Lower Minnesota River Watershed District

Third Generation Watershed Management Plan
2011 - 2020

November 2011 (June 2015)

Prepared by

LOWER **MINNESOTA RIVER**
WATERSHED DISTRICT

and

HDR Engineering, Inc.

Amended by

Burns & McDonnell
SINCE 1898

Watershed Management Plan
for the
Lower Minnesota River Watershed District
2011 - 2020

Approved
December 14, 2011 (Amended June 2015)

Board of Managers

Mgr. Kent Francis, Carver County
Mgr. Yvonne Shirk, Dakota County
Mgr. Len Kremer, Hennepin County
Mgr. Edward Schlampp, Hennepin County*
Mgr. Carla Shutrop, Scott County*

Staff

Terry Schwalbe, Administrator *
Joan Ellis, Assistant Administrator*
Linda Loomis, Administrator

Plan Consultants

Della N. S. Young, Hydrologist and Facilitator, HDR Engineering, Inc.
Daniel Murphy, P.E., HDR Engineering, Inc.

Plan Amendment Consultant
Della N. S. Young, PMP, CPESC, Burns & McDonnell Inc.

Lower Minnesota River Watershed District
112 East Fifth Street, Suite 102
Chaska, MN 55318
Telephone: 952-856-5880
Fax: 952-856-6067
www.watersheddistrict.org

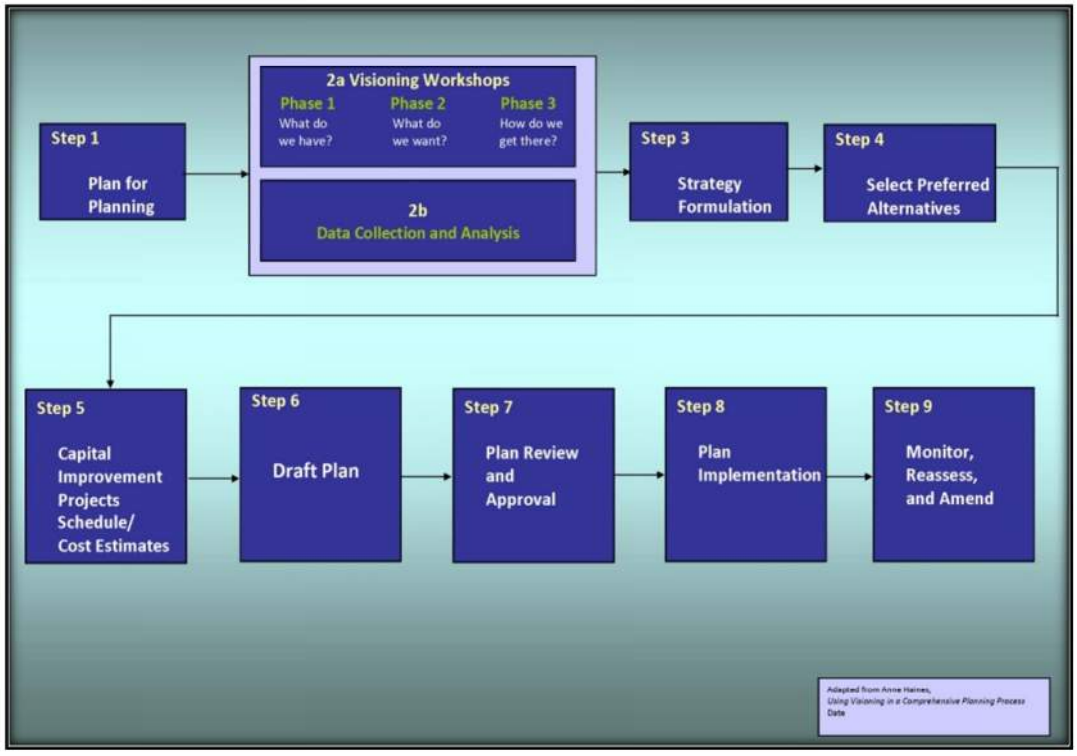
*No longer with the LMRWD

Foreword

The following Third Generation Watershed Management Plan (Plan) of the Lower Minnesota River Watershed District (District) is a comprehensive account of the body of work that began in 1960 when the District was formed, and continues today. Over the 50 year history of the District, the Plan had been updated four times. In December 2008, the District managers embarked on the fifth update of the plan. This foreword provides an overview of the planning process used to review and update District goals, policies, and strategies, and to set the direction of the District for the next decade.

The District's approach to this Plan update was to invite members of their advisory committees (Technical and Citizen) to participate in its development, specifically through visioning workshops. The District's process, shown below in Figure F-1, was adapted from Using *Visioning in Comprehensive Planning Process* (Haines, 2001). The visioning process contains three phases: 1) What do we have? 2) What do we want? 3) How do we get there? The advisory committees focused on phases 2 and 3 during four workshops. The decision to focus on those two phases was based on the premise that the District already has a good understanding of phase 1, the resources they are responsible for managing.

Figure F-1: Lower Minnesota River Watershed District – Watershed Management Planning Process



On January 28, 2009, the District hosted its first Technical Advisory Committee (TAC) visioning workshop at the Chaska Community Center. The workshop focused on tackling Phase 2, through addressing the question: What issues/items should the District address over the next 10 years? The following overarching issues/items emerged:

- Partnering and coordination
- Resource management
- Protection and restoration of water quality
- Channel maintenance
- Education and outreach
- Overarching programming
- Assessment inventory and monitoring
- Rules and regulations

Subsequent to this meeting it was decided not to address the issue of rules and regulations as a standalone item, but as a component of each of the other seven issues, since during prioritization it received no votes (See Appendix A f or documentation). Addressing the education and outreach component was then delegated to the assistant District administrator and the Citizen Advisory Committee (CAC), while the administrator and the TAC addressed the other six issues. These issues/items form the foundation on which this Plan is built.

After the first workshop, the District created and distributed a survey to the TAC. The survey captured specific actions the District could take over the next 10 years to address the overarching issues. Three additional TAC meetings were held (February 25, March 17, and April 8, 2009) focused on gathering information about the issues list and using the knowledge of the group to identify strategies for addressing each of them. April 8, 2009 was the last time the TAC convened formally as part of the planning process. However, TAC members were contacted on two occasions to solicit projects for the District to include a part of their capital improvements projects and to review a draft of the Plan.

As mentioned the education and outreach component was delegated to the CAC. At the time, the District did not have a CAC. The District placed articles in local newspapers read by residents in the watershed soliciting their participation in the CAC and inviting them to a CAC Town Hall meeting to learn about the District and meet the managers. As a result of those actions, the CAC was established. A series of meetings were held to educate the CAC on the District and the Plan writing process, and to develop education and outreach goals, policies, and strategies the District could implement. As a part of their activities, the CAC contacted municipalities within the District to learn how the District could partner with them on educational initiatives. The work of the CAC is on-going and the official launch of the education and outreach program will occur at the time of adoption of this Plan.

The District would like to thank the following individuals for their participation in the Plan development process as part of the TAC and CAC.

Technical Advisory Committee

- Allen Dye, Metropolitan Airport Commission
- Bill Monk, City of Chaska
- Brad Wozney, Board of Soil and Water Resources
- Brooke Asleson, MN Pollution Control Agency
- Daryl Jacobson, City of Burnsville
- Ellen Sones, Hennepin County
- Greg Genz, Upper Mississippi. Waterway Association.
- Eric Macbeth, City of Eagan
- Jack Frost and Judy Sventek, Metropolitan Council
- James Fallon, US Geological Survey
- Jim Bodensteiner, Xcel Energy
- Kevin Bigalke, Nine Mile Creek WD
- Laura Jester, Dakota SWCD
- Leslie Stovring, City of Eden Prairie
- Lisa Lund and Paul Machajewski, US Army Corps of Engineers
- Jessica Van Der Werff, Dakota SWCD
- Jennie Skancke, MN DNR
- Randy Anhorn, Hennepin County
- Mike Wanous, Carver SWCD
- Bryan Gruidl, City of Bloomington
- Mark Nemeth, Tamara Simonich, Molly Shodeen and Mark Cleveland, MN Dept of Natural Resources
- Melissa Bokman, Scott WMO
- Mike Kinney and Stacy Sass, Prior Lake – Spring Lake WD
- Nick Tiedeken, Wesley Saunders-Pierce, and Beth Neuendorf, Mn Dept of Transportation;
- Paul Nelson, Scott WMO
- Peter Beckius, Scott SWCD
- Sam Lucido, City of Savage
- Steve Sodeman, MN Corn Growers Association
- Susie Carlin, MN River Board
- Terry Jeffery, City of Chanhassen
- Tim Sundby and Greg Arndt, Carver County
- Charles Blair US Fish and Wildlife Service
- Warren Formo, MN Ag Water Resources Coalition
- Lawrence Samstad
- Steve Christopher, BWSR
- Joe Mulcahy, Metropolitan Council
- Troy Kuphal, Scott SWCD
- Paul Moline, Carver WMO
- Charlie Sawdey, Carver WMO
- Bruce Loney, Shakopee

Citizen Advisory Committee

Dan Boyum – Carver County
Glenda Spiotta – Dakota County
Jerry Hennen and Lawrence Samstad – Scott County
Bruce Kopruki – Hennepin County

Table of Contents

List of Tables

List of Figures

List of Appendices

List of Acronyms and Abbreviations

Term	Definition
AC	Acre
BMP	Best Management Practice
BOD	Biochemical oxygen demand
BWSR	Board of Water and Soil Resource
CAC	Citizen Advisory Council
CAMP	Citizen Assisted Monitoring Program
CCP	Minnesota River Valley National Wildlife Refuge Comprehensive Conservation Plan
CFS	Cubic feet per second
CHL-A	Chlorophyll-a
CIP	Capital Improvement Projects
CLP	Closed Landfill Program
CMMP	Channel Maintenance Management Plan
COE	U.S. Army Corps of Engineers
CSMP	Citizen Stream Monitoring Program
CSTS	Community Sewage Treatment System
CSWCD	Carver Soil and Water Conservation District
CWA	Clean Water Act
CWCS	Comprehensive Wildlife Conservation Strategies
DMMP	Dredge Material Maintenance Plan
DNR	Minnesota Department of Natural Resources
DO	Dissolved Oxygen
DOH	Minnesota Department of Health
DOT	Minnesota Department of Transportation
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
FIS	Flood Insurance Study
FQA	Floristic Quality Assessment
FT	Feet
ISTS	Individual Sewage Treatment System
ITPHS	Imminent Threat to Public Health and Safety
LGU	Local Government Unit
LID	Low Impact Development
LMRWD	Lower Minnesota River Watershed District (District)
LUST	Leaking Underground Storage Tanks

Term	Definition
LWP	Local Water Plan
LWPA	Local Watershed Plan Authority
M	Meter
M.S.	Minnesota Statute
Managers	District Board of Managers
MBS	Minnesota Biological Survey
MCCC	Minnesota Civilian Conservation Corps
MCES	Metropolitan Council Environmental Services
MDA	Minnesota Department of Agriculture
MG/L	Milligram per liter
MLCCS	Minnesota Land Cover Classification System
MN	Minnesota
MnRAM	Minnesota Routine Assessment Methodology
MOU	Memorandum of Understanding
MPCA	Minnesota Pollution Control Agency
MRBJPB	Minnesota River Basin Joint Powers Board
MRCC	Midwestern Regional Climate Center
MS4	Municipal Separate Storm Sewer System
MSP	Minneapolis-St. Paul
MUSA	Metropolitan Urban Services Area
NFIP	National Flood Insurance Program
NGO	Non-Government Organization
NHIS	Natural Heritage Information System
NO3	Nitrate
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NURP	National Urban Runoff Program
NWI	National wetland inventory
OHWL	Ordinary High Water Level
PLP	Permanent List of Priorities
QAPP	Quality Assurance Project Plan
QA/QC	Quality Control Quality Assurance
R.M.	River mile
RCRA	Resource Conservation and Recovery Act
SDS	State Disposal System
SDS	State Disposal System

Term	Definition
SFHA	Special Flood Hazard Areas
SNA	Scientific and Natural Area
SRE	Strategic Resources Evaluation
SSC	Suspended Sediment Concentration
SSL	Suspended Sediment Loads
SSTS	Subsurface Sewage Treatment System
SWCD	Soil and Water Conservation District
SWPPP	Storm Water Pollution Prevention Plan
TAC	Technical Advisory Committee
TDP	Total Dissolved Phosphorus
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSD	Treatment , Storage and Disposal
TSL	Total Suspended Load
TSS	Total Suspended Solids
UAA	Use Attainability Analyses
USAF	United States Air Force
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey
VIC	Voluntary Investigation Cleanup
WCA	Wetland Conservation Act
WD	Watershed District
WMO	Water Management Organization
WOMP	Watershed Outlet Monitoring Program
WWTP	Waste Water Treatment Plant
µG/L	Microgram per liter
MRB	Minnesota River Board

EXECUTIVE SUMMARY

The Lower Minnesota River Watershed District (District) Watershed Management Plan (Plan) describes how the District will address water resources management over the next 10 years as required by M.S. 103B and 103D and Minnesota Rules (MN Rules) 8410. The purpose of this Plan is to protect, preserve, and manage the surface water resources (Minnesota River, lakes, streams, and wetlands) and groundwater within the District.

The District was organized by petition from Hennepin, Ramsey, Dakota, Scott, and Carver counties in 1960 in response to the Minnesota Watershed Act of 1955. The District's first Watershed Management Plan was prepared, approved, and adopted in 1961.

The Metropolitan Surface Water Management Program (M.S. 103B) and Watershed Act requires the District to review and update its Plan every ten years. The second generation plan was prepared and adopted in 1999 and expired in 2009. This current amended Plan represents a third generation plan and will be effective from 2011 to 2020. In addition to complying with the aforementioned laws, this Plan meets the requirements of MN Rules 8410, 8420, and 7050. The Plan includes management standards and procedures for addressing surface water, wetland, and groundwater issues; and issues related to navigation along the Minnesota River.

E1. PLAN ORGANIZATION

This Plan documents the Lower Minnesota River Watershed and its management, and therefore, much of the information presented is technical. Background information regarding scientific terms and processes is provided where practical. An acronym list is also provided. Readers are encouraged to consult area professionals or professional references for more information.

The Plan contains the following sections as required by MN Rule 8410:

Executive Summary: Provides an overview of the plan.

Introduction: Summarizes State statutes, plan requirements, the organization and its history, and District accomplishments since the District's 1999 Second Generation Watershed Management Plan (Second Generation Plan).

Section 1.0: Land and Water Resource Inventory: Presents current and historic background and inventory information regarding the physical, hydrological, biological, and human environment of the watershed.

Section 2.0: Issues Identification/Assessment of Problems: Provides an overview of the issues identified during the planning process, assesses the adequacy of existing controls, and identifies potential management gaps.

Section 3.0: Goals, Policies, and Management Strategies: Presents the management framework (goals, policies, and strategies) adopted by the District Board of Managers (Managers) to address the priority issues and management gaps.

Section 4.0: Implementation Program: Describes the implementation elements of the Plan and its impact on local governments and residents. This section provides an implementation program table and preliminary annual budgets.

Section 5.0: Impact on Local Units of Government: Expresses the potential financial impact that the Plan changes will have on local government units (LGU).

Section 6.0: Amendment and Reporting: Describes the procedures for amending the Plan and addressing the annual reporting requirement.

E2. WATERSHED ISSUES

Watershed issues are problems or concerns identified by the Managers, by the Technical Advisory Committee (TAC), and the Citizen Advisory Committee (CAC). These issues need attention and, in some cases, resolution. The TAC and CAC held workshops and partnership work sessions to develop a list of watershed issues. Information generated at those sessions was presented to the Board and is addressed here. The following issues were identified, and are discussed in detail in Section 2.0 Issues and Problems Assessments.

1. Unclear role of the District
2. Outside influences
3. Water quality
4. Flooding and floodplain management
5. Erosion and sediment control
6. Groundwater
7. Commercial and recreational navigation
8. Public education and outreach
9. Potential problems

E3. WATERSHED MANAGEMENT FRAMEWORK

Section 3.0 presents the management framework of the Plan in terms of goals, policies, strategies, and standards. This framework is based on the issues identified by the TAC, CAC, and Manager, given their priority and the adequacy of existing controls. The mission and purpose of the District, presented below, were also taken into consideration when developing the framework.

E3.1. MISSION

The mission of the District is to manage and protect the Minnesota River, lakes, streams, wetlands, and groundwater, and to assist and facilitate in providing river navigation by:

- Promoting open communication, and partnering, with citizens, community organizations, and local, state, and federal agencies.
- Improving and protecting the quality of the Minnesota River and all water bodies in the watershed.
- Minimizing the negative effects of floods and droughts on the Minnesota River and all water bodies in the watershed.
- Collecting and distributing information regarding surface water and groundwater in the watershed to assist in establishing priorities and developing local plans to improve water resources in the watershed.
- Monitoring and understanding the effects of municipal groundwater appropriations and drought on groundwater levels.
- Working with LGUs to enforce the Wetland Conservation Act.
- Assisting and facilitating the efforts of state and federal agencies to maintain the navigation channel.
- Educating stakeholders about the impact they have on the water resources in the watershed and motivating them to change behaviors that have a negative impact.

E3.2. WATERSHED PURPOSE

The Metropolitan Surface Water Management Act states that the purposes of the District and other water management programs (quoted from M.S.103B.201) are as follows:

- Protect, preserve, and use natural surface and groundwater storage and retention systems.
- Minimize public capital expenditures needed to correct flooding and water quality problems.
- Identify and plan for means to effectively protect and improve surface and groundwater quality.
- Establish more uniform local policies and official controls for surface and groundwater management.
- Prevent erosion of soil into surface water systems.
- Promote groundwater recharge.
- Protect and enhance fish and wildlife habitat and water recreational facilities.
- Secure the other benefits associated with the proper management of surface and groundwater.

Unlike other water management programs in the state subject to M.S.103B, the District has an additional purpose, as noted in the District's mission, which is to assist and facilitate the efforts of state and federal agencies to maintain the Minnesota River 9-Foot navigation channel.

E3.3. GOALS

The following goals were established by the District. These goals are not presented in any particular order and do not reflect rank within the District.

- Goal 1: Organizational Management: – To manage the different roles of the District
- Goal 2: Surface Water Management – To protect, preserve, and restore surface water quality
- Goal 3: Groundwater Management – To protect and promote groundwater quantity and quality
- Goal 4: Unique Resources Management – To protect and manage unique resources
- Goal 5: Wetland Management – To protect and preserve wetlands
- Goal 6: Floodplain and Flood Management - To manage floodplains and mitigate flooding
- Goal 7: Erosion and Sediment Control – To manage erosion and control sediment discharge
- Goal 8: Commercial and Recreational Navigation – To maintain and improve navigation and recreational use of the Lower Minnesota River
- Goal 9: Public Education and Outreach – To increase public participation and awareness of unique natural resources and the Minnesota River

E3.4. PLAN IMPLEMENTATION

The three major elements of the implementation program described in Section 4 are highlighted below:

Administrative/Managerial Efforts: This includes staffing, day-to-day operations, and funding for audits, reporting, training, and contingency.

Studies and Programs: The Plan includes the following studies and programs.

- Governance study
- Monitoring and data collection
- Data analysis and assessment
- Cost share incentive program
- Water quality restoration program
- Conservation easement studies
- Resource inventory and assessment program (Strategic Resource Evaluation)
- Dredge material beneficial use plan
- Dredge material management plan execution
- Education and Outreach Program
- District monitoring program
- Wetland and Fen Assessment

Capital Improvements Projects: The Plan includes the projects listed below in Table E-1. Additional projects can be added during the annual meeting before the start of the budgeting process.

Table E-1: Lower Minnesota River Watershed District – Capital Improvement Projects*

Project Name	Project Partner	Estimated Cost	Estimated Timeline
Gully Erosion Projects	LGUs	$125,000	2012-2016
Mound Springs Gully Project	City of Bloomington	$250,000	2013-2014
Seminary Fen Restoration at Engler	City of Chaska	$35,500	2012
Ravine Stabilization at Seminary Fen	City of Chaska	$400,000	2012-2013
Heritage Hills Park and Gully Restoration Project	City of Bloomington	$100,000	2015-2016
Dean Lake Restoration Project	Scott County, City of Shakopee and Prior Lake Spring Lake WD	$200,000	2014-2016
Minnesota River Study Area 3 Bluff Stabilization	City of Eden Prairie	$250,000	2016
Bluff Creek Restoration Project	DOT, City of Chanhassen and Riley-Purgatory Bluff Creek WD	$50,000	2015
Long Meadow Outfall Project	City of Bloomington	$100,000	2014-2015
Wetlands and Fens Assessment	DNR and BWSR	$45,000	2016
Brickyard Clayhole Lake – Gully Stabilization	Cities of Chaska and Carver	$100,000	2016
East Chaska Creek Restoration	City of Chaska, Carver County Env. Services and Carver Soil and Water Conservation District (CSWCD)	$93,500	2018-2019
Riley Creek Restoration	City of Eden Prairie	$168,500	2018-2019

* Costs presented in this table represent the District's portion pending a match of up to 50 percent from project partners.

E3.4.1. LOCAL WATER PLANS

The required content of local water plans, as stipulated by MN 8410, is addressed in Section 4.2.1-4. In general, local water plans shall include

- Surface Water, Ground Water, Wetlands, Floodplain and Flood Management, Unique Natural Resources, and Erosion and Sediment Control Goals and Policies

- Watershed Management Standards
- Water Conservation Act (WCA) responsibilities and Wetland Inventories and Management Plans

E3.5. MEASURABLE OUTCOMES

The success of this Plan will be measured by the successful implementation of policies and strategies set forth to attain the nine identified goals mentioned above. Recognizing that the best measure of success is more quantitative and less qualitative, the trends generated by the annual review and assessment of program short-term and long-term metrics will be used to determine success. The short-term and long-term metrics are provided below in Table E-2.

Table E-2: Lower Minnesota River Watershed District Short-term and Long-term Metrics

Goal	Short-term Metric	Long-term Metric
Goal 1: Organizational Management	Completion of scheduled activities Annual LGU Audits Amount of dollars leveraged for projects from other agencies and property owners	Formation of a Minnesota River Basin Commission
Goal 2: Surface Water Management	Number and types of projects completed as part of the Cost Share Incentive Program and Water Quality Restoration Programs Number of targeted studies and projects completed	Trends in water quality parameters identified for monitoring efforts
Goal 3: Groundwater Management	Number of targeted studies and projects completed	Trends in water quality parameters identified for monitoring efforts
Goal 4: Unique Natural Resources Management	Number of targeted studies and projects completed	Number and acreage of unique natural resources protected, restored or enhanced Acquisition of high valued easement
Goal 5: Wetland Management	Completion of scheduled activities	Number and acreage of wetlands protected, restored or enhanced
Goal 6: Floodplain and Flood Management	Completion of scheduled activities	Number of structures damaged and value of flood damages
Goal 7: Erosion and Sediment Control	Completion of scheduled activities	Trends in water quality

Goal	Short-term Metric	Long-term Metric
Goal 8: Commercial and Recreational Navigation	Completion of scheduled activities Number of targeted studies and projects completed	Secure regular congressional and state legislative funding for the 9-foot channel
Goal 9: Public Education and Outreach	Number and types of sponsored events Number of participants at events Number of articles, press releases and pamphlets developed Number of articles, press releases and pamphlets printed Number of volunteers	Same as short-term metrics

INTRODUCTION

This section provides introductory information about the Lower Minnesota River Watershed District (District), including the history, location, boundaries, unique characteristics, and how the District is managed.

I1. HISTORY

In 1955, the Minnesota State Legislature enacted the initial Minnesota Watershed Act, previously called Minnesota Statute (M.S.) Chapter 112. Pursuant to this statutory authority, five counties (Hennepin, Ramsey, Dakota, Scott, and Carver) petitioned for the establishment of a watershed district. On March 23, 1960, the Minnesota Water Resources Board, now the Board of Water and Soil Resources (BWSR), established the Lower Minnesota River Watershed District.

The District was originally petitioned for in 1957, the first such petition in Minnesota. However, the petition was challenged and defeated in the courts. Meanwhile, on the national stage, the U.S. Congress ordered the U.S. Army Corps of Engineers (COE) to deepen the Minnesota River channel from four to nine feet from the confluence with the Mississippi River to river mile (R.M.) 14.7 in Savage, Minnesota. The congressional order required the COE to partner with a local regulatory entity to serve as the local sponsor. The District's original practitioner re-petitioned for the formation of a watershed district and added to the petition the role of local sponsor to the COE for the 9-Foot channel. The re-petition was successful, establishing the District in 1960, making it the second watershed district in Minnesota.

Minnesota state statutes and rules affecting watershed districts (WDs) and water management organizations (WMOs) have broadened the role of WDs in water management, especially in the Twin Cities metropolitan area. The statutes affecting WDs and WMOs in the metropolitan area were recodified to M.S.103D and M.S.103B, respectively. One requirement of the statutes is that WDs and WMOs, complete watershed management plans and update them every ten years. The District adopted its first Plan in 1961, and updated it in 1973. The next Plan, drafted in 1989 was never adopted or implemented in the District because of the extended length of time review agencies took to provide comments and because the rules governing Plan development were in flux. On August 25, 1999, BWSR approved the second generation plan, which was officially adopted by the Board of Managers (Managers) on September 14, 1999. This represents the third generation Plan.

I2. LOCATION AND BOUNDARIES

The District is located in the southwest part of the Twin Cities metropolitan area along the Minnesota River. The District encompass an area of 80 square miles of Carver, Hennepin, Dakota, Scott, and Ramsey counties, which includes the Minnesota River valley from Fort Snelling, at the confluence of the Minnesota and Mississippi rivers, upstream to Carver,

Minnesota. The width of the District includes the bluffs on both sides of the Minnesota River within this reach of the river. Portions of the communities of Mendota Heights, Mendota, Lilydale, Eagan, Bloomington, Burnsville, Savage, Shakopee, Eden Prairie, Chanhassen, Chaska, Chaska Township, Jackson Township, Louisville Township, and Carver are located within the District's boundaries. The legal description is in Appendix B.

I3. DISTRICT CHARACTERISTICS

The goals, policies, strategies, implementation plan, and capital improvements program set forth in this Plan reflect the specific characteristics of the District. The features of the District include:

- The District boundary generally follows the Minnesota River watershed up to the bluff line.
- Both quantity and quality of surface water resources are very closely tied to groundwater.
- Unique and rare water resources in the District include floodplain wetlands, calcareous fens, and trout waters.
- The District plays a critical role in commercial navigation, as stated in the original order creating the District.
- The District contains the upper reaches of the navigation pools created by Lock and Dam No. 2 on the Mississippi River at Hastings.

I4. DISTRICT MANAGEMENT

The affairs of the District are administered by five Managers appointed by County Commissioners from the county in which he or she resides. Presently, two Managers are appointed by Hennepin County. And one Manager each is appointed by Carver, Dakota, and Scott counties. (Ramsey County is no longer represented on the Board; since only a small uninhabited area of the county is within the District's boundaries.) Appointments are for staggered three-year terms and each Manager is eligible for reappointment. Table I-1 lists every Manager who has served, their term of office, and county of residence.

Since 1960, the Managers have met regularly each month. The Managers currently meet in the evening on the third Wednesday of each month. Public notice is provided for all meetings, and all are open to the public.

Financial records are provided monthly to the Managers. Annually, the Managers authorize and obtain financial audits of the District's books and records. In addition, the Managers review and propose a budget, initially prepared by the District administrator, for the following year. After a public hearing, the budget is approved for implementation.

Table I-1: Lower Minnesota River Watershed District Board of Managers (1960 - Present)

Manager	Term of Office	County Represented
Kenneth W. Westerberg	1960 – 1966	Scott
Charles H. Bingham	1960 – 1968	Ramsey
Alfred W. Hubbard	1960 – 1972	Hennepin
Casimir A. Lubansky	1960 – 1981	Carver
Jens A. Caspersen	1960 – 1984	Dakota
Merrill M. Madsen, Jr.	1966 – 1978, 1984 – 1994	Scott, Dakota
William J. Jaeger, Jr.	1968 – 1977, 1983 – 1994	Ramsey, Hennepin, Hennepin
Paul G. Fallquist	1972 – 1983	Hennepin
Russell A. Sorenson	1977 – 1992	Hennepin
J. William Kennedy	1978 – 1981	Scott
Russell K. Heltne	1981 – 1987	Scott
Cyril B. Ess	1981 – 1996	Carver
Jim A. Kephart	1988 – 1999	Scott
Edward A. Schlampp	1992 – 2012	Hennepin
Wallace E. Neal	1994 – 2002	Hennepin
Eugene A. DePalma	1995 – 1999	Dakota
Terry L. Schwalbe	1996 – 2002	Carver
Glenda Spiotta	1999 – 2002	Scott
Ronald Kraemer	2001 – 2008	Dakota
Stephen B. Dalsin	2002 – 2003	Hennepin
Lawrence Samstad	2002 – 2011	Scott
Leo Forner	2003 – 2006	Carver
Leonard Kremer	2003 – Present	Hennepin
Kent Francis	2006 – Present	Carver
Don McCready	2009 – 2010	Dakota
Carla Shutrop	2011 - 2013	Scott
Yvonne Shirk	2011 – Present	Dakota

The District maintains a Citizen's Advisory Committee (CAC) as an advisory committee to the managers. The CAC meets quarterly to:

- Act as liaison between the District and residents.
- Increase public awareness by educating District residents about actions to protect and improve water resources and habitat within the District.
- Advise the managers and staff on issues important to residents.

The District will consult with some or all of the Technical Advisory Committee (TAC), whose current members are listed in the Foreword of this Plan, on an as-needed basis, no less than twice a year to assist with the following activities:

- Preparing a governance study to research the options of expanding or contracting the District's boundary.
- Perform the District's biennial program review
- Implement Goals 4 and 9 of this Plan which increase the participation and awareness of unique natural resources and the Minnesota River.
- Implement Goal 9 of this Plan which is to increase public participation and awareness of unique natural resources and the Minnesota River

I5. 1999 TO 2010 ACCOMPLISHMENTS

The District has been invaluable in managing and protecting the Minnesota River, lakes, streams, wetlands, groundwater and unique resources and responding to the needs of their constituents and partners. A review of the District's performance in carrying out implementation activities specified in its 1999 Second Generation Watershed Management Plan (Second Generation Plan) was performed and is presented in Table I-2 below.

Table I-2: Lower Minnesota River Watershed District - Second Generation Plan Evaluation

ID Number	Planned Implementation Activity (Table 6-1, Second Generation Plan)	Accomplishments to Date
1	Acquire dredge material disposal sites.	In 2006, the District acquired the 18 acre River Mile (R.M.) 14.2 site. This site meets the COE needs for a dredge material disposal site above the I-35W river crossing. The District now has the task of acquiring a site to service dredge material disposal from the Minnesota and Mississippi River confluence upstream four miles. The District has been in contact with COE, DOT, USFWS, and the USAF to locate potential sites in the area. This effort has been temporarily suspended as the District awaits a COE cost/benefit analysis comparing the cost of dredge disposal site acquisition in the lower reach to transporting the material to an existing site in St. Paul.
2	Acquire permanent road access to dredge material disposal sites.	Permanent road access was acquired for the R.M. 14.2 site in 2010.
3	Manage dredge material disposal sites.	In 2001 and 2005, the District removed material from its previous leased disposal site at a cost of $240k. The costs were associated with the terms of the lease. The lease was not renewed in 2007 due to the District's acquisition of the RM 14.2 site in 2006.

ID Number	Planned Implementation Activity (Table 6-1, Second Generation Plan)	Accomplishments to Date
4	Develop and implement public/private dredge material management plan (DMMP).	Although the District did not formally develop a DMMP, steps were taken by the District to manage dredge material. In 2006, the District lobbied the State Legislature to modify state statute which allows the District to receive material from private river dredging and charge for this service.
5	Complete and revise joint resolutions with local governments regarding water management responsibilities.	Joint resolutions with all local governments were completed in 2001.
6	Maintain active citizen and technical advisory committees.	A citizen's advisory committee and technical advisory committee were established as part of the 3rd Generation Management Plan process.
7	Participate in discussions regarding possible expansion/contraction of the District boundaries.	In 2000, the District expanded its boundaries to include a portion of the Metropolitan Airport Commission's (MAC) Minneapolis-St. Paul Airport. Currently, 80% of the MAC's land is within the District with 100% of its storm water draining into the District.
8	Project/plan review.	The District reviews projects and plans as requested by LGUs per the joint resolutions with those entities. In addition, the District performs an annual informal audit to ensure that the joint resolutions with the LGUs are enforced.
9	Inspect projects.	The District inspects projects as they occur and contracts with SWCD's for inspection services when necessary.
10	Administer the District's floodplain regulations during interim period between its plan approval and local plan/ordinance approval.	Most LGUs within the District currently have floodplain ordinances. The District has administered floodplain regulations when appropriate as in the case of the Huber Park redevelopment in the City of Shakopee.
11	Publish and distribute annual newsletter.	From 2000 to 2003, the District published an annual newsletter. In 2004, the District began placing quarterly articles on its webpage in addition to articles, reports, and meeting minutes.
12	Identify and inventory the District's resources, distribute map to local units of government.	In 2004, the District adopted the Guidance to Implementation in order to move their implementation agenda forward. The document included identification and inventory of resources managed by the District.

ID Number	Planned Implementation Activity (Table 6-1, Second Generation Plan)	Accomplishments to Date
13	Collect existing water quality, biological and physical data for priority resources.	In the early 2000's, the District began monitoring East and West Chaska Creeks, Assumption, Spring, Willow and Eagle Creeks and Unnamed Trout Stream 7, along with extensive fen groundwater monitoring, including Nicol's, Fort Snelling, Quarry Island and Savage fens. In November 2005, the district adopted and began implementation of a groundwater monitoring strategy for the calcareous fens and trout streams in the District. The District also works with Carver County and the City of Chaska on monitoring and reporting of the three quarry lakes (Fireman's, Clayhole and Courthouse) in Chaska.
14	Assess priority resources and report results - Phase 1: data collection.	In 2004, the District adopted the Guidance to Implementation in order to move their implementation agenda forward. As part of the study, a comprehensive survey and review of ongoing resource management and monitoring efforts in the watershed was performed in an effort to assess critical areas. This included a written survey and follow-up discussions with the multiple cities, counties, agencies and individuals working on resource management in the watershed. The implementation strategy in the District's Second Generation Plan was then reviewed in the context of the resource management assessment. Specific activities in the Second Generation Plan were refined and prioritized, and additional activities were added based on discussions with stakeholders in the watershed. The result was a prioritized Implementation Guidance table, to allow the District to move forward in a proactive, systematic fashion.
15	Assess priority resources & report results - Phase 2: data and watershed analysis.	See comment for ID #14.
16	Lead consensus effort to develop goals for priority resources; assist (technically and financially) with development of resource plan for priority resources; publish plan.	See comment for ID #14.
17	Implement resource plan: undertake petitioned projects, provide financial support for capital projects, and public information efforts.	See comment for ID #14.

ID Number	Planned Implementation Activity (Table 6-1, Second Generation Plan)	Accomplishments to Date
18	Review local water management plans for conformance with the Second Generation Plan.	The District has reviewed the following local water management plans: City of Bloomington, City of Burnsville, Black Dog Watershed Management Organization (WMO), City of Carver, City of Chanhassen, City of Chaska, City of Eagan, City of Eden Prairie, City of Lilydale, City of Mendota Heights, City of Savage, City of Shakopee, Carver County WMO, Scott County WMO, Riley-Purgatory-Bluff Creek Watershed District (RPBCWD), Nine Mile Creek Watershed District (NMCWD), Gun Club Lake WMO, and the City of Mendota Comprehensive Plan.
19	Minnesota River floodplain redefinition study.	This study was completed in 2003 and the results have been shared with the DNR. The report has been used for the redefinition of floodplains in all counties within the District.
20	Collect and distribute hydrologic information pertaining to the Minnesota River and needed by communities for planning and resource management.	The District continues to collect and distribute data on its website in cooperation with the DNR, MCES, USGS, COE, counties and cities.
21	Identify, inventory, and map gully erosion and resultant siltation sites in the District. Add information to database.	In 2006 and 2007, the District hired the Minnesota Civilian Conservation Corps (MCCC) to inventory gullies within its boundaries. The inventory identified gullies with current and potential erosion and pollution issues. Cities then reviewed the information and chose the top 3-4 public sites in each that needed immediate attention. Feasibility analyses were completed by the Cities. As a result, four cooperative projects with the cities of Eden Prairie and Bloomington have been completed: Bloomington Parkers Picnic Area, the District contributed $22,265 for the restoration of a ravine including fill, grading, plantings and erosion control; Bloomington Minnesota River Valley Washout, the District contributed $98,214 for stream bank restoration on an unnamed stream near Lyndale Avenue and the Minnesota River; Eden Prairie Area 4, the District contributed $40,412 for stream bank restoration on Purgatory Creek; Eden Prairie Area 3 River Bank failure, the District contributed $78,704 for a feasibility study of this area of concern at R.M. 19.6 on the left descending bank.

ID Number	Planned Implementation Activity (Table 6-1, Second Generation Plan)	Accomplishments to Date
22	Participate in Metropolitan Council's Watershed Outlet Monitoring Program to monitor stream outlets into the Minnesota River.	The District, in cooperation with the Met Council, DNR, Scott SWCD, Dakota SWCD, and Carver County Environmental Services monitor the following streams: Chaska Creek, East Chaska Creek, Assumption Creek, Eagle Creek and Willow Creek. Thermal monitoring of Unnamed Trout Stream #7 is also being carried out.
23	Undertake petitioned bank erosion control projects for bank control measures on the Minnesota River.	As a result of the 2006/2007 gully inventory, the City of Eden Prairie petitioned the District to investigate an area of severe erosion near R.M. 19.6. The District hired a consultant to do further investigation of the site and offer 3 alternatives to solve the issue. The alternatives proposed to correct the situation range from $1 - $3 million. In consideration of the costs associated with the project, the District managers believed that funding should be provided by the state instead of a District wide or project levy.
24	Undertake petitioned bank erosion control projects for bank control measures on tributaries of the Minnesota River.	Three gully inventory projects in Eden Prairie and two projects completed in Bloomington, described above under implementation item 21, address bank control measures on tributaries to the Minnesota River.
25	Greenbelts - acquire conservation easements for stream buffers, shorelands, and other sensitive natural areas.	The District worked closely with the DNR and the Minnesota Legislature for the acquisition of private land at Seminary Fen for a Scientific and Natural Area (SNA) and the expansion of Raguay Wildlife Management Area (WMA) in 2008. The District provided in-kind services to acquire these areas. Currently, the District continues to work with the DNR, Chaska, Chanhassen, and the private land owners in the area of Seminary Fen for acquisition of those parcels identified as critical for protection of the Fen.
26	Develop public access to, and facilitate public enjoyment of, the District's resources.	The District provided $70k in funding of the Kraemer Nature Center in the City of Burnsville. The District provided $30k in funding of and relocation of the Shakopee boat launch site which is dedicated to longtime District consultant and manager Lawrence Samstad (Sam's Landing). The District provided $30k to the USFWS for two demonstration projects consisting of 1) construction of vernal ponds at the Bloomington Visitor Center and 2) conversion of the existing parking lot storm sewer system to a rain garden system. The District also provided in-kind services with these projects.

Below are additional items accomplished by the District:

- Introduced a Bill to create a Minnesota River Basin Commission. This should provide capital to assist with dredge material management and water quality.
- Collaborated with the Metropolitan Council and USGS on a water quality study of the Lower Minnesota River.
- Assisted the city of Eden Prairie with resolving flooding at the Charleston Road Development.
- Funded the watershed outlet monitoring program (WOMP), in cooperation with Scott Dakota and Carver Counties soil and water conservation districts (SWCD's) and the city of Chaska for Eagle Creek, Willow Creek, and east and west Chaska Creek
- Revised the District's boundary near the Minneapolis/St. Paul (MSP) International Airport.
- Served as a mediator between DOT and the Minnehaha Creek Watershed District in matters surrounding the re-design of highways 55 and 63 and the historic Camp Cold Water Springs. As a result of the District's participation in the matter, BWSR authorized the incorporation of approximately 3,500 acres near MSP airport.
- Ongoing services:
    - Fen wells monitoring in cooperation with SWCD for Scott and Dakota counties since 2007.
    - WOMP Streams
    - District Project Reviews: The District provides comments to cities regarding needed best management practices (BMPs) flooding concerns and other water management issues. In addition, the District follows up on those reviews with inspections to determine if recommended suggestions were implemented.

Based on the results of this comparison, it can be concluded that the District adequately addressed planned implementation activities. A major step towards reprioritizing implementation actions was the District's 2004 Guidance to Implementation document which is described above in Table I-2 under ID #14. Table I-3 shows the District's efforts to implement the activities listed in this document. Since 2004, the District has addressed nine of the fourteen implementation actions in the 2004 Guidance to Implementation document.

Table I-3: Assessment of Lower Minnesota River Watershed District's Performance executing the 2004 Guidance to Implementation

Number	*Action*	*Accomplishments to Date*
1A	Develop management plans for Courthouse Lake, Firemen's and Clay Hole Lake that outline strategies for protection and/or improvements as may be appropriate for each waterbody.	Completed in November 2004.
1B	Outline the watershed, identify stakeholders and initiate efforts for the development of a management plan for Assumption Creek and watershed.	This is an ongoing project. The District is currently working on a "Stewardship Plan" in cooperation with the Met Council, DNR, and the cities of Chaska, and Chanhassen. The Met Council is taking the lead on this effort as they were given a grant by the 2010 legislature to lead this effort.
1C	Keep the integrity of Dean Lake intact by maintaining existing conditions. Work with City and Prior Lake/Spring Lake Watershed District (PLSLWD) to maintain a wildlife corridor around lake.	The District has been and continues to work with the City of Shakopee and the PLSLWD for the protection of this waterbody.
1D, 1E	Work with the Minnesota River Board (MRB) to compile loading comparisons / summaries for monitored tributaries as data allows (MRB takes technical lead).	The District continues its aggressive stream monitoring program and posts the unchecked information on its web page on a quarterly basis.
1F	Act as a facilitator to bring together various stakeholders in Nicols Fen, Harnack and Kennealy Creeks (and possibly unnamed trout stream #1)	The district has developed a monitoring plan for these resources and has partnered with the Gun Club Lake WMO and developed a monitoring plan for Nichols fen. The district also coordinated the repair of storm water erosion problem created by drainage from DOT right-of-way.
1G	Assist City of Burnsville in assessing and possibly devising approach to remediate bank erosion problems along Minnesota River.	The District initiated talks with the COE for the repair of and or protection of the river banks adjacent to Black Dog Road. The COE stated the only funds available for this type of project were for areas which have infrastructure which was damaged as a result of erosion and nothing available for preventative measures. We then approached the City of Burnsville and due to budget issues they had no interest in participating in a project.
2A	Support City of Eagan in implementation of infiltration features in Cedar Grove.	No action. The project has been delayed due to economic conditions which have placed redevelopment in this area on hold.
2B	Assist in implementing Credit River Erosion Control Plan.	The City of Savage completed this Plan with grant monies from the State.
-	Develop overall TMDL strategy for all impaired reaches within the District.	No action.

Number	*Action*	*Accomplishments to Date*
2C	Assist in design/construction of stormwater quality retrofit improvements in downtown Chaska.	The District has worked closely with the City on redevelopment projects in the old town area of the City. As a result of this cooperation the City has installed several BMPs (sumps, proprietary devices, etc...) when reconstructing streets and other infrastructure.
2D	Assist City of Burnsville in assessing restoration potential of unnamed trout streams 4 and 7.	The District has installed thermal monitoring on unnamed trout stream 4.
2E	Conduct lake and watershed assessment for Black Dog Lake.	No action. Xcel energy owns the lake and is planning extensive alterations to their cooling operations
2F	Develop linked P8 model for that portion of the Black Dog watershed within the District.	No action. See number 2E above
-	Evaluate further potential implementation opportunities for Wedgewood Marsh, Blue Lake, Coleman Lake, Nine Mile Lake, Gun Club Lake, Fisher Lake, Nyssens Lake, Gillford Lake, Cyess Lake, Rice Lake, Long Meadow Lake, Snelling Lake, Riley Creek, Bluff Creek, Carver Creek, East Chaska Creek, and Chaska Creek.	Due to the frequent flooding of these floodplain lakes the District has chosen not to spend large amounts of money on these lakes. The District has worked with the DNR on a potential invasive control on Snelling Lake but this project has been deferred until completion of a MAC storm sewer project which impacts the lake is completed. Coleman Lake has been placed on hold due to the discovery of the Northern Cricket Frog. This frog is on the Minnesota Endangered Species List. All of the creeks listed have minor portions within the District. The District continues to work with WMO's and WDs on monitoring and TMDL development for these streams. The District plans to update resource inventories and assessments to identify potential implementation activities during the first two years after adoption of the 3rd Generation Watershed Management Plan.

1.0 LAND AND WATER RESOURCES INVENTORY

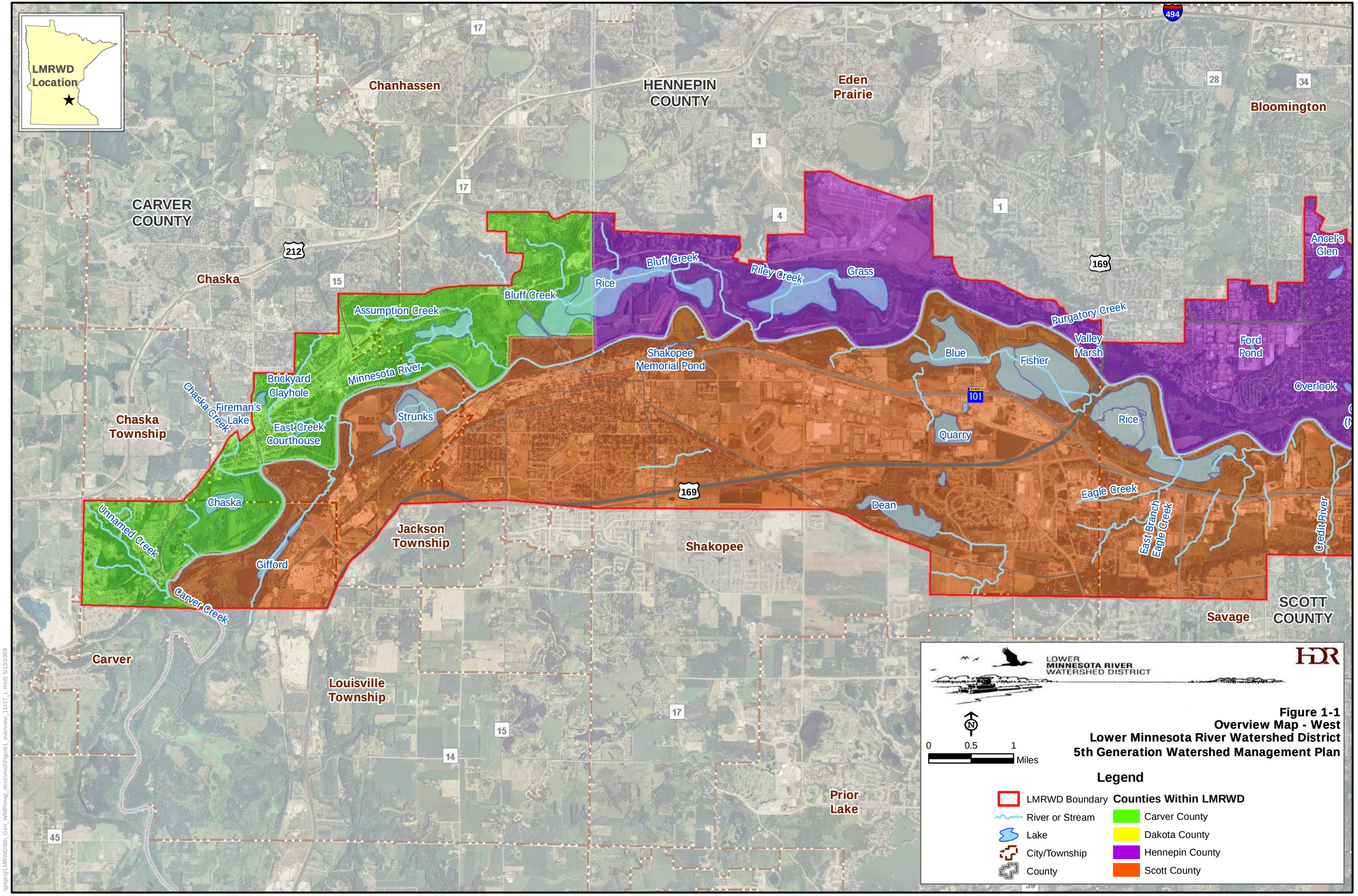
1.1 INTRODUCTION

The District is situated in the southwest portion of the Minneapolis-St. Paul (MSP) metropolitan area and covers an area of approximately 80 square miles. The District's boundary generally follows the bluff line along both banks of the Minnesota River for approximately 32 river miles (R.M.) from the City of Carver and Louisville Township in the west, to the Minnesota River's confluence with the Mississippi River in the east. The District's jurisdiction covers twelve cities, three townships, and five counties, and spans the north bank of the Minnesota River from the City of Carver in Carver County to the City of Minneapolis in Hennepin County, and the south bank of the Minnesota River from Louisville Township in (Figure 1) and Scott County to the City of Mendota in Dakota County (Figure 1-1 and Figure 1-2).

This section presents the land and water resource information for the District in accordance with M.S. 103B.231 and MN Rules 8410.0060. The statutes and rules require this plan to "contain an inventory of water resource and physical factors affecting the water resources based on existing records and publications." The paragraphs below provide general information on climate, watershed characteristics such as geology and soils, surface water resources, groundwater quality and its susceptibility to contamination, fish and wildlife habitat, the human environment, unique features, and potential pollutant sources.

1.2 CLIMATE AND PRECIPITATION

Minnesota has a continental climate, which means it is not affected by the moderating effects of any ocean. Given its mid-latitude location, the District has four distinct seasons. Winters are generally cold and subject to arctic outbreaks while summers are often subject to prolonged heat due to an influx of warm air from the southwestern United States, or warm, humid air from the Gulf of Mexico. Spring and fall are the moderate times of year, but can have outbreaks of severe thunderstorms due in large part to the interaction of cold and warm air masses, which dominate in winter and summer. The following sections document weather station information and temperature and precipitation trends for the District from 1971-2000.



\\gisprojs\LMRWD\5th Gen WMP\map_docs\mxd\Figure1_overview_11x17_L.mxd 5/13/2009

LMRWD Location

Minnetonka
Edina
HENNEPIN COUNTY
Richfield
Minneapolis
St. Paul
Mendota
Mendota Heights
Eagan
DAKOTA COUNTY
Eden Prairie
Bloomington
Burnsville
Savage
SCOTT COUNTY

Pike Island Marsh
Snelling
Gun Club
Cemetery Pond
Long Meadow
Hohag Pond
Kennaley's Creek
Harnack Creek
Unnamed to Black Dog Lake
One Mile Creek (Unnamed #4)
Minnesota River
Black Dog
Unnamed #7
Ninemile Creek
Ancel's Glen
Ford Pond
Overlook
Coleman (Nine Mile)
Valley Marsh
Purgatory Creek
Grass
Blue
Fisher
Rice
Quarry
Dean
Eagle Creek
East Branch Eagle Creek
Credit River

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

N

0 0.5 1 Miles

Figure 1-1
Overview Map - West
Lower Minnesota River Watershed District
5th Generation Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- City/Township
- County

Counties Within LMRWD

- Carver County
- Dakota County
- Hennepin County
- Scott County

\\pisproi\LMRWD\5th_Gen_WMP\map_docs\mxd\Figure1_overview_11x17_L.mxd) 5/13/2009

1.2.1 Weather Station

The MSP Airport Station of the United States National Oceanic and Atmospheric Administration (NOAA) is a "first order" (those maintained by either the National Weather Service or Federal Aviation Administration) weather station located less than 2 miles from the northern boundary of the eastern end of the District. The National Weather Service forecast office for the metropolitan area, located in Chanhassen, also records weather data. There is also a cooperative weather station at Chaska. The Chaska station provides minimum and maximum air temperature readings once a day, plus precipitation measurement. The Minnesota State Climatology Office manages a network of stations within the District and provides more detailed local weather data.

1.2.2 Temperature

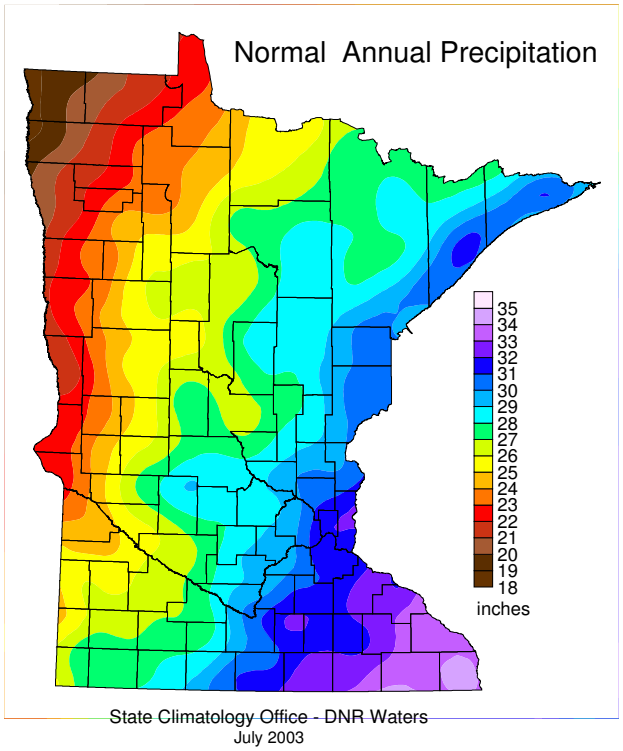
The highest temperature on record at the airport station to date was 108ºF, set in July 1936, and the lowest temperature was -34ºF, set 6 months earlier in January 1936. Extreme temperatures tell little except that in one season, temperatures can range from uncomfortably hot to bitterly cold. In general, temperature varies greatly from season to season, or even from day to day. However, temperature differences across the District are slight, as is evidenced from a comparison of the MSP Airport station data with the Chaska station data. The average annual temperatures of the two stations for the current 30-year period are 45.4ºF and 46.4ºF, respectively (MRCC 2000-2010).

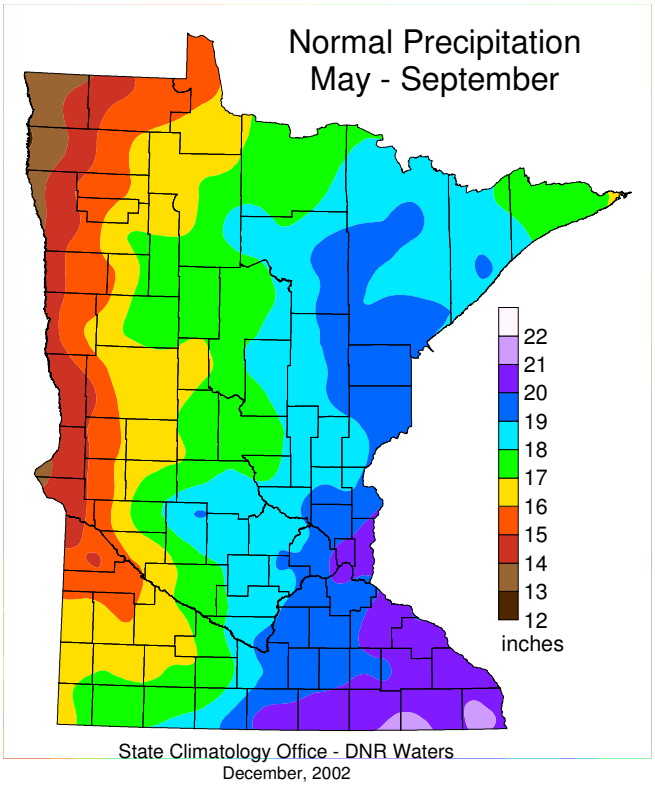
1.2.3 Precipitation

For the current 30-year period, average total annual precipitation at the MSP Airport station and the Chaska Station is 29.4 inches and 30.6 inches, respectively. The difference of one inch of average total annual precipitation does not indicate any significant tendency for any one part of the District to get more precipitation than another. However, in a given event, and especially in the warm season, storm precipitation totals can widely vary between individual stations within a region. Annual precipitation of 17.90 inches in 1987, and 9.82 inches in 1990, is another example of how extremes can occur in the area within a relatively short period of time (MRCC 2000-2010).

Average annual precipitation for the current 30-year period over the state of Minnesota is shown in Figure 1-3, which also shows the current 30-year (1981-2010) average precipitation for May to September, and April through October, respectively. Table 1-1 gives a precipitation summary for the MSP Airport station. Over the entire Minnesota River watershed, annual precipitation ranges from 22 inches in the west to 31 inches in the east.

Figure 1-3: Normal Precipitation





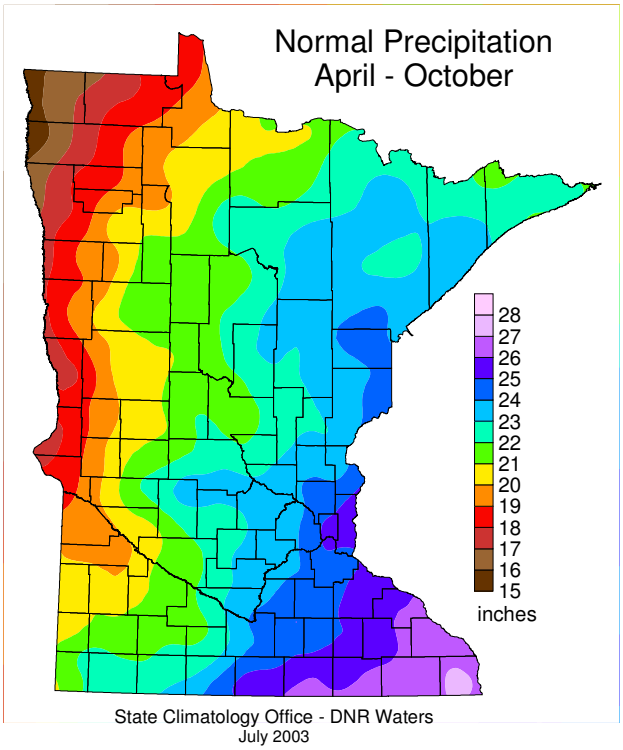


Table 1-1: Precipitation Summary - Minneapolis/St. Paul Airport Station Averages1981-2010 Extremes: 1891-2010

Total Precipitation, Inches					Snow inches		# Days with Precipitation	
Month	**Normal**	**Max Yr**	**Min Yr**	**1-Day Max**	**Normal**	**Max Yr**	**≥ .01**	**≥ 1.00**
Jan	0.90	3.63 1967	0.10 1990	1.21 1967	12.2	46.4 1982	8.9	0.0
Feb	0.77	2.14 1981	0.06 1964	1.34 2012	7.7	26.5 1962	7.4	0.0
Mar	1.89	4.75 1965	0.32 1994	1.66 1965	10.3	40.0 1951	9.3	0.2
Apr	2.66	7.00 2001	0.16 1987	2.58 2006	2.4	21.8 1983	10.7	0.4
May	3.36	9.3 2012	0.53 2009	3.39 2012	0.0	2.4 1954	11.5	0.5
Jun	4.25	9.82 1990	0.22 1988	3.28 2003	0.0	0.0 N/A	11.3	1.1
Jul	4.04	17.90 1987	0.58 1975	10.00 1987	0.0	0.0 N/A	10.2	0.9
Aug	4.30	9.3 2007	0.43 1946	7.36 1977	0.0	0.0 N/A	9.7	1.3
Sep	3.08	7.53 1942	0.30 2012	3.55 1942	0.0	1.7 1942	9.8	0.8
Oct	2.43	5.68 1971	0.01 1952	4.83 2005	0.6	8.2 1991	9.2	0.4
Nov	1.77	5.29 1991	0.02 1939	2.91 1940	9.3	46.9 1991	8.7	0.3
Dec	1.16	4.27 1982	0.00 1943	2.47 1982	11.9	33.6 2010	9.8	0.1
Annual	**30.61**	**17.90 1987**	**0.01 1952**	**10.00 1987**	**54.5**	**46.9 1991**	**116.5**	**6.0**
Winter (DJF)	2.83	6.24 – 1967	0.69 – 1958	1.90 02/24/1930	32.0	71.7 – 1967	9.3	0.2
Spring (MAM)	7.41	16.13 – 1965	2.12 – 1910	3.16 05/21/1906	13.7	48.1 – 1965	17.8	1.0
Summer (JJA)	12.43	23.52 – 1987	1.73 – 1894	9.15 07/23/1987	0.0	0.0 – 1949	20.2	3.2
Fall (SON)	6.74	13.50 – 1911	1.71 – 1952	4.96 09/12/1903	10.6	55.1 – 1991	14.5	1.3

Thunderstorms are the main source of precipitation during the warm season and can cause damage of varying degrees due to excessive rain, strong winds, lightning, hail, or any combination. A primary interest of the District is heavy or persistent rainfall and runoff, which have the potential to cause flooding. Significant rainfall in June and July of 1993 in the Upper Midwest, combined with wet soil conditions, were the cause of severe flooding in the Upper Mississippi River Basin, including the Minnesota River (Larson 1996).

Snowfall throughout the entire Minnesota River Basin can be considerable and may cause flooding in the District if the spring thaw occurs rapidly. Rapid melting of snow in the entire watershed was one of the most important contributing factors to the Minnesota River floods in 1951, 1965, 1969, 1997, and 2001. The heaviest monthly snowfall recorded to date at the MSP Airport station was 46.9 inches in November 1991. Annually, snowfall has been recorded in all months except June, July, and August (MRCC-Snow 2000 - 2010).

Tornadoes and sleet or freezing rainstorms occur infrequently. Humidity, another variable in the overall climate picture, is of minor importance except that the Minnesota River Valley probably experiences higher humidity than the upland areas that border the valley. Fog or low clouds occur but not with sufficient frequency to warrant management concerns.

Generally, the summer precipitation far exceeds that of the winter; summer rainfall usually being sufficient for proper plant growth. From May to September, the growing months, the average rainfall is 18.4 inches, or about 62 percent of the normal annual precipitation. The growing season is approximately 156 to 160 days for the current 30-year period, but can be as short as 120 days to as long as 188 days. In a cold year, freezing temperatures may occur until the middle of May and begin again in early September. In a warm year, the last freezing temperature of the spring may occur in the first week of April, and not occur again until late October. When adequate precipitation occurs, this growing season is suitable for production of most crops typically grown in the region (MRCC-Growing 2000 - 2010).

1.2.4 Climate Variability in Minnesota

The primary source of moisture for warm-season precipitation in Minnesota is the warm, moist air that moves into the state from the Gulf of Mexico. Minnesota is located in a unique position relative to dominant air masses of the continent. To the west and north, the dominant air mass is semi-arid, while to the south and east, the dominant air mass is semi-humid. As a result, the annual precipitation in the state is highest in the southeast, and declines to the northwest.

Seasonal variability occurs as different air masses dominate. During the warm season in Minnesota, moisture from the Gulf of Mexico is often available, and is the reason the majority of the state's precipitation occurs between May and September. However, when this moisture source is obstructed, or when atmospheric patterns divert storm systems around Minnesota, drought conditions can occur.

When Gulf of Mexico moisture is abundant and numerous storms move through Minnesota, unusually heavy precipitation can lead to flash floods. Weather patterns that tend to persist over seasonal or longer periods are affected by the jet stream position, which is in turn influenced by ocean temperature anomalies. Thus, although Minnesota has a continental climate, the occurrence of extended periods of wetter or drier conditions is often influenced by what is happening with ocean temperatures and currents. Regardless of whether the temperature increases or decreases in the event of global climate change, the physical distance between the Gulf of Mexico and the District will remain essentially the same, as will the physical distance between the District and the U.S. and Canadian Rocky Mountains; thus the battle for dominance between semi-arid and semi-humid air masses will continue.

Given the multiple weather scenarios affecting Minnesota, wide ranges of climatic outcomes are normal. It is important to note that climate extremes should not be considered as aberrations, but rather treated as an inherent characteristic of a continental climate (DNR-Climate 2010).

1.3 GEOLOGY AND TOPOGRAPHY

1.3.1 Surficial Geology

The geological history of Minnesota includes several periods when great sheets of ice (glaciers) covered the upper Midwest region. The last period when the glaciers advanced as far as the Twin Cities was the Mankato sub-stage of the Wisconsin Glacial Age, about 11,000 years ago.

The Mankato glacier retreated in an erratic fashion. At times, the edge, or terminus, of the glacier remained relatively static for many years. At other times, it melted at a great rate and retreated rather quickly across the face of the land, geologically speaking. These two rates of glacier retreat determined the geology and topography of the District. First, the glacier deposited large quantities of granular material (glacial till) in the form of a terminal moraine (a row of rocks and soil originally pushed up by the advancing edge of the glacier) during its stationary period. The hummocky terrain on the uplands south of the District is typical of such deposits. Second, as the glacier retreated along what is now the Minnesota River Valley, the melt water from the glacier was drained by the Glacial River Warren, which cut a channel in the glacial deposits. That channel is now the Minnesota River Valley. While melting, the glacier released tremendous quantities of water. This water cut the channel much deeper than it appears today. At one time, water filled the valley completely, from Richfield on the north to the bluffs on the south side of the valley.

As the flow receded, the valley filled with sediment. Again, the recession was not continuous, so erosion and sedimentation varied. As a result, the lower valley filled irregularly. Vestiges of this irregular sedimentation appear in terraces, most prominently in the area around Shakopee. Alluvium and terrace deposits cover the majority of District. Moraine deposits and lesser

amounts of glacial outwash deposits cover the remainder of the District. A map of the surficial geology of the District is included as Figure 1 -4 and Figure 1-5 (Meyer, 2007).

1.3.2 Bedrock Geology

Information describing bedrock geology in the District was obtained from the Minnesota Geological Survey's 2000 bedrock geologic and topographic maps of the seven-county MSP metropolitan area (Mossler, J.H. and R. G. Tipping 2000). The bedrock geology and structure of the District is shown on Figure 1-6 and Figure 1-7. The reader is also referred to the Hennepin, Ramsey, Dakota, and Scott county geologic atlases and the hydrologic investigations atlas, which covers Carver County, for more detailed bedrock geology information.

From the western boundary of the District to the west edge of Shakopee, the Minnesota River floodplain follows a buried bedrock valley. The oldest and deepest bedrock formation in this valley is the St. Lawrence/Franconia formation, made up of dolomite and sandstone. At Shakopee, this bedrock valley veers to the north side of the Minnesota River floodplain. In the area of Fisher Lake in Shakopee, another bedrock valley intersects from the south and the combined valley follows an easterly path north of the District through Bloomington, passing into and across the District at the north end of Long Meadow Lake.

The majority of the District is underlain by the subcropping Prairie du Chien group, composed mainly of dolomite. Outcrops of this bedrock formation can be seen on the bluffs on the south side of the Minnesota River, especially in Scott County and the western edge of Dakota County. Between the deeper St. Lawrence/Franconia formation and the Prairie du Chien formation is the Jordan Sandstone, which usually follows the buried bedrock valley. The Jordan sandstone also subcrops on the north side of the Minnesota River floodplain in Bloomington. On the uplands at the very east end of the District are found the shallower St. Peter sandstone and Platteville and Glenwood Formations subcropping bedrock.

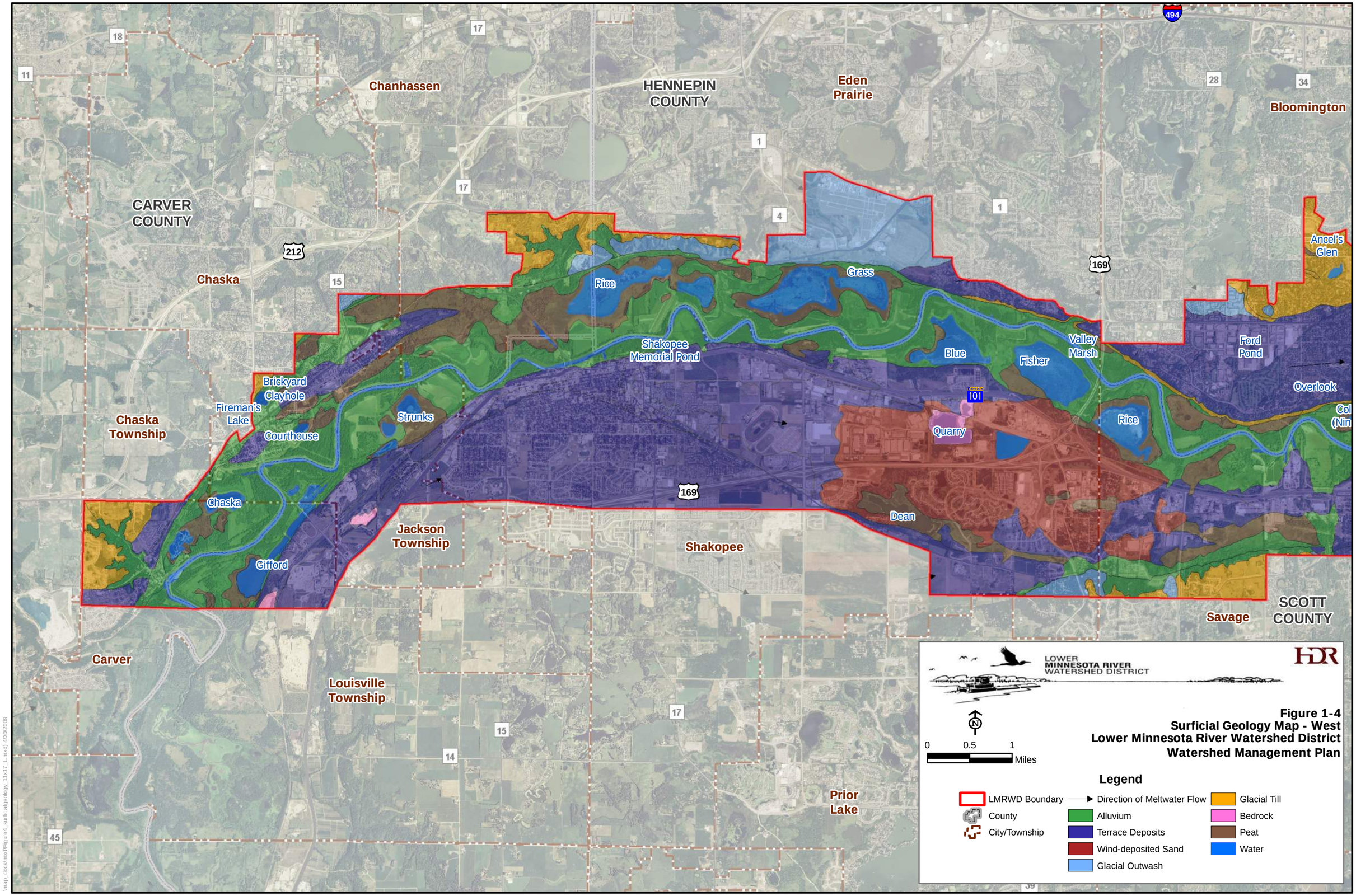
1.3.3 Topography

The topography of the District is dominated by the Minnesota River, the broad Minnesota River floodplain, and the steep river bluffs. Figure 1-8 and Figure 1-9 show the topography within the District from east to west. Elevations within the district range from approximately 1,025 feet to 600 feet above mean sea level. The highest elevations occur on the bluffs north of the Minnesota River in the cities of Eden Prairie and Bloomington. The lowest elevations occur throughout the District along the banks of the Minnesota River.

1.4 SURFACE WATER RESOURCES

Surface water resources within the District include several lakes, ponds, wetlands, streams, and approximately 32 miles of the Minnesota River. The Minnesota Department of Natural Resources (DNR) has regulatory jurisdiction over the lakes, wetlands, and watercourses defined

as public waters within the State. Figure 1-10 and Figure 1-11 identify the major DNR regulated public waters within the District.



\map_docs\mxd\Figure4_surficialgeology_11x17_L.mxd) 4/30/2009

Minnetonka
Edina
HENNEPIN COUNTY
Richfield
Minneapolis
St. Paul
Mendota
Mendota Heights
Eden Prairie
Bloomington
Eagan
DAKOTA COUNTY
Burnsville
Savage
SCOTT COUNTY
Pike Island Marsh
Snelling
Gun Club
Cemetery Pond
Long Meadow
Hohag Pond
Ancel's Glen
Ford Pond
Overlook
Coleman (Nine Mile)
Valley Marsh
Blue
Fisher
Rice
Quarry
Grass
Dean
Black Dog

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

N

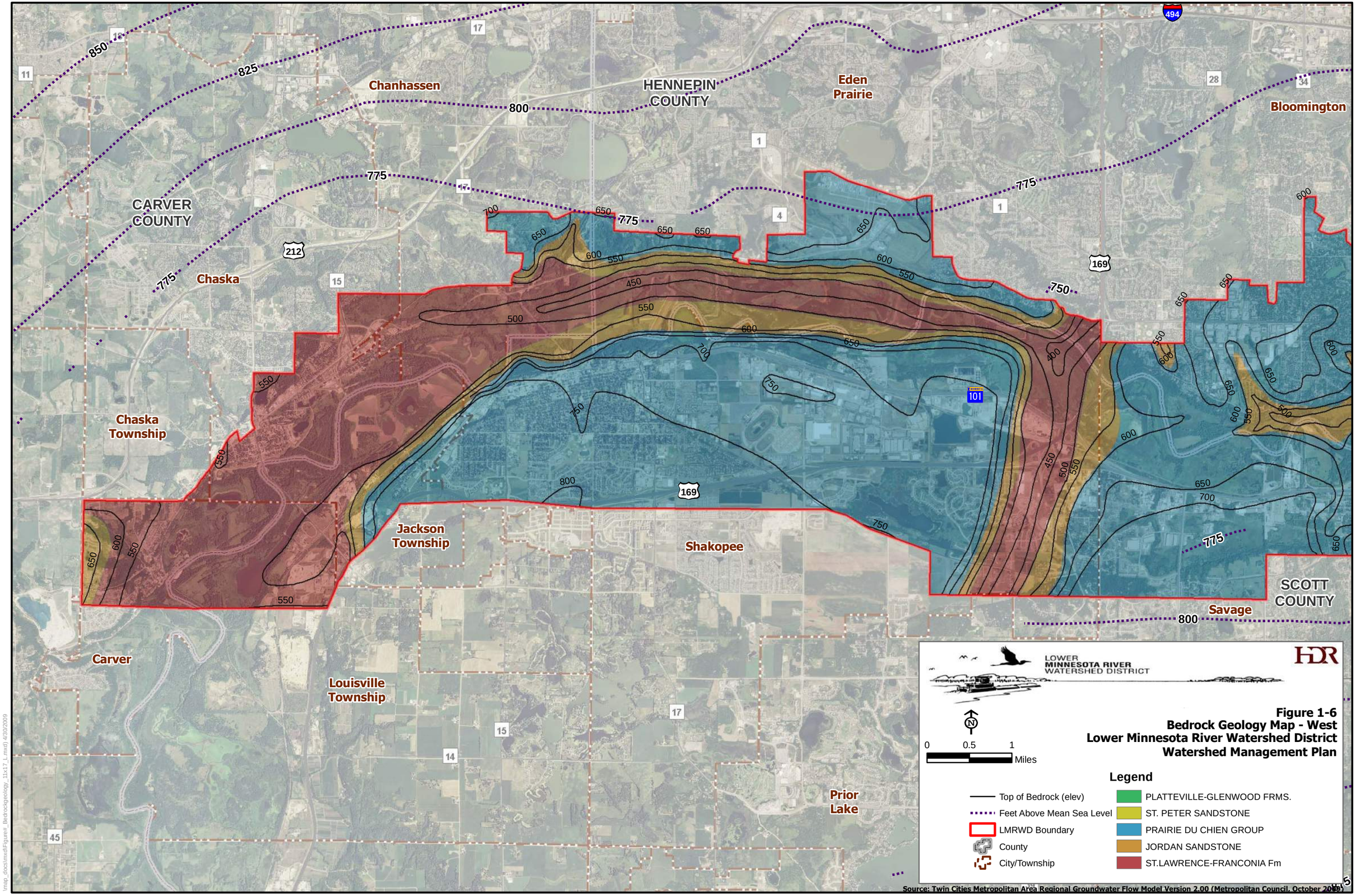
0 0.5 1 Miles

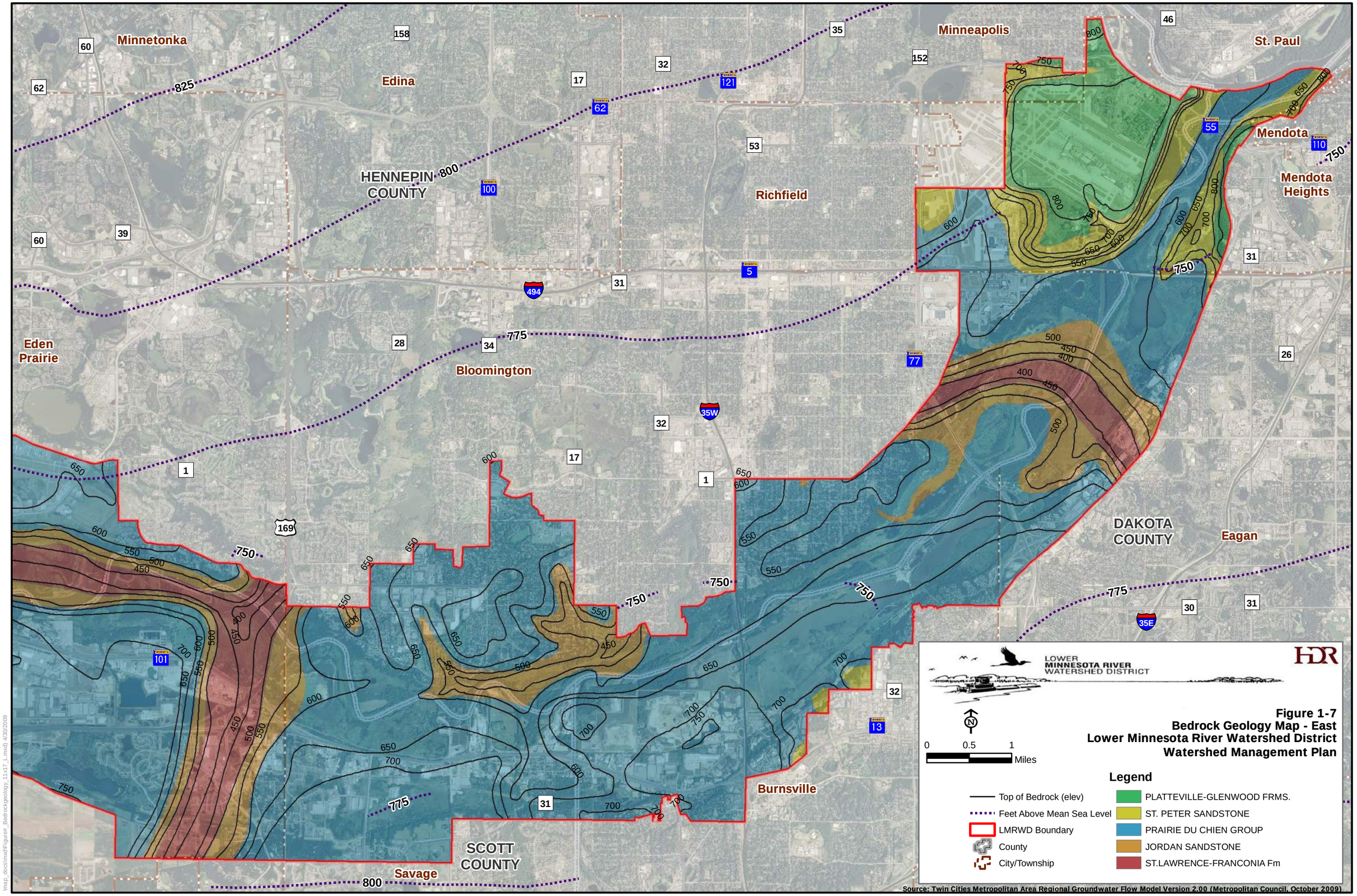
Figure 1-5
Surficial Geology Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

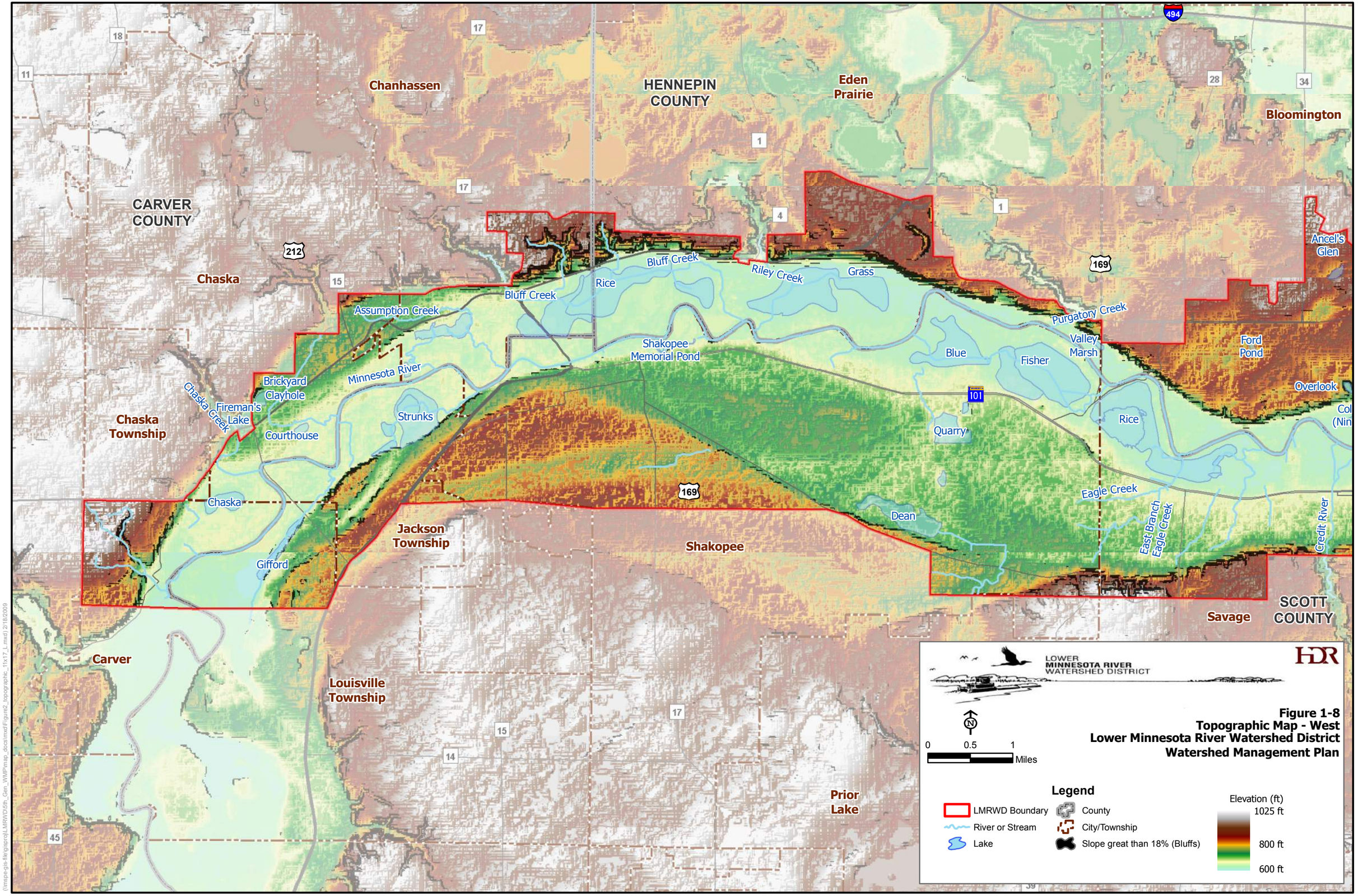
Legend

- LMRWD Boundary
- County
- City/Township
- Direction of Meltwater Flow
- Alluvium
- Terrace Deposits
- Wind-deposited Sand
- Glacial Outwash
- Glacial Till
- Bedrock
- Peat
- Water

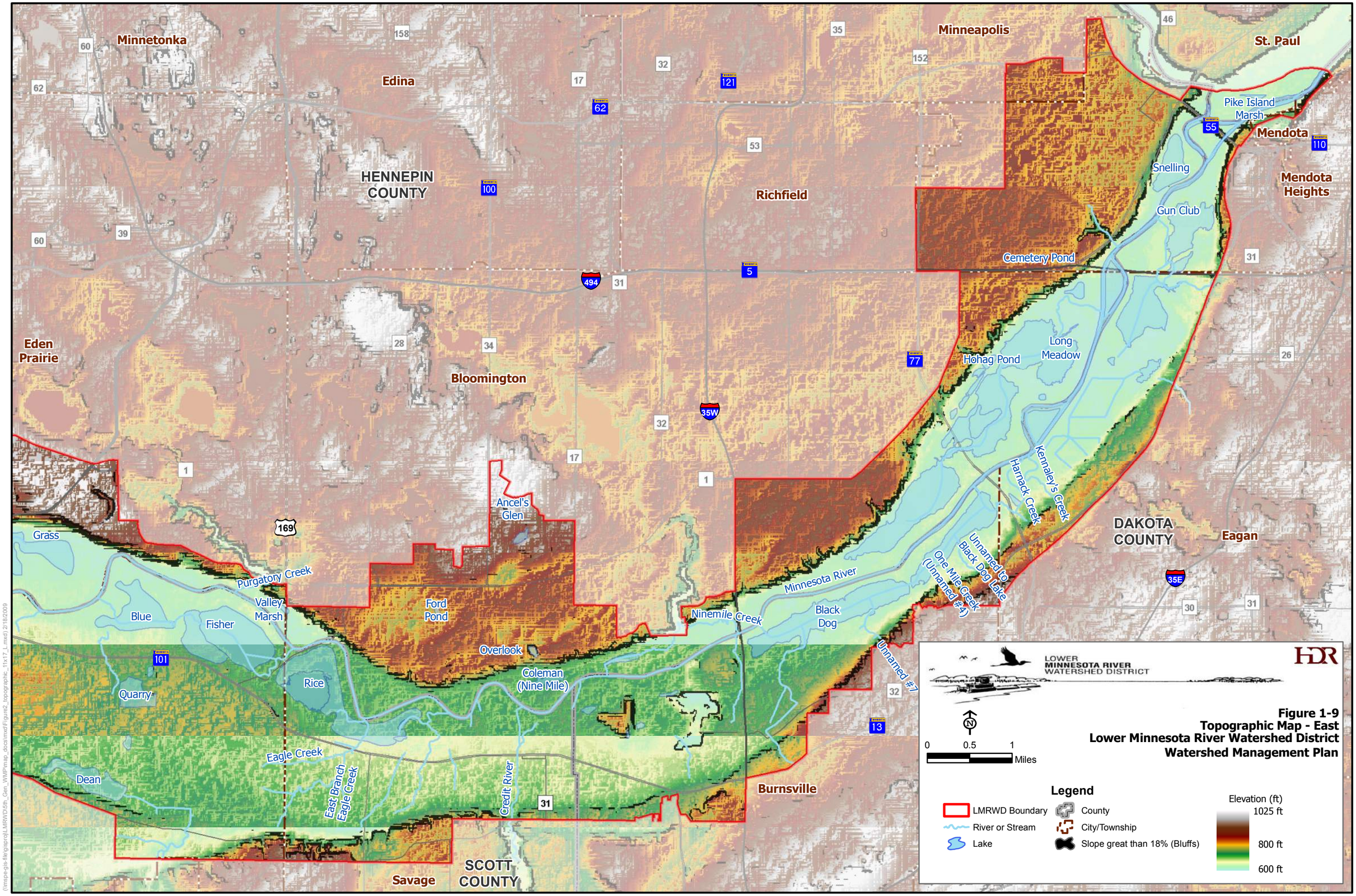
\map_docs\mxd\Figure4_surficialgeology_11x17_L.mxd) 4/30/2009


Chanhassen
HENNEPIN COUNTY
Eden Prairie
Bloomington
CARVER COUNTY
Chaska
Chaska Township
Jackson Township
Shakopee
Carver
Louisville Township
Prior Lake
SCOTT COUNTY
Savage
850
825
800
775
750
700
650
600
550
500
450
400
LOWER MINNESOTA RIVER WATERSHED DISTRICT
HDR
0 0.5 1 Miles
Figure 1-6
Bedrock Geology Map - West
Lower Minnesota River Watershed District
Watershed Management Plan
Legend
Top of Bedrock (elev)
Feet Above Mean Sea Level
LMRWD Boundary
County
City/Township
PLATTEVILLE-GLENWOOD FRMS.
ST. PETER SANDSTONE
PRAIRIE DU CHIEN GROUP
JORDAN SANDSTONE
ST.LAWRENCE-FRANCONIA Fm
Source: Twin Cities Metropolitan Area Regional Groundwater Flow Model Version 2.00 (Metropolitan Council, October 2009)
\map_docs\mxd\Figure#_Bedrockgeology_11x17_L.mxd) 4/30/2009

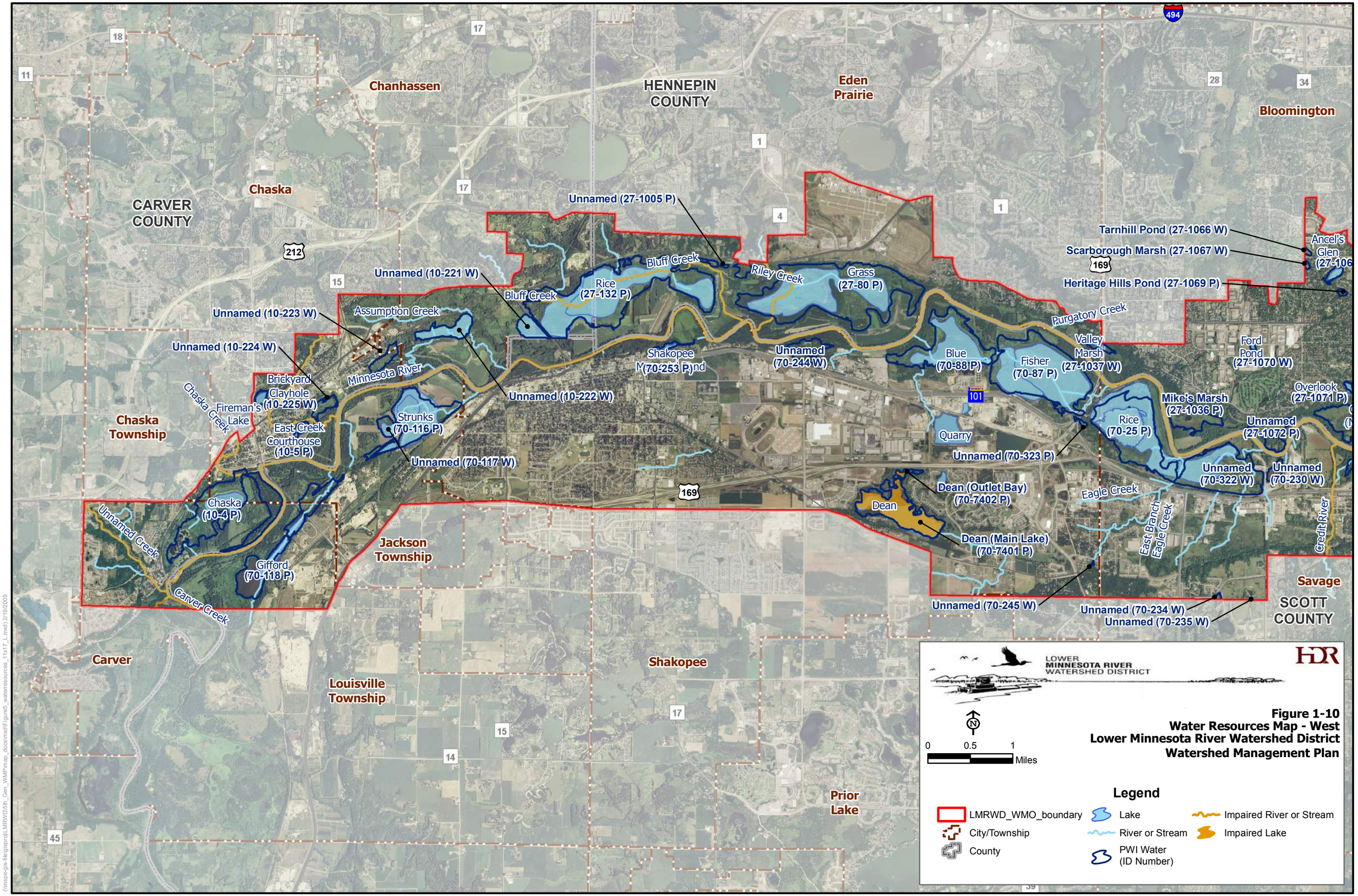

Minnetonka
Edina
HENNEPIN COUNTY
Richfield
Minneapolis
St. Paul
Mendota
Mendota Heights
Eden Prairie
Bloomington
Burnsville
DAKOTA COUNTY
Eagan
SCOTT COUNTY
Savage
825
800
775
750
494
35W
100
62
121
5
77
55
110
35E
169
101
13
LOWER MINNESOTA RIVER WATERSHED DISTRICT
HDR
N
0 0.5 1
Miles
Figure 1-7
Bedrock Geology Map - East
Lower Minnesota River Watershed District
Watershed Management Plan
Legend
Top of Bedrock (elev)
Feet Above Mean Sea Level
LMRWD Boundary
County
City/Township
PLATTEVILLE-GLENWOOD FRMS.
ST. PETER SANDSTONE
PRAIRIE DU CHIEN GROUP
JORDAN SANDSTONE
ST.LAWRENCE-FRANCONIA Fm
Source: Twin Cities Metropolitan Area Regional Groundwater Flow Model Version 2.00 (Metropolitan Council, October 2009)
\map_docs\mxd\Figure#_Bedrockgeology_11x17_L.mxd\ 4/30/2009



(\\mspe-gis-file\gisproj\LMRWD\5th_Gen_WMP\map_docs\mxd\Figure2_topographic_11x17_L.mxd) 2/18/2009



(\\mspe-gis-file\gisproj\LMRWD\5th_Gen_WMP\map_docs\mxd\Figure2_topographic_11x17_L.mxd) 2/18/2009



(\\mspe-gis-file\gisproj\LMRWD\5th_Gen_WMP\map_docs\mxd\Figure5_waterresources_11x17_L.mxd) 2/19/2009

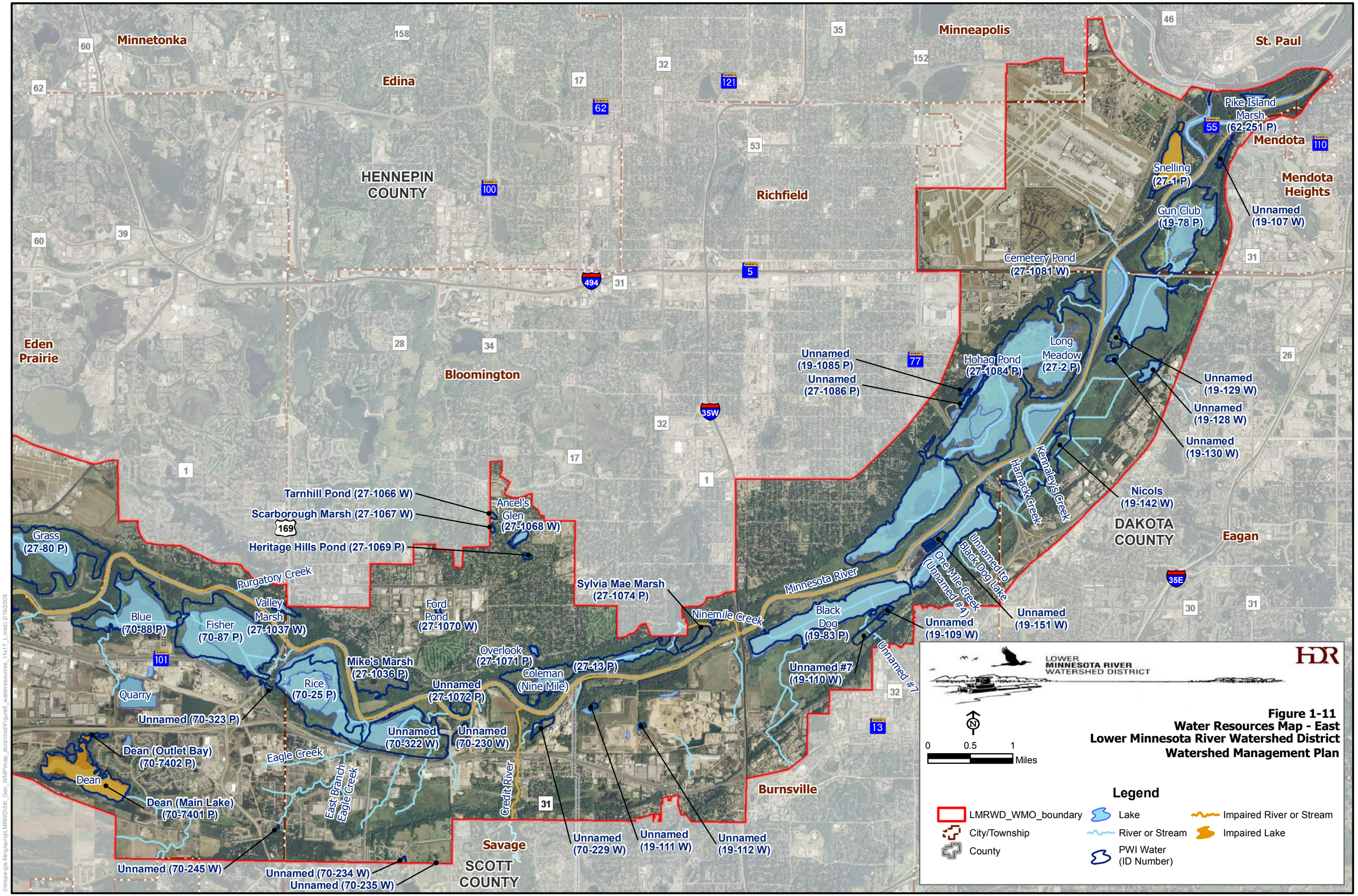


Figure 1-11
Water Resources Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

(\\mspe-gis-file\gisproj\LMRWD\5th_Gen_WMP\map_docs\mxd\Figure5_waterresources_11x17_L.mxd) 2/19/2009

1.4.1 Impaired Waters

The Minnesota River, Chaska Creek , Carver Creek, Unnamed Creek (Carver, MN), East Creek, Dean Lake, Snelling Lake, Credit River, Bluff Creek, Riley Creek, and Nine Mile Creek are currently on the Minnesota Pollution Control Agency's (MPCA) list of impaired waters. Lakes and streams on the list do not meet federal water quality standards for designated uses. For each water body on the list, the MPCA is required to conduct a study to determine the allowable Total Maximum Daily Load (TMDL) for each pollutant that exceeds the standards. Impaired waters within the District are summarized in Table 1-2 below. Figure 1-10 and Figure 1-11 identify the locations of public waters listed as impaired by the MPCA. Of the 21 impairments within the District, there are seven completed TMDL Implementation Plans and six in progress.

Table 1-2: 2010 Impaired Waters in the Lower Minnesota River Watershed District

Impaired Water	Affected Use	Pollutant or Stressor	TMDL Study		TMDL Implementation Plan Status
			Start	Completion	
Minnesota River	Aquatic recreation	Fecal Coliform	2018	2024	N/A
Minnesota River	Aquatic consumption	Mercury water column	-	2008	Completed
Minnesota River	Aquatic consumption	Mercury in fish tissue	-	2008	Completed
Minnesota River	Aquatic life	Dissolved oxygen	-	2006	Completed
Minnesota River	Aquatic life	Turbidity	2008	2011	In progress
Minnesota River	Aquatic consumption	PCB in fish tissue	1998	2011	In progress
Dean Lake	Aquatic recreation	Nutrients/ Eutrophication	2013	2018	N/A
Snelling Lake	Aquatic consumption	Mercury in fish tissue	-	2008	Completed
Credit River	Aquatic life	Turbidity	2008	2010	In progress
Bluff Creek	Aquatic life	Fish and Biological Assessments	2008	2011	In progress
Bluff Creek	Aquatic life	Turbidity	2008	2011	In progress
Nine Mile Creek	Aquatic life	Chloride	2005	2010	Completed
Nine Mile Creek	Fish and Biological Assessments	Fish and Biological Assessments	2005	2010	Completed
Riley Creek	Aquatic life	Turbidity	2011	2014	N/A
Unnamed Creek	Aquatic recreation	Fecal Coliform	2013	2018	N/A
Carver Creek	Aquatic recreation	Fecal Coliform	-	2008	Completed
Carver Creek	Aquatic life	Turbidity	2006	2010	In progress
Chaska Creek	Aquatic recreation	Fecal Coliform	2013	2016	N/A
East Creek	Aquatic life	Turbidity	2013	2018	N/A

Impaired Water	Affected Use	Pollutant or Stressor	TMDL Study		TMDL Implementation Plan Status
			Start	Completion	
East Creek	Aquatic recreation	Fecal Coliform	2013	2018	N/A
East Creek	Aquatic life	Fish and Biological Assessments	2013	2018	N/A

1.4.2 Minnesota River

The Minnesota River originates at Big Stone Lake on the border of Minnesota and South Dakota. From Big Stone Lake, the river flows southeasterly to Mankato before turning northeastward to its confluence with the Mississippi River at St. Paul, a total distance of 330 miles. The river drains an area of approximately 16,900 square miles, including about 1,610 square miles in South Dakota and 323 square miles in Iowa. In Minnesota, the watershed encompasses 37 counties. Approximately 90 percent of the watershed lands are used for agricultural purposes. There is a total of approximately 825 miles of tributary streams and 2,500 lakes in the Minnesota River watershed.

The river bed is relatively flat with an average slope of about 0.8 feet per mile. The width of the river floodplain varies from 0.75 to 3.0 miles. Upstream of the District, the river is a relatively shallow and free-flowing. Shortly after the river enters the District, the combined effect of channel dredging and the backwater pool created by the COE Dam No. 2 on the Mississippi River at Hastings, changes the river's character to a deeper, low-velocity channel maintained for commercial and recreational navigation.

Maximum Minnesota River flows tend to occur during March and April, following the spring snowmelt. Spring and early summer rains normally maintain relatively high river flows through mid-summer. Average river flows fall off through late summer and fall; the lowest flows occur in late winter in the absence of significant surface runoff.

The USGS, in cooperation with the COE, monitors the Minnesota River with a continuous water stage recorder located at R.M. 39.4, approximately 6.0 R.M. upstream of the western border of the District. Annual mean discharge from 1935 to 2008 was 4,551 cubic feet per second (cfs). Calculated on an area basis, the mean flow represents a direct runoff amount of 3.8 inches per year over the 16,200 square mile watershed above Jordan. The maximum recorded discharge of 117,000 cfs occurred at Jordan during the spring flood of 1965. Recent significant floods include the summer flood of 1993, the spring flood of 1997, and the spring flood of 2001; with maximum discharges of 92,200 cfs, 82,400 cfs, and 87,100 cfs, respectively. The minimum recorded discharge occurred in November 1955 with a flow rate of 79 cfs.

1.4.3 Streams

Tributary streams flowing to the Minnesota River in the District vary in size from a 1.0 square mile watershed area to nearly 45 square miles. The smaller watershed streams, such as Eagle

Creek, Assumption Creek, and other unnamed streams, are either totally or mostly within the District's boundaries and are groundwater dependent. The larger streams, such as Nine Mile Creek, Credit River, Chaska Creek, Bluff Creek, Purgatory Creek, Riley Creek, and Carver Creek, all have origins in watersheds that are outside the District but they all enter the Minnesota River valley from the surrounding uplands and flow across a portion of the valley before entering the river.

Some tributary streams/channels are managed by other watershed districts such as Nine Mile Creek, Riley-Purgatory-Bluff Creek, and Prior Lake-Spring Lake. Other streams come under the jurisdiction of joint power WMOs such as Credit River, Chaska Creek, and Carver Creek.

The DNR identifies the following six streams in the District as "fishable" trout streams:

- Assumption Creek
- Harnack Creek (Unnamed #1)
- Eagle Creek
- Kennaley's Creek

Figure 1-10 and Figure 1-11 identify the locations of the trout streams listed above.

1.4.4 Lakes

Most of the District's sixteen lakes are located within or adjacent to the Minnesota Valley National Wildlife Refuge, Recreation Area, and State Trail. Figure 1-10 and Figure 1-11 provide the locations of these lakes. Table 1-3 gives details on each of the lakes within the District that can be classified as floodplain/groundwater or quarry lakes.

Floodplain/groundwater lakes are generally shallow, with fish populations that experience frequent winterkills. However, these lakes are naturally restocked from annual flooding by the Minnesota River. In addition to the water supplied by flooding, all of the lakes are spring fed, and some have streams that flow through them. These lakes provide essential habitat for migratory birds, fish, and resident wildlife. For example, a population of the cricket frog, an extremely rare species in Minnesota, has been found near Coleman Lake (Nine Mile Lake), a floodplain lake in the City of Bloomington. The floodplain/groundwater lakes in the refuge are managed by the U.S. Fish and Wildlife Service (USFWS) to promote the growth of natural wildlife food and to provide wildlife-oriented recreation opportunities.

Dean Lake, in Shakopee, is an expression of the groundwater table in the area. It is underlain by a relatively thin layer of porous sand and dammed by a ridge of limestone. Groundwater flows through the lake and the lake's water surface elevation is affected by fluctuations in the groundwater table.

Courthouse Lake, in Chaska, is a DNR-designated trout lake and an example of a quarry lake. Quarry lakes are historical stone or clay quarries that have filled with relatively good quality

groundwater. These lakes occasionally experience flooding from the Minnesota River, which can have a degrading effect on water quality through deposition of pollutants carried in the floodwaters.

Table 1-3: Lower Minnesota River Watershed District Lake Data

Lake	Public Waters Inventory Number	Area (ac)	Depth (ft)		Lake Type	Water Supply
			Average	**Maximum**		
Black Dog	19-83P	391	1.5	3.0-4.0	Floodplain/ groundwater, used by Xcel for cooling water	Springs, seepage, intermittent surface drainage
Blue	70-88P	203	1.5	3.0	Floodplain/ groundwater/ marsh	Natural springs, seepage and intermittent surface drainage
Brickyard Clayhole	10-225W	11	25.0	41.0	Quarry	Springs
Chaska	10-4P	46	1.5	3.5	Floodplain/ groundwater	Springs
Coleman	27-13P	114	<1.0	3.5	Floodplain/ groundwater	Nine Mile Creek, seepage and springs
Courthouse	10-5P	12	25.0	57.0	Trout/quarry	Underground springs
Dean	70-74P	216	3.0	5.0	Floodplain/ groundwater	Seepage, natural springs and intermittent surface drainage
Fisher	70-87P	284	1.0	3.0	Floodplain/ groundwater/ marsh	Blue Lake, natural springs, seepage and minor surface drainage
Gifford	70-118P	116	Unknown	Unknown	Floodplain/ groundwater/ marsh and old quarry or channel bed	Springs, intermittent surface drainage
Grass	27-80P	467	1.5	3.5	Floodplain/ groundwater	Riley Creek, seepage and springs
Gun Club	19-78P	1216	1.0	2.5	Floodplain/ groundwater /marsh	Springs, seepage

Lake	Public Waters Inventory Number	Area (ac)	Depth (ft)		Lake Type	Water Supply
			Average	**Maximum**		
Long Meadow	27-2P	1,188	1.0	3.5	Floodplain/ groundwater/ marsh	Natural springs, some surface drainage from north and south
Rice (Hennepin Cty)	27-132P	517	1.0	3.0	Floodplain/ groundwater/ marsh	Bluff Creek, springs and intermittent surface drainage
Rice (Scott Cty)	70-25P	259	1.0	3.0	Floodplain/ groundwater/ marsh	Natural springs, seepage and some local drainage
Snelling	27-1P	119	6.0	12.0	Floodplain/ groundwater	Mainly natural springs, little surface drainage
Strunks and Unnamed	70-116P and 70-117P	185	1.0	4.0	Floodplain/ groundwater/ marsh and southern lake is old quarry or gravel pit	Spring, seepage and small amount of local drainage

1.4.5 Wetlands

The District also has large areas of wetlands, which are an important part of the natural environment and provide several valuable functions. Wetlands are a critical part of the natural storm drainage system. Wetlands help maintain water quality; reduce flooding and erosion; provide food and habitat for wildlife; and open spaces and natural landscapes for residents. Thus, wetlands are important physical, educational, ecological, aesthetic, recreational, and economic assets to the District.

Some of the District wetlands are adjacent to floodplain lakes, while others result from springs and low wet areas. Springs arising from limestone aquifers produce a special wetland called a calcareous fen. This rare wetland is identified by the specific vegetative community, which is found only in a calcareous fen. MN Rules 7050 identify the following calcareous fens in the District and classify them as "outstanding resource waters."

- Snelling Fen – Dakota County
- Nicols Meadow Fen – Dakota County
- Quarry Island Fen – Dakota County
- Savage Fen – Scott County
- Seminary Fen – Carver County

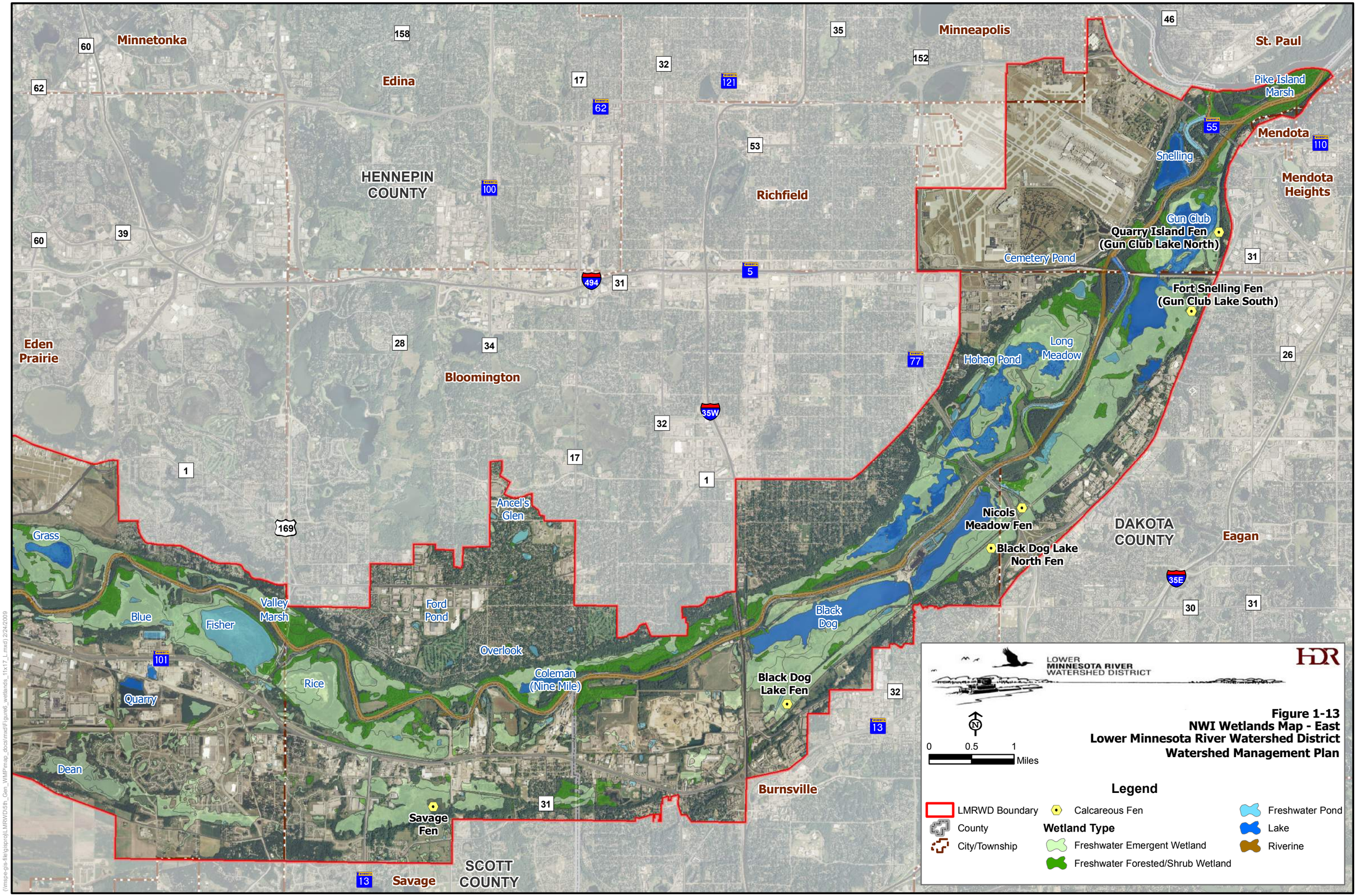
Locations of fens within the District are shown Figure 1-12 and Figure 1 - 13. The DNR is responsible for protecting these calcareous fens with assistance from the District. This partnership has yielded the acquisition of portions of Savage Fen and Black Dog Preserve Fen for management under the Scientific and Natural Area designation.

Figure 1-12 and Figure 1-13 show the National Wetlands Inventory (NWI) wetlands within the District and include information on wetland type and association with other types of water bodies. Detailed information about wetlands and wetland types can be found by contacting the USFWS and the DNR. Wetlands within the District are delineated by other agencies and entities, including USFWS, the COE, the Minnesota Department of Transportation (DOT) and municipalities and counties that administer the Wetland Conservation Act (WCA). (The WCA is discussed in a later section.)

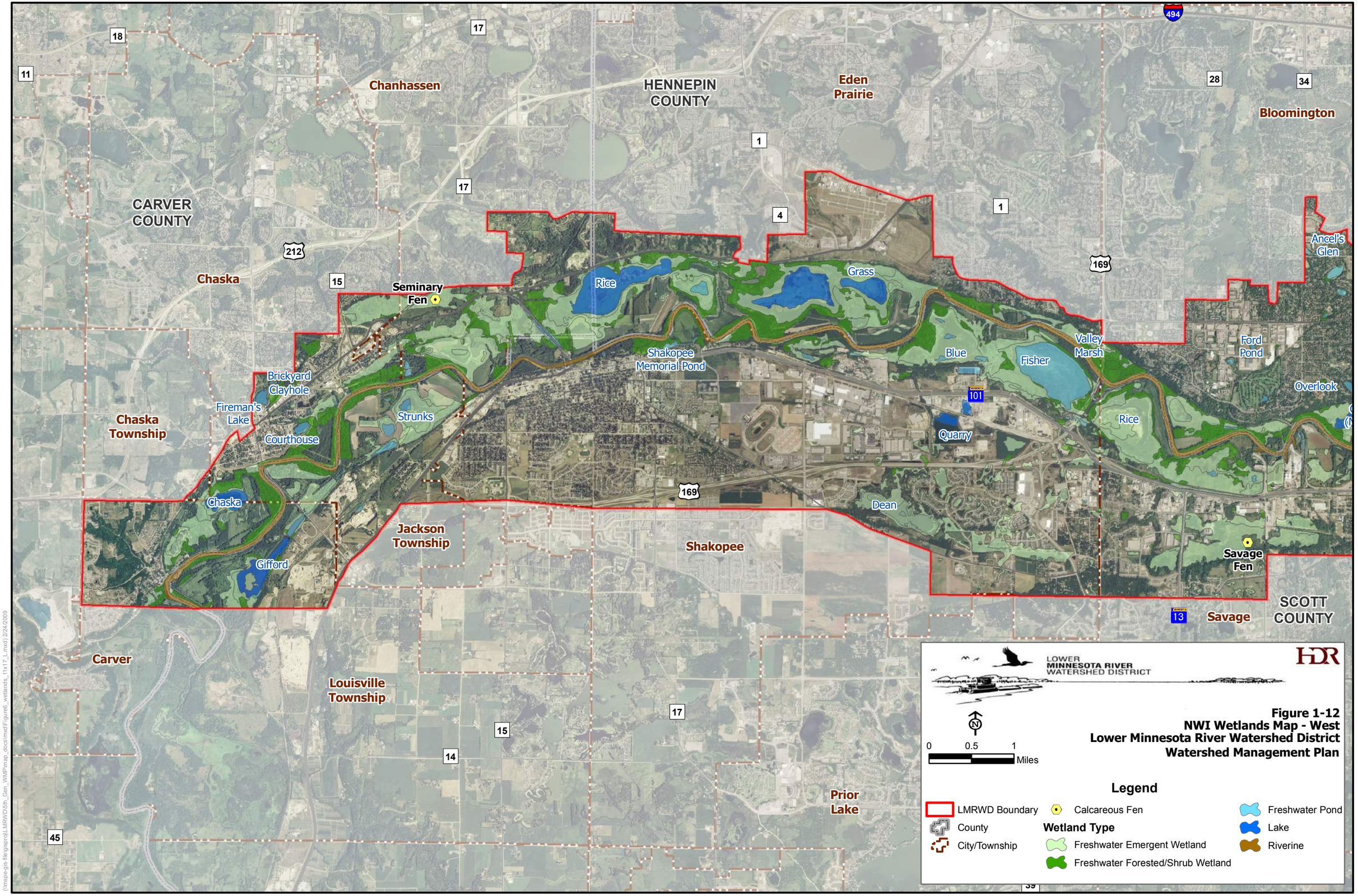
1.4.6 Stormwater System and Floodplain Information

Communities within the District have local water management plans that include maps showing areas served by each existing stormwater system, including stormwater ponds and outfalls. For specific details about storm drainage systems, the reader is referred to the respective communities' local surface water management plans. The following communities have such plans: Bloomington, Burnsville, Carver, Chanhassen, Chaska, Eden Prairie, Lilydale, Mendota, Mendota Heights, Minneapolis, Savage, Shakopee, and Scott County. Local water management plans provide information about peak flood elevations and flow rates for existing and proposed ponds. All of the communities within the District have adopted DNR-approved floodplain ordinances. Unincorporated areas are covered by DNR-approved county floodplain ordinances.

The District, in partnership with USGS and the COE, published the Lower Minnesota Floodplain Study in 2004. Upon appropriate review, the information contained in this report may be used as "Best Available Data" until the Federal Emergency Management Agency (FEMA) produces new Flood Insurance Study (FIS) maps of the affected communities.



(\\mspe-gis-file\gisproj\LMRWD\5th_Gen_WMP\map_docs\mxd\Figure6_wetlands_11x17_L.mxd) 2/24/2009



(\\nspe-gis-file\gis\proj\LMRWD\5th_Gen_WMP\mxd\Figure6_wetlands_11x17_L.mxd) 2/24/2009

1.5 HYDROLOGIC AND HYDRAULIC MODELING

Several cities within the District have constructed hydrologic and hydraulic models in conjunction with their local surface water management plans. These entities should be contacted for additional information. In addition, the DNR maintains hydraulic and hydrologic model data files for those water bodies situated in National Flood Insurance Program (NFIP) participant communities. Specific model information can be found in the appropriate FIS for a particular water body. Model data files are available from the Floodplain Management Program within the DNR Division of Waters.

1.6 SURFACE WATER QUALITY AND QUANTITY MONITORING

Monitoring in the District is carried out by the Metropolitan Council Environmental Services (MCES) and the District in cooperation with other entities and is available on the MPCA website. The MPCA serves as a central clearinghouse for much of the data. Figure 1-4 and Figure 1-15 show water quality and quantity monitoring sites within the District. (The location of the District's Willow Creek station on these figures is inaccurate, as it is in the process of being relocated, and the new location has not been determined). The following sections describe water quality data collection efforts and long term trend analyses, where available, for the Minnesota River and lakes, streams, and fens of the District.

1.6.1 Lakes

The MCES collects water quality data from Brickyard Clayhole, Courthouse Lake, and Fireman's Lake in cooperation with the City of Chaska and Carver County Environmental Services Departments; and from Dean Lake in cooperation with the City of Shakopee, as part of the Citizen Assisted Monitoring Program (CAMP). Data is available for Brickyard Clayhole and Dean Lake from 2002-2009, Courthouse Lake from 1997-2009, and Fireman's Lake from 2001-2009. Lakes are visited bi-weekly from April through October and the data is published on the CAMP website.

Surface water samples are collected and analyzed for total phosphorus (TP; typically the most limiting nutrient in Minnesota lakes), total Kjeldahl nitrogen (TKN), and chlorophyll-a (Chl-a; an estimate of phytoplankton biomass). Secchi transparency (a measurement of water clarity) is also monitored, as well as the lake's perceived physical condition and recreational suitability. In many Minnesota lakes as TP increases, so will phytoplankton biomass (i.e. Chl-a). Also, as phytoplankton biomass increases, water transparency (i.e. Secchi depth) decreases. Volunteers also measure each lake's surface water temperature and fill out a lake sampling form to describe the lake and the weather conditions at the time of sampling. Each lake is sampled at the deepest location.

Table 1-4 shows annual average TP, TKN, Chl-a and Secchi depth for Brickyard Clayhole from 2002 to 2009. Table 1-4 also shows State of Minnesota eutrophication standards for Chl-a, TP,

and Secchi depth found in Minnesota Administrative Rule 7050.0222. Annual average values for all four parameters remained relatively steady over the course of the monitoring period. Relatively slight increases were observed in TP and Chl-a concentrations in 2004 and TKN concentrations in 2007-2008. In 2009, annual average TKN concentration returned to pre-2007 values. Annual average values for Chl-a, TP and Secchi depth all met State of Minnesota eutrophication standards each year.

Table 1-4: Brickyard Clayhole Annual Average Water Quality Parameters

	MN Eutrophication Standard	2002	2003	2004	2005	2006	2007	2008	2009
Chl-a (µg/L)	<0.014	0.003	0.002	0.004	0.002	0.002	0.003	0.004	0.004
TKN (mg/L)	N/A	0.60	0.37	0.49	0.55	0.53	0.83	1.00	0.57
TP (mg/L)	<0.40	0.02	0.02	0.05	0.02	0.02	0.02	0.03	0.02
Secchi depth (m)	>2.5	3.3	3.9	4.2	4.5	4.8	3.5	3.9	3.8

Chart 1-1 shows the relationship between annual average Chl-a and Secchi depth for Brickyard Clayhole, which is not statistically-significant at the alpha = 0.05 level. The relatively narrow range and small values of Chl-a for Brickyard Clayhole are likely reasons for the poor relationship.

Chart 1-1: Brickyard Clayhole Annual Average Secchi depth versus Chl-a

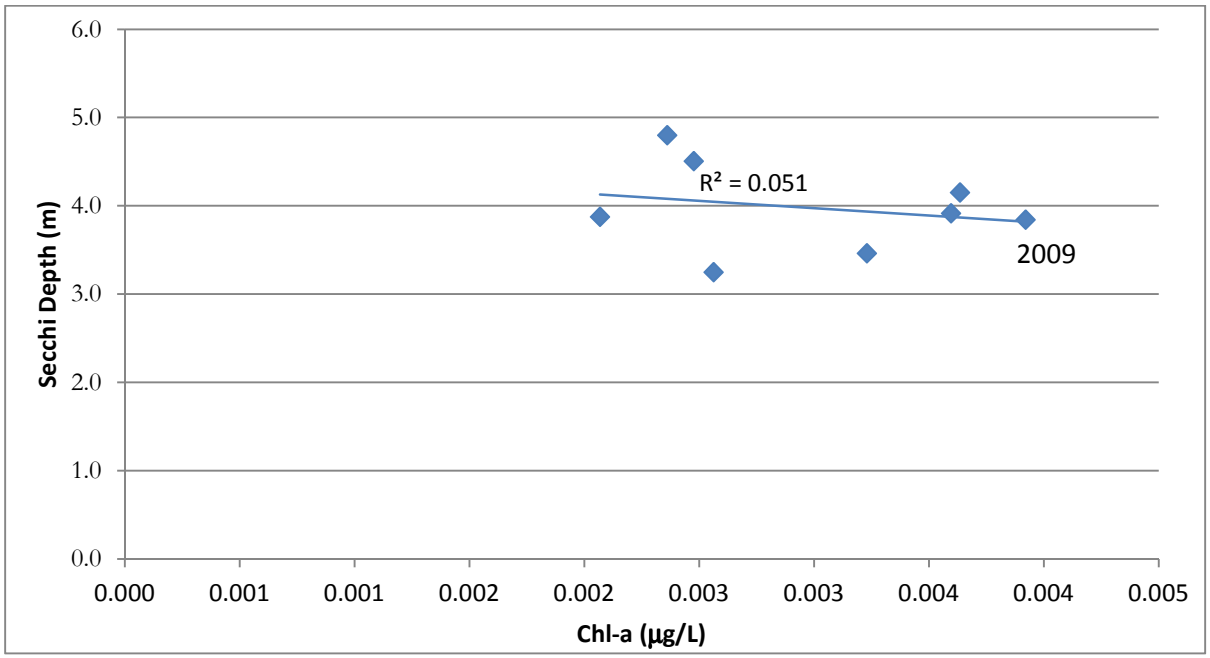


Chart 1-2 shows the relationship between annual average TP and Chl-a measurements for Brickyard Clayhole, which is not statistically-significant at the alpha = 0.05 level. The relatively narrow range and small values of both TP and Chl-a for Brickyard Clayhole are likely reasons for the poor relationship.

Chart 1-2: Brickyard Clayhole Annual Average Chl-a versus TP

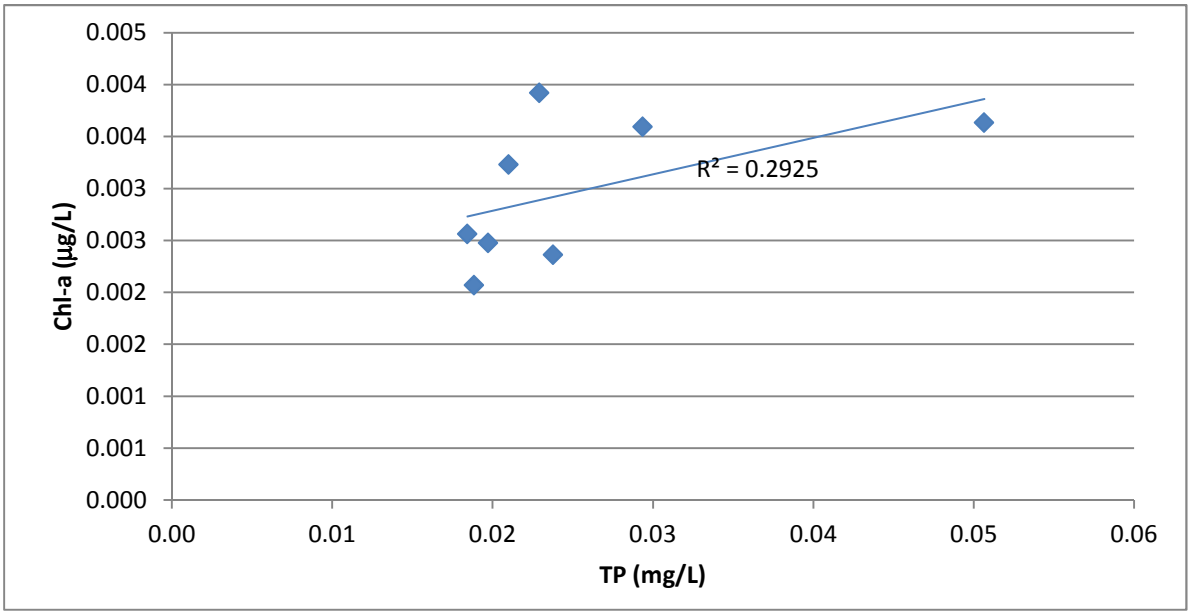


Chart 1-3 shows Brickyard Clayhole annual average Chl-a concentrations for 2002-2009. Chl-a concentrations trended upwards slightly over the course of the measurement period but are still relatively low compared to other lakes.

Chart 1-3: Brickyard Clayhole Annual Average Chl-a Concentrations

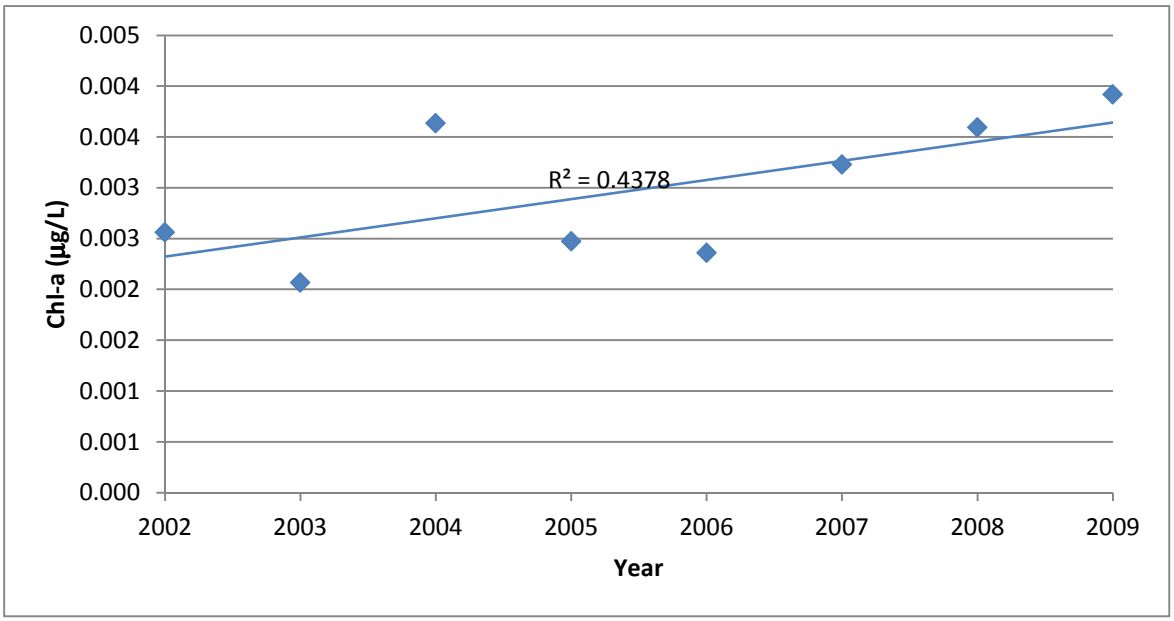


Table 1-5 shows annual average TP, TKN, Chl-a and Secchi depth for Fireman's Lake from 2002 to 2009. Table 1-5 also shows State of Minnesota eutrophication standards for Chl-a, TP, and Secchi depth found in Minnesota Administrative Rule 7050.0222. Annual average values for all four parameters remained steady over the course of the monitoring period with the exception of Chl-a which decreased significantly after 2001 where it remained steady through 2009. Annual average values for Chl-a, TP and Secchi depth all met State of Minnesota eutrophication standards each year.

Table 1-5: Fireman's Lake Annual Average Water Quality Parameters

	MN Eutrophication Standard	2001	2002	2003	2004	2005	2006	2007	2008	2009
Chl-a (µg/L)	<0.014	0.015	0.003	0.003	0.001	0.004	0.005	0.002	0.003	0.003
TKN (mg/L)	N/A	0.65	0.32	0.39	0.38	0.40	0.49	0.37	0.67	0.64
TP (mg/L)	<0.40	0.02	0.01	0.02	0.02	0.02	0.03	0.02	0.02	0.03
Secchi depth (m)	>2.5	2.6	1.7	3.1	3.4	3.1	2.8	2.9	3.2	3.3

Chart 1-4 shows the relationship between annual average Chl-A versus Secchi depth for Fireman's Lake, which is not statistically-significant at the alpha = 0.05 level. The relatively narrow range and small values of Chl-a for Fireman's Lake are likely reasons for the poor relationship.

Chart 1-4: Fireman's Lake Annual Average Secchi depth versus Chl-a

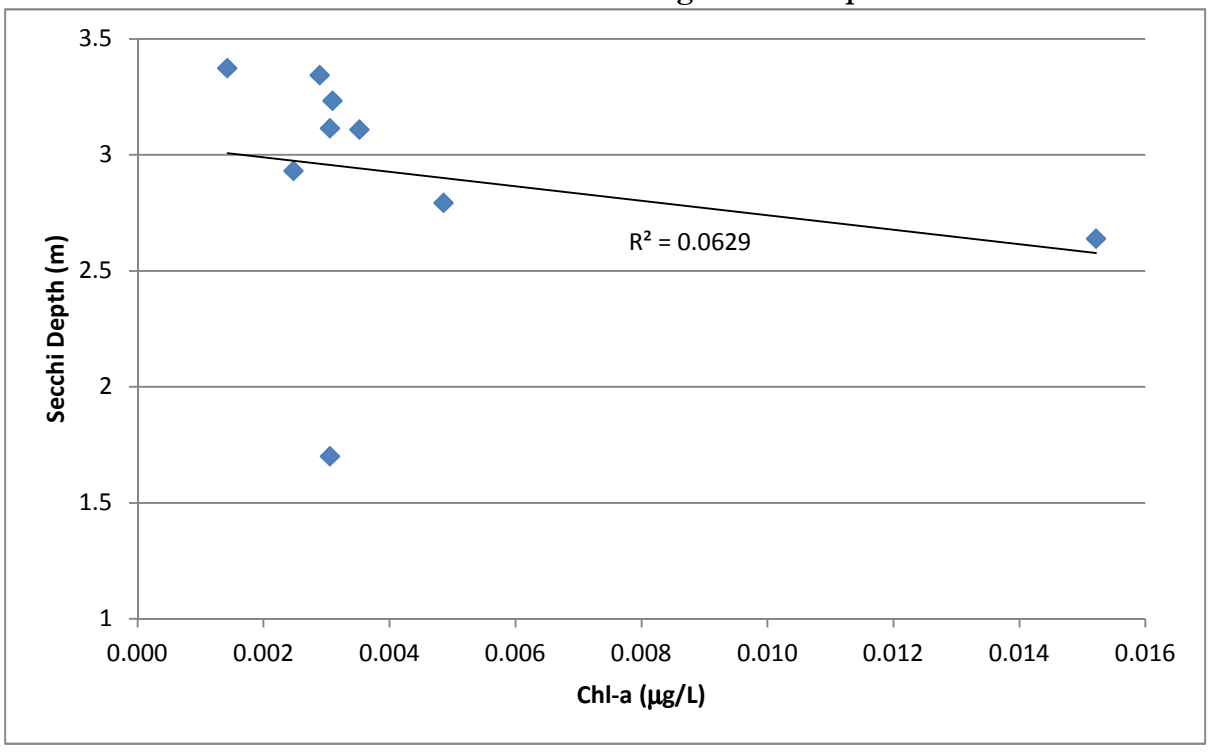


Chart 1-5 shows the relationship between annual average TP and Chl-a for Fireman's Lake, which is not statistically-significant at the alpha = 0.05 level. The relatively narrow range and small values of both TP and Chl-a for Fireman's Lake are likely reasons for the poor relationship.

Chart 1-5: Fireman's Lake Annual Average Chl-a versus TP

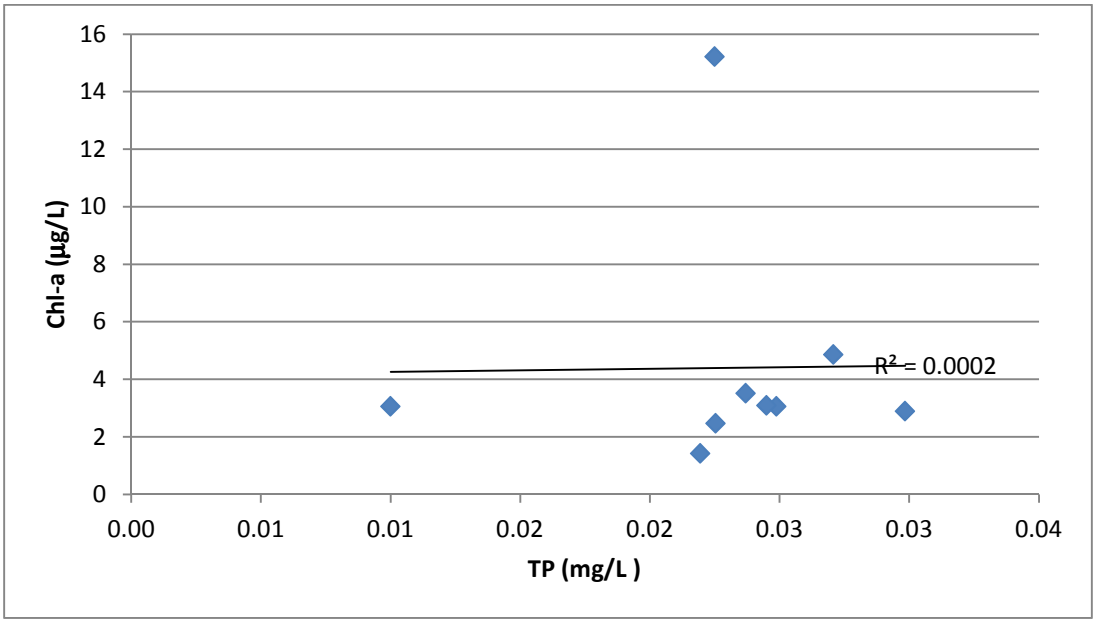


Chart 1-6 shows Fireman's Lake annual average Chl-a concentrations for 2002-2009. Annual average Chl-a for Fireman's Lake have trended downwards over the course of the monitoring period.

Chart 1-6: Fireman's Lake Annual Average Chl-a Concentrations

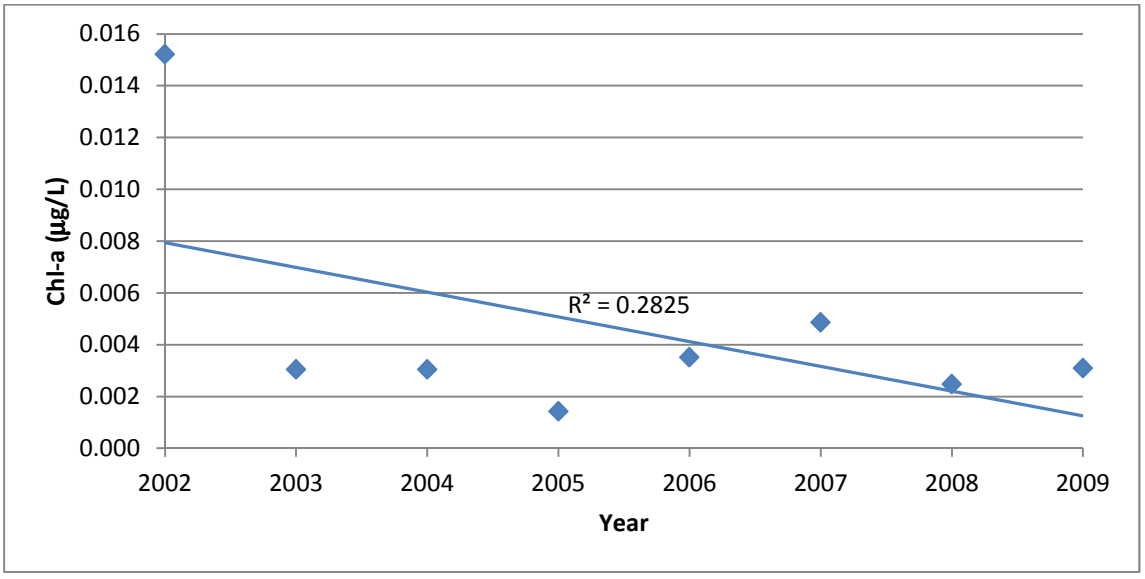


Table 1-6 shows annual average TP, TKN, and Secchi depth for Courthouse Lake from 1997 to 2009 and Chl-a from 2001 to 2003. Table 1-6 also shows State of Minnesota eutrophication standards for Chl-a, TP, and Secchi depth found in Minnesota Administrative rule 7050.0222. Annual average values for all four parameters remained steady over the course of the monitoring period with the exception of 2003 to 2006. During this time period, TP and TKN values increased and Chl-a decreased before returning to pre-2003 levels.

Table 1-6: Courthouse Lake Annual Average Water Quality Parameters

Year / Standard	Chl-a(µg/L)	TKN (mg/L)	TP(mg/L)	Secchi depth(m)
MN Eutrophication Standard	<0.006	N/A	<0.02	>2.5
1997	-	0.75	0.03	1.7
1998	-	0.64	0.02	3.5
1999	-	0.89	0.03	2.1
2000	-	0.67	0.03	3.3
2001	0.005	0.71	0.03	3.1
2002	0.006	0.71	0.03	2.5
2003	0.001	0.32	0.01	1.3
2004	0.006	0.94	0.09	2.6
2005	0.002	1.29	0.12	4.6
2006	0.002	0.57	0.02	4.7
2007	0.001	0.72	0.02	2.4
2008	0.007	0.98	0.02	3.6
2009	0.005	0.70	0.02	4.1

Chart 1-7 shows the relationship between annual average Chl-a and Secchi depth for Courthouse Lake from 2001-2009, which is not statistically-significant at the alpha = 0.05 level. The relatively narrow range and small values of Chl-a for Courthouse Lake are likely reasons for the poor relationship. Annual average values did not meet State of Minnesota eutrophication standards for Chl-a in 2008, TP in 1997, 1999-2001, and 2004-2005 and Secchi depth in 1997, 1999, and 2007.

Chart 1-7: Courthouse Lake Annual Average Secchi depth versus Chl-a

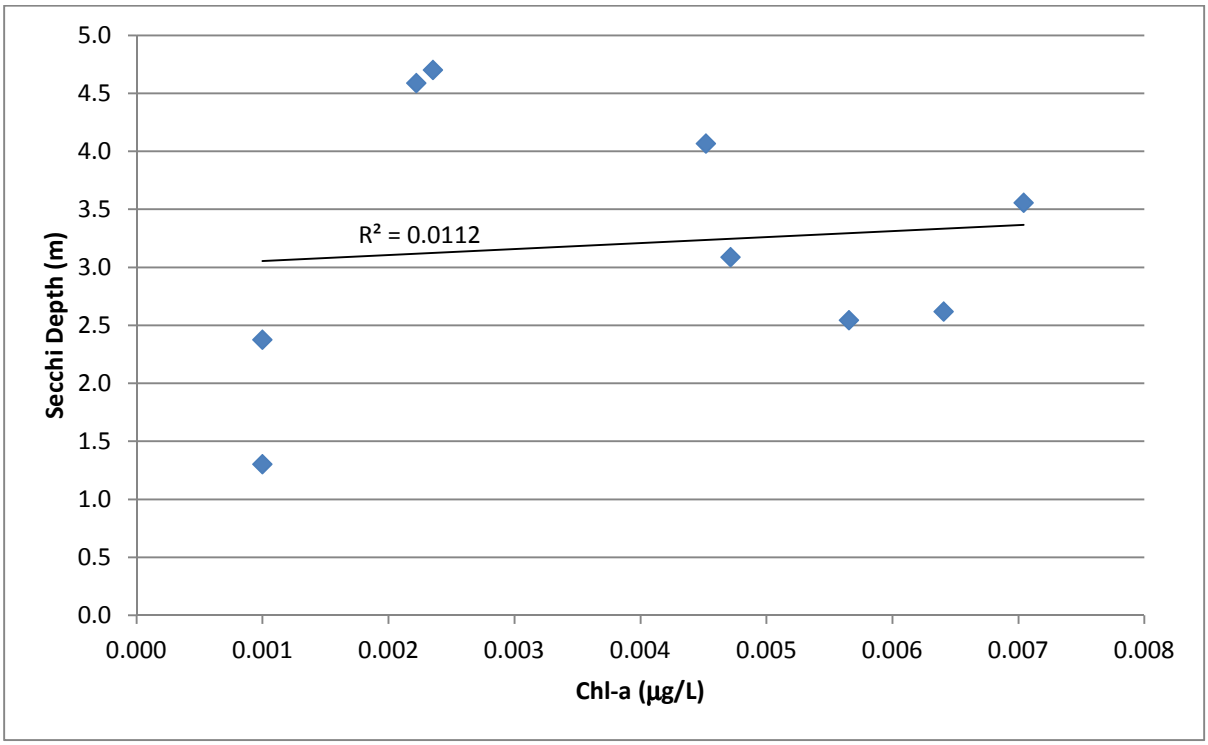


Chart 1-8 shows the relationship between annual average TP and Chl-a for Courthouse Lake, which is not statistically-significant at the alpha = 0.05 level. The relatively narrow range and small values of both TP and Chl-a for Courthouse Lake are likely reasons for the poor relationship.

Chart 1-8: Courthouse Lake Annual Average Chl-a versus TP

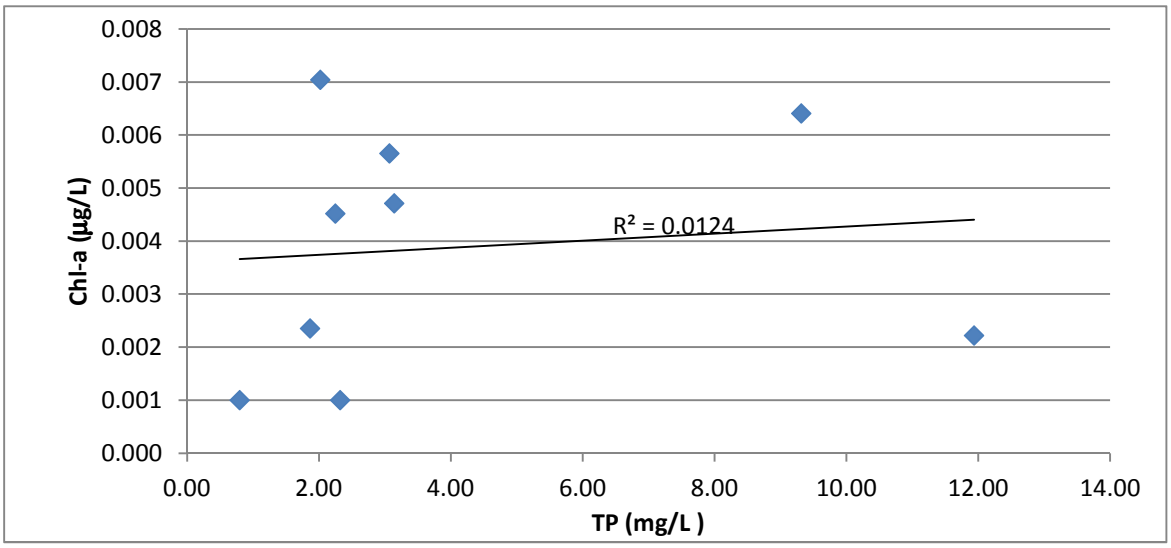


Chart 1-9 shows Courthouse Lake annual average Chl-a concentrations for 2001-2009. Annual average Chl-a concentrations for Courthouse Lake remained relatively steady over the monitoring period.

Chart 1-9: Courthouse Lake Annual Average Chl-a Concentrations

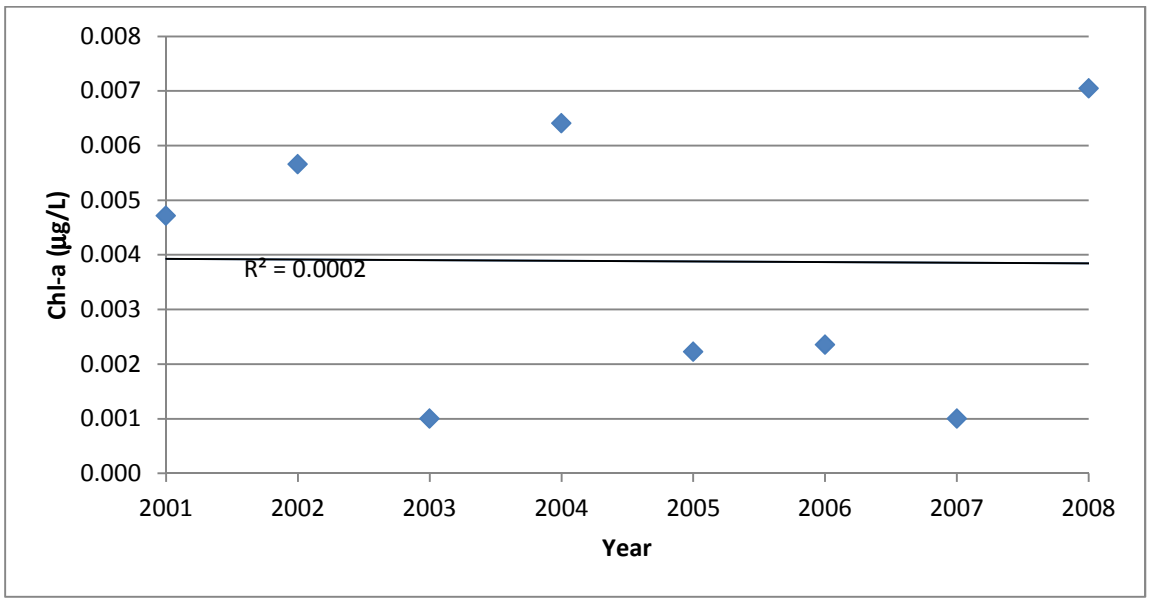


Table 1-7 shows annual average TP, TKN, and Secchi depth for Dean Lake from 2002 to 2009. Table 1-7 also shows State of Minnesota eutrophication standards for Chl-a, TP, and Secchi depth found in Minnesota Administrative rule 7050.0222. Annual average values for TKN and Secchi depth remained steady over the course of the monitoring period. Annual average Chl-a values fluctuated significantly over the monitoring period while TP values trended upwards. Dean Lake only met State of Minnesota eutrophication standard for Chl-a in 2004. Dean Lake met the State of Minnesota eutrophication standard for TP in all years except 2009 and did not meet the standard for Secchi depth in any years.

Table 1-7: Dean Lake Annual Average Water Quality Parameters

		MN Eutrophication Standard	2002	2003	2004	2005	2006	2007	2008	2009
Chl-a	(µg/L)	<0.014	0.043	0.024	0.007	0.039	0.067	0.003	0.015	0.047
TKN	(mg/L)	N/A	2.31	1.74	1.48	2.84	3.36	2.30	3.86	4.45
TP	(mg/L)	<0.40	0.15	0.21	0.11	0.19	0.28	0.23	0.19	0.44
Secchi depth	(m)	>2.5	0.5	0.5	0.4	0.3	0.7	0.4	0.0	0.0

Chart 1-10 shows the relationship between annual average Chl-a and Secchi depth for Dean Lake, which is not statistically-significant at the alpha = 0.05 level. The relatively narrow range and small values of Chl-a for Dean Lake are likely reasons for the poor relationship.

Chart 1-10: Dean Lake Annual Average Secchi depth versus Chl-a

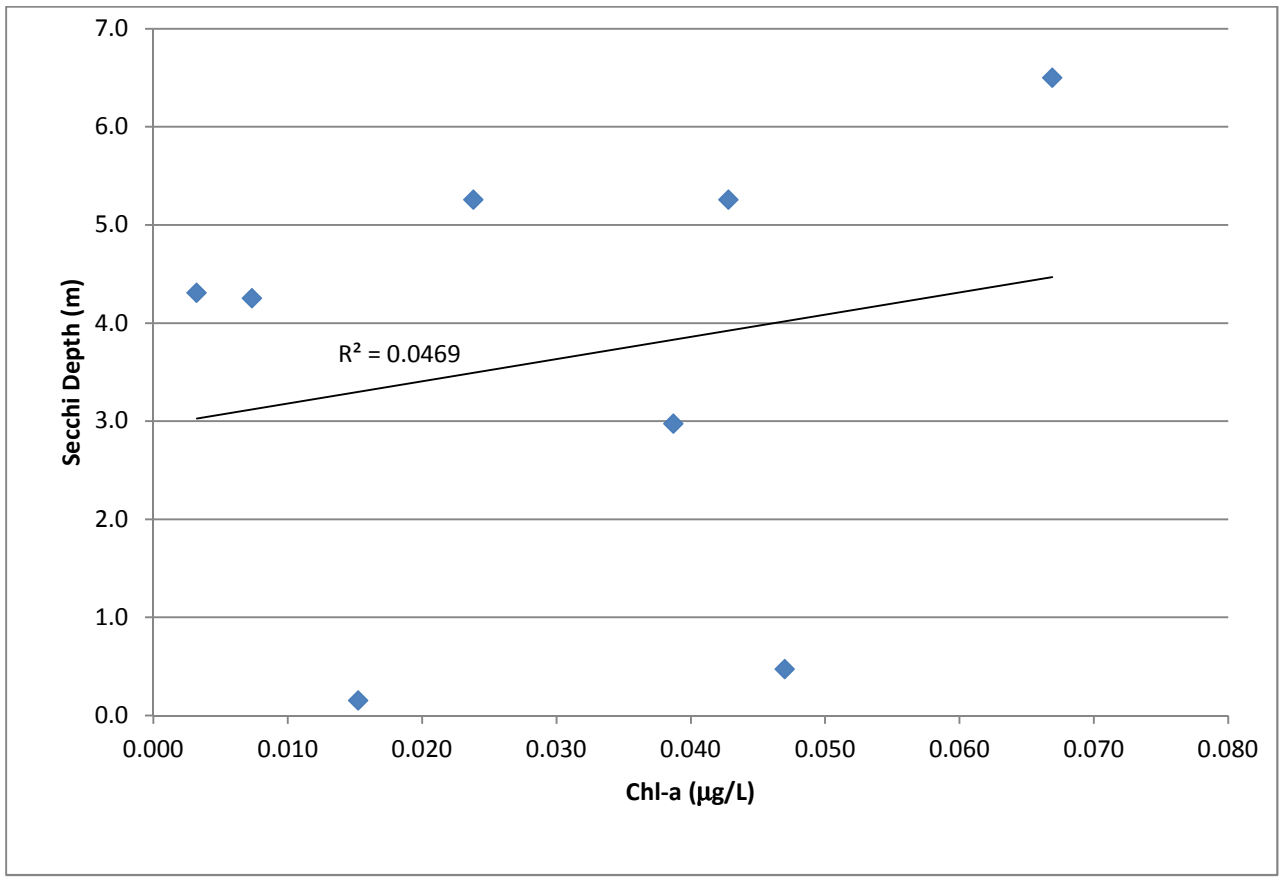


Chart 1-11 shows the relationship between annual average Chl-a and TP measurements for Dean Lake, which is not statistically-significant at the alpha = 0.05 level. The relatively narrow range and small values of both TP and Chl-a values for Dean Lake are likely reasons for the poor relationship.

Chart 1-11: Average Annual Dean Lake Chl-a versus TP

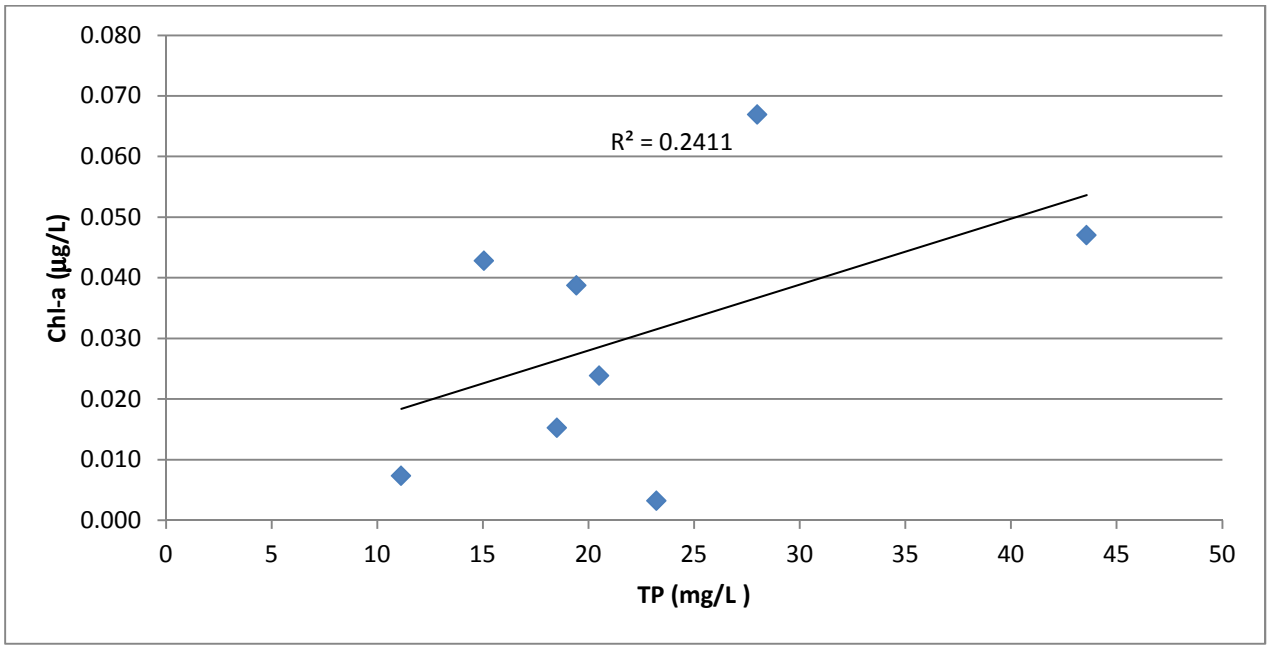
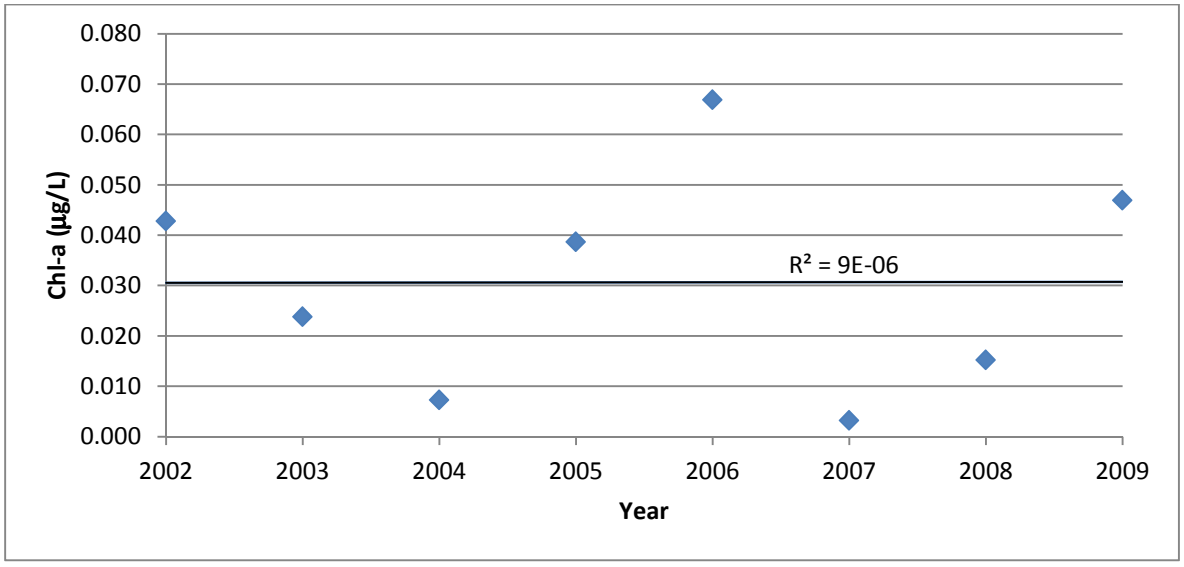


Chart 1-12 shows Dean Lake annual average Chl-a concentrations for 2002-2009. No significant trend exists over the course of the monitoring period.

Chart 1-12: Dean Lake Annual Average Chl-a Concentrations



MCES grades lake water quality relative to other lakes throughout the state based on the data presented in Table 1-8. Table 1-8 below summarizes the lake grade for each of the lakes monitored within the District given by the MCES in the yearly CAMP reports for each lake. Lake grades are based on analysis of water quality monitoring data for the year.

Table 1-8: Metropolitan Council Environmental Service Lake Grade

Lake	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Brickyard Clayhole						A	A	A	A	A	A	A	A
Courthouse	B	A	A	A	A	B	A	A	A	A	A	A	A
Fireman's					A	B	A	A	A	A	A	A	A
Dean						F	D	D	D	F	F	D	

Brickyard Clayhole and Courthouse and Fireman's Lake all have had excellent overall water quality over the course of the monitoring period. None of these lakes show any water quality trends, either upwards or downwards. In contrast, Dean Lake has had poor overall water quality over the course of the monitoring period without any upward or downward trends. Floodplain lakes with the District do not have enough water quality data to report. These lakes are significantly influenced by backwater from the Minnesota River, so monitoring data may not provide much information on water quality in these lakes.

1.6.2 Minnesota River

In an effort to understand historical runoff and pollutant loads entering the District from the greater Minnesota River Basin, a trend analysis of monitoring data collected by the Metropolitan Council and the USGS at the USGS gauge at Jordan (#05330000) was performed for annual runoff, total phosphorus (TP), and total suspended solids (TSS). Chart 1-13 shows total annual runoff in millions of acre-feet at the USGS gauge at Jordan from 1935 to 2007 (USGS-WaterInfo 2009). This data is a representation of the watershed runoff yield from the Minnesota River Basin upstream of the District. A trend analysis of the data indicates that annual yield has increased over the 72 years. The 20-year average annual yield has more than doubled in the latter 57 years of the data, increasing from nearly 2 million acre-feet in 1950 to over 5 million acre-feet in 2007. Chart shows the annual TSS load in tons at the Jordan gauge from 1976 to 2009 (MCES 2009). Chart 1-14 shows the annual TP load in tons at the Jordan gauge from 1979 to 2008 (MCES 2009).

Results of the analysis show that the watershed yield has doubled since the 1940s, the total TSS load has doubled since the 1980s, and the TP load has increased by about 15 percent since the 1980s. This is significant because, unless these trends are reversed, the District will experience more bank scour issues similar to those in Eden Prairie due to the increased runoff volumes and will suffer more sediment deposition in the navigation channel and in the flood plain lakes due to the significant increase in TSS loads. The increases in the TP loads will likely result in increased algae growth and more instances of low dissolved oxygen in the river, which will reduce fisheries habitat.

USGS operates an automatic monitoring network that continuously measures dissolved oxygen, temperature, pH, and specific conductance of the Minnesota River near Fort Snelling at R.M. 3.5. (Specific conductance, a measure of the ability of water to conduct an electrical current, gives a good idea of the amount of dissolved material in the water.) Biological monitoring, which assesses the integrated effects of water pollution on aquatic organisms, is also carried out at this site by the USGS.

Extensive conventional pollutant monitoring is also conducted to complement automatic monitoring. The monitoring results are used to characterize water quality and to determine specific sources of pollution, as well as the extent and nature of problems that may exist. Conventional pollutant monitoring is carried out at the following sites on the Minnesota River within the District:

- Near Shakopee (R.M. 25.1)
- Near Savage (R.M. 14.3)
- Near the Black Dog Power Plant (R.M. 8.5)
- Near Fort Snelling (R.M. 3.5)

More information regarding USGS monitoring on the Minnesota River is available by contacting the USGS or at the program website.

MCES is responsible for collecting and treating wastewater in the MSP metropolitan area. Performance monitoring of the two MCES wastewater treatment plant (WWTP) discharges, at the Seneca WWTP in the City of Eagan and the Blue Lake WWTP in the City of Shakopee, is conducted regularly to meet National Pollutant Discharge Elimination System (NPDES) permit requirements.

Chart 1-13: Annual Mean Discharge at the USGS Jordan Station – Minnesota River

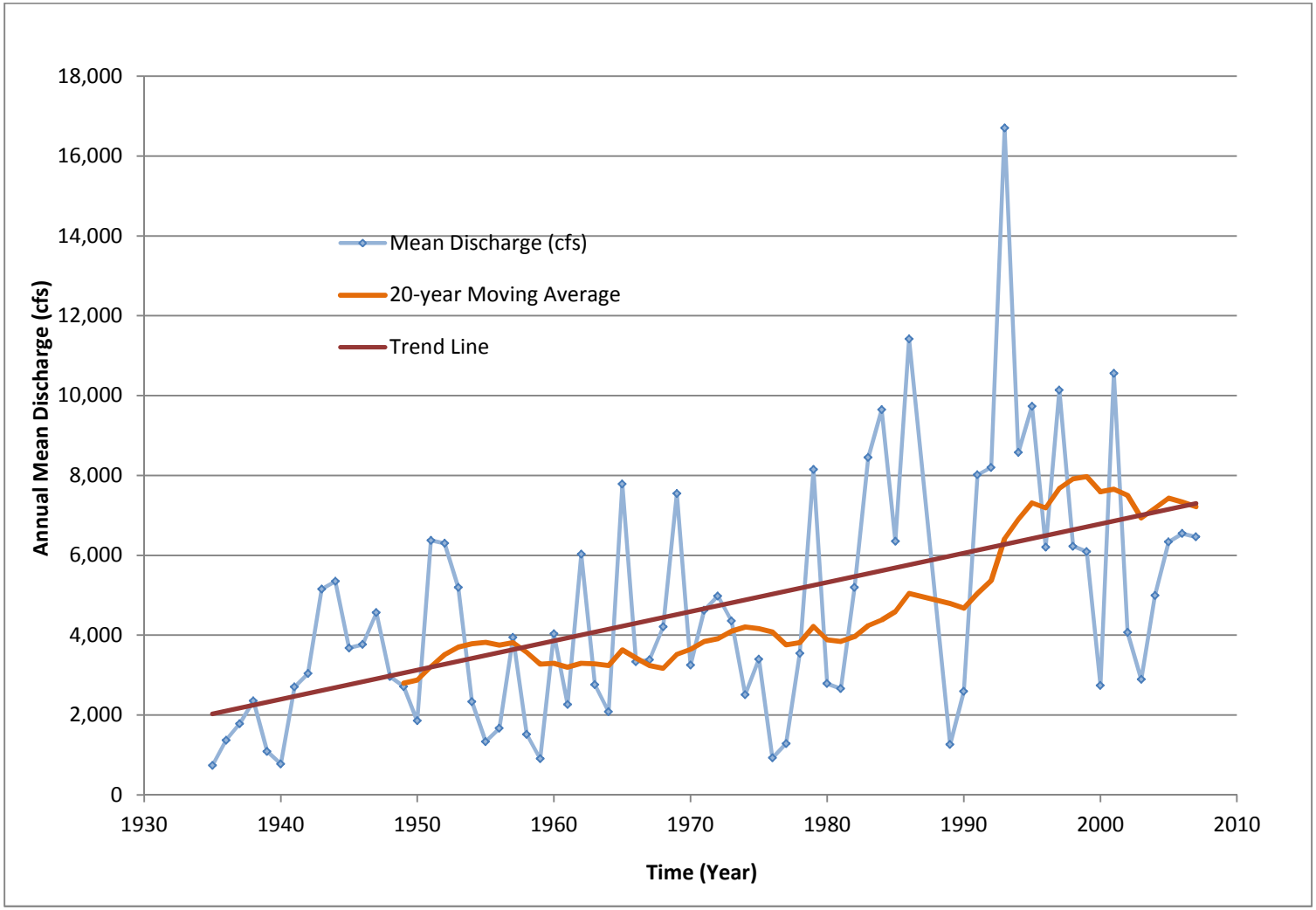


Chart 1-14: Annual Total Suspended Solids Load at the USGS Jordan Station – Minnesota River

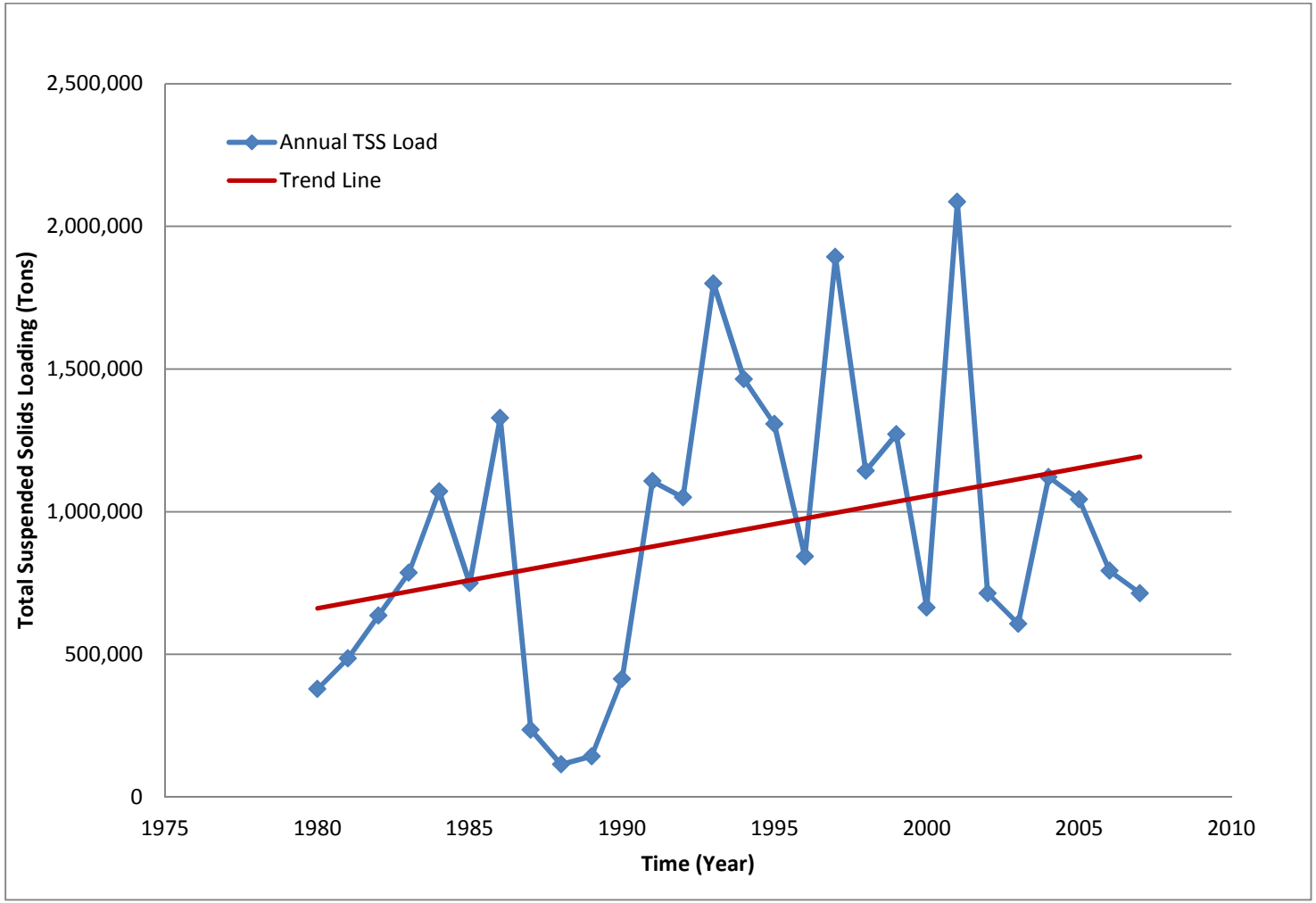
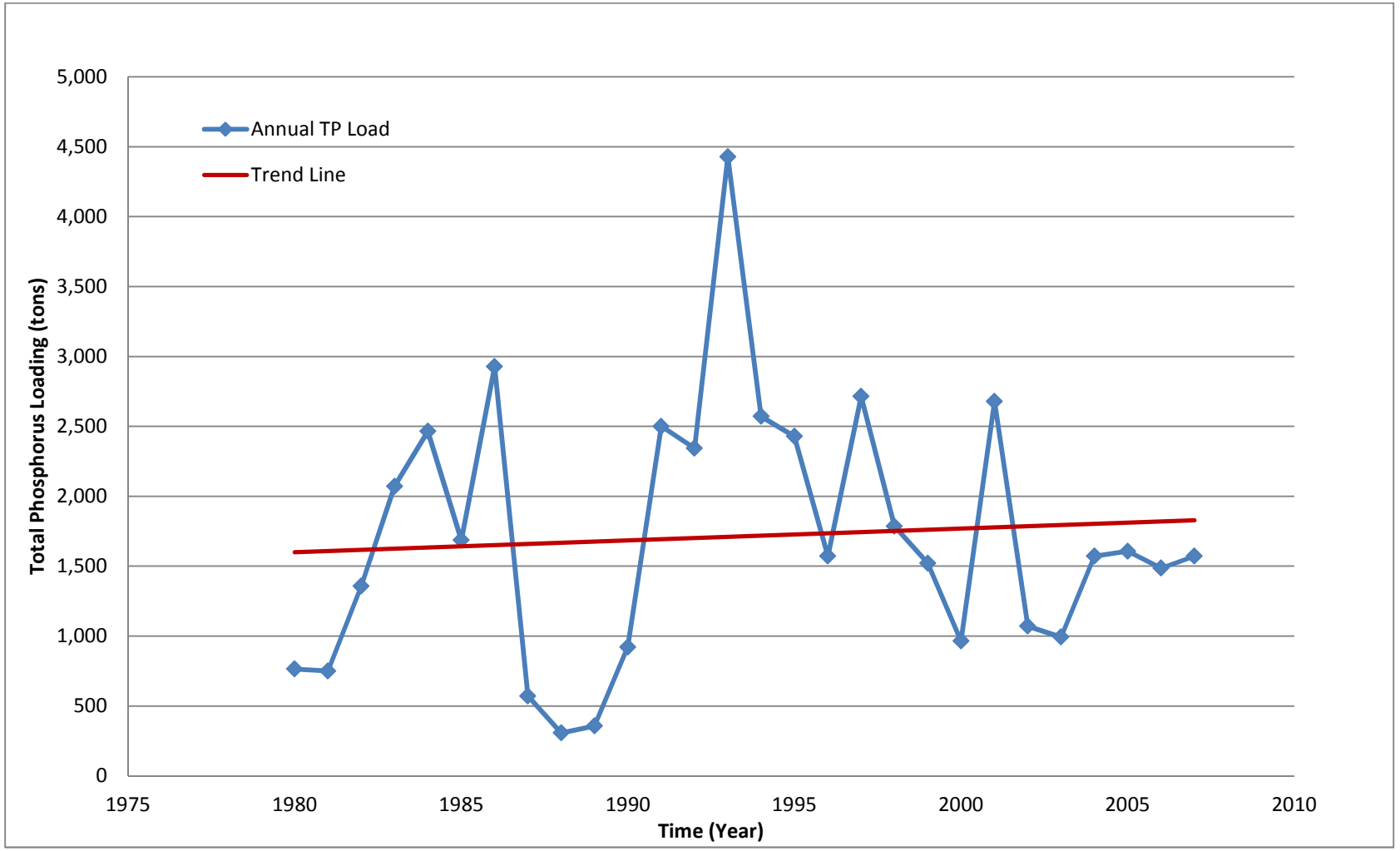
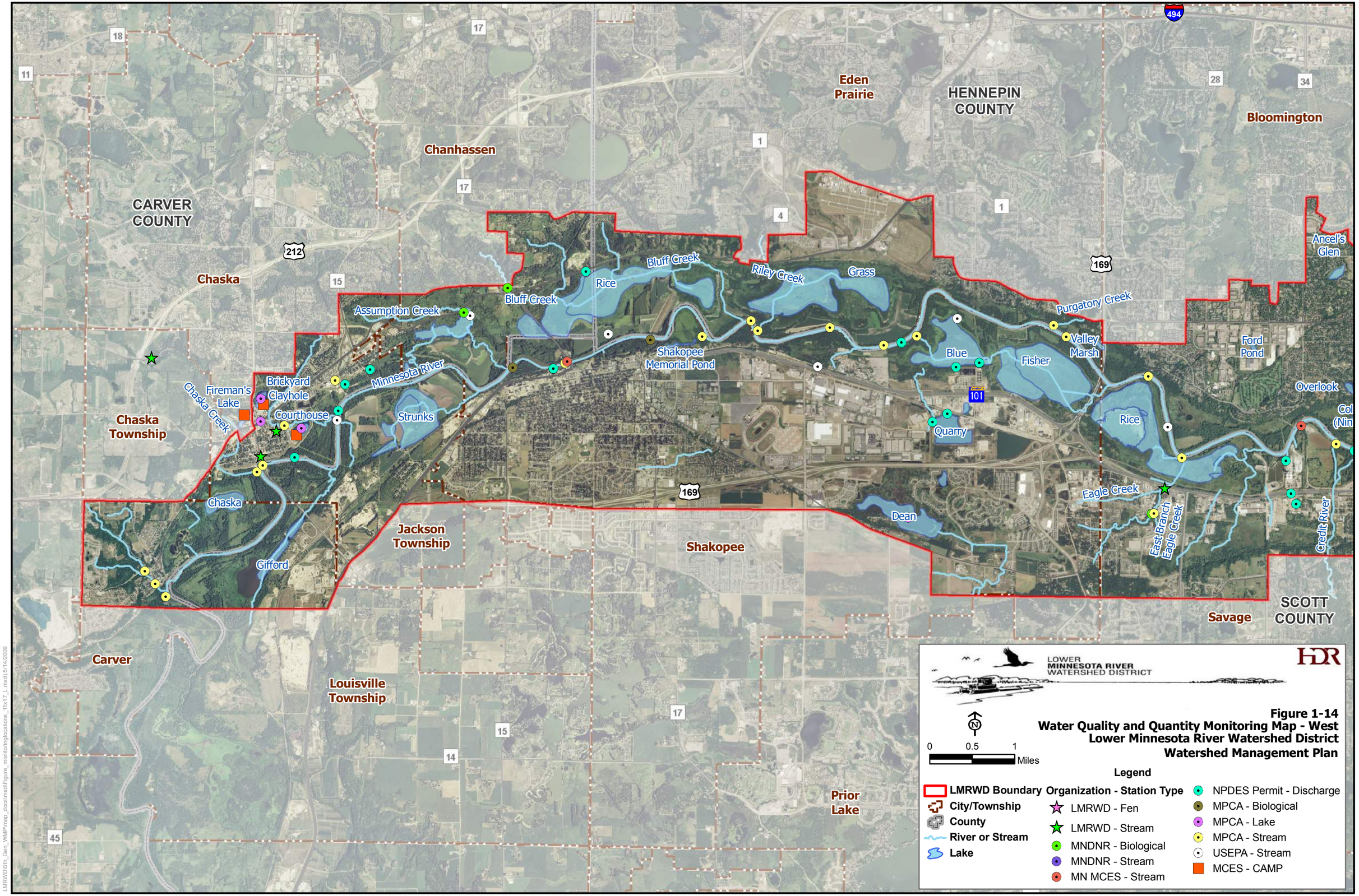


Chart 1-15: Annual Total Phosphorus Load at the USGS Jordan Station – Minnesota River



This page is intentional blank.



LMRWD\5th_Gen_WMP\map_docs\mxd\Figure_monitoringlocations_11x17_L.mxd\5/14/2009

Minnetonka
Edina
Minneapolis
St. Paul
Richfield
Mendota
Mendota Heights
Eden Prairie
HENNEPIN COUNTY
Bloomington
Burnsville
DAKOTA COUNTY
Eagan
SCOTT COUNTY
Savage
Pike Island Marsh
Snelling
Gun Club
Cemetery Pond
Long Meadow
Hohag Pond
Kennaley's Creek
Harnack Creek
Unnamed to Black Dog Lake
One Mile Creek (Unnamed #4)
Minnesota River
Black Dog
Ninemile Creek
Unnamed #7
Ancel's Glen
Ford Pond
Overlook
Coleman (Nine Mile)
Credit River
Grass
Purgatory Creek
Valley Marsh
Blue
Fisher
Rice
Quarry
Dean
Eagle Creek
East Branch Eagle Creek

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

Figure 1-15
Water Quality and Quantity Monitoring Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

0 0.5 1 Miles

Legend

- LMRWD Boundary
- City/Township
- County
- River or Stream
- Lake

Organization - Station Type

- LMRWD - Fen
- LMRWD - Stream
- MNDNR - Biological
- MNDNR - Stream
- MN MCES - Stream
- NPDES Permit - Discharge
- MPCA - Biological
- MPCA - Lake
- MPCA - Stream
- USEPA - Stream
- MCES - CAMP

LMRWD\5th_Gen_WMP\mxd\Figure_monitoringlocations_11x17_L.mxd 5/14/2009

1.6.3 Streams

The District, in cooperation with MCES and Scott SWCD, has operated a stream monitoring station on Eagle Creek in the City of Savage since 1999 and on Willow Creek in the City of Burnsville, in cooperation with MCES and Dakota SWCD, since 1999. The purpose of these stations is to measure the mass, or nonpoint source pollutant "load," that tributary streams transport to major rivers. Eagle Creek is sampled during significant runoff events and during base-flow conditions to help determine the sources and extent of nonpoint pollution. Since Eagle Creek supports a trout population, temperature monitoring at additional locations has also been sponsored by the District.

MCES also operates monitoring stations on streams tributary to the District but outside its jurisdiction at Bluff Creek (since 1990), Carver Creek (since 1989), Credit River (since 1989), Nine Mile Creek (since 1989), and Riley Creek (since 1999).

In 2005, MCES published the "2004 Stream Monitoring and Assessment" that, among other analyses, 1) contains the results of a trend analysis that was performed on annual loads and flow-weighted mean concentrations of pollutants using the Kendall Tau test and 2) compared historic to 2004 mean watershed yields and flow-weighted mean concentrations for a number of pollutants. The "2004 Stream Monitoring and Assessment" contained analyses for Eagle Creek, Bluff Creek, Carver Creek, Credit River, Nine Mile Creek, Riley Creek and Willow Creek in addition to 20 other Twin Cities metropolitan area streams.

The MCES' "2004 Stream Monitoring and Assessment" identified potential decreasing trends in Nine Mile Creek for nitrate (NO3), total dissolved phosphorus (TDP), total phosphorus (TP) and total suspended solids (TSS) and Bluff Creek for NO3 and TP. The report also identified decreasing trends in Sand Creek for TDP and TP and an increasing trend in Sand Creek for TSS. See Appendix C for the results of this trend analysis.

The MCES' "2004 Stream Monitoring and Assessment" comparison of historic to 2004 mean watershed yields and flow-weighted mean concentrations concluded the following regarding streams within or tributary to the District: 1) Sand Creek delivered the highest flow-weighted mean concentrations of TSS to the Minnesota River, 2) Bluff, Sand and Riley Creeks had the highest pollutant yields of TSS and 3) in general, the streams tributary to the Minnesota River had the greatest TSS, TP and NO3 yields of the 27 sites assessed. See Appendix C for graphical comparison of historic to 2004 mean watershed yields and flow-weighted mean concentrations of pollutants.

In late 2011, the MCES plans to 1) present a trend analysis of pollutant concentrations and 2) calculate annual pollutant loads and flow-weighted mean pollutant concentrations of the streams mentioned above over the period of record. The District, in an effort to avoid duplication of effort, will use the results of these analyses to prioritize monitoring efforts and implementation activities.

The District, in cooperation with Scott SWCD, has published quarterly or annual reports on Eagle Creek for pollutant monitoring since 2007 and temperature monitoring since 2006 (Appendix D). In general, these reports show that Eagle Creek is within eco-region means for pollutants and within trout supporting temperature ranges. The notable exception is winter time concentrations of bacteria, turbidity and sediment. Because the creek is spring fed, it does not freeze in the winter. The open water attracts a large number of waterfowl to the creek which elevates these pollutants.

The District, in cooperation with Dakota SWCD, has published quarterly reports on Willow Creek Pollutant monitoring since the fourth quarter of 2004. The October – December 2009 Quarterly Report (Appendix E) compares 2009 quarterly pollutant concentrations to historical (1999-2008) pollutant concentrations. When 2009 monitoring results are compared against historical mean concentrations, most parameters are near or below 10-year averages and suggest that water quality has remained relatively stable over the historical monitoring period. However, during the first quarter of 2009, concentrations for several endpoints (BOD, chloride, conductivity, hardness, lead, nickel, ammonia, and nitrate/nitrite) were substantially higher than 10-year averages. This is a consequence of early season runoff event samples which typically carry larger pollutant loads in excess of events sampled later in the year. This pattern of higher pollutant concentrations during the first quarter has routinely been observed for this station and appears to be the norm for this watershed.

In cooperation with Carver County Environmental Services and the City of Chaska, the District has operated three monitoring stations on East Chaska Creek since 2003. The purpose of these sites is to monitor the entire East Chaska Creek watershed for flow and nutrients. This data is used to analyze land use effects within the watershed on the creek. The District has published reports for these three sites over the monitoring period from 2003-2005 (Appendix F).

The District, in cooperation with the Minnesota Department of Agriculture (MDA), Carver County Environmental Services, and the City of Chaska, operates a monitoring site on West Chaska Creek. The purpose of this site is to gauge the output from the entire Chaska Creek watershed into the Minnesota River. The District has published reports for monitoring at this site in 1997 and for the period from 1999 to 2005 (Appendix G).

The District has monitored stream flows at three locations and, in cooperation with Chaska High School, monitored invertebrates in Assumption Creek. The District has published reports for stream flow monitoring in Assumption Creek in 2006 and for invertebrate monitoring since 2001 (Appendix H). Stream flow monitoring in Assumption Creek indicates presence of year round baseflow in Assumption Creek and invertebrate monitoring indicates that water quality is generally good. The District has monitored invertebrates in Spring Creek in cooperation with Chaska High School. The District has published reports for invertebrate monitoring in Spring Creek since 2001 (Appendix I). Invertebrate monitoring in Spring Creek indicate good to very good water quality. In addition, the District monitored temperatures in Unnamed Creek #7 during 2006 (Appendix J). Temperature monitoring at Unnamed Creek #7 in 2006 indicates that mean summer temperature was below the optimal limit for Brown trout for all of 2006 and there is little evidence of significant urban stormwater inputs based on temperature data collected in 2006.

Overland runoff and discharge from storm sewers has formed small intermittent streams that have created numerous gullies along the steep slopes of the Minnesota River bluffs. Many of these gullies have experienced excessive erosion which threatens slope stability and serves as source of sediment in the Minnesota River. In 2007, the District partnered with the Minnesota Conservation Corps (MCC) to take an inventory of these gullies and detect those with the most severe erosion. The District has used the results of this gully inventory to identify slope stabilization projects that it has since implemented and continues to implement with partnering cities. Appendix K contains the results of the gully inventory.

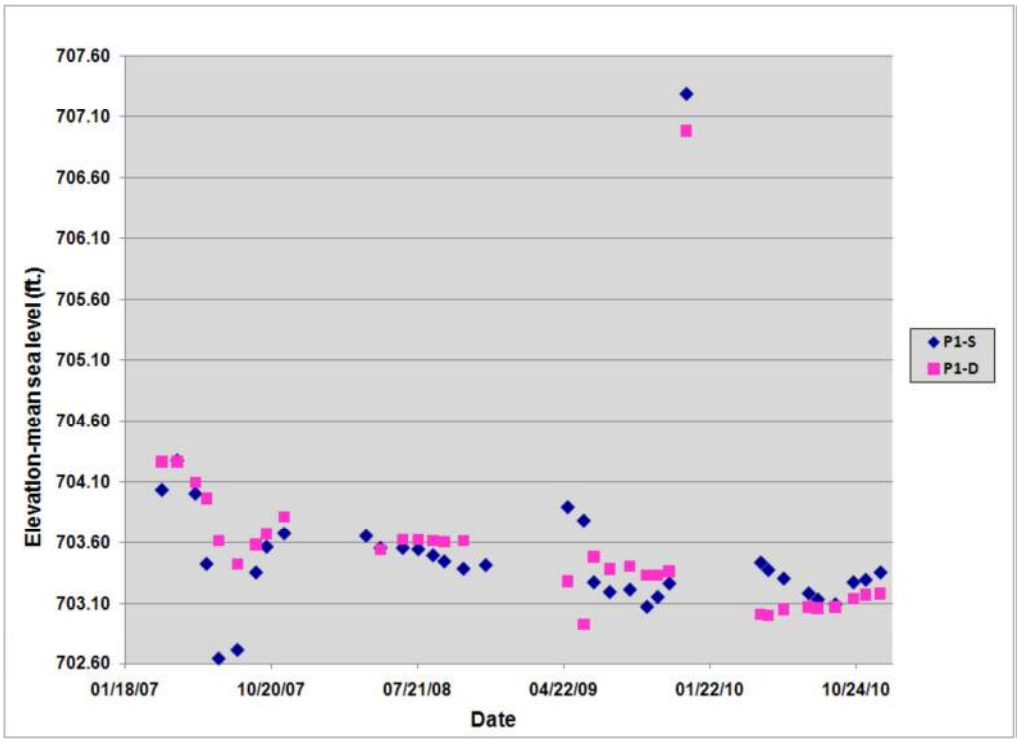
1.6.4 Fens

In 2007 the District began contracting with the Dakota County SWCD to collect monthly "depth to water" measurements for a network of 28 fen wells. Water levels are monitored at the following fens:

- Quarry Island
- Snelling Fen
- Nicols Fen

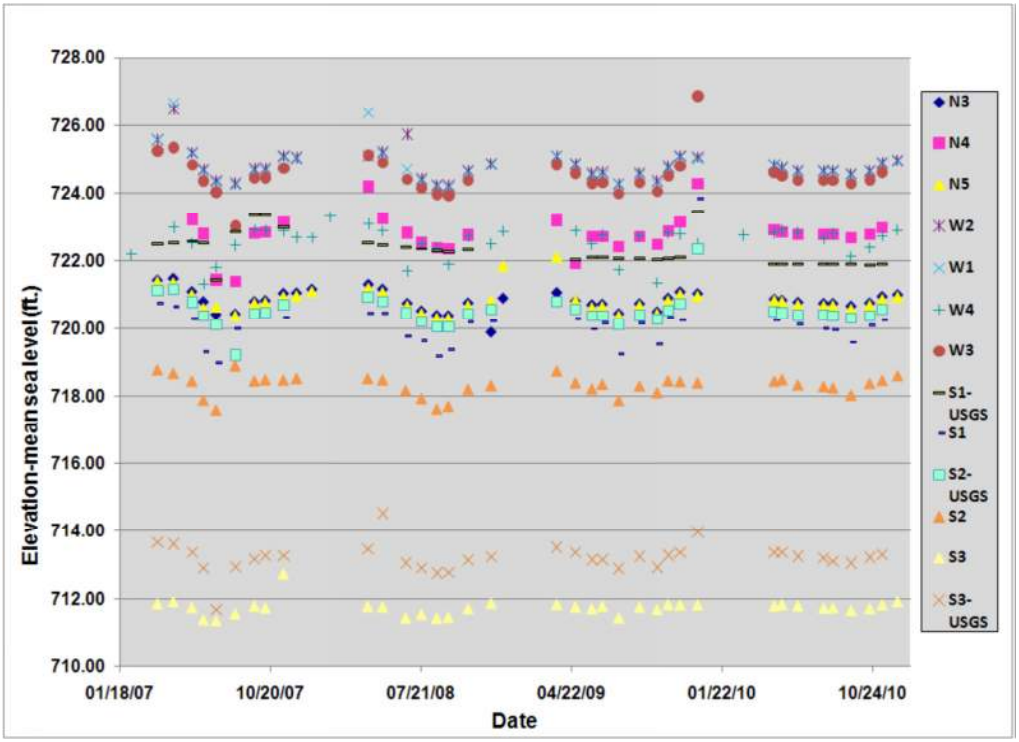
Chart 1-16, Chart 1-17 and Chart 1-18 shows fen well monitoring results for Quarry Island, Snelling and Nicols fens, respectively, from 2007 – 2010.

Chart 1-16: 2007-2010 Quarry Island Fen Well Monitoring Results



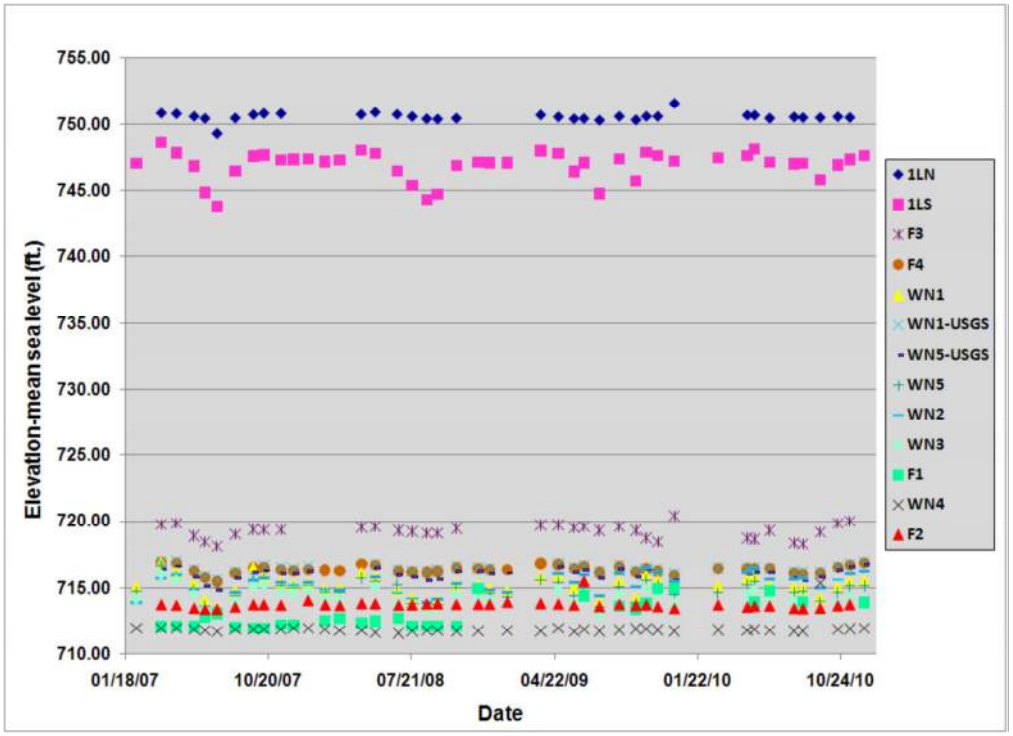
Source: 2010 Lower Minnesota River Watershed District Fen Well Monitoring Report

Chart 1-17: 2007-2010 Snelling Fen Well Monitoring Results



Source: 2010 Lower Minnesota River Watershed District Fen Well Monitoring Report

Chart 1-18: 2007-2010 Nicols Fen Well Monitoring Results



Source: 2010 Lower Minnesota River Watershed District Fen Well Monitoring Report

Water elevations among the 2007-2010 monitoring years have been relatively consistent and follow similar annual patterns in the Snelling and Nichols fens. Water elevations in the shallow wells of the Quarry Island Fen appear to be less consistent and slightly decreasing. In general, water elevations have decreased during dry summer months, and rebounded as precipitation increased in the fall. Although monthly fen well measurements do not closely mirror recent precipitation patterns, measurements do reflect general precipitation trends, especially during summertime periods of low rainfall.

Due to the brief period of record for this monitoring effort, a limited regression analysis was performed on the datasets for each well. A trend line was fitted to monthly data from each well to determine if water levels are increasing or decreasing (Table 1-9). A "goodness of fit" test was completed for all trend lines, with R2 values ranging from 0 to 0.6054. Due to these low R2 values, all trends should be considered weak.

Based on this analysis, water elevations in fen wells are mixed and do not demonstrate any obvious trends (low R2 values). However, one of the Nichols fen wells (F1) is beginning to exhibit a slight increasing trend (R2=-.6145). This trend may be due to increased precipitation amounts observed in recent years, reflecting higher groundwater levels. Additional monthly measurements are needed to expand on existing baseline data and to provide for a stronger trend analysis.

Table 1-9: Quarry Island, Fort Snelling and Nicols Fens 2007-2010 Regression Analysis

Quarry Island Fen Trends		
Well	*2007-2010 Trend*	*R2 (Trend Fit)*
P1-S	Negative	0.0034
P1-D	Positive	0.1067
Fort Snelling Fen Trends		
Well	*2007-2010 Trend*	*R2 (Trend Fit)*
N3	Negative	0.0287
N4	Positive	0.0251
N5	Negative	0.0209
W2	Negative	0.0782
W1	Negative	0.0768
W4	Positive	0.0122
W3	Positive	0.0002
S1-USGS	Negative	0.3038
S1	Positive	0.0068
S2-USGS	Positive	0.0001
S2	Negative	0.0006
S3	Negative	0.0056
S3-USGS	Positive	0.0088

Nicols Fen Trends		
Well	2007-2010 Trend	R2 (Trend Fit)
1LN	Positive	0.0017
1LS	Positive	0.0113
F3	N/A	0
F4	Positive	0.0144
WN1	Negative	0.0035
WN1-USGS	Positive	0.0144
WN5-USGS	Positive	0.0428
WN5	Negative	0.0056
WN2	Positive	0.2498
WN3	Negative	0.0654
F1	Positive	0.6054
WN4	Positive	0.0428
F2	Negative	0.0005

Source: 2010 Lower Minnesota River Watershed District Fen Well Monitoring Report

The District installed a series of groundwater observation wells in Savage Fen to monitor groundwater levels in Savage Fen since 1987. Chart 1-19 and Chart 1-20 show groundwater level monitoring results for Wells #10 and #12, respectively. These two wells were selected for analysis because they have the longest period of record. A trend line was fitted to monthly data for each well to determine if water levels are increasing or decreasing. Groundwater levels for Well #10 and Well #12 trend downwards over time. A "goodness of fit" test was completed for both trend lines, with R^2 values of 0.0134 for Well #10 and 0.0642 for Well #12. Due to these low R^2 values, trends for Wells #10 and #12 should be considered weak.

Chart 1-19: Savage Fen Groundwater Monitoring Results – Well #10

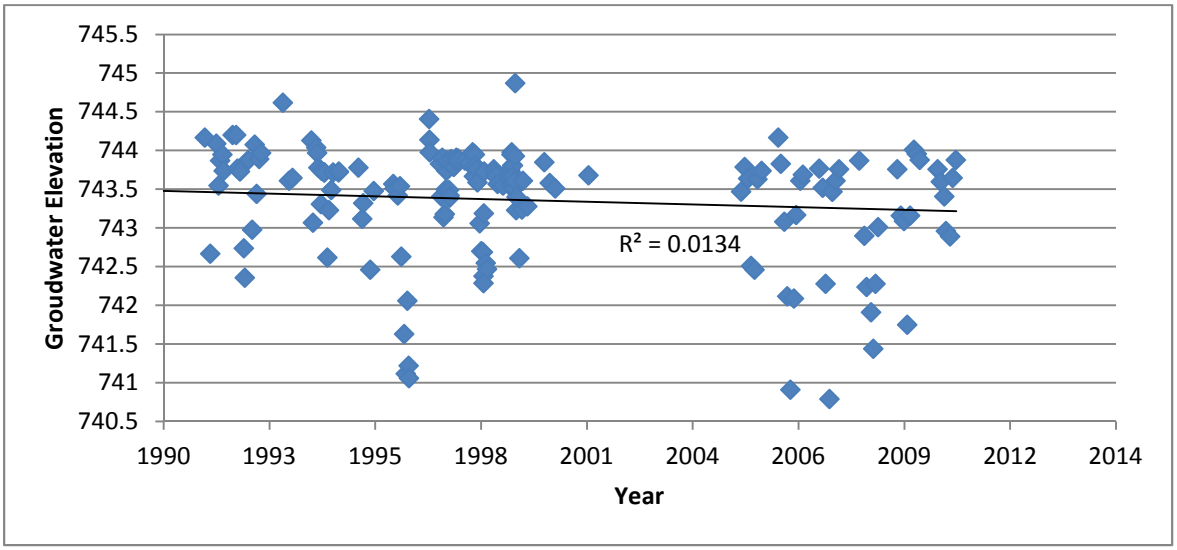
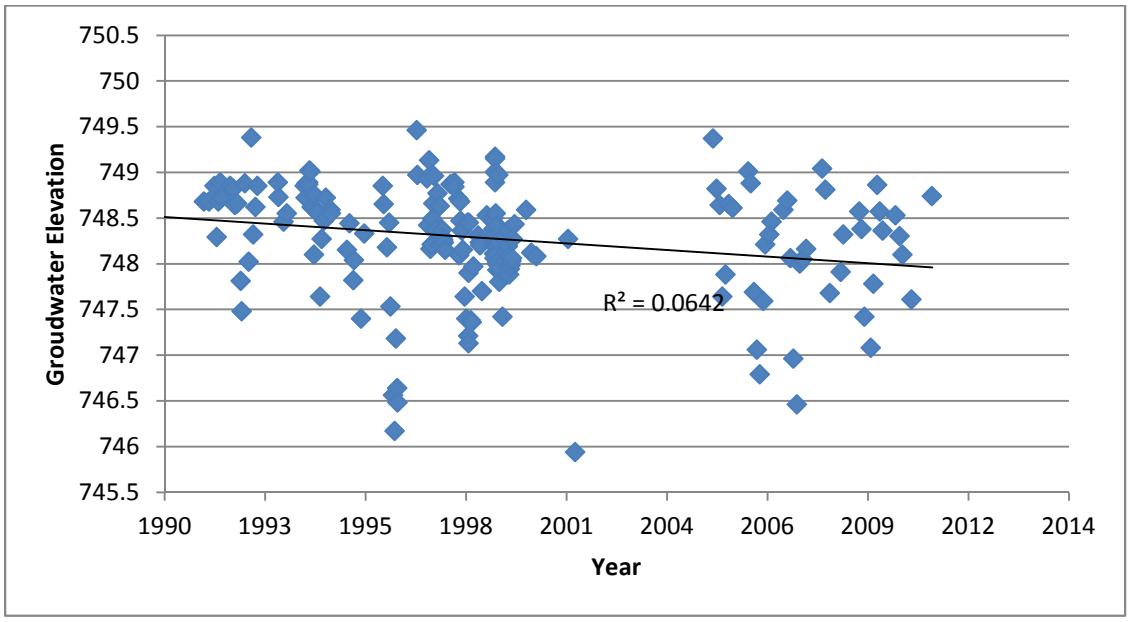


Chart 1-20: Savage Fen Groundwater Monitoring Results – Well #12



The District has also independently monitored water levels at Snelling Fen. Data from the fen monitoring is available at the District office or on the District's website. At Seminary Fen, the District has worked cooperatively with DOT and Carver County to monitor water levels from 2006 to 2007 These data were not presented as part of this Plan as longer-term data is needed to determine any trends in water levels at Seminary Fen.

1.7 SURFACE WATER APPROPRIATIONS

Several DNR-permitted surface water appropriations occur with the District. These include appropriations for irrigation, power generation, quarry dewatering, and other mining operations. Table 1-10 shows the 2007 surface water usage volumes for the DNR-permitted surface water appropriations.

Table 1-10: 2007 DNR Permitted Surface Water Appropriations

Permittee	Water Use	Water Body	Permitted Surface Water Use Volume (millions of gallons per year)
Xcel Energy - Black Dog Plan	Steam Power Cooling	Minnesota River	149,305
Kraemer Mining and Materials, Inc	Quarry Dewatering	Quarry/Gravel Pit	4,000
Edward Kraemer and Sons, Inc	Sand and Gravel Washing	Dug Pit	50
Minnesota Valley Country Club	Golf Course Irrigation	Dug Pit	60
Mueller & Sons, Inc	Sand/Gravel Pit	Quarry/Gravel Pit	70

	Dewatering		
Sever Peterson	Crop Irrigation	Minnesota River	13
US Fish and Wildlife Service	Lake Level Maintenance	Chaska Lake	8
US Fish and Wildlife Service	Fisheries/Hatcheries	Fisher Lake	8

1.7.1 Shoreland Ordinances

Shoreland ordinances vary according to the shoreland classification for a particular water body. The DNR's classifications are natural environment, recreational development, and general development. The DNR's shoreland regulations (i.e., setbacks) are most strict for natural environment water bodies and least strict for general development water bodies. Local government units (LGU) are responsible for the implementation, administration, and enforcement of shoreland management standards through their planning and zoning controls. The 2007 Minnesota State Legislature directed the DNR to commence rulemaking to update the statewide minimum shoreland development standards. As of April 2009, the DNR had created a draft of the proposed standards update, which incorporated the rules governing Minnesota's Wild, Scenic, and Recreational Rivers.

All of the municipalities within the District, with the exception of Mendota Heights, Lilydale, Mendota, and Carver, have DNR-approved shoreland management ordinances. Unincorporated areas come under the jurisdiction of the counties, all of which have DNR-approved shoreland ordinances.

1.8 GROUNDWATER RESOURCES

Groundwater protection and management in the District and the greater MSP metropolitan area is an important issue as counties in the area have a high reliance on groundwater for their domestic, municipal, industrial, and agricultural water supplies.

Counties within the District were given authority by the state to adopt groundwater management plans, which provide a mechanism to set priorities, address issues, and build local capacity for the protection and management of groundwater. Table 1-11 shows the status of the groundwater management plans for each of the counties within the District.

Table 1-11: County Groundwater Management Status

County	Groundwater Management Plan Status
Carver	Approved in 1992. Comprehensive water plan addressing both surface and groundwater issues adopted in 2001.
Dakota	Approved in 1992. Updated plan approved in 2000.
Hennepin	Approved in 1994.
Scott	Approved in 1999.
Ramsey	Approved in 1995. However, this has little impact on the District since Pike Island is the only portion of Ramsey County located within its boundary.

1.8.1 General Groundwater Information

The lower Minnesota River lies within an artesian basin containing glacial sediment and bedrock aquifers with large groundwater reserves. The DNR requires a permit for the appropriation of surface or groundwater in excess of 10,000 gallons of water per day or 1.0 million gallons per year. There are certain exemptions to this requirement related to domestic consumption, reuse of permitted water appropriations, test pumping, and agricultural purposes. More detailed information on groundwater usage for specific areas and on DNR-permitted appropriations within the District is available from the DNR Waters Division.

County geologic atlases and groundwater plans present detailed information about the water table and bedrock aquifers within the District, including the potentiometric surface (a measurement of water pressure) and potential aquifer yield. Figure 1-10 shows water table contours for the area around the District. The potentiometric surface indicates the direction of groundwater flow. Groundwater will flow from the areas of higher potentiometric elevation toward the lower potentiometric elevation. The cut of the Minnesota River valley has a predominant effect on the potentiometric levels in and near the valley.

1.8.2 Groundwater Quality

The general quality of deeper groundwater aquifers in the District is good and meets drinking water standards. Since most of the residents of the District receive their drinking water from these deeper groundwater supplies, and many of the District's water resources are groundwater-fed, protection of groundwater quality is of great concern.

As lands within the District continue to develop, the areas with impervious ground cover will increase. This, in turn, restricts the recharge of the aquifers by infiltration. This potential threat can be mitigated by use of development design practices that condense impervious areas and provide landscape features that promote infiltration.

Within the District, there are various potential sources of groundwater contamination. Septic tanks, spreading of chemicals and wastes, and commercial/industrial sites are all examples of pollution sources that could impair groundwater quality if improperly located or designed. Additional information on pollution sources within the District is provided in future sections.

Areas with sandy soils and a shallow depth to bedrock are particularly susceptible to groundwater contamination due to the rapid infiltration rate of the soils. An example of such an area would be the land around the City of Shakopee and Blue Lake. At this location, there is less than 50 feet of sand and gravel outwash over the Prairie du Chien aquifer. More information about areas susceptible to groundwater pollution can be obtained from county geologic atlases and groundwater plans.

1.8.3 Groundwater Availability and Use

Groundwater is available from multiple aquifers, including:

- Surficial aquifer (terrace deposits, alluvium and glacial outwash)
- St. Peter
- Prairie du Chien-Jordan
- Franconia-Ironton-Galesville
- Mt. Simon

The Minnesota River is a regional groundwater discharge area. Groundwater moves toward the Minnesota River and discharges into the river, floodplain lakes, wetlands, springs, and flowing wells, thus providing a high quality water source for the District's surface water resources. Flow directions in the surficial aquifers can be locally influenced by nearby surface water bodies or by pumping in deeper aquifers.

Table 1-12 summarizes groundwater use within the District. Surficial aquifer appropriations are included under 'Quaternary' aquifers in the table. The majority of surficial aquifer pumping is for temporary dewatering, which is typically performed for construction purposes and does not result in long-term impacts to the regional water table. As shown in Table 1-12, the primary categories of groundwater use from other aquifers include municipal water supply, agricultural processing, and sewage treatment. The principal source of groundwater for most of these uses, however, is the Prairie du Chien-Jordan aquifer.

Table 1-12: 2007 Groundwater Appropriation

Use Type	Aquifer Use 2007 (Millions of Gallons)				
	Franconia-Ironton-Galesville	Mt. Simon	Multi-Aquifer Wells	Prairie du Chien-Jordan	Quaternary
Agricultural Processing	59		762	136	
Dewatering					473

Use Type	Aquifer Use 2007 (Millions of Gallons)				
	Franconia-Ironton-Galesville	Mt. Simon	Multi-Aquifer Wells	Prairie du Chien-Jordan	Quaternary
Fire Protection					14
Golf Course				148	
Landscaping/ Athletic Fields			26	34	
Metal Processing				321	
Municipal Waterworks	214	640	35	2,036	
Non-Metallic Processing				151	
Heating / Air Conditioning				253	
Private Waterworks	6		3	6	
Sewage Treatment				638	
Steam Power Cooling				38	
Total	**279**	**640**	**826**	**3,762**	**487**

Pumping lowers the potentiometric surface in the aquifer, diverting flow toward the well. This diversion can occur vertically as well as horizontally, so that pumping in one aquifer can affect water levels and flow directions in another aquifer. As a result, pumping in a bedrock aquifer can eventually lower the water table in surficial aquifers. Some bedrock aquifers provide recharge to surface water bodies such as fens. As mentioned, the five calcareous fens within the District are recharged from groundwater. The hydraulics of these fens may be affected by pumping. This is just one reason why all new groundwater appropriation requests must be approved by the DNR prior to constructing pumping wells. During the approval process, and prior to making judgments on the sustainability of a new appropriation, the DNR reviews potentiometric surface levels, effects of seasonal pumping, proximity to existing appropriations, and total aquifer appropriations.

1.8.4 Groundwater Sustainability

Groundwater sustainability has been defined as the development and use of groundwater in a manner that can be maintained for an infinite time without causing unacceptable environmental, economic, or social consequences. Sustainability has traditionally been viewed mostly as protection of water quality and the absence of well interference (i.e., one well affecting the production of another).

Water quality protection has focused on aquifer susceptibility to contamination and protection of water supplies from sources of contamination. Aquifer susceptibility maps for the District are available in the county geologic atlases for Dakota, Hennepin, Ramsey, and Scott counties, and in the Carver County Surface Water Management Plan. The Minnesota Department of Health (DOH) administers the wellhead protection program, which focuses on preventing contamination of groundwater that may be captured by a public water supply well.

Traditional sources of contamination addressed in county groundwater plans include:

- Underground storage tanks
- Septic tanks
- Abandoned wells
- Use of pesticides and fertilizers
- Landfills and dumps

Future groundwater management for sustainability will include increased focus on coordinated management of groundwater, surface water, and water-dependent ecosystems. Examples of this new emphasis include management of groundwater to protect discharges to sensitive wetlands, rethinking the quantity and quality of groundwater discharges needed to protect fish and other biologic communities, and understanding the amount of water use that can be sustained indefinitely.

1.9 SOILS

Figure 1-16 and Figure 1-17 identify major soil associations within the District. More detailed soils information, such as development limitations, infiltration characteristics, and erosion characteristics of specific soil groups at specific sites can be found in the United States Department of Agriculture (USDA) Soil Survey for each of the counties in the District. Information is also available at the SWCD office for each county and on the USDA Natural Resources Conservation Service (NRCS) Website.

1.9.1 General Description

The Minnesota River valley includes, at its lowest elevations, floodplain soils such as alluvium, peat, and muck identified as the Chaska-Minneiska-Colo soil complex. Alluvial soils are usually flood deposits. The particulate sizes range from gravelly sand to silt and clay, with silt and very fine sands being predominant. Peat and muck are soils with high organic content. In peat, partially decayed vegetative (organic) matter such as reeds, grasses, mosses, and leaves can be identified. In muck, the decomposition has advanced to such a stage that the materials are not definable.

At the edge of the floodplain within the District, just below the bluffs that border the Minnesota River valley, lie well-drained silt loams and more poorly drained silty clay loams. These soils result from erosion on the higher levels of the bluffs.

In Dakota County, the break between floodplain and upland is very sharp. Above the bluff are soils that formed on glacial drift called the Mankato till, which were deposited as the Grantsburg Sublobe of the Des Moines lobe of the Mankato ice sheet retreated up the present day Minnesota River Valley. These gray-brown Podzolic soils developed for the most part under forest conditions that covered most of the District. Today, only remnants of that forest remain.

In Carver County, soils outside the floodplain are fine textured (sandy to loamy), level to gently sloping, and are the result of deposits of the Glacial River Warren. Above these soils on the steeper slopes are more coarse textured soils. Soils associated with glacial moraine are found on top of the bluffs.

In Hennepin County, the soil associations are similar to those in Carver County, extending over the same moraine deposits of the north bluff. Above the bluffs near Interstate Highway 35W, there is a small amount of sandy loam. These soils likely developed on stream-deposited material, with the bluff representing an old river terrace. This is further proof of the extent of the Glacial River Warren and the existence of river terraces in and near the Minnesota River valley.

In Scott County, about two miles west of Savage and between the floodplain and the higher upland regions, larger terraces begin to appear and continue to be evident to the western end of the District. Several related soils are found on these terraces: silt and silty clay loams on the lower terraces, and sandy loams on the upper terraces. District soils are shown on Figure 1-16 and Figure 1-17.

1.9.2 Soil Erosion and Sedimentation

Erosion and its resulting sedimentation are the primary causes of non-point source water quality problems on the Minnesota River. The sediments create navigation problems by forming sandbars which require monitoring in order for the channel to be maintained.

Cropland erosion (most of which is located outside of the District) is a major source of sediment problems in the District. Gully, streambank, roadside, and development-related erosion are also sources of sediment problems. Gully erosion can occur as a result of over-grazing, poor management, or intensive land use above steeply sloped lands such as the Minnesota River valley bluffs. These bluffs are composed almost entirely of highly erodible, sandy soils that are difficult to control, stabilize, and re-vegetate once disturbed. When development occurs without regard for slope, soil type, or loss of vegetation, soil erosion and sedimentation are accelerated.

Figure 1-16and Figure 1-17 show highly erodible land and potentially highly erodible land within the District for Scott and Hennepin counties. The topographic information on Figure 1-8 and Figure 1-9 identifies locations of steeply sloped lands (greater than 18 percent) such as the blufflands. Slope is a main factor in determining critical erosion areas; other factors include slope length, land cover, and erodibility.

Soil Association

- CHASKA-MINNEISKA-COLO (MN165)
- ESTHERVILLE-DICKMAN-DAKOTA (MN168)
- HAYDEN-CORDOVA-HAMEL (MN166)
- HUBBARD-ISAN-DUELM (MN072)
- KINGSLEY-MAHTOMEDI-QUAM (MN172)
- LESTER-HAMEL-LE SUEUR (MN080)
- LESTER-HAWICK-TERRIL (MN171)
- LESTER-HAYDEN-MUSKEGO (MN081)
- LESTER-KILKENNY-HOUGHTON (MN152)
- SPARTA-ESTHERVILLE-WAUKEGAN (MN169)
- WAUKEGAN-WADENA-HAWICK (MN173)

HENNEPIN COUNTY
Eden Prairie
Bloomington
CARVER COUNTY
Chaska
Chaska Township
Jackson Township
Shakopee
Savage
SCOTT COUNTY
Carver
Louisville Township
Prior Lake
Rice
Grass
Shakopee Memorial Pond
Brickyard Clayhole
Fireman's Lake
Courthouse
Strunks
Chaska
Gifford
Blue
Fisher
Valley Marsh
Quarry
Dean
Rice
Ancel's Glen
Ford Pond
Overlook
494
28
34
1
17
4
212
15
169
101
14
45
39

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-16
Soils Map - West
Lower Minnesota River Watershed District
Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

Erodibility (Scott & Hennepin Counties)

- Highly erodible land
- Potentially highly erodible land

(\\mspe-gis-file\gis\proj\LMRWD\5th Gen. WMP\map_docs\mxd\Figure3_soilsmap_11x17_L.mxd) 2/17/2009

Soil Association

- CHASKA-MINNEISKA-COLO (MN165)
- ESTHERVILLE-DICKMAN-DAKOTA (MN168)
- HAYDEN-CORDOVA-HAMEL (MN166)
- HUBBARD-ISAN-DUELM (MN072)
- KINGSLEY-MAHTOMEDI-QUAM (MN172)
- LESTER-HAMEL-LE SUEUR (MN080)
- LESTER-HAWICK-TERRIL (MN171)
- LESTER-HAYDEN-MUSKEGO (MN081)
- LESTER-KILKENNY-HOUGHTON (MN152)
- SPARTA-ESTHERVILLE-WAUKEGAN (MN169)
- WAUKEGAN-WADENA-HAWICK (MN173)

HENNEPIN COUNTY
Minneapolis
St. Paul
Richfield
Mendota
Mendota Heights
Eagan
Eden Prairie
Bloomington
Burnsville
Savage
DAKOTA COUNTY
SCOTT COUNTY

Pike Island Marsh
Snelling
Gun Club
Cemetery Pond
Long Meadow
Hohag Pond
Ancel's Glen
Ford Pond
Overlook
Coleman (Nine Mile)
Black Dog
Valley Marsh
Blue
Fisher
Rice
Quarry
Dean
Grass

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

N

0 0.5 1 Miles

Figure 1-17
Soils Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

Erodibility (Scott & Hennepin Counties)

- Highly erodible land
- Potentially highly erodible land

(\\mspe-gis-file\gisroot\LMRWD\5th Gen WMP\mxd_docs\mxd\Figure3_soilsmap_11x17_L.mxd) 2/17/2009

1.10 LAND USE AND PUBLIC UTILITY SERVICE

The District is located in the midst of the growing MSP metropolitan area. This location, coupled with commercial and recreational opportunities provided by the Minnesota River, make the District lands highly desirable for residential, commercial, and industrial development. In addition, the District contains some agricultural lands and large areas of open space. Open space is mostly located in and along the floodplain of the Minnesota River and consist almost entirely of public lands, which are administered federally by the USFWS in the Minnesota Valley National Wildlife Refuge. At the state level, the Minnesota DNR manages the parks and opens spaces in the Minnesota Valley State Recreation Area and Fort Snelling State Park, and locally, counties and municipalities manage the remaining parks and open spaces.

Figure 1-18 and Figure 1-19 show land use in the District as of 2005 as delineated by the Metropolitan Council. Figure 1-20 and Figure 1-21 show Regional Planned Land Use in the District up to the year 2030, as defined by Metropolitan Council. Land use remains relatively static between publication of this Plan and proposed changes for year 2030. The majority of land use changes will occur on the south side of the Minnesota River in the cities of Shakopee and Savage where agricultural and forested lands are anticipated to transition to single family residential use. Further development of lands in the District could have serious adverse effects on wildlife, water resources, and other sensitive resources. However, if projects are sited properly and the resources are adequately protected, these concerns may be alleviated.

Figure 1-20 and Figure 1-21 show the boundaries of the Metropolitan Urban Services Area (MUSA). Areas within the MUSA currently have municipal sanitary sewer facilities or are planned to have municipal sanitary sewer facilities in the future. Lands outside the MUSA boundary are served by individual waste disposal systems. Lands located within the MUSA boundary are more likely to develop quickly and at a greater density than lands located outside the MUSA boundary.

Existing Land Use

- Farmstead
- Seasonal/Vacation
- Single Family Detached
- Manufactured Housing Park
- Single Family Attached
- Multifamily
- Retail and Other Commercial
- Office
- Mixed Use Residential
- Mixed Use Industrial
- Mixed Use Commercial and Other
- Industrial and Utility
- Extractive
- Institutional
- Park, Recreational or Preserve
- Golf Course
- Major Highway
- Railway
- Airport
- Agricultural
- Undeveloped
- Water

Minneapolis
St. Paul
Edina
HENNEPIN COUNTY
Richfield
Mendota
Mendota Heights
Eden Prairie
Bloomington
Burnsville
DAKOTA COUNTY
Eagan
Savage
SCOTT COUNTY

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

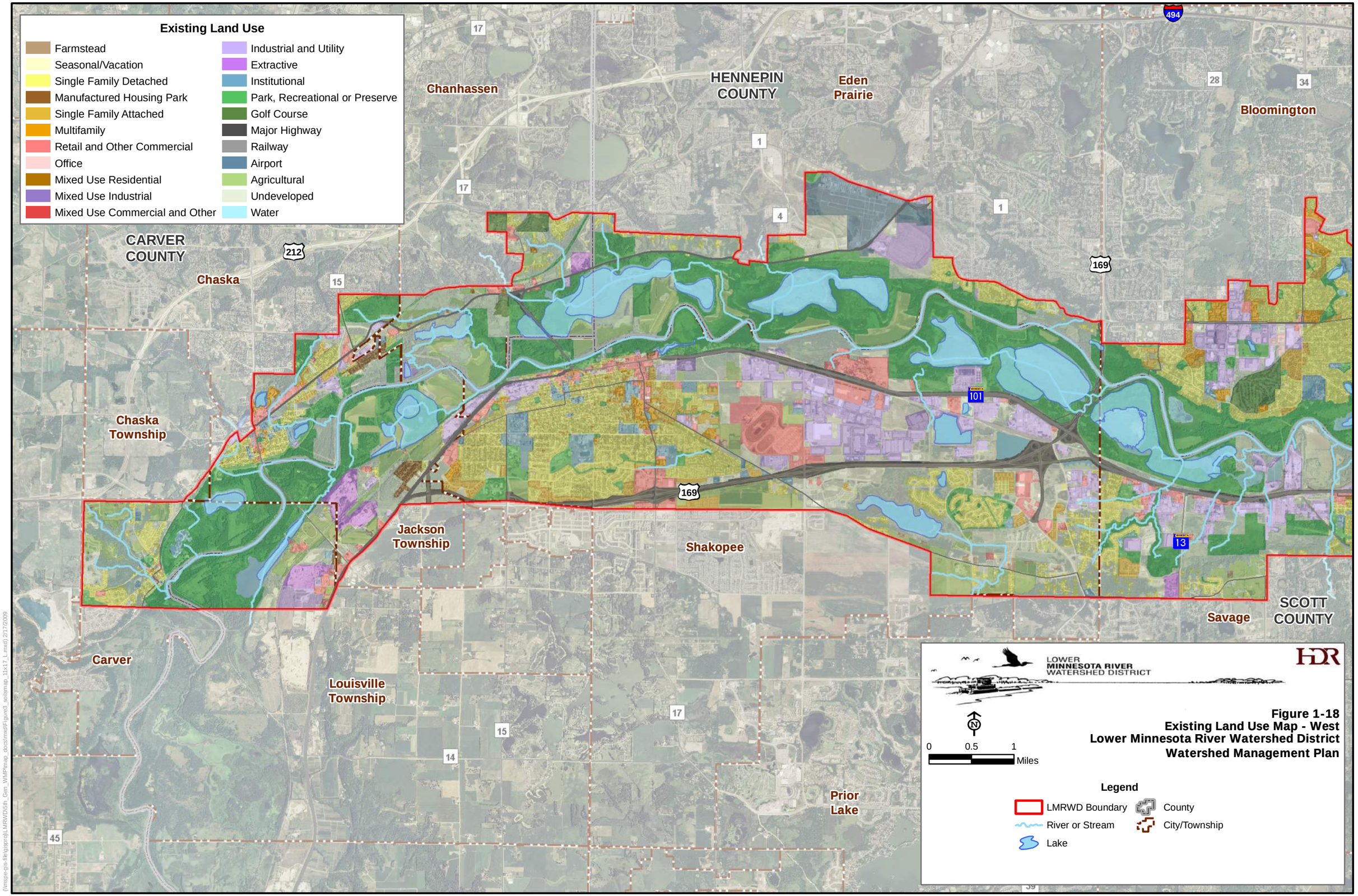
0 0.5 1 Miles

Figure 1-19
Existing Land Use Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

(\\mspe-gis-file\gis\roLMRWD\5th Gen WMP\map_docs\mxd\Figure3_soilsmap_11x17_L.mxd) 2/17/2009



(\\mspe-gis-file\gisproj\LMRWD\5th_Gen_WMP\map_docs\mxd\Figure3_soilsmap_11x17_L.mxd) 2/17/2009

Regional Planned Land Use

- Agricultural
- Rural or Large-Lot Residential
- Single Family Residential
- Multifamily Residential
- Commercial
- Industrial
- Institutional
- Mixed Use
- Multi-Optional Development
- Park and Recreation
- Open Space or Restrictive Use
- Rights-of-Way (i.e., Roads)
- Railway (inc. LRT)
- Airport
- Vacant or Unknown
- Open Water

Met Council Comprehensive Plan Composite

- 2010 MUSA as of 10/12/06
- 2020 MUSA
- 2030 MUSA
- 2040 Urban Reserve
- Not in Jurisdiction
- Permanent Agricultural
- Permanent Rural
- Undesignated MUSA

Minneapolis
St. Paul
Mendota
Mendota Heights
Richfield
Eden Prairie
Bloomington
Burnsville
Eagan
DAKOTA COUNTY
Savage
SCOTT COUNTY

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-21
2030 Regional Planned Land Use Map - East
Lower Minnesota River Watershed District
5th Generation Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

(\\mspe-gis-file\gis\roL\MRWD\5th Gen. WMP\map_docs\mxd\Figure3_soilsmap_11x17_L.mxd) 2/17/2009

Regional Planned Land Use

- Agricultural
- Rural or Large-Lot Residential
- Single Family Residential
- Multifamily Residential
- Commercial
- Industrial
- Institutional
- Mixed Use
- Multi-Optional Development
- Park and Recreation
- Open Space or Restrictive Use
- Rights-of-Way (i.e., Roads)
- Railway (inc. LRT)
- Airport
- Vacant or Unknown
- Open Water

Met Council Comprehensive Plan Composite

- 2010 MUSA as of 10/12/06
- 2020 MUSA
- 2030 MUSA
- 2040 Urban Reserve
- Not in Jurisdiction
- Permanent Agricultural
- Permanent Rural
- Undesignated MUSA

HENNEPIN COUNTY
Eden Prairie
Bloomington
CARVER COUNTY
Chaska
Chaska Township
Jackson Township
Shakopee
Carver
Louisville Township
Prior Lake
Savage
SCOTT COUNTY

494 28 34 1 4 1 212 15 169 101 169 13 17 15 14 45

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-20
2030 Regional Planned Land Use Map - West
Lower Minnesota River Watershed District
5th Generation Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

(\\mspe-gis-file\gisproj\LMRWD\5th_Gen_WMP\mxd\Figure3_soilsmxd_11x17_L.mxd) 2/17/2009

1.11 WATER BASED RECREATIONAL AREAS

There are approximately 24,000 acres of existing wildlife refuges, parks, trails, and open space located along the Minnesota River corridor managed under the Minnesota Valley National Wildlife Refuge. The Minnesota Valley National Wildlife Refuge was established through the efforts of local citizen groups to protect the Lower Minnesota River valley. The Minnesota Valley Trail was authorized by the state legislature in 1969. Federal legislation entitled "The Minnesota Valley National Wildlife Refuge Act of 1976" declared that the policy of the Congress would be to preserve the Minnesota River valley and, as a federal action, establish the 9,500-acre Minnesota Valley National Wildlife Refuge and an adjacent 8,000-acre wildlife recreation area. The majority of this area is within District's boundary.

The refuge portion of the area is managed by the USFWS with two main objectives: to provide habitat for a diversity of plants and animals, and to provide opportunities for people to observe and learn about the valley's wildlife. The recreation area is managed by local governments and by the DNR. These agencies are developing recreational and educational opportunities that are compatible with Minnesota River valley natural resources. The DNR Division of Parks and Recreation manages the state trail. Management objectives are to develop an accessible, scenic, and recreational travel route between Fort Snelling State Park and Le Sueur. This trail links with other metro area trails to provide hiking, bicycling, horseback riding, snowmobiling, and cross-country skiing opportunities for the residents of the MSP metropolitan area. Figure 1- 22 and Figure 1-23 show the location within the District of existing and proposed regional and state trails, state and federal parks, recreational areas, and the National Wildlife Refuge.

Unique Resources

Trails
- Regional Existing
- Regional Planned
- Regional Proposed
- State Existing

- Trout Lake
- Trout Stream
- MCBS Native Plant Community

MCBS Biodiversity Significance
- Moderate Significance
- High Significance
- Outstanding Significance

- Regionally Significant Ecological Area
- USFWS NWR
- MN SNA
- State Park
- National Park Service Boundary

CARVER COUNTY
Chaska
Chaska Township
Carver
Jackson Township
Louisville Township
Shakopee
Prior Lake
Eden Prairie
Bloomington
Savage
SCOTT COUNTY
Assumption Creek
Courthouse Lake
Minnesota Valley State Recreation Area
Eagle Creek
East Branch Eagle Creek
Savage Fen SNA
494
212
169
101
17
15
4
1
28
34
14
45
39

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-22
Unique Resources Map - West
Lower Minnesota River Watershed District
Watershed Management Plan

Legend
- LMRWD Boundary
- County
- City/Township

(\\mspe-gis-file\gispro\LMRWD\Sh_Gen_WMP\map_docs\mxd\Figure7_uniqueresources_11x17_L.mxd) 2/24/2009

Unique Resources

Trails
- Regional Existing
- Regional Planned
- Regional Proposed
- State Existing

- Trout Lake
- Trout Stream
- MCBS Native Plant Community

MCBS Biodiversity Significance
- Moderate Significance
- High Significance
- Outstanding Significance

- Regionally Significant Ecological Area
- USFWS NWR
- MN SNA
- State Park
- National Park Service Boundary

Minneapolis
St. Paul
Mendota
Mendota Heights
Richfield
HENNEPIN COUNTY
Eden Prairie
Bloomington
Fort Snelling State Park
Kennaley's Creek
Harnack Creek
DAKOTA COUNTY
Eagan
OneMileCreek (Unnamed#7)
Unnamed#7
Black Dog Preserve SNA
Burnsville
Eagle Creek
East Branch Eagle Creek
Savage Fen SNA
Savage
SCOTT COUNTY

35 46 152 53 60 39 100 494 31 5 55 110 28 34 77 26 32 35W 17 1 169 101 13 30 35E

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

N

0 0.5 1 Miles

Figure 1-23
Unique Resources Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

Legend
- LMRWD Boundary
- County
- City/Township

(\\mspe-gis-file\gis\proj\LMRWD\5th Gen WMP\map_docs\mxd\Figure7_uniqueresources_11x17_L.mxd) 2/24/2009

1.13 COMMERCIAL AND RECREATIONAL NAVIGATION

Navigation was one the primary initiatives driving the establishment of the District. The District was principally established to be a legal entity for providing local participation to the COE to construct a navigation channel. Water-borne freight traffic is one of the District's greatest commercial assets and is of great importance to the local and state economy. The Minnesota River is navigable from its confluence with the Mississippi River to the Carver Rapids, just above the City of Carver. The Hastings Dam, located on the Mississippi River at Hastings, Minnesota, controls the surface water of the Minnesota River and its effect extends as far as the Carver Rapids, just upstream of the most westerly boundary of the District.

Construction of a navigation channel on the Minnesota River was first authorized in 1892. In that year (1892), Congress authorized the Minnesota River navigation project, which provided for the construction of a 4-foot channel from the mouth of the Minnesota River at its confluence with the Mississippi River, upstream for a distance of 25.6 river miles to Shakopee. The COE is authorized to provide channel maintenance if appropriations and environmental concerns are addressed in advance.

In 1942, the COE dredged a 9-foot deep, 100-foot wide channel from the mouth of the Minnesota River to Savage (13.2 river miles), paid for by local interests. The 1958 River and Harbor Act authorized improvements on the Minnesota River from its mouth upstream to R.M. 14.7, a point one-half mile above the railroad bridge near Savage. Under this authorization, a channel 9 feet deep and 100 feet wide was provided. Three cutoffs to eliminate wide passage or turnouts to aid navigation were provided to permit tows to pass safely. The COE, with the District as the local sponsor, finished installation of the 100-foot wide, 9-foot deep channel in August 1968. The navigation channel cost roughly $2 million, or about $136,000 per mile. The resultant dredged materials were placed at temporary disposal sites.

Periodic dredging is required to maintain the navigation channel. The required maintenance is accomplished through a cooperative agreement between the District and the COE. Sites most frequently dredged by the COE are located between R.M. 12 and R.M. 14.7. Sites between river mile 1.0 and 2.0, near Pike Island, and between river mile 4.0 and 5.0 are occasionally dredged. Figure 1-24 and Figure 1-25 show the most frequently dredged locations on the Minnesota River. In the past, private interests extended the navigation channel upstream to R.M. 21.8 near Port Peavey in Shakopee, but this channel has been abandoned.

In 1978, the City of Savage petitioned the District to acquire and develop permanent sites for the disposal of dredged materials resulting from maintenance of the 9-Foot channel. The Managers accepted the petition and ordered preparation of an engineer's report. The engineer's report recommended acquisition and development of six permanent disposal sites. In 2007, the COE - St. Paul District published a Channel Maintenance Management Plan (CMMP), which

reviewed the feasibility of potential material placement sites along the Minnesota River, including the six sites originally investigated. The CMMP is available on the COE – St. Paul District website.

In 2007, the District acquired a site from Cargill on the south bank of the Minnesota River at mile 14.2 for dredge material placement. This acquisition is documented in the COE CMMP. The site was used in 2008, 2009 and 2010 and is estimated to have capacity for 185,000 cubic yards or 7to 9 years of dredge material placement without removal. The District is investigating acquisition of an additional site from the U.S. Air Force (USAF), on the north side of the Minnesota River at R.M. 3.5. This site would provide material placement for the less frequently dredged reaches of the river between R.M. 1.0 and 2.0, near Pike Island, and R.M. 4.0 and 5.0.

Several private dredge material placement sites are also in use within the District. These sites are primarily used for placement of dredge material from barge slip maintenance and include the following sites on the south bank of the river:

- Cargill-Westfield (R.M. 14.8)
- Kraemer (R.M. 12.1)
- Waste Management (R.M. 12.4)

Both private pleasure craft and commercial traffic navigate the Minnesota River within the District. Commercial barge traffic dominates, traveling the entire 14.7 miles upstream from the river mouth to the head of the 9-Foot navigation channel. Generally, tows on the Minnesota River consist of one power unit and two to four barges.

The main commodity transported on the river is bulk grain or grain products. All commercial terminals in the District are located in the City of Savage. Cargill handles grain products, corn products, and fertilizer. Bunge and CHS, Inc., both handle grain products. Other commercial terminals include U.S. Salt and Superior Minerals Company. U.S. Salt handles salt, lightweight aggregate, and cotton seed, and Superior Minerals Company handles aggregates. These shippers draw from an approximately 200,000 square-mile area, which includes eastern South Dakota, southeastern North Dakota, all of Minnesota, the western two-thirds of Wisconsin, and the northern two-thirds of Iowa.

According to the DOT Ports and Waterways Section, annual tonnages from the City of Savage commercial terminals decreased from 3,427,182 tons in 2004 to 1,705,650 in 2008. Annual tonnages vary due to seasonal flooding, freight rates, and foreign grain demands. DOT figures further show that the average barge movement via the Minnesota River since 1991 has been over four million tons per year. Ten years of that period had actual tonnage in excess of five million tons. As for the most recent six-year period, a drop in barge movement is explained by several events: First. According to DOT, the Minnesota ethanol industry removes roughly 100 million bushels of corn from the river market each year; that's the equivalent of 1,900 barges

annually.. As an aside, dried grains, a byproduct of corn ethanol, has a potential to move via barge when production stabilizes so as to justify the capital investment required to handle such movements. Second, periodically, abnormally high ocean shipping rates from New Orleans to Japan, for instance, diverted additional grain from Savage to west coast ports via rail. Without high ocean rates, these grains would have moved from Savage via the river. As a matter of reference, the spread of ocean rates to Japan from Gulf ports versus from Pacific Northwest states increased by a factor of 8 times against the Gulf, meaning grain destined to Japan via the Gulf was simply too expensive. However, the Panama Canal expansion scheduled to be completed in 2014 will enable the larger west coast vessels to serve Gulf ports thus removing the current Gulf penalty. Figure 1-24 and Figure 1-25 show public and private dredge material disposal sites within the District.

This page left blank intentionally.

CARVER COUNTY
HENNEPIN COUNTY
SCOTT COUNTY
Chanhassen
Eden Prairie
Bloomington
Chaska
Chaska Township
Jackson Township
Shakopee
Savage
Carver
Louisville Township
Prior Lake
Ancel's Glen
Ford Pond
Overlook
Bluff Creek
Riley Creek
Rice
Grass
Assumption Creek
Purgatory Creek
Valley Marsh
Blue
Fisher
Quarry
Shakopee Memorial Pond
4' Channel End
9' Channel End
Minnesota River
Brickyard Clayhole
Fireman's Lake
Chaska Creek
East Creek Courthouse
Strunks
Chaska
Unnamed Creek
Gifford
Carver Creek
Dean
Eagle Creek
East Branch Eagle Creek
Credit River
494
169
212
101

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

Figure 1-24
Commercial Navigation Map - West
Lower Minnesota River Watershed District
Watershed Management Plan

0 0.5 1 Miles

Legend

- LMRWD Boundary
- River or Stream
- Lake
- City/Township
- County
- River Mile

Dredged Material Disposal Sites
- District Owned
- Potential District Owned Site
- Privately Owned

Dredged Reaches
- Frequently Dredged
- Occasionally Dredged

LMRWDSth_Gen_WMPImap_docs\mxd\Figure_dredgesites_11x17_L.mxd) 5/12/2009

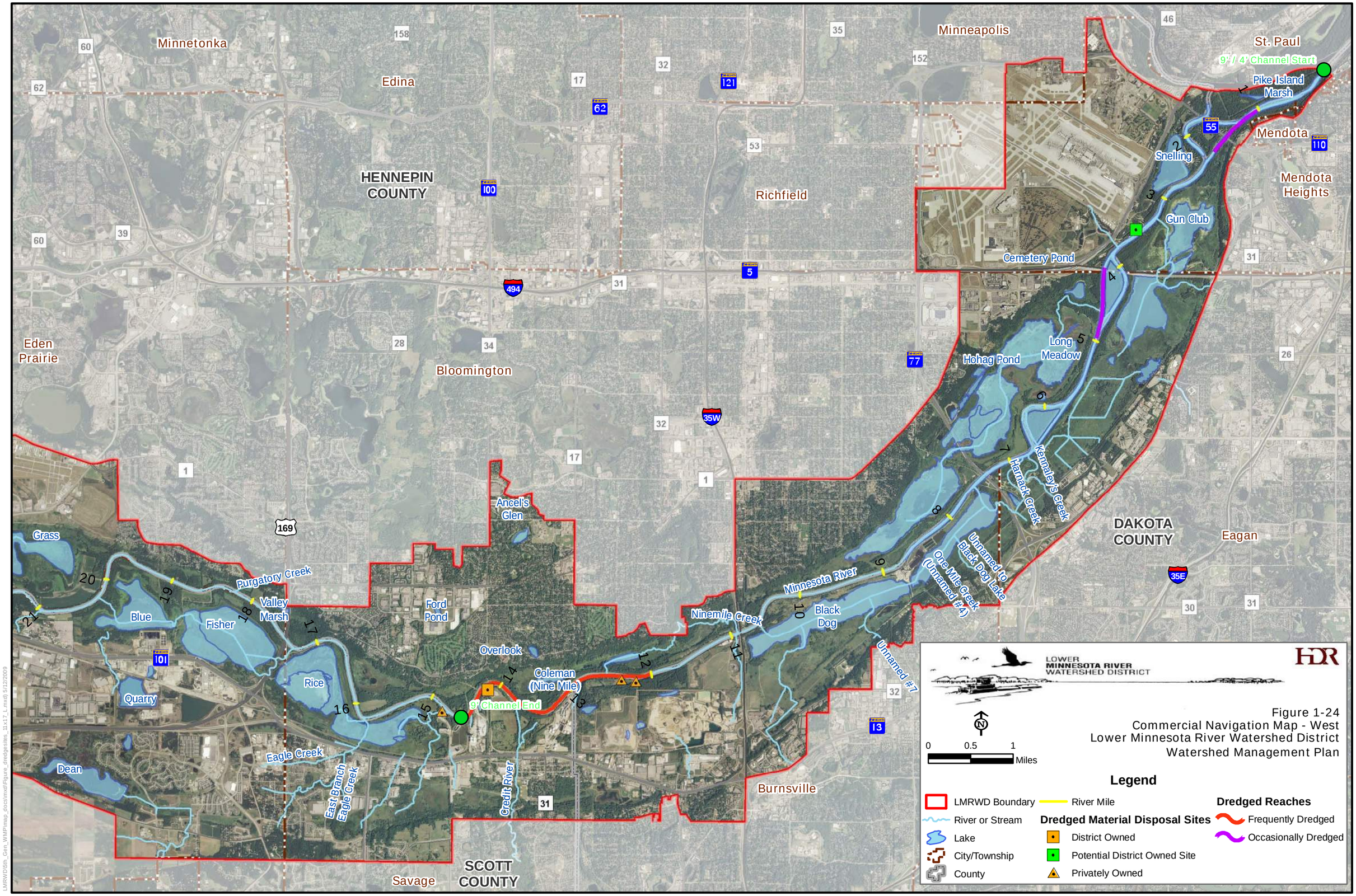


Figure 1-24
Commercial Navigation Map - West
Lower Minnesota River Watershed District
Watershed Management Plan

LMRWDSth_Gen_WMPmap_docs\mxd\Figure_dredgesites_11x17_L.mxd) 5/12/2009

1.14 FISH AND WILDLIFE HABITAT

The District supports critical needs of a large number of wildlife species. Bird watching clubs have recorded hundreds of species of birds in the area during migration. There are also several species of mammals and many species of amphibians and reptiles. The lakes, streams, and rivers of the District are inhabited by carp, buffalo head, bullhead, shad drum, catfish, dogfish, gar, shiner, northern pike, walleye, trout, and sunfish. Many of these species of fish are available in abundance and provide excellent fishing opportunities. However, before eating fish taken from the Lower Minnesota River, health warnings from the DOH should be consulted.

Appendix E of the Minnesota Valley National Wildlife Refuge Comprehensive Conservation Plan (CCP), completed in 2004, contains a detailed wildlife inventory. In addition, Appendix A of the CCP contains an environmental assessment that evaluates the effect of various management alternatives on fish and wildlife habitat in the Refuge. This assessment applies to all fish and wildlife located in the District. For additional information, the Conservation Plan is located on the USFWS Website.

1.15 UNIQUE FEATURES AND SCENIC AREAS

The District is home to several areas with moderate to high biodiversity significance. The combination of the Minnesota River, the floodplain, and the river bluffs result in a high occurrence of rare and endangered species, unique features, and scenic areas. Unique features include the fens and trout streams discussed in later sections. Scenic areas include the parks, trails, and refuges previously described.

In addition to unique water resources and scenic areas, there are several rare species and natural communities within the District that are important areas for conservation. Numerous native plant communities found in the District are shown on Figure 1-22 and Figure 1-23. The plant communities, delineated by the Minnesota County Biological Survey, interact with each other and their surrounding environment. These interactions have not been altered by human activity, or by introduction of non-native plant or animal species.

According to the Natural Heritage Information System, maintained by the DNR Natural Heritage and Non-game Research Program, there are hundreds of known occurrences of rare species and natural communities within the District. The Higgins eye pearly mussel is currently listed as a federally endangered species. The peregrine falcon, previously listed as a federally endangered species and since removed from the list, is still considered a threatened species in Minnesota. Endangered state species located in the District include the western prairie fringed orchid, Henslow's sparrow, the cricket frog, and eared false foxglove.

Rare natural communities include mesic prairies and Boiling Springs in Savage. Mesic prairies are found on sites that have relatively good drainage and contain some of the most diverse prairie wildflower displays. Mesic prairies are the most threatened prairie because most were converted

for agricultural use. Eagle Creek is the home of Boiling Springs, a location where the water bubbles up, creating the illusion that it is boiling. It is considered a sacred site by the local Native American community.

1.16 POLLUTANT SOURCES

1.16.1 Feedlots

Currently, there are no registered feedlots within the District. However, county groundwater plans propose to inventory currently unregistered feedlots.

1.16.2 Abandoned Wells

Abandoned and sealed wells, inactive wells, and wells of unknown status within the District, are identified on Figure 1-26 and Figure 1-27.

1.16.3 Storage Tanks

The MPCA maintains a database of all leak sites, including those from above- and below-ground storage tanks and leaking underground storage tanks (LUST). Many of these leak sites have been closed by the MPCA. The intent of the database is to protect human health and the environment by evaluating, minimizing, or correcting petroleum contamination impacts to soil and water caused by leaking storage tank systems.

Figure1-26 and Figure 1-27 identify LUST site locations.

1.16.4 Industrial Discharges

MCES is delegated as the Control Authority to regulate the use of public sanitary sewer systems within the MCES seven county service area. Companies are issued an Industrial Discharge Permit if it is determined they will have a significant impact on the public sewer system.

Figure 1-26 and Figure 1-27 identify the locations of sites that have been issued an Industrial Discharge Permit by the Industrial Waste and Pollution Prevention Section of MCES.

1.16.5 Wastewater Treatment Plants

Two wastewater treatment plants, Seneca in the City of Eagan and Blue Lake in the City of Shakopee, are located within the District.

Figure 1-26 and Figure 1-27 identify their locations. Discharge from these treatment plants, along with the associated sanitary sewer lines, urban storm water discharges, and various utility lines, present potential environmental hazards within the District.

- Inactive or Unknown Status Well Location
- Sealed Well Location
- MCES Permit
- MPCA LUST Site
- Wastewater Treatment Plant
- State Closed Landfill Program (CLP)
- State Superfund Site (PLP)
- RCRA Treatment, Storage and Disposal (TSD) Site
- RCRA Investigation/Cleanup Site
- Permitted Solid Waste
- Unpermitted Dump Sites
- Voluntary Investigation & Cleanup Site (VIC)

Eden Prairie
HENNEPIN COUNTY
Bloomington
Chanhassen
CARVER COUNTY
Chaska
Chaska Township
Jackson Township
Shakopee
Carver
Louisville Township
Prior Lake
Savage
SCOTT COUNTY
Bluff Creek
Rice
Riley Creek
Grass
Assumption Creek
Shakopee Memorial Pond
Minnesota River
Brickyard Clayhole
Chaska Creek
Fireman's Lake
Courthouse
Strunks
Gifford
Purgatory Creek
Valley Marsh
Blue
Fisher
Quarry
Dean
Eagle Creek
East Branch Eagle Creek
Credit River
Ancel's Glen
Ford Pond
Overlook
Col (Nin
17
494
28
34
1
4
212
15
169
101
45
14
39

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-26
Potential Pollutant Sources Map - West
Lower Minnesota River Watershed District
Watershed Management Plan

Legend

- LMRWD Boundary
- River or Stream
- County
- Lake
- City/Township

(\\mspe-gis-file\gisproj\LMRWD\5th_Gen_WMP\mxd_docs\mxd\Figure1-0_pollutantsources_11x17_L.mxd) 2/20/2009

- Inactive or Unknown Status Well Location
- Sealed Well Location
- MCES Permit
- MPCA LUST Site
- Wastewater Treatment Plant
- State Closed Landfill Program (CLP)
- State Superfund Site (PLP)
- RCRA Treatment, Storage and Disposal (TSD) Site
- RCRA Investigation/Cleanup Site
- Permitted Solid Waste
- Unpermitted Dump Sites
- Voluntary Investigation & Cleanup Site (VIC)

Minneapolis
St. Paul
Richfield
Bloomington
Eden Prairie
HENNEPIN COUNTY
Mendota
Mendota Heights
Eagan
DAKOTA COUNTY
Burnsville
Savage
SCOTT COUNTY
Pike Island Marsh
Snelling
Gun Club
Cemetery Pond
Long Meadow
Hohag Pond
Kennaley's Creek
Harnack Creek
Unnamed to Black Dog Lake
One Mile Creek (Unnamed #4)
Minnesota River
Ninemile Creek
Black Dog
Unnamed #7
Ancel's Glen
Ford Pond
Overlook
Coleman (Nine Mile)
Grass
Purgatory Creek
Valley Marsh
Blue
Fisher
Rice
Quarry
Eagle Creek
East Branch Eagle Creek
Credit River
Dean

LOWER MINNESOTA RIVER WATERSHED DISTRICT

HDR

0 0.5 1 Miles

Figure 1-27
Potential Pollutant Sources Map - East
Lower Minnesota River Watershed District
Watershed Management Plan

Legend
- LMRWD Boundary
- River or Stream
- Lake
- County
- City/Township

(\\mspe-gis-file\gisproj\LMRWD\5th_Gen_WMPmap_docs\mxd\Figure1-0_pollutantsources_11x17_L.mxd) 2/20/2009

1.16.7 Landfills and Solid Waste

The MPCA Closed Landfill Program (CLP) is a voluntary program established by the legislature in 1994 to properly close, monitor, and maintain Minnesota's closed municipal sanitary landfills. Three closed sanitary landfills in the CLP program are located within the District in Hennepin (Flying Cloud Sanitary Landfill), Scott (Louisville Landfill), and Dakota (Freeway Sanitary Landfill) counties. Figure 1-26 and Figure 1-27 show their locations.

Figure 1-26 and Figure 1-27 also show the locations of permitted solid waste sites within the District. These facilities manage household and commercial garbage and include landfills, transfer stations, demolition landfills, composting facilities, and solid-waste incinerators.

In the 1980s, MPCA created a list of unpermitted dumpsites that included abandoned dumps, demolition sites, tree disposal sites, industrial dumps, and other dumps. Most of these sites existed prior to the creation of the MPCA in 1967, and detailed information about them is not generally available. If, when these sites are investigated, they are found to present a risk to human health or the environment, they are moved into the appropriate cleanup program.

Figure 1-26 and Figure 1-27 also show locations of unpermitted dump sites within the District.

1.16.8 Hazardous Waste

MPCA, in conjunction with the Environmental Protection Agency (EPA), maintains information on sites with past, present, or potential for future hazardous waste contamination. These sites are regulated and administered under the various programs described below.

State of Minnesota superfund sites, also referred to as Permanent List of Priorities (PLP) sites, are those with known or suspected environmental contamination that has the potential to threaten public health, welfare, or the environment. These sites are investigated and cleaned up under the Minnesota Superfund Program. The PLP sites include those addressed by MPCA, as well as sites with agricultural chemical contamination, which are addressed by the Minnesota Department of Agriculture. PCI, Inc., located in Shakopee, is the only PLP site located within the District. PCI, Inc., shown on Figure 1-26 and Figure 1-27, was an ash disposal site.

Resource Conservation and Recovery Act (RCRA) Treatment, Storage and Disposal (TSD) facilities are those permitted to treat, store, and dispose of hazardous wastes. These facilities typically collect hazardous wastes from other businesses and treat or dispose of them properly. Safety-Kleen Eagan, located in Eagan, is the only RCRA TSD site within the District (Figure 1-27) RCRA Investigation/Cleanup sites are those where RCRA hazardous waste generators had an actual or potential release requiring investigation and/or cleanup. These generators fall into the very small, small, and large quantity generator classes. There is one RCRA Investigation/Cleanup site located within the District, General Dynamics, at 3101 East 80th Street in Bloomington (Figure 1-27).

The Voluntary Investigation and Cleanup (VIC) Program allows buyers, sellers, developers, or local governments to voluntarily investigate and, if necessary, clean up contaminated land to facilitate its sale, financing, or redevelopment. Those who complete investigation and/or cleanup activities under MPCA oversight can receive liability assurances that protect them from future superfund liability. Locations of sites in the VIC Program within the District are shown on Figure 1-26 and Figure 1-27.

1.16.9 Pesticide and Fertilizer

The Minnesota Department of Agriculture (MDA) is statutorily responsible for the management of pesticides and fertilizer other than manure to protect water resources. The MDA implements a wide range of protection and regulatory activities to ensure that pesticides and fertilizer are stored, handled, applied and disposed of in a manner that will protect human health, water resources and the environment. The MDA works with the University of Minnesota to develop pesticide and fertilizer Best Management Practices (BMPs) to protect water resources, and with farmers, crop advisors, farm organizations, other agencies and many other groups to educate, promote, demonstrate and evaluate BMPs, to test and license applicators, and to enforce rules and statues. The MDA has broad regulatory authority for pesticides and has authority to regulate the use of fertilizer to protect groundwater.

2.0 ISSUES AND PROBLEMS ASSESSMENTS

2.1 INTRODUCTION

In workshops and meetings with the Managers, the Technical Advisory Committee (TAC), the Citizen Advisory Committee (CAC), and staff, and through a critical review of the Second Generation Plan implementation, the District identified barriers blocking its ability to manage and protect the Minnesota River, lakes, streams, groundwater, and unique natural resources within the District. These barriers make it difficult for the District to effectively manage and protect resources:

- Unclear role of the district
- Incomplete understanding of the function and value of some of the resources within the District
- Competition for limited fiscal resources
- Inability to control activities that originate outside District boundaries but affect District resources
- Development and population pressures
- Partial understanding of constantly changing rules and requirements of other regulatory entities (cities, federal and state agencies, and non-governmental organizations)
- Unfavorable perception of the Minnesota River
- Limited state control of non-point source pollution
- Increasing demand for recreational opportunities and open space
- Increased runoff volumes and peak discharges
- Limited public participation

By themselves, or in conjunction with others, these barriers exacerbate District water quality and resource protection issues. The following sections present a discussion of the issues which directly or indirectly result from these barriers, assess existing programs and their adequacy to address the highlighted issues, and identify management gaps.

Management policies, goals, and strategies, which address the issues and gaps presented in this Section, are presented later in this Plan.

2.2 ISSUES SUMMARY

The following issues were identified through the planning process; a discussion of each issue follows.

1. Unclear Role of the District
2. Outside Influences
3. Water Quality
4. Flooding and Floodplain Management
5. Erosion and Sediment Control
6. Groundwater
7. Commercial and Recreational Navigation
8. Public Education and Outreach
9. Potential Problems

2.2.1 Issue 1 – Unclear Role of the District

The role of the District has changed notably during the 39-year period from its formation in 1960 through the completion of the last plan in 1999. The focus of the District transitioned from its founding goal: of assisting the COE in improving navigation of the Minnesota River channel, to one that includes the protection, preservation, and maintenance of surface, groundwater, and unique natural resources. This change reflects a shift in the value of resource protection and the expectations of watershed districts. With the introduction of new technology and improved methods to manage and protect resources, (such as adaptive management, sustainability approach, etc.), the District is again expected to change. The challenge the District faces is defining a clear role that will enable them to easily adjust to changes.

This shift was identified by the TAC during the 3rd Generation planning process and it was determined that some attention by the managers needed to be focused on re-affirming the role of the District. The issue that emerged was that there existed a disconnection between how the Managers saw their role in the District and how stakeholders viewed their role. In order to successfully implement the goals and strategies of this Plan, it is important for all parties on the same page. Therefore, Goal 1 – Organizations Management, described below, was included in this Plan.

2.2.2 Issue 2 – Outside Influences

The District encompasses the bottom 80 square miles of the 16,900-square-mile Minnesota River Basin (Figure 2-1). Major land use in the basin is agricultural in the upstream reaches and urban in the lower reaches. The District is the last subwatershed before the Minnesota River discharges into the Mississippi River. The geographical position of the District makes it susceptible to outside influences. It is largely accepted that the reach of the Minnesota River and a few other tributaries (Bluff Creek, Riley Creek, Credit River, and others) would continue to be impaired even if the District's discharge of point and non-point sources was reduced to zero.

This issue is perplexing and reflects the complexities of attempting to protect resources that are heavily influenced by factors outside the District's control.

Figure 2-1: Minnesota River Basin Map

2.2.3 Issue 3 – Water Quality

Non-point sources

Non-point source pollution causes major violations to water quality standards for the lower Minnesota River. This is pollution that cannot be traced to a single source, as with point source pollution. Instead, pollutants are carried from the land and the atmosphere through runoff water such as stormwater or snowmelt, in seepage through the soil (augmented by tiling), and through atmospheric deposition. Non-point source pollutants include:

- Excess fertilizers, herbicides, and insecticides from agricultural lands and residential areas
- Oil, grease, and toxic chemicals from urban runoff and energy production
- Sediment from improperly managed construction sites, crop and forest lands, and eroding streambanks
- Salt leached from the soil by irrigation practices, and from road and parking lot application
- Bacteria and nutrients from waterfowl, livestock, and pet wastes; and from faulty septic systems

- Hydrologic modifications [1]
- Atmospheric deposition

Both natural and human-caused sources of non-point pollution are closely related to land use and associated land management practices. As was previously mentioned, the land use in the upper watershed of the Minnesota River Basin is predominately agricultural, with the lower 80 or more square miles being largely urban. These lands outside the District boundaries contribute the majority of total suspended solids (TSS) and total phosphorus (TP) to the District's water resources as illustrated in Figure 2-2 and Figure 2-3 (University of Minnesota Extension 2002). The quantities of TSS and TP that end up in the lower Minnesota River cause adverse effects on the quality and health of the river and its surrounding resources, such as floodplain lakes and streams.

In urban sectors, vegetated pervious surfaces are being converted to impervious surfaces such as roads, roofs, and parking lots, thereby increasing rates of runoff. Potential problems documented in the Second Generation Plan from stormwater runoff impacts on water quality, and on fish and wildlife resources include:

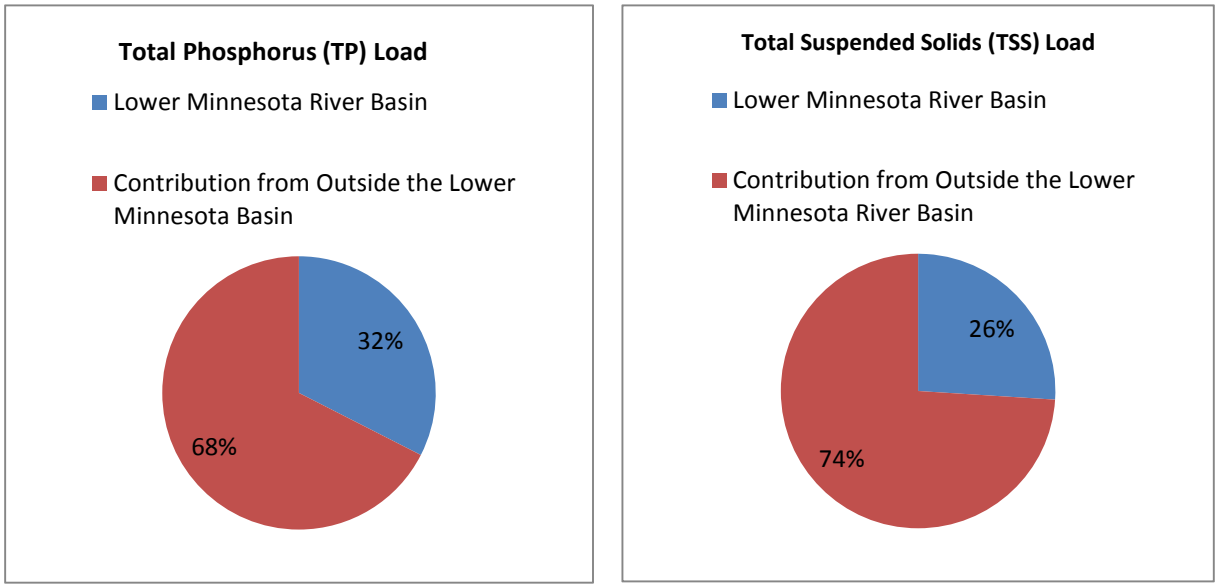
- Toxic levels of pollutants resulting in death or impairment of aquatic life
- Reductions in water clarity and water quality (including warm water temperatures) resulting in a shift to more pollution tolerant aquatic species
- Wildlife injury or death resulting from ingestion of, or entanglement with, trash and debris
- Negative impacts on wildlife habitat from nutrients, oxygen-poor water, and sediment

It is difficult to identify and quantify sources of non-point pollution affecting water resources while considering the diverse nature of the problem. The District faces challenges such as raising the awareness of land management practices outside their jurisdiction, and regulating development and re-development activities within the District to reduce non-point source pollution.

[1] Changes in the volume, speed, or timing of high and low flows in a water body, generally a stream or river. A major cause in the Minnesota River watershed is the intense agricultural land use in the watershed and development, which changes vegetation and covers land with roofs, sidewalks, streets, and parking lots. Rainwater, unable to soak into soil, rushes with flash-flood-like intensity to streams.(http://bluegreenbldg.org/technical-terms/)

Figure 2-2: Comparison of Loads from the Minnesota River Basin.

Figure 2-3: Load Comparison from the Lower Minnesota River Basin and External Contributors



Point Source Pollution

Point source pollutants, unlike non-point sources, discharge to a receiving surface water at a specific point from an identifiable source. Within the District, these sources include, but are not limited to, the Blue Lake and Seneca wastewater treatment plants, commercial dischargers like Gedney Pickle Factory and Rahr Malting, and other sites as identified in Section 1. Within the Minnesota River Basin, outside of the District's jurisdiction, there are also point discharges that affect water quality. These include commercial and municipal facilities and discharge from subsurface sewage treatment systems (SSTS) formally known as individual sewage treatment systems (ISTS).

The source of point source pollution is often known and regulated by MPCA through the National Pollutant Discharge Elimination Systems (NPDES) program. However, smaller point source discharges such as those from SSTS can go unregulated. When left untreated or partially treated, point source pollution may contain small amounts of radiation or toxics that increase water temperature, which affects aquatic wildlife and habitat, as well as potentially lowering the amount of dissolved oxygen in the receiving water. These pollutants can be hazardous to both humans and other forms of life.

According to the District Dissolved Oxygen Total Maximum Daily Load (TMDL) (Gunderson & Klag 2004), prepared by MPCA in 2004, there are an estimated 155,000 septic systems located wholly or partly in the Minnesota River Basin. Of those, nearly 20,000 are categorized as having the potential to cause imminent threat to public health and safety (ITPHS). SSTS that could cause ITPHS represent improperly treated discharges from noncompliant SSTS flowing to surface water.

Specific Water Quality Problems

This section discusses specific water quality problems and issues to be addressed in the District, grouped according to the type of water resource. Water resources discussed include: the Minnesota River, trout lakes/streams, tributary streams, lakes, fens, and wetlands.

Minnesota River

As documented, the Minnesota River water quality is impaired for aquatic recreation, aquatic consumption, and aquatic life because of intolerable levels of fecal coliform, mercury, dissolved oxygen, and turbidity. The Second Generation Plan noted that the historically severe water quality problems in the Minnesota River are due to the fine-grained soils in the watershed and the large amount of agricultural activity in the basin. It also noted that urban development and some poor wastewater treatment in the MSP metropolitan area contribute to the existing water quality of the Minnesota River. However, missing in that assessment was the adverse affect failing SSTS in rural parts of the basin, which exacerbate the agricultural impacts on the river.

Flooding also impacts water quality on the Minnesota River, as it erodes the soil surface and transports impaired water to floodplain lakes and streams.

Backwater effects from Lock and Dam No. 2 on the Mississippi River at Hastings, along with stream channelization work, have significantly altered the natural hydraulic characteristics of the lower Minnesota River (MPCA 1985). The resultant slower stream velocities and greater channel depths reduce atmospheric re-aeration potential, which reduces the river's capacity to assimilate pollutant loadings. The slower stream velocities also promote settling of suspended matter (non-point source pollutants) from upstream. The decomposition of the settled organic matter creates an additional demand on the available dissolved oxygen in the river. In the relatively narrow channel of the lower Minnesota River, the turbulence and wake created by each towboat passage may also add to water quality problems by re-suspending bottom sediments and eroding streambanks.

The poor water quality of the Minnesota River is one of the most significant and difficult water quality issues facing Minnesota.

Trout Lakes and Streams

The District contains several trout streams and lakes. The DNR designated these trout habitats because they have a stable supply of cold water, high oxygen concentrations, shade, and adequate nutrient inputs. These lakes and streams present both opportunities and problems for the District. The primary opportunity is recreational; trout fishing is a favorite pastime of many residents of the MSP metropolitan area and these streams and lakes present alternatives to outstate destinations.

Trout habitat is sensitive to development pressures associated with encroachment, increased stormwater rate, runoff volume, and transport of non-point pollution. These affect the temperature and oxygen concentrations in trout habitat. Temperatures higher than 16°C-21°C (60°F-70°F) threaten the health of trout. According to Kohler and Hubert, most coldwater fish do not tolerate summer temperatures above 22°C (72°F) and fish growth declines rapidly at temperatures above 29°C (68°F) (Kohler & Hubert 1993). Trout need higher oxygen levels than other types of fish (DNR-Trout 1996). Kohler and Hubert state that oxygen concentrations should be at least 8 mg/l for rearing and 10 mg/l for egg and larval development (Kohler & Hubert 1993).

Unrelated to the sensitivity of these resources, is increasing concern that some of these trout lakes and streams are not viable to support trout for the near future. An example is trout stream #4 in Burnsville. Sustaining its viability is of concern given the proximity of this resource to an urban area and the fact that it does not currently contain any trout species.

Fens

Some of the wetlands within the District are calcareous fens, which require specific hydrologic and chemical conditions to exist. Many factors threaten the health of calcareous fens, including changed groundwater conditions, stormwater runoff, sedimentation, and invasive plants.

The continued existence of these fens is highly dependent on the quantity, quality, and management of the groundwater that feeds them and on control of invasive species. The primary hydrology of fens is reliant on groundwater. However, an understanding of the area of influence or contributing subsurface recharges areas for each fen is unknown. This makes it challenging to be proactive in regulating appropriation and water quality controls. All of these details present a bigger issue of the deficiencies in established management requirements for these unique areas.

Tributary Streams

Many tributary streams enter the District from outside its boundaries. Urbanization and agricultural practices have created significant changes in tributary watersheds, particularly the streams that have large watershed areas outside the District As a result, water quality problems such as erosion and sedimentation are transported into the District and to the Minnesota River. This points back to Issue 2 - Outside Influences, which was previously discussed.

Lakes

Dean and Snelling lakes are impaired for aquatic recreation (nutrients) and aquatic consumption (mercury), respectively. In addition, the majority of lakes within the District are floodplain or backwater lakes. Floodwaters from the Minnesota River contribute a large portion of the nutrients and sediments that enter these lakes. After floodwaters subside, the lakes are again separated from the river, trapping the high sediment and nutrient loads.

The TAC brought up concerns about properly managing these floodplain lakes since there are unclear understandings about their function and value, and a lack of water quality data. Noteworthy is the fact that due to prolonged sedimentation in Coleman Lake from floodwater and other sources, its perceived function and value has changed; it now supports an endangered frog species.

Wetlands

Since many of the wetlands in the District are located in the Minnesota River floodplain, they face the same water quality threats as the floodplain lakes and Minnesota River tributary streams. Because the wetlands act as natural holding ponds during periods of flooding, pollutants from the Minnesota River are deposited in them. In addition, these wetlands are being further deteriorated because of surrounding development pressures.

2.2.4 Issue 4 – Flooding and Floodplain Management

Flooding

Flooding occurs when runoff from the landscape exceeds the capacity of natural and manmade storage systems. Excess runoff causes two scales of flooding; localized flooding in the upland stream reaches and municipal drainage systems within the District, and regional flooding affecting large segments of the Minnesota River.

Several factors leading to increased local and regional flooding can be discussed in terms of when they occur within the hydrologic cycle. The first part of the cycle, precipitation, is a natural phenomenon. Large amounts and the long duration of some precipitation events, which lead to flooding, are beyond the District's control. The second part of the cycle, runoff from the landscape, is impacted by land use changes due to human activity. An example is the conversion in the last 150 years of prairie land in the upper areas of the Minnesota River basin to agricultural land, and the later conversion from agricultural land to urban and suburban areas in the lower reaches of the basin. The third part of the cycle, storage of runoff on the landscape, is also impacted by human activity and land use change. Many wetlands and other natural depressions in the upland portions of the basin have been filled and drained with subsurface tiling to accommodate agriculture.

The two scales of flooding are not mutually exclusive and can occur simultaneously; with one type sometimes exacerbating the effects of and/or causing the other. For example, high water levels in the Minnesota River can create a backwater condition whereby flow in a tributary stream is backed up, causing flooding in upstream reaches.

An issue created by both localized flooding and Minnesota River flooding is damage to infrastructure within the District. The most common types of damage are trail washouts, trail crossing damage, and sanitary sewer failure. This damage causes budgetary strain for the owners of this infrastructure. The USFWS, DOT, cities, and counties are among several owners of infrastructure within the District. In addition to repair costs, infrastructure damage can pose health and safety risks to District residents, for example, due to road closures.

Another issue caused mainly by Minnesota River flooding and, to a lesser extent, localized flooding, is making recreational facilities inaccessible. Flooding can inundate boat landings, parks, and trails, cause unsafe fishing and boating conditions, and damage trails.

Specific areas within the District subject to flooding and its associated impacts are identified below in Table 2-1. These can be categorized as caused mainly by Minnesota River flooding, local flooding, or both.

Table 2-1: Flooding Problem Areas

Area	Main Cause of Flooding
Downtown Carver	Local flooding (Spring Creek), Minnesota River
TH 41 Between Chaska Levee and Gifford's Lake	Minnesota River
Highway 101 (Old 169) and Shakopee River Crossing	Minnesota River
Old 212 near Moon Valley Gravel Pit	Minnesota River
Savage Business District near Credit River/Fire Station	Local flooding (Credit River)
Black Dog Road in Burnsville	Minnesota River
Depressional flooding in Mendota	Local flooding

Floodplain Management

The District, in partnership with USGS and the COE, published the Lower Minnesota Floodplain Study in 2004. The information contained in this report may be used as "Best Available Data" until FEMA produces new FIS maps of the affected communities. An issue has arisen because some individuals seeking floodplain management information within the District consult the Flood Insurance Rate Maps (FIRM) for communities that have not updated their FIS. Therefore, although they are using the official FEMA publication, they are not using the "Best Available Data." The District publishes the 2004 Study on its website and will continue to provide the "Best Available Data" to cities and counties when projects require this information.

Dakota County has updated FIRM maps and an FIS report that were finalized on June 18, 2010. This is the "Best Available Data" for the mapped flood hazard areas within Burnsville.

2.2.5 Issue 5 – Erosion and Sediment Control

Erosion is the movement of solids, mainly sediment and soil, in the natural environment. Within the District, erosion typically occurs due to water transport and has direct effects on downstream water quality. Erosion is a natural process, but within the District, it has increased due to human land use practices. Similarly, water quality within the District has been greatly impacted by human land use practices within the Minnesota River basin upstream of District boundaries. Examples of land uses which have caused both erosion and degradation of water quality within the District include deforestation, unmanaged construction activity, road-building, and agricultural practices. Land that is used for agriculture experiences a significantly greater rate of erosion than land under natural vegetation. This is important, because a vast majority of the Minnesota River basin upstream of the District is used for agriculture. Agricultural practices upstream also include subsurface drainage which can increase runoff rates and volume leading to bank erosion in the District.

Issues related to erosion and sediment control fall into four categories based on the location and type of erosion: 1) construction site erosion, 2) bluff erosion, 3) streambank erosion and 4)

mainstem erosion. The issues related to each type of erosion are described in further detail below.

Construction Site Erosion

Construction erosion occurs when vegetated, stabilized ground surface is disturbed for earth grading and the construction of roads, buildings, parking lots, underground utilities, and other man-made structures. Several best management practices have been developed that can greatly minimize or even negate construction site erosion. However, severe construction site erosion occurs within the District when these practices are not implemented or implemented improperly. Poor site management is the primary issue related to construction site erosion in the District.

Bluff Erosion

The District is home to several miles of bluffs that outline the Minnesota River valley. The main factors that have led to bluff erosion include extreme slopes coupled with human land use above the bluff. Some bluff erosion is natural, but issues identified by the District are driven by human land use practices near the bluffs. These issues are a) insufficient building setbacks above the bluff line, b) insufficient vegetation management, c) the lack of buffers above the bluff line and d) concentrated channel flow over the bluffs due to drainage practices implemented by homeowners residing on the bluffs.

In 2006 and 2007, the District hired the Minnesota Civilian Conservation Corps (MCCC) to inventory gullies within the District. The inventory identified gullies with current and potential erosion and pollution issues. Cities then reviewed the information and chose the top 3-4 public sites in each that needed immediate attention. Feasibility analyses were completed by the Cities. As a result, four cooperative projects with the cities of Eden Prairie and Bloomington have been completed: Bloomington Parkers Picnic Area, the District contributed $22,265 for the restoration of a ravine including fill, grading, plantings and erosion control; Bloomington Minnesota River Valley Washout, the District contributed $98,214 for stream bank restoration on an unnamed stream near Lyndale Avenue and the Minnesota River; Eden Prairie Area 4, the District contributed $40,412 for stream bank restoration on Purgatory Cree; Eden Prairie Area 3 River Bank failure, the District contributed $78,704 for a feasibility study of this area of concern at R.M. 19.6 on the left descending bank. Appendix K contains the results of the gully inventory.

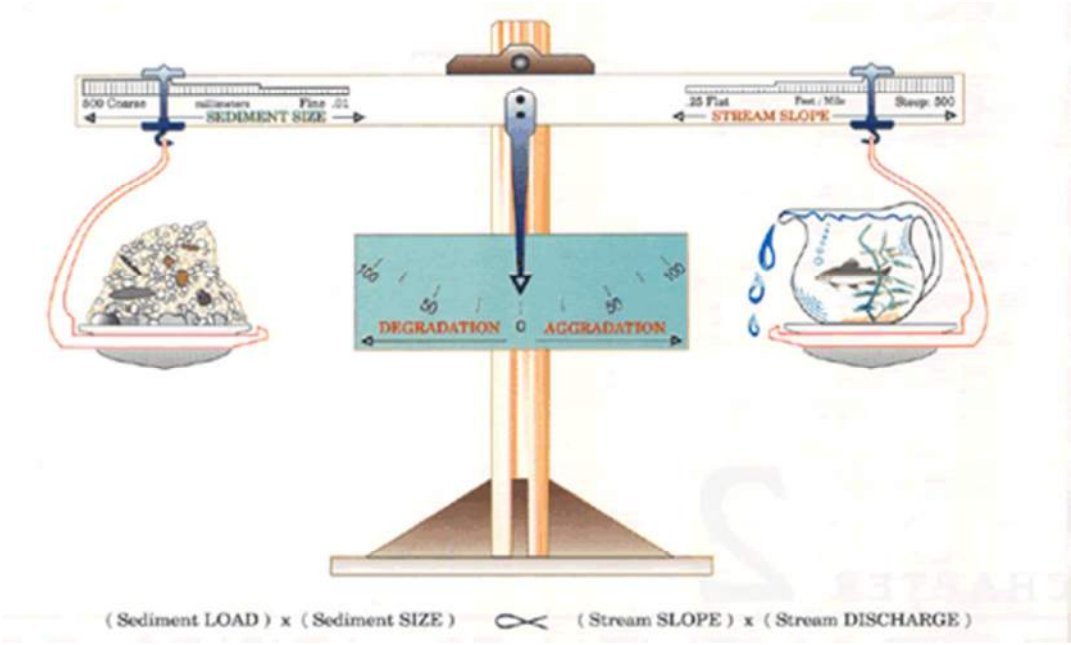
Streambank erosion

Streambank erosion within the District is naturally occurring but is accelerated by human activities. Streambank erosion on many Minnesota River tributary streams is driven by two main issues: a) the lack of stream buffers and, to a greater extent, b) significant changes in the hydrologic characteristics of the watershed, in and outside of the District.

Streambank erosion due to a lack of stream buffers occurs mainly within urban and suburban areas. Issues arise when property owners remove natural vegetation from the stream banks which accelerates bank erosion.

Changes in hydrologic characteristics of the watershed due to human land use practices is the primary issue surrounding streambank erosion within the District. Stream equilibrium is a method for classifying the status of a system between aggradation and degradation. Aggradation refers to excess sediment deposition and degradation refers to excess sediment erosion. Lane's scale, shown on Figure 2-4, modified by Rosgen, equates the product of sediment load and sediment size with the product of stream slope and stream discharge (Rosgen). The dynamic equilibrium of natural erosion and deposition is upset when one of these variables shifts excessively causing instability.

Figure 2-4: Lane's Scale of Stream Equilibrium



Stream discharges within the District have increased in the past, tipping stream equilibrium towards degradation and erosion. Stream stability can be directly correlated to the frequency of bankfull flow. Streams are expected to remain stable when the bankfull channel contains the peak flow from a 1-year to 2-year storm event. Wolman and Leopold suggested that the channel-forming discharge has a recurrence interval of 1 to 2 years (Wloman & Leopold 1957). A stream that receives bankfull runoff more frequently is likely to respond with bank erosion and changes in channel alignment. These conditions lead to loss of streamside zones, potential damage to

surrounding properties, and large quantities of sediment transported downstream (Bonestroo 2007).

Stormwater management within the urbanized areas of the District has focused on managing discharge rates higher than bankfull flows in streams tributary to the Minnesota River. High frequency, channel-forming flows have increased, causing stream instability and degradation. An issue is that stormwater management within the District has typically focused on controlling flooding and not on mitigating stream instability and degradation.

Mainstem Erosion

Mainstem erosion remains an issue in the District, due mainly to upstream agricultural practices. Subsurface drainage practices in the Minnesota River basin parallel the effect of urbanization on tributary streams within the District, as described above. Subsurface drainage practices increase the amount of water in the channel, forming higher frequency flows in the Minnesota River, which cause bank instability, degradation, and erosion. Runoff volume has increased significantly in the Minnesota River at Jordan since the 1980s (Graph 1-1). This has resulted in a doubling of the annual TSS from the 1980s to the present (Graph 1-2). The main problem the District faces in dealing with this issue is that it lacks the jurisdictional authority to promote management changes.

2.2.6 Issue 6 – Groundwater

Groundwater protection and management is an important issue as residents and businesses within the area rely on groundwater for domestic, municipal, industrial, and agricultural water supplies. For the District, the most important aspect of groundwater protection and management is its affect on unique natural resources, especially fens and trout streams. The quality of these resources relies heavily on the quality and quantity of groundwater supplying them. Issues for the District regarding groundwater protection and management revolve around the lack of understanding of groundwater and surface water interactions and their affect on unique natural resources of the District.

2.2.7 Issue 7 – Commercial and Recreational Navigation

Commercial and recreational navigation issues within the District fall into four categories: a) co-existence of commercial and recreational navigation, b) dredge material management, c) financing, and d) the effect of river traffic on water quality. Issues within each category are described below.

Co-Existence of Commercial and Recreational Navigation

The Minnesota River within the District is an important water resource for both commerce and recreation. Commercial activities include barge towing and tour boats. Recreational activities include fishing and the use of pleasure boats, canoes, and personal water craft. Safety becomes an issue where commercial and recreational uses intersect.

Recreational users must be educated on safe river navigation practices, while commercial users must be made aware of the different habits of recreational users. Recreational access becomes a complicating factor surrounding this issue, because the District believes there are not sufficient access points for recreation. However, greater accessibility could increase safety issues on the river. Therefore, navigational safety and increased recreational access must be considered as interrelated issues.

Dredge Material Management

Dredge material management, as it relates to commercial navigation, is the cornerstone of the District's history and continues to persist as a main responsibility today. Significant quantities of sediment are deposited into floodplain lakes and the Minnesota River channel from upstream sources which necessitates dredging for commercial navigation. Between 2000 and 2005, an average of 33 percent of the TSS load originating from sources upstream was stored in the Minnesota River channel and floodplain between Jordan and Ft. Snelling. (MPCA 2009)

The COE published a Dredge Material Management Plan (DMMP) in March 2007 that addressed long-term management of dredging and placement site requirements on the Minnesota River. It included public as well as private dredging requirements. Existing plans or placement sites formed the baseline condition, but the DMMP looked at additional requirements to satisfy placement of all material projected for the planning period (2007-2034).

During development of the DMMP, several problems were encountered while evaluating sites below the I-35W Bridge. The emphasis for the DMMP was changed to address only the area above the I-35W Bridge. The COE will continue to work on the area below the I-35W Bridge and supplemental DMMP will be furnished when completed.

The DMMP developed and evaluated several combinations of alternatives. The alternatives were ranked in order of preference for implementation. They were ranked this way because the District is responsible for implementation and this method would give it the most flexibility in negotiating agreements. The DMMP's recommended alternative for dredging above the I-35W Bridge is currently being implemented.

If implementation of the recommended alternative is no longer possible in the future, implementation will proceed with the next preferred alternative identified in the DMMP's Summary of Alternative Comparisons. The District will be responsible for documenting why

implementation is not possible and that they made a reasonable effort to implement the first preferred alternative prior to pursuing the second preferred alternative.

In addition to providing the District a clear direction regarding which placement sites to acquire and what is required to make sites usable, the DMMP serves to outline authorities and responsibilities for the agencies involved. The issues surrounding dredge material management are twofold: 1) dredge material site acquisition, and 2) handling of the dredge material. Specific issues concerning dredge material site acquisition include the need to acquire a site for dredging activities either between R.M. 1.0 and R.M. 2.0, near Pike Island, or between R.M. 4.0 and R.M. 5.0. Space constraints due to the abundance of protected federal and state land in the area complicate site acquisition. Further, there is limited information from COE as to whether it is financially beneficial to acquire a new site or to move material east to a COE operated site in St. Paul. The answer is unclear because the material would be transported greater than four miles, which would incur a surcharge fee.

The District continues to work with the COE, MPCA, and private industry on the development of an operation and maintenance plan for the R.M 14.2 Site. The District's goal, for working with these agencies and private industry, is to eventually advertise beneficial use(s) of the dredge material. In effect the District, if successful, could operate the site much like a public utility. While the District is not directly involved with dredging operations, which are the responsibility of the COE, it becomes their issue to cooperatively assist the COE as the designated local sponsor for the 9-Foot Channel. Issues exist for the COE in the administration and funding of dredging operations at the Federal level.

Issues concerning the actual handling of the dredge material, once in possession of the District, have also arisen. These issues include limited data about the material's beneficial uses, potential liability from pollutants in the material, and pressure to take private dredge material. In addition, the District does not have an operation and management plan for the site at R.M. 14.2.

Financing

Financing dredge material management from the 9-Foot channel equates to the acquisition, operation, and maintenance of public dredge material storage sites. As the local sponsor, the District is responsible for providing space for dredge material taken from the 9-Foot channel by the COE within the District's boundaries.

The District established a 9-Foot channel fund to finance these activities. The fund was initially established by special assessment and supplemented by ad valorem tax in 1980. Recently, the fund has been depleted and the District needs to use other funding mechanisms to restore it. There is a difference of opinion among the Managers as to which mechanism should be used to restore the fund: by an ad valorem tax (assess all properties in the District) or special assessment (assess the benefitted users).

The Mississippi River Project, enacted by the U.S. Congress in the 19th century, provides funding to the COE for dredging operations on the Mississippi River. In 1958, the Project began providing the same funding to the COE for dredging on the Minnesota River. The funds have separate mechanisms, with the Mississippi River Project receiving significantly more funds. In the past, funds to dredge the Minnesota River were insufficient, but the COE was able to borrow from the Mississippi River Project fund. Due to a congressional change, the COE can no longer reallocate funds from the Mississippi River Project to the Minnesota River Project for channel maintenance. The District could have a problem in the future if the Minnesota River channel maintenance appropriations are reduced.

In November of 2010 the Board of Managers passed resolution number 001-2010 a resolution requesting that the United States Congress modify the existing authorizations for the Minnesota River 9-Foot Navigation Channel Project and the Mississippi River 9-Foot Navigation Channel Project to combine them into a single authorization. This resolution asks the United States Congress to provide a more efficient and cost effective use of channel maintenance funding for the Minnesota River and to formally recognize that the navigable segment of the Minnesota River is an integral part of the Upper Mississippi River Navigation System.

The Effect of River Traffic on Water Quality

The effect of river traffic on water quality, fisheries, and wildlife has been identified as an issue by the District. According to a 2001 COE study, hydraulic disturbances by recreational vessel traffic include vessel wakes, propeller jet turbulence, propeller entrainment of water which causes sediment re-suspension in shallow areas, and bank erosion (Wilcox 2001). Ecological effects of these hydraulic disturbances on the Minnesota River include entrainment and impingement of aquatic plants and wildlife, fish stranding, and habitat disturbance.

2.2.8 Issue 8 – Public Education and Outreach

Limited public participation in District activities and lack of a structured education and outreach plan were identified as issues by the Managers and the TAC. Of particular concern was the need to enhance public participation and educate citizens on items related to the goals and policies of the District without duplicating efforts of other entities within the District.

As part of this Plan's development, a CAC was formed. The directive for the CAC from the Managers is to examine and advise on outreach activities for use in this Plan with the goal of developing a formal Education Plan.

2.2.9 Issue 9 – Potential Problems

Issues described thus far are immediate and ongoing. This section provides a description of issues identified by the District as likely to happen in the future.

The first potential issue is related to dredge material management. The liability the District could face if any constituent found in the dredge material, while currently not defined as a hazardous material or pollutant, was later defined as such is of concern to the District. The "chain of custody" and "cradle to grave" concepts within federal hazardous waste and pollutant regulations could potentially make the District responsible for future remediation at locations where dredge materials were eventually used.

The second potential issue relates directly to the discussion of how to fund the 9-Foot channel. If the question of who or what benefits and who should pay for commercial navigation maintenance within the District cannot be answered and/or the funding mechanism cannot be practically implemented, it could result in the District becoming unable to support navigation.

A third potential issue is a general concern about future unfunded federal mandates for entities outside the District, and how the District would go about helping to finance the implementation of these mandates.

The fourth potential issue is how the District will address upcoming TMDL implementation plans. How will the District assist other entities in achieving the goals set forth in implementation plans and will the District be individually responsible for any of these?

2.3 EXISTING REGULATORY CONTROLS

This section provides a description of the controls in place that regulate aspects of the issues previously discussed.

2.3.1 Water Quality

Water quality impacts are regulated at the federal, state, and local levels within the District. The majority of these controls are driven by the Clean Water Act, the primary federal law governing water pollution. In addition, state and local governments have independently implemented controls aimed at reducing water quality impacts. Regulatory controls concerning water quality in the District are described below.

National Pollutant Discharge Elimination System (NPDES)

The NPDES is a federal program established under the Clean Water Act (CWA), aimed at protecting the quality of nation's waterways. The NPDES is administered by MPCA in Minnesota as delegated by the U.S. Environmental Protection Agency (EPA) and regulates three main areas: 1) point source pollution, 2) non-point source pollution (construction and industrial activities), and 3) municipal separate storm sewer systems (MS4).

Point Source Pollution

Facilities that discharge wastewater to a surface or groundwater of the state are regulated under the NPDES/State Disposal System (SDS) Permit. This permit establishes the terms and conditions that must be met for point source discharges. The permit is jointly issued under two programs: NPDES and SDS. The SDS is a state program established under M.S. 115. In Minnesota, when both permits are required they are combined into one NPDES/SDS Permit administered by the MPCA.

Construction Activities (Non-point Source Pollution)

Activities related to construction that do not discharge directly to surface waters of the state are considered non-point source discharges of pollutants. The MPCA regulates construction activities under an NPDES/SDS general permit for sites that disturb:

- One acre or more of soil
- Less than one acre of soil that is part of a "larger common plan of development for sale" that is greater than one acre
- Less than one acre of soil, but MPCA determines that the activity poses a risk to water resources

Regulated projects under the NPDES construction stormwater permit are required to develop a stormwater pollution prevention plan (SWPPP). The SWPPP must 1) identify a knowledgeable person to oversee the project, 2) incorporate design and activity requirements, 3) contain discussion of temporary and permanent erosion and sediment control best management practices (BMPs), 4) include a site map, 5) identify areas not to be disturbed, where construction will be phased to minimize duration of exposed areas, and where surface waters and existing wetlands will receive storm water runoff, and 6) include information on final stabilization methods.

Most construction activities are regulated under MPCA's general NPDES stormwater permit for construction activity, but some construction sites are regulated under individual permits.

Municipal Separate Storm Sewer Systems (MS4)

The stormwater program for MS4s is designed to reduce the amount of sediment and pollution that enters surface and groundwater from storm sewer systems to the maximum extent practicable. Stormwater discharges associated with MS4s are regulated through the use of NPDES permits. An MS4 is a conveyance or system of conveyances owned or operated by a city, township, or county and designed or used for collecting or conveying stormwater.

MS4s are required to develop and implement a stormwater pollution prevention program to reduce the discharge of pollutants from their storm sewer system to the maximum extent practicable. The stormwater pollution prevention program must cover six minimum control measures: public education and outreach, public participation, illicit discharge detection and elimination, construction site stormwater runoff control, post-construction stormwater management in new development and redevelopment, and pollution prevention/good housekeeping for municipal operations. The MS4 must identify BMPs and measurable goals associated with each control measure. An annual report on the implementation of the stormwater pollution prevention program must be submitted each year.

Loading Assessment and Nondegradation Report

In recent years, MPCA modified the requirements of the NPDES permit for selected MS4s, including several municipalities within the District. In addition to the required stormwater pollution prevention program described above, several MS4s were required to assess the change in stormwater discharge loading for their permitted area using a pollutant loading water quality model. Those MS4s that had significant new or expanded discharges were required to complete a Nondegradation Report and incorporate its findings in BMPs that address nondegradation in their stormwater pollution prevention program. As part of this process MPCA determined that MN Rules 7050.0185 directs them to consider flow volume as a pollutant and MS4s were asked to address changes in flow volume that have resulted from increased urban development. The MS4s were required to identify mitigation measures to insure that flow volumes do not exceed 1988 volumes to avoid negative environmental impacts typically caused by increased flows.

Clean Water Act: Section 316

Section 316 of the CWA regulates thermal pollution discharges (Section 316(a)) and requires standards for cooling water intake structures (Section 316(b)). These standards are applicable to power plants and other industrial facilities. In Minnesota, facilities regulated under Section 316 of the CWA coordinate with MPCA to ensure that the intent of the regulations is followed.

Clean Water Act: Section 303(d)

Section 303(d) of the CWA requires states to:

- Assess all waters of the state to determine if they meet state water quality standards

- List waters that do not meet standards
- Conduct TMDL studies in order to set pollutant reduction goals needed to restore waters

In Minnesota, MPCA is responsible for assessing waters, listing impairments, and conducting TMDLs. MPCA also coordinates closely with other state and local agencies on restoration activities. Section 1 of this plan lists the waters within the District which are listed under Section 303(d).

Public Waters Work Permit Program

The DNR Waters Division oversees the administration of the Public Waters Work Permit Program. This program, begun in 1937, regulates water development activities below the ordinary high water level (OHWL) in public waters and public waters wetlands. Examples of development activities regulated under this permit include filling, excavation, shore protection, bridges, culverts, structures, docks, marinas, water level controls, dredging, and dams.

Water Appropriation

The DNR Division of Waters regulates surface water appropriations by requiring a permit for all users withdrawing more than 10,000 gallons of surface or groundwater per day, or 1 million gallons annually. All active water appropriation permit holders are required to measure monthly water use and report water use yearly. In order to safeguard water availability for natural environments and downstream users, the DNR can limit appropriations under certain low-flow conditions.

Subsurface Sewage Treatment Systems Program (SSTS)

The MPCA is responsible for the administration of the SSTS program formally known as the ISTS program. SSTS are regulated by M.S. 115.55 and 115.56. The goal of the SSTS program is to protect public health and the environment through adequate dispersal and treatment of domestic sewage from dwellings or other establishments generating volumes of less than 10,000 gallons per day. To achieve that goal, MPCA periodically revises MN Rules Chapters 7080, 7081, 7082, 7083, assists in interpreting those rules, and administer a statewide SSTS Certification and Licensing Program. The SSTS Certification and Licensing Program requires SSTS installers, maintainers, service providers, designers, advanced designers, inspectors, or advanced inspectors to obtain a license to practice.

Feedlot Program

The MPCA is the primary regulator of the collection, transportation, storage, processing, and disposal of animal manure and other livestock operation wastes. In all of the counties within the District—except for Hennepin, where MPCA is primarily responsible—feedlots are regulated under a cooperative agreement between MPCA and county government. County feedlot programs are responsible for implementing state feedlot regulations for facilities with fewer than 1,000 animals, or those that do not require federal permits. County responsibilities include: registration, permitting, inspection, education and assistance, and complaint follow-up.

Local Water Quality Regulation

Municipalities and counties within the District have adopted water quality requirements either in ordinances and codes, or within their respective surface water management plans. Much of this regulation is aimed at setting standards for development and redevelopment and is enforced during the development approval process. In addition, municipalities and counties have adopted shoreland management regulations, which are also enforced during the development and redevelopment process.

2.3.2 Unique Natural Resources

Regulatory controls concerning unique resources such as calcareous fens and trout streams within the District are described below.

Trout Stream Management

The DNR is primarily responsible for trout stream management within the District. The controls used by the DNR to manage these resources consist of trout stream designation (MN Rule 6264), fishing regulations (M.S. 97C.021), and easement acquisition. In addition, water quality regulations described earlier in this section are triggered for areas that drain to designated trout streams. NPDES MS4 permit requirements can also be triggered for those MS4s that drain to trout lakes or streams, which would otherwise not require them (MN Rule 7090). Trout lakes are also protected under MN Rule 7050: "Nondegradation for outstanding resource value waters," which is administered by MPCA. This rule requires that new or expanded discharges to waters that flow into outstanding resource value waters be controlled so as to assure no deterioration in the quality of the downstream outstanding resource value water. The rule also protects against thermal impacts.

Fen Management

Fen protection in the District is regulated under MN Rule 7050: "Nondegradation for outstanding resource value waters," which is administered by MPCA. Calcareous fens are classified as outstanding resource value waters under this rule. This rule requires that "New or expanded discharges to waters that flow into outstanding resource value waters be controlled so as to assure no deterioration in the quality of the downstream outstanding resource value water."

State rules regarding wetland conservation (MN Rule 8420), administered by BWSR and implemented by local government units, provide for the identification and listing of calcareous fens. In addition, these rules give BWSR the power to approve management plans to restore or upgrade a previously damaged calcareous fen.

The DNR is responsible for fen identification pursuant to MN Rule 8420.1020, and restricting off-road vehicle use in fens. The DNR also has a role in fen protection through the acquisition, designation, and management of fen areas as scientific and natural areas (SNA).

Minnesota River

The primary regulatory control concerning the Minnesota River is Section 10 of the Rivers and Harbors Act and is described below.

Rivers and Harbors Act: Section 10

This program regulates the placement of structures and/or work in, or affecting navigable waters of the Unites States which is the Minnesota River in the District. The COE is the agency responsible for administering this program.

Minnesota River Basin Joint Powers Board

The Minnesota River Basin Joint Powers Board (MRBJPB) was created in 1996 at the behest of Governor Arne Carlson and includes representatives from all 37 counties in the river basin, Their stated mission was to make the Minnesota River suitable for fishing and swimming by the year 2005 (M.S. 103F.378). While the MRBJPB has no regulatory authority, they provide leadership, build partnerships, and support efforts to improve and protect water quality in the Minnesota River Basin. According to state statute, the duties of the MRBJPB include:

- Coordinate cleanup goals for the Minnesota River
- Advise on the development and use of monitoring in the Minnesota River
- Conduct public meetings
- Conduct an ongoing information and education program
- Provide periodic reports and budget requests
- Advise on developments of projects
- Administer the distribution of project implementation funds

2.3.3 Wetlands

There are federal, state, regional, and local regulations pertaining to wetland management and protection within the District. These programs are described in detail below.

Clean Water Act: Section 404

This program regulates excavation of wetlands and the discharge of dredged or fill material into waters of the United States, which includes wetlands. There are two types of Section 404 permits: regional and nationwide general permits and individual permits. The COE has primary responsibility for administering the program, but the EPA can appeal to a higher COE authority or veto a COE decision.

Food Security Act of 1985: Swampbuster

The Swampbuster program regulates the alteration of wetlands for agricultural use and prohibits farms who receive federal subsidies from draining wetlands. Alteration of a wetland for agricultural use results in ineligibility for all government price and income support programs.

Wetland Conservation Act of 1991 (WCA)

The intent of the WCA is to promote no net loss of wetlands. BWSR oversees the administration of WCA within the state while the DNR provides enforcement. Cities and counties within the District have been designated as the LGUs, or administrators, of the WCA at the local level. DOT is the WCA LGU on its rights of way. WCA rules regulate some excavation. WCA rules require that drained and filled wetlands be replaced at a minimum ratio of 1:1 in agricultural areas and 2:1 in non-agricultural areas. The 1:1 replacement ratio only applies if the land is kept in agricultural use for 10 years after replacement. LGUs may have stricter wetland regulations. Amendments to the WCA in 1994 allow for preparation of wetland management plans by LGUs that may give them more flexibility through a more regional wetland analysis. The DNR is involved in enforcement of the WCA and is responsible for identification, protection, and management of calcareous fens.

2.3.4 Floodplain Management

Floodplain management responsibilities in the District are shared by FEMA, the state and LGUs. The NFIP drives floodplain management efforts at all levels and is described below.

National Flood Insurance Program

The NFIP was created through the National Flood Insurance Act of 1968. The program enables property owners in participating communities to purchase flood insurance protection from the government. This insurance is designed to provide an alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP is based on an agreement between local communities and the federal government which states that if a community will adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas (SFHA), the federal government will make flood insurance available within the community as financial protection against flood losses.

All of the local communities within the District participate in the NFIP.

Local Flooding Regulation

Most LGUs within the District have also adopted rate control standards and freeboard requirements to protect property from flooding outside of the SFHAs designated by the NFIP.

2.3.5 Erosion and Sediment Control

City and County Regulation

Several of the cities and counties within the District have adopted bluff setbacks, steep slope ordinances, and vegetation management requirements in an effort to reduce bluff erosion. In addition, erosion and sediment control measures have been established within city codes, ordinances, and surface water management plans in an effort to meet NPDES requirements.

2.3.6 Groundwater

Groundwater within the District is regulated by the DNR and the Department of Health (DOH). Regulatory controls handle both groundwater quality and quantity and are described below, with the exception of water appropriation which was already described.

Wellhead Protection

Wellhead protection is a way to prevent drinking water from becoming polluted by managing potential sources of contamination in the area that supplies water to a public well. The DOH administers the wellhead protection requirements found in M.S. 4720. Under these rules, local governments who own and operate public drinking supply wells are required to complete a wellhead protection plan which includes a delineation of the wellhead protection area and an assessment of the impacts that existing land and water uses located within the area may have on the aquifer serving the well. Specific wellhead protection requirements vary for the different classifications of public water systems in Minnesota.

Abandoned Wells

Decommissioned wells that have not been properly sealed can be a source of groundwater contamination, potentially affecting nearby drinking water wells. The DOH administers M.S. 103I.301 which spells out well-sealing requirements. Counties within the District also have grant programs which assist property owners to properly seal abandoned or unused wells.

2.3.7 Commercial and Recreational Navigation

Safety

The DNR administers the Boat and Water Safety program, which provides the public with safety information, collects and interprets statistical data on boat and water accidents and boating in general, and handles the free mandatory boating and safety education program for youth. The Minnesota Boating Guide, published by the DNR, summarizes Minnesota's boating laws and regulations. Another DNR publication summarizes the state's laws governing personal watercraft. The U.S. Coast Guard and Coast Guard Auxiliary offer courses that provide instruction to boaters at all levels. Information on these courses is available on the DNR website.

Dredge Material Management

COE policy dictates the development and implementation of Dredged Material Management Plans (DMMP) which satisfy the long-term material placement needs for COE navigation projects. The objective of the DMMP is to prepare a coordinated, long-term plan for managing dredging and placement site requirements. A DMMP has been prepared for the Minnesota River in Scott, Hennepin, and Dakota counties above the I-35W Bridge. A DMMP will need to be prepared for the Minnesota River below the I-35W Bridge.

Financing

The District has several options available to fund channel maintenance either directly or indirectly through financing of other District operations and improvements. These options are listed below and described in detail in future sections of this Plan.

- District-wide Ad Valorem
- Capital Improvements Funding
- Stormwater Utility
- Special Assessment
- State Funding

2.4 MANAGEMENT GAPS

The existing regulatory controls were presented to determine their adequacy in addressing the issues identified by the District through the planning process. Based on existing programs and an analysis of their ability to address the District's issues, management gaps were generated and are described below. These management gaps exist when neither the District nor any other entity is addressing a particular aspect of an issue.

2.4.1 Issue 1 – Unclear Role of District

As the District has evolved, so has its role and responsibilities. That shift, coupled with expectations and the irregular shape of the District, has left a couple of notable management gaps. The 9-Foot channel maintenance has driven the District's role historically. However, the District's role has shifted and it has been required to address various water quality and quantity issues within its boundary. Exacerbating this issue is that the District's boundary does not follow a hydrologic boundary and therefore is limited in how it can take on expected roles beyond channel maintenance. In addition, while stakeholders perceive the District as the lead agency in many roles related to water quality and quantity, it does not have the jurisdictional control necessary to address many of those roles.

2.4.2 Issue 2 – Outside Influences

The geography of the District, and the upstream watershed draining to it, make it highly susceptible to outside influences. The District has limited control of many of the activities occurring in its vast drainage area that affect water quality and quantity issues within the District. Management gaps arising from the size disparity between the Minnesota River Basin and the District's jurisdictional area include:

- Unregulated areas and land management practices in many areas of the basin.
- Non-uniform standards, especially between urban and rural areas of the basin.
- Lack of regulatory authority on the part of the MRBJPB, the sole entity charged with addressing water quality and quantity issues over the entire Minnesota River Basin. The MRBJPB also has limited ability to raise funds to address water quality and quantity issues.

2.4.3 Issue 3 – Water Quality

Non-Point Source

Land Use Management

The District reviews projects within its jurisdiction to ensure that they meet their water quality policies. Other land development permitting entities in the District forward plans to the District for comment, which these other entities consider in their approval of proposed projects. A management gap exists here because the District relies on other entities to both submit projects for review and incorporate its comments. The gap is review authority for all projects affecting sensitive resources. The current review process often does not provide adequate protection.

The District has signed memorandums of understanding (MOUs) with LGUs in its jurisdiction to enforce Districts policies. The District needs to ensure that these MOUs are being properly executed by the LGUs.

Use of Water Quality Data

The District has sponsored or carried out itself or in cooperation with other entities several water quality data collection efforts. However, some of this information has not been used as part of any analysis and therefore is of little use in documenting overall trends which can assist in making informed management decisions.

Minnesota River Basin

This gap is related to non-point water quality management in the agricultural areas of the Minnesota River Basin that drain to the District. While most urbanizing areas have adopted and enforced water quality standards and practices, agricultural stormwater quality has gone relatively unregulated. The gap is the lack of a regulatory body with the leverage and financial capability necessary to address Basin-wide issues. Because the gap encompasses many more entities than just the District, it must be addressed at a higher level. The District has initiated a dialogue with representatives at the state legislature to begin addressing this issue through a basin commission.

Point Source

The management gap identified for point source water quality issues involves point source pollution from septic systems within the Minnesota River Basin. According to the Lower Minnesota River Dissolved Oxygen TMDL, approximately 20,000 individual septic systems flow untreated to surface water in the Basin. The management gap is that there is no single entity in charge of addressing cleanup of these unregulated discharges.

2.4.4 Issue 4 – Flooding and Floodplain Management

Two management gaps related to flooding and floodplain management have been identified and are described below:

- Inconsistent runoff peak rates and infiltration standards are being enforced within the District's jurisdiction. The District has adopted peak runoff rate control standards for projects requiring review but has not adopted infiltration standards. Infiltration standards can reduce runoff volumes which, in some instances, can help mitigate localized flooding.
- The District lacks authority to regulate runoff outside of its boundaries.

2.4.5 Issue 5 – Erosion and Sediment Control

Three management gaps have been identified for issues related to erosion and sediment control in the District

Bluff Erosion

While many of the cities and counties within the District have vegetation management standards, the standards are inconsistent. In addition, the District has not established vegetation management standards addressing practices such as vegetative cutting and clearing on bluffs and steep slopes

Streambank Erosion

The District and other entities do not have management controls in place on streams not identified as trout streams.

Mainstem Erosion

The District has sponsored studies to determine BMPs to combat mainstem bank erosion. However, the source of mainstem erosion is mostly due to increased runoff rates and volume originating outside of the District.

2.4.6 Issue 6 – Groundwater

Groundwater is vital to many of the unique resources in the District, mainly trout streams and fens. Groundwater resources are currently managed by the DOH and the DNR with a focus on human consumption; fen and trout stream recharge areas are not specifically identified or regulated. This represents a management gap. Because these areas have not been identified they cannot be protected to ensure the health of the unique natural resources they support.

2.4.7 Issue 7 – Commercial and Recreational Navigation

Management gaps have been identified for several issues related to commercial and recreational navigation.

Navigational Safety

While the DNR and the US Coast Guard provide navigational safety resources to both commercial and recreational watercraft operators, much of this information is not readily available to the average recreational user.

Effect of Boat Traffic

No entity regulates boat traffic on the river with the intent of addressing water quality and mitigating the oftentimes detrimental effects of boat wake.

Beneficial Use for Dredge Material

The District has acquired a site for temporary dredge material disposal and storage, but to effectively manage the dredge material in the long term, the District must identify uses for the material.

Channel Maintenance Fund

The District must decide how to restore the 9-Foot channel fund. Alternatives to an ad valorem tax and a special assessment have been, and will continue to be, examined. In addition, attention needs to be given to the 4-foot channel. Potentially, a maintenance plan needs to be developed for maintenance of the 4-foot channel.

2.4.8 Issue 8 – Public Education and Outreach

The District runs the wildflower seed program, maintains a website with educational information, and recently developed a CAC to focus on developing educational initiatives. However, there is still limited awareness among the public of how actions within the District affect the river and other unique natural resources.

3.0 GOALS, POLICIES AND MANAGEMENT STRATEGIES

The roles of watershed districts have changed since the Lower Minnesota River Watershed District was formed in 1960. These changed roles reflect new public values, which have reordered priorities for addressing issues. The District is affected by these changes. A number of the purposes expressed in the original petition for establishment of the District conflict with the present-day purposes set forth in M.S. 103B.201. Overall, today's District goals are consistent with the purposes stated in recent statutes, recognizing also that the District has to address commercial navigation. The goals, policies, and strategies set forth in this section of the plan reflect the specific characteristics of this District.

The mission and purpose of the District is presented below, followed by the goals, policies, and strategies generated through the planning process with the TAC, CAC, Managers, and staff.

3.1.1 Mission

The mission of the District is to manage and protect the Minnesota River, lakes, streams, wetlands, and groundwater and to assist and facilitate in providing river navigation by:

- Promoting open communications and partnering with citizens, community organizations, and local, state, and federal agencies.
- Improving and protecting the quality of the Minnesota River and all water bodies in the watershed.
- Minimizing the negative effects of floods and droughts on the Minnesota River and all water bodies in the watershed.
- Collecting and distributing information regarding surface water and groundwater in the watershed to assist in establishing priorities and developing local plans to improve water resources in the watershed.
- Monitoring and understanding the effects of municipal groundwater appropriations and drought on groundwater levels.
- Working with LGUs to enforce the WCA.
- Assisting and facilitating the efforts of state and federal agencies to maintain the navigation channel.
- Educating stakeholders about the impact they have on the water resources in the watershed and motivating them to change behaviors that have a negative impact.

3.1.2 Purpose

The Metropolitan Surface Water Management Act states that the purposes of the District and other water management programs (quoted from M.S. 103B.201) are as follows:

- Protect, preserve, and use natural surface and groundwater storage and retention systems.
- Minimize public capital expenditures needed to correct flooding and water quality problems.

- Identify and plan for means to effectively protect and improve surface and groundwater quality.
- Establish more uniform local policies and official controls for surface and groundwater management.
- Prevent erosion of soil into surface water systems.
- Promote groundwater recharge.
- Protect and enhance fish and wildlife habitat and water recreational facilities.
- Secure the other benefits associated with the proper management of surface and groundwater.

Unlike other water management programs in the state subject to M.S. 103B, the District has an additional purpose which is to improve navigation. The district's primary role in improving navigation is serving as the local sponsor for the COE. In that role, the District is responsible for acquiring and managing dredge material sites.

The mission and purpose of the District, together with the issues and management gaps discussed in the previous section, serve as the foundation for the goals, policies, and strategies summarized below. Noteworthy is that this plan seeks to streamline the regulation imposed on LGUs and reduce inconsistencies by incorporating policies and strategies being used by surrounding WDs and WMOs, where appropriate.

3.1.3 Goal Summary

Table 3-1: Summary of District Issues, Goals, and Strategies

Issues	Goals	Strategies
Issue 1: Unclear Role of the District Issue 2: Outside Influences	Goal 1: Organizational Management	Strategy 1.1.1: Work cooperatively with local, state, and Federal forms of government; other agencies; and non-government organizations on issues affecting the District's resources. Strategy 1.2.1: Provide public information services Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 1.3.2: Research the options of expanding, contracting or maintaining the District's Boundary Strategy 1.3.3: Perform periodic assessments and program reviews Strategy 1.3.4: Use short-term and long-term metrics to measure progress

Issues	Goals	Strategies
Issue 3: Water Quality	Goal 2: Surface Water Management	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.1.1: Lower Minnesota River Watershed District – Water resources classification categories Strategy 2.2.1: Watershed management standards Strategy 2.2.2: Promote disconnected stormwater management and low impact development Strategy 2.2.3: Cost share incentive Program Strategy 2.2.4: Water quality restoration programs Strategy 2.2.5: Dean Lake Feasibilty/ Diagnostic Study Strategy 2.3.1: Modify and continue the monitoring program Strategy 2.3.2: Complete detailed assessments of data Strategy 2.3.4: Coordinate with other agencies and water quality programs Strategy 7.2.1: Develop a Vegetation Management Standard/Plan
	Goal 3: Groundwater Management	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.3.1: Modify and continue the monitoring program Strategy 3.1.1: Support wellhead protection efforts Strategy 3.2.1: Adopt infiltration standards Strategy 3.2.2: Promote conservation and wise use of groundwater Strategy 3.3.1: Groundwater monitoring Strategy 3.3.2: Regional modeling
	Goal 4: Unique Natural Resources Management	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.3.1: Modify and continue the monitoring program Strategy 4.2.1: Data aquistion and management Strategy 4.2.2: Provide technical assistance Strategy 4.2.3: Provide educational opportunities Strategy 4.3.1: Develop a mechinism for identifying and aquiring high value conservation easements Strategy 4.4.1:Encourage wildlife connectivity projects which achieve multiple goals, such as water quality improvements, and fen bluff protection Strategy 7.2.1: Develop a Vegetation Management Standard/Plan

Issues	Goals	Strategies
	Goal 5: Wetland Management	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 4.3.1: Develop a mechinism for identifying and aquiring high value conservation easements Strategy 5.1.1:Delegate Wetland Conservation Act (WCA) to LGU's Strategy 5.1.2: Require LGU's to conduct wetland inventories and complete wetland management plans Strategy 5.1.3: Review WCA notices as received Strategy 5.1.4: Wetland Standard Strategy 7.2.1: Develop a Vegetation Management Standard/Plan
Issue 4: Flooding and Floodplain Management	Goal 2: Surface Water Management	Strategy 2.1.1: Watershed Management Standards
	Goal 6: Floodplain and Flood Management	Strategy 6.1.1: Floodplain and drainage alteration standard Strategy 6.1.2: Adopt infiltration and peak flow standards Strategy 6.1.3: Manage localized flooding
Issue 5: Erosion and Sediment Control	Goal 6: Floodplain and Flood Management	Strategy 6.2.1: Adopt infiltration and peak flow standards
	Goal 7: Erosion and Sediment Control	Strategy 2.2.1: Watershed management standards Strategy 7.1.1: Support the NPDES general permit Strategy 7.1.2: Erosion and Sediment Control Standard Strategy 7.2.1: Develop a Vegetation Management Standard/Plan Strategy 7.3.1: Provide assessment of streambank and mainstem erosion Strategy 7.3.2: Continue work of repairing gully erosion Strategy 7.4.1: Promote and encourage shoreland protection Strategy 7.4.2: Shoreline and streambank standard
Issue 6: Groundwater	Goal 3: Groundwater Management	Strategy 1.3.1: Provide strategic resource evaluation and management Strategy 2.3.1: Modify and continue the monitoring program Strategy 3.1.1: Support wellhead protection efforts Strategy 3.2.1: Stormwater infiltration Criteria Strategy 3.2.2: Promote conservation and wise use of groundwater Strategy 3.3.1: Groundwater monitoring Strategy 3.3.2: Regional modeling

Issues	Goals	Strategies
Issue 7: Commercial and Recreational Navigation	Goal 8: Commercial and Recreational Navigation	Strategy 8.1.1: Promote safety education Strategy 8.2.1:Manage existing dredge sites and investigate and/or acquire additional dredge material sites Strategy 8.2.2: Develop a beneficial use plan for dredge materials Strategy 8.3.1: Develop a funding structure to ensure proper maintenance and improvement occurs along the river
Issue 8: Public Education and Outreach	Goal 9: Public Education and Outreach	Strategy 1.2.1: Provide public information services Strategy 4.2.3: Provide educational opportunities Strategy 8.1.1: Promote safety education Strategy 9.1.1: Maintain the citizen advisory committee (CAC) Strategy 9.1.2: Develop an outreach program Strategy 9.1.3: Engage and utilize volunteers Strategy 9.1.4: Provide opportunity for public input Strategy 9.2.1: Produce scientific studies and work products Strategy 9.2.2: Promote a variety of education programs Strategy 9.2.3: Use multiple outlets to distribute information

3.2 GOAL 1: ORGANIZATIONAL MANAGEMENT TO MANAGE THE DIFFERENT ROLES OF THE DISTRICT

As mentioned, the roles of watershed districts have changed since the District was formed in 1960. These new roles have reordered priorities and the means by which issues are evaluated and addressed. To adequately address assumed roles, the District identified and defined five primary policies which were reaffirmed during the planning process for this plan.

Policy 1.1: To Serve as a Facilitator

Strategy 1.1.1: Work Cooperatively with Local, State, and Federal Forms of Government; Other Agencies; and Non-Government Organizations on Issues Affecting District Resources.

Under this strategy the District will continue to work collaboratively with other government and non-government organizations (NGOs) to inventory and assess resources, to cost share on projects that protect or enhance these resources, and to lobby the Minnesota State Legislature and the United States Congress to ensure the Minnesota River receives the fiscal resources necessary to fulfill its mission and purpose.

The District will undertake projects that develop, protect, enhance, and/or restore the resources within its jurisdiction (such as erosion control, greenbelts, habitat creation, etc.), either independently or jointly with other LGUs or other organizations, as discussed in future sections, or in response to petitions. The District will place a higher priority on projects identified in this Plan and in future resources/implementation plans. Projects to be considered include, but are not limited to, those that benefit navigation (dredge material disposal sites, bank erosion control, etc.), address erosion and sediment control, and develop public access to, and facilitate public enjoyment of, the resources in the District.

The District will continue its effort at the Minnesota State Legislature to facilitate the formation of a Minnesota River Basin Commission. The commission would have the jurisdiction and authority necessary to manage land use practices and control point and non-point source pollution currently affecting the quality of the Minnesota River.

Policy 1.2: To Serve as an Educator

Strategy 1.2.1: Provide Public Information Services.

The District will develop a proactive, focused education and information program around the resources in the District and navigation in the lower Minnesota Valley. The program will be created in partnership with the CAC, will emphasize the District's work, and seek to support mutual goals of the District, LGUs, and neighboring WMOs/WDs.

Policy 1.3: To Serve as a Manager

Strategy: 1.3.1: Provide Strategic Resource Evaluation and Management.

The District will continue initiatives undertaken as part of the previous plan and work proactively with other agencies within the lower Minnesota River Valley to conduct resource assessments, planning, and implementation programs. There are two primary benefits of this effort: it provides information that the District and LGUs can use to develop and implement resource plans and it provides educational materials for the general public. Developing plans for the resources listed below was identified as an implementation activity in the Second Generation Plan.

- Dean Lake
- Assumption Creek
- Courthouse Lake
- Credit River
- Nine Mile Creek
- Purgatory Creek

In 2004, the District adopted the Guidance to Implementation in order to move their implementation agenda forward. As part of the study, a comprehensive survey and review of

ongoing resource management and monitoring efforts in the watershed was performed to assess critical areas. This included a written survey and follow-up discussions with multiple cities, counties, agencies and individuals working on resource management in the watershed.

Implementation strategies in the Second Generation Plan were then reviewed in the context of the resource management assessment. Specific activities in the Second Generation Plan were refined and prioritized, and additional activities were added based on discussions with stakeholders in the watershed. The result was a prioritized Implementation Guidance table, to allow the District to move forward in a proactive, systematic fashion. The strategic resource evaluation and management process will take approximately 1 year and a half to 2 years and will be conducted as follows and serve as an update to the 2004 Guidance to Implementation:

- **Step 1 - Identify and inventory resources.** Known land and water resources within the District have been inventoried as presented in Section 1 of the Plan. As part of this process, TAC members will be asked to provide additional information of undocumented resources. Given the information presented in Section 1, this is not expected to be laborious but necessary to address potential gaps.
- **Step 2 - Assess the condition of resources through inspection and analysis.** Using the information provided in Section 1 of the Plan and additional information from Step 1, TAC members and District staff will assess the condition of the resources in two phases.
    - Phase 1 will be a desktop review of resource trends. If data suggests that a resource is deteriorating and/or consistently exceeding State of Minnesota nutrient standards, the resources will be targeted for additional analysis. Resources that are meeting state nutrient standards for function and use with existing controls will be placed on a 5-year data analysis schedule.
    - Phase 2 will consist of a detailed evaluation of the resources, including a description and definition of the resource at the landscape and watershed level, and identification of stressors (direct or indirect). Depending on the outcome of the evaluation, resource management plans will be developed or a use attainability analysis (UAA) conducted. Resource management plans will identify specific projects focusing on abating or mitigating identified stressors. In the situation where it is determined that a water body's use is not attainable, the regulatory UAA process will be done.
- **Step 3 - Capital Improvement Program Amendment.** In accordance with Section 6 of the Plan, the outcomes of the management plan and UAA process will be incorporated. Specifically, applicable projects will be added to the District's CIP.

The Managers will focus their effort on resources not being addressed in detail by other agencies. In addition, the District will strive to consider and balance interests across all areas expressed in their Mission and Purpose statements.

Strategy 1.3.2: Research the Options of Expanding, Contracting, or Maintaining the District's Boundary

This strategy, recommended by the TAC, consists of the District researching three options for expanding, contracting, or maintaining District boundaries. The District's strategy is to lead three investigatory efforts. The first would look at expanding the District's boundary to create a true watershed boundary by engulfing adjacent WMOs and WDs (Riley Purgatory Bluff Creek WD, Nine Mile Creek WD, Scott WMO, and Carver WMO). The second option would investigate dissolving the District and forming a port authority to address navigation, while at the same time extending the boundaries of neighboring WDs and WMOs to the Minnesota River to address the other items covered in the existing District Mission and Purpose Statements. The third option would compare maintaining the current boundary to either expanding or contracting the District.

Strategy 1.3.3: Perform periodic assessments and program reviews.

This strategy was modeled after the Scott WMO policy for regular assessment of programs and progress. The District will regularly assess and review its programs. These include:

- Annual reports to BWSR
- Annual financial audits
- Annual water quality monitoring reports
- Annual reports or meetings with the LGUs to track and document local water plan (LWP) implementation
- Periodic review of development plans, targeting 10 percent of permits issued and the program's equivalence with this Plan
- A bi-annual program review that benchmarks accomplishments against the strategies and outcome articulated in the Plan

To avoid undue stress on the LGUs, the District will work to have annual reporting coincide with MS4 Permit Program annual reporting. The District intends to address the findings of these reviews, which will be included in its annual report, to improve operations. If reviews identify any needed Plan changes or additions, the District will address them through the Plan amendment process. The District will also use BWSR's Metro Watershed Performance Review and Assistance Program (PRAP) guidance to ensure that its meeting BWSR's required performance standards.

The District does not wish to duplicate existing regulatory authority of other agencies. The Managers believe that regulations are more properly performed at the local level (cities, townships, counties), rather than by the District. If the District finds that an LGU has failed to enforce its standards and policies, then the District will adopt regulations after taking the appropriate statutory steps to enforce its standards and policies.

Strategy 1.3.4: Use short-term and long-term metrics to measure progress.

This strategy was also modeled after the Scott WMO policy for regular assessment of programs and progress, strategy 7.6.2. It provides a set of metrics to help the District evaluate both short- and long-term progress. The short term metrics tend to be programmatic and related to the accomplishment of "activities, the number of activities, or the number of participants." Long term metrics generally involve resource based outcomes. Short-term and long-term metrics are presented in Table 3-2.

Table 3-2: Lower Minnesota River Watershed District Short-term and Long-term Metrics

Goal	Short-term Metric	Long-term Metric
Goal 1: Organizational Management	Completion of scheduled activities Annual LGU Audits Amount of dollars leveraged for projects from other agencies and property owners	Formation of a Minnesota River Basin Commission
Goal 2: Surface Water Management	Number and types of projects completed as part of the Cost Share Incentive Program and Water Quality Restoration Programs Number of targeted studies and projects completed	Trends in water quality parameters identified for monitoring efforts
Goal 3: Groundwater Management	Number of targeted studies and projects completed	Trends in water quality parameters identified for monitoring efforts
Goal 4: Unique Natural Resources Management	Number of targeted studies and projects completed	Number and acreage of unique natural resources protected, restored or enhanced Acquisition of high valued easements
Goal 5: Wetland Management	Completion of scheduled activities	Number and acreage of wetlands protected, restored or enhanced
Goal 6: Floodplain and Flood Management	Completion of scheduled activities	Number of structures damaged and value of flood damages
Goal 7: Erosion and Sediment Control	Completion of scheduled activities	Trends in water quality
Goal 8: Commercial and Recreational Navigation	Completed of scheduled activities Number of targeted studies and projects completed	Secure regular congressional and state legislative funding for the 9-Foot channel

Goal	Short-term Metric	Long-term Metric
Goal 9: Public Education and Outreach	Number and types of sponsored events Number of participants at events Number of articles, press releases and pamphlets developed Number of articles, press releases and pamphlets printed Number of volunteers	Same as short-term metrics

3.3 GOAL 2: SURFACE WATER MANAGEMENT TO PROTECT, IMPROVE, AND RESTORE SURFACE WATER QUALITY

Improved water quality in the Minnesota River is a priority with state and federal policy makers and the District's Managers, staff, and advisory committees. Impaired or poor quality water resources can unfavorably impact recreational uses, aquatic habitat, wildlife, groundwater quality, and other water use activities.

More than 16,000 square miles of the Minnesota River watershed are beyond the control of the District. Management of in-stream water quality from these tributary areas will be coordinated with other agencies with wider influence and jurisdiction. The District is committed to protecting and improving the quality of water originating within its boundaries and assisting other municipalities and WMOs to reduce point and non-point pollutant discharges to the Minnesota River and other water resources.

The following policies and strategies were identified through the planning process to protect and improve surface water resources to meet targeted state of Minnesota water quality standards, pursuant to MN Rule 7050, within the District.

Policy 2.1: To Use Classification Categories to Manage Water Resources

Strategy 2.1.1: Lower Minnesota River Watershed District - Water Resources Classification Categories

This strategy consists of managing water resource projects within the District based on classification categories. Classification categories will be used as a means to prioritize future projects and review projects.

Most systems classify water resources based primarily on existing and future use by humans. However, the District system also considers unique environmental characteristics of the water resources in determining their classification. Those include, but are not limited to, floodplain lakes and wetlands, calcareous fens, and trout streams. The four environmental characteristic categories are described below.

Minnesota River Category

The Minnesota River has been assigned a unique category to reflect the special efforts taken throughout the greater Minnesota River watershed to improve the river's water quality. A large amount of the Minnesota River watershed is outside of the District's control. The District will seek to regulate the water quality of the Minnesota River by employing recommendations set forth in the Implementation Plan of the South Metro Mississippi, Lower Minnesota River Dissolved Oxygen and Minnesota River Turbidity TMDLs, and by collaborating with stakeholders and the state Legislature to create a Minnesota River Basin Commission. Until the completion of the South Metro Mississippi and Minnesota River Turbidity TMDL Implementation Plans, the District's management goals for the Minnesota River will require reductions in point and non-point source pollution to the Minnesota River, and enhancement of natural and existing uses (such as fishing, boating, hiking, and biking).

Floodplain Category

This category applies to water resources located within the Minnesota River floodplain, which includes many of the Minnesota Valley National Wildlife Refuge lakes. Minnesota River floodwaters frequently inundate floodplain water resources, greatly impacting those resources. The interactions of some of the floodplain water resources with the Minnesota River are marginally managed. For example, levees were constructed that reduce the frequency of inundation, and outlets were installed to allow manipulation of water levels. Meanwhile, other floodplain water resources are allowed to interact freely with the Minnesota River.

The District will require that water resources in the floodplain category be managed mainly to enhance the natural plant and animal communities, and to preserve existing uses (such as fishing, hiking, biking, swimming, etc.).

Upland Category

This category refers to water resources located outside the Minnesota River floodplain that are not unique resources. Examples include the Credit River, stormwater ponds, and Dean Lake. The District will require that upland water resources be managed for both the natural and human communities that use them. Management goals for these water resources will emphasize enhancing interaction of the human and natural communities, and managing the stormwater and human impacts on the water resources.

Unique Natural Resources Category

Many unique natural resources located within the District, such as calcareous fens and trout waters, warrant special management. These resources will be managed for specific, identified natural biological communities of special importance or significance, in accordance with existing or future official management plans, such as the DNR Savage Fen Resource Plan and the Eagle

Creek Aquatic Management Area Plan. General management goals for these water resources are to understand, preserve, protect, and restore unique natural resources, while evaluating projects which propose to alter wetlands, buffer areas, floodplains, shoreland areas, water crossings, or other unique natural resources. Avoidance of greenways will be considered a primary project goal. If avoidance is not possible, impacts to greenways will be minimized.

Policy 2.2: To Prevent Further Degradation of Water Quality

Strategy 2.2.1: Watershed management standards

Stormwater Management Standard

It is the strategy of the District to:

- Manage new development or redevelopment greater than 1 acre, and drainage alternations, by requiring each development or land disturbing activity to manage its stormwater effectively, either on or off-site.
- Promote and encourage a reduction in runoff rates, to encourage infiltration, and to promote groundwater recharge.
- Maximize groundwater recharge as a means of maintaining drinking water supplies, preserving base flows in streams, and limiting discharges of stormwater to downstream receiving waters.
- Require that property owners control the rate and volume of stormwater runoff originating from their property so that surface water and groundwater quantity and quality is protected or improved, soil erosion is minimized, and flooding potential is reduced.
- Protect and improve natural resources within the watershed to prevent further degradation.

Regulation

A. Rate Control

The proposed [development] activity will not increase the peak stormwater runoff rate from the site, under pre-development conditions, for anything less than a 24-hour precipitation event with a return frequency of 1- or 2-, 10- and 100-years. Pre-development is defined as land use on a site immediately prior to the proposed alteration/activity. The Project must comply with the requirements of MPCA's General Permit for Construction Activities.

B. Volume Control

Stormwater runoff volume retention shall be achieved onsite in the amount equivalent to the runoff generated from one-half (0.5) inch of runoff over new impervious surfaces of

the redevelopment or development[2]. To achieve the volume control regulation, infiltration must be used where practicable. Filtration is an acceptable alternative for hydrologic soil group C and D type soils or when infiltration is infeasible per Criteria J. Volume control credits can be used to control up to one-half (0.5) inch of runoff as described in future sections.

C. Water Quality

Water quality stormwater management must comply with the requirements of MPCA General Permit for Construction Activities and additional guidelines set forth in the UAA, as described in Strategy 1.4.1. Recognizing that enforceability of TMDLs are being covered by the NPDES Permit and should not be duplicated here, as noted by this language from the MPCA General Permit:

> If the TMDL identifies specific implementation activities regarding construction stormwater that would apply to the site discharges, the Permittee(s) must include the following in the SWPPP:
>
> - The identity of the receiving water, the areas of the site discharging to it, and the pollutant(s) identified in the TMDL; and
> - BMPs identified in the TMDL and any other specific construction stormwater related implementation activities identified in the TMDL.

Facilities regulated by an individual NPDES permit with numerical TSS limits are exempt from complying with the requirements of the MPCA General Permit for Construction Activities and subsequent water quality criteria listed below.

D. Waste Disposal to Waters

Stormwater management must not result in the discharge of any regulated substance, hazardous or biological waste, or petroleum product, whether treated or untreated, to BMP devices that may have a deleterious effect upon a water of the state (surface and groundwater), unless the discharge is in compliance with federal, state, and local regulations.

[2] Development and redevelopment refers to changes to existing conditions from impervious and pervious surfaces where the net change increase in impervious surface is 1 acre or more. An impervious surface is defined as a constructed hard surface that either prevents or retards the entry of water into the soil and causes water to run off the surface in greater quantities and at an increased rate of flow than prior to development. Examples include rooftops, sidewalks, patios, driveways, parking lots, storage areas, and concrete asphalt or gravel roads. An impervious surface must be calculated on a site by site basis.

Criteria

Stormwater management plans shall comply with the following criteria:

A. A hydrograph method based on sound and generally accepted hydrologic theory will be used to analyze runoff for the design or analysis of flows and water levels.

B. Runoff rates for the proposed activities, development, or redevelopment within the watershed shall:

   a) Not exceed existing runoff rates for the 1- or 2-year, 10-year, and 100-year critical duration storm events;

   b) Not accelerate on- or off-site watercourse erosion, downstream nuisance, flooding, or damage as demonstrated by the project proposer; and

   c) Runoff rates may be restricted to less than the existing rates when necessary for the public health, safety, and general welfare of the District water resources. The local water plan authority (LWPA) (and the District, if consulted) will determine whether runoff rates need to be restricted to less than the existing rates on a case-by-case basis.

C. Stormwater facilities must provide:

   a) An identified overflow spillway and downstream route sufficiently stabilized to convey a 100-year critical storm event;

   b) Pond outlets designed to prevent short circuiting of the flow from pond inputs to the outlet;

   c) A minimum water depth for constructed stormwater ponds with dead storage of 3 feet and conformance to the design specifications of the Stormwater Manual, 2005 and as amended.

   d) An outlet skimmer to prevent migration of gross pollutants (floatables and oils) for the 2-year event; and

   e) Dedicated access for future maintenance that is free of plantings and impediments.

D. Regional ponds and practices can be used to provide for stormwater management based on the following criteria:

   a) Regional ponds are required to be designed based on ultimate conditions for the contributing subwatershed.

   b) Regional ponds are required to be constructed and operational prior to constructing impervious surfaces within the contributing drainage area.

E. Maintenance and Easements: Stormwater management easements shall be provided for (1) access for facility inspections and maintenance and (2) preservation of stormwater runoff conveyance, infiltration, and detention areas and facilities, including the overflow route.

   a) Land used by stormwater management facilities shall be preserved by dedication and/or perpetual easement to the LWPA, when required by the LWPA. These easements shall cover those portions of the property which are adjacent to the facility and which lie below the 100-year flood elevation.

   b) A maintenance agreement shall be recorded with the county as part of the LWPA development approval process. Minimum requirements for the maintenance agreement include:

      1. A list of the responsible party(s) (LWPA and facility owner/manager)
      2. Contact information
      3. A formalized maintenance schedule, with scheduled activities
      4. A "Failure to Perform" provision laying out remedial actions if the responsible party does not perform as expected
      5. Maintenance debris handling plans
      6. Emergency response (environmental, spill, safety)

   c) Maintenance is required for all stormwater practices constructed in compliance with these Policies. Each LWPA will conduct periodic inspection of stormwater practices. A minimum of 20 percent of all stormwater facilities shall be inspected annually by the LWPA. LWPAs must provide to the District annual inspection reports detailing inspection activities and proof of maintenance where required. Inspection reports as part of the LWPA's MS4 Report is an acceptable reporting tool for the District.

   d) When land used by stormwater management facilities is public land or public ROW, easements under this section will not be required, and a written agreement between the LWPA and applicant may be executed in lieu of the recorded maintenance agreement.

F. Design of all BMPs will be consistent with the Minnesota Stormwater Manual, November 2005, and as amended, and the MPCA General Permit Authorization to Discharge Stormwater Associated with Construction Activity under the NPDES/State Disposal Permit Program – MN R100001 (NPDES General Permit), issued by MPCA, August 1, 2008, and as amended.

G. When using infiltration for volume control, infiltration volumes, and facility sizes shall be calculated using the appropriate hydrological soil group classification and infiltration rate, and shall be capable of infiltrating the required volume within 72 hours or as specified in the NPDES General Permit, and as amended.

H. In evaluating the infiltration capacity of a constructed BMP under post-development conditions, the infiltration rates in the Minnesota Stormwater Manual, November 2005, and as amended, should be used. Select the infiltration design based on the least permeable soil horizon within the first 5 feet below the bottom elevation of the proposed infiltration facility. Site-specific infiltration measurements completed by a licensed professional (as described in the Minnesota Stormwater Manual) may be used in place of the values in the Minnesota Stormwater Manual, and as approved by the District.

I. All stormwater retention practices designed to meet the volume control regulation must provide pretreatment of stormwater runoff prior to infiltrating into the groundwater system or discharging downstream. Pretreatment methods must comply with the Minnesota Stormwater Manual, November 2005, and as amended, for the proposed practice. All highly recommended and recommended design criteria must be met, unless specifically waived by District staff.

J. To the maximum extent practicable, volume control shall be fully met onsite. Site conditions may make infiltration undesirable or impossible. The project proposer must make soil corrections and/or investigate other locations on the site for feasible infiltration locations. Infiltration of stormwater should avoid areas of contaminated soil. Infiltration practices are not allowed:

    a) For runoff from fueling and vehicle maintenance areas;

    b) Within hydrologic soil group C and D type soils;

    c) Within some wellhead protection areas (review Wellhead Protection Plans for additional guidance);

    d) Within 50 feet of a septic tank or drain field;

    e) On areas with less than three (3) feet vertical separation from the bottom of the infiltration system to the elevation of seasonal high groundwater or top of bedrock.

    f) For facilities that are prohibited from constructing new or expanding existing infiltration practices per NPDES/SDS MNR0500000.

If the proposed project claims that infiltration is not feasible or allowed onsite, supporting documentation must be provided. Filtration technologies may be an acceptable alternative for type C and D soils and other sites where infiltration is infeasible given the criteria above.

Recommended filtration BMPs include:

- Basins or swales with under drain systems.
- Manhole filtration device inserts

The MPCA's 2005 Minnesota Stormwater Manual should be consulted for additional filtration BMP options and design criteria.

Construction Erosion Control Standard

It is the strategy of the District to require the preparation and implementation of erosion and sediment control plans to control runoff and erosion, to retain or control sediment on land during land disturbing activities, and to prevent the degradation of resources and the loss or damage of property due to erosion and sedimentation.

Regulation

No project shall commence land disturbing activities, unless granted a variance, without first obtaining a permit from an LWPA that incorporates and approves an erosion and sediment control plan for the activity, development, or redevelopment. The proposed activity will be in compliance with the NPDES General Permit, as amended.

Criteria

Erosion and sediment control plans and the land disturbing activity shall comply with the following criteria:

a) Erosion and sediment control measures shall meet the standard for the NPDES General Permit, as amended, except where more specific requirements are provided.
b) The project proposer must ensure final stabilization of the site in accordance with the NPDES General Construction Permit requirements. The site will be considered as having achieved final stabilization following submission of Notice of Termination.
c) All onsite stormwater conveyance channels shall be designed and constructed to withstand, after construction, the expected velocity of flow from a 10-year frequency storm without erosion.

Exception

No erosion control plan or permit shall be required for the following land disturbing activities:

- Minor land disturbing activities such as home gardens contained within a residential lot, repairs, and maintenance work.
- Construction, installation, and maintenance of SSTS other than those on steep slopes, on riparian lots within a Shoreland District, or in a bluff impact zone.
- Installation of any fence, sign, telephone or electric poles, or other kinds of posts or poles.

- Emergency activity necessary to protect life or prevent substantial harm to persons or property.
- Minor wetland impacts that have received a "certificate of exemption or no loss" determination by the LGU (municipalities or DOT) administering the WCA.
- All maintenance, repair, resurfacing, and reconditioning activities which do not involve land disturbance.
- All land disturbing activities not required to obtain an NPDES General Permit, or to have an approved erosion and sediment control plan, shall nevertheless be conducted in full compliance with the Construction Erosion Control Standard.

Shoreline and Streambank Alteration Standard

It is the strategy of the District to manage stable, intact, and vegetated shorelines and streambanks that provide valuable functions to the associated water resource including prevention of erosion, reinforcement of soils through root structure, trapping of nutrients and sediments, and provision of fish and wildlife habitat. The District promotes the preservation and enhancement of the ecological integrity and natural appearance of shorelines and streambanks with the intent of preventing erosion. When alteration is necessary, the District encourages bioengineering, landscaping, and preservation of natural vegetation practices.

Regulation

Shoreline or streambank improvement or alteration partially or wholly below the ordinary high water mark of a lake or wetland, or bankfull height of a stream, shall not result in detrimental effects to the lake, wetland, or stream.

Criteria

- Bioengineering techniques should be used to the extent possible. The use of bioengineering is encouraged as an alternative to traditional engineered stabilization techniques for its cost advantage, aesthetic superiority, and ecological integrity.
- Retaining walls are to be used only when there is no adequate stabilization alternative and in accordance with MN Rules 6115.0211.

Stream and Lake Crossing Standard

The District discourages the use of beds and banks of streams and lakes for the placement of roads, driveways, and utilities. It is the policy of the District to regulate crossings of watercourses for driveways, roads, and utilities to maintain stream stability, conveyance capacity, and the ability to transport, without adverse effect, the flows and detritus of its watershed.

Regulation

The portion of a road, highway, utility, or associated structure that crosses the bed or bank of any waterbody shall not be installed, modified, or replaced without first demonstrating a public benefit and ensuring that the crossing will retain adequate hydraulic capacity and navigational capacity. If applicable, the project should preserve wildlife passage along each bank, not adversely affect water quality, and represent the "minimal impact" solution to a specific need with respect to all other reasonable alternatives. Projects must follow the DNR manual *Best Practices for Meeting DNR General Public Waters Work Permit GP 2004-0001*, when applicable.

Criteria

A. Analysis, by a qualified professional, is required demonstrating the stream's physical characteristics and the effect of the project on hydraulic capacity and water quality.

B. Construction must be timed to take advantage of seasons with no or low stream flow as appropriate.

C. Construction must be timed to avoid spawning seasons, if applicable.

D. Sizing and placement of stream crossings:

   a) Regardless of the stream's width-to-depth ratio (bankfull width/mean depth), minimum culvert width shall match or exceed stream bankfull width (water surface width at discharge associated with the 1.5-year return period). Combined width of multiple culverts is satisfactory.

   b) Culvert length shall extend beyond side slope toe.

   c) Slope of culvert shall match stream thalweg (the deepest continuous line along a watercourse) slope.

   d) Culverts shall be buried one-sixth of their height.

   e) When using multiple culverts, offset culvert inverts. Use the fewest and largest multiples possible. A minimum vertical separation of 1foot is required between the lowest placed culvert and multiples.

   f) Alignment of culvert shall match stream alignment.

   g) Additional consultation is required with DNR, the District, and other regulatory agency staff when the stream is a designated trout stream or contains endangered or threatened species.

Floodplain and Drainage Alteration Standard

It is the strategy of the District to regulate alterations within the floodplain and drainageways within the watershed to provide flood protection to natural resources, permanent structures, and private lands, in accordance with M.S. 103F.

Regulation

Alteration to or filling land below the 100-year flood elevation of any wetland, public water, or landlocked subwatershed shall be subject to the following regulations and shall be completed in accordance with a state-approved floodplain management and shoreland ordinance:

A. No filling is allowed within the 100-year floodplain which causes a rise in the 100-year flood elevation without providing compensatory floodplain storage equal to or greater than the volume of fill.

B. The lowest ground level of proposed structures must be a minimum of 2 feet above the 100-year high water level of nearby surface waters or 1 foot above the emergency overflow elevation, whichever is greater, unless they have protection through flood proofing or by another approved construction technique.

C. No permanent structure, with the exception of drainage conveyance structures and monitoring equipment, may be constructed in the floodway.

Criteria

A. Ultimate conditions must be used to determine the flood elevation.

B. No culvert or other artificial means to remove or drain surface water, and no obstruction to the natural flow of waters, shall be installed without demonstrating that there is no adverse impact on upstream or downstream landowners or water quality, habitat or fisheries.

C. There is reasonable necessity for such alteration.

Water Appropriations Standard

Groundwater and the surface-groundwater interactions within District boundaries are needed for the effective management of surface water resources and protection of groundwater dependent unique natural resources (such as springs and fens). Definition of the potential scope and effects of water appropriations is necessary to ensure proper stewardship of the system as a whole. It is the District's intent to be informed of proposed appropriation of surface or groundwater in or near unique natural resources. The District will carefully evaluate the potential impacts of public or private infrastructure (including private and municipal groundwater appropriations) on unique natural resources, and the potential impact that interference of flows may have on groundwater recharge, transmission, and discharge.

Regulation

A. In all cases of appropriation of surface or groundwater requiring a DNR appropriation permit in or near the District, a copy of the permit application and information on the location of the discharge/withdrawal must be filed with the District for their review.

B. The effect of the proposed appropriation must be defined for consideration by the District.

C. No project shall appropriate water from any public water basin within the watershed without first obtaining approval from DNR.

Bluff Standard

It is the strategy of the District to regulate land disturbing activities on bluffs which are adjacent to property, water, and unique natural resources.

Regulation

Land disturbing activities on bluffs adjacent to property, waterbodies, and unique natural resources shall incorporate protection from erosion, sedimentation, flooding, and other damage.

Criteria

A. Minimum Bluff Standards: Unless regulated as part of an approved local water plan (LWP), any land disturbing activity, development, or redevelopment of land shall require a topographic survey to determine if a bluff is present. At its discretion, the LGU may waive the topographic survey requirement where a review of the available contour information clearly indicates a bluff is not present. Where bluffs are present, the following Standards shall apply:

    a) All grading, clear cutting, removal of vegetation, and/or other land disturbing activities are prohibited in the Bluff Impact Zone and/or Bluff Face.

    b) All new structures shall be set back a minimum 30 feet from the top of bluff.

    c) All SSTS or community sewage treatment systems (CSTS) shall be set back a minimum of 50 feet from the top of bluff.

    d) All stormwater ponds, swales, infiltration basins, or other soil saturation-type features shall be set back a minimum of 50 feet from the top of bluff.

B. Standards under an Approved LWP: An LGU can identify certain bluffs in a mapped designated bluff area/Bluff Overlay District where land disturbing activity, development, or redevelopment of land is allowed under certain conditions. These bluffs shall be identified and mapped in an LWP. In determining what bluffs are suitable for land disturbance activity, the LGU shall reference sources such as: Soil Survey, Minnesota Land Cover Classification System (MLCCS), Minnesota Biological Survey (MBS), etc. The LGU will need to demonstrate to the District in LWP that any bluff identified for land disturbance activity is not an ecologically sensitive resource.

   a) For those bluffs deemed suitable for land disturbance activity in an approved LWP, the following Standards shall apply:

      i. Grading, clear cutting, removal of vegetation and/or other land disturbing activities may be allowed within the Bluff Impact Zone provided the activity is in compliance with the LWP's minimum performance standards. The LWP shall, at a minimum, require the following:

         1. The identification of any Bluff Preservation Areas where disturbance would be prohibited by LGU ordinance,

         2. The minimum Erosion and Sediment Control BMPs including site stabilization and slope restoration measures needed to ensure the proposed activity shall not result in:

            a. Adverse impact to adjacent and/or downstream properties or water bodies,

            b. Unstable slope conditions, and

            c. Degradation of water quality due to erosion, sedimentation, flooding and other damage.

         3. Prohibition of all activities which would result in disturbances or destabilization of the Bluff Face.

         4. Preservation of existing hydrology and drainage patterns. Land disturbing activities shall not result in any new water discharge points along the bluff.

   b) The following activities shall be permitted within the bluff face, and shall not constitute prohibited activities:

      i. Maintenance, repair, or replacement of public roads and utility and drainage systems that existed on creation of the Bluff Overlay District,

ii. Disturbances that are part of an LGU approved plan to repair, grade, or re-slope existing bluff faces that are eroding or unstable, as necessary to establish stable slopes and vegetation,

iii. Vertical cuts into the bluff face up to 10 vertical feet, measured from the existing top of bluff, provided that no stormwater is directed over the bluff face and stormwater runoff, including roof drainage, is collected and conveyed to a stable discharge point.

C. Standards for LGU-sponsored Projects. The LGU must demonstrate that any LGU proposed activity in the bluff does not: 1) impact adjacent properties, 2) result in unstable slope conditions, and 3) result in the degradation of water bodies from erosion, sedimentation, flooding, and other damage.

Exceptions

A. Where the LGU has determined mining is appropriate, mining activities shall be exempt provided that:

1. An extractive-use site development and restoration plan is developed, approved by the local government, and followed over the course of the project,
2. The mining operation is conducted in such a manner as to minimize interference with the surface water drainage outside of the boundaries of the mining operation,
3. Erosion and sediment control is provided in a manner consistent with this plan, and
4. The landowner complies with all other applicable state and local regulations governing mining.

B. Disturbances, grading, or re-grading of abandoned mine slopes necessary to establish stable slopes and vegetation.

C. For the purposes of constructing public improvement projects, land disturbances in the Bluff Impact Zone and bluff face may be permitted providing the project proposer demonstrates to the LGU an appropriate need for these activities and that avoidance and minimization sequencing was followed.

D. Maintenance, repair, or replacement of public roads, and utility and drainage systems that exist in designated bluff areas/Bluff Overlay Districts.

E. Disturbances that are part of an LGU approved plan to repair, grade, or re-slope existing bluff faces that are eroding or unstable as necessary to establish stable slopes and vegetation.

F. Plantings that enhance the natural vegetation or the selective clearing of noxious, exotic, or invasive vegetation or the pruning of trees or vegetation that is dead, diseased, or poses similar hazards.

Greenways and Open Space Standard

Greenways and open space preserve hydrologic corridors, provide flood protection, and safeguard groundwater resource areas. The District supports the DNR Metro Greenway Program goals. Greenways and open space protection will be considered when evaluating projects which propose to alter wetlands, buffers, floodplains, shorelands, water crossings, and other unique natural resources.

Strategy 2.2.2: Promote disconnected stormwater management and low impact development

This strategy promotes disconnected stormwater management, de-synchronization of flows, and stormwater volume control practices. The abovementioned standards set the stage for runoff volume control and establish requirements to manage peak runoff rates. These standards also included a number of low impact development (LID) credits that could be used with new or redevelopment as an effective way to design the site and promote LID while satisfying the volume control requirement. This strategy consists of continuing the current standards and incorporating additional LID practices that can be used for credits including:

- Buffer credit
- Forest/prairie restoration credit
- Grassed channel credit
- Green rooftop credit
- Natural area conservation credit
- Non-rooftop disconnection credit
- Permeable paver credit
- Reuse of stormwater credit.
- Rooftop disconnection credit
- Soil amendment credit

To receive credit, project proposers must request the credit(s), and provide calculations and documentation showing that the criteria set forth in the Minnesota Stormwater Manual are met (Minnesota Stormwater Manual 2005).

Strategy 2.2.3: Cost Share Incentive Program

This purpose of this strategy is to provide educational, technical and financial assistance to landowners (residential, commercial, industrial...etc); to implement projects that have water

quality, water quantity, channel maintenance, trout stream, fen or wetland restoration, or aquatic habitat benefit within the District; and to help achieve the goals of this Plan. Additional information about the Cost Share Incentive Program can be found in Appendix L.

Strategy 2.2.4: Water Quality Restoration Program

This purpose of this strategy is to provide financial assistance to non-government organizations and LGUs with in the District to implement BMPs or carry out studies which will aide in protecting and improving water resources within the District. Additional information about the Cost Share Incentive Program can be found in Appendix L.

Strategy 2.2.5: Dean Lake Feasibility/Diagnostic Study

As previous stated, for the period of record, Dean Lake has had poor overall water quality without any upward or downward trends (Table 1-8). The District has decided to conduct a Feasibility/Diagnostic Study of Dean Lake to assess the overall health of the lake and to develop and evaluate relevant information concerning appropriate restoration action for the lake. The Feasibility/Diagnostic Study of Dean Lake, scheduled to be completed within a year after the Plan is approved, would identify and evaluate all appropriate restoration alternatives based on site characterization information and allow for the selection of appropriate remedy (ies) by the District.

Policy 2.3: Enable Informed Decisions

The objective here is to collect and analyze data necessary for making informed decisions.

Strategy 2.3.1: Modify and Continue the Monitoring Program.

This strategy continues the cooperative relationship with MCES, CAMP, cities, counties, and SWCDs, as described in Section 1.6 (Surface Water Quality and Quantity Monitoring), with some modifications. These modifications initially include:

- Adding the MCES' Quality Assurance (QA) objectives to the monitoring program
- Incorporating regular data analysis to identify trends

The QA objectives consist of the collection of duplicate samples to assess field precision. One duplicate sample will be collected per lake or stream, per year. Given the monthly sampling schedule, this amounts to about 10 percent of samples. The guideline/target for assessing field precision will be the relative difference of less than 30 percent for total phosphorus.

In addition to working toward to the goals of the QA objective of field precision, the District will strive to incorporate accuracy and bias, representativeness, completeness, comparability and analytical sensitivity objectives as specified in the MCES QA program[3].

[3] (MCES, Environmental Monitoring and Assessement Section Water Resources Assessment Section, 2011)

Strategy 2.3.2: Complete Detailed Assessments of Data

Over the past few years, the District has collected a large quantity of water quality data. The Plan includes a preliminary assessment of lake water quality data. However, the last time a comprehensive evaluation of the data was completed was in 2000. Periodic evaluations of data collected are necessary to convert data into information that decision makers can use. Data collected for each water resource will be evaluated on a 3-year or 5-year cycle. As part of Strategy 1.3.1 and Section 4.3.1(Strategic Resources Evaluation and Management) all of the water resources within the watershed will be evaluated. An outcome of Strategy 1.3.1 and Section 4.3.1 will be groupings of water resources into High, Medium, Low categories for detailed data assessments and timetables formulated for each.

Strategy 2.3.3: Coordinate with Other Agencies and Water Quality Programs

This strategy consists of the District's coordinating with the MDA, MPCA, and Metropolitan Council to stay informed and to collaborate on changes to state standards and best practices for addressing impairments to water on the 303(d) listings. District staff will maintain communications with the various agencies, invite them to participate on the TAC, and attend agency sponsored meetings and training as time allows.

3.4 GOAL 3: GROUNDWATER MANAGEMENT TO PROTECT AND PROMOTE GROUNDWATER QUALITY AND QUANTITY

Groundwater quality and quantity are dependent on the infiltration of surface water/rainfall through the soil, which is dependent on soil type, land cover, weather, and other factors. Changes to any of these factors will influence groundwater. While some of the factors are difficult to control, some activities and changes to land cover can be regulated and/or managed. Groundwater is a finite resource with inputs and outputs. The input is generally rainwater and snowmelt that seep into the ground. The outputs can be groundwater that is pumped out for human use, or groundwater that naturally discharges to lakes, wetlands, and streams.

Maintaining clean, safe groundwater supplies is critical to human and environmental health and to the economic and social vitality of our communities. Groundwater can be contaminated by commercial and industrial waste disposal, landfills, leaking petroleum tanks, septic systems, mining operations, feedlots, and fertilizer/pesticide applications. The quantity and quality of groundwater flows have a direct impact on the resources located in the District, such as floodplains, wetlands, calcareous fens, and trout waters. The District intends to play an active role, working with other units of government and groups, to maintain and/or improve the health of these water resources.

Policy 3.1: To Support and Assist in Intercommunity Management of Groundwater

Strategy 3.1.1: Support Wellhead Protection Efforts.

This strategy consists of supporting wellhead protection planning efforts with District staff time and technical assistance or District consultant when requested by LGUs.

Policy 3.2: To Promote Groundwater Recharge

Strategy 3.2.1: Adopt Infiltration Standards

See Strategy 2.2.1 – Watershed Management Standards.

This strategy consists of establishing criteria as described previously to protect the quality of groundwater when infiltration practices are used to control stormwater runoff volumes. This might include pretreatment, as necessary, prior to infiltration for some source areas such as those with medium or high groundwater susceptibility, and areas close to wells. It could also include prohibiting infiltration of runoff from certain land uses, or where there is shallow groundwater or poor soils.

Strategy 3.2.2: Promote Conservation and Wise Use Of Groundwater.

This strategy consists of incorporating messages of conservation and wise use of groundwater through information sharing and education initiatives.

Policy 3.3: To Protect and Improve Groundwater Sensitive Water Resources

Strategy 3.3.1: Groundwater Monitoring.

This strategy consists of continuing and improving groundwater monitoring in the District. In 2005, the District developed strategies for a groundwater monitoring plan to provide guidance to the District and to increase information available on groundwater quality. This strategy would implement the recommendations of that report.

Strategy 3.3.2: Regional Modeling.

The Metropolitan Council recently completed a model of the MSP metropolitan region, called the Metro Model 2. This strategy consists of working with the Metropolitan Council on uses of the model.

3.5 GOAL 4: UNIQUE NATURAL RESOURCES MANAGEMENT TO PROTECT AND MANAGE UNIQUE NATURAL RESOURCES

The lower Minnesota River valley is a unique area which supports the critical needs of many fish and wildlife species, and provides tremendous outdoor recreation and educational opportunities for the population of the MSP metropolitan area. The District's goal is to maintain or improve the quality and quantity of fish and wildlife habitat, and outdoor recreational opportunities.

Policy 4.1: To Maintain or Improve the Quality and Quantity of Fish and Wildlife Habitat

Strategy 4.1.1: Encourage Protection of Fish and Wildlife Habitat

This strategy consists of working with the DNR, local governments, and NGOs to implement practices that will protect fish and wildlife habitat. These practices include, but are not limited to, limiting disturbance and soil erosion during construction, modifying zoning and subdivision codes, and establishing stream buffers.

Increases in sediment load decreases oxygen levels in the river which has an adverse affect on the aquatic habitat in both the river and in floodplain lakes within the District. The District will work with regulatory agencies and upstream watershed entities to reduce sediment loads.

Policy 4.2: Advocate for Protection, Education and Monitoring of Unique Natural Resources

Strategy 4.2.1: Data Acquisition and Management

This strategy consists of providing technical and financial support for data acquisition and management. The District will work with state, federal, and local entities to determine data needs and the best approach to manage the data.

Strategy 4.2.2: Provide Technical Assistance

This strategy consists of providing District staff time to assist LGUs, NGOs, and landowners interested in preserving unique natural resources. This assistance includes providing analysis, design, operation, and coordination on projects.

Strategy 4.2.3: Provide Educational Opportunities

This strategy consists of providing educational opportunities in resources areas such as signage and kiosks for the public. In addition, the District will develop educational material which can be provided to landowners and metro area tourists.

Policy 4.3: Coordinate with LGUs to Identify and Develop Critical Trails and Green Space Corridors for Improvement and Protection.

Strategy 4.3.1: Develop a Mechanism for Identifying and Acquiring High Value Conservation Easements

This strategy consists of reviewing studies in an effort to protect, preserve and enhance resource connectivity and identify prime areas for conservation easements. Once the areas have been identified, the District will work collaboratively with the LGUs, USFWS, DNR, and other regulatory agencies to acquire the necessary easements.

Policy 4.4: Protect, Preserve, and Enhance the Connectivity of Wildlife Habitat

Strategy 4.4.1: Encourage Wildlife Connectivity Projects which Achieve Multiple Goals, Such as Water Quality Improvements, and Fen and Bluff Protection

This strategy consists of promoting projects that incorporates connectivity of wildlife resources. Understanding that water quality and water resources management projects are the primary

focus; the District will also consider, during review of projects, the potential each has to fragment or maintain/preserve/restore resource connectivity.

3.6 GOAL 5: WETLAND MANAGEMENT TO PROTECT AND PRESERVE WETLANDS

Wetlands are an abundant resource within the District, providing value to the community. Wetlands come in many different shapes, sizes, and types and perform a variety of physical, chemical, and ecological functions. A healthy watershed is one in which wetlands are an integral part of the ecosystem.

Wetlands are among the most productive ecosystems in the world. These resources can support an immense variety of species of microbes, plants, insects, amphibians, reptiles, birds, fish, and mammals. Wetlands supply recreational and aesthetic benefits, flood reduction benefits, biodiversity, and low stream-flow augmentation. They enhance property values, serve as sources for groundwater recharge and discharge, and provide nutrient cycling, wildlife habitat, and fishery resources. Well-planned wetland protection and management efforts can have far-reaching benefits within the watershed and beyond. Active wetland management can improve water quality and wildlife habitat as well as provide recreational and educational opportunities for the public. The goal of the District is to protect and preserve these precious resources.

Policy 5.1: To Preserve Wetlands for Water Retention, Recharge, Soil Conservation, Wildlife Habitat, Aesthetics, and Natural Water Quality Enhancements

Strategy 5.1.1: Delegate Wetland Conservation Act (WCA) to LGUs.

This strategy consists of LGUs continuing, or taking on, the role of local regulatory authority responsible for administering the WCA and MN Rules 8420. Most of the cities, counties, and townships within the District are designated to administer the WCA. DOT also administers WCA along its ROW within the District. The District will act as the regulatory authority only if an LGU refuses to take on their role as the regulatory authority. LGUs must protect wetlands from impacts in the following order: 1) avoid, 2) minimize, and 3) mitigate. In addition, when wetland impacts are unavoidable, wetland mitigation shall be accomplished through restoration, wetland creation or other actions specified in WCA to achieve no net loss of wetlands in the District. LGUs must also evaluate the need to establish a wetland banking system per MN Rule 8410.0080 subpart 8.

Strategy 5.1.2: Require LGUs to Conduct Wetland Inventories and Complete Wetland Management Plans

This strategy consists of requiring LGUs to evaluate the function and value of wetlands either through development of a comprehensive wetland management plan or on a case by case basis, in accordance with MN Rules 8410.0060. LGUs shall use, or require the use of, the Minnesota Routine Assessment Methodology version 3.0 (MnRAM 3.0, as amended) or some other approved methodology to assess the function and values of individual wetlands. As part of the annual program audit discussed under Strategy 1.4.3, compliance will be assessed during the annual audit and documented in the District's annual report.

Strategy 5.1.3: Review WCA Notices As Received

This strategy consists of the District staff reviewing WCA notices from state and federal agencies regarding regulation changes. These notices will be evaluated and forwarded to the managers; LGUs within the District; and posted on the District's website.

Strategy 5.1.4: Wetland Standard

This strategy consist of requiring that LGUs implement the standards and criteria described below to protect wetlands from detrimental effects of erosion, sedimentation, and other non-point source pollutants.

It is the policy of the District to:

A. Achieve no net loss of wetlands in the District, in conformance with the Minnesota WCA of 1991, as amended, and associated MN Rules 8420.

B. Encourage wetland avoidance for all new developments and land disturbing activities.

C. Require mitigation of unavoidable wetland disturbance by replacing the lost wetland function and values in the same major watershed with a wetland of equal or greater value.

D. Require transportation projects to pursue wetland mitigation projects to the extent practical along the transportation corridor.

E. Identify and preserve wetlands for water retention, recharge, soil conservation, wildlife habitat, aesthetics, and natural enhancement of water quality.

F. Manage changes in volume and quality of local stormwater systems to minimize negative impacts to existing wetland function, value, or biological diversity.

G. Replace affected wetlands where avoidance is not feasible and prudent.

Regulation

A. No project shall drain, fill, excavate, or otherwise alter a wetland or public waters wetland without first obtaining approval of a wetland replacement plan from the LGU with jurisdiction over the activity.

Criteria

A. Any drainage, filling, excavation, or other alterations of a public waters wetland or wetland shall be conducted in compliance with M.S., Sec. 103G.245, the WCA, and regulations adopted thereunder.

B. A public waters wetland or wetland may be used for stormwater storage only if the use will not adversely affect the function and public value of the wetland as determined by the LGU.

C. Wetland replacement/mitigation siting must follow the priority order below:

   1. Mitigation on-site
   2. Mitigation within the same subwatershed
   3. Mitigation within the District boundary
   4. Mitigation within project county
   5. Mitigation within the same major watershed

D. A functional assessment for vegetative diversity will be completed for each wetland and public waters wetland delineated for a project.

E. For replacement wetlands less than 2 acres in size, a minimum average buffer width of 25 feet shall be established. For all other replacement wetlands, the buffer must be a minimum width of 25 feet and an average width of 50 feet.

The District intends that LGUs administer WCA, unless a particular city, township, or county has elected not to assume that role in its jurisdictional area. In that case, the District will serve as the LGU and administer WCA.

3.7 GOAL 6: FLOODPLAIN AND FLOOD MANAGEMENT

TO MANAGE FLOODPLAINS AND MITIGATION FLOODING

The natural function of river and stream floodplains is to carry or hold excess water during times of flooding. This function can be greatly hindered by channel restrictions and floodplain encroachments, thereby aggravating the tendency of the river to flood and cause damage. The floodplain also provides habitat for many species of plant and animal life. All communities within the District have DNR approved floodplain ordinances. Adoption of these ordinances

makes it their responsibility to regulate floodplain activities, unless the LGUs give the authority to the District. Landowners are required to obtain the necessary approvals from the appropriate LGU before making alterations to floodplains of the Minnesota River, streams, and other water bodies.

Policy 6.1: To Maintain Natural Water Storage Areas and the Minnesota River Floodway.

Strategy 6.1.1: Floodplain and Drainage Alteration Standard

See Strategy 2.2.1 – Watershed Management Standards.

Strategy 6.1.2: Adopt Infiltration and Peak Flow Standards

See Strategy 2.2.1 – Watershed Management Standards.

Strategy 6.1.3: Manage Localized Flooding

This strategy consists of requiring LGUs to address mitigation of localized flooding in their LWPs. These areas must include those local flooding areas listed in Table 2-1 and any other areas identified by the LGU.

3.8 GOAL 7: EROSION AND SEDIMENT CONTROL. TO MANAGE EROSION AND CONTROL SEDIMENT DISCHARGE

Policy 7.1: Endorse the NPDES General Permit

Strategy 7.1.1: Support the NPDES General Permit

This strategy consists of formalizing the requirement for LGUs to incorporate the NPDES General Permit requirements in their respective local water plans. The District requires LGUs to regulate land disturbing activities in order to protect against erosion and sedimentation and to limit the quantity of sediment entering water resources as described in Strategy 2.1.1 – Watershed Management Standards. In addition, LGUs are encouraged to enforce the NPDES General Permit.

Strategy 7.1.2: Erosion and Sediment Control Standard

See Strategy 2.2.1 – Watershed Management Standards.

Policy 7.2: Adopt Vegetation Management Standard

Strategy 7.2.1: Develop a Vegetation Management Standard/Plan.

This strategy consists of the District undertaking an effort, in partnership with the DNR, USFWS, BWSR, NRCS, and NGOs (e.g. Great River Greening), to develop a vegetation management standard/plan for unique natural resources within the District. This plan would be functional for all who live in, work in, and invest in the District.

Policy 7.3: Manage Streambank and Mainstem Erosion

Strategy 7.3.1: Continue Work of Addressing Gully Erosion

This strategy consists of the District continuing the work with local partners on repairing gullies that were identified in the gullies inventory project completed in 2006 (Appendix K). Three identified gully repair projects have been included in the CIP for this Plan (Table 4-4). The District will implement projects with the City of Bloomington to repair the Mound Springs gully in 2013-2014 and to repair the Heritage Hills Park gully in 2015. This District will also implement a project with the City of Chaska to provide ravine stabilization at Seminary Fen in 2012. In addition, other areas of severe gully erosion identified in the gullies inventory project will be reviewed annually with LGUs during the LGU audit identified in Strategy 1.3.3. The District will use funding set aside as part of its Gully Erosion Projects contingency fund to implement projects if the LGUs where the potential repair projects exist have funding or other resources available to work with the District to implement a repair project.

Policy 7.4: To maintain the Integrity of Shoreland

Strategy 7.4.1: Promote and Encourage Shoreland Protection

The District requires all government entities within its jurisdiction to identify, rank, and map disturbed shoreland areas. Shoreland areas include streambanks, the banks of the Minnesota River, and lakeshore areas. Along these areas the District will promote and encourage protection of non-disturbed shoreland and restoration of disturbed shorelines and streambanks to their natural state, to the maximum extent practical. In addition, the District will discourage the removal of streambank and lakeshore vegetation during and after construction projects.

Strategy 7.4.2: Shoreline and Streambank Standard

See Strategy 2.2.1 – Watershed Management Standards.

3.9 GOAL 8: COMMERCIAL AND RECREATIONAL NAVIGATION TO MAINTAIN AND IMPROVE NAVIGATION AND RECREATIONAL USE OF THE LOWER MINNESOTA RIVER

Since the establishment of the District in 1960, the philosophy of the Managers has been to participate in the construction and maintenance of the navigation channel for the lower Minnesota River as a primary responsibility. The District's goal is to maintain its role as the local sponsor to the COE and to preserve the recreational opportunities for the public.

Policy 8.1: Promote Co-Existence of Commercial and Recreational Navigation on the Lower Minnesota River

Strategy 8.1.1: Promote Safety Education

This District will undertake a proactive, focused education and information program in collaboration with the DNR, U.S. Coast Guard, and Coast Guard Auxiliaries regarding best

practices for safe use of the river. In the interim, links to existing safety programs and material will be added to the District website.

Policy 8.2: Manage Dredge Material

Strategy 8.2.1: Manage Existing Dredge Sites and Investigate and/or Acquire Additional Dredge Material Sites

The District will continue its role as the local sponsor required to acquire and manage dredge material sites. The District will continue to work with the COE on navigation channel maintenance on the lower Minnesota River by following the COE Dredged Material Management Plan for the dredged reaches upstream of the I-35W Bridge. The District will continue to investigate, for the COE, sites for placement of dredged material that are as environmentally safe and economically located as possible, and will facilitate coordination between citizens, LGUs, and the COE. Where appropriate and financially feasible, investigated sites will be acquired. The District will continue to follow a process which fulfills WCA and other legal requirements before a possible dredge material disposal site is used for placement of dredge materials. The District will perform a property survey, locate and delineate wetlands, perform any needed archaeological surveys, negotiate access to the site, and negotiate purchase or lease agreements. The District will try to avoid placement of dredged material in wetlands. If such placement cannot be avoided, then wetland replacement will be accomplished as required by law. In addition, the District will work cooperatively with the COE in developing a comprehensive public/private dredge material management plan for the dredged reaches on the Minnesota River south of the I-35W Bridge. Such a plan might allow private dredging companies to use public sites in exchange for user fees in the form of a lease or some other contractual agreement.

Strategy 8.2.2: Develop a Beneficial Use Plan for Dredge Materials

The District has a few dredge materials placement sites. Once material is placed in these areas, movement or use of the material is required to free storage space should the COE need it for additional dredge material. This strategy consists of the District developing a beneficial use plan for dredge material, which would address the use of the material. The following approaches will be considered for the plan:

- Locating sites where aquatic habitat can be created using dredged material/concrete rubble from federal and non-federal projects in an environmentally acceptable manner
- Establishing methods/processes, programs, and authorities that can assist with using and distributing the material
- Investigating funding partners and their respective roles
- Exploring alternative construction materials that can be used for containment structures, such as concrete rubble from demolition projects

- Creating a marketing plan to assist in fostering discussions with potential users.
- Establishing best management practices for dredged material

Policy 8.3: Provide Funding For Maintenance and Improvements for the 9-Foot Channel

Strategy 8.3.1: Develop a Funding Structure to Ensure Proper Maintenance and Improvement Occurs Along the River

This strategy consists of developing a strategic plan for funding necessary activities along the 9-Foot channel.

3.10 GOAL 9: PUBLIC EDUCATION AND OUTREACH PROGRAM TO INCREASE PUBLIC PARTICIPATION AND AWARENESS OF UNIQUE NATURAL RESOURCES AND THE MINNESOTA RIVER

Policy 9.1: Encourage Public Participation

Strategy 9.1.1: Maintain the Citizen Advisory Committee (CAC).

This strategy consists of continuing the CAC as an advisory committee to the managers. The CAC will:

- Act as liaison between the District and residents.
- Increase public awareness by educating District residents about actions to protect and improve water resources and habitat within the District.
- Advise the managers and staff on issues important to residents.

They will be responsible for:

1. Brainstorming ways to inform residents about the District and its resources. Examples include:
    a. Host neighborhood meetings
    b. Organize and promote community fairs and other events
    c. Educate landowners on vegetative buffers
    d. Develop and install educational signs
    e. Stencil storm sewer catch basins
    f. Organize and coordinate tours of District projects
2. Partnering with local community groups to use as a platform for education and outreach. Examples include:
    a. Boy/Girl Scouts

b. School groups

c. Senior citizen groups

d. Veteran's groups

e. Non-profit environmental groups

3. Developing an education and outreach plan, incorporating information gathered from tasks 1) and 2), and this Plan
4. Developing and implementing habitat improvement projects
5. Collecting water level and water quality data
6. Advising managers on other issues within the District

The managers and the CAC will meet regularly with the adjoining WDs/WMOs to determine how to work cooperatively to manage shared water resources.

Strategy 9.1.2: Develop an Outreach Program.

This strategy consists of developing an education outreach program to familiarize the LGUs and the public with District activities. The outreach program will include:

1. District attendance at meetings of city councils, counties, the Minnesota River Joint Powers Board, public interest groups (such as Friends of the Minnesota River Valley), etc.
2. District presentations to schools, conferences, seminars, etc., regarding activities in the District, water resource issues in the District, etc.
3. Conducting public tours of the watershed to targeted groups, such as city engineers, public officials, environmental groups, and members of the citizen and technical advisory committees.
4. Encouraging other LGUs to include information about the District in their water resource-related documents.
5. Sponsorship of and/or participation in grass-roots level environmental initiatives, such as streambank cleanup, storm drain stenciling, etc.
6. Coordination with other groups and LGUs in developing education programs or implementing ongoing education efforts to produce targeted educational materials.

Strategy 9.1.3: Engage and Utilize Volunteers

The District will continue to solicit and empower volunteers to help with water quality monitoring. Currently the District solicits volunteers and provides modest funding for the purchase of equipment and analysis of samples in participation with CAMP, and the CSMP.

Strategy 9.1.4: Provide Opportunity for Public Input

The District values input from the public regarding operations and design of its programs, and ideas for resource management. This strategy consists of providing opportunities for the public to provide input through open workshops and open house meetings. Particular actions of this strategy include having these types of meeting as part of the design for any new major programmatic effort.

Policy 9.2: Provide Education and Marketing to Foster Sustainable Behavior and Environmental Stewardship

Strategy 9.2.1: Produce Scientific Studies and Work Products

The District recognizes that scientific studies are technical, and are generally not written for the general public. This strategy consists of collecting and/or creating specific outreach materials written for the general public. The District maintains a library of pamphlets and brochures on water quality, lawn fertilizing, septic system care, etc; but anticipates the need for additional materials to present the results of scientific studies and of water plan initiatives and strategies.

Strategy 9.2.2: Promote a Variety of Education Programs

The District recognizes that the public is diverse, that different segments of the public are interested in different topics, and some have preferences for what types of activities they will participate in. The District has therefore chosen to have a variety of education programs. This variety has been on display throughout the discussion of this goal and includes open house meetings, written materials, hands-on stewardship events, workshops, etc. This strategy articulates the District's intent to use a variety of venues for education.

Strategy 9.2.3: Use Multiple Outlets to Distribute Information

The District recognizes that various information outlets reach different audiences. This strategy articulates the District's intention of using multiple outlets to distribute information when possible. Various outlets include literature racks at county offices, community newspapers, websites, e-mail distribution lists, etc.

.

4.0 IMPLEMENTATION PROGRAM

This section presents the Implementation Program (Program) for the Plan. The District's Program addresses water resources and programmatic issues discussed in Section 2 and apply the goals, policies, and strategies address in Section 3. The District's Program consists of administrative and managerial efforts, coordination, studies, and programs; capital improvement projects (CIP); and funding mechanisms to successfully execute the Plan. Each element is described below. An Implementation Program schedule and budget is presented in Table 4-1. Since this Plan was not completed in time for the 2011 budgeting cycle, this Program is slated to begin in 2012 and end in 2020. The estimated impacts of the implementation program on residents and local government are presented in the next section. The District will review the implementation program every two years, at minimum.

4.1 ADMINISTRATIVE AND MANAGERIAL

Administrative and managerial efforts will be carried out by the two District employees: a full-time administrator and a part-time assistant administrator. Staff will take care of the day-to-day operation of the District and implement other elements of the Program, as discussed below. Administrative services also include legal, audit and bookkeeping services, office space, office equipment, office rent, information management systems (e.g. computers, copiers, website, etc), training, and general engineering services. These efforts are financed by the District's general levy.

This page left blank intentionally.

Table 4-1: Lower Minnesota River Watershed District - Implementation Program Budget for 2012 – 2020

ACTION	Strategy Addressed	Potential Funding Sources	Duration	Year 2012	2013	2014	2015	2016	2017	2018	2019	2020
EXPENDITURES												
Administrative/Managerial*												
General Administrative Services	All	GL	Annual	$184,644	$189,260	**Administrative Costs Consolidated**						
Training and Conferences	All	GL	Annual	$1,025	$1,051							
Coordination	1.1.1,1.2.1,1.3.1-3, 2.3.1,2.3.4, 3.1.3,3.2.1, 3.3.2, 4.2.1-3, 4.3.1, 7.1.1, 7.4.1, 8.1.1, 8.2.2, 8.3.1, 9.1.1-4 and 9.2.1-3	GL	Annual	$2,050	$2,101							
LGU Program Review	1.2.1, 2.1.1, 2.2.1, ,2.2.23.2.1, 5.1.1, 5.1.2, 5.1.4, 6.1.1-6.1.3, 7.1.1, 7.1.2, 7.4.2	GL	Annual	$2,050	$2,101							
Advisory Committees (Technical and Citizen's)	1.3.2, 9.1.1, 9.1.2	GL	Annual	$2,050	$2,101							
Administrative/Managerial Budget Total	All			$191,819	$196,614	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
Studies and Programs												
Education and Outreach Program	1.2.1, 2.2.2, 3.2.2,4.2.3, 8.1.1, 9.1.1 -4, and 9.2.1 - 3	PI	Annual	$30,000	$30,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000	$25,000
Strategic Resource Evaluation and Management	1.3.1	PI	2 years	$100,000	$100,000							
Governance Study*	1.3.2	PI	1 year									
Periodic Assessments and Program Reviews	1.3.3, 1.3.4	PI	Annual	$40,000	$40,000	$40,000		$40,000	$40,000	$40,000	$40,000	$40,000
Dean Lake Feasibility/Diagnostic Study	2.2.5	PI	1 year		$50,000							
Cost Share Incentive and Water Quality Restoration Program	2.2.3 and 2.2.4	PI	Annual	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	$20,000
Monitoring Program	2.3.1, 2.3.2, 2.3.3, 3.3.1, and 4.2.1	PI	Annual	$95,000	$95,000	$50,000	$50,000	$95,000	$95,000	$95,000	$95,000	$95,000
Monitoring Data Analysis	2.3.1, 2.3.2, 2.3.3, 3.3.1, and 4.2.1					$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
USGS	2.3.1					$8,000	$18,000					
Plan Amendment	1.3.3, 1.3.4						$30,000				$15,000	
Technical Assistance	4.2.2	PI	Annual	$16,000	$16,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000
Wetlands and Fens Assessments	1.3.1, 4.2.1, 4.3.1, 7.2.1							$45,000				
Conservation Easement Acquisition	4.3.1	PI	1 year	$15,000	$30,000							
Vegetation Management Standard/Plan	7.2.1	PI	1 year			$15,000	$15,000					
Dredge Material Management Plan	8.2.1	PI	1 year	$10,000								
Dredge Material Beneficial Use Plan	8.2.2	PI	1 year	$25,000								
9-Foot Channel Strategic Funding Plan	8.3.1	PI	1 year		$25,000			$15,000				
9-Foot Channel	8.3.1					$15,000	Costs moved the administration					
Studies and Programs Budget Total				$351,000	$416,000	$183,000	$168,000	$250,000	$190,000	$190,000	$205,000	$190,000
Capital Improvements												
Contingency - Gully Erosion Projects	7.3.1 and 7.3.2	PI	Annual	$25,000	$25,000		$40,000	$40,000	$40,000	$40,000	$40,000	$40,000
Mound Springs Gully Erosion Project	7.3.1 and 7.3.2	PI	2 years		$100,000			$45,000	$100,000	$75,000		
Seminary Fen Restoration Project	2.2.4, 3.2.1, and 7.3.1	PI	1 year	$36,000								
Ravine Stabilization at Seminary Fen	7.3.1 and 7.3.2	PI	2 years			$100,000	$100,000					

ACTION	Strategy Addressed	Potential Funding Sources	Duration	Year								
				2012	2013	2014	2015	2016	2017	2018	2019	2020
Heritage Hills Park Gully Restoration Project	7.3.1 and 7.3.2	PI	1 Year					$45,000	$100,000	$75,000		
Dean Lake Restoration Project	2.2.5 and 2.3.1	PI	2 Years			$100,000	$30,000					
Minnesota River Study Area 3 Bluff Stabilization	4.4.1	PI	1 Years					$250,000				
Long Meadow Outfall Project	7.3.1 and 7.3.2					$100,000	$100,000					
Overlook Outfall (Bloomington)	7.3.1 and 7.3.2						$100,000					
Seminary Fen Drain Tile	2.2.4, 3.2.1, and 7.3.1						$25,000					
Brickyard Clayhole Lake - Gully Stabilization	2.2.4 and 7.3.1							$100,000				
East Chaska Creek Restoration	2.2.4, 7.3.1, and 7.4.1							$100,000	$201,000			
Bluff Creek Restoration	2.2.4 and 7.4.1								$50,000			
Carver Creek Restoration	2.2.4, 7.3.1, and 7.4.1									$75,000	$18,500	
Riley Creek Restoration	2.2.4 and 7.4.1									$75,000	$93,500	
Water Management Plan	All										$75,000	$75,000
Capital Improvements Budget				$127,650	$546,250	$516,250	$395,000	$580,000	$491,000	$340,000	$227,000	$115,000
TOTAL EXPENDITURES				**$670,469**	**$1,158,864**	**$733,000**	**$813,000**	**1,080,000**	**$931,000**	**$780,000**	**$682,000**	**$555,000**
REVENUE												
General Fund Balance from previous year				$512,650	$592,182	$516,661	$413,161	$255,161	$250,161	$254,161	$250,161	$250,000
General Levy				$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000	$250,000
Planning and Implementation Levy				$400,000	$700,000	$375,000	$400,000	$825,000	$685,000	$526,000	$431,839	$305,000
Special Channel Maintenance Funding												
Grants						$4,500	$5,000					
TOTAL REVENUE				**$650,000**	**$950,000**	**$629,500**	**$655,000**	**$1,075,000**	**$935,000**	**$776,000**	**$681,839**	**$555,000**
GENERAL FUND RESERVE				$492,181	$383,318	$413,161	$255,161	$250,161	$254,161	$250,161	$250,000	$250,000

** This study will be funded in 2011*

** Costs presented in this table represent the District's portion pending a match of up to 50 percent from project partners.

4.2 COORDINATION WITH LOCAL, STATE, AND FEDERAL GOVERNMENTS AND NON-GOVERNMENT ORGANIZATIONS

This element implements the District's role as a facilitator. This involves staff coordination with local, state, and federal government and non-government organizations. This involves staff presence and participation in issues being discussed during the Minnesota Legislative session (e.g. Minnesota River Basin Commission), and collaboration with the COE to secure federal funds for the Minnesota River.

Table 4-2: Coordination Strategies with District Partners

Strategy	Coordination Partner(s)	Schedule
Strategy 1.1.1, 1.2.1, 2.3.1, 2.3.4	LGUs, BWSR, MPCA, Metropolitan Council, SWCDs and neighboring WDs and WMO	Quarterly at a minimum
Strategy 1.3.1-2	LGUs, BWSR, MPCA, Metropolitan Council, SWCDs, neighboring WDs and WMOs and TAC	2011 - 2014
Strategy 4.3.1, 7.2.1	LGUs, BWSR, MPCA, Metropolitan Council, SWCDs, neighboring WDs and WMOs and TAC	2015 - 2017
Strategy 1.3.3, 2.2.1, 6.1.1-2	LGUs	Annually
Strategy 2.2.3, 2.2.4	LGUs and SWCDs	Annually
Strategy 2.3.1-3, 3.2.1, 4.2.1-3,	LGUs, BWSR, MPCA, Metropolitan Council, SWCDs and neighboring WDs and WMO	Annually
Strategy 3.1.3	DOH	Annually
Strategy 3.3.2	Metropolitan Council Environmental Services	2016
Strategy 5.1.2 - 3	LGUs and BWSR	Annually
Strategy 7.1.1	MPCA	Annually
Strategy 7.4.1	LGUs, SWCDs and shoreland property owners	Annually
Strategy 8.1.1	DNR, and US Coast Guard and Auxiliaries	2016
Strategies 8.2.1, 8.2.2, 8.3.1	COE	On-going
Strategies 9.1.1-4 and 9.2.1-3	LGUs, TAC, CAC, and SWCDs	On-going, Quarterly

4.2.1 Local Water Plan Development and Implementation

LGUs are required to develop a local water plan (LWP) providing a coordinated system of managing the watershed on a regional or subwatershed basis consistent with this Plan. In accordance with MN Rules 8410.0160, each LWP must, at a minimum, meet the requirements for local plans in Minnesota Statutes, section 103B.235, except as provided by the watershed management organization plan under part 8410.0110, subpart 3.which allows for all or part of a plan to be adopted by reference by a LGU for all or part of its local plan.

4.2.2 District LWP Review

After consideration, but before adoption by the governing body, each LGU shall submit its LWP to the District for review for consistency with this Plan. The District shall approve or disapprove the local plan or parts of the plan. The District shall have 60 days to complete its review and shall, as part of its review, take into account the comments submitted to it by the Metropolitan Council. If the District fails to complete its review within the prescribed period, the LWP shall be deemed approved unless the LGU agrees to an extension.

4.2.3 Metropolitan Council Review

Concurrently with submission of an LWP to the District as provided in M.S. 103 Subdivision 3a, each LGU shall submit its LWP to the Metropolitan Council for review and comment. The Metropolitan Council shall have 45 days to review and comment on the LWP or parts of the LWP with respect to consistency with the council's comprehensive development guide for the metropolitan area. The Metropolitan Council's 45-day review period shall run concurrently with the District's 60-day review period. The Metropolitan Council shall submit its comments to the District and shall send a copy of its comments to the LGU. If the Metropolitan Council fails to do this within the 45-day period, the District shall complete its review as provided in M.S. 103 Subdivision 3a.

4.2.4 Administration and Enforcement of LWPs

LGUs are responsible for implementing and enforcing LWPs covering their jurisdictions. The District will have oversight responsibility to ensure implementation of LWPs. Oversight will include spot checks of municipal projects and program audits. If the LGU is found to be non-implementing, the District will work with the LGU to correct the issue. However, if problems persist, the District will develop rules and a permitting program to take on the land use authorities granted by M.S. 103B and 103D to enforce the standards in this Plan. However, the District's preferred position is to avoid unnecessary duplication of permitting programs.

4.3 STUDIES AND PROGRAMS

Studies and programs include:

- Strategic Resource Evaluation and Management
    - Strategy 1.3.1
- Governance Study
    - Strategy 1.4.2
- Cost Share Incentive and Water Quality Restoration Program
    - All Goals and Policies
- Dean Lake Feasibility/Diagnostic Study
    - Strategy 2.2.5
- Monitoring Program

  - Strategy 2.3.1-2 and 3.3.1
- Vegetation Management Standard/Plan
  - Strategy 7.2.1
- Dredge Material Management Plan
  - Strategy 8.2.1
- Dredge Material Beneficial Use Plan
  Strategy 8.2.2
- 9-Foot Channel Strategic Funding Plan
  - Strategy 8.3.1
- Education and Outreach Program
  - Strategies 1.2.1, 4.2.3, 8.1.1, 9.1.1-4 and 9.2.1-3

Each program is briefly described below. Budgets for each program, with expenses beyond staff time, are shown in Table 4-1. Budgets shown are preliminary and are reviewed and approved each year. Funding for the programs below is provided primarily by the District's planning and implementation levy and grants.

4.3.1 Strategic Resources Evaluation

The strategic resource evaluation (SRE) implements Strategy 1.3.1 which was completed in 2014[4]. The TAC assisted the District with identifying resources for additional investigation and protection, as well as evaluated the District's Monitoring and Data Collection efforts. See Appendix M for the SRE Report.

4.3.2 Governance Study

This study implements strategy 1.3.2 and consists of investigating expanding, contracting or maintaining the District's boundary. The governance study commenced within the first year after adoption of this Plan. The goals of the governance study were to:

- To create a water management structure that will provide long-term protection for surface and ground water resources within the District.
- To ensure local water management units within the District with the fiscal capacity and authority to govern efficiently and effectively.
- To coordinate surface water, ground water, land-use and natural resources management to provide for a more comprehensive approach to resource management.
- To adopt a proactive rather than a reactive approach to countywide water governance.

The study evaluated four water governance options based on extensive qualitative analysis of stakeholder interviews and a literature review. Based on the information gleaned, the District has decided to proceed as follows:

[4] The 101 Bridge Project addresses a number of the comments included in the SRE on Bluff Creek.

- Maintain its boundary
- Continue to exist and increase its role as an advocate for the Lower Minnesota River
- Start conversations with county board members, cities, and state legislators to further examine the feasibility of a port authority
- Proactively engage stakeholders

See Appendix N for the Governance Study.

4.3.3 Cost Share Incentive Program

This program implements Strategy 2.2.3 and consists of maintaining a fund to cost share and promote projects and studies that have a water quality, water quantity, channel maintenance, trout stream, fen or wetland restoration, or aquatic habitat benefit. A detailed description of this program can be found in Appendix I.

The cost share and incentives will be reviewed annually. Effectiveness will be measured in two ways: by comparing water quality trends before and after Projects that could potentially be funded under the Cost Share Incentive Program are listed below in Table 4-3. Within 6 months after this Plan is approved by BWSR, the District (with the assistance of the TAC) will develop criteria and the application process for the Cost Share Incentive Program. Effectiveness of this program will be measured in two ways: by comparing water quality trends before and after projects are implemented and 2) by how many projects are funded through the program.

Table 4-3: Lower Minnesota River Watershed District Cost Share Incentive Program Projects under Consideration

Project Name	Description	Project Partner	Estimated Cost	Estimated Timeline
Overlook Lake Curly Leaf Pondweed Control Project	This project, primarily sponsored by the City of Bloomington, includes drawdown of Overlook Lake or chemical treatment of the lake with an aquatic herbicide early in the aquatic growing season while water temperatures are still cool, and prior to native vegetation growth. Due to its unique life cycle, reducing the amount of curly leaf pondweed would reduce the internal loading of phosphorus and can improve water clarity and encourage native plant growth.	City of Bloomington	$3,000	2013

Project Name	Description	Project Partner	Estimated Cost	Estimated Timeline
Bluff Creek Erosion Repair	This project, to be completed in cooperation with the City of Chanhassen, consists of correcting existing erosion problems and stabilizing the banks at problematic locations along Bluff Creek.	City of Chanhassen	$10,000	2016
Purgatory and Lower Riley Creek Erosion and Streambank Stability Feasibility Assessments	This project implements strategy 7.4.1 which is to promote and encourage shoreland protection. This is a cooperative project with the City of Eden Prairie to assess streambank stability at locations of concern on the Purgatory and Lower Riley Creeks.	City of Eden Prairie	$20,000	2016-2017
Old Highway 212 Business Corridor Storm Water Improvement Study	The Chaska Boulevard business corridor (old Hwy 212) was developed prior to stormwater treatment requirements. As a result this corridor currently has a number of discharges that are directed into East Creek and the Clay Hole with no treatment. This project involves a preliminary investigation of pollution load reductions and water quality improvement features to be implemented for this portion of Chaska. The goal is develop a plan for water quality retrofit improvement projects along the portion of Chaska Downtown along Chaska Boulevard.	City of Chaska	$20,000	2016-2017

4.3.4 Water Quality Restoration Program

This broad based program implements Goal 2 which is to protect, improve, and restore surface water and groundwater quality within the District. This program will also implement Strategy 2.2.4, the District's Strategic Resources Evaluation, which will be used as a basis to identify targeted areas to fund programs. Starting in 2011 funds are budgeted to help local entities work toward restoring declining and impaired waters within the District. A detailed description of this program can be found in Appendix I.

This program will fund activities that reduce urban nonpoint source pollution, improve and protect groundwater quality, and promote surveys and studies of wetlands (fen) health and management. Effectiveness of this program will be measured in two ways: by comparing water

quality trends before and after projects are implemented and 2) by how many projects are funded through the program.

4.3.5 Monitoring Program

This implements Strategies 2.3.1, 2.3.2 and 2.3.3 which will continue the District's current monitoring, data collections and data assessment efforts as described earlier in this Plan. The outcome of the Strategic Resource Evaluation modifies the monitoring program as specified below and in the SRE (Appendix N).

Snelling Lake

Snelling Lake will be assessed for nutrient impairment during the summers of 2015 and 2016 (one sampling event per month, June-September period) using the standard measures of secchi depth, chlorophyll-*a*, and total phosphorus. Cooperation with Fort Snelling State Park staff and training them to conduct the lake monitoring is recommended. A canoe is available on-site for collecting samples at a mid-lake location. Chlorophyll-*a* and total phosphorus sample bottles will be acquired from a state-approved analytical laboratory. Field samples should be collected just below the lake surface using the provided bottles. A secchi disk reading should be recorded during each visit. Sample bottles must be kept at 39 degrees F (4 degrees C) until delivery to the analytical laboratory. The following pre-monitoring tasks will need to be completed before the start of monitoring activities:

1. Develop a project monitoring plan
2. Develop a quality assurance project plan (QAPP) in conjunction with MPCA requirements for determination of impairment
3. Train Fort Snelling State Park staff as lake monitors
4. The District will then review data from the field and analytical laboratory and develop draft and final reports based on 2015 and 2016 lake data. Upon completion of these tasks, Snelling Lake should change from a Category 1 to a Category 2 resource.

Wetlands and Fens

Data for most of the wetlands and fens within the District have not been updated with quality, value, and function assessments since the 1990s. An overall, consistent and focused assessment of all of the wetlands and fens is required to categorize the wetland and fen resources. The following is a plan for completing the assessment.

- Update the native plant community (NPC)[5] study data for the large wetland complexes in the Minnesota River Valley This would involve reviewing the initial delineations accuracy. Where there are discrepancies, the delineations should be updated to reflect changes since the NPC study. In most cases, the NPC data did not gather or show plant

[5] NPC is a hierarchical system of plant community identification that is presented in the guide book series: Field Guide to the Native Plant Communities of Minnesota (see http://www.dnr.state.mn.us/npc/classification.html). A state-wide data layer is available from the DNR Data Deli as "MBS Native Plant Communities."

community makeup, nor did it indicate the presence (dominance) of invasive species or provide a Floristic Quality Assessment (FQA).

This initial step would provide the District with updated and consistent baseline data needed to perform a feasibility study of management strategies. Detailed field forms summarizing plant community types by NPC definitions should be used for each of the "natural" remnant communities (plant communities with little or no historical human disturbance) within the wetland complexes. This would not be required for land covers that would no longer be considered "natural" due to absolute dominance by non-native invasive species, farming, or development.

- Perform an FQA of each of the fens, identifying three sampling points (with a 25' radius) in each fen. An FQA is a vegetation-based ecological assessment approach that can be used for wetland quality monitoring and assessment. The FQA sampling locations should be provided to the District and the DNR in a GIS format in order to act as baseline data for future assessments. Performing this detailed plant analysis provides a picture of the relative quality and/or degradation within these rare plant communities. The DNR has performed qualitative assessments over the years, but does not appear to have established a way to monitor the fens in the District. To that extent, some of the fens (Black Dog North in particular) may be too degraded for restoration. An FQA is needed in order to provide a quality, consistent baseline for each of the fens and allows a comparison of quality and degradation of these communities across the valley.
  The best time to perform the FQA, is mid-June through July. Planning (i.e. identification of sampling points) should take place in advance (could happen with MLCCS work). Creating standardized methods for the FQA is an important step in ensuring that the work is applicable and replicable in the future. The value of the FQA for the fen assessments, but not wetlands is that the tool is very plant and detail intensive, requiring identification of all species to the species level. It is also a quantitative method that provides a strong baseline assessment.
- Perform Minnesota Routine Assessment Methodology (MnRAM) on all of the large wetland complexes. This should be done in conjunction with the MLCCS surveys, and as such should not add a significant additional effort to the process.
- Baseline water level measurements were collected from 2007 to 2010 in Gun Club Lake North (two wells), Gun Club Lake South (13 wells) and Nichols Meadow (14 wells) fens. These locations should be monitored (or at least periodically updated) to verify that conditions have not changed since previous monitoring. The preferred method of data collection is using a submersible data-logging pressure transducer.

4.3.6 Conservation Easement Assessment

This assessment consists of implementing Policy 4.3 which is to review existing conservation easement studies in an effort to protect, preserve and enhance resource connectivity and identify prime areas for conservation easements. Once the areas have been identified, the District will work collaboratively with the LGUs, USFWS, DNR, and other regulatory agencies to acquire the necessary easements.

4.3.7 Dredge Material Management Plan

This implements Strategy 8.2.1, which will continue to implement the COE Dredged Material Management Plan for the dredged areas upstream of the I-35W Bridge. In addition, the District will cooperate with the COE to develop a Plan for the area downstream of the I-35W Bridge.

4.3.8 Dredge Material Beneficial Use Plan

This implements Strategy 8.2.2 which will address the issue that the District has a few dredge materials placement sites. Once material is placed in these areas, movement or use of the material is required to free storage space should the COE need it for additional dredge material. The District commissioned the dredge material management plan (DMMP) to review options for managing the Cargill East River (MN-14.2 RMP) site and deposited material and to review the District's financial liability as the local sponsor. Based on the DMMP, provided in Appendix O, the District will maintain its role as the local sponsor, generate funds to operate and manage the Cargill East River (MN-14.2 RMP) site, and purchase additional dredge placements sites, if necessary. The District will also explore partnerships with other entities to implement beneficial uses of the dredge material.

4.3.9 9- Foot Channel Strategic Funding Plan

This implements Strategy 8.3.1. The 9-Foot channel strategic funding plan will be based on the outcome of the dredge material beneficial use plan and governance study. The information from these two studies will determine the following: whether the District will continue in its role as local sponsor for the COE dredging activities; the potential market for the dredge material; and the best way to continue funding 9-Foot channel maintenance through sale of the material, use of the general levy, special assessments, federal or state funding or a combination thereof.

4.3.10 Education and Outreach Program

This implements Goal 9 which is being developed concurrently with this Plan by the assistant administrator and the CAC. The vision and mission of the Education and Outreach Program is to educate the public about the Minnesota River, its uniqueness and the importance to it the economies of Minnesota and the Nation. The objectives are to provide education on the history, commercial and recreational navigation, and unique natural resources.

4.4 CAPITAL IMPROVEMENT PROJECTS

A WMO which has adopted a watershed management plan in accordance with section 103B.231 may certify for payment by the counties all or any part of the cost of capital improvement projects (CIP) contained in the capital improvement program of the plan. A copy of the plan for the improvement shall be forwarded to the county board.

The District is required to hold a public hearing on the proposed CIP, following publication once each week for two successive weeks before the date of the hearing in a legal newspaper published in the counties in which a part or all of the affected waters and lands are located. The last publication shall occur not more than 30 days nor less than ten days before the hearing. The notice shall state the time and place of hearing, the general nature of the proposed improvement, the estimated cost, and the method by which the cost of the improvement is to be paid, including the cost to be allocated to each county. At least ten days before the hearing, the District shall send notices by mail to the counties and to each home rule charter or statutory city or town located wholly or partly within the territory of the WD. The District recognizes that failure to give mailed notice or to have defects in the notice shall not invalidate the proceedings. After the proceedings and assessment statements have been filed with the auditor, each affected county shall provide funds to meet its apportioned share of the total cost of the project based on engineer's reports or order of the Managers.

Table 4-4 contains descriptions and planning level cost estimates for the CIP identified for the time period between adoption of this Plan and the biennial Plan review.

Table 4-4: Lower Minnesota River Watershed District – Capital Improvement Projects

Project Name	Description	Project Partner	Estimated Cost	Estimated Timeline
Capital Improvement Projects				
Gully Erosion Projects	The District has set aside a contingency fund to finance projects which consist of constructing bluff stabilization projects with cooperating partners in those areas identified in the District's gully inventory as having severe erosion that have yet to be constructed or identified specifically in the CIP for this Plan.	LGUs	$125,000	2012-2016
Mound Springs Gully Project	Mound Springs is an erosion area identified in the Districts gully inventory. The site needs to balance the perennial groundwater stream and the stormwater discharge through the area to prevent erosion to Long Meadow Lake. The gully also includes a trail off 11th Avenue South that is identified in the City of Bloomington Park Master Plan as a trail access point to Mound Springs Park and the Minnesota River Valley Trails. The design may require accommodating unpaved trail access. The primary project sponsor is the City of Bloomington.	City of Bloomington	$250,000	2013-2014
Seminary Fen Restoration at Engler	This 6-acre portion of the Seminary Fen is a formerly farmed wetland that has been ditched and tiled. This project proposes to restore the natural hydrologic regime by rendering the tile and ditch inaffective in draining the wetland by partial removal and blocking of tile and ditch modifications to eliminate the man made hydrologic scope and affect on the wetland. In addition to an altered hydrologic system, the natural plant community in this wetland has been choked out by the invasive species reed canary grass. The project will restore the native plant community by controlling reed canary grass and re-introducing native plant species. Collection of seed for this project will be from City owned land adjacent to the project site to insure local ecotype seed is utilized. Restoring native vegetaion will offer further vegetative buffering protection to the Seminary Fen, protecting the Fen's native plant diversity.	City of Chaska	$35,500	2012
Ravine Stabilization at Seminary Fen	Ravine erosion is causing a large area of sedimentation along the north half of the fen. This project is phase 2 of a project that was completed in 2009 by the City of Chaska that involved restoration of a wetland outlet for rate control to the ravine. Stabilization of the ravine is still necessary to reduce the transport of sediment to the Seminary Fen. Annualized sediment transport was modeled using a 1-D bedload sediment transport model by Meyer-Peter and Muller (1948). Under existing conditions sediment transport to the Seminary Fen is estimated at 1.85 million tons per year. The goal of this project is to complete ravine stabilization improvements that are estimated to reduce the transport rate of sediment to 0.68 million tons per year. This represents a 63% reduction in sediment load to Seminary Fen.	City of Chaska	$400,000	2012-2013
Heritage Hills Park and Gully Restoration Project	A small stream connecting Ancel Glen Pond to South Glen Pond (that flows through Heritage Hills Pond – Middle between the two ponds) is experiencing significant erosion. The area has several small woodchip trails and is surrounded by private residences on both sides. The project would involve stream restoration of the eroded gully area, erosion prevention, and maintenance or replacing the woodchip trail system. The primary project sponsor is the City of Bloomington.	City of Bloomington	$100,000	2015
Dean Lake Restoration Project	This project will implement the results of the Dean Lake Feasibility Study. This project will consist of financing adjacent septic system connection to city sanitary sewer, construction of sedimentation basins, water quality treatment BMPs in the upstream watershed, improvements to the inlet or outlet, shoreline restoration, and/or in-lake management such as dredging and chemical treatment.	Prior Lake Spring Lake WD and MPCA	$200,000	2014- 2016
Minnesota River Study Area 3 Bluff Stabilization	This project consists of analysis, design, and construction of Minnesota River at Study Area 3 project in Eden Prairie to address the river bank erosion. An October 2008 study of the area was completed for the city of Eden Prairie in cooperation with the District. This project expands the 2008 study with additional data collection and analysis and extends it to final design, permitting, and construction.	City of Eden Prairie	$250,000	2016
Bluff Creek Restoration	The project consists of the following activities. Provide an energy dissipation structure at the tunnel exit. Apply bank stabilization measures along outside creek bends. Re-direct runoff coming off of the North Highway 101 Bridge. Stabilize the areas around the bridge abutments.	DOT, City of Chanhassen and Riley Purgatory Bluff Creek WD	$50,000	2015
Long Meadow Outfall Project	This project consists of implementing, in cooperation with the City of Bloomington, one of two alternatives to address water quality improvement downstream of Long Meadow Lake. The two alternatives include: Abandon storm sewer outfall to Long Meadow Lake from Bloomington Central Station area and reroute through a regional infiltration basin likely on the Kelley Farm property during redevelopment. From the Kelley property the storm sewer would discharge to the Bass Ponds area, keeping in mind the trout stream currently being stocked in the Bass Ponds area. Rehabilitate or reconstruct existing storm sewer outfall to Long Meadow Lake from the Bloomington Central Station area incorporating water quality best management practices to provide additional treatment.	City of Bloomington	$100,000	2014-2015

Project Name	Description	Project Partner	Estimated Cost	Estimated Timeline
Wetlands and Fens Assessment	This project consists of completing a floristic quality assessment that provides a replicable, descriptive picture in time of the fens. Used as a baseline indicator of fen condition to be compared against in the future (i.e., track degradation or functional lift). Then update the MLCCS, MnRAM and MLCCS to: provide a complete, accurate baseline dataset of wetland plant communities found in the marshes. Include quality control of existing data and addition of new information.	DNR and BWSR	$45,000	2016
Brickyard Clayhole Lake – Gully Stabilization	This project consists of stabilizing gullies along the northern bluff of Brickyard Clayhole Lake as noted in the 2010 Watershed Management Plan to deter sedimentation in the lake.	Cities of Chaska and Carver	$100,000	2016
East Chaska Creek Restoration	The project consists of the following activities. Removing debris jams in the channel reaches would help reduce localized erosion. Outfall A: remove log jam, stabilize right bank at outfall, re-vegetate the stream bank, remove sediment deposit. Outfall B: stabilize outfall with rock, step down the outfall, toe protection 10-ft upstream & 40-ft downstream. Using structures to control steep grades along this reach would help reduce localized erosion. Near Beech St Bridge: apply grade control throughout the reach, along with toe protection and left bank stabilization. Selective clearing, excavation, toe protection, erosion controls (jute mesh) and topsoil placement and grading for approximately 2000 ft.	City of Chaska, Carver County Env. Services and Carver Soil and Water Conservation District (CSWCD)	$301,000	2016-2017
Carver Creek Restoration	The project consists of the following activities. Stabilize outer bends with toe protection. Grade banks to a more stable slope. Stabilize the gully	City of Carver, Carver WMO, CSWCD and USFWS	$93,500	2018-2019
Riley Creek Restoration	This project consist of providing an energy dissipation structure below CR 61 and redirecting flows away from outside creek meanders	City of Eden Prairie	$168,500	2018-2019
Potential Unfunded Projects				
West 3rd Street Ditch – Creek	Currently this is a ditch that conveys water from an existing residentail area in downtown Chaska to the the West Creek flood control diversion. The existing channel is in disrepair and has unnatural amounts of sedimentation. Currently the turf of back and side yards are directly adjacent to the channel. The proposed project would be to replace the existing channel with a storm sewer pipe conveyance system. The channel would be filled in to create a swale to collect local drainge. This swale will allow for infiltration features (rain water gardens) to be installed along the corridor. This project will provide 5 – 10 lbs of phosphorous removal per year for this portion of downtown that currently does not have treatment.	City of Chaska	$330,000	2013
Clay Hole North Slope Erosion – Site 3	Substantial gullies have begun to form on the hillside located north of the Clayhole and directly east of Trunk Highway 41. These gullies are approximately 1000 feet long. The City of Chaska has completed some work to control erosion in this area include rock check dams and erosion mats. Additional work is necessary to control other erosion areas. This project will reduce erosion entering Clay Hole Lake and remove an existing sediment plume from the lake.		$100,000	2014
Chaska Downtown Old 212 at East Creek Water Quality Treatment Site – South Side of 212	This project is proposed in a portion of downtown Chaska that currently does not have treatment. Due to a lack of space for storm water ponds the goal of this project is to treat the small to medium size precipitation events, between 1 and 1.5 inches of precipitation. Due to the lack of space for ponding In-Manhole treatment (V2B1, EcoStorm, etc.) or other below ground treatment techniques will be utilized. The goal of the treatment is to have a 50 - 70% reduction in suspended solids and 60 – 80% reduction in phosphates to East Creek and the Minnesota River.	City of Chaska	$90,000	2015
Chaska Downtown Beech Street at East Creek Water Quality Treatment Site – North Side	The proposed treatment location Downtown where Stoughton Avenue drainage discharges into east creek–This project is proposed in a portion of downtown that currently does not have treatment. Due to a lack of space for storm water ponds the goal of this project is to treat the small to medium size precipitation events, between 1 and 1.5 inches of precipitation. Due to the lack of space for ponding in downtown Chaska In-Manhole treatment (V2B1, EcoStorm, etc.) or other below ground treatment techniques will be utilized. This goal of the treatment is to have a 50 - 70% reduction in suspended solids and 60 – 80% reduction in phosphates to East Creek and the Minnesota River.	City of Chaska	$60,000	2015
Chaska Downtown Old 212 at East Creek Water Quality Treatment Site – North Side of 212	The proposed treatment location is in downtown Chaska along old 212 where highway drainage discharges into East Creek. This project is proposed in a portion of downtown that currently does not have treatment. Due to a lack of space for storm water ponds the goal of this project is to treat the small to medium size precipitation events, between 1 and 1.5 inches of precipitation. Due to the lack of space for ponding In-Manhole treatment (V2B1, EcoStorm, etc.) or other below ground treatment techniques will be utilized. This goal of the treatment is to have a 50 - 70% reduction in suspended solids and 60 – 80% reduction in phosphates to East Creek and the Minnesota River.	City of Chaska	$90,000	2015

Project Name	Description	Project Partner	Estimated Cost	Estimated Timeline
Chaska Downtown Beech Street at East Creek Water Quality Treatment Site – South Side	The proposed treatment location is in downtown Chaska where Beech street drainage discharges into east creek–This project is proposed in a portion of downtown that currently does not have treatment. Due to a lack of space for storm water ponds the goal of this project is to treat the small to medium size precipitation events, between 1 and 1.5 inches of precipitation. Due to the lack of space for ponding in downtown Chaska In-Manhole treatment (V2B1, EcoStorm, etc.) or other below ground treatment techniques will be utilized. This goal of the treatment is to have a 50 - 70% reduction in suspended solids and 60 – 80% reduction in phosphates to East Creek and the Minnesota River.	City of Chaska	$40,000	2016
Chaska Downtown Walnut & 1st Street Water Quality Treatment Site	The proposed treatment location is in downtown Chaska. This project is proposed in a portion of downtown that currently does not have treatment. Due to a lack of space for storm water ponds the goal of this project is to treat the small to medium size precipitation events, between 1 and 1.5 inches of precipitation. In-Manhole treatment (V2B1, EcoStorm, etc.) or other below ground treatment techniques will be utilized. This goal of the treatment is to have a 50 - 70% reduction in suspended solids and 60 – 80% reduction in phosphates to the Minnesota River	City of Chaska	$50,000	2016
Dred Scott's Fields Storm Water Reuse project	This feasibility study, to be completed in cooperation with the City of Bloomington, consists of collecting runoff from impervious areas, such as parking areas, roadways, etc., and then using it as a source of irrigation water.	City of Bloomington	$75,000	2016
Non-Degradation Volume Reduction	The City of Bloomington was one of 30 municipalities required to meet non-degradation requirements as part of the NPDES MS4 Permit. The non-degradation report evaluated changes in runoff quantity and quality from 1988 to the present, and projected changes from the present to the year 2020. Where significant increases in stormwater runoff occurred or were projected to occur, options to keep pollutant loading of receiving waters at the 1988 levels were discussed. This project would involve a volume reduction to meet the non-degradation requirements and return pollutant loading to 1988 levels.	City of Bloomington	$125,000	2016-2017
Chaska Downtown Sixth Street at East Creek Water Quality Treatment Site	The proposed treatment location is in downtown Chaska where Sixth Street intersects east creek. This project is proposed in a portion of downtown that currently does not have treatment. Due to a lack of space for storm water ponds the goal of this project is to treat the small to medium size precipitation events, between 1 and 1.5 inches of precipitation. Due to the lack of space for ponding in downtown Chaska In-Manhole treatment (V2B1, EcoStorm, etc.) or other below ground treatment techniques will be utilized. This goal of the treatment is to have a 50 - 70% reduction in suspended solids and 60 – 80% reduction in phosphates to East Creek and the Minnesota River.	City of Chaska	$65,000	2017
BMP Retrofits at Valley Fair and Port of Savage	This project is to be completed in cooperation with Scott County and consists of BMP retrofits to increase pervious surfaces and infiltration at Valley Fair and the Port of Savage.	City of Savage	$25,000	2018

4.5 FUNDING MECHANISMS

Laws regarding project funding are different between metropolitan WDs and WMOs, and out-state watershed districts. M.S. Chapter 103D applies to all watershed districts, while Chapter 103B applies only to the Minneapolis/St. Paul metropolitan area watershed districts and WMOs. Since the District is both a watershed district and is located in the metropolitan area, both sets of statutes apply. This section provides a brief summary of the many funding sources available to the District, followed by a discussion of the District's proposed funding method(s).

4.5.1 Funding Statutes Available to Watershed District

Special Assessments

M.S. 103D.601 allows a project to be instituted by resolution of a majority of the watershed district managers, but the project must be financed by grants totaling at least 50 percent of the estimated cost and the engineer's estimate of costs to parties (including assessments against benefited properties but excluding state, federal, or other grants) is not more than $750,000. Projects initiated using this procedure must be paid for by special assessments against benefitting properties. Benefitted properties are defined in M.S. 103D.725.

M.S. 103D.701 requires that in order to initiate projects, watershed districts must first have a BWSR-approved watershed management plan. Projects that are to be paid for by assessment of benefited property must be initiated by a petition, by unanimous resolution of the managers, or by some other method prescribed in statute.

M.S. 103D.705 provides for cities or residents to petition a watershed district for a project that generally conforms to the watershed management plan. The petitioners must guarantee the funds used to pay for the project's preliminary feasibility studies.

Ad Valorem Taxes

M.S. 103D.905 allows watershed district managers to use a portion of their administrative fund for construction and maintenance of projects of common benefit to the watershed district. The upper limit of this fund is $250,000 per year for the District. This also authorizes watershed district managers to levy a tax over the entire watershed district (an ad-valorem tax) to pay the cost attributable to the basic water management features of projects initiated by petition of a municipality/political subdivision, or at least 50 resident owners whose property is within the watershed. The levy may not exceed 0.00798 percent of the taxable market value for a period not to exceed 15 consecutive years.

Procedure for Projects to be Funded Using M.S. 103D.905, Subd. 3 (Basic Water Management Features Projects)

Formal minor plan amendments are not required for projects funded using the additional levy allowed under M.S. 103D.905, Subd. 3. Therefore, the District will follow an informal proposed project information process to inform the LGUs about these proposed projects. The District

will distribute the proposed project information to the affected LGUs for review and comment, but not to the state review agencies or the Metropolitan Council. BWSR will not take formal action, since it is not a formal amendment.

M.S. 103B.231 requires watershed districts within the Twin Cities metropolitan area to prepare a water management plan. The statute requires that a capital improvement project be part of the plan. For those improvements included in the plan M.S. 103B.231, Subd.10 and M.S. 103D.605, allow watershed districts to implement projects without a petition. According to these statutes, watershed districts may levy ad valorem taxes to pay for capital improvements (including maintenance of improvements) either over the entire watershed district (M.S. 103B.241), or over all property within a portion or subwatershed of the watershed district (M.S. 103B.251). M.S. 103B.241, similar to M.S. 103D.729, also allows watershed districts to accumulate funds to finance improvements as an alternative to issuing bonds. In order for the District to use either funding mechanism, the District must adequately describe the projects, studies, and project maintenance in the plan. The plan must also specify that the source of funding will be in accordance with these statutes. Currently there is no levy limit.

The advantage of using M.S. 103B.231 (Subd. 10) and 103B.241 is that a hearing is not required for each project. As long as the capital improvement project is specified in the plan, the watershed district need only conduct an annual hearing on the entire capital improvement program, in accordance with M.S. 103B.241. Under M.S. 103B.241, projects are paid for by ad valorem tax over the entire watershed district.

M.S. 103B.251, on the other hand, allows the watershed district to set up a special taxing district or subwatershed over which funds are raised by an ad valorem tax. M.S. 103B.251 requires that (a) a copy of the plan be filed with the county, (b) a special improvement hearing be held for the capital improvement projects, and (c) the county raises the funds by selling bonds paid for by an ad valorem tax over the subwatershed/special tax district.

Procedure for Projects to be Funded Using M.S. 103B.241 or M.S. 103B.251

Formal minor plan amendments will be required for projects funded under M.S. 103B.241 or M.S. 103B.251 that are not described in sufficient detail in the plan. The District will follow the formal minor plan amendment process of MN Rules 8410.0140 for these types of projects. The formal process requires that the District distribute the plan amendment to the affected local units of government, the Metropolitan Council, and the state review agencies (including BWSR) for review and comment. The counties will have 90 days from receipt of the minor plan amendment to either approve or disapprove the amendment, and to hold any public hearings regarding the amendment. Unless the District agrees to an extension, if a county fails to complete its review within the prescribed period the amendment will be deemed approved by that county. The proposed amendment will be deemed to be a minor amendment if either

BWSR agrees that the amendment is a minor amendment or BWSR fails to act within 45 days of receipt of the minor plan amendment.

Procedure Following Approval of Proposed Project Information or Minor Amendment

Following approval of the proposed project information or minor amendment, and prior to advertising for bids to undertake the project, the District will hold at least one additional public hearing to review the final design of the proposed project. At this point, the District shall have completed all of the final design plans and specifications necessary for the contract bidding process and construction. Although this last stage of public hearings is not required by statute, the public and other interested parties will have an additional opportunity to review and comment on the details of the proposed project

Utility/Fees

Similar to stormwater utilities for cities, M.S. 103D.729 allows watershed districts to establish a water management district or a subwatershed within the district for the purpose of collecting revenues and paying costs of projects initiated under M.S. 103B.231, M.S. 103D.601, 605, 611, or 730. For the District to use this funding mechanism, it must be included in its plan, or the plan must be amended to include this funding mechanism in accordance with 103D.411 or 103d.231 and in compliance with subdivisions 3 and 4.

Emergency Projects

M.S. 103D.615 allows watershed district managers to declare an emergency and order work to be done without a contract. The cost of work can be paid for either by special assessment against benefitted properties or an ad valorem tax levy, if the cost is not more than 25 percent of the most recent administrative ad valorem levy.

M.S. 103B.252 allows watershed districts to declare an emergency and order work to be done without a contract. M.S. 103B.252 is similar to M.S. 103D.615 except it does not contain levy limits. In addition to the abovementioned funding sources, the District could receive funding from various state, federal, and private sources, such as grant and loan programs. This affords the District the opportunity to use grants and loans for projects instead of county-issued bonds.

4.5.2 District Past and Proposed Funding Mechanisms

The District has financed its past administrative, program, and project costs through its annual administrative fund ad valorem tax levies under the authority of the Watershed Act (M.S. 103D.905). The District's administrative fund levy limit is $250,000. The District's administrative fund is used only for initiatives that benefit the water resources of the District; it is not used for projects that benefit commercial navigation. The majority of the District's efforts and funding have been put toward activities that address water quality, runoff management, or flood control problems and issues. In the past the District has maintained a capital reserve fund consisting of

any unused portions of previous administrative levies. These result when the District's actual expenditures are less than those projected in the budget.

9-Foot Channel Maintenance

A one-time special assessment was done to support the COE initial dredging for the 9-Foot channel. This was supplemented in 1980 by a district-wide ad valorem levy. The balances from these activities were kept in a special fund (the 9-Foot Channel Fund). The District can use this fund only for implementation activities that address commercial navigation purposes, such as the purchase or management of dredge material disposal sites. Over the years, the 9-Foot Channel Fund has been depleted. To replenish the fund, the District will use the available funding mechanisms described above in accordance with applicable statutes.

Petitioned Projects

The District will place a priority on petitioned projects that are identified as implementation projects in future resource plans. The advantages of going through a petition process are: 1) the statute sets forth a definite process for the petition and subsequent actions; 2) the Managers are required to make a decision whether to order the project or not; and 3) if additional funding is needed, the statute allows for ad valorem funding of these petitioned projects. The disadvantage of the petition process is that it may require more lead time to approve a project than the current District process. M.S.103D.905, subd.3 allows the District to levy an additional ad valorem tax over the entire District to pay for the basic water management features of projects which have been initiated by a petition of a municipality within the watershed. The Managers anticipate funding projects using this authority, except projects that benefit navigation. If no city petitions the District for a project which the District believes is a priority, the District may consider initiating the project under the provisions of Chapter 103.

5.0 IMPACT OF IMPLEMENTATION

This section discusses how the District's implementation program, discussed in the previous section, will affect LGUs in terms of administration and cost.

5.1 EXISTING CONTROL

The District's intention in developing this plan was to limit additional requirements imposed upon LGUs. The impact of the District's plan on each LGU's controls is difficult to quantify, although general observations can be made. Most of the Plan's implementation program elements are either solely District projects or voluntary projects/programs that call for cooperation and collaboration with LGUs. Many of the implementation program elements reflect the goals, policies, and requirements of state and regional units of government that LGUs would need to address regardless.

The standards for preparation and review of runoff management plans and erosion control plans (see Section 5.13) may require more work for local governments, at least in the short term. These standards were developed in compliance with MN Rules 8410.0090 Subp. 3. Implementation of future resource plans may result in additional requirements for proposed projects in those watersheds. The District recognizes the importance of keeping the financial burden low on the member municipalities and taxpayers.

Most LGUs already have ordinances in place which address many of the District requirements. Applicable ordinances address shorelands, floodplains, wetland protection, stormwater utilities, erosion control, and stormwater system maintenance. All of the municipalities within the District, with the exception of Mendota Heights, Lilydale, Mendota, and Carver, have DNR-approved shoreland management ordinances. LGUs must adopt the DNR's shoreland regulations, if required by the DNR. See Section 5.5.1, Section 6.2.2, and Section 6.2.3 regarding the role of LGUs and the District in floodplain regulation.

Stormwater quality requirements of this Plan are not expected to create additional cost or burden to LGUs. Cities in the Twin Cities metropolitan area within the Minnesota River basin are already required to adopt the Metropolitan Council's "Interim Strategy to Reduce Nonpoint Source Pollution to the Minnesota River" in their stormwater plans, which require LGUs to adopt standards for new stormwater ponds using Nation Urban Runoff Program (NURP) or similar criteria. Local water management plans must also include the MPCA's best management practices as listed in "Protecting Water Quality in Urban Areas) (1989).

The District is not increasing the wetland regulation burden for most local units of government; most of the cities and counties are already acting as the LGU for the Wetland Conservation Act and this will not change. Local units of government can take on an increased role in wetland

management by preparing a wetland management plan that identifies and prioritizes all the wetlands in their community.

LGUs may adopt all or any part(s) of this Plan by reference for their LWP.

5.1.1 Financial Impact on Local Government

The District plan will not significantly change existing municipal, township, and county financial obligations, since it is the District's policy to not increase its tax levies. The District will increase tax levies only in response to requests by the local units of government (i.e. project petitions). As a result, the financial impact of this water management plan on local government should be minimal. An exception might be the maintenance and other management programs required by MN Rules 8410.0100, Subp. 6, which may result in additional costs to LGUs.

6.0 ADMINISTRATION

6.1 PLAN AMENDMENTS

This plan remains through 2020, unless it is superseded by the adoption and approval of a subsequent plan. All amendments to this plan must follow the procedures set forth in this section, or as required by Minnesota laws and rules. Amendments to the plan may be proposed by any person, special interest group, local government LGU, or federal, state, or regional agency to the District Managers. All proposed amendments must be submitted to the District Administrator in writing identifying the problem and need, a rationale for District involvement, and a cost estimate. The District will review all proposals at their monthly Managers' meetings to determine whether or not proposed changes fit state laws and rules governing minor or major amendments.

6.1.1 Major Amendments

MN Rules 8410.0140, Subp. 2, requires that all plan amendments adhere to the procedure documented in M.S. 103B.231, Subp. 11, except when the proposed amendments constitute minor amendments and:

- The District has held a public meeting on the amendments and published a legal notice of the meeting twice, at least seven days and fourteen days before the date of the meeting;
- The District has sent copies of the amendments to the affected local units of government, the Metropolitan Council, and the state review agencies for review and comment; and
- BWSR has either agreed that the amendments are minor or failed to act within 45 days of receipt of the amendments.

Major changes or changes that affect other jurisdictions within the District shall be submitted to those jurisdictions for review and comment as required by M.S. 103B.231, Subp. 11 and, if applicable, subparts 7, 8, or 9. The District staff shall notify the sponsor of each proposed amendment of the time and place of the public meeting and shall publish or distribute meeting notices summarizing all proposed changes. Furthermore, before any action on the proposed amendment, LGUs shall be given a period of sixty (60) days review, if the action proposes changes in funding. Changes requiring LGU and agency review will indicate the impact on LWP and will identify those local plans that will require revision upon approval of the change. The review period shall be limited to sixty (60) days.

Concurrently, the proposed changes shall be submitted to the Metropolitan Council, DNR, MPCA, and BWSR. Following the prescribed review period, or upon receipt of all comments, the District shall publish a notice of public hearing on the proposed plan amendments in at least one legal newspaper in each of the municipalities covered under the Plan

6.1.2 Minor Amendments

MN Rule 8410.0140, Subp. 3 considers amendments to the approved capital improvement program to be minor plan amendments if the following conditions are met:

> The original plan set forth the capital improvements but not to the degree needed to meet the definition of "capital improvement program" as provided in M.S., section 103B.205, subdivision 3; and
>
> The affected county or counties approve the capital improvement in its revised, more detailed form.

The following examples of other minor plan amendments are given in MN Rules 8410.0020, Subp. 10:

> … Recodification of the plan, revision of a procedure meant to streamline administration of the plan, clarification of the intent of a policy, the inclusion of additional data not requiring interpretation, or any other action that will not adversely affect a local unit of government or diminish a water management organization's ability to achieve its plan's goals or implementation program.

6.1.3 Amendment Format and Distribution

Upon completion, the District will submit the plan amendment to the appropriate review authorities in a format consistent with MN Rules 8410.0140, Subp. 4. The rule requires that, unless the entire document is reprinted, all amendments adopted must be printed in the form of replacement pages for the plan, each page of which must:

- Show deleted text as stricken and new text as underlined:
- Be renumbered as appropriate; and
- Include the effective date of the amendment.

The District will maintain a distribution list of everyone who receives a copy of the Plan. Within 30 days of adopting an amendment, the District will distribute copies of the amendment to everyone on the distribution list.

6.2 ANNUAL REPORTING

MN Rules 8410.0150 requires the District complete annual financial, activities, and audit reports within 120 days of the end of the fiscal year. The District shall submit to BWSR the aforementioned reports, separately or combined as a single document, for the preceding fiscal year if it has expended or accrued funds during that time.

6.2.1 Financial Report

MN Rules 8410.0150, Subp. 2., requires that all annual financial reports have the following information:

- District approved budget;
- Reporting of revenue; and
- Reporting of expenditures.

6.2.2 Activity Report

The activity report shall include the following, as outlined in MN Rules 8410.0150, Subp.3:

- A list of the District manager, advisory committee members, and manager vacancies at the end of the reporting year, including the names of designated officers and members and contact information, and indicating the county that each member is appointed;
- A list of District employees and consultants, including mailing addresses and telephone numbers;
- An assessment of the previous year's annual work plan that indicates whether the stated goals and objectives were achieved and, if they were not achieved, indicates why they could not be achieved;
- A projected work plan for the next year indicating the desired goals and objectives;
- A summary of water quality monitoring data collected by the District or its local units of government;
- An evaluation of the status of local plan adoption and implementation based on a review of LGU activities by the District during the past year;
- A copy of the written communication required by part 8410.0100, subpart 3;
- The District's activities related to the biennial solicitations for interest proposals for legal, professional, or technical consultant services under M.S., section 103B.227, subdivision 5; and
- An assessment of changes in fund balances, including a description of the costs of each program element with respect to the overall annual budget.

6.2.3 Audit Report

A financial audit report, prepared by a certified public accountant or the state auditor, shall include a balance sheet, a classification of revenues and expenditures, an analysis of changes in final balances, and any additional statements considered necessary for full financial disclosure.

This page left blank intentionally.

7.0 REFERENCES AND SOURCES

AirNav.com. 2008. Aviation Facilities. (http://www.airnav.com/airports/us/mn)

Bonestroo. 2007. Elm Creek Channel Study . In *Elm Creek Channel Study* (pp. 13-24). Minnesapolis.

Bureau of Transportation Statistics. 2007. Aviation Facilities. http://www.bts.gov/publications/national_transportation_atlas_database/2007/

Carver County, Dakota County, and Scott County. 2006, 2007, and 2008. County Parks, Parcel Data. Scott County Parks Dataset.

Dakota County Farmland and Natural Areas Program. 2008. Farmland and Natural Areas Program Lands. (http://www.co.dakota.mn.us/CountyGovernment/Projects/FarmlandNaturalArea/Program+Summary+and+Overview.htm)

Ducks Unlimited. Minnesota Restorable Wetlands. http://prairie.ducks.org/index.cfm?&page=minnesota/restorablewetlands/home.htm

Endreny, T.A., 2003, Fluvial Geomorphology Module, UCAR COMET Program and NOAA River Forecast Center, http://www.fgmorph.com, Syracuse, NY

Gunderson, L., and J. Klag. 2004. *Lower Minnesota River Dissolved Oxygen - Total Maximum Daily Load Report.* Minnesota Pollution Control Agency - Regional Environmental Management Division, St. Paul, Minnesota.

Justia.Com US Laws. (n.d.). Retrieved August 17, 2009, from *40 C.F.R 131.3 Definitions: Title 40-Protection of Environment.* http://law.justia.com/us/cfr/title40/40-21.0.1.1.18.1.16.3.html

Kohler, C.C. and W.A. Hubert. 1993. *Inland Fisheries Management in North America.* American Fisheries Society.

Land Management Information Center. 2003. Hospital Locations. (http://www.lmic.state.mn.us/chouse/metalong.html#health).

———. 2008. Electric Substations. (http://www.lmic.state.mn.us/chouse/metadata/elec_trans07.html).

Larson, L.W. 1996. *The Great USA Flood of 1993.* International Association of Hydrological Sciences Conference. Anaheim, California.

Lower Minnesota River Watershed District. (n.d.). Retrieved from Lower Minnesota River Watershed District: www.watersheddistrict.org/reports.html

Metropolitan Council. 2007. Trails, Regional Existing and Proposed. MetroGIS. http://www.datafinder.org/metadata/trails_regional.htm.

———. 2007. Metro Parks. (http://www.datafinder.org/metadata/parks_regional.htm)

———. 2007. Regional Recreation Open Space Dataset. (http://www.datafinder.org/metadata/parks_regional.htm)

Meyer, G. 2007. *Surficical Geology of the Twin Cities Metropolitan Area.* St. Paul: Minnesota Geological Survey Miscellaneous Map Series M-178.

Midwestern Regional Climate Center (MRCC). 2000-2010. Historical Climate Data. Retrieved April 21, 2009, from: http://mcc.sws.uiuc.edu/climate_midwest/historical/temp/mn/215435_tsum.html

———. 2000 - 2010. Growing Degree Day Averages. Retrieved April 21, 2009, from Historical Climate Data: http://mcc.sws.uiuc.edu/climate_midwest/historical/grow/mn/215435_gsum.html

———. 2000 - 2010. Historical Climate Data - Snowfall Summary. Retrieved April 21, 2009. http://mcc.sws.uiuc.edu/climate_midwest/historical/snow/mn/215435_ssum.html

Minnesota Board of Water and Soil Resource. 2008. Easements. Wetland Easements Data.

———. 2007, 2008. Reinvest in Minnesota Easements. http://www.bwsr.state.mn.us/easements/rim/index.html

Minnesota Department of Health. 2007. Hospital Locations. http://www.health.state.mn.us/divs/fpc/directory/fpcdir.html.

Minnesota Department of Natural Resources - Division of Waters. Karst Areas, University of Minnesota Department of Geology and Geophysics. http://deli.dnr.stat.mn.us/

Minnesota Department of Natural Resources. 1996. DNR-Trout. *Report of the Statutes of DNR Metro Region Trout Resources: A Metro Region Trout Committee Report.* St. Paul.

———. 1999. GIS Data Deli. *Ecological Classification System.* (http://deli.dnr.stat.mn.us/)

———. 2006. Native Plant Communities., Minnesota County Biological Survey. http://deli.dnr.stat.mn.us/

———. 2006. Public Land Survey System. http://deli.dnr.state.mn.us/.

———. 2006-2007. Trails, Snowmobile. http://deli.dnr.stat.mn.us/

———. 2007. Game Range Dataset.

———. 2007. Minnesota State Parks. http://deli.dnr.state.mn.us/.

———. 2007. Prairie Bank Dataset.

———. 2007. Scientific and Natural Areas. http://deli.dnr.stat.mn.us/

———. 2008. *Rare Plants, Animals, and Natural Features*. The Natural Heritage and Nongame Research Program, Natural Heritage Information System. http://www.dnr.state.mn.us/eco/nhnrp/index.html.

———. 2008. Minnesota County Biological Survey, Sites of Biodiversity Significance. http://deli.dnr.stat.mn.us/.

———. 2008. Wild & Scenic Rivers Program. http://www.dnr.state.mn.us/waters/watermgmt_section/wild_scenic/index.html.

———. 2008. Wildlife Management Areas. http://deli.dnr.stat.mn.us/.

———. 2010. DNR-Climate. Retrieved April 14, 2009, from *Climate's impact on water availability*: http://www.dnr.state.mn.us/climate/water_availability.html

———. 2010. *24K and 100K Lakes*. http://deli.dnr.stat.mn.us/

———. 2010. GIS Data Deli. County Boundaries. http://deli.dnr.stat.mn.us/

———. 2010. Metro SNRA. (http://deli.dnr.stat.mn.us/)

———. 2010. Migratory Waterfowl Feeding and Resting Areas. Dataset. http://www.dnr.state.mn.us/wildlife/shallowlakes/mwfra.html

———. 2010. Public Waters Inventory. http://deli.dnr.stat.mn.us/

———. 2010. State Designated Railroad Prairie, http://deli.dnr.stat.mn.us/

———. 2010. Streams. *24K and 100K Streams*. http://deli.dnr.stat.mn.us/

———. 2010. Trails, State. http://deli.dnr.stat.mn.us/.

———. 2010. Trout Streams. *Legally Designated Trout Streams*. http://deli.dnr.stat.mn.us/

———. 2010. *Water Access Points*. http://deli.dnr.stat.mn.us/

———. 2010. Wildlife Section Dataset. Shallow Lakes. http://files.dnr.state.mn.us/wildlife/shallowlakesprogram/shallow_lakes_list.pdf

———. 2010. GIS Data Deli. Aquatic Management Areas and Fish Management Areas. (http://deli.dnr.state.mn.us/)

Minnesota Department of Transportation. 2006. Indian Reservation Lands. (http://www.dot.state.mn.us/maps/gisbase/html/statewide.html)

———. 2007. Aggregate Locations. (http://www.mrr.dot.state.mn.us/geotechnical/aggregate/asisrlt.asp) and (http://www.mrrapps.dot.state.mn.us/pits/Run.htm).

———. 2007. MetroGIS, Planned MN DOT Road Upgrades. http://www.datafinder.org/catalog/index.asp#Transportation.

———. 2008. Municipalities.

———. 2008. Railroads. http://deli.dnr.stat.mn.us/

———. 2008. Roads. http://deli.dnr.state.mn.us/

Minnesota Land Trust. 2008. Easements. Conservation Project Data.

Minnesota Pollution Control Agency. 2008. Inventory of Impaired Waters. (http://www.pca.state.mn.us/water/tmdl/tmdl-maps.html).

———. 2008. Master Entity System. (http://www.pca.state.mn.us/backyard/neighborhood.html#data)

———. 2009. Identifying Sediment Sources in the Minnesota River Basin. http://www.pca.state.mn.us/index.php?option=com_docman&task=doc_download&gid=8099&amp. June 2009.

Minnesota Scenic Byways 2007. Scenic Byways. National Scenic Byway http://www.byways.org/ and http://www.exploreminnesota.com/experiences/byways/index.aspx)

Minnesota State Historical Preservation Office Database. 2007-2008. Cultural Resource Data, Archaeological and Historic Structures.

Mossler, J.H. and R. G. Tipping. 2000. *Bedrock Geology and Structure of the Seven County Twin Cities Metropolitan Area, Minnesota.* Minnesota Geological Survey Miscellaneous Map Series M-104.

Nature Conservancy. 2007. Nature Conservancy Holdings. http://www.dnr.state.mn.us/prairierestoration/prairiebank.html

Scott County. 2008. Scott County Comprehensive Plan: 2030 Landuse, 2005 Landuse, Future Road Functional Class.

Scott County. 2008. Scott County Dataset, Anthrax Locations.

U.S. Geological Survey. Gap Analysis Program Data. *(*http://deli.dnr.stat.mn.us/*)*

United State Census Bureau. 2000. Census Block Group Data.

United State Geological Survey. 2009. USGS-WaterInfo. National Water Information System. Retrieved November 24, 2009, *USGS 05330000 Minnesota River near Jordan, MN*: http://waterdata.usgs.gov/nwis/uv?05330000

United States Department of Agriculture. 1994. Natural Resources Conservation Service. State Soil Geographic (STATSGO) Database for Minnesota. http://SoilDataMart.nrcs.usda.gov/

———. 2005. Natural Resources Conservation Service Soil Survey Geographic (SSURGO) Database for Minnesota, various counties. http://SoilDataMart.nrcs.usda.gov/

United States Department of Agriculture Farm Service Agency (FSA) National Agriculture Imagery Program (NAIP). 2003, 2006, 2008. Aerial Photography. Minnesota. http://www.lmic.state.mn.us/chouse/airphoto_usda.html

United States Federal Emergency Management Agency. 1986. Digital Flood Insurance Rate Maps, Minnesota. (http://msc.fema.gov/webapp/wcs/stores/servlet/StoreCatalogDisplay?storeId=10001&catalogId=10001&langId=-1&userType=G)

United States Fish and Wildlife Service. 2007. Datasets, Easements. (Various types and Areas of Expansion).

———. 2007. National Wetlands Inventory Polygon. http://www.fws.gov/wetlands/data/DataDownload.html.

———. 2007. *Waterfowl Production Areas.*

———. 2008. Restoration Grassland. Private Land Grassland Restoration Projects Dataset.——. 2008. Restoration Wetlands, Private Land Wetland Restoration Projects Dataset.

———. 2008. National Wildlife Refuge.

University of Minnesota Extension. 2002. Minnesota River Basin Water Quality Overview. Retrieved June 15, 2009: http://www.extension.umn.edu/distribution/naturalresources/DD7079.html

Wilcox, D. 2001. *Effects of Recreational Boating on the Upper Mississippi River System.* U.S. Army Corps of Engineers - St. Paul District. Retrieved June 15, 2009. http://www.mvp.usace.army.mil/docs/nav/effects.pdf

Wloman, M., and L. Leopold. 1957. *River Flood-Plain: Some Observation on their Formation.* USGS Paper 282-C.