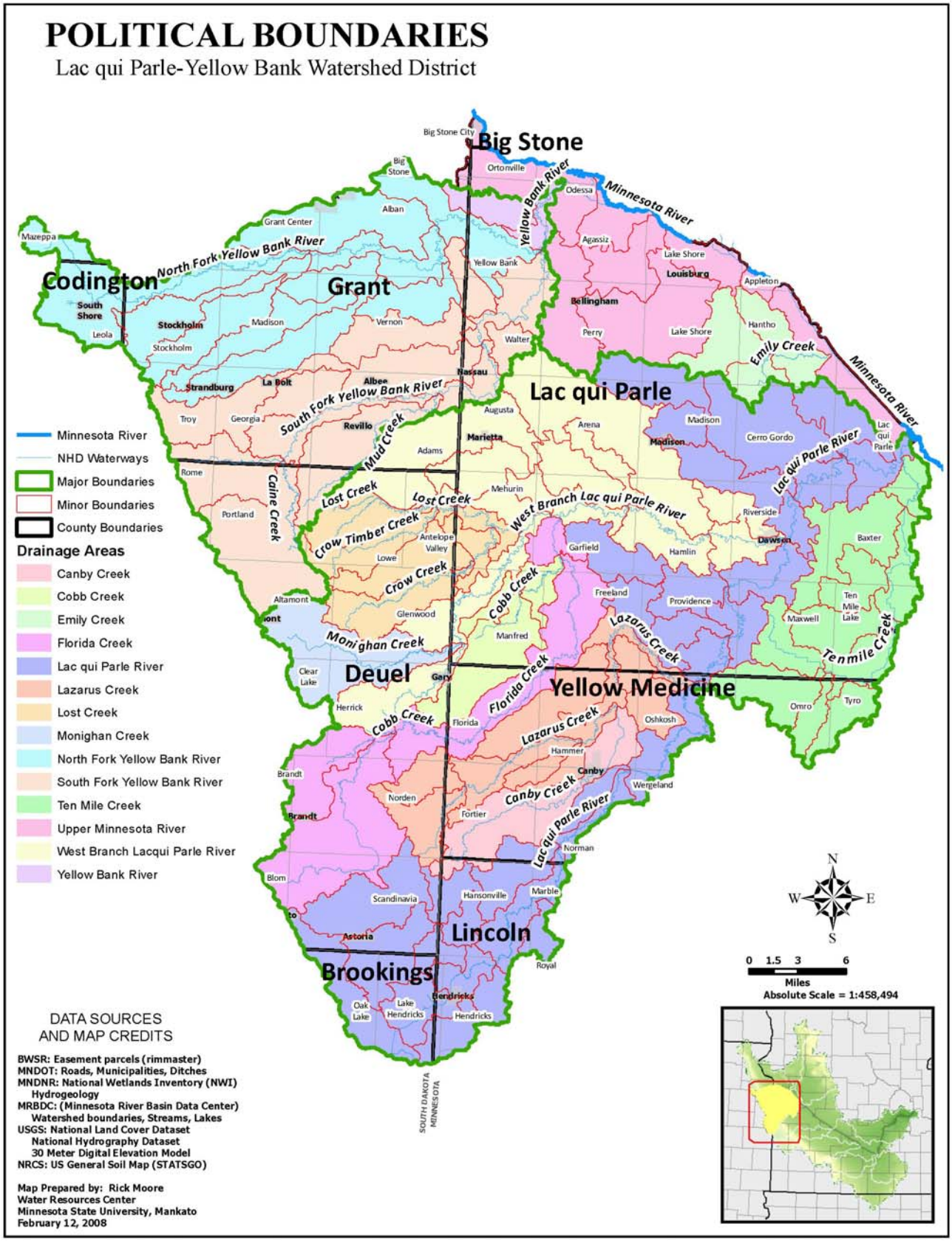
Figure Two


POLITICAL BOUNDARIES
Lac qui Parle-Yellow Bank Watershed District
Big Stone
Lac qui Parle
Yellow Medicine
Deuel
Lincoln
Brookings
Codington
Grant
Minnesota River
NHD Waterways
Major Boundaries
Minor Boundaries
County Boundaries
Drainage Areas
Canby Creek
Cobb Creek
Emily Creek
Florida Creek
Lac qui Parle River
Lazarus Creek
Lost Creek
Monighan Creek
North Fork Yellow Bank River
South Fork Yellow Bank River
Ten Mile Creek
Upper Minnesota River
West Branch Lacqui Parle River
Yellow Bank River
DATA SOURCES
AND MAP CREDITS
BWSR: Easement parcels (rimmaster)
MNDOT: Roads, Municipalities, Ditches
MNDNR: National Wetlands Inventory (NWI)
Hydrogeology
MRBDC: (Minnesota River Basin Data Center)
Watershed boundaries, Streams, Lakes
USGS: National Land Cover Dataset
National Hydrography Dataset
30 Meter Digital Elevation Model
NRCS: US General Soil Map (STATSGO)
Map Prepared by: Rick Moore
Water Resources Center
Minnesota State University, Mankato
February 12, 2008
N
W
E
S
0 1.5 3 6
Miles
Absolute Scale = 1:458,494

History and Organizational Structure

The initial petition to establish the Lac qui Parle-Yellow Bank Watershed District was submitted to the Minnesota Water Resources Board (Board) on July 14, 1967 by the County Commissioners of Lac qui Parle, Lincoln, and Yellow Medicine Counties. At that time, the Minnesota Water Resources Board (now called Board of Water and Soil Resources, BWSR) was also considering a petition seeking the establishment of the Big Stone Lake Watershed District. Land areas in northern Lac qui Parle County, including the watershed of the Yellow Bank River within the county and land in the county that drained directly into the Minnesota River between the mouth of the Yellow Bank River and the Lac qui Parle River were included in both petitions.

In September 1968, the Board approved the Big Stone Lake petition and established the Upper Minnesota River Watershed District. Those land areas in Lac qui Parle County included in both petitions were included in the Upper Minnesota River Watershed District. This action was appealed to the District Court by the aggrieved parties. They wished to have those lands in question in Lac qui Parle County excluded from the Upper Minnesota River Watershed. In November 1969, the District Court reduced the area of the Upper Minnesota River Watershed District in Lac qui Parle County. This action was appealed by the Minnesota Water Resources Board, and the appeal was ultimately dismissed in May 1970.

After due and proper notice was given, the Board conducted a public hearing on October 8, 1970 in Madison, Minnesota on the nominating petition for the establishment of the Lac qui Parle Yellow Bank Watershed District. The Board ordered the establishment of the Lac qui Parle Yellow Bank Watershed District on April 19, 1971 and the appointment of the first district board of managers. The Board of Managers was selected from a list of nominees submitted by the County Commissioners of the effected counties.

Madison, Minnesota was designated as the official place of business. The purpose of the District was to aid local citizens who had requested help in controlling flooding in the watershed. Much cross-over flooding had occurred over farm land between sub-watersheds, and had been identified as the highest priority need for the new district to address.
The original Watershed District Plan was established, as required by law, in October 1972. This document is the second *update* of the plan since the District was established.

Mission Statement

The Lac qui Parle-Yellow Bank Watershed District mission is to:

> *Serve as a partner in water planning and management with the state agencies, counties, cities, and Soil and Water Conservation Districts, and assist with the management of water quality and quantity within Lac qui Parle-Yellow Bank Watershed boundaries.*

Existing Programs

Education/Technical Program

Existing information and education goals provide a method to raise citizen awareness of the degraded state of the rivers and streams within the District. Education opportunities and outreach materials are provided through newsletters, promotional materials, booths and workshops.

Technical programs for the District entail pursuing funding for priority BMPs and work cooperatively with the SWCDs, WPs, and NRCS government units on practices that will improve the quantity and quality of the waters flowing throughout the District. Currently, there are several programs available for Best Management Practices (BMPs) through the MPCA Clean Water Partnership funds. These funds and available programs are subject to reassessment on a regular basis to target the impaired waters within the District.

Monitoring Program

One of the most significant aspects of the Lac qui Parle River watershed is the diversity of landscape features, soil types, and land uses. The basin can be divided into broad subregions based on logical grouping of these factors. Stream flow and water quality are influenced by these factors and there can be significant differences in the hydrologic response and water quality between sub regions. The objective of the monitoring is to evaluate effectiveness of implemented projects and their impact on water quality and quantity in the Lac qui Parle River.

The monitoring program for the District is assessed and adjusted frequently as results of current monitoring, staff and funding allow. The current proposed program entails: water quality monitoring will be conducted thirty times per year from March 2009 through September 2010 to characterize existing conditions and to determine effectiveness of best management practices installed in the watershed. The West Branch Lac qui Parle River will be monitored in Dawson at the Dawson Dam, known as Project Site 10, South Branch Lac qui Parle River will be monitored approximately 3 miles south of Dawson on County Road 23, known as Project Site 11 and Ten Mile Creek will be monitored at Project Site 7. Analysis will include Total Volatile Suspended Solids, Turbidity, Total Phosphorus, Ortho Phosphorus, Total Suspended Solids, Nitrate Nitrites, total Kjeldahl Nitrogen, and E. coli. The field measurements will include dissolved oxygen, pH, water temperature, transparency tube and visual observations. Flow will be contracted with DNR for sites 10, 11 and 7, (Site 7 will include updating the rating curve). The equipment for Site 7 will be loaned from MPCA.

Regulatory Program

The purposes of the rules and regulations are to promote public health and welfare and to minimize loss of lives and property caused by unregulated and uncontrolled water and mismanagement of the natural resources within the District. The regulations and the Board of Managers require that permits be secured from the Watershed District prior to the start of planned improvements. This is not intended to be a denial or to delay works of improvements, but is deemed necessary for the Board of Managers to be informed of planned projects and to insure orderly development of the natural resources within the District, and to control or regulate activities to promote public health and welfare.

A permit from the District does not relieve the applicant from the responsibility of obtaining any other additional permits or authorizations required from other agencies when public waters are involved. It is the intention of the Managers that no person shall be deprived or divested of any previously established beneficial use or right to natural resources by any rule or regulation of the District without due process of the law, and that all rules and regulations of the District shall be construed to said intention; and by rules and regulations to assist in the orderly use and conservation of the waters of the District. If any rule or regulation is inconsistent with the provisions of applicable state law, the provisions of such laws shall govern. A full text of the current rules and regulations as revised on July 1, 1974, and currently governing the District activities, is included as ***Appendix B.***

Existing Water Management Plans and Programs

Local Water Management Plans are written to address water and land resource management issues at the local level, within a watershed context. Lac qui Parle, Yellow Medicine and Lincoln Counties all have and actively implement these Plans. The District supports the water plans and cooperates with the local water plan coordinators. In turn, the water plan coordinators require the support of the District to accomplish the plan goals for each county.

A Clean Water Partnership (CWP) Program with the MPCA has been executed throughout the watershed where impairments exist. This is a long-term commitment on the part of both the MPCA and the District to mitigate the impairments in the rivers and streams of the watershed. The District employs a CWP Project Coordinator to oversee the monitoring and BMPs these grants help to fund.

Completed Projects

The **Lazarus Creek Flood Control Project** consists of an earthen dam 62 feet in height and 1350 feet in length, with a 48-inch pipe outlet structure. It is designed as a dry dam to control runoff from a 21 square mile drainage area, and will only impound waters during significant rainfall or runoff events. The 100-year storm flow reduction is 66.2 percent, reducing the cubic feet per second from 4982 to 408. Total cost of this project is estimated at $1.84 million and has taken over 35 years to come to fruition. In 2003 the Minnesota State Legislature appropriated $1.4 million to the Watershed District for the project. Construction started in May of 2004 and it was completed in 2005. The project will reduce flood flows which will reduce erosion, especially Streambank, reduce the introduction of sediment and nutrients into the downstream water courses reduce economic losses of downstream farmers, townships, counties and cities. The project will also allow for the installation of downstream road retentions which were not possible under previous hydrologic conditions.

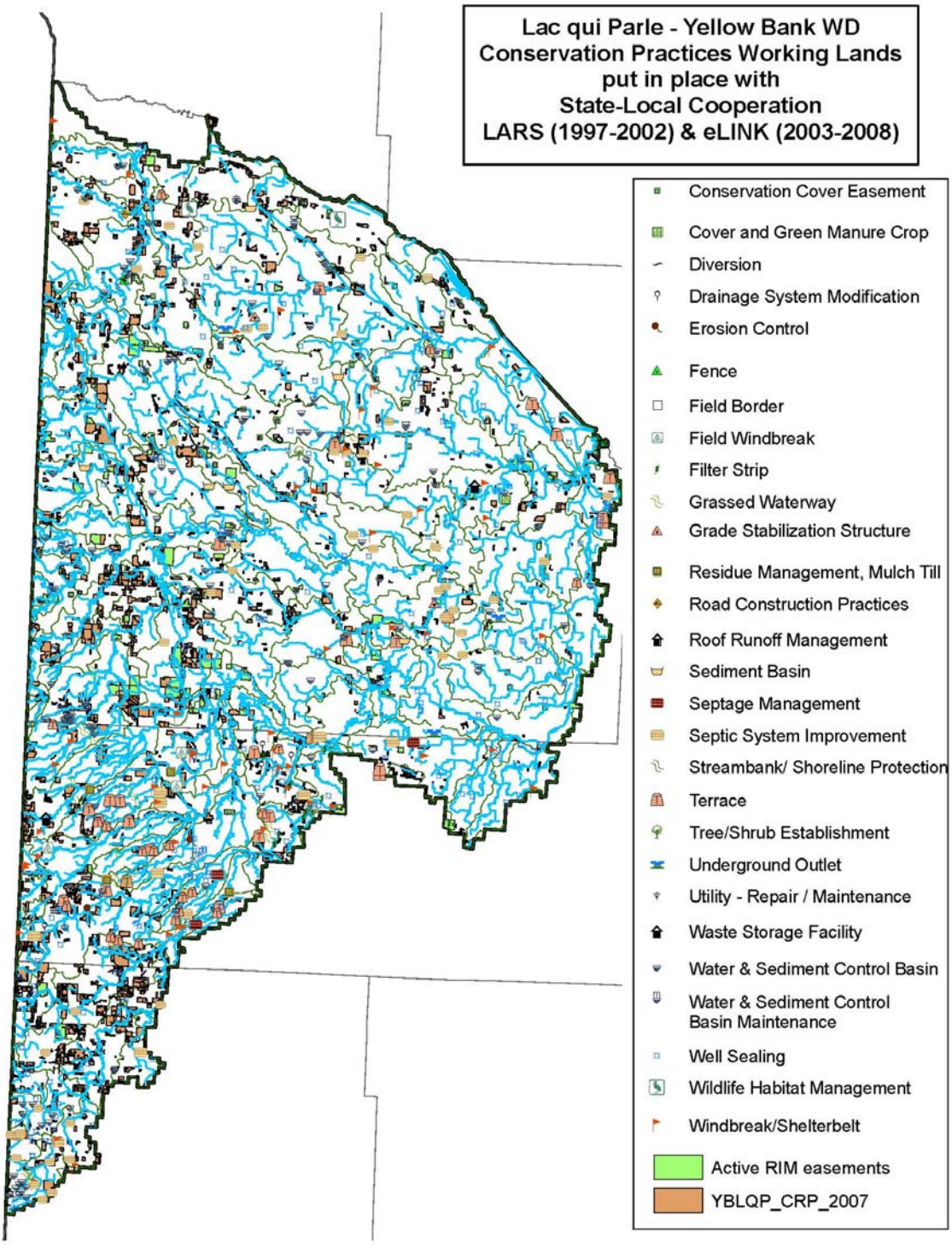
Since early 2000s, the District has been involved in an on-going **Clean Water Partnership Project** including a diagnostic study and implementation plan. BMPs for Total Maximum Daily Load (TMDL) reductions are the primary focus of this project. During the assessment phase of the project, $262,510 was spent to monitor and pinpoint problem areas. This phase was followed by 319 implementation funding of $298,000 and CWP continuation funding of $280,150 for BMPs. In addition to this funding, SSTS loans of $800,000 since 2005 have been spent and an additional $512,000 has been made available until 2011. Through this project, Clean Water Legacy funding for additional BMPs has been received in the amount of $210,000. Present work includes involvement in TMDL development for dissolved oxygen, fecal coliform, and turbidity impairments.

Numerous projects have been completed cooperatively through the WP, SWCD, NRCS and other state and local agencies. ***Figure Three*** illustrates the management practices within the past ten years within the District. These practices are summarized in ***Table Two***. Throughout the District 81,055 acres are in an easement program, which comprises about 13 percent of the land area. Theses easements are either Conservation Reserve Program (CRP), Reinvest in Minnesota (RIM), Wetland Preservation Areas (WPA) and Wildlife Management Areas (WMA).

Best Management Practices within the Lac qui Parle - Yellow Bank Watershed *Table Two*

Practice	***Number***	***Practice***	***Number***
Abandoned well sealing	267	Fence	1
Water and sediment control basin	140	Diversion	10
Roof runoff management	1	Drainage system modification	5
Windbreak/Shelterbelt establishment	60	Residue management - mulch	5
Erosion control	2	Cover and green manure crop	1
Terrace	51	Sediment basin	7
Septic system improvement	82	Waste storage facility	1
Grassed waterway	29	Field border	2
Conservation cover easement	1	Septage management	5
Filter strip	13	Underground outlet	3
Streambank and shoreline protection	1	Wildlife habitat management	2
Grade stabilization structure	2	Road construction practices	1
		Total	**649**

Figure Three



The District continues to maintain Stone Hill Regional Park as part of the **Canby Creek Flood Control Project**. Del Clark Lake, formed by the earthen flood control structure is viewed by anglers as a good walleye lake, with trout, northern pike, bass and pan fish also stocked in the man-made lake. In 2004 an access was added to this lake to provide people with disabilities access to fishing. It was completed through a cooperative effort with the NRCS in Clarkfield.

District Stakeholder Profile

Stakeholders provide important perspective and direction to the District. From the public living within the boundaries of the District to the State and Federal agencies and special interest groups, input provides direction to the Board for management. Lac qui Parle – Yellow Bank Watershed District stakeholders include:

Local:

Public

The public is the most important stakeholder within the District as nearly every decision made by the District has the potential to impact the public. Public input is valued by the District, therefore they will maintain an Advisory Committee and hold public hearings and informational meetings, as needed, to gather input for planning purposes. Monthly meetings by the Board of Managers will be open to the public and public attendance will be encouraged. Public meetings will be noticed in the official District newspaper, in accordance with Minnesota Statutes Chapter 103D.

Counties

The three counties lying within the District include Lac qui Parle, Yellow Medicine and Lincoln. They administer programs such as public drainage systems and land use controls, such as floodplain and shoreland management to regulate development along water resources. Through the administration of the Comprehensive Local Water Management Plan, they receive an annual grant from the State.

Cities

Nine cities reside within the District's boundaries: Bellingham, Boyd, Dawson, Louisburg, Madison, Marietta and Nassau cities in Lac qui Parle County, Hendricks in Lincoln County, and Canby in Yellow Medicine County. The incorporated cities have the authority to establish ordinances and conduct zoning activities within their territorial limits. Each city also has the responsibility to manage stormwater, drinking water and wastewater systems.

Townships

The primary responsibility of townships is to maintain rural roadways under their jurisdiction. Although none currently have, they may also establish and enforce land use controls. There are thirty-three townships located either wholly or partially within the District.

Soil and Water Conservation Districts (SWCD)

The three counties located within the District are served by a SWCD. SWCDs are established under Minnesota State Statute Chapter 103C, with a purpose of promoting programs and policies that conserve the soil and water resources within its boundary. Within the Watershed District, primary concerns are wind and water erosion and overland runoff of nutrients and bacteria. They are actively involved and work closely with the District on water management projects, education and promotion of soil and water conservation.

East Dakota Water Development District (EDWDD)

The EDWDD is a non-regulatory subdivision of South Dakota state government that provides expertise and assistance, both financial and technical, to a twelve-county area in South Dakota. This group has worked cooperatively with the LqP-YB Watershed District on projects of mutual benefit in both a technical and financial basis.

State:

Minnesota Board of Water and Soil Resources (BWSR)

The BWSR, established in 1986 by the Minnesota State Legislature, was formed to consolidate existing water resource programs. They work closely with and provide oversight of programs and funding of the State's SWCDs, formation and guidance of watershed districts, development

and implementation of county WPs, and implementation of the Minnesota Wetland Conservation Act (WCA). BWSR is responsible for review and approval of water management plans for watershed districts.

Minnesota Department of Natural Resources (DNR)
The DNR has both regulatory and enforcement authority over natural resource programs of the State. The principal divisions of the DNR include Ecological Services, Enforcement, Fisheries, Forestry, Lands and Minerals, Parks and Recreation, Trails and Waterways, Waters and Wildlife. The DNR has permit authority over watershed district projects that impact Public Waters of the State. The DNR is also actively involved in helping local units of government administer floodplain management ordinances and standards. Contact information for lakes over 10 acres is the area hydrologist (currently Lucas Youngsma) at 507-537-7258 and for the Shallow Lakes Specialist (currently Nicole Schiller) is 507-537-6607.

Minnesota Pollution Control Agency (MPCA)
The MPCA has both the regulatory and enforcement authority to protect the surface and ground waters of the State from pollution. Because many projects involve water quality considerations, the MPCA becomes an active participant in the watershed management activities. The MPCA is actively involved in the monitoring program and the TMDL process of addressing impaired waters within the District. The District and the MPCA have been in partnership since 2000 through Clean Water Partnership Diagnostic Studies and Implementation grants.

Minnesota Department of Agriculture (MDA)
The MDA is responsible for ensuring the safety of the agricultural related products in the State. They administer the Agricultural Best Management Practices Loan Program, providing low interest financing to rural landowners, agricultural supply businesses and farmers for BMPs that prevent or mitigate nonpoint source pollution. The MDA offers programs to educate homeowners about nitrates in groundwater and test the level of nitrates in their drinking water. They assist in collection and disposal programs for pesticide containers.

Minnesota Department of Health (MDH)
The MDH is the State's lead public health agency with permit and regulatory authority for the construction of wells and for monitoring public water supply facilities, as required by the Safe Drinking Water Act. These facilities include water wells, surface water intakes, water treatment and water distribution for public use. The MDH is assisting public water suppliers in the development and implementation of Wellhead Protection Plans.

Minnesota Department of Transportation (MnDOT)
The MnDOT is responsible for the administration of Federal and State highway systems. Highway systems within the District cross waterways, requiring interaction between the District and MnDOT, either in the form of a permit from the District to MnDOT or approval from MnDOT to the District for a project.

Minnesota Geological Survey (MGS)
The MGS is the University of Minnesota outreach center for the science and technology of earth resources in Minnesota. They conduct basic and applied earth science research, convey the information to the public through publications, presentations and service activities, and promote earth science education.

Minnesota Environmental Quality Board (EQB)
The EQB has final authority on permits involving a wide range of construction activity throughout the State. The EQB is comprised of the commissioners of State agencies, the chairmen of State boards, and five citizen members. They are responsible for the oversight of Environmental Assessment Worksheets (EAW) and Environmental Impact Statements (EIS) written for specific project proposals.

Federal Agencies

U.S. Army Corps of Engineers (USACE)
The USACE can potentially have permit and regulatory authority over projects within the District involving placement of fill or dredged material in wetlands and alterations or impact to navigable waters. They also work closely with the District in project planning and construction.

U.S. Department of Agriculture (USDA)
The USDA works with the District through the Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA). The NRCS provides technical advice and engineering design services to the local SWCDs within the District. The FSA participates in sponsoring and funding projects related to water and soil conservation.

U.S. Environmental Protection Agency (EPA)
The EPA is involved in the protection of the nation's air, soil, and water resources. The EPA has final authority over approval of TMDLs and implementation work plans within the District. They have regulatory authority over Stormwater Phase II regulations, as well as Section 404 permits issued by the USACE.

U.S. Fish and Wildlife Service (USFWS)
The USFWS enforces Federal wildlife laws, protects endangered species, manages migratory birds, restores nationally significant fisheries and conserves and restores wildlife habitat, especially wetlands. The USFWS has been involved in wetland restoration projects within the District.

U.S. Geological Survey (USGS)
The USGS offers the District stream flow discharge, ground water levels and water quality data. They maintain stream gauges within the watershed.

Wildlife, Conservation and Sportsmen's Organizations
There are several sportsmen's clubs and wildlife conservation groups within the District. These organizations sponsor a wide variety of environmentally positive initiatives, including wildlife habitat restoration, wetland development, and other activities that are beneficial to and consistent with the goals of the District.

Demographics/Economics

The 1990 and 2000 census showed that the population in rural areas and in the District has continued to decline. The decline from 1990 to 2000 has been 6.7% for the townships and cities of Lac qui Parle, Yellow Medicine and Lincoln Counties located within the District. This dramatic decline in rural population has been a continuous trend over the last 50 years. ***Table Three*** shows the breakdown by cities and townships.

The downward population trend is attributed to a decrease in the overall birth rate, an increase in out-migration of youth following high school graduation, and, more recently, a trend in out-migration of young to middle age adults. This age group tends to leave rural Minnesota to search for better jobs and opportunities elsewhere. The declining rural population results in rising costs of providing public services and administrating local government, which must be borne by fewer and fewer people. Retail trade suffers, which results in more business closings, which further restricts the job opportunities for rural youth. It is estimated that there were approximately 13,000 people living within the Watershed District in 1999.

Lac qui Parle - Yellow Bank Watershed District Demographics					*Table Three*
COUNTY		**2000 Census**	**1990 Census**	**Population Change**	**Percent Change**
Lac qui Parle	Agassiz township	104	127	-23	-18.1%
Lac qui Parle	Arena township	153	182	-29	-15.9%
Lac qui Parle	Augusta township	119	141	-22	-15.6%
Lac qui Parle	Baxter township	209	234	-25	-10.7%
Lac qui Parle	Bellingham city	205	247	-42	-17.0%
Lac qui Parle	Boyd city	210	251	-41	-16.3%
Lac qui Parle	Camp Release township	293	266	27	10.2%
Lac qui Parle	Cerro Gordo township	256	303	-47	-15.5%
Lac qui Parle	Dawson city	1539	1626	-87	-5.4%
Lac qui Parle	Freeland township	127	153	-26	-17.0%
Lac qui Parle	Garfield township	187	196	-9	-4.6%
Lac qui Parle	Hamlin township	185	215	-30	-14.0%
Lac qui Parle	Hantho township	154	134	20	14.9%
Lac qui Parle	Lac qui Parle township	183	231	-48	-20.8%
Lac qui Parle	Lake Shore township	239	265	-26	-9.8%
Lac qui Parle	Louisburg city	26	42	-16	-38.1%
Lac qui Parle	Madison city	1768	1951	-183	-9.4%
Lac qui Parle	Madison township	251	278	-27	-9.7%
Lac qui Parle	Manfred township	111	132	-21	-15.9%
Lac qui Parle	Marietta city	174	211	-37	-17.5%
Lac qui Parle	Maxwell township	206	212	-6	-2.8%
Lac qui Parle	Mehurin township	103	104	-1	-1.0%
Lac qui Parle	Nassau city	83	83	0	0.0%
Lac qui Parle	Perry township	137	142	-5	-3.5%
Lac qui Parle	Providence township	186	214	-28	-13.1%
Lac qui Parle	Riverside township	301	370	-69	-18.6%
Lac qui Parle	Ten Mile Lake township	195	205	-10	-4.9%
Lac qui Parle	Walter township	186	210	-24	-11.4%
Lac qui Parle	Yellow Bank township	177	199	-22	-11.1%
Lac qui Parle	**Total**	**8067**	**8924**	**-857**	**-9.6%**
Lincoln	Hansonville township	122	150	-28	-18.7%
Lincoln	Hendricks city	725	684	41	6.0%
Lincoln	Hendricks township	220	255	-35	-13.7%
Lincoln	Marble township	195	214	-19	-8.9%
Lincoln	**Total**	**1262**	**1303**	**-41**	**-3.1%**
Yellow Medicine	Canby city	1903	1826	77	4.2%
Yellow Medicine	Florida township	164	177	-13	-7.3%
Yellow Medicine	Fortier township	116	117	-1	-0.9%
Yellow Medicine	Hammer township	233	295	-62	-21.0%
Yellow Medicine	Norman township	291	300	-9	-3.0%
Yellow Medicine	Omro township	184	166	18	10.8%
Yellow Medicine	Oshkosh township	249	249	0	0.0%
Yellow Medicine	Tyro township	208	226	-18	-8.0%
Yellow Medicine	Wergeland township	201	215	-14	-6.5%
Yellow Medicine	**Total**	**3549**	**3571**	**-22**	**-0.6%**
Total Census Change 1990 to 2000		**12878**	**13798**	**-920**	**-6.7%**

Physical Environment

The majority of the geological features within the Lac qui Parle – Yellow Bank Watershed District were formed during the Late Wisconsin Glacial event. Several minor glacial moraines, which were deposited by ice lobes that had advanced from the northwest, are exposed in the northern part of the District. A major lobe of the Altamont – Gary Moraine is exposed in Lincoln County. Glacial till deposits overlay Cretaceous shale throughout the Watershed District; the deposits range in thickness from 0 feet on Precambrian granite outcrops in the north to over 400 feet in the southwest part of the District. Underlying the glacial till and Cretaceous shales throughout the Watershed District are Precambrian granites and gneisses that extend to an undetermined depth. Surficial Geology of the District is shown in ***Figure Four***. In this figure, the descriptions in the key are a series of four letters and/or numbers. The first letter describes the geologic association in the soil within that area as follows:

D	Des Moines Lobe	O	Organic Deposits
J	Lake and Pond Sediments	Q	Glacial Lake Benson
F	Fluvial	C	Scoured Bedrock Uplands

The second series of letters describes the phase or glaciations period that the sediment was laid down. Descriptions of these phases are:

Wi	Wisconsin	Ho	Holocene
Be	Bemis Phase	---	Undifferentiated

The numbering that follows describes the topography of the land. It varies from 1 to 5 and is described as level, rolling hills, steep/hummocky, steep, and intermediate – in that order. Lastly, the sediment is described in the following manner:

S	Supraglacial Drift Complex	O	Outwash
P	Peat	T	Till Plain
L	Lacustrine		

As an example, the two largest areas on the map are QWi1L and DWi2T. The first, QMi1L, is a part of Glacial Lake Benson from the Wisconsin glacier. It is on level ground with lacustrine soils. The second is from the Des Moines Lobe of the Wisconsonian glacier with rolling hills and Till Plain soils. The map in this plan is for general understanding. This map and others related to the geology of the area are available on a large scale in the District office or online at: http://www.dnr.state.mn.us/waters/programs/gw_section/mapping/platesum/umrbrha.html.

One of the most pronounced geological features in the District is the large valley containing the Minnesota River, which form the northeast boundary of the District. At places this valley is over 100 feet below the surrounding plains' land surface. Meltwater from the receding glacier was impounded to form Lake Agassiz, which occupied the Red River Valley north of the Watershed District. Drainage from Lake Agassiz through its southern outlet formed Glacial River Warren, which flowed through what is now the Minnesota River Valley. This large and fast moving river meltwater caused accelerated erosion of the valley floor, resulting in the incision of the valley to its present size and configuration.

Another prominent geologic feature in the District is the highland plateau known as the Coteau des Prairie. This prominent ridge of hills consists of the Gary – Altamont moraine complex which is an erosional remnant of numerous stacked and reworked tills dating back some 1.5 million years at its base. The Coteau des Prairie extends from northeastern South Dakota in a southeasterly direction into Nobles County in Minnesota and enters the District in Lincoln County. The Coteau des Prairie forms a watershed boundary between the Big Sioux River of the Missouri River Basin on the west and the Minnesota River of the Mississippi River Basin on the east. The Lac qui Parle and Yellow

Bank Rivers and most of their tributaries originate in this highlands plateau and flow in a northeasterly direction.

The Lac qui Parle River enters into the Minnesota River on the northeastern boundary of the District. The river carried a large amount of sediment which was deposited on the floor of the Minnesota River forming a delta. This delta formed a barrier impounding the Minnesota River, forming the original Lac qui Parle Lake. In 1936-1938 the United Stated Army Corps of Engineers constructed a flood control dam downstream from the Lac qui Parle River outlet and raised the lake level to its present elevation.

The topography of most of the Lac qui Parle-Yellow Bank Watershed District is nearly level to gently rolling terrain. The rolling topography becomes more pronounced, with steep slopes, along the bluffs of the Minnesota River Valley. In the southwestern part of the District, in Lincoln County, the topography is rolling with long slopes. Extensive and well developed flood plains along the rivers extend from the foot of the Coteau des Prairie to the Minnesota River Valley. The land surface in these areas is nearly level.

The lowest elevation in the watershed is 931 feet above sea level on the shore of Lac qui Parle Lake. The highest elevation is 2,001 feet above sea level and is in South Dakota, as shown in ***Figure Five***. The highest elevation in the Watershed District is located southwest of Hendricks and is between 1,870 and 1,880 feet above sea level. The dramatic change in elevation within the watershed is the cause of many of the flooding problems. There is a 1,070 foot drop in elevation in the first 60 miles of the drainage, and a 931 foot drop in elevation over the next 1,000 miles of the drainage.

Figure Four

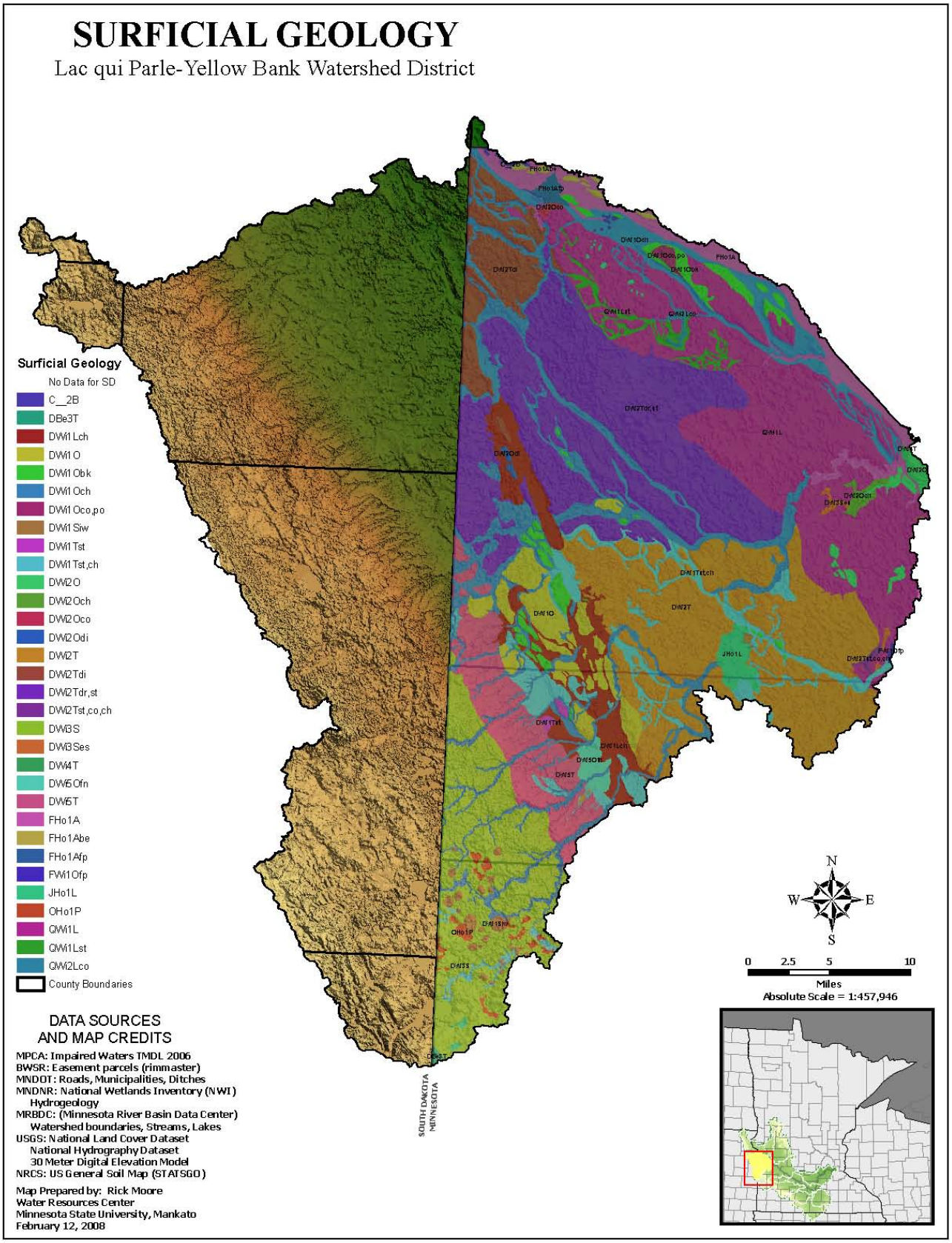
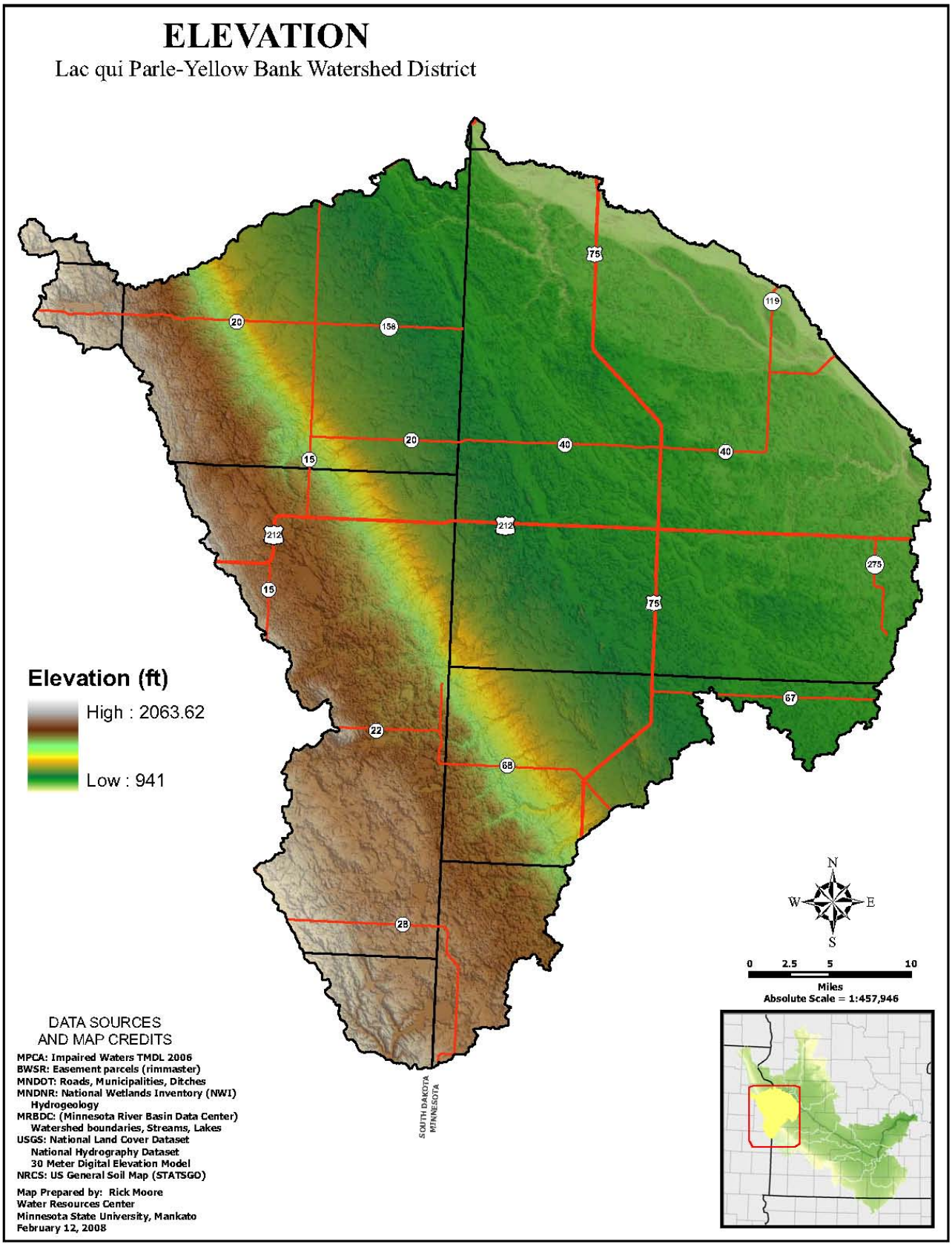

SURFICIAL GEOLOGY
Lac qui Parle-Yellow Bank Watershed District
Surficial Geology
No Data for SD
C__2B
DBe3T
DWi1Lch
DWi1O
DWi1Obk
DWi1Och
DWi1Oco,po
DWi1Siw
DWi1Tst
DWi1Tst,ch
DWi2O
DWi2Och
DWi2Oco
DWi2Odi
DWi2T
DWi2Tdi
DWi2Tdr,st
DWi2Tst,co,ch
DWi3S
DWi3Ses
DWi4T
DWi5Ofn
DWi5T
FHo1A
FHo1Abe
FHo1Afp
FWi1Ofp
JHo1L
OHo1P
QWi1L
QWi1Lst
QWi2Lco
County Boundaries
DATA SOURCES
AND MAP CREDITS
MPCA: Impaired Waters TMDL 2006
BWSR: Easement parcels (rimmaster)
MNDOT: Roads, Municipalities, Ditches
MNDNR: National Wetlands Inventory (NWI)
Hydrogeology
MRBDC: (Minnesota River Basin Data Center)
Watershed boundaries, Streams, Lakes
USGS: National Land Cover Dataset
National Hydrography Dataset
30 Meter Digital Elevation Model
NRCS: US General Soil Map (STATSGO)
Map Prepared by: Rick Moore
Water Resources Center
Minnesota State University, Mankato
February 12, 2008
SOUTH DAKOTA
MINNESOTA
N
W
E
S
0 2.5 5 10
Miles
Absolute Scale = 1:457,946

Figure Five


ELEVATION
Lac qui Parle-Yellow Bank Watershed District
Elevation (ft)
High : 2063.62
Low : 941
DATA SOURCES
AND MAP CREDITS
MPCA: Impaired Waters TMDL 2006
BWSR: Easement parcels (rimmaster)
MNDOT: Roads, Municipalities, Ditches
MNDNR: National Wetlands Inventory (NWI)
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SOUTH DAKOTA
MINNESOTA
N
W
E
S
0 2.5 5 10
Miles
Absolute Scale = 1:457,946

Climate/Precipitation

The U. S. Weather Service has maintained records at Canby, Dawson, and Madison within the District. Recording at Canby began in 1916, but there have been several interruptions since that time. Weather recording has been continuous at Madison since 1940 and at Dawson since 1941. There are four United States Weather Stations with long term records just outside the District at Milan and Montevideo to the east, and at Milbank and Brookings, South Dakota to the west. The SWCDs, in cooperation with the State Office of Climatology and the Board of Water and Soil Resources, have been part of a comprehensive precipitation gathering program since 1977 through a volunteer rain gauge monitor program as shown in ***Figure Six***.

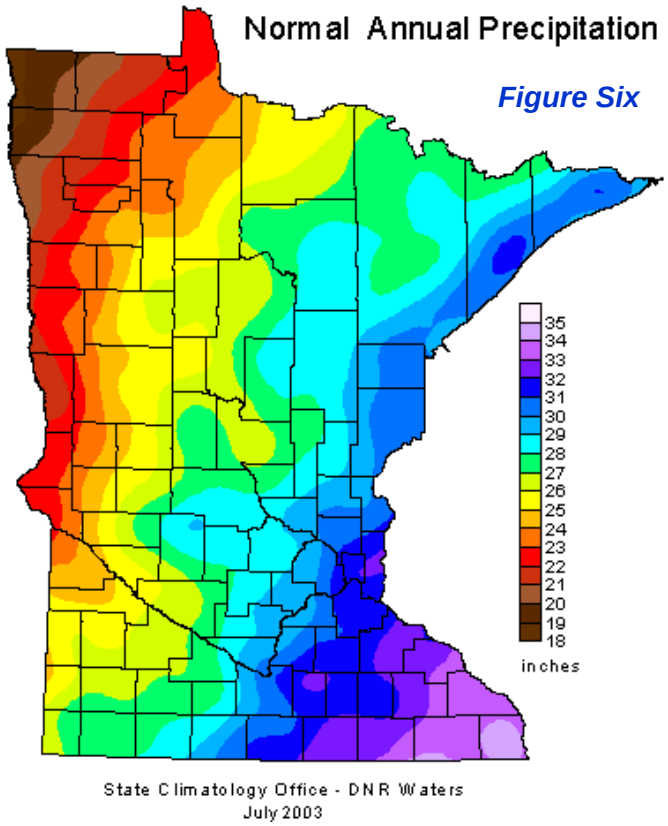


Figure Six

According to records at Milbank, the mean annual temperature for the District is 44 degrees F., ranging from a low monthly average of 12 degrees F. in January to a high monthly average of 74 degrees F. in July. Average annual precipitation is 22.5 inches, with a January average of .6 inches and a June average of 4.0 inches as the extremes. About 16 inches of the total precipitation, or approximately 70%, occurs during the crop production season of May through September. The average season snowfall is 36 inches. The average length of the frost free season in the District is 144 days. The last freezing temperature (32 degrees F.) occurs on average on May 10th. The average date of the first fall frost is October 2nd at Canby. The maximum temperature recorded was 111 degrees F. at Canby. The minimum recorded temperature was 31 degrees below zero F., also at Canby. Data collected from four stations within the District from 2001-2007, as shown in ***Table Four***, indicated the District has encountered wetter years compared to the recorded 22.5 average annual precipitation.

Total Annual Precipitation Watershed Wide 2001-2007 — ***Table Four***

Year	Hendricks	Canby	Madison	Odessa	Watershed Average
2001	32.6	32.0	26.8	26.5	29.5
2002	23.0	23.2	22.1	21.7	22.5
2003	21.7	22.7	15.3	13.0	18.2
2004	29.0	27.2	23.0	31.0	27.6
2005	33.8	28.2	26.7	29.4	29.6
2006	25.8	24.9	22.2	20.5	23.3
2007	29.7	26.3	26.0	31.7	28.4
7 Year Average	**27.9**	**26.4**	**23.2**	**24.8**	**25.6**

Surface Water Resources

The Lac qui Parle River and its tributaries, public and private drainage systems, lakes and wetlands, define the drainage network of the major watershed. The Lac qui Parle River flows to its confluence with the Minnesota River above the Lac qui Parle Dam in Lac qui Parle County. The total distance of the stream network within Minnesota is 1,434 miles of which 1,052 miles are intermittent streams and 382 miles are perennial streams

Rivers and Natural Streams

Fluvial systems in the District are relatively young, forming after the major ice sheets melted to the north. Most tributaries have poorly developed drainage networks because of their young age. In higher relief areas such as the Coteau des Prairie, streams flow straight down the escarpment forming straight parallel rills.

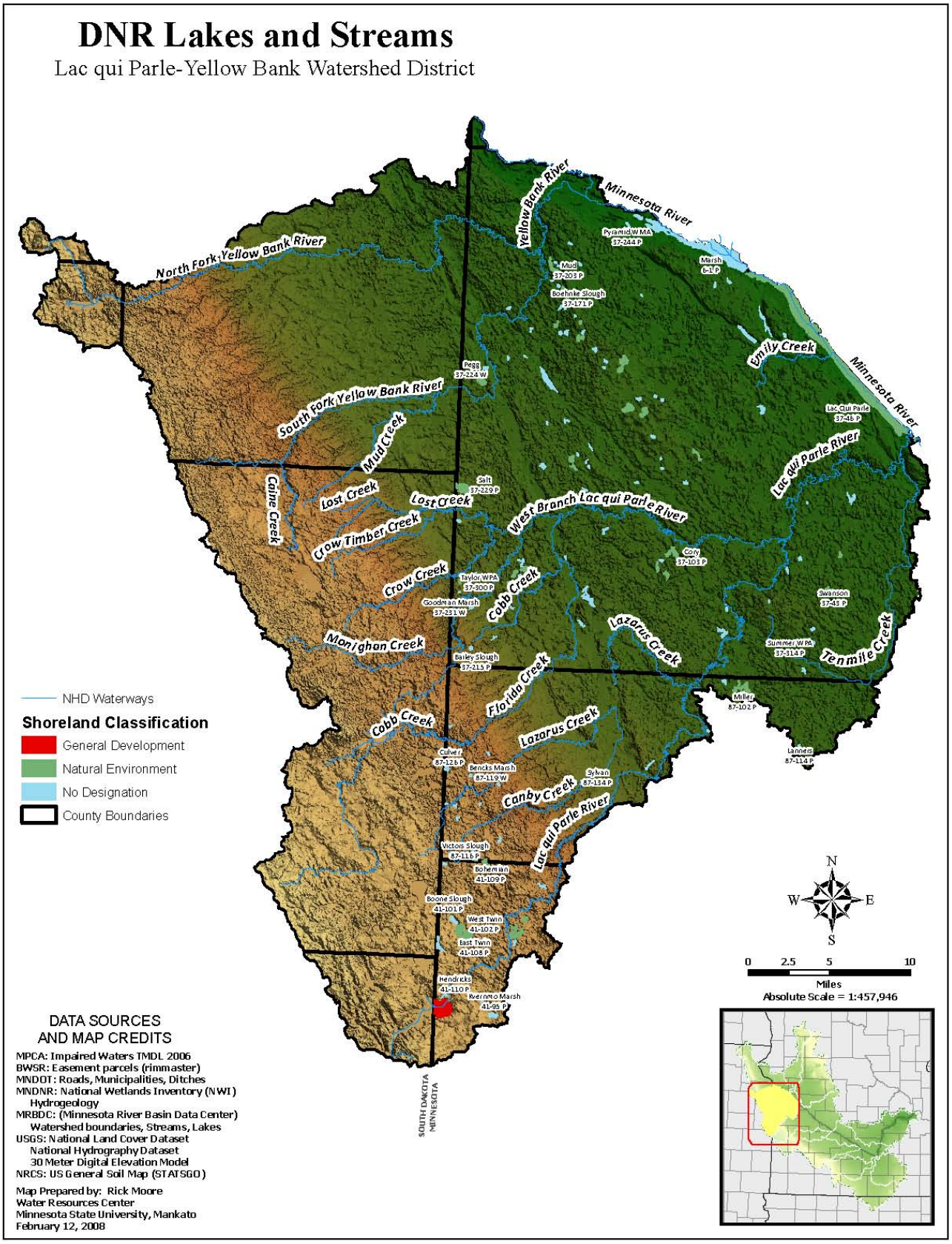
The U. S. Geological Survey Hydrological Atlas (HA-269) has data on the Minnesota River at Montevideo dating back to 1900. Rainfall has been consistent ranging from 19.6 inches in the 1930s to a high of 25.9 inches in the past 18 years. The average annual runoff in the Lac qui Parle River at Lac qui Parle in the past eight years, determined from stream flow records, is 2.2 inches per year. Water lost through evaporation and transpiration averages 20.7 inches per year. The U.S. Geological Survey maintains a stream gage station on the Lac qui Parle River near the outlet into Lac qui Parle Lake. They also have on record some data of stream flow from the Yellow Bank River. The data in ***Table Five*** is a summary of U. S. Geological Survey reports as of 1970. While this information is valuable, it has likely changed some in the past 38 years. A review of the water budget would be beneficial for decision making purposes. In the 40 years since this water budget was developed, the average discharge and average annual runoff has increased, as discussed further in Section Two of this Plan.

River Flow Summary — ***Table Five***

Category	Lac qui Parle River (near outlet)	Yellow Bank River (near Odessa)
Drainage Area	983 Square Miles	398 Square Miles
Years of Record	1910-1914, 1931-1964	1940-1962
Maximum Discharge	11,100 CFS	6.200 CFS
Minimum Discharge	No Flow	No Flow
Average Discharge	112 CFS	59.4 CFS
Average Annual Runoff	1.55 Inches	1.96 Inches

There are 675.6 miles of streams within the watershed area, 435.4 of these located within the District, but all drain into it as shown in ***Figure Seven*** A breakdown of the streams by sub-watershed is shown in ***Table Six***. The Lac qui Parle and Yellow Bank Rivers and most of their tributaries originate on the northeast slope of the Coteau des Prairies. Runoff water from the steeply sloping land to the west flows down waterways and ravines which merge to form numerous small creeks, most of them unnamed. These small creeks merge to form the major tributaries, which merge on the flood plains to form the major river channels in the watershed. The general flow direction is from southwest to northeast.

Figure Seven



Miles of Streams by Sub-Watershed			*Table Six*
Stream Name	**Total Stream Miles**	**Total Minnesota Stream Miles**	**Percent of Sub-Watershed in Minnesota**
Cobb Creek	32.7	0.0	0.0
Crow Creek	119.9	43.7	36.4
Florida Creek	53.1	44.6	84.0
Lazarus Creek	70.8	67.9	95.9
Upper Lac qui Parle River	48.8	41.2	84.4
Middle Lac qui Parle River	21.4	21.4	100.0
Lower Middle Lac qui Parle River	28.1	28.1	100.0
Lower Lac qui Parle River	28	28	100.0
Ten Mile Creek	30.7	30.7	100.0
West Branch Lac qui Parle River	29.7	29.7	100.0
Minnesota River	34.6	34.6	100.0
North Fork Yellow Bank River	63.1	8.5	13.5
South Fork Yellow Bank River	82.4	24.6	29.9
Yellow Bank River	32.5	32.5	100.0
Total Stream Miles in Watershed	**675.6**	**435.4**	**64.4**

Sub-Watersheds

The next several pages consisting of ***Figures Eight A-AB*** will identify the sub-watersheds, their properties, impairments, land uses, and Best Management Practices (BMP) s completed within the drainage area. This will provide the tools to identifying issues and assessing needs for implementation strategies.

Sub-Watershed #1 – Cobb Creek

Figure Eight A

Florida Creek originates in Deuel County, South Dakota, near Toronto, where it is known as Cobb Creek. It flows northeast and enters Minnesota 3.5 miles south of Gary, South Dakota. The creek crosses the northwest corner of Yellow Medicine County, and continues north to join the West Fork in Section 17, Garfield Township, Lac qui Parle County. Predominant land use is cultivated crops.

Area: 42,258 Acres

Minor Sub-Watersheds:
24074 (11,595 acres)
24075 (30,663 acres)

Surface Waters: No lakes in Minnesota, Fox Lake and Cottonwood Slough in South Dakota.
Miles of stream: **32.7**
Cobb Creek: **25.0**
North Branch Cobb Creek: **7.7**

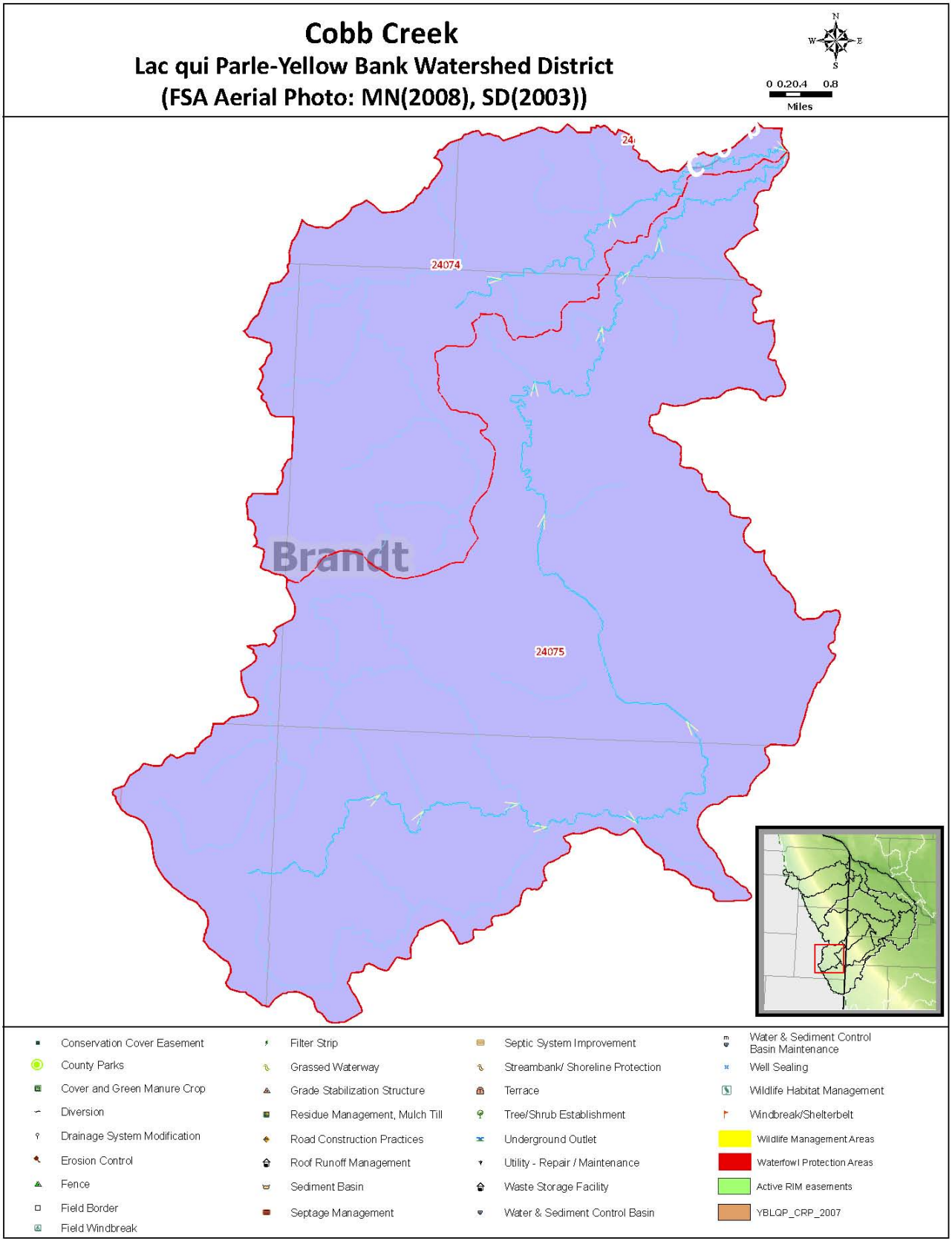
Local Government: Lies entirely in South Dakota

Areas of Concern: Water entering Minnesota from Cobb Creek is impaired for Aquatic Life and Aquatic Recreation.

Land Use Within the Cobb Creek Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	649.81	1.54
21	Developed, Open Space	1495.39	3.54
22	Developed, Low Intensity	26.13	0.06
23	Developed, Medium Intensity	9.99	0.02
24	Developed, High Intensity	1.32	0.00
31	Barren Land (Rocks, Clay, Sand)	0.00	0.00
41	Deciduous Forest	181.59	0.43
42	Evergreen Forest	0.00	0.00
52	Shrub/Scrub	1.55	0.00
71	Grassland/Herbaceous	11433.83	27.04
81	Pasture/Hay	3437.43	8.13
82	**Cultivated Crops**	**23062.91**	**54.55**
90	Woody Wetlands	10.23	0.02
95	Emergent Herbaceous Wetlands	1941.58	4.59
	Unknown	27.61	0.07
	Total	**42,279.37**	**99.9**

Figure Eight B



Sub-Watershed #2 – Crow Creek

Figure Eight C

Crow Creek Watershed is made up of Monighan Creek in South Dakota, The West Branch of the Lac qui Parle River, Crow Creek and Lost Creek. Lost Creek is one of two major tributaries that drain into the West Fork. Lost Creek has a watershed of approximately 60,000 acres; 50,000 acres in Deuel County, South Dakota and 10,000 acres in Lac qui Parle County, Minnesota. Lost Creek lays parallel to and just north of U.S. Highway 212 and flows east. Many small creeks drain into Lost Creek from the south. The largest is Crow Timber Creek in Deuel County; the rest are unnamed. Lost Creek enters the West Fork in Section 24, Mehurin Township, Lac qui Parle County. Grasslands, Pasture and Cultivated Crops are the dominant land uses within this watershed.

Area: 102,416 Acres

Minor Sub-Watersheds:

24071 (9,028 acres)
24072 (9,124 acres)
24043 (4,417 acres)
24044 (4,300 acres)
24045 (4,556 acres)
24046 (12,123 acres)
24047 (12,413 acres)
24010 (11,502 acres)
24060 (24,675 acres)
24061 (10,279 acres)

Surface Waters: Goodman Marsh, Taylor WPA and 6 unnamed public waters in Minnesota and Rush Lake, Lone Tree Lake, Lake Francis, and Briggs Lake in South Dakota.

Miles of stream: **119.9**
Crow Creek: **23.3**
Crow Timber Creek: **13.3**
Lost Creek: **30.5**
Monighan Creek: **18.5**
West Branch LqP River: **34.4**

Local Government:

County: Lac qui Parle
Townships: Mehurin, Manfred, Garfield
Cities: (Brandt in SD)

Areas of Concern: The West Branch of the Lac qui Parle River, coming out of Crow Creek, is impaired for Aquatic Recreation.

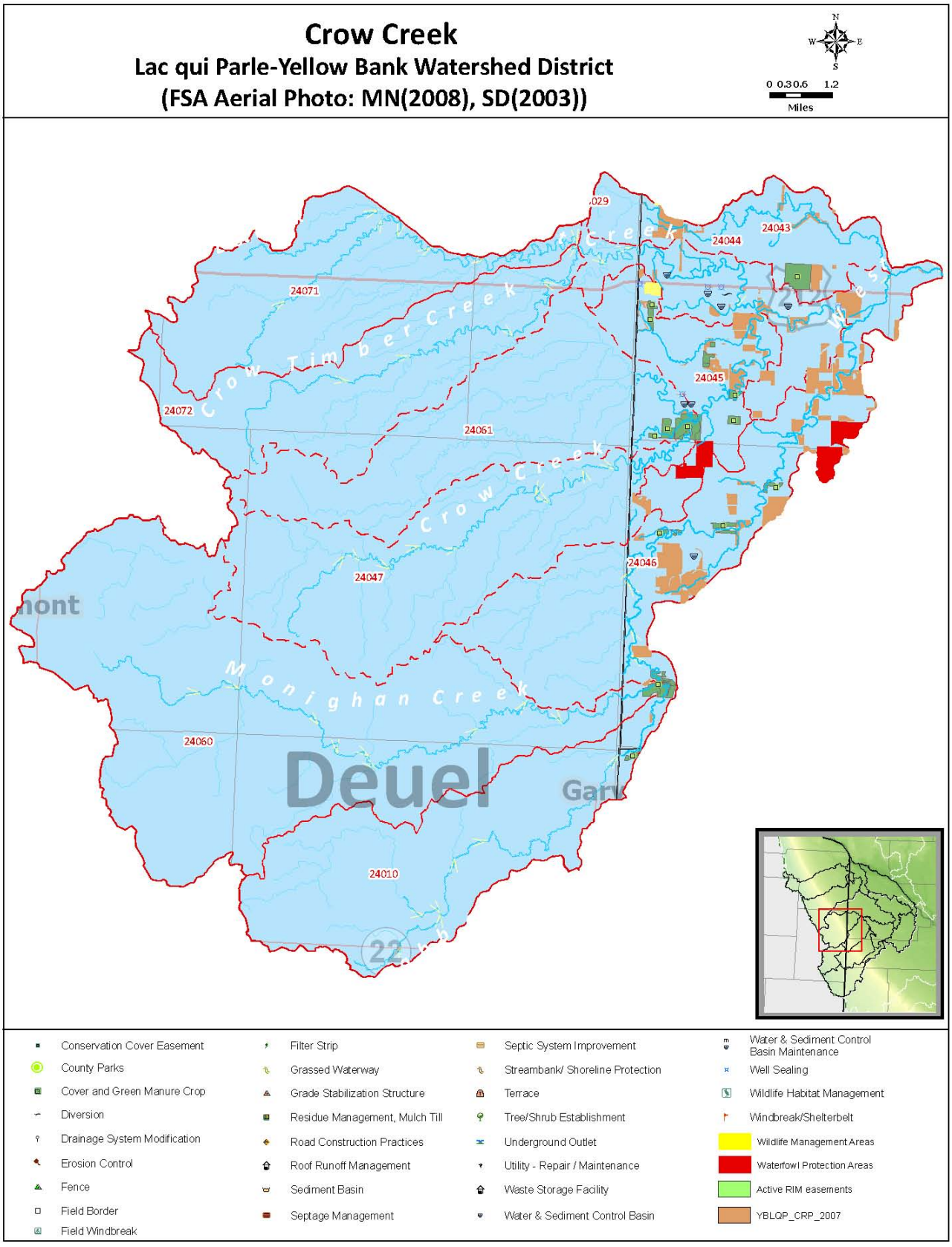
Land Use Within the Crow Creek Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	1479.24	1.44
21	Developed, Open Space	3779.68	3.69
22	Developed, Low Intensity	128.28	0.13
23	Developed, Medium Intensity	22.55	0.02
24	Developed, High Intensity	3.56	0.00
31	Barren Land (Rocks, Clay, Sand)	19.35	0.02
41	Deciduous Forest	656.19	0.64
42	Evergreen Forest	2.89	0.00
52	Shrub/Scrub	0	0.00
71	**Grassland/Herbaceous**	**25278.8**	**24.68**
81	**Pasture/Hay**	**23785.59**	**23.22**
82	**Cultivated Crops**	**40067.18**	**39.12**
90	Woody Wetlands	153.78	0.15
95	Emergent Herbaceous Wetlands	7023.16	6.86
	Unknown	17.97	0.02
	Total	**102,418.22**	**100**

Crow Creek Easements	
Acres enrolled in CRP	2220.43
Acres enrolled in RIM	653.29
WPA acres	359.42
WMA acres	49.34
Number of WMA easements	1

Crow Creek Sub-watershed Best Management Practices	
Abandoned well sealing	5
Water and sediment control basin	7
Diversion	1

Figure Eight D



Sub-Watershed #3 – Florida Creek

Figure Eight E

Florida Creek originates in Deuel County, South Dakota, near Toronto, where it is known as Cobb Creek. It flows northeast and enters Minnesota 3.5 miles south of Gary, South Dakota. The creek crosses the northwest corner of Yellow Medicine County, and continues north to join the West Fork in Section 17, Garfield Township, Lac qui Parle County. Cultivated Crops are the dominant land use in the drainage area.

Area: 56,473 Acres

Minor Sub-Watersheds:
24008 (28,048 acres)
24009 (17,060 acres)
24042 (4,178 acres)
24048 (4,153 acres)
24062 (3,035 acres)

Surface Waters: Bailey Slough and 16 unnamed public waters in Minnesota and none in South Dakota.
Miles of stream: **53.1**
Cobb Creek: **28.9**
Florida Creek: **24.2**

Local Government:
Counties: Lac qui Parle, Yellow Medicine
Townships: Garfield, Freeland, Manfred
Cities: None

Areas of Concern: Florida Creek is impaired for Aquatic Life and Aquatic Recreation.

Land Use Within the Florida Creek Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	528.83	0.94
21	Developed, Open Space	2322.56	4.11
22	Developed, Low Intensity	58.94	0.10
23	Developed, Medium Intensity	9.56	0.02
24	Developed, High Intensity	0.22	0.00
31	Barren Land (Rocks, Clay, Sand)	112.51	0.20
41	Deciduous Forest	559.63	0.99
42	Evergreen Forest	3.33	0.01
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	4935.43	8.74
81	Pasture/Hay	9884.42	17.50
82	**Cultivated Crops**	**29793.28**	**52.76**
90	Woody Wetlands	420.22	0.74
95	Emergent Herbaceous Wetlands	7838.34	13.88
	Unknown	0	0.00
	Total	**56,467.27**	**100**

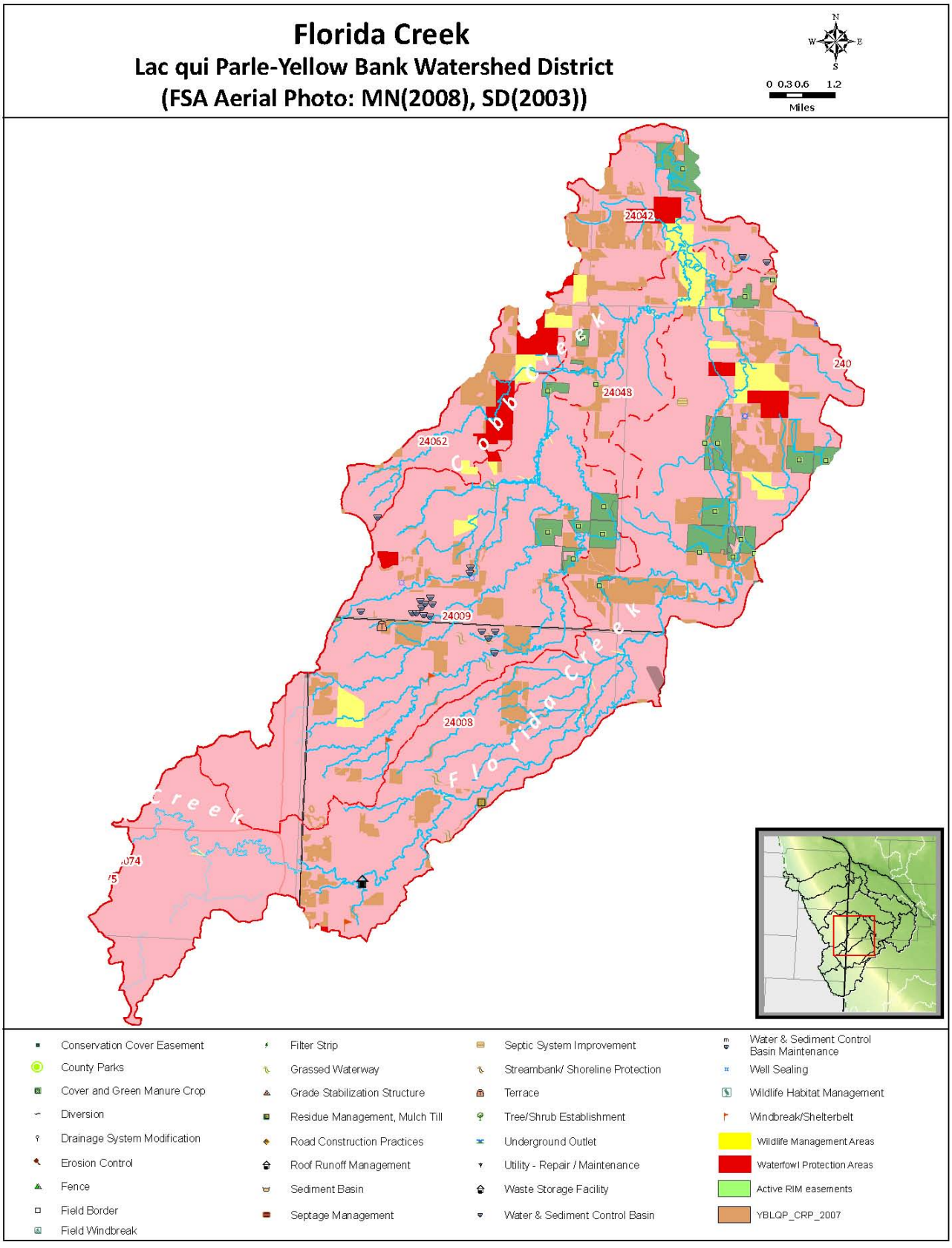
Florida Creek Easements

Acres enrolled in CRP	6684.02
Acres enrolled in RIM	2074.27
WPA acres	1347.31
WMA acres	1620.08
Number of WMA easements	12

Florida Creek Sub-watershed Best Management Practices

Abandoned well sealing	7
Water and sediment control basin	19
Roof runoff management	1
Windbreak/Shelterbelt establishment	5
Residue management - mulch	1
Terrace	1
Septic system improvement	1
Grassed waterway	7

Figure Eight F



Sub-Watershed #4 – Lazarus Creek

Figure Eight G

The Lazarus Creek Watershed is north of Canby Creek, and also flows northeast. There are many unnamed creeks and waterways that drain into Lazarus Creek. About 16,000 acres of the watershed are in South Dakota, including the area around Fox Lake and Lake Cochrane in Deuel County. There are about 20,500 acres of the sub-watershed in Minnesota, all of which are in Yellow Medicine County. The Canby Creek Watershed adjoins the main channel of the Lac qui Parle Watershed on the north. Major land use is cultivated crops.

Area: 85,622 Acres

Minor Sub-Watersheds:

24005 (6,990 acres)
24006 (3,870 acres)
24007 (14,371 acres)
24011 (5,895 acres)
24012 (8,603 acres)
24013 (8,598 acres)
24014 (2,844 acres)
24015 (6,306 acres)
24016 (23,034 acres)
24017 (5,110 acres)

Surface Waters: Del Clark Lake – impoundment, Culver Lake, Lake Sylvan, Bohemian Lake, Victor's Slough and 12 unnamed public waters in Minnesota and Lakes Oliver, Cochrane and Cottonwood Slough in South Dakota.

Miles of stream: **70.8**
Canby Creek: **23.9**
Lazarus Creek: **46.9**

Local Government:

Counties: Lac qui Parle, Yellow Medicine, Lincoln
Townships: Freeland, Florida, Hammer, Fortier, Norman, Hansonville
Cities: Canby

Land Use Within the Lazarus Creek Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	1854.97	2.17
21	Developed, Open Space	3908.24	4.57
22	Developed, Low Intensity	371.05	0.43
23	Developed, Medium Intensity	131.87	0.15
24	Developed, High Intensity	49.29	0.06
31	Barren Land (Rocks, Clay, Sand)	59.6	0.07
41	Deciduous Forest	717.66	0.84
42	Evergreen Forest	0	0.00
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	9021.66	10.54
81	Pasture/Hay	10226.24	11.94
82	**Cultivated Crops**	**54126.27**	**63.22**
90	Woody Wetlands	94.33	0.11
95	Emergent Herbaceous Wetlands	5051.16	5.90
	Unknown	0	0.00
	Total	**85,612.34**	**100**

Lazarus Creek Easements

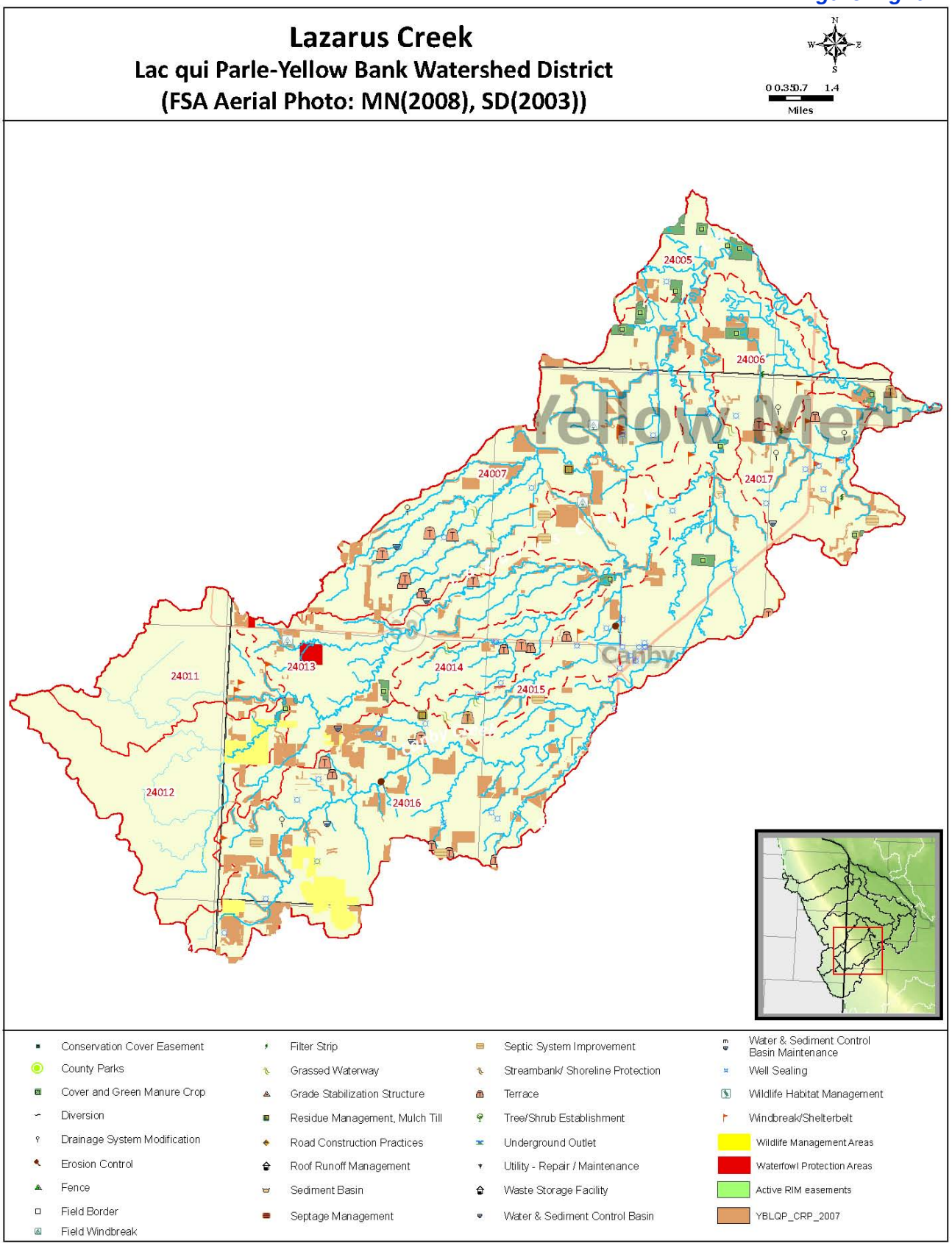
Acres enrolled in CRP	7396.06
Acres enrolled in RIM	782.37
WPA acres	181.05
WMA acres	1369.53
Number of WMA easements	5

Lazarus Creek Sub-watershed Best Management Practices

Abandoned well sealing	43
Water and sediment control basin	6
Residue management - mulch	3
Windbreak/Shelterbelt establishment	22
Erosion control	2
Terrace	25
Septic system improvement	6
Grassed waterway	9
Conservation cover easement	1
Filter strip	3
Streambank and shoreline protection	1
Drainage system modification	5

Areas of Concern: Lazarus Creek is impaired for Aquatic Life and Aquatic Recreation. Del Clark Lake is impaired for Aquatic Consumption.

Figure Eight H



Sub-Watershed #5 – Upper Lac qui Parle River

Figure Eight I

The main channel of the Lac qui Parle River Watershed includes about 46,500 acres in South Dakota. That area extends from southwest of Lake Hendricks, northwest following Upper Deer Creek to near the village of Toronto, and then northeast to include Fish Lake in Deuel County. In Minnesota, the entire Lac qui Parle River watershed area is about 170,000 acres and is relatively long and narrow compared to the rest of the sub-watershed. Cultivated crops are the dominant land use within the drainage area.

Area: 100,048 Acres

Minor Sub-Watersheds:
24020 (3,858 ac.), 24021 (9,282)
24022 (9,023), 24063 (3,336)
24064 (4,847), 24065 (3,573)
24066 (3,584), 24067 (4,845)
24068 (3,780), 24069 (5,829)
24070 (7,836), 24076 (15,674)
24077 (12,234), 24078 (12,306)

Surface Waters: Lake Hendricks, East Twin Lake, West Twin Lake, Boone Slough, Kvernmo Marsh, and 12 unnamed public waters in Minnesota and Fish Lake, Oak Lake and Lake Astoria in South Dakota.

Miles of stream: **48.8**
Deer Creek: **3.5**
Lac qui Parle River: **45.3**

Land Use Within the Upper Lac qui Parle River Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	4268.96	4.27
21	Developed, Open Space	4293.04	4.29
22	Developed, Low Intensity	181.84	0.18
23	Developed, Medium Intensity	48.16	0.05
24	Developed, High Intensity	13.98	0.01
31	Barren Land (Rocks, Clay, Sand)	13.32	0.01
41	Deciduous Forest	1341.01	1.34
42	Evergreen Forest	0	0.00
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	23624.58	23.61
81	Pasture/Hay	8819.5	8.81
82	**Cultivated Crops**	**52961.56**	**52.93**
90	Woody Wetlands	109.84	0.11
95	Emergent Herbaceous Wetlands	4320.41	4.32
	Unknown	68.39	0.07
	Total	**100,064.59**	**100**

Local Government:
Counties: Lincoln, Yellow Medicine
Townships: Hansonville, Marble, Hendricks
Cities: Hendricks, (Astoria in SD)

Upper Lac qui Parle River Easements	
Acres enrolled in CRP	6664.04
Acres enrolled in RIM	815.98
WPA acres	57.06
WMA acres	1346.47
Number of WMA easements	12

Upper Lac qui Parle River Sub-watershed Best Management Practices	
Abandoned well sealing	55
Water and sediment control basin	21
Diversion	1
Windbreak/Shelterbelt establishment	5
Residue management - mulch	3
Terrace	1
Septic system improvement	40
Grassed waterway	2
Septage management	3

Areas of Concern: Hendricks Lake is impaired for Aquatic Consumption; the Lac qui Parle River is impaired for Aquatic Consumption, Life and Recreation.

Figure Eight J

Sub-Watershed #6 – Middle Lac qui Parle River

Figure Eight K

Over 70 percent of the land is utilized for Cultivated Crops within the Middle Lac qui Parle drainage area.

Area: 13,773 Acres

Minor Sub-Watersheds:
24018 (9,824 acres)
24019 (3,949 acres)

Surface Waters: No Lakes in Minnesota or South Dakota, 2 unnamed public waters in Minnesota.
Miles of stream: **21.4**
Lac qui Parle River: **21.4**

Local Government:
County: Yellow Medicine
Townships: Wergeland, Oshkosh, Norman
Cities: None

Areas of Concern: The Lac qui Parle River is impaired for Aquatic Consumption, Life and Recreation.

Land Use Within the Middle Lac qui Parle River Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	42.64	0.31
21	Developed, Open Space	679.88	4.94
22	Developed, Low Intensity	29.03	0.21
23	Developed, Medium Intensity	3.39	0.02
24	Developed, High Intensity	0	0.00
31	Barren Land (Rocks, Clay, Sand)	12.55	0.09
41	Deciduous Forest	68.84	0.50
42	Evergreen Forest	0	0.00
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	156.06	1.13
81	Pasture/Hay	874.79	6.35
82	**Cultivated Crops**	**10667.61**	**77.46**
90	Woody Wetlands	36.87	0.27
95	Emergent Herbaceous Wetlands	1178.56	8.56
	Unknown	22.15	0.16
	Total	**13,772.37**	**100**

Middle Lac qui Parle River Easements	
Acres enrolled in CRP	729.41
Acres enrolled in RIM	263.52
WPA acres	0
WMA acres	285.21
Number of WMA easements	2

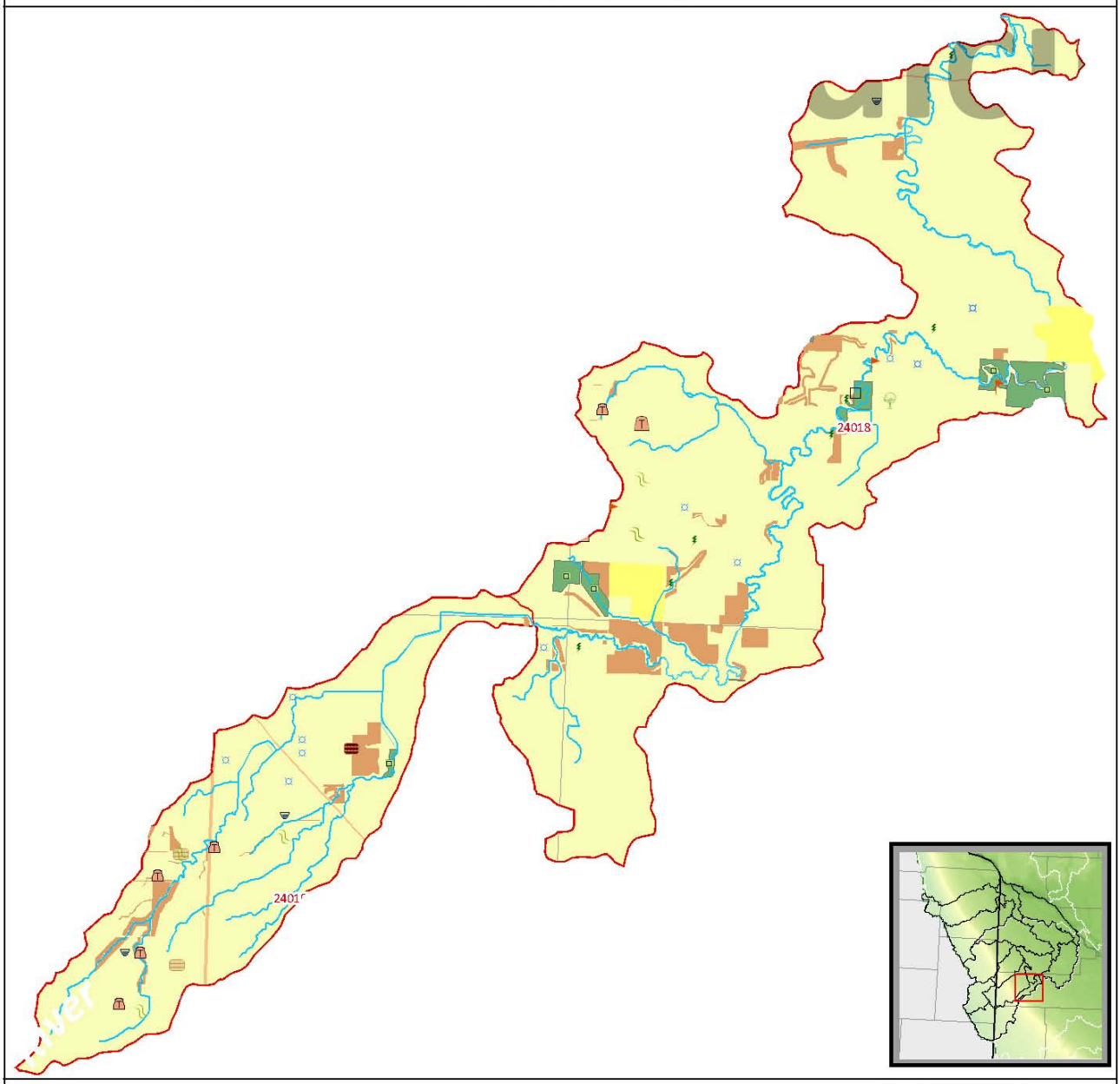
Middle Lac qui Parle River Sub-watershed Best Management Practices	
Abandoned well sealing	14
Water and sediment control basin	3
Filter strip	7
Windbreak/Shelterbelt establishment	4
Field border	2
Terrace	6
Septic system improvement	2
Grassed waterway	7
Septage management	1

Figure Eight L

Middle Lac qui Parle River

Lac qui Parle-Yellow Bank Watershed District

(FSA Aerial Photo: MN(2008), SD(2003))



- Conservation Cover Easement
- County Parks
- Cover and Green Manure Crop
- Diversion
- Drainage System Modification
- Erosion Control
- Fence
- Field Border
- Field Windbreak
- Filter Strip
- Grassed Waterway
- Grade Stabilization Structure
- Residue Management, Mulch Till
- Road Construction Practices
- Roof Runoff Management
- Sediment Basin
- Septage Management
- Septic System Improvement
- Streambank/ Shoreline Protection
- Terrace
- Tree/Shrub Establishment
- Underground Outlet
- Utility - Repair / Maintenance
- Waste Storage Facility
- Water & Sediment Control Basin
- Water & Sediment Control Basin Maintenance
- Well Sealing
- Wildlife Habitat Management
- Windbreak/Shelterbelt
- Wildlife Management Areas
- Waterfowl Protection Areas
- Active RIM easements
- YBLQP_CRP_2007

Sub-Watershed #7 – Lower Middle Lac qui Parle River

Figure Eight M

The Lac qui Parle River has its source in Lake Hendricks, located on the Minnesota-South Dakota border between Lincoln County, Minnesota and Brookings County, South Dakota. The stream flow is to the northeast, to within a few miles of Canby. At that point it meanders northeast near Dawson, and discharges to the Minnesota River in Lac qui Parle Lake. From the source at the outlet of Lake Hendricks, through Lincoln and Yellow Medicine Counties, the channel is located near the southeast boundary of the Watershed District. As the river descends, it is joined by many tributaries on both the west and northwest. Many of these are small creeks and waterways that carry excess runoff down the slopes of the Coteau des Prairies. Some are larger permanent tributaries which join the Lac qui Parle River in the flood plain. These major tributaries include Ten Mile Creek, Canby Creek, Lazarus Creek, Lac qui Parle Creek, The West Fork of the Lac qui Parle River, and Lost Creek and Florida Creek, both tributaries of the West Fork. Greater than 80 percent of the land use is Cultivated Crops.

Area: 45,722 Acres

Minor Sub-Watersheds:

24004 (4,733 acres)
24041 (8,623 acres)
24049 (5,230 acres)
24050 (6,878 acres)
24051 (5,547 acres)
24052 (6,231 acres)
24053 (8,480 acres)

Surface Waters: No Lakes, 10 unnamed public waters
Miles of stream: **28.1**
Lac qui Parle River: **28.1**

Local Government:
County: Yellow Medicine
Townships: Wergeland, Oshkosh, Norman
Cities: None

Areas of Concern: The Lac qui Parle River is impaired for Aquatic Consumption, Life and Recreation.

Land Use Within the Lower Middle Lac qui Parle River Sub-Watershed

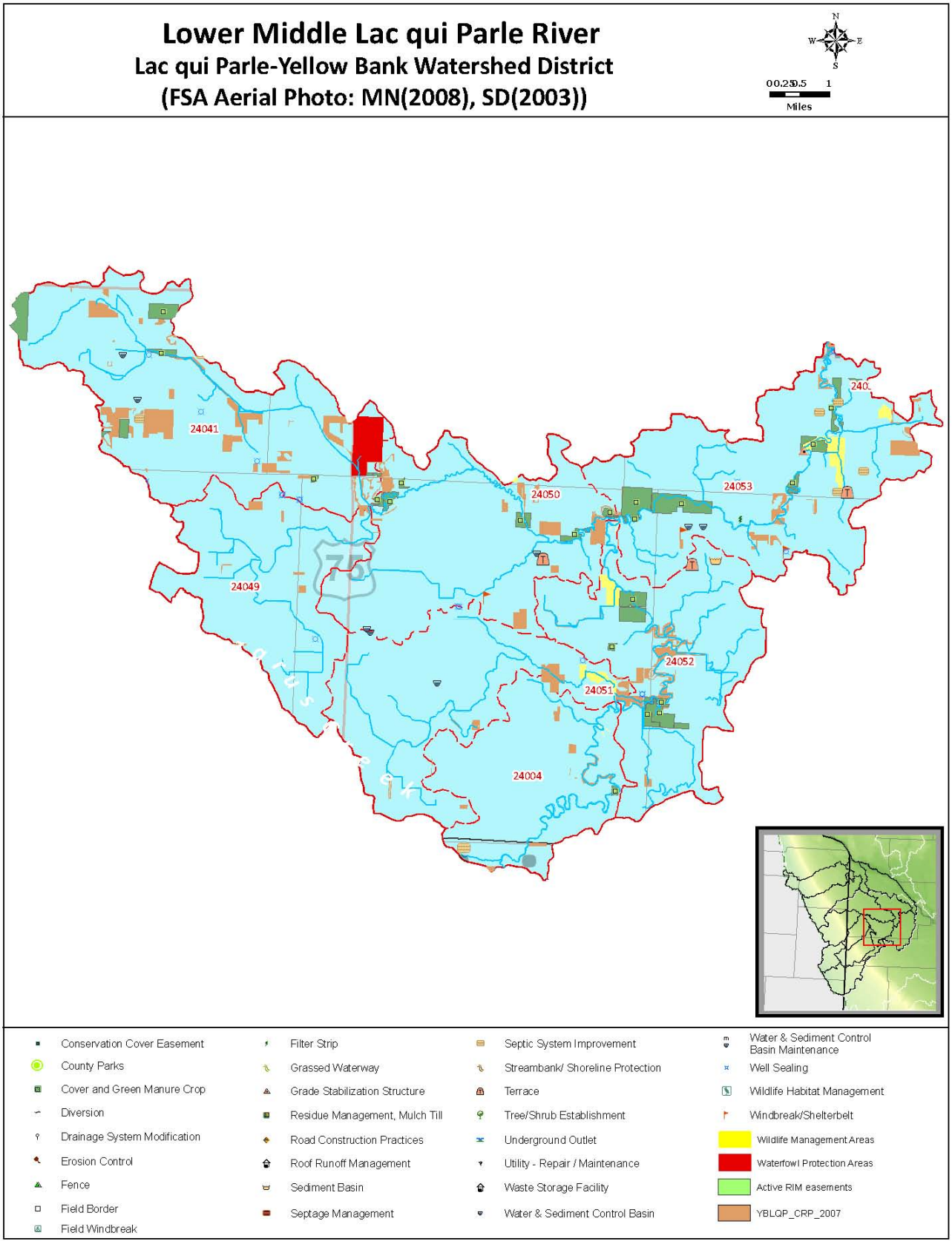
	Land Use Classification	Acres	Percent
11	Open Water	211.51	0.46
21	Developed, Open Space	2090.35	4.57
22	Developed, Low Intensity	65.91	0.14
23	Developed, Medium Intensity	4.23	0.01
24	Developed, High Intensity	0.22	0.00
31	Barren Land (Rocks, Clay, Sand)	23.32	0.05
41	Deciduous Forest	289.81	0.63
42	Evergreen Forest	0	0.00
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	230.83	0.50
81	Pasture/Hay	870.39	1.90
82	**Cultivated Crops**	**38482.77**	**84.17**
90	Woody Wetlands	152.73	0.33
95	Emergent Herbaceous Wetlands	3298.35	7.21
	Unknown	0	0.00
	Total	**45,720.42**	**100**

Lower Middle Lac qui Parle River Easements	
Acres enrolled in CRP	1756.16
Acres enrolled in RIM	1097.2
WPA acres	279.08
WMA acres	337.87
Number of WMA easements	4

Lower Middle Lac qui Parle Sub-watershed Best Management Practices	
Abandoned well sealing	18
Water and sediment control basin	8
Filter strip	1
Windbreak/Shelterbelt establishment	3
Grade stabilization structure	1
Terrace	4
Septic system improvement	6
Sediment basin	2

Figure Eight N

Lower Middle Lac qui Parle River
Lac qui Parle-Yellow Bank Watershed District
(FSA Aerial Photo: MN(2008), SD(2003))



Sub-Watershed #8 – Lower Lac qui Parle River

Figure Eight O

The dominant land use in this section of the Lac qui Parle River drainage area is Cultivated Crops.

Area: 62,831 Acres

Minor Sub-Watersheds:

24023 (7,126 acres)
24025 (19,869 acres)
24026 (10,488 acres)
24033 (10,115 acres)
24034 (6,481 acres)
24037 (3,983 acres)
24058 (4,770 acres)

Surface Waters: No Lakes, 12 unnamed public waters
Miles of stream: **28.0**
Lac qui Parle River: **28.0**

Local Government:

County: Lac qui Parle
Townships: Perry, Arena, Lake Shore, Madison, Hamlin, Cerro Gordo, Riverside, Maxwell, Lac qui Parle, Baxter
Cities: Madison

Areas of Concern: The Lac qui Parle River is impaired for Aquatic Consumption, Life and Recreation.

Land Use Within the Lower Lac qui Parle River Sub-Watershed

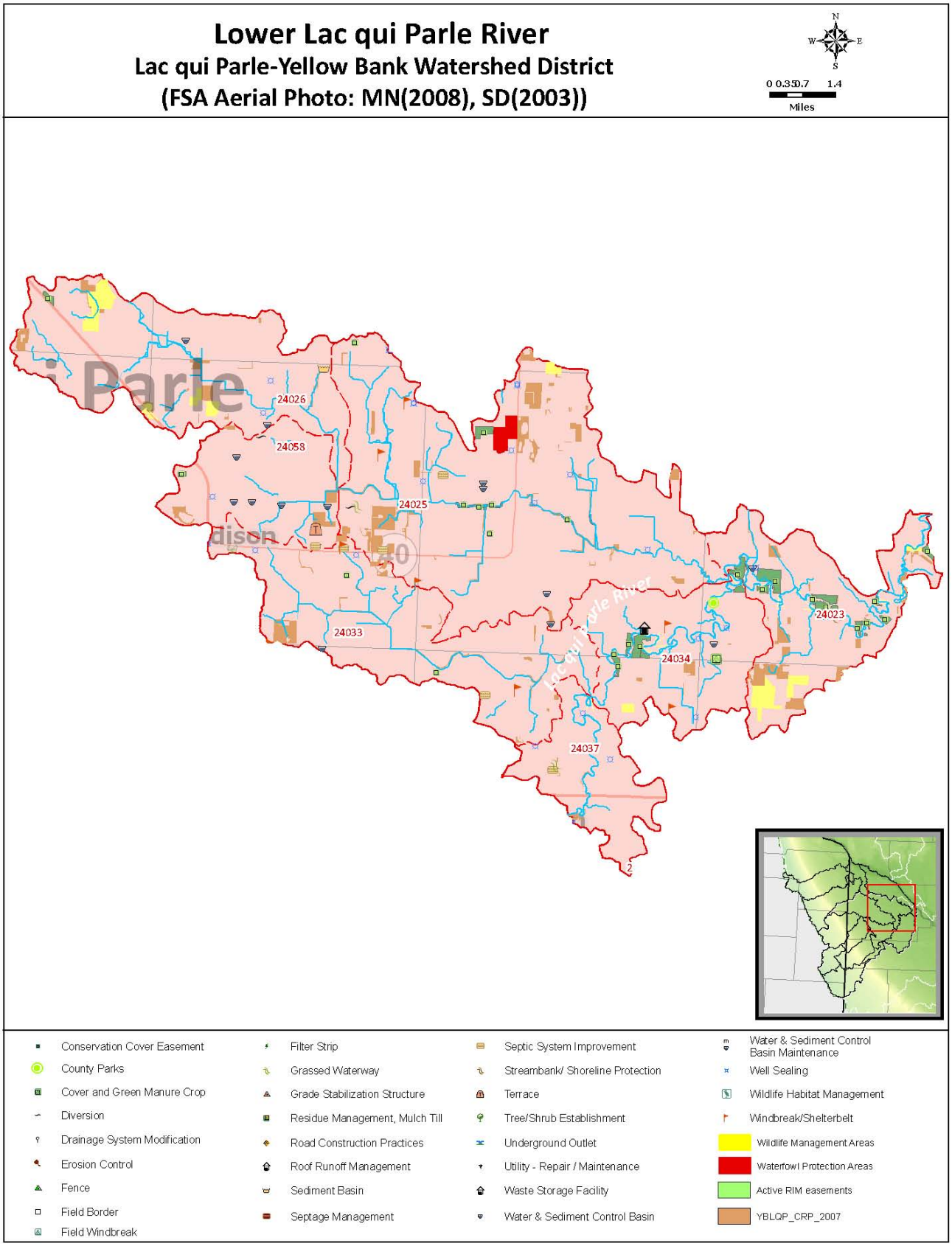
	Land Use Classification	Acres	Percent
11	Open Water	516.52	0.82
21	Developed, Open Space	3088.61	4.92
22	Developed, Low Intensity	346.95	0.55
23	Developed, Medium Intensity	104.42	0.17
24	Developed, High Intensity	43.82	0.07
31	Barren Land (Rocks, Clay, Sand)	30.09	0.05
41	Deciduous Forest	1305.65	2.08
42	Evergreen Forest	0	0.00
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	195.14	0.31
81	Pasture/Hay	1179.04	1.88
82	**Cultivated Crops**	**53383.61**	**84.97**
90	Woody Wetlands	74.82	0.12
95	Emergent Herbaceous Wetlands	2557.79	4.07
	Unknown	1.17	0.00
	Total	**62,827.63**	**100**

Lower Lac qui Parle River Easements	
Acres enrolled in CRP	2286.19
Acres enrolled in RIM	635.32
WPA acres	178.24
WMA acres	729.36
Number of WMA easements	7

Lower Lac qui Parle River Sub-watershed Best Management Practices	
Abandoned well sealing	24
Water and sediment control basin	15
Diversion	2
Windbreak/Shelterbelt establishment	8
Cover and green manure crop	1
Terrace	1
Septic system improvement	6
Grassed waterway	2
Sediment basin	1
Waste storage facility	1

Figure Eight P

Lower Lac qui Parle River
Lac qui Parle-Yellow Bank Watershed District
(FSA Aerial Photo: MN(2008), SD(2003))



Sub-Watershed #9 – Ten Mile Creek

Figure Eight Q

Ten Mile Creek (Judicial Ditch 8) is the only tributary to the east of the Lac qui Parle River. This is a relatively level drainage area. The creek originates in Omro Township, Yellow Medicine County, and extends northerly through the village of Boyd to join the Lac qui Parle River in Section 26, Lac qui Parle Township. Greater than 90 percent of the land use within Ten Mile Creek is Cultivated Crops.

Area: 76,419 Acres

Minor Sub-Watersheds:

24001 (6,815 acres)
24002 (3,743 acres)
24003 (10,671 acres)
24035 (4,029 acres)
24036 (15,199 acres)
24054 (6,953 acres)
24055 (9,008 acres)
24056 (7,052 acres)
24057 (6,789 acres)
24090 (6,160 acres)

Surface Waters: Swanson Lake, Lanners Lake, Miller Lake, Summer WPA, and 7 unnamed public waters

Miles of stream: **30.7**

Ten Mile Creek: **30.7**

Land Use Within the Ten Mile Creek Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	291.48	0.38
21	Developed, Open Space	3317.88	4.34
22	Developed, Low Intensity	339.44	0.44
23	Developed, Medium Intensity	40.8	0.05
24	Developed, High Intensity	3.76	0.00
31	Barren Land (Rocks, Clay, Sand)	88.77	0.12
41	Deciduous Forest	459.69	0.60
42	Evergreen Forest	0	0.00
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	400.64	0.52
81	Pasture/Hay	490.51	0.64
82	**Cultivated Crops**	**69060.16**	**90.37**
90	Woody Wetlands	48.22	0.06
95	Emergent Herbaceous Wetlands	1811.57	2.37
	Unknown	62.74	0.08
	Total	**76,415.66**	**100**

Local Government:

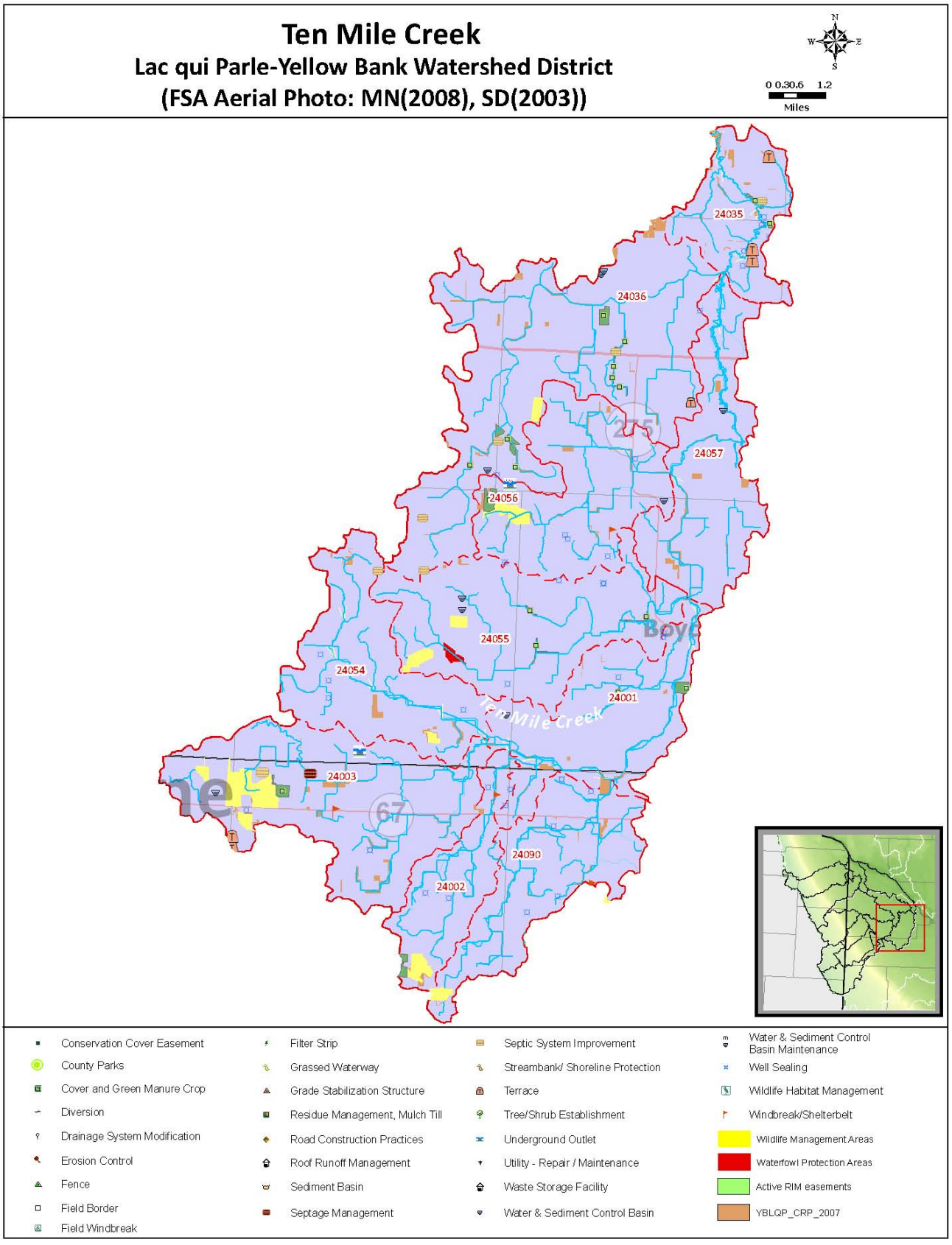
County: Lac qui Parle, Yellow Medicine
Townships: Riverside, Maxwell, Lac qui Parle, Baxter, Ten Mile Lake, Omro, Tyro
Cities: None

Areas of Concern: The Lac qui Parle River is impaired for Aquatic Consumption, Life and Recreation.

Tem Mile Creek Easements	
Acres enrolled in CRP	1519.11
Acres enrolled in RIM	501.97
WPA acres	64.81
WMA acres	1209.32
Number of WMA easements	11

Ten Mile Creek Sub-watershed Best Management Practices	
Abandoned well sealing	42
Water and sediment control basin	9
Septage management	1
Windbreak/Shelterbelt establishment	3
Underground outlet	2
Terrace	7
Septic system improvement	7

Figure Eight R



Sub-Watershed #10 – West Branch Lac qui Parle River *Figure Eight S*

The West Branch of the Lac qui Parle River originates north of Gary, South Dakota where many small creeks, including *Monighan Creek*, converge into a single channel. The stream flows northeast, until it reaches U.S. Highway 212, where it turns and meanders in an easterly direction to its junction with the Lac qui Parle River one mile east of Dawson, Minnesota. The watershed of the West Fork adjoins the Yellow Bank River Watershed to the north. The Minnesota portion of this watershed includes 96,000 acres, and the South Dakota portion contains 64,000 acres, mostly located in Deuel County, with a small portion in Grant County. Lost Creek is one of two major tributaries that drain into the West Fork. Lost Creek has a watershed of approximately 60,000 acres; 50,000 acres in Deuel County, South Dakota and 10,000 acres in Lac qui Parle County, Minnesota. Lost Creek lays parallel to and just north of U.S. Highway 212 and flows east. Many small creeks drain into Lost Creek from the south. Predominant land use is Cultivated Crops.

Area: 108,291 Acres

Minor Sub-Watersheds:
24027 (32,090 ac.), 24030 (2,999), 24028 (25,440), 24029 (9,281), 24031 (8,671), 24032 (4,723), 24038 (5,238), 24039 (9,740), 24040 (4,314), 24059 (5,795)

Land Use Within the West Branch Lac qui Parle River Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	998.74	0.92
21	Developed, Open Space	4949.31	4.57
22	Developed, Low Intensity	388.04	0.36
23	Developed, Medium Intensity	122.06	0.11
24	Developed, High Intensity	49.25	0.05
31	Barren Land (Rocks, Clay, Sand)	36.41	0.03
41	Deciduous Forest	598.52	0.55
42	Evergreen Forest	0	0.00
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	652.75	0.60
81	Pasture/Hay	5440.03	5.02
82	**Cultivated Crops**	**82379.1**	**76.08**
90	Woody Wetlands	653.95	0.60
95	Emergent Herbaceous Wetlands	12016.77	11.10
	Unknown	0	0.00
	Total	**108,284.93**	**100**

Surface Waters: Salt Lake, Cory Lake and 17 unnamed public waters in Minnesota, none in South Dakota.
Miles of stream: **29.7,** all West Branch Lac qui Parle River

West Branch Lac qui Parle River Easements	
Acres enrolled in CRP	5441.56
Acres enrolled in RIM	2143.44
WPA acres	312.94
WMA acres	3747
Number of WMA easements	16

West Branch Lac qui Parle River Best Management Practices	
Abandoned well sealing	20
Water and sediment control basin	22
Filter strip	1
Windbreak/Shelterbelt establishment	3
Sediment basin	3
Terrace	1
Septic system improvement	5

Local Government:

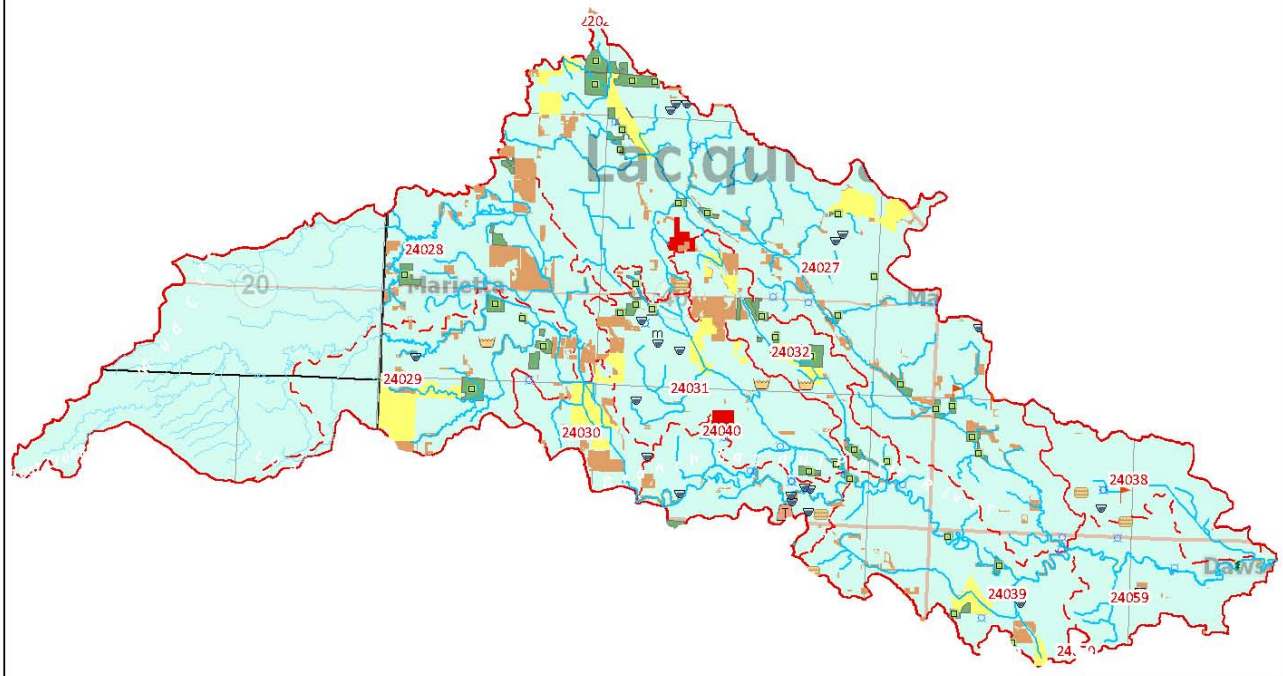
County: Lac qui Parle
Townships: Augusta, Walter, Perry, Arena, Madison, Riverside, Hamlin, Garfield, Mehurin
Cities: Marietta
Areas of Concern: The West Branch of the Lac qui Parle River is impaired for Aquatic Recreation.

Figure Eight T

West Branch Lac qui Parle River

Lac qui Parle-Yellow Bank Watershed District

(FSA Aerial Photo: MN(2008), SD(2003))



- Conservation Cover Easement
- County Parks
- Cover and Green Manure Crop
- Diversion
- Drainage System Modification
- Erosion Control
- Fence
- Field Border
- Field Windbreak
- Filter Strip
- Grassed Waterway
- Grade Stabilization Structure
- Residue Management, Mulch Till
- Road Construction Practices
- Roof Runoff Management
- Sediment Basin
- Septage Management
- Septic System Improvement
- Streambank/ Shoreline Protection
- Terrace
- Tree/Shrub Establishment
- Underground Outlet
- Utility - Repair / Maintenance
- Waste Storage Facility
- Water & Sediment Control Basin
- Water & Sediment Control Basin Maintenance
- Well Sealing
- Wildlife Habitat Management
- Windbreak/Shelterbelt
- Wildlife Management Areas
- Waterfowl Protection Areas
- Active RIM easements
- YBLQP_CRP_2007

Sub-Watershed #11 – Minnesota River

Figure Eight U

Upper Minnesota River: There are two drainage areas, the Louisburg Sub-watershed and Emily Creek Sub-watershed, adjacent to and on the southwest side of the Minnesota River in Lac qui Parle County.

The Louisburg Sub-watershed consists of 15,000 acres and adjoins the Upper Minnesota River Watershed District on the north and the Yellow Bank River Watershed on the west. The sub-watershed includes all lands which drain into the Minnesota River below U.S. Highway 75 to the lower part of Marsh Lake. County Ditch 3A provides drainage for the major part of the area.

Emily Creek: sub-watershed contains approximately 49,000 acres and abuts the east side of the Louisburg Sub-watershed. The sub-watershed includes the drainage area on the southwest side of Lac qui Parle Lake and the lower part of Marsh Lake. Emily Creek drains into Lac qui Parle Lake just north of State Highway No. 40. The creek provides an outlet for several county ditches in the northern part of the sub-watershed. Cultivated Crops make up the dominant land use within the Minnesota River drainage areas.

Area: 82,930 Acres

Minor Sub-Watersheds:
22002 (1,675 acres), 22007 (10,376), 22008 (6,542), 22020 (9,036), 22021 (4,453), 22023 (9,728), 22026 (9,986), 22015 (22,826), 24024 (8,307)

Land Use Within the Minnesota River Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	5297.94	6.39
21	Developed, Open Space	3494.13	4.21
22	Developed, Low Intensity	228.92	0.28
23	Developed, Medium Intensity	37.78	0.05
24	Developed, High Intensity	4.19	0.01
31	Barren Land (Rocks, Clay, Sand)	79.98	0.10
41	Deciduous Forest	742.87	0.90
42	Evergreen Forest	0	0.00
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	584.3	0.70
81	Pasture/Hay	5391.47	6.50
82	**Cultivated Crops**	**57948.51**	**69.88**
90	Woody Wetlands	355.82	0.43
95	Emergent Herbaceous Wetlands	8719.92	10.52
	Unknown	38.52	0.05
	Total	**82,924.35**	**100**

Surface Waters: Lac qui Parle Lake, Marsh Lake and 7 unnamed public waters in Minnesota, none in SD.
Miles of stream: **34.6**
Emily Creek: **9.6**
Lac qui Parle River: **1.0**
Minnesota River: **24.0**

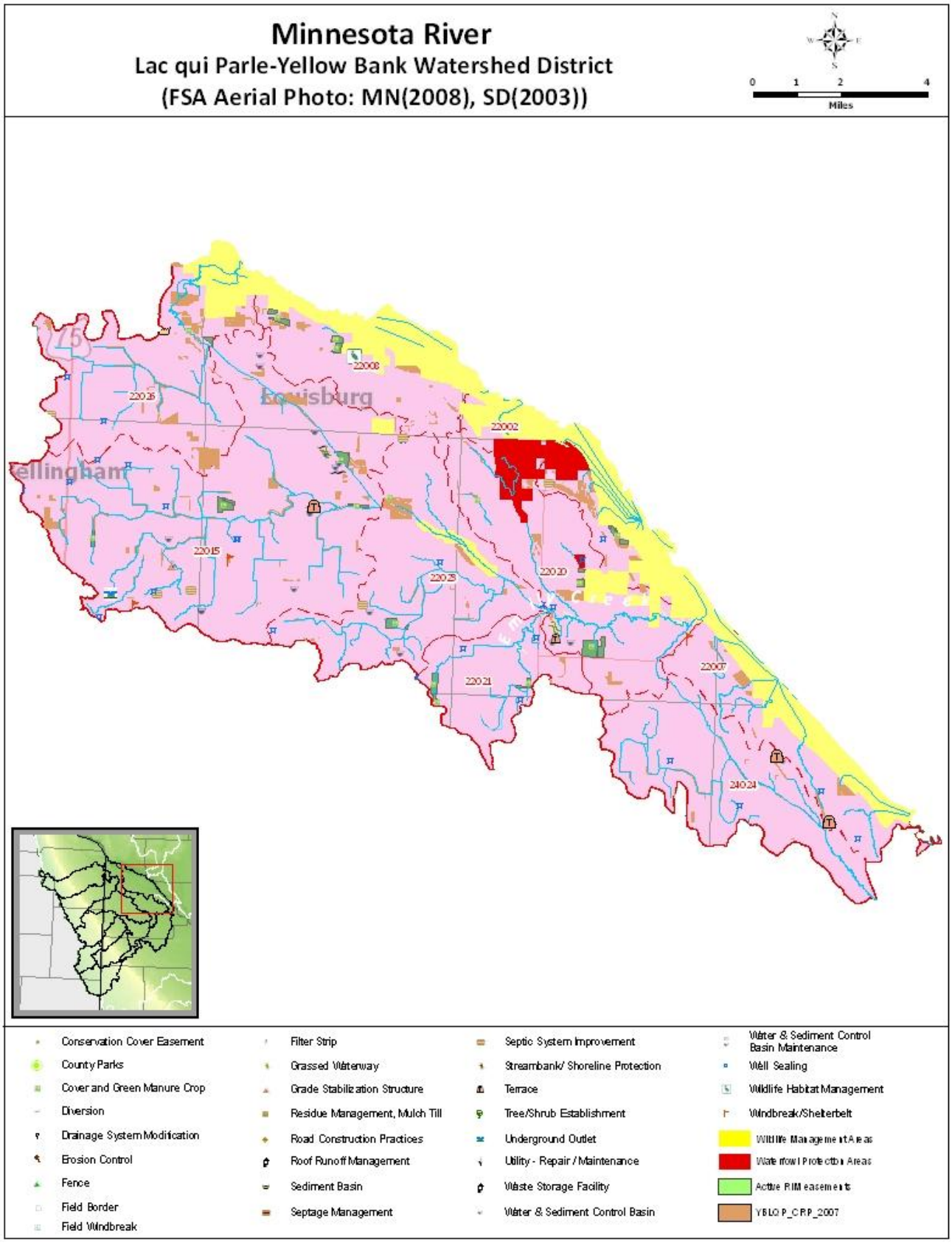
Local Government:
County: Lac qui Parle
Townships: Odessa, Agassiz, Lake Shore, Appleton, Hantho, Perry, Cerro Gordo, Lac qui Parle
Cities: Bellingham, Louisburg

Minnesota River Easements	
Acres enrolled in CRP	2934.06
Acres enrolled in RIM	534.07
WPA acres	1377.94
WMA acres	11939.31
Number of WMA easements	4

Minnesota River Sub-watershed Best Management Practices	
Abandoned well sealing	30
Water and sediment control basin	16
Grade stabilization structure	1
Windbreak/Shelterbelt establishment	3
Diversion	4
Terrace	4
Septic system improvement	5
Grassed waterway	2
Sediment basin	1
Underground outlet	1
Wildlife habitat management	1

Areas of Concern: The Minnesota River, Marsh Lake and Lac qui Parle Lake are impaired for Aquatic Consumption. Emily Creek is impaired for Aquatic Life

Figure Eight V



Sub-Watershed #12 – North Fork Yellow Bank River

Figure Eight W

The North Fork of the Yellow Bank River originates near Stockholm, in Grant County, South Dakota. It flows from there in a northeasterly direction and enters Minnesota in Section 17, Yellow Bank Township, Lac qui Parle County. Most of the North Fork Sub-watershed is in South Dakota, with only a small portion in Minnesota. Dominant land uses include Cultivated Crops, Grassland and Pasture.

Area: 138,300 Acres

Minor Sub-Watersheds:
22022 (14,877 acres)
22058 (8,098 acres)
22059 (9,531 acres)
22060 (21,294 acres)
22061 (10,821 acres)
22062 (12,416 acres)
22063 (29,018 acres)
22064 (11,615 acres)
24065 (20,631 acres)

Surface Waters: None in Minnesota, Punished Woman Lake, Round Lake and Lake Albert in South Dakota.
Miles of stream: **63.1**
North Fork Yellow Bank River: **63.1**

Local Government:
County: Lac qui Parle, Lies mainly in SD
Townships: Yellow Bank, Walter
Cities: None, (Strandberg, Stockholm, South Shore in SD)

Areas of Concern: The Yellow Bank River is impaired for Aquatic Recreation.

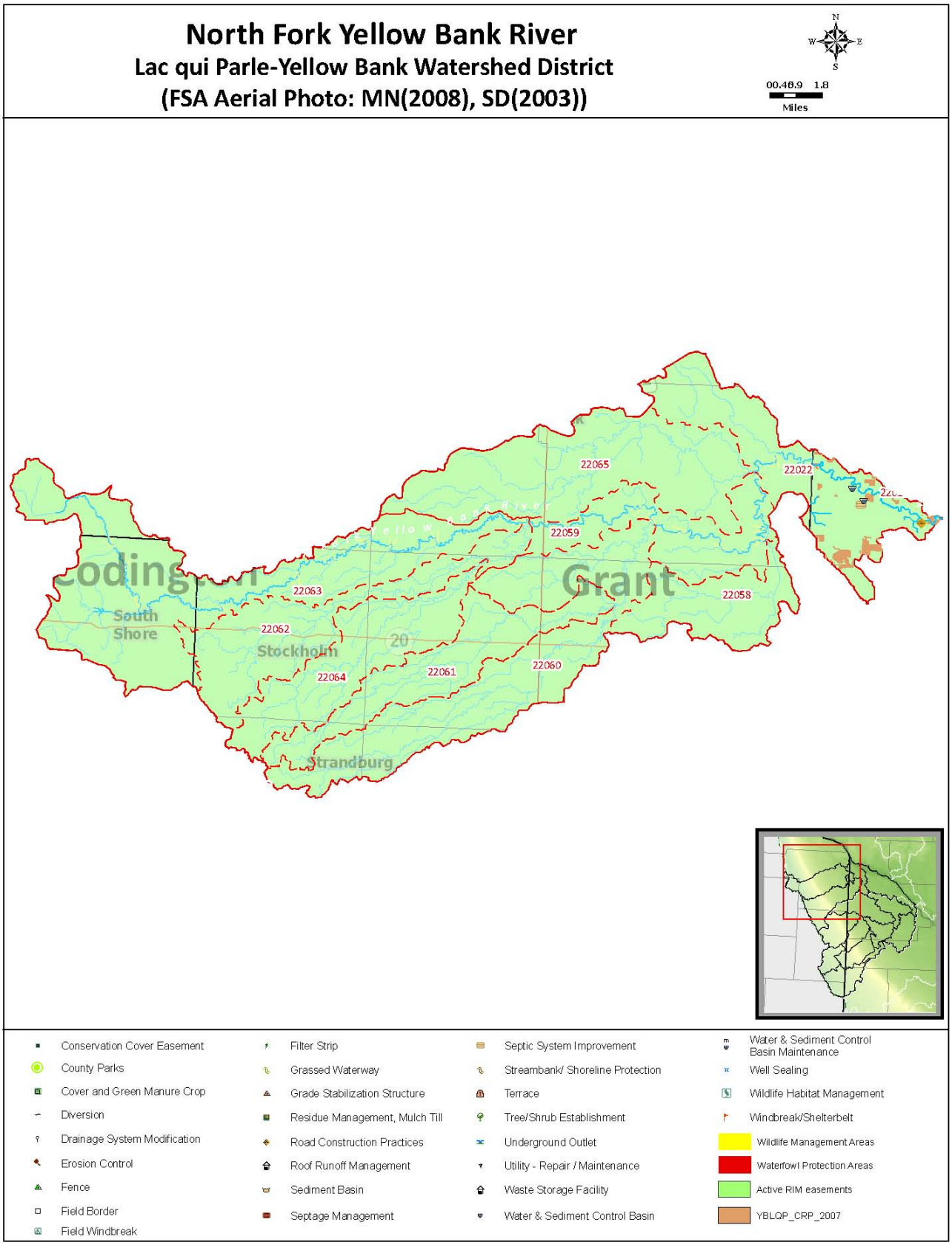
Land Use Within the North Fork Yellow Bank River Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	1776.22	1.28
21	Developed, Open Space	5608.79	4.06
22	Developed, Low Intensity	663.69	0.48
23	Developed, Medium Intensity	223.57	0.16
24	Developed, High Intensity	48.26	0.03
31	Barren Land (Rocks, Clay, Sand)	233.9	0.17
41	Deciduous Forest	1690.45	1.22
42	Evergreen Forest	2.66	0.00
52	Shrub/Scrub	2	0.00
71	**Grassland/Herbaceous**	**29602.38**	**21.41**
81	**Pasture/Hay**	**18045.99**	**13.05**
82	**Cultivated Crops**	**73685.08**	**53.28**
90	Woody Wetlands	59.56	0.04
95	Emergent Herbaceous Wetlands	6556.88	4.74
	Unknown	86.86	0.06
	Total	**138,286.29**	**100**

North Fork Yellow Bank River Best Management Practices	
Septic system improvement	1
Water and sediment control basin	3
Road construction practices	1

North Fork Yellow Bank River Easements	
Acres enrolled in CRP	726.95

Figure Eight X



Sub-Watershed #13 – South Fork Yellow Bank River

Figure Eight Y

The South Fork of the Yellow Bank River originates at Lake Alice near Toonerville, in Deuel County, South Dakota. It flows north into Grant County and then northeasterly entering Minnesota near Nassau. The drainage area consists of 93,000 acres in South Dakota, and 40,700 acres in Minnesota. There is a small tributary to the South Fork which is considered to be a separate unit. This sub-watershed, Mud Creek, is approximately 17,000 acres, and is fully contained in South Dakota. Major land use is cultivated crops

Area: 134,434 Acres

Minor Sub-Watersheds:

22016 (3,789 acres)
22017 (15,087 acres)
22018 (27,520 acres)
22019 (10,870 acres)
22024 (10,410 acres)
22025 (4,858 acres)
22054 (16,595 acres)
22055 (24,965 acres)
24056 (13,167 acres)
22057 (7,172 acres)

Surface Waters: Pegg Lake and 5 unnamed public waters in Minnesota, Lake Alice in South Dakota.

Miles of stream: **82.4**
Caine Creek: **12.4**
Mud Creek: **19.5**
South Fork Yellow Bank River: **50.5**

Land Use Within the South Fork Yellow Bank River Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	2338.14	1.74
21	Developed, Open Space	5465.48	4.07
22	Developed, Low Intensity	348.09	0.26
23	Developed, Medium Intensity	60.3	0.04
24	Developed, High Intensity	7.42	0.01
31	Barren Land (Rocks, Clay, Sand)	75.16	0.06
41	Deciduous Forest	932.11	0.69
42	Evergreen Forest	1.11	0.00
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	35147.91	26.15
81	Pasture/Hay	17549.69	13.06
82	**Cultivated Crops**	**65562.37**	**48.77**
90	Woody Wetlands	92	0.07
95	Emergent Herbaceous Wetlands	6809.39	5.07
	Unknown	30.75	0.02
	Total	**134,419.92**	**100**

Local Government:

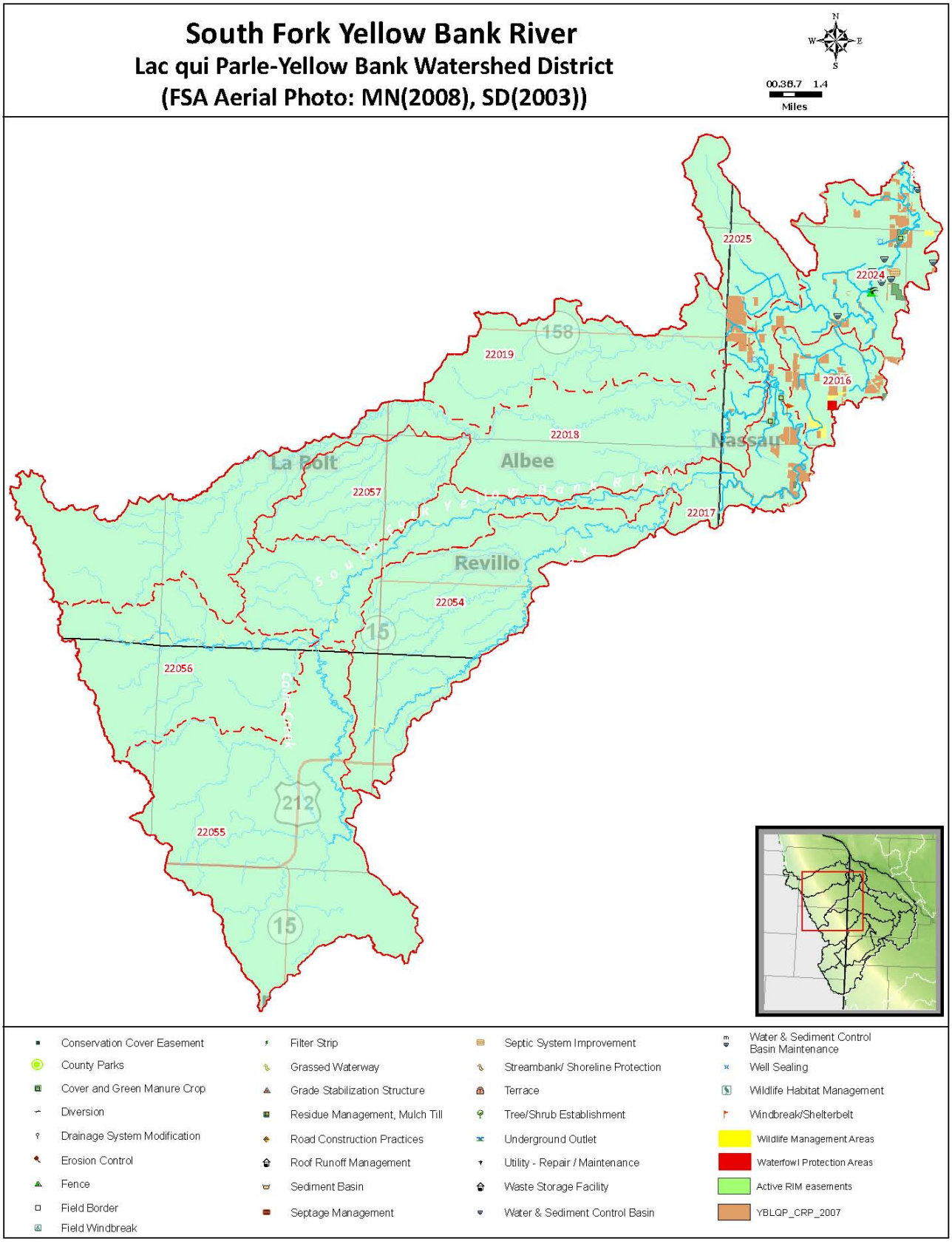
County: Lac qui Parle, Lies mainly in SD
Townships: Yellow Bank, Walter, Agassiz, Perry
Cities: Nassau, (Albee, Revillo, La Bolt in SD)

South Fork Yellow Bank River Easements	
Acres enrolled in CRP	2151.75
Acres enrolled in RIM	146.87
WPA acres	39.88
WMA acres	165.85
Number of WMA easements	3

South Fork Yellow Bank River Best Management Practices	
Abandoned well sealing	2
Water and sediment control basin	7
Filter strip	1
Windbreak/Shelterbelt establishment	1
Fence	1
Diversion	2
Septic system improvement	1

Areas of Concern: The Yellow Bank River is impaired for Aquatic Recreation.

Figure Eight Z



Sub-Watershed #14 –Yellow Bank River

Figure Eight AA

The Yellow Bank River Watershed is to the north side of the Lac qui Parle River Watershed. The river has two main branches, the North and South Forks, which join in Section 25, Yellow Bank Township, Lac qui Parle County. From that point, the river flows almost due north into the Upper Minnesota River Watershed District and discharges into the Minnesota River three miles south of Odessa. Major land use is cultivated crops.

Area: 44,051 Acres

Minor Sub-Watersheds:

22009 (6,028 acres)
22010 (15,858 acres)
22011 (5,801 acres)
22012 (3,509 acres)
22014 (12,855 acres)

Land Use Within the Yellow Bank River Sub-Watershed

	Land Use Classification	Acres	Percent
11	Open Water	2265.12	5.14
21	Developed, Open Space	1749.37	3.97
22	Developed, Low Intensity	130.19	0.30
23	Developed, Medium Intensity	21.22	0.05
24	Developed, High Intensity	3.55	0.01
31	Barren Land (Rocks, Clay, Sand)	59.98	0.14
41	Deciduous Forest	568.68	1.29
42	Evergreen Forest	0	0.00
52	Shrub/Scrub	0	0.00
71	Grassland/Herbaceous	766.68	1.74
81	Pasture/Hay	3494.01	7.93
82	**Cultivated Crops**	**24121.37**	**54.76**
90	Woody Wetlands	812.03	1.84
95	Emergent Herbaceous Wetlands	10014.41	22.74
	Unknown	40.49	0.09
	Total	**44,047.10**	**100**

Surface Waters: Boehnke Slough, Mud Lake, Pyramid WMA and 17 unnamed public waters

Miles of stream: **32.5**
Minnesota River: **23.8**
Yellow Bank River: **8.7**

Yellow Bank River Easements	
Acres enrolled in CRP	2558.18
Acres enrolled in RIM	359.01
WPA acres	32.41
WMA acres	950.41
Number of WMA easements	8

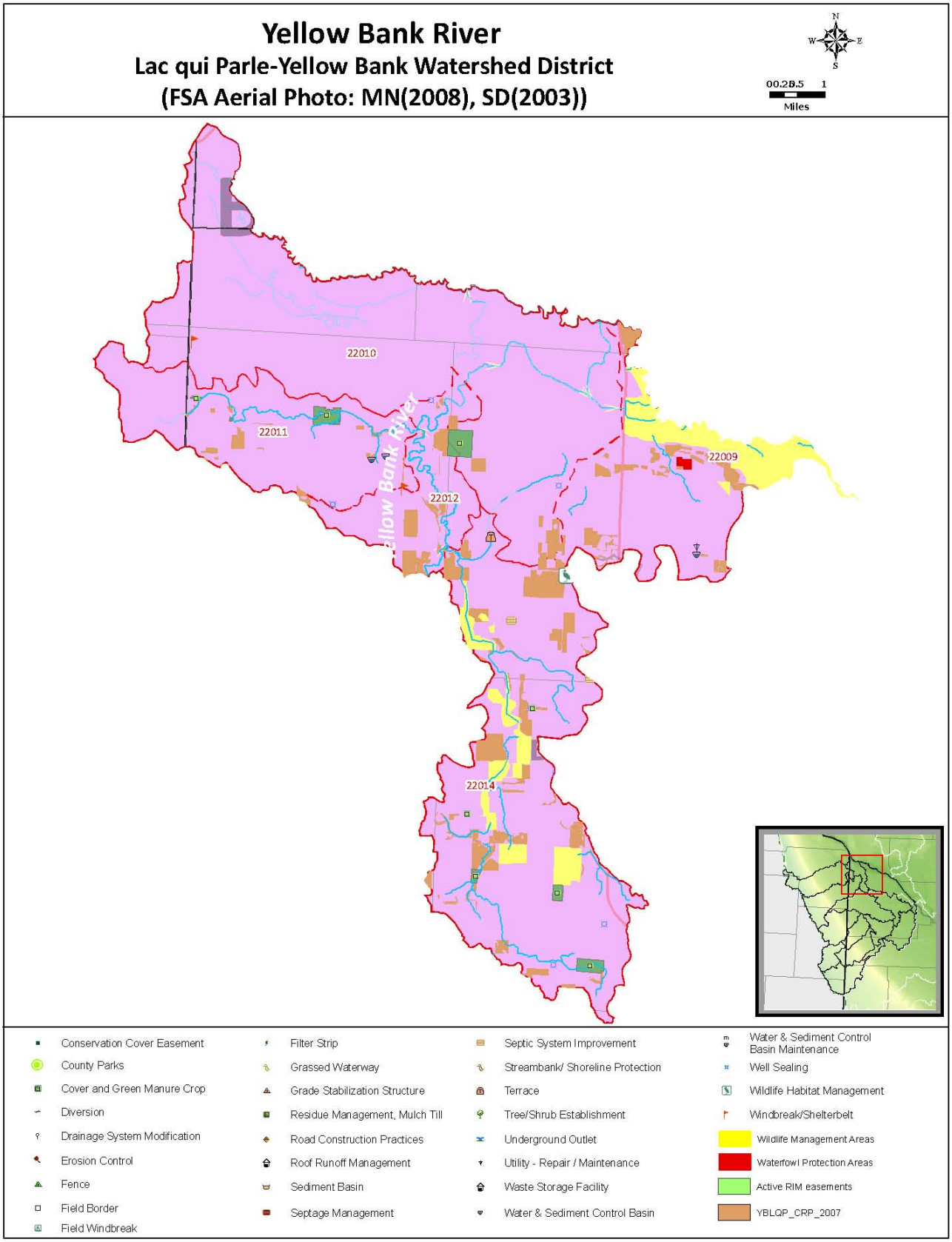
Yellow Bank River Best Management Practices	
Abandoned well sealing	7
Water and sediment control basin	4
Septic system improvement	2
Windbreak/Shelterbelt establishment	3
Wildlife habitat management	1
Terrace	1

Local Government:

County: Lac qui Parle, Big Stone
Townships: Ortonville, Yellow Bank, Agassiz, Perry, Big Stone City
Cities: None

Areas of Concern: The Yellow Bank River is impaired for Aquatic Recreation.

Figure Eight AB



Lakes

There are few meandered lakes in the Watershed District. Those include that portion of Lac qui Parle Lake within Lac qui Parle County, the southeastern portion of Marsh Lake; that portion of Salt Lake (Rosabel Lake) within Lac qui Parle County; and that portion of Lake Hendricks in Lincoln County, Twin Lakes in Lincoln County, and Del Clark Lake, the largest of the three recreational impoundments in the Canby Creek Watershed Development project.

All lakes have controlled outlets, and Lac qui Parle Lake, Lake Hendricks, and Del Clark Lake have significant flood control functions. Lac qui Parle Lake is the largest of the lakes in the District. The lake was created by the Lac qui Parle Flood Control Project, completed in 1951. The reservoir behind the dam has a carrying capacity of 122,800 acre feet and was designed for fish and wildlife conservation and recreation, in addition to flood control. Lac qui Parle Lake is one of the best fishing lakes in western Minnesota. The fisheries have been managed for northern pike, walleye, and pan fish such as crappies. Nongame fish such as bullheads and carp are abundant. Most of the shoreline of Lac qui Parle Lake is part of a state game refuge, which protects it from commercial and residential development. The Del Clark Lake impoundment was established in the early 1980s by what was, at that time, Minnesota's largest earthen dam. The land surrounding the impoundment is owned by the District and will not be developed to protect the integrity of the earthen dam.

Since the 1970s, Lac qui Parle Lake and Marsh Lake have become a nationally significant goose management area and is also the largest pelican nesting colony in Minnesota, producing over 4,000 young a year. Lac qui Parle State Park on the south end of Lac qui Parle Lake provides camping facilities, a museum, picnic areas with shelters, lake and beach access and recreational trails. Lake Hendricks is a favorite recreational area in the southern part of the District. The lake receives extensive use for fishing, swimming, and boating. The town of Hendricks maintains a city park with facilities for camping and picnicking. Del Clark Lake and park facilities, which were developed as part of the Canby Creek project, provide popular recreational facilities in the District. All three lakes in the project have been stocked with game fish and are managed for sport fishing, as well as swimming and other types of water recreation.

There are 205 identified Public Waters in the District. Most are unnamed and shallow prairie lakes. It is important to manage these lakes as shallow lakes and not make the comparison to larger, deeper lakes within the state. A complete listing can be found in ***Appendix C***. A summary of the lakes greater than 100 acres within the entire watershed, including South Dakota, is provided in ***Table Seven.*** Lac qui Parle and Marsh Lakes in the Minnesota River sub-watershed are the largest lakes located entirely in Minnesota. Lake Hendricks lies partially in both states.

The DNR has established a system to rate lakes in Minnesota. The DNR Class of NE stands for Natural Environment Lake and comes with the most restrictive standards for lot size and setback for dwellings. It is a classification for sensitive lakes that are either smaller in size, shallower in depth, or has other parameters sensitive to development pressures. The GD Class is the General Development standard. This classification allows for the most density and closest setback from the water for dwellings. It is reserved for lakes of large acreage with deep areas. It is a classification for a lake able to withstand the pressures of development. Lake Hendricks is the only lake within the District with this designation. The rest of the lakes within the District are either Natural Environment or unrated.

Lakes Greater Than 10 Acres in LqP-YB Watershed				*Table Seven*
Lake Id No.	**Acres**	**Lake Name**	**DNR Class**	**Sub-watershed**
*	222.3	Fox Lake		Cobb Creek
*	202.4	Cottonwood Slough		Cobb Creek
*	150.5	Rush Lake		Crow Creek
*	171.1	Lone Tree Lake		Crow Creek
*	121.6	Lake Francis		Crow Creek
41010900	113.2	Bohemian	NE	Lazarus Creek
87011600	121.0	Victors Slough	NE	Lazarus Creek
87018000	158.1	Del Clark Lake		Lazarus Creek
*	172.1	Lake Oliver		Lazarus Creek
*	363.3	Lake Cochrane		Lazarus Creek
*	248.9	South Slough		Lazarus Creek
37018500	217.6	Unnamed	NE	Lower Lac qui Parle River
37009300	130.1	Unnamed		Minnesota River
37004600	283.2	Lac qui Parle	NE	Minnesota River
06000100	336.0	Marsh		Minnesota River
06000100	1,689.2	Marsh		Minnesota River
37004600	1,806.7	Lac qui Parle	NE	Minnesota River
37004600	1,902.8	Lac qui Parle	NE	Minnesota River
*	487.1	Punished Woman Lake		North Fork Yellow Bank River
*	159.6	Round Lake		North Fork Yellow Bank River
*	258.0	Lake Albert		North Fork Yellow Bank River
37022400	124.2	Pegg	NE	South Fork Yellow Bank River
*	1,081.4	Lake Alice		South Fork Yellow Bank River
87011400	104.6	Lanners		Ten Mile Creek
37004300	130.1	Swanson	NE	Ten Mile Creek
87010200	227.5	Miller	NE	Ten Mile Creek
41010500	172.9	Unnamed	NE	Upper Lac qui Parle River
41010800	191.8	East Twin	NE	Upper Lac qui Parle River
41010200	203.9	West Twin	NE	Upper Lac qui Parle River
41011000	658.9	*Lake Hendricks*	GD	Upper Lac qui Parle River
*	1,491.8	*Lake Hendricks*		Upper Lac qui Parle River
*	401.9	Oak Lake		Upper Lac qui Parle River
*	749.8	Fish Lake		Upper Lac qui Parle River
37010700	130.2	Unnamed	NE	West Branch Lac qui Parle River
37025100	141.7	Unnamed		West Branch Lac qui Parle River
37010300	165.1	Cory	NE	West Branch Lac qui Parle River
37014800	173.8	Unnamed	NE	West Branch Lac qui Parle River
37022900	239.8	Salt	NE	West Branch Lac qui Parle River
37020300	120.5	Mud	NE	Yellow Bank River
***Located in South Dakota**			**NE=Natural Environment GD=General Development**	

Wetlands

The USFWS National Wetland Inventory Office at the Federal Center in the Twin Cities is the responsible agency for the National Wetland Inventory efforts in western Minnesota. The nation's 95 million acres of wetlands are an extremely important feature of the American landscape. Wetlands serve a variety of ecological functions such as maintaining water quality, stabilizing shorelines, reducing floodwaters, and trapping sediments and other pollutants, as well as providing habitat for aquatic plants and animals. More than half the nation's wetlands have been destroyed in the past 100 years.

A high percentage of the original wetlands in the District have been drained. The USFWS first inventoried wetlands in 1954 under the auspices of the 1934 Fish and Wildlife Coordination Act. In 1974, the USFWS initiated the National Wetland Inventory (NWI), which was the first systematic, national survey of wetland resources. This survey, in addition to mapping specific wetlands, collects information on hydrology, hydric soils, wetland vegetation, and plant communities. It also collects information on wetland values, acreage trends, and protection status. The survey relies primarily on color-infrared photographs taken at an elevation of 30,000 feet, and on field investigations for wetlands identification and mapping. The 1986 Emergency Wetlands Resources Act, which amended the Land and Water Conservation Fund Act to fund the purchase of wetlands, affirmed the National Wetland Inventory's mapping schedule, requiring the Fish and Wildlife Service to produce maps for the conterminous United States by 1998 and maps of Alaska in the succeeding years. It also required the Fish and Wildlife Service to produce periodic reports on the status and trends of wetland and deep water habitats.

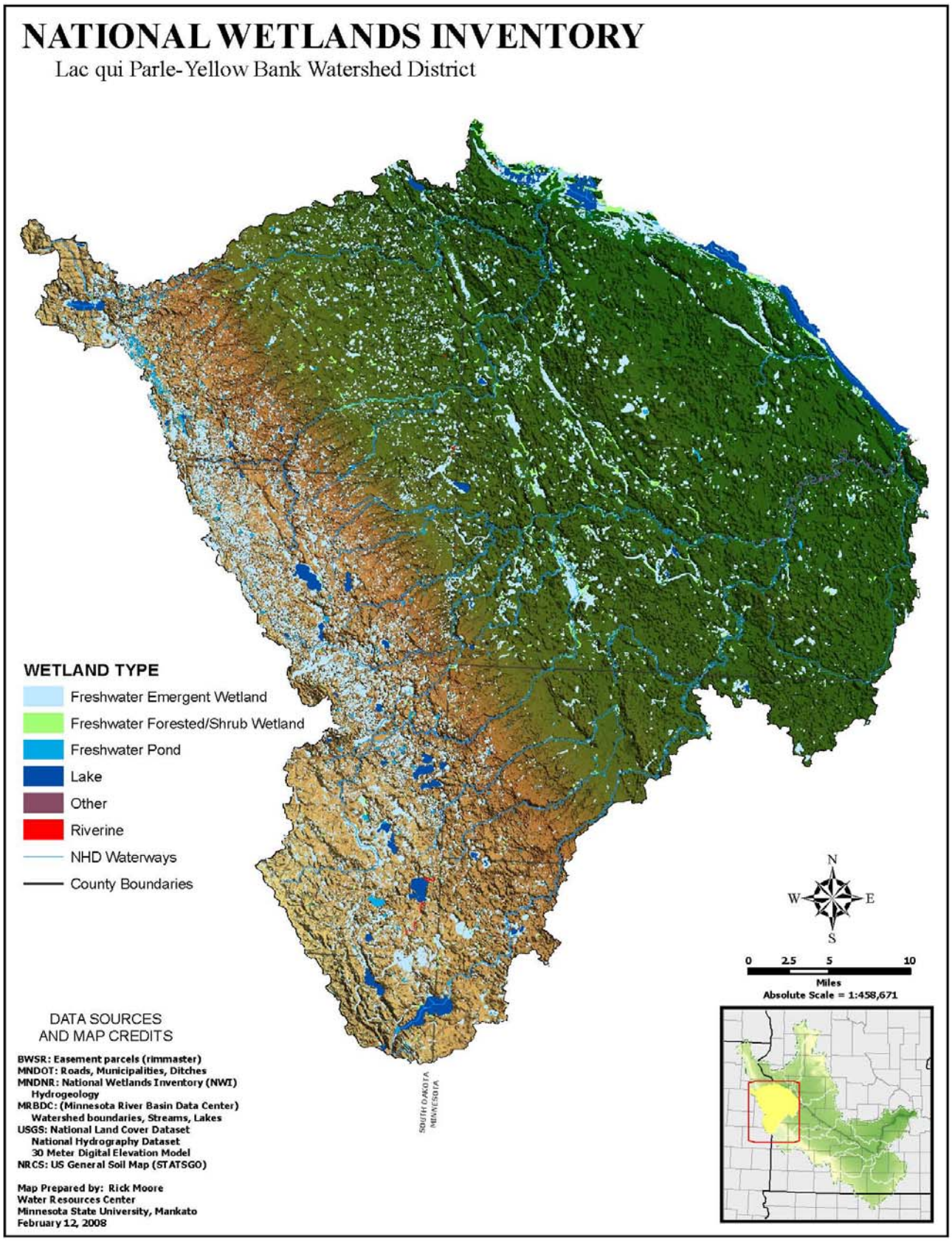
Final maps have been completed for the counties in the District and are available in the SWCD offices in Lac qui Parle, Lincoln, and Yellow Medicine Counties. Copies of these maps are also available from the USFWS. Wetlands in the Lac qui Parle – Yellow Bank Watershed District are listed by type in ***Table Eight*** and shown by location and type in ***Figure Nine***.

Further drainage of existing wetlands is restricted by the swamp buster provisions of the 1985 Food Security Act. This provision is aimed at discouraging the conversion of wetlands for agricultural purposes. If wetlands are converted to crop land, then landowner eligibility for certain USDA program benefits could be lost. Wetlands, as defined by the Act, consist of soils that are covered with standing water or are saturated most of the year, and that support mostly water-loving plants. Since annual participation in USDA programs in the District has exceeded 85%, this protects significant wetland acres in the District. In addition, the district participates in the Minnesota Wetland Conservation Act, which serves to protect those remaining public wetlands in the watershed.

Wetlands in LqP-YB WD from National Wetlands Inventory	***Table Eight***
Wetland Type	**Acres**
Seasonally Flooded / Floodplains	7,719.6
Wet Meadows	2,875.0
Shallow Marshes	35,501.0
Deep Marshes	3,306.1
Open Water Wetlands	23,740.9
Shrub Swamps	1,181.5
Wooded Swamps	2,982.5
Bogs	0.7
Freshwater Pond	31.3
Riverine	5,051.0
Wetlands - Unknown Class	5,671.7
Total	**88,061.2**

The Comprehensive Local Water Management Plans for the associated counties in the District have listed goals and actions related to wetland preservation, as well as for inventorying potentially restorable wetlands in the counties. Actions include supporting voluntary restoration of drained wetlands, where feasible, to assist in solving water quality and quantity problems.

Figure Nine


NATIONAL WETLANDS INVENTORY
Lac qui Parle-Yellow Bank Watershed District
WETLAND TYPE
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Other
Riverine
NHD Waterways
County Boundaries
N
W
E
S
0 2.5 5 10
Miles
Absolute Scale = 1:458,671
DATA SOURCES
AND MAP CREDITS
BWSR: Easement parcels (rimmaster)
MNDOT: Roads, Municipalities, Ditches
MNDNR: National Wetlands Inventory (NWI)
Hydrogeology
MRBDC: (Minnesota River Basin Data Center)
Watershed boundaries, Streams, Lakes
USGS: National Land Cover Dataset
National Hydrography Dataset
30 Meter Digital Elevation Model
NRCS: US General Soil Map (STATSGO)
Map Prepared by: Rick Moore
Water Resources Center
Minnesota State University, Mankato
February 12, 2008
SOUTH DAKOTA
MINNESOTA

Drainage systems (ditches)

Legal Drainage System

Drainage of agricultural land in the Watershed District has been extensive where adequate outlets exist as shown in ***Table Nine***. Most of the public drainage systems occur in eastern Lac qui Parle County. In addition to the public drainage system, there are many private ditches that drain into the legal drain system. In much of the area where drainage is needed, the land is subject to extensive flooding and the outlets are inadequate.

Legal Drainage Ditches in Lac qui Parle – Yellow Bank Watershed District		***Table Nine***
Watershed/Sub-watershed	**County**	**Drainage System, Number, Kind**
Yellow Bank	Lac qui Parle	**C-2, C-24**
Louisburg	Lac qui Parle	**C-3, C-3A, C-13, C-13A, C-84, C-88, C-89**
Emily Creek	Lac qui Parle	**C-8, C-9A, C-22A, C-91, C-92, C-98, C-99**
Lac qui Parle (Below Dawson) Northwest Channel	Lac qui Parle	**C-4, C-4A, C-10, C-12, C-15, C-20, C-27, C-45, C-67, C-93**
Southwest Channel	Lac qui Parle	**C-40, C-48, C-77, C-86, C-94**
Above Dawson	Lac qui Parle	**C-29A, C-36, C-55, C-57, C-63, C-70, C-79, C-83, C-85**
Ten Mile Creek	Yellow Medicine	**C-26**
	Lac qui Parle/Yellow Medicine	**J-8**
West Fork Lac qui Parle	Lac qui Parle	**C-5, C-17, C-18, C-28, C-32, C-42, C-49, C-69, C-74, C-75, C-78, C-96, C-97, CJ-4**
Florida Creek	Lac qui Parle	**C-53, C-54**
Lazarus Creek	Yellow Medicine	**C-19, C-42**
Lac qui Parle Creek	Lac qui Parle/Yellow Medicine	**J-1, J-14**
Canby Creek	Yellow Medicine	**C-8**
* Note : C= County Ditch; J= Judicial Ditch		

Water management structures

There are few meandered lakes in the District. All of those have controlled outlets, and at least three have major flood control functions. Lac qui Parle Lake, the largest impoundment in the District, is operated by the U.S. Army Corps of Engineers primarily for flood control, but secondarily for recreational purposes. Seasonal and unstable high water levels in Lac qui Parle Lake have resulted, at times, in the closing of portions of the State Park campground. Most of the lakes are shallow, windswept and turbid, and susceptible to fish winter kill. The District has identified outlet structures and they can be seen in ***Appendix D*** or at the District office on a larger map.

Groundwater Resources (Hydrogeology)

Distribution

In the Upper Minnesota River watershed area ground water is from three principal aquifers: near surface sand and gravel aquifers, buried sand and gravel aquifers, and aquifers within Cretaceous deposits. Hard water (high in iron) is found within the sand and gravel aquifers. The Cretaceous aquifers have relatively softer water (low iron) but high in chloride, sulfate, sodium, and boron. The principal aquifers (water-bearing materials) in the Lac qui Parle – Yellow Bank Watershed District are characterized by two broad groups; unconsolidated glacial-drift aquifers and bedrock aquifers.

Quantity and Yield

Unconsolidated glacial drift aquifers

Four continental glaciations have advanced and retreated across the region, blanketing the bedrock with glacial drift materials as thick as 700 feet. Sand and gravel deposits in this drift provide significant water-bearing deposits, particularly where the drift is thickest and where bedrock aquifers have small yields. These unconsolidated sand and gravel aquifers can be further characterized as surficial-drift or buried-drift aquifers. Surficial-drift aquifers are exposed at the land surface and are found throughout the District. Most of these aquifers consist of sand and gravel deposits called outwash, which consists of material washed out of glaciers by melt waters. Other surficial aquifers consist of lake bed, beach-ridge, and ice-contact deposits along ancient glacial lakes. Wells into water-bearing strata of these aquifers are typically at depths of 30-240 feet and commonly produce 100-800 gallons per minute, although they may exceed 2,000 gallons per minute in localized areas. Although surficial aquifers have been only slightly to moderately developed in most areas of the District, these aquifers can be a significant source of water for irrigation.

Water from these aquifers is of generally good quality, with calcium magnesium bicarbonate the dominant water type. These aquifers provide fresh water with dissolved-solids concentrations usually less than 500 mg/l (milligrams per liter) and maximum concentrations of about 1,000 mg/l (fresh water is defined by dissolved-solids concentrations of less than 1,000 mg/l). Hardness ranges from 200-400 mg/l, and large concentrations of iron and manganese may occur in some areas. Nitrate contamination is present in some areas. Within the District, a large area of surficial sand and gravel extends from near Nassau to the southeast to near the Yellow Medicine County line. A smaller area extends from Canby north to the Lac qui Parle County line.

Buried-drift aquifers are also composed of sand and gravel deposits, but because of repeated glaciations in the state, they lie below confining layers of silt and clay. These aquifers may occur in nearly all areas of the District where depth to bedrock exceeds 100 feet; however, their size and extent is generally not well documented. The aquifers consist of discontinuous lenses of fine to coarse sand and gravel isolated by compact clay and silt-rich glacial till.

Most buried-drift aquifers are less than 10 feet thick, but they may be as much as 150 feet thick in localized areas. Wells utilizing these aquifers are commonly at depths of 80-380 feet, with typical yields of 100-600 gallons per minute ranging up to 1,500 gallons per minute in localized areas.

Buried-drift aquifers are used extensively for public water supply, irrigation, and farm wells in central and southwestern Minnesota. These aquifers generally provide fresh water with dissolved-solids concentrations less than 1,000 mg/l; localized areas may have maximum concentrations ranging to about 2,000 mg/I. Hardness ranges from 300-1,200 mg/l, with large iron, sulfate, and chloride concentrations in some areas, particularly where they are underlain by Cretaceous aquifers. The dominant water type is calcium magnesium bicarbonate.

Bedrock aquifers are geologically much older than glacial-drift aquifers and are characterized by rock type into sedimentary or crystalline rock aquifers. Sedimentary bedrock aquifers consist of sandstone, dolomite, and limestone laid down in seas that covered the District long before the glaciers. The two sedimentary bedrock aquifers that occur in western Minnesota are the Cretaceous aquifers and the Red River-Winnipeg aquifer.

Cretaceous aquifers in the District were formed between 65 and136 million years ago and consist of sandstone lenses near the base of predominantly gray, soft, argillaceous (solidified mud and clay) shale sections. They are generally confined, and where present, range from 280-620 feet below the surface. Wells utilizing these aquifers commonly yield 10-250 gallons per minute, with local yields ranging up to 1,000 gallons per minute. This aquifer is generally not widely used for groundwater except where drift aquifers are absent or where well yields are poor. The aquifer is a major source of water southwest of the Minnesota River. Most water use from these aquifers is for rural domestic and livestock supplies, and the potential for development of large municipal and industrial water supplies is poor. Wells in this aquifer commonly produce hard water with high sulfate, chloride, and dissolved-solids concentrations in many areas. Sodium bicarbonate water occurs in some areas, with dissolved-solids concentrations generally between 500-1,500 mg/l and hardness ranging from 25200 mg/l. Sodium chloride water is common in the extreme west with dissolved-solids concentrations ranging from 2,000-4,000 mg/I.

Groundwater Quality

Groundwater quality is a significant issue in the District, since practically all domestic consumption supplies are from groundwater sources. District groundwater resources are located in surficial and buried-drift aquifers scattered throughout the watershed. Surficial aquifers are easily and quickly recharged by precipitation since they are exposed to the ground surface. These aquifers, however, can also be quickly contaminated by spills, improper chemical or fertilizer application, or improper dumping. If the surficial aquifers are contaminated, there is a very good chance of contaminating the rest of the counties' groundwater supplies, since all aquifers are connected to some degree. Groundwater in the District is generally thought to be uncontaminated, although the water is generally highly mineralized, containing large amounts of calcium, magnesium, and sulfates. Although the high mineral content may be objectionable from the standpoint of smell or taste, it generally does not constitute a health hazard with consumption. Relatively few wells have been tested for contamination, however, and there is need for more data. Elevated levels of nitrates and coliform bacteria have been reported in some wells that have been tested. The sources of this contamination may be related to the depth of the wells, conditions of the casing and method of construction, nearness of septic system drain fields or livestock facilities, drainage patterns, and/or agricultural practices.

A significant risk of contamination to rural wells relates to their historical location within the farm site. Wells were traditionally located near the center of the farm sites. This location placed them near fuel and chemical storage areas, and at potential risk of contamination by accidental spills or overfills. Abandoned wells are another potential source of groundwater contamination. Wells are abandoned when rural water systems are installed, municipal water systems are installed in subdivisions, when old farm, rural schools, or church sites are abandoned, or when new wells are installed. Many of these wells have historically been improperly sealed. Many have simply been cut off and the pipe covered up with materials ranging from old lumber to rocks or tin cans. An improperly abandoned well is a direct route for contaminants into the groundwater. The old well pipe is the path of least resistance for anything soaking through the soil.

Groundwater Recharge Areas

Recharge of the major surficial and buried-drift aquifers in the District occurs primarily through precipitation, and primarily in the ice contact sands and gravels where infiltration rates are high and the topography is rolling and hummocky. Recharge of confined aquifers is greatest where unconfined surficial aquifers are present. Recharge areas include gravel pits, wetlands and ponds, lakes and rivers, and even road ditches. Recharge can also occur, although more slowly, through confining layers into confined aquifers. Most recharge occurs in spring from snow melt and rainfall when groundwater demands by growing vegetation are minimal and precipitation can soak through to the water table. There is generally little recharge during the active growing season. District aquifers may be recharged in part outside of watershed boundaries, or in other states. Parts of the District may also serve as recharge areas for groundwater resources of neighboring regions.

Groundwater Discharge Areas

Surficial aquifers are related to glacial outwash material deposited in meltwater channels and valleys. The outwash ranges from 10 to over 50 feet thick and is composed of medium to coarse gravels and sand. The upper limit of the aquifer is the water table, and the lower limit is the top of the glacial till. Water levels in the surficial aquifers are commonly within 10 feet of the land surface. Saturated thickness of the surficial aquifers may range from less than 10 feet to over 30 feet. Most wells in the surficial aquifers are generally less than 100 feet deep. General water movement in the surficial aquifers is from southwest to northeast, into the Minnesota River. Groundwater discharge from surficial aquifers occurs as underflow and seepage to streams and rivers. Part of the base flow of the Minnesota River is the result of seepage from the surficial aquifers in the area.

Glacial till acts as a confining layer, controlling the vertical flow of groundwater. Aquifers between layers of material that restrict vertical flow are burled-drift aquifers and are confined aquifers. The limits and extent of the confined aquifers are not well known in the District. Discharge from the buried-drift aquifers leaks into surficial aquifers, as well as into streams and rivers.

Cretaceous limestone and shale, the bedrock aquifers in the District, underlie the glacial drift throughout much of the District. Many flowing wells are located near the base of the Coteau des Prairies. The flow represents discharge from both buried-drift aquifers and the Cretaceous bedrock aquifers.

Groundwater can move horizontally through the aquifers as well as vertically across aquifers and even confining beds as a result of natural or pumping stress. The extent of this interconnection is not well known. Several of the confined aquifers are known to coalesce with either the unconfined aquifers or another confined aquifer.

Most of the aquifers in the county are underutilized. Most municipal groundwater withdrawals in the District are from confined aquifers, however, and are in direct contact with the surficial aquifers. The surficial aquifers are rapidly recharged and are also very susceptible to surface contamination. This places the buried aquifers at risk of contamination as well.

Unique or Outstanding Resource Value Waters

The valley bottoms provide a rich diverse habitat for many species of wildlife-large and small game animals, song birds, waterfowl, and fur-bearers. Marsh and Lac qui Parle lakes are incorporated into some of the largest and most important wildlife management areas and public hunting grounds in the state, and are stopovers for great concentrations of migrating waterfowl in spring and fall. Brushy, wooded hills bordering the river bottoms with agricultural fields, swamps, and wetlands, provide both food and cover.

There are several state parks located within the Upper Minnesota River watershed, including; Big Stone Lake State Park, with three separate units along the headwater lake; Lac qui Parle State Park, at the lower end of Lac qui Parle Lake, site of an early fur trading post, church, school, and mission serving the Dakota.

The Minnesota Department of Natural Resources Natural Heritage Program gathers information state-wide on the status of natural communities which have not been affected greatly by human activity. Occurrences of natural communities with their pre-settlement features have been greatly reduced in Minnesota, and now represent only a small fraction of the landscape. Twenty-two of Minnesota's natural communities have been identified as ecologically sensitive, and two of these occur in the watershed district. One of the communities is the Mesic Blacksoil Prairie. The only identified outstanding resource value waters within the watershed district is a Calcareous Fen.

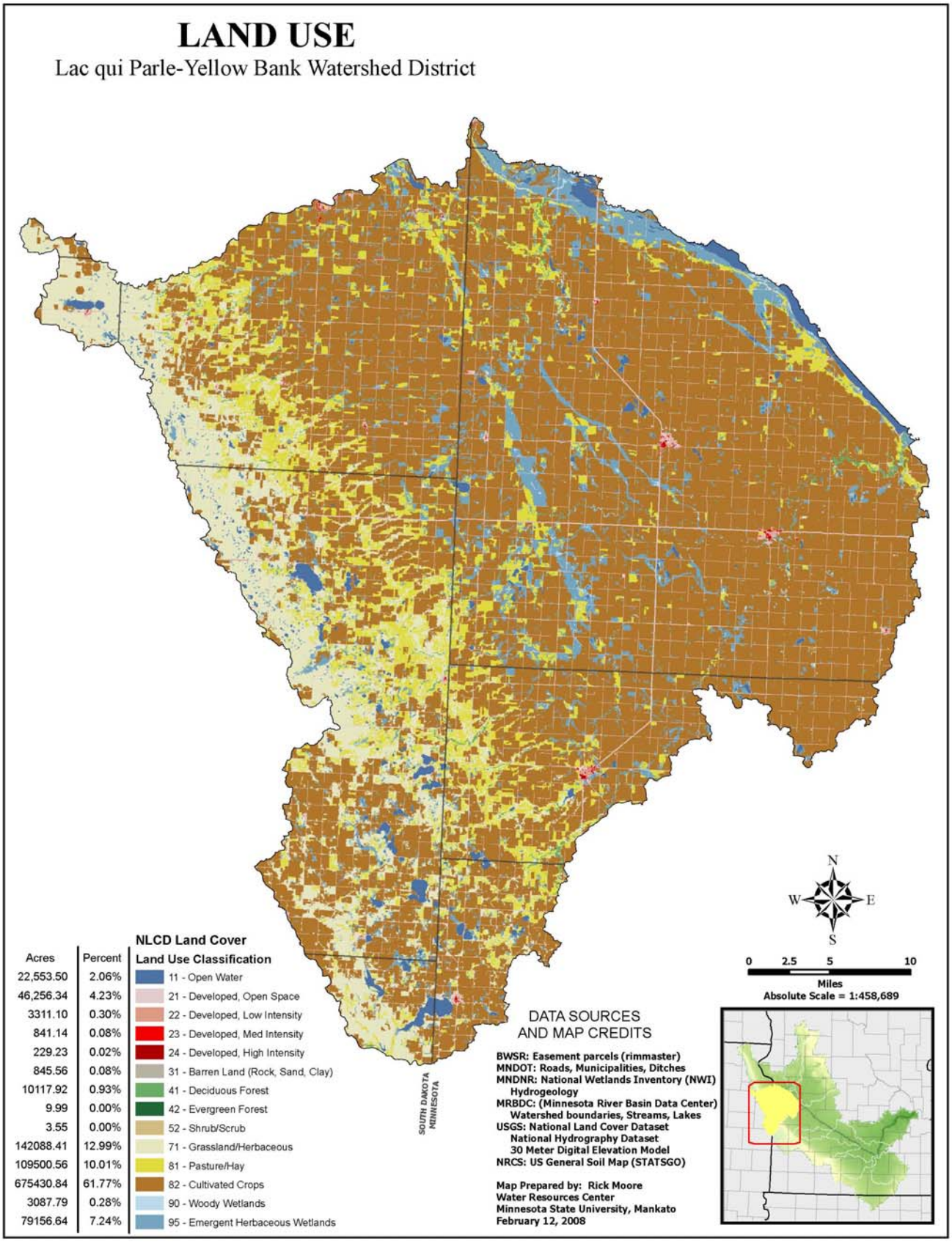
Land Use

According to the DNR, during presettlement times tallgrass prairie virtually covered the watershed. Wet prairies covered a much smaller proportion of the landscape than in the Minnesota River Prairie subsection and was restricted to narrow stream margins. Forest was similarly restricted to ravines along a few streams. Today, general land use in the District is predominantly agricultural, consisting of 61 Percent crop land, 10 percent pasture land and range land, forested areas, public wildlife land, urban and built-up land, and land used for other purposes. *Upper Minnesota River Sub Basins Study, 1985* (The 639 Report). A map of 2000 land use in the District is shown in ***Figure Ten.***

There are some industries in the District. A.G.P. Soybean Processing, and AMPI Milk and Cheese in Dawson, and the Health Care Industry in Madison all employ District residents. The majority of District residents are employed in the production or processing of agricultural products or in services dependent on the farm trade. Agriculture has dominated the basic industrial output since settlement in the latter half of the 19th century, although the numbers of farms in the county has dropped steadily since 1930. The average size farm, approximately 325 acres in 1972, increased to approximately 453 acres in 1990.

Crop land includes land used for production of adapted row crops and close growing crops such as grain, hay, and rotation pasture. Corn is the major crop followed by soy beans and small grains. Beef cattle and hogs are the major livestock enterprises. The number of livestock in the District has declined in recent years, although the number of livestock per farm has increased, following state and nation-wide patterns of agribusiness growth. Dairy cattle are a minor component of the livestock industry in the District.

Figure Ten


LAND USE
Lac qui Parle-Yellow Bank Watershed District
NLCD Land Cover
Acres | Percent | Land Use Classification
22,553.50 | 2.06% | 11 - Open Water
46,256.34 | 4.23% | 21 - Developed, Open Space
3311.10 | 0.30% | 22 - Developed, Low Intensity
841.14 | 0.08% | 23 - Developed, Med Intensity
229.23 | 0.02% | 24 - Developed, High Intensity
845.56 | 0.08% | 31 - Barren Land (Rock, Sand, Clay)
10117.92 | 0.93% | 41 - Deciduous Forest
9.99 | 0.00% | 42 - Evergreen Forest
3.55 | 0.00% | 52 - Shrub/Scrub
142088.41 | 12.99% | 71 - Grassland/Herbaceous
109500.56 | 10.01% | 81 - Pasture/Hay
675430.84 | 61.77% | 82 - Cultivated Crops
3087.79 | 0.28% | 90 - Woody Wetlands
79156.64 | 7.24% | 95 - Emergent Herbaceous Wetlands
SOUTH DAKOTA
MINNESOTA
N
W
E
S
0 2.5 5 10
Miles
Absolute Scale = 1:458,689
DATA SOURCES
AND MAP CREDITS
BWSR: Easement parcels (rimmaster)
MNDOT: Roads, Municipalities, Ditches
MNDNR: National Wetlands Inventory (NWI)
Hydrogeology
MRBDC: (Minnesota River Basin Data Center)
Watershed boundaries, Streams, Lakes
USGS: National Land Cover Dataset
National Hydrography Dataset
30 Meter Digital Elevation Model
NRCS: US General Soil Map (STATSGO)
Map Prepared by: Rick Moore
Water Resources Center
Minnesota State University, Mankato
February 12, 2008

Soil productivity in the District ranges from marginal to high; however, most of the crop land in the District is subject to water erosion or wind erosion to some degree. The major management needs are measures to control water erosion and wind erosion, reduce the wetness of the more poorly drained soils, improve fertility and tilth, and control weeds. Crop production in the District is closely tied to available moisture. For example the difference in crop yields between 1987 and 1988 is dramatic due to a drought. Corn production fell by almost 65% per acre in 1988, and all crops had a reduction of at least 50 % in production yields.

Major recreational activities in the District are hunting and fishing. Goose hunting on the Lac qui Parle Refuge draws large numbers of hunters from major metropolitan areas, and the abundant public hunting areas are heavily used for pheasant and duck hunting. The general lack of lakes with recreational potential limits water oriented recreational activities. With the exception of the hill slopes along the Minnesota River and Lac qui Parle Lake, there are limited wooded or forested areas in the District.

The Watershed District is served by an excellent system of federal, state, county, township, and private roads. U.S. Highway 75 cuts across the District from north to south, through the municipalities of Bellingham, Madison, Canby, Lake Benton, and along Ivanhoe. This is a major transcontinental highway extending from the Canadian border in Minnesota to the Mexican border in Texas. U.S. Highway 212 traverses the District from from east to west, through Dawson. Highway 212 is also a transcontinental highway. State Highway No. 40 crosses Lac qui Parle County east-west through Madison and Marietta. Another east-west State Highway, No. 67 is located in northern Yellow Medicine County, east from U.S. Highway No. 75. State Highway No. 271 serves Hendricks, and State Highway No. 275 goes into Boyd. U.S. Highway 14 crosses Lincoln County, and State Highway 19 crosses Lincoln County and goes through Ivanhoe.

There is no major railroad passing through the District, although branch lines of several major carriers do serve a number of municipalities. Airports are located in Madison and Canby, but there is no scheduled air service.

Most of the land in the District is under private ownership. The Yellow Bank Sub-watershed contains approximately 1.3% public land, and the Lac qui Parle Sub-watershed contains approximately 2.5% public land. The majority of public lands are state and federal wildlife management areas and parks, the largest single holding being the Lac qui Parle Wildlife Management Area along Lac qui Parle and Marsh Lakes.

Soils

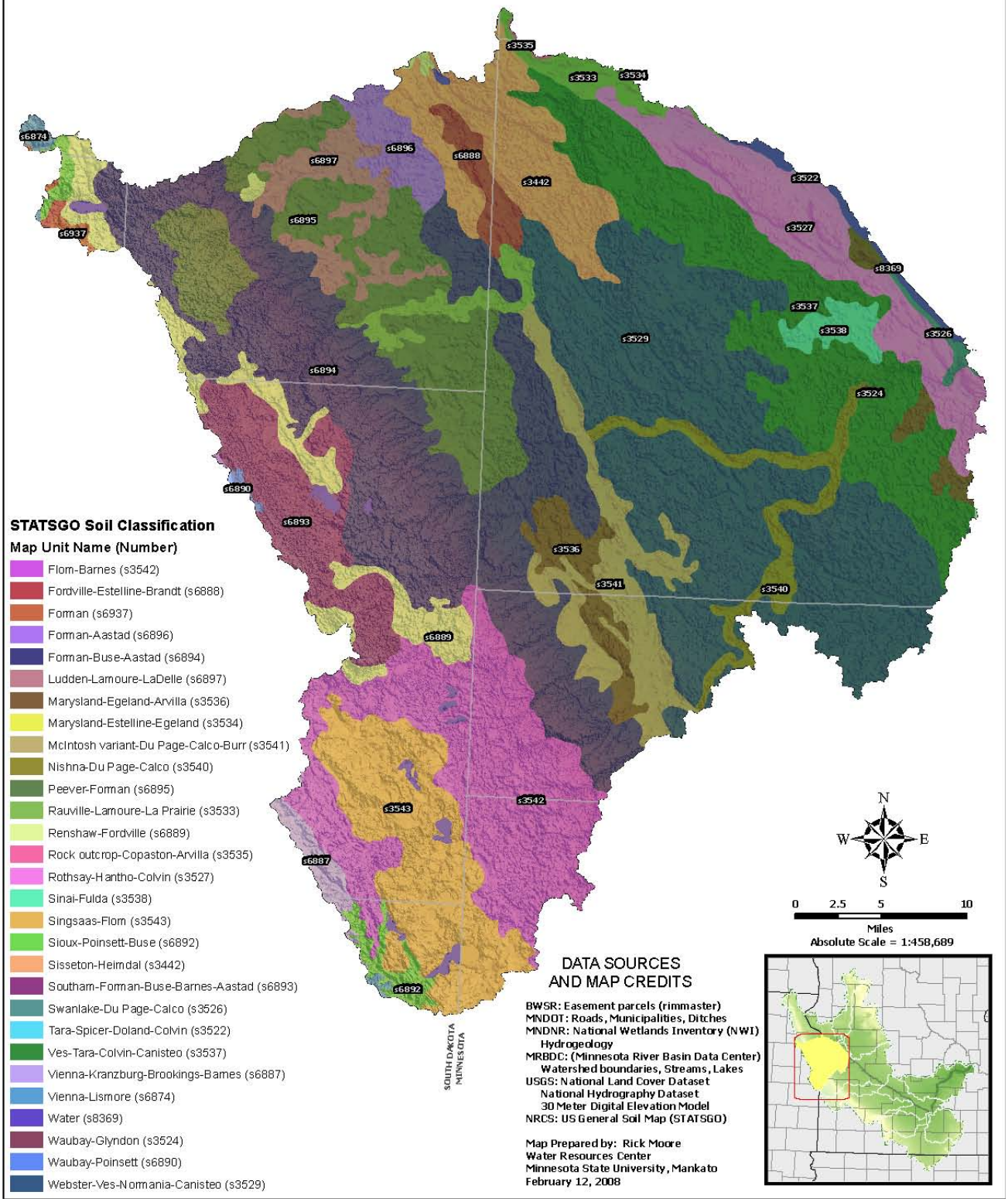
The soils in the District are produced by natural processes acting through time on material deposited or accumulated by geologic processes. Soils have a significant interaction with, and effect on, water resources in the District. For example, highly erodible soils can contribute sedimentation to rivers and streams. Conversely, sandy soils with high infiltration and surface permeability characteristics significantly contribute to aquifer recharge. A map of the soils can be found in ***Figure Eleven.***

Soil characteristics are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material accumulated; plant and animal activities and material on and in the soil; and relief or topography in the area of soil formation. Soil parent material in the District ranges from clay in the uplands to sandy loam in the major river valleys. Soils with identical or nearly identical profiles are grouped into a soil series, normally named for a geographical feature where it was first described. Each series has the same characteristics regardless where it is subsequently found.

Figure Eleven

SOIL CLASSIFICATIONS

Lac qui Parle-Yellow Bank Watershed District



STATSGO Soil Classification

Map Unit Name (Number)

- Flom-Barnes (s3542)
- Fordville-Estelline-Brandt (s6888)
- Forman (s6937)
- Forman-Aastad (s6896)
- Forman-Buse-Aastad (s6894)
- Ludden-Lamoure-LaDelle (s6897)
- Marysland-Egeland-Arvilla (s3536)
- Marysland-Estelline-Egeland (s3534)
- McIntosh variant-Du Page-Calco-Burr (s3541)
- Nishna-Du Page-Calco (s3540)
- Peever-Forman (s6895)
- Rauville-Lamoure-La Prairie (s3533)
- Renshaw-Fordville (s6889)
- Rock outcrop-Copaston-Arvilla (s3535)
- Rothsay-Hantho-Colvin (s3527)
- Sinai-Fulda (s3538)
- Singsaas-Flom (s3543)
- Sioux-Poinsett-Buse (s6892)
- Sisseton-Heimdal (s3442)
- Southam-Forman-Buse-Barnes-Aastad (s6893)
- Swanlake-Du Page-Calco (s3526)
- Tara-Spicer-Doland-Colvin (s3522)
- Ves-Tara-Colvin-Canisteo (s3537)
- Vienna-Kranzburg-Brookings-Barnes (s6887)
- Vienna-Lismore (s6874)
- Water (s8369)
- Waubay-Glyndon (s3524)
- Waubay-Poinsett (s6890)
- Webster-Ves-Normania-Canisteo (s3529)

DATA SOURCES AND MAP CREDITS

BWSR: Easement parcels (rimmaster)
MNDOT: Roads, Municipalities, Ditches
MNDNR: National Wetlands Inventory (NWI)
Hydrogeology
MRBDC: (Minnesota River Basin Data Center)
Watershed boundaries, Streams, Lakes
USGS: National Land Cover Dataset
National Hydrography Dataset
30 Meter Digital Elevation Model
NRCS: US General Soil Map (STATSGO)

Map Prepared by: Rick Moore
Water Resources Center
Minnesota State University, Mankato
February 12, 2008

Soil associations, which are described in county general soils maps, are a distinct pattern of soil series in defined proportions. Most associations contain one or more major soil series and at least one minor series. Associations are named from the major soil series name. Soil association maps provide an overview of where high runoff or erosion could be expected, or where areas of high or low agricultural potential are likely to be located. Most of the soils in the District have been mapped by general associations. Detailed soils maps for each county are available in the individual county Soil and Water Conservation District offices.

Major Soil Associations in the Watershed District

Esmond-Heimdal-Pamell Association

The soils of this association are found on gently undulating to very steep hilly upland and depressions. These soils formed from glacial till on the moraine. Esmond and Heimdal soils are well drained loams and the Parnell soils are very poorly drained silty clay loams in depressions and flat areas. These soils are used for both crop land and pasture.

Forman-Buse-Parnell Association

This association occurs on uplands and depressions on the Coteau and varies from nearly level to moderately steep with slopes of up to 18 %. Both the Forman and Buse soils are well drained clay loams formed from glacial till while the Parnell soils are poorly or very poorly drained silty clay loams formed on glacial till and local alluvium. These soils are used for both crop land and pasture.

Yes-Canisteo Association

Found on the uplands and flats on till plains, this association covers about 33 % of the District. Terrain varies from nearly level to undulating with slopes of up to 18 %. Yes loams are well drained and are found on the knolls and side slopes. The clay loam Canisteo soils occupy the flats and depressional areas and are poorly drained. These soils are used for both crop land and pasture.

Poinsett- Buse-Colvin Association

These level to undulating soils are found on uplands and drainage ways and are developed on till plains and lacustrine deposits. The association covers about 20 % of the District and may have slopes of up to 18 %. Both Poinsett and Buse soils are well drained and are silty clay loam and clay loam in texture, respectively. The low lying and poorly to very poorly drained Colvin soils are silty clay loams. Buse soils are developed on till while Poinsett and Colvin originated on lacustrine deposits. These soils are used for both crop land and pasture.

Zell-Rothsay-Colvin Association

This association, which covers about 13 % of the District, is found on uplands and drainage ways on the lacustrine deposits of glacial lake plains. Slopes range from level to 12 %. Zell and Rothsay soils are well drained silt loams while the silty clay Colvin soils are poorly drained. These soils are used for both crop land and pasture.

Fulda-Sinai Association

Developed on lacustrine sediments on uplands, these soils cover about 4 % of the District on level to nearly level sites. Both soils are silty clay in texture with Fulda soils being poorly drained and Sinai soils being moderately well drained. These soils are used primarily as crop land.

Burr-Calco Association

This association occupies flats and nearly level areas on alluvial sediments of glacial lake plains. It covers about 5 % of' the District. Both soils are silty clay loams and are poorly drained, the Burr soils having developed on clayey lacustrine deposits and the Calco on silty alluvial sediments. These soils are used for both crop land and pasture.

Calco- Du Page Association
This association is found on nearly level flats, terraces, and drainage ways on flood plain areas where the slope does not exceed 2 %. Calco soils are poorly drained silty clay loams formed on silty lacustrine sediments. The moderately well drained Du Page loams formed on loamy lacustrine material. These soils are used for both crop land and pasture.

Arvilla-Egeland Association
The soils of this association are formed in glacial outwash material on nearly level to undulating terrain. Slopes range from nearly level to 18 %. The Arvilla soils are somewhat excessively drained loams and the Egeland soils are well drained sandy loams. These soils are used for both crop land and pasture.

Terril-Swanlake Association
This small association is found on slopes of 12 to 40 % in river bluff areas. Both soils are loam in texture. Terril soils are moderately well drained and formed on loamy colluvial sediments. Swanlake soils are well drained and formed on loamy glacial till. These soils are used for pasture and wildlife habitat. Limitations for other uses are erosion potential and steepness.

The ability of soils to absorb and transmit water is one of their most important characteristics for watershed planning. Soil infiltration rates and permeability depend on the parent material as well as the slope and topography. Infiltration rates and permeability affect runoff rate and groundwater pollution potential, and may limit suitability of some areas for uses such as irrigation or individual septic tanks.

District soils developed on ground moraine are well to moderately well drained. Water readily penetrates those soils, and moves through the soils once absorbed. They may, however, have slow infiltration rates in some areas because of slope and soil texture. In areas where soils are developed on outwash sands and gravels (notably the outwash plains) and river sediments, permeability, and infiltration rates are very high.

Many of the soils in District are easily eroded by water and wind, even though they don't always fit the highly erodible soil classification. Stream bank erosion and channel sedimentation are serious problems in tributaries and the Lac qui Parle River in the District. In a Minnesota Department of Natural Resources Fisheries Stream Survey conducted in 1994, specific reaches of the Lac qui Parle River, the West Branch of the Lac qui Parle River, and the Yellow Bank River, where bank erosion is particularly severe, are identified. Eroded soils are also deposited on the flood plains of tributaries, especially in those areas abutting the Coteau highlands. Sediments, nutrients, and chemicals carried into surface water by eroded soils further degrade water resources. Sedimentation on flood plain lands decreases crop production and increases tillage costs.

Water Use

Public Water Supplies and Well Head Protection Areas
Literally all domestic water supplies in the District, both private and public, are from groundwater sources. The DNR regulates large appropriations over 10,000 gallons per day or 1,000,000 gallons per year through the Water Appropriations permitting process. Hydrogeologic analysis of the water source and records of the amount of water appropriated is utilized to ensure safe yield of aquifer resources. The MDH monitors and regulates those public water suppliers, and providers are in compliance with those regulations. All counties in the watershed have addressed Wellhead Protection Areas in their updates to the Comprehensive Local Water Plans. The Wellhead Protection Plans must be completed by all public water suppliers to ensure that groundwater recharge areas and well head areas are safeguarded from contaminants. The counties will generally assist the providers with the development of the plans, and the District will provide information to support the process.

Municipal Wastewater Treatment System Inventory

Wastewater discharge from municipal sewage treatment systems is controlled by the Minnesota Pollution Control Agency (MPCA). Permits are required for any discharge into state waters, and are issued for five years. The permitting process requires self-monitoring reports of dischargers, which are reviewed by the MPCA. Private septic systems and individual sewage treatment systems are also controlled by MPCA Individual Sewage Treatment Standards (6 MCAR 4.8040). Counties in the District have adopted the MPCA standards and have made them part of their zoning ordinances. These ordinances require permitting procedures for installation of septic systems, and licensing requirements for designers, installers, and inspectors. As of 1996, any property that is transferred must have a septic system that meets all state regulations. Jurisdiction does not extend to within municipal boundaries, however. Municipalities, schools, or industry in the District that have wastewater discharge permits include:

- Bellingham (Ditch to Marsh Lake)
- Boyd (Connected to Clarkfield)
- A.G.P. Soybean Processing Inc. (Ditch to the Lac qui Parle River)
- AMPI Milk and Cheese (Lac qui Parle River)
- Dawson (Ditch to the Lac qui Parle River)
- ISD #6011 (Ditch to the Lac qui Parle River)
- Madison (County Ditch 27)
- Marietta (County Ditch 28)
- Nassau (Connected to Marietta)
- Canby (Canby Creek)
- Hendricks (Lac qui Parle River)

Louisburg is an unsewered community and is presently working with the MPCA to build a compliant treatment system. Rural homes in the District do not have a central sewage treatment collection and treatment system. Each household operates an individual treatment system, which may or may not be in compliance. Those out of compliance are a potential source of groundwater or surface water contamination.

Section Two: Assessment and Issue Identification

Water Quantity Management: District's Role

Floodplain Management

Stream and watershed cross-over flooding problems and drainage problems are related issues in the District, and will be considered together in this plan. Flood damage to crops and agricultural land is considerable in the District. Flood problems are not related to the conventional view of damages caused by a major 50-or l00-year flood event. Rather, most damage is from annual over-bank flooding of streams and tributaries during spring runoff or heavy summer precipitation events. The Lac qui Parle and Yellow Bank Rivers, as well as most of their tributaries, begin in the highlands of the Coteau de Prairies (Coteau). There is an elevation drop of about 1,070 feet from the highest point to the outlet at the Minnesota River, with the greatest fall occurring on the slopes of the Coteau. There, the slope of the stream channels is about 25 feet per mile, whereas on the flood plain it is only about 2 feet per mile. Close to the Minnesota River, the fall increases to about 10 feet per mile. Any rapid precipitation event such as fast spring thaws while the ground is still frozen, or high intensity spring rains, causes rapid runoff of water onto the flood plains. With the drop in fall, and with over-bank flow, the runoff slows down and any soil eroded from the channels on the slope of the Coteau is deposited. This clogs the channels with silt, further reducing their capacity, and results in even more over-bank flooding. Further, deadfalls, fallen trees and other debris restrict the flow, slow the water velocity, and increase sedimentation in the channel. As flow exceeds the banks onto the flood plain, it meanders in several directions. Some overflows the watershed boundary into another stream, causing watershed cross-over flooding. Commonly storms on the Coteau in South Dakota will result in flooding in the District, where no precipitation may have fallen.

The natural drainage for rivers and major tributaries in the District is southwest to northeast. The geological drainage pattern, established after the last glaciations period, was northwest to southeast. Whenever over-bank flooding occurs on the flood plain, water has the tendency to cross watershed boundaries into the watersheds to the southeast. Most of the rivers and tributaries in the District have their main channels located very near the southeast boundary of the watershed. When cross-over flooding occurs, the water related problems in the receiving watershed are intensified. In places, overflow waters have eroded channels to the point that most flood waters are diverted. Historically, installing dikes and filling these overflow sites was done in order to contain the overflow within the natural watershed.

Locations where cross-over flooding occurs within the District are:

- Yellow Bank River into the Lac qui Parle River, two miles southeast of Nassau at Section 3, Augusta Township, Lac qui Parle County.
- Florida Creek into Lac qui Parle Creek at Sections 21 and 28, Freeland Township, Lac qui Parle County.
- Florida Creek into Lac qui Parle Creek at Sections 6 and 7, Hammer Township, Yellow Medicine County.
- Florida Creek into Lazarus Creek at Sections 17 and 18, Hammer Township, Yellow Medicine County.
- Lazarus Creek into Canby Creek at Section 4, Norman Township, Yellow Medicine County.
- Canby Creek into Lac qui Parle River at Section 1, Norman Township, Yellow Medicine County.

Locations where cross-over flooding occurs from a stream within the District to a stream outside

- Lac qui Parle River into Spring Creek (Yellow Medicine River) at Sections 11 and 13, Oshkosh Township, Yellow Medicine County.
- Lac qui Parle River into Mud Creek (Yellow Medicine River) at Section 5, Wergeland Township, Yellow Medicine County.
- Lac qui Parle River into Judicial Ditch 8 at three places, miles 6, 7, and 8 south of Dawson.

Once the flood waters reach the descent into the Minnesota River Valley, the channels are well entrenched and little further flooding occurs.

The Upper Minnesota River Sub-basins Study (Public Law 78-639) Interim Feasibility Report on the Yellow Bank and Lac qui Parle Sub-basins, referred to in this plan as the 639 Report, provides a coordinated and responsive detailed analysis of the stream and cross-over flooding problems in the watershed, and provides a number of alternative solutions. The 639 Report was an outcome of a SCS (now the NRCS) Type IV Study, a reconnaissance level study that encompassed the entire Minnesota River basin. The Type IV study was prepared at a time when the federal government was substantially involved in assisting with structural flood control and surface water supply problems. This study divided the Minnesota River basin into several subareas. The only subarea found to have a number of potential projects with economic feasibility for federal involvement was Area II, which includes the Lac qui Parle and Yellow Bank River Basins. The NRCS designed and assisted with construction of a number of flood control dams identified by the Type IV Study. However, changing federal cost share criteria and priorities have essentially eliminated NRCS involvement in these types of projects. Area II Minnesota River Basin Projects, Inc, the Watershed District, and the State of Minnesota recently completed the last flood control impoundment in Area II that was carried into the preliminary design stages by the NRCS. This is the Lazarus Creek Project discussed below. The joint SCS (NRCS) - COE 639 Study focused on flood control within Area II primarily via flood water impoundments, levees, and channelization. It identified only one project for which it was economically feasible for the COE to participate, which involved rural levees and channelization. That project has not proceeded due to environmental concerns. The 639 Study acknowledged the changing federal government involvement in flood control and the related need for local and state governments to pursue a flood damage reduction strategy in Area II involving both structural and nonstructural flood control measures. The large scale hydrologic, hydraulic, and economic analysis conducted during the 639 Study provided a broad basis for flooding problem definition and prioritization. This report is available in the Watershed District Office, and provides a useful reference for watershed planning. The 639 Study has become dated, however, and lacks detail within the Lac qui Parle - Yellow Bank Watershed necessary to evaluate the benefits of currently available flood damage reduction measures such as road retention structures, conservation easements, wetland restoration, off-channel storage, and alternative land use for floodway creation.

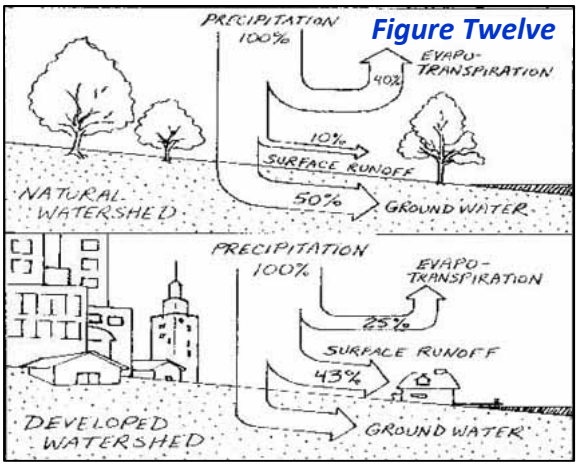
In this overall plan for the Lac qui Parle-Yellow Bank Watershed District, drainage refers to the removal of surplus water from agricultural lands. Indiscriminate drainage of wetlands, sloughs, and potholes to bring new lands into production is not intended or permitted. Removal of excess water through adequate drainage on heavily textured level soils frequently allows a change in land use and production from low to high value crops. High water tables can restrict root growth and lower crop yields. High water during floods drowns tile line outlets, preventing them from working.

The history of drainage projects in the District and throughout Minnesota had been to remove surplus water from the land as fast as possible, and to dump it into any channel that would deliver it from the area. These practices are no longer valid or acceptable in the District.

Stormwater Management

According to the 1996 National Water Quality Inventory, stormwater runoff is a leading source of water pollution. Stormwater runoff can harm surface waters such as rivers, lakes, and streams which in turn cause or contribute to water quality standards being exceeded.

Stormwater runoff can change natural hydrologic patterns, accelerate stream flows, destroy aquatic habitats, and elevate pollutant concentrations and loadings. Development substantially increases impervious surfaces thereby increasing runoff from city streets, driveways, parking lots, and sidewalks, on which pollutants from human activities settle. As shown in ***Figure Twelve***, loss of surface area for infiltration can increase runoff from 10% to 43% (source: EPA website).



No Municipal Separate Stormwater Sewer Systems within the boundaries of the District require a National Pollutant Discharge Elimination Permit, but the Cities manage their own stormwater. Education of property owners within each stormwater drainage area is an effective step in reduction of fertilizer, leaves, detergents and other pollutants entering the waterways.

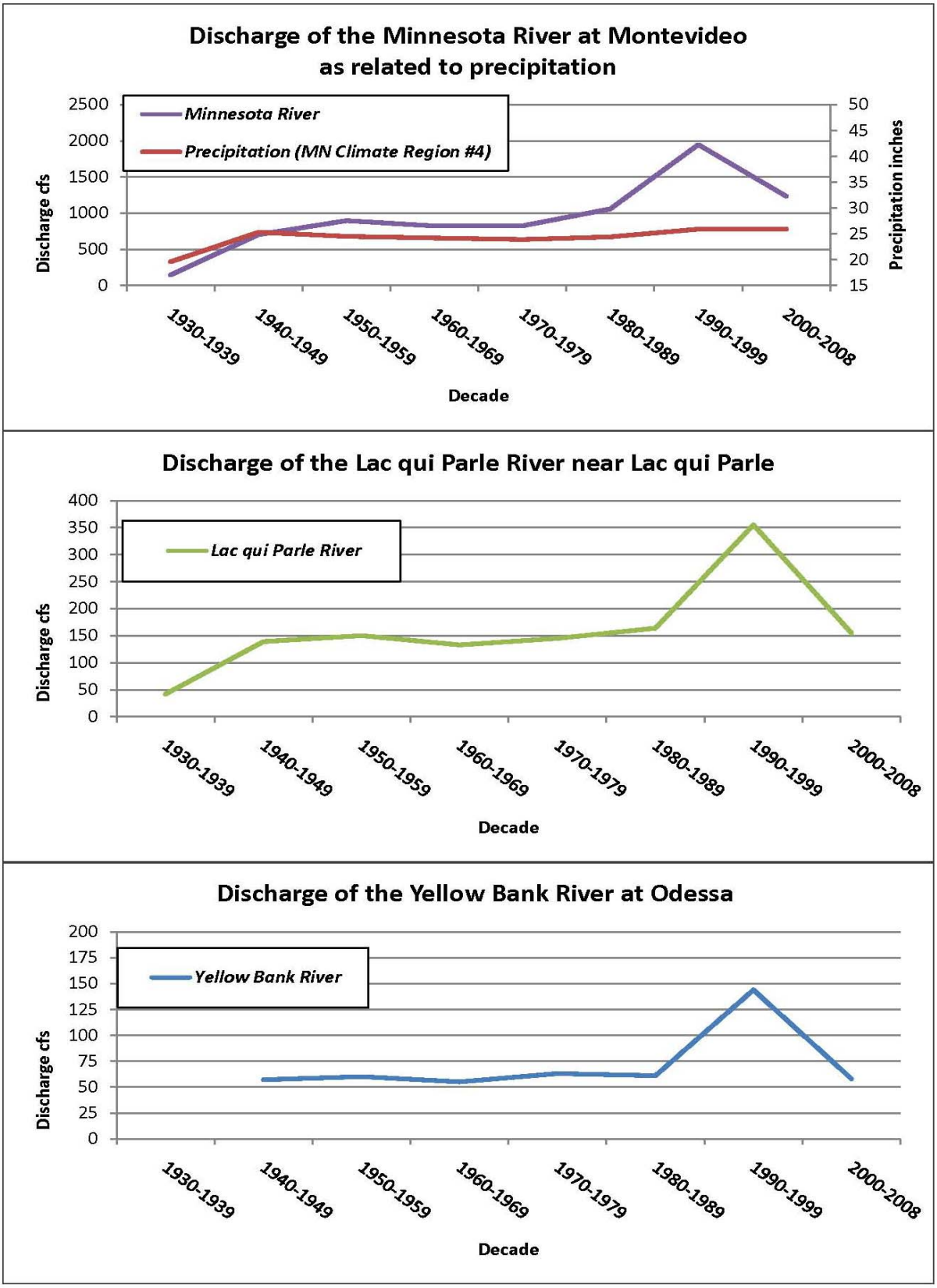
Public Drainage System

The public drainage system within the District is expansive. While maps of these systems are available, they are outdated and some are so old they are fragile. Mapping the public drainage system will allow for an overall visual of the location of the ditches in conjunction with the rest of the overall drainage patterns. This will allow the board members to more clearly identify the impacts of the system on the streams and rivers within the District.

Flow Data

The USGS has continuous flow monitoring stations on two river sites in the District. The Lac qui Parle River site, located near Lac qui Parle, was established in 1909; and the Yellow Bank River site, located near Odessa, was established in 1939. Both the Yellow Bank and Lac qui Parle rivers discharge into the Minnesota River upstream of the Montevideo gauge. Summarized below, complete data from these three USGS gauging stations can be found on the District's website at: http://www.lqpco.com/lqpybwd/wsdi.php. The data in ***Figure Thirteen*** shows a consistent, dramatic increase in overall discharge from the major rivers since monitoring started during the drought in the 1930s. The drought period depleted groundwater in addition to diminishing flow in the rivers. When the drought ended, it took time to replenish aquifers and groundwater before normalized inflows to the rivers were reestablished, and the subsequent increased discharges, could be observed. While the actual flow during each 10-year time period varied greatly, the averages are used to determine trends.

Figure Thirteen



The discharge is sensitive to even minor changes in precipitation and can be exacerbated by changes in land use. Land use practices such as removing or changing vegetation, creating impervious surfaces and removing surface and subsurface storage area have likely impacted the overall discharge in the District's rivers. Increasing the water storage areas will remove some of this excess water from the immediate runoff system and allow for slowing and lessening of the volume of discharge. This will reduce soil erosion from uplands and stream banks and consequently improve the water quality within the rivers.

Precipitation is derived from Climate Region Four – an area delineated by the National Oceanic and Atmospheric Administration, NOAA, and the National Weather Service as shown in ***Figure Fourteen***. This area encompasses the approximate drainage area of the Upper Minnesota River and is the best estimate of the precipitation averages driving runoff discharge for the Minnesota River at the USGS gauge at Montevideo.

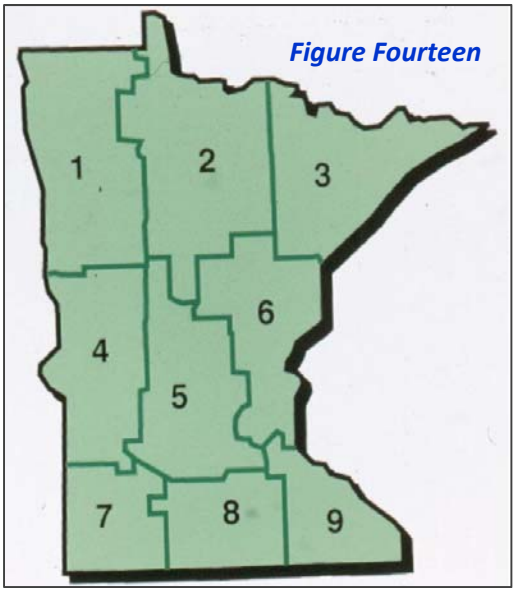


Figure Fourteen

Utilizing the rain-fall and the flow data, a water budget can be estimated, determining the water that is evaporated, soaked into the soil and what is left to contribute to runoff. As graphed in ***Figure Fifteen***, a water budget estimate can show how much water actually runs off and how much is used by the land and groundwater. The graph is based on the data from figure thirteen. The percentage of runoff has steadily risen from 1.6 in the 1930s to 16.5 in the 1990s and 10.5 from 2000 to the present.

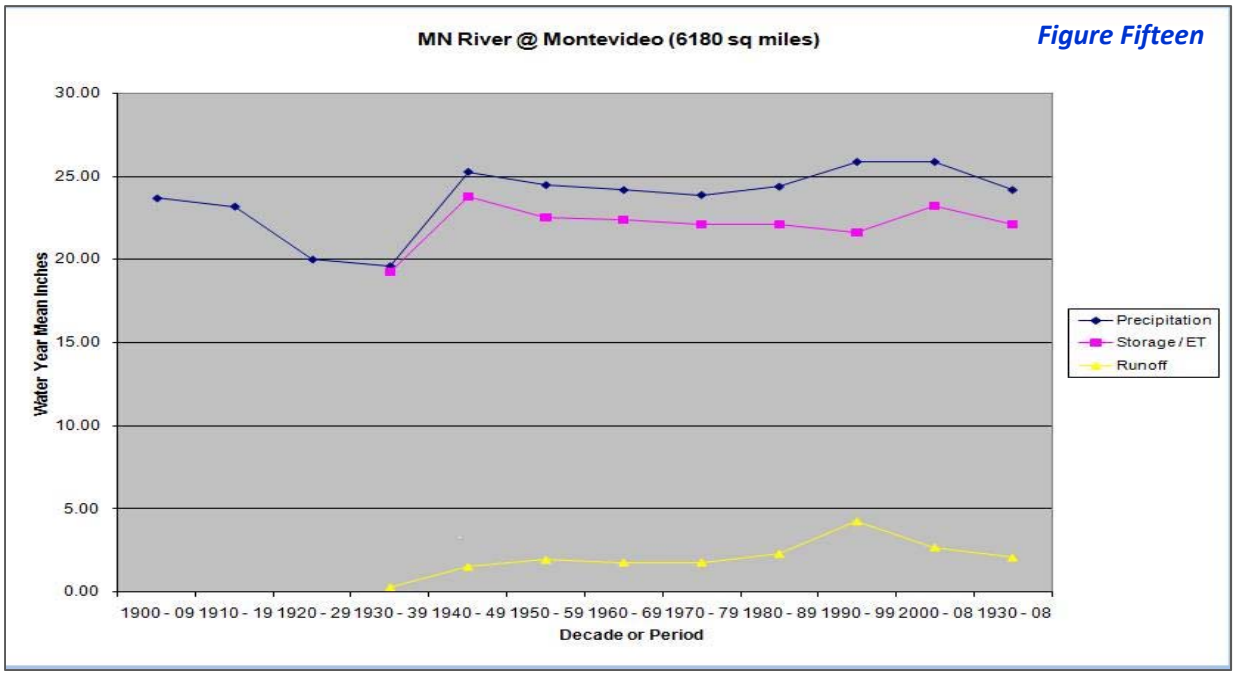


Figure Fifteen

Lake Levels

Lakes within the District have a single lake level reading with an established Ordinary High Water Level (OHW). The only lake with a significant number of readings and the ability to create a hydrograph is Lake Hendricks. This lake has had 1080 readings dating from 1952 to the present. The highest recorded level was noted in 1993 at 1759.65 feet above sea level. The lowest recorded was in 1968 at 1753.19 feet above sea level. The OHW elevation on Lake Hendricks is 1756.3 feet above sea level. In the past ten years the lake level has fluctuated by about 2 inches. The U.S. Army Corps of Engineers monitors and controls the lake levels on Lac qui Parle Lake as it is an impoundment for the multiple purposes of water conservation, fisheries / habitat, recreation and flood control. The normalized control elevation ranges from 933 to 934 feet MSL depending on the time of the year and tributary inflows; the overflow elevation beyond control is approximately 941 feet MSL.

Groundwater

The agency responsible for groundwater and surface water appropriations is the DNR. An appropriation permit is required for withdrawals greater than 10,000 gallons per day or one million gallons per year (MGY). Permit holders are required to measure monthly water use and report to the DNR annually.

As seen in ***Table Ten***, industrial processing is the major water user with combined groundwater (607 MGY) and stream/river (19.8 MGY) averages.

Water Appropriations within the Lac qui Parle – Yellow Bank Watershed District — ***Table Ten***

Source	Use Type	Number of Permits	Withdrawal (MGY)	
			Average 1988-2007	Permitted
Groundwater	Industrial Processing	9	607.0	3649.0
	Major Crop Irrigation	34	474.0	2229.0
	Golf Course	2	20.4	23.3
	Livestock Watering	17	7.7	74.9
	Commercial/Institutional Waterworks	3	3.7	36.0
	Municipal Waterworks	24	320.6	1794.0
	Rural Water Districts	9	237.4	1850.0
	Total Groundwater	**98**	**1670.8**	**9656.2**
Lake	Golf Course	1	6.1	6.0
Stream / River	Industrial Processing	1	19.8	30.0
	Major Crop Irrigation	3	26.4	121.0
	Golf Course	1	9.7	17.4
Dug Pits	Major Crop Irrigation	4	4.4	164.2
	Golf Course	2	6.8	41.4
	Sand / Gravel Pit Dewatering	1	0.0	50.0
Quarry/Mine/Gravel Pit	Major Crop Irrigation	1	16.7	50.0
Wetland	Major Crop Irrigation	1	0.0	5.0
	Total Surface Water	**15**	**89.9**	**485.0**

Actual groundwater usage of 1,670.8 MGY is considerably lower than the permitted amount of 9,656.2 MGY. Of the 115 permits issued, 98 come from the ground. Major crop irrigation is third after drinking water uses. Volume of water supply available has not been a concern to date.

Priority Water Quantity Issues

Priority issues for water quantity include the update of existing data, such as the 639 study and the public drainage inventory. This will enable new modeling of storage problems and show where improvements have been made.

Water storage continues to be a priority with the City of Dawson's current project of dam removal and future plans on Florida Creek and other projects as outlined in the 639 study.

Reducing Priority Pollutants: District's Role

The District's role in water management includes working with the MPCA and DNR to monitor and managing surface water and groundwater quality and quantity, working with the SWCDs, NRCS, BWSR, DNR, and the USACE to provide for flood control, stream bank stabilization, and drainage system management and regulating, conserving, and controlling the use of water within the District. They are also charged with providing recreational opportunities and enhanced wildlife habitat as additional benefits of water quality and flood control projects.

Water Quality Standards

Ecoregion Classification and Standards

The Lac qui Parle – Yellow Bank Watershed District area exists within the Northern Glaciated Plains Ecoregion. This is a designation determined by the MPCA based on past monitoring of reference lakes and streams in areas based on topography, soils, land use and vegetation. Minnesota is divided into seven ecoregion areas, as shown in ***Figure Sixteen***. The ecoregion standards for the Northern Glaciated Plains (NGP) are shown in ***Table Eleven***.

Figure Sixteen

Ecoregion Averages NGP ***Table Eleven***

	Parameter	Average Value
Lakes	Total Phosphorus (mg/l)	0.130 - 0.250
	Chlorophyll a (mg/l)	35 - 55
	Secchi Disk (ft.)	1 - 3.3
	Total Kjeldahl Nitrogen (mg/l)	1.8 - 2.3
Streams	Total Phosphorus (mg/l)	0.09 - 0.25
	Total Suspended Solids (mg/l)	11 - 63
	Turbidity (NTU)	5.6 - 23.5

Lakes located within this ecoregion are generally shallow, prairie lakes. They tend to be nutrient rich and have frequent algal blooms. They are sensitive to runoff from the land and sediment transport to the lake will affect clarity. Further information about ecoregions can be found in "Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions", available online at:
http://www.pca.state,mn.us/publications/tdr-gl-03.pdf

Water quality standards for the purpose of determining impairments of waterbodies have been set by the MPCA. Standards for Aquatic Recreation within the watershed include

Fecal Coliform. This standard is being changed to an E.coli standard of 126 cfu/100ml. Standards for Aquatic Life within the watershed include Turbidity standards of 10 NTU for Class 2A waters, 25 NTU for Class 2Bd, B, C or D waters and Dissolved Oxygen standards of not less than 7 mg/l for Class 2A waters, not less than 5 mg/l for class 2Bd, 2B or 2C. The standard for Fish IBI and documentation explaining the above standards are explained more fully in the document "2007 Guidance Manual for Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment" which is available on the internet at: http://www.pca.state.mn.us/water/tmdl/tmdl-policyguidance.html.

Trophic Status

The Trophic State Index (TSI) is one of the most commonly used methods of assessing overall lake health. The TSI quantifies lake fertility/productivity on a scale from 0 to 100 based on Secchi disk readings, total phosphorus and chlorophyll-a. The classifications are as follows:

- Oligotrophic (TSI less than 40) lakes are nutrient poor lakes with low productivity. They are characterized by high transparency and low concentrations of chlorophyll-a and total phosphorus.
- Mesotrophic (TSI 40 to 50) lakes are moderately productive with intermediate transparency and chlorophyll-a and total phosphorus concentrations.
- Eutrophic (TSI 50 to 70) lakes are very productive and fertile lakes. They have low transparency with high chlorophyll-a and total phosphorus concentrations.
- Hypereutrophic (TSI greater than 70) lakes are the most productive and nutrient rich lakes. They are characterized by very poor transparency and extremely high chlorophyll-a and total phosphorus concentrations.

The only lake with enough monitoring data to properly assess for trophic status is Lake Hendricks (Lake Number 41011000). Lake Hendricks has a TSI of 57.1, which places it in the Eutrophic range.

Total Maximum Daily Load

Section 303(d) of the 1972 Clean Water Act requires the State of Minnesota to report to the federal government an assessment of the water quality of all rivers, streams and lakes in Minnesota. It also requires the state to list any water resources determined to be non-supportive to beneficial uses. This list is also known as the 303(d) Impaired Waters List. Impaired waters not meeting state water quality standards will be required to determine a Total Maximum Daily Load (TMDL) that will bring the bodies of water back into compliance with water quality standards. A TMDL is the sum of waste load allocations from point sources, load allocations from nonpoint sources including natural background, a margin of safety to account for potential scientific error, and a reserved capacity to account for future growth.

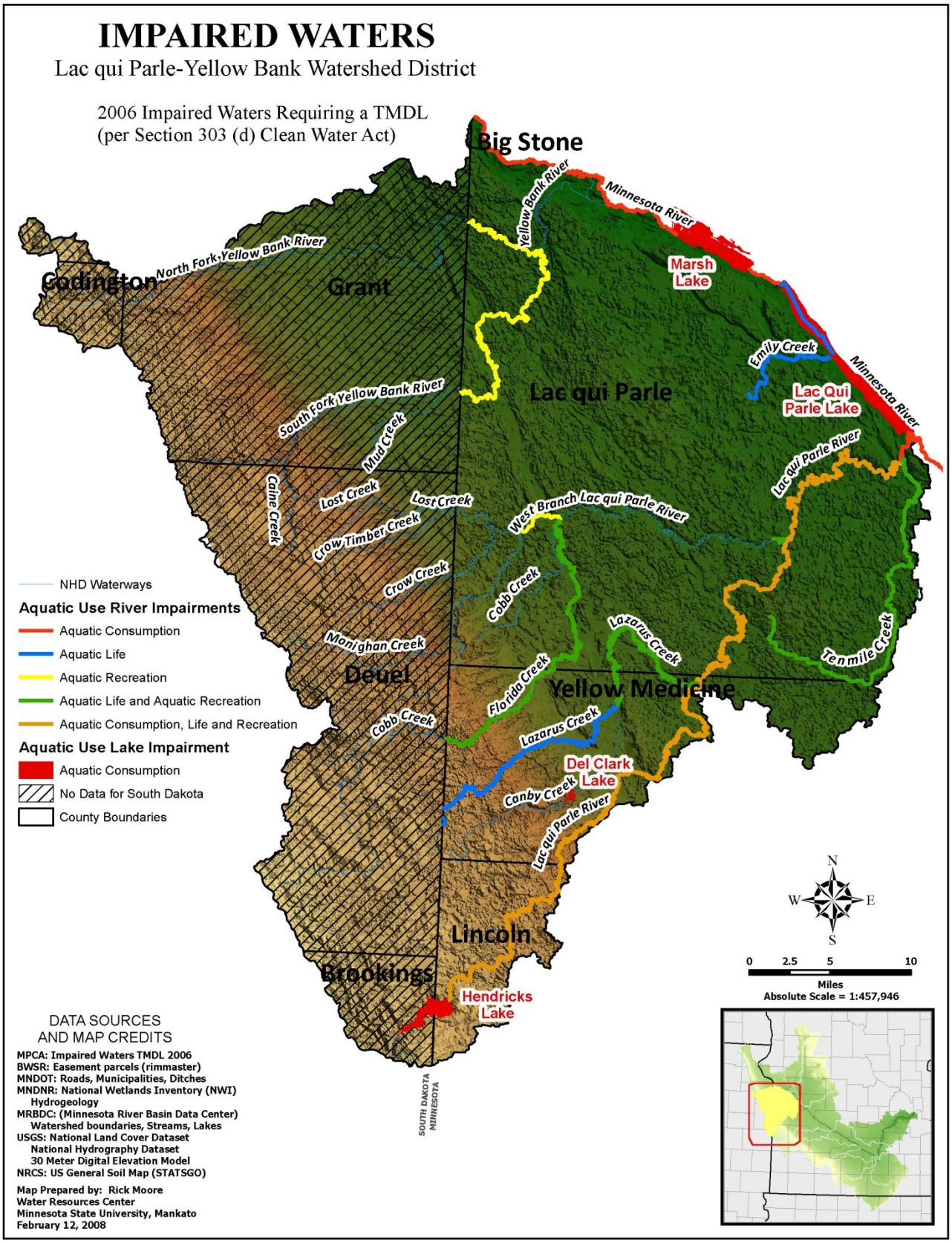
The Watershed District conducted a Diagnostic Study on the Lac qui Parle River, Yellow Bank River and their primary tributaries. The monitoring results were submitted to the MPCA. The results of the study were previously described. Within the Lac qui Parle-Yellow Bank Watershed District there are six water resources listed on the 2008 MPCA list of impaired waters. These water bodies are shown on the 2006 impaired waters map in ***Figure Seventeen*** and are listed below in ***Table Twelve***. There were no changes from the 2006 to 2008 impaired waters list within the Lac qui Parle – Yellow Bank Watershed District boundaries.

2008 Clean Water Act Section 303 [d] List of Impaired Waters in the Lac Qui Parle – Yellow Bank Watershed *Table Twelve*

Reach	Assessment Unit ID #	Affected Use	Pollutants/ Stressors	County
Lac qui Parle River W Br Lac Qui Parle R to Tenmile Cr	07020003-501	Aquatic Recreation	Fecal Coliform	Lac Qui Parle
		Aquatic Life	Oxygen, Dissolved2,5	Lac Qui Parle
		Aquatic Life	Turbidity	Lac Qui Parle
Lac qui Parle River Headwaters (Lk Hendricks 41-0110-00) to Lazarus Cr (Canby Cr)	07020003-505	Aquatic Recreation	Fecal Coliform	Yellow Medicine, Lincoln
		Aquatic Life	Fish Bioassessments	Yellow Medicine Lincoln
		Aquatic Life	Turbidity	Yellow Medicine Lincoln
Lac qui Parle River Lazarus Cr (Canby Cr) to W Br Lac qui Parle R	07020003-506	Aquatic Recreation	Fecal Coliform	Lac Qui Parle Yellow Medicine
		Aquatic Life	Turbidity	Lac Qui Parle Yellow Medicine
Lazarus Creek (Canby Creek) Canby Cr to Lac Qui Parle R	07020003-508	Aquatic Recreation	Fecal Coliform	Lac Qui Parle Yellow Medicine
		Aquatic Life	Turbidity	Lac Qui Parle Yellow Medicine
Lazarus Creek MN/SD border to Canby Cr	07020003-509	Aquatic Life	Fish Bioassessments	Yellow Medicine
Tenmile Creek Headwaters to Lac Qui Parle R	07020003-511	Aquatic Recreation	Fecal Coliform	Yellow Medicine Lac Qui Parle
		Aquatic Life	Fish Bioassessments	Lac Qui Parle Yellow Medicine
Lac qui Parle River, West Branch Unnamed cr to Unnamed ditch	07020003-512	Aquatic Recreation	Fecal Coliform	Lac Qui Parle
Lac qui Parle River, West Branch Lost Cr to Florida Cr	07020003-516	Aquatic Recreation	Fecal Coliform	Lac Qui Parle
Florida Creek MN/SD border to W Br Lac Qui Parle R	07020003-521	Aquatic Recreation	Fecal Coliform	Lac Qui Parle Yellow Medicine
		Aquatic Life	Fish Bioassessments	Lac Qui Parle Yellow Medicine
		Aquatic Life	Turbidity	Lac Qui Parle Yellow Medicine
Yellow Bank River N Fk Yellow Bank R to Minnesota R	07020001-525	Aquatic Recreation	Fecal Coliform	Lac Qui Parle
Yellow Bank River, North Fork, MN/SD border to Yellow Bank R	07020001-510	Aquatic Recreation	Fecal Coliform	Lac Qui Parle
Yellow Bank River, South Fork, MN/SD border to N Fk Yellow Bank R	07020001-526	Aquatic Recreation	Fecal Coliform	Lac Qui Parle

The MPCA is currently working on a TMDL study with the Watershed District that covers those reaches impaired for turbidity, bacteria and dissolved oxygen. Once approved, an implementation plan will be developed and available for the district to use in future planning. As funding becomes available, additional monitoring will be conducted to further assess the quality of the water resources within the District.

Figure Seventeen



Water Quality Data Profile

Surface Water Quality

Very little water quality data exists on the Upper Minnesota River and its tributaries prior to 1960. Most historic information prior to 1960 comes from local resident's personal recollections and journals. A map of Lac qui Parle Lake created in 1909 describes sediments in the lake as sand and gravel, in spite of a depth of only three to four feet. Erik Severid's journal of his 1930 canoe trip from Minneapolis to Hudson Bay described the Lac qui Parle Lake as clean and clear in the 1930s, with an abundance of freshwater clams, as attested by area residents. A decline in water quality was noted in the 1940s, with the first algae blooms reported in the 1960s. *(Lac qui Parle Area Management Plan, Public Review Draft. September 20, 1996)*. Monitoring data can be found from as far back as 1967 and efforts to assess the quality of the lakes and streams have been on-going. The most extensive data accumulation has been through CWP projects and has taken place more recently. The 2001-2006 cumulative data from STORET, MPCA's data storage database, was used to develop the graphics used in this plan to describe the water quality conditions of the Lac qui Parle - Yellow Bank Watershed. The complete data can be found on the MPCA website at: http://www.pca.state.mn.us/data/edaWater/index.cfm

Significant changes have occurred within the watershed during the twentieth century. Prairies were broken and tilled. The advent of larger and larger equipment replacing horse drawn equipment resulted in the replacement of pastures with row crops. Increased weed control, more fall plowing, and more efficient tillage resulted in more land laid bare over the winter. This change in activity resulted in more erosion and uncontrolled spring runoff from farm fields in the watershed. In addition, extensive drainage of wetlands changed the natural hydrology of tributaries by delivering water more rapidly to the rivers, and increasing the drainage area in the watershed. This increased the discharge of tributaries and rivers increased the chances of flooding downstream and increased bank and stream channel erosion. Some of this land is being returned to its original use through several conservation programs. A summary of the statewide conservation easements can be found in on the BWSR website at: http://www.bwsr.state.mn.us/easements/COENROL.XLS. In Lac qui Parle County, 14.6 percent of the land is enrolled in an easement program – 21.9 percent in Lincoln and 6.7 percent in Yellow Medicine County. Surface water quality issues have been becoming more and more important to residents in the District. The Comprehensive Local Water Management Plans and their revisions for the counties in the District also list water quality issues as high priority action items. Aquatic weed and algae growth in surface water has been increasing, caused by excessive fertility entering streams, rivers, and lakes. Sources of this fertility include point sources, such as pipe discharges from industry, municipal sewage treatment systems, or individual septic treatment systems and runoff from parking lots or feed lots, and nonpoint sources, such as runoff from agricultural fields, over fertilized lawns, and roads.

Over the last 20 years strong efforts have been made to identify and remove point sources of pollution to surface water. Nonpoint sources are harder to identify and remedy. The most significant impact on nonpoint source pollution in the District is an awareness of the effect land use has on surface water quality. The 639 Report includes the results of an extensive water quality sampling program conducted on the Yellow Bank and Lac qui Parle River Watersheds. Rivers and streams in the watershed are generally high in total dissolved solids, phosphorous, nitrates, and other dissolved ions. Coliform bacteria counts are also high. The specific water quality information is available in the 639 Report, copies of which are available in the District office, and will not be repeated here.

Over the past 100 years most of the original prairie landscape has been extensively altered, primarily to improve agricultural production. Settlement and development for agriculture and the supporting communities have had measurable impact on quality and quantity of the nature resources within the District. Most of the remaining native grasslands and wetlands have been confined to small patchy areas. Natural water ways have been ditched and straightened. The rivers and streams natural flow patterns have been altered due to flooding, channelizing and bank sloughing.

Nutrient loading and turbidity observed in the Lac qui Parle and Yellow Bank watershed surface waters is attributed to both watershed runoff and in-stream alterations. The stream channels have been significantly modified over time by flooding. Loss of habitat observed in the Lac qui Parle and Yellow Bank Rivers, and associated tributaries, results from sediment buildup, loss of riparian vegetation and increased stream flow. Riparian vegetation helps maintain a healthy stream ecosystem by providing a woody canopy cover which provides shade for cooler water temperature, stabilizes stream banks and removes nutrients from overland runoff before reaching the surface waters. These beneficial functions are lost when riparian vegetation is removed which then leads to habitat degradation. Stream flow alterations, such as ditching, drain tiling systems and municipal storm drains have also contributed to habitat loss within this watershed.

Impacts from agricultural activities and drainage are significant and have lead to concentrations of nutrients and total suspended solids (TSS) that are in excess of what is expected for this ecoregion. Fecal coliform bacteria also plague this watershed to levels which may impact recreational uses if not addressed.

Lac qui Parle – Yellow Bank Watershed Diagnostic Study -Water Quality Summary

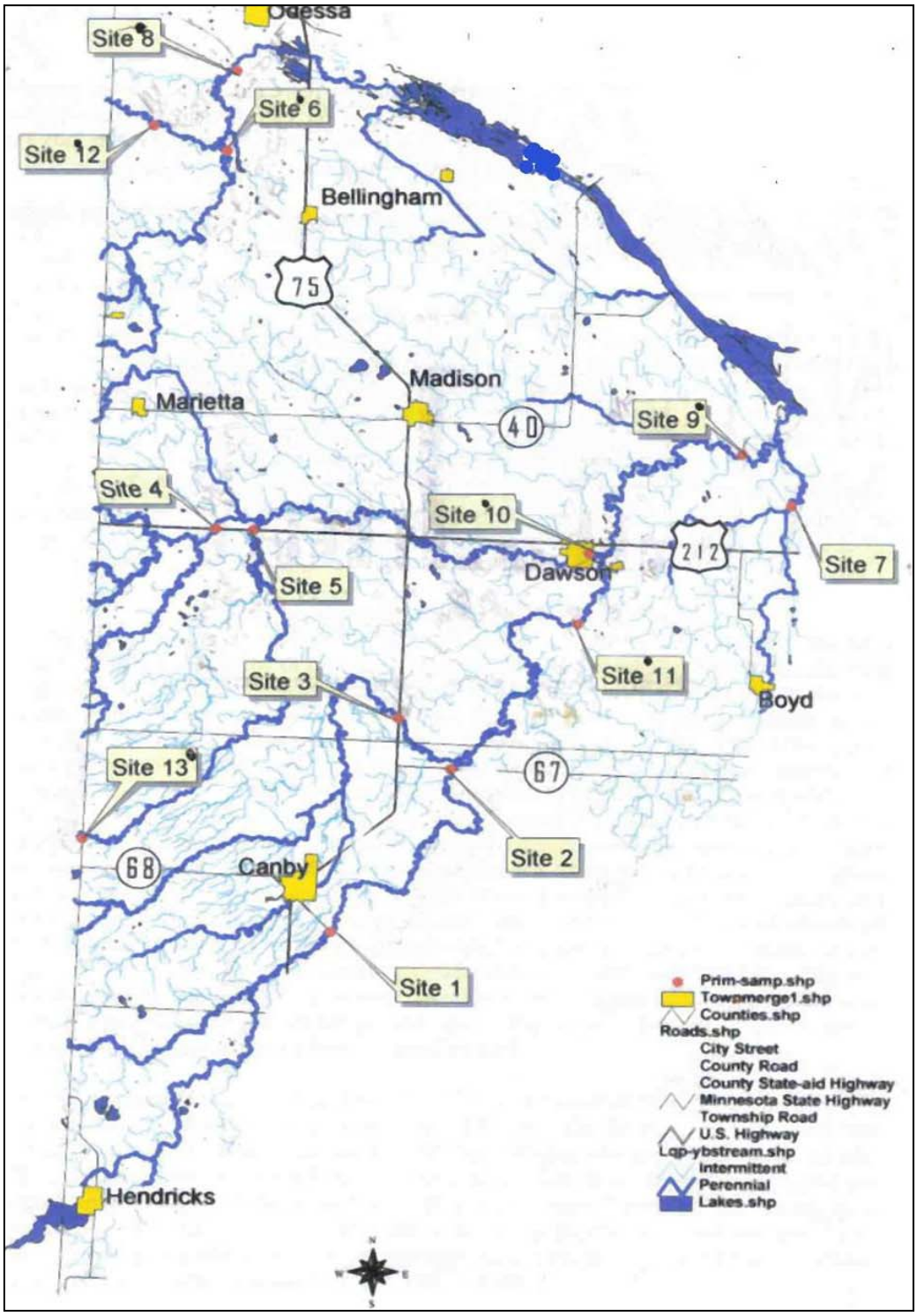
The Lac qui Parle and Yellow Bank Watershed District conducted a watershed wide diagnostic study from 2001-2003. The purpose of the study was to assess the water quality and land use throughout the District to develop a strategic implementation plan that could be shared with watershed partners, such as the county SWCD and P& Z offices.

Thirteen sites strategically located throughout the watershed were monitored. Sub-watersheds were monitored to determine load contribution from each minor watershed. The monitoring locations are shown in ***Figure Eighteen*** and ***Table Thirteen***.

LqP - YB Monitoring Sites			***Table Thirteen***
Site	**STORET**	**Station Name**	**Site Description**
1	S003-084	Lac qui Parle River, S Branch	At MN SH 68 - 2 miles SE of Canby, MN
2	S003-085	Lac qui Parle River, S Branch	At MN SH 67 - 7.5 miles NE of Canby, MN
3	S003-074	Lazarus Creek	At USH 75 - 8 miles N of Canby, MN
4	S003-086	Lac qui Parle River, W Branch	At USH 212 - 12.5 miles SW of Madison, MN
5	S003-088	Florida Creek	At USH 212 - 11 miles SW of Madison, MN
6	S003-090	Yellow Bank River, S Branch	At Twp Rd - 6.25 miles NW of Bellingham, MN
7	S003-075	Ten Mile Creek	At CR 18 - 10 miles NE of Dawson, MN
8	S003-091	Yellow Bank River	At CH 40 - 2.75 miles W of Odessa, MN
9	S003-087	Lac qui Parle River	At CH 31 - 1 mile SW of Lac qui Parle, MN
10	S003-089	Lac qui Parle River, W Branch	On East Diagonal Street in Dawson, MN
11	S003-079	Lac qui Parle River	At CR 23 - 2.5 miles S of Dawson, MN
12	S003-083	Yellow Bank River, N Fork	At CH 7 - 10 miles N of Marrietta, MN
13	S003-081	Cobb Creek	At SH 22 - 3 miles S of Gary SD

Water quality data was collected at these 13 monitoring sites, five primary and seven secondary. The primary sites are linked to USGS gauging stations which recorded stream level, discharge and precipitation. The secondary sites were not linked to a USGS station. The 13 monitoring sites were selected to determine sediment and nutrient concentrations, as well as bacteria levels throughout the District.

Figure Eighteen



Results of the study indicate that fecal coliform bacteria are prevalent within the district and that all 13 monitoring locations recorded concentration levels that exceed state standards. The high concentrations are said to be attributed to substandard septic systems, feedlot runoff, urban stormwater, industrial wastes and land runoff.

Another concern listed in the Diagnostic Study was the high levels of nitrate + nitrite nitrogen found in the Ten Mile Creek sub-watershed. The 2003 modeling results recorded flow-weighted mean concentrations twice as high as the rest of the entire watershed district.

Total Suspended Solid concentrations, turbidity and Total Phosphorus concentrations were monitored throughout the watershed as well. Turbidity and sedimentation has impacted the watershed's natural resources and its wildlife populations. The Lac qui Parle River, from Canby to Dawson, showed particularly high concentrations reaching near 75th percentile in TSS and exceeding the 75th percentile in turbidity compared to ecoregion standards.

Additional monitoring data was collected throughout the Watershed District at four of the 13 designated sites from 2004-2007, only at the primary sites (sites 8 -12) and secondary sites as funding was available. A summary by sub-watershed follows:

Florida Creek Sub-Watershed (secondary site):
Florida Creek was monitored during the 2001-2003 Diagnostic Study and is a secondary watershed (site 5). Site 5 was not monitored from 2004-2007. Florida Creek is a sub-watershed of the West Branch of the Lac qui Parle River. The drainage area for Florida Creek is 155 square miles. It converges with the West Branch of the Lac qui Parle River just downstream of US Hwy 212. Fecal Coliform Bacteria, turbidity and TSS concentrations were found to be issues of concern for water quality and recreation, and flood control.

Lazarus Creek Sub-Watershed (secondary site):
Lazarus Creek was monitored during the 2001-2003 Diagnostic Study and is considered a secondary watershed (site 3). The Lazarus Creek sub-watershed includes the small minor watershed of Canby Creek with a total watershed of 49 square miles. Lazarus Creek drains into the South Branch of the Lac qui Parle River near Hwy 67; however the monitoring station is located 3.5 miles upstream. The diagnostic results show a strong correlation between turbidity and fecal coliform bacteria as well as TP and TSS.

Table Fourteen
Lazarus Creek (site 3)
Fecal Coliform Bacteria Data

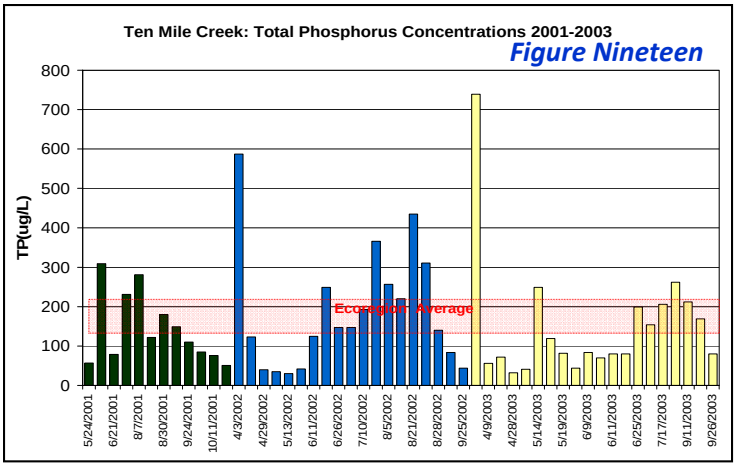
Date	FC #/100ml
7/20/2006	1000
8/2/2006	720
8/17/2006	550
9/5/2006	2200
9/7/2006	550
9/25/2006	900
5/31/2007	390
7/17/2007	580
7/30/2007	140
8/6/2007	700
8/20/2007	600

Lazarus Creek was also monitored in 2006 and 2007 by the District through a Clean Water Partnership Program with the MPCA. The monthly average data for turbidity and TSS indicates that sediment concentration levels exceeded ecoregion standards throughout most of the monitoring season. Total Phosphorus concentrations data indicate levels within the ecoregion standards.

Fecal coliform bacteria data was also recorded during the 2006 and 2007 monitoring season. ***Table Fourteen*** shows the dates and fecal coliform units per 100 ml of solution. A geometric mean was not calculated due to limited data points. However, by aggregating the data for the 30 day period of July 20 - August 20 for both years a

geometric mean was calculated to be 540 organism/100 ml for Lazarus Creek, which exceeds state standards for Fecal Coliform of 200 organism/100 ml (MPCA Guidance Manual for Assessing MN Surface Waters October 2007, page 58)**.**

Ten Mile Creek Sub-Watershed (secondary site):
The Ten Mile Creek is a small tributary to the Lac qui Parle River. Monitoring (site 7) was conducted 3 miles upstream from where it converges with the Lac qui Parle River, which is a short distance from where the River discharges into the Minnesota River. The limited data available for Ten Mile Creek indicates stormwater runoff management needs to be addressed to reduce the TP as shown in ***Figure Nineteen***, and TSS loading into the Lac qui Parle River and ultimately the Minnesota River. The data collected shows a direct correlation between an increase in turbidity and TSS concentrations to snowmelt and rain events. There is a strong correlation between total phosphorus and total suspended solids concentrations.

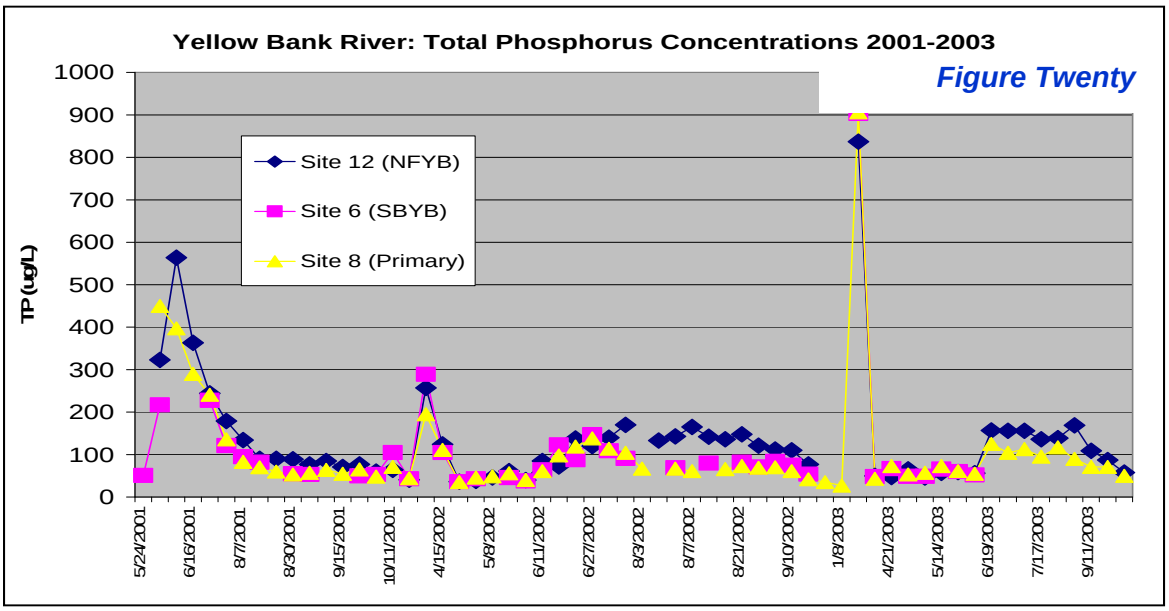


Ten Mile Creek is also known as Judicial Ditch 8. This stream/ ditch is the receiving body of water for the community of Boyd which may be attributed to the high TP and Fecal coliform bacteria levels recorded during the diagnostic study, especially during dry years when there is less water dilution.

Cobb Creek Sub-Watershed (Primary Site):
Cobb Creek is located in Deuel County, near Gary, South Dakota. Its name changes to Florida Creek as it enters Minnesota. This monitoring site (site 13) provides water quality data as the creek leaves South Dakota. Cobb Creek (upstream of the state line) has a drainage area of 77 square miles. The flow data is supported by a USGS gauging station. During the Study, Cobb Creek recorded the highest fecal coliform bacteria averages in the watershed, with the highest reading of 30,800 organisms per 100 ml, in September 2001. No additional monitoring data is available for this site at the time of this plan.

Yellow Bank River Watershed (1 secondary site and 2 primary sites):
The Yellow Bank River watershed includes the North Fork and South Branches of the Yellow Bank River. Three monitoring sites are located within this watershed. Site 6 is used to monitor the minor watershed of the South Branch, Site 12 to monitor the North Branch and Site 8 to monitor downstream from where the two branches merge, about 4.5 miles upstream from the confluence of the Yellow Bank River and the Minnesota River. The Yellow Bank River Watershed encompasses a total of 316,785 acres.

North Fork of the Yellow Bank River (Primary Site):
The North Branch of the Yellow Bank River was monitored during the 2001-2003 Diagnostic Study and is considered a primary watershed (site 12). The monitoring site is located approximately 3 miles upstream from the convergence with the South Branch of the Yellow Bank River. The North Branch has a drainage area of 138,300 acres. The Diagnostic Study Data showed a very strong correlation between TP and TSS and Turbidity to Fecal bacteria levels. The North Fork site, as shown in ***Figure Twenty***, typically recorded the highest TP concentrations within the Yellow Bank River watershed during the 2001-2003 monitoring seasons.



South Branch of the Yellow Bank River (Secondary Site):
The South Branch of the Yellow Bank River was monitored at site 6 during the 2001-2003 Diagnostic Study. This sub-watershed has a drainage area of 134,434 acres. The monitoring site is located just upstream from the convergence with the North Branch of the Yellow Bank River. Monitoring data recorded indicated fecal coliform standards were exceeded June, July and August of 2002. Transparency readings were recorded as the highest throughout the watershed.

Yellow Bank River (Primary Site):
The Yellow Bank River converges with the Minnesota River near Odessa, MN. The primary monitoring site (Site 8) for the Yellow Bank River is located 3 miles downstream from where the two branches merge, about 4.5 miles upstream from the confluence with Minnesota River. The drainage area is 44,051 acres and is linked with a USGS station. The data collected during the diagnostic study show consistent low turbidity levels and TSS, nitrogen and TP concentrations. However, data shows that secondary standards for fecal coliform levels were exceeded in June and July of 2001, with readings as high as 3,800 and 2,500 per 100 ml.

Lac qui Parle River Watershed (2 secondary sites and 3 primary sites):
The Lac qui Parle River watershed includes the South Branch and the West Branch of the Lac qui Parle River, Lazarus Creek (see above) and Florida Creek (see above). Four monitoring sites are located along the main stem (south branch) and one along the west branch of the river. Sites 1 and 2 monitored the upper reaches of the South Branch before Lazarus enters the river. Site 11 monitored further downstream just before the

convergence of the west branch. Site 10 monitored the West Branch just upstream where the two branches merge. Site 9 is the primary monitoring station for the entire Lac qui Parle River. Site 9 is located near the village of Lac qui Parle and is about 4 miles upstream from where it empties into Lac qui Parle Lake (reservoir on the Minnesota River).

The Lac qui Parle River watershed encompasses a total of 330,665 acres. The three primary monitoring sites along the Lac qui Parle River are linked with a USGS stations. The data collected during the diagnostic study is described below by individual stations.

South Branch of the Lac qui Parle River:
The first site on the South Branch of the Lac qui Parle River (Site 1, near Canby, MN) is located at the foot of the Coteau before the Lac qui Parle River enters the Till Plains, catching the water as it drains off steep slopes. The drainage area is 154 square miles. The primary water quality concern encountered during the diagnostic study is the elevated fecal coliform bacteria levels. The geometric mean for August 2002 (1,386) far exceeded the state standards of 200 colony forming units (cfu) per 100 ml. Turbidity and TSS concentrations also exceeded standards, but to a lesser degree.

The second site (Site 2) is located further downstream at Highway 67, approximately one half mile upstream from the convergence of Lazarus Creek. Data collected during the Diagnostic study determined this site the have the highest total suspended solids concentrations and turbidity levels. Accordingly, the 25 NTU state standard was exceeded throughout the monitoring season with the average turbidity reading being 60 NTUs and TSS level averaging 80 mg/l.

Near Providence, MN the Lac qui Parle River was again monitored (Site 11) prior to merging with the West Branch of the La qui Parle River. This monitoring station is a primary site and includes drainage from Lazarus Creek with at total drainage area of 377 square miles. This site is linked to a USGS station for daily flow and precipitation data. Data collected at this site determined high levels of TSS and turbidity. The average turbidity for 2002 was 46 NTUs which exceeded state standard of 25 NTUs. In June and July 2002 Fecal Coliform levels exceeded the second portion of the fecal coliform stands with readings as high as 23,000 and 2,200 organisms per 100 ml.

West Branch of the Lac qui Parle River (Primary)
The West Branch of the Lac qui Parle River (Site 10) was monitored approximately one mile upstream from the convergence with the main stem of the river, near a low head dam. The drainage is 474 square miles and is located at a USGS station. The data collected here showed low levels of TSS and turbidity and the August 2002 geometric mean for fecal coliform bacteria was 232 organisms per 100 ml.

Lac qui Parle River (Primary Site)
The Lac qui Parle River was monitored from 2001-2006 about four miles upstream from where it drains into the Lac qui Parle Lake, upstream from the convergences with Ten Mile Creek. This monitoring site (Site 9) is located at a USGS stations and has a drainage area of 960 square miles. This site is the primary site for the Lac qui Parle River and the data collected here is used to determine the overall water quality and quantity of the entire watershed before it merges with the Minnesota River, at Lake Lac qui Parle.

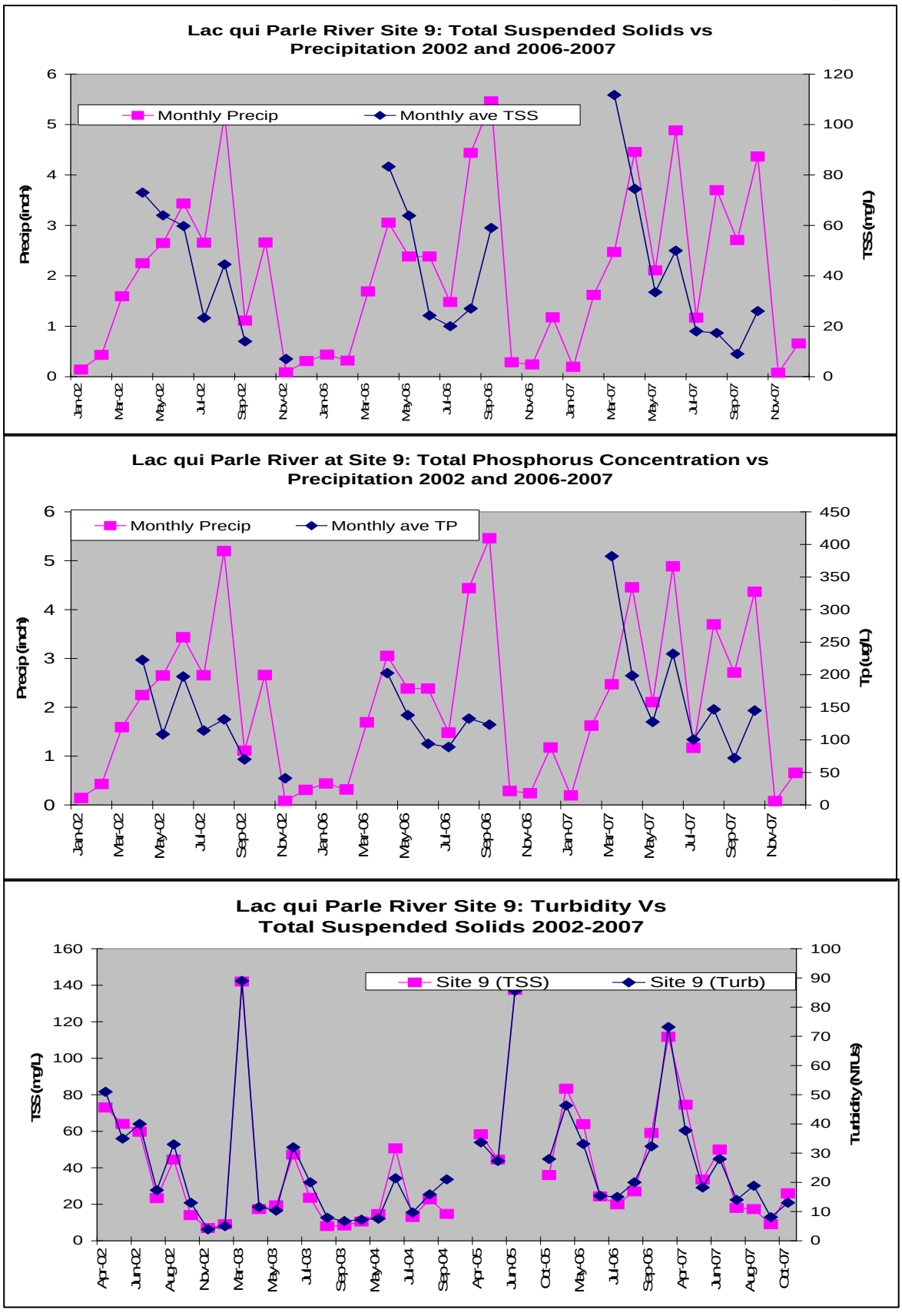
Cumulative Monitoring Data for Sites 1-13
The 2001-2006 cumulative data from all available sites were used for the graphics shown in this plan to describe the water quality conditions of the Lac qui Parle- Yellow Bank Watershed.

For the 13 monitoring stations, strategically located throughout the Lac qui Parle- Yellow Bank Watershed, the available existing data indicates that significant nutrient loading occurs during snow melt and large rain events. The precipitation data shown in ***Table Fifteen*** below was collected from the Minnesota State Climatology Office. Precipitation from four sites (1 top, 2 middle and 1lower) within the watershed was collected and averaged annually. Monthly averages were also used for comparison with water quality data. As shown in ***Figure Twenty-one***, the Lac qui Parle River data collected at the primary site (site 9), prior to its merging with Ten Mile Creek and the Minnesota River, there is a strong correlation between nutrient concentrations (TP) and runoff from precipitation. There is an even stronger relationship between precipitation and Total Suspended solids. Each spike in TSS and Turbidity can also be linked to snow melt and rainfall during the spring months and wetter months, for example March of 2003 and April 2007.

Total Annual Precipitation 2001-2007 — ***Table Fifteen***

Year	Hendricks	Canby	Madison	Odessa	Watershed Ave.
2001	32.6	32.0	26.8	26.5	29.5
2002	23.0	23.2	22.1	21.7	22.5
2003	21.7	22.7	15.3	13.0	18.2
2004	29.0	27.2	23.0	31.0	27.6
2005	33.8	28.2	26.7	29.4	29.6
2006	25.8	24.9	22.2	20.5	23.3
2007	29.7	26.3	26.0	31.7	28.4
7 Year Average	**27.9**	**26.4**	**23.2**	**24.8**	**25.6**

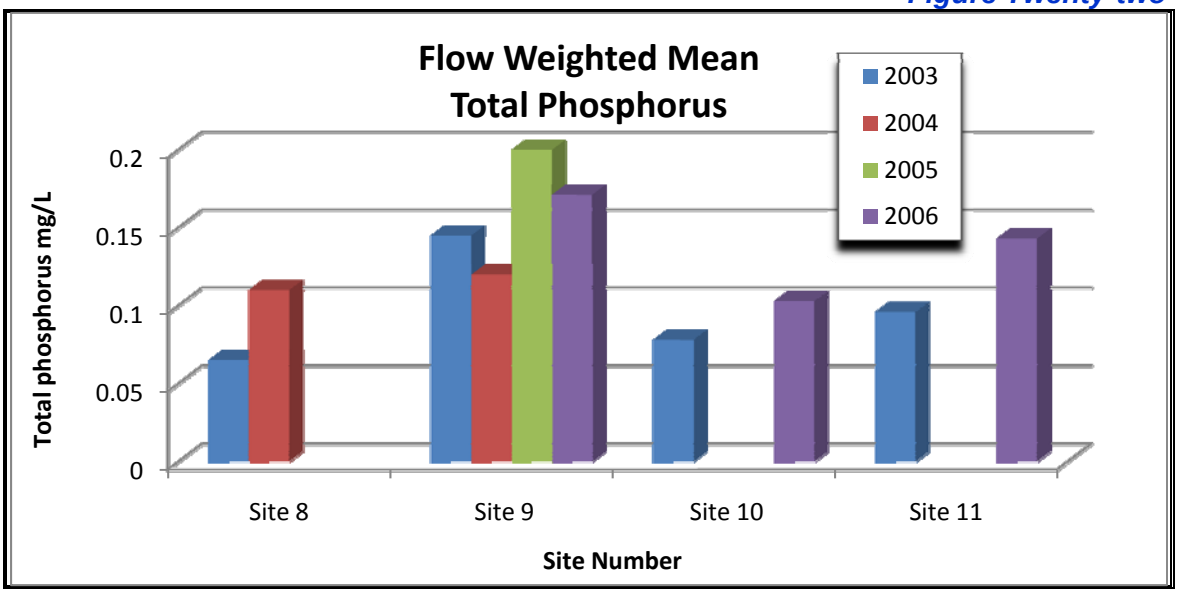
Figure Twenty-one



Total Phosphorus

The flow weighted mean concentration (FWMC) is calculated by dividing the total mass or load of a pollutant by the total flow, for a given time period. It is possible to calculate a FWMC when real-time flow is available. The data shown in ***Figure Twenty-two*** depicts the FWMC of Total phosphorus at the four primary sites from 2003 to 2006. The ecoregion average for Total phosphorus is 0.09 to 0.25 mg/l. The mean lies within this range.

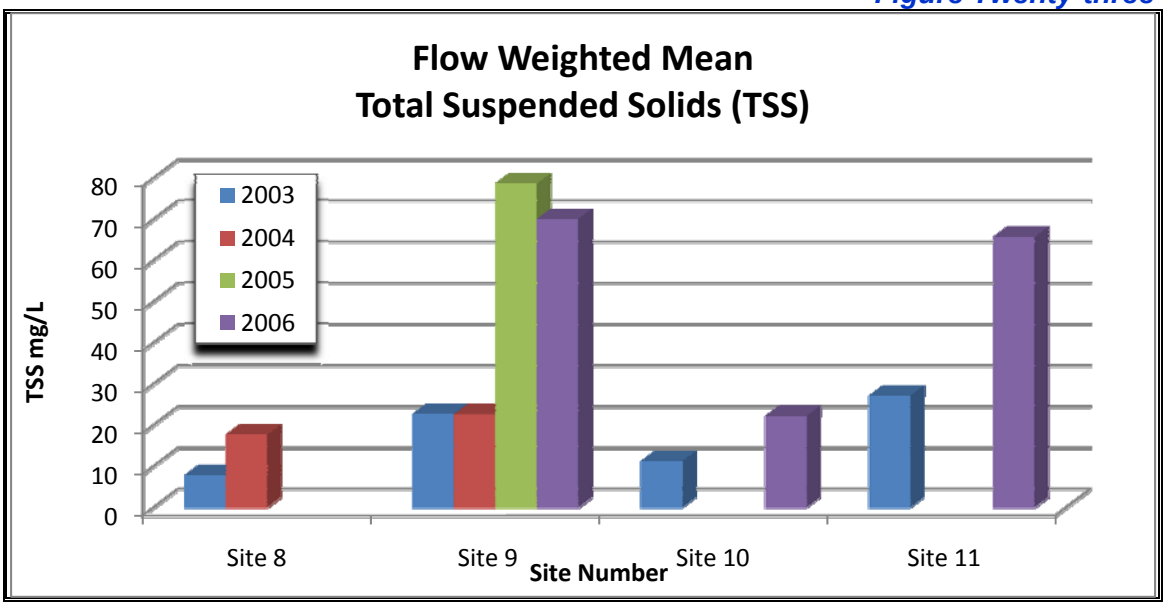
Figure Twenty-two



Total Suspended Solids

Total Suspended Solids (TSS) is one of the major pollutants of concern for streams within the District. As graphed in ***Figure Twenty-three***, the four primary sites have been monitored from 2003 through 2006. Sites 9 and 11, both located on the Lac qui Parle River, are the largest contributors. The rest are below the typical annual stream water quality range of 11 – 63 mg/l in the Northern Glaciated Plains ecoregion.

Figure Twenty-three



Fecal Coliform

Fecal Coliform is the other major pollutant within the District. Exceedance in the 200 organisms per 100 ml has occurred in all seven of the sites monitored. Future monitoring will test for E. coli with a standard of 126 organisms per 100 mL as the MPCA has revised the bacteria standards from Fecal Coliform to E. coli. This will be further studied and interpreted in the TMDL process in the Lac qui Parle River (including the south and west branches), Ten Mile Creek, Lazarus Creek and Florida Creek. Complete data for fecal coliform can be found in the *Lac qui Parle – Yellow Bank Watershed Diagnostic Study Report and Implementation Plan,* October 2003 located at the District office.

Additional monitoring watershed wide will provide further water quality information to assist the decision makers within the District to develop implementation priorities and assessments for direct correlations between various landuse activities and water quality

Point Sources of Pollution

Potential point sources of pollution are likely related to the fecal coliform impairments within the District.

Sub Surface Sewage Treatment System (SSTS)

Sub-surface Sewage Treatment Systems (SSTS) are used for the treatment and disposal of wastewater from individual homes, clusters of homes, isolated communities, industries or institutional facilities. When properly functioning, SSTSs are an effective means of treating wastewater. However, if improperly designed, installed or maintained SSTSs have the potential to adversely impact surface and groundwater resources. Human waste contains fecal coliform bacteria and other chemicals including nitrogen, phosphorus, salts and trace elements. These pollutants are a public health concern when not properly treated.

It is estimated that 50 to 60 percent of SSTS within the State of Minnesota are either failing to protect the groundwater or surfacing to tile lines, ditches or overland. There are approximately 6,245 rural residents in the District. Using the 2002 census figure of nearly 2.5 residents per household, there are approximately 2,498 rural households in the District. If 50% of the septic systems in rural households are noncompliant, it is assumed that there are approximately 1.249 rural households with failing septic systems within the District.

Feedlot Runoff

The MPCA regulates and controls pollution created by animal feedlots. The MPCA's feedlot rules were first adopted in 1971 and were last amended in 2000. All three counties within the District have a County Feedlot Officer to inventory and inspect feedlots. They work closely with the MPCA to implement the feedlot program. The trend in agriculture has been toward fewer but larger livestock and poultry facilities. There has also been an increasing awareness of the potential environmental effects of feedlots. Runoff from livestock feedlots, pastures, and land application areas has the potential to be a significant source of fecal coliform bacteria and other pollutants.

There is considerable spatial variation in the type and density of livestock across the watershed. The numbers of feedlots located within the District are noted in ***Table Sixteen***. The feedlots with 1,000 or more animal units are required to have a NPDES permit by the MPCA. They work closely with the owner to maintain zero runoff from the feedlot and they are not considered an impact to the waters of the state. The 332 feedlots with 10 to 299 AU and the 58 with 300 to 999 are the focus of BMPs throughout the District.

Feedlots within LqP-YB Watershed District			*Table Sixteen*
	Animal Units		
County	**10-299**	**300 -999**	**1,000+**
Lac qui Parle	186	39	16
Yellow Medicine	104	19	1
Lincoln	42	0	0
Total	**332**	**58**	**17**

Municipal/Industrial Discharge

All of the incorporated Cities within the District, with the exception of Louisburg, have MPCA permits for wastewater discharge. The treated wastewater from these communities discharges to a creek, ditch or river. All permitted facilities are required to monitor their effluent to ensure that concentrations of specific pollutants remain within levels specified in the discharge permit. The MPCA regularly reviews the Discharge Monitoring Reports to determine if violations have occurred. Louisburg is working with the MPCA on a system to manage and treat the effluent from wastewater.

Unincorporated communities also need to deal with wastewater needs. Often these small communities of eight to thirty residences have open pipe sewers, flowing directly into the river system via small streams and/or ditches. This contributes to fecal coliform in the receiving waters and is a violation of MN State rules. The communities of Rosen, Lac qui Parle Village, Jorgenson Beach Sub-district on Lake Hendricks and Sunset Drive in Canby have either unknown or straight-pipe systems. These communities are a priority for the MPCA to investigate and provide options.

Non-Point Sources of Pollution

Movement of sediment is one of the primary non-point source contributors to the lakes and streams within the District. Another is management of manure on the feedlot and in the fields. One of the major practices utilized by the SWCD and NRCS offices involves **Crop Residue Management (CRM).** This program is made up of a year-round system beginning with the selection of crops that produce sufficient quantities of residue and may include the use of cover crops after low residue producing crops. CRM includes all field operations that affect residue amounts, orientation and distribution throughout the period requiring protection. Site-specific residue cover amounts needed are usually expressed in percentage but may also be in pounds. CRM acres are shown in ***Table Seventeen*** and is an "umbrella" term encompassing several tillage systems including no-till, ridge-till, mulch-till, and reduced-till.

Conservation Tillage practices include any tillage and planting system that covers 30 percent or more of the soil surface with crop residue, after planting, to reduce soil erosion by water. Where soil erosion by wind is the primary concern, any system that maintains at least 1,000 pounds per acre of flat, small grain residue equivalent on the surface throughout the critical wind erosion period. Some commonly used practices include:

- **No-till/strip-till** - The soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width (strips may involve only residue disturbance or may include soil disturbance). Planting or drilling is accomplished using disc openers, coulter(s), row cleaners, in-row chisels or roto-tillers. Weed control is accomplished primarily with crop protection products. Cultivation may be used for emergency weed control. Other common terms used to describe No-till include direct seeding, slot planting, zero-till, row-till, and slot-till.

- **Ridge-till** - The soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width. Planting is completed on the ridge and usually involves the removal of the top of the ridge. Planting is completed with sweeps, disk openers, coulters, or row cleaners. Residue is left on the surface between ridges. Weed control is accomplished with crop protection products (frequently banded) and/or cultivation. Ridges are rebuilt during row cultivation.
- **Mulch-till** – Full-width tillage involving one or more tillage trips which disturbs the entire soil surface and is done prior to and/or during planting. Tillage tools such as chisels, field cultivators, disks, sweeps or blades are used. Weed control is accomplished with crop protection products and/or cultivation.

Other Tillage Types:

Reduced-till (15-30% residue) - Full-width tillage which involving one or more tillage trips which disturbs the entire soil surface and is performed prior to and/or during planting. There is 15-30 percent residue cover after planting or 500 to 1,000 pounds per acre of small grain residue equivalent throughout the critical wind erosion period. Weed control is accomplished with crop protection products and/or row cultivation.

Intensive-till - Full width tillage which disturbs the entire soil surface and is performed prior to and/or during planting. There is less than 15 percent residue cover after planting, or less than 500 pounds per acre of small grain residue equivalent throughout the critical wind erosion period. Generally involves plowing or intensive (numerous) tillage trips. Weed control is accomplished with crop protection products and/or row cultivation.

Conservation Tillage Practices in LqP-YB Watershed District — ***Table Seventeen***

		Lac qui Parle	Lincoln	Yellow Medicine	Total Acres
Conservation Tillage		Acres	Acres	Acres	
	No Till	12,284	3,898	7,987	24,169
	Ridge Till	2,098	557	0	2,655
	Mulch Till	140,728	82,930	85,471	309,129
	Total	155,110	87,385	93,458	335,953
Other Tillage Practices					
	Reduced Till	116,665	72,851	107,221	296,737
	Intensive Till	70,578	47,487	161,322	279,387
	Total Acres				**912,077**

In Lac qui Parle County, over 46% of the crops are in conservation tillage, in Lincoln County, 42% is participating and in Yellow Medicine County 25.8% practices conservation tillage. Increasing acres in the program is an easy fix for sediment and erosion control.

Manure management practices include planting filter strips and installing buffers along with the residue management practices discussed above. The Statewide Conservation Lands Summary, prepared by BWSR 2/20/09 shows the acres that have been planted with filter strips, and land that has been set-aside to prevent runoff of sediment and/or nutrients. This document can be found in ***Appendix E***. The Lac qui Parle-Yellow Bank Watershed District has worked with local environmental agencies such as the WP, SWCD and NRCS to complete numerous BMPs that address both point and non-point

pollution sources. These projects are summarized in ***Table Eighteen*** and are a compilation of the BMPs implemented within the District along with estimated benefits of these practices.

Estimated Soil Loss and Nutrient Reduction for BMPs Implemented within the District from 1997-2008 — ***Table Eighteen***

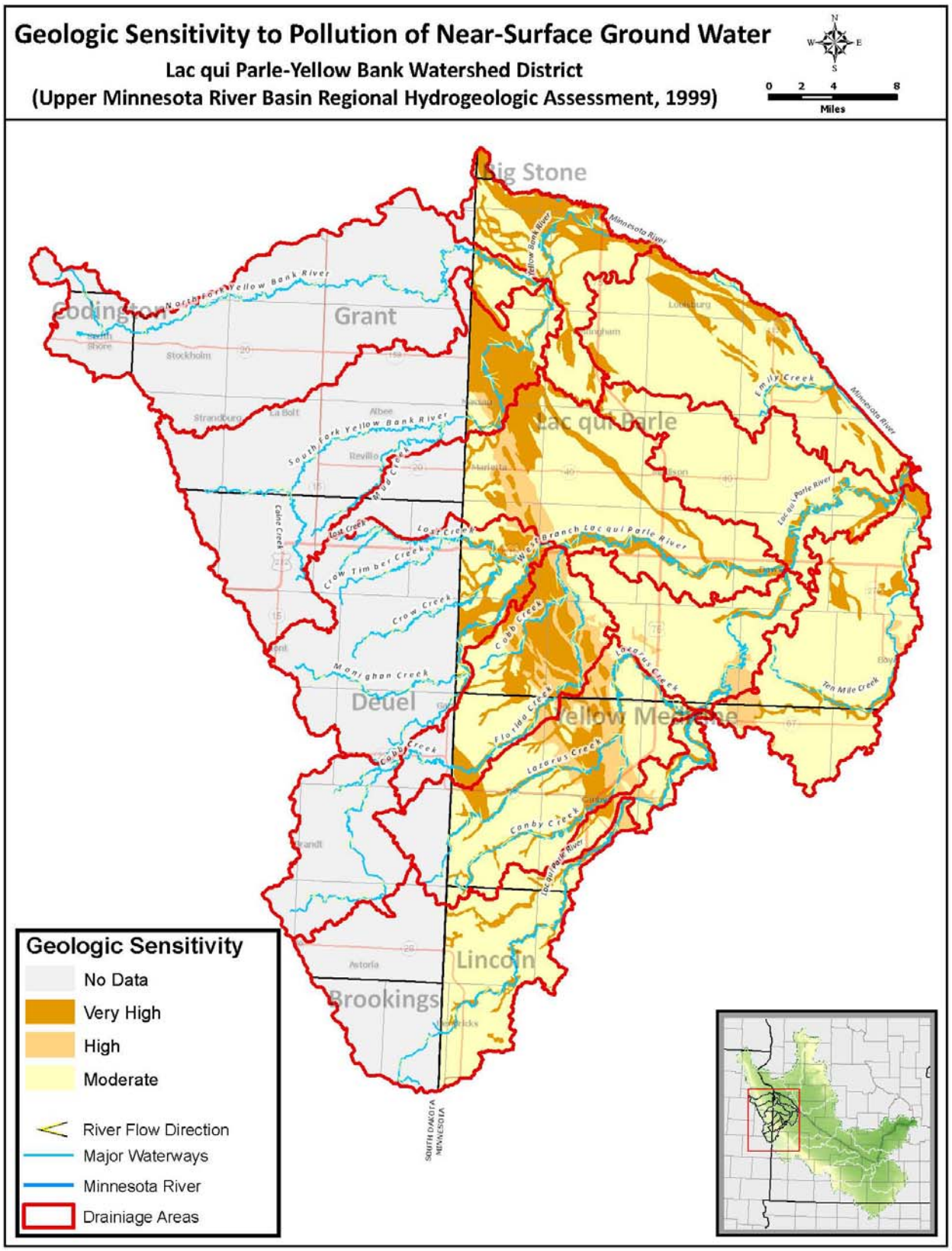
BMP NAME	*Total Acreage*	*Estimated Phosphorus Reduction (lbs/yr)*	*Estimated Sediment Reduction (tons/yr)*	*Estimated Soil Loss Reduction (tons/yr)*
Abandoned Well Sealing	94	0	0	0
Conservation Cover Easement	95	37	20.09	57.18
Cover and Green Manure Crop	1	0	0	0
Diversion	8	260.13	236.52	2,466.56
Drainage System Modification	5	0	0	0
Erosion Control	2	0	0	0
Fence	0	0	0	0
Field Border	2	0	0	0
Field Windbreak	3	0	0	30.8
Filter Strip	157	11.63	7.96	4.5
Grade Stabilization Structure	0	35.83	31.15	31.15
Grassed Waterway	37	3,258.95	2,848.35	5,162.08
Residue Management, Mulch Till	5	0	0	0
Road Construction Practices	1	99.45	99.45	99.45
Roof Runoff Management	0	14.49	0	0
Sediment Basin	7	525.67	509.66	509.66
Septage Management	5	0	0	0
Septic System Improvement	13	0	0	0
Streambank and Shoreline Protection	0	0	0	0
Terrace	62	3,103.99	3,167.75	10,554.03
Tree/Shrub Establishment	2	0	0	0
Underground Outlet	3	24.89	22.53	5,164.25
Utility - Repair / Maintenance	0	0	0	0
Waste Storage Facility	1	13	0	0
Water & Sediment Control Basin	90	57,192.76	57,978.08	66,232.31
Water & Sediment Control Basin Maintenance	0	95.2	95.2	95.2
Well Sealing	0	0	0	0
Wildlife Habitat Management	2	0	0	0
Windbreak/Shelterbelt Establishment	6	2	0	315.9
Data compiled from eLink and LARS through BWSR Total Reductions	601	64,674.99	65,016.74	90,723.07

Groundwater Contamination

Groundwater quality is a significant issue in the District, since practically all domestic consumption supplies are from groundwater sources. District groundwater resources are located in surficial and buried-drift aquifers scattered throughout the watershed. Surficial aquifers, as shown in ***Figure Twenty-four***, are easily and quickly recharged by precipitation since they are exposed to the ground surface. Approximately 72% of the groundwater has a geologic sensitivity of moderate. This means it is only moderately susceptible to contamination from surface activities. There is likely some type of layer of soil that slows, treats or blocks the entry from surface water. Twenty two percent of land area within the District is considered to be very high in geologic sensitivity. These areas are vulnerable to contamination from land uses on the surface. As you can see from the map, these areas border the waterways as a rule and need to be protected. The remaining 6% are high sensitivity and these areas also need to be protected. These aquifers can also be quickly contaminated by spills, improper chemical or fertilizer application, or improper dumping. If the surficial aquifers are contaminated, there is a very good chance of contaminating the rest of the counties' groundwater supplies, since all aquifers are connected to some degree. Groundwater in the District is generally thought to be uncontaminated, although the water is generally highly mineralized, containing large amounts of calcium, magnesium, and sulfates. Although the high mineral content may be objectionable from the standpoint of smell or taste, it generally does not constitute a health hazard with consumption. Relatively few wells have been tested for contamination, however, and there is need for more data. Elevated levels of nitrates and coliform bacteria have been reported in some wells that have been tested. The sources of this contamination may be related to the depth of the wells, conditions of the casing and method of construction, nearness of septic system drain fields or livestock facilities, drainage patterns, and/or agricultural practices. A significant risk of contamination to rural wells relates to their historical location within the farm site. Wells were traditionally located near the center of the farm sites. This location placed them near fuel and chemical storage areas and at potential risk of contamination by accidental spills or overfills. Abandoned wells are another potential source of groundwater contamination. Wells are abandoned when rural water systems are installed, municipal water systems are installed in subdivisions, when old farm, rural schools, or church sites are abandoned, or when new wells are installed. Many of these wells have historically been improperly sealed. Many have simply been cut off and the pipe covered up with materials ranging from old lumber to rocks or tin cans. An improperly abandoned well is a direct route for contaminants into the groundwater. The old well pipe is the path of least resistance for anything soaking through the soil.

Most groundwater use is for municipal and rural water supplies. There is little irrigation in the District, and there have been few conflicts between water users.

Figure Twenty-four



Wellhead Protection

Literally all domestic water supplies in the District are from groundwater sources. The Minnesota Department of Health (MDH) monitors and regulates those public water suppliers, and providers are in compliance with those regulations. All counties in the watershed have addressed well head protection areas in their updates to the Comprehensive Local Water Plans. The Well Head Protection Plans must be completed by all public water suppliers to ensure that groundwater recharge areas and well head areas are safeguarded from contaminants. The counties will generally assist the providers with the development of the plans, and the District will provide information to support the process. These plans identify potential sources of contamination that could impact the recharge areas for the source wells and devise strategies to protect those areas. Public water suppliers that are required under this rule to develop a plan are listed in ***Table Nineteen***. These water suppliers work closely with the MDH to assess the integrity of the aquifer and develop a management plan to protect it from contamination.

Drinking Water Supply Management Areas — ***Table Nineteen***

Public Water Supplier Name	ID	Ground Water Assessment	City	County
Associated Milk Producers, Inc.	5370201	GW	Dawson	Lac qui Parle
Bellingham	1370001	GW	Bellingham	Lac qui Parle
Borgund Lutheran Church	5370019	GW	Madison	Lac qui Parle
Boyd	1370002	Purchased Water	Boyd	Lac qui Parle
Bruce's 66	5370208	GW	Marietta	Lac qui Parle
Dawson	1370003	GW	Dawson	Lac qui Parle
Garfield Lutheran Church	5370040	GW	Marietta	Lac qui Parle
Hunter's Haven, Inc.	5370212	GW	Dawson	Lac qui Parle
Lac qui Parle Lutheran Church	5370018	GW	Dawson	Lac qui Parle
Lac qui Parle Valley School	5370051	GW	Madison	Lac qui Parle
Living Water Evangelical Lutheran Church	5370211	GW	Dawson	Lac qui Parle
Madison	1370004	GW	Madison	Lac qui Parle
Marietta	1370005	Purchased Water	Marietta	Lac qui Parle
Minnesota Valley Lutheran Church	5370202	GW	Louisburg	Lac qui Parle
Nassau	1370006	Purchased Water	Nassau	Lac qui Parle
St. Joseph Catholic Church	5370043	GW	Rosen	Lac qui Parle
St. Joseph Catholic Church/School Bldg.	5370209	GW	Rosen	Lac qui Parle
Trinity Lutheran Church	5370005	GW	Bellingham	Lac qui Parle
Hendricks	1410001	Purchased Water	Hendricks	Lincoln
Canby	1870001	GW	Canby	Yellow Medicine
Canby Golf Club	5870031	GW	Canby	Yellow Medicine

Priority Reduction Issues

Priority reductions include a watershed-wide approach to addressing contaminants. The District will pursue funding to assess the impaired waters and develop TMDLs for abatement of the contaminants of concern, such as fecal coliform, turbidity, dissolved oxygen, phosphorus and any other discovered impairment.

Addressing these contaminants will require upgrade of SSTS, BMPs for feedlot and agriculture runoff and management of stormwater runoff from communities.

Upland Resources: Opportunities

Agriculture

Agriculture has dominated the basic industrial output since settlement in the latter half of the 19th century, although the numbers of farms in the county has dropped steadily since 1930. The Board of Managers will endeavor to support agriculture by encouraging and supporting sustainable agricultural land use practices.

Crop land includes land used for production of adapted row crops and close growing crops such as grain, hay, and rotation pasture. Corn is the major crop followed by soy beans and small grains. Beef cattle and hogs are the major livestock enterprises. The number of livestock in the District has declined in recent years, although the number of livestock per farm has increased, following state and nation-wide patterns of agribusiness growth. Dairy cattle are a minor component of the livestock industry in the District.

Soil productivity in the District ranges from marginal to high; however, most of the crop land in the District is subject to water erosion or wind erosion to some degree. The major management needs are measures to control water erosion and wind erosion, reduce the wetness of the more poorly drained soils, improve fertility and tilth, and control weeds. Crop production in the District is closely tied to available moisture. For example the difference in crop yields between 1987 and 1988 is dramatic due to a drought. Corn production fell by almost 65% per acre in 1988, and all crops had a reduction of at least 50% in production yields.

Fish and Wildlife Habitat

The Lac qui Parle-Yellow Bank Watershed District is located in the western prairie region of Minnesota. There are numerous sloughs and prairie potholes which are essential habitat for the reproduction of waterfowl, pheasants, and whitetail deer, as well as numerous other nongame wildlife species. The District is on the migration flyway for waterfowl and the shallow lakes and marshes in the region are of great importance to these migratory birds. Lac qui Parle and Marsh Lake are major refuges for ducks and geese, as well as pelicans and other birds. River bottom forests and grasslands provide habitat for deer and fur bearers such as beaver, fox, and muskrats. These resources provide a valuable addition to the district economy, with revenue provided by hunters purchasing goods and services, as well as leasing parcels of land for hunting. Wildlife habitat also provides a pleasing, esthetically important landscape.

Active wetland acquisition by the Minnesota Department of Natural Resources, the U.S. Fish and Wildlife Service, and the Nature Conservancy has provided a nucleus of wildlife management areas and refuges. These areas are managed for wildlife habitat. The majority of wildlife habitat, however, remains in private ownership. Much of these private wetland areas are unsuitable for agriculture even if drained. These areas should be preserved, and the landowners compensated in some way, if that natural resource is to be preserved.

The Conservation Reserve Program is very effective in removing highly erodible, sensitive, and riparian lands from production, and providing perennial vegetative cover. The current changes in the CRP program may impact total eligible acres, but further targets enrollment to address water quality impacts. The use of the Reinvest in Minnesota Program is another excellent opportunity to preserve marginal land, although it is limited in use in the District.

The Board of Managers will endeavor to preserve and improve wildlife habitat within the District by investigating ways to cooperate with private individuals, other agencies, and private organizations to voluntarily remove marginal farm land from production and convert it to mixed and diverse wildlife habitat. In addition to providing habitat, these areas would aide in reducing wind erosion, and serve as sediment and nutrient traps, preserving surface water quality. For example, the best use of flood plains may be the creation of wildlife habitat. This would reduce crop damages, and would not cause more problems downstream.

Water Based Recreational Opportunities

The Lac qui Parle-Yellow Bank Watershed District consists of predominantly open agricultural land. There are no forested lands, and the only areas of native trees are along the natural waterways. There are only four meandered lakes in the District. Lac qui Parle and Marsh Lakes are very popular waterfowl hunting areas and the controlled goose hunting on the Lac qui Parle Refuge is known statewide. Lac qui Parle and Del Clark Lakes are also known as a good fishing lake for walleye and other game fish. The Lac qui Parle State Park on the south end of Lac qui Parle Lake and Stone Hill Park are a popular place for travelers.

Potential exists for extending the canoe route on the Lac qui Parle River. In addition, all lakes in the Canby Creek project have been stocked with game fish and will be available for fishing.

The Board of Managers will cooperate with other resource management groups and watershed districts to address the use of Lac qui Parle Lake to maximize use of the resource. Goals, objectives, and actions related to water based recreation are discussed later in this document.

Other Water and Land Related Resources

There are few unique water related features in the District. Of the twenty-two of Minnesota's natural communities that have been identified as ecologically sensitive, only two occur in the watershed district. One of the communities is the Mesic Blacksoil Prairie. The only identified outstanding resource value waters within the watershed district is a Calcareous Fen. Both are adequately protected.

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Section Three: Goals, Objectives and Desired Outcomes

This section presents the priority issues as determined by input from several sources: the public at three informational meetings, written input from the state and local agencies and WPs from the three involved counties. Working with the CWP technical TEAM, the District Advisory Board and the Board of Managers, these priority issues were taken into consideration for the development of the implementation plan in Section Four. Minutes and supportive data are included in ***Appendix A***.

PRIORITY ISSUE: WATER MANAGEMENT

GOAL: Protect and enhance surface and ground water to maintain quality and quantity as needed to support their designated uses.

Surface Water Quality Objective: *Reduce sediment loading to water bodies within the District by reducing soil erosion.*

- Outcome: Establish and maintain a vegetative buffer strip incentive program by working through LqP-YB WD Clean Water Partnership program (CWP) and other local agencies.
- Outcome: Work with and encourage local environmental agencies to implement agricultural Best Management Practices (BMPs) to reduce erosion and sedimentation by pursuing additional funding options.
- Outcome: Apply BMP land treatment in critical areas to reduce runoff and maximize infiltration into the soil. Meet with Soil and Water Conservation Districts (SWCDs) and Comprehensive Local Water Plan (WP) coordinators annually in December to identify and target critical areas for implementation activities.
- Outcome: Inventory areas of severe stream bank erosion and channel sedimentation. Utilize the Department of Natural Resources (DNR), Fisheries stream surveys of Watershed Rivers and tributaries to identify critical areas, and work with landowners to address the problem areas.
- Outcome: Encourage reduction of storm water erosion by restoring appropriate drained / cropped wetlands. Develop a communication or coordination system to track activities of other organizations, government agencies and/or private individuals.
- Outcome: Encourage Conservation use lands throughout the District where applicable.
- Outcome: Support the development of workable land use regulations that protect lakes and streams within the District.
- Outcome: Encourage local agencies to enhance crop residue management through innovative conservation tillage practices.

Surface Water Quality Objective: *The District will work with the local agencies and municipalities to address storm water discharge from local communities.*

- Outcome: Support the development of additional local land use regulations that protect Lakes and streams within the District.
- Outcome: Promote BMPs to improve sediment reduction within the city limits by storm water retention basin, rain gardens and other innovative water retention options.

Surface Water Quality Objective: *Address impaired waters in the Watershed to assess the ability to meet ecoregion standards.*

- Outcome: Pursue funding to address Total Maximum Daily Load (TMDL) issues as requested.
- Outcome: Set up a strategic monitoring program through the Clean Water Legacy or EPA 319 program to determine sources of impairments and soundness of mitigation practices.

Outcome: Research and encourage innovative and sustainable water management improvement practices to better water quality.

Outcome: Encourage watershed residents to implement water quality improvement practices, including local businesses and public entities.

Outcome: Involve stakeholders within the watershed in the TMDL planning process.

Surface Water Quantity Objective*: Protect the general public from flooding through measures that ensure public safety yet maintain established drainage systems to support agriculture, local communities and their residents.*

Outcome: Improve control of surface water in the District to reduce the impact of stream & watershed cross-over flooding.

Outcome: Identify and evaluate flooding problems in the sub-watersheds within the District to develop a comprehensive approach for identifying specific areas where works or improvement will solve specific problems on a small scale.

Outcome: Assist with developing a method to prioritize those sub-watersheds requiring flood control measures. Seek technical assistance from and work with Area II and the DNR.

Outcome: Evaluate land use practices on flood plains in those areas prone to flooding, and investigate restricting land use in those areas to activities that would not be damaged by flooding.

Outcome: Continue to evaluate the stream gauging and flow recording system in the District, and ensure that the system is sufficient to provide information required to evaluate flood potential. Request evaluation assistance from the Natural Resources Conservation Service (NRCS), DNR, Area II, and the U.S. Geological Survey agencies.

Outcome: Continue to evaluate structural flood control measures in critical areas such as dikes and levees, and small water retention practices to contain runoff within stream channels. Inventory small NRCS water retention structures in the District. Evaluate and determine if maintaining or repairing these structures would be beneficial, seek available cost share funding for sites identified for repair.

Outcome: Collect existing inventories of restored and restorable wetlands from Task Force Members and categorize this information by sub-watershed. Determine additional inventory needs. Define critical areas and cross reference within the inventory information. Where possible restore additional wetlands in these critical areas in cooperation with landowners, where beneficial storage would be feasible for retention purposes.

Outcome: Cooperate with the East Dakota Water Development District/State of South Dakota to build retention structures in the hills on the Coteau in Eastern South Dakota to reduce flooding in the headwaters of tributaries flowing into the District.

Outcome: Coordinate the identification, evaluation, and implementation of large retention projects, utilizing assistance from Area II, DNR, the NRCS, and other appropriate groups and agencies.

Outcome: Continue to work with Area II to implement road retention technology to increase water retention and reduce peak flows. Wherever possible, design road and bridge replacements in a manner that provides reductions in peak flow.

Outcome: Maintain maximum flow capacity in tributaries and rivers in the District

Outcome: Continue to promote removal and snagging of debris from channels where appropriate to minimize stream bank erosion and maximize channel flow during flooding. Work with the DNR to ensure that cleaning activities do not disrupt

critical fish spawning habitat. The District may provide cost-share funding for clearing activities, and will request a cost-share from the DNR.

Outcome: Evaluate grade stabilization, channel diversion, or other methods of channel improvement.

Surface Water Quantity Objective*: Evaluate Drainage Practices in the District*

Outcome: Promote pattern tiling and blind intakes in place of open ditches and inlets where feasible, and in agreement with landowners.

Outcome: The Board of Managers will enforce regulations pertaining to drainage, as well as annually review the District Drainage Policy to ensure it is current, appropriate, and applicable to the District needs.

Outcome: The District is the Local Government Unit responsible for administration and implementation of the Wetland Conservation Act in Lac qui Parle County.

Outcome: Update the information and data base on public drainage systems using current technologies by seeking funding to complete a current inventory of the public drainage systems in the District, compiling information into a GIS format.

Outcome: The District may request an annual presentation on Minnesota Public Drainage Law, the Minnesota Wetland Conservation Act, and USDA Swamp Buster Program changes.

Ground Water Quality Objective*: Protect the general public from groundwater contamination through measures that ensure safe drinking water throughout the District.*

Outcome: Identify and manage groundwater recharge areas to augment & protect base flows.

Outcome: Protect and sustain the water quality of the District's groundwater by working with the local, state, and federal agencies to establish source water protection plans.

Outcome: Enhance public education and information on the importance of ground water protection and its impact to the community.

PRIORITY ISSUE: MONITORING, INVENTORY AND MAPPING

GOAL:

Monitoring Objective *: A strategic monitoring plan is needed within the Lac qui Parle-Yellow Bank Watershed District to establish base line data in areas that have not been monitored and to do effectiveness monitoring after BMP projects are implemented throughout the next 10 years. This data will be used to determine priority areas to focus additional improvement efforts.*

Outcome: Encourage a continuous water quality monitoring program through MPCA and Clean Water Legacy / EPA 319 funding with local and state partners to characterize current conditions, which will determine the state of the District's water resources by tracking water quality before, during, and after water management project's are installed and assess long-term water quality trends.

Outcome: Work with the MPCA and other local units of government to establish water quality monitoring sites to monitor the parameters listed for impairment and the on-going watershed TMDL projects.

Outcome: Encourage communication to ensure that the water quality components of projects and other activities are coordinated with other water quality programs and projects within the watershed to avoid duplication of efforts, increase sharing of information and decrease cost associated with water quality monitoring.

Outcome: Continue use of the MPCA's Quality Assurance Project Plan (QAPP) to ensure that the field sampling/monitoring and lab analysis are of high quality and the

quantity of adequate date points are provided for accurate documentation of water quality changes throughout the watershed.

Outcome: Encourage a strategic monitoring program to qualify and quantify both the current water quality situation and the extent of any water quality problem in the sub-watershed. Data collected should include baseline data collection and analysis and specific data collection and analysis required for TMDL purposes.

Outcome: Continue the current monitoring program to include a continuous collection of flow, chemical, physical, and biological data. Sampling strategy should include at least bi-monthly sampling for at least 30 years for baseline information.

Outcome: Pursue funding to implement and maintain long-term monitoring and research.

Outcome: Develop and implement methods / programs for measuring, tracking, and reporting progress towards achieving water quality and quantity goals.

Inventory and Mapping Objective*:*

Outcome: Work with local and state agencies to inventory current and potential retention structures in the District.

Outcome: Encourage / promote 1-cm resolution LIDAR mapping throughout the District.

Outcome: Cooperate with local and state agencies to track land use changes within the District.

Outcome: Continue and increase the number of citizen monitors in the Citizen Monitoring Network in the Watershed District.

PRIORITY ISSUE: EDUCATION AND COMMUNICATION

GOAL:

Education Objective: *The Lac qui Parle-Yellow Bank Watershed District through the CWP Program will enhance its current education program by establishing a more tailored water management education plan for the watershed residents. The education program will include, but not be limited to the following activities:*

Outcome: Educate watershed residents of all ages about water resource protection and management and their importance to the local area.

Outcome: Distribute credible information about water quality data and help watershed residents understand the connection between their Outcomes and the quality of water through informational meetings, brochures, mailings and additional media sources.

Outcome: Increase awareness of the importance of macro-invertebrates by working with local high schools, citizen monitors and information displays and materials.

Outcome: Provide information and opportunities to watershed residents to better understand the watershed concept.

Outcome: Accelerate the adoption of BMPs to improve water quality.

Outcome: Develop and organize tours, seminars, and workshops in the watershed district.

Outcome: Continue to implement & educate residents of the watershed on the ISTS low interest loan program.

Outcome: Develop hands-on learning activities for residents of the watershed for a personal experience and to encourage a personal commitment to improving water quality.

Outcome: Work with local media in the watershed such as newspaper & radio for specific topics of interests and concerns of watershed residents.

Outcome: Develop and implement a storm drain awareness program in the watershed district.

Outcome: Enhance the current website by updating ongoing projects, District accomplishments and potential projects.

Outcome: Educate watershed residents of all ages about water resource protection and management.

Communication and Outreach Objective*: The residents of the Lac qui Parle-Yellow Bank Watershed District continue to work towards achieving the water quality and quantity goals of the District. To recognize the efforts of the residents within the watershed the District will establish a Recognition Program that publicly honors and supports the efforts of its residents.*

Outcome: The LqP-YB Advisory Board will be given the charge to establish a recognition program that will publicly recognize individuals putting forth efforts to improve flood control measures while enhancing water quality.

Outcome: Work with the local media to establish a public announcements system.

PRIORITY ISSUE: REDUCE PRIORITY POLLUTANTS

GOAL: The Lac qui Parle – Yellow Bank Watershed District, through the CWP and similar programs will provide an incentive program to conduct the following activities:

Outcome: Pursue funding options through the CWP and similar programs to maintain the Incentive Program and provide financial incentives to landowners of the District.

Outcome: Promote cost-share of small dam repairs.

Outcome: Accelerate adoption of BMPs in high priority areas.

Outcome: Promote & enhance existing conservation programs in the watershed such as Continuous Conservation Reserve Program (CCRP), Environmental Quality Incentive Program (EQIP), Minnesota State Cost share program, Feedlot/Water Quality Grants, State Revolving Fund Loan Program by 25%.

Outcome: Reduce the amount of fecal coliform bacteria entering the Lac qui Parle River and its tributaries.

Outcome: Reduce turbidity and total suspended solids in the reach of the Lac qui Parle River.

Outcome: Promote buffer strips.

Outcome: Continue to work with local agencies and Ag producers to develop a map depicting land application of manure with manure management plans.

Outcome: Continue to work with all communities in the watershed to develop point source reduction plans.

Outcome: Develop and implement plans to address TMDL requirements.

PRIORITY ISSUE: TOO MANY REGULATIONS

GOAL: The residents living within the District will have a better understanding of regulations and the reasoning behind them.

Outcome: Add cards to mailings that address regulations and what water quality issues they address.

Outcome: Have “ask the watershed district” section in area newspapers monthly.

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Section Four: Implementation

The core of this Watershed District Plan is the identification and implementation of effective strategies that will assist in the management of water quality and quantity within the Lac qui Parle - Yellow Bank Watershed boundaries. The following Management Strategies have been identified and will be implemented as funding becomes available over the next ten years (2009 - 2019). The Watershed District will pursue funding options through grant writing and support of available programs.

A. Goals, Objectives and Management Strategies Defined:

This Implementation Plan is based on the goals, objectives and management strategies developed through the process of public input, technical advisory critique and stakeholder review. **Goals**, intentionally general in nature, are long-term intentions. **Objectives** are more action oriented. They support the goal and can be measured. **Management Strategies** are specific implementation steps to be followed in order to achieve the goal and objective.

B. Implementation Information:

Each identified management strategy in this section has been assigned to priority sub-watersheds, as applicable. This allows the Watershed District to focus grantwriting and implementation efforts on areas of the most need. An approximate time frame for each of the strategies has also been identified to assist in decisions on priority order of addressing the many strategies identified in this plan. Coordinating agencies have been identified for each strategy, with an asterisk denoting the lead agency or agencies.

KEY

Coordinating Agencies / Definitions	Abbreviation
Army Corps of Engineers	ACOE
Minnesota River Basin Projects, Inc.	Area II
Board of Water and Soil Resources	BWSR
County Highway Department	CHD
Clean Water Legacy	CWL
Clean Water Partnership	CWP
Ditch Authority	DA
Department of Natural Resources	DNR
East Dakota Water Development District	EDWDD
Environmental Office	EO
Environmental Protection Agency	EPA
Feedlot Officer	FO
Lac qui Parle - Yellow Bank Watershed District	LqP-YB WD
Minnesota Pollution Control Agency	MPCA
Natural Resources Conservation Service	NRCS
Soil and Water Conservation District	SWCD
Total Maximum Daily Load	TMDL
United States Fish and Wildlife Service	USFWS
United States Geologic Survey	USGS
Local Water Management Plan	WP

Sub-basin	Abbreviation
Minnesota River	MR
Yellow Bank River	YBR
North Fork Yellow Bank River	NFYB
South Fork Yellow Bank River	SFYB
West Branch Lac qui Parle River	WLqP
Upper Lac qui Parle River	ULqP
Middle Lac qui Parle River	MLqP
Lower Middle Lac qui Parle River	LMLqP
Lower Lac qui Parle River	LLqP
Crow Creek	CR
Florida Creek	FL
Lazarus Creek	LA
Cobb Creek	CO
Ten Mile Creek	TM
Federal 319 Funding	319

	Management Strategy	Priority Subwatershed(s)	Proposed Time Frame	Coordinating Agencies *Lead Agency	Estimated Cost
GOAL 1: PROTECT AND ENHANCE SURFACE WATER QUALITY					
Objective A: Address impaired waters in the Watershed to assess the ability to meet ecoregion standards.					
1.	Coordinate the preparation and implementation of TMDL studies for the impaired waters reaches addressing low Dissolved Oxygen. Address all Turbidity and Fecal Coliform TMDLs starting in 2009-2010 and the Fish Bioassessments in 2016. Work closely with the MPCA as funding becomes available for preparation and pursue additional funding for implementation.	NFYB,SFYB, WLqP, ULqP, MLqP, LMLqP, LLqP, FL, LA, TM	2009 - 2019	*LqP-YB WD, CWP/319/CWL, MPCA, DNR	$500,000
2.	Work with the MPCA to monitor five sites within the Watershed to determine effectiveness of TMDL implementation and/or areas of impairment	NFYB,SFYB, WLqP, ULqP, MLqP, LMLqP, LLqP, FL, LA, TM	2009 - 2019	*LqP-YB WD, CWP/319/CWL, MPCA, DNR	$95,000
3.	Maintain load monitoring at sites #8 and #9 near the confluences of Yellow Bank River/Minnesota River and Lac qui Parle River/Minnesota River. Encourage USGS to keep sites active.	All	2009 - 2019	*MPCA,*USGS, ACOE, LqP-YB WD	MPCA expense
4.	Continue contract with the DNR to monitor flow at sites #11 (3 miles south of Dawson) and #10 (Diagonal Street in Dawson).	WLqP, LMLqP	2009 - 2019	*LqP-YB WD, CWP/319/CWL, DNR	$58,000
5.	Involve stakeholders within the watershed in the development of the TMDL project. Hold meetings at least annually to inform and receive comment.	NFYB,SFYB, WLqP, ULqP, MLqP, LMLqP, LLqP, FL, LA, TM	2009 - 2019	*LqP-YB WD, CWP/319/CWL, MPCA	$500
6.	Enhance the current website by updating ongoing projects and TMDLs, District accomplishments and potential projects.	All	2009 - 2019	*CWP/319/CWL, LqP-YB WD	$3,000
7.	Distribute credible information about water quality data and help watershed residents understand the connection between their actions and the quality of water through informational meetings, brochures, mailings, website and additional media sources.	All	2009 - 2019	*LqP-YB WD, CWP/319/CWL, SWCD, MPCA, LWMP, USGS, EO	$45,000
Objective B. Reduce sediment loading to water bodies by reducing soil erosion.					
8.	Establish and maintain existing vegetative buffer strips by utilizing available incentive programs through the LqP-YB CWP program, Federal 319, Clean Water Legacy and other local agencies. Install 100 acres per year.	All	2009 - 2019	*LqP-YB WD, CWP/319/CWL, *SWCDs, NRCS	$105,000
9	Help implement residue management practices that reduce runoff curve numbers utilizing state and federal cost share programs and LqP-YB CWP, Federal 319, and/or Clean Water Legacy incentives.	All	2009 - 2019	*SWCDs/NRCS, *CWP/319/CWL, Lqp-YB WD	$10,000

	Management Strategy	Priority Subwatershed(s)	Proposed Time Frame	Coordinating Agencies *Lead Agency	Estimated Cost
10.	Provide technical and financial assistance, as available, to local governments and landowners for the implementation of erosion and sediment control BMPs (10 sediment control basins, 3 acre waterway, seeding 175 acres of highly erodible soil, 10,000 feet of field windbreaks or grassed strips, 6,500 feet of terracing, grazing system on 250 acres of pastureland for 5 years, 3 acres of farmstead windbreaks and 100 acres of buffers) per year.	All	2009 - 2019	LqP-YB WD, *CWP/319/CWL, *SWCDs/NRCS, Area II	$3,087,500
11.	Inventory areas of severe stream bank erosion and channel sedimentation. Utilize the DNR, Fisheries stream surveys of watershed rivers and tributaries to identify critical areas and work with landowners to address problem areas.	LA,FL,WLqP, ULqP, MLqP, LMLqP, LLqP	2009 - 2019	*DNR, LqP-YB WD, SWCD, CWP/319/CWL	$6,000
12.	Cost-share on side-inlets to reduce sediment loading. Depending on available funding and cost/demand, fund up to $10,000 per year.	All	2009 - 2019	*LqP-YB WD, CWP, *NRCS, SWCD	$100,000
13.	Provide financial incentives to landowners for the implementation of alternative drainage practices, such as blind tile inlets, that have potential to improve water quality. Target 50 each year.	All	2009 - 2019	*LqP-YB WD, CWP, *NRCS, SWCD	$115,000
14.	Work with contractors and others to educate the public on ditch and streambank management - buffers, side inlets, stabilization, and cause/effect of erosion	All	2009 - 2019	*LqP-YB WD, SWCD/NRCS, CWP/319/CWL, Contractors	$5,000
15.	Set-up tours within the Watershed highlighting current applied practices to land users. Work cooperatively with local government and state agencies to promote.	NFYB,SFYB, WLqP, ULqP, MLqP, LMLqP, LLqP, FL, LA, TM	Every 3 years	*LqP-YB WD, * SWCD, CWP/319/CWL, MPCA	$5,000
16.	Promote CWP in acquiring funding for 5 stream and riverbank stabilization projects.	LA,FL,WLqP, ULqP, MLqP, LMLqP, LLqP	2009 - 2019	*CWP/319/CWL, LqP-YB WD, SWCD/NRCS	$300,000
17.	Report all water quality monitoring data to MPCA STORET and all CWP/CWL/319 practices and fiscal accountability to the eLINK system.	All	2009 - 2019	*CWP/319/CWL, LqP-YB WD, *MPCA	$5,000
18.	Continue and increase the number of citizen monitors in the volunteer Citizen Monitoring Program in the District	All	2009 - 2019	LqP-YB WD, *CWP/319/CWL, *MPCA	$5,000
19.	Support USGS proposed Minnesota River Basin Watershed study including small watershed modeling and 1 cm. resolution LiDAR mapping.	All	2009 - 2013	*ACOE, DNR, *USGS, LqP-YB WD	staff time
Objective C: Work with local agencies and municipalities to address stormwater discharge from local communities.					
20.	Support the development of additional local stormwater regulations that protect lakes and streams within the District.	All	2009 - 2019	*Cities	$1,000

	Management Strategy	Priority Subwatershed(s)	Proposed Time Frame	Coordinating Agencies *Lead Agency	Estimated Cost
21.	Promote BMPs to improve sediment reduction within the city limits by storm water retention basins, rain gardens and other innovative water retention options.	All	2009 - 2019	*Cities,CWP/319/CWL, LqP-YB WD, SWCD	$25,000
22.	Develop and implement a storm drain awareness program within the Watershed District.	All	2009 - 2019	*Cities, LqP-YB WD, EO, CWP/319/CWL, SWCD	$15,000
Objective D: Manage public drainage systems to provide both conveyance and ecological benefits.					
23.	Enforce regulations according to State Drainage Law (M.S. Chapter 103E) on public drainage systems. Annually review the Drainage Law to note changes.	All	2009 - 2019	*DA, LqP-YB WD	staff time
24.	Cooperatively work with stakeholders to restore channelized segments of the River to a more natural state.	FL	2009 - 2013	*LqP-YB, CWP/319/CWL, BWSR, *DNR, LqP & YM Counties	$60,000
25.	Update information and data base on public county drainage systems using current technologies by seeking funding to complete a current inventory of the public drainage systems in the District, compiling information in a GIS format.	All	2009 - 2013	*DA, *LqP-YB WD, BWSR	$50,000
Objective E: Reduce Priority Pollutants within the Watershed					
26.	Collect county feedlot inventory data from annual assessment of 10% of feedlots and assess for prioritization of e. coli reduction.	YBR, WLqP, ULqP, MLqP, LMLqP, LLqP, FL, LA	2009 - 2019	*EO, *FO, MPCA, LqP-YB WD	$50,000
27.	Pursue funding options through the CWP, CWL, EPA 319 and similar programs to maintain the Incentive Program and provide financial incentives to landowners of the District. Work with 1-2 producers each year to bring their feedlot into compliance.	YBR, WLqP, ULqP, MLqP, LMLqP, LLqP, FL, LA	2009 - 2019	*FO, LqP-YB WD, *MPCA, *SWCD/NRCS, EO, CWP/CWL/319	$500,000
28.	Continue to work with local agencies and Ag producers to develop a map depicting land application of manure with manure management plans. Increase manure management planning by encouraging EQIP and other programs.	YBR, WLqP, ULqP, MLqP, LMLqP, LLqP, FL, LA	2009 - 2019	*FO, *NRCS, * Ag producers, EO, *MPCA, LqP-YB WD	$10,000
29.	Work with MPCA and local communities to develop feasibility studies for unsewered communities.	YBR, WLqP, ULqP, MLqP, LMLqP, LLqP, FL, LA	2009 - 2019	*MPCA, *Unsewered Communities, EO	$25,000
30.	Use CWP, Federal 319, Clean Water Legacy and/or Ag BMP loans to help upgrade 30 SSTS per year.	All	2009 - 2019	*Lqp-YB WD, *SWCD, Counties	$1,400,000
31.	Work with local governments on identification of surfacing SSTS.	All	2009 - 2019	*Counties, LqP-YB WD	$10,000
32.	Continue to work with all communities in the watershed to develop point source reduction plans.	All	2009 - 2019	*Cities, *Counties	staff time

	Management Strategy	Priority Subwatershed(s)	Proposed Time Frame	Coordinating Agencies *Lead Agency	Estimated Cost
GOAL 2: PROTECT GROUNDWATER QUALITY					
Objective A: Protect the public from groundwater contamination through measures that ensure safe drinking water throughout the District.					
33.	Participate in the preparation and implementation of wellhead protection plans for public water suppliers. Work with water suppliers to educate land owners regarding land use practices and offer voluntary BMPs to protect wellhead protection areas.	All	2009 - 2019	*Cities, *MDH, LqP - YB WD	$5,000
GOAL 3: ENSURE AN ADEQUATE SUPPLY OF SURFACE AND GROUNDWATER FOR DRINKING WATER, AGRICULTURAL, COMMERCIAL, INDUSTRIAL, NATURAL RESOURCES AND RECREATIONAL PURPOSES, WHILE MINIMIZING FLOOD RELATED DAMAGE.					
Objective A: Minimize water use conflicts.					
34.	Review all water appropriation permit applications submitted to the DNR within the District. Comment as necessary. Offer education and BMPs.	All	2009 - 2019	*DNR,	$2,500
Objective B: Improve control of surface water in the District to reduce the impact of stream and cross-over flooding.					
35.	Provide technical and financial assistance, as available, for removal and snagging of debris from channels where appropriate to minimize stream bank erosion and maximize channel flow during flooding in non-critical habitat areas.	All	2009 - 2019	*DNR, LqP-YB WD	$150,000
36.	Work cooperatively with the East Dakota Water Development District / State of South Dakota to reduce flooding in the headwaters of tributaries flowing into the District.	YBR, NFYB, SFYB, CR, FL, LA	2009 - 2019	*EDWDD, LqP-YB WD	staff time
37.	Participate in the reconstruction and repair of dams and other water control structures in the District. Provide technical and financial assistance for 2 per year at $12,000 to $30,000 per project, as available, for the reconstruction and repair to ensure adequate water levels are maintained.	All	2009 - 2019	*Lqp-YB WD, Area II, DNR	$400,000
38.	Continue to evaluate structural flood control measures in critical areas such as dikes and levees, and small water retention practices to contain runoff within stream channels. Inventory small NRCS water retention structures in the District. Evaluate and determine if maintaining or repairing these structures would be beneficial, seek available cost share funding for sites identified for repair.	All	2009 - 2019	* Area II, *Lqp-YB WD, NRCS, DNR	$5,000
39.	Restore 150 acres of wetlands where beneficial storage would be feasible for retention purposes.	All	2009 - 2019	Lqp-YB WD, DNR, *SWCD/NRCS, USFWS	$15,000
40.	Develop a method to prioritize those sub-watersheds requiring flood control measures. Seek technical assistance from and work with Area II and the DNR.	All	2009 - 2019	*Lqp-YB WD, * Area II, CHD, DNR, SWCD	staff time

	Management Strategy	Priority Subwatershed(s)	Proposed Time Frame	Coordinating Agencies *Lead Agency	Estimated Cost
41.	Continue to work with Area II to implement road retention technology in three projects to increase water retention and reduce peak flows. Wherever possible, design road and bridge replacements in a manner that provides reductions in peak flow.	All	2009 - 2019	*Lqp-YB WD, *Area II, CHD, DNR	$405,000
42.	Coordinate the identification, evaluation, and implementation of 3 large retention projects over ten years, utilizing assistance from EDWDD, Area II, DNR, the NRCS, and other appropriate groups and agencies.	All	2009 - 2019	*Lqp-YB WD, *Area II, EDWDD, NRCS, DNR, SWCD	$405,000
GOAL 4: PROMOTE AND MAXIMIZE WATER-BASED RECREATIONAL ACTIVITIES					
Objective A: Increase opportunities for water-based recreation.					
43.	Sponsor canoe trips to enhance recreational use. Support reasonable use and preservation of water bodies.	All	2009 - 2019	LqP-YB WD, *CWP/319/CWL	$2,500
44.	Manage Del Clark Lake park and camping facility. Support contributions from local government agencies to maintain public use.	All	2009 - 2019	*LqP-YB WD	$60,000
GOAL 5: ENSURE PROTECTION OF UNIQUE WATER AND NATURAL RESOURCES.					
Objective A: Identify and preserve unique and rare water and natural resources located within the District.					
45.	Encourage protection of unique natural features such as Calcareous fens and native prairie resources.	All	2009 - 2019	LqP-YB WD	staff time
46.	Maintain wildlife habitat within the watershed district. Use available state and federal cost share programs to voluntarily enhance and rehabilitate these resources with interested landowners.	All	2009 - 2019	NRCS, *SWCD/NRCS, DNR, LqP-YB WD, USFWS	$40,000
GOAL 6: PROVIDE FOR EFFICIENT AND EFFECTIVE ADMINISTRATION					
Objective A: Maintain a complete board and adequate staffing.					
47.	Maintain all watershed district manager positions on the Board; conduct monthly board meetings and other business as required.	All	2009 - 2019	LqP-YB WD	$60,000
48.	Maintain adequate staffing to address the goals and objectives of the District.	All	2009 - 2019	LqP-YB WD	$400,000
49.	Utilize consultants to address engineering, hydrologic and planning issues when necessary.	All	2009 - 2019	LqP-YB WD	$100,000
Objective B: Implement District Rules and Permitting.					
50.	District Rules - review, revise, adopt and implement rules for the district.	All	2009 - 2019	LqP-YB WD	staff time
51.	Permitting - implement the watershed district permitting program.	All	2009 - 2019	LqP-YB WD	staff time
52.	Administer Wetland Conservation Act for Lac qui Parle County. ($10,000/yr)	LqP County	2009 - 2019	LqP-YB WD	$100,000

	Management Strategy	Priority Subwatershed(s)	Proposed Time Frame	Coordinating Agencies *Lead Agency	Estimated Cost
Objective C: Maintain active advisory committee.					
53.	Hold at least two meetings of the Advisory Committee each year to discuss water resource issues.	All	2009 - 2019	LqP-YB WD	$1,000
54.	Hold technical committee and TEAM meetings as necessary to address specific water resource issues.	All	2009 - 2019	*CWP/319/CWL, LqP-YB WD	staff time
55.	Foster relationships with partners to discuss partnership opportunities and roles in implementation.	All	2009 - 2019	*CWP/319/CWL, LqP-YB WD	staff time
Objective D: Maintain a public relations program					
56.	Maintain the District website	All	2009 - 2019	*CWP/319/CWL, LqP-YB WD	$2,500
57.	Prepare and distribute and Annual Report that summarizes the District's accomplishments.	All	2009 - 2019	LqP-YB WD	$1,000
58.	Provide tours of the watershed to residents that highlight projects completed and to show areas that are in need of attention. Prepare newsletters and news releases that identify accomplishments, educate on water resource issues and explain District activities.	All	2009 - 2019	LqP-YB WD, SWCDs	$5,000
Objective E. Provide training opportunities for Board Managers and staff.					
59.	Provide funding for Board Managers and staff to attend conferences and workshops to increase internal knowledge and skills.	All	2009 - 2019	CWP/319/CWL, LqP-YB WD	$10,000
Objective F: Strive for fiscal accountability.					
60.	Prepare and adopt an annual budget following the statutory requirements of M.S. Chapter 103D.	All	2009 - 2019	LqP-YB WD	staff time
61.	Conduct an annual audit of the financial records of the District.	All	2009 - 2019	LqP-YB WD	$1,000
62.	Utilize appropriate financing mechanisms to fund District initiatives, including but not limited to mechanisms and procedures outlined in M.S. Chapter 103D.	All	2009 - 2019	LqP-YB WD	staff time
63.	Actively pursue additional funding sources, such as grants, in order to help fund the implementation of management strategies in the watershed district plan.	All	2009 - 2019	*CWP/319/CWL, LqP-YB WD	staff time

	Management Strategy	Priority Subwatershed(s)	Proposed Time Frame	Coordinating Agencies *Lead Agency	Estimated Cost

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Section Five: Plan Administration

This section provides detailed information on Plan administration, with sections on coordination, implementation and scheduling. It will define the roles of the District and other agencies in the implementation process, discuss recommended changes to State programs, and resolution process for intergovernmental conflict. Plan amendment and evaluation procedures will also be defined.

Plan Coordination

Water resource management in the District involves many stakeholders. To effectively achieve the management strategies outlined in this Plan, the Board of Managers is committed to working closely with the Advisory Board, the CWP TEAM, and the state and local stakeholders.

Plan Implementation

The District will ensure coordination and implementation of its Overall Plan through its Advisory Committee, the CWP Coordinator and the TEAM technical group. The committee will meet, at least annually, to review progress and identify emerging problems, opportunities and issues. The Board of Managers will coordinate the activities of the Advisory Committee and direct the administration of the Plan.

Plan Schedule

Implementation of this Plan shall commence with its adoption by the Board of Managers and final approval from the BWSR. The Plan will remain in effect for a ten-year period, which is specified as July 1, 2009 through June 30, 2019.

District's Role in Implementation

An evaluation of the estimated costs associated with the implementation of this Plan is provided in ***Table Twenty***. According to the table, to fully implement the 63 strategies contained in the Plan would cost approximately $8,444,500 over the next ten years.

Estimated Plan Implementation Costs — ***Table Twenty***

Goal		Number of Strategies	Total Estimated Cost
1	Protect and enhance surface water quality	32	$6,591,000.00
2	Protect groundwater quality	1	$5,000.00
3	Ensure an adequate supply of surface and groundwater for drinking water, agricultural, commercial, industrial, natural resources and recreational purposes, while minimizing flood related damage.	9	$1,382,500.00
4	Promote and maximize water-based recreational activities	2	$62,500.00
5	Ensure protection of unique water and natural resources.	2	$40,000.00
6	Provide for efficient and effective administration	17	$680,500.00
	Total	**63**	**$8,761,500.00**

This updated Overall Plan for the District presents a description of the District, its problems, and some possible solutions. Management Strategies identified in this plan are for planning purposes, and are not intended to be viewed as contractual for implementation purposes. The plan is not intended to be complete for all eventualities, and for all individual projects, but rather to provide a framework from which the District will operate. The District has broad authority by law to conserve, control, develop, improve, maintain, and restrict the use of the waters and natural resources within the District for the best interests and welfare of the residents.

The Board of Managers recognizes that implementation of this updated and revised Watershed

District Plan will require close cooperation and coordination with the stakeholders. Strategies will be implemented as time and funding permits. In addition, the District can and will cooperate with the State of South Dakota to develop works of improvement with mutual benefits to both states. The District is unable to accomplish its goals by working alone to solve issues that have resulted from years of change within the watershed, or from problems originating outside of the state and District political boundaries. In addition to watershed district funds and landowner contributions it is expected that significant funding will come from USDA – NRCS and FSA cost-share incentive programs. Also State of Minnesota monitoring, assessment, cost-share incentive programs and technical assistance will be important and needed funding. Cost-share, Clean Water Legacy funding, 319 funding, low interest loan programs and the opportunities from the recently approved Clean Water, Land and Legacy Amendment will be pursued to assist in this plan implementation.

In the plan, as well as in the appended rules and regulations of the District, reference is made to the adoption of regulations requiring permits to precede various planned improvements or other works. The requirement to obtain permits is not intended to be a denial for works of improvements. Regulations, including permit requirements are necessary for the Board of Managers to know what developments are planned and to insure orderly development of the District's natural resources. Permits are also required by state agencies in the regulation of various water management projects. The Watershed District will assist residents in obtaining the needed state permits when the proposed works of improvements are in the best interest and welfare of the District.

The Watershed District, by itself, cannot meet all of the objectives for which it was established. By working cooperatively with the District, residents can move ahead in solving problems through water management and planning. Implementing this plan is an effective vehicle to implement change for the betterment of residents of the District, and to provide for wise use and conservation of natural resources.

Recommended Changes to State and Federal Programs

To implement the initiatives set forth in the Overall Plan, continued cooperation between the District and various State and Federal agencies is necessary. In an effort to increase coordination in this effort, the District respectfully makes the following recommendations regarding State agency programs.

- The District should be better informed of State and Federal agency program changes and the availability of funding.
- Data collected by State and Federal agencies should be readily shared with the District to avoid duplicative efforts.
- State and Federal agencies should continue to provide local and/or regional staff to assist local officials with agency programs.
- State and Federal agencies should provide greater flexibility to districts in setting annual work plan priorities. Priorities should be based upon current needs, availability of funding and changes in State initiatives and regulations.
- Data collected by the NRCS regarding Best Management Practices should be made available to the District in the form of acres, costs, reductions. This can be accomplished without compromising the privacy of the landowner.

Intergovernmental Conflicts / Resolution Process

During the development of this Plan, no intergovernmental conflict occurred. Should such a conflict arise, the Board of Managers and the Advisory Committee will attempt to mitigate the conflict. If efforts to resolve the conflict fail, the BWSR will by petitioned to conduct a contested case hearing.

Plan Evaluation

Periodic review is necessary to assess the success of implementation of this Plan. The Advisory Committee and the Board of Managers will conduct a review every two to three years to ensure the management strategies remain pertinent. Amendments to the Plan will be recommended if needed.

Plan Amendment Procedure

The Board of Managers may initiate an amendment of a watershed management plan or revised watershed management plan by:

1. Submitting a petition with the proposed amendment to the BWSR.
2. The BWSR must give notice and hold a hearing on the amendment in the same manner as for the watershed management plan.
3. After the hearing, the BWSR may, by order, approve or prescribe changes in the amendment.
4. The amendment becomes part of the watershed management plan after approval by the board.
5. The BWSR must send the order and approved amendment to the entities that receive an approved watershed management plan under section 103D.401, subdivision 5.