Vermillion River Watershed Management Plan

June 2016

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Vermillion River Watershed Management Plan

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Approved by the Minnesota Board of Water and Soil Resources
May 25, 2016

Adopted by the Vermillion River Watershed Joint Powers Board
June 23, 2016

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Special thanks to the Vermillion River Watershed Planning Commission (WPC) and Technical Advisory Group (TAG) for assistance in developing this Watershed Plan.

All websites and web links provided in this report were current as of June 23, 2016. If specific links do not navigate the reader to the reference cited, please contact the Vermillion River Watershed Joint Powers Organization at water@co.dakota.mn.us.

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Executive Summary

The Vermillion River Watershed is the largest watershed, in terms of geographic area, in the Seven County Metropolitan Area in Minnesota. The watershed encompasses 335 square miles in Dakota and Scott counties, including farmland, rural communities, growing suburbs, cities, parks, significant natural areas, and historical or cultural sites.

This 2016-2025 Vermillion River Watershed Management Plan guides water management in the Vermillion River Watershed for the next 10 years. To develop the Plan, the Vermillion River Watershed Joint Powers Organization (VRWJPO) asked its board, advisory groups, cities, townships, stakeholders, watershed residents, and landowners to identify their issues and priorities for the next 10 years. This Plan includes the collective wisdom of many people who care about the water resources threaded throughout the watershed where they live, work, or play.

Purpose of the VRWJPO

The VRWJPO was formed through a Joint Powers Agreement between Dakota and Scott counties in September 2002. The purpose of the VRWJPO is to "exercise leadership in the development of policies, programs, and projects that will promote the accomplishment of the purposes found in Minn. Stat. § 103B.201, including the preparation, adoption and implementation of the plan required by Minn. Stat. § 103B.211 for the Vermillion River Watershed" and "guide and assist Dakota County and Scott County in acting jointly and individually to take actions that will promote the goals listed in Minn. Stat. § 103B.201 and fulfill their responsibilities under Chapter 103 B."

These responsibilities, listed in the Introduction, can be summarized by the VRWJPO's recently adopted mission statement.

VRWJPO Mission Statement

(adopted May 28, 2015)

"Collaboratively providing education, science, and support to restore and protect the Vermillion River Watershed's natural resources for all who live, work, and play within its boundaries."

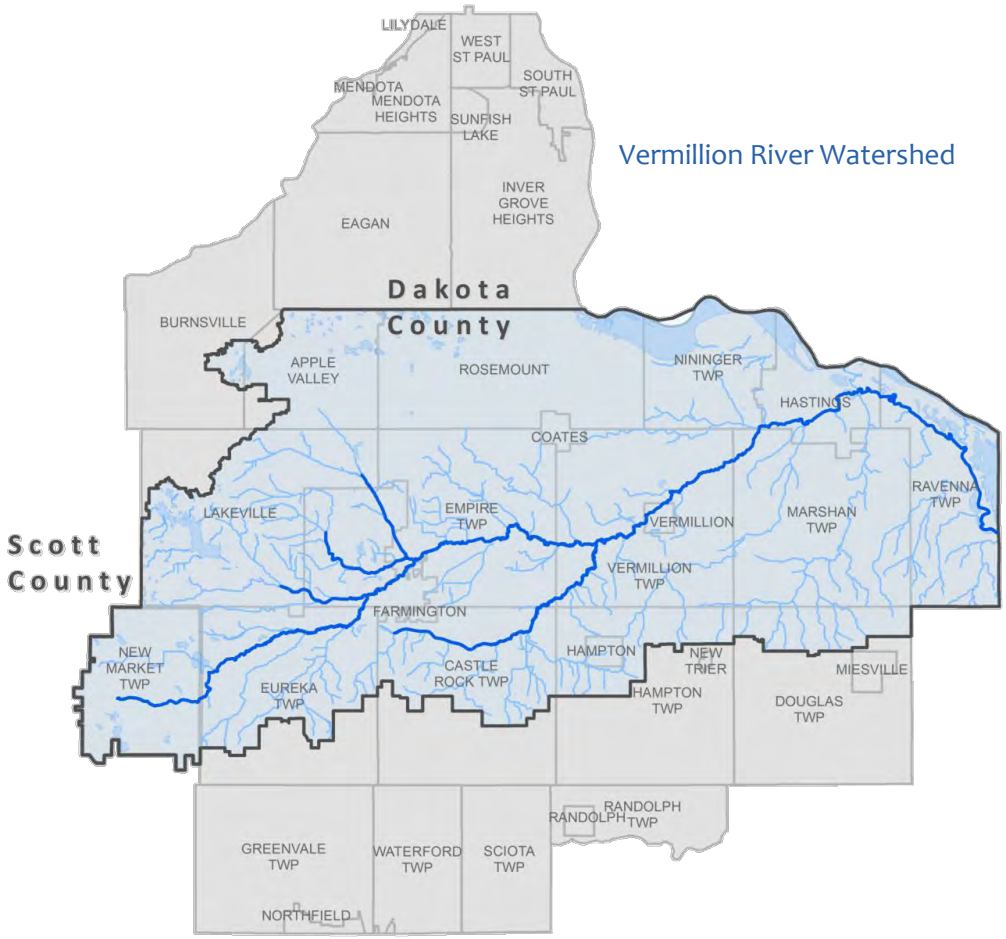
Vermillion River Watershed

The watershed is located in the southeast portion of the Seven County Metropolitan Area. The Vermillion River headwaters are located in southeastern Scott County; the majority of the watershed is located in central Dakota County. The watershed includes all or portions of 20 cities and townships.

Issues and Priorities

The VRWJPO spent a substantial part of the two-year planning period asking people what they saw as the most important issues that the Watershed Plan should address. After identifying the issues, the VRWJPO asked people to prioritize those issues. These discussions with diverse audiences revealed differences of opinion on some matters and consensus on others. The issues, listed in order of priority, are:

1. Surface water quality is threatened or impaired.
2. Water quality improvement competes with other public, private, and individual priorities. There is a perception that costs of improving water quality are not allocated fairly.
3. Groundwater quality is at risk, with known contamination above health risk limits for nitrate in some areas.
4. Increasing consumption of groundwater threatens the future water supply.
5. Changing precipitation patterns, decreased rainwater infiltration, and increased stormwater runoff have contributed to more intense fluctuations in river flow rate and volume.
6. Public awareness and specific knowledge on the impacts of daily activities and appropriate



Vermillion River Watershed

stewardship is lacking.

7. Several federal, state, and local agencies manage specific aspects of water protection, and limited coordination and communication among these agencies can create inefficiencies and cause confusion.
8. Minnesota's climate is getting warmer and wetter, which poses a threat to water quality, wildlife, and infrastructure.
9. The Vermillion River Watershed JPO is a "young" organization in a dynamically changing landscape and has not always been able to fill gaps and address new opportunities.
10. Sensitive biological resources -- plants, fish, insects, and wildlife -- in the Vermillion River are not as healthy as those in reference rivers.

Some of the issue statements identify problems that the VRWJPO should try to solve. Others identify how various people and interests want the VRWJPO to do its job.

Plan Goals

Seven goals form the foundation for actions to be taken by the VRWJPO during the 10-year life of this Plan. They were derived using public input, as well as plans, reports, assessments, and inventories, as detailed in Section 7: Implementation Plan. The goals are:

A. Protect or restore water quality in lakes, streams, and wetlands.
B. Protect and restore groundwater quality.
C. Maintain a sustainable water supply.
D. Address more intense fluctuations (up and down) in river flow rate and volume.
E. Improve public awareness and stewardship of water resources.
F. Improve watershed resilience to changing precipitation and temperature patterns.
G. Protect or restore sensitive biological resources, such as plants, fish, insects, and wildlife.

These goals are both similar to and different from goals in the 2005 Watershed Plan. As with the goals in the 2005 Plan, these goals are shared with many other different agencies, local units of government, and organizations. Goal A, for example, is one for which the VRWJPO has major roles and responsibilities. Goal C, on the other hand, is one for which partner groups have major roles and responsibilities; the VRWJPO's role is supporting or of ancillary importance.

To call out this distinction, the VRWJPO has organized the Plan's Section 6: Goals, Objectives, and Actions according to the VRWJPO's roles. The roles are:

1. Administration and Operations
2. Regulation
3. Research and Planning
4. Monitoring and Assessment
5. Land and Water Treatment
6. Coordination and Collaboration
7. Public Communications and Outreach

Major Actions in the Plan

The actions detailed in Section 6: Goals, Objectives, and Actions are subdivided according to the organization's roles. Those actions that are of highest priority, are new, or are changed from the 2005 Watershed Plan include:

≈ Restoring impaired waters, following the completion of the Vermillion River Watershed Restoration and Protection Strategy (WRAPS) in 2015.
≈ Developing an annual Capital Improvement Program to focus on the highest-priority water quality improvement projects.
≈ Ensuring that local governments include the VRWJPO Standards in Local Water Management Plan revisions and implement them through official controls.

- ≈ Increasing lake and riparian shoreline miles with managed vegetated buffers/filter strips to mitigate stormwater runoff impacts.
- ≈ Establishing procedures to review implementation of local water management ordinances.
- ≈ Updating the VRWJPO's surface water quality monitoring program to assess conditions and track trends.
- ≈ Completing assessments of all Vermillion River reaches and tributary sub-watersheds within 10 years to identify potential improvement projects.
- ≈ Optimizing cost share funding to achieve the greatest benefits for the least expenditure of public money.
- ≈ Using standard pollutant-reduction calculators to estimate cost-effectiveness of BMPs installed or cost-shared by the VRWJPO.
- ≈ Collaborating to reduce non-point source pollution from agricultural activities.
- ≈ Building partnerships, exchanging ideas, and problem-solving with agricultural producers to improve water quality.
- ≈ Collaborating with partners to promote soil health and nutrient management practices that protect groundwater from nitrate contamination while maintaining viable agricultural production and urban landscapes.
- ≈ Promoting and cost-sharing BMPs that conserve water.
- ≈ Addressing known flooding/erosion/flow diversion or alteration problems that cross community boundaries.
- ≈ Targeting and prioritizing cost-share, incentives, and outreach activities for retrofits in developed areas to reduce stormwater flow rates and volumes.
- ≈ Continuing collaboration with SWCDs and communities to include and cost-share Low Impact Development (LID) features that may include Minimal Impact Design Standards (MIDS).
- ≈ Identify and develop an appropriate role for the VRWJPO in K-12 education in cooperation with teachers, environmental educators, and other key education stakeholders.
- ≈ Supporting and creating opportunities for people to work together on projects that will improve water quality, water quantity, or habitat.
- ≈ Maintaining and expanding the VRWJPO website as a comprehensive information source about the watershed and the VRWJPO.
- ≈ Increasing resilience of the watershed to climate changes through direct preparedness, outreach, and engagement efforts.
- ≈ Providing clear information to landowners and other stakeholders on how to navigate the multiple layers of water governance.
- ≈ Establishing wetland banks in the watershed.
- ≈ Establishing a riparian habitat improvement program that includes tree shading in critical reaches.
- ≈ Identifying and implementing sediment-reducing BMPs in the highest sediment-yielding subwatersheds.

Responsibilities of Local Governments

Each municipality within the VRWJPO is required to complete a local water management plan (LWMP) that conforms to Minn. Stat. 103B.235 and Minnesota Rules 8410.0160. The policies and goals established by the LWMP must be consistent with the VRWJPO's Plan. The section of the LWMP covering problem assessment must include those issue statements in the VRWJPO Plan that affect the community.

All of the 20 cities and townships in the watershed completed VRWJPO-approved LWMPs and adopted official controls to implement the VRWJPO Standards and operate a permitting program. If at some future time the local government units are determined to be non-implementing through program evaluation, or if a local government actively resolves to transfer permitting to the VRWJPO, the VRWJPO may assume the authority and directly apply rules implementing a permitting program.

Potential costs to local government units associated with adoption of the VRWJPO's 2016-2025 Watershed Management Plan include local water plan development and cooperative roles in implementation programs and projects. The VRWJPO plans to work with cities and townships to coordinate revisions to existing LWMPs with the schedule for Comprehensive Plans. The cities, townships, and counties in the Seven County Metropolitan Area prepare Comprehensive Plans, as required by the Metropolitan Land Planning Act.

Communities with municipal separate storm sewer system (MS4) permits have responsibilities for stormwater management associated with those permits, and requirements are consistent with those of the VRWJPO. Communities within the watershed also have responsibility for recreational lakes within their jurisdictions, through completed Total Maximum Daily Load (TMDL) studies or Lake Management Plans.

The VRWJPO received thoughtful and practical suggestions on the 2016-2025 Vermillion River Watershed Management Plan from local government staff. The VRWJPO will continue to work cooperatively with cities and townships to achieve the water quality and quantity improvement goals in this Plan.

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Introduction

The Vermillion River Watershed is the largest watershed, in terms of geographic area, in the Seven County Metropolitan Area in Minnesota. The watershed encompasses 335 square miles of farmland, rural communities, growing suburbs, cities, parks, significant natural areas, and historical or cultural sites.

The Vermillion River Headwaters emerge in New Market Township, Scott County. The river flows east-northeast through central Dakota County to the City of Hastings, dropping over a 35-foot natural waterfall and then flowing through bottom lands along the Mississippi River. The Vermillion River joins the Mississippi River near Red Wing in Goodhue County. On its way to the Mississippi, the Vermillion River collects water from four major tributaries (North Creek, Middle Creek, South Creek, and South Branch, shown in Figure 0.1.1: Vermillion River Watershed) with many minor waterways, and groundwater inflows.

The Vermillion River Watershed Joint Powers Board (VRWJPB) adopted its first Vermillion River Watershed Management Plan in 2005. Since the

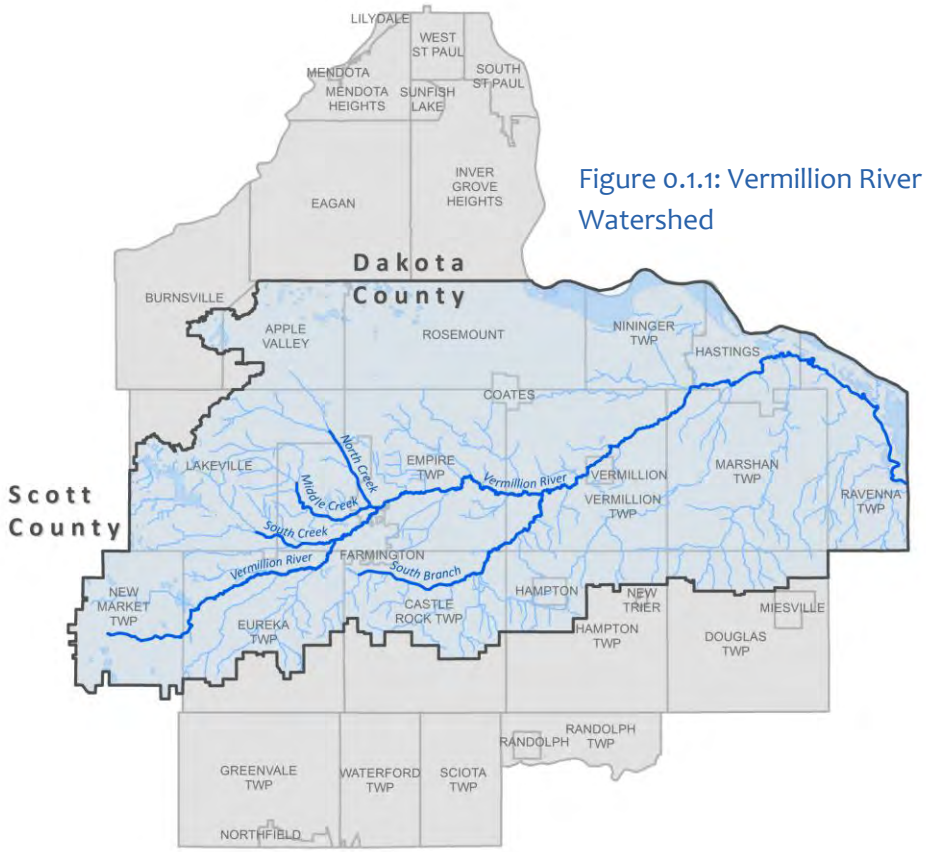


Figure 0.1.1: Vermillion River Watershed

Plan's adoption, many things have changed, including:

- ≈ Continued rapid population growth in some areas of the watershed;
- ≈ Increased frequency of intense storm events as reflected in the National Oceanic and Atmospheric Administration (NOAA) Atlas 14;
- ≈ Moderate-to-severe drought conditions in four of the past 10 years;
- ≈ Continued loss of prime agricultural land to development;
- ≈ Changes in national, state, regional, and local regulations affecting water management;

- ≈ Key scientific research that changed understanding of water resources;
- ≈ Innovative technology developments; and
- ≈ Enhanced funding for water quality and habitat as the result of Minnesota voters passing the Clean Water, Land, and Legacy Amendment in 2008.

This Watershed Plan addresses these changes in the context of water resource quality and quantity management. The Plan will guide the Vermillion River Watershed Joint Powers Organization (VRWJPO) in collaboration with its partners for 10 years (2016-2025). Many stakeholders and citizens have informed and improved this Plan, and the VRWJPO appreciates their contributions. (See Watershed Plan Community Involvement later in this Introduction.)

Communities in the Watershed

Twenty Dakota County and Scott County cities and townships lie entirely or partly within the boundaries of the Vermillion River Watershed. An estimated 167,000 people live in the Vermillion River Watershed, based on the 2010 U.S. Census. The 10 cities that are all or partly within the watershed are:

- ≈ Apple Valley
- ≈ Burnsville
- ≈ Coates
- ≈ Elko New Market
- ≈ Farmington
- ≈ Hampton
- ≈ Hastings
- ≈ Lakeville
- ≈ Rosemount
- ≈ Vermillion

Ten townships all or partly within the Vermillion River Watershed are:

- ≈ Castle Rock Township
- ≈ Douglas Township
- ≈ Empire Township
- ≈ Eureka Township
- ≈ Hampton Township
- ≈ Marshan Township
- ≈ New Market Township
- ≈ Nininger Township
- ≈ Ravenna Township
- ≈ Vermillion Township

Vermillion River Watershed Joint Powers Organization

In 1984, the then-21 cities and townships (two cities, Elko and New Market, merged into one city, Elko New Market) included within the Vermillion River Watershed entered into a joint powers agreement to manage water resources within the watershed. This organization struggled to fulfill the conditions required by the Metropolitan Surface Water Management Act (Minn. Stat. Chapter 103B).

In August 2000, the management organization dissolved, and Dakota and Scott counties became statutorily responsible for managing the Vermillion River Watershed.

Dakota and Scott counties entered into a joint powers agreement that created the VRWJPO (see Appendix A: Joint Powers Agreement). The VRWJPO is governed by the three-member VRWJPB, composed of two Dakota County Commissioners and one Scott County Commissioner.

The joint powers agreement also establishes a nine-member citizen advisory Watershed Planning Commission (WPC), which provides recommendations and support to the VRWJPB. The VRWJPO established a Technical Advisory Group (TAG) consisting of technical representatives of cities, state agencies, and other interested groups to provide informal technical consultation to the VRWJPO and VRWJPB.

Dakota and Scott counties jointly fund the activities of the VRWJPO. The Counties established special watershed

tax districts within the Vermillion River Watershed portions of each county and annually set a levy to fund watershed management activities. The VRWJPO also obtains funding through successful grant applications to various organizations, including state and federal government agencies. The VRWJPO leverages funding from partners and cooperators.

The mission of the VRWJPO is to collaboratively provide education, science, and support to restore and protect the Vermillion River Watershed's natural resources for all who live, work, and play within its boundaries.

Watershed Plan Community Involvement

The VRWJPB authorized staff to begin the planning process for the 2016-2025 Vermillion River Watershed Management Plan on June 27, 2013. The planning process and final Plan must be completed in accordance with the State of Minnesota Metropolitan Area Local Water Management Rules (Minn. Rules Chapter 8410).

The State Rules, promulgated in 1992 by the Board of Water and Soil Resources (BWSR), were revised effective July 13, 2015, in the midst of drafting this plan.

Purpose of Water Management Organizations

The Metropolitan Surface Water Management Act states that the purposes of watershed management organizations and water management programs are to:

- ≈ 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.

The VRWJPO followed the revised rules, which (among other updates) require more public involvement in developing watershed issues, goals, and implementation strategies. The Watershed Plan will be consistent with the revised rules. The revised rules are available on the BWSR website.

In July 2013, the VRWJPO sent letters to a list of 240 stakeholders requesting their issues and priorities for the next generation Vermillion River Watershed Management Plan. Many responded to the initial request, and their comments were included in the first draft of the issues and priorities.

In addition, the VRWJPO asked the WPC, TAG, and VRWJPB to identify elements in the 2005 implementation plan that had not been completed by 2010 and were high priorities for action in the new Plan. Results of this 2005 Watershed Plan analysis were included in this Plan.

The VRWJPB approved public notice of a Watershed Plan kick-off meeting. At the meeting on October 22, 2013, participants reviewed comments to date and added their own issues and priorities. These were integrated, along with the issues identified by staff, into a single document. Staff grouped comments into 10 broad issue statements. Each issue statement defines a major problem facing the watershed.

The VRWJPO scheduled two rounds of "community conversations" in three locations across the watershed. The

purpose of the first round of community conversations (Hastings, March 26, 2014; Elko New Market, April 1, 2014; and Farmington, April 10, 2014) was to bring these initial issue statements to the general public audience for their responses, suggestions, and priorities.

Comments received led to substantial revisions of the issue statements. Goals and objectives were written based on these issues. Goals and objectives incorporated suggestions and ideas received from the public. A second round of community conversations (Hastings, November 19, 2014; Elko New Market, December 3, 2014; and Farmington, December 11, 2014) engaged stakeholders and the public in clarifying goals and objectives, and providing additional solutions.

The issues identified during the public engagement process fell into two distinct categories: "what" actions the VRWJPO should or could take to manage the watershed to its highest and best condition; and "how" the VRWJPO should or could manage its operations to be more sensitive to landowners' economic conditions, coordinate efforts among government entities with water responsibilities, become more efficient, and respond nimbly to emerging water quality problems or conditions.

The Watershed Planning Team found ways to reflect the "how" priorities in the draft Plan. In Section 6: Goals, Objectives, and Actions, the primary roles of the VRWJPO are defined. Those role definitions incorporate many of the "how" priorities – fairness, economic accountability, efficiency, flexibility, consultation with advisory groups and the public, and coordination with partner agencies.

Individual implementation actions also specify how the VRWJPO should work on specific types of projects. For example, Goal A, Objective 6, Action 7 is "Seek *representative* and *timely* consultation with the public in developing VRWJPO policies, plans, and programs." Input received in our public engagement process clearly identified that consultation with the public is not sufficient; it must be representative (fairly include those affected) and timely (take place before final decisions are made).

Issue Statements

Stakeholders and community conversation participants ranked the issue statements in priority order. (See Section 5: Issues and Priorities.) The issue statements are:

- ≈ Surface water quality is threatened or impaired.
- ≈ Water-quality improvement competes with other public, private, and individual priorities. There is a perception that costs of improving water quality are not allocated fairly.
- ≈ Groundwater quality is at risk, with known contamination above health risk limits for nitrate in some areas.
- ≈ Increasing consumption of ground-water threatens the future water supply.
- ≈ Changing precipitation patterns, decreased rainwater infiltration, and increased stormwater runoff have contributed to more intense fluctuations in river flow rate and volume.
- ≈ Public awareness and specific knowledge is lacking on the impacts of daily activities and appropriate stewardship actions.
- ≈ Several federal, state, and local agencies manage specific aspects of water protection, and limited coordination and communication among these agencies can create inefficiencies and cause confusion.
- ≈ The Vermillion River Watershed JPO is a "young" organization in a dynamically changing landscape and has not always been able to fill gaps and address new opportunities.

- ≈ Sensitive biological resources -- plants, fish, insects, and wildlife -- in the Vermillion River are not as healthy as those in reference rivers.
- ≈ Minnesota's climate is getting warmer and wetter, which poses a threat to water quality, wildlife, and infrastructure.

Watershed Goals

The goals encompass the issue statements. (See Section 6: Goals, Objectives, and Actions.)

The goals are:

A. Protect or restore water quality in lakes, streams, and wetlands.
B. Protect and restore groundwater quality.
C. Maintain a sustainable water supply.
D. Address more intense fluctuations (up and down) in river flow rate and volume.
E. Improve public awareness and stewardship of water resources.
F. Improve watershed resilience to changing precipitation and temperature patterns.
G. Protect or restore sensitive biological resources, such as plants, fish, insects, and wildlife.

Watershed Plan Organization

The Plan is divided into sections:

- ≈ Executive Summary
- ≈ Introduction
- ≈ Section 1: Existing and Future Physical Environment
- ≈ Section 2: Existing and Future Biological Environment
- ≈ Section 3: Water Quality and Quantity
- ≈ Section 4: Existing and Future Land Use
- ≈ Section 5: Issues and Priorities
- ≈ Section 6: Goals, Objectives, and Actions
- ≈ Section 7: Implementation Plan
- ≈ Section 8: Outcome Measures
- ≈ Section 9: Roles and Responsibilities of the VRWJPO and Partners
- ≈ Section 10: Plan Review, Update, Adoption, and Revision
- ≈ Section 11: Plan Terms and Acronyms
- ≈ Section 12: Watershed Plan References
- ≈ Section 13: List of Figures
- ≈ Appendix A: Joint Powers Agreement
- ≈ Appendix B: VRWJPO Standards

Timeframe for Watershed Plan Adoption

The VRWJPO prepared a draft Watershed Plan for the required 60-day review and comment period for the public and stakeholders (such as cities, townships, and state agencies). The Watershed Plan was posted on the VRWJPO website during the 60-day review and comment period, October 1 – November 30, 2015. The VRWJPO notified the public of the Watershed Plan's availability for review and comment. The VRWJPO:

- ≈ Ran a public notice in the newspaper of record;
- ≈ Placed copies of the draft Watershed Plan in six libraries in Dakota and Scott counties;
- ≈ Sent emails to stakeholder lists announcing the Watershed Plan's availability;
- ≈ Sent a news release to media outlets in the watershed and the Metro area;
- ≈ Sent emails and (when requested) copies of the draft Watershed Plan to the Metro Plan Review Roster;
- ≈ Sent emails or copies to cities and townships all or partly within the watershed;
- ≈ Attended the Township Officers Meeting on September 26, 2015, to

provide an overview of the Watershed Plan; and
≈ Established a dedicated electronic mailbox to receive comments (vermillionplan@co.dakota.mn.us).

The VRWJPO held a public hearing on the Watershed Plan January 26, 2016, after which modifications were made in response to public comments. The final draft was sent to the Minnesota Board of Water and Soil Resources (BWSR) for a 90-day review period. On May 25, 2016, the BWSR Board approved the final Watershed Plan.

The VRWJPB adopted the 2016-2025 Vermillion River Watershed Management Plan on June 23, 2016. The 20 cities and townships affected by the Watershed Plan will be required to update Local Water Management Plans (LWMPs) and local ordinances within two years of adoption. The updated Minnesota Metropolitan Area Local Water Management Rules (Minn. Rules Chapter 8410) require LWMP and local ordinance revision be incorporated into the Comprehensive Planning process. The Comprehensive Plans will be due to the Metropolitan Council in 2018.

How was the Watershed Plan developed?

This Watershed Plan incorporates elements of many other plans, documents, and resources. These include:

≈ Vermillion River Watershed Restoration and Protection Strategy (2016);
≈ Vermillion River Water Quality Monitoring Reports (2006-2014);
≈ Vermillion River Fish Sampling Reports (2009-2014);
≈ EPA Targeted Watersheds Grant (Thermal Trading) Report (2009);
≈ Vermillion River Corridor Plan (2010);
≈ VRWJPO Stream Classifications and Buffer Standards (2006);
≈ Subwatershed Geomorphic Assessments: South Creek (2009), Etter Creek and Ravenna Coulees (2010), North and Middle Creeks (2011), and Empire Drainages (2012);
≈ Subwatershed Analysis for the Vermillion River Headwaters (2014);
≈ Upper Vermillion River and South Branch Drainage Areas Drained Wetland Inventory (2012); and many other federal and state resources.

See Section 12: Watershed Plan References for more information.

Section 1: Existing and Future Physical Environment

1.0 Background

The Vermillion River winds through rural, suburban, and urban landscapes from its headwaters in Scott County, across Dakota County, to its confluences with the Mississippi River at Hastings and Red Wing, Minnesota. Understanding the Vermillion River's existing and future condition is critical in determining actions that will best protect watershed resources and meet communities' needs. Section 1 summarizes existing and future physical environments in the watershed, as well as plans, trends, or changes that are expected to affect the watershed from 2016 through 2025 – the 10-year term of this Watershed Plan.

1.1 Topography

The overall topography of the Vermillion River Watershed is relatively flat, with low-relief throughout most of the watershed. The watershed's highest elevation is 1,230 feet and lowest elevation is 667 feet. The western part of the watershed has varied topographical features due to glacial moraine deposits. The central and eastern portion flattens out into a relatively level glacial outwash plain. Near the Mississippi River, bedrock bluffs provide more significant relief, but bluff lands make up a small proportion of the overall watershed area. (See Figure 1.1.1: Vermillion River Watershed Topography.)

1.2 Soils

Soils are described based on their physical and chemical properties. Soil classification systems group soils of similar properties and provide a systematic means of mapping soils. For the purposes of this Plan, the soils of the watershed are classified into their hydrologic soil group (HSG). This classification system is based on infiltration rates (water seepage down into soil) and transmission rates (groundwater migration horizontally through soil). A soil's HSG classification describes its potential to produce runoff.

The four hydrologic soil groups are listed below (from Minnesota Pollution Control Agency Stormwater Manual, 2014). The groups range from low runoff potential (Group A) to high runoff potential (Group D):

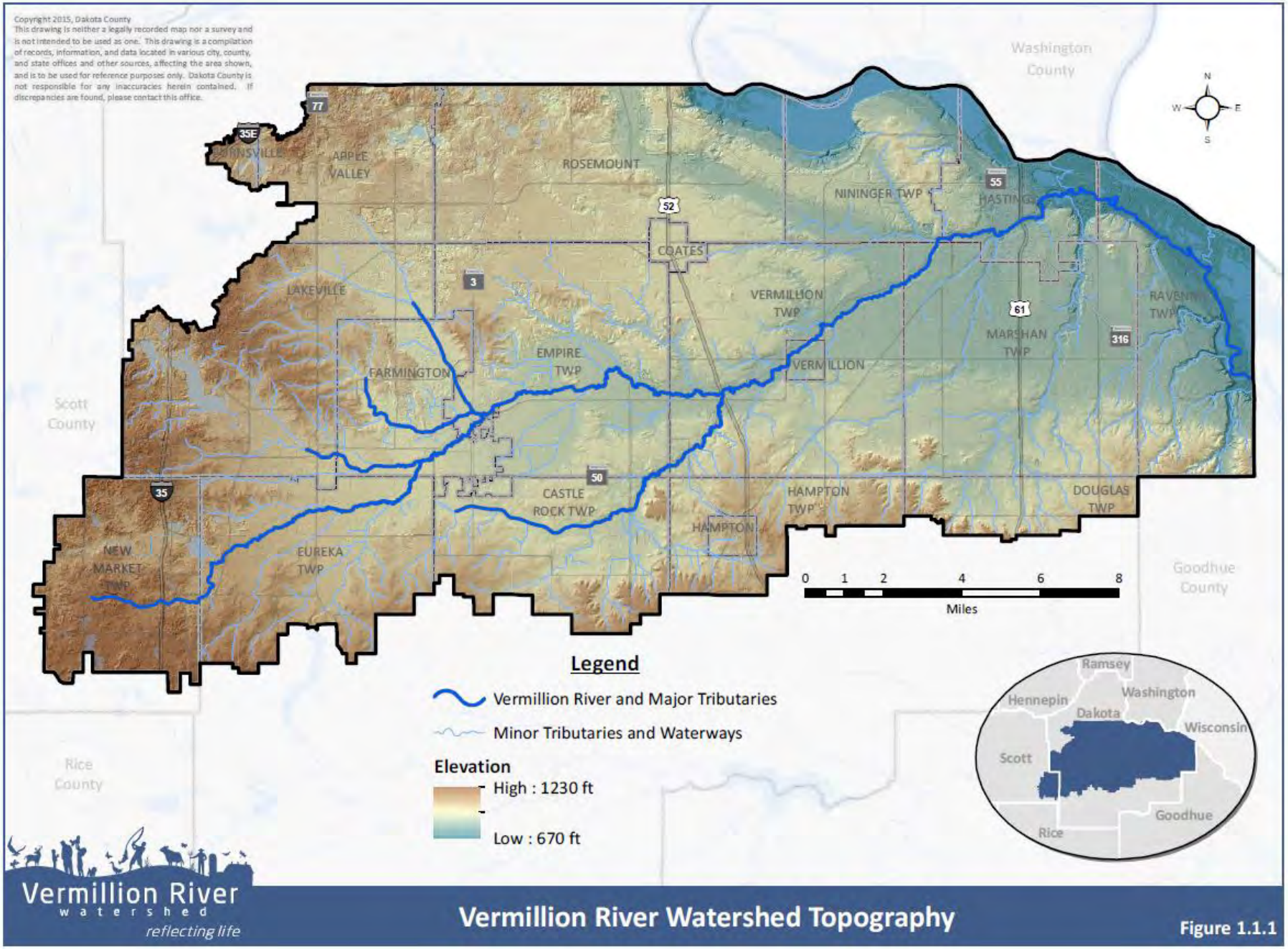
Group A: These are well-drained to excessively drained soils. Soils have a high infiltration rate, even when thoroughly wetted. Gravel, sandy gravel, and silty gravel generally have infiltration rates averaging around 1.63 inches per hour. Sand, loamy sand, and sandy loam generally have infiltration rates averaging around 0.8 inches per hour.

Find Recent Maps on County Websites

Dakota and Scott counties' interactive Geographic Information Systems (GIS) allow users to turn on layers of various data associated with each county. Users seeking current data layers can use these online resources at:

Dakota County GIS
http://gis.co.dakota.mn.us/DCGIS/

Scott County GIS
http://gis.co.scott.mn.us/scottgis2.0/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Washington County
Scott County
Rice County
Goodhue County
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ROSEMOUNT
NININGER TWP
HASTINGS
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COATES
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LAKEVILLE
VERMILLION TWP
61
MARSHAN TWP
316
EMPIRE TWP
FARMINGTON
VERMILLION
35
50
CASTLE ROCK TWP
HAMPTON TWP
DOUGLAS TWP
HAMPTON
NEW MARKET TWP
EUREKA TWP
0 1 2 4 6 8
Miles
Legend
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Elevation
High : 1230 ft
Low : 670 ft
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Vermillion River Watershed Topography
Figure 1.1.1

Group B: These are moderately well- to well-drained soils. They show moderate infiltration rates when thoroughly wetted. Silty sands generally have infiltration rates averaging around 0.45 inches per hour. Loam and silty loam generally have infiltration rates averaging around 0.3 inches per hour.

Group C: These soils have an impeding layer to downward movement and low infiltration rates when thoroughly wetted. Sandy clay loam, clay loam, silty clay loam, and sandy clay generally have infiltration rates averaging around 0.2 inches per hour.

Group D: These are soils with almost impervious material at or near the surface or other limitations to infiltration or water movement. They have very low infiltration rates when thoroughly wetted. Silty clay and clay generally have infiltration rates averaging around 0.06 inches per hour.

The majority of the watershed's soils are well-drained, silty or loamy soils with occasional sandy areas. These soils fall into Groups A and B. Areas of low infiltration (Groups C and D) are generally isolated in river and tributary floodplains, and lower and flatter areas of the upper watershed. (See Figure 1.2.1: Vermillion River Watershed Hydrologic Soil Groups.)

The relationship of a soil to its landscape position is also important in delineating wetlands and determining a soil's susceptibility to erosion. Wetland, or former wetland, areas are characterized by hydric soils, soils that are "inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in saturated soil (from the U.S. Department of Agriculture Natural Resources Conservation Service or NRCS, see www.nrcs.usda.gov/wps/portal/nrcs/main/national/water/wetlands/). Areas with low infiltration rates (Groups C and D) and flatter topography are more likely to be areas with wetlands. Wetlands may also form anywhere the water table is at or near the surface, regardless of soil texture. (See Figure 1.2.2: Vermillion River Watershed Hydric Soils.)

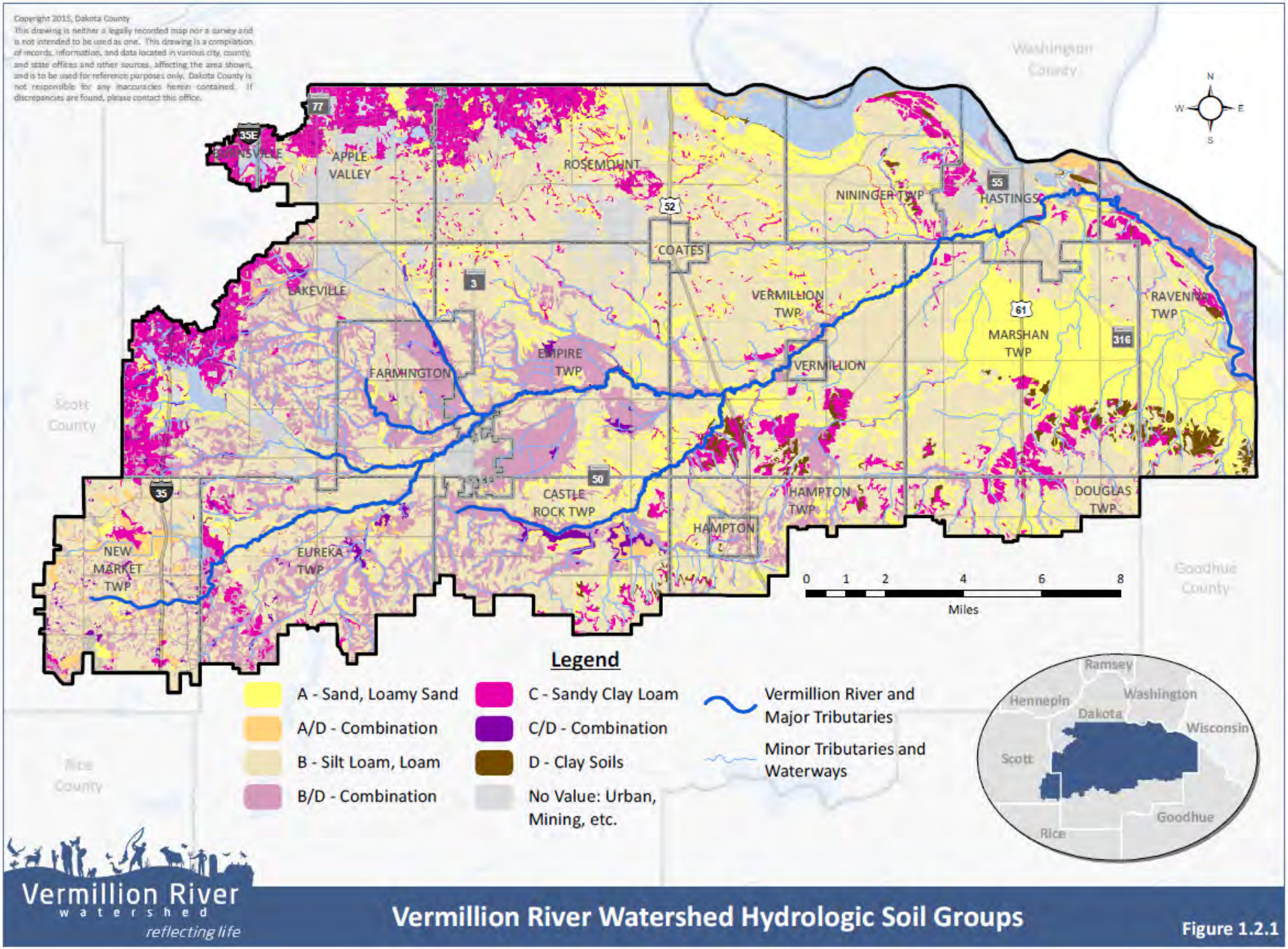
Dakota and Scott counties' interactive GIS mapping sites contain soils data that are electronically digitized from soil survey maps originally created by the NRCS.

These data illustrate other soil features. (See Figure 1.2.3: Vermillion River Watershed High Infiltration Soils and Figure 1.2.4: Vermillion River Watershed Highly Erodible Soils.)

1.3 General Geology

Geologic processes have determined the physical environment of the watershed over the course of millions of years. The distribution of bedrock, unconsolidated sediments, landforms, and structural features are the basis on which the existing biological and human environments exist. The characteristics of the physical environment ultimately determine the availability of natural resources, the susceptibility of resources to pollution, and the success of living organisms in the watershed.

Throughout time, the forces of wind, water, and ice modify the watershed's landscape. Movement of continental ice sheets was the most influential process to shape the current watershed topography. During the Pleistocene Epoch (between 2 million and 10,000 years ago), glaciers repeatedly covered most of Minnesota. The last glaciation, or Ice Age, occurred approximately 20,000 years ago, and ended approximately 10,000 years ago.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NEW MARKET TWP
EUREKA TWP
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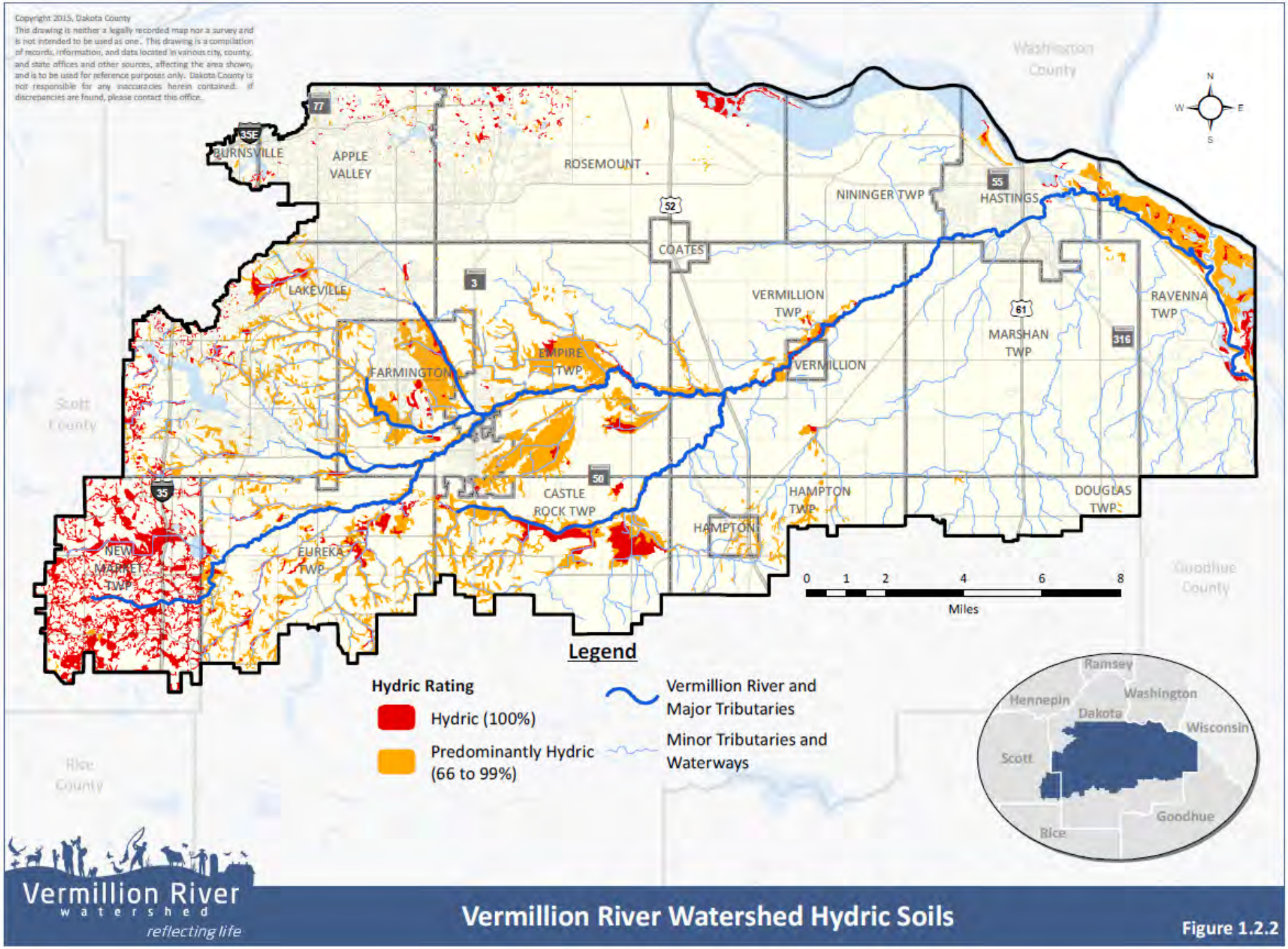
Miles
Legend
A - Sand, Loamy Sand
A/D - Combination
B - Silt Loam, Loam
B/D - Combination
C - Sandy Clay Loam
C/D - Combination
D - Clay Soils
No Value: Urban, Mining, etc.
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Vermillion River Watershed Hydrologic Soil Groups
Figure 1.2.1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Hydric Rating
Hydric (100%)
Predominantly Hydric (66 to 99%)
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Vermillion River Watershed Hydric Soils
Figure 1.2.2

Glaciers and ice sheets were very effective at shaping the landscape through erosion and deposition of materials. The landforms and surficial sediments of the watershed are dominated by glacial landforms and sediment. (See Figure 1.3.1: Vermillion River Watershed Surficial Geology.)

The northwestern portion of the watershed is located in the Eastern St. Croix Moraine, and the southwestern portion of the watershed is located in the Prior Lake Moraine. Moraines (masses of rocks, gravel, sand, clay, etc. carried and deposited directly by glaciers) form at the edge of a glacier.

The Eastern St. Croix Moraine and the Prior Lake Moraine mark the limit of the former Superior Lobe and Des Moines Lobe, respectively. (Lobes are finger-shaped glaciers that develop at the edge of continental ice sheets). Moraine areas result in landscapes of rolling to steep hills and closed depressions where lakes and wetlands are common.

The sediments of moraine areas are a complex assortment of till (a mixture of sand, silt, clay, pebbles, cobbles, and boulders), silt and sand lenses, and sand and gravel deposits. The till of the Superior Lobe is red and has a coarse texture (sandy loam). The till of the Des Moines Lobe is gray to yellowish brown with a fine texture (loam).

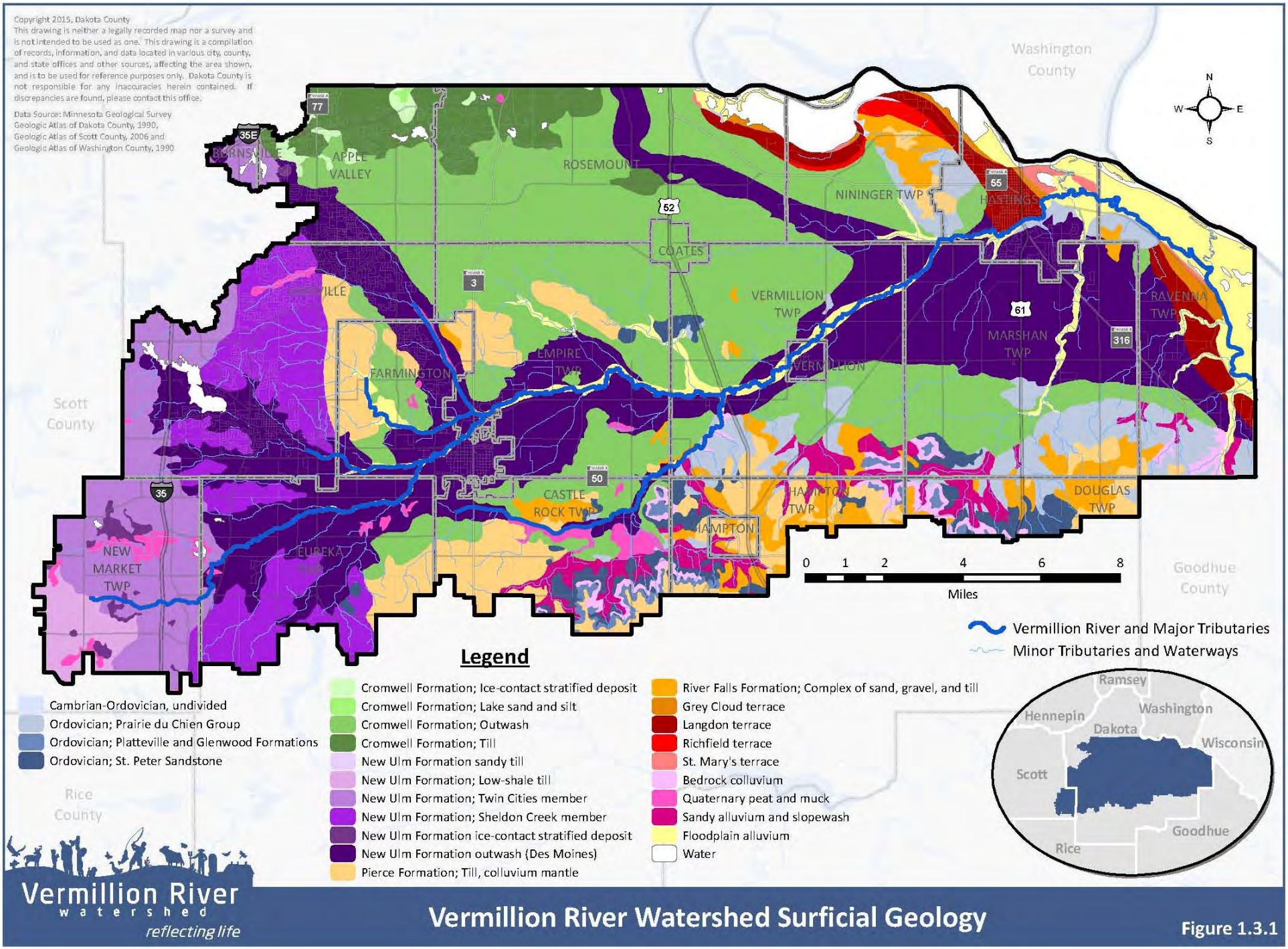
Outside moraine areas, the landscape shows the effects of glaciation. A till plain extends away from the Prior Lake Moraine in the west-central portion of the watershed. This till plain is composed of a thin layer of Des Moines Lobe till covering the sediments from older glaciations. The topography of this area is characterized by long rolling hills.

The predominant geomorphic features beyond the moraines and till plain in the watershed are outwash plains and valleys. Outwash (sand, gravel, and other assorted sediments carried by flowing water) blanketed the landscape as water from the melting glaciers drained away. Outwash from the Superior Lobe forms a large plain that extends over much of the watershed area. The sands and gravels of the outwash plain become thinner and finer in texture farther away from the moraine. The outwash associated with the Des Moines Lobe cuts across the Superior outwash plain in broad valleys. The sands and gravels of the outwash valleys also become thinner and finer eastward away from the moraine. The outwash plain and the outwash valleys are very subtle topographic features. They appear on the landscape as nearly level topography and terraces.

Dissecting and crossing the glacial geomorphology of the Vermillion River Watershed are the recent effects associated with modern streams and rivers. The Vermillion River and its tributaries have their own local floodplains, terraces (abandoned floodplains due to down-cutting), and associated landforms (meanders, bars, natural levees, etc.). The Mississippi River, along the eastern edge of the watershed, has a wide floodplain and three distinct terrace levels.

The fluvial (river) sediments of these floodplains and terraces are poorly bedded (arranged or deposited in layers) and moderately sorted materials deposited by the rivers and streams during flood stage. The fluvial sediments of the Mississippi River are much thicker than those of the Vermillion River.

Beneath the unconsolidated surficial sediment and landforms described previously is the bedrock surface. The depth to bedrock in the watershed varies from zero (where it is exposed on the land surface) to more than 400 feet.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Geologic Atlas of Scott County, 2006 and
Geologic Atlas of Washington County, 1990
Washington County
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Miles
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Legend
Cambrian-Ordovician, undivided
Ordovician; Prairie du Chien Group
Ordovician; Platteville and Glenwood Formations
Ordovician; St. Peter Sandstone
Cromwell Formation; Ice-contact stratified deposit
Cromwell Formation; Lake sand and silt
Cromwell Formation; Outwash
Cromwell Formation; Till
New Ulm Formation sandy till
New Ulm Formation; Low-shale till
New Ulm Formation; Twin Cities member
New Ulm Formation; Sheldon Creek member
New Ulm Formation ice-contact stratified deposit
New Ulm Formation outwash (Des Moines)
Pierce Formation; Till, colluvium mantle
River Falls Formation; Complex of sand, gravel, and till
Grey Cloud terrace
Langdon terrace
Richfield terrace
St. Mary's terrace
Bedrock colluvium
Quaternary peat and muck
Sandy alluvium and slopewash
Floodplain alluvium
Water
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Vermillion River Watershed Surficial Geology
Figure 1.3.1

The shape of the bedrock surface is determined by each rock type's varying resistance to weathering. Shales and poorly cemented sandstones break down rapidly, while limestones and dolostones are more resistant. Resistant rock units become high points in the bedrock topography, while the less resistant rock units become low areas. (See Figure 1.3.2: Vermillion River Watershed Bedrock Geology.)

The most significant topographic features on the bedrock surface in the watershed are the buried bedrock valleys. These valleys developed under ancient drainage patterns, independent of modern drainage. Sediments from advancing and retreating glaciers filled the valleys and obscured the bedrock topography, creating the modern landscape. The largest of these valleys is located in the eastern portion of the watershed. This valley is filled with outwash from the last ice age and is believed to be an ancient Mississippi River course. (See Figure 1.3.3: Vermillion River Watershed Depth to Bedrock.)

The bedrock units underlying the watershed are sedimentary rocks (formed by the deposit of sediment) of marine origin. The watershed is on the southeastern edge of the Twin Cities Basin and the rock in the watershed dips toward the north and west.

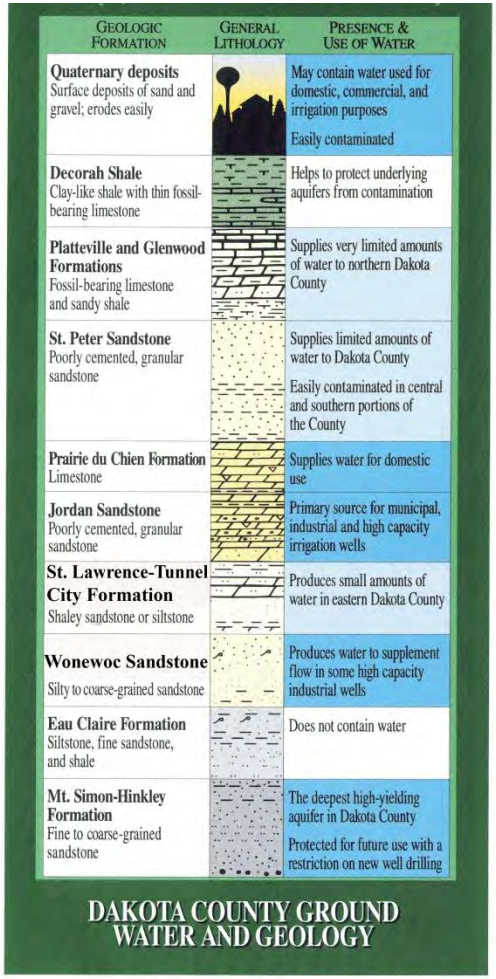
The dominant structural features in the watershed associated with the Twin Cities Basin are the Vermillion Anticline (a fold, convex upward) and the Empire Fault. Both the anticline and the fault are oriented geographically from the northeast to the southwest almost parallel to the course of the modern Vermillion River.

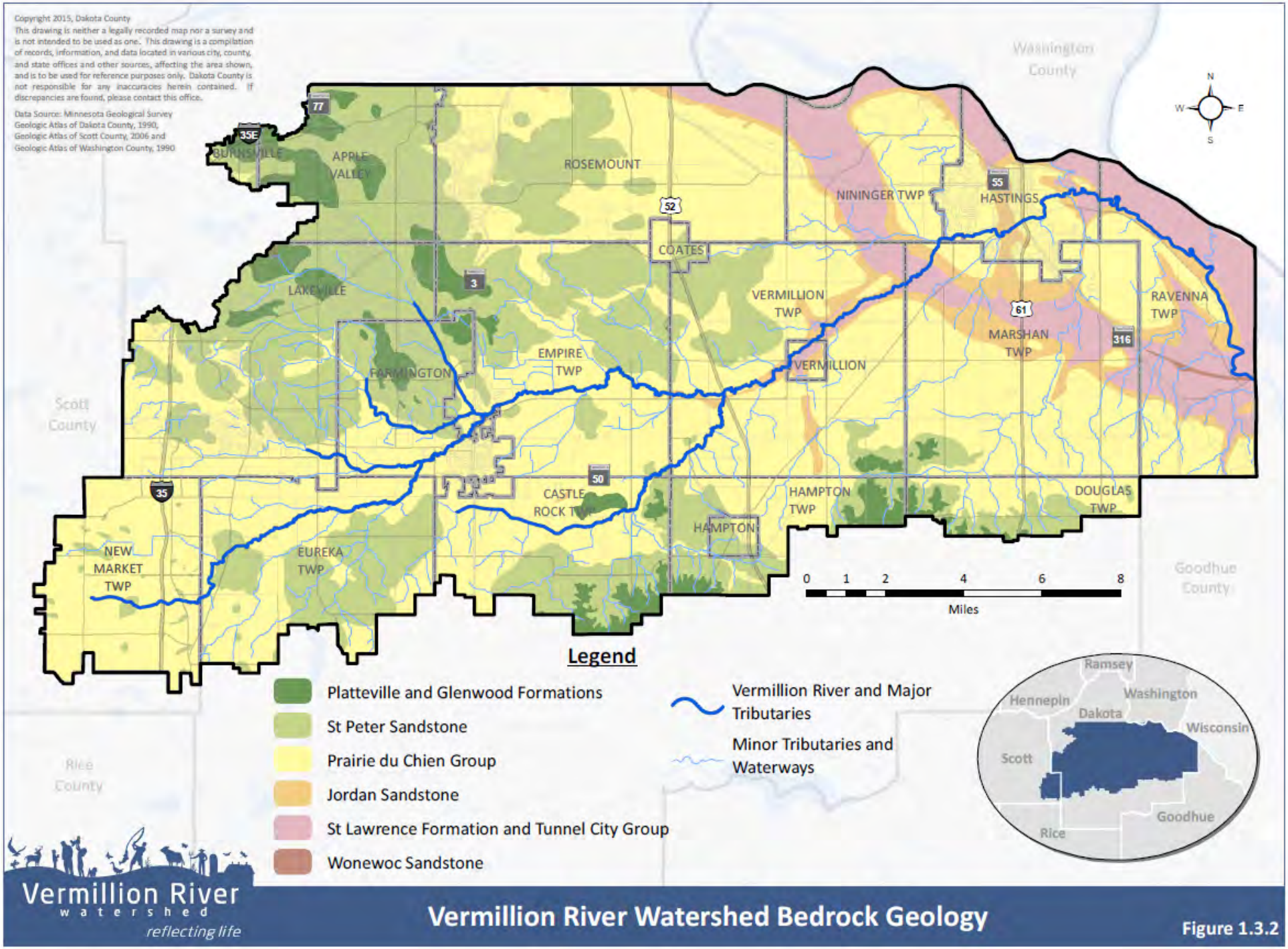
These structural features are not expressed on the land surface, but can be seen in bedrock outcrops along the Mississippi River bluffs above the City of Hastings. Bedrock units serve as a storage place for groundwater and are often used by humans as a source of drinking water.

1.4 Aquifers

An aquifer is a geologic unit that can store and transmit enough water to reasonably supply wells. (See Figure 1.4.1: Vermillion River Watershed Bedrock Profile.) The human population of the Vermillion River Watershed is dependent on the region's aquifers for almost 100 percent of its drinking water. The geologic units underlying the watershed serve as an important source of groundwater. Below the water table, the pore spaces, cracks, and voids in sediment and rock are filled with water. Just like surface waterbodies, an aquifer has inputs, outputs, and storage capacity.

Figure 1.4.1: Vermillion River Watershed Bedrock Profile

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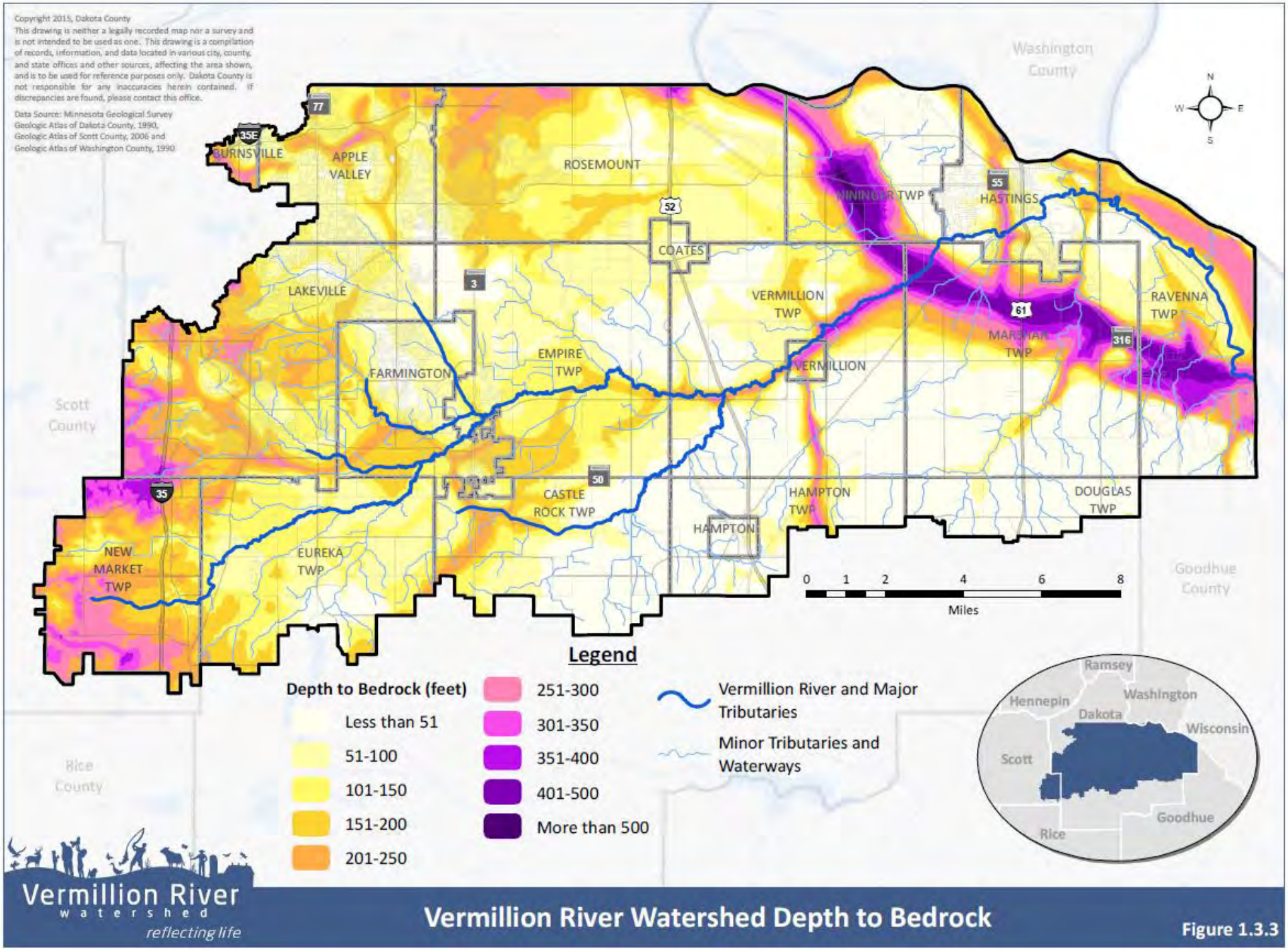
Miles
Legend
Platteville and Glenwood Formations
St Peter Sandstone
Prairie du Chien Group
Jordan Sandstone
St Lawrence Formation and Tunnel City Group
Wonewoc Sandstone
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Vermillion River Watershed Bedrock Geology
Figure 1.3.2



Vermillion River Watershed Depth to Bedrock

Figure 1.3.3

Water can enter an aquifer through percolation of surface water, injection wells, and/or flow from other aquifers. Water exits an aquifer through discharge to surface waters as base flow, to the ground surface through seeps or springs, to other aquifers, or by withdrawals from wells.

Water from lakes, rivers, and wetlands may move into aquifers and water from aquifers may discharge into surface water features. Pollutants are exchanged between surface and groundwater features; surface and groundwater systems do not operate independently of one another.

Therefore, protection of the quality and quantity of the watershed's surface water resources is vital to protecting the quality and quantity of the watershed's groundwater resources and vice versa.

Quaternary Aquifers

The uppermost aquifers (surficial aquifers) in the watershed are located in the unconsolidated sediments left behind by glaciers. These "Quaternary" aquifers are not used for municipal or public drinking water supply within the watershed, but are a significant source of water for private domestic and irrigation wells. The surficial aquifer is also the source of groundwater that maintains the cool water temperatures that support the Vermillion River's brown trout population.

Because the thickness of glacial sediments varies dramatically across the watershed, the saturated thickness (depth of material where all pore spaces are filled with water) of the Quaternary aquifers varies from zero to more than 200 feet. The potential yield (the maximum rate at which water can be withdrawn from an aquifer without unacceptably changing the characteristics of the aquifer) varies naturally with the saturated thickness of the Quaternary aquifers from less than five gallons per minute in the shallowest areas to more than 2,000 gallons per minute in the thickest areas (the buried valleys). Since the majority of the Quaternary aquifers are composed of sand and gravel, water can move very quickly through them (as much as 100,000 to 200,000 gallons per foot per day). The high movement rates through these aquifers, combined with their proximity to surface activities, make these aquifers highly sensitive to pollution. High nitrate concentrations have been documented in the Quaternary aquifers, and pesticide pollution is also common.

Bedrock Aquifers

Bedrock aquifers are often named for the rock unit in which they occur and therefore have the same stratigraphic relationships. The uppermost bedrock units in the watershed, the Platteville and St. Peter formations, occur discontinuously primarily in the northwestern region of the watershed.

Both of these formations are sometimes dry or locally contain an unreliable amount of water. The Platteville is used for several domestic wells in Mendota Heights, South St. Paul, and Inver Grove Heights (outside the VRWJPO boundary).

The St. Peter aquifer is used for domestic wells in the northern portion of Dakota County. The Minnesota Geological Survey reports that water from this aquifer is also used in combination with water from the Prairie du Chien aquifer in some older municipal wells and higher capacity wells. When it is not overlain by the Platteville and Glenwood formations, the St. Peter lies directly below surface deposits.

In parts of Randolph and Castle Rock Townships, the water table is in the St. Peter formation. Recharge into the St. Peter is greatest where the Glenwood Formation is missing and sands overlay the aquifer.

The most significant and widely used aquifer in the watershed is the Prairie du Chien–Jordan. This aquifer is composed of two geologic units (dolomite and sandstone) with differing hydrologic characteristics. In other parts of Minnesota, the Prairie du Chien-Jordan is treated as a single aquifer. However, in Dakota County, the two are separated and act as independent aquifers. The saturated thickness of the Prairie du Chien-Jordan aquifer in the watershed extends to a depth of 300 feet. The potential water yield is similar to that of the Quaternary aquifers, ranging from under 500 gallons per minute to more than 2,500 gallons per minute.

The Minnesota Geological Survey designated the majority of the Prairie du Chien and Jordan aquifers located within watershed boundaries to be highly-to-very-highly sensitive to contamination.

The sensitivity rating is based on the geologic characteristics of the overlying rock and sediment. These characteristics include the surface's ability to absorb and hold contaminants, dilute contaminants to below levels of concern, and control the rate that contaminants can move into and through aquifers. In areas rated as having high sensitivity, contaminants can reach the aquifer within weeks to years. In areas with very high sensitivity ratings, contaminants can enter the aquifer in a matter of hours to months.

Below the Prairie du Chien-Jordan are the Tunnel City (formerly called the Franconia) and the Wonewoc (formerly called the Ironton-Galesville) formations. The Tunnel City formation is a low-to-moderate yield (<200 gpm) sandy dolomite aquifer, and the Wonewoc is a thin sandstone aquifer (about 50 feet thick). Neither aquifer serves as a significant source of groundwater for the watershed's population.

The deepest, high-yield aquifer available in the watershed, the Mt. Simon-Hinckley, is separated from the nearest aquifer by 200 feet of the Eau Claire Formation, a confining layer (a geologic unit with little or no permeability). Under normal conditions, the Mt. Simon-Hinckley aquifers are hydraulically isolated from the Tunnel City and Wonewoc formations.

Because of the pristine and isolated nature of these aquifers, appropriations from the Mt. Simon-Hinckley are addressed directly in state statute (Minn. Stat. 103G.271, Subd. 4a). The Minnesota Department of Natural Resources (DNR) is not allowed to issue permits for this aquifer in metropolitan counties unless it is for potable (drinking) water, there is no alternative source, and a water conservation plan is included in the permit.

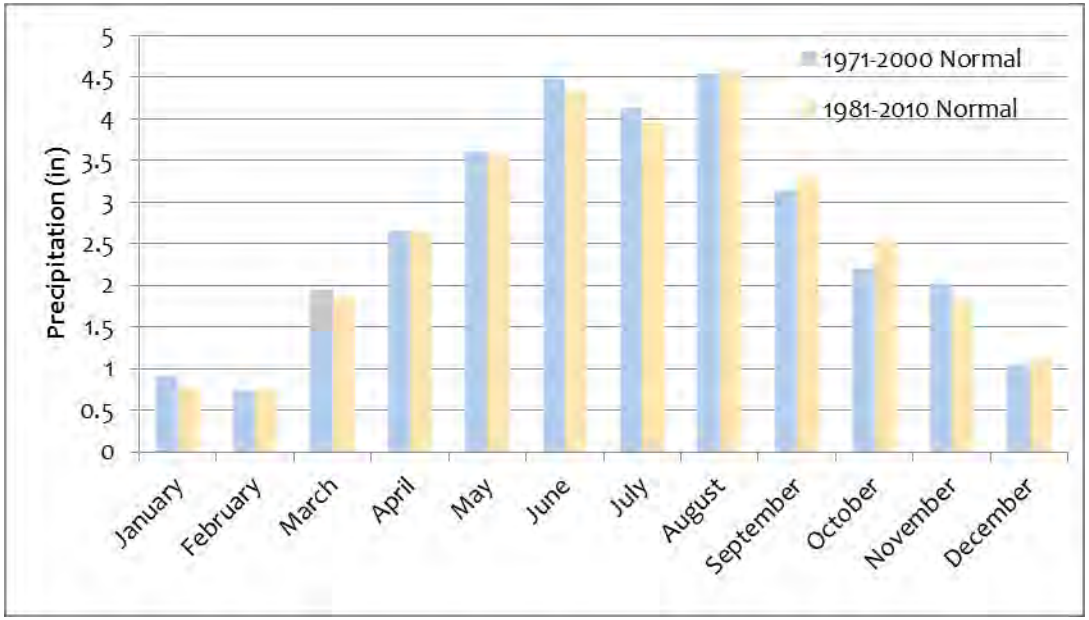
The potential yield of this aquifer is calculated to be between 650 and 1,800 gallons per minute, and several communities in the watershed use this aquifer for high-capacity industrial, municipal, and multi-aquifer wells. As a result of these wells, the Mt. Simon-Hinckley aquifer is recharged from the overlying aquifers, locally changing the flow direction and water chemistry.

1.5 Precipitation

In the United States, the National Oceanic and Atmospheric Administration (NOAA) is in charge of collecting and interpreting climatic information. The National Weather Service (a division of NOAA) has collected more than 126 years of climate data within the local area of the Vermillion River Watershed.

The following discussion about precipitation in the watershed uses the term "normal," which refers to the average of the past 30 years (current official time period is 1981-2010), not the entire available climate record (1888-2014). This definition takes into account that climate changes over time. For example, the normal climatic conditions

Figure 1.5.1: Current and Previous 30-year Average Monthly Precipitation



in 1942 are not necessarily the same as normal conditions for today.

In the previous 30-year period (1971-2000), the normal total annual precipitation consisting of rain and snow was the equivalent of 31.43 inches. The normal total annual precipitation for the current 30-year period (1981-2010) consisting of rain and snow is the equivalent of 31.30 inches. It appears that the current normal period is experiencing more precipitation in late summer and early fall than the previous normal period. (See Figure 1.5.1: Current and Previous 30-year Average Monthly Precipitation.)

One observation of recent years is that although the amount of rainfall on a monthly or annual basis is not significantly different than the previous normal period, the intensity of that precipitation in the current normal period has increased.

The federal government, and subsequently state and local governments, are adopting and using NOAA's Atlas 14 for precipitation-frequency calculations. The Vermillion

River Watershed Joint Powers Board (VRWJPB) adopted a policy on October 23, 2014, to use the NOAA Atlas 14, Vol. 8 precipitation frequency estimates as the basis for designing and reviewing stormwater infrastructure in the Vermillion River Watershed.

The atlas improves on previous precipitation-frequency analyses in three primary areas: denser data networks with a greater period of record, the application of regional frequency analysis using L-moments (a statistical analysis) for selecting and setting parameters for probability distributions, and new techniques for spatial interpolation and mapping.

An example is the "100-year storm," a storm with a one-percent chance of recurrence, that guides many critical infrastructure calculations scientists, engineers, hydrologists, and others use for planning and design. Technical Paper 40, or TP40, created by the United States Weather Bureau in 1961, was the foremost precipitation-frequency atlas used until Atlas 14 was released.

TP40 estimated that the 100-year, 24-hour storm, or the storm with a one-percent chance of recurrence within the Vermillion River Watershed, was approximately six inches of precipitation. (See Figure 1.5.2: TP 40 Return Frequency.)

Atlas 14 predicts that the one percent chance of recurrence or 100-year storm

in the area near the City of Farmington, Minnesota, is 7.40 inches of precipitation (See Figure 1.5.3: Atlas 14 Point Precipitation Frequency Estimates.)

This change in the estimated precipitation is clearly different from the TP40's estimated precipitation, and means that significant changes will be likely in how engineers plan and design infrastructure in the future. It also means that because the values have increased, existing infrastructure may be inadequately designed to handle current and future climate conditions.

Figure 1.5.2: TP 40 Return Frequency

Duration	1-Year (100%)	2-Year (50%)	10-Year (10%)	50-Year (2%)	100-Year (1%)
5-minute	0.4	0.43	0.59	0.76	0.84
15-minute	0.7	0.84	1.2	1.6	1.7
1-hour	1.1	1.4	2.1	2.7	3
2-hour	1.3	1.7	2.5	3.2	3.5
3-hour	1.45	1.8	2.7	3.5	3.9
6-hour	1.7	2.1	3.2	4	4.5
12-hour	2.02	2.5	3.7	4.7	5.3
24-hour	2.2	2.8	4.2	5.4	6
2-day	2.6	3.3	4.8	6.3	7
4-day	3.2	4	5.6	7.5	8.3

Figure 1.5.3: Atlas 14 Point Precipitation Frequency Estimates

Duration	1-Year (100%)	2-Year (50%)	10-Year (10%)	50-Year (2%)	100-Year (1%)
5-minute	0.35	0.42	0.64	0.92	1.05
15-minute	0.63	0.75	1.15	1.64	1.88
1-hour	1.16	1.38	2.18	3.27	3.81
2-hour	1.43	1.70	2.72	4.17	4.91
3-hour	1.60	1.89	3.04	4.76	5.66
6-hour	1.86	2.20	3.54	5.58	6.66
12-hour	2.13	2.49	3.88	5.95	7.03
24-hour	2.46	2.80	4.16	6.28	7.40
2-day	2.85	3.18	4.51	6.64	7.78
4-day	3.33	3.69	5.12	7.30	8.45

Section 2: Existing and Future Biological Environment

2.0 Background

Understanding existing and future conditions in the Vermillion River Watershed is critical in determining goals, objectives, and actions that best protect, restore, or enhance watershed resources and meet communities' needs. This section summarizes existing and future biological environments in the watershed and conditions expected to affect the watershed's biological make-up through the 10-year term of the Watershed Plan.

2.1 Ecoregions

The U.S. Environmental Protection Agency (EPA) and Minnesota Pollution Control Agency (MPCA) classify the state into seven ecoregions – geographic contiguous areas with similar climate, soil types, and plant and animal species. These ecoregion classifications have a direct impact on water-quality standards for rivers and streams in the Vermillion River Watershed.

Lakes and streams around Minnesota have different physical and chemical properties, based on their location and geographic and environmental conditions in the area. The metrics to evaluate water quality for an individual water body in Minnesota depend on its ecoregion. These ecoregions consist of large land masses containing a geographically distinct collection of plants, animals, natural communities, and environmental conditions. (See Figure 2.1.1: Vermillion River Watershed Level III and IV Ecoregions.) The MPCA uses the Level III ecoregions as a starting point for establishing many of the water quality standards for surface waters in the State.

The Vermillion River Watershed is in three different Level III ecoregions:

North Central Hardwood Forest

Both the western edge of the watershed and a small portion on the northeastern edge are in the North Central Hardwood Forest ecoregion. It is an area of transition between forested and agricultural areas. The terrain varies from rolling hills to smaller plains. Upland areas are forested by hardwoods and conifers. Plains include livestock pastures, hay fields and row crops such as potatoes, beans, peas and corn. This ecoregion contains many lakes, and general water clarity and nutrient levels are moderate. Land surrounding many of these lakes has been developed for housing and recreation, and the densely populated metropolitan area dominates the eastern portion of this region. Typical measurements for lakes and streams in this ecoregion are presented in Figure 2.1.2: Lakes in the North Central Hardwood Forest Ecoregion, and Figure 2.1.3: Streams in the North Central Hardwood Forest Ecoregion.

Western Corn Belt Plains

The majority of the watershed is in the Western Corn Belt Plains ecoregion, which is predominantly cultivated with row crops. The land cover of the Western Corn Belt Plains in the first half of the 19th century was predominantly tall-grass prairie, forest (riparian and oak-prairie savanna), and wetlands (herbaceous marshes and wooded floodplains). The combination of the ecoregion's climate, topography, and soils enabled settlers during the 19th century to convert the existing land cover to mostly farmland. Chief surface water quality problems are turbidity and high levels of nutrients, as sediment and fertilizers are washed into the area's streams and shallow lakes. Figures 2.1.4

and 2.1.5 show typical measurements for lakes and streams in this ecoregion.

Driftless Area

A small portion of the watershed's eastern edge is in the Driftless Area ecoregion, called "driftless" for its lack of recent glacial activity. The Driftless Area is characterized by thin soils and karst terrain, which includes bluffs and coulees. Lakes are practically non-existent in this area. Because so few lakes exist in this ecoregion, typical conditions for lakes cannot be calculated. Streams in the Driftless Area have similar characteristics of those in the North Central Hardwood Forest ecoregion.

Determinations of water quality are based on what is considered normal for the Level III ecoregion where the lake, river, or stream is located.

Figure 2.1.2: Lakes in the North Central Hardwood Forest Ecoregion

Field pH	Total Suspended Solids (in mg/L)	Nitrogen/ Nitrate (in mg/L)	Total Phosphorus (in mg/L)	Turbidity (in NTU)	Secchi (in m)	Chlorophyll a (in ug/L)	Total Kjeldahl Nitrogen (in mg/L)
8.6 - 8.8	2 - 6	<0.01	0.023 - 0.050	1 - 2	1.5 - 3.2	5 - 22	<0.60 - 1.2

Figure 2.1.3: Streams in the North Central Hardwood Forest Ecoregion

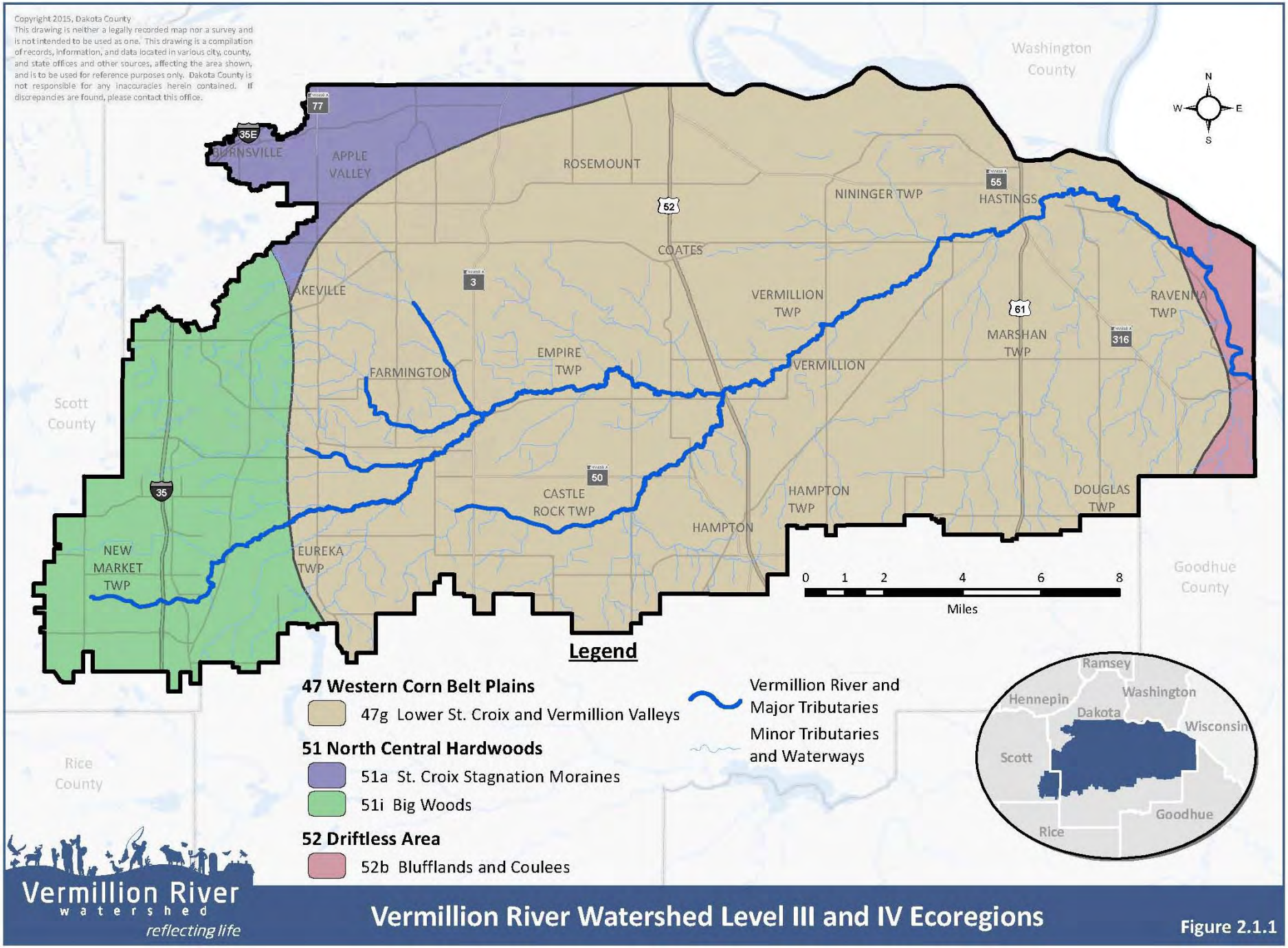
Field pH	Total Suspended Solids (in mg/L)	Nitrogen/ Nitrate (in mg/L)	Total Phosphorus (in mg/L)	Turbidity (in NTU)	Fecal Coliform (in # of organisms per 100 ml)	Temp. (°C)	Biological Oxygen Demand (in mg/L)
7.9 - 8.3	4.8 - 16	0.04 - 0.26	0.06 - 0.15	3 - 8.5	40 - 360	2 - 21	1.5 - 3.2

Figure 2.1.4: Lakes in the Western Corn Belt Plains

Field pH	Total Suspended Solids (in mg/L)	Nitrogen/ Nitrate (in mg/L)	Total Phosphorus (in mg/L)	Turbidity (in NTU)	Secchi (in m)	Chlorophyll a (in ug/L)	Total Kjeldahl Nitrogen (in mg/L)
8.2 - 9.0	7 - 18	0.01 - 0.02	0.065 - 0.150	3 - 8	0.5 - 1.0	30 - 80	1.3 - 2.7

Figure 2.1.5: Streams in the Western Corn Belt Plains

Field pH	Total Suspended Solids (in mg/L)	Nitrogen/ Nitrate (in mg/L)	Total Phosphorus (in mg/L)	Turbidity (in NTU)	Fecal Coliform (in # of organisms per 100 ml)	Temp. (°C)	Biological Oxygen Demand (in mg/L)
8.0 - 8.2	10- 61	1.4 - 7.4	0.16 - 0.33	5.2 - 22	70 - 790	3.5 - 20	2.0- 5.5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This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information, and data located in various city, county, and state offices and other sources, affecting the area shown, and is to be used for reference purposes only. Dakota County is not responsible for any inaccuracies herein contained. If discrepancies are found, please contact this office.
Washington County
Scott County
Rice County
Goodhue County
BURNSVILLE
APPLE VALLEY
ROSEMOUNT
NININGER TWP
HASTINGS
COATES
LAKEVILLE
VERMILLION TWP
RAVENNA TWP
MARSHAN TWP
EMPIRE TWP
FARMINGTON
VERMILLION
CASTLE ROCK TWP
HAMPTON TWP
HAMPTON
DOUGLAS TWP
NEW MARKET TWP
EUREKA TWP
77
35E
52
55
3
61
316
50
35
N
W
E
S
0 1 2 4 6 8
Miles
Legend
47 Western Corn Belt Plains
47g Lower St. Croix and Vermillion Valleys
51 North Central Hardwoods
51a St. Croix Stagnation Moraines
51i Big Woods
52 Driftless Area
52b Blufflands and Coulees
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed reflecting life
Vermillion River Watershed Level III and IV Ecoregions
Figure 2.1.1

2.2 Ecological Classification

The Minnesota Department of Natural Resources (DNR) and the U.S. Forest Service developed a statewide Ecological Classification System (ECS). Ecological land classifications are used to identify, describe, and map progressively smaller areas of land with uniform ecological features. These classifications are not identical to those defined by the EPA in ecoregions.

The system uses associations of biotic and environmental factors, including climate, geology, topography, soils, hydrology, and vegetation. ECS mapping enables resource managers to consider ecological patterns in managing land and water resources. The ECS has eight levels of classification. For the purposes of the Vermillion River Watershed Plan, only descriptions of the subsections in the watershed are discussed here.

The watershed includes parts of five Ecological Subsections, each of which has unique features and sensitivities. Descriptions are derived from the Minnesota Department of Natural Resources 2006 report *Tomorrow's Habitat for the Wild and Rare: Comprehensive Wildlife Conservation Strategy*.

Big Woods Subsection

This subsection covers the portion of the watershed furthest to the west. It includes the City of Elko New Market and New Market Township. The subsection coincides with a large block of deciduous forest that was present at the time of Euro-American settlement. Topography is gently to moderately rolling. Soils are formed in thick deposits of gray limey glacial till left by the Des Moines lobe. Northern red oak, sugar maple, basswood, and American elm were most common in this dominantly forested region.

More than 75 percent of the subsection is currently cropland, with an additional 5 to 10 percent pasture. The remaining 10 to 15 percent is either upland forest or wetland. Big Woods habitats feature woodland birds, such as red-shouldered hawks and warblers, savanna species such as Blanding's turtles and red-headed woodpeckers, and wetland species such as turtles, ospreys, Forster's terns, and black terns.

St. Paul Baldwin Plains and Moraines Subsection

This subsection encompasses much of the eastern Twin Cities metropolitan area and is dominated by urban land uses. Oak and aspen savannas were primary plant communities before European settlement; tallgrass prairie and maple-basswood forest were also common. The Mississippi River flows through the center of this subsection and the St. Croix River forms its eastern boundary. It is a significant migratory corridor for birds. Mussels and fish depend on the clear, unpolluted waters of the St. Croix. Featured species include bald eagles, peregrine falcons, red-shouldered hawks, Blanding's turtles, trumpeter swans, hooded warblers and bobolinks. Recreational opportunities abound in state and regional parks, scientific and natural areas, and nature centers.

The Blufflands Subsection

The furthest eastern edge of the Vermillion River Watershed, including parts of the City of Hastings and Ravenna Township, is in the Blufflands Subsection. This subsection consists of an old plateau covered by loess that has been extensively eroded along rivers and streams. It is characterized by highly dissected landscapes associated with major rivers in southeastern Minnesota.

Bluffs and deep stream valleys (500 to 600 feet deep) are common. River bottom forests grew along major streams and rivers. About 35 percent of this subsection is cropped, 23 percent is in pasture, and 33 percent is in

woodland. The Blufflands provide a critical migratory corridor for forest songbirds, raptors, and waterfowl. It is the most important subsection for reptiles and one of the most important subsections for mollusks.

Oak Savanna Subsection

Most of the Vermillion River Watershed is in the Oak Savanna Subsection. Much of this subsection is a rolling plain of loess-mantled ridges over sandstone and carbonate bedrock and till. Moraine ridges are at the southwestern edge of the subsection. They are a continuation of those present in the Big Woods subsection, but smaller. As a result, fires from the surrounding prairies to the south, west, and east burned the landscape frequently enough to maintain oak opening rather than forest.

Most of the area is farmed. Urban development is accelerating along the northern boundary. Oak savanna is one of Minnesota's rarest wildlife habitats. The scattered trees in a grassy landscape are home to Swainson's hawks, red-headed woodpeckers, regal fritillaries, bobolinks, sandhill cranes, wood turtles, Blanding's turtles, trumpeter swans, northern harriers, dickcissels, Ozark minnows, and redfin shiners.

Rochester Plateau Subsection

Portions of the southeastern watershed, including parts of Marshan, Douglas, Vermillion, and Hampton townships, are located in the Rochester Plateau Subsection. This subsection consists of an old plateau covered by loess along the eastern border and pre-Wisconsin age glacial till in the central and western parts. The western portion is a gently rolling glacial till plain that is covered by loess in places. The majority of this unit is heavily farmed.

Wildlife present in this subsection include a variety of reptiles, such as timber rattlesnakes, western foxsnakes, racers, Blanding's turtles and wood turtles; birds, including Louisiana waterthrushes, prothonotary warblers, cerulean warblers, blue-winged warblers, peregrine falcons; fish, including American brook lampreys and suckermouth minnows; and mussels, such as ellipse mussels.

Subsection Management

Each subsection requires natural resource management for different types of problems: threats from fires, floods, or tornadoes; disappearance of key habitat types as urban development and agriculture expand; loss of connectivity among types of habitat; invasive species that push native species out; and deterioration of habitat along shoreland areas and within lakes and streams.

Climatic patterns are likely to influence these ecological subsections in the future. More intense storm events may increase habitat flooding and damage. Changes in precipitation, temperature, and humidity may shift the range of current species. Some invasive species may find the changed conditions favorable and provide a competitive advantage over existing native species in areas that are disturbed or modified. Building resilience through improved management and habitat restoration and improvement will be important within the watershed for long term ecological stability.

2.3 Endangered Species

Minnesota has a rich natural heritage, but some of the species seen by early explorers of the state no longer exist or survive only in small, fragmented populations. In an effort to prevent further losses, the state Legislature passed Minnesota's Endangered and Threatened Species law in 1971. The law directs the DNR to identify species that are at greatest risk of disappearing from the State.

The DNR manages endangered species regulations, permitting, and environmental review processes.

The watershed includes three species listed by the U.S. Fish and Wildlife Service as federally endangered or threatened; the forces that may result in loss of species diversity are noted.

≈ The Northern long-eared bat, a mammal, is newly proposed for the endangered species list because of a disease called white-nose syndrome. The disease is thought to kill bats in hibernation by using up their stored energy too rapidly. Gates or other structures to exclude people from caves and mines restrict bat flight and movement, change airflow, and change internal cave and mine microclimates. A few degrees change can make a cave unsuitable for hibernating bats. Also, cave-dwelling bats are vulnerable to human disturbance while hibernating.

≈ The Higgins eye pearlymussel, a freshwater mussel, is an endangered species. Higgins eye depend on deep, free-flowing rivers with clean water. Much of their historic habitat has been changed from free-flowing to impounded river systems. Municipal, industrial, and farm run-off have degraded water quality in areas preferred by Higgins eye. Mussels concentrate chemicals and toxic metals in body tissues; they can be poisoned by chemicals in their water. Dredging and waterway traffic produce siltation, which can cover river substrate and mussel beds. Finally, zebra mussels (an invasive species) attach to pearlymussels and prevent them from moving, burrowing, or opening and closing their shells. (While the Higgins eye pearlymussel is within the range of the Vermillion River Watershed, it is primarily a deep river species and is unlikely to be found in or to migrate to the watershed.)

≈ Prairie bush clover is a federally threatened prairie plant found only in the tallgrass prairie region of four Midwestern states, including Minnesota. It is a member of the bean family and a Midwestern "endemic" – known only from the tallgrass prairie region of the upper Mississippi River Valley. Some of the surviving populations are threatened by conversion of pasture to cropland, overgrazing, agricultural expansion, herbicide application, urban expansion, rock quarrying, and transportation right-of-way maintenance and rerouting.

The Vermillion River Watershed may contain endangered, threatened, or special concern species found in Dakota and Scott counties. (See Figure 2.3.1 Endangered, Threatened, and Special Concern Rare Plants and Animals in Dakota and Scott Counties.)

The DNR implements regulations, permits, and environmental reviews affecting these species. However, managers aware that certain species are endangered, threatened, or of special concern have a better chance of addressing issues and maintaining a diverse and sustainable population of plants, animals, and aquatic species.

Figure 2.3.1: Endangered, Threatened, and Special Concern Rare Plants and Animals in Dakota and Scott Counties

Common Name	Scientific Name	Group	Federal Status	State Status
Acadian Flycatcher	*Empidonax virescens*	bird	none	special concern
American Ginseng	*Panax quinquefolius*	vascular plant	none	special concern
Bald Eagle	*Haliaeetus leucocephalus*	bird	none	special concern
Beach-heather	*Hudsonia tomentosa*	vascular plant	none	special concern
Beaked Spike-rush	*Eleocharis rostellata*	vascular plant	none	threatened
Bell's Vireo	*Vireo bellii*	bird	none	special concern
Big Tick-trefoil	*Desmodium cuspidatum* **var.** *longifolium*	vascular plant	none	special concern
Black Buffalo	*Ictiobus niger*	fish	none	special concern
Black Sandshell	*Ligumia recta*	mussel	none	special concern
Blanding's Turtle	*Emydoidea blandingii*	reptile	none	threatened
Blue Sucker	*Cycleptus elongatus*	fish	none	special concern
Butterfly	*Ellipsaria lineolata*	mussel	none	threatened
Canada Frostweed	*Helianthemum canadense*	vascular plant	none	special concern
Cerulean Warbler	*Setophaga cerulea*	bird	none	special concern
Clasping Milkweed	*Asclepias amplexicaulis*	vascular plant	none	special concern
Clustered Broomrape	*Orobanche fasciculata*	vascular plant	none	special concern
Creek Heelsplitter	*Lasmigona compressa*	mussel	none	special concern
Creeping Juniper	*Juniperus horizontalis*	vascular plant	none	special concern
Eared False Foxglove	*Agalinis auriculata*	vascular plant	none	endangered
Ebonyshell	*Fusconaia ebena*	mussel	none	endangered
Elephant-ear	*Elliptio crassidens*	mussel	none	endangered
Elktoe	*Alasmidonta marginata*	mussel	none	threatened
Fluted-shell	*Lasmigona costata*	mussel	none	special concern
Forster's Tern	*Sterna forsteri*	bird	none	special concern
Gophersnake	*Pituophis catenifer*	reptile	none	special concern
Hair-like Beak-rush	*Rhynchospora capillacea*	vascular plant	none	threatened
Henslow's Sparrow	*Ammodramus henslowii*	bird	none	endangered
Hickorynut	*Obovaria olivaria*	mussel	none	special concern
Higgins Eye	*Lampsilis higginsii*	mussel	endangered	endangered
Hill's Thistle	*Cirsium pumilum* **var.** *hillii*	vascular plant	none	special concern
Hooded Warbler	*Setophaga citrina*	bird	none	special concern
James' Polanisia	*Polanisia jamesii*	vascular plant	none	endangered
Kentucky Coffee-tree	*Gymnocladus dioica*	vascular plant	none	special concern
Kitten-tails	*Besseya bullii*	vascular plant	none	threatened

Common Name	Scientific Name	Group	Federal Status	State Status
Loggerhead Shrike	*Lanius ludovicianus*	bird	none	threatened
Monkeyface	*Quadrula metanevra*	mussel	none	threatened
Mucket	*Actinonaias ligamentina*	mussel	none	threatened
Narrow-leaved Pinweed	*Lechea tenuifolia* **var.** *tenuifolia*	vascular plant	none	endangered
North American Racer	*Coluber constrictor*	reptile	none	special concern
Old Field Toadflax	*Nuttallanthus canadensis*	vascular plant	none	special concern
Ovate-leaved Skullcap	*Scutellaria ovata* **var.** *versicolor*	vascular plant	none	threatened
Ozark Minnow	*Notropis nubilus*	fish	none	special concern
Peregrine Falcon	*Falco peregrinus*	bird	none	threatened
Pirate Perch	*Aphredoderus sayanus*	fish	none	special concern
Pistolgrip	*Tritogonia verrucosa*	mussel	none	threatened
Plains Hog-nosed Snake	*Heterodon nasicus*	reptile	none	special concern
Plains Pocket Mouse	*Perognathus flavescens*	mammal	none	special concern
Plains Wild Indigo	*Baptisia bracteata* **var.** *glabrescens*	vascular plant	none	special concern
Prairie Bush Clover	*Lespedeza leptostachya*	vascular plant	threatened	threatened
Purple Wartyback	*Cyclonaias tuberculata*	mussel	none	threatened
Rattlesnake-master	*Eryngium yuccifolium*	vascular plant	none	special concern
Red-shouldered Hawk	*Buteo lineatus*	bird	none	special concern
Regal Fritillary	*Speyeria idalia*	insect	none	special concern
Rhombic-petaled Evening Primrose	*Oenothera rhombipetala*	vascular plant	none	special concern
Rock Pocketbook	*Arcidens confragosus*	mussel	none	endangered
Rock Sandwort	*Minuartia dawsonensis*	vascular plant	none	special concern
Rough-seeded Fameflower	*Phemeranthus rugospermus*	vascular plant	none	endangered
Round Pigtoe	*Pleurobema sintoxia*	mussel	none	threatened
Sandy Stream Tiger Beetle	*Cicindela macra macra*	insect	none	special concern
Sea-beach Needlegrass	*Aristida tuberculosa*	vascular plant	none	special concern
Sheepnose	*Plethobasus cyphyus*	mussel	endangered	endangered
Skipjack Herring	*Alosa chrysochloris*	fish	none	special concern
Small White Lady's-slipper	*Cypripedium candidum*	vascular plant	none	special concern
Smooth Softshell	*Apalone mutica*	reptile	none	special concern
Snow Trillium	*Trillium nivale*	vascular plant	none	special concern
Spectaclecase	*Cumberlandia monodonta*	mussel	endangered	threatened
Spike	*Elliptio dilatata*	mussel	none	special concern
Sterile Sedge	*Carex sterilis*	vascular plant	none	threatened
Sullivant's Milkweed	*Asclepias sullivantii*	vascular plant	none	threatened
Tall Nut-rush	*Scleria triglomerata*	vascular plant	none	endangered

Common Name	Scientific Name	Group	Federal Status	State Status
Trumpeter Swan	*Cygnus buccinator*	bird	none	threatened
Tubercled Rein-orchid	*Platanthera flava* var. *herbiola*	vascular plant	none	endangered
Tuberous Indian-plantain	*Arnoglossum plantagineum*	vascular plant	none	threatened
Twig-rush	*Cladium mariscoides*	vascular plant	none	special concern
Valerian	*Valeriana edulis* **var.** *ciliata*	vascular plant	none	threatened
Wartyback	*Quadrula nodulata*	mussel	none	endangered
Washboard	*Megalonaias nervosa*	mussel	none	threatened
Water-hyssop	*Bacopa rotundifolia*	vascular plant	none	special concern
Waterwillow	*Decodon verticillatus*	vascular plant	none	special concern
Western Harvest Mouse	*Reithrodontomys megalotis*	mammal	none	special concern
White Wild Indigo	*Baptisia lactea* **var.** *lactea*	vascular plant	none	special concern
Whorled Nut-rush	*Scleria verticillata*	vascular plant	none	threatened
Winged Mapleleaf	*Quadrula fragosa*	mussel	endangered	endangered
Wolf's Spike-rush	*Eleocharis wolfii*	vascular plant	none	endangered
Wood Turtle	*Glyptemys insculpta*	reptile	none	threatened
Yellow Sandshell	*Lampsilis teres*	mussel	none	endangered

2.4 Invasive Species

Several Minnesota state laws regulate the introduction and spread of invasive species. Invasive species are classified as prohibited, regulated, or unregulated non-native species. The DNR and Minnesota Department of Agriculture (MDA) have primary responsibilities for preventing invasive species from migrating into or within Minnesota and damaging natural resources and native species.

Figure 2.4.1: Prohibited Invasive Species in the Range of the Vermillion River Watershed

Prohibited	Common Name	Scientific Name
Aquatic Plants	Curly-leaf pondweed	*Potamogeton crispus*
	Eurasian watermilfoil	*Myriophyllum spicatum*
	Purple loosestrife	*Lythrum salicaria or Lythrum virgatum*
	Flowering rush	*Butomus umbellatus*
Fish	Bighead carp	*Hypophthalmichthys nobilis*
	Grass carp	*Ctenopharyngodon idella*
	Silver carp	*Hypophthalmichthys molitrix*
Invertebrates	Zebra mussel	*Dreissena spp.*

Figure 2.4.2: Regulated Invasive Species in the Range of the Vermillion River Watershed

Regulated	Common Name	Scientific Name
Aquatic Plants	Non-native waterlilies	*Nymphaea spp.*
	Yellow iris or yellow flag	*Iris pseudacoris*
Fish	Common carp, koi	*Cyprinus carpio*
	Goldfish	*Carassius auratus*
Invertebrates	Banded mystery snail	*Viviparus georgianus*
	Chinese mystery snail, Japanese trap door snail	*Cipangopaludina spp.*

The Vermillion River Watershed has unique protection against some invasive species provided by the Vermillion River Falls in the City of Hastings. This 35-foot drop, located adjacent to the ConAgra Foods facility, serves as a natural barrier to the migration of some aquatic species, such as carp that threaten the St. Croix and Mississippi Rivers.

Prohibited Invasive Species

It is unlawful (a misdemeanor) to possess, import, purchase, transport, or introduce prohibited species except under a permit for disposal, control, research, or education. The species in Figure 2.4.1, Prohibited Invasive Species in the Range of the Vermillion River Watershed, have been found in or near the Vermillion River Watershed.

Regulated Invasive Species

It is legal to possess, sell, buy, and transport regulated invasive species, but they may not be released or planted in public waters. (See Figure 2.4.2., Regulated Invasive Species in the Range of the Vermillion River Watershed.)

Unregulated Non-native Species

One species in this category is important in the Vermillion River Watershed – the brown trout (*L. Salmo trutta*). Some reaches of the Vermillion River are DNR-designated trout streams in part because brown trout that were stocked before 2007 are now self-sustaining.

Figure 2.4.3: Noxious Weeds in the Range of the Vermillion River Watershed

Classification	Common Name	Scientific Name
Prohibited-eradicate	Oriental bittersweet	*Celastrus orbiculatus* Thunb.
Prohibited-control	Leafy spurge	*Euphorbia esula (L.)*
Prohibited-control	Canada thistle	*Cirsium arvense (L.) Scop.*
Prohibited-control	Plumeless thistle	*Carduus acanthoides* L.
Prohibited-control	Purple loosestrife	*Lythrum salicaria L.*
Prohibited-control	Wild parsnip	Pastinaca *sativa*
Prohibited-control	Common tansy	*Tanacetum vulgare*
Prohibited-control	Spotted knapweed	*Centaurea stoebe spp. micranthos*
Restricted	Common or European buckthorn	*Rhamnus cathartica (L.)*
Restricted	Glossy Buckthorn (and all cultivars)	*Frangula alnus Mill.*
Restricted	Garlic Mustard	*Alliaria petiolata (Bieb.)*

Noxious Weeds

The MDA regulates noxious weeds, classifying them as prohibited, restricted, and specially regulated. Neither Dakota nor Scott County has a county-specific noxious weed list. (See Figure 2.4.3: Noxious Weeds in the Range of the Vermillion River Watershed.)

Figure 2.4.4: Insect Pests with Agricultural Impacts in the Vermillion River Watershed		
Common Name	**Scientific Name**	**Impacts**
Brown marmorated stink bug	*Halyomorpha halys*	Pest of fruit, leaves, stems, and seeds of fruit trees, vegetables, and soybeans.
Emerald ash borer	*Agrilus planipennis*	Pest that attacks and kills ash trees; Dakota County is under emergency quarantine.
Soybean aphid	*Aphis glycines*	Pest that causes reduction in plant vigor and growth rates, as well as leaf puckering, reduced pod/seed counts, and reduced yields.

Specific insect pests also pose particular threats to forestry and agriculture, and the MDA wants to limit the range and extent of these species. Pests found in the Vermillion River Watershed are shown in Figure 2.4.4., Insect Pests with Agricultural Impacts in the Vermillion River Watershed. Other pests, such as the Japanese beetle (*Popillia japonica*) and Reed canary grass (*Phalaris arundinacea*), are already so widespread in the state that the MDA no longer regulates them.

2.5 Fish and Wildlife Habitat

The Vermillion River fish population has been an important focus of the VRWJPO, DNR, MPCA, and recreation and wildlife groups for several years. The DNR oversaw the gradual development of a self-sustaining brown trout population in the cold-water reaches of the river and its tributaries. The VRWJPO partnered with EPA and the MPCA on two major studies between 2007 and 2012 aimed at maintaining the river's cold/cool water temperature regime.

During this time, the MPCA performed a watershed assessment that included evaluating fish communities in the VRWJPO. Several reaches of the Vermillion River and its tributaries are listed on the federal Clean Water Act 303(d) list as impaired for fish and macroinvertebrates. (In impaired reaches, the fish and macroinvertebrate populations do not meet state standards.)

DNR Scientific and Natural Areas

The Scientific and Natural Area (SNA) program preserves natural features and rare resources of exceptional scientific and educational value, two of which are located in the Vermillion River Watershed.

≈ Hastings Sand Coulee SNA is in a sandy ravine or coulee formed by a tributary stream to the Vermillion River. This site is the largest of the few remaining sand-and-gravel prairies in Dakota County. It contains 13 rare species of plants and animals.

≈ Chimney Rock SNA is in Marshan Township, within a portion of the state that escaped the last glacial advance and is characterized by deposits of loess over bedrock. The site contains a significant geologic feature consisting of three St. Peter Sandstone chimney formations capped by Platteville Limestone Formation rock. The SNA also contains four native plant communities characteristic of the dry sandy soils that underlie the site.

DNR Wildlife Management Areas

The Wildlife Management Areas (WMAs) are part of Minnesota's outdoor recreation system and are established to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. Five

are located in the Vermillion River Watershed.

- Gores Pool #3 WMA, located partially in Hastings and Ravenna townships, consists entirely of Mississippi and Vermillion River Flood Plain forest and backwater marshes. A designated Migratory Waterfowl Refuge near the south end of North Lake is off limits to all activities.
- Hastings WMA consists of restored prairie, with several small woody cover plantings and woodlands. Gores Pool #3 WMA and the Mississippi River lie just to the east of the Hastings WMA. This WMA provides habitat for upland species. Hastings Sand Coulee SNA is adjacent to the eastern boundary.
- Vermillion Highlands Research, Recreation, and WMA were established by the State as part of the University of Minnesota (U of M) stadium agreement in 2006. The unit, managed by the DNR and U of M, provides recreation for the public and research opportunities for the University. Portions of the WMA are open for in-season hunting of certain species throughout the year.
- Spartina WMA in New Market Township (Scott County) is located entirely within a drained wetland basin. It is located within an area of scattered woods and wetlands, and the predominant vegetation is lowland shrubs and trees, some wetland and some grassland. This unit is managed for wetland species as well as species that prefer brushland.

DNR Aquatic Management Areas

Aquatic Management Areas (AMAs) are areas acquired along shorelines to provide angler and management access, protect critical shoreland habitat, and provide areas for education and research.

The Vermillion River AMA consists of separate parcels, formerly farmed, through which the Vermillion River flows. The DNR has completed large aquatic restoration projects at the Miles, Otting, and Kummer parcels to improve trout habitat and plans to complete a restoration project at the Kasel parcel. Recreation opportunities include hunting, fishing, birding, and photography.

The efforts of fish and wildlife conservation groups to preserve habitat have been very successful in maintaining and expanding fishing, hunting, birdwatching, and other recreation within the Vermillion River Watershed. The groups partner with local governments, including the VRWJPO, and help fund restoration and improvement through grants, volunteer efforts, and community engagement.

Dakota Habitat Alliance (DHA) has been improving and protecting wildlife habitat in Dakota County for many years. The DHA is a cooperative partnership among:

- Dakota County Soil and Water Conservation District (SWCD),
- Dakota Ringnecks Chapter of Pheasants Forever,
- Dakota Great Swamp Chapter of the Minnesota Waterfowl Association,
- Twin Cities Chapter of Trout Unlimited,
- National Wild Turkey Federation, and
- Southern Dakota County Sportsmen's Club.

Among those important habitat protection and restoration projects undertaken by these groups (together, in partnership with government agencies, or individually) are:

- Vermillion River AMA stream restorations, which included stream re-meanders, stream stabilization, installation of trout habitat (root wads, lunker structures), shoreline vegetation, invasive species removal, and shading.
- Dakota County Agricultural Society Easement, a 210-acre protected area

south of the Dakota County Fairgrounds, first taken out of agricultural production by the Society's board at the request of wildlife and habitat groups in 2000. These groups helped restore the natural prairie habitat and established walking trails for public use along with allowing coordinated use for educational activities like the Dakota County SWCD Outdoor Education Days. Pheasants Forever and Dakota County SWCD have been key drivers in the development of this native prairie. The easement was acquired to permanently protect the area in 2011, partially funded by the VRWJPO. It is located at the headwaters of the South Branch tributary to the Vermillion River.

- Fish stocking assistance for the DNR, including the initial stocking of brown trout before the population became self-sustaining, continues to be a focus for the Southern Dakota County Sportsmen's Club.
- The Vermillion Stewards program, coordinated by Friends of the Mississippi River and partly funded by the VRWJPO, holds several volunteer events each year to preserve rare habitat in the watershed and improve habitat along the Vermillion River. Restoration, invasive species removal, and seed collection take place annually at the Hastings Sand Coulee SNA.
- Great River Greening has planted native species and removed invasive plants around Lake Alimagnet in Apple Valley.
- The Hastings Environmental Protectors organizes Mississippi River clean-up events and partners with Carpenter St. Croix Nature Center on improvements to bird habitat along the Mississippi flyway.
- Lakeville Friends of the Environment participates in an annual South Creek clean-up event.

2.6 Water-based Recreation

Both Dakota and Scott counties contain areas with rapidly expanding populations. Substantial planning in both counties ensures that parks and open spaces are protected.

Dakota and Scott counties acquire easements to provide permanent protection for prime farmland, natural areas, and shoreland. A current map of protected lands in Dakota County is available on the County website, www.dakotacounty.us, term search *land conservation map summary*.

Dakota County conducted a Vermillion River Corridor planning and visioning effort in 2010 to ask people what they perceived as the river's best future condition and how it could be achieved. The Corridor Plan focused on improvements to water quality, habitat, and recreation opportunities. Dakota County parks and trails within (or affecting the hydrology of) the Vermillion River Watershed include: Lebanon Hills Regional Park in Eagan; Spring Lake Park Reserve in Hastings; Whitetail Woods Regional Park in Empire Township; Dakota Woods Dog Park in Rosemount; and the Mississippi River Regional Trail. Each park has a master plan, available at www.dakotacounty.us, search *park master plans*.

Figure 2.6.1: Lake Impairments in the Vermillion River Watershed

Impaired Water	Location	Designated Use	Impairment	Year Listed	TMDL
Farquar Lake	Apple Valley	Aquatic Recreation	Nutrients	2002	Yes
Long Lake	Apple Valley	Aquatic Recreation	Nutrients	2002	Yes
Marion Lake	Lakeville	Aquatic Consumption	Mercury	1998	Yes
East Lake	Lakeville	Aquatic Recreation	Nutrients	2012	Yes
Alimagnet Lake	Burnsville and Apple Valley	Aquatic Recreation	Nutrients	2002	Yes
Lake Rebecca	Hastings	Aquatic Consumption	Mercury	1998	Yes

Several recreational lakes in the Vermillion River Watershed are impaired for aquatic recreation or aquatic consumption. Figure 2.6.1, Lake Impairments in the Vermillion River Watershed, summarizes the lakes, the impairments, and whether a Total Maximum Daily Load (TMDL) study has been completed. These recreational lakes are shown in Figure 2.6.2: Recreational Lakes in the Vermillion River Watershed. The cities in which these lakes are located have assumed the primary responsibility for TMDL studies or ongoing planning and management of local lakes.

The City of Apple Valley completed a TMDL study and plan for Long and Farquar Lakes and is implementing improvements, including projects cost-shared by the VRWJPO. The city has assumed the leadership role for reducing nutrient loads to Long and Farquar Lakes, working cooperatively with the local lake association and routinely communicating results to citizens. The TMDL study and plan for Long and Farquar Lakes are on the MPCA website.

The Cities of Apple Valley and Burnsville developed a lake management and implementation plan for Lake Alimagnet, which is partially located in each jurisdiction. The 2005 lake management plan is available on the City of Apple Valley website. The VRWJPO completed a TMDL study for Lake Alimagnet in 2015 and strategies for reducing nutrient impairment are included in the Vermillion River Watershed Restoration and Protection Strategy (WRAPS).

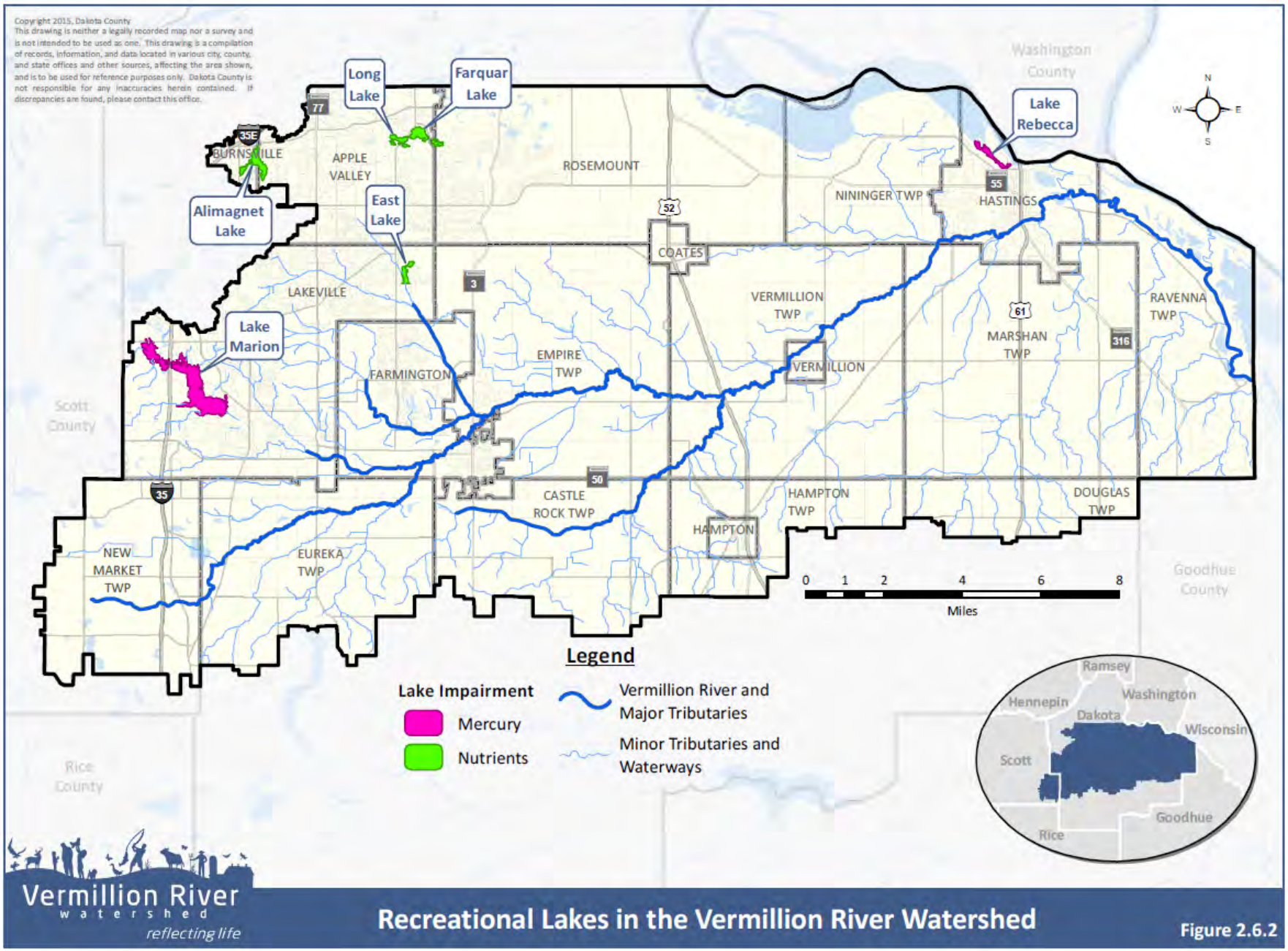
The City of Lakeville has defined East Lake as a wetland and included it in its 2003 Wetland Management Plan. The MPCA defines East Lake as an impaired lake, and the VRWJPO included it in the WRAPS.

The MS4 communities with nutrient-impaired lakes have been allocated waste load reductions for phosphorus, which will be incorporated into their NPDES permits.

Lake Marion and Lake Rebecca, which are impaired for mercury, are widely used for recreation. Preventing Lake Marion water quality from impairment for nutrients is a priority for the City of Lakeville and the VRWJPO. The VRWJPO has provided cost-share for projects to help the city prevent impacts of excess nutrients on Lake Marion.

Canoeing and kayaking opportunities in the Vermillion River main stem, primarily east of U.S. Hwy 52 and on the Vermillion River Bottoms (below the falls), can be accessed at road crossings at the road rights-of-way or on public land.

Because approximately 90 percent of the land along the Vermillion River corridor is privately owned, users of the river for canoeing and kayaking must be sensitive to the rights of landowners. However, the lower main stem of the Vermillion River and the Vermillion River Bottoms could see increased use for canoeing and kayaking in the future.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Long Lake
Farquar Lake
Lake Rebecca
Alimagnet Lake
East Lake
Lake Marion
BURNSVILLE
APPLE VALLEY
ROSEMOUNT
NININGER TWP
HASTINGS
COATES
LAKEVILLE
VERMILLION TWP
MARSHAN TWP
RAVENNA TWP
EMPIRE TWP
FARMINGTON
VERMILLION
CASTLE ROCK TWP
HAMPTON TWP
HAMPTON
DOUGLAS TWP
NEW MARKET TWP
EUREKA TWP
Washington County
Scott County
Goodhue County
Rice County
0 1 2 4 6 8
Miles
Legend
Lake Impairment
Mercury
Nutrients
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Recreational Lakes in the Vermillion River Watershed
Figure 2.6.2

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Section 3: Water Quality and Quantity

3.0 Monitoring

The primary purposes of water quality and quantity monitoring include:

- Characterize waters and identify changes or trends in water quality over time;
- Identify specific existing or emerging water-quality problems;
- Gather information to design specific pollution prevention or restoration programs or projects;
- Determine whether program goals -- such as compliance with state water quality standards or implementation of effective best management practices (BMPs) -- are being met;
- Respond to emergencies, such as spills and floods; and
- Identify conditions and trends associated with river flows, sources of volume and rate of flow, and potential compliance with standards.

Some monitoring activities achieve several purposes; others are specifically designed for one reason. The VRWJPO has a comprehensive monitoring system, as well as data from special studies, partner agencies, and problem-specific monitoring.

3.1 Historical Overview of Water Quality

Historical information suggests great improvements in water quality since the 1950s and '60s, when the river was reported to be seriously polluted. European settlement in the 19th and early 20th centuries converted much of the original prairie, oak savanna, and wetlands to agricultural land. Those early land-use changes, and limited knowledge and application of conservation practices, led to increases in erosion, drainage, runoff, and water pollution.

The Hastings Falls is historically significant as the site of Harrison H. Graham's 1853 grist mill. The mill produced high quality flour from the Midwest's tough spring wheat using a refined purifier, a process that transformed the flour-milling industry. Hastings Falls provides a natural barrier to migration of fish and other aquatic species to the Vermillion River.

The Dust Bowl's severe dust storms greatly damaged the ecology and agriculture of the U.S. and Canadian prairies during the 1930s; severe drought and a failure to apply erosion prevention methods caused the phenomenon. Abnormally dry and hot growing seasons, combined with lack of vegetation, turned Minnesota farm fields to dust throughout the better part of two decades. The drought and dust storms significantly affected Minnesota's economic, social, and natural landscapes. The catastrophic impacts of the Dust Bowl elevated public education, training, and technical assistance to bring soil and water conservation practices into the farm fields.

By the 1940s, U.S. entry into World War II raised concerns about adequate ordnance production. The government built the Gopher Ordnance Works (GOW) munitions plant in southern Rosemount to fulfill demand for gunpowder. The plant, although never brought to full production, discharged processed wastewater containing hazardous substances, pollutants, and contaminants to groundwater. Wastes also flowed (via a small tributary) to the Vermillion River until 1945, when GOW was closed. The river continued to deteriorate.

Meanwhile, the booming Twin Cities population began moving out to the suburbs, and cities in the northern and western areas of Dakota County grew rapidly. Commercial, industrial, and especially residential housing development swallowed up farmland, increased

pavement and parking lots, and created wastewater in need of treatment. In the 1950s and '60s, municipal sewage could be discharged in its raw form directly into the river. For cities with combined sewer systems, a heavy rain event could lead to a sewage overflow into water resources. This was a low point in the Vermillion River's health. The Vermillion River's water quality in the 1950s was "a disgrace, an insult to intelligence, and a blight on the landscape," according to Richard Dorer, game supervisor for the State of Minnesota Conservation Department (predecessor of the Minnesota Department of Natural Resources or DNR).

The public began to demand better water and hazardous waste regulations following a series of national high-profile environmental disasters. The first Earth Day took place in 1970, and not long afterwards, the U.S. Congress passed the Clean Water Act of 1972 (updated in 1977 and 1987). The Clean Water Act triggered changes in the way people managed discharge coming out of a pipe; point sources required permits. The Clean Water Act required large cities to separate sanitary and storm sewers to stop sewage overflows. Wastewater treatment plants developed large-scale systems for removing pollutants from both sewage and industrial wastewater.

Metropolitan Council Environmental Services (MCES) Empire Wastewater Treatment Plant discharged effluent to the Vermillion River until 2008, when effluent was re-routed to discharge to the Mississippi River. In a report, "The Comprehensive Water Quality Assessment of Select Metropolitan Area Streams," the MCES analyzed data collected between 1989 and 2012. It showed significant declines in phosphorus and chloride concentrations in the Vermillion River after the wastewater effluent diversion. (Download the MCES study from www.metrocouncil.org/streams.)

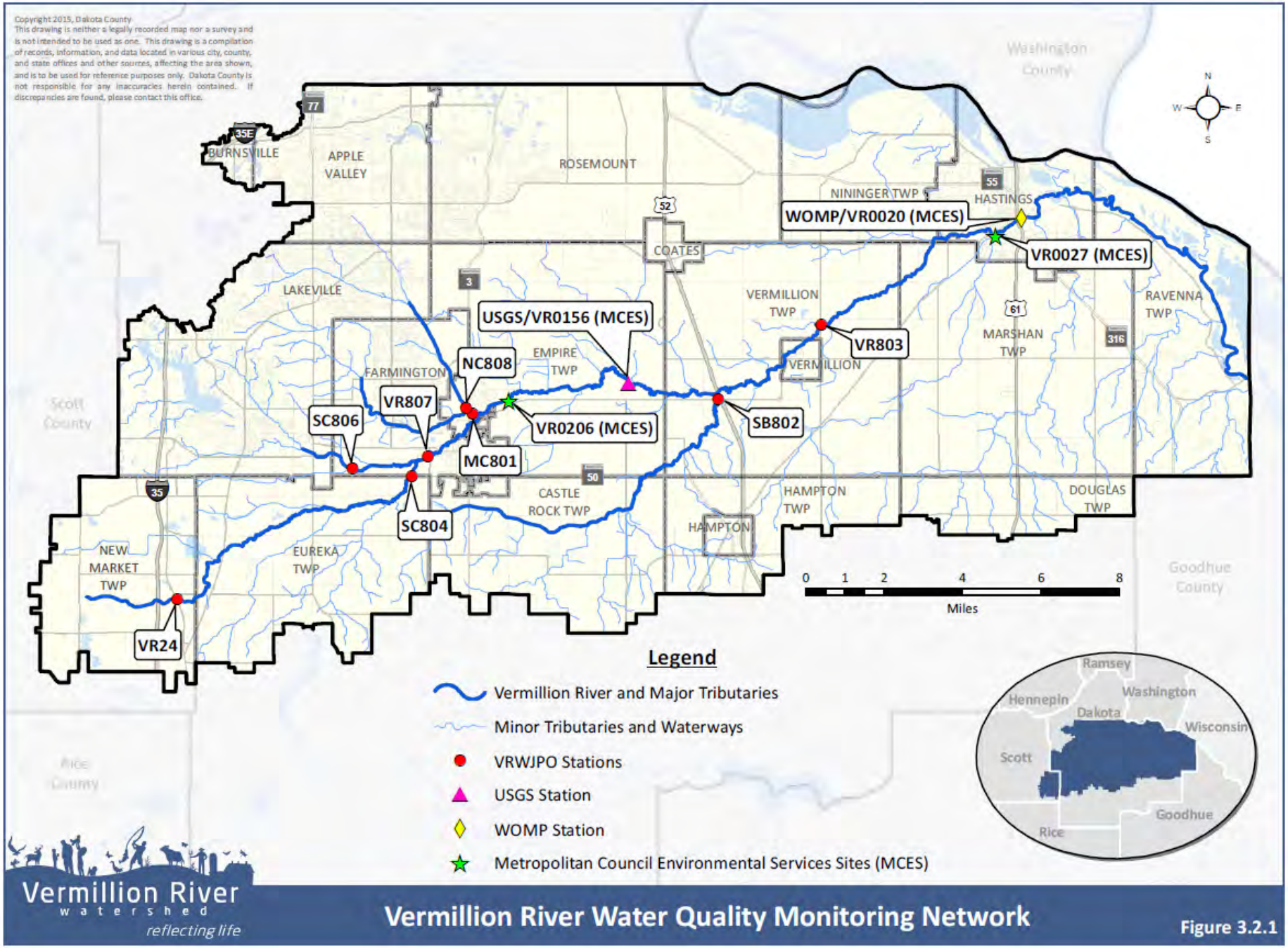
Two wastewater treatment plants (Cities of Hampton and Vermillion) exist within the watershed. The City of Hampton's wastewater treatment plant effluent discharge goes to a ditch that leads to a tributary to the South Branch of the Vermillion River. However, that discharge normally infiltrates to groundwater before reaching the tributary. The City of Vermillion's wastewater treatment plant effluent discharge goes more directly to the main stem of the Vermillion River. Elko New Market's wastewater treatment plant also re-routed its effluent to the Empire Wastewater Treatment Plant and stopped discharging to the Vermillion River in August 2011.

The river has recovered since the 1950s and '60s. The improvements in the river's water quality are measurable; the MCES report, for example, shows reductions in phosphorus, nitrate, and sediment from 1989 to 2012.

3.2 Monitoring Network

The VRWJPO implements a baseline monitoring program in the Vermillion River and its tributaries, and has done so for more than a decade. (See Figure 3.2.1: Vermillion River Water Quality Monitoring Network.) The VRWJPO, working with Dakota County Soil and Water Conservation District and Scott County Soil and Water Conservation District (SWCD), collects water samples from monitoring stations primarily located at the outlets of each major subwatershed. (See Figure 3.2.2 Vermillion River's Major Subwatersheds.)

Changes in sampling protocol and monitoring locations occasionally occur, but in general, water quality monitoring consists of collecting samples and performing lab analysis for the following: total Kjeldahl nitrogen, total phosphorus, total suspended solids, volatile suspended solids, nitrate, nitrite, dissolved phosphorus, total ammonia nitrogen, chlorophyll-a, and *E. coli* bacteria.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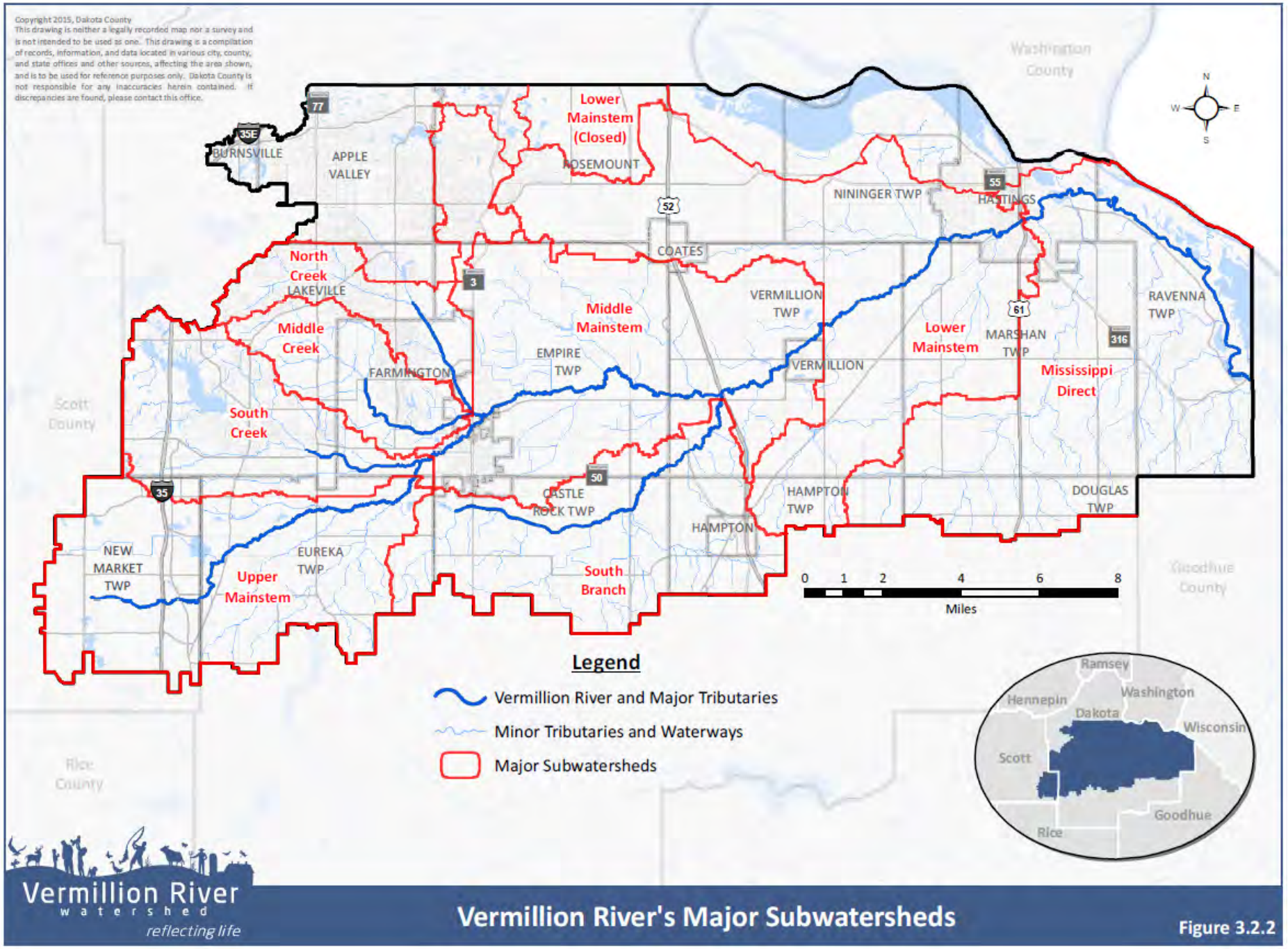
Washington County
BURNSVILLE
APPLE VALLEY
ROSEMOUNT
NININGER TWP
HASTINGS
WOMP/VR0020 (MCES)
VR0027 (MCES)
COATES
LAKEVILLE
USGS/VR0156 (MCES)
VERMILLION TWP
RAVENNA TWP
VR803
MARSHAN TWP
VERMILLION
EMPIRE TWP
FARMINGTON
NC808
VR807
SC806
VR0206 (MCES)
SB802
MC801
Scott County
CASTLE ROCK TWP
HAMPTON TWP
DOUGLAS TWP
HAMPTON
SC804
NEW MARKET TWP
EUREKA TWP
VR24
Goodhue County
0 1 2 4 6 8
Miles
Legend
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
VRWJPO Stations
USGS Station
WOMP Station
Metropolitan Council Environmental Services Sites (MCES)
Ramsey
Washington
Hennepin
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Vermillion River Water Quality Monitoring Network
Figure 3.2.1



Vermillion River's Major Subwatersheds Figure 3.2.2

The following parameters are measured on site at the time of sample collection: temperature, conductivity, pH, and dissolved oxygen (DO).

Detailed information is available in the annual monitoring reports. Data show changes in water quality, both good and bad, during the past decade.

Phosphorus and nitrate concentrations in the river were dramatically reduced when the Empire Wastewater Treatment Plant effluent was redirected. However, nitrate concentrations have been steadily rising in the South Branch Vermillion River subwatershed, although levels do not exceed the state standard.

This subwatershed has porous soils, agricultural land use, and artificial drainage systems that are likely factors affecting above-average nitrate concentrations in the South Branch. As the river nears the City of Vermillion, the underlying geology allows the river to become a losing reach, where the river water is lost to groundwater aquifers. This water then becomes drinking water for many residents and communities in the eastern portion of the watershed.

The Vermillion River Monitoring Network data help identify and track trends in pollutants. Those of most concern because they are not currently meeting state water quality standards are:

- Insufficient dissolved oxygen;
- Elevated levels of *E. coli* bacteria;
- Elevated average summer stream temperatures; and
- Elevated turbidity.

The baseline data confirm that most stream reaches meet state standards for all other indicators. However, only biomonitoring can fully assess current conditions of aquatic life.

3.3 Biomonitoring Plan

In 2009, the VRWJPO developed and implemented a biomonitoring plan. The plan established a basis to evaluate biological organisms (specifically macroinvertebrates and fish), to characterize the health of these biological communities, and identify potential stressors. Fish and macroinvertebrates are considered "end users" of the Vermillion River and its tributaries. By evaluating their populations and diversity, more can be determined about the health of the river and tributaries than can be assessed with chemical sampling alone.

An additional reason for biomonitoring is to establish the health and composition of key species to have a better idea of what is "normal." When the Minnesota Pollution Control Agency (MPCA) proposes water bodies to be listed as impaired under the Clean Water Act, determinations are made based on chemical and biomonitoring results. The VRWJPO currently monitors 10 "anchor" biomonitoring sites on an annual basis with 14 sites overall (see Figure 3.3.1 Biomonitoring Plan Annual Monitoring Sites) and has maintained annual sampling since 2009. This figure includes the locations of the designated trout stream reaches for purposes of illustration.

The biomonitoring sites are selected to ensure that the VRWJPO has data on fish and macroinvertebrates from the river and all major tributaries. Most have had a geomorphic assessment to determine habitat and channel conditions. Since 2009, biomonitoring results show that many of the Vermillion River's reaches and tributaries score fair to poor on the MPCA's Index of Biological Integrity (IBI).

The IBI evaluates fish and macroinvertebrate conditions as compared to a standard set for similarly classified rivers. The IBI metrics compare the types and quantity of species present, resulting in a score. Ultimately, the IBI scores are used to decide if a stream or stream reach is considered impaired.

The following are the eight metrics used to evaluate the health of the cold-water reaches:

1. Relative abundance (%) of individuals that are Sensitive in cold-water streams
2. Number of taxa that are Tolerant in cold-water streams
3. Relative abundance (5) individuals that are Herbivores
4. Relative abundance (%) of individuals that are Pioneer species
5. Relative abundance (%) of taxa that are Detritivores
6. Relative abundance (%) of individuals that are Native Cold-water species
7. Relative abundance (%) of taxa that are Native Cold-water species
8. Relative abundance (%) of individuals with DELT Anomalies

Metrics 6 and 7 are based on the presence of native cold-water species. There have been no native cold-water species of fish captured in the annual sampling, and the natural barrier provided by the Hastings Falls prevents the possible migration of native cold-water species. Brown trout have been a key indicator species for the Vermillion River, but brown trout is a non-native species. Brown trout are figured into the IBI in several ways. The presence of brown trout results in a positive score for metrics 1-5. Metric 8 is based on fish identified with anomalies and the species type is not critical.

Absent the stocking of native cold-water species, the VRWJPO has limited means to improve fish IBI scores.

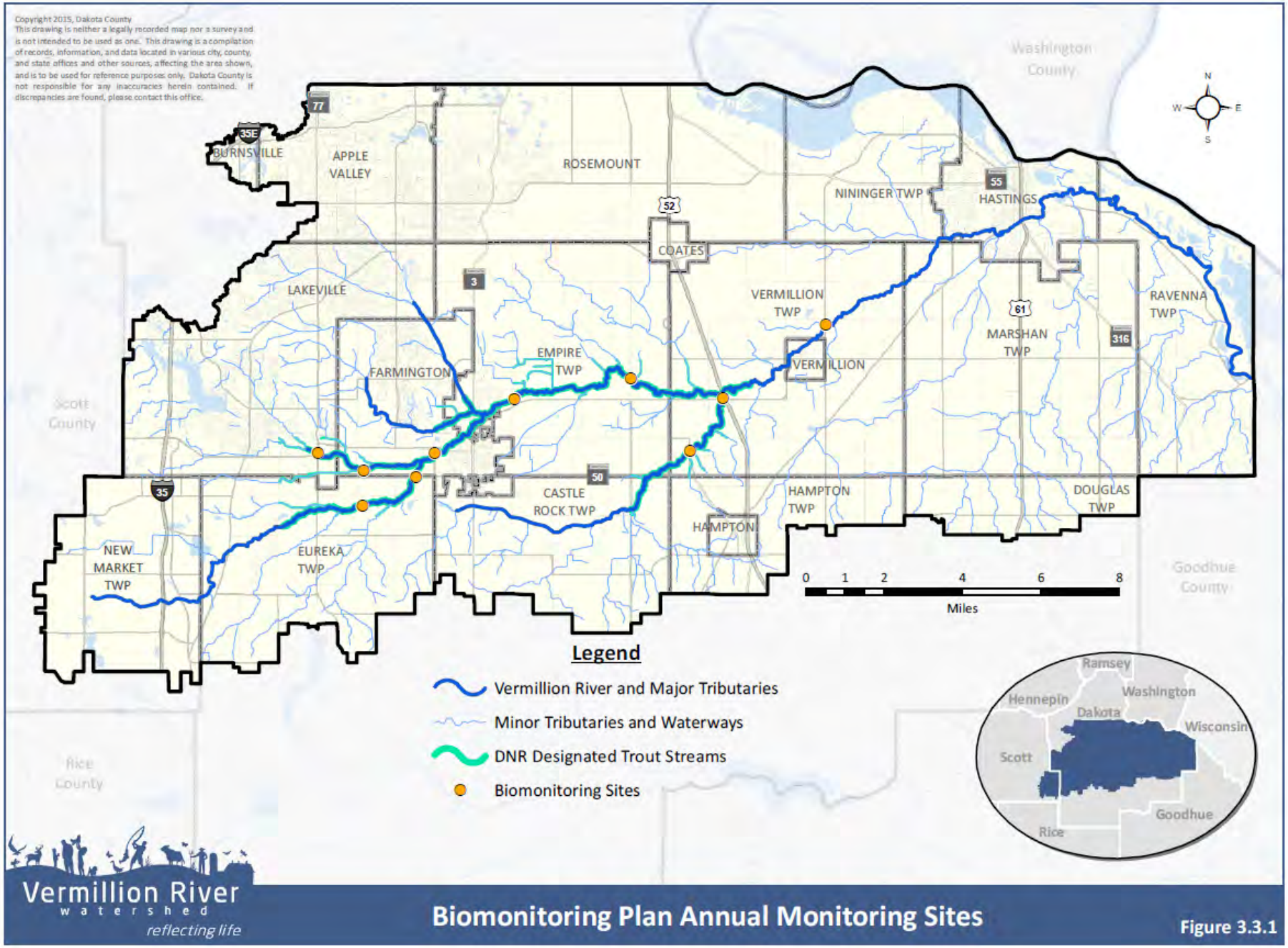
Macroinvertebrates also score fair to poor on the macroinvertebrate IBI in the Vermillion River but can overcome physical barriers and colonize in areas of suitable water quality. Macroinvertebrate scores have the potential to improve under favorable habitat conditions and improved water quality.

The majority of reaches in the Vermillion River and tributaries were identified as DNR-designated trout streams in the mid-2000s. The DNR uses multiple data sources to determine whether or not a stream is a trout stream, including stream temperature, dissolved oxygen, presence of stocked and naturally reproducing trout, and inclusion within the DNR's public waters inventory. Until recently, the MPCA has followed the DNR trout stream designation and classified designated trout streams as 2A, a cold-water resource. More stringent regulations apply to waters classified as 2A to protect native and sensitive cold water species.

Implementing the Watershed Restoration and Protection Strategy (WRAPS) and the Watershed Plan will improve water quality and habitat. This may effect reducing the presence and abundance of tolerant species and improve IBI scores. However, improvements may similarly favor improvement for tolerant species and deter a reflection in improved fish IBI scores and movement toward an unimpaired status.

Minnesota is currently revising its water quality standards (Minn. Rule Chapter 7050) to incorporate a tiered aquatic life use (TALU) framework for rivers and streams. The TALU framework represents a significant revision to the water quality standards of the state's aquatic life use classification. Whether the rule-making process will influence the VRWJPO's success in removing stream reaches from the impaired waters list remains to be seen.

The brown trout population in the Vermillion River is a self-sustaining population under current fisheries management. The stocking of rainbow trout in Rambling River Park in Farmington as a put-and-take fishery continues annually. Few rainbow trout have survived for regular capture during annual fishery surveys.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Washington County
Scott County
Rice County
Goodhue County
BURNSVILLE
APPLE VALLEY
ROSEMOUNT
NININGER TWP
HASTINGS
COATES
LAKEVILLE
VERMILLION TWP
RAVENNA TWP
MARSHAN TWP
EMPIRE TWP
FARMINGTON
VERMILLION
CASTLE ROCK TWP
HAMPTON TWP
DOUGLAS TWP
HAMPTON
NEW MARKET TWP
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0 1 2 4 6 8
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Vermillion River and Major Tributaries
Minor Tributaries and Waterways
DNR Designated Trout Streams
Biomonitoring Sites
Ramsey
Washington
Hennepin
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Biomonitoring Plan Annual Monitoring Sites
Figure 3.3.1

3.4 Watershed Restoration and Protection Strategy (WRAPS)

The MPCA shifted its approach to assessment, protection, and restoration of impaired waters in the past 10 years. Minnesota's watersheds have become the management structure for impaired waters. The MPCA plans to complete intensive assessments for each watershed, staggering the assessments over a 10-year period. From those assessments come proposals for listing water bodies as impaired and funds for developing a watershed-wide strategy to protect healthy waters and restore impaired waters. The Vermillion River Watershed was one of the first watersheds to complete a Watershed Restoration and Protection Strategy (WRAPS). (See the WRAPS studies on the VRWJPO website, Impaired Waters in the Watershed or on the MPCA website, http://www.pca.state.mn.us/w4ypk3y.)

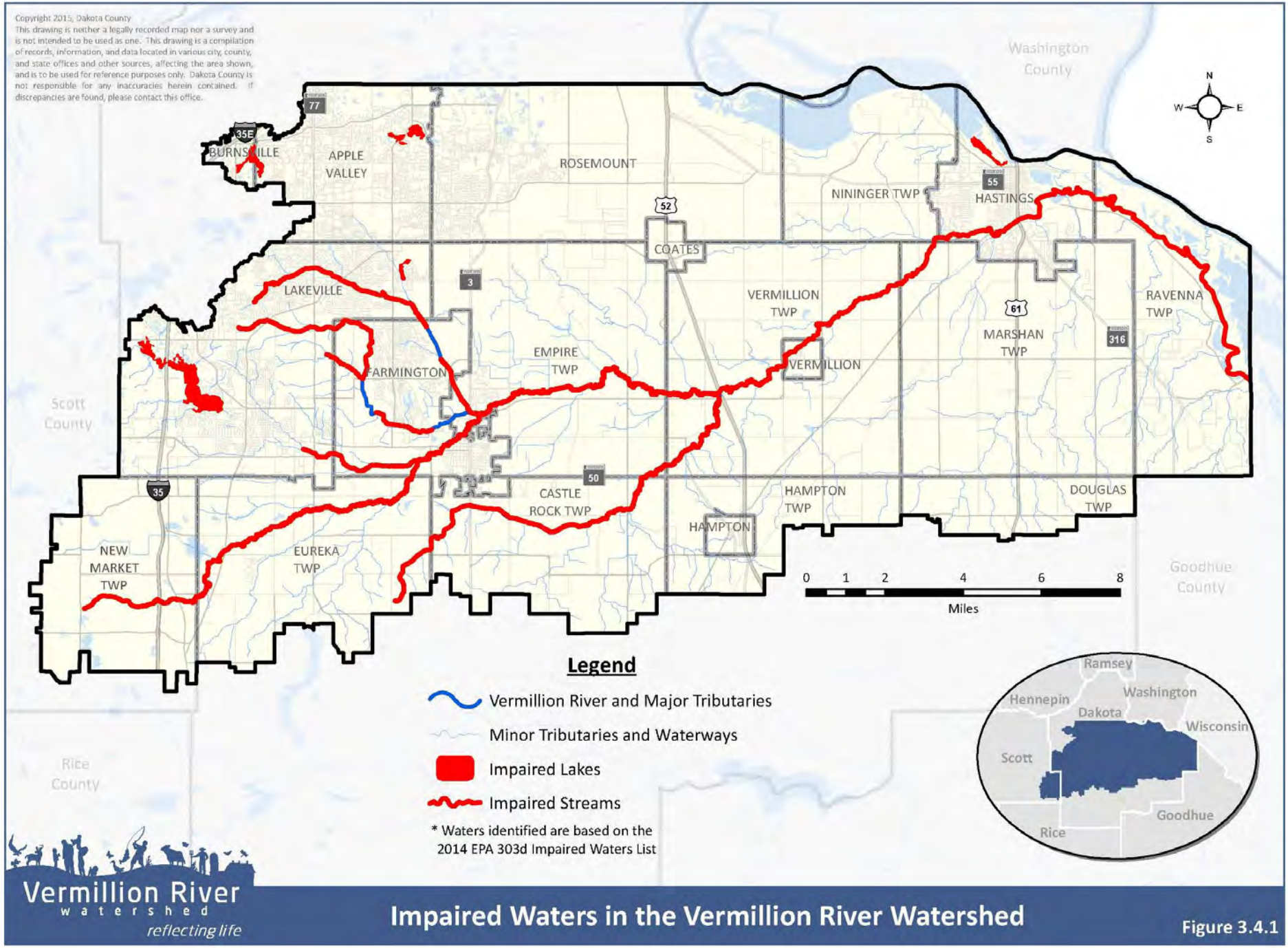
In 2008, the MPCA conducted an intensive water quality and biological data collection effort in the Vermillion River Watershed. Combined with the data from the VRWJPO baseline monitoring program, the MPCA assessed lakes' and streams' attainment of water quality standards. According to the results, many of the Vermillion River Watershed's surface waters are impaired for one or more pollutants. As of 2014, lakes and streams in the watershed are impaired for one or more of the following: excess turbidity, lack of dissolved oxygen, fecal coliform bacteria, *E. coli* bacteria, excess nutrients, fish, macroinvertebrates, mercury, and polychlorinated biphenyls (PCBs). (See Figure 3.4.1: Impaired Waters in the Vermillion River Watershed.) The VRWJPO prepared a complete list of impairments by water body and reach for its Watershed Engagement Team, a civic engagement work group. The impairments are shown in Figure 3.4.2: List of Impaired Waters in the Vermillion River Watershed, 2012.

The MPCA and VRWJPO worked together on the stressor identification (from 2012 through 2015) to identify primary stressors on fish and macroinvertebrate species and pollutant sources contributing to those stressors. Turbidity (excessive sediment or cloudiness of water) was determined the primary stressor within the river and tributaries. Excess sediment fills in vital cover and spawning areas, causes stress and injury to fish and macroinvertebrates, carries other pollutants bound to its particles, and impairs the ability of predator species to hunt for prey.

Other contributing stressors were identified, including lack of dissolved oxygen, increased water temperature, and alterations to habitat. In the lakes studied as part of the WRAPS (Lake Alimagnet and East Lake), the cause of impairment was excess nutrients (primarily phosphorus).

The next step was to develop Total Maximum Daily Loads (TMDLs) for the water resources and calculate how much pollution reduction would allow the water to meet state standards. The MPCA and VRWJPO calculated Waste Load Allocations for Municipal Separate Storm Sewer System (MS4) communities, which when final, will be incorporated into their MS4 stormwater permits. Load Allocations for unincorporated areas (townships and non-MS4 cities) will need to be achieved collectively. The VRWJPO has developed the WRAPS report, which includes strategies for achieving load reductions in each subwatershed and protecting those water bodies not on the impaired waters list. Many strategies within the WRAPS are incorporated into Section 7: Implementation Plan.

While there are currently no impairments in the watershed for chloride, it is important for the VRWJPO and its partners to be proactive in managing chloride use in the watershed to prevent future impairment. The VRWJPO hosted a three-year series of workshops on winter management of roads, parking lots and sidewalks, and summer management of turf. This was one of the strategies outlined in the Twin Cities Metro Area Chloride TMDL.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Washington County
N
W
E
S
77
35E
BURNSVILLE
APPLE VALLEY
ROSEMOUNT
52
NININGER TWP
55
HASTINGS
COATES
3
LAKEVILLE
VERMILLION TWP
61
MARSHAN TWP
316
RAVENNA TWP
EMPIRE TWP
FARMINGTON
VERMILLION
Scott County
35
50
CASTLE ROCK TWP
HAMPTON TWP
DOUGLAS TWP
HAMPTON
NEW MARKET TWP
EUREKA TWP
0 1 2 4 6 8
Miles
Goodhue County
Legend
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Impaired Lakes
Impaired Streams
* Waters identified are based on the 2014 EPA 303d Impaired Waters List
Rice County
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Impaired Waters in the Vermillion River Watershed
Figure 3.4.1

Figure 3.4.2: List of Impaired Waters in the Vermillion River Watershed, 2012

Impaired Water / HUC	Affected Resource	Jurisdictions	Designated Use	Impairment	Year Listed	TMDL
Vermillion River 504	Hastings to Mississippi River	Hastings, Ravenna Twp.	Aquatic consumption	Mercury and PCBs	1998	Statewide
			Aquatic life	Turbidity	1994	Yes
Vermillion River 507	T114 R19W S30, south line to S Br Vermillion R	Farmington, Empire Twp., Vermillion Twp.	Aquatic life	Invert and Fish IBI	2012	No
			Aquatic recreation	Fecal coliform	2002	Yes
			Aquatic consumption	Mercury	2012	Statewide
Vermillion River 516	Headwaters to T113 R20W S8, east line	Elko New Market, Newmarket Twp., Eureka Twp.	Aquatic recreation	E. coli	2012	No
			Aquatic consumption	Mercury	2012	Statewide
Vermillion River 517	T113 R20W S9, west line to T114 R19W S31, north line	Farmington, Eureka Twp.	Aquatic life	Invert and Fish IBI	2012	No
			Aquatic recreation	Fecal coliform	2008	Yes
			Aquatic consumption	Mercury	2012	Statewide
			Aquatic life	Dissolved oxygen	2010	No
			Aquatic life	Turbidity	2008	No
Vermillion River 691	S Br Vermillion R to T114 R18W S20, east line	Vermillion Twp.	Aquatic consumption	Mercury	2012	Statewide
		Vermillion Twp.	Aquatic life	Invert and Fish BI	2012	No
Vermillion River 692	T114 R18W S21, west line to Hastings Dam	Hastings, Vermillion, Vermillion Twp., Marshan Twp., Nininger Twp.	Aquatic recreation	Fecal coliform	2002	Yes
			Aquatic life	Fish IBI	2012	No
			Aquatic consumption	Mercury	2012	Statewide
South Branch 706	Headwaters to T113 R19W S2, east line	Castle Rock Twp., Eureka Twp.	Aquatic recreation	Fecal coliform	2008	No
South Branch 707	T113 R19W S2, east line to T114 R18W S29, north line	Vermillion Twp., Empire Twp., Castle Rock Twp.	Aquatic recreation	Fecal coliform	2008	No
			Aquatic life	Invert and Fish BI	2012	No
Unnamed Creek 527	Unnamed cr to Vermillion R	Farmington, Lakeville	Aquatic life	Invert and Fish BI	2012	No
			Aquatic recreation	Fecal coliform	2008	No
Unnamed Creek 542	Headwaters to Unnamed cr	Farmington, Lakeville	Aquatic recreation	Fecal coliform	2008	No
Unnamed Creek 545	Unnamed cr to Vermillion R	Farmington, Empire Twp.	Aquatic recreation	Fecal coliform	2008	No
			Aquatic life	Dissolved oxygen	2010	No
Unnamed Creek	Headwaters to Unnamed cr	Farmington, Lakeville	Aquatic recreation	E. coli	2010	No

Impaired Water/HUC	Affected Resource	Jurisdictions	Designated Use	Impairment	Year Listed	TMDL
Unnamed Creek 548	Unnamed cr to Unnamed cr	Farmington, Lakeville	Aquatic recreation	E. coli	2010	No
Unnamed Creek 668	Unnamed cr to T114 R20W S25, east line	Farmington	Aquatic recreation	Fecal coliform	2008	No
Unnamed Creek 670	Unnamed cr to T114 R19W S19, south line	Farmington	Aquatic recreation	E. coli	2010	No
Unnamed Creek 671	T114 R19W S30, north line to Unnamed cr	Farmington, Empire Twp.	Aquatic recreation	Fecal coliform	2008	No
Farquar Lake 19-0023-00	Farquar Lake	Apple Valley	Aquatic recreation	Nutrients	2002	Yes
Long Lake 19-0022-00	Long Lake	Apple Valley	Aquatic recreation	Nutrients	2002	Yes
Marion Lake 19-0026-01	East Bay	Lakeville	Aquatic consumption	Mercury	1998	Statewide
Marion Lake 19-0026-02	Middle Bay	Lakeville	Aquatic consumption	Mercury	1998	Statewide
Marion Lake 19-0026-03	West Bay	Lakeville	Aquatic consumption	Mercury	1998	Statewide
Unnamed Lake 19-0349-00	East Lake Park Pond	Lakeville	Aquatic recreation	Nutrients	2012	No
Alimagnet Lake 19-0021-00	Alimagnet Lake	Burnsville, Apple Valley	Aquatic recreation	Nutrients	2002	No
Lake Rebecca 19-0003-00	Lake Rebecca	Hastings	Aquatic consumption	Mercury	1998	Statewide

The VRWJPO recognizes that positive actions and results in the upstream areas of watersheds have positive influence and results in downstream areas. While surface waters in the Vermillion River Watershed are not impaired for nitrate, specific reaches (South Branch tributary to the Vermillion River, for example) are potentially impaired for nitrate, depending upon the level at which state standards for nitrate in surface water are set. Draft standards being evaluated by the MPCA for surface waters, if implemented, would likely lead to impaired listings in certain reaches of the Vermillion River, such as the South Branch. The VRWJPO and Dakota County are seeing nitrate levels in private wells that are well above health risk limits for drinking water. The "losing" reach of the Vermillion River east of U.S. Hwy 52 contributes nitrate to the groundwater.

Many actions in the Vermillion River Watershed Management Plan are focused on phosphorus and nitrogen reductions in the watershed. These actions are consistent with the Statewide Nutrient Reduction Strategy (http://www.pca.state.mn.us/zihy1146). The VRWJPO is aware that actions to reduce nutrients in water resources solve not just local issues, but downstream state, federal,

and international issues as well (Lake Pepin, Gulf of Mexico, etc.).

The WRAPS also includes strategies for protection of resources. It is the assumption of the VRWJPO that water resources with completed assessments that have not been identified as impaired are automatically brought into the protection category. Any unassessed water bodies also would be considered within the protection category, until such time as a formal assessment is performed and they are listed as impaired.

3.5 Surface Water Quantity

Water Quantity prior to 2005

At the time of the previous Watershed Plan development, the Vermillion River was the receiving water for effluent from four wastewater treatment plants: Empire, City of Elko-New Market, City of Vermillion, and the City of Hampton. In addition, commercial and residential development was booming, adding impervious surfaces in the form of roads, parking lots, rooftops, and driveways that rapidly move surface water to storm sewers and eventually the river and its tributaries.

Water quantity in the Vermillion River Watershed has been the subject of numerous studies and ongoing measurements by the VRWJPO and other agencies. In 1974, the U.S. Department of Agriculture Soil Conservation Service (SCS) completed a flood hazard analysis for the Vermillion River main stem. The SCS estimated that a 100-year frequency flood would inundate 2,700 acres of the study area. The report noted that local residents observed the river to go out of its banks almost every year.

In 1998, the U.S. Army Corps of Engineers performed a hydrologic study of the Vermillion River using the HEC-1 model. The HEC-1 model includes computer software that estimates river flows as the result of rainfall. The HEC-1 was calibrated by adjusting the model's input data to produce flows that matched the discharge frequency curve at the U.S. Geological Survey (USGS) Empire gauge, a sentinel site with the longest continuous record of flow within the watershed. Using the 100-year-storm data from a September 1992 event, the model calculated discharge for existing conditions and future conditions (with no additional stormwater management practices implementation). The results of the HEC-1 model were used to develop the Federal Emergency Management Agency (FEMA) floodplain delineation maps currently used in the watershed.

In 2002, Dakota County and the Metropolitan Council commissioned a Vermillion River Volume Study (Dakota County Vermillion River Volume Study Final Report, September 2002, Montgomery Watson Harza). The study explored stream flow volume in the Vermillion and its tributaries. Using data from the Empire USGS gauge, the consultant evaluated flow data during a 25-year period from 1974-1999. Major study results (all for the Empire USGS gage) include:

- ≈ River flow volume at the Empire USGS location increased during 1974-1999.
- ≈ Runoff volume increased on a year-to-year basis and for each season during the 25-year window.
- ≈ Total annual precipitation increased, especially in the 1990s, a decade that was one of the wettest ever recorded.
- ≈ Bankfull flow events occurred more frequently during 1974-1999. (See Figure 3.5.1: Frequency of Flow at or Near Bankfull Capacity, Vermillion River Empire USGS Gage.)

The 2002 Vermillion River Volume Study also calculated impacts of stormwater management practices, specifically infiltration BMPs, on river flow and runoff volumes. Analysis showed that 72 percent of all areas zoned to undergo development coincide with high-infiltration soils, and infiltration BMPs provide a significant volume and peak flow reduction.

The Hastings Area Nitrate Study (HANS) confirmed that the Vermillion River loses water to groundwater in the main stem

between the City of Vermillion and the City of Hastings. This "losing" reach directly affects nitrate levels in private drinking water supplies in the eastern watershed.

Water Quantity 2005-2014

The past 10 years have seen growth, change, and intense weather events with both beneficial and problematic impacts on water quantity. In 2005, the primary concern was that development taking place without sufficient stormwater management would increase the rate and volume of the Vermillion River. The situation in 2015 is more complex. Some of the reasons are:

- The VRWJPO adopted watershed Standards in October 2006 and Rules in March 2007, which included criteria for construction erosion control, post construction water quality, runoff temperature control, peak runoff rate control, and runoff volume control. These were adopted in cities' and townships' local water management plans and ordinances. New developments in the watershed are required to implement practices to treat, infiltrate, store, or keep stormwater volume on site. This reduced the impact of development on river volumes.
- The Empire Wastewater Treatment Plant discharged an average of 12.5 cubic feet per second (cfs) to the Vermillion River in 1997 – or approximately 15 percent of the river's flow at that time. The Metropolitan Council completed plant upgrades in 2005, including an outfall pipe that discharges effluent to the Mississippi River. This significantly improved water quality and quantity in the Vermillion River.
- The Elko-New Market Wastewater Treatment Plant connected to the Metropolitan Council's Empire Wastewater Treatment Plant, which removed Elko New Market discharge from the Vermillion River.

Figure 3.5.1: Frequency of Flow at or Near Bankfull Capacity, Vermillion River Empire USGS Gage

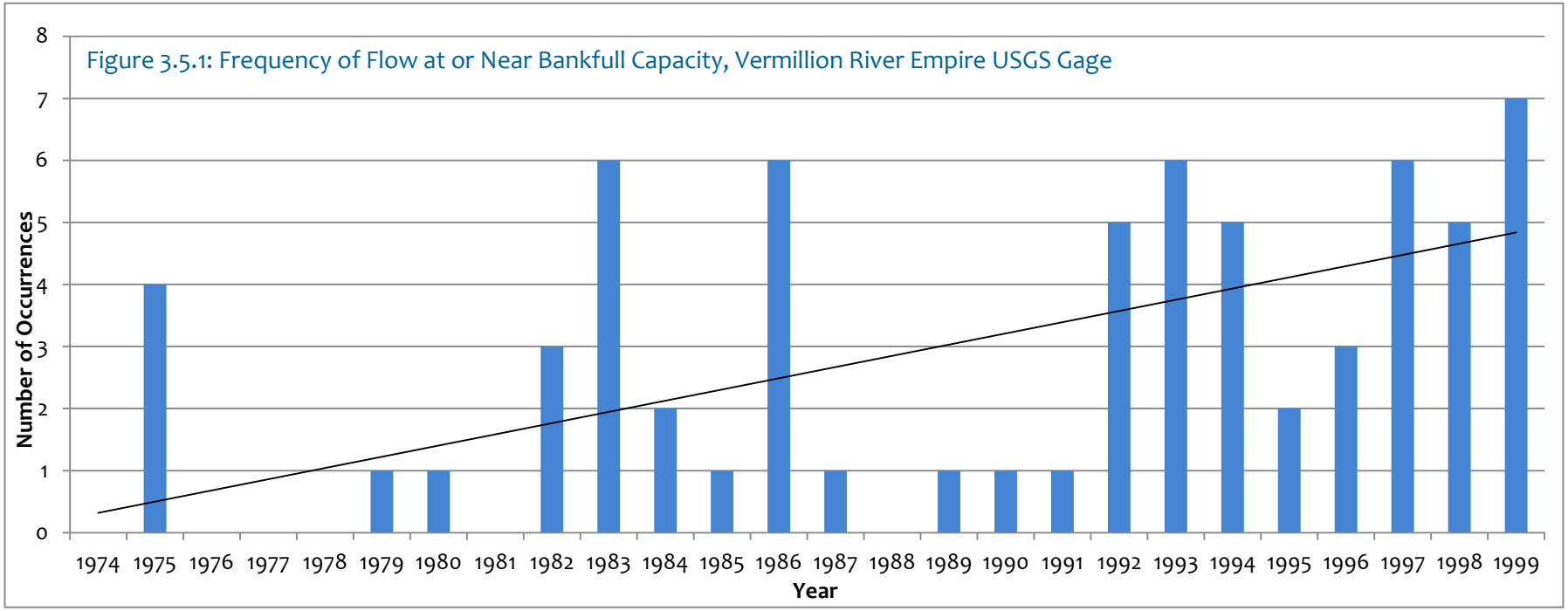
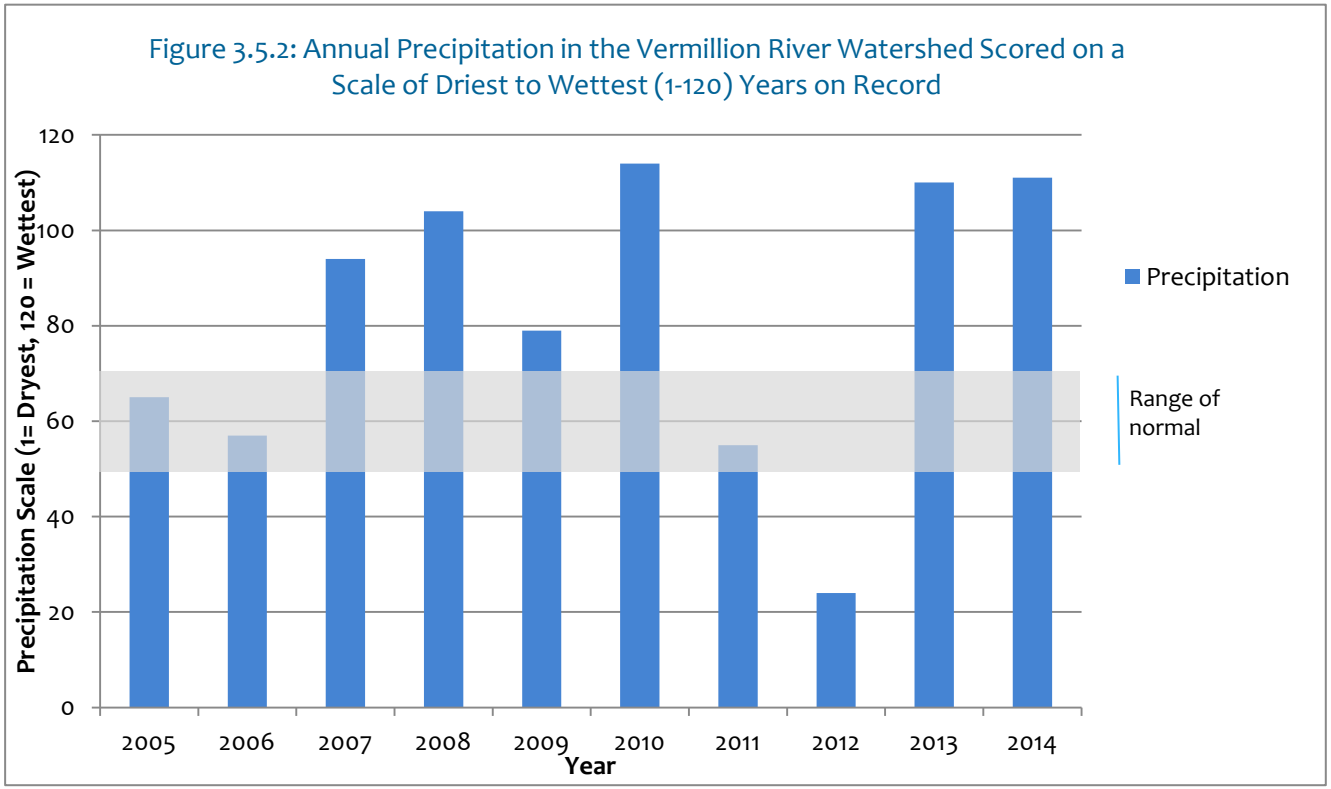


Figure 3.5.2: Annual Precipitation in the Vermillion River Watershed Scored on a Scale of Driest to Wettest (1-120) Years on Record



- Flow from the City of Hampton wastewater treatment plant frequently infiltrates before it reaches the river, so no large volume contribution has been detected.
- In cooperation with cities, businesses, public entities, and individual landowners/homeowners, the VRWJPO and Dakota County and Scott County SWCDs have cost-shared and provided technical assistance for more than 180 stormwater best management practices since 2006.
- Precipitation amounts during the years 2005-2014 have varied substantially, with one year below normal, three years of normal precipitation, and six years with above- or much above-normal precipitation. (See Figure 3.5.2: Annual Precipitation in the Vermillion River Watershed Scored on a Scale of Driest to Wettest Years on Record.)
- The VRWJPO approached the MCES to initiate discussion about the potential to redirect effluent flow from the Empire Wastewater Treatment Plant currently directed to the Mississippi River, back to the Vermillion River during extreme low flow situations.
- The City of Rosemount has requested the VRWJPO consider the option of allowing water from the city's stormwater management system (pipes, ponds, etc.) to be routed to the Vermillion River. The VRWJPO and City of Rosemount recently undertook the inclusion of the area of the City in the VRWJPO's XPSWMM Hydrologic Model to establish intercommunity flow standards.
- The Vermillion River Watershed Joint Powers Board (VRWJPB) adopted the National Oceanic and Atmospheric Administration (NOAA) Atlas 14

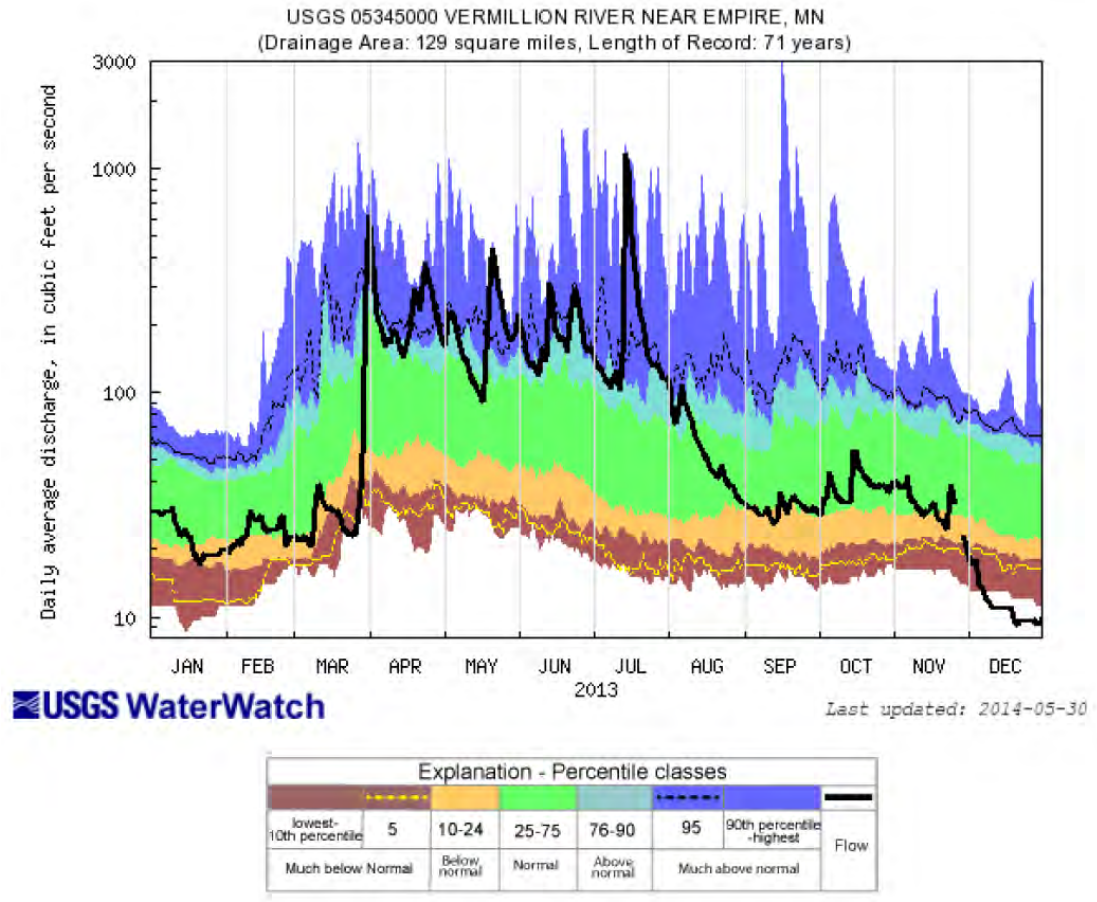
precipitation frequency estimates to guide the design and review of stormwater infrastructure. Atlas 14 includes precipitation frequency estimates that are different than those used to develop the 2005 Watershed Plan.

≈ The overall picture of flow in the watershed is of greater precipitation and flow extremes (higher highs and lower lows), rather than a steady increase in volume as the result of increased development, or a steady decrease in volume as the result of rerouting wastewater effluent. These fluctuations in flow can go from very high to very low within one calendar year. Flow rates in the watershed may be increasing, but precipitation intensity and frequency may be the biggest drivers of this change.

Discharge is continuously monitored by the USGS at the monitoring station along Blaine Avenue in Empire Township, in cooperation with the VRWJPO. In 2013 (most recent report available), as a result of above-average spring precipitation, flow was very high from April through July. Late summer had little rain, and flow quickly dropped to a low normal in August and remained there until late November. By December, flow was below the lowest 10th percentile. (See Figure 3.5.3: Daily Average Discharge in Cubic Feet/Second in Vermillion River at USGS Empire Gage in 2013.) Even with dry conditions during late summer, the 2013 cumulative flow was above normal because the stream was discharging more than average in the spring. (See Figure 3.5.4: Cumulative Streamflow in Millions of Cubic Feet at the USGS Empire Gage in 2013.)

Flow at all network monitoring stations is typically measured manually by Dakota County and Scott County Soil and Water Conservation District (SWCD) staff five to seven times per season at each site over a variety of flow regimes to develop a mathematical relationship in which flow can be estimated at any river level (stage). Each station is equipped with automated

Figure 3.5.3: Daily Average Discharge in Cubic Feet/Second in Vermillion River at USGS Empire Gage in 2013



data loggers that record continuous stage at 15-minute intervals. With these two approaches, the VRWJPO can get an accurate discharge rate at any water level.

The DNR supplements the flow measurements collected by Dakota County and Scott County SWCDs and helps analyze and organize flow data. These water quantity data are available from the Minnesota Cooperative Stream Gaging Program, www.dnr.state.mn.us/waters/csg/index.html.

To have a more accurate sense of flow in the Vermillion River Watershed, the VRWJPO commissioned hydrologic modeling. Previous modeling analyses of the watershed focused on flows in the Vermillion River (rather than the River and tributaries) and were developed using the curve number method.

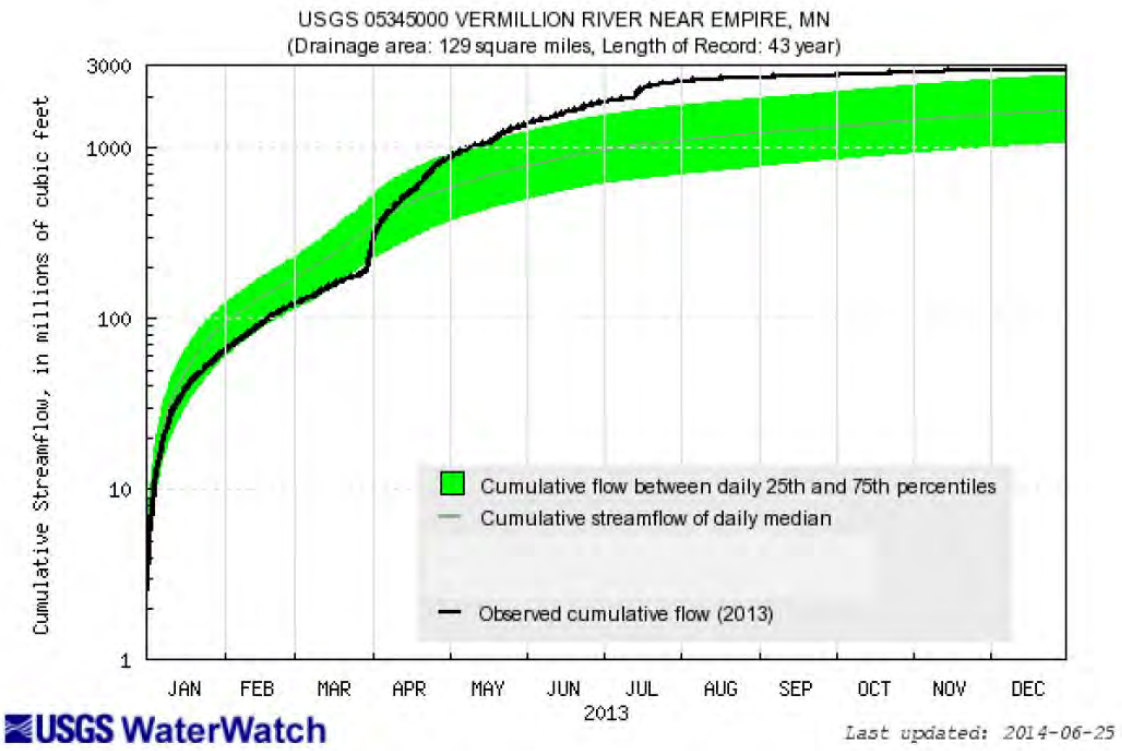
The calibrated XP-SWMM model used in the study was developed independently of previous models. Following model validation, the consultant summarized total volume and peak flow rates at 61 standard locations where streams cross municipal boundaries for the 1-, 2-, 10-, 50-, and 100-year storm. VRWJPO and cities can use the results to regulate proposed development so peak flows and total runoff volume do not exceed intercommunity flow standards.

Subwatershed hydrologic parameters (e.g., percent impervious surface or hydraulic conductivity) were determined for each individual land-use classification and hydrologic soil group. This provides the VRWJPO with a consistent set of hydrologic parameters for communities and developers modeling proposed development in any part of the watershed.

Discussions about surface water quantity in the Vermillion River Watershed are incomplete without an overview of two studies completed in 2009 and 2013 about thermal impacts on the river's self-sustaining brown trout population. Both studies affirmed the beneficial impact of groundwater inflow on river volume during both high- and low-flow situations.

The VRWJPO received a U.S. Environmental Protection Agency (EPA) Targeted Watersheds Grant to determine whether a thermal water quality trading program would be economically and scientifically feasible in the watershed. A summary of the completed study, "Creating the Optimal Regulatory and Market Framework

Figure 3.5.4: Cumulative Streamflow in Millions of Cubic Feet at the USGS Empire Gage in 2013



to Preserve Stream Flow and Temperature Stability in an Urbanizing Trout Stream in the Midwest," is on the VRWJPO website. Conclusions relevant to surface water quantity include:

- Groundwater makes up 80- 85 percent of the Vermillion River's base flow. During low flow conditions, it maintains sufficient stream volume and surface water quality. During high flow conditions, it helps maintain relatively stable temperatures in cold water stream reaches.
- Stream monitoring data and information from a longitudinal temperature survey show specific locations where groundwater discharge points create cool spots or refuge reaches for brown trout.
- Efforts to define "groundwatersheds" or groundwater trading zones emphasized the complex interconnections between surface water and groundwater. The study determined that groundwater impacts on stream volumes and temperatures are not tradable.
- Groundwater infiltration is important everywhere in the watershed. Infiltration practices that reduce stormwater volume also reduce heat impacts on streams. Any land or water uses that materially affect the groundwater base flow will affect trout stream temperatures.

As a follow-up to the thermal trading study, the VRWJPO proposed a demonstration project to install and collect data on stream-cooling best management practices. A summary of the completed study, "Stream-cooling Demonstrations in the Vermillion River Watershed," is available on the website.

The study concluded that stormwater volume reduction/infiltration practices are the first and best choice for reducing heat loading to the river. By preventing stormwater runoff from reaching water resources, volume control/infiltration BMPs can achieve multiple benefits: stabilizing flow rates, replenishing groundwater, and removing pollutants through filtration and biodegradation.

While the focus of these studies was stream temperature, both reaffirmed the importance of surface water and groundwater interactions in the Vermillion River Watershed – on both surface water quality and quantity.

3.6 Groundwater Quantity

Watershed aquifers viewed in a geologic column are shown in Section 1.4, Figure 1.4.1: Geologic Column of Dakota County. Of those shown, the Prairie du Chien-Jordan aquifers are primarily used for domestic and municipal drinking water supplies, as well as some industrial and high-capacity irrigation wells. Figure 3.6.1: Surface Water and Groundwater Use (2011), illustrates how increasing population, development, and climate variability have increased groundwater use for drinking water, landscape watering, agricultural irrigation, and commercial/industrial purposes. These figures do not take into account groundwater pumped from private wells in rural areas.

In 2013, the Minnesota Legislature addressed growing concerns about the state's water future by appropriating $7 million from the general fund to support enhanced water management programs and an additional $3 million for statewide mapping and establishment of groundwater management areas.

Concurrent with these discussions, the DNR's Division of Ecological and Water Resources initiated strategic planning to chart a course for addressing issues of groundwater overuse and contamination.

The DNR proposed statewide goals for groundwater management for 2013-2018:

- All aquifers are within sustainability thresholds for water levels.
- All appropriators of groundwater have the required permits.

- ≈ All permitted groundwater users employ water conservation practices.
- ≈ All aquifers are without water use conflicts and well interferences.
- ≈ Permitted groundwater appropriations do not adversely impact trout streams, calcareous fens, other groundwater-dependent surface water features, or other groundwater-dependent biological communities.
- ≈ Permitted groundwater appropriations do not adversely impact water quality.

In 2014, in keeping with its directives from the Minnesota Legislature, the DNR looked closely at groundwater appropriation permits in the Vermillion River Watershed, especially those within 1.5 miles of DNR-designated trout streams.

Research conducted by the VRWJPO, as part of the U.S. EPA Targeted Watersheds Grant, confirmed the importance of groundwater inflow to maintaining the trout stream reaches of the Vermillion River system. Agricultural producers applying for or renewing irrigation permits became concerned about the possibility of an appropriation permit being delayed or denied.

The first series of community conversations on the Watershed Plan update were dominated by water appropriation issues and potential impacts on farmers' livelihoods. The DNR has been working with stakeholders to develop groundwater appropriation processes, as well as monitoring to get a more complete understanding of groundwater withdrawal impacts on both groundwater and surface water.

The Metropolitan Council issued a January 2014 "Progress Report on Water Supply Planning" that sounds a cautionary note about the future availability of groundwater supplies in the Metro area. The modeling predicts groundwater drawdown exceeding 50 percent of available head in portions of the Cities of Rosemount and Apple Valley by 2040.

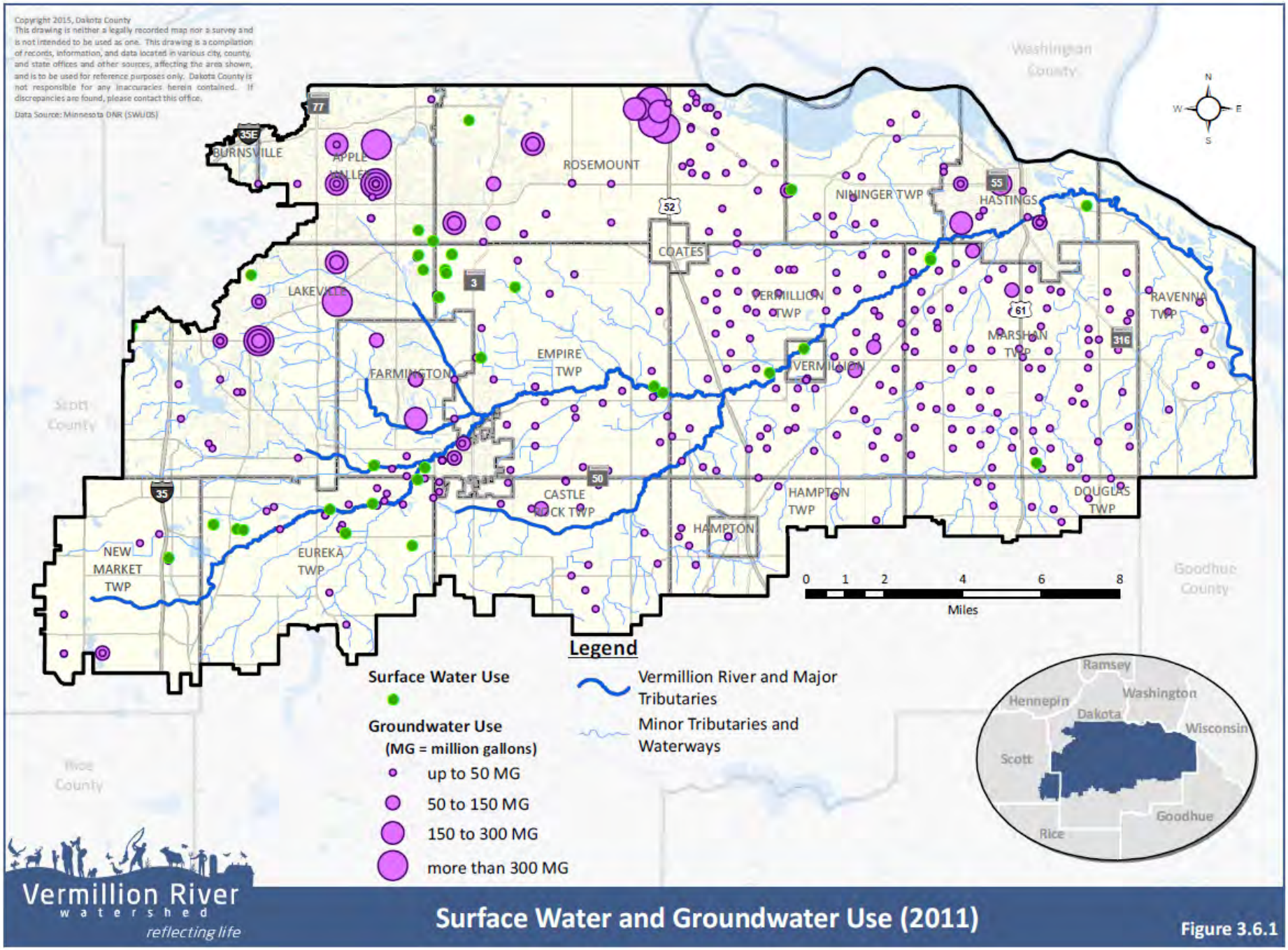
The VRWJPO's current role in groundwater monitoring and appropriation is very limited. Lawn-watering restrictions are in place in all of the urbanizing cities in the watershed. Public messages on reducing water use to protect the resource and save money are widely disseminated.

The VRWJPO's most productive strategies for ensuring sustainable groundwater resources in the watershed involve stormwater management and re-use. Stormwater management practices that infiltrate stormwater and replenish the groundwater continue to be the VRWJPO's preferred strategy. More recently, the VRWJPO has taken a step toward achieving groundwater conservation by promoting re-use of stormwater. The VRWJPO cost-shared a project in the City of Lakeville to irrigate public baseball fields with stormwater from a nearby pond rather than withdrawing water from the municipal groundwater supply. The VRWJPO may cost-share technologies to re-use stormwater, process water, and treated wastewater.

3.7: Permitted Wastewater and Stormwater Discharges

The MPCA issues permits for municipal and industrial wastewater and stormwater discharges in the watershed.

The MPCA is delegated to issue National Pollutant Discharge Elimination System (NPDES) permits on behalf of the U.S. Environmental Protection Agency (EPA) and State Discharge System (SDS) permits for the State of Minnesota. These permits limit the type and amount of pollutants in wastewater discharge. Most of the permittees discharge to the sanitary sewer and pollutants are treated at the Metropolitan Council Environmental Services facilities. The MPCA is charged with reviewing discharge monitoring reports on permitted facilities and initiating compliance activities, enforcement actions, or penalties when needed.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Data Source: Minnesota DNR (SWUDS)
BURNSVILLE
APPLE VALLEY
ROSEMOUNT
NININGER TWP
HASTINGS
COATES
LAKEVILLE
VERMILLION TWP
RAVENNA TWP
MARSHAN TWP
EMPIRE TWP
FARMINGTON
VERMILLION
CASTLE ROCK TWP
HAMPTON TWP
HAMPTON
DOUGLAS TWP
NEW MARKET TWP
EUREKA TWP
Washington County
Scott County
Rice County
Goodhue County
N
W
E
S
0 1 2 4 6 8
Miles
Legend
Surface Water Use
Groundwater Use
(MG = million gallons)
up to 50 MG
50 to 150 MG
150 to 300 MG
more than 300 MG
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Ramsey
Washington
Hennepin
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Surface Water and Groundwater Use (2011)
Figure 3.6.1

Facilities with permitted wastewater discharges pose limited risks to the Vermillion River and its tributaries, lakes, wetlands, or other water resources. The primary threat posed by permitted wastewater dischargers is an accidental release. These include facility-related accidents (such as releasing an unpermitted pollutant or high levels of a permitted pollutant) and external accidents (pipeline break, fire, explosion, or weather damage, for example).

According to the MPCA's "What's in My Neighborhood?" database feature, the watershed included 46 NPDES/SDS permits; 17 were active when this Plan was written. (See Figure 3.7.1: Active Wastewater Discharge Permits in the Watershed.)

The watershed includes 10 facilities with Municipal Separate Storm Sewer System (MS4) permits. (See Figure 3.7.2: Active MS4 Permits in the Watershed.)

The MPCA's "What's in My Neighborhood" allows a search for permitted facilities, including industrial stormwater permits. At the time this Watershed Plan was drafted, there were 61 active industrial stormwater permits within the Vermillion River Watershed eight-digit HUC code, 58 in the Dakota County portion of the watershed, three within the Scott County portion of the watershed.

Figure 3.7.1: Active Wastewater Discharge Permits in the Vermillion River Watershed

Facility	Business Type	Permit Type	City or Township
Fischer Sand and Aggregate LLP	Sand and gravel mining	NPDES/SDS	Apple Valley
Flint Hills Resources Pine Bend Refinery	Petroleum refinery	NPDES/SDS	Rosemount
Flint Hills Resources LP	Petroleum refinery	NPDES/SDS	Rosemount
Hampton WWTP	Sewage treatment	NPDES/SDS	Hampton
Kemps Culture Facility	Milk and cheese manufacturing	NPDES/SDS	Farmington
MCES - Empire Wastewater Treatment Plant	Sewage treatment	NPDES/SDS	Empire Township
Pine Bend Paving Inc.	Sand and gravel mining	NPDES/SDS	Rosemount
SKB/Ped Sand Pit	Sand and gravel mining	NPDES/SDS	Rosemount
Vermillion WWTP	Sewage treatment	NPDES/SDS	Vermillion
Country Stone	Landscaping supply	SDS	Eureka Township
Duo Plastics	Plastics manufacturing	SDS	Farmington
Endres Processing LLC/Endres Farms	Animal feed manufacturing	SDS	Rosemount
Granite Unlimited Inc.	Granite, marble, and quartz manufacturing	SDS	Lakeville
MCES - Rosemount Pond 3 Biosolids Storage	Biosolids storage	SDS	Rosemount
Magellan Pipeline Co. LP	Transportation of refined petroleum	SDS	Apple Valley
McNamara Contracting Inc.	Construction services	SDS	Empire Township
Win-Tron Racing	Car/truck racing facility	SDS	Eureka Township

Figure 3.7.2: Active MS4 Permits in the Watershed

Facility	Permit	City or Township
City of Apple Valley	MS4	Apple Valley
City of Burnsville	MS4	Burnsville
Dakota County Government Complex	MS4	Hastings
Empire Township	MS4	Empire Township
City of Farmington	MS4	Farmington
City of Hastings	MS4	Hastings
City of Lakeville	MS4	Lakeville
MnSCU-Dakota County Technical College	MS4	Rosemount
City of Rosemount	MS4	Rosemount
City of Elko New Market	MS4	Elko New Market

At the time this Watershed Plan was drafted, the database included 116 active construction stormwater permits in Dakota County and 16 active construction stormwater permits in Scott County portions of the watershed.

3.8: Stormwater Systems, Drainage Systems, and Control Structures

Section 4 describes land-use changes and population growth in both the Dakota County and Scott County portions of the Vermillion River Watershed. Between 1984 and 2000, nearly 25 percent of the watershed's land area converted from agriculture to developed uses (residential, recreation, and industrial) or was slated for future development. An economic downturn beginning in 2008 slowed or halted many development plans. In 2015, the brisk pace of development has resumed.

A description or map of stormwater systems, drainage systems, and control structures in the Vermillion River Watershed would be rapidly outdated. The cities and other MS4 permittees have the most up-to-date information about stormwater infrastructure within their jurisdictions.

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Section 4: Existing and Future Land Use

4.1 Introduction

Interactions between land use and water resources are complex. The Vermillion River Watershed Joint Powers Organization (VRWJPO) Watershed Management Plan, local comprehensive land use plans, and community water management plans have an impact on water resources and their management. This section describes historic and current land-use patterns in the watershed, how these patterns affect water quality, and how land can be managed to reduce adverse impacts to water resources.

4.2 Land Use Change over Time

The VRWJPO logo includes the tagline, "Reflecting Life," recognizing that life activities, including the use and management practices on the land, are reflected in the condition of the water resources.

Land use in the Vermillion River Watershed is a story of change over time. Land use evolved into a diverse mix of rural agriculture areas, small towns, and suburban areas developing outward from the Twin Cities urban core. From initial European settlement in the mid-1800s to the end of World War II, agriculture was the predominant land use in the watershed. Endowed with rich agricultural soils and positioned south of the confluence of the Mississippi and Minnesota rivers, central Dakota and Scott counties developed later than the Metro communities north of these rivers. With growth over the last 50 years, land use in the northwestern portion of the Vermillion River Watershed is no longer dominated by agriculture, as shown in the land use series on the VRWJPO website:

Figure 4.2.1: 1984 Land Use

Figure 4.2.2: 2000 Land Use

Figure 4.2.3: 2010 Land Use

Figure 4.2.4: 2030 Future Land Use

By the mid 1970s, residential development arrived in the northwestern corner of the watershed, in Burnsville and Apple Valley, and the I-35 corridor established a springboard for future growth in Lakeville. By 1984, agricultural land represented 82 percent of the watershed, with primary urban development areas in Hastings and Farmington, and new development reaching into Apple Valley and northern Lakeville.

Between 1984 and 2000, nearly 25 percent of the watershed's land area converted from agriculture to developed uses (residential, recreation, and industrial) or was slated for future development, based on land-use data prepared by local governments and compiled by the Metropolitan Council. (See Figure 4.2.5: Watershed Land Use by Area, 1984-2000.)

Aggregate mining takes place throughout the watershed, tapping into resources is evident in Figure 4.2.6: Vermillion River Watershed Aggregate Resources. The growth in aggregate mining is related to development as sources of quality aggregate are sought near to its market. In addition to rich farming soils, the watershed has some of the richest available remaining gravel deposits in the Twin Cities, providing an essential resource for road and development projects in the region.

Between 2000 and 2010, seven percent of the watershed's agricultural and undeveloped land shifted to development (residential, recreational, industrial, and commercial). In all, over the past 26 years, nearly 30 percent of the watershed has become developed. Conversion of land out of agriculture in the past decade was

modest compared to the 1980s and 1990s, but growth is expected to resume.

Park and recreational land acres increased substantially between 2000 and 2010, (Figure 4.2.7: Land Use by Area, 2010) in part because of the conversion of nearly 3,000 acres of the University of Minnesota's Rosemount Research Center from agricultural use to a Wildlife Management Area, Vermillion Highlands.

Although future land use cannot be predicted with absolute certainty, current land use combined with demographic and economic trends can provide insights on what to expect. Each decade, communities prepare comprehensive plans projecting future land use to address growth-related needs, such as housing, transportation, public sewer, drinking water, and parks.

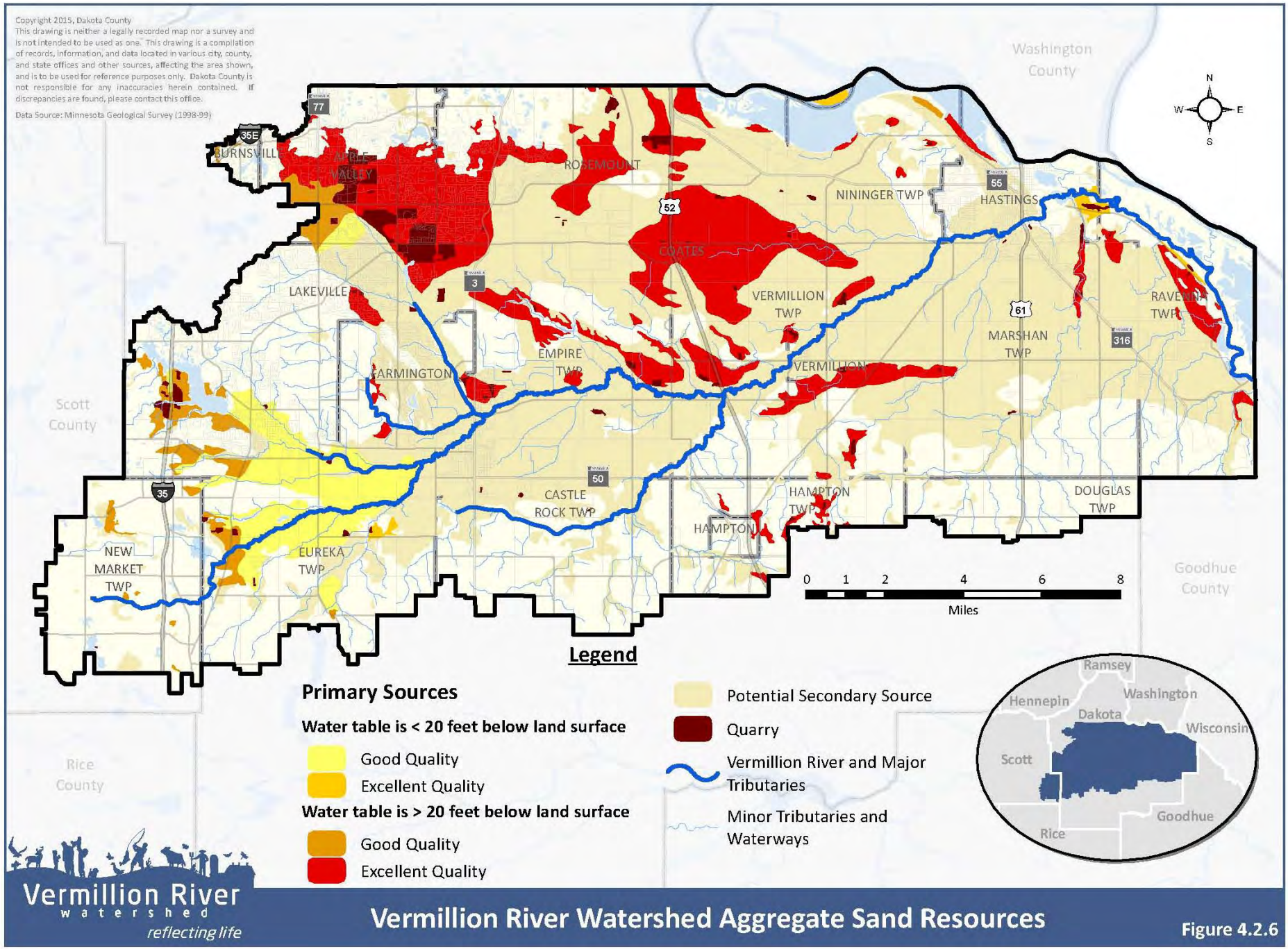
Land-use maps for 2030, developed by communities in the watershed, project expanded housing, commercial, and industrial development. Such expansion has the potential to place greater stress on the river and its tributaries, especially in headwaters of the Vermillion River's main stem and major tributaries. Development in upper subwatersheds can have profound impacts on river water quality if adequate mitigation of stormwater and pollution impacts does not occur.

Local community planners' assessments of the most likely changes that will occur by 2030 include:

- ≈ Lakeville, Elko New Market, and Hastings transition out of rural agriculture to large-lot rural residential.
- ≈ Development in Empire Township connects to Farmington and UMore Park, the University of Minnesota's planned community.
- ≈ Development occurs eastward in Rosemount along County Hwy 46 east of U.S. Hwy 52.
- ≈ Rural townships in Dakota County largely remain in agriculture, which will become the land use for only half (or less than half) of the watershed's land area.

Figure 4.2.5: Watershed Land Use by Area, 1984-2000

1984 Land Use in the Vermillion Watershed	1984 Acres	1984 Percent of Watershed	2000 Acres	2000 Percent of Watershed	Percent Change 1984-2000
Agricultural and Farmstead	176,030	82.47	122,802	57.58	- 24.89
Other Undeveloped (industrial, institutional)	12,446	5.83	40,837	19.12	+ 13.29
Residential	10,211	4.78	23,390	10.97	+ 6.19
Parks, Recreation, Golf Courses, Preserves	3,922	1.84	9,300	4.36	+ 2.52
Open Water	6,062	2.84	6,554	3.07	+ 0.23
Industrial/Utility/Mining	1,775	0.83	4,573	2.14	+ 1.31
Office, Retail, Commercial, Institutional	2,117	0.99	3,977	1.86	+ 0.87
Transportation	884	0.41	1,834	0.86	+ 0.45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Data Source: Minnesota Geological Survey (1998-99)
Washington County
Scott County
Rice County
Goodhue County
BURNSVILLE
APPLE VALLEY
ROSEMOUNT
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HASTINGS
COATES
LAKEVILLE
VERMILLION TWP
RAVENNA TWP
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DOUGLAS TWP
NEW MARKET TWP
EUREKA TWP
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Primary Sources
Water table is < 20 feet below land surface
Good Quality
Excellent Quality
Water table is > 20 feet below land surface
Good Quality
Excellent Quality
Potential Secondary Source
Quarry
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Vermillion River Watershed Aggregate Sand Resources
Figure 4.2.6

Figure 4.2.7: Land Use by Area, 2010			
2010 Land Use in the Vermillion Watershed	**Acres**	**Percent of Watershed**	**Percent Change 2000-2010**
Agriculture	112,507	52.75	- 4.83
Other Undeveloped	36,763	17.20	- 1.92
All Residential	28,680	13.45	+ 2.48
Parks, Recreation, Golf Courses, Preserves	15,837	7.43	+ 3.07
Open Water	6,624	3.10	+ 0.03
Industrial/Utility/Mining	5496	2.58	+ 0.48
Office, Retail, Commercial, Institutional	5,265	2.47	+ 0.61
Transportation	2,092	0.98	+ 0.12

4.3 Land Use Change and Water Impacts

Both agriculture and development can alter natural hydrologic cycles, processes, and connections. Over the past 150 years, natural hydrology has been altered through land-use activities in major ways, including:

1) Interruption of natural infiltration processes that recharge groundwater, and

2) Expediting water movement off the land to surface waterways.

Figure 4.3.1: Connections between Urban and Rural Land Uses and Water Quality, illustrates impacts on water quality from urban and rural land uses. In many cases, these impacts are inter-related.

The Vermillion River Watershed contains established urban areas; rapidly developing suburban areas; rural and agricultural areas; and parks and open space. All of these land uses have had impacts on the hydrology within the watershed; specific changes pertinent to the current condition of the watershed are described below.

Urban: Increased Impervious Surfaces

The increase in impervious surface that usually accompanies urban development:

1) Promotes rapid runoff of large volumes of stormwater and snowmelt to nearby waterways, causing channel and downstream bank erosion, and at the same time carrying sediment, surface pollutants, and heat; and

2) Impedes the natural process of soil infiltration and groundwater recharge.

Figure 4.3.2: Impervious Surface and Stream Health from a study conducted by the State of Maryland, depicts the extent of impervious surface in a watershed correlated with the negative impacts to surface water.

Negative impacts to stream health can begin to occur with as little as 10 percent impervious cover in a watershed. As the proportion of impervious surface increases, streams collect more heat and pollutants, with impacts to native insects, plants, fish, and mussels.

Figure 4.3.3: Impervious Surface in the Vermillion River Watershed displays estimates of impervious surface. More than 25 percent of the watershed's land area exceeds 10 percent impervious cover.

The VRWJPO anticipated the potential impacts of increased impervious surface in urban development through adoption of watershed Standards that specify stormwater control measures to mitigate the expected impacts. The Standards (amended in 2010) include specific requirements in regard to volume control.

Figure 4.3.1: Connections between Urban and Rural Land Uses and Water Quality		
Stressor/ Impact	**Land Use Causal Relationship**	**Context**
Change in Flow Rates (Increase and Decrease) and Patterns	Groundwater depletion: increasing groundwater withdrawals, e.g., increasing water demand from population growth, irrigation, and gravel mine dewatering (coupled with decreasing natural groundwater recharge)	Urban and Rural
	Artificial conveyance systems: moving storm water quickly out of an area, with agriculture drain tiling and urban storm sewers that outlet to waterways	Urban and Rural
	Lack of stormwater storage: draining and altering wetlands and low land collection areas	Urban and Rural
	River channel straightening: removing meanders and bends to expedite water movement during storm events	Urban and Rural
	Impervious surfaces: reducing infiltration and aquifer recharge, and increasing runoff	Mostly Urban
Erosion and Sediment Loading	Lack of resilient vegetative cover along drainage ways	Urban and Rural
	Lack of adoption of agricultural best management practices	Rural
	Channel alteration, e.g., straightening and streambank destabilization	Urban and Rural
	Lack of stormwater storage draining and altering wetlands and low land collection areas	Urban and Rural
Increased Bacteria and Nutrient Loading	Fertilizer runoff and excess application	Urban and Rural
	Change in cropping practices	Rural
	Lack of uniformly applied, adequate agricultural best management practices	Rural
	Lack of uniformly applied, adequate livestock and manure management practices	Rural
	Failing septic systems	Rural
	Wildlife population increases and changes in habitat preferences	Urban and Rural
	Pet wastes left on yards and in parks (improperly managed)	Urban
	Waste disposal (including yard waste) and littering	Urban and Rural
Increased Temperatures	Impervious surface heating stormwater during summer months, conveying heated runoff faster, preventing infiltration	Urban
	Lack of streambank shading	Urban and Rural
	Stormwater pond design prioritizing rate control over potential thermal impacts	Urban
	Groundwater depletion	Urban and Rural

The Standards require (with some exceptions) that runoff generated post-development from the 2-year/24-hour storm in excess of pre-development conditions (2005 land cover) be managed on site (primarily promoting infiltration).

Important considerations moving forward are the reduction of impervious cover in future development, potentially through the application of:

- Low Impact Development (LID) approaches,
- Disconnection of impervious cover within the drainage system, and
- Storage of runoff generated from impervious surfaces, with the potential to infiltrate or re-use stored stormwater.

Rural: Cropping Practices and Water Management

As Figure 4.2.5: Watershed Land Use by Area, 1984-2000, indicates, acres within the watershed used for agriculture and farmsteads decreased by almost 25 percent. However, those lands in agricultural production have taken advantage of scientific research to make land more productive. One strategy to achieve these gains has been planting large areas in one crop – corn has been one of the most marketable in recent years. Through use of irrigation, nutrients, and pesticides, the farmer can achieve high yields and economic benefit. However, this and other changes in cropping practices have influenced watershed hydrology by:

- Increasing the intensity of irrigation needed to support crop production;
- Increasing the use of draining and ditching to convey excess water more rapidly from the land;
- Increasing the use of inputs, such as fertilizer and pesticides, that move into groundwater and surface water; and
- Decreasing the soil's ability to hold water by reducing organic matter and diversity of soil organisms, such as those provided by plant materials from previous crops, perennial or multi-year vegetation (pasture, alfalfa, etc.), animal manure, cover crops, or other amendments.

Important considerations moving forward include rural landowners adopting (or restoring) cropping practices that support agricultural production and maintain natural hydrology and soil health, including:

- Crop rotation,
- Cover crops,
- Conservation tillage,
- Water-saving irrigation systems and practices, and
- Conservation drainage systems.

Industrial: Mining

Mineral production in the Vermillion River Watershed includes mining and processing sand, gravel, or bedrock, and concrete and asphalt production and recycling.

Mining operations have water-withdrawal permits that allow pumping groundwater to a level below the resource being extracted. Pumped water is often used on-site for washing the aggregate product.

Mining operations tapping into high-quality gravel deposits provide an essential resource for constructing roads and buildings.

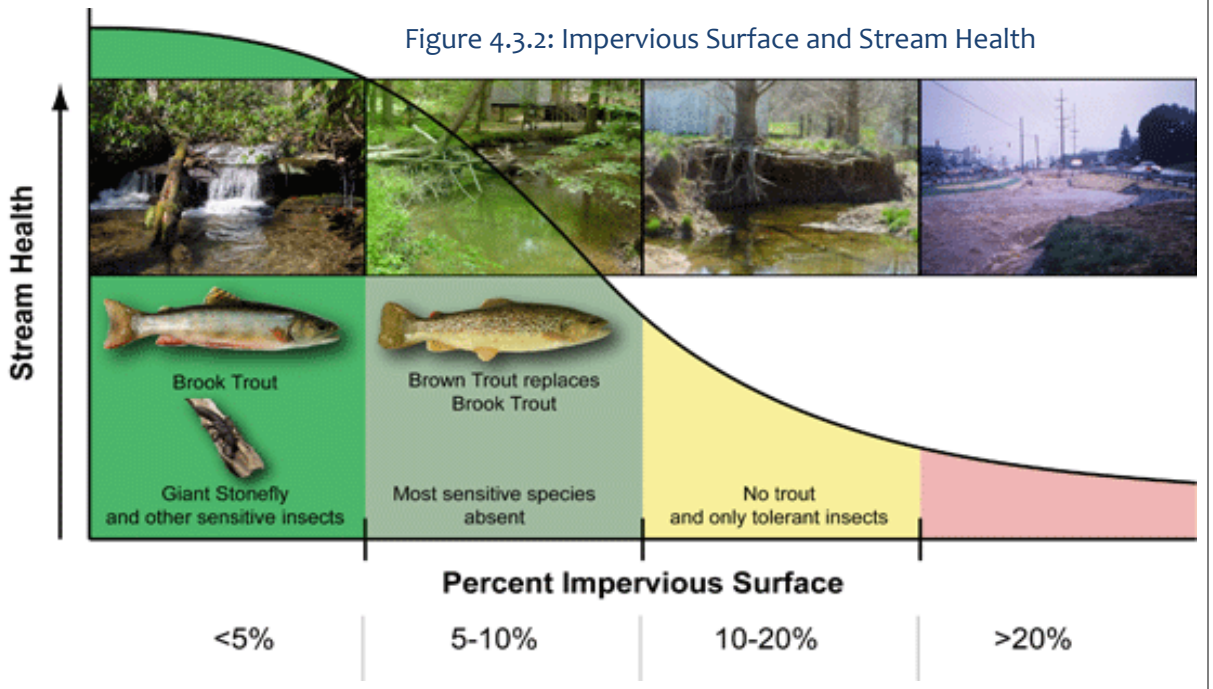
On average, construction of one mile of four-lane interstate highway requires 85,000 tons of aggregate; a six-room house requires 90 tons. Dakota County has been a major provider of aggregate materials for construction projects around the Twin Cities. (See Figure 4.3.4: Aggregate Material Mining in Dakota County, 2008-2012.)

Sand from sedimentary bedrock is mined in Minnesota for hydraulic fracturing to extract natural gas and oil as well as other industrial applications. Sand mining has not occurred within the watershed. Although St. Peter sandstone is available in many areas of the watershed, sand from the Jordan formation is preferred and is more accessible in southeastern Minnesota.

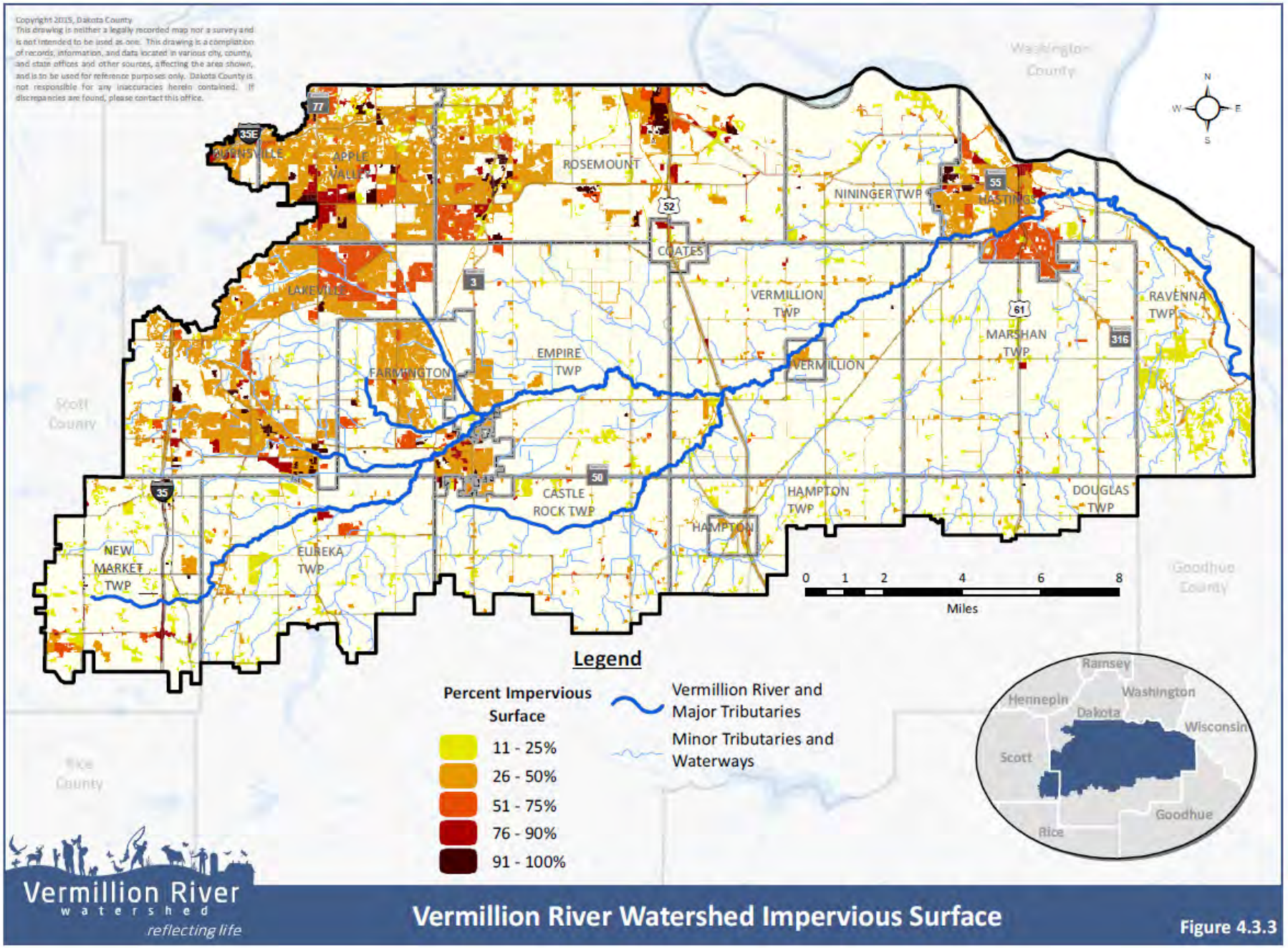
Figure 4.3.4: Aggregate Material Mining in Dakota County, 2008-2012

Year	Aggregate Mined
2012	6.4 million tons
2011	5.5 million tons
2010	5.3 million tons
2009	5.5 million tons
2008	7.3 million tons
Total	30 million tons (enough for more than 350 miles of four-lane interstate highway)

Figure 4.3.2: Impervious Surface and Stream Health



<5%	5-10%	10-20%	>20%
• Water cool and clean	• Water may be warmer and slightly polluted	• Water warmer	• Water warm and pollution usually evident
• Stream banks and bottom typically stable	• Erosion may be evident	• Erosion usually obvious	• Unstable habitat
• Trout can be found	• No brook trout	• Trout absent	• Trout absent
• Endangered species can be found	• Most rare and endangered species absent	• Rare stream species absent	• Non-native species dominate some streams
• Many fish species	• Many pollution tolerant fish	• Fewer fish species	• Only tolerant fish species
• Many salamander species	• Fewer salamander species	• Only three tolerant salamander species	• One salamander species
• Many freshwater mussels	• Only tolerant mussels	• No native mussels	• No native mussels
• Many insect taxa	• Fewer insect taxa	• Mostly tolerant insects	• Only tolerant insects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FARMINGTON
EMPIRE TWP
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DOUGLAS TWP
NEW MARKET TWP
EUREKA TWP
Scott County
Washington County
Goodhue County
Rice County
0 1 2 4 6 8
Miles
Legend
Percent Impervious Surface
11 - 25%
26 - 50%
51 - 75%
76 - 90%
91 - 100%
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Vermillion River Watershed Impervious Surface
Figure 4.3.3

4.4 Land Use Impacts on Water Quantity

Both surface water and groundwater are used in the Vermillion River Watershed. Based on Minnesota Department of Natural Resources (DNR) permit data, groundwater annual use greatly exceeds surface water annual use (15 billion gallons of groundwater appropriation to 280 million gallons of surface water in 2011). Totals do not include water from private residential wells.

Groundwater supplies drinking water for Apple Valley, Farmington, Hastings, Lakeville, and Rosemount. They collectively pumped more than seven billion gallons of water in 2011. Crop irrigation is the second largest groundwater consumer, followed by industrial processing. (See Figure 4.4.1: Groundwater Use Category, 2011.)

Surface water is used to a lesser extent. The largest volumes used over the decade 2000-2010 were for irrigation or sand and gravel processing. Eight of the 37 active permits identify the Vermillion River as the water source, with irrigation as the major use. (See Figure 4.4.2: Surface Water Use Category, 2011.)

Figure 3.6.1: Surface and Groundwater Use in Section 3, shows site-specific surface water and groundwater use, as permitted by the State of Minnesota. Groundwater permits are mapped with proportional icons related to the volume of water withdrawn annually. The map does not include private residential wells, which are common in rural areas not served by public water supplies.

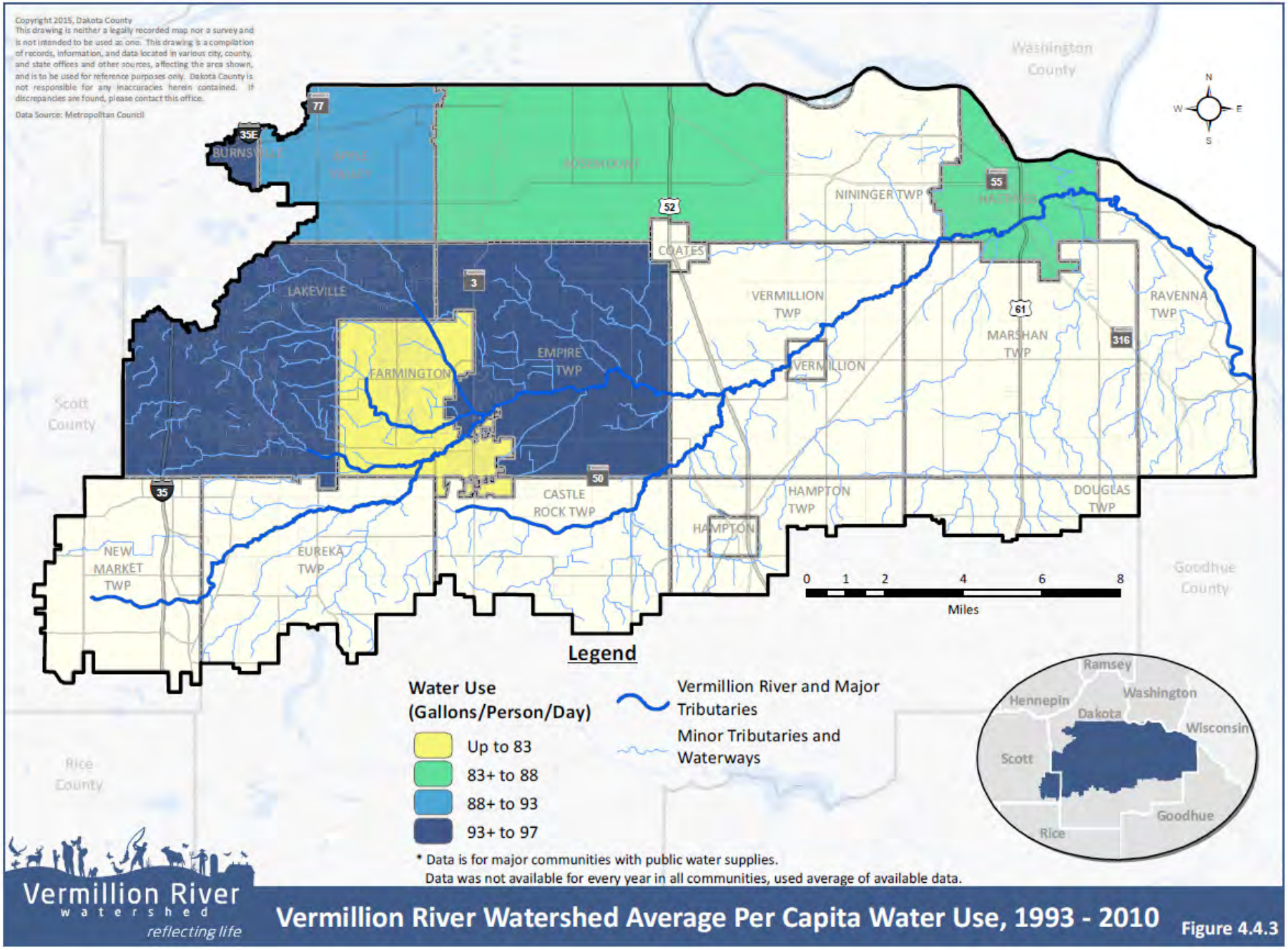
Water use patterns vary, as shown in Figure 4.4.3: Per Capita Water Use, for public supplies. The main consumers of municipally-supplied water include residents and businesses. Daily per capita consumption can vary significantly among communities for a number of reasons.

Figure 4.4.1: Groundwater Use Category, 2011

Groundwater Use Category	Number of wells	2011 Volume Used, in Millions of Gallons
Public Water Supplies	74	7,201.6
Major Crop Irrigation	238	4,472.5
Industrial Processing (including petroleum refining)	29	2,550.5
Non-Crop Irrigation	39	562.5
Special Categories (pollution containment, wastewater treatment)	14	102.3
Water Level Maintenance	8	86.1

Figure 4.4.2: Surface Water Use Category, 2011

Water Use Category	Number of Permits	Water Use 2000-2010, Total Volume (in millions of gallons)
Non-Crop Irrigation (golf courses, nurseries)	7	1,519
Industrial Use (sand-gravel processing)	16	1,349
Major Crop Irrigation	9	587
Water Level Maintenance	5	50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Data Source: Metropolitan Council
Washington County
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BURNSVILLE
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NININGER TWP
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HASTINGS
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LAKEVILLE
VERMILLION TWP
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RAVENNA TWP
MARSHAN TWP
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EMPIRE TWP
FARMINGTON
VERMILLION
Scott County
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CASTLE ROCK TWP
HAMPTON TWP
DOUGLAS TWP
HAMPTON
NEW MARKET TWP
EUREKA TWP
Goodhue County
0 1 2 4 6 8
Miles
Legend
Water Use (Gallons/Person/Day)
Up to 83
83+ to 88
88+ to 93
93+ to 97
Vermillion River and Major Tributaries
Minor Tributaries and Waterways
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Rice County
* Data is for major communities with public water supplies.
Data was not available for every year in all communities, used average of available data.
Vermillion River watershed
reflecting life
Vermillion River Watershed Average Per Capita Water Use, 1993 - 2010
Figure 4.4.3

4.5 Public Land Ownership and Land Conservation

Public Lands

More than 25,000 acres, just under 12 percent of the watershed land area, is in public ownership and includes a range of land uses. (See Figure 4.5.1: Publicly Owned Lands in the Vermillion River Watershed.) Nearly half of these public lands (or 10,740 acres) are undeveloped and were acquired for permanent natural resource protection.

DNR wildlife management areas (WMAs) comprise the largest share and are the least developed public lands. Gores Pool, for example, straddling Ravenna Township and portions of Goodhue County, is more than 6,700 acres. The Vermillion Highlands modified WMA in Empire Township is more than 2,800 acres. Public lands that will not be developed, such as WMAs, Scientific and Natural Areas (SNAs), and Aquatic Management Areas (AMAs), retain more natural hydrologic functions.

City, township, and County parks comprise the next largest share of public lands in the watershed, and vary in degree of development and impervious surface. A smaller percentage of the watershed's public lands supports public infrastructure, such as transportation corridors, wastewater treatment plants, and airports. Public lands also include developed sites, such as government offices, libraries, and schools.

Public lands offer the opportunity to demonstrate water-related best management practices. An example of model stewardship on a large public infrastructure site is the Empire wastewater treatment plant. Wetlands have been restored on more than 50 acres and a series of stormwater best management practices reduce stormwater discharges to near zero.

Land Protection

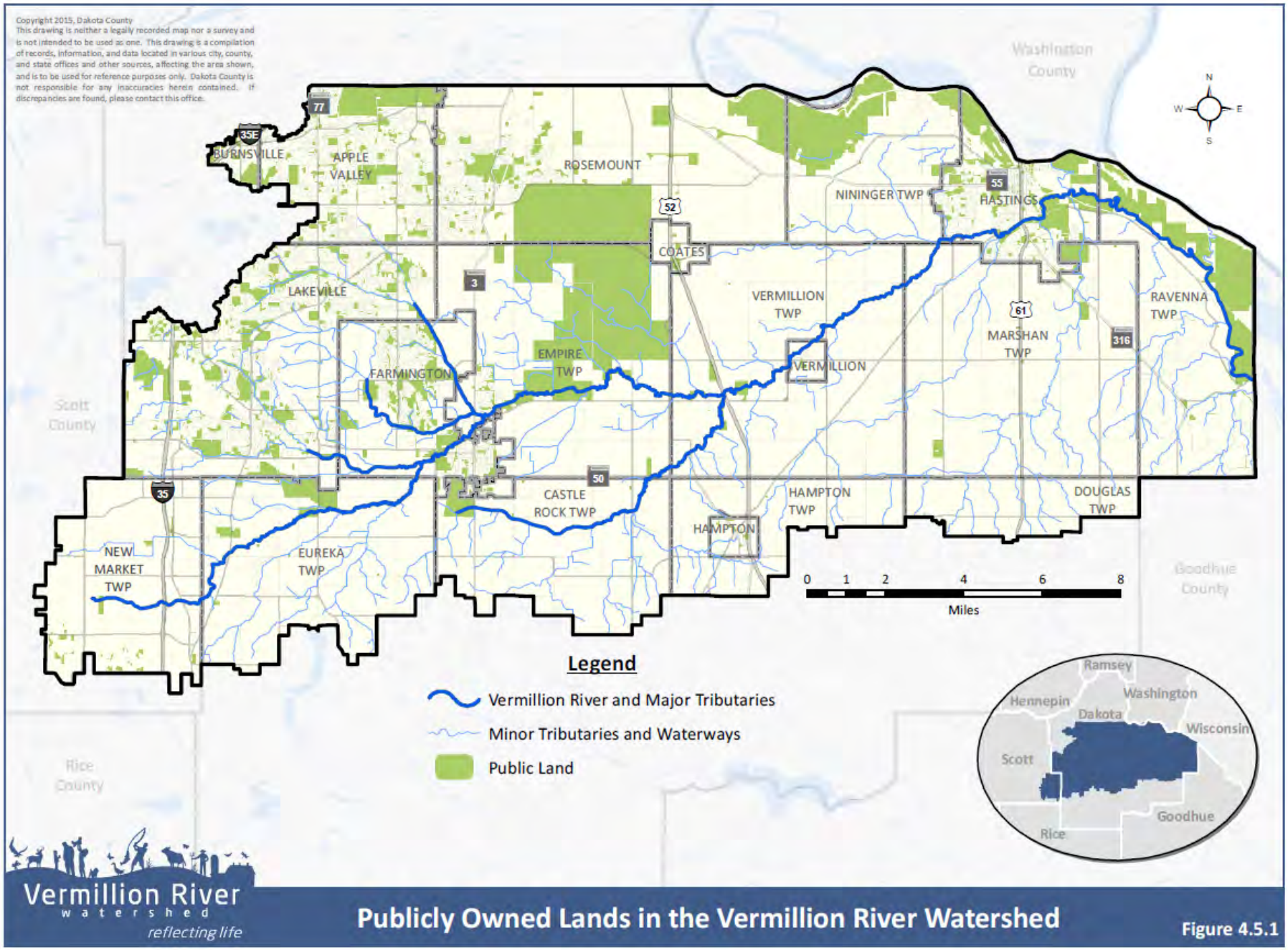
The purchase of conservation easements on private land with unique or sensitive natural resources has been used in the Vermillion River Watershed to protect water resources and habitat.

Voluntary protection of farmland and natural areas has occurred in the Dakota County portion of the watershed through the Farmland and Natural Areas Program (FNAP) and protection projects along shoreland of the Vermillion River. A current map of protected lands in Dakota County is available on the County website, www.dakotacounty.us, search *land conservation map summary*.

4.6 Best Management Practices

The VRWJPO adopted Standards (October 2006) and Rules (March 2007) that address land alteration. Rules require that developments include plans to control erosion (during and after construction), runoff volume, rate, and temperature, among other things. Compliance is accomplished through installing best management practices (BMPs) designed to capture, infiltrate, and clean stormwater before it reaches the water resources (wetlands, lakes, or streams).

BMPs are based on scientific research and practical experience. A BMP that works to retain water on the land, infiltrate it into the soil, remove pollutants, control erosion, or reduce the speed, force, or temperature of water can be planned into new development or retrofit into existing development. BMPs can be designed to accomplish one or more goals, and designs can be adjusted to fit with local conditions and needs.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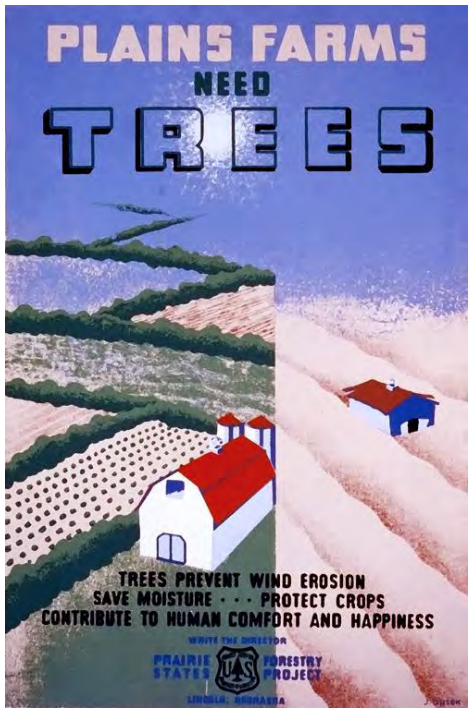
Minor Tributaries and Waterways
Public Land
Rice County
Ramsey
Hennepin
Washington
Dakota
Wisconsin
Scott
Goodhue
Rice
Vermillion River watershed
reflecting life
Publicly Owned Lands in the Vermillion River Watershed
Figure 4.5.1

Agricultural producers and landowners generally understand the consequences of soil loss and erosion. The Dust Bowl, a period of severe drought and dust storms causing major ecological and agricultural damage in the 1930s, illustrated the benefits of soil and water conservation practices.



Crop and livestock production BMPs that gained favor during and after the Dust Bowl years include:

- Contour or terrace farming
- Conservation tillage
- Planned grazing
- Pasture planting
- Crop rotation
- Wetland preservation
- Buffers and swales
- Tree planting for windbreaks

Planning BMPs to restore natural hydrology, clean stormwater, replenish groundwater, or manage flow, rate, or volume, is best done during the design process for new development. Retrofitting BMPs on existing sites can be challenging, but can be achieved.

Some of the easiest and least expensive BMPs to install are those on individual residences, including raingardens, rain barrels, shoreland buffers, and roof disconnection (roof runoff channeled to a place where the water can infiltrate and move away from driveways and pavement). New construction BMPs are required, but the majority of BMPs on existing private land are voluntary. Federal, state, regional, and local agencies that manage water resources (including Dakota and Scott counties and the VRWJPO) offer incentives or cost-share programs to assist landowners with the expense of installing BMPs.

Dakota County and Scott County Soil and Water Conservation District (SWCD) staff has expertise in BMP selection, sizing, design, and installation. Many environmental consulting firms specialize in water quality BMP design and installation. Working with landowners, the SWCDs or consultants can assist with BMPs that restore natural hydrology, remove pollutants, improve habitat, and are cost effective.

Information on a wide range of BMPs, cost sharing, and technical assistance is available on the VRWJPO's website, including a FAQ overview of appropriate BMPs for urban and rural landowners.

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Section 5: Issues and Priorities

5.0 Introduction

This section describes the issues that the Vermillion River Watershed Joint Powers Organization (VRWJPO) will focus on during the 10-year term of the Watershed Plan, 2016 through 2025. The issues form the basis for the watershed's goals, described in Section 6. These issues were identified through consultations with advisory groups, stakeholders, and conversations with watershed residents.

The issue statements are accompanied by data, information, or observations about why the issue is important for the VRWJPO to address or manage. A general overview of how the public and stakeholders prioritized each issue is included.

The issues are:

1. Surface water quality is threatened or impaired.
2. Water quality improvement competes with other public, private, and individual priorities. There is a perception that costs of improving water quality are not allocated fairly.
3. Groundwater quality is at risk, with known contamination above health risk limits for nitrate in some areas.
4. Increasing consumption of groundwater threatens the future water supply.
5. Changing precipitation patterns, decreased rainwater infiltration, and increased stormwater runoff have contributed to more intense fluctuations in river flow rate and volume.
6. Public awareness and specific knowledge on the impacts of daily activities and appropriate stewardship is lacking.
7. Several federal, state, and local agencies manage specific aspects of water protection, and limited coordination and communication among these agencies can create inefficiencies and cause confusion.
8. Minnesota's climate is getting warmer and wetter, which poses a threat to water quality, wildlife, and infrastructure.
9. The Vermillion River Watershed JPO is a "young" organization in a dynamically changing landscape and has not always been able to fill gaps and address new opportunities.
10. Sensitive biological resources -- plants, fish, insects, and wildlife -- in the Vermillion River are not as healthy as those in reference rivers.

5.1 Surface water quality

The issue statement agreed upon by almost all stakeholders is "Surface water quality is threatened or impaired." Sixteen reaches of the Vermillion River main stem or tributaries are listed as impaired, meaning they do not meet state water-quality standards for their designated uses. Six lakes within the watershed are listed as impaired. The streams are impaired by turbidity (suspended solids that cloud the water and block light for plants and animals), insufficient levels of dissolved oxygen, elevated levels of fecal coliform/ *E.coli* bacteria, mercury, and polychlorinated biphenyls (PCBs). Lakes are impaired for excess nutrients (primarily phosphorus). While watershed lakes and streams are not impaired for nitrate, nitrate levels on the South Branch are elevated.

Causes of surface water pollution include changes in land use (urban, suburban, and rural) that have altered the river's natural hydrology. Over time, changes such as straightened channels, filled wetlands, increased runoff from paved surfaces, and runoff from farm

fields and construction sites bring pollutants to surface water.

The "end users" of the river, streams, and lakes are the aquatic species that live in these environments. Pollutants in surface water stress these aquatic species. Streams and lakes with surface water impairments can become unable to support healthy communities of fish and macroinvertebrates. When this happens, the water resource is considered impaired. Several reaches of the Vermillion River and its tributaries are listed as impaired for fish and macroinvertebrates.

The Minnesota Pollution Control Agency (MPCA) and VRWJPO investigated the stressors on aquatic life and sources of pollution; set targets for pollution reductions; developed the Watershed Restoration and Protection Strategies (WRAPS); and will work with partners to implement the WRAPS during the 10-year term of the Watershed Plan.

Surface water quality is a high priority. As issue statements were developed, stakeholders and the public were asked to select their three highest priority issues. The Technical Advisory Group (TAG) consistently ranked threats to surface water quality among its top three priorities. People attending the Community Conversations were less certain. Only the participants attending the Community Conversation meeting held in the City of Hastings ranked threats to surface water quality in its top three priorities. Minn. Stat. Chapter 103B.201 requires watershed management organizations to "protect and improve surface water quality," which increases this issue's priority.

5.2 Water-quality improvement costs

The issue statement is "Water quality improvement competes with other public, private, and individual priorities. There is a perception that costs of improving water quality are not allocated fairly." Participants in the Community Conversations voiced their concerns about the costs of water-quality improvement and fair allocation of those costs.

Local governments, businesses, organizations, and individual households are challenged with many and varied economic pressures that drive their budgeting priorities. Vermillion River Watershed residents and landowners do not want costs of achieving water-quality improvement to be passed on (through regulations or taxes) to them. The public wants the cost of water-quality improvement to be allocated fairly.

The economic and fairness issues associated with environmental protection (or any other public service in which the benefits and costs are perceived as unequally shared) are frequently raised and difficult to resolve. The VRWJPO cannot resolve these concerns in the Watershed Plan. What the VRWJPO can do is be open and transparent about how it makes decisions and spends money.

The "polluter pays" principle is well-established in environmental law and policy. This principle is not feasible for assigning costs involving pollutants in stormwater or sediments at the bottom of lakes and streams. The sources of these pollutants are hard to determine, in both space (where is it coming from?) and time (when did it get there?). The most effective way to reduce stormwater pollution is to focus resources on best management practices that prevent it from reaching or harming water resources.

The VRWJPO has a governing board of elected officials – the Vermillion River Watershed Joint Powers Board (VRWJPB); an annual budget set by VRWJPB; and specific responsibilities required under state law for

metropolitan watershed management organizations. Within this context, the VRWJPO can be responsive to concerns about fair and cost-effective management.

Among actions the VRWJPO can take:

- Set priorities to ensure that the most important problems are addressed first;
- Provide access to cost-share funding to any watershed landowner with a proposal to improve water and land resources;
- Partner with others to leverage resources and reduce costs to watershed residents;
- Make optimal use of available public dollars, including grants;
- Seek strategies and technologies with high benefit/cost ratios;
- Oversee projects and contracts to ensure that taxpayers get what they paid for;
- Base decisions on sound, consensus science and law;
- Consider maintenance costs for local governments or landowners installing best management practices; and
- Evaluate and report outcomes.

Economic viability and fairness are high priorities. As issue statements were developed, stakeholders and the public were asked to select their three highest priority issues. The TAG ranked the economic viability issue as a medium-low priority for the watershed. Participants in the Community Conversations in Hastings and Elko New Market, however, placed a high priority on economic viability for watershed management programs. The Farmington participants reviewed the revised issue statements and ranked the issue as their top priority.

5.3 Groundwater quality

The issue statement is "Groundwater quality is at risk, with known contamination above health-risk limits for nitrate in some areas." Most public and private drinking water in the watershed is drawn from groundwater aquifers. Clean drinking water is a top priority for watershed residents in urban, suburban, or rural areas. Responsibilities for drinking water quality are shared among federal, state, regional, and local government agencies.

The VRWJPO pays attention to the relationship between surface water and groundwater. Surface water quality in the upper Vermillion River and tributaries (west of U.S. Hwy 52) is dependent on inflow of clean, cold groundwater, making groundwater protection an important goal for the VRWJPO. Groundwater quality east of U.S. Hwy 52 is susceptible to river and tributary pollutants that seep into groundwater from the surface water. This contributes to already existing problems with nitrate pollution in drinking water supplies in the eastern watershed.

In 2013 and 2014, Dakota County, with funding from the Minnesota Department of Agriculture (MDA), conducted a Targeted Townships Nitrate Sampling that detected nitrate levels exceeding federal drinking water standards in 30 percent of the private wells in several rural townships. The City of Hastings has added technology to remove high nitrate levels from its municipal water supply system. Surface water quality in the Vermillion River affects drinking water supplies for the City of Hastings. The lower Vermillion River is included in the Hastings Drinking Water Supply Management Area (DWSMA).

The same best management practices that prevent stormwater from affecting lakes and streams often protect groundwater as well. Roles that the VRWJPO can fulfill in groundwater protection include:

- ≈ Support Dakota and Scott Counties' groundwater monitoring and protection activities;
- ≈ Work with landowners to better manage nitrogen fertilizer applications;
- ≈ Provide cost-share assistance for installation of nitrogen treatment BMPs where appropriate;
- ≈ Identify and protect groundwater recharge areas;
- ≈ Promote practices that infiltrate and treat stormwater; and
- ≈ Promote groundwater conservation practices, such as use of stormwater for irrigation.

Groundwater quality is a high priority. As the issue statements were developed, stakeholders and the public were asked to select their three highest priority issues. The Vermillion River Watershed Technical Advisory Group (TAG) ranked groundwater protection and restoration the first priority. Participants in the Elko New Market Community Conversation ranked groundwater quality in their top three priorities. All Community Conversation participants recognized the importance of groundwater quality and many specifically asked about nitrate contamination.

5.4 Groundwater quantity

The issue statement is "Increasing consumption of groundwater threatens the future water supply." The Metropolitan Council recently reported that by 2040, the Prairie du Chien-Jordan aquifer, from which residents in a large part of the watershed obtain drinking water, may be drawn down by 50 percent. An April 2013 report by the Freshwater Society reports that "Current levels of groundwater pumping already are unsustainable in some parts of the state." As the population in the watershed's larger cities grows, the demand for groundwater may not be sustainable.

Primary authority for groundwater appropriation permits falls to the Minnesota Department of Natural Resources (DNR). The Minnesota Department of Health (MDH) sets drinking water standards and performs health risk assessments. Municipal water suppliers maintain and monitor drinking water. The VRWJPO's role in groundwater sustainability includes:

- ≈ Support Dakota County and Scott County groundwater monitoring and protection activities;
- ≈ Protect groundwater recharge zones;
- ≈ Promote water conservation;
- ≈ Promote stormwater and treated wastewater re-use; and
- ≈ Promote stormwater treatment and infiltration whenever possible.

Groundwater sustainability is a high priority. The TAG ranked a sustainable water supply as one of its top three priorities. Participants in the Community Conversations in Elko New Market and Farmington also ranked a sustainable water supply as one of their top three priorities. Concerns about the DNR's (since revised) process of issuing water appropriation permits played a role in all of the Community Conversations. Concern among agricultural irrigators about groundwater appropriation permits elevated groundwater quantity or sustainability to a higher priority.

5.5 River flow rate and volume

The issue statement is "Changing precipitation patterns, decreased rainwater infiltration, and increased stormwater runoff have contributed to more intense fluctuations in river flow rate and volume." Data from the Vermillion River Monitoring Network, Minnesota Cooperative Stream Gaging Program, and the Metropolitan Council's Watershed Outlet Monitoring Program (WOMP) site in Hastings confirm a trend

for river flow and volume to deviate (both up and down) from normal ranges. By using the most modern technology available, the VRWJPO has reliable data illustrating these "higher highs and lower lows."

Within the past five years, the watershed has experienced both local flooding and severe drought (sometimes within the same year). Data from 2012-2013 show that from October 2012 to February 2013, river flow was well below average; from June to September 2013, the flow was well above average. This fluctuation stresses plants, animals, and aquatic life. Both flooding and drought threaten infrastructure and damage crops.

The VRWJPO's role in managing rate and volume include:

- ≈ Monitor river flow and volume;
- ≈ Support practices that infiltrate, store, or slow stormwater;
- ≈ Adopt the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 for infrastructure sizing and design;
- ≈ Promote water conservation and re-use.

Intense fluctuations in river flow and volume are a medium-high priority. In its initial ranking, the TAG ranked flow rate and volume fluctuations in the top half of the issue statements, but not in the top three. The TAG ranked the revised issue statements the same, with flow rate and volume fluctuations at priority 4. Participants in the Community Conversations ranked flow rate and volume fluctuations almost exactly the same as the TAG members. In Hastings, flow rate and volume fluctuations ranked priority 4; in Elko New Market, priority 4; and in Farmington, priority 5. Heavy rain events and moderate drought have affected the watershed in recent years, so flow and volume fluctuations seem to be "on the radar" as a fairly high priority.

5.6 Public stewardship

The issue statement is: "Public awareness and specific knowledge on the impacts of daily activities and appropriate stewardship actions is lacking." As the population in the watershed grows and diversifies, people may not be aware of impairments in local water resources, recommended best management practices, and developments in water science and technology.

The VRWJPO wants to connect people to lakes and streams, as well as encourage them to make personal choices that will improve water quality.

Public outreach and communication are key roles in watershed management and include:

- ≈ Engage and encourage people to learn about local water resources;
- ≈ Support partners working with citizens to increase awareness and involvement;
- ≈ Convey current water conditions and trends through multiple channels; and
- ≈ Identify actions and choices people can make to improve water resources.

Public outreach and communication were medium-high priorities. The TAG ranked promoting public awareness and stewardship as a mid-range priority for the VRWJPO. TAG members agree that raising public awareness and stewardship is a responsibility of cities under local water management plans or MS4 permits. Participants in Community Conversations ranked public awareness and stewardship higher. It was in the top three priorities for participants at the Hastings and Farmington community conversations, and in the mid-range at Elko New Market.

5.7 Agency coordination and communication

The issue statement is: "Several federal, state, and local agencies manage specific aspects of water protection, and limited coordination and communication among these agencies can create inefficiencies and cause confusion." Watershed residents and stakeholders have concerns about "too many hands" on water resources within the watershed. Watershed residents report confusion about which agency or organization to approach for assistance or information. The Vermillion River Watershed is located in a growing metropolitan area with varied interests and pressures on water resources. Federal, state, regional, and local governments all have roles in watershed management that are not always clearly defined.

The VRWJPO coordinates activities with:

- Dakota and Scott Counties;
- Other water and land-use staff (surface water, land protection, parks) within each county;
- County soil and water conservation districts;
- Cities and townships;
- Metropolitan Council;
- State agencies with overarching authority, such as the Board of Water and Soil Resources (BWSR), Minnesota Department of Agriculture (MDA), Minnesota Department of Health, Minnesota Department of Natural Resources (DNR), and the Minnesota Pollution Control Agency (MPCA);
- University of Minnesota Extension;
- Federal agencies, such as the U.S. Environmental Protection Agency, National Forest Service, U.S. Fish and Wildlife, U.S. Geological Survey, National Parks Service, U.S. Army Corps of Engineers; and
- Environmental organizations, such as Trout Unlimited, Southern Dakota County Sportsmen's Club, Pheasants Forever, Friends of the Mississippi River, Hastings Environmental Protectors, and more.

The VRWJPO routinely communicates with many of these partner or stakeholder agencies or organizations. More communication with coordinating partners and better definition of the watershed's responsibilities would help. Among the actions the VRWJPO could take:

- Increased coordination and communication with these agencies and organizations;
- Streamlined VRWJPO processes;
- Directions for customers on how to navigate multiple agency requirements; and
- Commenting on other agencies' proposed rules, policies, or plans.

Coordination among agencies and organizations is a medium priority.

The TAG ranked this issue in the bottom three priorities for the watershed for the revised issue statements. When the original issues statements were presented initially to the TAG, the "too many hands" issue was ranked in the TAG's top three priorities.

Participants in the Community Conversations saw better coordination among agencies or fewer agencies altogether as a high priority: in Hastings and Elko New-Market, better coordination was participants' number one priority; in Farmington, participants ranked better coordination as a mid-level priority for the watershed.

5.8 Climate change

The issue statement is "Minnesota's climate is getting warmer and wetter, which poses a threat to water quality, wildlife, and infrastructure." State climatology records indicate that Minnesota is becoming warmer and wetter. These changes may cause more

intense storms, higher river flows/flooding, more intense droughts, record high dew points, warmer overnight temperatures, and increased stream temperatures. Shifting climate conditions affect native species (die-off, range changes) and invasive species (range expansion/ shift).

The National Oceanic and Atmospheric Administration (NOAA) recently published Atlas 14 with precipitation frequency estimates for the watershed area based on recent and improved data. Atlas 14 estimates show increased rainfall expectations for most rain events and especially for major rain events. The VRWJPB has adopted Atlas 14, Section 8 precipitation frequency as its interim standard for the VRWJPO. The more intense storms may overload existing infrastructure, require greater stormwater storage capacity, make rivers and streams "flashier," and de-stabilize stream banks.

Among actions that the VRWJPO could take:

- ≈ Monitoring river and stream rate and volume;
- ≈ Increase stormwater storage capacity; and
- ≈ Build resilience by promoting river buffers or tree planting, restored habitat, and natural hydrology.

Climate change impacts are a low priority. The TAG ranked climate change as a very low priority in its initial evaluation. The TAG increased climate change's priority to 4 (in a tie with rate and volume fluctuations, to which it is related) when ranking the revised issue statements.

Participants in the Community Conversations were consistent in ranking climate change as a low priority. Climate change was ranked in the bottom three priorities by participants attending meetings in Hastings, Elko New Market, and Farmington.

5.9 Responding to emerging issues

The issue statement is "The Vermillion River Watershed JPO is a young organization in a dynamically changing landscape and has not always been able to fill gaps and address new opportunities." Rapid changes in water science, technology, and policy challenge the VRWJPO and other water management organizations to "keep up." Some of these changes include:

- ≈ Ability to detect new or emerging pollutants;
- ≈ Ongoing development of technical standards and rules;
- ≈ New scientific information about surface water, groundwater, water dynamics, climate, weather, and precipitation; and
- ≈ New technologies to improve water quality (iron-enhanced sand filters, bioreactors).

There have also been new threats to water resources and the human, animal, and plant "end users" of water, such as:

- ≈ Disappearance of native species (pollinators, bats, Monarch butterflies);
- ≈ Migration of invasive species (carp, zebra mussels, emerald ash borer);
- ≈ Evolving risks (pesticide-resistant species, vector-borne illness, changes in species ranges);
- ≈ Environmental incidents or accidents (chemical leaks and spills, blue-green algae toxicity, fish kills); and
- ≈ Changes in economic, political, and public priorities.

The VRWJPO has to track changes in science and technology and adapt to new challenges. Among actions that the VRWJPO could take:

- ≈ Distribute information on emerging issues to partners and the public;
- ≈ Conduct research on emerging threats to water resources;

- ≈ Demonstrate promising new technologies;
- ≈ Participate in overall emergency/ disaster response planning; and
- ≈ Adapt strategies and programs for newly developing circumstances.

Adapting or responding to emerging issues is a low priority. The TAG ranked program and operational improvements in its lowest three priorities for the watershed. Participants in the Community Conversations also ranked program development a lower priority: it was ranked in the bottom three priorities in Hastings and Farmington, medium-low priority in Elko New Market.

5.10 Health of biological communities

The issue statement is "Sensitive biological resources – plants, fish, insects, and wildlife – in the Vermillion River are not as healthy as those in reference rivers." Data from five years of VRWJPO biomonitoring show that fish and macroinvertebrate communities in the Vermillion River and its tributaries are struggling. Most river reaches do not meet state standards for cold-water and warm-water communities. Fish populations lack diversity of species, the quantity of particular species, or both, particularly in the cold water streams. Streams contain higher numbers of pollution-tolerant species, few sensitive species and no native cold-water species.

Several years of data from the Wetland Health Evaluation Program (WHEP) show that wetlands monitored by trained volunteers have varying plant and macroinvertebrate health. Geomorphic assessments completed for the VRWJPO in North, Middle, and South Creeks, and the river and its tributaries in Empire Township, have identified many areas where habitat restoration is needed.

Among actions that the VRWJPO could take:

- ≈ Continue monitoring health of fish/macroinvertebrate populations;
- ≈ Work with partners on habitat restoration; and
- ≈ Keep healthy habitat from deterioration.

The TAG and the three Community Conversation groups all concurred that the Sensitive Biological Resources issue ranked among the lowest priority issues in their evaluations.

The DNR and many partners have worked persistently to establish, restore, and improve habitat. The VRWJPO, in partnership with the U.S. Environmental Protection Agency and MPCA, has studied the dynamics of stream temperature and trout, as well as potential best practices for mitigating thermal impacts. The VRWJPO has completed an EPA-approved WRAPS study that includes addressing stressors associated with impairments for aquatic biota.

Section 6: Goals, Objectives, and Actions

6.0 Introduction

The goals forming the foundation for all actions to be taken by the Vermillion River Watershed Joint Powers Organization (VRWJPO) during the ten-year life of this plan are:

A. Protect or restore water quality in lakes, streams, and wetlands
B. Protect and restore groundwater quality
C. Maintain a sustainable water supply
D. Address more intense fluctuations (up and down) in river flow rate and volume
E. Improve public awareness and stewardship of water resources
F. Improve watershed resilience to changing precipitation and temperature patterns
G. Protect or restore sensitive biological resources, such as plants, fish, insects, and wildlife

Within each goal, a series of objectives and actions are presented according to the roles of the VRWJPO in watershed management. The VRWJPO, for example, has a substantial role in managing stormwater; it has a very limited role in working with endangered or invasive species.

Seven key VRWJPO roles in watershed management are used as categories to sort the objectives and actions. A checklist of the seven roles is included under each goal statement. The roles that the VRWJPO can play in achieving the goal are marked on the checklist. Objectives and actions to achieve the goal are listed under the role.

For example, VRWJPO objectives and actions to achieve Goal C: "Maintain a sustainable water supply," are included in only four of the seven categories (those checked). The VRWJPO does not have a role in water supply administration and operations, regulation, or monitoring.

The VRWJPO will evaluate the outcome of each action listed in Section 6 during assessments of Watershed Plan progress that will occur at least every two years. Specific outcomes will be reported (such as pollutant load reductions) for BMPs installed or CIP projects completed. However, the Vermillion River Watershed Joint Powers Board (VRWJPB) asked for a limited number of broad measures that would provide indicators of progress. The VRWJPO has incorporated sub-goals into Section 6 and has developed these broad measures in Section 8: Outcome Measures by Sub-goal.

6.1 Roles of the VRWJPO

The primary roles of the VRWJPO are:

≈ Administration and Operations
≈ Regulation
≈ Research and Planning
≈ Monitoring and Assessment
≈ Land and Water Treatment
≈ Coordination and Collaboration
≈ Public Communications and Outreach

The purpose of each role and related activities for each role follow.

Administration and Operations

Maintain an effective and responsive watershed organization with services and programs that address priority issues.

a. Operate the organization effectively, developing appropriate procedures, organizational capacity, and clear work direction to implement watershed objectives.
b. Report to the VRWJPB and receive its direction on policy, budget, plans,

and projects. Consult with citizen and technical advisory bodies.

c. Develop watershed programs and projects. Use metrics to evaluate program and project effectiveness. Improve programs and operations to address public needs and new opportunities. Report on program and project outcomes to the VRWJPB, stakeholders and the public.
d. Manage fiscal resources with annual budgeting and capital improvement program processes. Develop cost-effective solutions and leverage local, state, and federal resources for priority projects.

Regulation

Use the VRWJPO's regulatory tools to prevent further degradation of water and land resources and reduce flooding risks.

a. Establish and enforce standards and requirements for managing water resources in the watershed.
b. Provide oversight and tracking on implementation of local water management plans.
c. Review and comment on permits and land-alteration plans prepared under delegated authority incompliance with local stormwater management plans.

Research and Planning

Develop strategic approaches for managing water resources.

a. Monitor and evaluate emerging issues related to water resources in the watershed.
b. Collect and evaluate data to support informed decision-making on water resources.
c. Develop comprehensive strategic approaches and policies for water resources in the watershed.
d. Conduct feasibility studies to develop projects for enhanced land and water management.
e. Prepare and update comprehensive and strategic plans to protect and improve water resources in the watershed.
f. Engage the public, stakeholders, and partners in planning and policy issues.

Monitoring and Assessment

Analyze and share information on the condition of water resources.

a. Inventory and monitor water resources in the watershed.
b. Analyze data and identify trends in resource quality and quantity.
c. Diagnose problems and pollution sources.
d. Report on the current conditions of water resources and natural resources.
e. Monitor implemented projects for effectiveness in achieving the desired outcome.

Land and Water Treatment

Improve water resources with targeted implementation of projects and programs.

a. Target areas identified in VRWJPO assessments and studies when implementing projects and allocating funding.
b. Reduce barriers to implementing conservation practices for local municipalities, businesses, and landowners through technical assistance and cost-sharing initiatives.

Coordination and Collaboration

Work with others to improve water resources.

a. Review and comment on environmental assessments and relevant products developed by other agencies.
b. Provide technical consultation on water resources to other agencies.

c. Form project and program partnerships with other organizations to achieve shared water resource objectives and maximize efficiency.
d. Participate in professional associations that exchange information and ideas.

Public Communications and Outreach:
Share information on water resources and provide opportunities for citizens and stakeholders to engage in water-resource protection.

a. Maintain a clear watershed identity through consistency and quality in external communication
b. Ensure that watershed messages are available through multiple channels and media.
c. Develop information, educational materials, programs, events, training, and outreach activities to motivate stakeholders to make choices that will improve water resources.
d. Work with communities to promote civic engagement and citizen-based action on water and natural resources issues.

6.2: Goals, Objectives, and Actions

Each goal includes sub-goals, followed by a series of objectives and actions presented according to the VRWJPO's major roles (e.g., Research and Planning). Objectives are numbered (1, 2, 3) and actions are in alphabetic order (a, b, c).

Goal A: Protect or restore water quality in lakes, streams, and wetlands

Sub-goals

≈ Restore impaired waters and protect those currently not impaired.
≈ Reduce non-point source pollution, erosion and sedimentation
≈ Protect and improve the River corridor
≈ Protect, enhance, and restore wetlands
≈ Protect and enhance recreational lakes

Objectives and Actions Organized by Major VRWJPO Roles

☒ Administration and Operations
☒ Regulation
☒ Research and Planning
☒ Monitoring and Assessment
☒ Land and Water Treatment
☒ Coordination and Collaboration
☒ Public Communications and Outreach

Administration and Operations

1. Define outcome measures for waterbodies or stream reaches in each sub-watershed, based on statutory classifications, designated uses, impairments, current conditions, in consultation with local governments and partners.
   a. Identify key indicators for sub-watershed water resources (e.g., phosphorus loading reduction in Lake Alimagnet or nitrate reduction in South Branch).
   b. Set baseline measures reflecting current data for high and low flows.
   c. Estimate changes resulting from sub-watershed BMPs installed the previous year.
   d. Report outcomes for key indicators in the annual activity

report and financial statement, and other reports.

2. Prepare a Capital Improvement Program (CIP) annually that focuses resources on highest-priority sub-watershed problems.
   a. Identify and prioritize projects using the Watershed Restoration and Protection Strategy (WRAPS), geomorphic assessments, restorable wetlands inventory, and the Vermillion River Monitoring Network.
   b. Develop an approved project list in consultation with potential partners and stakeholders.
   c. Fund high-priority projects using CIP dollars, cost-sharing with partners, grant funding or a combination of strategies.
3. Adopt VRWJPO budgets that are transparent, allocate levy amounts fairly, and include accountability measures.
   a. Develop annual budgets with levy requests based on a transparent public process.
   b. Develop annual budgets with levy requests based on the watershed tax capacity within each county.
   c. Provide expense and treasurer's reports on the website and in the full packet for each VRWJPB meeting.
4. Use VRWJPO dollars to leverage additional funding for watershed management.
   a. Apply (solely or in partnership) for grants to conduct special projects, studies, and demonstrations, as well as fund best management practices.
   b. Report on leveraged federal, state and local dollars in cost share.
5. Simplify VRWJPO procedures for working with partners in other levels of government.
   a. Develop capacity to hold webinars and videoconferences to share information with partners.
   b. Develop the website capacity to include more partner information.
   c. Facilitate acquisition and restoration of restorable wetlands suitable for wetland banking.
   d. Facilitate development of a wetland bank, using income from wetland credit sales for further wetland restoration.
   e. Use restorable wetland tools and inventories to develop partnerships and implement restoration projects.
6. Seek recommendations, solutions, and balanced representation from advisory groups.
   a. Meet routinely with "key leaders" in water resource management to exchange information, solve problems, identify opportunities, or streamline processes.
   b. Convene one-time "summits" or short-term task forces that engage people with specific skills, knowledge, or interests to advise the VRWJPO staff or VRWJPB on unique watershed issues or problems (e.g., Water Monitoring Summit, WRAPS Watershed Engagement Team).
   c. Discuss critical watershed issues and seek recommendations from the citizen advisory Watershed Planning Commission (WPC).
   d. Discuss and resolve technical or scientific issues affecting the watershed in consultation with the TAG.
7. Seek representative and timely consultation with the public in developing VRWJPO policies, plans, and programs.

Regulation

8. Update, adopt, and enforce VRWJPO Standards/Rules.

a. Update Standards to ensure that requirements minimize land disturbance impacts on water resources and adopt updated Standards as part of Plan adoption.
b. Consider new watershed standards to respond to changes in legislation, new scientific information, or altered conditions.

9. Ensure that local governments include the VRWJPO Standards in Local Water Management Plan revisions and implement them through official controls.
   a. Ensure that VRWJPO regulations minimize water quality impacts from land-disturbing activities.
   b. Consider an "above and beyond" Stormwater Management certification for (re-) development interests seeking documentation of higher performance (e.g., conserve water or meet a sustainability goal).
   c. Require local governments to submit proposed land alteration plans to the VRWJPO for review and comment, prior to issuing a permit, if plans include any of the following:
      1. Variances from local ordinances that affect surface water or impact surface water/groundwater interactions
      2. Diversions
      3. Intercommunity flows (to or from)
      4. Project site size of 40 acres or more
      5. Activities directly adjacent to the Vermillion River, its tributaries, a lake, or protected wetland.
10. Increase lake and riparian shoreline miles with managed vegetated buffers/filter strips to mitigate stormwater runoff impacts.
    a. Enforce buffer standards tied to changes in land use in rural areas.
    b. Support consistent enforcement of existing state and local government buffer regulations.
    c. Provide information on riparian easements and buffer benefits, requirements, and incentives on the VRWJPO website.
11. Establish procedures to review implementation of local water management ordinances.
    a. Meet annually with MS4 communities to review implementation of local water management plan.
    b. Require annual reporting on permits and inspections from non-MS4 communities fully or partly within the watershed.
    c. Spot check individual permits for compliance with VRWJPO Standards. Where deficiencies exist, investigate why and determine solutions.

Research and Planning

12. Review relevant planning documents for potential conflicts or synergies with the Vermillion River Watershed Plan.
    a. Review updates of Dakota County and Scott County Comprehensive Plans for potential conflicts or synergies with the Vermillion River Watershed Plan.
    b. Review updates of Dakota County Groundwater Plan for potential conflicts or synergies with the Vermillion River Watershed Plan.
13. Track emerging issues, legislation, trends, and technologies with potential watershed management impacts.

a. Remain engaged in professional water management networks that discuss issues, trends, and technology.
b. Maintain contacts with agencies developing or revising statutes or rules, pollutant standards, detection limits, testing recommendations, grant opportunities, or information resources.
c. Maintain contact with educational/research institutions studying watershed management, developing new technologies, or providing conferences, demonstrations, and training.
d. Maintain contact with environmental education, communication, civic engagement, and survey research professionals to be more informed about effective approaches.
e. Explore implementation of BWSR's "One Watershed, One Plan" principles as a means of addressing watershed-wide needs.

14. Complete and implement the Watershed Restoration and Protection Strategy (WRAPS).
    a. Integrate WRAPS recommendations for high-priority restoration and protection projects into the VRWJPO's CIP.
    b. Assist communities with municipal separate storm sewer system permits (MS4s) to meet required pollutant load reductions to impaired waters.
    c. Provide MS4s with technical assistance, cost-share, or grant funding to install best management practices (BMPs) identified in the WRAPS and/or the CIP.
    d. Provide townships and MS4 communities with waste load allocations an annual summary of BMPs installed using VRWJPO cost share (including raingardens) and estimated pollutant reduction.
    e. Apply and partner with others to apply for grant funding to implement high-priority restoration and protection projects.
15. Study how aggregate mining affects surface water and groundwater quality, quantity, or inflow in the Vermillion River and its tributaries.
    a. Review existing research on aggregate mining impacts on water and groundwater, in conditions comparable to the watershed.
    b. Discuss research needs to evaluate cumulative landscape-scale impacts of aggregate mining in the watershed with partners.
    c. Evaluate need for new Watershed Standards on aggregate mining, if research shows potential water resource impacts.

Monitoring and Assessment

16. Update the VRWJPO's surface water quality monitoring program to assess conditions and track trends.
    a. Conduct synoptic surveys and other studies to pinpoint specific pollution sources and target prevention or restoration activities.
    b. Collect and analyze surface water quality monitoring data and report annually on condition, trends, and recommendations for improvement.
    c. Coordinate with the USGS for maintenance of the Empire monitoring station.
    d. Coordinate with the DNR for flow-gaging assistance to develop and maintain rating curves.
    e. Provide surface water quality monitoring data online and

summarize data for public information.

17. Complete assessments of all Vermillion River reaches and tributary sub-watersheds within 10 years to identify potential improvement projects.
    a. Complete geomorphic assessments on priority subwatersheds.
    b. Develop prioritization criteria for restoration projects identified through the assessments and integrate highest priority restoration projects into the VRWJPO's CIP.

Land and Water Treatment

18. Ensure that technical assistance is available to landowners considering BMPs for water quality or habitat improvement.
    a. Coordinate with county SWCDs to provide technical assistance to landowners in the Dakota County and Scott County portions of the watershed.
    b. Provide technical assistance or referrals to assistance providers to watershed landowners that contact the VRWJPO.
    c. Assist Dakota County in its agricultural outreach.
19. Provide cost-share and other incentives to watershed landowners implementing best management practices.
    a. Update and clarify the VRWJPO's cost-share policy's eligibility requirements, types of BMPs covered, cost-share percentages, application process, selection criteria, and other details.
    b. Promote cost-share funding and other incentives to targeted audiences, including cities; townships; homeowners associations; and public, business, and agricultural landowners.
    c. Cost-share or stack incentives for demonstrations of new or innovative BMPs that are potentially more effective at reducing impacts to surface waters, less expensive, or easier to maintain.
    d. Consider cost-share or other incentives to fund the long-term operation and maintenance of BMPs.
    e. Annually review the cost-share program to ensure that identified priorities are being addressed.
20. Optimize cost share funding to achieve the greatest benefits for the least expenditure of public money.
    a. Prioritize projects that provide multiple benefits, multiple pollutant reductions, system-wide improvement, or synergy with other projects.
    b. Target projects to water resources that have problems that are urgent, pose potential health risks, threaten public infrastructure, or adversely affect people, property, or natural resources.
    c. Measure project outcomes in reducing pollutants and estimate derived benefits.
21. Use standard pollutant-reduction calculators to estimate cost-effectiveness of BMPs installed or cost-shared by the VRWJPO.
    a. Estimate soil loss, sediment, and phosphorus reduction from practices that reduce sheet and rill erosion; stabilize gully, stream bank, or ditch erosion; or act as filter strips or buffers.
    b. Estimate water use reduction from various water conservation actions.
    c. Estimate thermal reductions from volume or temperature control BMPs.

Coordination and Collaboration

22. Refer individuals and organizations to other federal, state, regional, or local agencies with services or resources not available from the VRWJPO.
    a. Promote existing information on programs, funding, and resources for best management practices (e.g., MDA's Ag BMP Handbook).
    b. Consult or partner with cities, townships, or other public entities on applications for public and private grants.
    c. Assist Dakota County, the MPCA, and cities in implementing the Wetland Health Evaluation Program.
    d. Continue to support agricultural outreach by the counties, MDA, University of Minnesota Extension and other partners.
    e. Assist Dakota County and Scott County Land Protection programs in acquiring permanent conservation easements in riparian areas in the Vermillion River Watershed.

23. Collaborate to reduce non-point source pollution from agricultural activities.
    a. Assist agencies that provide information and technical assistance on point and non-point source pollution prevention and remediation to feedlot operators and agricultural landowners.
    b. Coordinate with other agencies to identify potential agricultural point and non-point pollution sources.
    c. Work with livestock owners and public agencies to manage direct livestock access to natural water bodies (e.g., wetlands, rivers, streams).
    d. Work with landowners and other agencies to reduce fencing across public waters and associated potential liabilities (e.g., Vermillion River and tributaries).
    e. Promote participation in conservation programs, such as Reinvest in Minnesota (RIM), Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentives Program (EQIP), Dakota County Land Protection, and Wildlife Habitat Incentives Program (WHIP), and others.

24. Assist local governments in management of recreational lakes in the watershed.
    a. Review the status of lake water quality and management plans on at least a five-year basis as part of VRWJPO planning.
    b. Collaborate with existing programs to cost-share landowner lakeshore restoration projects.
    c. Assist state and local programs in preventing the spread of aquatic invasive species (e.g., zebra mussels).

25. Work with local government units to ensure that stormwater infrastructure is maintained and functions effectively over time.
    a. Initiate discussions with local government units about barriers to stormwater infrastructure maintenance.
    b. Consider providing stormwater management system maintenance guidance for watershed communities.

26. Work with public agencies and landowners to improve the ecological quality of the Vermillion River corridor and main tributaries.
    a. Assist with buffer acquisition, riparian plantings, shoreline restoration, or removal of structures that degrade the corridor.

27. Evaluate impacts of proposed land uses on surface water and groundwater when commenting on environmental reviews prepared by local governments, such as Environmental Assessment Worksheets (EAW), Alternative Urban Area Reviews (AUAR), and Environmental Impact Statements (EIS).

28. Build partnerships with professionals engaged in land-use change (developers, planners, environmental consultants, lenders, builders, real estate agents, development agencies, and others) to achieve water-quality improvements in development and redevelopment.

29. Build partnerships, exchange ideas, and problem-solve with agricultural producers to improve water quality.
    a. Consider implementing demonstration projects with VRWJPO funds to bring attention to promising innovative technologies and BMPs for water quality improvement.
    b. Foster partnerships with groups and individuals working closely with farmers using broadly based civic engagement methods.

Public Communications and Outreach

30. Develop contacts and networks inclusive of all ages, cultural backgrounds, educational attainment, economic status, or faiths to participate in watershed management planning, events, or initiatives.
    a. Identify and suggest partnerships with organizations or community leaders representing Southeast Asian, Hispanic/Latino, and other cultural groups that farm or rent land in the watershed.
    b. Collaborate with park agencies to identify how different populations use public natural resources for fishing, swimming, or recreation.
    c. Consider developing social media for the Vermillion River Watershed to engage younger audiences.

31. Provide opportunities for Vermillion Stewards volunteers on targeted watershed priorities.

Goal B: Protect and restore groundwater quality

Sub-goals

≈ Track trends in groundwater quality
≈ Protect groundwater quality from contamination
≈ Reduce existing levels of groundwater contamination

Objectives and Actions Organized by Major VRWJPO Roles

☐ Administration and Operations
☐ Regulation
☒ Research and Planning
☐ Monitoring and Assessment
☐ Land and Water Treatment
☒ Coordination and Collaboration
☒ Public Communications and Outreach

Research and Planning

1. Help advance research on the watershed's groundwater system and groundwater management strategies.
    a. Coordinate with other agencies to monitor condition and trends in groundwater levels and contaminant concentrations.

b. Assist partners in study of groundwater/surface water interactions in the watershed.
c. Seek partnerships to develop and implement collaborative groundwater projects and programs (e.g., Hastings Area Nitrate Study future phases, Vermillion River Headwaters Groundwater Study).

Coordination and Collaboration

2. Assist federal, state, and local partners in monitoring, restoring, and maintaining groundwater quality.
   a. Continue support for Dakota County's ambient groundwater monitoring program.
   b. Collaborate with Scott County on groundwater monitoring for the Scott County portion of the watershed.

3. Continue contributing to groundwater information networks tracking current and emerging issues and trends.
   a. Support and consult partners (MPCA, MDA for fertilizer and pesticides) when historical land uses (spills, leaks, dump sites) may pose a threat to groundwater or surface water in the watershed.
   b. Consult hazardous waste and remediation resources to ensure that land-disturbing BMPs for which the VRWJPO is providing cost share do not have a documented history of site contamination.
   c. Consult databases of confirmed remediation sites, industrial wastewater permits, and other point sources of pollution when investigating groundwater and surface water incidents or complaints.

4. Collaborate to reduce levels of *E. coli* bacteria, nitrate, and other pollutants in groundwater and surface water through improved management of septic systems in the watershed.
   a. Assist the MPCA in implementing or requiring communities to implement a septic system inventory, inspection, and upgrade program.
   b. Assist Dakota County's efforts to inventory failing/ noncompliant systems, prioritize areas for upgrades, and implement upgrades.

5. Assist state and local agencies in managing wells (installation, testing, placement, or sealing) to protect groundwater quality.
   a. Assist in identifying potential impacts on public or private drinking water supplies during plan and permit reviews.
   b. Assist partners in identifying natural and constructed conduits from the ground surface to the groundwater (e.g., Karst features, improperly abandoned wells) with potential to introduce pollutants into drinking water.
   c. Assist Dakota and Scott counties with inventory assessment, and sealing of abandoned wells.
   d. Assist Dakota and Scott counties with increasing landowner awareness of well information and participation in well sealing programs.

6. Assist MDH and other agencies in implementing wellhead protection programs and plans in the watershed.

a. Assist communities in assessing septic systems in wellhead protection areas.
b. Support use of appropriate stormwater best management practices in wellhead protection areas.

7. Work with Dakota County and Scott County Geographic Information Systems (GIS) managers on improving access to data on areas sensitive to groundwater contamination.
   a. Request that county GIS managers obtain MDH data on wellhead protection management zones and drinking water supply management zones and incorporate into local data layers
   b. Make local data layers including wellhead protection and drinking water supply management zones available to GIS users.

Public Communications and Outreach

8. Collaborate with partners to promote soil health and nutrient management practices that protect groundwater from nitrate contamination while maintaining viable agricultural production and urban landscapes.
   a. Assist Dakota County's agricultural outreach program activities (Crop Days, Field Days, and newsletter) that focus on economically optimal nitrogen rates in rural communities.
   b. Provide cost-share or other incentives for producers using cover crops or nutrient management plans.
   c. Assist in implementation of MDA's Nitrogen Fertilizer Management Plan.
   d. Consider agricultural demonstrations of bioreactors in tiled land and saturated buffers. Partner with County and Extension outreach to introduce demonstrations via Field Days, Crop Days, and the *Ag News*.
   e. Assist partners in assessing nitrogen application rates in high infiltration areas of the watershed and promoting nitrogen application rate reductions.
   f. Collaborate with partners on turf and fertilizer management workshops for facility managers of businesses, parks, schools, and others.
   g. Consider outreach on nutrient management practices to turf-intensive developments, such as homeowners associations, golf courses, business campuses, and other urban/suburban users of fertilizers.
   h. Consider facilitating a watershed- or county-wide outreach and education campaign to increase awareness about the urban and rural land use contributions to nitrate contamination of groundwater.

9. Collaborate with the Dakota County Groundwater Unit to promote the MDH's well-owner handbook.
   a. Provide the well-owner's handbook (or link) on the VRWJPO website.
   b. Consider outreach to real estate agents, to distribute

the handbook to purchasers of properties with private wells.

c. Consider outreach to visitors' bureaus and "welcome" organizations to include in information packets for new homeowners with a private well.

Goal C: Maintain a sustainable water supply

Sub-goals

≈ Promote conservation of groundwater

≈ Protect high capacity groundwater recharge areas and promote infiltration, where appropriate

≈ Promote re-use of stormwater and treated wastewater, where appropriate

Objectives and Actions Organized by Major VRWJPO Roles

☐ Administration and Operations
☐ Regulation
☒ Research and Planning
☐ Monitoring and Assessment
☒ Land and Water Treatment
☒ Coordination and Collaboration
☒ Public Communications and Outreach

Research and Planning

1. Assist partners in preventing reductions to the river's base flow and to normal levels in lakes and wetlands.
   a. Consider developing Water Conservation Standards for the watershed.
   b. Facilitate discussions with appropriate agencies (e.g., DNR and Southwest Metro Groundwater Workgroup) about well interference water appropriation conflicts, and groundwater management.

2. Identify and protect groundwater recharge areas in the watershed.
   a) Review 2006 inventory of groundwater recharge areas and update, if needed.
   b) Request County GIS to create a GIS layer for groundwater recharge areas identified in the inventory.

Land and Water Treatment

3. Continue policies and programs to conserve groundwater by use of plant species' drought and water tolerances.
   a. Promote and cost-share bio-infiltration BMPs for new development, redevelopment, and stormwater retrofits.
   b. Promote and cost-share infiltration and native species planting through raingarden programs.
   c. Require certified native seed mixes where appropriate for VRWJPO-funded restoration projects.

4. Promote and cost-share BMPs that conserve water.
   a. Promote and cost-share BMPs that infiltrate stormwater and replenish groundwater, where feasible and not a threat to groundwater quality.
   b. Promote and cost-share BMPs that use stormwater for irrigating urban landscapes.
   c. Consider cost-sharing demonstration projects that re-use treated industrial or municipal wastewater.
   d. Research strategies for water use, re-use, or infiltration that minimize groundwater use at mining sites.

Coordination and Collaboration

5. Assist state and local partners in promoting and implementing water conservation.

a. Promote water-use assessments/audits to help permitted high-volume users identify strategies to conserve water and save money.
b. Review and comment on DNR groundwater appropriation permits with potential impacts on the watershed's water resources.

6. Assist partners in promoting and cost-sharing practices that conserve groundwater in agricultural settings.
   a. Promote consultations between producers and irrigation experts (such as the UM Extension irrigation specialist) on technological advances in irrigation management and scheduling.
   b. Assist federal, state and local partners in promoting irrigation water management and BMPs.
   c. Consider cost-sharing improvements to irrigation equipment to gain water efficiency.
   d. Promote cover crops, no-till, conservation tillage, conservation cropping rotation, and other BMPs that help maintain water in the soil.

Public Communications and Outreach

7. Work with partners to develop a public outreach campaign designed to promote practices to mitigate drought conditions for implementation during persistent drought.

Goal D: Address more intense fluctuations (up and down) in river flow rate and volume

Sub-goals

≈ Regulate intercommunity flows
≈ Address sources of increased flows
≈ Protect floodplains and maintain the river floodway
≈ Address erosion problem areas

Objectives and Actions Organized by Major VRWJPO Roles

☐ Administration and Operations
☒ Regulation
☐ Research and Planning
☐ Monitoring and Assessment
☒ Land and Water Treatment
☒ Coordination and Collaboration
☐ Public Communications and Outreach

Regulation

1. Use Vermillion River Hydrologic Model to set intercommunity flow Standards that are consistent and science-based to prevent conflicts about water flows among neighboring jurisdictions.

2. Support requirements for local governments to identify, protect, and reconnect floodplains.
   a. Require local governments to enforce ordinances that are consistent with the VRWJPO Standards.
   b. Require cities and townships to obtain easements for flood, flood drainage, maintenance access, and emergency overflow routes during development and/or building permit processes.
   c. Assist responsible government units in ensuring that structures are properly located relative to the floodplain before permits are issued.
   d. Limit floodplain alterations to obtain "no net loss" of floodplain storage, and preserve, restore and manage floodplain wetlands.
   e. Encourage local governments to require compensatory storage at

2:1 level for filling in floodplain.

3. Address known flooding/erosion/flow diversion or alteration problems that cross community boundaries.
   a. Continue to document intergovernmental hydrology through use and maintenance of the watershed hydrologic model.
   b. Coordinate mediation with affected local government units to find practical and equitable solutions.
   c. Ensure that local water management plans incorporate consensus solutions to intercommunity flow issues.

4. Assist cities and counties in meeting MS4 permit requirements.
   a. Assess public outreach and communication needs of MS4 permit holders and identify gaps or opportunities for collaboration.
   b. Promote Stewardship Grants to help cities or local groups undertake one-time water quality improvement projects toward meeting MS4 permit requirements.

Land and Water Treatment

5. Target and prioritize cost-share, incentives, and outreach activities for retrofits in developed areas to reduce stormwater flow rates and volumes.
   a. Identify urban/suburban developed areas without adequate stormwater infrastructure.
   b. Evaluate developed areas to prioritize those with the greatest impacts on flow and volume fluctuations.
   c. Develop outreach and cost-share incentives for homeowners, homeowners' associations and businesses in areas without stormwater controls to install stormwater rate and volume control BMPs.
   d. Research and make recommendations about BMPs suitable for ultra-urban conditions (no room to integrate most BMPs).

6. Mitigate the impact of past increases in stormwater discharge on downstream conveyance systems.
   a. Identify bank stabilization projects and restore damaged banks at priority locations.
   b. Collaborate with SWCDs, federal, state and local programs to cost share for stream bank restoration projects.

7. Address gully erosion problems in the watershed.
   a. Identify and prioritize gully erosion problems using geomorphic or other relevant assessments.
   b. Consider proposals to work with Goodhue County to resolve gully and erosion problems that originate in Goodhue County but have infrastructure and property impacts in Dakota County.

Coordination and Collaboration

8. Request state agencies to evaluate the impacts of increased drain tiling on river flows and develop a strategy with stakeholders to minimize or mitigate the impacts.

9. Continue collaboration with SWCDs and communities to include and cost-share Low Impact Development (LID) features that may include Minimal Impact Design Standards (MIDS).

10. Work with partners to ensure that the Vermillion River and its tributaries are managed properly for large debris, beaver dams, and other channel blocking features to avoid flooding with property/ infrastructure damage, and other flow related issues.
    a. Work with partners to develop assessment techniques for channel blockages, define appropriate criteria for potential removal/ management, and identify funding sources to achieve identified removal/ management activities. Ensure that removing blockages does not adversely affect river pattern, structure, wildlife, or habitat.

    b. Implement a targeted program to inform landowners about liabilities associated with artificial river blockages located on or originating from private land.

Goal E: Improve public awareness and stewardship of water resources

Sub-goals

≈ Increase awareness of the Vermillion River, tributaries, and other waters within the watershed as unique resources
≈ Increase awareness of the VRWJPO and its services
≈ Maintain a clear watershed identity through consistency and quality in external communications
≈ Ensure that watershed messages are available through multiple channels and media
≈ Plan and host events, such as programs, training and outreach activities, to motivate stakeholders to make choices that will improve water resources
≈ Promote civic engagement and citizen-based action on water and natural resources issues

Objectives and Actions Organized by Major VRWJPO Roles

☐ Administration and Operations
☐ Regulation
☒ Research and Planning
☐ Monitoring and Assessment
☐ Land and Water Treatment
☒ Coordination and Collaboration
☒ Public Communications and Outreach

Research and Planning

1. Update the VRWJPO communication plan.
    a. Incorporate appropriate recommendations from "Perspectives on Minnesota Water Resources: A Survey of Sand Creek and Vermillion River Watershed Landowners," a University of Minnesota 2012 survey; WRAPS civic engagement plan; and annual Dakota County Residential Survey into the VRWJPO communication plan.
    b. Conduct a follow-up of watershed landowners in 2017 (five years after the University of Minnesota survey).

Coordination and Collaboration

2. Identify and develop an appropriate role for the VRWJPO in K-12 education in cooperation with teachers, environmental educators, and other key education stakeholders.
    a. Support Dakota and Scott counties' role and participation in the annual Children's Water Festival.
    b. Collaborate with educators, including DNR's Project WET, to determine an appropriate role

for the VRWJPO in water education.

3. Assist in public education and civic engagement regarding the fish, macroinvertebrates, plants, and wildlife in the Vermillion River Watershed.
   a. Support Dakota County, local communities, and volunteers participating in the Wetland Health Evaluation Program.
   b. Collaborate with county and city parks on programs, classes, and activities that focus attention on the fish, macroinvertebrates, plants, and wildlife in the watershed.
   c. Assist science teachers conducting field education classes or projects in the watershed.

4. Assist state and local partners in providing information and education on protecting groundwater quality and quantity.
   a. Employ existing communication channels (VRWJPB, WPC, TAG, Dakota and Scott counties, Agricultural Outreach, newsletters, website, other) to update key stakeholders about groundwater quality issues of importance to the watershed.
   b. Update existing public information and education materials on groundwater, private well testing, and the connection between land use and groundwater quality.
   c. Collaborate with partners to develop a consistent message on the low cost of groundwater protection and the high cost of groundwater remediation.
   d. Collaborate with partners to develop public awareness about the connectivity of groundwater and surface water.
   e. Develop a consistent message about protecting areas sensitive to groundwater contamination from land-use impacts and practices.
   f. Provide education opportunities to local governments and residents regarding the hydrologic cycle, groundwater, groundwater/surface water interactions, groundwater recharge areas, and groundwater conservation.

Public Communications and Outreach

5. Recognize and celebrate stewardship in the Vermillion River Watershed.
   a. Consult with local community leaders on appropriate methods to build community pride in water quality achievements.
   b. Host VRWJPO watershed tours for elected and appointed officials to highlight demonstrations of innovative technology, successful water quality and quantity improvement practices, and restoration activities.
   c. Assist Vermillion Stewards, a coordinated volunteer program to raise awareness of the importance of watershed protection; involve community members in stewardship and education activities; and provide a recognition program for volunteers.
   d. Publish stories recognizing stewardship activities online, in the newsletter, and other public venues.
   e. Write and post CIP project fact sheets on the VRWJPO website.
   f. Consider establishing kiosks, signs, or other location-specific educational displays at VRWJPO

CIP projects, public access, and open spaces.

6. Support and create opportunities for people to work together on projects that will improve water quality, water quantity, or habitat.
   a. Build capacity among individuals and groups interested in watershed protection and improvement to participate in, lead, or develop civic engagement actions.
   b. Support and participate in the Scott Clean Water Education Program.
   c. Assist Scott and Dakota counties in planning and implementing their respective Outdoor Education Days.
   d. Promote and implement the Stewardship Grant program for short-term events and activities that educate and engage people to improve or protect water quality.
   e. Develop and maintain a VRWJPO presence at community events with relevance to the watershed (Earth Week events, clean-up events, lake association meetings, community festivals, park opening events, for example).
   f. Facilitate multi-partner solutions to water quality or habitat restoration issues.

7. Increase public awareness of the Vermillion River and its major tributaries as a valued resource.
   a. Continue working with WaterShed Partners to educate the general public on water resources and stewardship behaviors and choices.
   b. Promote the recreational opportunities and other initiatives to increase appreciation and enjoyment of the Vermillion River system.

8. Maintain and expand the VRWJPO website as a comprehensive information source about the watershed and the VRWJPO.
   a. Post all VRWJPB, WPC, and TAG agendas, background materials and meeting minutes.
   b. Post all major proposed plans and request public comment through published notices and news releases.
   c. Post all progress, activity, and financial reports.

9. Publish a VRWJPO e-newsletter at least once a year.

10. Submit articles on the watershed and its activities to publications of partners (e.g., *MPCA Waterfront Bulletin*, *Scott County Scene*) and news media (newspapers, magazines).

11. Continue to implement targeted education programs on responsible land use and stewardship for elected officials, inspectors, real-estate professionals, and other key groups.

12. Increase resilience of the watershed to climate changes through direct preparedness, outreach, and engagement efforts.
   a. Promote and support programs to learn about, design, and install residential raingardens and shoreline restorations.
   b. Promote and support Vermillion Stewards hands-on educational events/workshops.
   c. Consider continuing workshops on ice/snow management and turf grass maintenance.
   d. Work with partners to develop a watershed-wide education and outreach effort on flood/storm resilience.

13. Provide clear information to landowners and other stakeholders

on how to navigate the multiple layers of water governance.

a. Update water resource management governance diagram to illustrate and concisely explain the roles of various government organizations in water resource management in the Vermillion River Watershed.
b. Develop or adapt a "by-topic" web-based tool to inform users of the appropriate agencies or organizations to answer questions about regulations, permits, or resources.
c. Encourage local governments and interested parties to coordinate a review meeting at one time in one place for projects with potential water resource impacts.

Goal F: Improve watershed resilience to changing precipitation and temperature patterns

Sub-goals

≈ Seek to maintain pre-development hydrology
≈ Increase the resilience of the River Corridor through vegetative protection and restoration techniques.

Objectives and Actions Organized by Major VRWJPO Roles

☒ Administration and Operations
☐ Regulation
☒ Research and Planning
☐ Monitoring and Assessment
☒ Land and Water Treatment
☒ Coordination and Collaboration
☒ Public Communications and Outreach

Administration and Operations

1. Establish wetland banks in the watershed.
   a. Develop procedures to operate wetland banks and sustain wetland restorations in the Vermillion River Watershed, creating a revolving fund that rolls fees from purchasers back into further wetland restorations.

2. Establish a riparian habitat improvement program that includes tree shading in critical reaches.

Research and Planning:

3. Use the VRWJPO hydrologic model in planning decisions with local communities to prevent adverse impacts to intercommunity flows.

Land and Water Treatment

4. Develop, implement, and promote demonstration projects of BMPs that help mitigate the impacts of high flows, flooding, high temperatures, drought, and severe weather events.
   a. Consider providing 100 percent capital costs of BMPs not commonly used or well-understood by landowners that have high potential to mitigate flow, precipitation, or temperature extremes.
   b. Work with media outlets to call attention to demonstration projects with significant benefits or results.
   c. Promote and cost share BMPs that manage stormwater through disconnection of runoff from impervious surfaces.

5. Increase resilience of the river system to changing precipitation and temperature patterns through riparian buffers/filter strips, shading, in-stream restorations, and shoreland/floodplain management.

a. Assist partners in establishing shoreland easements along the Vermillion River corridor.
b. Promote the benefits of buffers/filter strips for water quality improvement and watershed resilience to landowners along the river and tributaries.
c. Cost-share in-stream restorations that increase shade, dissolved oxygen, and bank stability, such as riffles, root wads, lunker structures, toe wood, refuge pools, and other features.
d. Consider options for re-routing treated wastewater effluent to supplement base flow during drought conditions.
e. Encourage and promote alternative perennial crops and cover crops in agricultural areas of the watershed.

Coordination and Collaboration

6. Preserve and restore the Vermillion River watershed's pre-development hydrology to the extent practicable.
   a. Work with partners and landowners to preserve and protect healthy meandered river and stream reaches through conservation easement, buffers/filter strips, invasive species control, and other stabilization practices.
   b. Work with partners and landowners to restore straightened river or stream reaches through remeandering projects, streambank stabilization, buffers, revegetation, habitat improvement or other techniques.
   c. Work with partners and landowners to protect and restore wetlands with strategic value in flood protection and pollutant filtration through conservation easements, restoration, revegetation, and other techniques.
   d. Encourage cities and developers to integrate LID practices when feasible.

7. Collaborate with local and regional land-use planning partners to address potential cumulative impacts of specific land-use changes that affect Vermillion River Watershed water resources or natural hydrology (e.g., expansive aggregate mining, widespread drainage management practices, or impervious cover expansion).

Public Communications and Outreach

8. Increase awareness and understanding of the benefits of maintaining predevelopment hydrology.

Goal G: Protect or restore sensitive biological resources, such as plants, fish, insects, and wildlife

Sub-goals

≈ Monitor fish and macroinvertebrate populations in the river and tributaries
≈ Use current research, long-range trend data, policies, and partnerships to protect habitat for native and sensitive aquatic species

Objectives and Actions Organized by Major VRWJPO Roles

☐ Administration and Operations
☒ Regulation
☒ Research and Planning
☒ Monitoring and Assessment
☒ Land and Water Treatment
☒ Coordination and Collaboration
☐ Public Communications and Outreach

Regulation

1. Protect sensitive habitats, communities, and rare species.
    a. Require local water management plans (and comprehensive wetland management plans, where existing) to take reasonable measures to avoid impacts of land-disturbing activities on known sensitive habitats, communities, and rare species.
    b. Review projects and plans for land-disturbing activities within the VRWJPO's jurisdiction for potential impacts on sensitive habitats, communities, and rare species, and propose reasonable measures to avoid the impacts.

Research and Planning

2. Research emerging scientific information and technology on reducing thermal impacts to streams from stormwater runoff to protect species sensitive to elevated temperature or low dissolved oxygen conditions.
    a. Review recommendations from prior VRWJPO research on thermal trading and thermal reduction BMPs.
    b. Propose demonstration or research projects that have the potential to protect the fish population from thermal impacts.

Monitoring and Assessment

3. Update and continue implementing the VRWJPO Biomonitoring Plan.
    a. Consider modifying monitoring frequency after sufficient fish and macroinvertebrate trends have been identified.
    b. Continue partnerships with the DNR and others to sample fish and macroinvertebrates.

Land and Water Treatment

4. Identify and implement sediment-reducing BMPs in the highest sediment-yielding subwatersheds.
    a. Collect data from the Vermillion River Monitoring Network annual sampling regime to identify sensitive species, analyze TSS, and locate sediment sources from the highest sediment-yielding subwatersheds.
    b. Target locations where implementing BMPs would effectively reduce sediment loading.
    c. Incorporate potential BMPs for sediment-load reduction in the CIP.

Coordination and Collaboration

5. Coordinate with partners to identify, prioritize, protect, connect, restore, and maintain lands with impacts or connectivity to riparian habitat.
    a. Collaborate with Dakota County Land Conservation staff to identify and prioritize riparian and upland habitat and assist in easement acquisition and restoration or protection through cost-share and incentives.
    b. Collaborate with Scott County Land Conservation staff to identify high priority riparian habitat and assist in easement acquisition and restoration or protection through cost-share and incentives.
    c. Collaborate with other partners, agencies and groups (Pheasants Forever, Trout Unlimited, DNR, for example) to identify high priority riparian habitat and assist with restorations or protection by providing technical assistance, volunteers, cost-share, or incentives.
    d. Collaborate with other agencies, organizations, and private landowners to develop fish and wildlife habitat corridors that connect open spaces, lakes,

wetlands, stream corridors, and other critical habitat.

6. Coordinate with partners to protect and enhance refuge areas in the Vermillion River trout streams.
   a. Support and cost-share projects to protect and enhance refuge areas for in-stream restorations (such as stream remeanders).
   b. Work with partners to develop and fund a cooperative strategy to manage beavers and remove dams that create poor conditions for sensitive biological communities.

7. Consult with state agencies in review of the Index of Biotic Integrity metrics as applied to the Vermillion River and its tributaries.

   a. Consult the MPCA for the potential to include brown trout as a native cold-water species equivalent in development, application, and calculation of the Index of Biological Integrity (IBI) for fish within the Vermillion River Watershed.
   b. Encourage DNR to consider the potential to stock native cold-water species in suitable habitat reaches of the Vermillion River.

8. Assist federal, state, and local public health agencies to address water-related health and safety issues, such as high bacteria levels or toxic algae blooms in recreational waters.

9. Provide educational materials to help prevent the spread of aquatic invasive species.

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Section 7: Implementation Plan

7.0 Introduction

This section describes the Implementation Plan, as well as how activities were selected for implementation within the 10-year timeframe of the 2016-2025 Vermillion River Watershed Management Plan.

The implementation section of the Plan identifies specific, measurable actions necessary to achieve goals identified in Section 6: Goals, Objectives, and Actions.

These actions were suggested during the public involvement process or taken from the Vermillion River Watershed Restoration and Protection Strategy (WRAPS), geomorphic assessments, subwatershed assessments, partner Capital Improvement Plans (CIPs), and other previously completed planning documents.

The process of "blending" action steps from so many different sources into a coherent implementation plan was a challenge. An implementation table containing all recommended actions individually would be exhaustive, duplicative, and lacking in focus and priority.

The VRWJPO contracted with Emmons & Olivier Resources (EOR) to develop a process for an implementation plan. The VRWJPO wanted an implementation plan that would be true to source materials (WRAPS, geomorphic assessments, etc.) as well as the priorities expressed by stakeholders and the public.

Figure 7.0.1: VRWJPO Implementation Plan Development Process summarizes the steps taken to achieve the implementation plan.

An action in Section 6: Goals, Objectives, and Actions in the Implementation Plan are statements of intent by the VRWJPO. Implementation depends on future decisions by the Vermillion River Watershed Joint Powers Board (VRWJPB), which budgets for and authorizes initiatives. In many cases, implementation requires participation of other parties.

The VRWJPO is committed to regular evaluation of its programs, projects, and capital improvements. The VRWJPO will periodically (at least every two years) review its progress towards implementing this Plan. In response to feedback, new information, changes in priorities, or new technical approaches, the VRWJPO may revise or amend the Implementation Plan.

Figure 7.0.1: VRWJPO Implementation Plan Development Process

Step 1: Compile Potential Implementation Activities	Step 2: Evaluate Implementation Activities	Step 3: Identify Watershed-wide Implementation Activities	Step 4: Develop Subwatershed Management Plans	Step 5: Prioritize Implementation Activities
Populated table with implementation activities found in the Goals, Objectives, and Actions (GOA), WRAPS, geomorphic assessments, Vermillion River Headwaters assessment, and others.	Sorted implementation activities by VRWJPO role: Administration and Operations; Coordination and Collaboration; Land and Water Treatment; Monitoring and Assessment; Public Communication and Outreach; Regulation; and Research and Planning.	Implementation activities that could occur anywhere within the watershed are included in the Implementation Plan Summary ("the big table").	Implementation activities that are unique to a specific area were identified in individual subwatershed management plans.	Implementation activities in individual subwatershed were prioritized by the VRWJPO. Estimates were made of the percentage of VRWJPO funding and effort that would be expended on each subwatershed.
Evaluated whether specific activities had been implemented; if yes, removed them from the table.	Made certain that implementation activities (now sorted by VRWJPO role) were assigned a goal and objective to track its origins in the GOA.	Implementation activities that are currently being performed or are ongoing responsibilities were grouped in one line item in "the big table" – Staff Function.	Implementation activities identified in geomorphic assessments were cross-referenced with projects in member communities' CIP to see if there was overlap and an opportunity to partner.	Ensured that all implementation activities had been evaluated, prioritized, and included in "the big table," with cost estimates based on the VRWJPO's annual budget projections over the next 10 years.
Contacted member communities (cities, counties) to request Capital Improvement Plans to identify opportunities for collaboration.		Implementation activities assumed to be new functions or projects of the VRWJPO are listed separately in "the big table."	After filling in each subwatershed management plan, total annual costs for implementation activities was calculated for that subwatershed and included in "the big table."	

7.1 Subwatershed Management Plans

The development of specific subwatershed management plans allows the VRWJPO to prioritize its projects among various subwatersheds based on resource conditions, impacts on other subwatersheds, or other issues. For example, a water quality improvement project implemented in an upstream subwatershed will benefit the resources downstream.

The VRWJPO staff developed a prioritization for subwatersheds based on these factors. (See Figure 7.1.1: Subwatershed Priorities.) The priority factor is the percentage of available project funding to be allocated for projects in specific subwatersheds.

Figure 7.1.1: Subwatershed Priorities

Subwatershed	Priority Factor
Upper Main Stem	25
South Creek	20
North Creek	15
South Branch Vermillion	15
Middle Creek	10
Middle Main Stem	7
Lower Main Stem	5
Mississippi River Direct	3

Implementation projects depend on a variety of factors, including partner participation, opportunity, and available staff time. The annual budget allocations for projects in each subwatershed are contingent on VRWJPB approvals.

The subwatershed management plans (Figures 7.2 through 7.9) consist of all of the potential projects that have been identified for the given subwatershed. The categories highlighted in beige represent those projects identified in geomorphic or subwatershed assessments. For example, Figure 7.3 South Creek Subwatershed, includes a category "Culvert/crossing" that includes several specific projects identified in the South Creek geomorphic assessment.

The projects in white are those that are recommended in the WRAPs, partner CIP plans, or other planning documents.

Clearly, the VRWJPO will not be able to complete all of the projects listed in the subwatershed plans within its current budget structure. Each of the subwatershed management plan figures includes funding estimates based on:

- ≈ All potential projects that have been identified within the subwatershed.
- ≈ A prioritized list of projects to be completed within the subwatershed given a $500,000 annual capital improvement budget.
- ≈ A prioritized list of projects to be completed within the subwatershed given the VRWJPO's existing annual budget, after watershed-wide initiatives have been allocated.

Consultants developed cost estimates for each activity in the subwatershed plans. Cost estimates were identified in the geomorphic assessments; the VRWJPO used the mid-range of the cost estimates in the subwatershed management plans.

To reduce project costs, the VRWJPO will continue to collaborate with partners. Consultants reviewed the capital improvement programs or other planning documents of local partners to determine where work within the watershed is being proposed.

Some proposed partner projects – such as road reconstruction, facility upgrades, or residential developments – can be significantly improved by installing stormwater management or treatment practices concurrently. Partners can incorporate BMPs that protect infrastructure, reduce impacts of new impervious surface, reduce and treat stormwater, build resilience to weather events, and add landscape interest.

VRWJPO cost share funding can provide partners these benefits at a reduced cost. At the same time, the VRWJPO achieves its water and land improvement goals while working efficiently and economically in concert with activities already underway.

7.2 Upper Main Stem Subwatershed

The Upper Main Stem Subwatershed is the top priority for implementation projects. The subwatershed includes two reaches of the Vermillion River (520 and 517). Potential projects are shown in Figure 7.2.1.: Upper Main Stem Subwatershed Management Plan.

Figure 7.2.1: Upper Main Stem Subwatershed Management Plan

Upper Main Stem Subwatershed Management Plan	**Original Scenario (All Activities)**	**500K Annual Scenario 1**	**Current Balance Scenario**
Vermillion Headwaters Subwatershed Assessment BMPs	$ 137,720	$ 137,720	$ 137,720
Subtotal	$ 137,720	$ 137,720	$ 137,720
Culverts/crossings	*$ 500,000*	*$ 1,112,280*	*$ 406,030*
Riparian buffers	*$ 250,000*		
Natural Channel Restoration	*$ 250,000*		
Streambank stabilization	*$ 750,000*		
Additional projects identified in future geomorphic assessment	*$ 500,000*		
Future Geomorphic Subtotal	*$ 2,250,000*		
Ten Year Total Budget (25% of total)	**$ 2,387,720**	**$ 1,250,000**	**$ 543,750**

A geomorphic assessment has not been conducted for this subwatershed, so dollar amounts shown for these activities (shaded beige in the figure) were estimated based on expenditures found in other, similar subwatersheds. Note that the dollar amount to be spent on projects identified in the geomorphic assessments is lumped for the two budget scenarios. The specific geomorphic assessment projects to be conducted will be determined based on the evaluation criteria and priorities established within the assessment.

7.3 South Creek Subwatershed

The South Creek Subwatershed was identified as one of the top priorities for implementation projects. The subwatershed includes impaired reach 527 and Lake Marion. Potential projects are identified in Figure 7.3.1.: South Creek Subwatershed Management Plan.

Figure 7.3.1: South Creek Subwatershed Management Plan

South Creek Subwatershed Management Plan	Original Scenario (All Activities)	500K Annual Scenario 1	Current Balance Scenario
Bacteria Feasibility Study	$ 25,000		
Bacteria Project	$ 125,000		
BMP retrofits Lakeville downstream of Marion Lake.	$ 300,000	$ 300,000	$ 300,000
BMPs for Hamburg Ave. re-construction in reaches 570, 715	$ 150,000		
Subtotal	$ 600,000	$ 300,000	$ 300,000
Bank Stabilization	*$ 18,750*	*$ 700,000*	*$ 135,000*
Culvert/crossing	*$ 131,250*		
Infastructure/Bank Stabilization	*$ 18,750*		
Infrastructure	*$ 393,750*		
Natural Channel Restoration	*$ 2,343,750*		
Riparian Management	*$ 1,087,500*		
Geo Morph Subtotal	*$ 3,993,750*		
Ten Year Total Budget (20% of total)	**$ 4,593,750**	**$ 1,000,000**	**$ 435,000**

The projects highlighted in beige were identified in the geomorphic assessment that was done for South Creek, available on the VRWJPO website. Note that the dollar amount to be spent on projects identified in the geomorphic assessments is lumped for the two budget scenarios. The specific geomorphic assessment projects to be conducted will be determined based on the evaluation criteria established within the assessment.

7.4 North Creek Subwatershed

The North Creek Subwatershed was identified as one of the top priorities for implementing projects. The subwatershed includes three impaired reaches of North Creek (545, 670 and 671). Potential projects are identified in Figure 7.4.1.: North Creek Subwatershed Management Plan.

Figure 7.4.1: North Creek Subwatershed Management Plan

North Creek Subwatershed Management Plan	Original Scenario (All Activities)	500K Annual Scenario 1	Current Balance Scenario
Bacteria Feasibility Study	$ 25,000		$ -
Bacteria Project	$ 75,000		$ -
SW Storage in Headwaters	$ 300,000	$ 150,000	$ 150,000
SW Retrofits: Pilot Knob	$ 275,000	$ 125,000	$ 125,000
Assess weirs/dams and backwaters	$ 85,000	$ 85,000	
Subtotal	***$ 760,000***	***$ 360,000***	***$ 275,000***
Bank Stabilization	*$ 37,500*	*$ 390,000*	*$ 51,250*
Crossing/culvert	*$ 937,500*		
Grade Stabilization	*$ 281,250*		
Infrastructure	*$ 150,000*		
Natural Channel Restoration	*$ 731,250*		
Riparian Management	*$ 187,500*		
Geo Morph Subtotal	*$ 2,512,500*		
Ten Year Total Budget (15% of total)	**$ 3,085,000**	**$ 750,000**	**$ 326,250**

The projects highlighted in beige were identified in the geomorphic assessment that was done for North Creek and its tributaries, available on the website. Note that the dollar amount to be spent on projects identified in the geomorphic assessments is lumped for the two budget scenarios. The specific geomorphic assessment projects to be conducted will be determined based on the evaluation criteria established within the assessment.

7.5 South Branch Vermillion Subwatershed

The South Branch Vermillion Subwatershed was identified as one of the top priorities for implementing projects. The subwatershed includes South Branch reach 707. Potential projects are identified in Figure 7.5.1.: South Branch Vermillion Subwatershed Management Plan.

Figure 7.5.1: South Branch Vermillion Subwatershed Management Plan

South Branch Vermillion Subwatershed Management Plan	Original Scenario (All Activities)	500K Annual Scenario 1	Current Balance Scenario
Woodchip bioreactors and other N removal BMPs	$ 75,000	$ 75,000	$ 75,000
Riparian Buffers	*$ 250,000*	*$ 250,000*	*$ 125,625*
Natural Channel Restoration	*$ 100,000*	*$ 100,000*	*$ 125,625*
Culverts/crossings	*$ 50,000*	*$ 50,000*	*$ 50,000*
Ten Year Total Budget (15% of total)	**$ 475,000**	**$ 475,000**	**$ 376,250**

A geomorphic assessment has not been conducted for this subwatershed yet so the dollar amounts shown for these activities (shaded beige in the figure) were estimated based on expenditures found in other, similar subwatersheds. The specific geomorphic assessment projects to be conducted will be determined based on the evaluation criteria and priorities established within the assessment.

7.6 Middle Creek Subwatershed

The Middle Creek Subwatershed was identified as a lower priority for implementing projects. The subwatershed includes two impaired reaches of Middle Creek (548 and 668). Potential projects are identified in Figure 7.6.1.: Middle Creek Subwatershed Management Plan.

Figure 7.6.1: Middle Creek Subwatershed Management Plan

Middle Creek Subwatershed Management Plan	Original Scenario (All Activities)	500K Annual Scenario 1	Current Balance Scenario
Headwater Stream Ponds (upstream of 195th St)	$ 200,000	$ 100,000	$ 100,000
Bacteria Feasibility Study	$ 25,000		0
Bacteria Project	$ 125,000		0
Headwaters Cost Share	$ 25,000	$ 25,000	0
Connect re-constructed area in reach 547 downstream of 195th Street	$ -	0	0
Subtotal	$ 375,000	$ 125,000	$ 100,000
Bank Stabilization	*$ 56,250*	*$ 375,000*	*$ 117,500*
Crossing/culvert	*$ 356,250*		
Grade Stabilization	*$ 262,500*		
Infrastructure	*$ 37,500*		
Natural Channel Restoration	*$ 1,068,750*		
Riparian Management	*$ 112,500*		
Geo Morph Subtotal	*$ 1,893,750*		
Ten Year Total Budget (10% of total)	**$ 2,268,750**	**$ 500,000**	**$ 217,500**

The projects highlighted in beige were identified in the geomorphic assessment that was done for Middle Creek and its tributaries, available on the website. Note that the dollar amount to be spent on projects identified in the geomorphic assessments is lumped for the two budget scenarios. The specific geomorphic assessment projects to be conducted will be determined based on the evaluation criteria established within the assessment.

7.7 Middle Main Stem Subwatershed

The Middle Main Stem Subwatershed was identified as a lower priority for implementing projects. The subwatershed includes Vermillion River reach 507. Potential projects are identified in Figure 7.7.1.: Middle Main Stem Subwatershed Management Plan.

Figure 7.7.1: Middle Main Stem Subwatershed Management Plan

Middle Main Stem Subwatershed Management Plan	**Original Scenario (All Activities)**	**500K Annual Scenario 1**	**Current Balance Scenario**
Study to determine SW pond temperature	$ 25,000	$ 25,000	$ 25,000
Subtotal	$ 25,000	$ 25,000	$ 25,000
Bank Stabilization	*$ 337,500*	*$ 325,000*	*$ 127,250*
Culvert/crossing	*$ 637,500*		
Infrastructure	*$ 131,250*		
Natural Channel Restoration	*$ 2,231,250*		
Riparian Management	*$ 600,000*		
Geo Morph Subtotal	*$ 3,937,500*		
Ten Year Total Budget (7% of total)	**$ 3,962,500**	**$ 350,000**	**$ 152,250**

The projects highlighted in beige were identified in the geomorphic assessment that was done in the Empire Flowages, available on the website. Note that the dollar amount to be spent on projects identified in the geomorphic assessments is lumped for the two budget scenarios. The specific geomorphic assessment projects to be conducted will be determined based on the evaluation criteria established within the assessment.

7.8 Lower Main Stem Subwatershed

The Lower Main Stem Subwatershed was identified as a lower priority for implementing projects. The subwatershed includes Vermillion River reach 692. Potential projects are identified in Figure 7.8.1.: Lower Main Stem Subwatershed Management Plan.

Figure 7.8.1: Lower Main Stem Subwatershed Management Plan

Lower Main Stem Subwatershed Management Plan	Original Scenario (All Activities)	500K Annual Scenario 1	Current Balance Scenario
Riparian Buffers	*$ 250,000*	*$ 50,000*	*$ 54,375*
Urban BMP retrofit opportunities in residential areas of Hastings	$ 450,000	$ 150,000	
Streambank Stabilization	*$ 250,000*	*$ 50,000*	*$ 54,375*
Ten Year Total Budget (5% of total)	**$ 950,000**	**$ 250,000**	**$ 108,750**

A geomorphic assessment has not been conducted for this subwatershed yet so the dollar amounts shown for these activities (shaded beige in the figure) were estimated based on expenditures found in other, similar subwatersheds. The specific geomorphic assessment projects to be conducted will be determined based on the evaluation criteria and priorities established within the assessment.

7.9 Mississippi River Direct Subwatershed

The Mississippi River Direct Subwatershed was identified as a lower priority for implementing projects. The subwatershed includes the Ravenna Coulees. Potential projects are identified in Figure 7.9.1.: Mississippi River Direct Subwatershed Management Plan.

Figure 7.9.1: Mississippi River Direct Subwatershed Management Plan

Mississippi Direct Subwatershed Management Plan	Original Scenario (All Activities)	500K Annual Scenario 1	Current Balance Scenario
Ag BMPS in Upstream Areas	$ 25,000	$ 25,000	$ 25,000
Riparian Buffers	*$ 50,000*	*$ 50,000*	*$ 50,000*
Urban BMP retrofit opportunities in residential areas of Hastings	$ 300,000		
Ravenna Coulee 1, West Drainage, PP01 Grade Stabilization	*$ 25,000*	*$ 25,000*	
Ten Year Total Budget (3% of total)	**$ 400,000.00**	**$ 100,000.00**	**$ 75,000.00**

The projects highlighted in beige were identified in the geomorphic assessment that was done in the Etter Creek/ Ravenna Coulees, available on the website. Note that the dollar amount to be spent on projects identified in the geomorphic assessments is lumped for the two budget scenarios. The specific geomorphic assessment projects to be conducted will be determined based on the evaluation criteria established within the assessment.

7.10 Implementation Plan Table

Figure 7.10.1: Implementation Plan Table uses the VRWJPO roles and Watershed Plan goals to provide cost estimates for the Section 6 actions not included in the subwatershed plans.

Those actions that can be taken by VRWJPO staff as part of current operations are included in the "Staff Function" line in the Implementation Plan Table. An annual budget of $240,000 over each of the next 10 years for staff functions encompasses many of the actions listed in Section 6.

Those actions that require additional resources (planning, development, policy, consultation, etc.) are specifically listed in the table, with cost estimates. The subwatershed plan costs are summarized and listed in the Land and Water Treatment category.

Where implementation activities are dependent upon one another (e.g. water quality improvement project dependent upon the completion of a feasibility study and/or modeling effort), the relationship is reflected in the schedule.

Implementation activities and cost estimates are taken from previous studies or projects. In other cases, the costs are estimates based on current understanding of the activity's scope. Cost estimates are shown as either a one-time cost (typical of feasibility studies and capital improvement projects) or as annual costs for ongoing programs. In general, the Implementation Plan provides a planning-level projection that can be used as a starting point for the detailed annual budgeting process.

The implementation plan table is organized by the roles of the VRWJPO as defined in Section 6: Goals, Objectives, and Actions. For each of the VRWJPO roles, the plan table provides a budget for general staff functions.

7.11 VRWJPO Financing

Dakota and Scott counties jointly fund the administration and activities of the VRWJPO, as specified in the Joint Powers Agreement (see Appendix A). The funding is provided through the counties' annual property tax levies, using the following process:

- Dakota and Scott counties provide the VRWJPO with estimates of Vermillion River Watershed Management Tax District tax capacity.
- In August, the VRWJPO staff submits a preliminary annual budget and Vermillion River Watershed Management Tax District Levy for the subsequent year to the VRWJPB.
- The VRWJPB holds a public hearing and adopts the proposed budget and levy amounts for the next year.
- In September, the Dakota County and Scott County Boards certify the preliminary levy amounts allocated to the portions of the watershed in each County according to tax capacity.
- In December, as the annual budget cycle ends, the VRWJPO staff updates the proposed budget to a final version for the subsequent year. The VRWJPB adopts the final budget and levy.
- In December, the Dakota County and Scott County Boards certify the final Vermillion River Watershed Management Tax District levy.

The Vermillion River Watershed Management Tax District levy is a primary, but not the only, source of funding for VRWJPO activities. The VRWJPO also pursues grant opportunities, partnerships, or coordinated efforts that align with Watershed Plan goals and needs. The VRWJPO may also pursue other alternative funding options as identified in Minnesota Statutes 103B, if these options are consistent with the Joint Powers Agreement.

Figure 7.10.1: Implementation Plan Table

VRWJPO Roles and Goals	Implementation Initiatives	Grant Eligibility	Costs										
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	10-Year Total
Administration and Operations			**$ 245,000**	**$ 245,000**	**$ 240,000**	**$ 240,000**	**$ 240,000**	**$ 240,000**	**$ 240,000**	**$ 240,000**	**$ 240,000**	**$ 240,000**	**$ 2,410,000**
	Staff Function		$ 240,000	$ 240,000	$ 240,000	$ 240,000	$ 240,000	$ 240,000	$ 240,000	$ 240,000	$ 240,000	$ 240,000	$ 2,400,000
Goal F	Establish a riparian habitat improvement program that includes tree shading in trout stream reaches	Yes	$ 5,000.00	Tree shading efforts are included within each of the individual subwatershed management plans									5000
Goal A	Use restorable wetland tools and inventories to develop partnerships and implement restoration projects.	Yes	$ -	$ 5,000.00									5000
Coordination & Collaboration			**$ 20,000**	**$ 20,000**	**$ 30,000**	**$ 20,000**	**$ 20,000**	**$ 20,000**	**$ 20,000**	**$ 20,000**	**$ 20,000**	**$ 20,000**	**$ 210,000**
	Staff Function		See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	$ -
	Collaborate with Dakota and Scott County Land Conservation staff to identify high priority riparian habitat and assist in easement acquisition and restoration or protection through cost-share and incentives		*See previous item #1 under Climate Change above*	*See previous item #1 under Climate Change above*	*See previous item #1 under Climate Change above*	*See previous item #1 under Climate Change above*	*See previous item #1 under Climate Change above*	*See previous item #1 under Climate Change above*	*See previous item #1 under Climate Change above*	*See previous item #1 under Climate Change above*	*See previous item #1 under Climate Change above*	*See previous item #1 under Climate Change above*	$ -
	Work with partners and landowners to protect wetlands and restore wetlands with strategic value in flood protection and pollutant filtration through conservation easement, fee title, tile removal, revegetation, and other techniques		*See following item*	*See following item*	*See following item*	*See following item*	*See following item*	*See following item*	*See following item*	*See following item*	*See following item*	*See following item*	$ -
Goal A	Assist Dakota County and Scott County Land Protection programs in acquiring permanent conservation easements in riparian areas in the Vermillion River Watershed		$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 200,000
	Work with landowners and other agencies to eliminate fencing across public waters and associated potential liabilities (e.g., Vermillion River and tributaries).		*See item under L&WT, WQ*	*See item under L&WT, WQ*	*See item under L&WT, WQ*	*See item under L&WT, WQ*	*See item under L&WT, WQ*	*See item under L&WT, WQ*	*See item under L&WT, WQ*	*See item under L&WT, WQ*	*See item under L&WT, WQ*	*See item under L&WT, WQ*	$ -
	Consider developing stormwater management system maintenance guidance for watershed communities		$ -	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,000
	Assist with buffer acquisition, riparian plantings, shoreline restoration, acquisition and/or removal of structures that degrade the corridor		*See previous item #1 under Climate Change above*	*See previous item*	*See previous item*	*See previous item*	*See previous item*	*See previous item*	*See previous item*	$ -	$ -	$ -	$ -
Land and Water Treatment			**$ 243,475**	**$ 278,475**	**$ 313,475**	**$ 293,475**	**$ 283,475**	**$ 313,475**	**$ 288,475**	**$ 268,475**	**$ 268,475**	**$ 268,475**	**$ 2,819,750**
	Staff Function		See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	$ -
	Implement activities identified in the North Creek Subwatershed Management Plan	Yes	$ 32,625	$ 32,625	$ 32,625	$ 32,625	$ 32,625	$ 32,625	$ 32,625	$ 32,625	$ 32,625	$ 32,625	$ 326,250
	Implement activities identified in the Middle Creek Subwatershed Management Plan	Yes	$ 21,750	$ 21,750	$ 21,750	$ 21,750	$ 21,750	$ 21,750	$ 21,750	$ 21,750	$ 21,750	$ 21,750	$ 217,500
	Implement activities identified in the South Creek Subwatershed Management Plan	Yes	$ 43,500	$ 43,500	$ 43,500	$ 43,500	$ 43,500	$ 43,500	$ 43,500	$ 43,500	$ 43,500	$ 43,500	$ 435,000
	Implement activities identified in the Upper Mainstem Subwatershed Management Plan	Yes	$ 54,375	$ 54,375	$ 54,375	$ 54,375	$ 54,375	$ 54,375	$ 54,375	$ 54,375	$ 54,375	$ 54,375	$ 543,750
Goal A	Implement activities identified in the South Branch Vermillion Subwatershed Management Plan	Yes	$ 37,625	$ 37,625	$ 37,625	$ 37,625	$ 37,625	$ 37,625	$ 37,625	$ 37,625	$ 37,625	$ 37,625	$ 376,250
	Implement activities identified in the Middle Mainstem Subwatershed Management Plan	Yes	$ 15,225	$ 15,225	$ 15,225	$ 15,225	$ 15,225	$ 15,225	$ 15,225	$ 15,225	$ 15,225	$ 15,225	$ 152,250
	Implement activities identified in the Lower Mainstem Subwatershed Management Plan	Yes	$ 10,875	$ 10,875	$ 10,875	$ 10,875	$ 10,875	$ 10,875	$ 10,875	$ 10,875	$ 10,875	$ 10,875	$ 108,750
	Implement activities identified in the Mississippi River Direct Subwatershed Management Plan	Yes	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 7,500	$ 75,000
	Conduct Subwatershed Assessments		$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ -	$ -	$ -	$ 140,000
	Identify urban/suburban developed areas without adequate or any stormwater controls				$ 25,000								$ 25,000
Goal D	Develop outreach and cost-share incentives for homeowners, homeowners' associations and businesses in areas without stormwater controls to install stormwater rate and volume control BMPs		0	10000	10000	15000	15000	20000	20000	20000	20000	20000	150000
	Research and make recommendations about BMPs suitable for ultra-urban conditions (no room to integrate most BMPs).		$ -	$ -	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,000
	Provide cost-share or other incentives for producers using cover crops or nutrient management plans		--	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 25,000	$ 225,000

Figure 7.10.1: Implementation Plan Table

VRWJPO Roles and Goals	Implementation Initiatives	Grant Eligibility	Costs										
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	10-Year Total
Goal C	Research strategies for water use, re-use, or infiltration that minimize groundwater use at mining sites			$ -	$ 10,000	$ -	$ -	$ 25,000	$ -	$ -	$ -	$ -	$ 35,000
Monitoring and Assessment			**$ 202,500**	**$ 202,500**	**$ 227,500**	**$ 202,500**	**$ 192,500**	**$ 232,500**	**$ 192,500**	**$ 192,500**	**$ 192,500**	**$ 192,500**	**$ 2,030,000**
	Staff Function		See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	$ -
Goal A	Add continuous dissolved oxygen (DO) monitoring to Monitoring Network sampling for reaches listed as impaired for DO		$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ 40,000
	Collect and analyze surface water quality monitoring data and report annually on condition, trends, and recommendations for improvement		$ 192,500	$ 192,500	$ 192,500	$ 192,500	$ 192,500	$ 192,500	$ 192,500	$ 192,500	$ 192,500	$ 192,500	$ 1,925,000
	Complete geomorphic assessments on the South Branch and Lower Main stem Vermillion River (Hwy 52 to Hastings).		$ -	$ -	$ 25,000	$ -	$ -	$ 40,000	$ -	$ -	$ -	$ -	$ 65,000
Public Communication and Outreach			**$ 221,000**	**$ 226,000**	**$ 231,000**	**$ 226,000**	**$ 226,000**	**$ 221,000**	**$ 226,000**	**$ 226,000**	**$ 221,000**	**$ 221,000**	**$ 2,245,000**
	Staff Function		$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 2,200,000
Goal E	Host VRWJPO watershed tours for elected and appointed officials to highlight demonstrations of innovative technology, successful water quality and quantity improvement practices, and restoration activities		$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 10,000
Goal B	Collaborate with partners on turf and fertilizer management workshops for facility managers of businesses, parks, schools, and others	Yes			$ 5,000		$ 5,000			$ 5,000			$ 15,000
	Continue to promote and support workshops on ice/snow management and turfgrass maintenance			$ 5,000		$ 5,000			$ 5,000				$ 15,000
	Consider facilitating a watershed- or county-wide outreach and education campaign to increase awareness about the urban and rural land use contributions to nitrate contamination of groundwater	Yes			$ 5,000								$ 5,000
Goal A	Implement outreach activitities identified in the WRAPS Civic Engagement Plan												$ -
Regulation			**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 100,000**	**$ 1,000,000**
	Staff Function		$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 1,000,000
Research and Planning			**$ 10,000**	**$ 35,000**	**$ 10,000**	**$ 165,000**	**$ 45,000**	**$ 10,000**	**$ 160,000**	**$ -**	**$ 10,000**	**$ 150,000**	**$ 595,000**
	Staff Function		See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	See initial Staff Function	$ -
Goal G	Propose demonstration or research projects that have the potential to protect the brown trout population from thermal impacts	Yes				$ 150,000			$ 150,000			$ 150,000	$ 450,000
Goal E	Conduct a follow-up of watershed landowners in 2017 (five years after the University of Minnesota survey).		$ -	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 10,000
Goal B	Coordinate with other agencies to monitor condition and trends in groundwater levels and contaminant concentrations		$ 10,000		$ 10,000		$ 10,000		$ 10,000		$ 10,000		$ 50,000
Goal A	Evaluate need for new Watershed Standards on aggregate mining, if research shows potential water resource impacts	Yes	$ -	$ 25,000	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 25,000
	Review existing research on aggregate mining impacts on water and groundwater, in conditions comparable to the watershed.	Yes		$ -	$ -	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ -	$ 10,000
	Discuss research needs to evaluate cumulative landscape-scale impacts of aggregate mining in the watershed with partners	Yes	*See previous item*	*See previous item*	*See previous item*	*See previous item*	*See previous item*	*See previous item*	*See previous item*	*See previous item*	*See previous item*	*See previous item*	$ -
	Explore implementation of BWSR's "One Watershed, One Plan" principles as a means of addressing watershed-wide needs.		$ -	$ -	$ -	$ -	$ 25,000	$ -	$ -		$ -	$ -	$ 25,000
Goal C	Consider developing Water Conservation Standards for the watershed		$ -	$ -	$ -	$ 15,000	$ -	$ -			$ -	$ -	$ 15,000
	Review 2006 inventory of groundwater recharge areas and update, if needed		$ -	$ -	$ -	$ -	$ -	$ 10,000	$ -	$ -	$ -	$ -	$ 10,000
ANNUAL TOTALS			**$ 1,041,975**	**$ 1,106,975**	**$ 1,151,975**	**$ 1,246,975**	**$ 1,106,975**	**$ 1,136,975**	**$ 1,226,975**	**$ 1,046,975**	**$ 1,051,975**	**$ 1,191,975**	**$ 11,309,750**
TOTALS FUNDED THROUGH LEVY			$ 1,041,975	$ 1,081,975	$ 1,151,975	$ 1,096,975	$ 1,096,975	$ 1,136,975	$ 1,076,975	$ 1,046,975	$ 1,051,975	$ 1,041,975	$ 10,824,750
TOTALS FUNDED THROUGH GRANTS			$ -	$ 25,000	$ -	$ 150,000	$ 10,000	$ -	$ 150,000	$ -	$ -	$ 150,000	$ 485,000

7.12 Decision-making and Staffing

VRWJPO decision-making and staffing are described in the Joint Powers Agreement (see Appendix A). As the agreement states, "the purpose (of this Agreement) is to establish a joint powers board that will… guide and assist Dakota County and Scott County in acting jointly and individually to take actions that will promote the goals listed in Minn. Stat. § 103B.201 and fulfill their responsibilities under Chapter 103B."

As described in the Watershed Plan Introduction, the VRWJPB consists of one county commissioner from Scott County and two county commissioners from Dakota County. Each county's Board of Commissioners appoints representatives to the VRWJPB, including one commissioner appointed as an alternate.

Each county representative has one vote. If a county representative is absent, that county's alternate has one vote. The VRWJPB functions by a majority vote of the county representatives present.

The VRWJPB:

- prepares, adopts and implements a watershed management plan that meets the requirements of Minn. Stat. § 103B.231;
- reviews and approves local water management plans as provided in Minn. Stat. § 103B.235; and
- ensures that the VRWJPO Standards are implemented through local controls or through a VRWJPO permitting program. To date, all 20 cities and townships in the Vermillion River Watershed have adopted local controls to implement the Standards and a permitting program.

Dakota and Scott counties provide staff support to the VRWJPB, providing offices for staff and services including accounting, public outreach and communication, engineering, recruitment and hiring, information technology, contracts, training, GIS services, and other support. Dakota County provides legal counsel and other legal services in support of the VRWJPB as needed. Dakota County acts as the fiscal agent for the VRWJPO.

The VRWJPO identifies opportunities to achieve its goals by funding or contracting with other organizations and individuals with special expertise or experience. This is accomplished through contracts for service, joint powers agreements, or grant agreements, where legally binding documents are required.

For example, he VRWJPO contracts for the services of the Dakota County Soil and Water Conservation District (SWCD) and Scott SWCD. The SWCDs provide technical assistance, including:

- Sample collection for the Vermillion River Monitoring Network;
- Data analysis, modeling, and reporting;
- Biological and habitat assessments;
- Landscaping for clean water workshops, design workshops, and implementation help, including $250 grants funded by the VRWJPO for completed projects;
- Special studies, such as a restorable wetland inventory; and
- Marketing, preliminary design, and technical assistance for capital improvement projects, using VRWJPO cost-share and other funding options.

The VRWJPO's annual budget sets the general framework for the activities planned for the coming year. As employees of Dakota or Scott Counties, the VRWJPO staff participates in annual work planning, training, and performance management, as well as other processes consistent with those of the respective county.

7.13 Watershed Evaluation and Reporting

The VRWJPO provides an annual report and financial statement each year, as required by Minn. Rules 8410.0150.

Each year, water management organizations (including the VRWJPO) report to the Minnesota Board of Water and Soil Resources (BWSR) about activities and expenditures from the previous year. The VRWJPO Annual Activity Report and Financial Statement has reported on the following categories:

- Administration, including budget management, board meetings, contracts, and reporting.
- Monitoring and Data Analysis, including the Vermillion River Monitoring Network, biological and habitat assessments, groundwater assessments, and geomorphic assessments.
- Public Outreach and Communication, including the Wetland Health Evaluation Program, Vermillion River Stewards, Landscaping for Clean Water workshops, twice-yearly newsletter, and event participation.
- Inventory and Assessment, including, for example, geomorphic assessments, assessments of groundwater/surface water interaction, land cover changes, nitrate in groundwater assessment, restorable wetland inventory; depending on needs identified for the year.
- Capital Improvement Projects, including cost-share projects with individual landowners, townships, or cities with proposals to improve water quality in the Vermillion River and its tributaries.
- Feasibility and Preliminary Studies, including project feasibility evaluations, design of restoration projects, and systematic evaluations of potential projects.
- Evaluation and Policy, evaluations of existing processes and programs and associated policy development as well as new policy development for unaddressed or emerging areas of need.
- Regulatory Review and Regulation, including plan reviews, engineering assistance, and evaluation or support for local water management plans and ordinances.
- Coordination with Other Agencies, including federal, state, and local agencies.
- Reports on special initiatives or grants.

The report also summarizes VRWJPO income and expenditures for the year. Budget categories and reporting categories are identical, which provides consistency in evaluation and analysis. The VRWJPO submits the annual report to the Board of Water and Soil Resources (BWSR) in April of each year.

Beginning in 2017, the VRWJPO will be adapting the annual report and financial statement format and measures to capture progress in implementing the 2016-2025 Vermillion River Water Management Plan. This will occur in two different ways.

During strategic planning with the VRWJPB in 2015, the VRWJPO staff received direction from the board members to provide clear, over-arching evaluation measures to show how the watershed's water and land resources were improving over time. As part of the Watershed Plan development process, the VRWJPO staff developed these overarching outcome measures, which are discussed in Section 8: Outcome Measures by Sub-goal. The VRWJPO staff will report to the VRWJPB on these measures.

These over-arching measures relate to the Watershed Plan, but do not capture the Plan's detailed and specific actions – or whether the VRWJPO is achieving

specific progress on Plan implementation.

Therefore, at least every two years, the VRWJPO will evaluate progress on implementation of the Watershed Plan.

Broadly, the VRWJPO will need to evaluate implementation of Watershed Plan activities in three different categories:

- Staff functions: This will include metrics associated with ongoing programs (such as number of Landscaping for Clean Water participants and installed raingardens, for example). It will include metrics associated with regulatory actions (number of plan reviews or inspections, for example). It will include data about funding leveraged by the VRWJPO from other sources (grant funding obtained, partner contributions to cost share). It will cover many of the same activities currently included in the annual activity report and financial statement.
- Pollutant reductions: Actions taken under the subwatershed plans and completed during the reporting year will include pollutant-reduction estimates, based on commonly accepted pollution-reduction calculators. In addition, trend information based upon the annual Vermillion River Monitoring Network report will provide data on changes in physical and chemical parameters measured within the watershed.
- New initiatives: Actions taken to develop, implement, and measure new programs, projects, and initiatives will be evaluated in terms of process, participation, and outcomes.

The purpose of this evaluation will be to determine the level or progress achieved on each of the VRWJPO's stated goals. It will allow the VRWJPO to evaluate performance, assess priorities and focus areas, and guide budgeting activities for the subsequent year or years. The evaluation will determine if a Plan amendment is necessary. This evaluation will also be used by the VRWJPO to identify priority actions and financial assistance needs in response to the BWSR Biennial Budget Request.

Each municipality within the VRWJPO is required to complete a local water management plan (LWMP) that conforms to Minnesota Statutes 103B.235 and Minnesota Rules 8410.0160. The policies and goals established by the LWMP must be consistent with the VRWJPO's plan. The section of the LWMP covering assessment of problems must include those issue statements in the VRWJPO's Plan that affect the community.

Following adoption of the 2016-2025 Vermillion River Watershed Management Plan, the VRWJPO will develop a process to evaluate local implementation. This process will include a formal evaluation of the local unit of government's regulations and permitting program. The process also will include procedures to address a local government unit failing to implement its LWMP or parts of its LWMP. Underperforming entities will be provided direction for improving performance within a reasonable time frame.

7.14 Implementation Programs

The overarching programs used to implement the actions identified in the Implementation Plan Table are described below. The description also discusses how these programs will be coordinated with those of the Counties and the Soil and Water Conservation Districts (SWCDs).

Capital Improvement Program

The Implementation Plan identifies structural solutions for attaining surface water management goals that cannot be addressed by nonstructural,

preventative actions. Many of these structural solutions were previously identified in the WRAPS, geomorphic assessments, and subwatershed assessments (where structural and nonstructural solutions were evaluated). These solutions are included in the individual subwatershed management plans.

Operation and Maintenance Program

The VRWJPO does not currently own any Capital Improvement Projects, stormwater management facilities, or other infrastructure in the watershed. Therefore, it does not have any operation and maintenance responsibilities associated with the ownership of these types of facilities. In cases where the VRWJPO has provided cost-share for a nongovernmental entity, the contract or agreement with the individual contains a formal maintenance agreement. In cases where the VRWJPO has provided cost-share to public entities, the public entity, through provisions within the Joint Powers Agreement, retains responsibilities for operation and maintenance.

Public Outreach and Communication Program

The VRWJPO's Public Outreach and Communication Program includes four tiers to inform, educate, and engage elected officials, stakeholders, watershed residents, and the general public.

- ≈ Direct outreach by the VRWJPO staff to various audiences.
- ≈ Direct partnerships with other entities, which may include in-kind staffing, funding, or a combination.
- ≈ Direct funding where there is limited participation by the VRWJPO or its staff. Funding is provided to another entity to carry out specific outreach activities.
- ≈ Support or participation where the VRWJPO may provide information or staff in support of an event or activity of another entity.

Data Collection Program

The VRWJPO is actively working to maintain a comprehensive monitoring program to fully characterize the river, other surface water resources, and groundwater. The VRWJPO performs physical, chemical, and biological sampling on a regular basis and supplements that sampling with specific studies, synoptic surveys, or other analytics as needed. In addition, the VRWJPO cost shares or otherwise supports the data collection efforts of other entities such as the United States Geological Survey (USGS) and the Minnesota Department of Natural Resources (DNR).

Monitoring information allows the VRWJPO and its member communities to assess achievement of its water quality goals. In addition, monitoring helps guide the appropriate selection and design of BMPs and a mechanism to evaluate BMP performance. The VRWJPO produces an annual monitoring report to convey both the level of activity, parameters measured, and a summary analysis of results.

Regulatory Program

The VRWJPO will ensure the Watershed Plan's implementation by revising and adopting Standards and Rules (as part of the Plan update or as Plan amendments). The Standards are an important mechanism for direct Plan implementation. The Standards establish the watershed management outcomes the VRWJPO wants to achieve.

If a local government unit is not implementing the Standards through ordinance, the VRWJPO will assume permitting authority and implement through its Rules, which are the legal framework for VRWJPO enforcement. The reasons for the VRWJPO to develop Standards and Rules are to:

- ≈ Ensure a consistent minimum level of regulation for the alteration of land or water resources within the watershed;
- ≈ Establish standards and criteria for incorporation into local ordinances;
- ≈ Form the basis for oversight of local government implementation;
- ≈ Establish criteria for approval of local projects and plans; and
- ≈ Form the basis for VRWJPO permitting (when necessary).

Through the Plan, Standards, and Rules, the VRWJPB will decide the extent of the VRWJPO's regulatory functions. The VRWJPO will consult with stakeholders and other interested parties in developing Standards and Rules, while the VRWJPB has the final authority for their adoption.

Local governments will need to adopt local plans compliant with this Watershed Management Plan by the end of 2018.The Standards adopted by the VRWJPB will apply to areas within the watershed and may be adopted by local units of government. Local government standards or controls can be more restrictive than the VRWJPO Standards. Implementation of the Standards will apply to landowners, developers, industries, and local transportation authorities as part of permits they request for new development, redevelopment, and other land-disturbing activities.

Generally, the role of the VRWJPO throughout the implementation of the 2005 Watershed Plan was to set Standards and implement them through local governments. The VRWJPO prefers that the cities and townships operate regulatory programs, in keeping with their land-use authorities in Dakota County. (Both townships and cities have land use authority in Dakota County, whereas Scott County has land-use authority within its townships.)

The VRWJPO will clarify expectations for local water management plans, as well as how these plans can meet the VRWJPO's requirements and those of other programs (e.g., NPDES MS4 permit requirements).

The outcomes that the VRWJPO wants to achieve through the LWMPs are:

- ≈ To develop greater alignment among water-related programs and requirements for local governments to avoid unnecessary duplication of effort;
- ≈ To emphasize development and implementation of consistent and effective official controls; and
- ≈ To provide local governments an opportunity to fill in gaps and address issues that cannot or do not fit with local ordinances.

Cities and townships must obtain approval of local water management plans from the VRWJPB. When a plan is received by the VRWJPO, it will be reviewed for consistency with the Watershed Plan.

If a local government incorporates the VRWJPO Standards into its local controls and demonstrates implementation, that local government will be responsible for permitting. However, the VRWJPO will require local governments responsible for permitting to submit proposed land alteration plans to the VRWJPO for review and recommendation of approval, waiver, or denial if those plans include any of the following conditions:

- ≈ Variances from the local government's ordinances that affect surface water or surface water/ groundwater interactions
- ≈ Diversions
- ≈ Intercommunity flows (to or from)
- ≈ Project site size of 40 acres or more
- ≈ Projects that are adjacent to or appear to impact a watercourse or unique natural resources.

The submittal is required prior to the local government issuing a permit.

The VRWJPO may also evaluate local government permitting programs. If these evaluations show non-compliance with the VRWJPO's Standards and/or the local government's ordinances, the VRWJPO will work with the local government to achieve compliance. If this does not resolve compliance issues, the VRWJPO will implement its Rules via a permitting program in that local government jurisdiction. The VRWJPO has established and will collect permit fees to offset the costs of implementing the Rules (if necessary).

7.15 Incentive Programs

The VRWJPO has developed a number of programs to incentivize the protection, restoration, and management of the watershed's surface water and groundwater resources.

Cost Share Programs

Through cost share programs, the VRWJPO provides assistance and incentives for Local Government Units and other partners seeking effective solutions to local water quality problems. The VRWJPO updated its implementation project funding policy in January 2016. These cost share activities may include:

- Funding aspects of a development that goes above and beyond existing stormwater treatment requirements;
- Funding Capital Improvement Projects within road right-of-ways that promote stormwater infiltration/ treatment, improve water quality and increase groundwater recharge to groundwater; or
- Cost-sharing or incentivizing changes to practices or management approaches.

While many of these cost-sharing activities occur as opportunities arise, the VRWJPO has the following formal cost-share programs.

Dakota SWCD Cost Share Programs

Dakota SWCD receives funding from the VRWJPO to implement a variety of cost-share programs to improve water quality. These include:

- Landscaping for Clean Water Grant Program –combines incentive funding with training and technical assistance to make it easy for watershed residents to plan and install native gardens, raingardens, and stabilized shorelines.
- Conservation Cost Share - supports smaller conservation practices on individual properties by providing technical and cost share assistance. Depending on project ranking and the availability of funding, cost share amounts up to $5,000 may be approved to reimburse the applicant for up to 65 percent of the actual project cost.
- Conservation Initiative Funding Program – supports larger conservation practices on commercial or multiple properties by providing technical and cost share assistance. Depending on project ranking and the availability of funding, cost share amounts up to $25,000 may be approved to reimburse the applicant up to 65 percent of the actual project cost.
- Community Conservation Partnership – supports public landowners to implement TMDL and local water management plans by providing technical and cost share assistance. Depending on project ranking and the availability of funding, cost share amounts up to $50,000 may be approved to reimburse the applicant for up to 65 percent of the actual project cost. The applicant's contribution can be based on in-kind value.
- Incentive Payment Practice Program – leverages state and federal dollars to improve feedlots and other agricultural land.

Scott SWCD Cost Share Programs

Scott SWCD also received funding from the VRWJPO to implement cost-share programs to improve water quality, comparable to the programs listed for Dakota County SWCD.

Rosemount Cost Share Joint Powers Agreement

The VRWJPO entered a joint powers agreement with the City of Rosemount in 2007, which required cost share related to the storm drainage improvement project commonly referred to as Eagan Project 905R, a major project that involved Dakota County's Lebanon Hills Regional Park stormwater management. The VRWJPO agreed to cost share in a principal amount of $544,829, to be repaid over 10 years in 10 equal annual installments of principal with interest being paid on each principal payment at the rate of four percent per year.

The VRWJPO continues to provide these cost-share payments. Future development occurring in the project area will contribute to returning payment of costs to the VRWJPO as that development occurs.

7.16 Stewardship Grants

The VRWJPO values and encourages efforts to protect, restore, manage, and improve water resources in the watershed. The VRWJPO's Stewardship Grant program promotes water quality improvement by focusing on short-term events and activities. Stewardship Grants support local, specific, community-based action to protect and improve lakes, rivers, streams, wetlands, and habitat in the Vermillion River Watershed by providing up to $5,000 for a particular project.

Events and activities funded through a Stewardship Grant should build community understanding, knowledge, and initiative related to water and natural resource issues and solutions. Events and activities should educate and engage people in the watershed and improve or protect water quality. Applicants receiving grants will increase their capacity to lead and promote water quality improvement efforts. Sponsored events and activities may include water quality education, clean up events, planting native species, or invasive plant removal, etc.

Applicants that are eligible to receive a stewardship grant within one budget year (Jan. 1 through Dec. 31) include community and civic organizations (including faith-based organizations), non-profit organizations, neighborhood groups, including condominium or lake associations, schools, local units of government, and business and professional associations.

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Section 8: Outcome Measures by Sub-goal

As this Plan is implemented over the coming decade, a series of outcome measurements will be used to track progress against the Plan goals. This section includes outcome measures for each of the major sub-goals within the Plan. These measures will be tracked and reported to the Vermillion River Watershed Joint Powers Board (VRWJPB) and the public. Two general types of measures are used:

≈ **Activity measures** that quantify the specific types and levels of efforts made by the JPO and its partners to improve the quality and quantity of water resources. These measures can be thought of as inputs designed to improve the quality of the resource, but can also be designed to measure the JPO's effectiveness, sustainability of specific approaches used, and stewardship of financial resources in addressing water quality.

≈ **Resource measures** that regularly assess water quality and quantity, and provide trend information over time. These measures can provide some indication of the effectiveness of implemented Plan actions taken over time.

Goal A: Protect or restore water quality in lakes, streams, and wetlands

1. Restore impaired waters and protect those currently not impaired
   OUTCOME MEASURE: Water quality monitoring demonstrates a trend toward meeting water quality standards

2. Reduce non-point source pollution, erosion and sedimentation
   OUTCOME MEASURE: Document sediment and phosphorus reductions associated with best management practices supported by the VRWJPO

3. Protect and improve the River corridor
   OUTCOME MEASURE: Work with Dakota and Scott counties to annually document the DNR-protected waterways that have perennial vegetated buffers
   OUTCOME MEASURE: Document areas that meet the VRWJPO buffer standard (both those that are triggered by the buffer standard and those that are not)

4. Protect, enhance, and restore wetlands
   OUTCOME MEASURE: Document number and acres of wetlands restored
   OUTCOME MEASURE: Document number and acres of known wetlands lost, altered, or impacted

5. Protect and enhance recreational lakes
   OUTCOME MEASURE: Water quality monitoring of recreational lakes demonstrates a trend

toward maintaining or improving water quality

Goal B: Protect and restore groundwater quality

1. Track trends in groundwater quality
   OUTCOME MEASURE: Compile existing information, assess its adequacy, and propose strategic improvements that will provide a comprehensive view of groundwater quality in the watershed in 2017 and 2022

2. Protect groundwater quality from contamination
   OUTCOME MEASURE: Annual expenditure and cost sharing for groundwater quality protection best management practices
   OUTCOME MEASURE: Awareness about urban and rural land-use impacts on nitrate contamination in groundwater are increased, as measured through Dakota County resident survey every 2-3 years.

3. Reduce existing levels of groundwater contamination
   OUTCOME MEASURE: Measure number and amount of cost share for alternative practices and cropping systems to reduce input levels

Goal C: Maintain a sustainable water supply

1. Promote conservation of groundwater
   OUTCOME MEASURE: Track trends of overall water use per capita for municipal consumers, per acre usage for agriculture consumers, and number of gallons per day for industrial consumers
   OUTCOME MEASURE: Document number of implemented projects targeted at the highest overall water users that promote or provide for groundwater conservation

2. Protect high-capacity groundwater recharge areas and promote infiltration, where appropriate
   OUTCOME MEASURE: Track the number of acres of critical recharge areas protected via partnerships or directly by the VRWJPO

3. Promote re-use of stormwater and treated wastewater, where appropriate
   OUTCOME MEASURE: Document the number of implemented cost share projects that re-use stormwater or treated wastewater

Goal D: Address more intense fluctuations (up and down) in river flow rate and volume

1. Regulate intercommunity flows
   (No outcome measure determined)

2. Address sources of increased flows
   OUTCOME MEASURE: Measure number of voluntarily implemented practices that address increased flows
   OUTCOME MEASURE: Measure the number of stormwater retrofits in urban

areas developed prior to 2006

3. Protect floodplains and maintain the river floodway
   OUTCOME MEASURE: Verify and document that all permitted activities intersecting with identified floodplains have no impacts
   OUTCOME MEASURE: Complete research, analysis, and recommendations on water quality and quantity impacts of aggregate mining.

4. Address erosion problem areas
   OUTCOME MEASURE: Track the number of stabilization projects addressing erosion
   OUTCOME MEASURE: Quantify the sediment reduction for all stabilization projects addressing erosion

Goal E: Improve public awareness and stewardship of water resources

1. Increase awareness of the Vermillion River, tributaries, and other waters within the watershed as unique resources
   OUTCOME MEASURE: Measure people's awareness of the river, tributaries, and other waters on a regularly scheduled basis

2. Increase awareness of the VRWJPO and its services
   OUTCOME MEASURE: Annually track the public's use of the website

3. Maintain a clear watershed identity through consistency and quality in external communications
   OUTCOME MEASURE: Complete an annual update to the communications plan
   OUTCOME MEASURE: Report communications plan outcomes on an annual basis

4. Ensure that watershed messages are available through multiple channels and media
   OUTCOME MEASURE: Track the number of different types of outlets used to convey messages

5. Plan and host events, such as programs, training and outreach activities, to motivate stakeholders to make choices that will improve water resources
   OUTCOME MEASURE: Annually track the number and type of events, and number of participants at each event

6. Promote civic engagement and citizen-based action on water and natural resource issues
   OUTCOME MEASURE: Annually track the number of events, groups, and participants engaged in VRWJPO supported activities

GOAL F: Improve watershed resilience to changing precipitation and temperature patterns

1. Seek to maintain pre-development hydrology
   OUTCOME MEASURE: Annually track cost-shared best management practices that increase storage or infiltration capacity
   OUTCOME MEASURE: Report outcome of

evaluation of standards compliance

OUTCOME MEASURE: Annually track implementation of voluntary or innovative best management practices that mitigate thermal impacts

2. Increase the resilience of the River Corridor through vegetative protection and restoration techniques

   OUTCOME MEASURE: Annually track the number and type of voluntary projects supported by the VRWJPO that retain or capture stormwater in the watershed

GOAL G: Protect or restore sensitive biological resources, such as plants, fish, insects, and wildlife

1. Monitor fish and macroinvertebrate populations in the river and tributaries

   OUTCOME MEASURE: Annually report Index of Biotic Integrity (IBI) data and track trends of fish and macroinvertebrate populations

   OUTCOME MEASURE: Assess brown trout to determine population changes and annually report data

2. Use current research, long-range trend data, policies, and partnerships to protect habitat for native and sensitive aquatic species

   OUTCOME MEASURE: Annually track riparian or instream habitat improvement projects supported by the VRWJPO

Section 9: Responsibilities of the VRWJPO and Partners

9.1 Roles and Responsibilities of the VRWJPO and Local Governments

A watershed is defined as "the region or area drained by a river or stream." The watershed management approach recognizes that rivers, lakes, streams, and wetlands are natural features that conform to natural, rather than political, boundaries. Water resources are directly affected by geology, topography, weather, and land use. Therefore, the Minnesota Legislature determined that the most effective, sustainable, and comprehensive way to manage water resources would be to manage them within a watershed's natural boundaries.

The Metropolitan Surface Water Management Act identifies specific authorities and requirements for different types of watershed management organizations. Figure 9.1.1: Comparison of Duties and Responsibilities (Mandatory = M or Discretionary = D) of Watershed Districts and Joint Powers Water Management Organizations, outlines the responsibilities (mandatory and discretionary) of these watershed authorities. It also shows how the VRWJPO chooses to fulfill these responsibilities of water management organizations.

In Dakota County, the jurisdictions within (or partly within) the watershed have land-use and permitting authority; in Scott County, the county has land-use authority. The VRWJPO may assume a permitting program under the following circumstances:

- A local government does not have an approved and adopted local water management plan or has not adopted the watershed Standards or official controls to implement the Standards.
- A permit application to a local government requires an amendment or variance from the adopted local water management plan or official controls.
- The local government has authorized the VRWJPO to implement a permitting program in its jurisdiction.

During the term of the 2006-2015 Vermillion River Watershed Management Plan, all 20 local governments all or partly within the watershed developed and adopted an approved local watershed management plan. All but one jurisdiction adopted official controls to implement the Standards. The VRWJPO adopted watershed Rules in 2007 and implemented the permitting program for Eureka Township until 2015, when the township adopted official controls and assumed responsibility for local permitting.

The annual reporting and evaluation requirements in Minn. Rules 8410.0150 specify that the VRWJPO evaluate the status of local water plan adoption and local implementation of activities required by the watershed management organization. The VRWJPO oversight of LWMP implementation has been informal to date. In 2016, the VRWJPO will develop a more formal oversight process for local government implementation of official controls.

One difficulty identified by Vermillion River Watershed Joint Powers Board

(VRWJPB) members and stakeholders is a resource discrepancy between cities with MS4 permits and townships. Cities have knowledgeable staff (or consultants), established processes, and systems set up to implement permitting. Many, if not most, townships do not. As a VRWJPO oversight process is developed, this discrepancy will be examined and considered.

9.2 Watershed Standards

The VRWJPO ensures the Watershed Plan's implementation by setting and revising Standards for incorporation into official controls. The VRWJPO made minor changes to the Standards (see Appendix B) incorporated into the 2016-2025 Vermillion River Watershed Management Plan.

The VRWJPO Standards are intended to be understandable, achievable, adaptable, and enforceable. The framework for updating the Standards and Rules will include review of current goals, objectives, and policies; assessment of the adequacy of current rules and regulations; and identification of gaps. The general structure of the Rules, if needed, will include policies, regulations, criteria, exhibits, maintenance provisions, and exceptions.

9.3 Regulatory Authorities

Many levels of government monitor, regulate, assess, restore, or oversee water resources in the Vermillion River Watershed. In addition, many non-governmental organizations take part in water protection, improvement, or restoration activities.

The general public, specifically watershed landowners, have expressed confusion in finding the most direct path to get technical assistance, permits, funding, or compliance information. "There are too many hands in the watershed," has been a frequent statement made by landowners. Figures 9.3.1 through 9.3.8 describe the many governmental organizations with authorities in the Vermillion River Watershed. Maintaining clear and effective communication with these many partners is an ongoing responsibility of the VRWJPO.

Figure 9.1.1: Comparison of Duties and Responsibilities (Mandatory = M or Discretionary = D) of Watershed Districts and Joint Powers Water Management Organizations

Duties and Responsibilities	Watershed Districts	Metro Area Watershed Districts	Joint Powers Water Management Organizations	Vermillion River Watershed Joint Powers Organization
Adopt a Watershed Management Plan	M	M	M	Adopts Watershed Management Plan
Prepare an annual report	M	M	M	Prepares annual report
Appoint an advisory committee	M	M	M	Appoints WPC and invites TAG members
Manage transferred drainage system	M	M	D	No
Receive drainage system improvement and establishment petitions	M	M	D	No
Adopt water management rules	M	M	D	Adopts rules
Receive petitions for projects	M	M	D	Solicits and acts upon project requests
Conduct hearing on annual budget	M	M	D	Conducts annual budget hearing
Hire employees	M	M	D	Employees are hired by the respective counties
Enter into contracts and agreements	D	D	D	Enters into contracts and agreements
Regulate development	D	D	D	No
Initiate projects	D	D	D	Initiates projects
Approve local water management plans (LWMP)	D	M	M	Approves LWMPs
Financing authority	D	D	D	Vermillion River Watershed Management Tax District

Figure 9.3.1: Roles and Responsibilities of Government for Groundwater Regulation

Federal Government	**U.S. Environmental Protection Agency** • Safe Drinking Water Act – includes source water protection; wellhead protection; underground injection; groundwater rules. • CERCLA – investigates, enforces clean-up of releases of hazardous substances, pollutants, and contaminants to groundwater. **Agency for Toxic Substances and Disease Registry** • Assessment – conducts assessment of health risks at Superfund sites.
State Government	**Department of Natural Resources** • Preliminary Well Assessment – approval for drilling a well that will draw more than 10,000 gallons per day/1 million per year • Water Appropriations Permit – permit required to draw more than 10,000 gal/day, 1 million/yr. • Groundwater Hydrology Program – monitoring statewide resources **Board of Water and Soil Resources** • County Groundwater Plans – reviews and approves county groundwater protection plans. **Minnesota Pollution Control Agency** • MERLA – investigates, enforces clean-up of releases of hazardous substances, pollutants, and contaminants to groundwater. • LUST – investigates, enforces clean-up of releases of hazardous substances, pollutants, and contaminants to groundwater. • Closed Landfill Program – completes closure requirements on former MPCA-permitted sanitary landfills. **Minnesota Dept. of Public Safety** • Emergency Response – state duty officer notified of any leaks, spills, or incidents affecting groundwater. **Minnesota Dept. of Agriculture** • Agricultural Chemicals – state duty officer notified of any leaks, spills, or incidents affecting groundwater.
Watershed (highlighted items will be new or expanded roles)	**VRWJPO** • Infiltration of Surface Water – sets volume control standard requiring infiltration, or filtration if soils don't allow for infiltration or are susceptible to contamination. • Recharge Zones – identifies and protects groundwater recharge zones. • Beneficial Re-use – identifies and implements beneficial use/re-use for stormwater to conserve groundwater supplies. • Water Conservation – works with cooperators on strategies to conserve groundwater.
County Government	**Dakota County** • Wells and Water Supply – sets standards, guidelines, and regulations for wells and water supplies. • Abandoned Well Identification – provides technical assistance, funding for closing abandoned wells. • Groundwater Model – administers the County groundwater model. • Groundwater Protection Plan – prepares Groundwater Protection Plan as part of Comprehensive Plan • Ambient Groundwater Sampling – testing private wells for nitrate, bacteria, pesticides and other contaminants.
Cities (Incorporated)	**Cities (Incorporated)** • Wellhead Protection Plan – defined area in which activities pose a potential threat to groundwater used for public water supply. • Infiltration of Surface Water – sets volume control standard requiring infiltration, or filtration if soils don't allow for infiltration or are susceptible to contamination.

Figure 9.3.2: Roles and Responsibilities of Government for Drinking Water Regulation	
Federal Government	**U.S. Environmental Protection Agency** • Safe Drinking Water Act – sets standards, such as Maximum Contaminant Levels for pollutants in drinking water supplies; drinking water protection; water security and sustainability.
State Government	**Minnesota Department of Health** • Well Management Program – sets regulations for drilling new water wells; sealing abandoned water wells. • Safe Drinking Water Act – regulates construction of wells used as public water supply systems. • Health Risk Limits – sets maximum contaminant levels for state drinking water supplies; declares drinking water emergencies. • Wellhead Protection -- community public water systems required to delineate, inventory, and manage an inner wellhead management zone and create a formal wellhead protection plan. • Source Water Assessment – all public drinking water systems were provided source water assessments by MDH, which should be updated by water suppliers. **Minnesota Dept. of Public Safety** • Drinking Water Security – the safety and security of drinking water resources is the role of DPS Homeland Security. **Minnesota Dept. of Natural Resources** • Local Water Supply Planning – provides a checklist and instructions for water suppliers to help develop plans. **Metropolitan Council** • Metro Water Supply Planning – provides regional planning and research on metro water supplies (surface and groundwater). • Laboratory Testing Services – approved laboratory testing for groundwater, surface water, and drinking water samples.
Watershed (highlighted items will be new or expanded roles)	**VRWJPO** • Restore Impaired Waters – implements strategies to reduce health risks in surface water from bacteria and nitrate.
County	**Dakota County** • Private Well Testing – tests for bacteria and nitrate. • Research – ongoing study of nitrate in drinking water supplies in Dakota County; collaboration with MDA on Targeted Townships sampling for nitrate. • Outreach – sponsors outreach on nitrate reduction and agricultural groundwater protection in rural watershed.
Cities (Incorporated)	**Cities (Incorporated)** • Water Supply Plan – public water suppliers develop plan as part of comprehensive planning; plan also required if water suppliers want to expand the system. • Water Conservation – public water suppliers develop voluntary water conservation measures by ordinance. • Restore Impaired Waters – implements strategies to reduce health risks in surface water from nitrate.

Figure 9.3.3: Roles and Responsibilities of Government for Surface Water Regulation	
Federal Government	**U.S. Environmental Protection Agency** • Clean Water Act – requires states to identify and submit a list of impaired waters; investigate and identify sources of impairment; and determine Total Maximum Daily Loads. **U.S. Army Corps of Engineers** • Rivers and Harbors Act, Sec. 10 – placement of structures in navigable waters of the U.S.; work in or affecting navigable waters of the U.S. • Clean Water Act Section 404 Permits – permit for discharge of dredged or fill material into the waters of the U.S.
State Government	**Minnesota Pollution Control Agency** • Water Quality Certification, Section 401 of the Clean Water Act – certification for activities that require federal permits (Section 10, Section 404, FERC). • Surface Water Standards – establish standards for surface water quality. • Surface Water Ambient Monitoring Program – establish background water quality statewide. • Impaired Waters – complete major watershed assessments; propose impaired waters list; work with cooperators on study, TMDLs, Restoration and Protection Plan. • Permits for Chemical Treatment (Alum) – both the MPCA and DNR must issue a permit for chemical treatment. **Department of Natural Resources** • Public Waters Work Permit – permits for work taking place below the ordinary high water level of public waters. • Lake Aeration Permit – permit for installation and operation of an aeration system in public waters • Dam Safety Permit – permit required to perform major dam maintenance; modify dam operation; reconstruct, remove, or build a dam; or transfer a dam's ownership. Some exemptions for smaller dams. • Permit for Chemical Treatments (Alum) – both DNR and MPCA must permit these treatments. • Surface Water Appropriation Permits – permit required to withdraw surface water for irrigation. • Surface Water Hydrology Programs – monitoring and assistance for gaging and rating curves. **Board of Water and Soil Resources** • County Comprehensive Water Plans – reviews county comprehensive water plans. • Watershed Management Organization/Watershed District Oversight – sets requirements for watershed management organizations/Watershed Districts; reviews and approves major reports, such as Watershed Plans and Annual Reports. • Conflict Resolution – provides resolution of water policy issues and conflicts. • Legislative Liaison – provides forum for local issues, priorities to be incorporated into state public policy; coordinates state and federal resources to realize local priorities. • Soil and Water Conservation District Oversight – functions as the state soil conservation agency; sets requirements for SWCDs; reviews and approves major documents; directs private land soil and water conservation programs. • Minnesota Wetland Conservation Act – administers rules for WCA. **Minnesota Dept. of Public Safety** • Emergency Response – state duty officer notified of any leaks, spills, or incidents affecting surface water.

	Minnesota Dept. of Agriculture • Emergency Response – state duty officer notified of any leaks, spills, or incidents affecting surface water. • Monitoring – conducts monitoring and assessment of agricultural chemicals in groundwater and surface water. **Metropolitan Council** • River and Stream Water Quality Monitoring Program in Metro Area
Watershed (highlighted items will be new or expanded roles)	• **VRWJPO** • Watershed Planning – develop and adopt a Watershed Management Plan • Monitoring – develops and implements monitoring programs to assess current condition, trends, constituent concentrations, and loading. • Subwatershed Assessments – conducts assessment of physical river and stream conditions to identify structural and habitat restoration needs. • Restore Impaired Waters – implement strategies to restore water quality to state standards. • Protect through Standards – set standards for floodplain alteration, wetland alteration, buffers, intercommunity flows, and drainage alteration protective of water quality and flow rates/volumes. • Compliance – ensure local adoption and implementation of local water management plans and VRWJPO Standards.
County	**Dakota County SWCD** • Wetland Conservation Act Rules and Administration – regulates draining and filling wetlands larger than 2,000 sq. feet; requires 2:1 replacement of drained or filled wetlands. **Scott County SWCD** • Wetland Conservation Act Rules and Administration – regulates wetlands through Minn. Rules Chapter 8420 in Sand Creek Township only.
City (Incorporated)	**Cities (Incorporated)** • Local Water Management Plans – cities adopt watershed standards in Local Water Management Plans and adopt ordinances to implement the plan; permits issued. • Wetland Conservation Act Rules and Administration – regulates wetlands through Minn. Rules Chapter 8420 within city limits in Scott County. • Lake and Stream Management Plans – plan to protect, improve, and maintain lakes or stream, with or without an impaired waters involvement.
Townships (Unincorporated)	**Townships (Unincorporated)** • Wetland Conservation Act Rules and Administration – regulates wetlands through Minn. Rules Chapter 8420 within each township in Scott County. • Local Water Management Plans – townships adopt watershed standards in Local Water Management Plans and adopt ordinances to implement the plan; permits issued for erosion and sediment control.

Figure 9.3.4: Roles and Responsibilities of Government for Stormwater Regulation	
Federal	**U.S. Environmental Protection Agency** • National Pollutant Discharge Elimination System (NPDES) – controls water pollution by regulating point sources that discharge pollutants into the waters of the U.S.
State	**Minnesota Pollution Control Agency** • NPDES General Stormwater Permit for Construction Activities – permit for construction that disturbs one or more acres; requires preparation of stormwater pollution plan for erosion and sediment control. • NPDES General Industrial Stormwater Permit – permit for industrial/commercial activities that affect stormwater; requires preparation of a stormwater pollution prevention plan • NPDES Phase II MS4 Stormwater Permit – permit required of municipal separate storm sewer systems serving populations less than 100,000 located in urban areas; requires stormwater pollution prevention program.
Watershed (highlighted items will be new or expanded roles)	**VRWJPO** • Protect through Standards – set standards for stormwater management and maintenance protective of water quality and stable flow rates/volume. • Restore Impaired Waters – implement strategies to retrofit and improve stormwater management to restore water quality to state standards. • Compliance – ensure local adoption and implementation of Standards.
County	**Scott County** • Stormwater Management – regulates stormwater through Scott County Zoning Ordinance Chapter 6. • Erosion Control – regulates erosion control through Scott County Zoning Ordinance Chapter 6. • Grading Permits – permit for land-disturbing activities in unincorporated areas in accordance with Scott County Ordinance Chapter 6; requirement for permit is Natural Resource Management Plan or Erosion and Sediment Control Plan. • Maintenance – all stormwater management structures and facilities owned by Scott County shall be maintained to function as originally designed. **Dakota County** • Maintenance – all stormwater management structures and facilities owned by Dakota County shall be maintained to function as originally designed.
City (Incorporated)	**Cities (Incorporated)** • Stormwater Pollution Prevention Plan – plan is required of cities with MS4 permits. • Grading Permits – permits for land-disturbing activities in accordance with Scott County Ordinance Chapter 6; requirement for permit is Natural Resources Management Plan or Erosion /Sediment Control Plan. • Maintenance – all stormwater management structures and facilities shall be maintained to function as originally designed.
Townships (Unincorporated)	**Townships (Unincorporated)** • Maintenance – all stormwater management structures and facilities shall be maintained to function as originally designed.

Figure 9.3.5: Roles and Responsibilities of Government in Shoreland/Floodplain Regulation	
Federal Government	**Federal Emergency Management Agency** • National Flood Insurance Program -- identify and publish special flood hazards and flood risk zones as authorized and required by Congress.
State Government	**Department of Natural Resources** • Shoreland Management – requirement for counties to have shoreland ordinance regulating development. • Municipal Shoreland Management – requirement for cities with shoreland to have ordinance regulating development. • Aquatic Plant Management – installation of aquatic plants below ordinary high water level of public water bodies • National Flood Insurance Program – implements NFIP for participating communities.
Watershed (highlighted items will be new or expanded roles)	**VRWJPO** • Monitoring – develops monitoring program to assess current river and stream rates and volume, trends, and inputs to calibrate modeling software. • Subwatershed Assessments – conducts assessment of physical river and stream conditions to identify projects for restoration of natural hydrology and infrastructure management. • Restoration of Shoreland/Floodplain Habitat – develops strategies to restore habitat to prevent erosion, filter pollutants, reduce runoff temperatures, and improve resilience. • Protect through Standards – set standards for floodplain alteration, wetland alteration, buffers, intercommunity flows, and drainage alteration protective of water quality and flow rates/volumes. • Intercommunity Flows -- resolve intercommunity conflicts arising from shoreland/floodplain alterations in unincorporated areas. • Cooperate with Partners
County	**Dakota County** • Shoreland and Floodplain – regulation of shoreland and floodplain in unincorporated areas through Dakota County Ordinance 50. • Shoreland Protection – permanently protects shoreland through easement acquisition and restoration/management planning. **Dakota SWCD** • Shoreland Protection – protects shoreland through federal and state conservation programs and restoration/management planning. **Scott County** • Shoreland and Floodplain – regulation of shoreland and floodplain in unincorporated areas through Scott County Zoning Ordinance Chapters 70 and 71.
Cities (Incorporated)	**Cities (Incorporated)** • Shoreland and Floodplain – regulation of shoreland and floodplain via local ordinances.

Figure 9.3.6: Roles and Responsibilities of Government in Wastewater Regulation	
Federal	**U.S. Environmental Protection Agency** • Section 301 – sets requirements for publicly owned treatment plants to pretreat certain types of industrial wastewater. • Section 304 – sets effluent guidelines for industrial discharges to surface water or publicly owned treatment plants.
State	**Minnesota Pollution Control Agency** • State Discharge System/National Pollutant Discharge Elimination System Permit – required for all point source discharge of treated wastewater to surface water. • Wastewater Treatment Certification – provides training and certification for wastewater treatment plant operators. • Subsurface Sewage Treatment Systems – sets minimum technical standards for individual and mid-size SSTS. • SSTS Installers – requires statewide licensing and certification of SSTS professionals. • SDS/NPDES Permit – permit required for all point source discharge of process wastewater to surface waters. **Met. Council Environmental Services** • Wastewater Treatment – operates wastewater treatment plants; complies with all permit conditions; sets requirements for effluent; works to expand or repair wastewater infrastructure; conducts monitoring, inspections, and complaint response. • Sewer Availability Charge – one-time fee for hook-up to the sanitary sewer and increase in capacity. • Industrial Discharge Permit – permit is needed to discharge process wastewater to the wastewater treatment plant. • Pre-treatment Pollution Prevention – working with industrial dischargers to reduce pollutants in effluent.
Watershed (highlighted items will be new or expanded roles)	**VRWJPO** • Cooperate with Partners
County	**Dakota County** • Subsurface Sewage Treatment Systems – regulates through County Ordinance 113. **Scott County** • SSTS – regulated through Scott County Ordinance 4.
Cities (Incorporated)	**Cities (Incorporated)** • SSTS – regulated through city ordinance.
Townships (Unincorporated)	**Townships (Unincorporated)** • SSTS – regulated through township ordinance.

Figure 9.3.7: Roles and Responsibilities of Government in Fish and Wildlife	
Federal	**U.S. Department of the Interior** • Fish and Wildlife Service – manages Minnesota Valley Wetland Management District; Minnesota Valley National Wildlife Refuge; provides land management and fire protection; land acquisition; wildlife inspection; invasive species information; endangered species listing; permits for working near endangered species, import or export of species, and migratory bird permits (for falconers, for example). **National Invasive Species Council** • Coordination of federal agencies – includes multiple health, environment, and other agencies to coordinate planning. • National Invasive Species Management Plan – developing a national-scale plan for invasive species.
State	**Department of Natural Resources** • Designation and management of trout streams • Acting as agent for fish stocking • Endangered species – maintains state list of threatened and endangered species. • Stream Restoration – protects prime fish and wildlife habitat through land acquisition (AMAs, WMAs); undertakes and provides grants for aquatic habitat restoration. • Invasive Species Permits – permits, grants, and authorizations to comply with invasive species laws and rules. • State Climatology Office – provides current weather and climate trend data; drought and flooding condition reports and alerts.
Watershed (highlighted items will be new or expanded roles)	**VRWJPO** • Monitoring -- develops and implements monitoring program to assess current fish and macroinvertebrate numbers, diversity, and richness; trends; and stressors that adversely affect fish and macroinvertebrate communities. • Subwatershed Assessments – conducts assessment of physical river and stream conditions to identify projects for restoration of fish and wildlife habitat. • Restoration of Shoreland and Aquatic Habitat -- develops strategies to restore habitat to prevent sedimentation, filter pollutants, reduce stream temperatures, provide in-stream habitat, maintain groundwater inflow, and improve resilience. • Cooperate with Partners
County	**Dakota County SWCD** • County Agricultural Inspector – the SWCD contracts with Dakota County to provide technical assistance, ensure noxious weed ordinance is in place, provides training on weed removal and management

Figure 9.3.8: Roles and Responsibilities of Government in Agriculture	
Federal	**U.S. Department of Agriculture** • Natural Resource Conservation Service (NRCS) – technical assistance for "swampbuster," "sodbuster," and highly erodible land determinations; provides benefits for farmers in compliance with these laws. • Farm Services Agency (FSA) – provides map for highly erodible land determination; provides benefits to those in compliance with erodible land determinations. **U.S. Environmental Protection Agency** • Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) – registration of pesticides; enforcing banned pesticide laws.
State	**Minnesota Department of Agriculture** • Nutrient Management Plan – develops guidelines for nutrient management; develops guidelines for soil amendments. • Pesticide Applicators – provides training, guidance, and licensing for commercial and private pesticide applicators. • FIFRA delegation of pesticide registration – registering pesticides that will be used in Minnesota • Pollinator protection – developing BMPs for protecting pollinators. • Technical and financial assistance – provides information, current research, recommendations, and funding options for agricultural BMPs. • Regulation – regulates use, storage, handling, and disposal of pesticides and fertilizer. **Minnesota Pollution Control Agency** • Feedlot Permits – permit required for feedlots more than 1,000 animal units; enforcement under Minn. Rules Chapter 7020. • Manure Management Plans – required for NPDES-permitted feedlots. **Minnesota Board of Animal Health** • Disease Monitoring – surveillance and response to animal diseases and outbreaks; disposal of animal remains.
Watershed (highlighted items will be new or expanded roles)	**VRWJPO** • Protect through Standards – sets standards for agriculture that protect water quality, groundwater quality, and rate/volume control. • Cooperate with Partners
County	**Dakota County** • Feedlot Permits – permits for feedlots 300 to 1,000 animal units; registers feedlots; feedlot inspections. Feedlot permitting is a delegated program of the MPCA which, if not implemented locally reverts to the authority of the MPCA (State). **Scott County** • Feedlot Permits – permits for feedlots up to 1,000 animal units; feedlot permitting, inspections under Scott County Zoning Ordinance Chapter 9. . Feedlot permitting is a delegated program of the MPCA which, if not implemented locally reverts to the authority of the MPCA (State).

9.4 VRWJPO's Financial Mechanisms

Dakota and Scott counties jointly fund the administration and activities of the VRWJPO per the Joint Powers Agreement. Based on tax capacity, in 2016 Dakota County currently contributes approximately 96 percent and Scott County contributes approximately 4 percent of total VRWJPO management costs supported through levy (the percentages may change somewhat as tax capacities change).

Dakota and Scott counties established special purpose tax districts within their respective portions of the Vermillion River Watershed to provide a mechanism for funding their shares of the organization's costs. The following is a list of the funding mechanisms available to watershed management organizations, including a county-managed organization, with Minnesota Statute references where appropriate.

- **Contributions from general fund of member agencies.** There are no statutory limits. Counties may fund planning or projects identified in an approved plan. Counties may also fund amounts necessary to pay the costs to soil and water conservation districts to administer and implement projects (103B.241).

- **Creation of watershed management tax districts by ordinance**. Notification of new tax districts must be given to the county auditor by July 1 to be effective for taxes payable in the following year. After adoption of a tax district, taxes may be levied annually on all taxable property in the district to fund watershed projects. The tax may not exceed 0.02418% of market value of property in rural towns, unless allowed by resolution of the "town electors" (103B.245, Subd. 1).

- **Levy.** Levy for taxes is in addition to any other money levied and distributed in the tax district (103B.245, Subd. 3).

- **Bonds.** The tax district may issue bonds necessary to cover project costs. Bonds are to be repaid from tax proceeds raised in the district by the WMO. No election is required. Obligation is not included in the net indebtedness of the local government unit (103B.245, Subd. 4).

- **General obligation bonds.** Counties may also issue general obligation bonds to cover part or all of the costs of a project certified to the county (103B.251, Subd. 7).

- **Grants.** Grants may be pursued for certain qualifying projects according to grant sourcing criteria. Grant funding is of particular interest for research, demonstration, or implementation of the Watershed Restoration and Protection Strategy (WRAPS), but may extend n general to resource restoration, improvement, protection, or enhancement.

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Section 10: Plan Review, Adoption, Update, and Revision

10.0 Introduction

The Vermillion River Watershed Joint Powers Organization (VRWJPO) is updating its Watershed Plan during a time when many changes in water management are underway or being proposed at the state level.

The Minnesota Board of Water and Soil Resources (BWSR) approved revisions in Minn. Rules Chapter 8410, in July 2015. These changes affect metropolitan area local water management and watershed plans. The VRWJPO followed the prior rules for updating the Watershed Plan, but also incorporated important elements of the new rules (in consultation with BWSR).

Among the rule changes:

- Watershed management organizations can lead on developing total maximum daily loads (TMDLs) for impaired waters – which the VRWJPO and Minnesota Pollution Control Agency (MPCA) have already done;
- Watershed Plans can implement the Watershed Restoration and Protection Strategies (WRAPS), if the WRAPS implementation is stated as a plan objective;
- Watershed Plan issues and priorities should involve and engage partners, stakeholders, and the public early and often;
- Revisions to local water management plans (LWMPs) should be linked to comprehensive plan revisions that occur every 10 years; and
- Watershed management organizations are required to evaluate implementation processes and outcomes every two years (at a minimum).

The VRWJPO has integrated features of the new Minn. Rules Ch. 8410 into the Watershed Plan update – especially those pertaining to stakeholder involvement and the WRAPS.

The VRWJPO enlisted the Vermillion River Watershed Joint Powers Board (VRWJPB), advisory groups, local government units, stakeholders, and the public in identifying issues and priorities, as well as forming goals, objectives, and actions for the Watershed Plan update (see details of community involvement in the Introduction to the Watershed Plan).

The VRWJPO has explicitly integrated WRAPS implementation into several objectives in the Watershed Plan update. (See the WRAPS on the Minnesota Pollution Control Agency website.) Section 6: Goals, Objectives, and Actions, has specific actions that incorporate the WRAPS recommendations. Section 7: Implementation Plan incorporates the WRAPS recommendations into specific subwatershed management plans.

10.1: Plan Review, Approval, and Adoption

The VRWJPO provided the VRWJPB, Watershed Planning Commission (WPC), and Technical Advisory Group (TAG) with sections of the Watershed Plan for discussion, comment, and revision during summer 2015.

The advisory groups paid particular attention to Section 5: Issues and Priorities; Section 6: Goals, Objectives, and Actions; and Appendix B: Standards. The WPC and TAG had seen or received all Watershed Plan sections by September 9, 2015, for any final comments before the VRWJPB

authorized its release to the public and stakeholders on October 1, 2015.

As part of the formal review process and in accordance with Minnesota statutes, the Watershed Plan was submitted for review to the cities and townships within the VRWJPO, as well as state, regional, and local partner agencies with a direct interest in watershed management and the Vermillion River Watershed. (See Figure 10.1.1.: Watershed Plan Reviewers.)

The VRWJPO posted the draft Watershed Plan on the website and widely publicized its availability. In addition to a formal public notice in the newspaper of record, the VRWJPO sent out a news release to local media outlets, attended the September Township Officer's Meeting to discuss aspects of the Watershed Plan, and conducted outreach to interested parties. The VRWJPB held a Public Hearing on the Watershed Plan after the 60-day review period on January 26, 2016.

After incorporating suggested changes into the final draft Watershed Plan, it was provided to BWSR for review and approval. BWSR approval signifies that

Figure 10.1.1 Watershed Plan Reviewers

Cities and Townships in the Watershed	**State and Regional Agencies**	**Other Organizations**
City of Apple Valley	Metropolitan Council	University of Minnesota Extension
City of Burnsville	Minnesota Board of Water and Soil Resources	Trout Unlimited
City of Coates	Minnesota Department of Agriculture	Friends of the Mississippi River
City of Elko New Market	Minnesota Department of Health	Great River Greening
City of Farmington	Minnesota Department of Natural Resources	
City of Hampton	Minnesota Department of Transportation	
City of Hastings	Minnesota Pollution Control Agency	
City of Lakeville	Natural Resource Conservation Service	
City of Rosemount		
City of Vermillion	**Other Local Government Organizations**	
Castle Rock Township	Dakota County Environmental Resources	
Douglas Township	Scott County Natural Resources	
Empire Township	Scott Watershed Management Organization (WMO)	
Eureka Township	Black Dog WMO	
Hampton Township	Eagan-Inver Grove Heights WMO	
Marshan Township	Lower Mississippi River WMO	
New Market Township	North Cannon River WMO	
Nininger Township	South Washington Watershed District	
Ravenna Township	Dakota County SWCD	
Vermillion Township	Scott County SWCD	

the Plan meets all the requirements of current Minnesota laws and rules. BWSR approved the Plan on May 25, 2016. The VRWJPB formally adopted the Plan on June 23, 2016.

This Plan will guide VRWJPO activities through 2025, unless it is superseded by adoption and approval of amendments or a subsequent Plan. Approximately two years prior to the expiration date of this Plan (in 2023), VRWJPO will again begin the process of updating its Plan.

10.2 Local Water Management Plan (LWMP) Adoption

The revision of Minn. Rules 8410, adopted in July 2015, changes the process for adoption of LWMPs. The intent of the changes is to coordinate the LWMPs with other planning documents and processes required of local governments, such as the local comprehensive plans.

Minn. Rules 8410.0160 requires that LWMPs incorporate specific portions of the 2016-2025 Vermillion River Watershed Management Plan. Figure 10.2.1: Requirements for Local Water Plans, provides the details about what must be included in LWMPs.

The LWMP (or any amendment to the LWMP) shall be submitted for review according to Minn. Statutes. § 103B.235.

The revised Minn. Rules 8410 has a significant impact on when LGUs must adopt LWMPs. The revised rules say that "organizations may extend all or portions of local water plans to align with the local comprehensive plan schedule during the initial three years of transition to the amended rule."

The amended rule was adopted in July 2015. The 2016-2025 Vermillion River Watershed Management Plan is scheduled for adoption by the Vermillion River Watershed Joint Powers Board (VRWJPB) in June 2016.

According to the Metropolitan Council, comprehensive plan updates for jurisdictions within the watershed will be due by the end of 2018. Therefore, the deadline for adopting LWMPs is also the end of 2018. Local official controls must be enacted within six months of VRWJPB approval of the LWMP.

The LWMP may be included as a chapter of each LGUs local comprehensive plan. All comprehensive plans must be consistent with local water plans adopted by the LGU.

Each LGU must notify watershed management organizations with jurisdiction over the area subject to the LWMP and the Metropolitan Council within 30 days of adoption of the LWMP (or an amendment to the LWMP). This notice must include adoption of any official controls.

The LWMP may also serve as a stormwater pollution prevention program (SWPPP). The LWMP can be the SWPPP if it complies with the requirements of applicable National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) stormwater permits and is approved by the Minnesota Pollution Control Agency (MPCA).

10.3 Failure to Implement the Watershed Plan

The revised Minn. Rules 8410 provides a mechanism to remedy a situation in which a watershed plan is not being implemented. Reasons for non-implementation include lack of a viable watershed management organization, lack of watershed plan adoption, or lack of implementation of an approved plan.

The Board of Water and Soil Resources (BWSR) has developed criteria and standards for determining whether a

watershed management organization is failing to implement its plan. The process begins with a written petition by a plan review agency, BWSR staff member, local government unit, or 50 residents with land in the area that is subject to the petition.

BWSR has a wide range of options to work with the watershed management organization, including further investigation, ordering plan amendment, enter dispute resolution, and other remedies, up to and including declaring a county or counties non-implementing or termination of a watershed district. The BWSR also has an appeal process to ensure fairness in its determinations.

10.4 Amendments to the Plan

The VRWJPO may revise its 2016-2025 Vermillion River Watershed Management Plan prior to the next Plan update. The VRWJPO is required to evaluate Plan implementation at least every two years. During these evaluations, the VRWJPO may find valued needs to improve and clarify language; change, add, or eliminate watershed Standards; respond to changes in watershed conditions; or integrate elements of state or federal law. The VRWJPO may then choose to incorporate changes to its Watershed Management Plan or Standards through public processes.

Some revisions to the Watershed Plan can be done without a formal plan amendment process. These include:

- Plan format or reorganization;
- Revision of a procedure meant to streamline administration of the plan;
- Clarification of existing plan goals or policies;
- Inclusion of additional data not requiring interpretation;
- Expansion of public process; or
- Adjustments to how an organization will carry out program activities within its discretion.

Watershed Plan amendments must adhere to a review process provided in Minn. Statutes §103B.231, subd. 11, unless determined to be "minor." A minor amendment is one that:

- The BWSR has agreed are minor,
- Plan review authorities have had a 30-day comment period and consider the amendment minor,
- No county board has an objection to the amendment during the 30-day comment period,
- The watershed management organization has issued a public notice and held a public meeting to explain the amendment, or
- The amendment has nothing to do with an approved and adopted county groundwater plan.

Formal amendments can be sent electronically, but reviewing agencies or organizations may request paper format. Draft amendments must show deleted text (~~as stricken~~) and new text (<u>as underlined</u>). All amendments adopted must be in the form of replacement pages for the plan, pages renumbered if appropriate, and the effective date of the amendment. Any agency or individual who has received the Watershed Plan should receive a copy of an approved amendment. In addition, amendments to the Watershed Plan must be posted on the VRWJPO website within 30 days of adoption.

Figure 10.2.1 : Requirements for Local Water Plans*				
Requirements for Local Water Management Plans	Description	Not in VRW Plan	Incorporate by Reference from VRW Plan or Other Plans	Taken Verbatim from VRW Plan
Executive summary	Summary of highlights of the LWMP	X		
Water management agreements	Water resources management-related agreements that have been entered into by the LGU, including Joint Powers Agreements with the VRWJPO, adjoining communities, or private parties	X		
Existing and proposed physical environment and land use	Drainage areas and volumes, rates, and paths of stormwater runoff		X	
Assessment of existing or potential water resource related problems	Problem assessment is needed for only those areas within the corporate limits of the LGU		X (Section 5)	
Local implementation program	Description of nonstructural, programmatic, and structural solutions to problems identified in the assessment (above)		X (Section 6)	
≈ **Areas and elevations for stormwater storage**	The areas and elevations must be adequate to meet performance standards or official controls	X		X (Appendix B)
≈ **Water quality protection methods**	Must be adequate to meet performance standards or official controls		X	X (Appendix B)
≈ **Responsibilities of LGU for carrying out implementation**	Define LGUs responsibility for implementation versus those of other organizations (such as the VRWJPO)		X (Section 9)	X (Appendix B)
≈ **Official controls as updated**	Describe official controls and any changes relative to requirements in the VRW Plan	X		X (Appendix B)
≈ **Implementation program table**	Describe each component of the implementation program, as well as schedule, estimated cost, funding, and annual budget totals	X	X (Section 7)	
≈ **Capital improvement program**	Describe details of each planned capital improvement with schedule, estimated cost, and funding source	X	X (Section 7)	
Amendment procedures	Establish a process by which amendments made be made to the LWMP	X		

*Note: The final authority on requirements for local water management plans is Minn. Rules 8410, as updated in July 2015.

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Section 11: Plan Terms and Acronyms

The following table includes definitions for terms and acronyms used in the Watershed Plan.

Term	Acronym	Definition/Description	For More Information
Alternative Urban Area Review	AUAR	A type of environmental assessment conducted by a government unit to determine environmental impacts caused by future urban development over a specific geographic area.	www.eqb.state.mn.us
Aquatic Management Area	AMA	Properties with riparian shoreline that have been acquired by the DNR for permanent protection.	www.dnr.state.mn.us
Aquifer		An underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, or silt) from which groundwater can be extracted using a well. The aquifers most used for water (drinking, irrigation, process water) are the Prairie du Chien Limestone and Jordan Sandstone aquifers.	www.mngs.umn.edu
Best Management Practice	BMP	As used in watershed management, a practice (or combination of practices) that is an effective and practical means of preventing or reducing the amount of pollutants to achieve water quality improvement.	www.pca.state.mn.us
Biological Oxygen Demand	BOD	The amount of dissolved oxygen that must be present in water in order for microorganisms to decompose the organic matter in the water, used as a measure of the degree of pollution.	www.pca.state.mn.us
Biota		The plant and animal life of a particular region or period of time.	www.dnr.state.mn.us
Board of Water and Soil Resources	BWSR	The state's administrative agency for 90 soil and water conservation districts, 46 watershed districts, 23 metropolitan watershed management organizations, and 80 county water managers.	www.bwsr.state.mn.us
Capital Improvement Program	CIP	A short-range plan that identifies capital projects and equipment purchases, provides a planning schedule, and identifies options for financing the planned improvements or purchases.	
Clean Water Act	CWA	A federal law that establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.	www.epa.gov
Conservation Reserve Enhancement Program	CREP	A land conservation program administered by the Farm Service Agency (FSA). In exchange for removing environmentally sensitive land from production and introducing conservation practices, the CREP pays farmers, ranchers, and agricultural land owners an annual rental rate.	www.fsa.usda.gov

Term	Acronym	Definition/Description	For More Information
Conservation Reserve Program	CRP	A land conservation program administered by the Farm Service Agency (FSA). In exchange for a yearly rental payment, farmers enrolled in the program agree to remove environmentally sensitive land from agricultural production and introduce plant species that will improve environmental health and quality.	www.fsa.usda.gov
Curve Number	CN	A hydrologic parameter used to describe the stormwater runoff potential for drainage area. The curve number is a function of land use, soil type, and soil moisture.	www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044171.pdf
Dissolved Oxygen	DO	The amount of oxygen dissolved in a body of water as an indication of the degree of health of the water and its ability to support an aquatic ecosystem.	www.pca.state.mn.us
Ecoregions		A large area of land or water containing characteristic, geographically distinct assemblages of natural communities and species.	www.pca.state.mn.us
Environmental Assessment Worksheet	EAW	A public process designed to disclose information about potential negative environmental effects of a proposed development and ways to avoid or minimize them before the project is permitted and built.	www.eqb.state.mn.us
Environmental Impact Statement	EIS	An extensive and detailed public process designed to disclose information about potential negative environmental effects of a proposed development, ways to avoid or minimize them, and whether the project can be built safely.	www.eqb.state.mn.us
Environmental Quality Incentives Program	EQIP	A voluntary program providing financial and technical assistance to agricultural producers willing to maintain environmental best management practices (BMPs) for up to 10 years.	www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip
Farm Service Agency	FSA	A federal agency serving farmers, ranchers, and agricultural partners through the delivery of effective, efficient agricultural programs.	www.fsa.usda.gov
Federal Emergency Management Agency	FEMA	A federal agency that supports citizens and first responders to build, sustain and improve our capability to prepare for, protect against, respond to, recover from, and mitigate all hazards.	www.fema.gov
Geographic Information System	GIS	A computer-based system to visualize, question, analyze, and interpret data to understand relationships, patterns, and trends related to the surface of the Earth.	www.mngeo.state.mn.us
Groundwater	GW	Water that collects or flows beneath the Earth's surface, filling the porous spaces in soil, sediment, and rocks. Groundwater originates from rain and melting snow and ice. It is the source of water for aquifers, springs, and wells.	www.mngs.umn.edu
Hastings Area Nitrate Study	HANS	A Dakota County study of nitrate in public and private drinking water supplies to determine sources of nitrate, estimate groundwater flow of nitrate-contaminated water, and propose solutions to nitrate contamination.	www.dakotacounty.us

Term	Acronym	Definition/Description	For More Information
Health Risk Limit	HRL	A minimum level of water quality suitable for human consumption. HRLs are used to determine whether groundwater is subject to regulatory or advisory actions based on human health concerns.	www.health.state.mn.us
Hydrologic Soil Group	HSG	Soils are classified into hydrologic soil groups to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs are one element used in determining runoff curve numbers.	http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba
Hydrology		A science dealing with the properties, distribution, and circulation of water on and below the earth's surface and in the atmosphere.	
Index of Biological Integrity	IBI	An indexing procedure used to assess the effect of human disturbance on streams and watersheds by looking at biological communities (fish and macroinvertebrates, for example).	www.pca.state.mn.us
Individual Sewage Treatment System	ISTS	See "Subsurface Sewage Treatment System (SSTS)"	www.pca.state.mn.us
Joint Powers Agreement	JPA	A contract between a city, a county, and/or a special district in which the city or county agrees to perform services, cooperates with, or lends its powers to, the special district.	
Karst		An area of limestone terrain characterized by sinks, ravines, and underground streams.	www.mngs.umn.edu
Land Alteration Plan	LAP	A detailed site plan and current picture of shoreline for a land alteration permit. The detailed site plan must show water drainage, erosion control measures, area to be disturbed and amount of fill to be placed in the project, distance from the Ordinary High Water Mark (OHW), property lines and road. The site plan must also show locations of all structures, wells and septic systems, with all dimensions and distances.	
Load Allocation	LA	A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that load among the various sources of that pollutant.	www.pca.state.mn.us
Local Government Unit	LGU	All divisions of government below the regional level.	
Local Water Management Plan	LWMP	In 1982, the Minnesota Legislature approved the Metropolitan Surface Water Management Act, requiring local water management authorities to prepare and implement surface water management plans. Minnesota Rule Chapter 8410 determines and defines the plan content. This rule also requires that plans are revised every 5 to 10 years.	www.bwsr.state.mn.us
Loess		An unstratified, usually buff-to-yellowish-brown loamy deposit believed to be chiefly deposited by the wind	

Term	Acronym	Definition/Description	For More Information
Low Impact Development	LID	An approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective impervious surfaces, and creating functional and appealing site drainage that treats stormwater as a resource rather than a waste product.	www.pca.state.mn.us
Macroinvertebrate		*Macroinvertebrates* are aquatic organisms that are large (macro) enough to be seen with the naked eye and lack a backbone (invertebrate). They inhabit all types of rivers, lakes, and wetlands.	
Maximum Contaminant Level	MCL	Standards set by the EPA under the Safe Drinking Water Act that establish legal thresholds on the allowable amount of a substance in public water supplies.	www.epa.gov
Mercury	Hg	A toxic metal that becomes airborne as a byproduct of coal-burning power plants. Mercury deposited at high enough levels into water resources can bioaccumulate in fish tissue, posing a health risk to people and animals that eat the fish.	www.pca.state.mn.us
Metropolitan Council Environmental Services	MCES	MCES provides wastewater services and integrated planning to ensure sustainable water quality and water supply for the region.	www.metrocouncil.org
Metropolitan Urban Service Area	MUSA	The Metropolitan Urban Service Area, or MUSA, is the area in the seven counties in which the Metropolitan Council ensures that regional services and facilities, such as sewers and major highways, are provided or planned.	www.metrocouncil.org
Minimum Impact Design Standards	MIDS	MIDS consist of performance standards, design standards, or other tools to enable and promote the implementation of low impact development and other stormwater management techniques.	www.pca.state.mn.us
Minnesota Department of Agriculture	MDA	MDA's mission is to ensure the integrity of the food supply, the health of the environment, and the strength of the agricultural economy.	www.mda.state.mn.us
Minnesota Department of Health	MDH	MDH's mission is protecting, maintaining and improving the health of all Minnesotans.	www.health.state.mn.us
Minnesota Department of Natural Resources	DNR	DNR works with citizens to conserve and manage the state's natural resources, to provide outdoor recreation opportunities, and to provide for commercial uses of natural resources in a way that creates a sustainable quality of life.	www.dnr.state.mn.us

Term	Acronym	Definition/Description	For More Information
Minnesota Pollution Control Agency	MPCA	The MPCA monitors environmental quality, offers technical and financial assistance, and enforces environmental regulations.	www.pca.state.mn.us
Mississippi National River and Recreation Area	MNRRA	Preserves unimpaired the natural and cultural resources and values of the area for the enjoyment, education, and inspiration of this and future generations.	www.nps.gov/miss/index.htm
Municipal Separate Storm Sewer System	MS4	A municipal separate storm sewer system (MS4) is a conveyance or system of conveyances (roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, storm drains, etc.) that is publicly owned. Stormwater discharges associated with MS4s are subject to regulation under the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS). Through the MS4 General Permit, the system owner or operator is required to develop a stormwater pollution prevention program (SWPPP) that incorporates best management practices (BMPs) applicable to their MS4.	www.pca.state.mn.us
National Flood Insurance Program	NFIP	The NFIP offers flood insurance to homeowners, renters, and business owners, if their communities participate in the NFIP.	www.fema.gov/national-flood-insurance-program
National Oceanic and Atmospheric Administration	NOAA	A federal agency under the Department of Commerce charged with evaluating and predicting changes in climate, weather, oceans, and coasts; sharing that knowledge and information with others; and conserving and managing coastal and marine ecosystems and resources.	www.noaa.gov
National Pollutant Discharge Elimination System	NPDES	A permit program authorized by the Clean Water Act that controls water pollution by regulating point sources that discharge pollutants into waters of the United States.	www.epa.gov
Natural Resource Conservation Service	NRCS	A federal agency offering technical and financial assistance to help farmers, ranchers and forest managers to implement conservation practices on working lands.	www.nrcs.usda.gov
Nitrate	NO_3-	A compound used in fertilizer that acts as a nutrient in soil and a pollutant when found at high levels in groundwater and surface water.	
Ordinary High Water Level	OHWL	The upper boundary of water basins, watercourses, public waters, and public waters wetlands, commonly the point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. For watercourses, the ordinary high water level is the elevation of the top of the bank of the channel.	www.dnr.state.mn.us/waters
Phosphorus	P	A chemical element used in fertilizers and other products that acts as a nutrient in soil and a pollutant when found at high levels in groundwater, surface water, and wastewater.	

Term	Acronym	Definition/Description	For More Information
Polychlorinated Biphenyl	PCB	Synthetic organic chemicals used in industrial applications that can accumulate in the leaves and above-ground parts of plants and food crops. They are also taken up or bioaccumulated in the tissue of small organisms and fish. Fish containing high levels of PCBs pose a health risk to people and animals.	www.pca.state.mn.us
Potassium	K+	An element used widely in fertilizers and salts.	
Public Waters Inventory	PWI	The DNR conducted the original public waters inventory in the late 1970s, maintains and updates the inventory records, and provides maps of public waters.	www.dnr.state.mn.us
Reinvest In Minnesota	RIM	A program implemented by BWSR that protects and improves water quality, reduces soil erosion, and enhances fish and wildlife habitat on privately owned lands by retiring environmentally sensitive lands from agricultural production. Conservation practices are established by planting native vegetation and restoring wetlands.	www.bwsr.state.mn.us/easements
Riparian		Relating to, living on, or located on the bank of a natural watercourse (as a river) or lake.	
Scientific and Natural Area	SNA	SNAs are lands owned and managed by the DNR to preserve natural features and rare resources of exceptional scientific and educational value.	www.dnr.state.mn.us
Soil and Water Conservation District	SWCD	Local units of government that manage and direct natural resource management programs at the local level. Districts work in both urban and rural settings, with landowners and other units of government, to carry out a program for the conservation, use, and development of soil, water, and related resources.	www.bwsr.state.mn.us
Storm Water Management Model	SWMM	Rainfall-runoff simulation model used for single event or long-term (continuous) simulation of runoff quantity and quality from primarily urban areas.	
Storm Water Pollution Prevention Plans	SWPPP	Holders of NPDES permits (for municipal, industrial, and construction purposes) must prepare a SWPPP in order to obtain permit coverage for stormwater discharges.	http://water.epa.gov/polwaste/npdes/stormwater/Stormwater-Pollution-Prevention-Plans-for-Construction-Activities.cfm
Stream Classification		Based on considerations of best usage and the need for water quality protection in the interest of the public, the waters of the state are grouped into one or more of classes. In the Vermillion River, river and stream segments are Class 2 waters, used for aquatic life and recreation. Class 2A streams are cold-water; Class 2B streams are warm-water.	www.pca.state.mn.us

Term	Acronym	Definition/Description	For More Information
Subsurface Sewage Treatment System (SSTS)	SSTS	Commonly known as septic systems. SSTS are regulated to protect public health and the environment through adequate dispersal and treatment of domestic sewage from dwellings or other establishments generating volumes less than 10,000 gallons per day.	www.pca.state.mn.us
Technical Advisory Group (TAG)	TAG	The TAG provides consultation to the VRWJPO on scientific, technical, and policy issues that affect watershed resources. Members include representatives of cities, state agencies, environmental consulting firms, and other interested groups.	www.vermillionriverwatershed.org/about-us/technical-advisory/
Total Kjeldahl Nitrogen	TKN	Test for total concentration of organic nitrogen and ammonia in surface water.	
Total Maximum Daily Load	TMDL	A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, as well as an allocation of that load among the various sources of that pollutant.	www.pca.state.mn.us
Total Suspended Solids	TSS	Particles that are larger than 2 microns found in the water column. Anything smaller than 2 microns (average filter size) is considered a dissolved solid.	
Turbidity		A water clarity measure of how much material suspended in water decreases the passage of light through the water. Suspended materials include soil particles (clay, silt, and sand), algae, plankton, microbes, and other substances.	
U.S. Army Corps of Engineers	COE or USACE	A federal agency of civilian and military personnel that performs engineering, design, and construction services. Although generally associated with dams, canals, and flood protection in the United States, USACE is involved in a wide range of public works throughout the world.	www.mvp.usace.army.mil
U.S. Department of Agriculture	USDA	Provides leadership on food, agriculture, natural resources, rural development, nutrition, and related issues based on public policy, the best available science, and effective management.	www.usda.gov
U.S. Environmental Protection Agency	EPA	A federal agency responsible for environmental research, monitoring, standard-setting and enforcement activities to protect human health and the environment.	www.epa.gov
U.S. Fish and Wildlife Service	USFWS	*A federal agency that conserves, protects and enhances fish, wildlife and plants and their habitats.*	www.fws.gov
U.S. Geological Survey	USGS	A federal agency that provides reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.	www.usgs.gov

Term	Acronym	Definition/Description	For More Information
Waste Load Allocation	WLA	The portion of a water resource's Total Maximum Daily Load (TMDL) that is determined to come from a specific source or area. The MS4 community that contains this source or area is assigned to reduce its pollutant load by this portion.	www.pca.state.mn.us
Wastewater Treatment Plant	WWTP	A facility where various physical, biological, or chemical processes are used to change the properties of the wastewater (e.g. by removing harmful substances) in order to turn it into a type of water (also called effluent) that can be safely discharged into the environment or that is usable for other purposes.	www.metrocouncil.org
Watershed		An area of land draining into a river, river system, or other water body.	
Watershed District	WD	Special government entities in Minnesota that monitor and regulate water in watersheds.	www.bwsr.state.mn.us
Watershed Management Organization	WMO	Special government entities in Minnesota that monitor and regulate water in watersheds that conduct activities according to an approved watershed management plan.	www.bwsr.state.mn.us
Watershed Planning Commission	WPC	The formal citizen advisory group to the Vermillion River Watershed Joint Powers Board (VRWJPB) that provides advice and recommendations on watershed issues to the board. Nine members are appointed to the WPC, eight from Dakota County and one from Scott County.	www.vermillionriverwatershed.org/about-us/planning-commision/
Watershed Restoration and Protection Strategy	WRAPS	A document summarizing scientific studies of a major watershed; identification of impairments and water bodies in need of protection; identification of biotic stressors and sources of pollution; total maximum daily loads (TMDL) for the impairments; and an implementation table containing strategies and actions designed to achieve and maintain water quality standards and goals.	www.pca.state.mn.us
Wellhead Protection Areas		A surface and subsurface land area regulated to prevent contamination of a well or well-field supplying a public water system.	www.health.state.mn.us/divs/eh/water/swp/whp
Wetland Conservation Act	WCA	A federal law that requires anyone proposing to drain, fill, or excavate a wetland first to try to avoid disturbing the wetland; second, to try to minimize any impact on the wetland; and, finally, to replace any lost wetland acres, functions, and values.	www.bwsr.state.mn.us/wetlands/wca

Section 12: Watershed Plan References

The Vermillion River Watershed Joint Powers Organization (VRWJPO) used a wide range of source materials in the Vermillion River Watershed Management Plan. This section provides citations and/or links for those sources referenced in the Plan, as well as other references used in the Plan's preparation.

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JOINT POWERS AGREEMENT

BETWEEN DAKOTA COUNTY AND SCOTT COUNTY FOR VERMILLION RIVER WATERSHED

WHEREAS, Minnesota Statutes § 471.59 authorizes local governmental units to jointly or cooperatively exercise any power common to the contracting parties; and

WHEREAS, pursuant to Minn. Stat. § 103B.231 a watershed management plan is required for watersheds comprising all minor watershed units wholly or partly within the metropolitan area, in accordance with the requirements of § 103B.205 to § 103B.255; and

WHEREAS, the Vermillion River Watershed is a watershed comprising minor watershed units wholly within the metropolitan area, specifically, within Dakota County and Scott County; and

WHEREAS, pursuant to Minn. Stat. § 103B.231 if a watershed management organization within the metropolitan area is terminated, the counties containing the watershed unit shall prepare, adopt, and implement the watershed plan and shall have the planning, review, permitting, and financing authority of a watershed management organization specified in Minn. Stat. §§ 103B.211 to 103B.255; and

WHEREAS, the Vermillion River Watershed Management Organization, consisting of 21 cities and towns located within the Vermillion River Watershed ceased to exist as of August 1, 2000; and

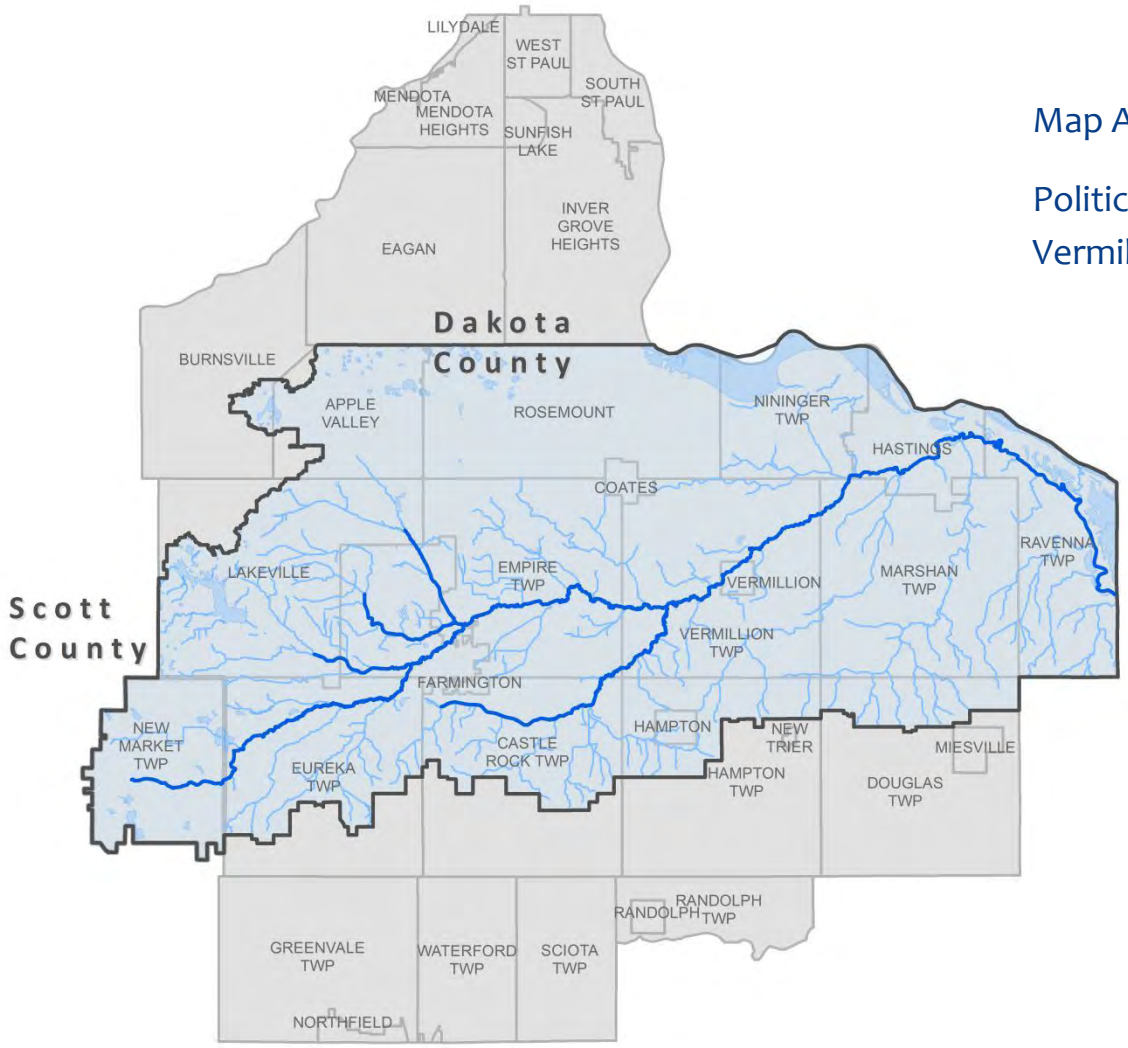
WHEREAS, Dakota County and Scott County desire to cooperatively carry out their responsibilities and duties pursuant to Minn. Stat. §§ 103B. 211 to 103B.255; and

WHEREAS, Dakota County and Scott County desire to do so pursuant to the authority granted to them pursuant to Minn. Stat. § 471.59.

NOW, THEREFORE, in consideration of the mutual promises and benefits that Dakota County and Scott County shall derive herefrom, Dakota County and Scott County hereby enter into this joint powers agreement for the purposes herein.

I. Purposes

This Agreement has been executed by Dakota and Scott Counties for the purposes set forth at Minn. Stat. § 103B.201 within the political boundary of the Vermillion River watershed located in Dakota County and Scott County, as shown on the attached Map A, hereby incorporated by reference. Specifically, the purpose of this Agreement is to establish a joint powers board that will (1) exercise leadership in the development of policies, programs and projects that will promote the accomplishment of the purposes found at Minn. Stat. § 103B.201, including the preparation, adoption and implementation of the plan required by Minn. Stat. § 103B.211 for the Vermillion River watershed and (2) guide and assist Dakota County and Scott County in acting jointly and individually to take actions that will promote the goals listed in Minn. Stat. § 103B.201 and fulfill their responsibilities under Chapter 103B.



Map A

Political Boundary of the Vermillion River Watershed

II. Joint Powers Board

A. Creation and Composition of Joint Powers Board. A joint powers board, known as the Vermillion River Watershed Joint Powers Board (VRWJPB), is established for the purposes contained herein with the powers and duties set forth in this Agreement. The VRWJPB shall consist of one county commissioner from Scott County and two county commissioners from Dakota County. The board of commissioners of each county shall appoint, by resolution, its representative(s) to the VRWJPB, together with one alternate commissioner. Resolutions appointing representatives of each county shall be filed with the clerk to the board of commissioners of Dakota County.

B. Terms. Each county representative and alternate shall be appointed for a two-year term, except that the terms of the initial members shall extend from the date of their appointment through December 31, 2004. In the event that any county representative or alternate shall not have been appointed by the board of commissioners prior to expiration of the representative's term, the incumbent representative shall serve until a successor has been appointed.

C. Vacancies. If the appointment of any representative commissioner or alternate is vacated before the end of the term, the vacancy shall be filled by appointment by the appropriate county board of commissioners. A vacancy shall be deemed to have occurred when any of the conditions specified in Minn. Stat. § 351.02 exist or if a representative fails to qualify or act as a commissioner.

D. Chair and Vice-chair. The VRWJPB shall elect a chair and a vice-chair from its membership for one-year terms. The chair shall preside at all meetings of the VRWJPB and shall perform other duties and functions as may be determined by the VRWJPB. The vice-chair shall preside over and act for the VRWJPB during the absence of the chair.

E. Secretary/Treasurer. The VRWJPB shall elect a secretary/treasurer from its membership for a one-year term. The secretary/treasurer shall submit all minutes of VRWJPB meetings for approval by the VRWJPB and shall assist the chair in overseeing the VRWJPB's budget and finances.
F. Meetings. The VRWJPB shall have regular meetings at least annually and at such times and places as the VRWJPB shall determine. Special meetings may be held on reasonable notice by the chair or by a majority of the VRWJPB upon terms and conditions as the VRWJPB may determine. The presence of a majority of the VRWJPB at a meeting shall constitute a quorum. The VRWJPB shall be subject to the requirements of the Open Meeting Law, Minn. Stat. Ch. 13D.

G. Voting. Each county representative shall be entitled to one vote. If a county representative is absent that county's alternate is entitled to one vote. If more than one Dakota County representative is absent, Dakota County's alternate shall be entitled to only one vote. The VRWJPB shall function by a majority vote of the county representatives present.

H. Staff. Dakota County and Scott County shall provide staff support to the VRWJPB. Dakota County and Scott County shall provide legal services as needed, and in accordance with law.

I. Duties of the VRWJPB. The VRWJPB shall have the responsibility to prepare, adopt and implement a plan for the Vermillion River watershed that meets the requirements of Minn. Stat. § 103B.231; the responsibility to review and approve local water management plans as provided in Minn. Stat. § 103B.235; the responsibility to regulate the use and development of land in the Vermillion River watershed if the conditions found at Minn. Stat. §. 103B.211, subd. 1(3)(i)(ii)(iii) are present.

III. Powers of the VRWJPB

A. General Powers. The VRWJPB is hereby authorized to exercise such authority as is necessary and proper to fulfill its purposes and perform the duties identified in paragraph II(I) above. Such authority shall include, but not be limited to, those specific powers enumerated in

paragraph III (Sections B through I) herein. The VRWJPB may refer decisions for approval by the boards of commissioners of Dakota County and Scott County. The VRWJPB shall not have the authority described at Minn. Stat. § 103B.211, subd. 1(a)(6).

B. Contracts. The VRWJPB may enter into any contract necessary or proper for the exercise of its powers or the fulfillment of its duties and enforce such contracts to the extent available in equity or at law, including contracts with Dakota County and/or Scott County. Additionally, the VRWJPB may enter into agreements pursuant to Minn. Stat. § 471.59. The VRWJPB may approve any contract up to the amount included in the approved annual budget and may authorize its chair to execute these contracts. No payment on any invoice for services performed by a consultant or any other person or organization providing services in connection with this Agreement shall be authorized unless approved by the chair and vice-chair or by the chair and secretary/treasurer. The chair shall report to the VRWJPB and the VRWJPB shall ratify any such payments authorized under this provision at its next regular meeting.

C. Funds. The VRWJPB may disburse funds in a manner which is consistent with the Agreement and with the method provided by law for the disbursement of funds by the parties to this Agreement.
D. Bylaws. The VRWJPB shall have the power to adopt and amend such bylaws that it may deem necessary or desirable for the conduct of its business. Such bylaws shall be consistent with this Agreement and any applicable laws or regulations.

E. Grants and Loans. The VRWJPB may apply for and accept gifts, grants or loans of money, other property or assistance from the United States government, the State of Minnesota, or any person, association or agency for any of its purposes; enter into any agreement in connection therewith; and hold, use and dispose of such money, other property and assistance in accordance with the terms of the gift, grant or loan relating thereto.

F. Property. The VRWJPB may hold such property as may be required to accomplish the purposes of this Agreement and upon termination of this Agreement make distribution of such property as is provided for in this Agreement.

G. Insurance. The VRWJPB may obtain any liability insurance or other insurance it deems necessary to insure itself and Dakota County and Scott County for action arising out of this Agreement.

H. Exercise of Powers. All powers granted herein shall be exercised by the VRWJPB in a fiscally responsible manner and in accordance with the requirements of law. The purchasing and contracting requirements of the county which is the lead for the project shall apply to the VRWJPB.

I. Public Participation. The VRWJPB shall provide for such public participation in the conduct of its activities as will promote understanding of its activities among the public and local governmental units affected by the activities and the informal resolution of disputes or complaints.

IV. Reservation of Authority

All responsibilities not specifically set out to be jointly exercised by the VRWJPB under this Agreement are hereby reserved to the Counties.

V. Budgeting and Funding

A. Budget. By September 1 of each year, the VRWJPB shall adopt a budget for the following calendar year. Any proposed contribution from Dakota County or Scott County which the VRWJPB deems appropriate to be satisfied from the annual property tax levy must be recommended to Dakota County and Scott County prior to the date by which the counties shall establish their maximum levy pursuant to Minn. Stat. § 275.065, subd. 1. Other proposed contributions or assessments from Dakota County or Scott County may be made at any time.

B. County Funding. If there is proposed funding from Dakota County or Scott County which is to be satisfied from the annual property tax levy, such proposed funding shall not become the obligation of either county unless and until the respective county has agreed to the funding as part of the county's annual budget and levy process pursuant to Minn. Stat. § 275.065. If there is proposed funding from Dakota County or Scott County which is not to be satisfied from the annual property tax levy, such funding shall not become the obligation of either county until the respective county has agreed by resolution to the funding. Any proposed funding from Dakota County or Scott County which has been included within the county's levy or which has been approved by resolution of the Dakota County or Scott County board of commissioners shall constitute an assessment against the county and shall be paid over to the VRWJPB pursuant to its terms, this Agreement, and as required by law.

C. Expenditure Policy. Dakota County and Scott County agree that the budget for each year shall include expenditures which will benefit the portion of the Vermillion River Watershed located in Scott County.

D. Fiscal Agent. Dakota County agrees to serve as the fiscal agent for the VRWJPB. Dakota County agrees to provide any and all budgeting and accounting services necessary or convenient for the VRWJPB. Such services include, but are not limited to, management of all funds, including county contributions and grant monies; payment for contracted services; relevant record keeping and bookkeeping. The treasurer/auditor of Dakota County shall act as controller for the VRWJPB and shall draw warrants to pay demands against the VRWJPB when the demands have been approved by the VRWJPB. Scott County retains the authority to request reports pertaining to any and all budgeting and accounting services. All interest earned from VRWJPB funds shall be credited back to that fund.

E. Accountability. All funds shall be accounted for according to generally accepted accounting principles.

VI. Watershed Planning Commission

As soon as practicable after appointment of the VRWJPB, the VRWJPB by resolution shall establish and make appointments to the Watershed Planning Commission (WPC). The VRWJPB shall utilize an open appointments process for making these appointments.

A. Responsibilities of WPC. The WPC shall have the responsibility to advise the VRWJPB with respect to implementation of the VRWJPB's duties pursuant to this Agreement, including the responsibility to review, comment and recommend upon the proposed watershed management plan; review, comment and recommend upon the proposed annual work plan and budget; and recommend action regarding disputes pursuant to section IX hereof.

B. Membership. The WPC shall consist of nine members who are residents of the Vermillion River Watershed. One shall be from Scott County and eight shall be from Dakota County. WPC members shall be appointed to three-year staggered terms. WPC members must be and remain residents of the watershed and the County from which they were appointed. WPC members are limited to serving two consecutive terms.

C. Conflict of Interest. If any WPC member has a financial interest or personal interest with respect to the parties involved, or stands to realize a financial or personal gain or loss with respect to an action on any matter coming before the WPC, that member shall disclose this fact and be disqualified from taking part in any discussion or action on the matter as a member of the WPC. The chair of the WPC shall make rulings on such disqualifications. Any WPC member who believes that the WPC chair should be disqualified from any matter hereunder may refer the matter to the vice-chair who shall make a ruling on such disqualification.

D. Compensation. Members of the WPC shall be eligible to receive a per diem payment of $35 per meeting in lieu of expenses.

E. Officers. The WPC shall elect a chair and vice-chair from among its members. The chair and vice-chair shall serve for one-year terms.

F. Meetings. The WPC shall meet regularly pursuant to a schedule established by the WPC. Special meetings may be called by the chair. The WPC shall be subject to the Open Meeting Law, Minn. Stat. Ch. 13D.

G. Bylaws. The WPC shall adopt bylaws governing its activities. Such bylaws shall be subject to approval by the VRWJPB and shall be consistent with law and terms of this Agreement.

H. Staff Support. Dakota County and Scott County shall provide staff support to the WPC. The cost of such support will be funded through the budget of the VRWJPB. The VRWJPB also may make technical support available to the WPC.

VII. Indemnification

If the VRWJPB incurs any expenses as a result of a claim for damages, the expenses and any damages paid shall be assessed against the counties in proportionate shares. Proportionality will be measured with reference to fault, percentage of county financial contribution, location of the project or other similar factors giving rise to the damages or expenses. Dakota County and Scott County hereby agree to indemnify, save, hold harmless and defend the VRWJPB, its officers, employees, and agents for negligent or intentional acts or omissions of itself, its officers, employees, and agents that result in expenses or damages assessed against the VRWJPB.

VIII. Records, Accounts, and Reports

The books and records of the VRWJPB shall be subject to the provisions of Minn. Stat. Ch. 13. The VRWJPB annually shall give a complete written report of all financial activities for the previous fiscal year to the counties.

IX. Dispute Resolution

Disputes between Dakota County and Scott County may be addressed by any means agreed upon by them, and may include the procedures set forth at Minn. Stat. § 103B.345.

X. Termination

This Agreement shall terminate upon the withdrawal of either member county. Either county may withdraw upon one year's written notice to the other county. Withdrawal shall not act to discharge any liability incurred or chargeable to the withdrawing county before the effective date of the withdrawal. Such liability shall continue until discharged by law or agreement.

XI. Distribution of Surplus Funds and Property

Upon termination of this Agreement, funds and property held by the VRWJPB shall then be distributed to Dakota County and Scott County in proportion to their contributions.

XII. Amendments

This Agreement may be amended only in writing and upon consent of each of the county boards of commissioners in Dakota County and Scott County.

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Appendix B: VRWJPO Standards

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Standards for the
Vermillion River Watershed Joint Powers Organization

Forward

The following document presents the Standards for the Vermillion River Watershed Joint Powers Organization (VRWJPO).

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Last Updated: September 25, 2019

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SECTION 1: POLICY STATEMENT

The Vermillion River Watershed Joint Powers Organization (VRWJPO) is a watershed management organization as defined in the Metropolitan Surface Water Management Act (Minn. Statutes Chapter 103B). This Act provides the VRWJPO with the power to accomplish its statutory purpose – to protect, preserve and manage surface and groundwater systems within the Vermillion River Watershed (Watershed).

The VRWJPO has adopted a Watershed Plan pursuant to the Act and Minn. Rules Chapter 8410.

The Watershed Plan provides the management goals, objectives, and actions that the VRWJPO will use to protect, improve, preserve, and manage water resources in the Watershed, and the need and reasonableness for standards, rules, and ordinances to enforce the objectives of the plan. The following Standards implement the plan's goals, objectives, and actions.

Many of the issues identified in the Plan are interrelated. The most notable interrelationship is the hydrology of the Vermillion River (River) and the potential for change associated with various land uses and their management, especially those anticipated with urban development and agriculture. The challenge is in accurately assessing the causes of the effects to the hydrology of the River and related water quality factors. In the future, additional development is expected in the watershed, both the transition from agricultural to urban/ suburban uses and additional drainage and irrigation of agricultural lands, while wastewater discharges from the Empire and Elko/New Market wastewater treatment plants have been diverted from the river. These changes have the potential to further impact flows, water quality, and sensitive resources including wetlands and groundwater.

Water quality is an important amenity in the Watershed – both in terms of surface water and groundwater. Stormwater can carry a variety of pollutants, which can affect downstream areas as well as groundwater through infiltration. Water bodies assessed in terms of water quality and found to be impaired will appear on the Minnesota Pollution Control Agency (MPCA) 303(d) list of impaired waters. For each of these impairments, a total maximum daily load (TMDL) study is required. TMDLs are a process by which the sources of the pollutant are studied and allowable loads are calculated and allocated to each source so that the waterbody will meet its intended use without impairment. Additional pollutants in runoff from land use change and land management cannot only affect the TMDLs and the ability to address existing impairments, but could create or expand other water quality threats such as temperature effects on aquatic life, particularly trout, which is an important local issue.

The 1999 Vermillion River Assessment found numerous streambank and channel stability problems, and that the stream types along the Main Stem are very sensitive to disturbance, providing high sediment supplies and having a very high potential for streambank erosion.

Subsequent assessments have also documented streambank erosion on the Main Stem, primarily in reaches downstream of Farmington, where changes in land use and land management throughout the watershed have resulted in increased flow volume, intensity, and duration, combined with poor quality riparian vegetation, leading to bank instability. There are also economic implications due to increased volumes and flow of stormwater. In addition to flooding, unstable stream channels over time have the ability to depress land values, damage property, endanger high value structures and render prime building locations unbuildable, directly impacting the health, safety and welfare of the Watershed. Accelerated streambank erosion can also increase the rate and severity of stream channel migration and resulting property loss. In addition, unstable channels undermine bridges, clog culverts, and can otherwise damage infrastructure, requiring costly repairs and ensuring legal issues for both public agencies and private individuals.

A number of sensitive habitats and communities exist in the watershed including designated trout stream areas, natural communities, rare species, and wetlands. Trout and their habitats may be threatened by development without appropriate stormwater management or appropriate land management on agricultural lands. Other sensitive resources, such as natural communities, rare species, and wetlands have been largely depleted or have been substantially altered throughout the Watershed. This has increased the value of remaining natural communities and resources. Wetlands can be impacted directly by development and land disturbing activities; and indirectly by hydrologic and water quality changes associated with development and other land disturbing activities. Wetlands provide a variety of functions and values, which are important to the overall character and function of the Watershed.

Cities and residents throughout the Watershed derive their drinking water from groundwater. High nitrates have been documented in groundwater and wells in the eastern portions of the Watershed near the City of Hastings. The nitrates have largely been linked to agricultural activities. Future activities without better management or adequate controls may further impact groundwater quality.

These Standards address the issues identified in the VRWJPO Watershed Plan and protect the public health, safety, welfare and natural resources of the VRWJPO by regulating the improvement or alteration of land and waters within the Watershed to reduce the severity and frequency of high water, to preserve floodplain and wetland storage capacity, to improve the chemical and physical quality of surface waters, to reduce sedimentation, to preserve the hydraulic and navigational capacities of waterbodies, to preserve and protect channels and drainageways, to promote and preserve natural infiltration areas, protect groundwater, and to preserve natural shoreline features. In addition to protecting natural resources, these Standards are intended to minimize future public expenditures and liability on issues caused by the improvement or alteration of land and waters.

The following Standards each begin with a subsection on Policy. The policies listed in these subsections are either paraphrased or copied from the goals, objectives, or actions of the approved VRWJPO Watershed Plan. These policies provide the rationale for the Standards as

well as other activities and programs of the VRWJPO. The articulated policies support why the Standards are written the way they are, but it is not the intent of the VRWJPO to accomplish these policies solely through regulatory Standards.

SECTION 2: RELATIONSHIP WITH MUNICIPALITIES AND COUNTIES

The VRWJPO recognizes that the control and determination of appropriate land use is the responsibility of the Local Governmental Units (LGUs; i.e., municipalities and counties). In March 2007, the VRWJPO adopted Rules consistent with these Standards in the event it acquires the authority of a watershed district under Minn. Stat. § 103B.211, Subd. 1(a)(3) .

LGUs are responsible for adopting Local Water Plans (LWPs) that implement the VRWJPO Watershed Plan. Pursuant to Minn. Stat. § 103B.235, the LGUs must complete Local Plans within a time period specified in the Watershed Plan. The Vermillion River Watershed Joint Powers Board must approve local water plans. The standards in the local plans must meet or exceed the VRWJPO's Standards, and local controls must implement the Standards. After approval of the Local Plans the LGUs have 120 days to begin implementing the plans and 180 days to amend their official controls which implement the Watershed Standards.

The VRWJPO may conduct selected project reviews in order to evaluate the implementation of LGU official controls.

The Cities are the LGUs within their corporate limits. The Townships are the planning and zoning authority in the unincorporated areas in Dakota County, while Dakota County maintains permitting authority for Shorelands, Floodplain, and Individual Sewage Treatment Systems in unincorporated areas; both the County and Townships are considered LGUs for unincorporated areas in Dakota County. Dakota County will have permitting authority over Floodplain, Individual Sewage Treatment Systems, and general Shoreland regulations in Shoreland areas. In Scott County, the County is the planning and zoning authority in addition to maintaining permitting authority over Shorelands and Floodplain and Individual Sewage Treatment Systems in unincorporated areas. Thus, in the Scott County portions of the Watershed, cities are the LGUs in incorporated areas and Scott County is the LGU in unincorporated areas.

The VRWJPO envisions two categories of permitting responsibility following adoption of the VRWJPO rules:

- ≈ Category 1 – VRWJPO assumes responsibility for all permitting.
- ≈ Category 2 – LGUs assume responsibility for all permitting.

Following VRWJPO rule adoption, the VRWJPO will evaluate local government official controls to determine if they match the VRWJPO Standards. If a local government's official controls are found to be insufficient (i.e., do not meet the VRWJPO Standards), the VRWJPO will implement a permitting program in that community (Category 1).

If an LGU incorporates the VRWJPO Standards into its official controls, and demonstrates compliance with the VRWJPO Standards, that LGU will be responsible for permitting (Category 2). The VRWJPO will require LGUs responsible for permitting to submit some proposed land alteration plans to the VRWJPO for review and comment each year through a VRWJPO evaluation program. Land alteration plans with the following conditions are particularly important to the VRWJPO for review:

- ≈ Diversions
- ≈ Intercommunity flows (upon request from adjoining communities)
- ≈ Project site size of 40 acres or more
- ≈ Projects that are adjacent to or appear to impact watercourses or unique natural resources

All land alteration plans that require an amendment to, or a variance from, the adopted local water plan must be submitted to the VRWJPO for review and approval, or denial, as prescribed by Minn. Stat. § 103B.211.

The VRWJPO can enforce its permits and Rules as allowed by Minn. Stat. § Chs. 103B and 103D (Category 1). The VRWJPO may also evaluate local government permitting programs. If these evaluations show non-compliance with the VRWJPO's Standards and/or the local government's official controls, the VRWJPO will implement a permitting program in that community.

The VRWJPO may establish special subtaxing districts to collect funds to cover its cost to implement the permitting program in communities where the VRWJPO has permitting authority. As an alternative to setting up special subtaxing districts, the VRWJPO will consider collecting permit fees to offset the costs of implementing a permitting program.

The following presents the VRWJPO's interpretation of how the goals, objectives, and actions in the Watershed Plan should be translated into Standards. LGUs may adopt more restrictive standards. In addition, the VRWJPO recognizes that LGUs have different authorities and different ways of implementing programs that will necessitate variation in language and approaches from those presented in the following Standards. However, ordinances and official controls implementing the VRWJPO Standards must ultimately show compliance.

SECTION 3: DEFINITIONS

Unless the context clearly indicates otherwise, the following words and phrases shall have the meanings ascribed to them in this section. Unless specifically defined herein, terms used in these Standards shall have the same definition as provided in Minn. Stat. § Chs. 103B and 103D and Minn. R. Ch. 8410 as may be amended, and if not defined there, shall have common usage meaning. For purposes of these Standards, the words "must" and "shall" are mandatory and the word "may" is permissive.

3.1 **Agricultural Activity** – The use of land for growing and/or production and wholesale distribution of field crops, livestock, and livestock products for the production of income or own use, including but not limited to the following:

A. Field crops, including but not limited to, barley, beans, corn, hay, oats, potatoes, rye, sorghum, and sunflowers
B. Livestock, including but not limited to, dairy and beef cattle, goats, sheep, hogs, horses, poultry, game birds and other animals, including deer, rabbits and mink
C. Livestock products, including but not limited to, milk, butter cheese, eggs, meat, fur, and honey
D. Trees, shrubs, bushes, and plants for wholesale distribution
E. Sod farming
F. Orchards

3.2 **Agricultural Preserve** – A land area created and restricted according to Minn. Stat. § 473H.05 to remain in agricultural use.

3.3 **Alteration or Alter** – When used in conjunction with public waters or wetlands, any activity that will change or diminish the course, current or cross-section of public waters, public waters wetlands, or wetlands.

3.4 **Bankfull Channel Width** – The channel width of a stream, creek, or river at bankfull stage.

3.5 **Bankfull Stage** – The water level in a stream channel, creek, or river where the flow just begins to leave the main channel and enter the connected floodplain.

3.6 **Base Flood Elevation** – The elevation of surface water resulting from a flood that has a one percent chance of equaling or exceeding that level in any given year.

3.7 **Best Management Practices or BMPs** – Techniques proven to be effective in controlling runoff, erosion and sedimentation, including those documented in the Minnesota Construction Site Erosion and Sediment Control Planning Handbook (BWSR, 1988);

Protecting Water Quality in Urban Areas (MPCA, 2000); the Minnesota Small Sites BMPs Manual (Metropolitan Council, 2001); The Minnesota Stormwater Manual (MPCA 2005); and, other sources as approved by the VRWJPO: as such documents may be amended, revised or supplemented.

3.8 **BWSR** – The Minnesota Board of Water and Soil Resources.

3.9 **Buffer** – An area of natural, minimally maintained, vegetated ground cover abutting or surrounding a watercourse, public waters wetland, or wetland.

3.10 **Commercial Use Development** – The development of property for use as a commercial business or office.

3.11 **Compensatory Storage** – Excavated volume of material below the floodplain elevation required to offset floodplain fill.

3.12 **Dakota SWCD** – The Dakota County Soil and Water Conservation District.

3.13 **Dead Storage –** The volume of space located below the overflow point of a basin, pond or landlocked basin.

3.14 **Drain or Drainage** – Any method for removing or diverting water from water bodies, including excavation of an open ditch, installation of subsurface drainage tile, filling, diking or pumping.

3.15 **Erosion** – The wearing away of the ground surface as a result of wind, flowing water, ice movement or land disturbing activities.

3.16 **Erosion and Sediment Control Plan** – A plan of BMPs or equivalent measures designed to control runoff and erosion and to retain or control sediment on land during the period of land-disturbing activities with standards. Erosion and Sediment Control Plans are intended to be simpler plans illustrating or describing the placement of erosion and sediment control BMPs that do not require the detail of SWPPPs that are required under State permits.

3.17 **Excavation** – The artificial removal of soil or other earth material.

3.18 **Fill** – The deposit of soil or other earth materials by artificial means.

3.19 **Filtration** – A process by which stormwater runoff is captured, temporarily stored, and routed through a filter, vegetated strip, or buffer to improve water quality and slow down stormwater runoff.

3.20 **Floodplain** – The area adjacent to a water body that is inundated during a 100-year flood.

3.21 **Floodplain Storage** – The volume of space available for flood waters within the floodplain.

3.22 **Fragmentation** – The breaking up of an organism's habitat into discontinuous chunks.

3.23 **Grassed Waterway** – A natural or constructed channel that is shaped or graded to required dimensions and established in suitable vegetation for the stable conveyance of runoff. (Minnesota NRCS Conservation Practice Standard Code 412, November 2006)

3.24 **Green Acres** – Real property or real estate that qualifies as agricultural property having agricultural use under the Minnesota Agricultural Property Tax Law, Minn. Stat. § 273.111.

3.25 **Industrial Use Development** – The development of property for industrial use as identified by the Standard Industrial Classification (SIC) codes or the North American Industry Classification System (NAICS code).

3.26 **Infiltration** – A stormwater retention method for the purpose of reducing the volume of stormwater runoff by transmitting water into the ground through the earth's surface.

3.27 **Impervious Surface** – 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.

3.28 **Infrastructure** – The system of public works for a county, state, or LGU, including, but not limited to, structures, roads, bridges, culverts, sidewalks, stormwater management facilities, conveyance systems and pipes, pump stations, sanitary sewers and interceptors, hydraulic structures, permanent erosion control and stream bank protection measures, water lines, gas lines, electrical lines and associated facilities, and phone lines and supporting facilities.

3.29 **Land Disturbing Activity** – Any activity on property that results in a change or alteration in the existing ground cover (both vegetative and non-vegetative) and/or the existing soil topography. Land disturbing activities include, but are not limited to, development, redevelopment, demolition, construction, reconstruction, clearing, grading, filling, stockpiling, excavation, and borrow pits. The use of land for new and continuing agricultural activities and routine vegetation management activities shall not constitute a land disturbing activity under these Standards. For example, clearing of trees for agricultural field crops or pasture,

management of trees on woodlands or wooded lots, and natural area restoration activities would not constitute a land disturbing activity under these Standards.

3.30 **Landlocked Basin** – A basin that is one acre or more in size and does not have a natural outlet at or below the existing 100-year flood elevation as determined by the 100-year, 10-day snowmelt runoff event.

3.31 **Local Governmental Unit or LGU** – All cities, counties, and townships lying in whole or part within the Vermillion River Watershed.

3.32 **Lot** – A parcel of land designated by metes and bounds, registered land survey, or other accepted means and separated from other parcels or portions by said description for the purpose of sale, lease, or separation thereof, as designated by Scott or Dakota County.

3.33 **Lot of Record** – Any lot that legally existed prior to March 22, 2007, as designated by Scott or Dakota County.

3.34 **Meander** – A sinuous bend of a river, stream, or creek.

3.35 **Meander Belt** – The area between lines drawn tangential to the extreme limits of fully developed meanders.

3.36 **Minimum Impact Alignment** – The alignment for a proposed road, street, utility, path or access that creates the smallest area of impact to a buffer, watercourse, or floodplain. For activities that cross a buffer, watercourse, or floodplain the minimum impact alignment is one that crosses perpendicular, or near perpendicular, to the longitudinal orientation of the buffer, watercourse, or floodplain as reasonable to serve the intended purpose of the improvement.

3.37 **MPCA** – The Minnesota Pollution Control Agency.

3.38 **Native Vegetation** – Plant species that are indigenous to Minnesota, or that expand their range into Minnesota without being intentionally or unintentionally introduced by human activity, and are classified as native in the Minnesota Plant Database (Minnesota DNR, 2002).

3.39 **Natural Retention or Detention** – Retention or detention storage of rainwater and runoff that occurs due to the natural landscape and is not artificially constructed.

3.40 **New Development** - The construction of any public or private improvement project, infrastructure, structure, street or road that creates more than 1 acre of new or additional impervious surface or, the subdivision of land.

3.41 **Noxious Weeds** – Any plant listed as a prohibited, restricted or secondary weed under Minn. R. Ch. 1505.

3.42 **NPDES** – National Pollutant Discharge Elimination System.

3.43 **NRCS** – United States Department of Agriculture Natural Resources Conservation Service.

3.44 **Ordinary High Water (OHW) Level** – The boundary of water basins, watercourses, public waters, and public waters wetlands as set by the Minnesota Department of Natural Resources.

3.45 **Outlot** – A parcel of land shown on a subdivision plat as an outlot, as designated by Scott or Dakota County, and designated alphanumerically, (for example – Outlot A.). Outlots are used to designate one of the following: Land that is part of the subdivision but is to be subdivided into lots and blocks at a later date; land that is to be used for a specific purpose as designated in a developer's agreement or other agreement between the Local Governmental Unit and the developer; or for a public purpose that may have restricted uses such as a buffer.

3.46 **Plat** – The drawing or map of a subdivision prepared for filing of record pursuant to Minn. Stat. § Ch. 505.

3.47 **Pre-development Condition** – The land use on a site that existed in 2005.

3.48 **Public Waters Wetland** – Any public waters wetland as defined in Minn. Stat. § 103G.005, subd. 15a.

3.49 **Recreational Use Development** – Any development of land for recreational use, including but not limited to, parklands, sporting facilities, golf courses, and other commercial or public facilities designed and used to provide recreational opportunities to the public.

3.50 **Redevelopment** – The rebuilding, repair, or alteration of a structure, land surface, road or street, or facility that creates less than 1 acre of new impervious surface, and disturbs, replaces, or alters more than 1 acre of existing impervious surface. Note: for the purposes of these Standards, if an activity creates more than 1 acre of new or additional impervious surface, the activity is considered new development and exceptions in these Standards for redevelopment do not apply to the increased (new) impervious surface exceeding 1 acre.

3.51 **Right-Of-Way** – A strip of land occupied or intended to be occupied by a street, railroad, electric transmission line, oil or gas pipeline, water main, sanitary or storm sewer main, or another special use, and dedicated to public use by the recording of the plat on which such right-of-way is established.

3.52 **Runoff** – Rainfall, snowmelt or irrigation water flowing over the ground surface.

3.53 **Rural Preserves** – Class 2a or 2b property that had been assessed under Minnesota Stat. § 2006, section 273.111, or that is part of an agricultural homestead under Minnesota Stat. § 2006, section 273.13, subdivision 23, paragraph (a).

3.54 **Scott SWCD** – The Scott County Soil and Water Conservation District.

3.55 **Sediment** – Soil or other surficial material transported by surface water as a product of erosion.

3.56 **Sedimentation** – The process or action of depositing sediment.

3.57 **Sinuous** – The curving patterns of a river, stream, or creek.

3.58 **Stewardship Plan** – A conservation plan completed for agricultural land and activities accepted by the Dakota SWCD, the Scott SWCD, or the VRWJPO.

3.59 **Stream Type** – One of numerous stream types based on morphology defined by Rosgen D., *Applied River Morphology*, 1996.

3.60 **Stormwater Pollution Prevention Plan or SWPPP** – A plan for stormwater discharge that includes erosion prevention measures and sediment controls that, when implemented, will decrease soil erosion on a parcel of land and decrease off-site nonpoint pollution.

3.61 **Structure** – Anything manufactured, constructed or erected which is normally attached to or positioned on land, including portable structures, earthen structures, water and storage systems, drainage facilities and parking lots.

3.62 **Subdivision** – The separation of an area, lot, or tract of land under single ownership into two or more parcels, tracts, or lots.

3.63 **USDA** – United States Department of Agriculture.

3.64 **VRWJPO** – Vermillion River Watershed Joint Powers Organization.

3.65 **Watercourse** – Intermittent and perennial streams identified on Map 1 attached to these Standards.

3.66 **Wetland** – Any wetland as defined in Minn. Stat. § 103G.005, subd. 19.

3.67 **Wetland Conservation Act or WCA** – The Minnesota Wetland Conservation Act of 1991, as amended.

SECTION 4: FLOODPLAIN ALTERATION STANDARDS

SUMMARY OF PURPOSE AND JURISDICTION GUIDANCE

Floodplain alteration involves land disturbing activities and projects that may impact the floodplain, or the area around waterbodies that is inundated during heavy rainfall or snowmelt events (i.e., the 100-year flood). Regulations exist for land disturbing activities and projects in floodplain areas to maintain floodplain storage, to minimize changes to upstream and downstream property and stream reaches, and to protect property and structures.

In Dakota County, cities are the LGUs in the incorporated areas while Dakota County administers Shoreland and Floodplain requirements through its Ordinance 50 in the unincorporated townships and must be contacted for appropriate permits, as needed. In Scott County, cities are the LGUs for incorporated areas while Scott County requires permits for the unincorporated areas.

4.1 Policy

It is the policy of the VRWJPO to:

A. Protect the natural function of the Federal Emergency Management Agency (FEMA)-designated floodplain storage areas from encroachment.
B. Maintain storage volumes in FEMA-designated floodplains.
C. Require Local Plans to include a provision that restricts construction of new structures in FEMA-designated floodplains.
D. Require Local Governments to adopt floodplain ordinances that are consistent with Dakota and Scott County water resources plans and ordinances.
E. Require floodplain alterations result in "no net loss" of floodplain storage, including the preservation, restoration, and management of floodplain wetlands.

F. Encourage local governments gain compensatory storage above direct replacement for new developments within the floodplain.

4.2 Regulation

No person or political subdivision shall alter or fill land, or build a structure or infrastructure below the Base Flood Elevation of any watercourse, public waters, public waters wetland, or other wetland without first obtaining a permit from the appropriate LGU.

4.3 Criteria

A. Floodplain alteration or filling shall not cause a net decrease in flood storage capacity below the projected 100-year critical flood elevation unless it is shown that the proposed alteration or filling, together with the alteration or filling of all other land on the affected reach of the waterbody to the same degree of encroachment as proposed by the applicant, will not cause high water or aggravate flooding on other land and will not unduly restrict flood flows.

B. Where Base Flood Elevations have been established, all new structures shall be constructed with the low floor consistent with the minimum elevations as specified in State of Minn. R. Ch. 6120: Shoreland and Floodplain Management; Dakota County Ordinance No. 50: Shoreland and Floodplain Ordinance; or Scott County Zoning Ordinance 71: FP, Floodplain District; as applicable.

C. Projects involving development, redevelopment, or the subdivision of land, shall establish flood storage, flowage, and drainage easements over areas below the Base Flood Elevation of any public water, public waters wetland, or wetland.

D. Setbacks for floodplain alterations, fill, and new underground utilities; such as water, sanitary, storm sewers and interceptors, gas lines, phone lines, and pipelines; shall be established and used along watercourses. These setbacks shall be established as follows. The exception is for utilities that need to reach or cross the watercourse, provided the minimum impact alignment is used.

   1. Where a watercourse has a sinuous flow pattern and a meander belt can be identified, the setback for new underground utilities shall be setback 15 feet from the outer edge of the meander belt.
   2. Where a sinuous flow pattern and meander belt are not readily identifiable because of past channel alterations and/or the geomorphology of the channel, the setback established for new underground utilities shall provide for the potential for restoration and a sinuous flow pattern as follows.

3. Where there are existing encroachments that limit full restoration of the stream to the meander widths appropriate for the stream type, the setback shall be 15 feet from the reasonably achievable restoration width for the meander belt given the existing encroachments.
4. Where full restoration is possible, the setback shall be 15 feet from a meander belt width established along the stream reach that has a width 10 times the bankfull channel width. An assessment of the stream type may be completed, and meander belt widths established according to the stream type, in place of using the above 10x formula. Note: the 1999 Vermillion River Assessment Report, or amendments thereto, provide assessment of stream type for many reaches of the Vermillion River and is available at the Dakota SWCD or the Dakota County offices of the VRWJPO.
5. Where buffers are required, above ground encroachments, alterations, and fill shall be consistent with the prohibited and allowed uses and widths specified in the Buffer Standard.

E. Projects that alter floodplain boundaries, such as bridge crossings and regional ponds that increase upstream high water levels are allowed provided that:
1. The applicant submits easements or other documentation in a form acceptable to the LGU or the VRWJPO demonstrating and recording the consent of the owner of any land affected by the increased high water levels; and,
2. The action is consistent with other portions of these Standards, and Local, State, and Federal Regulations; and,
3. The upstream impacts, riparian impacts, and habitat impacts of the proposed action are analyzed and no detrimental impacts result, or adverse impacts are mitigated.

SECTION 5: WETLAND ALTERATION STANDARDS

SUMMARY OF PURPOSE AND JURISDICTION GUIDANCE

Wetlands are areas that collect and filter water and are defined by their soils, vegetation, and hydrology (the way water is held by, and flows through them). Wetlands are critical resources for storage and treatment of surface water runoff and extremely valuable to the watershed. LGUs are required to enforce the Wetland Conservation Act (WCA) in Minnesota.

In Dakota County, cities and townships are the LGUs for WCA and require wetland delineations and permit approvals if wetland impacts cannot be avoided. The Dakota County Soil and Water Conservation District (SWCD) is contracted to do wetland reviews for many of the townships and some cities in Dakota County. In Scott County, cities are the LGUs for incorporated areas while Scott County reviews delineations and approvals for the unincorporated areas.

5.1 Policy

It is the policy of the VRWJPO to:

A. Work to achieve no net loss of wetlands in the Watershed.
B. Replace lost wetlands in the same subwatershed whenever possible.
C. Provide equal or greater functions and values for lost wetlands at the replacement ratios dictated by the WCA.
D. Avoid direct or indirect wetland disturbance in accordance with State and Federal requirements and approved local wetland management plans.
E. Limit the use of high quality wetlands for stormwater management where other alternatives exist.
F. Avoid fragmentation of natural areas and corridors when feasible and mitigate when unavoidable.

5.2 Regulation

No person or political subdivision shall drain, fill, excavate, or otherwise alter a wetland or public waters wetland without first submitting a wetland application and obtaining the approval from the LGU with jurisdiction over the activity.

5.3 Criteria

A. Any drainage, filling, excavation, or other alteration of a public waters wetland or wetland shall be conducted in compliance with Minn. Stat. § 103G.245, the WCA, Minn. R. Ch. 8420, Minn. R. Ch. 7050.0186, and regulations adopted hereunder.
B. In order to preserve WCA exemption or no loss determination, projects involving excavation in Types 1, 2, 6, and 7 wetlands must demonstrate a beneficial purpose, such as habitat or water quality improvements, and minimize loss of wetland function as determined by the VRWJPO or LGU.
C. A high quality (or equivalent value) public waters wetland or wetland, as determined using the Minnesota Routine Assessment Method (MNRAM 3.0 as amended) or other state accepted functional assessment method for vegetative diversity, may not be used for stormwater management and treatment unless the use will not adversely affect the function and public value of the wetland and other alternatives do not exist.
D. Wetland replacement/mitigation siting must follow the priority order below:
    1. Mitigation on-site
    2. Mitigation within the same minor subwatershed as established by the Minnesota Department of Natural Resources for the "1979 Watershed Mapping Project" pursuant to Minnesota Laws 1977, chapter 455, section 33, subdivision 7, paragraph (a).

3. Mitigation within the JPO boundary
4. Mitigation within Dakota or Scott County

E. Transportation projects shall pursue wetland mitigation projects to the extent practical using the criteria above. However, this does not preclude the use of the BWSR Replacement Program.

SECTION 6: BUFFER STANDARDS

SUMMARY OF PURPOSE AND JURISDICTION GUIDANCE

Buffers are areas of perennial vegetation surrounding watercourses, public waters wetlands, and wetlands that help protect water resources by limiting erosion and filtering runoff. These VRWJPO Buffer Standards will ensure placement of buffers upon development to protect watercourses and wetlands.

In Dakota County, cities and townships ensure that buffer requirements are met through the platting, subdivision, and permitting process. In Scott County, cities oversee buffers through the platting, subdivision, and permitting process, while Scott County ensures buffer requirements are met for subdivisions in the unincorporated areas. Under 6.4c below, the buffer requirements do not apply to areas with agricultural zoning, but the VRWJPO recommends that the buffer be applied as a building setback distance through local building permits because 1) buffer areas likely have periodic flowing water that may impact structures, and 2) buffers can be installed later upon further development.

6.1 Policy

It is the policy of the VRWJPO to:

A. Work to establish buffers, acting as filter strips, around every wetland and watercourse based on its management classification.
B. Avoid fragmentation of natural areas and corridors when feasible and mitigate when unavoidable.
C. Protect wetlands and watercourses from chemical, physical, biological, or hydrological changes so as to prevent significant adverse impacts.

Based on program evaluation, water quality monitoring, and research, the VRWJPO may, in the future, modify standards to vary by subwatershed or require buffers on lands in addition to developing land in order to meet water quality management objectives.

6.2 Regulation

For any lot created after March 22, 2007 or the adoption of local ordinances implementing the VRWJPO standards, a buffer shall be maintained around the perimeter of all wetlands, watercourses, and public waters wetlands. The buffer provisions shall not apply to any lot of record as of March 22, 2007 until such lot is subdivided. Buffer strip establishment shall apply to all lots of the proposed subdivision as a whole, regardless of whether or not the watercourse, wetland, or public waters wetland is on a specific lot within a proposed development.

6.3 Criteria

A. Where acceptable natural vegetation exists in buffer areas, the retention of such vegetation in an undisturbed state is required unless approval to replace such vegetation is received. A buffer has acceptable vegetation if it:
   1. Has a continuous, dense layer of non-invasive perennial grasses and forbs that has been uncultivated or unbroken for at least 5 consecutive years; or
   2. Has an overstory of non-invasive trees and/or shrubs that has been uncultivated or unbroken for at least 5 consecutive years; or
   3. Contains a mixture of the plant communities in 1 and 2 above that has been uncultivated or unbroken for at least 5 years.

B. Buffers shall be staked and protected in the field prior to construction unless the vegetation and the condition of the buffer are considered inadequate. Existing conditions vegetation will be considered unacceptable if:
   1. Physical condition of the buffer tends to channelize the flow of surface water.
   2. Vegetative cover is less than 90%.

C. Where buffer vegetation and conditions are unacceptable, or where approval has been obtained to replant, buffers shall be replanted and maintained according to the following Standards:
   1. Buffers shall be planted with a native seed mix approved by the State of Minnesota, NRCS or the Dakota or Scott SWCD, with the exception of a one-time planting with an annual nurse or cover crop. Plantings of native forbs and grasses may be substituted for seeding. All substitutions must be approved by the LGU. Groupings/clusters of native trees and shrubs, of species and at densities appropriate to site conditions, can also be planted throughout the buffer area.

2. The seed mix and planting shall be broadcast/installed according to the State of Minnesota, NRCS or Dakota or Scott SWCD specifications. The selected seed mixes and plantings for permanent cover shall be appropriate for the soil site conditions and free of invasive species.
3. Buffer vegetation (both natural and created) shall be protected by erosion and sediment control measures during construction.
4. During the first five full growing seasons, except where the LGU has determined vegetation establishment is acceptable, the owner or applicant must replant buffer vegetation where the vegetative cover is less than 90%. The owner or applicant must assure reseeding/or replanting if the buffer changes at any time through human intervention or activities.

D. Where a buffer is required, the LGU shall require the protection of the buffer under a conservation easement, acceptable to the LGU, or include the buffer in a dedicated outlot as part of platting and subdivision approval, except where the buffer is located in a public transportation right-of-way. Buffers shall also be monumented to clearly designate the boundaries of all new buffers within new residential subdivisions. A monument shall consist of a post and a buffer strip sign approved by the LGU.

E. Alterations, including building, storage, paving, routine mowing, burning, plowing, introduction of noxious vegetation, cutting, dredging, filling, mining, dumping, grazing livestock, agricultural production, yard waste disposal, or fertilizer application are prohibited within any buffer. Periodic mowing or burning, or the use of fertilizers and pesticides for the purpose of managing and maintaining native vegetation is allowed with approval of the LGU. Noxious weeds may be removed and mechanical or spot herbicide treatments may be used to control noxious weeds, but aerial or broadcast spraying is not acceptable. Prohibited alterations would not include plantings that enhance the natural vegetation or selective clearing or pruning of trees or vegetation that are dead, diseased or pose similar hazards, or as otherwise clarified in Criteria F.

F. The following activities shall be permitted within any buffer, and shall not constitute prohibited alterations:
1. The following activities are allowed within both the minimum and average buffer width areas:
    a. Use and maintenance of an unimproved access strip through the buffer, not more than 10 feet in width, for recreational access to the watercourse or wetland and the exercise of riparian rights.
    b. Structures that exist when the buffer is created.
    c. Placement, maintenance, repair, or replacement of public roads and utility and drainage systems that exist on creation of the buffer or are required to comply with any subdivision approval or building permit obtained from the LGU or county, so long as any adverse impacts of public road, utility, or drainage systems on the function of the buffer have been avoided or minimized to the extent practical.
    d. Clearing, grading, and seeding are allowed, if part of an approved Wetland Replacement Plan or approved Stream Restoration Plan.

e. A multipurpose trail through an area protected by conservation easement or in a dedicated outlot, is allowed provided it is designed and constructed to minimize erosion and new impervious surfaces, and maintains an absolute minimum distance of at least fifteen feet as measured from the edge of the trail nearest the water resource to the wetland or public waters wetland edge, the bank of the watercourse, or the meander belt, and averages at least one-half the total VRWJPO identified buffer width. Where needed to cross the watercourse, the minimum impact alignment shall be used. The area between the trail and the water resource must be maintained in perennial vegetation in an undisturbed state excepting regular required maintenance of the buffer. Boardwalks and pedestrian bridges associated with a multipurpose trail must be approved by the LGU or the VRWJPO.

f. The construction of underground utilities such as water, stormwater, and sanitary sewers and pipelines provided the minimum impact alignment is used, the area is stabilized in accordance with Criteria C above, and setbacks established in the Floodplain Alterations Standard Criteria D are met.

2. The following activities are allowed within those portions of the average buffer width that exceed the minimum buffer width:

   a. Stormwater management facilities, provided the land areas are stabilized in accordance with Criteria C above, and alterations prohibited in Criteria E above are upheld.

   b. The area of shallow vegetated infiltration and biofiltration facilities, and water quality ponds not to exceed 50 percent of the pond area, adjacent to wetlands and watercourses may be included in buffer averaging provided the facilities do not encroach into the minimum buffer width, and the land areas are stabilized in accordance with Criteria C above, and alterations prohibited in Criteria E above are upheld.

G. A wetland functional assessment for vegetative diversity, using the Minnesota Routine Assessment Method (MNRAM 3.0 as amended) or other state accepted functional assessment method, will be completed with each wetland and public waters wetland, delineated for a project and buffers established according to the management classification in the following table.

Buffer Requirement	Exceptional Quality Wetland (Preserve)	High Quality Wetland (Manage 1)	Medium Quality Wetland (Manage 2)	Low Quality Wetland (Manage 3)
Average Buffer Width	50 feet	40 feet	30 feet	25 feet
Minimum Buffer Width	30 feet	30 feet	25 feet	16.5 feet

H. Buffers shall be established adjacent to watercourses as shown and classified on Map 1 attached to these Standards, and as described for the various classifications below:

Classification	Buffer Width Standard
Conservation Corridor	Lower Reach (Vermillion River downstream of Biscayne Avenue) – 150-foot average, 100-foot minimum measured from the edge of the meander belt of the river. Upper Reach (Vermillion River upstream of Biscayne Avenue and South Branch Vermillion River) – 150 foot average, 100-foot minimum measured from the edge of the meander belt of the river.
Aquatic Corridor – Principal Connector	Required buffer width 100-foot average, 65-foot minimum measured from the edge of the meander belt of the river.
Aquatic Corridor – Principal Connector with Trout Stream Designation	100 foot, no averaging, as required by the General Permit Authorization to Discharge Storm Water Associated With Construction Activity Under the National Pollutant Discharge Elimination System/State Disposal System Permit Program Permit MN R100001 (NPDES General Construction Permit) issued by the Minnesota Pollutant Control Agency, August 1, 2003.
Aquatic Corridor – Tributary Connector	50-foot average, 35-foot minimum, plus 2 feet for every 1 percent of slope measured from the edge of the meander belt of the tributary.
Water Quality Corridor	30-foot average, 20-foot minimum where there is a flow path for concentrated surface runoff measured from the center line of the flow path.

6.4 Exceptions

A. The Buffer Standards do not apply to any wetland or public waters wetland with an applicable exemption listed under the WCA, and to those portions of wetlands that will be filled under approved wetland replacement plans per the WCA.

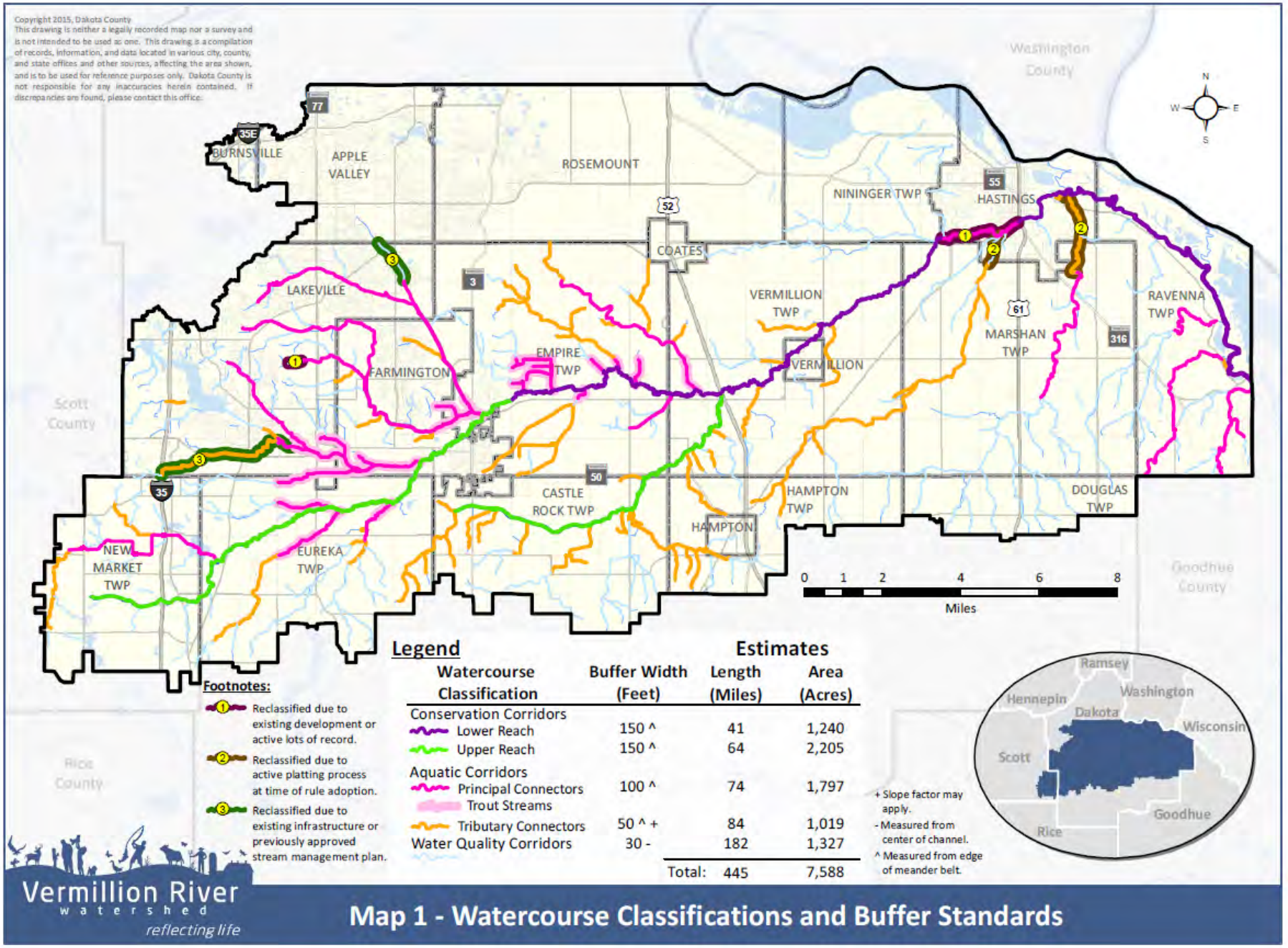
B. LGU Comprehensive Wetland Management Plans which prescribe required buffer widths shall be compliant with standards set by the VRWJPO; applicable ordinances governing widths, restrictions, allowable uses, and monumentation must meet or exceed the requirements set by the VRWJPO.

C. In areas where land use zoning provides for agricultural zoning with one building eligibility per every quarter of a quarter section (40 acres) of property, the buffer requirement will not be exercised until such time as the land use zoning is changed to an alternate use zoning or a higher density of residential building eligibilities. At that time, the buffer requirement will be fully implemented. For all properties seeking a permit where this exemption would apply, the permit will require that setbacks are met which allow the future implementation of the buffer requirement with no impact to permanent structural elements. This exemption does not include transfer of building eligibilities for purposes of clustering.

D. The Buffer Standards do not apply to existing outlots that received preliminary plat approval in the two year period preceding March 22, 2007. Buffer standards in effect at the time of LGU approval of a development agreement shall remain in effect throughout the term of the agreement or for a ten year period from the date of approval, whichever is less.

E. Where a stream meandering project has been completed, the buffer width shall be established by the LGU and shall be no less than the minimum.

F. The Buffer Standards do not apply to lots created that are enrolled in Green Acres, Rural Preserves, Agricultural Preserves, or similar agricultural or rural preservation programs controlling or limiting the potential for future lot subdivision or development, as part of the subdivision process.



Watercourse Classification	Buffer Width (Feet)	Estimates Length (Miles)	Estimates Area (Acres)
Conservation Corridors			
Lower Reach	150 ^	41	1,240
Upper Reach	150 ^	64	2,205
Aquatic Corridors			
Principal Connectors	100 ^	74	1,797
Trout Streams			
Tributary Connectors	50 ^ +	84	1,019
Water Quality Corridors	30 -	182	1,327
	Total:	445	7,588

+ Slope factor may apply.
- Measured from center of channel.
^ Measured from edge of meander belt.

Vermillion River watershed
reflecting life

Map 1 - Watercourse Classifications and Buffer Standards

SECTION 7: EROSION AND SEDIMENT CONTROL STANDARDS

SUMMARY OF PURPOSE AND JURISDICTION GUIDANCE

Land disturbing activities, like building construction projects, expose soils to rainfall and runoff which can cause erosion of soil and deposition of sediment onto neighboring properties or in waterbodies and watercourses. Erosion and sediment control measures (e.g., a silt fence) keep soil on site during construction and help ensure soil does not permanently wash away.

In Dakota County, cities and townships are generally the LGUs for oversight of erosion and sediment control. Erosion and sediment control requirements are often incorporated into requirements for building, agricultural building, grading, or other local permits. In Scott County, cities are the LGUs for oversight of erosion and sediment control in incorporated areas while Scott County requires erosion and sediment control measures for the unincorporated areas.

7.1 Policy

It is the policy of the VRWJPO to:

A. Minimize the movement of soil within the landscape of the watershed.
B. Reduce or mitigate the mechanisms that are the cause of soil movement to the extent practicable.
C. Capture soil that does move as close to its point of origination as possible.
D. Reduce the delivery of sediment to natural water bodies due to land disturbing activities to the extent practicable.

7.2 Regulation

No person or political subdivision shall commence a land disturbing activity meeting or exceeding the thresholds provided below, without first obtaining a permit from a LGU or the VRWJPO that incorporates and approves a SWPPP or erosion and sediment control plan. The LGU shall adopt an ordinance or procedure requiring erosion prevention and sediment control BMPs with issuance of permits.

Land disturbing activities meeting or exceeding the following thresholds require erosion and sediment controls:

A. Land disturbing activities encompassing one acre or more ~~acre~~ of land, consistent with the Minnesota General Permit Authorization to Discharge Storm Water Associated With Construction Activity Under the National Pollutant Discharge Elimination System/State Disposal System Permit Program Permit MN R100001 (NPDES General Construction Permit) issued by the Minnesota Pollution Control Agency (MPCA). Activities meeting this threshold must develop a SWPPP, consistent with the NPDES General Construction Permit.
B. Land disturbing activities encompassing less than one acre of land if any one of the following thresholds are met or exceeded. Activities meeting or exceeding these thresholds may develop an erosion and sediment control plan in place of the formal SWPPP.

a. Land disturbing activities on slopes greater than six percent.
b. Greater than 100 cubic yards of imported or stockpiled material.
c. New public or private roads or driveways greater than 125 feet in length.
d. Land disturbing activities greater than 10,000 square feet of land if commercial, industrial, or recreational use development.
e. Filling, draining, or altering of natural or artificial stormwater storage, retention, or watercourses.
f. Land disturbing activities located within 150 feet of wetlands identified on or adjacent to the land disturbing activities.
g. Land disturbing activities that could reasonably be expected to deliver sediment to adjacent properties, wetlands, or water resources.

C. Note that land disturbing activities located within the Shoreland area (i.e., within a regulated distance of public waters) may require erosion and sediment controls through the Shoreland permit administered by the applicable LGU (i.e., the city, Dakota County, or Scott County) regardless of the thresholds provided herein.

7.3 Criteria

A. Erosion and sediment control measures shall be consistent with Best Management Practices (BMPs), and shall be sufficient to retain sediment on site.
B. All temporary erosion and sediment controls shall be installed on all down gradient perimeters before commencing the land disturbing activity, and left in place and maintained as needed until removed per LGU approval after the site had been stabilized. All permanent erosion control measures shall be installed and operational per the design and as required by the LGU.
C. Erosion and sediment controls shall meet the standards for the NPDES General Construction Permit issued by the PCA , August 1, 2018, as amended, for projects disturbing more than 1 acre.
D. Permanent cover of the site must be completed in accordance with the NPDES General Construction Permit requirements.
E. All on-site stormwater conveyance channels shall be designed and constructed to withstand the expected velocity of flow from a 10-year frequency storm without erosion.
F. If the activity creates more than 1 acre of disturbed area, and the activity is taking place on a site where soils are currently disturbed (e.g., a tilled agricultural site that is being developed), areas that will not be graded as part of the development and areas that will not be stabilized according to the timeframes specified in the NPDES General Construction Permit, shall be seeded with a temporary or permanent cover before commencing the proposed land disturbing activity.

7.4 Exceptions

The following land disturbing activities are exempt from Erosion and Sediment Control Standards and do not require a SWPPP or erosion and sediment control plan:

A. Minor land disturbing activities such as home gardens, repairs and maintenance work.

B. Construction, installation, and maintenance of individual sewage treatment systems other than those on steep slopes (e.g., 6 percent or greater), or on riparian lots within a Shoreland District.
C. Construction, installation, and maintenance of public utility lines or individual service connections unless the land disturbing activity affects more than 1 acre, in which case the Standards apply.
D. Installation of any fence, sign, telephone or electric poles, or other kinds of posts or poles.
E. Emergency activity necessary to protect life or prevent substantial harm to persons or property.
F. All maintenance, repair, resurfacing and reconditioning activities on impervious surfaces, which do not involve land-disturbing activities outside of the existing impervious surfaces.
G. Construction of any structure on an individual lot in a subdivision with an approved SWPPP, so long as any land disturbing and stormwater management activity complies with the approved plan.

SECTION 8: STORMWATER MANAGEMENT STANDARDS

SUMMARY OF PURPOSE AND JURISDICTION GUIDANCE

When development and construction projects create new impervious surfaces like roofs and parking lots, they increase the amount of water and the speed of water that can leave the site as runoff. Stormwater management addresses the rate and volume of stormwater leaving sites through long-term practices like stormwater ponds and infiltration basins.

In Dakota County, cities and townships are generally the LGUs responsible for oversight of stormwater management requirements. Stormwater management requirements are often incorporated into requirements for building, agricultural building, grading, or other local permits. In Scott County, cities are the LGUs responsible for oversight of stormwater management in incorporated areas while Scott County ensures stormwater management requirements are met in the unincorporated areas.

8.1 Policy

It is the policy of the VRWJPO to:

A. Manage stormwater to minimize erosion.
B. Require land disturbing activities to address impacts on water resources, including cumulative impacts.
C. Require development plans to consider impacts on local natural resources and corresponding receiving waters.
D. Minimize impacts of runoff from land disturbing activities and preserve in-stream conditions supportive of a viable trout fishery by developing stormwater rate and volume control techniques.

E. Develop standards that include requirements for controlling stormwater runoff by minimizing impervious surfaces, maximizing infiltration, requirements for cities and townships to control stormwater rates crossing municipal boundaries, and creating stormwater storage that addresses not only peak flows for extreme events, but takes into account the cumulative effects of runoff volume, and will include stormwater rate control requirements.
F. Mitigate and reduce impacts of past increases in stormwater discharge on downstream conveyance systems.
G. Improve the condition of waterbodies in the watershed included on the MPCA impaired waters [303(d)] list so that these waterbodies can be removed from the list.
H. Encourage the use of existing natural retention and detention areas for stormwater management to maintain or improve existing water quality.
I. Minimize water quality impacts (including thermal impacts) from land disturbing activities.
J. Ensure stormwater management systems are maintained by establishing Stormwater Management System Maintenance Standards for cities and townships within the watershed.

8.2 Regulation

No person or political subdivision shall commence a land disturbing activity for "new development" or "redevelopment" (per Section 3: Definitions, 3.40 or 3.50), unless specifically exempted below, without first obtaining a permit from a LGU or the VRWJPO that incorporates and approves a SWPPP and the stormwater management requirements below.

8.3 Criteria

Stormwater management criteria are presented separately below for post construction water quality, runoff temperature control, peak runoff rate control, and runoff volume control.

A. Post Construction Water Quality Criteria
    1. Post construction stormwater runoff quality measures shall meet the standard for the General Permit Authorization to Discharge Storm Water Associated with Construction Activity under the NPDES General Construction Permit issued by the Minnesota Pollution Control Agency, June 25, 2013, as amended; except where more specific requirements are provided in paragraphs 2, 3, 4, and 5 below.
    2. Infiltration/filtration options described under Runoff Volume Control Criteria are the preferred approach to satisfying the water quality treatment requirements of the NPDES General Construction Permit in areas that drain to the trout stream portions of the Vermillion River and its tributaries where such areas do not first drain to a waterbody with 10 or more acres of open water.
    3. Ponds with permanent wet pools are allowed in areas tributary to the trout stream portions of the Vermillion River and its tributaries where such areas do not first drain to a waterbody with 10 or more acres of open water, if the applicant demonstrates:
        a. No net increase in the temperature of the discharge for the 2-year 24-hour event with the use of alternative technologies and has met the Volume Control requirements of these Standards; or

b. That the wet pond is designed for zero discharge for the 2-year, 24-hour storm; or
c. That the Volume Control requirements of these Standards are met and the following measures are used to the extent practical in order of decreasing preference:
    i. The wet pond is designed with a combination of measures such as shading, filtered bottom withdrawal, vegetated swale discharges, or constructed wetland treatment cells that will limit temperature increases.
    ii. Additional volume control measures and credits are used beyond that required to meet the Runoff Volume Standards as a means of limiting the frequency and duration of discharges from the pond.

4. The water quality control volumes necessary to meet the NPDES General Construction Permit that are satisfied using infiltration or filtration technologies (filtration only on Type C and D soils) can count toward the Volume Control requirements of these Standards.
5. Ponds with overflows or outlets located below the seasonally high water table are allowed only where it can be demonstrated that there is a reasonable need for such an outlet to control seepage damage to existing structures.
6. Redevelopment (see definitions) projects are required to incorporate water quality BMPs to the maximum extent practicable.

B. Runoff Temperature Control Criteria

Post construction runoff criteria for controlling temperature increases relies on the establishment of buffers as specified in the Buffer Standard; the prioritization of temperature sensitive BMPs such as infiltration and filtration, and the designation of temperature sensitive wet pond design approaches in the Post Construction Water Criteria above; and the control of runoff volume increases with the Runoff Volume Control Criteria below. No additional specific temperature criteria are incorporated since these other areas of the Standards emphasize approaches sensitive to runoff temperature. However, since these other areas of the Standards allow flexibility, and in some cases waivers, permit applications involving the creation of one or more acres of new impervious surface in the trout stream portions of the Vermillion River and its tributaries where such areas do not first drain to a waterbody with 10 or more acres of open water:

1. Must include a narrative description of the temperature sensitive practices incorporated; and
2. The LGU or the VRWJPO may limit or deny waivers, or may require additional runoff temperature BMPs, if the LGU or the VRWJPO finds that the site design does not minimize the potential for runoff temperature increases.

C. Peak Runoff Rate Control Criteria

1. A hydrograph method based on sound hydrologic theory will be used to analyze runoff for the design or analysis of flows and water levels.
2. Runoff rates for proposed activities, and development shall:
    a. Apply land cover conditions existing in 2005 as the baseline for existing conditions in runoff calculations.
    b. Not exceed existing runoff rates for the 1-year, 10-year, and 100-year critical duration storm events.

c. Be implemented by LGUs such that peak runoff rate controls keep future peak flood flows for the Vermillion River 100-year, 4-day event from increasing above existing conditions peak flows.
d. Numerical flow standards must be adopted at intercommunity boundaries as identified in the VRWJPO Hydrologic Model (2009 as amended) for the communities of Burnsville, Apple Valley, Rosemount, Lakeville, Farmington, Hastings, and Elko-New Market. Those communities must apply the VRWJPO Hydrologic Model values in the calibration of their own local hydrologic models.

3. Detention basins with permanent wet pools are allowed in areas tributary to the trout stream portions of the Vermillion River provided Post Construction Water Quality Criteria 3 above is met.

D. Runoff Volume Control Criteria

1. New development must incorporate volume control practices into the design sufficient to prevent an increase in the runoff volume for the 2-year 24-hour storm above 2005 conditions unless waived in accordance with Runoff Volume Control Criteria 6. Determination of the necessary control volume to achieve this Standard can be completed by the LGU on a regional basis and included in an approved Local Water Plan, or calculated on a site-by-site basis for each individual proposal. Runoff volume reducing practices in site design are the preferred method for meeting volume control requirements and shall be considered prior to the design of required infiltration or filtration facilities. Practices applying the Minnesota Minimal Impact Design Standards (MIDS) are allowed. Applicants must identify specific practices and provide documentation of the application of the MIDS calculator in practice selection and site design. Stormwater volume reducing BMPs other than those identified by MIDS, and their associated credits, must be approved by the VRWJPO. Final crediting must be approved by the LGU or VRWJPO before application to final design of site stormwater volume control facility requirements.
2. The water quality control volumes necessary to meet the NPDES General Construction Permit that are satisfied using infiltration or filtration technologies (filtration only on Type C and D soils) can count toward the Volume Control requirements of these Standards.
3. When using infiltration for volume control, infiltration volumes and facility sizes shall be calculated using appropriate site information and applying design criteria from the Minnesota Stormwater Manual.
4. Constructed infiltration facilities, such as infiltration basins and trenches:
   a. Can only be used if there is pretreatment of stormwater runoff designed to protect the infiltration system from clogging with sediment and to protect groundwater quality;
   b. Cannot be used within 400 feet of a municipal or other community supply well or within 100 feet of a private well unless specifically allowed by an approved wellhead protection plan;
   c. Cannot be used for runoff from fueling and vehicle maintenance areas and industrial areas with exposed significant materials;
   d. Cannot be used on areas with less than 3 feet vertical separation from the bottom of the infiltration system and the seasonal high water table; and
   e. Cannot be used in Type C and D soils.

5. Infiltration areas must be fenced or otherwise protected from disturbance before the land disturbing activity starts.
6. Volume control amounts may be waived by the LGU or the VRWJPO for sites with predominately Type C and D soils, or where a shallow water table prevents construction of infiltration systems, provided the following are met in order of decreasing preference:
    a. BMPs and site design practices to minimize the creation of connected impervious surfaces are used to the maximum extent practicable.
    b. Underdrains are used to promote filtration instead of infiltration.
7. Vegetation used in conjunction with infiltration systems must be tolerant of urban pollutants, and the range of soil moisture conditions anticipated.

8.4 Maintenance

All stormwater management structures and facilities shall be maintained in perpetuity to assure that the structures and facilities function as originally designed. The responsibility for maintenance shall be assumed either by the city, township, or county with jurisdiction over the structures and facilities; or by the applicant, their successors, or assigns entering into a maintenance agreement with the LGU.

8.5 Easements

The applicant shall establish, in a form acceptable to the LGU, temporary and perpetual easements, or dedicated outlots, for ponding, flowage, and drainage purposes over hydrologic features such as waterbodies and stormwater basins. The easements, or outlots, shall include the right of reasonable access for inspection, monitoring, maintenance, and enforcement purposes.

8.6 Covenants

The LGU may require that the land be subjected to restrictive covenants, a conservation easement, or easement in form acceptable to the LGU, to prevent the future expansion of impervious surfaces and the loss of infiltration capacity.

8.7 Waivers

The VRWJPO or applicable LGU may waive on-site runoff rate, water quality, and runoff volume criteria if an LGU has an approved local water plan that provides for off-site stormwater facilities capable of meeting the Standards.

8.8 Trading

The VRWJPO allows off-site pollutant trading on a case-by-case basis. Any proposed trade must document conditions whereby the proposed off-site facility or practice provides a benefit that directly offsets any potential pollutant increase to the stream resulting from the proposed

development. The responsibility for maintenance shall be addressed according to Section 8.4 of these standards. Any proposed off-site trade must be approved by the VRWJPO before implementation.

8.9 Exceptions

The exceptions included in section 7.4 for the Erosion and Sediment Control Standards also apply for these Stormwater Management Standards.

SECTION 9: DRAINAGE ALTERATION STANDARDS

SUMMARY OF PURPOSE AND JURISDICTION GUIDANCE

The intent of these drainage alteration standards is to provide a means for permitting significant drainage changes within the watershed that may have negative impacts for water resources.

There is no specific LGU that oversees drainage alteration permits, but local communities should review proposed drainage alterations as part of subdivision reviews, building permits, grading permits, or other local controls. Local communities should provide land alteration plans to the VRWJPO for projects with proposed drainage alterations and are encouraged to contact the VRWJPO staff for assistance with drainage alteration concerns.

9.1 Policy

It is the policy of the VRWJPO to:

A. Use existing natural retention and detention areas for stormwater management to maintain or improve existing water quality.
B. Manage stormwater to minimize erosion.
C. Allow outlets from landlocked basins, provided such outlets are consistent with State and Federal regulations, and the downstream impacts, riparian impacts, and habitat impacts of such outlets have been analyzed and no detrimental impacts result.
D. Mitigate and reduce the impact of past increase in stormwater discharge on downstream conveyance systems.
E. Address known flooding/erosion problems that cross jurisdictional boundaries and address other boundary issues and the diversion/alteration of watershed flows in local water plans.
F. Address gully erosion problems in the watershed.
G. Maximize upstream floodwater storage.

9.2 Regulation

No person or political subdivision shall artificially drain surface water, or obstruct or divert the natural flow of runoff so as to affect a drainage system, or harm the public health, safety, or general welfare of the VRWJPO, without first obtaining a permit from the LGU or the VRWJPO.

9.3 Criteria

A. Outlets from landlocked basins with a tributary drainage area of 100 acres or more will be allowed, provided such outlets are consistent with other portions of these Standards, State and Federal regulations, and the downstream impacts, riparian impacts, and habitat impacts of such outlets have been analyzed and no detrimental impacts result. The analysis and determination of detrimental impacts shall:
   1. Use a hydrograph method based on sound hydrologic theory to analyze runoff for the design or analysis of flows and water levels;
   2. Ensure a hydrologic regime consistent with the Peak Runoff Rate Control Criteria and the Runoff Volume Control Criteria of these Standards;
   3. Ensure the outlet does not create adverse downstream flooding or water quality conditions, or materially affect stability of downstream watercourses;
   4. Maintain dead storage within the basin to the extent possible while preventing damage to property adjacent to the basin;
   5. Ensure that the low floors of new structures adjacent to the basin are set consistent with the Floodplain Alterations Standards; and
   6. Ensure that proposed development tributary to the land-locked basin has incorporated runoff volume control practices to the extent practicable.

B. Artificial drainage, flow obstruction, and diversions involving watercourses, public waters, public waters wetlands, wetlands with drainage areas of 640 acres or more, will be allowed provided such alterations or diversions are consistent with other portions of these Standards, State and Federal regulations, and the downstream impacts, riparian impacts, and habitat impacts of such alterations or diversions have been analyzed and no detrimental impacts result. Proposals for drainage alterations and diversions shall demonstrate that:
   1. There is a reasonable necessity for such drainage alteration or diversion to improve or protect human health and safety, or to improve or protect aquatic resources;
   2. Reasonable considerations have been made and actions taken to avoid unnecessary injury to upstream and downstream land and water resources;
   3. The utility or benefit accruing to the land on which the drainage will be altered outweighs the harm resulting to the land receiving the burden; and
   4. The drainage alteration or diversion is being accomplished by improving and aiding the normal and natural system of drainage according to its natural carrying capacity, or, in the absence of a practicable natural drain, a reasonable and feasible artificial drainage system that does not create adverse impacts is being implemented.

C. Drainage alterations, diversions, and landlocked basin outlets shall be provided with stable channels and outfall.

9.4 Exceptions

A. No permit shall be required where it is demonstrated that the proposed drainage alteration or diversion does not cause off-site erosion, sedimentation, flooding, or other damage.
B. The LGU or the VRWJPO may waive the requirements regarding upstream and downstream flooding impacts if the applicant submits easements or other documentation in form acceptable to the LGU or the VRWJPO demonstrating and recording the consent of the owner of any land burdened by the proposed alteration.

SECTION 10: AGRICULTURAL STANDARDS

SUMMARY OF PURPOSE AND JURISDICTION GUIDANCE

The intent of these agricultural standards is to increase awareness for voluntary implementation of Best Management Practices to affect improvements in water quality and retain water in the landscape.

The VRWJPO approach to Agricultural Standards is voluntary at this time and is based on:

A. Requiring a Stewardship Management Plan as part of being eligible to receive cost share for incentive practices sponsored by the VRWJPO; and
B. Implementation of the Minnesota Nitrogen Fertilizer Management Plan of 2015 and the Pesticide Management Plan of 2005.

The VRWJPO recognizes that the Minnesota Department of Agriculture (MDA) is the lead state agency for most pesticide and fertilizer environmental and regulatory functions (Minn. Statute Ch. 18B and 18C). In accordance with the 1989 Groundwater Protection Act, the MDA has developed a strategy for addressing groundwater contamination from agricultural sources. This strategy focuses on promoting new or updated voluntary BMPs. A regulatory approach may be taken, if the implementation of voluntary BMPs is ineffective and BMPs are not widely adopted given a reasonable timeframe for implementation.