



APPENDIX A

Memorandum of Agreement (Planning)

**MEMORANDUM OF AGREEMENT
NORTH FORK CROW RIVER
WATER PLANNING PARTNERSHIP
(as revised 1/20/16)**

This agreement (Agreement) is made and entered into between:

The County of Kandiyohi, by and through the County Board of Commissioners, and
The County of Meeker, by and through the County Board of Commissioners, and
The County of Pope, by and through the County Board of Commissioners, and
The County of Stearns, by and through the County Board of Commissioners, and
The County of Wright, by and through the County Board of Commissioners, and
The County of McLeod, by and through the County Board of Commissioners.

The Kandiyohi Soil and Water Conservation District (SWCD), by and through the Soil and Water Conservation District (SWCD) Board of Supervisors, and
The Meeker SWCD, by and through the Soil and Water Conservation District (SWCD) Board of Supervisors, and
The Pope SWCD, by and through the Soil and Water Conservation District (SWCD) Board of Supervisors, and
The Stearns SWCD, by and through the Soil and Water Conservation District (SWCD) Board of Supervisors, and
The Wright SWCD, by and through the Soil and Water Conservation District (SWCD) Board of Supervisors, and
The McLeod SWCD, by and through the Soil and Water Conservation District (SWCD) Board of Supervisors.

The Middle Fork of the Crow River Watershed District, by and through the Board of Managers, and
The North Fork of the Crow River Watershed District, by and through the Board of Managers.

The Crow River Organization of Water (CROW), by and through the CROW Board of Directors.

Collectively referred to as the "parties."

WHEREAS, the Counties of this Agreement are political subdivisions of the State of Minnesota, with authority to carry out environmental programs, water management, and land use controls, pursuant to Minnesota Statutes Chapter 375 and as otherwise provided by law, e.g., Minnesota Statutes Chapter 103B, 103E; and

WHEREAS, the Soil and Water Conservation Districts (SWCDs) of this Agreement are political subdivisions of the State of Minnesota, with statutory authority to carry out erosion control and other soil and water conservation programs, pursuant to Minnesota Statutes Chapter 103C and as otherwise provided by law; and

WHEREAS, the Watershed Districts of this Agreement are political subdivisions of the State of Minnesota, with statutory authority to carry out conservation of the natural resources of the state by land use controls, flood control, and other conservation projects for the protection of the public health and welfare and the provident use of the natural resources, pursuant to Minnesota Statutes Chapter 103B, 103D and as otherwise provided by law; and

WHEREAS, the CROW through Minnesota Statutes §471.59 is a political subdivision of the State of Minnesota, with the authority to carry out environmental programs; and

WHEREAS, the parties to this Agreement have a common interest and statutory authority to prepare, adopt, and assure implementation of a comprehensive watershed management plan in North Fork of the Crow River watershed to conserve soil and water resources through the implementation of practices, programs, and regulatory controls that effectively control or prevent erosion, sedimentation, siltation and related pollution in order to preserve natural resources, ensure continued soil productivity, protect water quality, reduce damages caused by floods, preserve wildlife, protect the tax base, and protect public lands and waters; and

WHEREAS, with matters that relate to coordination of water management authorities pursuant to Minnesota Statutes Chapters 103B, 103C, and 103D with public drainage systems pursuant to Minnesota Statutes Chapter 103E, this Agreement does not change the rights or obligations of the public drainage system authorities, and/or the other authorities inherent to the parties to this Agreement.

WHEREAS, preparing and adopting a comprehensive watershed management plan for the North Fork of the Crow River, pursuant to Minnesota Statutes §103B.101 Subd. 14, also known as One Watershed, One Plan and to the standards and specifications outlined by the Board of Water and Soil Resources for One Watershed, One Plan, shall satisfy all water management requirements of local units of government as required by the State and shall serve as a homogeneous water management plan for the North Fork watershed.

NOW, THEREFORE, the parties hereto agree as follows:

1. **Purpose:** The parties to this Agreement recognize the importance of partnerships to plan and implement protection and restoration efforts for the North Fork of the Crow River (see Attachment A for map of planning area). The purpose of this Agreement is to collectively develop and adopt, as local government units, a coordinated watershed management plan for implementation per the provisions of the Plan and the BWSR content requirements as referenced in Attachment C.

2. **Term:** This Agreement is effective upon signature of all parties in consideration of the Board of Water and Soil Resources Participation Requirements for *One Watershed, One Plan (1W1P)*; and will remain in effect until canceled according to the provisions of this Agreement, unless earlier terminated by law. Notwithstanding the dates of the signatures of the parties, the term of this Agreement shall be from December 1, 2014 through December 31, 2016, unless earlier terminated by law or according to the provisions of this Agreement. Any party to this Agreement may opt out of this Agreement at any point in time pursuant to 30 days written notice to the Policy Committee.
3. **Adding Additional Parties:** A party desiring to become a member of this Agreement shall indicate its intent by adoption of a board resolution. The party agrees to abide by the terms and conditions of the Agreement; including but not limited to the bylaws, policies and procedures adopted by the Partnership.
4. **General Provisions:**
 - a. **Compliance with Laws/Standards:** The parties agree to abide by all Federal, State or local laws; statutes, ordinances, rules and regulations now in effect or hereafter adopted pertaining to this Agreement or to the facilities, programs and staff for which the Agreement is responsible.
 - b. **Indemnification:** Each party to this Agreement shall be liable for the acts of its officers, employees or agents and the results thereof to the extent authorized or limited by law and shall not be responsible for the acts of the other party, its officers, employees or agents. The provisions of the Municipal Tort Claims Act, Minnesota Statute Chapter 466 and other applicable laws govern liability of the parties. To the full extent permitted by law, actions by the parties, their respective officers, employees and agents, pursuant to this Agreement are intended to be and shall be construed as a "cooperative activity" and it is the intent of the parties that they shall be deemed a "single governmental unit" for the purpose of liability, as set forth in Minnesota Statutes Section 471.59, Subd. 1a(a), provided further that for purposes of that statute it is the intent of each party that this Agreement does not create any liability or exposure of one party for the acts or omissions of the other party.
 - c. **Records Retention:** The parties agree that records created pursuant to the terms of this Agreement will be retained in a manner that meets their respective entity's records retention schedules that have been reviewed and approved by the State in accordance with Minnesota Statutes §138.17. The parties further agree that records prepared or maintained in furtherance of the Agreement shall be subject to the Minnesota Government Data Practices Act. At the time this Agreement expires, all records will be turned over to the CROW for continued retention.
 - d. **Timeliness:** The parties agree to perform obligations under this Agreement in a timely manner and keep each other informed about any delays that may occur.

- e. **Termination:** The parties anticipate that this Agreement will remain in full force and effect through the term of the grant agreement with BWSR and until canceled by all parties unless otherwise terminated in accordance with law or other provisions of this Agreement.
- f. **Membership:** This Agreement establishes a Policy Committee for the development and adoption of a comprehensive watershed management plan for the North Fork Crow River. Each Policy Committee member shall have one vote regarding its duties and responsibilities, except for the CROW which shall serve as an ex-officio member. In addition, the Policy Committee shall establish a Technical Advisory Committee (TAC) that will be responsible for reviewing and assisting in drafting this plan. The TAC shall not have plan approval authority. These Committees will be collectively referred to as the North Fork Crow River Water Planning Partnership (Partnership).

5. Administration:

- a. **Establishment of Committees for Development of the Plan:** The parties agree designate one representative (must be an elected official, or in the case of a watershed district an official as appointed by a county board), from the respective Local Government Unit (LGU) pursuant to Minnesota Statutes Chapter 103D, to a Policy Committee for development of the comprehensive watershed management plan. The parties also agree to designate one or more technical representatives to a TAC.
 - i. The Policy Committee will meet monthly or as needed to decide/ approve on the content of the Plan. Each representative shall have one vote, except for the CROW which shall serve as an ex-officio member. The governing boards may choose alternates from their boards to serve on the Policy Committee as needed.
 - ii. The Policy Committee will establish and adopt bylaws within 60 days of execution of this document.
 - iii. The TAC will meet monthly or as needed to provide technical support and make recommendations to the Policy Committee on the development and content of the Plan.
- b. **Submittal of the Plan.** The Policy Committee will recommend the Plan to the parties to this Agreement. Each party will be responsible for initiating a review and comment process that conforms to Minnesota Statutes Chapters 103B, 103C, and 103D including required public hearings. The Policy Committee will be responsible for initiating a formal review process for the comprehensive watershed management plan conforming to Minnesota Statutes 103B and 103D including public hearings. Upon completion of local review and comment, and approval of the plan for submittal by each party, the Policy

Committee will submit the comprehensive watershed management plan jointly to the Board of Water and Soil Resources for review and approval.

- c. **Adoption of the Plan.** The parties to this Agreement, at their discretion, agree to adopt and begin implementation of the plan within 120 days of state approval and provide notice of plan adoption pursuant to Minnesota Statutes Chapter 103B, 103C, and 103D.
6. **Fiscal Agent and Grant Administration:** The CROW will act as the fiscal agent and grant administrator for the purposes of this Agreement and agrees to:
 - a. Accept all responsibilities associated with the Administration and Implementation of the BWSR grant agreement for developing a comprehensive watershed management plan.
 - b. Perform all financial transactions as part of grant contract implementation.
 - c. Provide a full and complete annual financial audit report.
 - d. Provide the Policy Committee with such records as is necessary to describe the financial condition of the BWSR grant agreement.
 - e. Retain fiscal records consistent with the CROW's records retention schedule after termination of the Agreement. Accept all day-to-day responsibilities associated with the implementation of the BWSR grant agreement for developing a comprehensive watershed management plan including being the primary BWSR contact for the One Watershed, One Plan grant agreement and be responsible for BWSR reporting requirements associated with the grant agreement.
 - f. Provide the Policy Committee with such records as are necessary to describe the planning condition of the BWSR grant agreement.
7. The CROW agrees to provide the following additional services as listed in Attachment B to the Partnership.
8. Reimbursement of services provided by parties in developing the Plan shall be as outlined in the by-laws.

9. Authorized Representatives: The following persons will be the primary contacts for all matters concerning this Agreement:

Kandiyohi County
Jeff Bredberg or successor
Water Plan Coordinator
400 SW Benson Ave, Willmar
(320-231-6229)

Meeker County
Kristin Cote or successor
County Administrator
325 Sibley Ave N, Litchfield
(320-693-5200)

Pope County
David Green or successor
Planning and Zoning Administrator
130 E Minnesota Ave, Glenwood
(320-634-7791)

Stearns County
Susan McGuire or successor
Water Plan Coordinator
705 Courthouse Sq, Rm 343, St. Cloud
(320-656-3613)

Wright County
Sean Riley or successor
Planning & Zoning Administrator
10 2nd St NW, Buffalo
(763-682-7330)

McLeod County
Roger Berggren or successor
Environmental Services
830 E. 11th Street, Glencoe
(320-864-1214)

Kandiyohi SWCD
Richard Reimer or successor
District Manager
1005 High Ave NE, Willmar
(320-235-3906)

Meeker SWCD
Joe Norman or successor
District Technician

916 E St. Paul St, Litchfield
(320-693-7287)

Pope SWCD
Holly Kovarik or successor
District Manager
1680 N Franklin St, Glenwood
(320-634-5327)

Stearns SWCD
Dennis Fuchs or successor
Administrator
110 Second St S, Ste 128, Waite Park
(320-251-7800)

Wright SWCD
Kerry Saxton or successor
District Manager
311 Brighton Ave S, Ste C, Buffalo
(763-682-1970)

McLeod SWCD
Ryan Freitag or successor
District Manager
1103 Gruenhagen Dr., Glencoe
(320-864-5176)

North Fork Crow River WD
Tara Ostendorf or successor
Administrator
PO Box 40, Brooten
(320-346-2869)

Middle Fork Crow River WD
Margaret Johnson or successor
Administrator
189 Cty Rd 8 NE, Spicer
(320-796-0888)

Crow River Organization of Water
Diane Sander or successor
Watershed Coordinator
311 Brighton Ave Ste C, Buffalo
(763-682-1933)

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: Kandiyohi County

APPROVED:

BY:  3-24-15
Board Chair Date

BY: _____
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: County of Meeker

APPROVED:

BY: Bryan W. Lamm 4-7-15
Board Chair Date

BY: _____
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

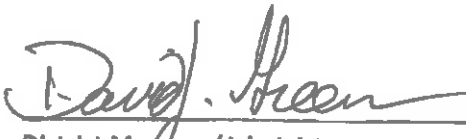
BY: Brandt P. Shih 4/8/2015
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: Pope County

APPROVED:

BY:  3-17-15
Board Chair Date

BY:  4-15-15 *YG*
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: Stearns County

APPROVED:

BY:  3/24/15
Board Chair Date

BY: _____
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: Wright County

APPROVED:

BY: Michael Potter 3-24-15
Board Chair Date

BY: Lee Kelly 3-24-15
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: MCLEOD COUNTY

APPROVED:

BY: Paul White 1-19-16
Board Chair Date

Patrick McLean 1/19/16

BY: _____
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: [Signature] 1-22-16
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: Kandiyohi SWCD

APPROVED:

BY:  3-17-15
Board Chair Date

BY:  3-17-2015
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: Meeker SWCD

APPROVED:

BY:  4/6/2015
Board Chair Date

BY:  4/6/15
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: Pope Soil and Water Conservation District

APPROVED:

BY: Keith Appenel - Pope SWCD 3-19-15
Board Chair Vice-Chair Date

BY: Nels Kaurin 3-19-15
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: Stearns County Shred

APPROVED:

BY: Chuck Uphoff 4/21/15
Board Chair Date

BY: [Signature] 4/21/15
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: Wingot SWED

APPROVED:

BY: Ch. J. Wre 3-18-15
Board Chair Date

BY: Kenny Sexton 3-18-15
District Manager Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: McLEOD SOIL AND WATER CONSERVATION DISTRICT

APPROVED:

BY:  1-11-16
Board Chair Date

BY:  1-11-16
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

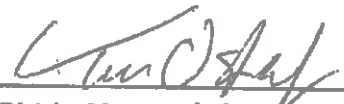
BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: North Fork Crow River WD

APPROVED: April 13th, 2015

BY:  4-13-15
Board Chair - James Wuerz Date

BY:  _____
District Manager/Administrator Date
Tara Ostendorf

APPROVED AS TO FORM *(use if necessary)*

BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. *(Repeat this page for each participant)*

PARTNER: MIDDLE FORK CROWN RIVER WATERSHED DISTRICT

APPROVED: 4/7/15

BY: Bruce W. [Signature] April 7-15
Board Chair Date

BY: Magett John [Signature] 4/7/15
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

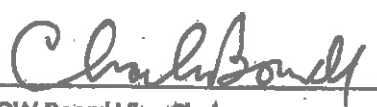
BY: _____
County Attorney Date

IN TESTIMONY WHEREOF the parties have duly executed this Agreement by their duly authorized officers. (Repeat this page for each participant)

PARTNER: Crow River Organization of Water (CROW)

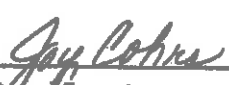
APPROVED:

BY:  4-1-15
CROW Board Chair Date

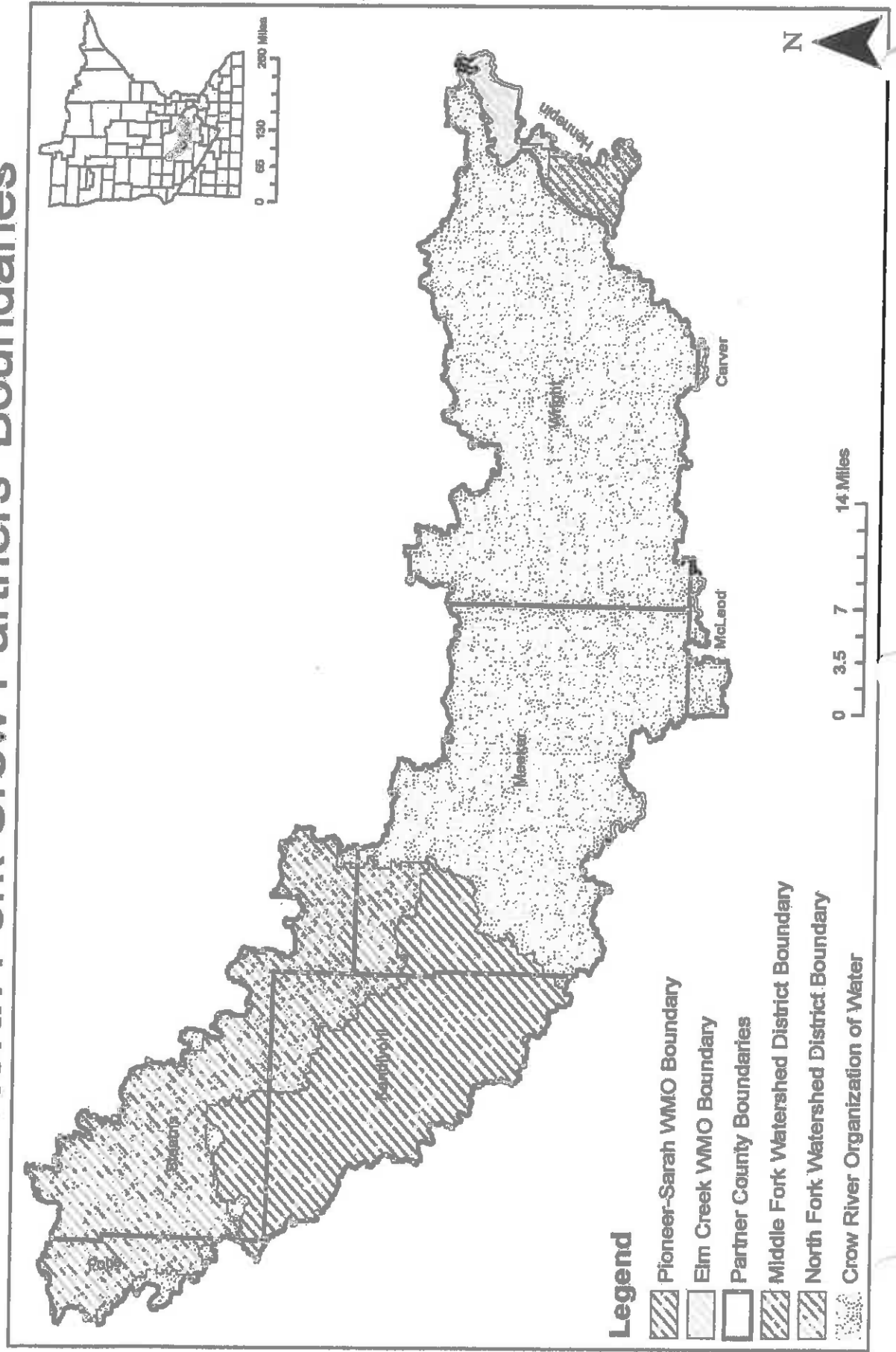
BY:  4-1-15
CROW Board Vice Chair Date

BY:  4-1-15
CROW Board Second Vice Chair Date

BY:  4-1-15
CROW Board Treasurer Date

BY:  4/1/15
CROW Board Secretary Date

North Fork Crow Partners' Boundaries



Attachment B

CROW Responsibilities and Services for North Fork Crow River One Watershed, One Plan

Facilitation of One Watershed, One Plan grant agreement

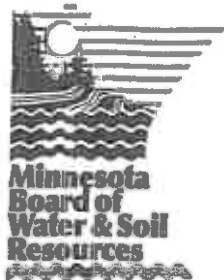
- Coordinate and draft the By-laws as required for BWSR grant
- Serve as liaison between Partnership and BWSR
- Coordinate with the Partnership crafting of a "Work-Plan" as required for the BWSR grant agreement
- Communicate progress/issues with the Partnership.

Planning Process/Grant Administration

- Enter into grant agreement with BWSR
- Serve as Fiscal Agent for grant expenditures
- Report grant progress and final report to BWSR per grant agreement requirements
- Coordinate and manage the functions and responsibilities of the Policy Committee
- Coordinate and manage the functions and responsibilities of the Advisory Committee
- Draft, in collaboration with lead staff from the Partnership, Request For Proposal(s) and hire/manage contractors to carry out provisions of the planning process.
- Coordinate the acquisition and amalgamation of planning data and services that may be provided by the Partnership.
- Manage the implementation of the Planning Process for the completion of a Plan per the "Work Plan".
- Facilitate the adoption of the Plan by the MOA parties.
- Facilitate amendments to the Memorandum of Agreement, if necessary.

ATTACHMENT C

BWSR PLAN CONTENT POLICY DOCUMENT



One Watershed, One Plan

Plan Content for Pilot Watersheds

September 23, 2014



Purpose: As per Minnesota Statutes §103B.101 Subd. 14, the Board of Water and Soil Resources "may adopt resolutions, policies, or orders that allow a comprehensive plan, local water management plan, or watershed management plan, developed or amended, approved and adopted, according to chapter 103B, 103C, or 103D to serve as substitutes for one another or be replaced with a comprehensive watershed management plan," also known as *One Watershed, One Plan*. This document outlines plan content requirements for implementing this statute through selected pilot watersheds.

Introduction

This document contains specific details on the content requirements for drafting a plan through the *One Watershed, One Plan* pilot program. Full operating procedures for developing the plan - including initiating the planning process through review, approval, and adoption - are contained in the *One Watershed, One Plan* Operating Procedures document on the *One Watershed, One Plan* page of the BWSR website.

The following Guiding Principles provided sideboards and direction in the plan content requirements outlined in this document:

- *One Watershed, One Plan* will result in plans with prioritized, targeted, and measurable implementation actions that meet or exceed current water plan content standards.
- *One Watershed, One Plan* will strive for a systematic, watershed-wide, science-based approach to watershed management; driven by the participating local governments.
- Plans developed within *One Watershed, One Plan* should embrace the concept of multiple benefits in the development and prioritization of implementation strategies and actions.
- *One Watershed, One Plan* planning and implementation efforts will recognize local commitment and contribution.
- *One Watershed, One Plan* is not intended to be a one size fits all model.

The requirements in this document are also supported by the vision of the Local Government Water Roundtable that future watershed-based plans will have sufficient detail that local government units can, with certainty, indicate a pollutant of concern in a water body, identify the source(s) of the pollutant, and provide detailed projects that address that particular source. This vision also includes a future of limited wholesale updates to watershed-based plans; with a streamlined process to incorporate collected data, trend analysis, changes in land use, and prioritization of resource concerns into the watershed-based plan; and an emphasis on watershed management and implementation through shorter-term workplans and budgeting. This vision includes acknowledging and building off of existing plans and data (including local and state plans and data), as well as existing local government services and capacity.



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NOTE: Operating Procedures for establishing planning boundaries, requirements for participation and formal agreement between local governments within the boundary, and procedures for plan development are provided in a separate document.

I. Overview

The requirements for plan content found in this document in general include background information and a purpose for the requirement, guidance for how the requirement can be met through the planning process, and the specific plan content requirements. The primary planning terms used are: priority issues, goals, and actions. These terms are defined within the sections they are used.

Plan development procedures and steps such as: Initiating a plan, establishing a planning boundary, requirements for participation and formal agreements between local governments within the boundary, and procedures for formal review and approval can be found in the *One Watershed, One Plan Program Operating Procedures for Pilots* document found on the BWSR website. Also found in the *Operation Procedures for Pilots* is the concept of three approvable plan types within the *One Watershed - One Plan* framework:

- **Water Quality Implementation Plan:** This plan further develops the strategies identified in a Watershed Restoration and Protection Strategies (WRAPS) document or equivalent studies into a consolidated implementation plan. This plan can be used to replace the implementation section of an existing plan(s), or can be used by local government partners on its own to collaboratively apply for state grants.
- **Priority Concerns Watershed Implementation Plan:** This plan leverages the existing process for developing a plan based on priority concerns typically associated with current county water planning; but shifts the scope of the plan to a watershed boundary and elevates requirements for prioritizing, targeting, and measuring implementation actions.
- **Comprehensive Watershed Management Plan:** This all-inclusive plan leverages the existing requirements for watershed district plans and has the highest standards of the three plan options. These plans will address surface and groundwater, water quality and quantity, and land use; and implementation actions in the plan will consider the broad range of tools, including capital improvements, official controls, and other tools and programs necessary to achieve the goals of the plan.

Each plan content requirement section in this document contains a statement as to how the requirement may vary by these plan types. The Water Quality Implementation Plan type must have goals to address the water quality priority issues. The remaining plan types must have goals to address all identified priority issues such as water quality, water quantity, groundwater, etc.

Although not required, a recommendation in the planning process is to develop an overarching mission or vision statement, as well as higher-level guiding principles or purposes. The purpose of establishing a vision, mission, and/or guiding principles is to provide a sense of direction for the plan and participants in the planning process. Additionally, overall organization and format of the watershed-based plan is a local decision unless otherwise specified in these requirements as long as the plan content requirements are met. However, using planning terminology consistent with this document is recommended.

An underlying theme within these requirements is the intent for watershed-based plans developed through *One Watershed, One Plan* to be succinct, with a thorough and science-based process used in development, and an emphasis in the resulting plan on the implementation schedule and implementation programs. For example, the information found in a Land and Water Resources Inventory is extremely valuable to the planning process and ultimate implementation of the actions in the plan; however, the majority of this information can be incorporated into the final plan document by reference.

II. Plan Content Requirements

Each watershed-based plan will contain the elements outlined in the following sections.

1. Executive Summary

Each plan will have a section entitled "Executive Summary." The purpose of the executive summary is to provide a condensed and concise summary of the contents of the overall plan. A well-written executive summary is beneficial for current and future elected officials, staff, citizens, and stakeholders to achieve an understanding of the plan and its intent.

Plan Content Requirement: Executive Summary

Each plan will have a section entitled "Executive Summary." The purpose of the executive summary is to provide a brief look at the contents of the plan. The summary will include:

- A. Purpose, mission, or vision statement if developed;
- B. A general map or description of the planning boundary and smaller planning or management units if used;
- C. A summary of the priority issues and goals that are addressed in the plan;
- D. A summary of the implementation actions and programs;
- E. A brief description of the process used to identify the measurable goals and targeted implementation actions; and
- F. An outline of the responsibilities of participating local governments.

This requirement applies to all plan types; however, the requirement to have a separate Executive Summary for the plan type Water Quality Implementation Plan can be waived if this plan type is amended into an existing local water plan.

2. Analysis and Prioritization of Issues

This section of the plan is intended to summarize the process planning partners used to reach understanding of and agreement on the watershed issues and priorities that will be addressed within the lifespan of the plan. Prioritizing is recognition that not all identified issues can be addressed in the timeframe of a ten year plan—some items will be addressed before others.

Planning partners are strongly encouraged to consider the potential for more extreme weather events and their implications for the water and land resources of the watershed in the analysis and prioritization of issues. While these events cannot be predicted with certainty as to time and occurrence, the meteorological record shows increased frequency and severity of extreme weather events, which has a direct effect on issues in local water planning.

Broad issues likely to be identified through the watershed planning process include:

- Soil erosion and sedimentation
- Soil health
- Altered hydrology
- Shoreland and riparian management
- Maintenance of core services; understanding of local capacity
- Water quality
- Water supply (protect, provide and conserve)
- Drinking water supply
- Wetland management
- Drainage system management
- Wastewater management
- Groundwater protection
- Flood damage reduction
- Drought mitigation
- Habitat, wildlife and fisheries
- Education, outreach and civic engagement
- Contaminants of emerging concern
- Emerging issues (e.g. land cover, climate change, etc.)
- Invasive species management

The list above is not all inclusive; any land and water related issue could be part of the plan. The process for considering and prioritizing issues generally has two parts: agreement on priority natural resources and agreement on priority issues impacting those resources. High quality recreational lakes, the main stem of the primary river in the watershed, or a specific groundwater aquifer that is the primary drinking water source in the watershed are all examples of priority resources. Identifying priority issues goes a step further by focusing on the issue(s) that impact the priority resources of the watershed, such as: "high quality recreational lakes showing a downward trend in water quality" or "sedimentation in the main stem of the priority river."

Through plan development, potential priority resources and issues are reviewed, aggregated, and summarized from: existing local plans, studies, and information; modeling, data collection, and assessment completed through the WRAPS and/or TMDLs; other state plans or studies; feedback received from the initial notifications to the plan review authorities and stakeholders; and the initial planning meeting(s) held in the watershed (see *One Watershed, One Plan* Operating Procedures for Pilots). These summarized issues are then filtered through local knowledge and information, and priority issues are selected in consideration of:

- Science and data generated through modeling, data collection, and assessment such as WRAPS, TMDLs, or equivalent;
- Anticipated future impacts or landuse changes that may provide an opportunity or escalate a risk if nothing occurs;
- Understanding of trends and/or tipping points for individual water resources;
- Understanding of precipitation frequency as per National Oceanic and Atmospheric Administration (NOAA) Atlas 14;
- Understanding of citizen and local landowner willingness to participate in potential changes to watershed management;
- Local values which may incorporate specific water or landscape resources as a priority.

Additional consideration should be made of the high-level state priorities identified in the state's Nonpoint Priority Funding Plan for Clean Water Implementation Funding. These are the priorities identified by the state agencies for investing Clean Water Fund nonpoint implementation money, based on the principles of asset preservation and risk-opportunity assessment.

- Restore those impaired waters that are closest to meeting state water quality standards.
- Protect those high-quality unimpaired waters at greatest risk of becoming impaired.
- Restore and protect water resources for public use and public health, including drinking water.

Plan Content Requirement: Analysis and Prioritization of Issues

The plan must contain:

1. A summary of the issues and resource concerns identified;
2. The steps used to consider and prioritize the identified resources and issues; and
3. A list of the agreed upon priority resources and issues for the watershed and a brief description of why the issue was selected.

Priority issues can be articulated in the plan through both a list/descriptions and map(s). The format and exact planning terminology used in the plan for presenting priority issues may vary as long as the plan covers the three requirements above, and the terminology used is defined in the plan (the summary and steps are suggested to be included as appendices). The plan is not expected to address all identified issues; however, it should include a brief explanation as to why certain issues were rejected as priorities for this planning cycle.

In the event that conflicts exist in the interpretation of issues and/or selection of priority issues, consider whether the conflict can be addressed by having both watershed-wide priorities as well as individual priorities of the participating local governments.

Plans that do not demonstrate a thorough analysis of issues, using available science and data, will not be approved. BWSR will consider the guidance and recommended tools outlined in *Section 2 Analysis and Prioritization of Issues* in assessing if analysis has been thorough.

Through the development of the *One Watershed, One Plan* program, BWSR has partnered with the University of Minnesota to assess tools and models to assist in prioritization for the purposes of developing a watershed-based plan. Through this project, specific models and tools are recommended to be used in the pilot watersheds to assist in the identification of priority issues.

Assistance with selecting and using the models and tools will be made available to pilot watersheds through BWSR. Additional or alternative models, tools, or processes that are already in use across the state may be proposed; however, agreement between the pilot watershed and BWSR staff on whether the proposed tool, model, or process meets the specific criteria outlined in the analysis will need to be achieved before proceeding. This agreement will be outlined in the approved workplan for the pilot watersheds.

3. Establishment of Measurable Goals

The plan must contain measurable goals, sometimes called objectives in planning, to address the priority issues. Measurable goals articulate what the planning partners want to achieve and allow for future evaluation of progress. A useful method for assessing if a goal is measurable is to ask the question for each goal: "will we be able to measure / show / report that we have been successful in achieving this goal when we assess implementation of the plan in the future?"

The development of measurable goals and the resulting implementation actions will be an iterative process. Goals from existing local water plans and information should be summarized and discussed for potential inclusion as part of this process. WRAPS, TMDLs, and the models used for the prioritization process noted above should all be used in the setting of goals. The implementation programs and schedule for achieving the goals should be considered and goals adjusted to reflect those achievable within the timeframe of the plan versus those that may reflect a longer view.

Formatting, terminology, and organization in the plan to meet this requirement can vary. For example, a goal to “maintain clean drinking water for future generations” is too broad to be feasibly measured and may better serve as a guiding principle. However, a broad goal such as this could be acceptable if it is supported by a series of measurable sub-goals or objectives similar to the examples below. The plan may contain a blend of goals common to the watershed as a whole, goals individual to a specific local government participant(s) and/or resource, and goals that persist beyond the timeframe of the plan.

Not every goal can be measurable within the timeframe of the plan; however the aggregate of goals in the plan should together articulate an intended pace of progress. For example, if a water quality standard is unable to be met within the lifespan of the plan, the plan should contain longer-term goals with interim points at which progress can be examined and methods and models to establish the goal can be reevaluated. Ideally, these interim points would use some measure to show attainment of an interim goal.

The timeframe of goals may also need to recognize unique settings and situations across the state. As an example, The Minnesota Geological Survey notes that response time of nitrate concentrations to changes in land use practices in southeast Minnesota will likely vary in different hydrogeologic settings, and may lag behind landuse changes by decades. In addition some water quality or designated use support goals may take decades to achieve (e.g. changes in stream biota, altered base flow hydrology).

Plan Content Requirement: Establishment of Measurable Goals

Each priority issue must have associated measurable goals for addressing the issue. Some goals will be watershed-wide; however, the majority should be focused on a specific subwatershed, natural resource, or local government. Goals for prevention of future water management problems should also be considered. Plans that do not contain sufficient measurable goals to indicate an intended pace of progress for addressing the priority issues will not be approved.

BWSR will consider the guidance and recommended tools outlined in *Section 2 Analysis and Prioritization of Issues*, the balance of broad versus focused goals and shorter-term versus longer-term goals, and detail in the targeted implementation schedule to assess if goals are sufficient. Additionally, the pace of progress towards achieving goals will be used in determinations of the extent or depth of future 10 year plan revisions. BWSR may consider issuing findings when a plan and associated implementation is sufficient that a complete revision will not be required.

The Water Quality Implementation Plan type must have goals to address the water quality

4. Targeted Implementation Schedule

Targeting takes a closer look at the priority issues and identifies cost-effective, targeted, and measurable actions necessary to achieve the goals. These actions are included in the plan in consideration of: available technical skills and capabilities, knowledge of landowner willingness, funding resources available, and implementation items or projects from existing local water plans and information and the Strategies and Actions table from the WRAPS. Actions are entered into a schedule or table that provides the details of:

- A brief description of what each action is;
- Location targeting where the action will occur;
- Identification of roles and who is responsible for the action;

- An estimate of cost and potential sources of funding for implementing the action;
- An estimate of when the implementation will occur within the 10 year timeframe of the plan; and
- How the action will be measured.

The purposes of the implementation schedule are to clearly indicate an intended pace of progress for achieving the goals, support development of shorter term workplans and budgets for the planning partners, and to support budget requests to the state through BWSR's Biennial Budget Request (BBR). A template for the targeted implementation schedule will be provided. The schedule should be supported by maps indicating the location(s) of the targeted activities.

The development of a targeted implementation schedule and associated actions is an iterative process. The same tools used for prioritization and goal setting can be used to assist with the selection of actions to be included in the targeted implementation schedule. Additionally, some actions may require prior feasibility study to determine the viability of the action.

The depth and specificity of targeted actions identified in the plan will vary. For example, capital improvement projects and best management practices to be implemented on public land can generally be specifically located and identified in the plan; whereas, conservation practices proposed for private lands may be specifically identified through the use of models and tools for purposes of developing measurable goals and the targeted implementation schedule, but those locations are only generally described in the plan itself. For these areas, the plan must overtly describe actions to work with landowners in these critical areas and tailor conservation practices.

Plan Content Requirement: Targeted Implementation Schedule

Each plan will have a targeted implementation schedule for achieving the goals with:

1. A brief description of what each action is;
2. Targeting where the action will occur;
3. Identification of roles and the responsible government unit for the action;
4. An estimate of cost and potential sources of funding for implementing the action;
5. An estimate of when the implementation will occur within the 10 year timeframe of the plan; and
6. How the action will be measured.

The schedule must clearly identify the actions the planning partners will undertake with available local funds versus the actions that will be implemented only if other sources of funds become available, and should be supported by maps indicating the location(s) of the targeted activities.

5. Implementation Programs

The implementation programs described below support the targeted implementation schedule by describing the overarching program(s) that will be used to implement actions identified in the schedule and how these programs will be coordinated between the local water management responsibilities.

- A. Plan Administration and Coordination:** The plan must describe the following administration and coordination programs as indicated in the table *Plan Content Requirement: Implementation Programs by Plan Type* at the end of this section.
- i. **Decision-making and Staffing:** Describe how the partners will transition from a planning partnership to implementation of a watershed-based plan through descriptions of roles and responsibilities of participating local governments.
 - a. **Policy Team (decision-making):** Describe if the policy team created to develop the plan will continue through plan implementation, or clearly outline an alternative method to provide oversight and maintain accountability throughout plan implementation.
 - b. **Advisory Committee (advising):** Describe if the advisory committee(s) created for plan development will continue through plan implementation and/or describe alternative methods to ensure: a dependable forum to exchange information and knowledge about the watershed and implementation of the plan, and meet the statutory requirements for ongoing advisory committees of counties (Minnesota Statutes §103B.301-103B.3355) and watershed districts (Minnesota Statutes §103D.331-103D.337).

The plan should also establish procedures for engaging state agencies, and describe the ongoing role and commitments of the state agencies on project teams for plan implementation.
 - c. **Identification and Coordination of Shared Services (staffing):** Describe specialized and shared service areas that will be used in the watershed to implement the actions identified in the schedule and achieve greater efficiencies in service delivery. This may include shared services for program management such as if a plan action requires forest resource management technical assistance, but the local government where the action is occurring does not have a staff forester. The watershed plan and associated formal agreements should describe how the service will be shared and/or the need met. Or it may include project management, for example if one county has history and experience in implementing a large-scale multipurpose drainage project, another county in the watershed may want to contract for services with staff of the first to implement a similar project. Shared services may also include partnership with non-governmental organizations.
 - ii. **Collaboration with other Units of Government:** Describe relationships with other units of government not part of the formal agreement for plan development, including the drainage authorities within the planning boundary. For example, cities and townships are not required participants; however, recognition and inclusion of cities and townships is important and especially critical to recognize for actions involving waste water treatment plants, source water and wellhead protection for population centers, MS4s, etc.

Additionally, federal government partners are not required participants; however, federal programs and partnerships are very important resources in watershed management.

- iii. **Funding:** Describe how actions in the implementation schedule will be funded. Both the state and local governments have responsibility for funding water management. All funding methods currently available to participants remain available to the participants and/or to the organization as a whole through the participants.
 - a. **Local Funding:** The local government planning partners have variable methods and options for generating funds to implement watershed management and to leverage state and other funding. These methods, options, and commitments of the participants must be clearly outlined in the plan.
 - b. **State Funding:** Describe state funding needs for implementation of the plan. This can be achieved through separation in the targeted implementation schedule of locally funded projects versus projects that will proceed only with state funds.
 - c. **Collaborative Grants:** Describe the intended approach to coordinated submittal of state grant applications. Collaborative grant making is a goal of *One Watershed, One Plan*.
 - d. **Federal Funding:** Federal sources of funds can be important to watershed management. The plan should describe what type of federal funding resources may be pursued to implement the plan, to the extent possible.
 - e. **Other Funding Sources:** Other sources of funds, such as from non-governmental organizations and private landowner funding, can be important to watershed management. The plan should describe what types of other funding resources may be pursued to implement the plan, to the extent possible.
- iv. **Work Planning:** Describe how the targeted implementation schedule and the implementation programs will be used for work planning. For example, describe if a collaborative work plan for the watershed, individual work plans for each local government participant, or some combination work planning be used; and describe how the work plan will be finalized and approved.
 - a. **Local Purpose:** Include a frequency, method, decision-making, and local purposes for work planning. Frequency is suggested to be annual in order to be incorporated into local budgeting and staffing decisions related to implementation of the plan and can be no more than every two years. Purposes depend on the extent of collaboration intended in the implementation schedule, programs, and subsequent agreements; as well as the extent of collaborative grant-making intended.
 - b. **State Purpose:** Describe a biennial commitment to collaboratively review and submit a BWSR biennial budget request (BBR) from the watershed. Future BBRs should be generated from the Targeted Implementation Schedule. Submittal of the BBR is a requirement for Soil and Water Conservation Districts and Counties to meet planning requirements associated with grants.
- v. **Assessment and Evaluation:** Describe the frequency, method(s), purposes, decision-making, and procedures for periodic assessment and evaluation of plan implementation. Periodic understanding of accomplishments—based on the targeted implementation schedule—is needed to measure progress, drive the work plan, and provide accountability.

- a. **Annual Evaluation:** Describe an annual commitment to collaboratively review and submit to BWSR's Level I Performance Review and Assistance Program performance standards. Additionally, describe sufficient baseline local evaluation of previous years' work to support generation of the local work plan above (if an annual local work plan is being used) and reporting requirements below.
 - b. **Biennial Evaluation:** If the watershed chooses a biennial work plan, a biennial evaluation must be described to evaluate the previous years' work and support the work plan. It is recommended this baseline evaluation ties to the requirement for measurability in the targeted implementation schedule and that a method for tracking implementation consistently across the watershed be described.
 - c. **Five Year Evaluation:** Include a schedule for a thorough five year assessment and potential revision to implementation schedule. The purpose of this evaluation is to determine progress and consider whether staying the course or resetting direction is necessary, and it may include revisions to models, considerations of new monitoring data, etc. Additional guidance, including BWSR involvement in this evaluation, will be developed through the pilot watersheds.
 - d. **Reporting:** Describe collaborative approaches to provide accountability to stakeholders and to meet annual reporting requirements of local governments, grant reporting requirements, and specific program and financial reporting requirements. Information on required annual reporting can be found on the BWSR website: www.bwsr.state.mn.us/grants/reporting/reporting.html. Consider a periodic 'state of the watershed report,' or individualized 'waterbody report cards' or other methods to provide accountability and demonstrate outcomes locally. See also the Education and Information requirements below.
 - vi. **Plan Amendments:** Describe procedures for considering plan amendments, who can propose amendments, what criteria will be used in considering amendments, and who makes the decision to proceed with the amendment.
 - vii. **Formal Agreements:** List and briefly describe any formal agreements between local governments that are pertinent to water management. This includes longstanding existing agreements and any new agreements to be implemented as part of the plan. For example, prior to completion of the plan the formal agreement between partners for planning purposes should be revisited in consultation with Minnesota Counties Intergovernmental Trust (MCIT) and legal counsel. MCIT may recommend revising the planning agreement, establishing separate agreements or contracts for specific services or actions; and/or developing a broader, watershed-wide agreement for ongoing partnership.
- B. Plan Implementation Programs:** Describe the following programs to support the targeted implementation schedule, including necessary feasibility studies, as indicated in the table *Plan Content Requirement: Implementation Programs by Plan Type* at the end of this section.
- i. **Incentive Programs:** Describe local voluntary cost share or grant programs necessary to achieve the goals; including the general purpose and scope, criteria that will be used to select projects/disperse funds, actions to work with landowners in these critical areas to tailor conservation practices, and how the program(s) will be implemented across the watershed to provide consistency and achieve goals. Incentive programs may be targeted



- v. **Data Collection and Monitoring:** Describe data collection and monitoring activities necessary to support the targeted implementation schedule and reasonably assess and evaluate plan progress.
- a. **Inventory:** Describe additional inventories needed in the watershed to address any gaps in the land and water resources inventory support actions in the targeted implementation schedule, if applicable.
 - b. **Monitoring:** Describe the locations, frequency, and parameters of existing water quality, quantity and other monitoring programs in the watershed. Describe if these established monitoring programs are capable of producing an accurate evaluation of the progress being made toward the goals, including improved calibration of model(s), and any new monitoring needed to improve understanding of the watershed baseline or assess particular resources. State agencies are available to assist with identification of state monitoring activities.
- Include a requirement for periodic analysis of the data, a commitment to collect data consistent with state compatibility guidelines, and a commitment to submit locally collected data to the appropriate state agency for entry into public databases.
- vi. **Information, Outreach, and Education Programs:** The plan must describe information, outreach, and education program(s); specifically, opportunities where there are benefits from watershed-wide collaborations and areas where focused or targeted actions will support the priority issues and goals of the plan. At a minimum, include the purpose, targeted audiences, and a description of the actions or methods. Consider development of an education plan for the overall watershed using an approach currently successfully used in Minnesota is an adaptation of the U.S. Environmental Protection Agency guidance "Getting in Step: A Guide for Conducting Watershed Outreach Campaigns" available at: www.epa.gov/owow/watershed/outreach/documents/getnstep.pdf.

Plan Content Requirement: Implementation Programs by Plan Type

The following outlines the *minimum* plan content requirements for implementation programs, by plan type. BWSR will use the descriptions of the programs above to determine if the requirement has been met.

	Plan Content Requirement	Water Quality Implementation Plan	Priority Concerns Implementation Plan	Comprehensive Watershed Management Plan
Plan Administration & Coordination	Decision-making and staffing	Required	Required	Required
	Collaboration with other units of government	May include	May include	Required
	Funding	Required	Required	Required
	Work Planning	Required	Required	Required
	Assessment and Evaluation	Required	Required	Required
	Plan Amendments	Required	Required	Required
	Formal Agreements	Required	Required	Required
Implementation Programs	Incentive Programs	Required	Required	Required
	Capital Improvements	May include	Required if necessary to address priorities	Required
	Operation and Maintenance	May include	Required if necessary to address priorities	Required
	Regulation and Enforcement	May include	Required if necessary to address priorities	Required
	Data Collection and Monitoring	Required	Required	Required
	Information, Outreach, and Education	Required	Required	Required

6. Plan Appendix - Land and Water Resources Inventory

A land and water resource inventory is simply an account of the water resources and physical factors affecting the water resources within the watershed. In most cases, adequate data, inventories, and general analysis of land and water resources already exist; new information does not necessarily need to be generated and the majority of resource information can be incorporated by reference with a brief general description. At a minimum, the plan should acknowledge the resource information from existing local water plans and the Watershed Restoration and Protection Strategies Report (WRAPS). This information is important not just to understand the historic status of the watershed, but useful to consider the future.

Going forward, wholesale updates and/or revisions to land and water resource inventories should be limited. Instead greater flexibility and a streamlined process for more frequent updates to incorporate collected data, updated trends analysis, and changes in land use typically associated with land and water resource inventories are envisioned.

Plan Content Requirement: Land and Water Resources Inventory

The plan must contain sufficient land and water resource information to inform the planning process and support actions in the plan. Specifically, the plan must include a brief general description of—and reference where to find—the typical and available land and water resource information. This information includes, but is not limited to:

- Topography, soils, general geology;
- Precipitation;
- Water Resources
 - Surface water resources; including streams, lakes, wetlands, public waters and public ditches;
 - Groundwater resources, including groundwater and surface water connections if known;
 - Water quality and quantity, including trends of key locations and 100-year flood levels and discharges, regulated pollutant sources and permitted wastewater discharges;
 - Stormwater systems, drainage systems and control structures;
 - Water-based recreation areas;
- Fish and wildlife habitat, rare and endangered species;
- Existing land uses and proposed development

Inventory information critical to supporting the priorities and actions of the plan may need to be more thoroughly described. For example, a description of results of trend analysis may need more in-depth description to support a priority issue in the plan; however, the data behind the analysis can be referenced.

If gaps in inventory information are identified through the plan development process, consider implementation action(s) to fill the gap rather than delaying the planning process to generate new data.

This requirement applies to all plan types and is suggested to be included as an appendix to the plan.



APPENDIX B

Land and Water Resources Inventory



LAND AND WATER RESOURCES INVENTORY

North Fork Crow River Watershed

LAND AND WATER RESOURCES INVENTORY

North Fork Crow River Watershed

July 13, 2016



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ATTACHMENTS

Attachment 1: Endangered, Threatened, and Special Concern Species in the North Fork Crow River Watershed

Attachment 2: Mollusks in the North Fork Crow River Watershed

ACRONYMS

1W1P – One Watershed One Plan
AMA –Aquatic Management Area
AUIDs – Assessment Unit IDs
BFEs – Base Flood Elevations
DO – Dissolved oxygen
DTW – Depth to water
FEMA – Federal Emergency Management Agency
FMA –Fish Management Area
IBI – Index of biotic integrity
MAU – Monitoring Assessment Unit
MBS – Minnesota Biological Survey
MCL – Maximum contaminant level
MDA – Minnesota Department of Agriculture
NFCR – North Fork Crow River
NFIP – National Flood Insurance Program
PMRs – Pesticide monitoring regions
QBAA - Quaternary Buried Artesian Aquifer
QBUA - Quaternary Buried Unconfined Aquifer
QBUU - Quaternary Buried Undifferentiated Aquifer
QUUU - Quaternary Undifferentiated Unconfined Aquifer
QWTA - Quaternary Water Table Aquifer
SNA – Scientific and Natural Area
SWUDS – Site-specific water-use data system
TMDL – Total Maximum Daily Load
TP – Total phosphorus
VOCs – Volatile organic compounds
WMA – Wildlife Management Area



1 INTRODUCTION

The North Fork Crow River (NFCR) One Watershed, One Plan (1W1P) boundary follows the boundary of the North Fork Crow River Watershed (HUC 07010204), and is shown in **Figure 1**. The NFCR watershed is located in an agricultural region of south-central Minnesota, draining an area of 1,483 square miles (950,000 acres). The watershed is located in the Upper Mississippi River Basin and encompasses parts of Pope (3.7%), Stearns (16.0%), Kandiyohi (16.0%), Meeker (28.4%), Wright (31.7%), Hennepin (3.0%), Carver (0.1%), and McLeod (1.0%) counties. There are 31 municipalities located completely or partially within the boundaries of the watershed.

The vast majority of the watershed is within the North Central Hardwood Forest Ecoregion, with a small portion lying within the Western Cornbelt Plains Ecoregion, meaning the watershed was originally a mixture of hardwood trees and prairie. The watershed's surface waters are abundant with 679 lakes and 233 streams segments, or assessment units (AUIDs) throughout the watershed. From its source at Grove Lake in Pope County, the North Fork Crow River runs east-southeast for a total length of 157 miles, flowing through Rice Lake and Lake Koronis until it meets the South Fork Crow River, where the confluence of the two rivers at Rockford forms the Crow River. The Crow River flows northeast until it meets the Mississippi River near the cities of Otsego and Dayton (MPCA, 2015). The watershed elevation ranges from approximately 800 to 1400 feet above sea level, decreasing from west to east (**Figure 2**).

The information contained within this Land and Water Resources Inventory is largely transcribed from the Minnesota Pollution Control Agency (MPCA) *North Fork Crow River Watershed Groundwater Report* (Draft, December 2015), the MPCA *North Fork Crow Watershed, Watershed Restoration and Protection Strategy Report* (December 2014), and the Minnesota Department of Natural Resources (MnDNR) *Bonanza Valley Groundwater Management Plan* (Draft, July 2015) for the purpose of providing background information on the existing natural resources within the watershed for the North Fork Crow River 1W1P.

Figure 1: North Fork Crow River Watershed Plan Boundary

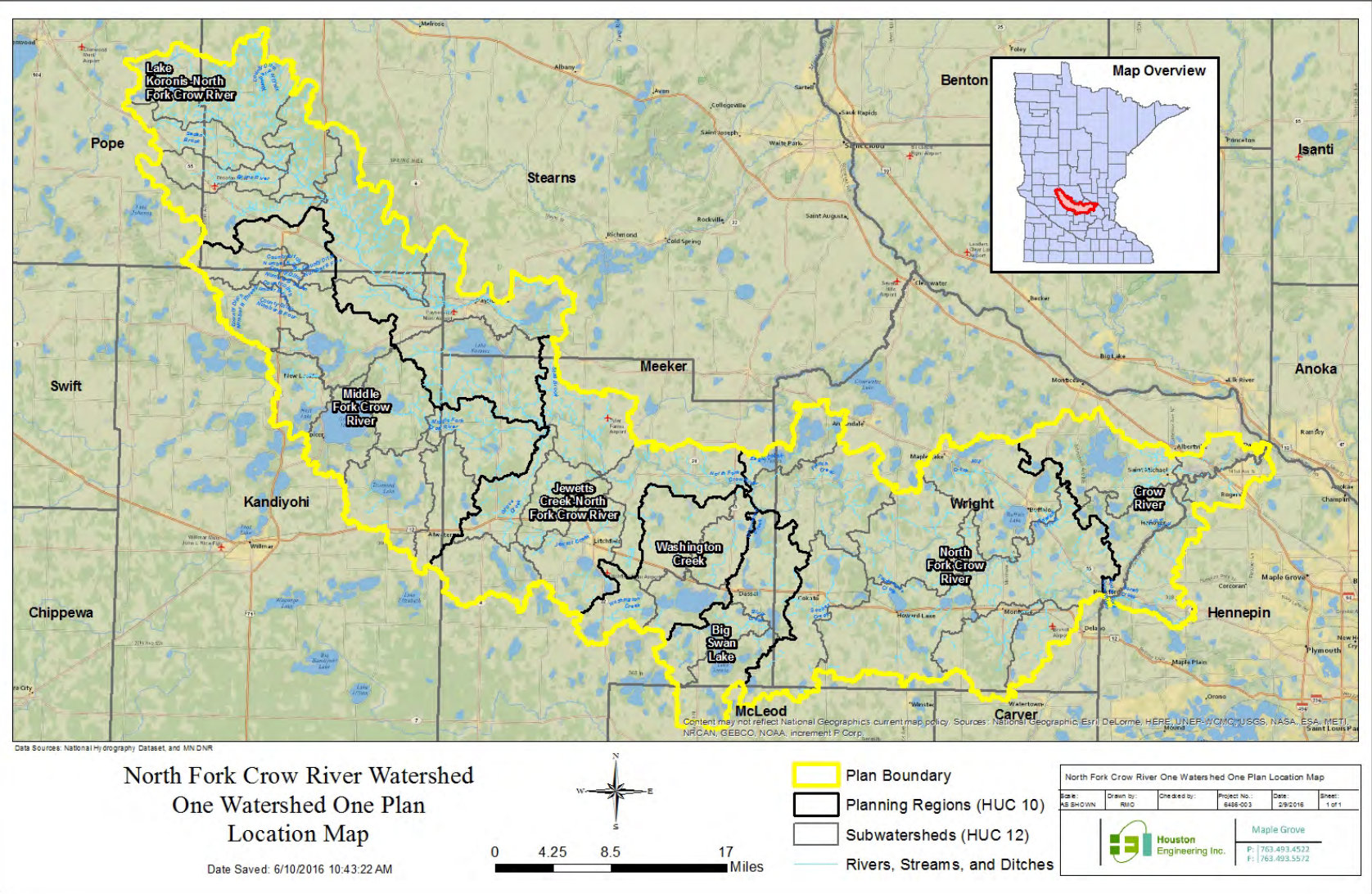
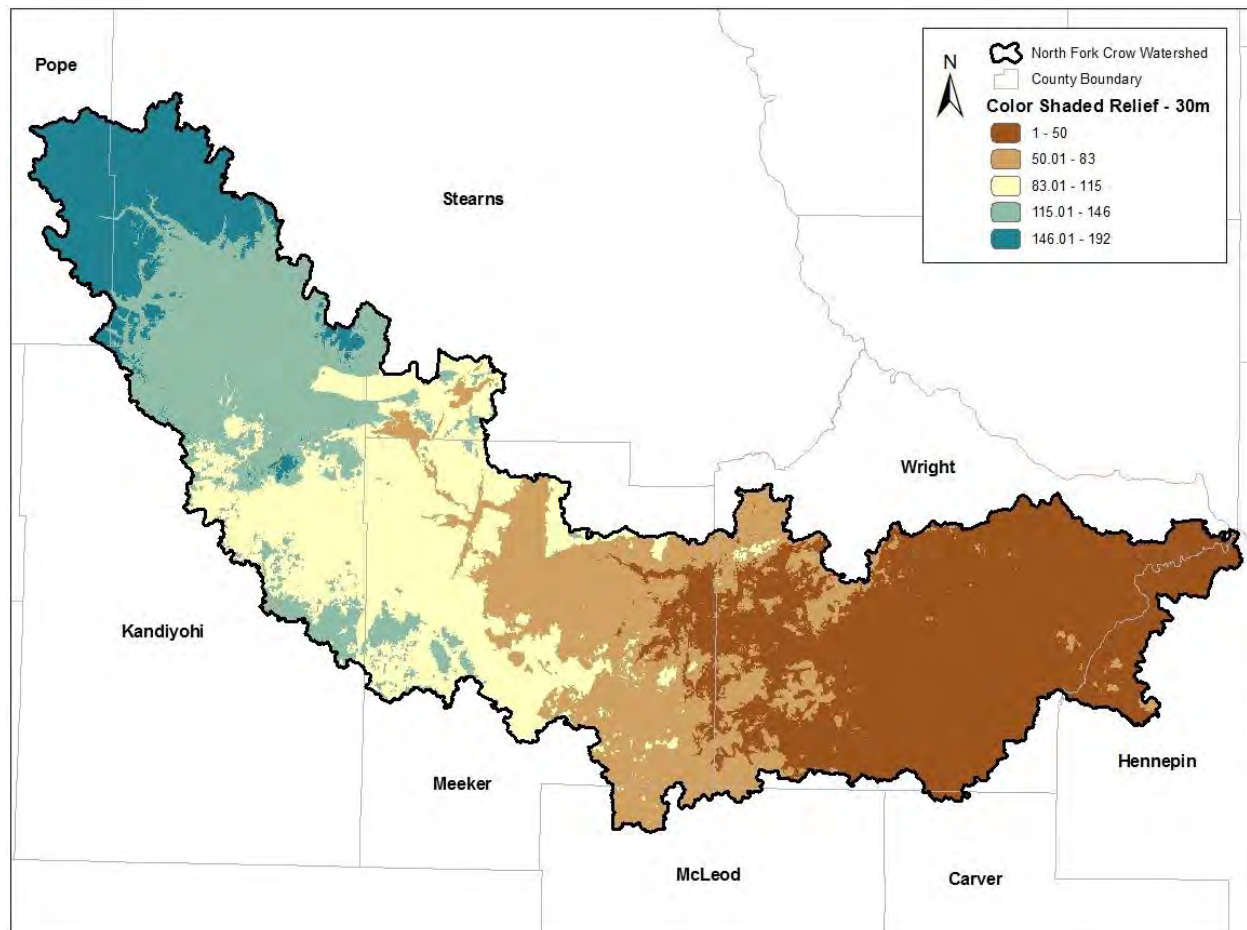


Figure 2: North Fork Crow River 8-HUC Watershed Relief (GIS Source: MnDNR)

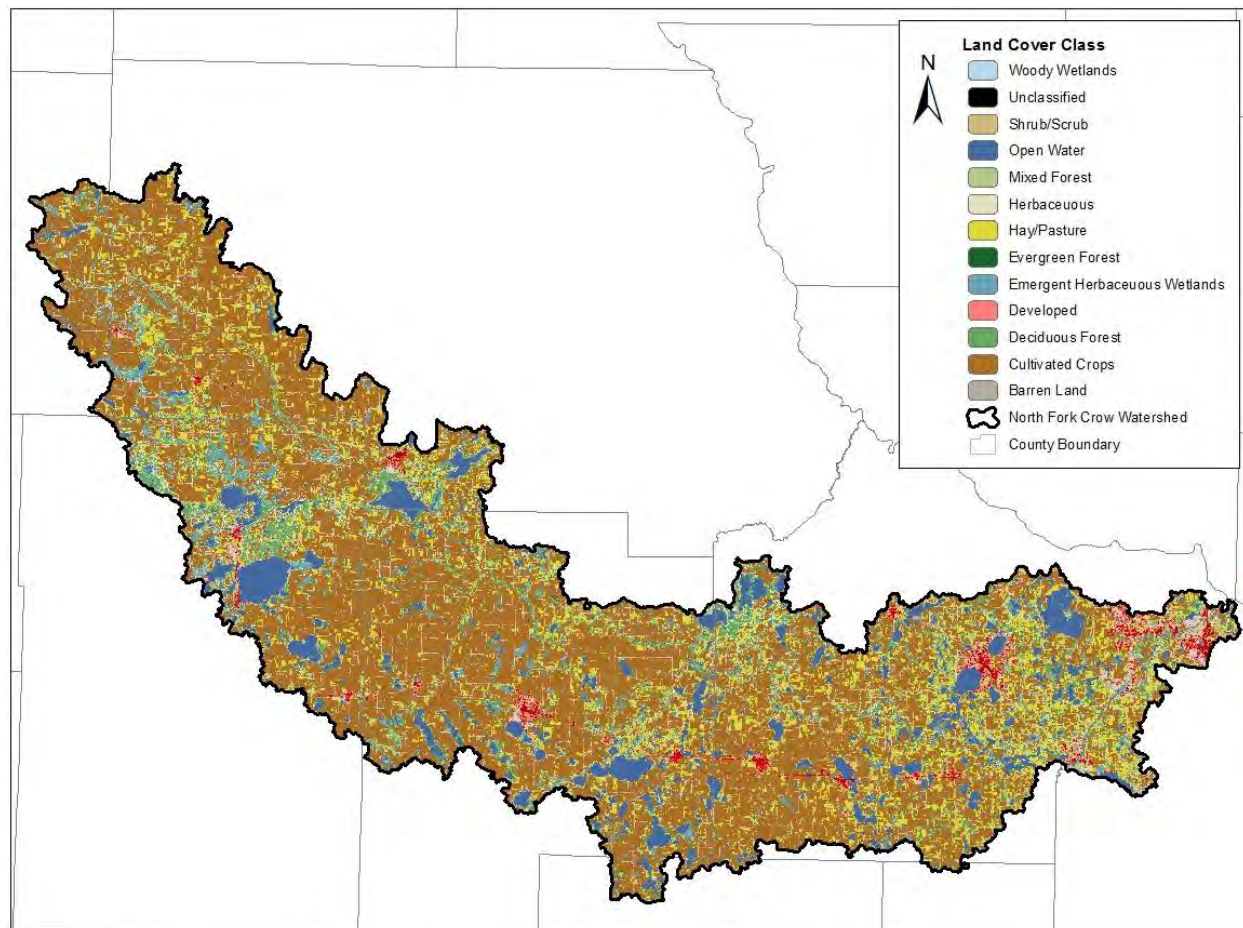


Source: MPCA, North Fork Crow River Watershed Groundwater Report (Draft December 2015), Figure 3.

2 LAND USE

Land use in the NFCR Watershed is mostly agricultural with the exception of the eastern portion which accounts for metro fringe urban and commercial land uses. Much of the landscape of this watershed has been modified by the early settlers in the area and subsequent residents. In order to make the land more suitable for agriculture, timber was removed, wetlands were drained, and streams were modified from their natural channel. Land use and cover within the watershed currently includes forest/shrub (9.7%), wetlands (4.4%), open water (6.8%), grass/pasture/hay (17.6%), cropland (55.4%) and residential/commercial development (6%) (**Figure 3**). The land is predominately owned by private owners (96.4%). Remaining non-private land is County land (0.6%), Federal land (1.2%), State land (1.7%) or conservancy land (0.1%). Total population of the watershed is 96,990 with an estimated 2,864 farms.

Figure 3: Land Cover (GIS Source: NLCD, 2011)



Source: MPCA, North Fork Crow River Watershed Groundwater Report (Draft December 2015), Figure 4.

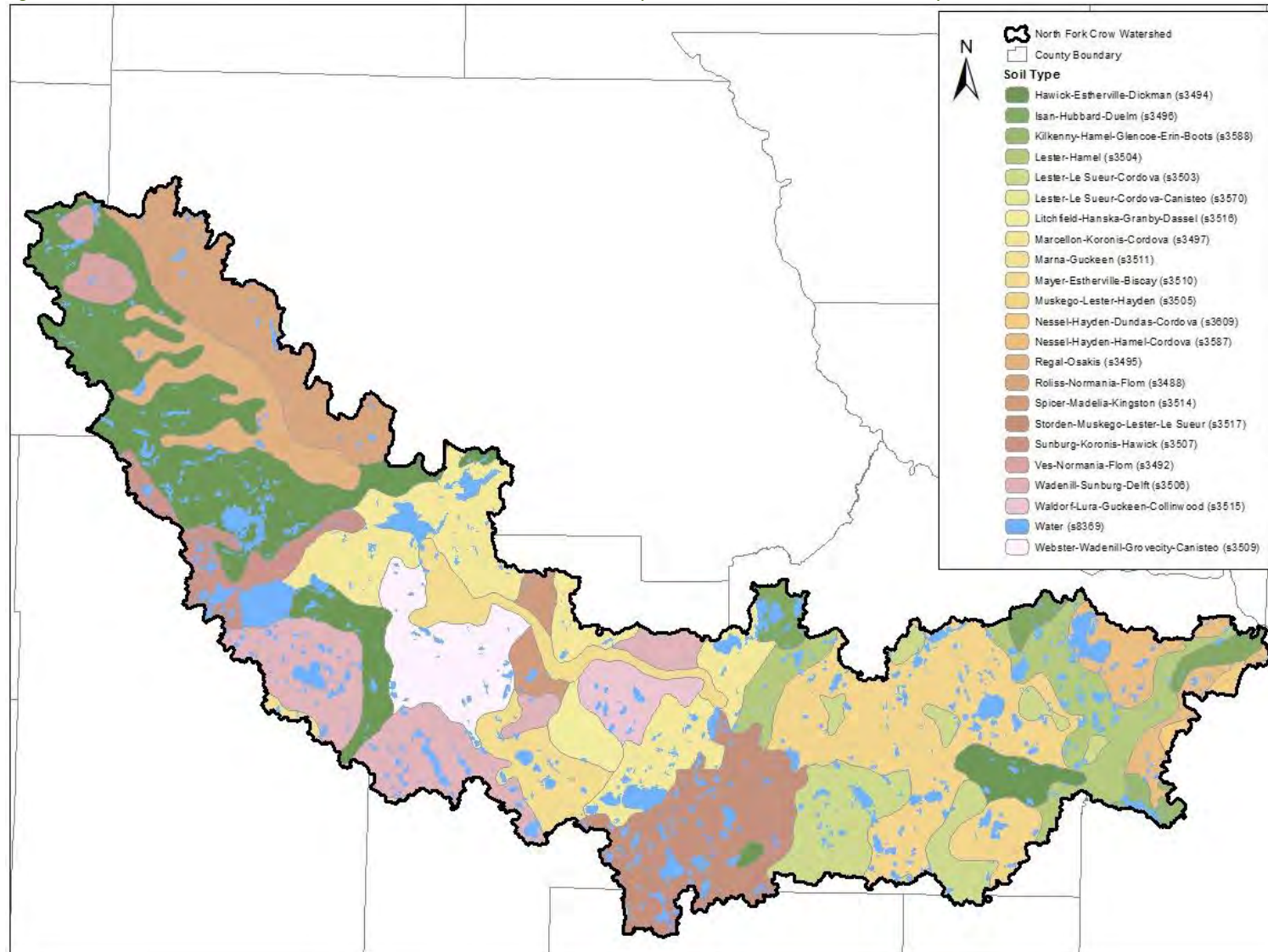
3 ECOREGION AND SOILS

The watershed is located within the North Central Hardwood Forest Ecoregion, with a small portion lying within the Western Cornbelt Plains Ecoregion. According to the Ecological Classification System (ECS), the NFCR Watershed is located within the Prairie Parkland Province and the Eastern Broadleaf Forest Province, the North Central Glaciated Plains Section and the Minnesota and Northeast Iowa Morainal Section. The watershed also lays within the ECS subsections Minnesota River Prairie (west), the Hardwood Hills (north central) and the Big Woods (east) Subsections.

The watershed is comprised of calcareous glacial deposits of sand and gravel outwash from the Des Moines Lobe and Wadena Lobe, primarily of alluvium and outwash, steep drier moraines, steeper till, and rolling moraines. Soils in the lower watershed are primarily alfisols, while those in the upper watershed are primarily molliols (USDA, NRCS). Alfisols are formed from weathering processes under forests or mixed vegetation that contributes to high clay content; making them fertile with a high moisture holding capacity.

Mollisols are characteristically found from grassland ecosystems under calcareous sediments with a thick, organic, rich, and fertile surface horizon. Both of these soils are considered very productive for agricultural soils, as demonstrated by the high percentage of land used for row crops and pasture. Soil types are illustrated in **Figure 4**.

Figure 4: Soil Classifications for the North Fork Crow River Watershed (GIS Source: USDA NRCS, 2006)



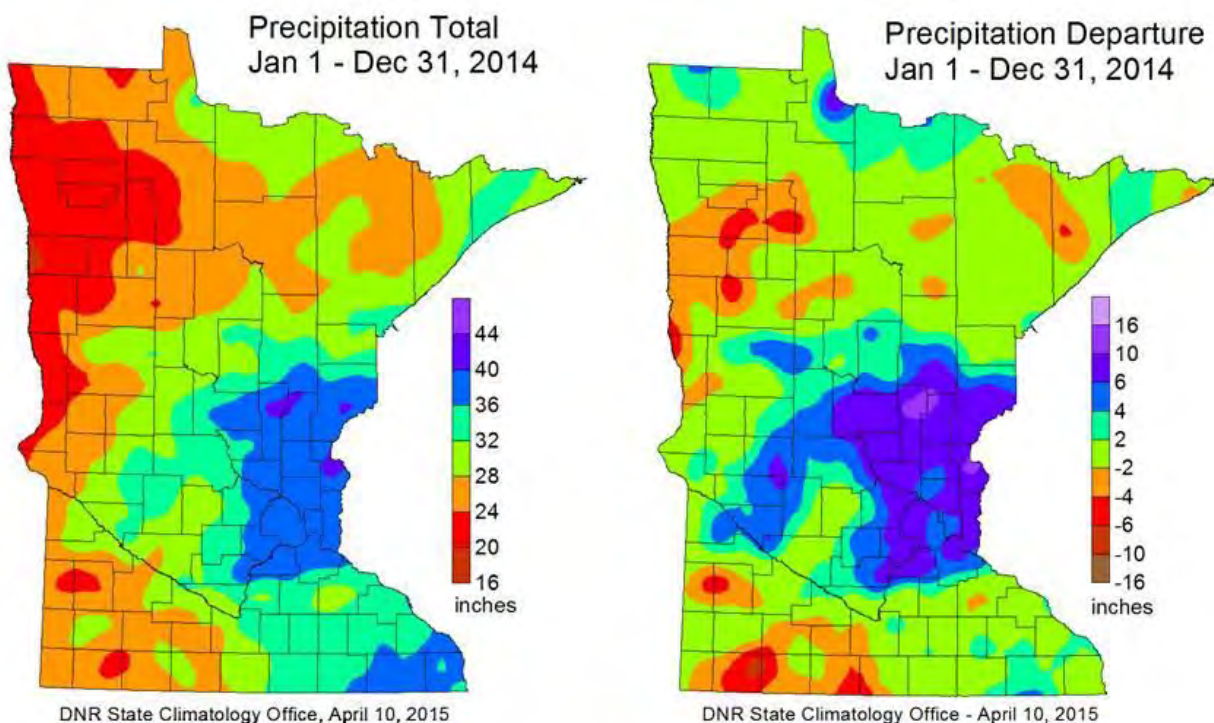
Source: MPCA, North Fork Crow River Watershed Groundwater Report (Draft December 2015), Figure 6.

4 CLIMATE AND PRECIPITATION

Due to its position in the continent, Minnesota is located on the boundary between the semi-humid climate regime of the eastern U.S., and the semi-arid regime to the west. Semi-humid climates are areas where average annual precipitation exceeds average annual evapotranspiration, leading to a net surplus of water. Minnesota's ecoregion has a continental climate, characterized by warm summers and cold winters. The mean annual temperature for Minnesota is 4.5°C (40.1°F); the mean summer temperature for the NFCR Watershed is 20.0°C (68°F); and the mean winter temperature is -10.6°C (12.9°F) (MnDNR: Minnesota State Climatologists Office, 2013).

Precipitation is the source of almost all water inputs to a watershed. **Figure 5** shows two representations of precipitation for calendar year 2014. On the left is total precipitation, showing the typical pattern of increasing precipitation toward the eastern portion of the state. According to this figure, the NFCR watershed area received 28 to 36 inches of precipitation in 2014. The display on the right shows the amount those precipitation levels departed from normal. For the NFCR watershed, the map shows that precipitation ranged from two (2) inches below normal to six (6) inches above normal.

Figure 5: Statewide Precipitation Levels During 2014

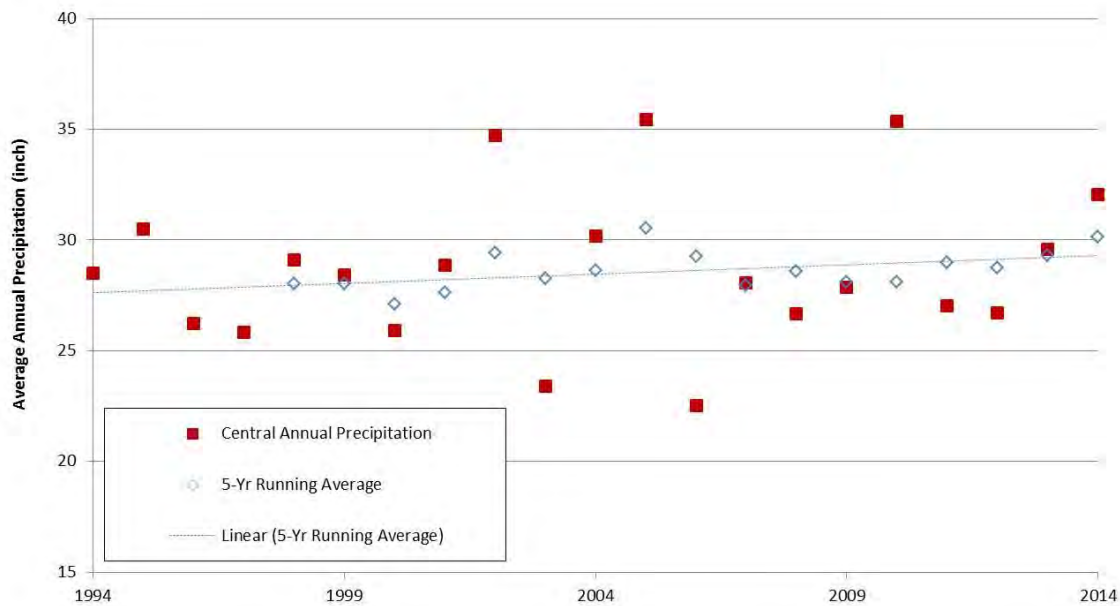


Source: MnDNR State Climatology Office, Annual Precipitation Maps, http://climate.umn.edu/doc/annual_pre_maps.htm (accessed March 22, 2016).

The NFCR watershed is located in the Central precipitation region. **Figure 6 and 7** (below) display the areal average representation of precipitation in Central Minnesota for 20 and 100 years, respectively. An areal

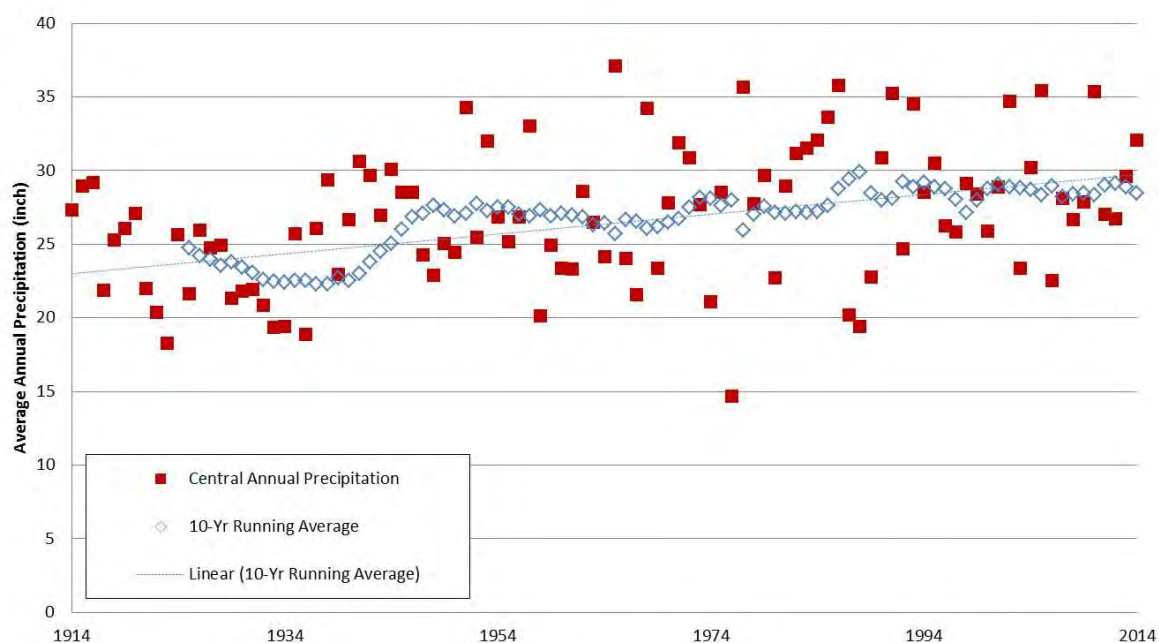
average is a spatial average of all the precipitation data collected within a certain area presented as a single dataset. Though rainfall can vary in intensity and time of year, rainfall totals in the Central region display no significant trend over the last 20 years. However, precipitation in Central Minnesota exhibits a significant rising trend over the past 100 years ($p=0.001$). This is a strong trend and matches similar trends throughout Minnesota.

Figure 6: Precipitation Trends in Central Minnesota (1994-2014) with Five-Year Running Average



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 9.

Figure 7: Precipitation Trends in Central Minnesota (1914-2014) with Ten-Year Running Average



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 10.

4.1 FLOODING

As identified in the NFCR Watershed WRAPS report, additional hydrology information, including flood frequency and other discharge characteristics such as periods of low or zero flow, base flow volume, and seasonal variability are planned to be conducted in the next iteration of the watershed study for the NFCR Watershed, commencing in 2017.

Communities within the NFCR Watershed boundary participate in the National Flood Insurance Program (NFIP). Floodplain maps and designations are developed by the Federal Emergency Management Agency (FEMA). The current Digital Flood Insurance Rate Map identifies Special Flood Hazard Areas that are regulated through the participating community's floodplain ordinance. These areas are subject to inundations by the 1% annual chance flood are designated by zones A, AE, AH, AW, AR A99, V, and VE. The 1% annual chance flood, also known as the base flood or 100-year flood, has a 1% chance of happening or being exceeded each year. Special Flood Hazard Areas are subject to flooding by 1% annual chance flood. The Base Flood Elevation is the water-surface elevation of the 1% chance flood.

Figure 8 provides a map showing the designated FEMA Flood Zones within the NFCR Watershed. Areas within the watershed are designated as A, AE, Floodway, and as areas with 0.2% Annual Chance of Flood Hazard, which are defined below¹.

¹ Definitions provided by U.S. Department of Homeland Security, FEMA website: <http://www.fema.gov/flood-zones> (accessed April 11, 2016).

Zone A

Areas subject to inundation by the 1% annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

Zone AE

Areas subject to inundation by the 1 % annual-chance flood event determined by detailed methods. BFEs are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

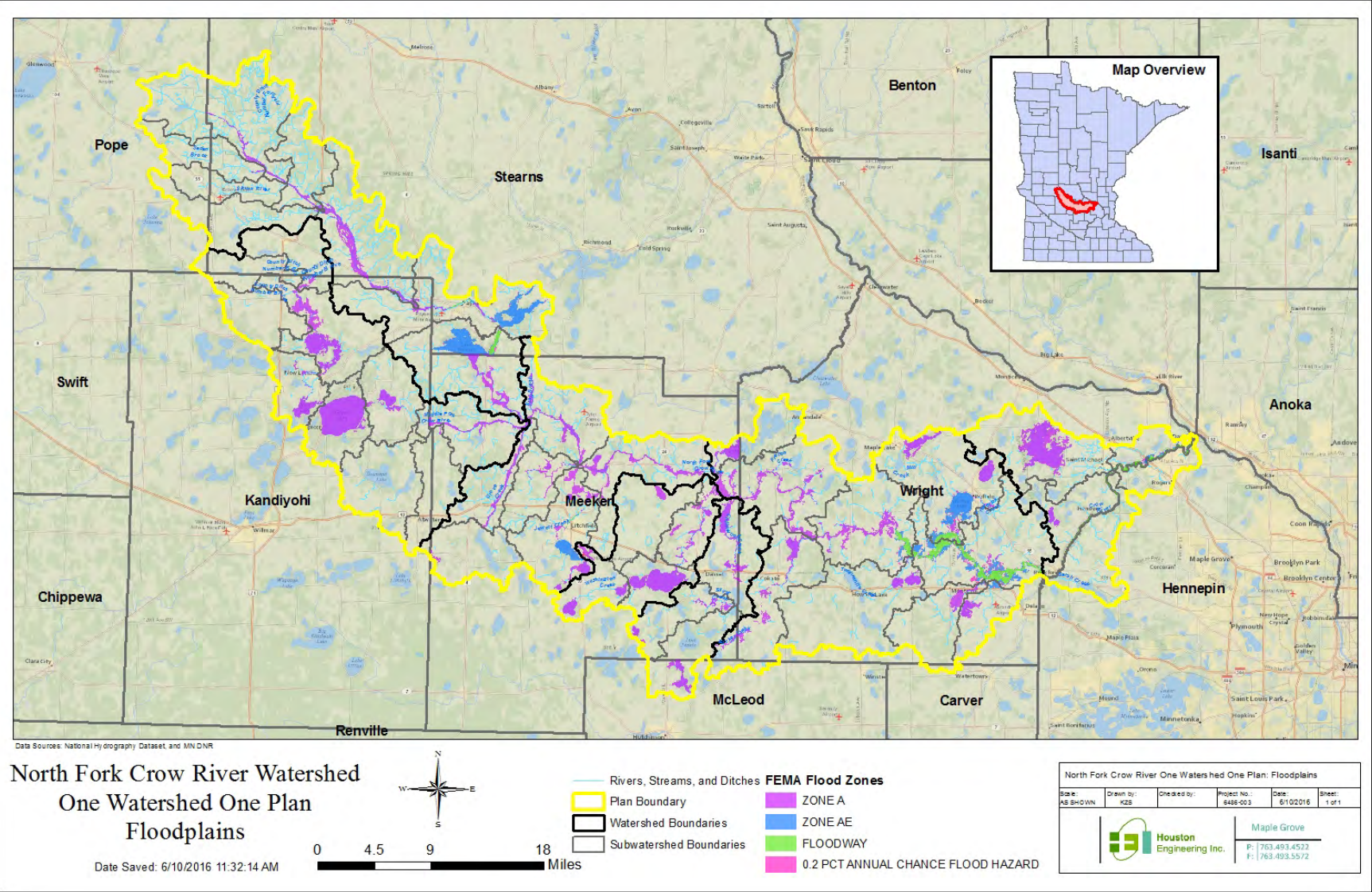
Floodway

A “Regulatory Floodway” describes the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where FEMA has provided BFEs, but no floodway has been designated, the community must review floodplain development on a case-by-case basis to ensure that increases in water surface elevations do not occur, or identify the need to adopt a floodway if adequate information is available.

0.2% Annual Chance of Flood Hazard

The 0.2% annual-chance of flood hazard represent areas inundated by a 500-year flood.

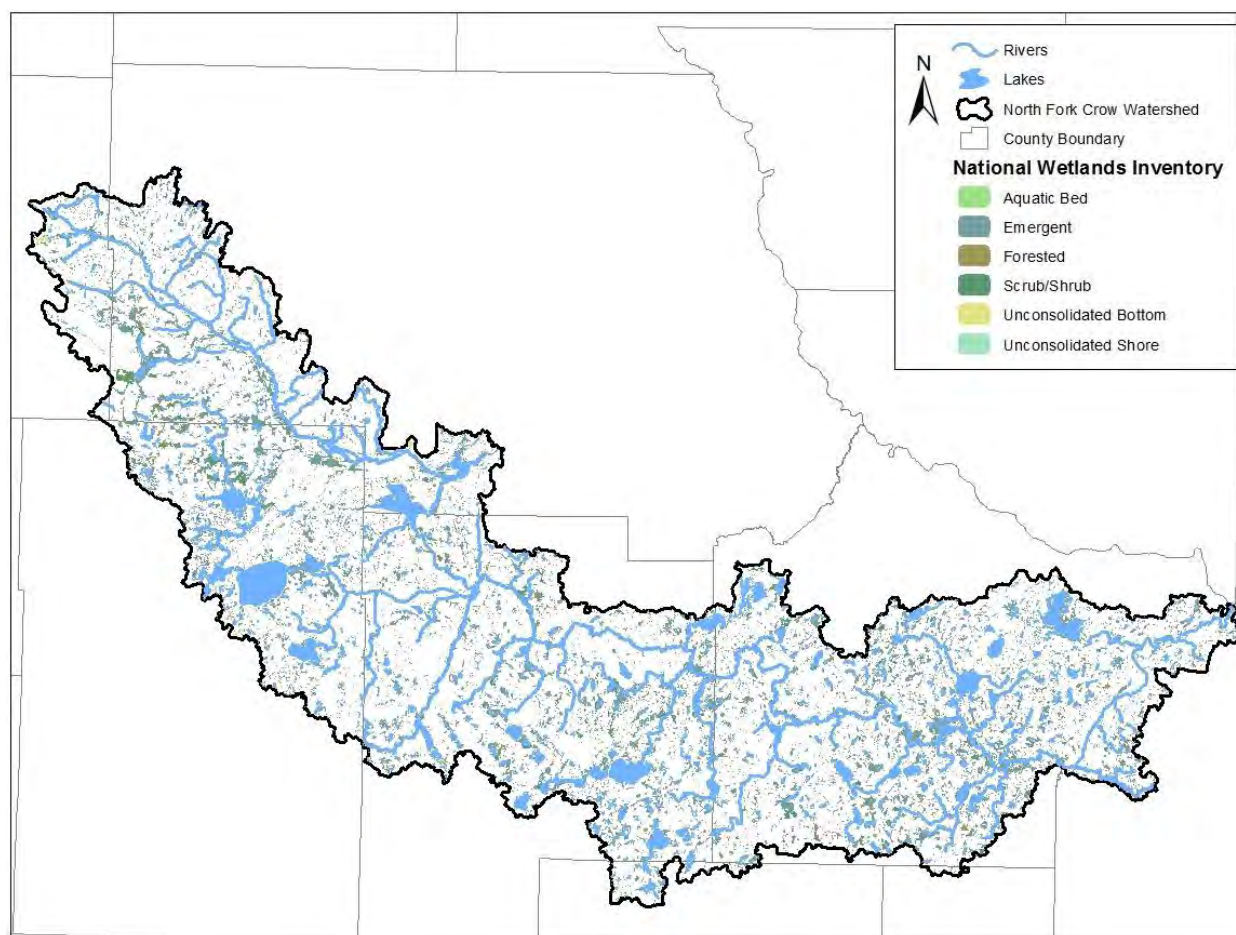
Figure 8: Floodplains (FEMA Flood Zones) within the North Fork Crow River Watershed



5 SURFACE WATER HYDROLOGY

The NFCR watershed is characterized with an abundance of surface water resources, with 1,983 stream miles, 679 lakes, and 17,330 acres of wetlands (**Figure 9**). Its namesake river begins at Grove Lake in Pope County, and travels 120 miles before joining the South Fork Crow River at Rockford where they form the Crow River. The Crow then flows northeast until it joins the Mississippi River at Dayton, Minnesota. Other major rivers and creeks in the watershed (as defined by MPCA) include Jewitts Creek, Grove Creek and Mill Creek, and major lakes include Diamond Lake, Green Lake, Rice Lake and Lake Koronis (MPCA, 2016).

Figure 9: Lakes, Wetlands, and Waterbodies in the North Fork Crow River Watershed



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 12.

5.1 STREAM AND LAKE SURFACE WATER QUALITY

Lake and stream quality conditions in the NFCR watershed are typical of waters in areas dominated by agricultural land uses. Although the watershed generally has water quality issues driven by land use, the general trend in lake water quality decreases from upstream to downstream (west to east) throughout the watershed. Many of the lakes and

reaches of the NFCR do not meet water quality standards for beneficial uses such as aquatic recreation, drinking, and swimming. Phosphorus is the primary lake pollutant that causes algae blooms during summer months. Reaches of the NFCR are listed for biological, bacteria, dissolved oxygen, and turbidity impairments. Further description of the condition of streams and lakes in the watershed, including associated pollutant sources, are detailed within the Watershed Restoration and Protection Strategy (WRAPS) Report for the North Fork Crow Watershed (MPCA 2014).

In 2007, intensive monitoring began that initiated a new watershed approach with the NFCR Watershed. The following documents are available in draft or final versions on the MPCA webpage for the NFCR Watershed (<https://www.pca.state.mn.us/water/watersheds/north-fork-crow-river>).

- Report summarizing results of the biological data for streams;
- Lake assessment reports;
- Stressor ID reports;
- HSPF modeling report;
- TMDL document; and
- WRAPS report.

5.1.1 STREAM AND LAKE CONDITION STATUS

Of the 679 lakes and 233 stream segments (AUIDs) in the watershed, 90 lakes and 74 streams have been assessed and their impairment status is presented in the NFCR Watershed WRAPS report. Although there are many other lakes and stream resources within the watershed, not all have been assessed as some may be too small (lakes under four (4) hectares) or they are limited resource waters (ditches or heavily channelized streams). The 90 lakes have been evaluated for aquatic recreation, which are assessed using total phosphorus (nutrient) criteria. The 74 streams have been assessed for aquatic life parameters including dissolved oxygen (DO), index of biotic integrity (IBI), and turbidity; in addition, aquatic recreation parameters include bacteria (fecal coliform or *E. coli*) were also used to assess streams. Some of the waterbodies in the NFCR watershed are impaired by mercury; however, the WRAPS report does not cover toxic pollutants. For more information on mercury impairments see the statewide mercury TMDL at: <http://www.pca.state.mn.us/wfhy9efl>.

In general, water quality within the watershed declines from upstream to downstream or from west to east. Most of the nutrient lake impairments, with a few exceptions, are located in the eastern half of the watershed while stream impairments are located throughout the watershed. Many of the impairments in the watershed are typical of a predominantly agricultural watershed (MPCA 2014). Excess nutrient runoff resulting in lake eutrophication is a typical stressor for lake water quality. Stream channel modification and overland runoff are a primary stressor resulting in *E. coli*, turbidity, and dissolved oxygen violations.

5.1.1.1 STREAMS

Of the 233 reaches assigned AUIDs, 74 have been assessed for aquatic life or aquatic recreation. The parameters, as mentioned previously, used to assess aquatic life are IBI, DO, and turbidity, while the parameter used to assess aquatic recreation is bacteria (*E. coli* and fecal coliform). The 74 AUIDs assessed using the aforementioned criteria are summarized in WRAPS report. Of the 74 that have been assessed, four fully support aquatic life and one fully supports aquatic recreation, while 20 are impaired for aquatic life and 16 are impaired for aquatic recreation.

TMDLs were completed for stream reaches on the 2010 303(d) impaired waters list. Allocation summaries for completed stream reach TMDLs in the NFCR watershed are summarized in the WRAPS report (MPCA 2014). Additional impairments were identified and added to subsequent 303(d) lists as assessments were completed through the NFCR watershed process. Due to timing of the watershed process, budgeting and contracting constraints, the additional new stream impairments are deferred until the 2017 cycle.

5.1.1.2 LAKES

All 90 lakes assessed in the NFCR watershed are classified as class 2B waters. Minnesota use classifications for waters of the state as prescribed under MN Rule 7050.0140, defines Class 2 waters as those for which aquatic life and recreation are the protected beneficial uses:

“Aquatic life and recreation includes all waters of the state that support or may support fish, other aquatic life, bathing, boating, or other recreational purposes and for which quality control is or may be necessary to protect aquatic or terrestrial life or their habitats or the public health, safety, or welfare.”

The Minnesota standard for all class 2 waters states “...there shall be no material increase in undesirable slime growths or aquatic plants including algae.” In order to evaluate whether a lake is in an impaired condition the MPCA developed “numeric translators” for the narrative standard for purposes of determining which lakes should be included in the section 303(d) list as being impaired for nutrients. Aquatic life impairments are determined using nutrient criteria parameters that include total phosphorus (TP), Secchi depth measurements, and chlorophyll-a.

Of the 90 lakes assessed, 46% are impaired for aquatic recreation, 33% are fully supporting aquatic recreation, and 21% have insufficient data to make an assessment. TMDLs were completed for all nutrient impaired NFCR lakes on the draft 2012 303(d) impaired waters list. Allocation summaries for completed lake TMDLs in the NFCR watershed are summarized in the WRAPS report (MPCA 2014).

5.1.2 WATER QUALITY TRENDS

Long-term water quality was recorded at the Crow River near Dayton, Minnesota (site S000-004) from 1953 to 2009 for TSS, BOD, TP, Nitrite/Nitrate, Unionized Ammonia, chloride, and pH (**Table 1**). The MPCA used this dataset to analyze the long-term (1953 to 2009) and short-term (1995 to 2009) water quality trends (Seasonal Kendall Trend Test) in the NFCR watershed. Most parameters saw no significant change ($p < 0.1$) in long-term or short-term trends; however, total suspended solids decreased significantly from 1995 to 2009 and Nitrite/Nitrate and chloride increased significantly from 1953 to 2009.

Table 1: Water Quality Trends of the Crow River near Dayton, Minnesota (MPCA, 2011)

Parameter	Historical Trend (1953-2009)	Recent Trend (1995-2009)
Total Suspended Solids (TSS)	No trend	-35%
Biochemical Oxygen Demand	No trend	No trend
Total Phosphorus	No trend	No trend
Nitrite/Nitrate	+371%	No trend
Unionized Ammonia	No trend	No trend
Chloride	+893%	No trend
pH	No trend	No trend

Green/**bold** values indicate an improving trend in water quality for that parameter. Red/*italic* values indicate a degrading trend in water quality for that parameter.

5.2 DRAINAGE SYSTEMS

Stormwater management and control practices and methods are wide-ranging within the watershed and it is challenging to describe or define the drainage systems present at such a large scale. For the purposes of this Land and Water Resources Inventory, stormwater systems, control structures, and drainage systems residing within the NFCR Watershed are illustrated in **Figure 11** by presenting the Municipal stormwater (MS4) boundaries, locations of BWSR eLINK statewide conservation efforts, and drainage ditches.

A municipal separate storm sewer system is defined by the MPCA as a conveyance or system of conveyances which may include roads with drainage systems, municipals streets, catch basins, curbs, gutters, ditches, man-made channels, storm drains, and the like. These may be owned or operated by a public entity (e.g., city, township, county, hospitals, highway department, etc.) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including, but not limited to, special districts under State law such as a sewer district, flood control district or drainage district. Such system(s) may be designed or used for collecting or conveying stormwater; may/may not be combined sewer; and may/may not be part of a publically owned treatment works. Such systems are permitted through the MPCA, MS4 General Permit program that is designed to reduce the amounts of sediment and pollution that enters surface and groundwater from stormwater sewer systems to the maximum extent practicable.

The NFCR watershed is mainly agricultural and has numerous public and private drainage ditches. Public drainage systems are managed by the North Fork Crow River Watershed District or other drainage authority on behalf of the benefitted landowners. For locations of drainage systems within the watershed, see **Figure 10**.

5.3 EXISTING WATER RESOURCE PRACTICES

The Minnesota Board of Water and Soil Resources (BWSR), maintains the eLINK database, which is a web-based conservation tracking system. Dating back to 1986, BWSR has required reports from local units of government that indicate progress made in protecting the state's resources. Within the NFCR Watershed (according to 2014 data) there were 556 varying types of Best Management Practices (BMPs) that have been implemented throughout the watershed. These various types of BMPs are presented in **Figure 11** as those implemented at feedlots; for protecting groundwater; conservation efforts; and for protecting against wind and water erosion. More specifically, these various types of BMPs implemented include, but are not limited to: septic system improvement(s); water and sediment control basin(s); water management system(s); well decommissioning; windbreak/shelterbelt establishment; filter strip(s); streambank and shoreline protection; wetland restoration; bioretention basin(s).

Figure 10: Drainage Systems within the North Fork Crow River Watershed

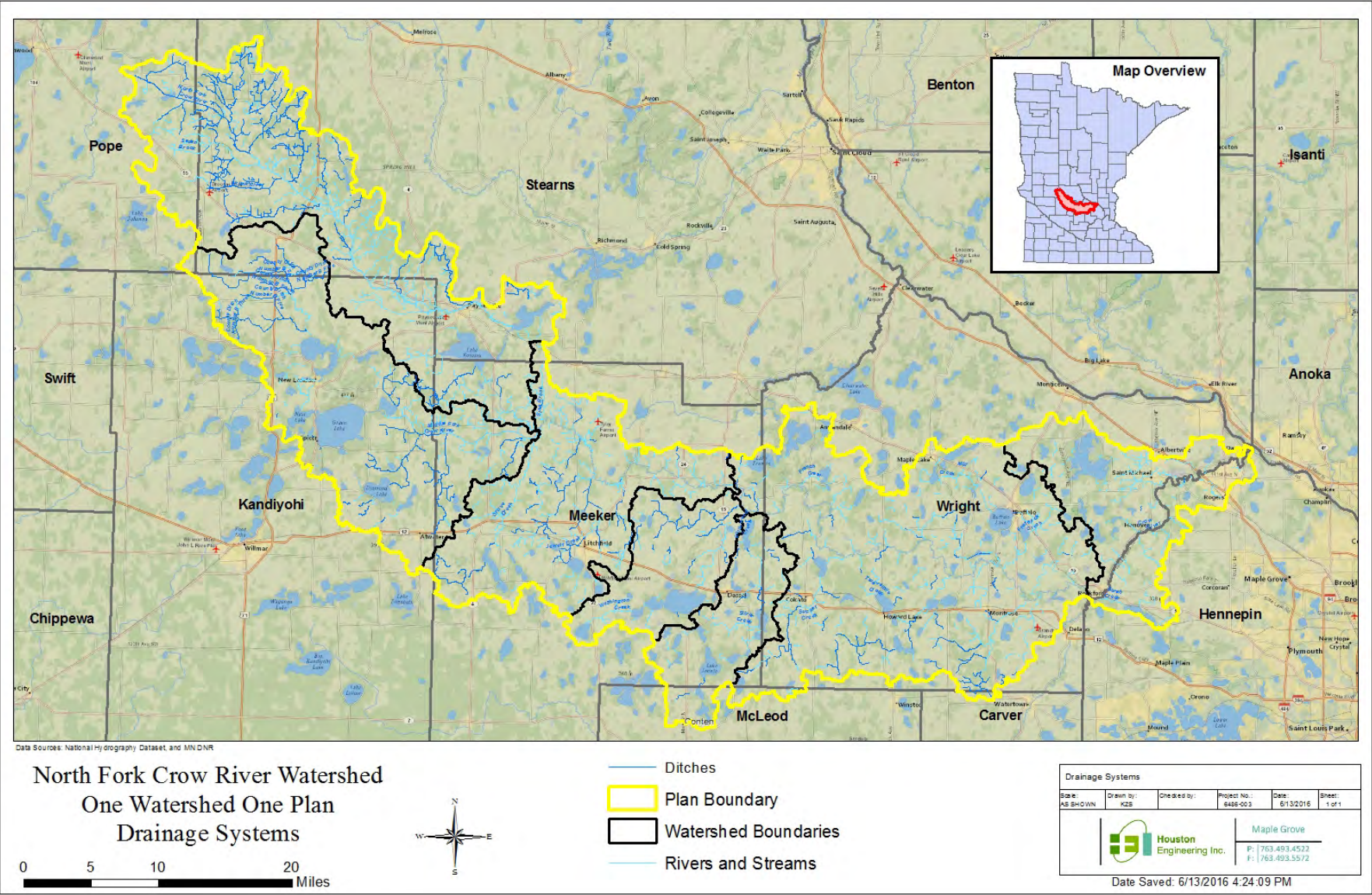
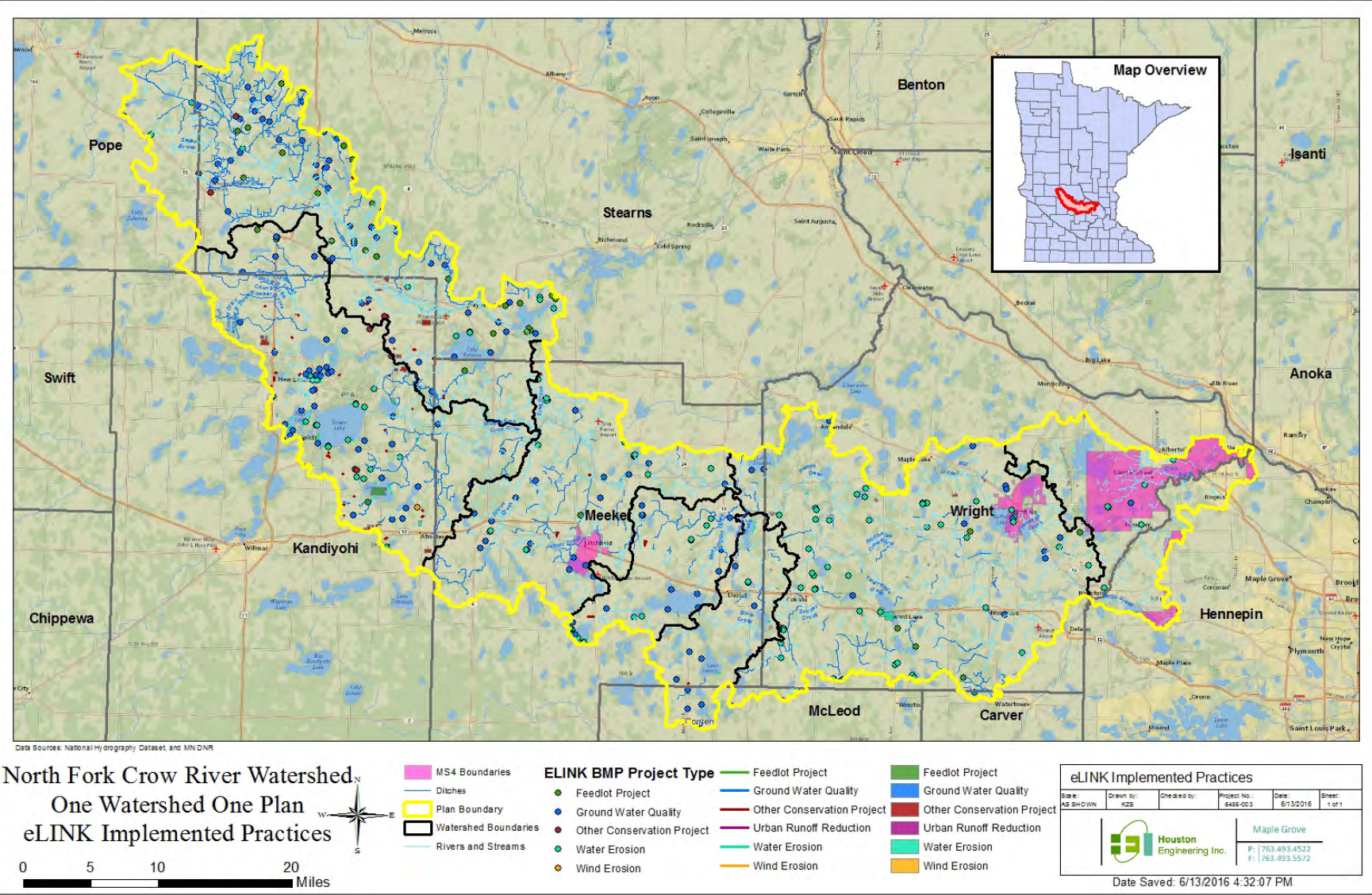


Figure 11: Existing eLINK water resources practices within the North Fork Crow River Watershed

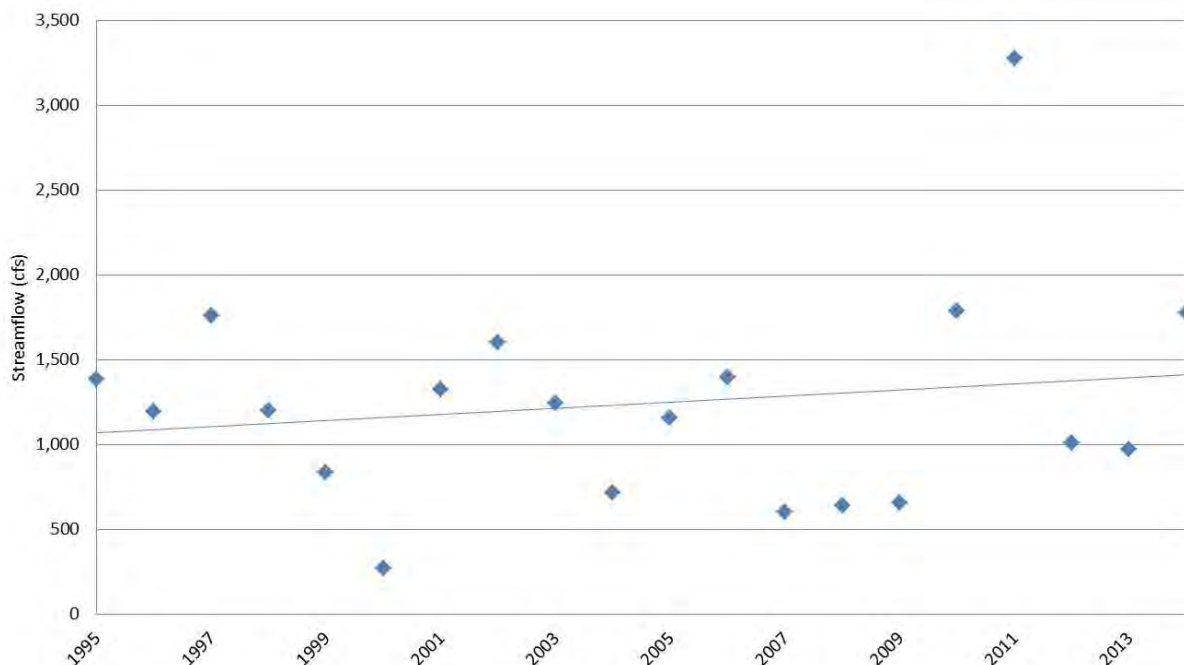


5.4 STREAM FLOW

Stream flow data from the United States Geological Survey's real-time streamflow gaging stations for one river in the North Fork Crow River Watershed was analyzed for annual mean discharge and summer monthly mean discharge (July and August). **Figure 12** is a display of the annual mean discharge for the Crow River at Rockford, MN from water years 1995 to 2014. The data shows that although streamflow appears to be slightly increasing, there is no statistically significant trend. **Figure 13** displays July and August mean flows for water years 1995 to 2014 for the same water body. The data appear to be increasing in July and decreasing in August, but not at a statistically significant rate. By way of comparison at a state level, summer month flows have declined at a statistically significant rate at a majority of streams selected randomly for a study of statewide trends. For additional streamflow data throughout Minnesota, please visit the USGS website:

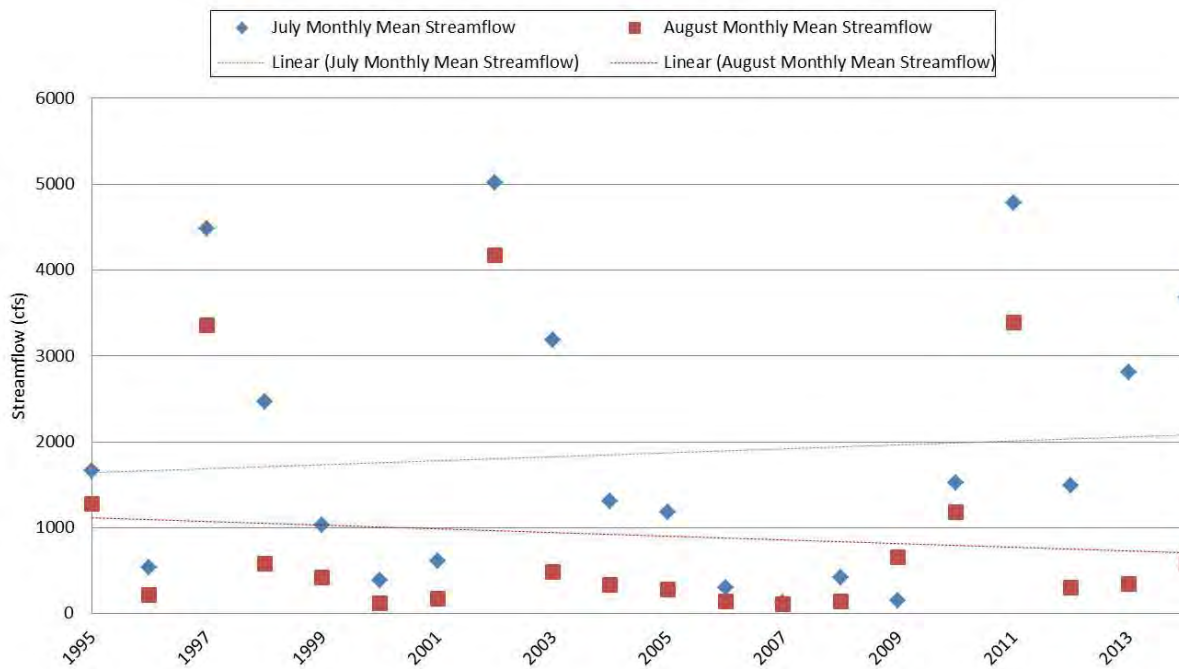
<http://waterdata.usgs.gov/mn/nwis/rt>.

Figure 12: Annual Mean Discharge for Crow River at Rockford, MN (1995-2014)



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 13.

Figure 13: Mean Monthly Discharge for Crow River at Rockford, MN (1995-2014)



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 14.

5.5 LAKE LEVELS

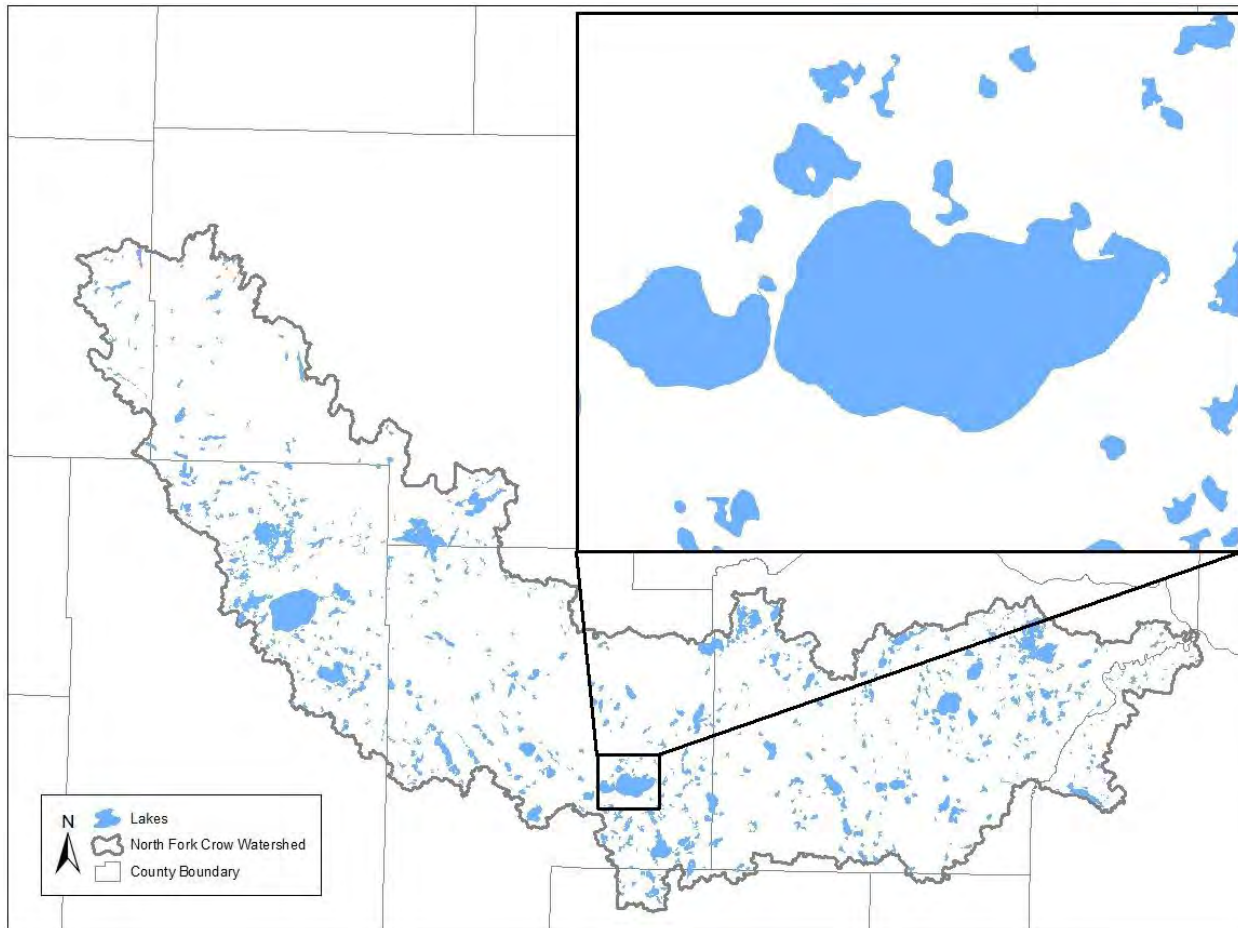
The water levels of lakes within the North Fork Crow Watershed has significant ramifications on aquatic life, aquatic recreation, and the local economy. The *North Fork Crow River Watershed Groundwater Report* (Draft, December 2015) investigates three lakes (Lake Washington, Pelican Lake, and Green Lake), reporting current conditions within the lakes and long-term trends of lake levels.

5.5.1 LAKE WASHINGTON

Lake Washington (Inventory Number 47004600) in Meeker County is located near Darwin in the central area of the watershed (**Figure 14**). The area of the lake is 2,422 acres with a maximum depth of 17 feet and an average lake water elevation of 1067.77 feet. The lake's use classification is 2B, 3C, which is defined as a healthy warm water aquatic community; industrial cooling and materials transport use without a high level of treatment. The overall condition is described as "suitable for swimming and wading, with good clarity and low algae levels throughout the open water season". More information about Lake Washington can be found on the Minnesota Department of Natural Resources (MnDNR) LakeFinder:

<http://www.dnr.state.mn.us/lakefind/lake.html?id=47004600>.

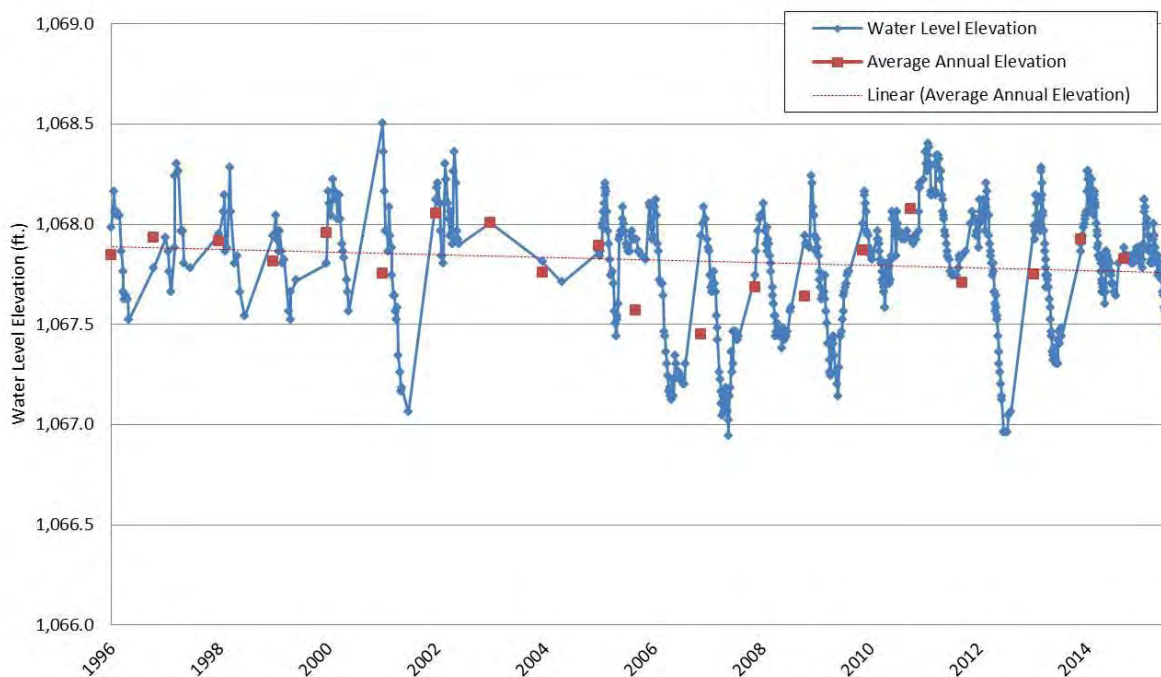
Figure 14: Lake Washington within North Fork Crow River Watershed



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 15.

A 2014 survey by the Department of Natural Resources determined the dominant bottom substrate of the lake to be sand. There were 31 varieties of aquatic plants present with an average water clarity of 3.3 feet, which is considered poor and was associated with an algal bloom. The shoreline is heavily developed for residential purposes. The lakeshed is heavily agricultural, primarily used for row crop corn and soybeans. Over the last 20 years, lake level elevation has remained constant, altering for seasonal fluctuations (Figure 15). Lake elevation data can be found from the MnDNR LakeFinder website provided above.

Figure 15: Lake Washington Water Level Elevation (1996-2015)



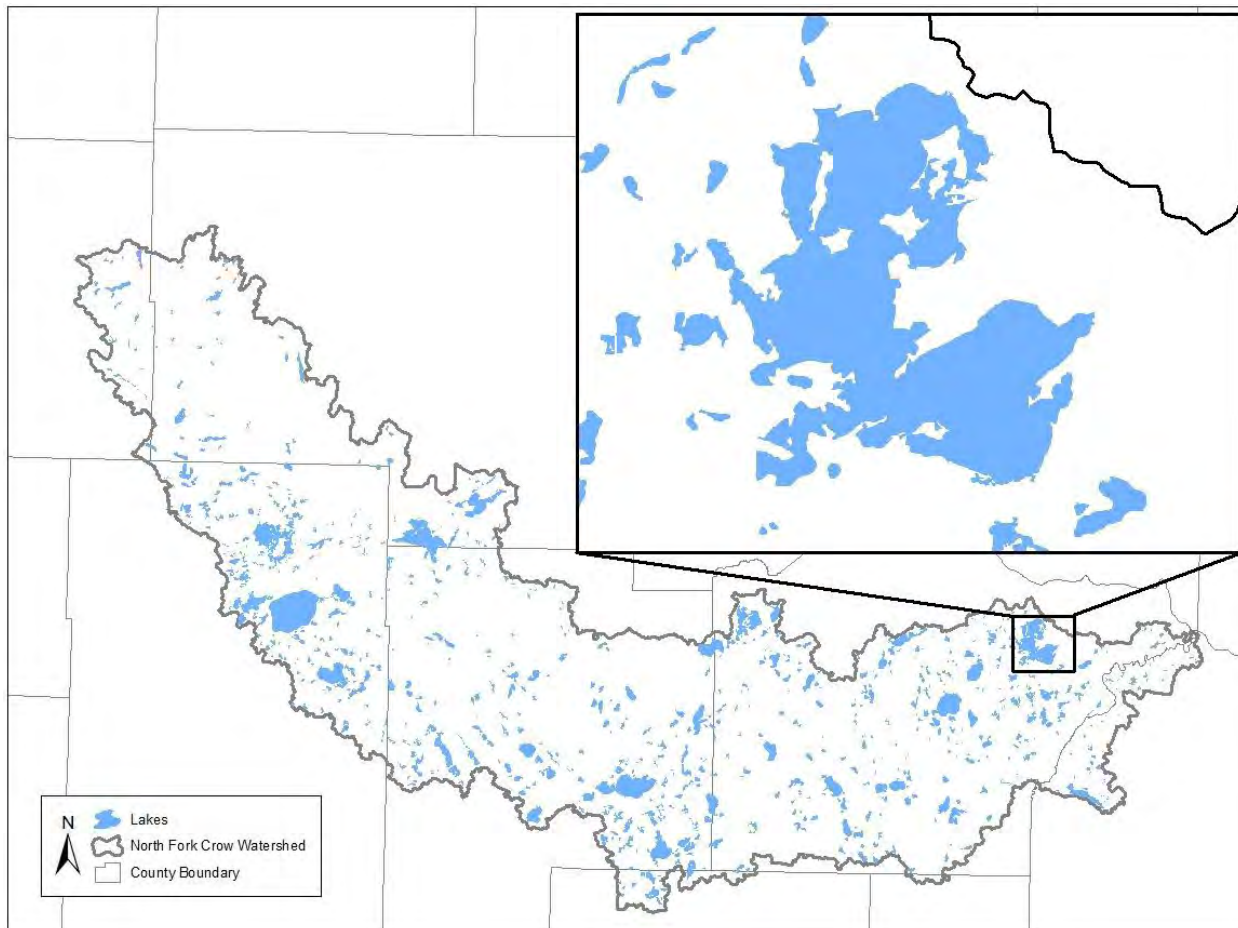
Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 16.

5.5.2 PELICAN LAKE

Pelican Lake (Inventory Number 86003100) in Wright County is located near Saint Michael and Annandale in the eastern area of the watershed (**Figure 16**). The area of the lake is 2,336 acres with a maximum depth of 9 feet and an average lake water level elevation of 953.1 feet. The lake's use classification is 2B, 3C; but the overall condition is described by the MPCA as "not always suitable for swimming and wading due to low clarity or excessive algae caused by the presence of nutrients, such as phosphorus in the water". More information about Pelican Lake can be accessed through the MnDNR LakeFinder:

<http://www.dnr.state.mn.us/lakefind/lake.html?id=86003100>.

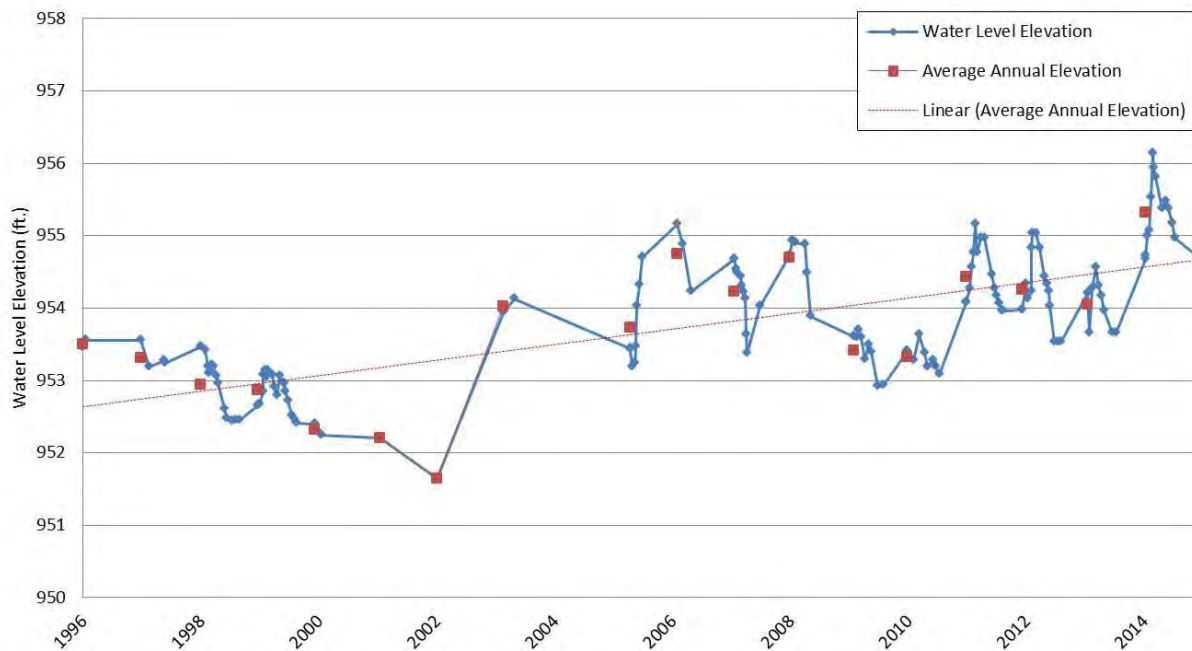
Figure 16: Pelican Lake within the North Fork Crow River Watershed



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 17.

Pelican Lake has been identified as a state wildlife lake in 1977 - one of the 48 in Minnesota -due to diver duck species utilizing the lake as a spring and fall migration habitat. The lake is also currently undergoing an enhancement project by the MnDNR Wildlife Division. The purpose of the project is to improve water quality and enhance waterfowl habitat. As seen in **Figure 17**, water levels have been rising consistently over time ($p=0.05$), and according to the MnDNR, this rise has reached almost five feet over the last 28 years. The lake has experienced frequent, severe fish kills due to flooding of aquatic vegetation and nutrient and sediment loading. This has led to increased water level and fishery management efforts via wetland restoration, stabilization of stream channels, temporary water level drawdown and potentially stocking predator fish species.

Figure 17: Pelican Lake Water Level Elevations (1996-2015)

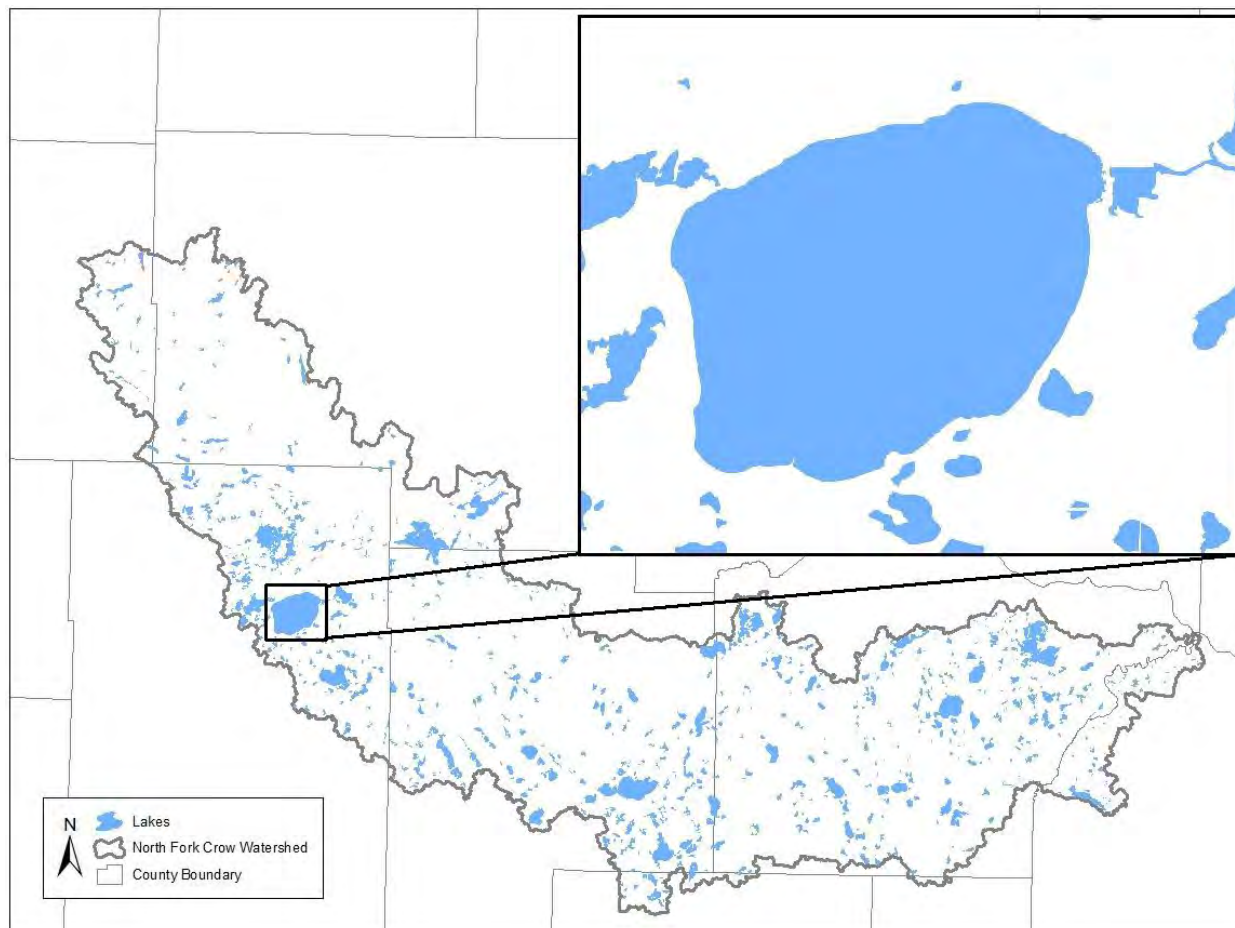


Source: MPCA, North Fork Crow River Watershed Groundwater Report (Draft December 2015), Figure 18.

5.5.3 GREEN LAKE

Green Lake (Inventory Number 34007900) in Kandiyohi County is located at Spicer in the western area of the watershed (**Figure 18**). The area of the lake is 5,534 acres with a maximum depth of 110 feet and an average lake water level elevation of 1156.4. The lake's use classification is 2B, 3C; and the overall condition is described as "suitable for swimming and wading, with good clarity and low algae levels throughout the open water season". More information about Green Lake can be found on the MnDNR, LakeFinder website: <http://www.dnr.state.mn.us/lakefind/lake.html?id=34007900>.

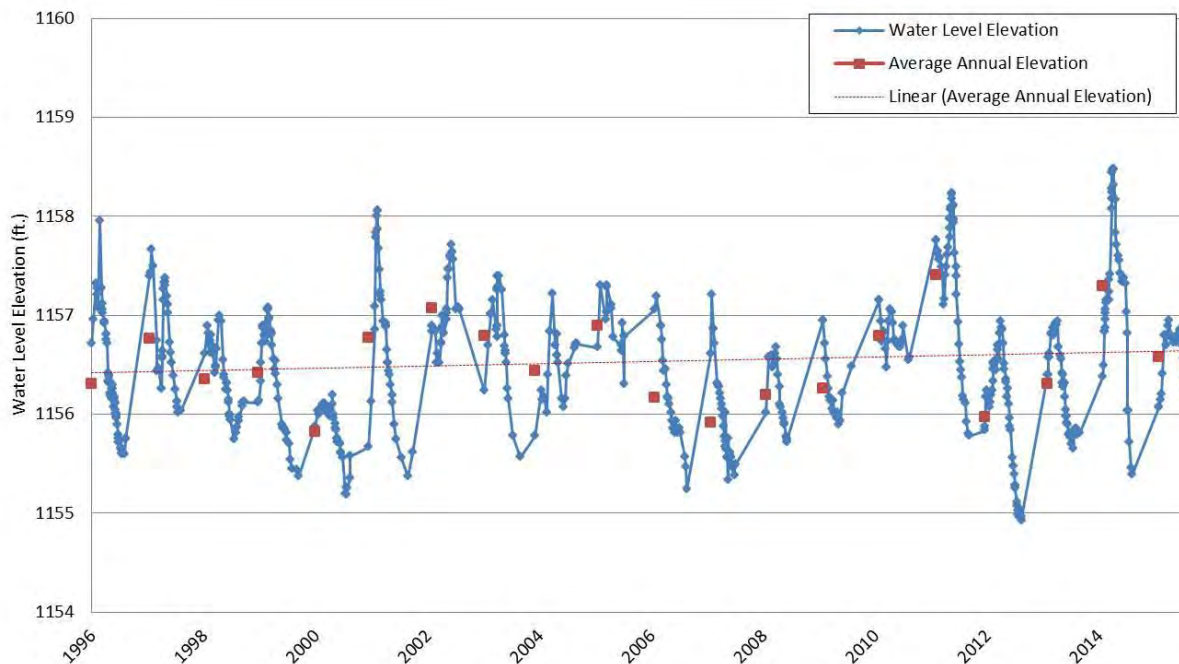
Figure 18: Green Lake within North Fork Crow River Watershed



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 19.

A 2014 survey by the MnDNR determined that the lake had low water clarity (average 9.7 feet). Runoff into the lake is contributed from the heavily developed shoreline (690 homes), the city of Spicer (residential, highways), and agricultural runoff from row crops from the Middle Fork Crow River, the largest inlet into Green Lake. Although there are seasonal fluctuations throughout the year, lake level elevation has remained relatively constant during the last 20 years (no statistical trend) (**Figure 19**).

Figure 19: Green Lake Water Level Elevations (1996-2015)



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 20.

5.6 WATER-BASED RECREATION

The North Fork of the Crow River, along with other streams and lakes in the NFCR watershed provide potential water-based recreational resources. A portion of the North Fork of the Crow River located in Meeker County is classified as a “recreational” waterway under Minnesota’s Wild and Scenic Rivers Program. A recreational river as defined under MN R. 6105.0060 (subp.4), “are those rivers that may have undergone some impoundment or diversion in the past and that may have adjacent lands which are considerably developed, but that are still capable of being managed so as to further the purpose of this act”. The original management plan for this stretch of the Crow River was adopted in 1976. According to the MnDNR, there is currently no Wild & Scenic Rivers planning process underway for the North Fork of the Crow River (MnDNR, 2016).

As previously mentioned, of the 233 stream reaches assigned AUIDS, 74 have been assessed for aquatic life or aquatic recreation. Of these 74 assessed, four (4) fully support aquatic life and one (1) fully supports aquatic recreation. Twenty (20) are impaired for aquatic life and 16 are impaired for aquatic recreation. These lakes are listed in Table 1 of the WRAPS report: <https://www.pca.state.mn.us/sites/default/files/wq-ws4-06a.pdf>.

Of the 679 lakes within the watershed, 90 lakes were assessed in the NFCR WRAPS report. All lakes assessed are classified as Class 2B waters or those that are protected for aquatic life and recreational uses. As previously mentioned, 46% of the 90 assessed lakes are impaired for aquatic recreation, 33% are fully supporting aquatic

recreation, and 21% have insufficient data to make the assessment. These lakes are listed in Table 2 of the WRAPS report: <https://www.pca.state.mn.us/sites/default/files/wq-ws4-06a.pdf>.

The NFCR Watershed offers many outdoor recreational opportunities, which include the Sibley State Park, Aquatic Management Areas (AMAs), Fish Management Areas (FMAs), Wildlife Management Areas (WMAs), and Scientific and Natural Areas (SNAs); locations of these are presented in **Figure 20**. The DNR oversees several programs for the management of the aforementioned special designated areas for the conservation of the state's natural resources. Similar to WMA's, additional recreational opportunities may also be offered by US Fish and Wildlife Waterfowl Production Areas (WPAs) and Nature Conservancy Lands located throughout the NFCR Watershed (**Figure 20**).

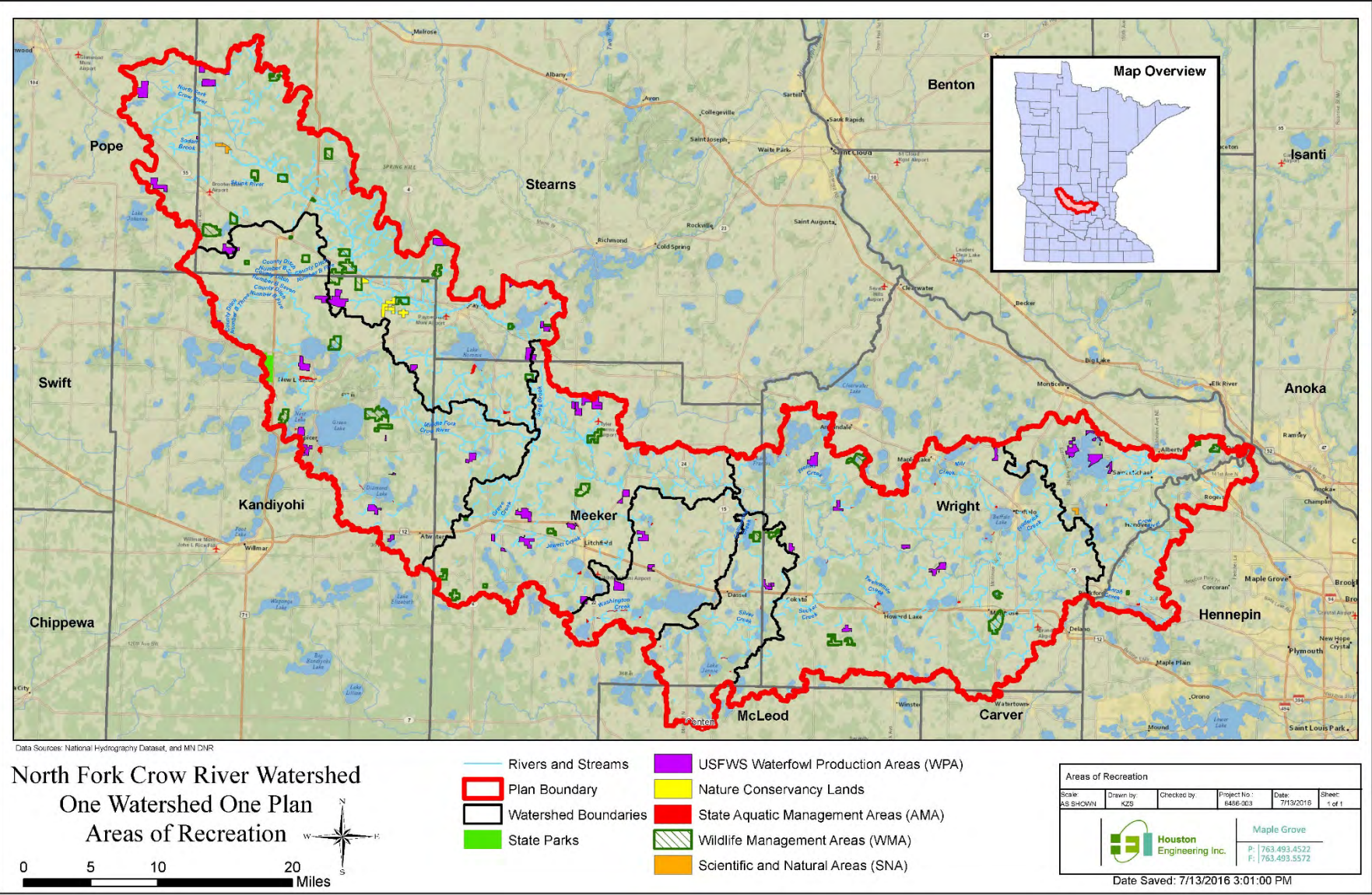
The Sibley State Park is located in the northern portion of the watershed in New London, Kandiyohi County. This State Park offers camping, hiking, bird watching, fishing, cross-country skiing, and interpretive programs. Mount Tom is one of several high points in the park which is popular for hiking. The aesthetics of this area incorporates forest, farmland, prairie knolls, and lakes for an integrative experience. Summer activities at this park include swimming, boating, and fishing on Lake Andrew and Henschien Lake and Swan Lake offers a canoe route. Additional information can be accessed on the DNR, Sibley State Park website: http://www.dnr.state.mn.us/state_parks/sibley/index.html.

Fishing is a well favored leisure activity within the Land of 10,000 Lakes, and is a major economic driver within the NFCR Watershed. Both the NFCR Watershed and the State protects and conserves areas in efforts to support the recreational legacy of fishing within the watershed and its surrounding area. DNR acquires riparian shoreline parcels for FMAs and AMAs and manages and conserves these critical fish and wildlife habitats, ensuring non-boat public access to water resources and development of habitat on previously disturbed areas. The NFCR has many locations of FMAs and AMAs throughout the watershed, though due to the scale of the map provided (**Figure 20**) it may be challenging to observe these.

WMAs are part of Minnesota's outdoor recreation system and are established to protect those lands and waters that have a high potential for wildlife protection, public hunting, trapping, fishing, and other such recreational uses. These areas are intended to protect wildlife habitat for future generations, provide citizens with various outdoor recreation opportunities, and promote wildlife-based tourism in the state. There are forty (40) WMAs located throughout the NFCR Watershed. More information on WMAs and those located within the watershed can be accessed on the DNR, Wildlife Management Areas website: <http://www.dnr.state.mn.us/wmas/index.html>.

There are three (3) SNAs located within the watershed. The Sedan Brook Prairie and Sarah Vest Memorial units are adjacent parcels located in the northernmost portion of the watershed in Stearns County. These designated areas comprise the Sedan Brook Prairie SNA. This SNA is located along a portion of Sedan Brook and comprises over ten (10) acres amidst an adjoining area that has largely been converted to farmland. More information about this resource can be accessed through the DNR, Sedan Brook Prairie SNA website: <http://www.dnr.state.mn.us/snas/detail.html?id=sna02023>. The Mary Schmidt Crawford Woods SNA is located in the southern portion of the watershed in Wright County. This SNA contains an excellent remnant of the maple-basswood forest called the "Big Woods", as well as several small wetlands. More information about this resources can be accessed through the DNR, Mary Schmidt Crawford Woods SNA website: <http://www.dnr.state.mn.us/snas/detail.html?id=sna01022>.

Figure 20: Recreation areas (aquatic and terrestrial) within the North Fork Crow River Watershed



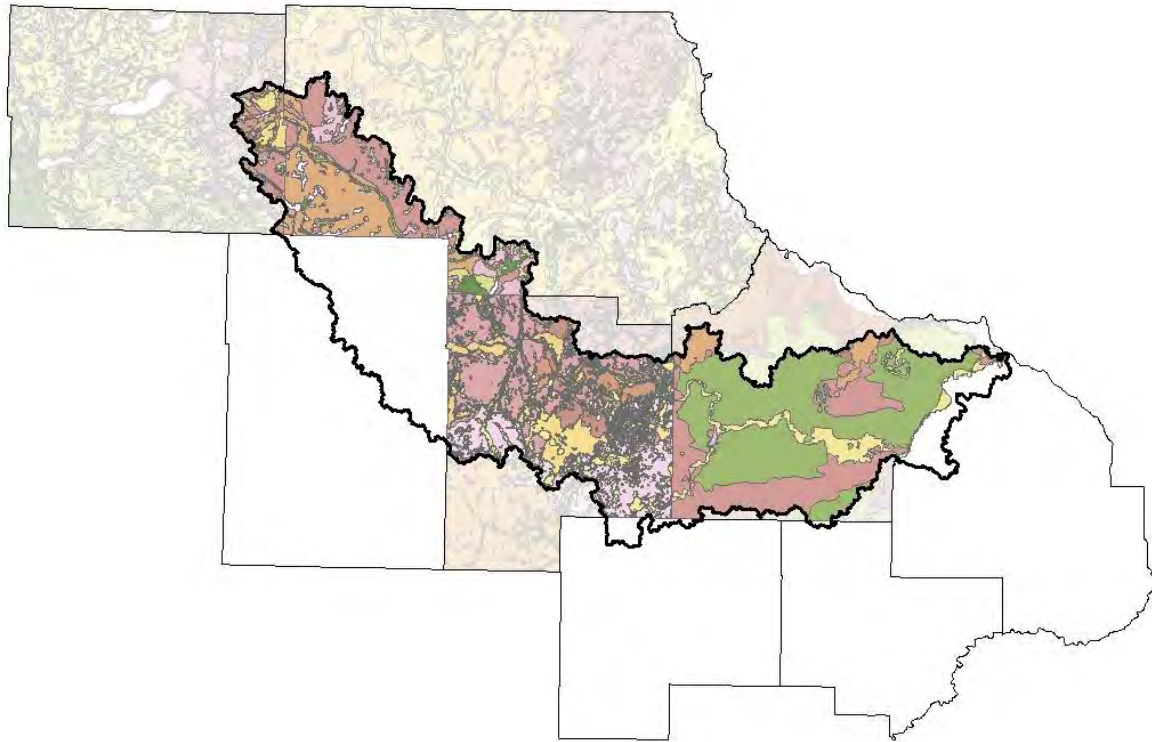
6 HYDROGEOLOGY

Hydrogeology is the study of the interaction, distribution, and movement of groundwater through the rocks and soil of the earth. The geology of a region strongly influences the quantity of groundwater available, the quality of the water, the sensitivity of the water to pollution and how quickly the water will be able to recharge and replenish the source aquifer. This branch of geology is important to understand as it indicates how to manage groundwater withdrawal and land use and can determine if mitigation is necessary.

6.1 SURFICIAL AND BEDROCK GEOLOGY

The MnDNR and Minnesota Geological Survey (MGS) have collaborated to develop the County Geologic Atlas Program, with the purpose of developing maps and reports of the geology and hydrogeology for all the counties in Minnesota. Each completed county atlas consists of a Part A (geology by MGS) and Part B (hydrogeology by MnDNR). For the NFCR watershed, Part A is complete for Pope, Stearns, Meeker, Wright, Hennepin, Carver and McLeod counties and Part B is complete for Pope, Stearns, Hennepin, McLeod and Carver counties. Due to the small fraction of the watershed within McLeod, Hennepin and Carver counties, the Stearns (southwest corner), Pope (eastern edge), Meeker and Wright county atlases were primarily used for this report (**Figure 21**). For more information on the County Geologic Atlases available, please visit: http://www.dnr.state.mn.us/waters/groundwater_section/mapping/index.html.

Figure 21: Geologic County Atlases, Part A Surficial Geology for Available Watershed Counties



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 22.

Surficial geology is identified as the earth material located below the topsoil and overlying the bedrock. Glacial sediment is at the surface in much of the NFCR Watershed and is the parent material for the soils that have developed since glaciation. The depth to bedrock ranges from 18 to 675 feet and is buried by deposits of the various ice lobes (i.e., the Wadena, Rainy, and Des Moines lobes) that reached this watershed during the last glacial period, as well as during previous glaciations in the last 2.58 million years. The majority of glacial sediment at the surface is associated with the Des Moines Lobe. Also at the surface are generally thin postglacial sediments which consist primarily of alluvium and peat, but also include lake silt and clay, lake sand, muck or bogs, and Aeolian sand.

Quaternary deposits in this watershed can be divided into two time periods: the Pleistocene Epoch (2 Ma to 10 ky) and the Holocene Epoch (10 ky to present). The Wisconsin Episode occurred during the Pleistocene Epoch, which includes a number of different formations (basic rock units) over the watershed. The glacial sediments can be grouped by material texture: 1) sand and gravel deposited by flowing meltwater, 2) clay, silt and fine-grained sand deposited in still water of a glacial lake, and 3) an unsorted mixture deposited by ice (till).

The till in the area is typically calcareous and has a loamy to sandy loam matrix texture (nearly equal parts sand, silt and clay), with larger clasts suspended in the matrix (pebbles to boulders). Minor units include ice-contact stratified deposits, modified till and other tills (loamy till; sandy till; washed till; loam to sandy loam textured), coarser stream sediment (sand, gravelly sand and cobbly gravel), fine offshore and slightly coarser nearshore lake sediment, and deltaic sediment².

Bedrock is the main mass of rocks that form the Earth, located underneath the surficial geology and can only be seen in a few places where weathering has exposed the bedrock. The bedrock geology of the NFCR Watershed region includes Precambrian and Paleozoic sedimentary rocks in the lower watershed, Cretaceous rocks in the central region, and Precambrian crystalline rocks in the upper watershed (**Figure 22**). The uppermost bedrock is the Cretaceous bedrock, which is described as sandstone layers interbedded with thick layers of shales and are often used as the local water source. The Cretaceous bedrock includes the Dakota Formation, comprised of interbedded sandstone, siltstone and mudstone, undifferentiated rocks, red-brown to pale olive mudstone and siltstone with interbedded yellow gray, very fine to medium-grained sandstone, or undivided rocks, which are poorly lithified rocks with sandstone, siltstone, shale and sometimes marl. The Paleozoic bedrock consists of the Wonegan, Eau Claire and Mount Simon Sandstones (sandstone, siltstone and shale), the Decorah, Platteville, Glenwood, and St. Peter (shale, limestone and sandstone), the Jordan, St. Lawrence and Tunnel City Group (siltstone, shale and dolostone), and the Prairie du Chien Group (dolostone and sandstone). The Precambrian bedrock covers the extent of the watershed, displaying evidence of volcanic activity. The main terrane groups include East-Central Minnesota batholith (gabbro or granite), Minnesota River Valley subprovince (granitic orthogneiss and migmatite, amphibolitic to dioritic gneiss), Little Falls Formation (greywacke, mudstone, and schist and slate), North, South Range and Mille Lacs Group (mafic metavolcanic and hypabyssal intrusive rocks, argillite, slate, graywacke), and Hinckley, Fond du Lac, Solar Church (sandstone, siltstone, conglomerate). Mafic intrusion with pyroxenite, peridotite, gabbro and lamprophyre are also prevalent throughout the watershed.

² See the respective atlases for a complete legend of units:

Meyer, G.N. (2015), Geologic County Atlas of Meeker County: Surficial Geology. County Atlas Series, Atlas C-35, Part A, Meeker County, Plate 3-Surficial Geology.

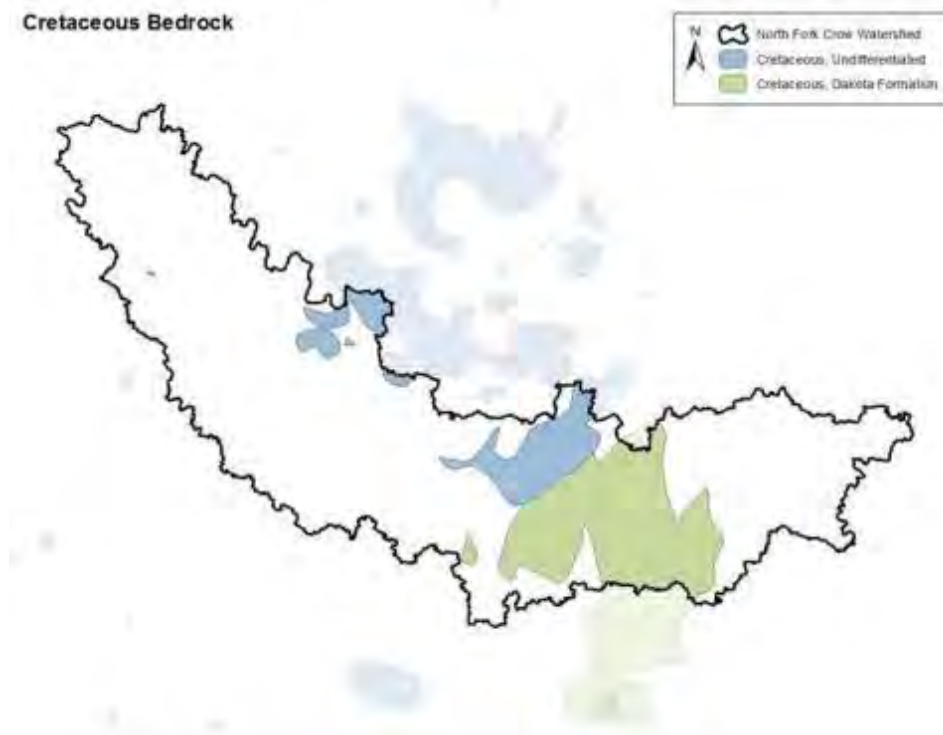
Harris K. L and Knaeble, A.R. (2003), Geologic County Atlas of Pope County: Surficial Geology. County Atlas Series, Atlas C-15, Part A, Plate 3-Surficial Geology.

Meyer, G.N. and Knaeble, A.R. (1995), Geologic County Atlas of Stearns County: Surficial Geology. County Atlas Series, Atlas C-10, Part A, Plate 3-Surficial Geology.

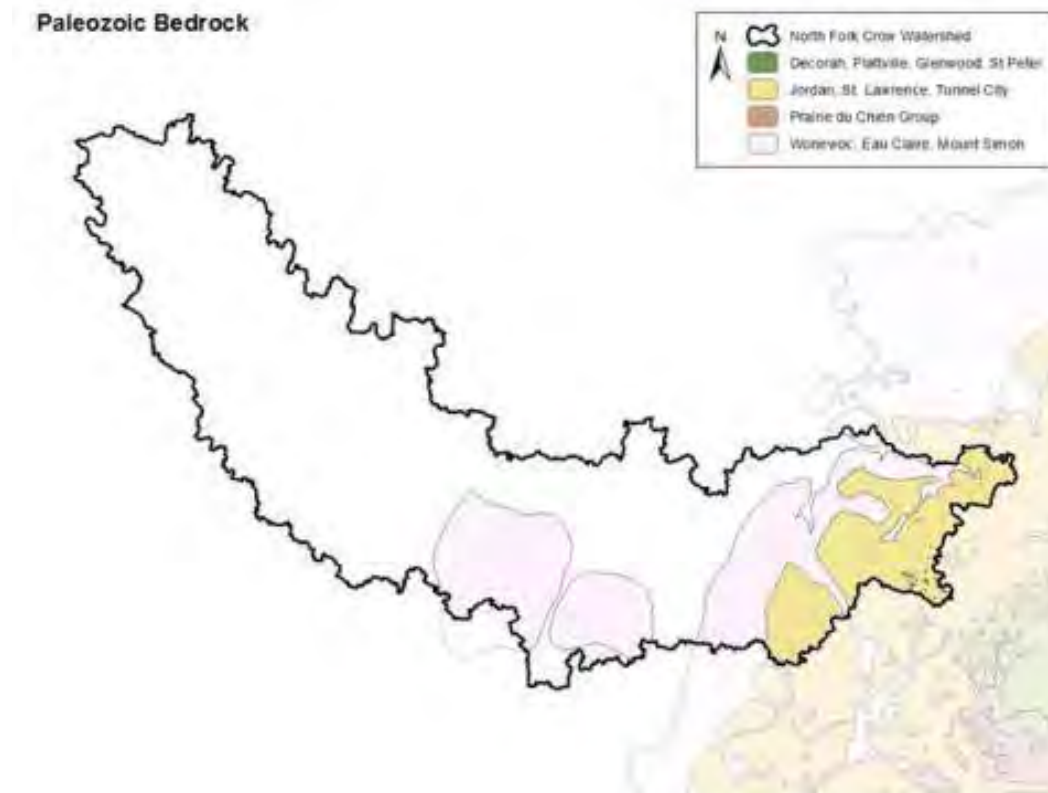
Hobbs, H.C. (2013), Geologic County Atlas of Wright County: Surficial Geology. County Atlas Series, Atlas C-30, Part A, Plate 3-Surficial Geology

Figure 22: Bedrock Geology of the North Fork Crow River Watershed - Cretaceous, Paleozoic, and Precambrian (GIS Source: MGS, 2011)

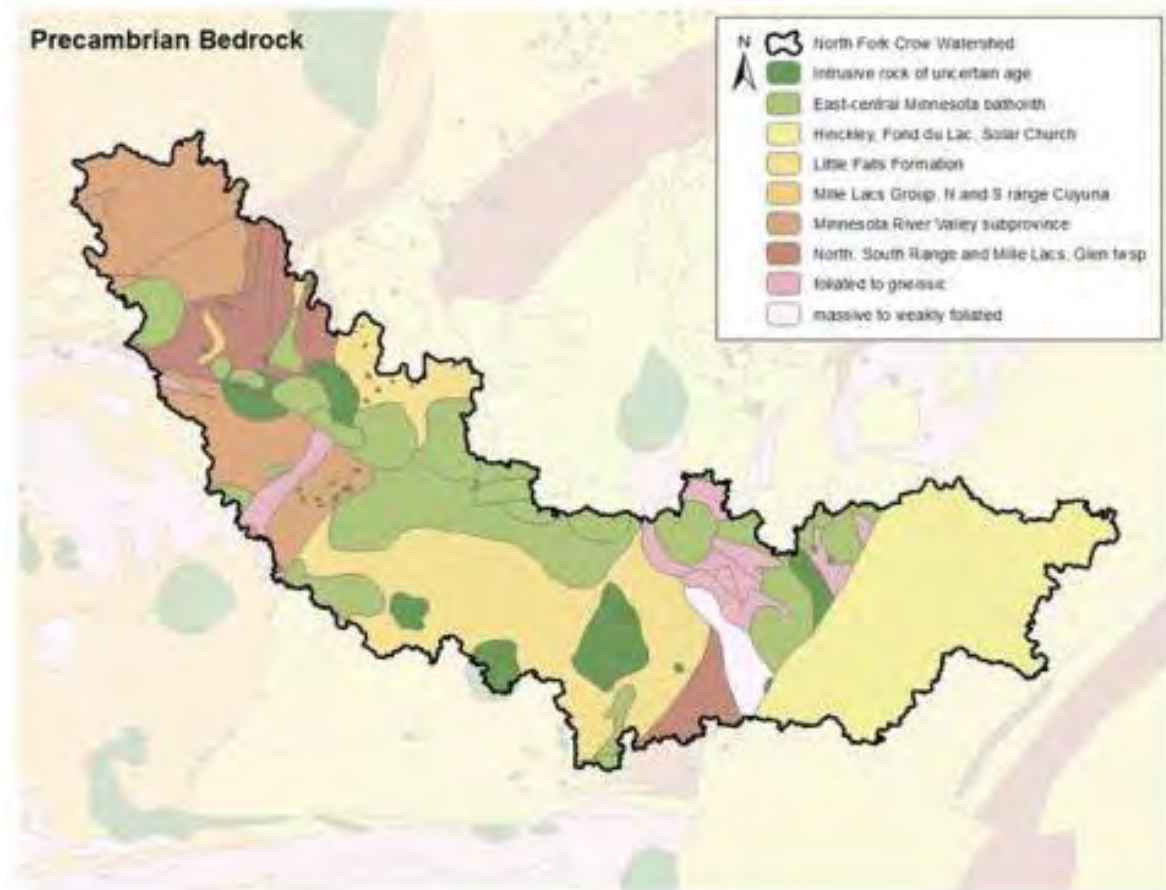
Cretaceous Bedrock



Paleozoic Bedrock



Source: MPCA, North Fork Crow River Watershed Groundwater Report (Draft December 2015), Figure 23.



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 23.

6.2 AQUIFERS

Groundwater aquifers are layers of water-bearing rocks that readily transmit water to wells and springs. As precipitation hits the surface, it infiltrates through the soil zone and into the void spaces within the geologic materials underneath the surface, saturating the material and becoming groundwater. The water table is the uppermost portion of the saturated zone, and the geologic material determines the permeability and availability of water. Sand and gravel materials are considered highly permeable and are utilized as aquifers, while till layers are less permeable and are considered confining units.

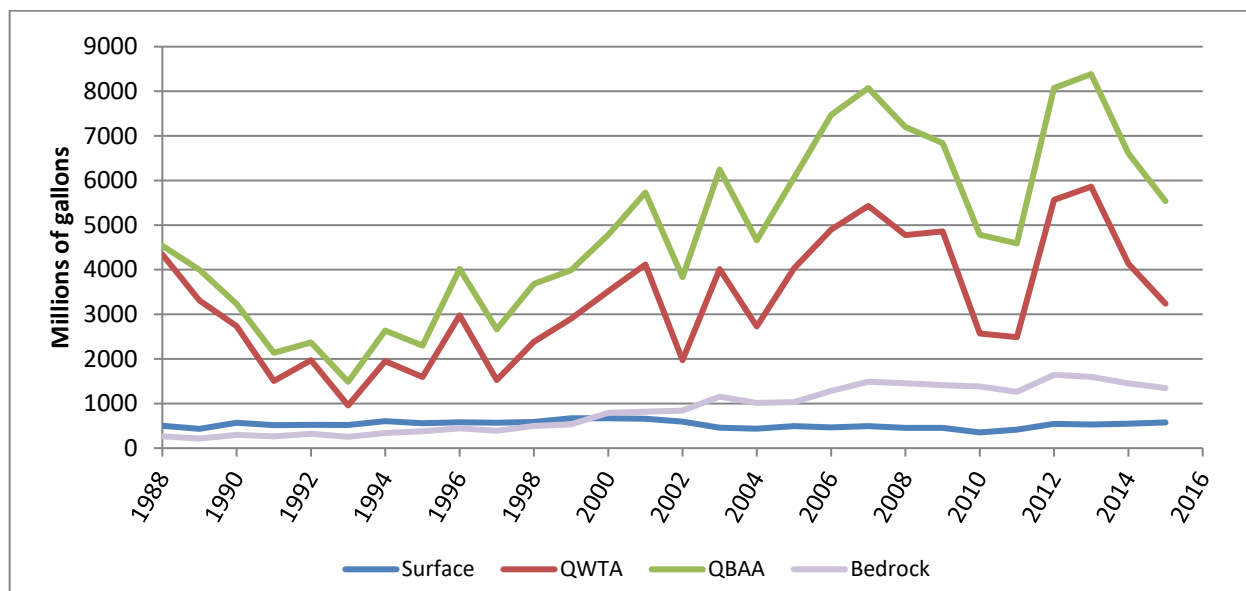
This region contains four (4) main types of aquifers which are vital groundwater sources, including:

- Quaternary aquifers (buried sand and gravel aquifers):
 - o **Quaternary Buried Artesian Aquifer (QBAA)**
 - o Quaternary Buried Unconfined Aquifer (QBUA)
 - o Quaternary Buried Undifferentiated Aquifer (QBUU)
- Surficial sand and gravel aquifers (two main aquifers):

- Quaternary Water Table Aquifer (QWTA)
- Quaternary Undifferentiated Unconfined Aquifer (QUUU)
- Precambrian aquifers (underlying bedrock aquifers), and
- Cretaceous aquifers.

It is from the buried sand and gravel aquifers (QBAA, QBUA, and QBUU) that the majority of wells in this region of Minnesota yield the greatest amount of groundwater. Other important sources of groundwater are the surficial sand and gravel aquifers, which consist of well-sorted outwash deposits left behind from the Des Moines Lobe. Two main aquifers included in this category, as listed above are the QWTA and QUUU. For the North Fork Crow River Watershed, the **QWTA** and **QBAA** aquifers are the primary sources for groundwater withdrawal (**Figure 23**).

Figure 23: Water Use by Resource Type in the NFCR Watershed (1988-2015).



Source: MnDNR, Draft Excerpt: North Fork Crow River GRAPS (Draft, 2016).

6.3 GROUNDWATER POLLUTION SENSITIVITY

When defining and discussing groundwater pollution sensitivity, refer to the MnDNR website:

http://www.dnr.state.mn.us/waters/groundwater_section/mapping/sensitivity.html.

“The DNR defines an area as sensitive if natural geologic factors create a significant risk of groundwater degradation through the migration of waterborne contaminants. Migration of contaminants dissolved in water through unsaturated and saturated sediments is affected by many things, including biological degradation, oxidizing or reducing condition and contaminant density. General assumptions include: contaminants move conservatively with water; flow paths are vertical; and permeability of the sediment is the controlling factor.

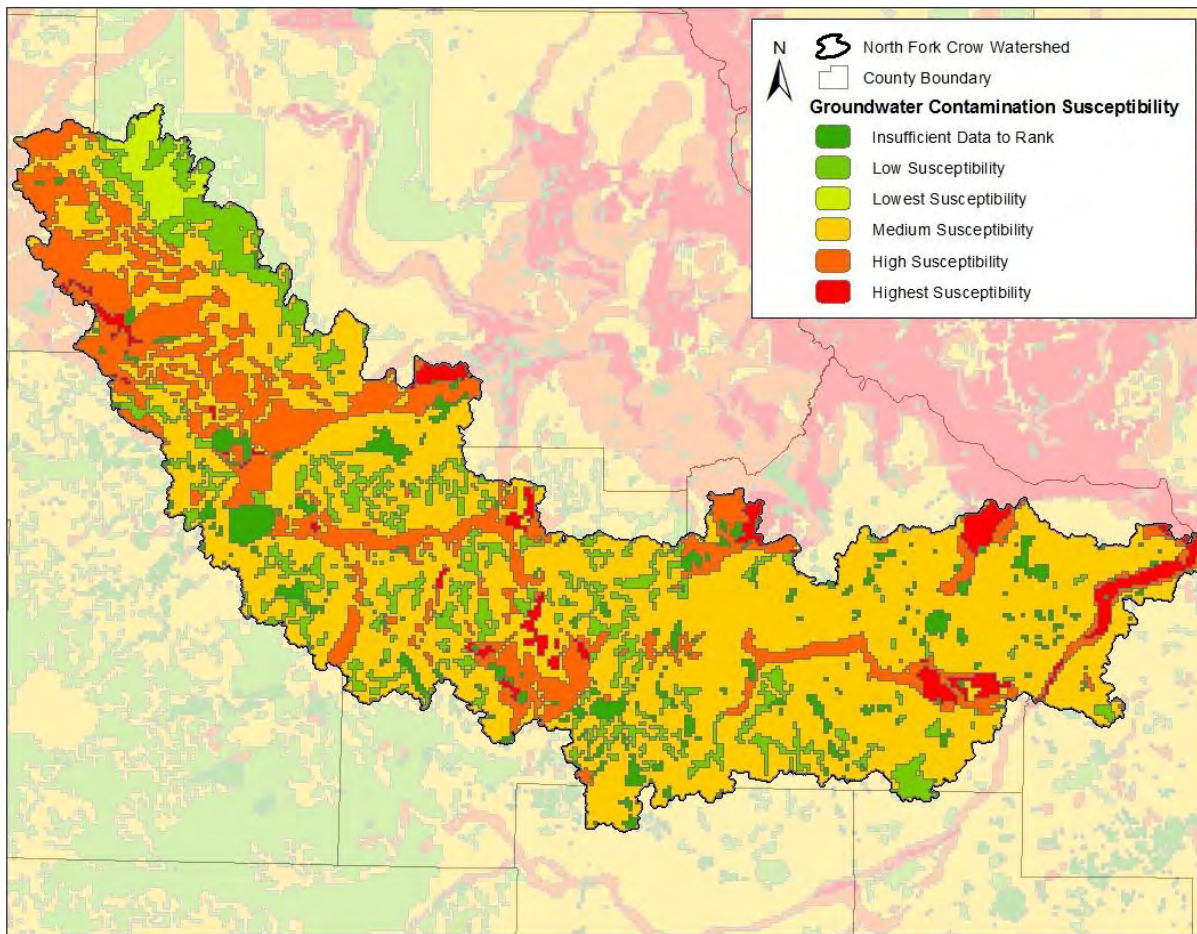
The pollution sensitivity of buried sand and gravel aquifers and of the first buried bedrock surface represents the approximate time it takes for water to move from land surface to the target (residence time). Groundwater chemistry is used to support hypotheses relating geologic factors to travel time. Dye traces, naturally occurring chemicals, and other human-introduced chemicals are used to date groundwater and better understand flow paths and residence times” (MnDNR, 2015).

The MPCA is working on a hydrogeological atlas focused on the pollution sensitivity of the bedrock surface. It is being produced county-by-county, and is not completed for the NFCR Watershed at this time. However, since the bedrock aquifers are typically covered with thick till, they would normally be better protected from contaminant releases at the land surface. It is also less likely that withdrawals from these wells would have a direct and significant impact on local surface water bodies. In contrast, surficial aquifers are typically more likely to:

1. Be vulnerable to contamination;
2. Have direct hydrologic connections to local surface water; and
3. Influence the quality and quantity of local surface water.

For these reasons, a statewide evaluation of groundwater contamination susceptibility determined that the NFCR Watershed is estimated to have primarily medium contamination susceptibility with some areas of low and high contamination susceptibility (**Figure 24**).

Figure 24: Groundwater Contamination Susceptibility for the North Fork Crow River Watershed (GIS Source: MPCA, 1989)

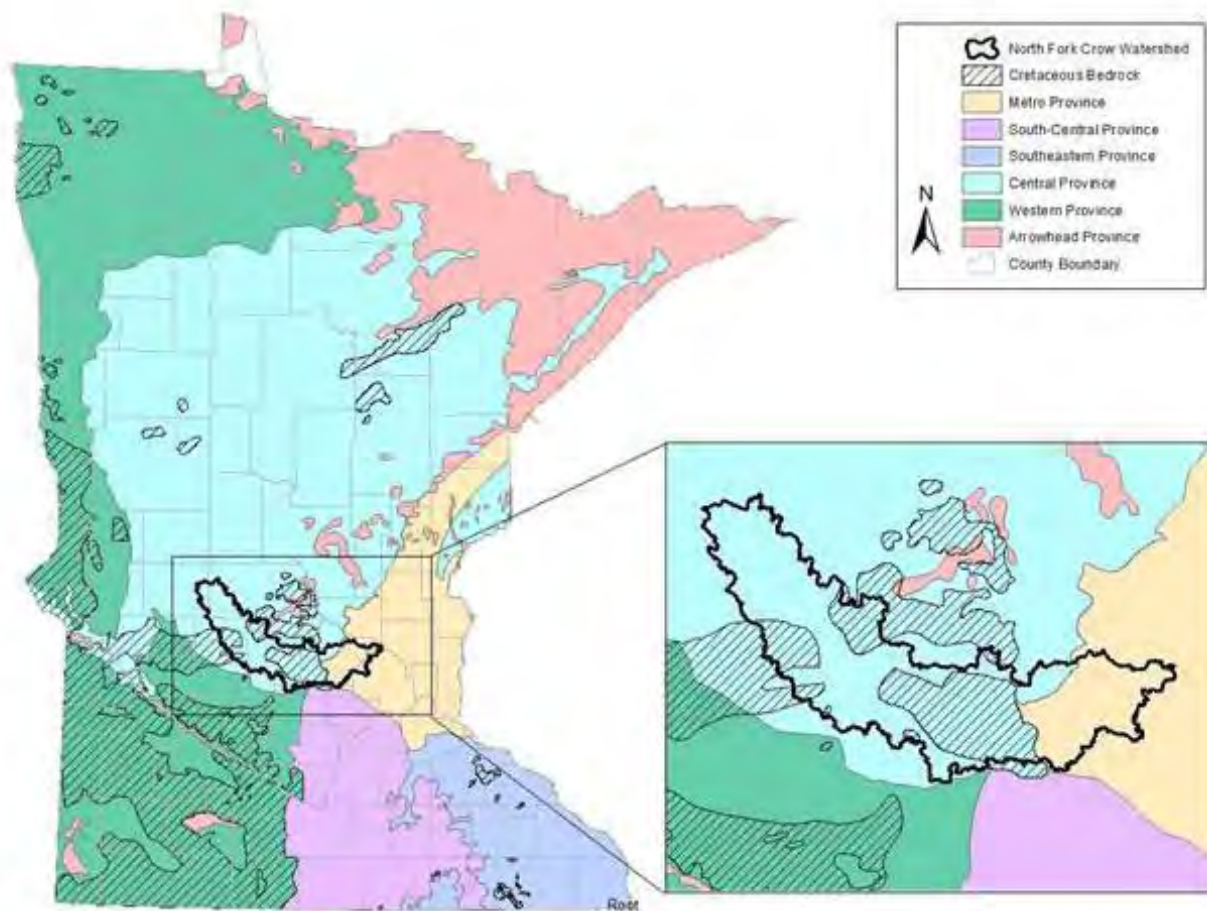


Source: MPCA, North Fork Crow River Watershed Groundwater Report (Draft December 2015), Figure 24.

6.4 GROUNDWATER PROVINCES

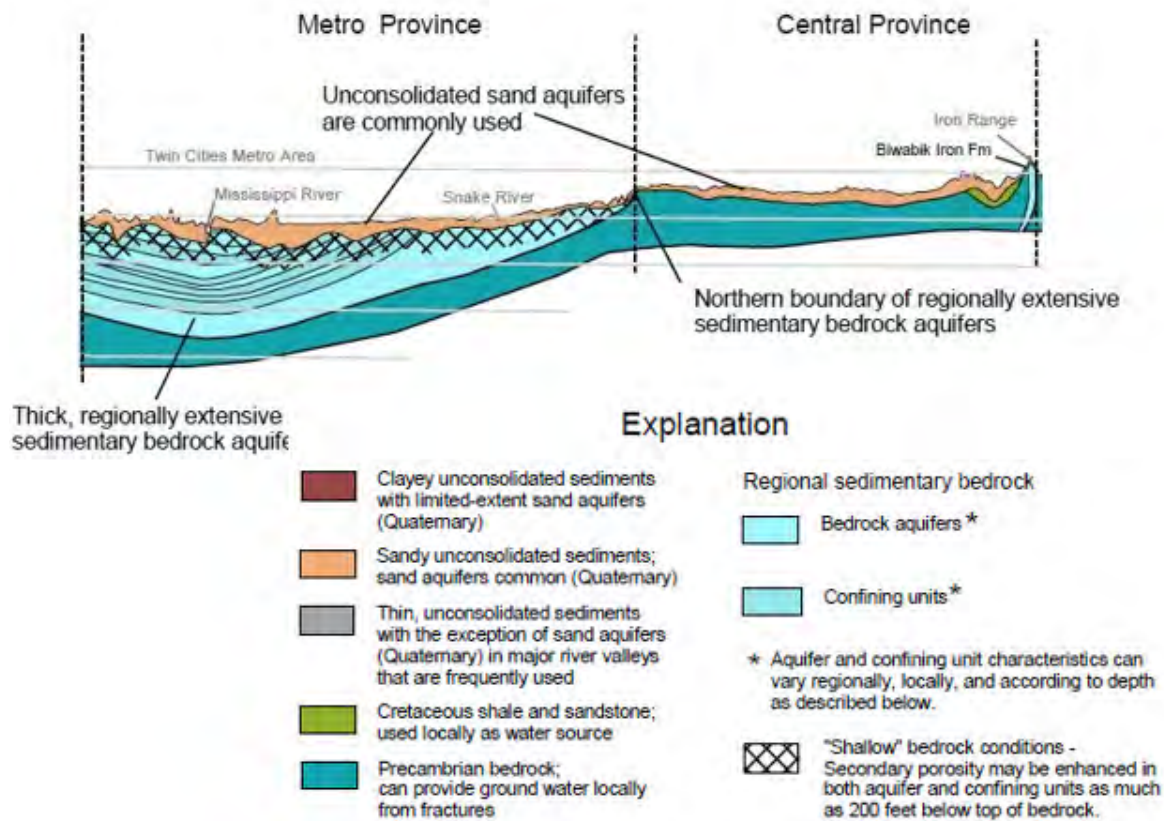
The NFCR Watershed falls within two of Minnesota's six Groundwater Provinces: the Central and Metro Provinces (**Figure 25**). The majority of the watershed lies within the Central Province which is characterized by "sand aquifers in generally thick sandy and clayey glacial drift overlying Precambrian and Cretaceous bedrock" (MnDNR, 2001). The eastern portion of the watershed is within the Metro Province, which is characterized by "sand aquifers in generally thick (greater than 100 feet) sandy and clayey glacial drift overlying Precambrian sandstone and Paleozoic sandstone, limestone, and dolostone aquifers" (MnDNR, 2001).

Figure 25: Metro and Central Province Groundwater Provinces within the NFCR Watershed (Source: MnDNR, 2001)



Source: MPCA, North Fork Crow River Watershed Groundwater Report (Draft December 2015), Figure 25

Figure 26: Minnesota Groundwater Provinces - Generalized Cross Section for Metro and Central Provinces



Source: Jim Berg, MnDNR, *Minnesota Ground Water Provinces – Generalized Cross Sections* (November 2001).

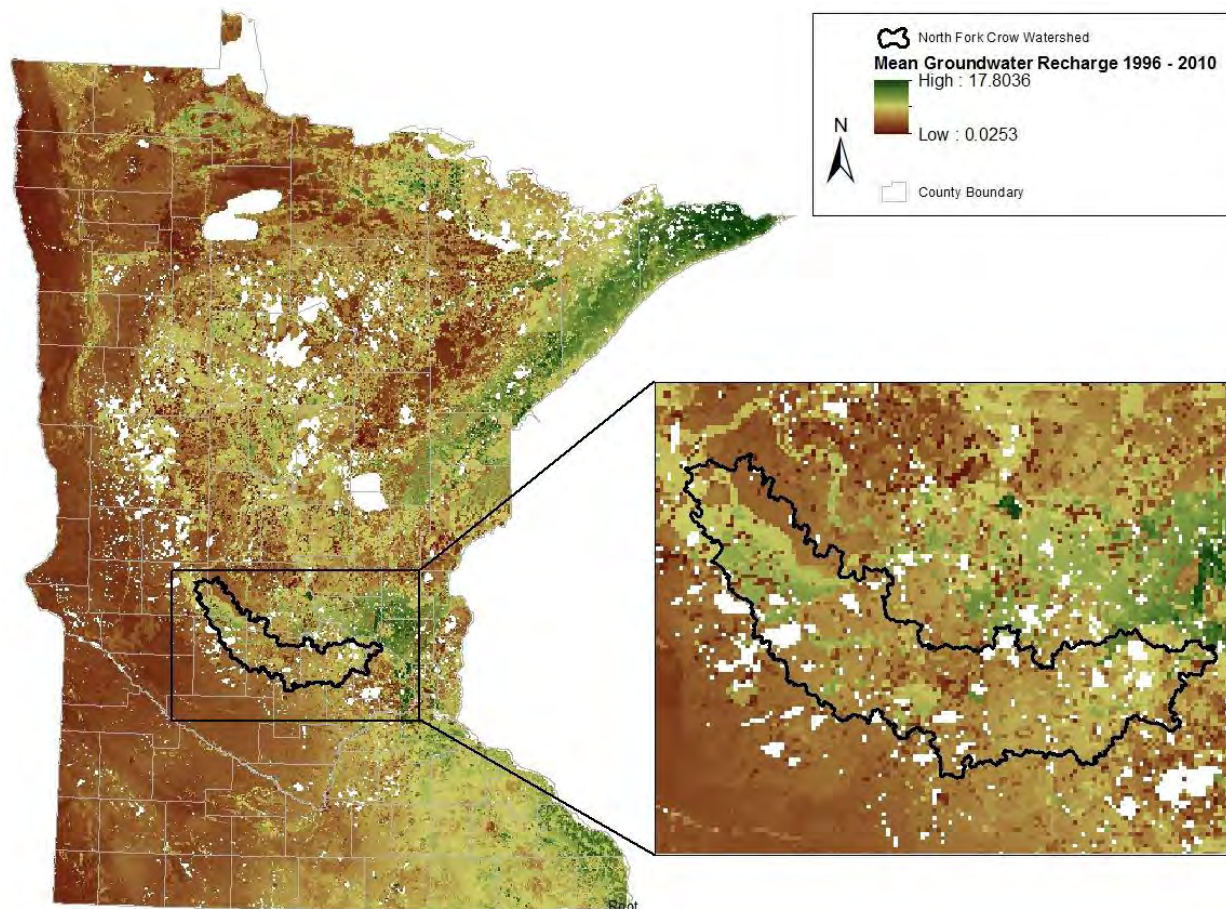
6.5 GROUNDWATER POTENTIAL RECHARGE

Groundwater recharge is one of the most important parameters in the calculation of water budgets, which are used in general hydrologic assessments, aquifer recharge studies, groundwater models, and water quality protection. Recharge is a highly variable parameter, both spatially and temporally, making accurate estimates at a regional scale difficult to produce. The MPCA contracted the US Geological Survey to develop a statewide estimate of recharge using the SWB – Soil-Water-Balance Code. The result is a gridded data structure of spatially distributed recharge estimates that can be easily integrated into regional groundwater studies. The full report of the project as well as the gridded data files are available at: <https://gisdata.mn.gov/dataset/geos-gw-recharge-1996-2010-mean>

Recharge of these aquifers is important and limited to areas located at topographic highs, those with surficial sand and gravel deposits, and those along the bedrock-surficial deposit interface (**Figure 27**). Typically, recharge rates in unconfined aquifers are estimated at 20 to 25 percent of precipitation received, but can be less than 10 percent of precipitation where glacial clays or till are present. For NFCR Watershed, the average annual

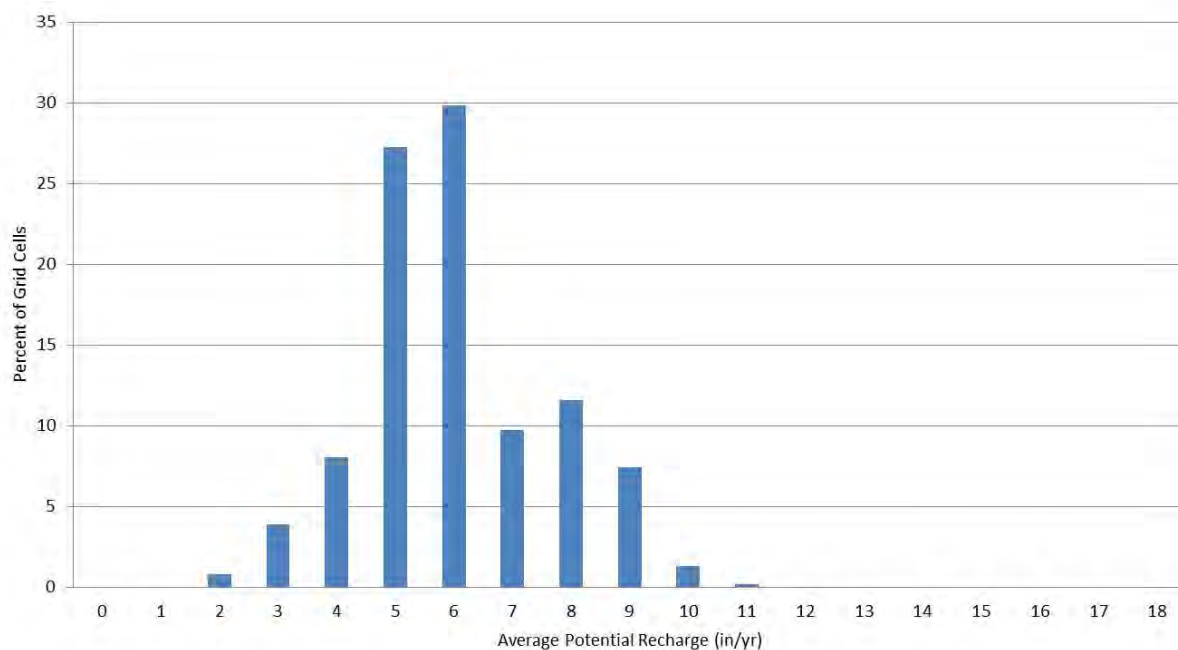
potential recharge rate to surficial materials ranges from 1.3 to 10.5 inches per year, with an average of 5.5 inches per year (**Figure 28**). The statewide average potential recharge is estimated to be four (4) inches per year with 85 percent of all recharge ranging from three (3) to eight (8) inches per year (**Figure 29**). When compared to the statewide average potential recharge, the NFCR Watershed receives a higher average and range of potential recharge, mostly likely attributed to the variability of the surficial sediment distribution of the area.

Figure 27: Average Annual Potential Recharge Rate to Surficial Materials in North Fork Crow River Watershed (1996-2010)



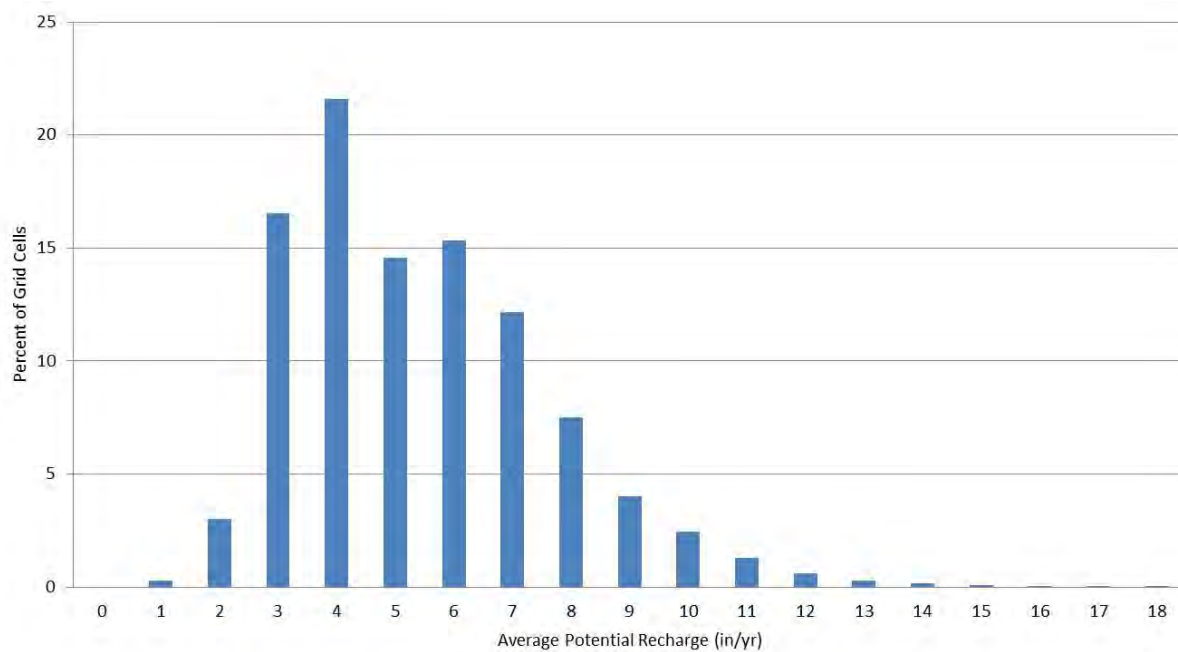
Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 26.

Figure 28: Average Annual Potential Recharge Rate Percent of Grid Cells in the North Fork Crow River Watershed (1996-2010)



Source: MPCA, North Fork Crow River Watershed Groundwater Report (Draft December 2015), Figure 27.

Figure 29: Average Annual Potential Recharge Rate Percent of Grid Cells Statewide (1996-2010)



Source: MPCA, North Fork Crow River Watershed Groundwater Report (Draft December 2015), Figure 28.

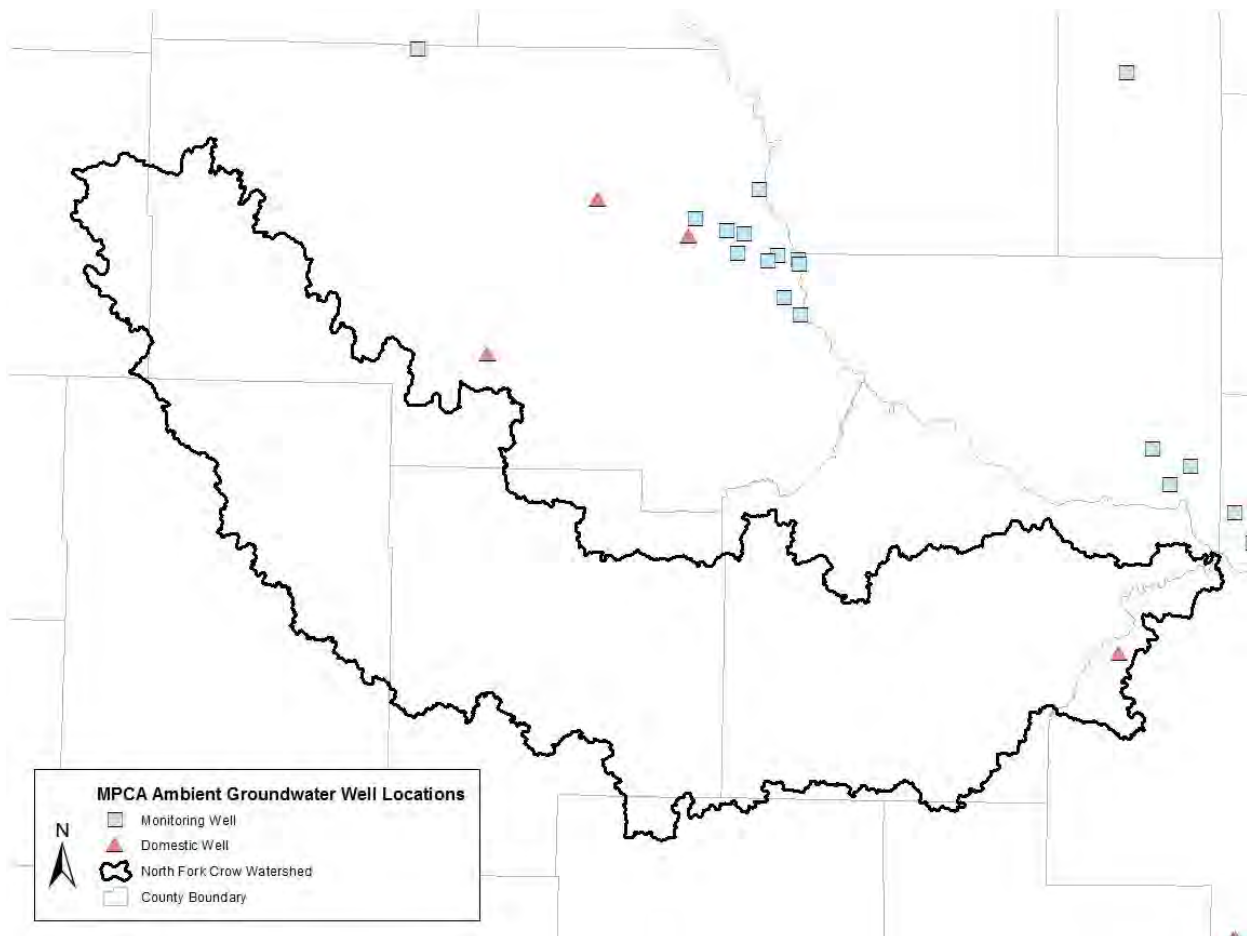
7 GROUNDWATER QUALITY

7.1 AMBIENT GROUNDWATER NETWORK

Approximately 75 percent of Minnesota's population receives their drinking water from groundwater, undoubtedly indicating that clean groundwater is essential to the health of its residents. The MPCA Ambient Groundwater Monitoring Program monitors trends in statewide groundwater quality by sampling for a comprehensive suite of chemicals including nutrients, metals, and volatile organic compounds. These ambient wells represent a mix of deeper domestic wells and shallow monitoring wells. The shallow wells interact with surface waters and exhibit impacts from human activities more rapidly. Available data from federal, state and local partners are used to supplement reviews of groundwater quality in the region.

There is currently one (1) MPCA Ambient Groundwater Monitoring well (domestic) within the NFCR Watershed. **Figure 30** displays the locations of ambient groundwater wells within and around this watershed.

Figure 30: MPCA Ambient Groundwater Monitoring Well Locations near the North Fork Crow River Watershed



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 30.

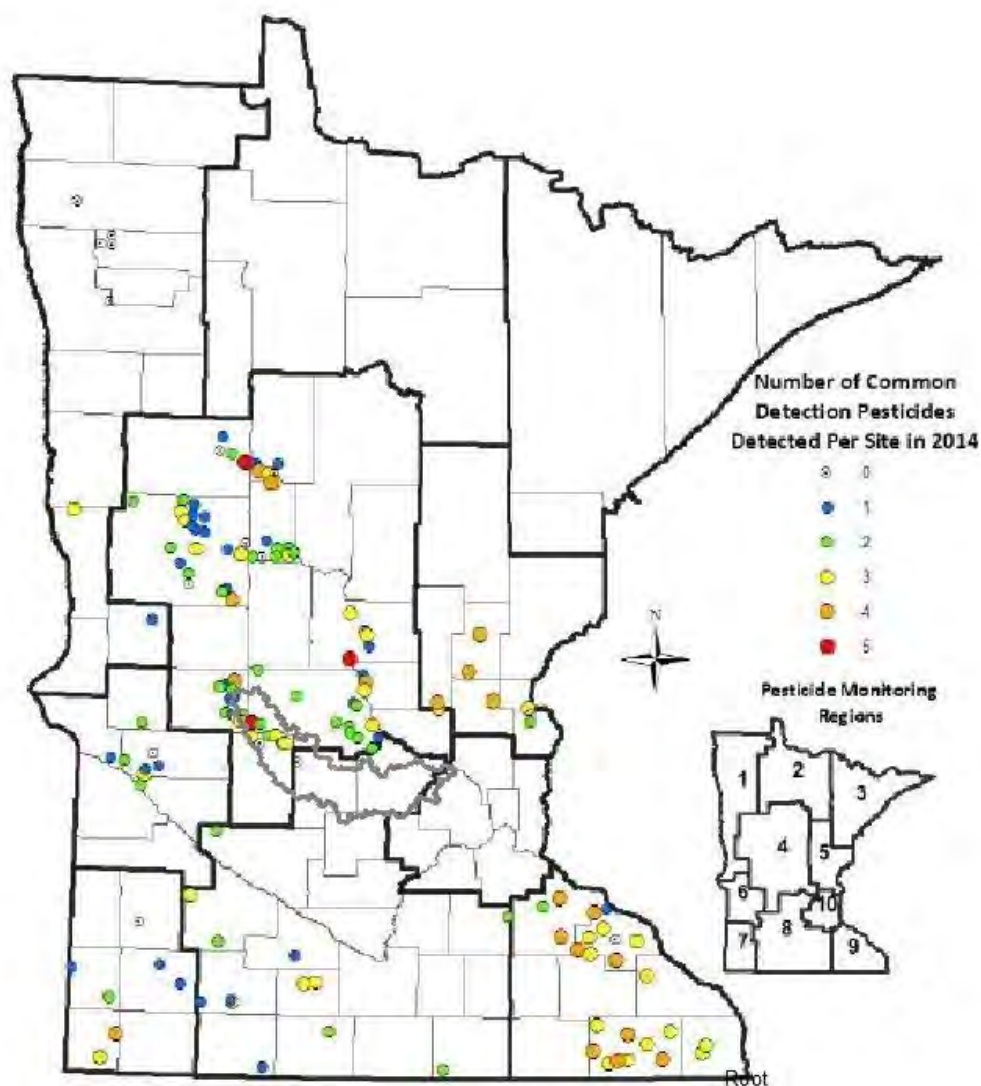
7.2 REGIONAL GROUNDWATER QUALITY

According to the MPCA NFCR Watershed Groundwater Report, from 1992 to 1996, the MPCA conducted baseline water quality sampling and analysis of Minnesota's principal aquifers based on dividing Minnesota into six hydrogeologic regions: Northwest, Northeast, Southwest, Southeast, North Central and Twin Cities Metropolitan Regions. The NFCR lies primarily within the Southwest and North Central Hydrogeologic Regions. The baseline study determined that the groundwater quality in the Southwest Region is considered poor when compared to other areas with similar aquifers, with exceedances of drinking criteria in antimony, beryllium, boron, manganese, nitrate, vanadium and zinc. The groundwater quality in the North Central Region is considered very good, but identified exceedances in arsenic, beryllium, boron, manganese, nickel, nitrate, selenium, thallium and vanadium. The exceedances identified were contributed to natural sources, such as geology, residence times and well construction. However, nitrate concentration was identified as the primary concern in both hydrogeologic regions, which is associated with anthropogenic sources. Volatile organic compounds (VOCs) were also detected in both regions with the most commonly detected compounds associated with fuel oils, gasoline and well disinfection.

The Minnesota Department of Agriculture (MDA) monitors pesticides and nitrate on an annual basis in groundwater across agricultural areas in the state. The MDA also separates the state into regions, which consist of ten regional water quality monitoring networks referred to as Pesticide Monitoring Regions (PMRs). The NFCR Watershed lies within the regional water quality monitoring networks for Region 4 (PMR 4) and Region 8 (PMR 8). PMR4 is also referred to as the Central Sands Region and PMR 8 is referred to as the South Central Region.

The Monitoring and Assessment Unit (MAU) of the MDA sampled 167 sites throughout Minnesota for pesticides in groundwater in 2014. Within the NFCR Watershed, the MAU sampled sites in the northwestern area for the presence of pesticides (**Figure 31**). Although some wells detected up to five common detection pesticides or degradants, which include acetochlor, alachlor, atrazine, metolachlor and metribuzin, no detections exceeded drinking water standards for human consumption.

Figure 31: Pesticide Detections within the North Fork Crow River Watershed (Source: MDA, 2015)



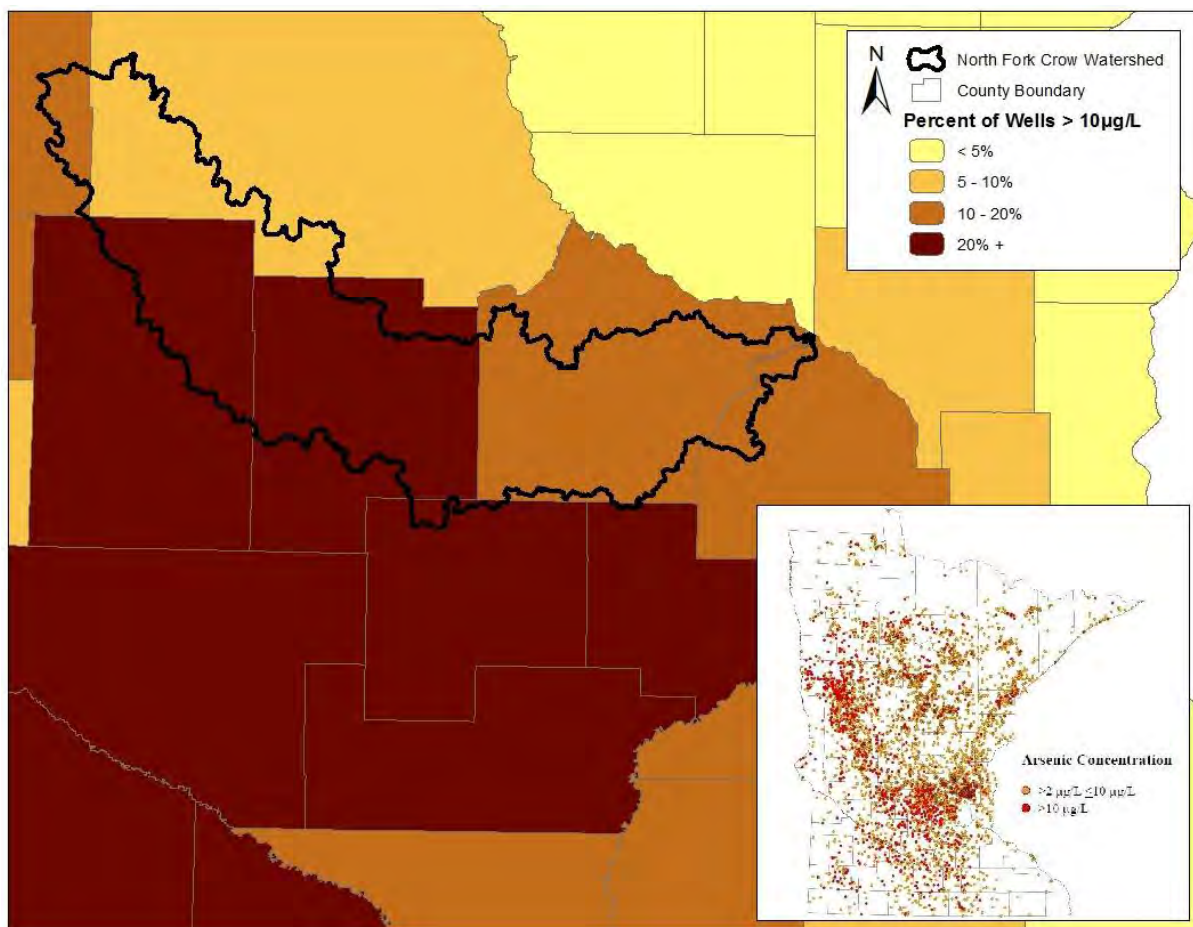
Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 31.

Although there are limited sampling sites specifically within the watershed, both PMRs displayed high levels of nitrogen-nitrate detections. The MDA 2014 Water Quality Monitoring Report (published June 2015) determined that nitrate-nitrogen was detected in 97 percent of the wells sampled in PMR 4 with a median concentration of 15.55 milligrams per liter (mg/L). Of those samples, 14 percent were at or below background level of 3.00 mg/L, 23 percent were within 3.01 and 10.00 mg/L, and 59 percent were above drinking water standard of 10.00 mg/L. For PMR 8, nitrate-nitrogen was detected in 67 percent of samples with a median of 1.00 mg/L, 22 percent were at or below background level of 3.00 mg/L, 14 percent were within 3.01 and 10.00 mg/L, and 25 percent were above drinking

water standard of 10.00 mg/L. Additionally, a MPCA report on the statewide condition of Minnesota's groundwater found that Central and Southwestern regions have the greatest nitrate concentrations in the state, with approximately 20 percent of the shallow sand and gravel aquifer wells exceeding the maximum contaminant level.

Another source of information on groundwater quality comes from the MDH. Mandatory testing for arsenic, a naturally occurring but potentially harmful contaminant for humans, of all newly constructed wells has found that 10.7 percent of all wells installed from 2008 to 2015 have arsenic levels above the maximum contaminant level (MCL) for drinking water of 10 micrograms per liter (MDH, 2015). In the NFCR Watershed, the majority of new wells are within the water quality standards for arsenic levels, but there are exceedances to the MCL. When observing concentrations of arsenic by percentage of wells that exceed the MCL of 10 micrograms/liter per county, the watershed lies within counties that range from five to greater than 20 percent. By county, the percentages of wells identified with concentrations exceeding the MCL are as follows: Pope (16.1%), Stearns (7.0%), Wright (19.7%), Hennepin (15.5%), Carver (23.0%), McLeod (37.9%), Meeker (29.6%) and Kandiyohi (29.1%) (**Figure 32**). For more information on arsenic in private wells, please refer to the MDH, Well Management Program website: <http://www.health.state.mn.us/divs/eh/wells/waterquality/arsenic.html>.

Figure 32: Percent Wells with Arsenic Occurrence Greater Than the Maximum Containment Level (2008-2015) (Source: MDH, 2014)



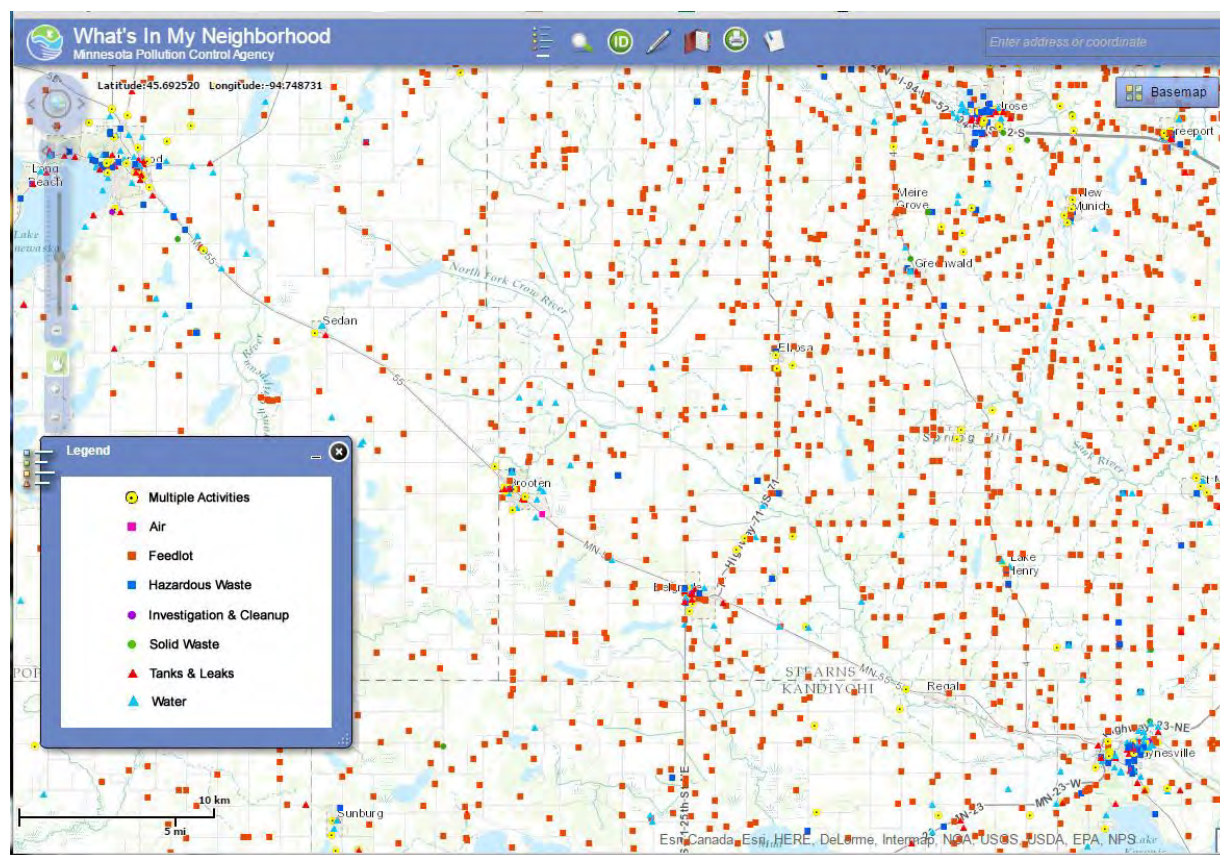
Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 32.

A statewide dataset of potentially contaminated sites and facilities with environmental permits and registrations is available at the MPCA's website, through a web-based application called, "What's In My Neighborhood". This MPCA resource enables the public a method to access a wide variety of environmental information about communities across the state. The data is divided into two groups. The first is potentially contaminated sites, and includes contaminated properties, formerly contaminated sites, and those that are being investigated for suspicion of being contaminated. The second category is made up of businesses that have applied for and received different types of environmental permits and registrations from the MPCA. An example of an environmental permit would be for a business acquiring a permit for a stormwater or wastewater discharge, requiring it to operate within limits established by the MPCA (Figure 33).

Regulated pollutant sources and permitted wastewater discharge sources are tabulated in Tables 5 and 6 of the NRCR Watershed WRAPS report.

For more information regarding "What's in My Neighborhood", refer to the MPCA webpage at <http://www.pca.state.mn.us/index.php/data/wimn-whats-in-my-neighborhood/whats-in-my-neighborhood.html>

Figure 33: Example Screen Shot of the MPCA Application "What's In My Neighborhood"



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 33.

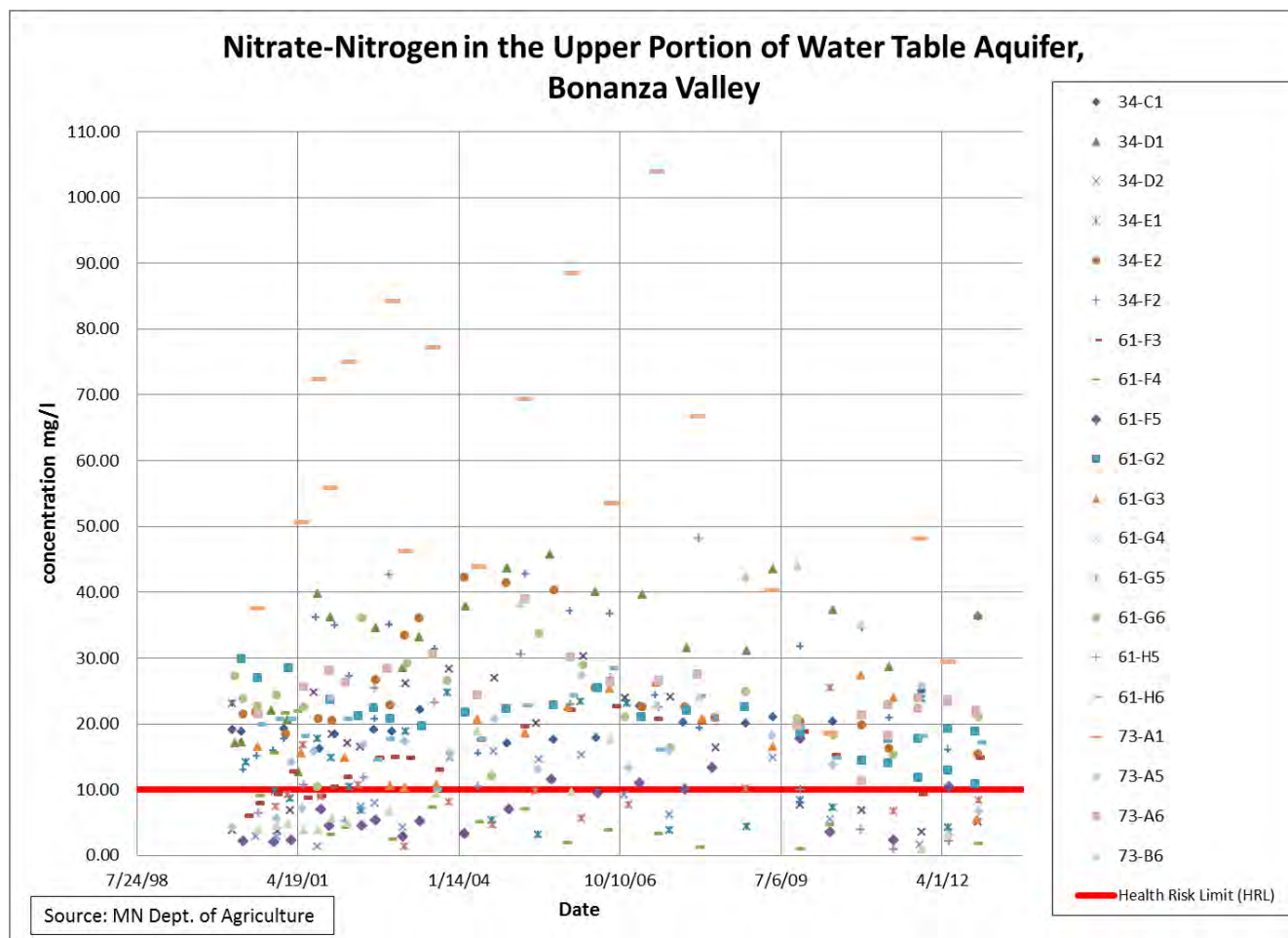
7.3 BONANZA VALLEY GROUNDWATER MANAGEMENT AREA GROUNDWATER QUALITY

Groundwater is at risk of overuse and contamination throughout the state and in some specific areas of the state this risk is a more urgent issue. To address concerns about long term sustainable use of groundwater in these areas, the MnDNR is defining Groundwater Management Areas (GWMA) and developing management plans. As part of a statewide analysis of groundwater resources, the MnDNR identified the Bonanza Valley Groundwater Management Area (GWMA) as an area of specific concern where groundwater resources are at risk of overuse and degraded quality. The MnDNR has drafted the *Bonanza Valley Groundwater Management Area Plan* in response to this concern (MnDNR 2015, Draft).

The upper portion of the NFCR Watershed coincides with the southeastern extent of the Bonanza Valley Aquifer system (**Figure 34**), a regionally important groundwater resource which is highly utilized by area landowners for high capacity use, the majority of which is for crop irrigation (MPCA 2014). In the Bonanza Valley GWMA, movement of groundwater contaminants is recognized as a potential impact to drinking water, other groundwater uses and ecosystems. The water quality in the Quaternary Water Table Aquifer (QWTA) in Bonanza Valley GWMA has been sampled regularly at 20 sites between 2000 and 2012 by the MDA (**Figure 35**). The results show 73 percent of the 421 samples taken had nitrate-Nitrogen levels above 10 mg/l (ppm), the current Minnesota Health Risk Limit (HRL) for nitrate-Nitrogen. Over time (2000–2010), the nitrate-Nitrogen concentrations in the Bonanza Valley GWMA are increasing and the trend is statistically significant as described in the 2012 MDA report (MnDNR 2015, Draft).

 LAND AND WATER RESOURCES INVENTORY

Figure 35: Reported Nitrate-nitrogen concentrations in water table aquifer in Bonanza Valley GWMA



Source: MnDNR, *Bonanza Valley Groundwater Management Area Plan* (Draft July 2015), Figure 4-11.

8 GROUNDWATER QUANTITY

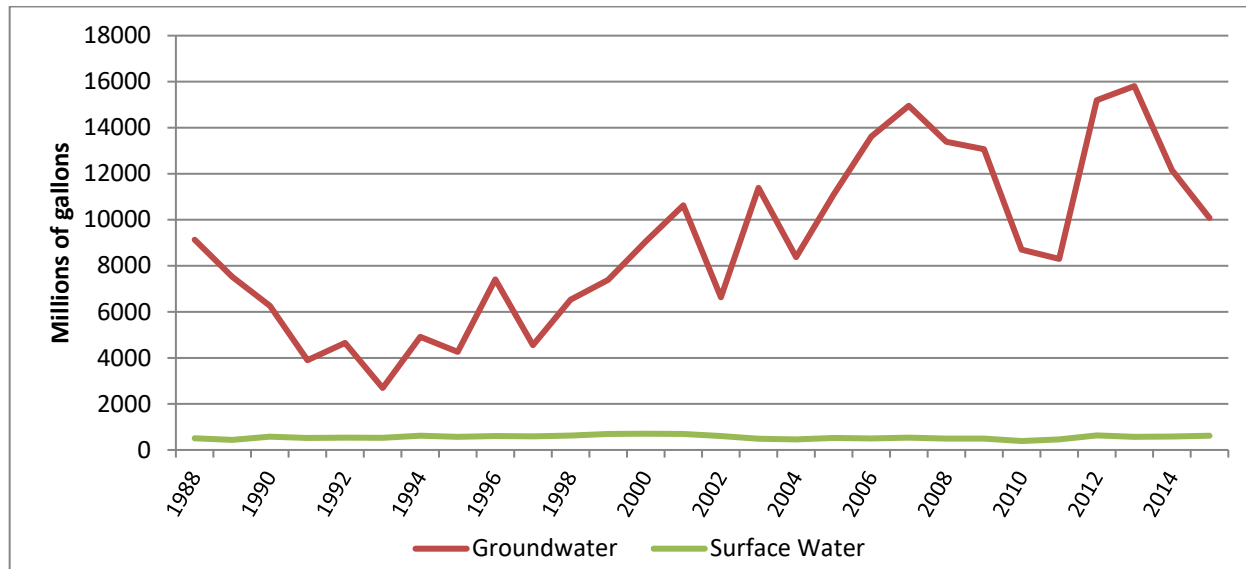
8.1 GROUNDWATER AND SURFACE WATER WITHDRAWALS

The MnDNR permits all high capacity water withdrawals where the pumped volume exceeds 10,000 gallons per day or one million gallons per year. Permit holders are required to track water use and report back to the MnDNR yearly. The changes in withdrawal volume detailed are a representation of water use and demand in the watershed and are taken into consideration when the MnDNR issues permits for water withdrawals. Other factors considered when issuing permits include: interactions between individual withdrawal locations, cumulative effects of withdrawals from individual aquifers, and potential interactions between aquifers. This holistic approach to water allocations is necessary to ensure the sustainability of Minnesota's groundwater resources.

Of all water appropriated in 2015 in the NFCR Watershed (10.7 billion gallons), approximately 94.4% of water appropriations were from groundwater resources. Within the same year, 5.6% of appropriated water came from

surface water resources (**Figure 36**). Water use statistics indicate that the vast majority of historical water use within the NFCR Watershed has been from groundwater resources (MnDNR, Draft, 2016).

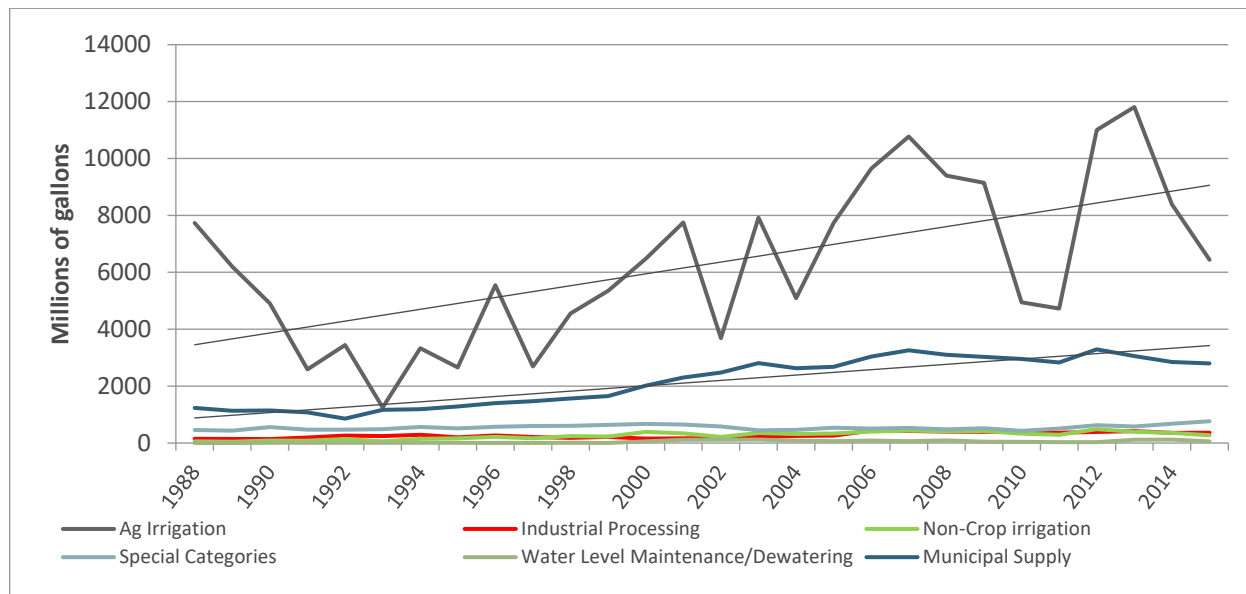
Figure 36: Groundwater vs. Surface Water Use in the North Fork Crow River Watershed (1988-2015)



Source: MnDNR, *Draft Excerpt: North Fork Crow River GRAPS* (Draft, 2016).

In 2015, agricultural crop irrigation comprised the majority of permitted groundwater use in the NFCR Watershed (60.4%) followed by municipal use (26.1%) (**Figure 37**) (MnDNR, Draft, 2016). As shown in **Figure 37**, water use for agricultural crop irrigation from groundwater resources has been gradually increasing over the period of record (1988-2015), as has use for municipal systems (MnDNR, Draft, 2016).

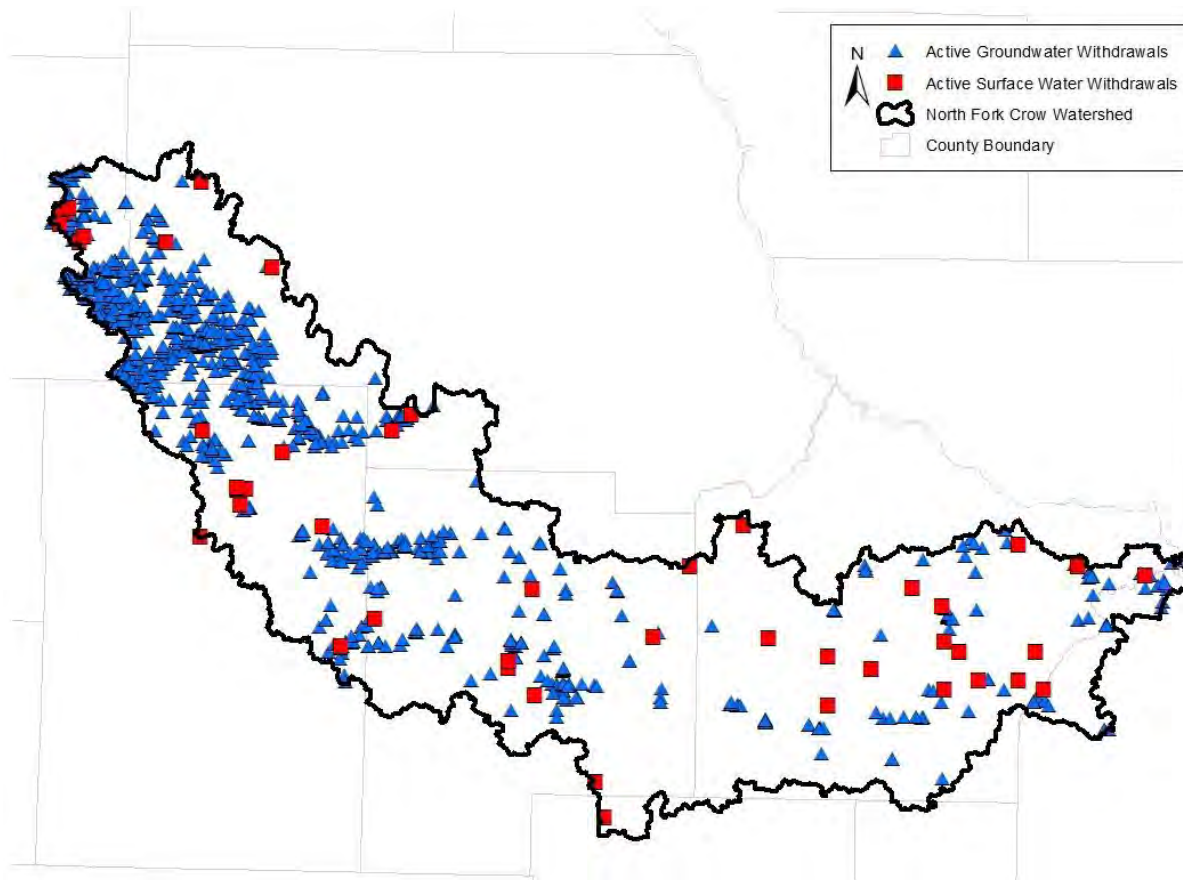
Figure 37: Water Use by Permit Type in the North Fork Crow River Watershed (1988-2015)



Source: MnDNR, *Draft Excerpt: North Fork Crow River GRAPS* (Draft, 2016).

Figure 38 displays total high capacity withdrawal locations within the watershed with active permit status in 2013. Permitted groundwater withdrawals are displayed below as blue triangles and surface water withdrawals as red squares. The increase in groundwater withdrawals can be quantified further by the most recent USGS site-specific water-use data system (SWUDS) data. In 1994, the number of active permits within the watershed for groundwater sources that reported withdrawal quantities was 409, pumping a reported amount of approximately 5.7 billion gallons of water. In 2013, the number of active permits for groundwater that reported withdrawal quantities was 755, withdrawing 15.6 billion gallons of water. For surface water withdrawals in 1994, the number of active permit holders was 20 and withdrew 690 million gallons, while in 2013, the number of active permit holders increased to 41, but the amount withdrawn decreased to 589 million gallons.

Figure 38: Locations of Active Status Permitted High Capacity Withdrawals in 2013 within the North Fork Crow River Watershed



Source: MPCA, *North Fork Crow River Watershed Groundwater Report* (Draft December 2015), Figure 36.

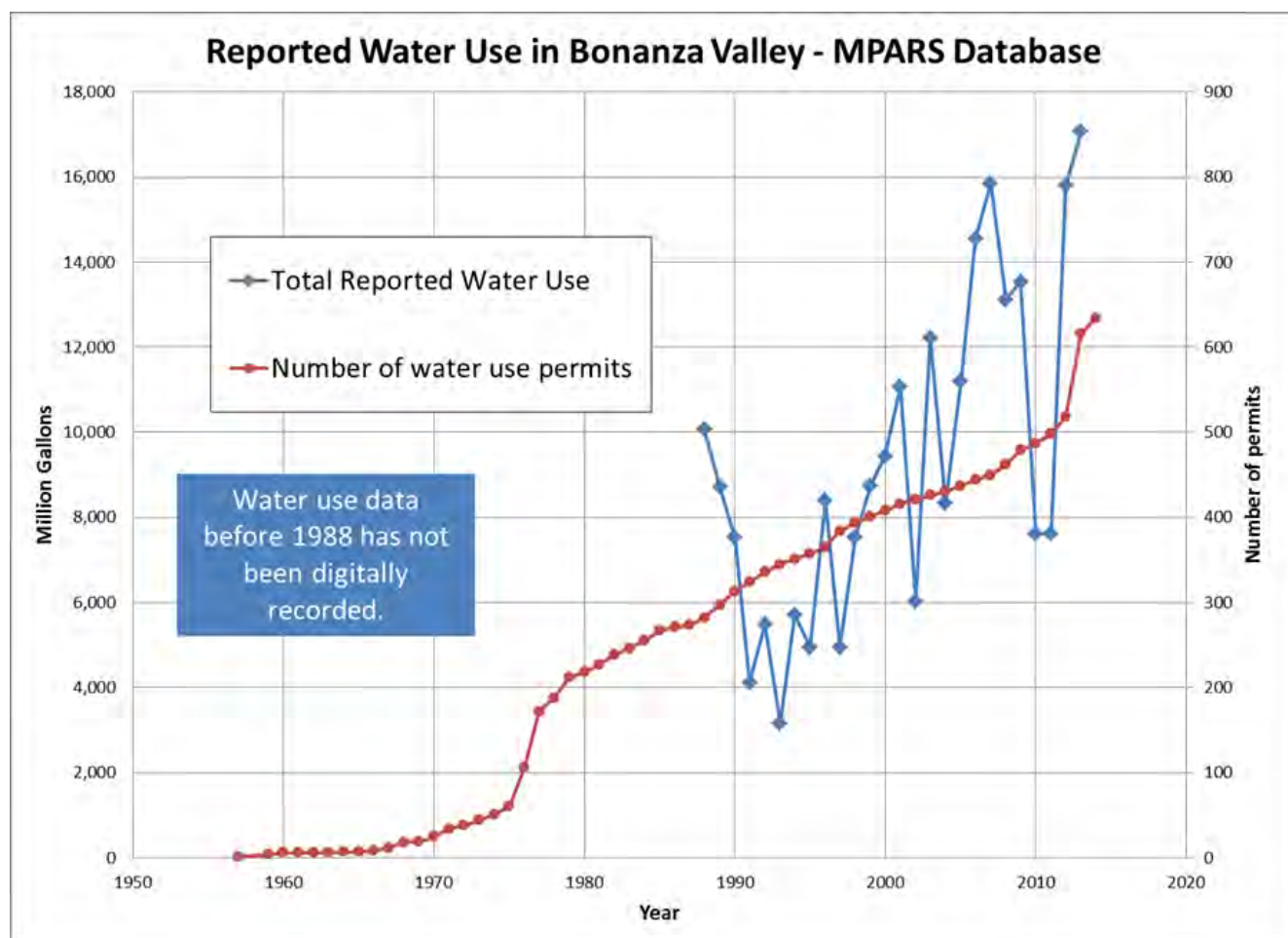
8.2 BONANZA VALLEY GROUNDWATER MANAGEMENT AREA GROUNDWATER WITHDRAWALS

The upper portion of the NFC watershed coincides with the southeastern extent of the Bonanza Valley Aquifer system (see **Figure 34**), a regionally important groundwater resource which is highly utilized by area landowners for high capacity use, the majority of which is for crop irrigation. As part of a statewide analysis of groundwater resources, the MnDNR identified the Bonanza Valley Groundwater Management Area (GWMA) as an area of specific concern where groundwater resources are at risk of overuse. The statewide increase in water demands over the previous 25 years was 35 percent. The growth in water use in the Bonanza Valley GWMA area is over 5 times the growth rate of water use across the state of Minnesota (MnDNR, Draft, 2015).

As presented in the *Bonanza Valley Groundwater Management Plan* (Draft, July 2015), in the past 10 years (2004-2013) of groundwater use in the Bonanza Valley, 91.8 percent was used for irrigation and agricultural products processing, 3 percent was used for municipal water supply, 2.3 percent was estimated for private domestic well use, and 2.9 percent was used for other permitted uses. As of December 2013, the MDH's County Well Index (CWI) showed 5,724 wells on record for the Bonanza Valley which includes all wells, even those that may no longer be in service. The number of wells for both domestic and irrigation purposes has steadily increased since water well records were required in 1974 (**Figures 39-42**). The cumulative number of domestic wells installed in the Bonanza Valley is 3,527 and the cumulative number of wells installed for major crop irrigation is 1,211. The remaining wells are from other categories including commercial, monitoring, industrial, test wells and 18 other categories. Though older wells exist, the CWI well records include only wells constructed from about 1974 to present (MnDNR, Draft, 2015).

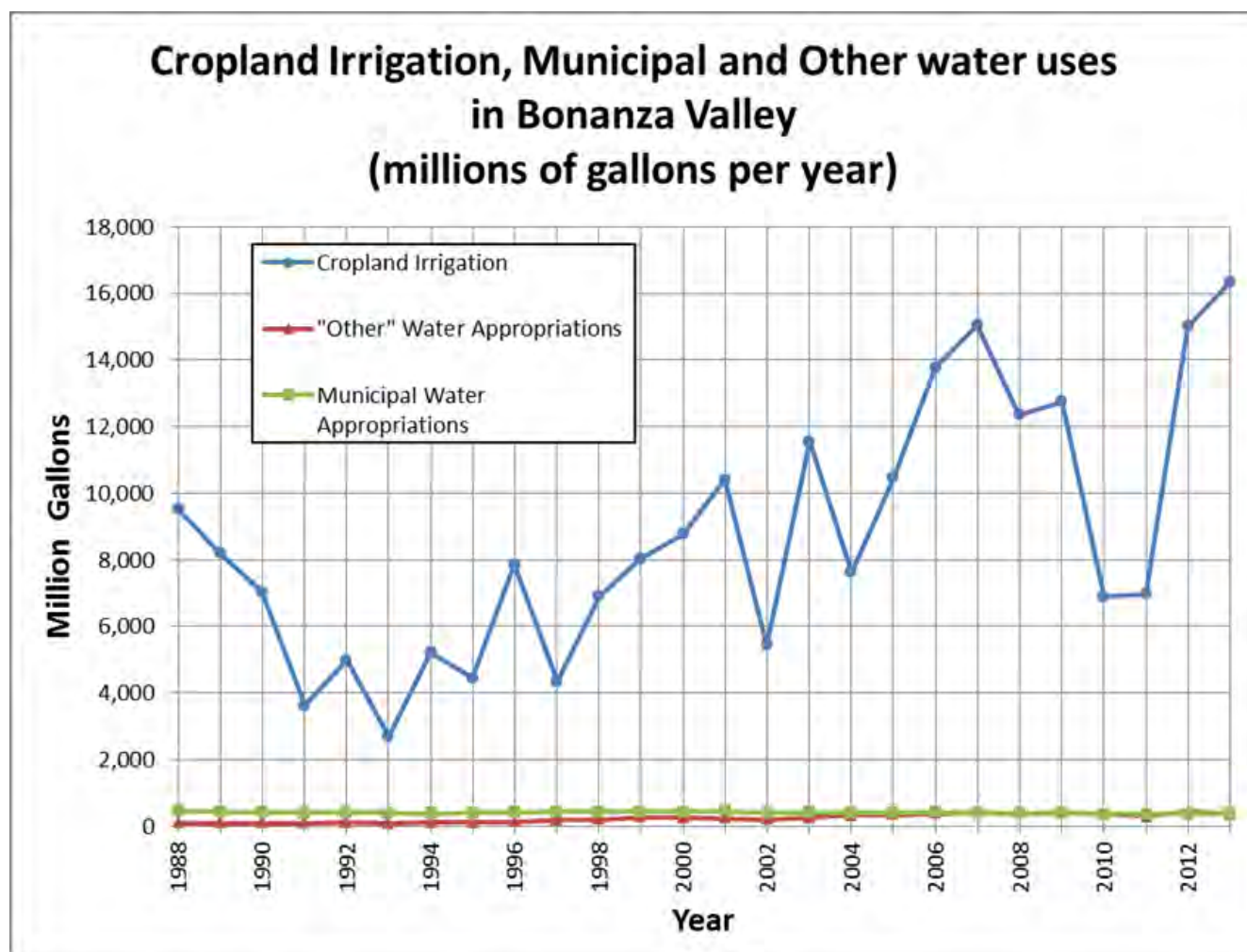
As of December 2014, there were 1,057 active MnDNR permitted wells in the Bonanza Valley on file with the MnDNR. An active well is a well boring that contributes to the amount of water allowed in the water appropriation permit. Some water appropriation permits may have multiple wells. There are 367 inactive groundwater appropriation permits on file (MnDNR, Draft, 2015).

Figure 39: Reported Water Use (1988 – 2013) and Number of Permits in BV GWMA



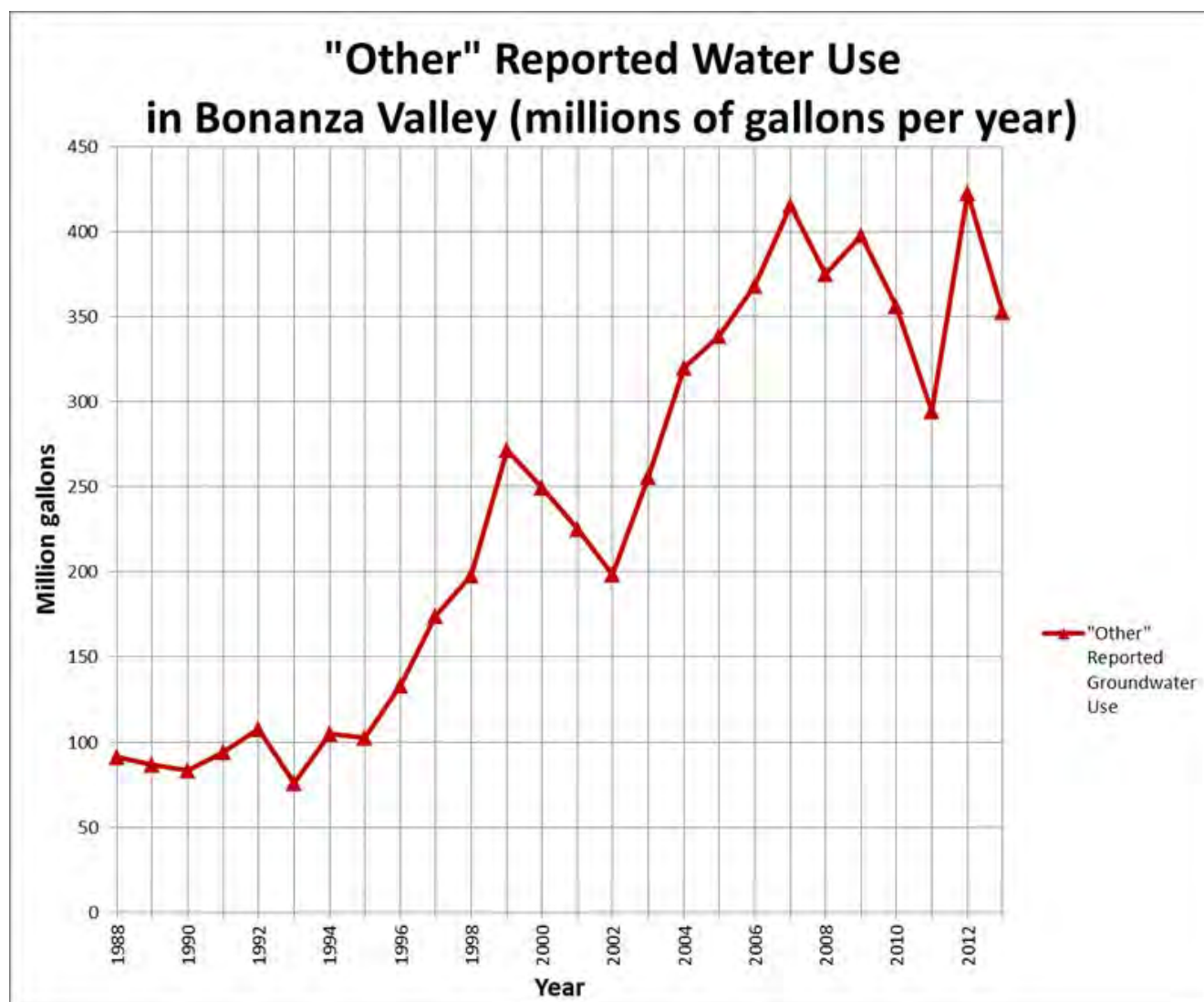
Source: MnDNR, *Bonanza Valley Groundwater Management Area Plan* (Draft July 2015), Figure 2-7.

Figure 40: Water use in the Bonanza Valley GWMA by type of appropriation



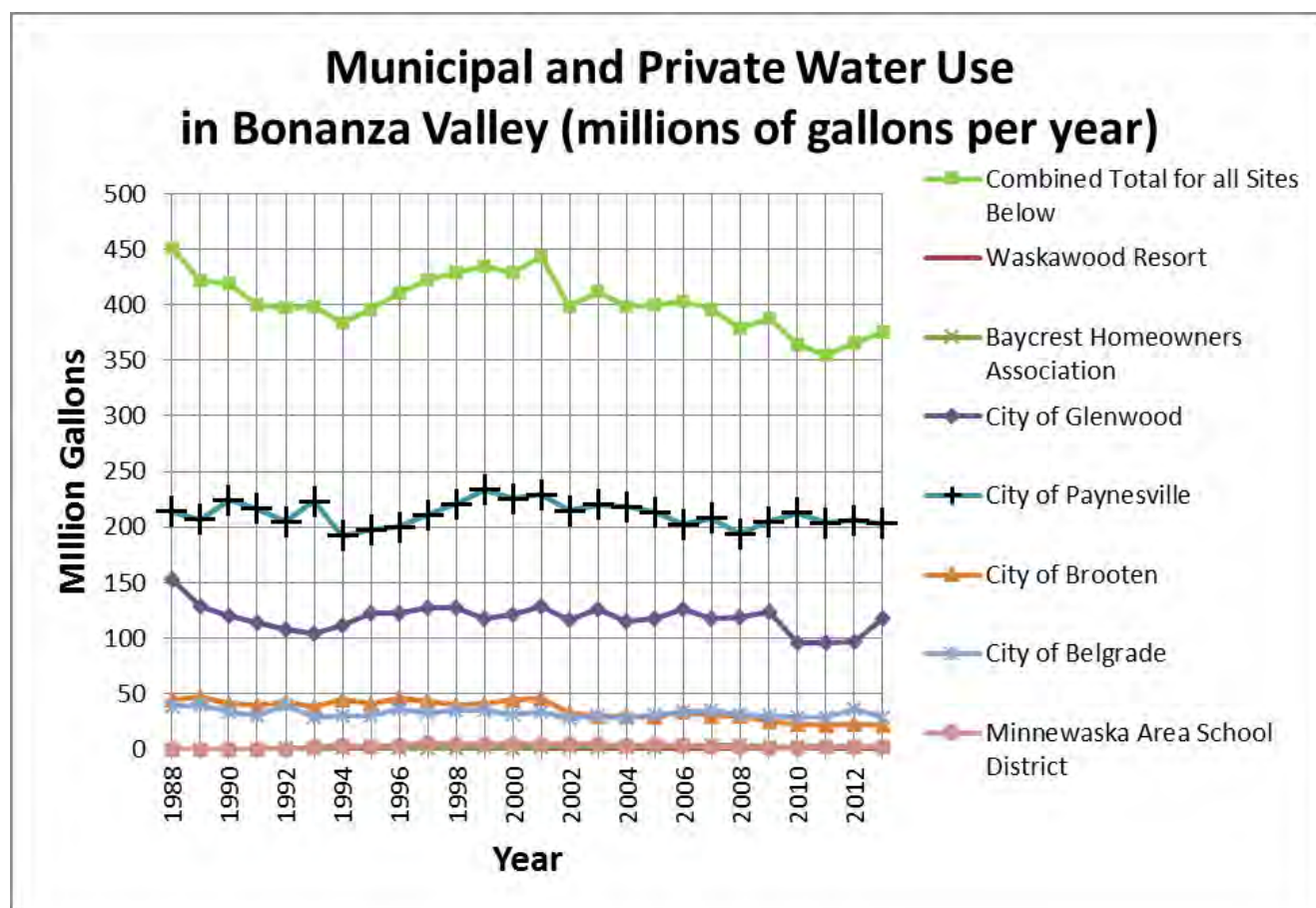
Source: MnDNR, *Bonanza Valley Groundwater Management Area Plan* (Draft July 2015), Figure 2-8.

Figure 41: Water use in the Bonanza Valley GWMA by "Other" type of appropriation from Figure 40 above.



Source: MnDNR, *Bonanza Valley Groundwater Management Area Plan* (Draft July 2015), Figure 2-9.

Figure 42: Water use in the Bonanza Valley GWMA by Municipal and Private Use type of appropriation from Figure 41 above



Source: MnDNR, *Bonanza Valley Groundwater Management Area Plan* (Draft July 2015), Figure 2-10.

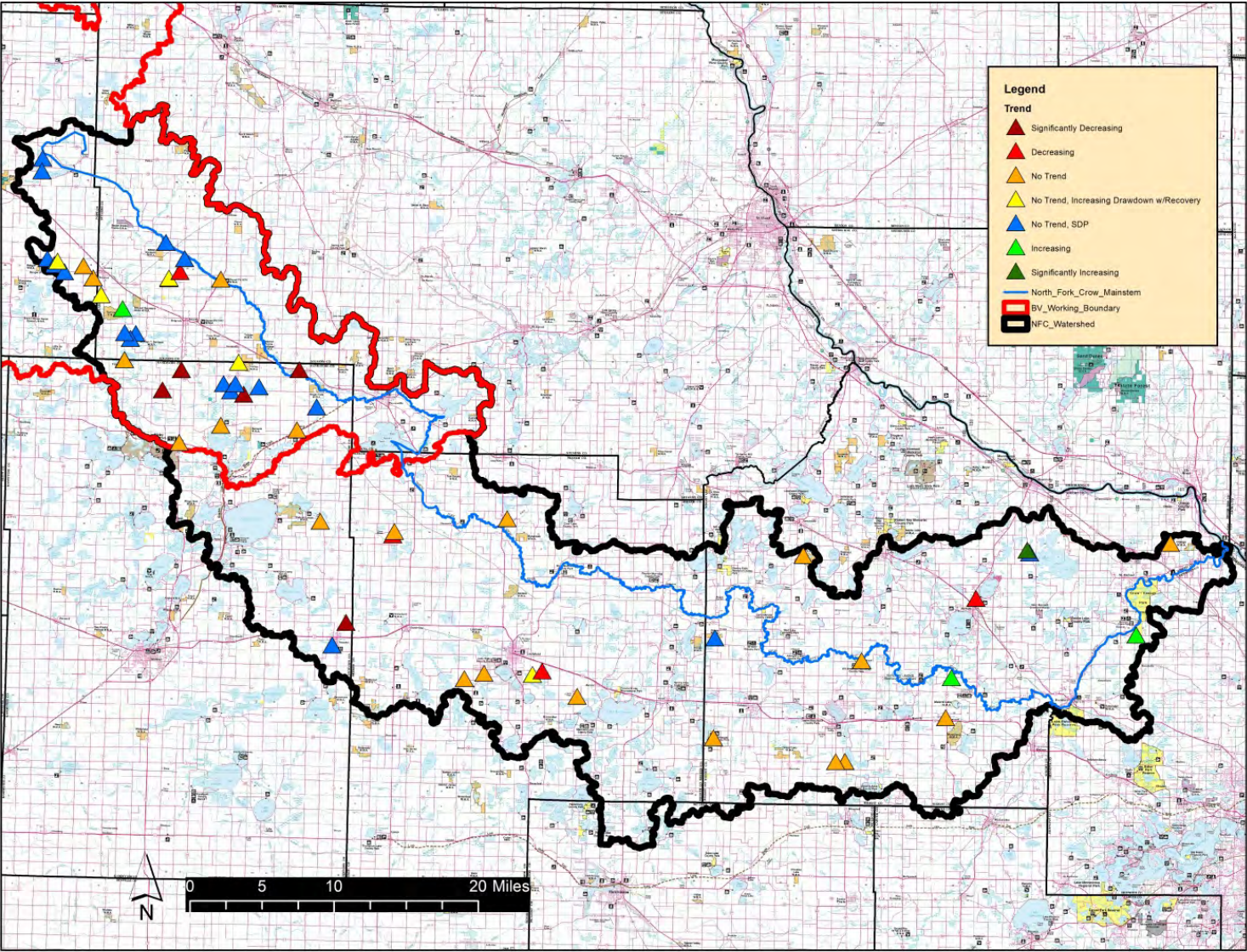
8.3 MINNESOTA DEPARTMENT OF NATURAL RESOURCES OBSERVATION WELLS

Monitoring wells from the MnDNR Observation Well Network track the elevation of groundwater across the state. The elevation of groundwater is measured as depth to water in feet and reflects the fluctuation of the water table as it rises and falls with seasonal variations and anthropogenic influences. To access the MnDNR Observation Well Network, please visit: <http://www.dnr.state.mn.us/waters/cgm/index.html>.

As part of the North Fork Crow River Groundwater Restoration and Protection Strategy (GRAPS) effort, an assessment of water level trends in MnDNR observation wells within the NFCR Watershed was conducted. The placement of observation wells in proximity to areas of concentrated use or very high capacity users can be used to measure of sustainability in regards to long term use of water resources. Historically, wells can also be used in proximity to potentially sensitive resources to determine direct effects of seasonal or long term use on water levels (MnDNR, Draft, 2016).

Decreasing water level trends were noted in 11 wells (**Figure 43**), with decreasing trends noted in wells sourced in both QWTA and QBAA formations. A number of wells also displayed significant drawdowns with recovery at the end of each water year. Of these wells, nine wells displayed increasing drawdowns in more recent years compared to historic information, the majority of which are located within the Bonanza Valley GWMA and sourced in QBAA formations. Increasing drawdowns can be indicative of use trends beginning to push aquifers towards sustainability limits (MnDNR, Draft, 2016).

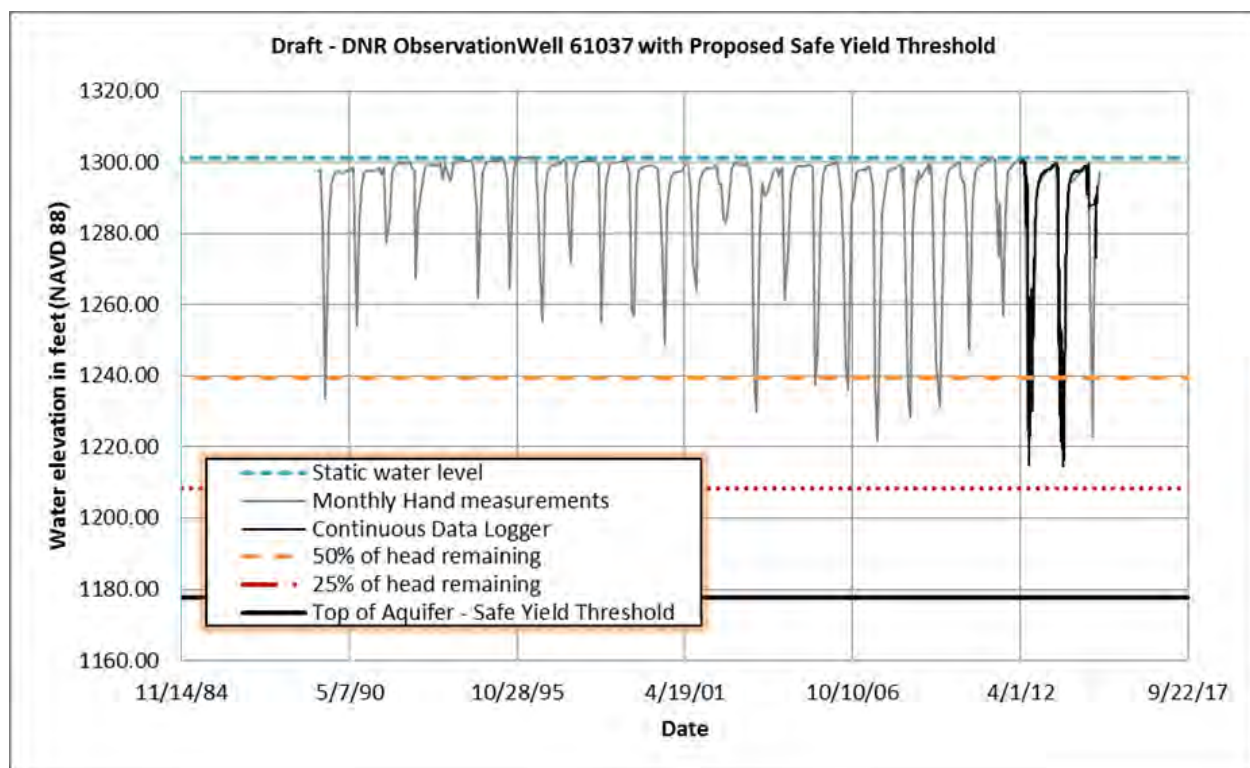
Figure 43: Observation Well Water Level Trend Information in the North Fork Crow River Watershed



Source: MnDNR, Draft Excerpt: North Fork Crow River GRAPS (Draft, 2016).

Part of the *Bonanza Valley Groundwater Management Plan* (Draft, July 2015) included a hydrograph analysis of MnDNR observation wells within the Bonanza Valley GWMA. There are 58 actively measured MnDNR water-level observation wells within the Bonanza Valley GWMA boundary area. Thirty nine wells are constructed in the water table aquifer and 19 are constructed into buried aquifers. Hydrograph analysis from the 16 MnDNR observation wells with established water level records in buried aquifers shows that 4 wells have been drawn down below the level of 50% of remaining head pressure (i.e.: **Figure 48**). Of those wells, there have been 30 (number of occurrences) times where water in the observation well has been drawn down below the 50% of remaining head pressure. A greater number of these drawdowns have occurred in recent years. No MnDNR observation wells have been drawn down past the 25% of remaining head pressure (MnDNR, Draft, 2015).

Figure 44: MnDNR observation well hydrograph for buried artesian aquifer within the Bonanza Valley GWMA



Source: MnDNR, *Bonanza Valley Groundwater Management Area Plan* (Draft, July 2015), Figure 4-8.

9 FISH, WILDLIFE, AND RARE AND ENDANGERED FEATURES

9.1 FISH AND WILDLIFE HABITAT

9.1.1 TERRESTRIAL ENVIRONMENT

There is currently no readily available, watershed-wide assessments of the wildlife within the NFCR Watershed.

The NFCR Watershed is primarily located within the North Central Hardwood Forest Ecoregion with a small portion of the south-central watershed in Meeker and Kandiyohi counties located in the Western Cornbelt Plains Ecoregion. As identified in the MnDNR and U.S. Forest Service developed Ecological Classification System, the NFCR Watershed resides within the Prairie Parkland Province and Eastern Broadleaf Forest Province. Within these provinces, the watershed is more precisely located within the North Central Glaciated Plains Section and Minnesota and Northeast Iowa Morainal Section and the Minnesota River Prairie (west), Hardwood Hills (north central), and Big Woods (east) subsection units of the said sections. These are further defined on the MnDNR website for the Ecological Classification System: <http://www.dnr.state.mn.us/ecs/index.html> (MnDNR, 2016).

Furthermore, refer to **Section 9.2.2** of this Land and Water Resources Inventory, which presents the Minnesota County Biological Survey, Sites of Biodiversity Significance and Native Plant Communities.

9.1.2 AQUATIC

The MPCA NFCR Watershed Biotic Stressor Identification Report (March 2014) presents a summary of key causes or “stressors” that contribute to impaired fish and aquatic macroinvertebrate communities in the NFCR. This report is located on the MPCA’s website:

<https://www.pca.state.mn.us/sites/default/files/wq-ws5-07010204b.pdf> (MPCA, March 2014).

9.2 RARE AND ENDANGERED FEATURES

9.2.1 RARE AND ENDANGERED PLANT AND ANIMAL SPECIES

Minnesota’s Endangered Species Statute (MS.84.0895) requires the MnDNR to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of concern. Corresponding regulations that regulate the treatment of species designated as endangered and threatened is in Minnesota Administrative Rules (MN R.6212.1800 - 6212.2300). There are twenty-nine (29) species of plants and animals within the NFCR 1W1P Boundary that are listed in Minnesota’s List of Endangered, Threatened, and Special Concern Species (MN R. 6134).

The MnDNR tracks occurrences of state-listed rare species in the Natural Heritage Information System (NHIS). The NHIS also has listed an additional 3 “Watchlist” species, 9 “Animal Assemblages” and 103 “Terrestrial Communities”, which have no particular legal status, but are monitored. These species of interest within the NFCR 1W1P Boundary have been tabulated and provided in **Attachment 1**. A separate list of mollusks that have been found within the watershed is provided as **Attachment 2**. There are six (6) species of “Common or Presumed Healthy” species and two (2) species listed as Special Concern species.

Plant and animal species designated as *Endangered* or *Threatened* at the state or federal level or designated as a *species of Special Concern* are defined as:

“Endangered” plants and animals are threatened with extinction throughout all or a significant portion of their ranges in Minnesota.

“Threatened” plants and animals are likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges in Minnesota.

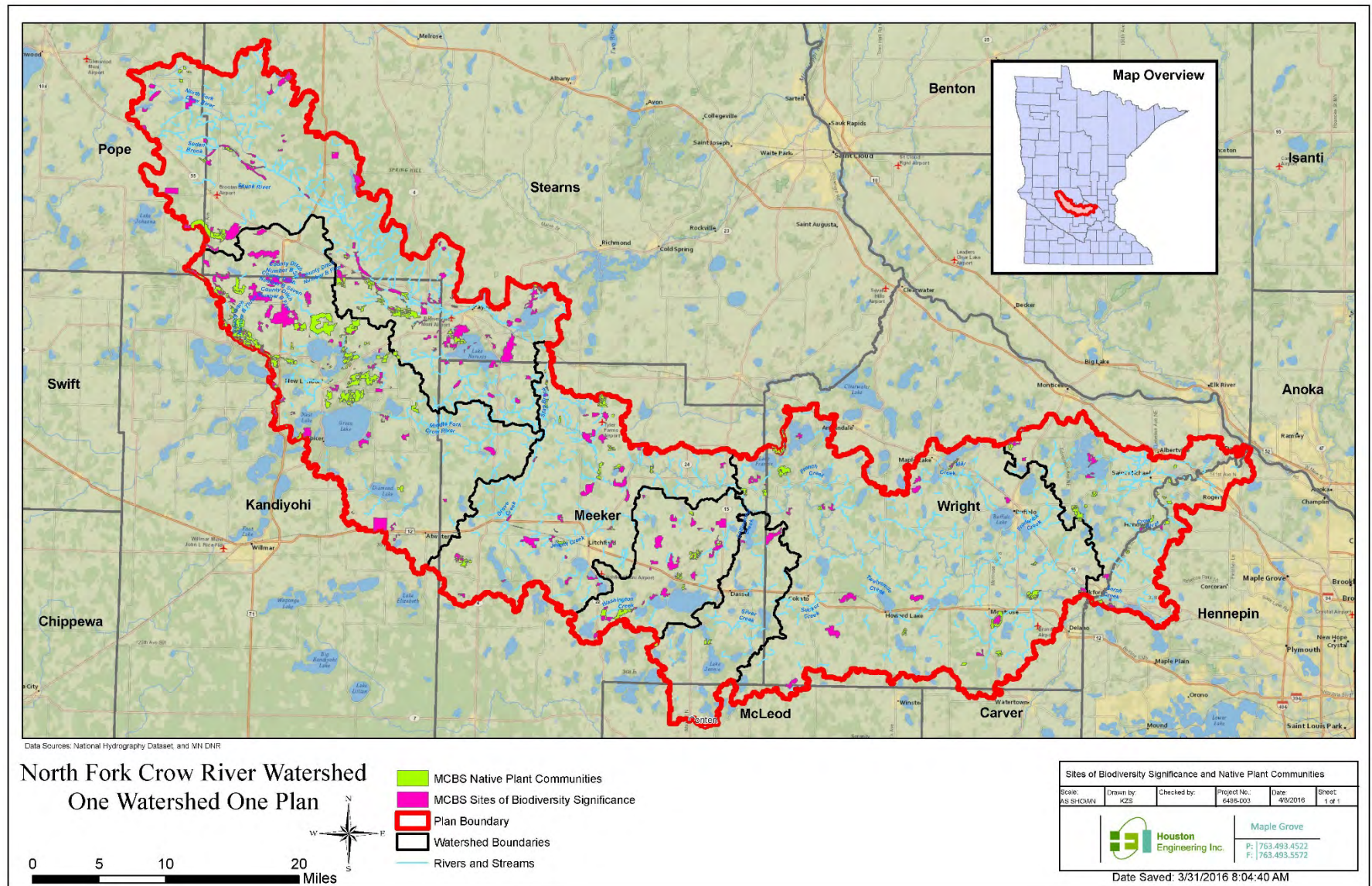
“Special Concern” plants and animals are extremely uncommon in Minnesota, or have unique or highly specific habitat requirements, and deserve careful monitoring. Species on the periphery of their ranges that are not listed as threatened may be included in this category along with those species that were once threatened or endangered but now have increasing or protected, stable populations.

9.2.2 MCBS SITES OF BIODIVERSITY SIGNIFICANCE AND NATIVE PLANT COMMUNITIES

The Minnesota County Biological Survey (MCBS) is a MnDNR program within the Division of Ecological and Water Resources with the goal of identifying significant natural areas and collecting and interpreting data on the distribution and ecology of rare plants, rare animals, and native plant communities. Data collected by MCBS are entered into the Natural Heritage Information System, managed by the DNR's Division of Ecological and Water Resources. As a result of this systematic survey, the relative ecological importance of natural areas and representative ecological landscapes can be assessed.

Following the initial mapping of native plant communities from aerial photos in each county, MCBS ecologists delineated sites of biodiversity significance that helped to geographically organize the data. According to the MCBS data, there are 359 sites of biodiversity significance encompassing approximately 39,215 acres within the NFCR Watershed and 351 native plant communities encompassing approximately 15,957 acres, identified. Minnesota Sites of Biodiversity Significance and Native Plant Communities are shown in **Figure 45**.

Figure 45: Minnesota County Biological Survey (MCBS) Sites of Biodiversity Significance and Native Plant Communities



10 REFERENCES

Minnesota Department of Natural Resources (2016), Wild & Scenic Rivers Program, *The Wild & Scenic North Fork of the Crow River*:

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Attachments

Endangered, Threatened, and Special Concern Species in the North Fork Crow River Watershed

Scientific Name	Common Name	Category	State Protection Status
Lanius ludovicianus	Loggerhead Shrike	Vertebrate Animal	Endangered
Oarisma poweshiek	Poweshiek Skipperling	Invertebrate Animal	Endangered
Carex sterilis	Sterile Sedge	Vascular Plant	Threatened
Emydoidea blandingii	Blanding's Turtle	Vertebrate Animal	Threatened
Hudsonia tomentosa	Beach-heather	Vascular Plant	Threatened
Notropis anogenus	Pugnose Shiner	Vertebrate Animal	Threatened
Phalaropus tricolor	Wilson's Phalarope	Vertebrate Animal	Threatened
Alisma gramineum	Narrow-leaved Water Plantain	Vascular Plant	Special Concern
Buteo lineatus	Red-shouldered Hawk	Vertebrate Animal	Special Concern
Cirsium pumilum var. hillii	Hill's Thistle	Vascular Plant	Special Concern
Cygnus buccinator	Trumpeter Swan	Vertebrate Animal	Special Concern
Cypripedium candidum	Small White Lady's-slipper	Vascular Plant	Special Concern
Etheostoma microperca	Least Darter	Vertebrate Animal	Special Concern
Gallinula galeata	Common Gallinule	Vertebrate Animal	Special Concern
Lasmigona compressa	Creek Heelsplitter	Invertebrate Animal	Special Concern
Ligumia recta	Black Sandshell	Invertebrate Animal	Special Concern
Limosa fedoa	Marbled Godwit	Vertebrate Animal	Special Concern
Microtus ochrogaster	Prairie Vole	Vertebrate Animal	Special Concern
Najas guadalupensis ssp. olivacea		Vascular Plant	Special Concern
Najas guadalupensis ssp. olivacea		Vascular Plant	Special Concern
Najas marina	Sea Naiad	Vascular Plant	Special Concern
Panax quinquefolius	American Ginseng	Vascular Plant	Special Concern
Pelecanus erythrorhynchos	American White Pelican	Vertebrate Animal	Special Concern
Pituophis catenifer	Gophersnake	Vertebrate Animal	Special Concern
Progne subis	Purple Martin	Vertebrate Animal	Special Concern
Ruppia cirrhosa	Widgeon-grass	Vascular Plant	Special Concern
Setophaga cerulea	Cerulean Warbler	Vertebrate Animal	Special Concern
Speyeria idalia	Regal Fritillary	Invertebrate Animal	Special Concern
Sterna forsteri	Forster's Tern	Vertebrate Animal	Special Concern
Bartramia longicauda	Upland Sandpiper	Vertebrate Animal	Watchlist

Endangered, Threatened, and Special Concern Species in the North Fork Crow River Watershed

Grus canadensis	Sandhill Crane	Vertebrate Animal	Watchlist
Haliaeetus leucocephalus	Bald Eagle	Vertebrate Animal	Watchlist

Scientific Name	Common Name	Category
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	Animal Assemblage
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	Animal Assemblage
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	Animal Assemblage
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	Animal Assemblage
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	Animal Assemblage
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	Animal Assemblage
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	Animal Assemblage
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	Animal Assemblage
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Site	Animal Assemblage
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Basswood - Bur Oak - (Green Ash) Forest Type	Basswood - Bur Oak - (Green Ash) Forest	Terrestrial Community - Other Classification
Calcareous Fen (Southwestern) Type	Calcareous Fen (Southwestern)	Terrestrial Community - Other Classification
Calcareous Fen (Southwestern) Type	Calcareous Fen (Southwestern)	Terrestrial Community - Other Classification
Dry Hill Prairie (Southern) Type	Dry Hill Prairie (Southern)	Terrestrial Community - Other Classification
Dry Hill Prairie (Southern) Type	Dry Hill Prairie (Southern)	Terrestrial Community - Other Classification
Dry Sand - Gravel Prairie (Southern) Type	Dry Sand - Gravel Prairie (Southern)	Terrestrial Community - Other Classification

Endangered, Threatened, and Special Concern Species in the North Fork Crow River Watershed

[illegible]

Endangered, Threatened, and Special Concern Species in the North Fork Crow River Watershed

[illegible]

Endangered, Threatened, and Special Concern Species in the North Fork Crow River Watershed

Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest Type	Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest	Terrestrial Community - Other Classification
Rich Fen (Mineral Soil) Type	Rich Fen (Mineral Soil)	Terrestrial Community - Other Classification
Rich Fen (Mineral Soil) Type	Rich Fen (Mineral Soil)	Terrestrial Community - Other Classification
Rich Fen (Prairie Seepage) Type	Rich Fen (Prairie Seepage)	Terrestrial Community - Other Classification
Sedge Meadow Type	Sedge Meadow	Terrestrial Community - Other Classification
Sedge Meadow Type	Sedge Meadow	Terrestrial Community - Other Classification
Sedge Meadow Type	Sedge Meadow	Terrestrial Community - Other Classification
Sedge Meadow; Lake Sedge Subtype	Sedge Meadow, Lake Sedge Subtype	Terrestrial Community - Other Classification
Sedge Meadow; Tussock Sedge Subtype	Sedge Meadow, Tussock Sedge Subtype	Terrestrial Community - Other Classification
Seepage Meadow/Carr Type	Seepage Meadow/Carr	Terrestrial Community - Other Classification
Silver Maple - (Virginia Creeper) Floodplain Forest Type	Silver Maple - (Virginia Creeper) Floodplain Forest	Terrestrial Community - Other Classification
Southern Seepage Meadow/Carr Class	Southern Seepage Meadow/Carr	Terrestrial Community - Other Classification
Sugar Maple - Basswood - (Bitternut Hickory) Forest Type	Sugar Maple - Basswood - (Bitternut Hickory) Forest	Terrestrial Community - Other Classification
Sugar Maple - Basswood - (Bitternut Hickory) Forest Type	Sugar Maple - Basswood - (Bitternut Hickory) Forest	Terrestrial Community - Other Classification
Sugar Maple - Basswood - (Bitternut Hickory) Forest Type	Sugar Maple - Basswood - (Bitternut Hickory) Forest	Terrestrial Community - Other Classification
Sugar Maple Forest (Big Woods) Type	Sugar Maple Forest (Big Woods)	Terrestrial Community - Other Classification
Sugar Maple Forest (Big Woods) Type	Sugar Maple Forest (Big Woods)	Terrestrial Community - Other Classification
Tamarack Swamp (Southern) Type	Tamarack Swamp (Southern)	Terrestrial Community - Other Classification
Tamarack Swamp (Southern) Type	Tamarack Swamp (Southern)	Terrestrial Community - Other Classification
Tamarack Swamp (Southern) Type	Tamarack Swamp (Southern)	Terrestrial Community - Other Classification
Wet Prairie (Southern) Type	Wet Prairie (Southern)	Terrestrial Community - Other Classification
Wet Seepage Prairie (Southern) Type	Wet Seepage Prairie (Southern)	Terrestrial Community - Other Classification
Willow - Dogwood Shrub Swamp Type	Willow - Dogwood Shrub Swamp	Terrestrial Community - Other Classification
Willow - Dogwood Shrub Swamp Type	Willow - Dogwood Shrub Swamp	Terrestrial Community - Other Classification
Willow - Dogwood Shrub Swamp Type	Willow - Dogwood Shrub Swamp	Terrestrial Community - Other Classification
Willow - Dogwood Shrub Swamp Type	Willow - Dogwood Shrub Swamp	Terrestrial Community - Other Classification

Mollusks in the North Fork Crow River Watershed

River	Scientific Name	Common Name	Species Status
Crow (N. Fk.)	Anodontoides ferussacianus	Cylindrical papershell	Common or Presumed Healthy
Crow (N. Fk.)	Lampsilis cardium	Plain pocketbook	Common or Presumed Healthy
Crow (Mid. Fk., Green Lk outflow)	Lampsilis cardium	Plain pocketbook	Common or Presumed Healthy
Crow (M. Fk.)	Lampsilis cardium	Plain pocketbook	Common or Presumed Healthy
Crow	Lampsilis cardium	Plain pocketbook	Common or Presumed Healthy
Crow (N. Fk.)	Lampsilis siliquoidea	Fatmucket	Common or Presumed Healthy
Green Lake	Lampsilis siliquoidea	Fatmucket	Common or Presumed Healthy
Crow (Mid. Fk., Green Lk outflow)	Lampsilis siliquoidea	Fatmucket	Common or Presumed Healthy
Crow (M. Fk.)	Lampsilis siliquoidea	Fatmucket	Common or Presumed Healthy
Crow	Lampsilis siliquoidea	Fatmucket	Common or Presumed Healthy
Crow (N. Fk.)	Lasmigona compressa	Creek heelsplitter	Special Concern
Crow (N. Fk.)	Ligumia recta	Black sandshell	Special Concern
Crow	Ligumia recta	Black sandshell	Special Concern
Nest Lake	none		
Crow (N. Fk.)	none		
Crow (N. Fk.)	Pyganodon grandis	Giant floater	Common or Presumed Healthy
Green Lake	Pyganodon grandis	Giant floater	Common or Presumed Healthy
Crow (Mid. Fk., Green Lk outflow)	Pyganodon grandis	Giant floater	Common or Presumed Healthy
Crow (N. Fk.)	Strophitus undulatus	Squawfoot or Strange floater	Common or Presumed Healthy
Crow (N. Fk.)	Utterbackia imbecillis	Paper floater	Common or Presumed Healthy



APPENDIX C

Policy Committee Bylaws



North Fork Crow River Water Planning Partnership
Policy Committee Bylaws

The County of Kandiyohi, by and through the County Board of Commissioners, and
The County of Meeker, by and through the County Board of Commissioners, and
The County of Pope, by and through the County Board of Commissioners, and
The County of Stearns, by and through the County Board of Commissioners, and
The County of Wright, by and through the County Board of Commissioners.
The Kandiyohi Soil and Water Conservation District (SWCD), by and through the SWCD Board of Supervisors, and
The Meeker SWCD, by and through the SWCD Board of Supervisors, and
The Pope SWCD, by and through the SWCD Board of Supervisors, and
The Stearns SWCD, by and through the SWCD Board of Supervisors, and
The Wright SWCD, by and through the SWCD Board of Supervisors.
The Middle Fork of the Crow River Watershed District, by and through the Board of Managers, and
The North Fork of the Crow River Watershed District, by and through the Board of Managers, and
The Crow River Organization of Water (CROW), by and through the CROW Board of Directors.

ADOPTED JUNE 3, 2015

These bylaws establish rules governing the conduct of business by the Policy Committee of the North Fork Crow River Water Planning Partnership, hereafter referred to as the Policy Committee.

ARTICLE I: PURPOSE

1. The purpose of the Policy Committee is to develop and adopt a comprehensive watershed management plan pertaining to that area within the North Fork Crow River watershed.
2. The Policy Committee operates under a Memorandum of Agreement set forth between members of local units of government: Kandiyohi County, Meeker County, Pope County, Stearns County, Wright County, Kandiyohi Soil and Water Conservation District, Meeker Soil and Water Conservation District, Pope Soil and Water Conservation District, Stearns Soil and Water Conservation District, Wright Soil and Water Conservation District, The Middle Fork of the Crow River Watershed District, The North Fork of the Crow River Watershed District, and The Crow River Organization of Water (CROW).

ARTICLE II: MEMBERSHIP

1. The membership of the Policy Committee shall be comprised of at least thirteen (13) members; with membership composed of one (1) representative (must be an elected official, or in the case of a watershed district an official as appointed by a county board) from each member Local Government Unit (LGU).
2. Members of the Policy Committee shall be appointed for a one (1) year term (or until the Memorandum of Agreement is terminated) to run concurrently with each Policy Committee member's term on his/her respective board. Members may be reappointed by the respective board of that local unit of government.
3. An alternate member may be appointed. Only in the absence of the member is the alternate given voting responsibilities.
4. A Policy Committee member's term continues until a successor is appointed and qualified. In the event a member of the Policy Committee resigns or is otherwise unable to complete his or her term on the Policy Committee, the Policy Committee will advise the appointing authority of the vacancy thus created as soon as practicable, and the vacancy will be filled according to the requirements of the respective local unit of government.
5. The Policy Committee shall not take action that may materially benefit the financial interest of a Policy Committee member, a member's family member or a member's close associate unless that interest first is disclosed for the record. The interested Policy Committee member may be present to answer questions, but may not advocate for or vote on the action. If a Policy Committee member concludes that his or her interest does not create a conflict but that there may be an appearance of conflict, he or she shall disclose the interest for the record before participating in discussion or voting on an action.

ARTICLE III: OFFICERS

1. The officers of the Policy Committee shall consist of a chairperson, vice chairperson, and a secretary elected by members of the Policy Committee at the first meeting June 3, 2015.
 - a. The chairperson shall:
 - i. Serve as chairperson for all meetings; and
 - ii. Sign and deliver in the name of the Policy Committee any correspondence pertaining to the business of the Policy Committee.
 - b. The vice chairperson shall:
 - i. Discharge the chairperson's duties in the event of the absence or disability of the chairperson.
 - c. The secretary shall:
 - i. Maintain records of the Policy Committee;
 - ii. Certify records and proceedings of the Policy Committee;
 - iii. Ensure that minutes of all Policy Committee meetings are recorded and made available in a timely manner to the Policy Committee, and, maintain a file of all approved minutes including corrections and changes;
 - iv. Provide for proper public notice of all meetings; and
 - v. The secretary may delegate a representative to record the minutes and perform other duties of the secretary. The elected secretary will sign the official minutes of all meetings following approval of the Policy Committee.
2. An officer will serve until replaced by the election of a successor. No Policy Committee member may hold more than one office at a time.
3. In the event an officer cannot complete his or her term of office, the Policy Committee shall immediately elect from among its members an individual who will complete the unexpired portion of the term. The individual designated to complete the unexpired term of another officer may not already be serving as an officer of the Policy Committee.
4. The Policy Committee will request the respective local unit of government member to replace their representative member after missing two (2) consecutive meetings without notice to the chairperson.

ARTICLE IV: MEETINGS

1. All meetings of the Policy Committee will comply with statutes and rules requiring open and public meetings.
2. The conduct of all meetings of the Policy Committee shall be generally governed by the most recent edition of Robert's Rules of Parliamentary Law.

3. A quorum of the Policy Committee shall consist of a simple majority of the voting members.
4. All votes by Policy Committee members shall be made in person, and no member may appoint a proxy for any question coming before any meeting for a vote.
5. The notice of meetings shall be mailed or emailed not less than seven (7) days prior to the scheduled meeting date of the Policy Committee.
6. The minutes of any meeting shall be made available to all Policy Committee members prior to the next meeting.

ARTICLE V – VOTING

1. Each representative shall have one vote, except for the CROW which shall serve as an ex-officio (non-voting) member.
2. A motion or resolution shall be approved by a favorable vote of a simple majority of the members present providing enough members are present to make a quorum.
3. A supermajority vote of 75% of those members present will be required for final plan submittal or changes to these By Laws or Memorandum of Agreement.

ARTICLE VI – COMPENSATION

1. Policy Committee members may be compensated for meetings and expenses incurred by the member local unit of government they represent, according to the policies of the local unit of government.
2. Policy Committee members may be compensated for expenses incurred in attending meetings by the member local unit of government they represent, such as mileage and meals according to that local unit of government's policy. This compensation will not be paid to members attending as part of their professional duties.

ARTICLE VII – SUBCOMMITTEES OF THE POLICY COMMITTEE

1. The Policy Committee may appoint subcommittees for the purpose of assisting the Policy Committee in the performance of its duties. Except for a Policy Committee member appointed to a subcommittee, no other member of a subcommittee shall be able to make motions for consideration, or vote on matters put before the Policy Committee.
2. The Policy Committee will appoint an Advisory Committee. The Advisory Committee will routinely advise the Policy Committee on the plan and plan implementation and on issues of policy and administration as related to the purpose.
 - a. A member of the Policy Committee or an alternative will be assigned by the chairperson of the Policy Committee to meet with the Advisory Committee as an ex-officio member.

- b. Each member local government unit shall appoint a representative(s) to the advisory committee.
- c. In addition to member local government appointments, the advisory committee will include representatives from the state's main water management or plan review agencies (Board of Water and Soil Resources, Department of Agriculture, Department of Health, Department of Natural Resources, Metropolitan Council and Pollution Control Agency). Each agency will designate a lead contact from their agency to participate on the advisory committee; however, specific participation may vary depending on local needs.
- d. Subcommittees may be formed to increase effectiveness or to address specific topics or project areas.

ARTICLE VIII: MEETING LOCATION

- 1. All regular meetings of the Policy Committee will be held at a location within the North Fork Crow River watershed.

ARTICLE IX: MISCELLANEOUS

- 1. Addition to, alteration, or repeal of any part of these bylaws by the Policy Committee may be made at any meeting, provided thirty days' written notice of the proposed change has been given to each member of the Policy Committee.
- 2. The Policy Committee's official records and requirements of the BWSR grant agreement shall be maintained by the fiscal agent, The Crow River Organization of Water (CROW). The maintenance and disposition of these records shall be in accordance with applicable laws.
- 3. All expenses incurred by Policy Committee or Advisory Committee must have prior approval of the Policy Committee, have a signed claim form with itemized expenses for the Policy Committee's approval.
- 4. These bylaws are intended to be consistent with applicable provisions of Minnesota Statutes Chapters 103B, 103C, and 103D. In all cases of omission or error, those statutes will govern.

ARTICLE X – CERTIFICATION

- 1. These By-laws were adopted by a vote of _____ ayes and _____ nays by the members of the Policy Committee on _____, 2015.

Secretary



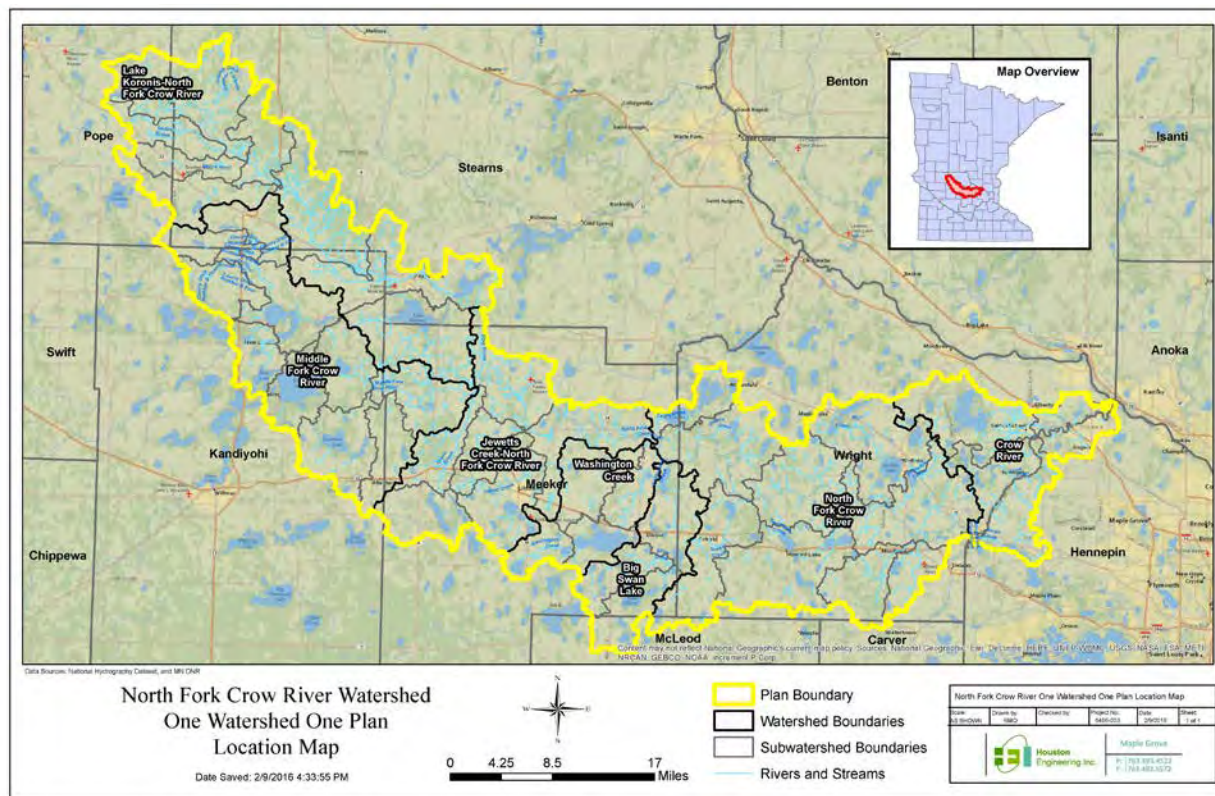
APPENDIX D

Participation Plan

NORTH FORK CROW RIVER WATERSHED: ONE WATERSHED ONE PLAN PARTICIPATION PLAN

Background

The Counties of Kandiyohi, McLeod, Meeker, Pope, Stearns, and Wright Counties (Counties), by and through their respective County Board of Commissioners, and the Kandiyohi, McLeod, Meeker, Pope, Stearns, and Wright Soil and Water Conservation Districts (SWCDs), by and through their respective Soil and Water Conservation District Board of Supervisors, and the Middle Fork of the Crow River and North Fork of the Crow River Watershed Districts (WDs), by and through the Board of Managers, and the Crow River Organization of Water (CROW), by and through the CROW Board of Directors were selected by the Minnesota Board of Water and Soil Resources (BWSR) as a One Watershed One Plan (1W1P) pilot. Collectively, the parties are called the “North Fork Crow River Water Planning Partnership” (hereafter referred to as the “NFCRWPP”). The NFCRWPP recognized the importance of collaborating to plan and implement protection and restoration efforts for the North Fork Crow River Watershed (an area of approximately 950,000 acres).



The NFCRWPP is responsible for preparing a comprehensive watershed management plan (i.e., a Plan) under the 1W1P effort. The members of the NFCRWPP share an interest in and the statutory authority to prepare, adopt, and assure implementation of a Plan for the North Fork Crow River Watershed.

The NFCRWPP has the specific goal of developing the Plan for the North Fork Crow River Watershed. This document describes the participation process for developing the Plan.

Audience & Roles

One of the Guiding Principles of One Watershed, One Plan is the process “must involve a broad range of Stakeholders to ensure an integrated approach to watershed management.” A Stakeholder is defined as a party (person or group) who holds a vested interest in the outcome of the planning process. The primary outcome resulting from the Plan will be a targeted implementation plan, focused on the implementation of specific conservation practices, projects, programs, and regulatory controls. A variety of Stakeholders may be directly or indirectly affected.

Participants in the planning process are comprised of several potential target audiences or groups and collectively comprise the Stakeholders. These groups include:

Policy Committee – The primary role of the Policy Committee is making final decisions about the content of the plan and its submittal to and approval by BWSR. Bylaws have been adopted to guide the decision making process, leadership, and direction of process for the Policy Committee. Expectations are that the Policy Committee will review and approve a draft of the plan outline, review and approve information about the priority resources, priority concerns and issues affecting the priority concerns, review and approve the targeted implementation plan, and review and approve the Plan. An additional expectation is that members of the Policy Committee will engage in constructive discussion and debate about issues addressed by the Plan and provide consensus direction on plan development matters, to the Planning Work Group. The Policy Committee will review and approve membership on the Advisory Committee. The Policy Committee has additional obligations as described by The Memorandum of Agreement executed by the NFCRWPP members.

Advisory Committee – Membership on the Advisory Committee may consist of members from the Planning Workgroup, other local government staff, the state's main water agencies and/or plan review agencies, the general public, trade organization, nonprofit organizations, and special interest groups. Leaders within the local community are valued members of the Advisory Committee. Membership to the Advisory Committee is reviewed and approved by the Policy Committee.

The purpose of an Advisory Committee is to make recommendations on the Plan and the Targeted Implementation Schedule to the Policy Committee, including identification of priority resources, priority concerns and issues affecting the priority concern. Expectations are that members of the Advisory Committee will communicate Plan related activities to their respective organizations. Advisory Committee members are expected to communicate practical concerns during the plan development process and to assist the Policy Committee in ensuring a credible Plan development process.

Each state or federal agency or organization participating on the Advisory Committee shall designate one lead representative and one designated alternate. An agency's or organization's guidance, input, and decisions shall be communicated through the lead representative or

designated alternative. The lead agency or organization representative is expected to coordinate information flow and communication within their agency or organization.

Planning Work Group – The Planning Work Group is comprised of local staff, local water planners, local watershed staff, and local SWCD staff for the purposes of logistical and day-to-day decision-making in the planning process. The Planning Work Group includes the consultant and other advisors responsible for assembling the draft and final Plans. Members of the Planning Work Group are responsible for providing information needed for the planning process, reviewing and accepting draft plan related information, and assisting in Plan development. Identifying Priority Resources, Priority Concerns and Issues Affecting the Priority Concerns for their specific county is also the responsibility of the Planning Work Group.

Planning Work Group Subcommittee – The Planning Work Group Subcommittee is a subcommittee of the Planning Work Group. This Subcommittee is comprised of no more than 6 members, with a designated leader for working with the consultant and the CROW. That leader's job is to facilitate discussion among the Planning Work Group Subcommittee to gain consensus within that subcommittee and the larger Planning Work Group on plan decisions. They are also to provide materials and timeline review of products.

General Public – Various public meetings and hearings will be completed as part of the Plan development process. The general public is expected to be an important Stakeholder group. Input from the public meetings will be used to ensure a complete list of priority resources and priority concerns is developed. The role of the general public is expected to include identifying issues affecting the priority concerns. The public will be engaged to rank concerns establishing a “public priority concern” rank. An additional role for the general public is expected to include review of and discussion about the targeted implementation schedule and ability to achieve the measurable goals.

Intent for Stakeholder Involvement

The principal intent of involving stakeholders during the planning process is to build acceptance of the Plan and the recommended solutions described by the Targeted Implementation Schedule. Acceptance is critical because the NFCRWPP is focused on actively utilizing their Plan to implement projects and programs within the North Fork Crow River Watershed. Successful implementation will depend highly on the degree to which the Stakeholders believe their concerns, issues or expectations are addressed within the Plan.

The NFCRWPP intends for the Stakeholder involvement process to be active, genuine and credible. To that end, the Stakeholder groups will be involved early in the planning process and will remain engaged through plan completion. Input provided by Stakeholders is intended to help ensure the comprehensiveness of the Plan and validate the implementation priorities of the NFCRWPP and Stakeholders.

Tools for Stakeholder Involvement

The NFCRWPP expects to use several tools to involve Stakeholders. These tools include:

- o Inform the stakeholders of status and progress by posting information on each county website, including document drafts as they become available.

- o Convening meetings and workshops with Stakeholders at key milestones (refer to Attachments A and B) to discuss relevant content and obtain input.
- o Use of existing “standing” committees within each county, including local water plan advisory committees. These committees tend to include broad representation.

There are many methods for conveying information and communicating messages. This Stakeholder Involvement Plan will utilize a variety of tools as appropriate and beneficial for sharing progress and soliciting input. Information about the planning process can be obtained from the Crow River Organization of Water website (<http://www.crowriver.org/NorthFork1W1P.html>).

Conduct

The conduct of members of the various Stakeholder Groups —how the Committees function and affect the process—will be based on the overall intent of building acceptance of the Plan through a credible yet timely process. Where appropriate, the NFCRWPP will strive to achieve consensus on Plan related matters. However, because of the diversity of issues and range of resources, full agreement between or among all Stakeholders is not realistic or expected. Within the Policy Committee, bylaws specify voting (Article V). The ultimate responsibility for the content of the Plan rests with the Policy Committee. Participants are expected to act in a professional, constructive and contributory manner. Members failing to act in good faith during the planning process can be removed from the Advisory Committee by consensus of the Policy Committee.

ATTACHMENT A
STAKEHOLDER LIST

NORTH FORK CROW RIVER WATERSHED: ONE WATERSHED ONE PLAN

Policy Committee Members

Name	Primary / Alternate	Organization	Phone	Email
Doug Krueger	Primary	McLeod County	(612) 756-2855	Doug.krueger@co.mcleod.mn.us
Roger Schultz	Primary	McLeod SWCD	(320) 864-1214	1424 Queen Ave, Glencoe MN 55336
Terry Schaefer	Primary	Kandiyohi SWCD	(320) 243-5022	sixpack@lakedalelink.net
Roger Imdieke	Primary	Kandiyohi County	(320) 796-0017	roger.imdieke@co.kandiyohi.mn.us
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Chuck Uphoff	Primary	Stearns SWCD	(320) 837-5204	cduphoff@albanytel.com
Arlyn Lawrenz	Alternate	Stearns SWCD	(320) 746-2634	lawrenz@cloudnet.com
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Charles Borrell	Primary	Wright County	(763) 682-7685	charles.borrell@co.wright.mn.us
Robert Hodapp	Primary	Middle Fork Crow River WD	(320) 796-2009	bobe56@charter.net
John Hanson	Primary	North Fork Crow River WD	(320) 453-5398	jt2hanson@aol.com

Advisory Committee Members

Name	Organization	Phone	Email
David Green	Pope County*	320-634-7791	David.green@co.pope.mn.us
Holly Kovarik	Pope SWCD*	320-634-5327	Holly.kovarik@mn.nacdnet.net
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Dennis Fuchs	Stearns SWCD*	320-251-7800 x32	Dennis.fuchs@mn.nacdnet.net
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Joe Norman	Meeker SWCD*	320-693-7287 x119	joseph.norman@mn.nacdnet.net
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Roger Berggren	McLeod County	320-864-1214	Roger.berggren@co.mcleod.mn.us
Ryan Freitag	McLeod SWCD	320-864-5176	Ryan.Freitag@mn.nacdnet.net
Tara Ostendorf	North Fork Crow River Watershed District*	320-346-2869	nfcwrsd@tds.net
Margaret Johnson	Middle Fork Crow River Watershed District*	320-796-0888	margaret@mfcrow.org
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Joel Settles	Hennepin County	612-348-6157	joel.settles@hennepin.us
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Ethan Jenzen	MN Dept. of Natural Resources	320-796-2161 x232	Ethan.jenzen@state.mn.us
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Jeff Hrubes	MN Board of Water and Soil Resources	218-203-4478	Jeff.Hrubes@state.mn.us
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Aaron Janz	MN Dept. of Agriculture	651-201-6143	Aaron.janz@state.mn.us

March 7, 2016

Karen Jensen	Metropolitan Council	651-602-1401	karen.jensen@metc.state.mn.us
Craig Peterson	USDA Natural Resources Conservation Service	763-566-2941 x104	Craig.peterson@mn.usda.gov
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Stan Lilleberg	Kandiyohi County Farmer	320-220-0624	roklane@frontiernet.net
Winton Nelson	Meeker County Farmer	320-221-2266	24817 608 th Ave, Litchfield MN 55355
Roger Schaumann	Stearns County Farmer	H: 320-243-1501 C: 320-250-0693	rgschaumann@windstream.net
Greg Bakeberg	Wright County Farmer	320-543-3848	9156 Grover Ave SW, Waverly MN 55390

Charlene Brooks	Crow River Organization of Water	763-682-1933 ext.3	Charlene.brooks@mn.nacdnet.net
Tom Petersen	Crow River Organization of Water	651-644-3873	tompetersenjr@gmail.com
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Melissa Lewis	MN Board of Water and Soil Resources	651-297-4735	melissa.k.lewis@state.mn.us
Paul Radomski	MN Dept. of Natural Resources - Zonation	218-833-8643 218-203-4300 – Brainerd Of	paul.radomski@state.mn.us
Marv Kelvin	Kandiyohi COLA Rep		marvcalvin@tds.net

*Planning Work Group Member

March 7, 2016

ATTACHMENT B – SCHEDULE

North Fork Crow River One Watershed One Plan Tentative Dates and Topics by Meeting

DRAFT - 01/28/2016

		Meeting Number																			
Plan Group	Date	1 PWG & AC 17-Feb	2 PC 2-Mar	3 PWG 16-Mar	4 PWG & AC 20-Apr	5 PC 4-May	6 PWG 18-May	7 PWG & AC 15-Jun	8 PC 6-Jul	9 PWG 20-Jul	10 PWG & AC 17-Aug	11 PC 7-Sep	12 PWG 21-Sep	13 PWG & AC 19-Oct	14 PC 2-Nov	15 PWG 16-Nov	16 PWG & AC 21-Dec	17 PC 4-Jan	18 PWG 18-Jan	19 PWG & AC 15-Feb	20 PC 1-Mar
Plan Considerations																					
Governance	Introduce																				Decide
Organizational Structure	Introduce	Decide																			
Meeting Schedule	Introduce	Decide																			
Definitions: Resource, Concerns, Issues	Introduce	Decide																			
Planning Region Boundaries	Introduce	Decide																			
Plan Outline	Introduce	Decide																			
Stakeholder Plan	Introduce	Discuss	Discuss	Decide																	
List of Concerns																					
Prioritization Matrix	Introduce	Discuss	Discuss	Decide																	
Priority Resource Concerns																					
Prioritization Process		Introduce	Discuss	Discuss	Decide																
Protection / Restoration Definitions		Introduce	Discuss	Discuss	Decide																
Measurable Goals																					
Measurable Goals, Strategies, Actions			Introduce	Discuss	Discuss	Decide						Revisit									
Implementation Plan																					
Programs			Introduce	Discuss	Decide																
Projects			Introduce	Discuss	Decide																
Funding			Introduce	Discuss	Discuss	Discuss	Discuss	Discuss	Discuss	Discuss	Decide										
Roles and Responsibilities								Introduce	Discuss	Discuss	Discuss	Decide					Revisit				
Review of Draft Plan																					
Introduction						Introduce	Discuss	Decide													
Prioritization / Priority Concerns						Introduce	Discuss	Decide													
Implementation						Introduce	Discuss	Discuss	Decide												
Strategies and Actions										Introduce	Discuss	Discuss	Decide								
Targeted Schedule													Introduce	Discuss	Discuss	Discuss	Decide				
Final Draft																		Introduce	Discuss	Decide	
Final																			Introduce	Decide	

Plan Group	Meeting Time	Meeting Location
Planning Work Group (PWG)	9:00 AM - 12:00 PM	Litchfield, MN
Advisory Committee (AC)	12:30 PM - 3:30 PM	Litchfield, MN
Policy Committee (PC)	Following CROW Board Mtg (~ 11:00 AM)	Litchfield, MN



APPENDIX E

Comments and Responses

Commenter	Comment #	Comment Letter Page #	Comment	Material Grammatical	Editorial	Plan Change Made (Yes/No)	Plan Section	Comment Response / Action
BWSR	General-1	1	A clearer description of the conservation delivery system should be included. This should include a general discussion of the partners' roles and authorities in implementing the Plan.		x	No	N/A	Agree. We believe more information can be included in future planning efforts to better guide conservation delivery decision making on the ground.
	General-2	1	We appreciate that the group has identified various implementation levels based on funding. Understanding what can take place with the current levels compared to the total amount needed is valuable information in determining necessary funding allocations.		x	No	N/A	Comment acknowledged with thanks.
	General-3	1	The baseline implementation level assumes statutory obligation and ordinance implementation levels will go unchanged. Will the LGUs self-report a performance review to the partnership to ensure that this is taking place? Please add any LGU reporting responsibilities to Section 5.5.4.4 resulting from this comment.	x		Yes	5	LGU's reporting responsibilities will be conducted per state agency requirements.
	General-4	1	There are inconsistencies within the main document and Executive Summary. Please review for consistency and make changes.	x		Yes	ES	Revised per comments referencing section "ES" in this table.
	Executive Summary-1	1	Within Table ES-3, we feel that the Progress Towards Load Reduction Goal is strong and provides measurability to the Plan. This table should be added to Section 3 and include language on how the partnership will track and measure the progress of implementation.		x	No	3	Agree that this is the true measurability part of the Plan, however, placing it in Section 3 before discussion of PTMA results or the selected implementation scenario would be very confusing from a readability perspective.
	Executive Summary-2	2	Include similar language within the Executive Summary to address potential funding opportunities for drinking water from surface water: Potential concerns were designated as A, B, C, D, or E priority level. The potential concerns identified as A, B, and C level will be the focus of initial implementation efforts. It should be noted that many issues affecting one or more priority concerns permeate to lower level priority concerns, therefore benefiting those resources. For example, drinking water (surface water) will benefit from strategies addressing phosphorus, phosphorus, nitrogen, and bacteria levels.	x		Yes	ES	Text added: <i>It should be noted that many implementation efforts affecting one or more priority concerns permeate to lower level potential concerns, therefore benefiting those resources too. For example, streams and rivers emerged as a B-level priority concern, while surface drinking water emerged as a D-level concern. The Crow River is a defining water feature of the NFCR Watershed, and discharges to the Mississippi River. The Crow River discharge (which includes both the North and South Fork Watersheds) at times doubles the concentration of nutrients and sediment in the Mississippi River. The discharge location is upstream of the drinking water intakes of both the City of St. Paul Regional Water Services and the City of Minneapolis Water Treatment and Distribution Services. These utilities provide drinking water to nearly 1 million residential customers. Thus, when streams and rivers (e.g. Crow River and its tributaries) benefit from strategies addressing nutrients (phosphorus and nitrogen), sediment, and bacteria loading, so too does surface drinking water sources for many people downstream.</i>
	Executive Summary-3	2	Summarize the impact the North Fork Crow River has on downstream waters. For example: The loading of sediment to the Mississippi River doubles after the confluence.	x		Yes	ES	Addressed via BWSR Comment "Executive Summary-3"
	Section 2-1	2	The partnership should consider prioritizing specific water resources to focus implementation efforts around in order to demonstrate greater levels of improvement and success to stakeholders.	x		Yes	3	Text added to Section 3.4.3: Priority implementation for streams and rivers can be led by maps identifying reaches that are nearly or barely impaired, therefore aligning with BWSR's Nonpoint Priority Funding Plan. Text added to 3.4.4: Priority implementation for lakes can be led by priorities within the LPSS or TMDL.
	Section 2-2	2	Addressing fecal coliform: The plan seems to take a concerted and systematic approach to addressing fecal coliform concerns / impairments. Consider developing goals and associated implementation actions for these types of public health concerns.		x	No	4	We agree, and would like to do more with bacteria. We are limited by the source data we have. We would like to see this expanded in future plans with robust data. Bacteria is an issue impacting streams and rivers, a B-level priority concern. Therefore, actions were developed to address this issue. Examples: Action #4, 7, 15, 32, 33...Bacteria is also presented in the surface water measurable goal for streams and rivers through protection / restoration maps, and a goal of achieving load allocations.
	Section 2-3	2	2.3 Priority Concerns and Issues. A brief narrative should be provided here regarding shifting items that are a lower priority to implementation. For example: based on opportunity for collaboration, stacked benefits, what the decision making process could be.	x		Yes	2	Text added: Priorities may shift during plan implementation, based on opportunity for collaboration, stacked benefits, or new data and information. Priority issues will be considered and addressed as necessary through annual evaluations and local work plan development (see Section 5).
	Section 2-4	2	Figure 2-3. It is unclear what DNR 24K Ditches are.		x	No	2	See "explanation" box within figure.
	Section 2-5	2	Figure 2-13. Consider adding source water protection maps to the appendices, including the protection area for the Twin Cities drinking water intakes.		x	No	Appendix	Comment acknowledged. Geospatial data layers shown in figure represent input from Planning Work Group and Advisory Committee.
	Section 2-6	2	2.4.2. Policy and Funding Emerging Issues. The title is confusing. Consider "Past Impediments to Effective Water Plan Management."		x	Yes	2	Title changed to "Non-Technical Emerging Issues" to provide clarity.
	Section 2-7	2	2.4.2.6. Inconsistent use of "not limited to" may provide confusion as to what is an all-inclusive list and what is not.	x		Yes	2	Removed "not limited to"
	Section 3-1	2	In general, the measurable goals could be improved by adding 10-year targets as part of the goal statements.		x	No	3	Agreed. More specific targets may be added during plan implementation. We will see the success of the Partnership in making progress towards goals and adapt goals accordingly.

Commenter	Comment #	Comment Letter Page #	Comment	Material	Grammar	Editorial	Plan Change Made (Yes/No)	Plan Section	Comment Response / Action
	Section 3-2	2	As assumption is made with Establishing Measurable Goals that addressing 40% of all cropland areas in the watershed will increase soil health. Provide connection to how 1% improvement will be made to the 40% goal.	x			Yes	3	Text revised for clarity: Management practices such as cover crops, conservation tillage to increase residue, and permanent cover (e.g., alfalfa, prairie grass) can be implemented to improve soil health, or the SOM content. The watershed-wide measurable goal for rural stewardship is aimed at implementing these management practices in cropland areas with rural stewardship categories of "Probability Low" and "Probability Depends on Practice Effectiveness." to increase SOM content by 1%.
	Section 3-3	2	3.4.4 Lakes. Measurable Goal is LPSS lake. Metric: Number of unimpaired lakes. This is a long term goal. Is there a separate 10-year/short term goal and how it will be measured.			x	No	3	10 year targets were not developed as part of this pilot planning effort. BWSR has since drafted guidance documents, which will be considered in future plan efforts.
	Section 3-4	2	3.4.4 Lakes. Metric: Number of acres / lbs. treated in infested lakes. How many lakes are currently infested? Do all infested lakes have management plans?			x	No	3	Designated infested lakes are shown in Figure 2-2. Text within Section 3.4.4: Currently 38 lakes have been designated as "infested" within the NFCR Watershed.
	Section 3-5	2	3.4.6 Wetlands. What is the definition of no net loss of wetlands? Will wetlands replaced outside of the watershed, but within the requirement of the Wetland Conservation Act count against this number?			x	Yes	3	Stated in text: The Minnesota Wetland Conservation Act (WCA) has set the goal for no-net-loss of wetlands in total acreage and functions. Added text: WCA will define goals for the watershed.
	Section 3-6	3	3.4.6 Wetlands. Will the group take credit / keep account of wetland creation or restoration completed by groups like US Fish and Wildlife Service, DNR, Ducks Unlimited?			x	No	3	Yes- if local dollars are spent and to the extent of groups working cooperatively using the plan.
	Section 5-1	3	Table 5-2. Years (Start & End) should not be the length of the plan. 1-3 year intervals is preferred and provides greater transparency to the public and aids in workplanning.	x			Yes	5	Start and end dates updated per input from the local Partnership. Table completed to the best knowledge of the group.
	Section 5-2	3	Table 5-3. Complete the table. Current regulations exist but are shown as N/A in the table.	x			No	5	Table completed to the best knowledge of the group.
	Section 5-3	3	5.3.1 Administration of Statutory Responsibilities. 103E Drainage Law should be included.	x			Yes	5	Included within Table 5-3 for Public Drainage System. Also added to Section 5.3.3.1: "Actions impacting public drainage systems are subject to Minnesota Statutes 103E"
	Section 5-4	3	5.5.4.2 Biennial Evaluation. The Biennial Budget Request is not an evaluation. This section would better fit within 5.3.3 Workplanning. Describe the intended biennial evaluation process.	x			Yes	5	The NFCRWPP is using annual evaluations and a five year evaluation. Therefore, discussion about the BBR was moved to Section 5.5.3.2 as proposed, and reference to biennial evaluation was removed.
	Section 5-5	3	Table 5-7 specifically identifies CROW for a set of identified tasks. This should be listed fiscal / administrative agent as defined by the Implementation Agreement. This would allow greater flexibility if changes are necessary and avoid the need for a Plan Amendment. Additional bullet needed for responsible party to compile reports, submit reports to BWSR as required or reference items in Section 5 for "statutory reporting requirements"	x			Yes	5	Changed text in table from "CROW" to "fiscal / administrative agent".
	Section 5-6	3	Table 5-7 Plan Administration and Implementation. BWSR strongly recommends having separate fiscal and administrative agendas to provide a higher level of internal control. Periodic review of duties should be performed- outline the frequency at which this will occur.			x	No	5	Comment acknowledged.
	Section 5-7	3	An Implementation Agreement should be developed to further identify the structure of decision making, financial and admin responsibilities.			x	No	5	Agreed. Plan content includes what was done at the time of the plan. Planning partners are drafting a revised MOA.
DNR	GW Sustainability-1	1	Concerns regarding groundwater sustainability are addressed in the plan, with high priority given to protection of groundwater supplies in the Bonanza Valley Groundwater Management Area. Goal statements also specifically address sustainability and preventing long-term downward water level trends. Section 3.4.2 specifically addresses the Bonanza Valley Groundwater Management Area, however, groundwater sustainability is an issue of concern in many areas throughout the watershed. Section 3.4.2 specifically addresses the Bonanza Valley Groundwater Management Area, however, groundwater sustainability is an issue of concern in many areas throughout the watershed. Language added to Section 3.4.2 to address sustainability watershed-wide could include: <i>Increasing demands for groundwater will require improved information to make land-use decisions. The MN DNR has a monitoring system including groundwater observation wells, and stream and lake monitoring networks. Encouraging accurate record keeping of water use is critical. Ensuring LGU decision makers are connected with the raw data and interpretation of the data should help sync development, land use decisions, and water permitting. More coordination will be needed between local units of government as water users in and outside of municipal boundaries are competing for the same water resources. Efficient use of water resources and finding approaches to limit demands will be necessary if water use continues to rise.</i>	x			Yes	3	Suggested text added to Section 3.4.2.
	GW Sustainability-2	2	Please consider adding language to Section 3.4.2 to convey: "Additional groundwater level monitoring in municipal areas and high-density use areas will be needed to assess long-term sustainability watershed-wide."	x			Yes	3	Suggested text added to Section 3.4.2.

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	GW Sustainability-3	2	Section 3.4.2 begins with a description of the Bonanza Valley aquifer. We suggest the second paragraph in this section beginning with the second sentence read: "...The purpose of the Bonanza Valley Groundwater Management Area (GWMA) Plan is to guide DNR actions in managing the appropriation and use of groundwater within the GWMA. Many of the management actions developed will result in improved information gathering, development of management tools, and processes that will form the foundation for better decisions regarding long-term aquifer sustainability in this system." This language comes from the final Bonanza Valley GWMA Plan.	x		Yes	3	Suggested text added to Section 3.4.2.
	GW Sustainability-4	2	We also suggest the third paragraph in section 3.4.2 be reworded to read: "There are currently 58 measured observation wells within the GWMA boundary. Additional groundwater level monitoring wells are needed to improve the information to make good decisions. Stream and lake monitoring networks will be enhanced by adding additional gage sites to determine the effects of groundwater withdrawals on surface water systems." Please also consider changing the language in paragraph 6 of Section 5.1.3 to reflect this suggested change.	x		Yes	3	Suggested text added to Section 3.4.2.
	GW Sustainability-5	2	Nitrogen Infiltration Risk maps were developed for this plan in Section 4.5.2 and Appendix M as an approach for identified BMPs to directly address recharge while protecting groundwater quality. Are the infiltration practices referenced in Table 5-1 those prioritized for use as a result of this effort, or are there additional practices to consider? Future updates of the plan could include irrigated areas as a portion of calculations with regards to nitrogen impacts.		x	No	3	Infiltration practices listed in Table 5-1 are probable management practices or structural BMPs eligible for funding under the BMP Cost Share Initiative, grouped by PTMApp treatment group. These are not explicitly prioritized for implementation (see Planning Region Implementation Profiles or Table 4-5 for a list of prioritized practices, based on planning region goals).
	High Quality Lakes / Lakes at Risk - 1	2	We are pleased to see concerns regarding most elements of high quality and high resource value lakes addressed in the plan, including criteria for protection called out in Table 2-1, and goals established for protection were included in Section 3.4.4.		x	No	3	Comment acknowledged with thanks.
	High Quality Lakes / Lakes at Risk - 2	2	While criteria and goals were in sync with concerns, we encourage additional action items for lake protection be included in Table 4-1. While strategies SW-9 through SW- 15 in Appendix Kand actions listed in Table 4-1 address watershed (external) loading to lakes, internal nutrient loading was not assessed as a portion of this plan. We encourage adding action items to Table 4-1 to address internal loading through the development of Lake Management Plans. Including internal sources and watershed contributions defined in the 1WIP report, would result in more comprehensive management plans. This assessment could provide strategies to protect as well as specific targeting to maintain the high quality of these resources. Language for an action item in the Table 4-1 could read: "Develop lake management plans to enhance protection of unimpaired high resources value lakes and identify the most important work. Plans will include elements to address both internal and external stressors and identify monitoring needs/gaps, address specific land areas providing multiple natural benefits for protection, provide more emphasis on zoning, and promote improved in-lake and lake-watershed management."		x	No	4	Action #108 addresses in-lake management: Provide technical and financial assistance to lake associations and other stakeholders for the implementation of in-lake management efforts to improve the quality of water resources, when appropriate.
	High Quality Lakes / Lakes at Risk - 3	3	Shallow lakes are high value resources with significant benefits to hydrology, water quality, and aquatic habitat that play a large role in maintaining ecosystem services within the watershed. Shallow lakes were listed as an "E" Level priority, with concerns regarding shallow lakes addressed in Table 2-1. While shallow lakes' value as their own entity may be considered low, their contribution to a healthy watersheds is significant. We suggest adding language to Section 3.4.4 to convey: "Shallow lakes are high value resources. Shallow lakes and their functions are at risk due to sensitivity to landscape alterations and merit protection." The inclusion of this statement will provide for consideration of shallow lakes within lake protection criteria without specifically altering the "level" of priority concern establishment.		x	No	3	Comment acknowledged. Plan content remains unchanged as not to confuse approved prioritization efforts. Local focus was on Lakes (recreational in the LPSS) in recognition that they cannot address everything.
	High Quality Lakes / Lakes at Risk - 4	3	Section 3.4.4 also lists measureable goals and metrics for restoration of basins, with the specific metric listed as "Number of impaired basins". It may be difficult to meet/see water quality standards within 10 years despite improvements. It would be beneficial to implement a finer-scale metric for measuring improvements in water quality in lakes. Improvement of water quality resulting from implementation activities should be acknowledged as progress towards fewer impaired waters, even if it does rise above the threshold for water quality standards. We suggest that a second metric be added to on page 3-22 reading: "Improvement in water quality in impaired basins [statistically significant]."		x	No	3	Number of unimpaired lakes is the metric for lakes with an approved TMDL, as the goal would be moving those lakes to unimpaired status. Improvements (e.g. load reduction to lakes) shown as metric in other goals for lakes.

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	Riparian Areas and Loss of Vegetation - 1	3	Specific goals and strategies for rare species and natural plant communities is addressed in Section 3.4.7-8. While the multiple benefits of several types of projects are mentioned in Sections 3.4.6, 3.4.8 and Table 4-1, as well as in strategies in Appendix K, there is no specific statement regarding the importance of projects with multiple benefits in implementation or priority given to projects with multiple benefits. We suggest language as found in BWSR's 1WIP Guiding Principles document: <i>"Prioritized, multi-benefit projects provide benefits to more than one group or interest and address more than one environmental resource within a watershed. These types of projects are necessary to build the support of citizens and agencies, achieve water quality and quantity goals, and produce the environmental goods and benefits that a healthy watershed provides. Implementation projects that provide multiple resource benefits will be prioritized above projects providing more narrow focused resource benefits whenever possible."</i>			x	No	3	Comment acknowledged, however text remains unchanged. Projects in the targeted implementation approach were prioritized based on local goals to find the most cost effective practices for reducing sediment and nutrient delivery.
	Altered Hydrology - 1	3, 4	The altered hydrology priority was addressed in Section 3.4.5 and presented in Appendix L. The establishment of volume reduction goals is a good step in acknowledging the significance of altered hydrology within the North Fork Crow River watershed. We will continue to evaluate the scope, causes, and impacts of altered hydrology. While this assessment identifies that hydrology is altered from historic condition, it falls short of identifying why the changes have occurred in the watershed, and separating the effects of climate and land-use changes. Certainly projects that directly increase runoff and flows should be weighed against this plan and alternatives or mitigation should be considered. A stronger evaluation of projects impact on flow should occur. We concur with the need to refine hydrology assessments to a smaller scale and will continue to work with partners on evaluation of hydrology (paragraph 5 of page 3-23).			x	No	3	This methodology explicitly avoids discussion about causality, and instead focuses on confirming impact and how planning partners can document progress towards a stated storage goal. Thanks for your commitment to work with partners on evaluation of hydrology.
	Altered Hydrology - 2	4	Section 2.4.1.5 notes near-channel and in-channel sediment sources as a major contributor to stream loading. Section 4.5.1 discusses the limitations of PTMAApp with regards to in-channel and near-channel sediment sources. If the 1WIP process identifies reaches in need of geomorphology assessments, DNR hydrologists and watershed specialists are committed to the 1WIP and will make every effort to assist. Geomorphic survey involves collecting empirical data and can be conducted by DNR on a sub watershed scale. Unstable channels often have improper dimension, pattern, and/or profile. Merely cutting the hydrology of degraded channels will not result in immediate improvements as the plan implies (row 67 of Table 4-1). The evolution to a stable stream through the natural channel process can take years. Stream restoration may be needed.			x	No	4	Comment acknowledged with thanks.
	General - 1	4	We suggest a plain language summary document be prepared highlighting the important activities and actions for successful implementation. Creation of this general public summary would be an addition to the executive summary . This is a complex plan, with detailed technical elements and strategies. It will be challenging for the public to fully grasp the plan without a simplified version.			x	No	N/A	Comment acknowledged, and will be considered by planning partners.
	General - 2	4	Section 3.3 - Land Stewardship . This section provides a good overview of a different approach incorporating shared responsibility watershed health. Rural stewardship as outlined will incorporate strategies around soil health and increasing soil organic content. This goal will benefit hydrology and reduce nutrient/sediment loss from upland areas. We have concerns how soil organic matter will be measured. Future plans should detail specific methods, and research for accurately measuring the benefits of the practices . In addition to rural stewardship, DNR will continue to work with plan partners to further develop Urban and Shoreland Stewardship.			x	No	N/A	Comment acknowledged. SOM can be measured through field walkovers, which are covered under the BMP Cost Share Initiative.
	General - 3	4	Reducing the scale for targeting future local work plans would be an improvement. Applying the targeting process outlined on smaller scale subwatershed, prioritized by local partners could show tangible results like measuring outcomes from targeted cover crops. This plan may be more effective when plan partners are able to act on a smaller scale.			x	No	N/A	Agreed. This summarize planning at a large, HUC 8 scale. Data is available field scale through PTMAApp Desktop and PTMAApp Web.
	General - 4	4	DNR is listed in Action Items in Table 4-1 as a lead entity . We will work with local partners to the best of our ability. Greatest opportunities for collaboration will occur when NFC 1 WIP goals align with those listed in other approved DNR plans.			x	No	N/A	Comment acknowledged with thanks.
	General - 5	4	DNR is listed as having a statutory obligation for stream hydraulic capacity in Table 5-3. This table is representative of local statutory obligations, please remove DNR from this table.	x			Yes	5	Removed stream hydraulic capacity from the local table, as this does not fit as well under local statutory obligations.

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MPCA	General -1	1	The MPCA understands that because the Plan is focused on strategies at the Planning Region [Hydrologic Unit Code (HUC) 10] level, it limits the ability to use total maximum daily load (TMDL) reduction goals directly for the identified priority concerns. Therefore, it is possible that reduction goals established in the Plan may not attain TMDL requirements and/or achieve water quality standards. TMDL load reductions were established for bacteria and Turbidity/total suspended solids (11 impairments on six stream reaches) as well as 34 lakes impaired for nutrients in the watershed as part of earlier environmental studies. It is recommended that the HUC 10 watershed Planning Region implementation profiles be annotated to direct the reader toward additional information that is available in the TMDL report. As implementation proceeds, these additional resources can be used to gauge progress toward achieving water quality goals.	x			Yes	4	Text added to each implementation profile: For more information about impaired and assessed streams and lakes within this planning region, please see the NFCR Watershed Restoration and Protection Strategy Report (https://www.pca.state.mn.us/sites/default/files/wq-ws4-06a.pdf).
	General -2	1	Another resource that should be used to augment the Plan is the 2014 Watershed Restoration and Protection Strategy (WRAPS) report. It is recommended that the Plan specifically reference the current conditions and specific water quality Goals/Targets identified in Table 12, Restoration and Protection Strategies, of the final WRAPS document.			x	Yes	4	See response to MPCA comment "General-1"
	General -3	1	Please ensure that the Executive Summary accurately reflects language within the main document.	x			Yes	ES	Revised per comments referencing section "ES" in this table.
	General -4	1	We think it is important that a strong linkage between the Plan and existing documents (WRAPS/TMDLs/GRAPS etc.) be created and maintained in order to address water quality issues within the watershed. The Minnesota Water Management Framework relies on an ongoing cycle of data collection, analysis, and planning and implementation (and adaptive management) to achieve successful protection and restoration goals.			x	No	4	Agreed. Section 4.3 (Importance of Work Completed by Others) was drafted for this reason.
	ES - 1	2	Language regarding priority level designation of potential concerns should mirror that of the main document. (Example: the executive summary should note that level D and E priorities may be affected by implementing A, B, and C).	x			Yes	ES	Addressed via BWSR comment "Executive Summary-2"
	ES - 2	2	Table ES-1: Existing TMDLs within each HUC 10 should at a minimum be annotated with an asterisk or other type of explanation.			x	No	ES	Specific issues impacting "Streams and Rivers" or "Lakes" is found in Table 2-1. Reference included in Implementation Profiles directing reader to WRAPS for specific information about impaired / assessed lakes and streams.
	Section 3 -1	2	Table 3-1. Needs consistency with the rest of the document. For example: including cover crops in the soil health/tillage criteria.	x			Yes	3	Good catch. Cover crops added to criteria.
	Section 3 -2	2	3.4.1 Drinking Water (Groundwater). Metric: Areas subject to structural BMPs or management practices. Needs clarification (acres vs square feet/miles, etc.).			x	No	3	"Area" allows for flexibility on reporting based on local government needs.
	Section 3 -3	2	3.4.4 Lakes. Protection Goal. The description of how reduction targets were determined in this section differs from the description of the process found on the MN Geo Spatial Commons, which describes how the nutrient reduction targets were calculated. We recommend that it read as follows: "For each lake, a TP load target and load goal were computed. The target TP for each lake was identified as the 25th percentile of the in-lake summer mean TP concentration. This target concentration is then used to estimate the TP load reduction needed to achieve the target load. The TP load reduction goal is the estimated reduction (pounds/year) in the total phosphorus load to meet the TP load goal."	x			Yes	3	Text added.
	Section 3 -4	2	3.4.5 Public Knowledge and Behavior. Measurable goal. The Middle Fork Crow River watershed staff are currently working on developing an improved measure of effectiveness of public outreach efforts. The new approach will use new research tools to measure actual behavioral changes on the landscape that occur a year or more after the training or informational meeting has occurred, rather than simply basing the effectiveness of public event on the number of attendees. The new tools may include surveys, onsite visits, story boards, or anecdotal or other data-derived methods for determining success. As this process develops, it is hoped that the new metrics for measuring success will be available for ongoing implementation efforts.			x	No	3	Comment acknowledged for use as the process develops and implementation occurs.
	Section 4 - 1	2	Table 4-2. The table should include reference to the 2014 report "North Fork Crow River TMDL, Bacteria, Nutrients and Turbidity."	x			Yes	4	Text added to table.
	Section 4 - 2	2	4.2.1. Water Quality Impacts. To mitigate for the limitations of the TMDL model described in Section 4.5.1, including bacteria impacts, and sources of sediment and nutrient impacts other than those from the surface of the land (Subsurface Sewage Treatment System, point sources, shoreland erosion, etc.), MPCA suggests that this section of the document reference the North Fork Crow River Watershed MPCA webpage at: https://www.pca.state.mn.us/water/watersheds/north-fork-crow-river , with particular emphasis on the following documents for additional information: "North Fork Crow River Watershed Restoration and Protection Strategy Report", "North Fork Crow River TMDL Bacteria, Nutrients and Turbidity: Final TMDL, North Fork Crow River Watershed Monitoring and Assessment Report."	x			Yes	4	Text added: Additional information about bacteria, sources of sediment, and nutrient impacts (individual septic treatment systems, point sources, shoreland erosion, etc.), can be found within the North Fork Crow River WRAPS, North Fork Crow River TMDL Bacteria, Nutrients and Turbidity, and North Fork Crow River Watershed Monitoring and Assessment Report, available at https://www.pca.state.mn.us/water/watersheds/north-fork-crow-river .

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	Section 4 - 3	2	4.6.1 Content of Implementation Profiles. Soil Organic Matter. The subject of this section provides an excellent opportunity to promote resources that have recently or are currently gathering data on the methods needed to achieve and benefit from improving soil health. Examples of such resources include Natural Resource Conservation Service (NRCS) or the Sustainable Farming Association (SFA). Please consider adding a list of such resources to aid the public in making sound decision regarding soil health.		x	No	4	Comment acknowledged for implementation. List was not included so as not to exclude entities.
	Section 5-1	3	5.1.3. Data gaps and research initiative. We recommend that this plan include more detail on the plan and process of assessing progress within the watershed. Water chemistry and biological monitoring strategies which would measure success or progression are not included in this section. There is significant data (including site locations and parameters) that is available that would greatly benefit the plan. A map describing monitoring locations would highlight areas where data is readily available and also demonstrate where the gaps are. We also recommend text outlining the requirement for periodic analysis of data in order to meet Minnesota Board of Water and Soil Resources (BWSR) requirements for achieving measurable actions and goals. Since the Plan itself is broken down into subwatersheds (HUC 10) and targets for nutrients and sediment are established based on these boundaries, there should be a way for the reader to identify the station or stations that will be used to evaluate progress (example: A table with known stations, parameters, and responsible agencies).		x	Yes	5	Text added: Periodic analysis of data to meet BWSR requirements for achieving measurable actions and goals will be completed by local and partnering entities. Currently, Met Council is doing data analysis within the NFCR Watershed for the watershed outlet monitoring program (WOMP).
	Section 5-2	3	5.1.3 . Paragraph 4. There are 80 major watersheds in Minnesota. There are 98 total biological monitoring sites within streams and rivers in the North Fork Crow River Watershed that have been monitored from 1999-2017 . In 2007, 60 biological stations and 16 water chemistry stations were sampled. These assessments identified 17 streams that cannot support aquatic life, 15 that do not support bodily contact (MPCA, 2011) . Further monitoring was conducted in 2017, sampling 43 biological stations, 10 water chemistry stations, and numerous lakes.		x	Yes	5	Text added: There are several surface monitoring sites in the NFCR Watershed that are operated by the MPCA as part of the watershed monitoring approach. The watershed approach is a 10-year rotation for assessing waters of the state on the level of Minnesota's 80 major watersheds (MPCA, 2012). There are 98 total biological monitoring sites within streams and rivers in the North Fork Crow River Watershed that have been monitored from 1999-2017. In 2007, 60 biological stations and 16 water chemistry stations were sampled. These assessments identified 17 streams that cannot support aquatic life, 15 that do not support bodily contact (MPCA, 2011). Further monitoring was conducted in 2017, sampling 43 biological stations, 10 water chemistry stations, and numerous lakes.
	Section 5-3	3	Table 5-3. There are existing regulations that are shown as N/A in the table.	x		Yes	5	Comment addressed through BWSR comment "Section 5-2"
	Section 5-4	3	Table 5-6. U.S. Environmental Protection Agency Program should include Federal Clean Water Act (319) for additional funding sources. These are mentioned in section 5.4.4 but not in the table.	x		Yes	5	Section 319 added to table
	Section 5-5	3	5.5.5.2 General Plan Amendments . It would be beneficial to include TMDLs in here or in 5.5.5.3 to allow future adjustments based on changes from intensive watershed monitoring and TMDL based data or statutory changes.		x	No	5	Monitoring efforts support local entities in confirming progress towards surface water goals, but would not require an amendment. We encourage MPCA to use these monitoring efforts to confirm the implementation approach and inform local staff accordingly.
			General comments: A more clear description of conservation delivery or more specific implementation avenues should be included. Setting measurable goals with specific target dates, or by planning year, in relation to the Action Description table of Section 4. We appreciate and compliment the efforts of the large and diverse group to identify various implementation levels with new approaches and ideas based on funding.		x	No	N/A	See response to BWSR comment "General-1"
MDA	1	1	Section 5. Establishing measurable goals assumes that addressing practices on 40% of an cropland areas in the watershed will increase soil health. Please provide a connection and how the 1% increase in soil organic matter, or soil health, will be made on those acres to meet the 10 year goal. In addition, references to measurable goals related to structural, lake shore, storm water, and public engagement could also be noted at this time. It should be noted in this section that the ability to achieve the measurable goals is not solely based on increased funding. New avenues for public engagement, outreach, and involving the right people on the ground to deliver a simple and specific message in a creative way could provide a larger benefit.	x		Yes	3	See response to BWSR comment "Section 3-2"
	2	1	3.3.1.2. No indication of cropland acres in which landowners are already evaluating cover crops, conservation tillage, and permanent cover in the watershed; this could serve a great resource to provide assistance to help meet the 40% acreage goal in 10 years.		x	No	3	Agreed! Intent is to update % of watershed meeting "stewardship" through field walkovers (to claim existing work being done) and implementation (to get more management practices on the ground).
	3	2	3.4.10. It may be best to distinguish what portion of the 125 field walkovers will be focused on outreach to city consultations, shore land owner visits, and agricultural producers, or if that is 125 of each group? A metric to measure results and outcomes, including engaging the agricultural community in a thoughtful and creative way, could be included under Field Walkovers. Precision agriculture and technology could be a more useful and interesting method to be considered under Field Walkovers, as previously mentioned by MDA.		x	No	3	125 as a group: "Complete 125 field walkovers, city consultations, or shoreland owner visits over the duration of the plan". Number and metrics developed through input with Planning Work Group and Advisory Committee.
	4	2						

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	5	2	3.4.2 No indication of irrigated cropland acres in which landowners are already utilizing irrigation scheduling, precision agriculture such as variable-rate application, moisture sensors, or nozzle upgrades which would serve as a great resource to help meet water quantity goals and provide valuable outreach and engagement avenues in the future.			x	No	3	Agreed! It is the hope that more information about existing good work on the land is obtained during field walkovers.
	6	2	Section 5. BMP Cost share Initiative. It is not clear if the practices and projects will be held to NRCS standards or the Urban BMP storm water manual? Table 5-2. Years (Start & End) should not be in 10 year intervals. 2-3 year intervals is preferred and provides greater transparency to the public, aids in work planning, and provides avenues to evaluate and adjust in a more timely manner. 5.5.2.1 MDA also submitted comments letters to the NFCR Watershed 1W1P in addition to the other agencies listed, but is not mentioned. Concern - 2.5.4 "D" Level Potential Concerns Drinking Water (Surface Water) "D" level potential concerns are not anticipated to be directly addressed within this plan, and therefore referred to as "potential" rather than a "priority" concern and received a second lowest priority and were confirmed by the Policy Committee. MDH would request the NFCR 1W1P clearly acknowledge the benefits of implementing water quality improvement projects in the NFCR watershed can have on the downstream drinking water sources of Minneapolis and St. Paul given the influence the watershed contributes to the quality of water of the Mississippi River. While it is widely recognized that the strategies included in the plan will benefit downstream drinking water, identification of surface water drinking water protection benefits may help the NFCR 1W1P increase the importance and priority of funding for the watershed projects.(2.2.4.1 Funding for Plan Implementation) . MDH/Drinking Water Protection would request that future NFCR watershed planning prioritize all sources of drinking water as an "A" level priority concerns and be considered the initial focus for implementation efforts.	x			No	5	Text was intentionally adaptable to funding sources. Per text in Plan Section 5: <i>To be suitable for funding under the BMP Cost Share Initiative, practices and projects must be planned and implemented to a recognized standard, such as the NRCS design standard or guidance found within an urban BMP stormwater manual. A lesser design standard can be used to fund a project or practice, but the total allotted cost share amount will be reduced. If a lesser design standard is used to plan and implement a management practice or structural BMP, the burden for replacement is shifted to landowner.</i> MDA did not submit a comment letter during plan initiation.
MDH	1	1	"D" level potential concerns are not anticipated to be directly addressed within this plan, and therefore referred to as "potential" rather than a "priority" concern and received a second lowest priority and were confirmed by the Policy Committee. MDH would request the NFCR 1W1P clearly acknowledge the benefits of implementing water quality improvement projects in the NFCR watershed can have on the downstream drinking water sources of Minneapolis and St. Paul given the influence the watershed contributes to the quality of water of the Mississippi River. While it is widely recognized that the strategies included in the plan will benefit downstream drinking water, identification of surface water drinking water protection benefits may help the NFCR 1W1P increase the importance and priority of funding for the watershed projects.(2.2.4.1 Funding for Plan Implementation) . MDH/Drinking Water Protection would request that future NFCR watershed planning prioritize all sources of drinking water as an "A" level priority concerns and be considered the initial focus for implementation efforts.				Yes	ES	Addressed via BWSR Comment "Executive Summary-3"
	2	2	Figure 2-1: Information on this figure would be useful if the MDA monitoring well nitrate concentrations data was removed and the nitrate probability mapping and the Drinking Water Supply Management Areas in a separate figure. A figure showing the vulnerability of Public Water Supplies and the nitrate probability of the watershed would be helpful in prioritizing and protecting the drinking water sources. The existing figure is confusing and trying to combine multiple sources of data is not useful.	x			Yes	2	The map for Drinking Water- GW has been separated into two maps: One with MDA monitoring wells, and one with the remaining layers.
	3	2	"Plan participants recognize the need to provide public water supplies free from contaminants of emerging concern." How will these contaminants be managed to prevent them from entering the water resources? I could not find an action item to address this concern. - Encourage drug/pharmaceutical take back programs, Household Hazardous Waste (HHW) and other waste collection programs, along with education on proper disposal for various products. This compliments the vulnerable WHP communities and MS4 programs. - Action Item could be: o Enhance Minnesotans' understanding of Contaminants of Emerging Concern (CECs) by communicating the health impacts and exposure potential of emerging contaminants in drinking water. Outreach and Education Grants are available through the MDH CEC Initiative. See Outreach and Education Grants (www.health.state.mn.us/divs/eh/risk/guidance/dwec/outreachproj.html) for opportunities.			x	No	4	Action #121: Promote education for solid and hazardous waste disposal and awareness of existing regulations, rules, and ordinances pertaining to proper waste disposal to reduce chemical and nutrient contamination of water.
	4	2	Concern --"Groundwater resources meriting protection include public and private drinking water supplies with nitrogen concentrations equal to or less than natural backgrounds and transition levels". MDH data should be used to determine the nitrate levels in public water supply drinking water wells. MDA does not have this data and if you are using it to demonstrate merit for the protection of drinking water, this data should be obtained from water quality compliance data used to meet Safe Drinking Water Compliance. Concern--Seal 150 unused and abandoned wells per year, with 20 being targeted to areas of high and moderately high nitrogen infiltration risk The measurable goal should read "High and moderately high vulnerability to potential contamination. Unused wells are conduits for nitrogen and many other contaminants.	x			No	3	We agree. This is a valuable service that you can provide in local plans. In future plans, we would like to have long term monitoring data mapped to guide implementation. Unfortunately, this information as not provided during the planning process.
	5	2	Concern--Seal 150 unused and abandoned wells per year, with 20 being targeted to areas of high and moderately high nitrogen infiltration risk The measurable goal should read "High and moderately high vulnerability to potential contamination. Unused wells are conduits for nitrogen and many other contaminants.			x	No	3	Goal uses the Nitrogen Risk Maps, which also takes land use and N inputs into consideration of risk.

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	6	2	Concern- Measurable Goal to reduce the number of private and public drinking water supplies with equal or exceed the nitrate nitrogen maximum contaminant level (10 (mg/l) under the Safe Drinking Water Act. The nitrate-nitrogen standard under the Safe Drinking Water Act is a maximum contaminant level (MCL). Once the MCL is exceeded, a public water supplier would need to address the violation. Starting drinking water protection efforts after the nitrate MCL is exceeded, will not prevent the outlay of financial resources to make a technical fix to address the violation. It is considered prudent to evaluate the trends of nitrate concentrations above 3 mg/l and start working on nitrogen management (BMPs) so that the nitrate concentrations do not increase and exceed the .Safe Drinking Water Act maximum contaminant level (MCL).		x	No	3	Tiers created for this purpose, and are already presented in plan: Measurable Goal (Protection): Maintain unimpacted private and public drinking water supply wells with nitrate-nitrogen concentrations at or near a concentration representative of background and transitional levels (>3 mg/l). Measurable Goal (Restoration- Lower Urgency): Reduce the number of public and private drinking water supplies which have nitrate - nitrogen concentrations considered moderately elevated above background concentrations (> 3 mg/l but ≤ 7 mg/l) Measurable Goal (Restoration- Moderate Urgency): Reduce the number of private and public drinking water supplies which have nitrate - nitrogen concentrations representing a possible future health concern. (> 7 mg/l to < 10 mg/l)
	7	3	Table 4-1: Action # 1 Under Implementation Component" Structural BMPs", should also include "Management Practices" to reduce leaching of potential contaminates within DWSMAs.		x	Yes	4	Management practices added.
	8	3	Table 4-1: Action Item # 30-Incomplete table	x		No	4	All table properties complete. There is a page break.
	9	3	Table 4-1: Recommended action item: Action Item- Assist public water suppliers in implementing their wellhead protection plans.		x	Yes	4	Lead: Public Water Suppliers; Partners: MDH, WD, Counties, Cities, SWCD
	10	3	Table 4-1: Recommended action item: Work with well owners to insure minimum setbacks or "isolation distances" from possible sources of contamination and identify other steps to that could make their well safe. (This could be done in part by distributing and reviewing with well owners MDH Owner's Guide to Wells brochure)		x	No	4	Comment acknowledged but not added due to feasibility.
	11	3	Table 4-1: Recommended action item: For private wells, the 1W1P plan could outline a sequence of work in regard to well testing and working with agricultural landowners on nitrogen BMPs, that reflects the MDA Township Testing Program schedule.		x	No	4	Comment acknowledged but not added due to feasibility.
	12	3	It is not apparent when or where actions items would be implemented during the ten year plan.		x	No	4	See Planning Region Implementation Profiles.
	13	3	At the time the NFCR 1W1P as being developed the Groundwater Restoration and Protection Strategy (GRAPS) was not completed, please consider including the GRAPS report for the NFCR Watershed into the Appendix for future reference.		x	No	4	Included in Table 4-2.
Met Council	1	1	Executive Summary. Please review the Executive Summary and convert overly-technical sentences to plain language. Multiple readers will use the Executive Summary; many of those readers will be non-technical. Please make sure the Executive Summary is either written in plain language or produce a separate plan language summary.		x	Yes	ES	The executive summary was revised to include more visuals and convert overly-technical language to plain language.
	2	1	Executive Summary. Please include a summary of the effects of the Crow River on downstream waters, particularly the Mississippi River. Recent studies - including the Minnesota Pollution Control Agency's (MPCA) 2017 document "Our Upper Mississippi River: What to Protect, What to Fix" (https://www.pca.state.mn.us/sites/default/files/lwq-iw8-08ab.pdf), as well as the Council's 2014 document "Crow River. Comprehensive water quality assessment of select metropolitan area streams" (www.metrocouncil.org/streams) - have shown that the Crow River discharge (which includes both the North and South Fork watersheds) at times doubles the concentration of nutrients and sediment in the Mississippi River. The Crow River confluence with the Mississippi River is upstream of the drinking water intakes of both the City of St. Paul Regional Water Services and the City of Minneapolis Water Treatment and Distribution Services. Thus, activities undertaken by the Planning Partners to improve water quality in the Crow River will likely result in improved water quality (and potentially lower treatment costs) for the two utilities, their nearly 1 million residential customers, and their numerous commercial customers. The IWIP does include reference to downstream water quality in several places; for example, in Table 2-1: Resources, potential concerns, and issues affecting a potential concern for the plan area (Item 2.4. Drinking Water; page 2-4). This information simply needs to be included in the Executive Summary.	x		Yes	ES	Addressed via BWSR Comment "Executive Summary-3"
	3	2	Chapter 2, Figure 2-13: Drinking (surface) water potential concern locations within the plan area This comment does not require a change to the 1WIP but is a recommendation for the Minnesota Board of Soil and Water Resources (BWSR) for future 1WIP studies. We recommend removing downstream impacts from the prioritization process and addressing them in a separate section or chapter. Drinking water from surface water is not relevant to North Fork Crow River watershed residents, since all use groundwater for drinking water. Thus, this issue was prioritized as Category D (i.e. low priority). Obviously, this issue is of high priority for metropolitan area residents who rely on the Mississippi River (including Crow River water) as their drinking water source. Including a separate section focused on downstream impacts would ensure similar crucial issues are not lost.		x	No	N/A	Comment acknowledged for future planning efforts.

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	4	2	Chapter 3, Section 3.3.1 Rural Stewardship Council staff commend the Planning Partners and their consultant for including and implementing a very creative strategy for improving water quality and quantity through use of combined management practices to improve soil health, which has been called "rural stewardship" within the 1WIP.			x	No	3	Comment acknowledged with thanks.
	5	2	Chapter 3, Section 3.4.1 Drinking Water (Groundwater) The Groundwater Restoration and Protection Strategy (GRAPS) document, prepared by the Minnesota Department of Health and partners, was completed after the start of the 1WIP process, and was not included in the 1WIP. We recommend that strategies, guidelines, and recommendations listed in the GRAPS be incorporated in IWIP updates and amendments.			x	No	4	GRAPS was used as information became available, and is referenced in Table 4-2. Additional information can be considered in plan updates/amendments as needed.
	6	2	Table 4-2: State documents and relation to the North Fork Crow River Watershed 1WIP (page 4-12). We recommend including the following two studies on this table: the Minnesota Pollution Control Agency's (MPCA) 2017 document "Our Upper Mississippi River: What to Protect, What to Fix" (https://www.pca.state.mn.us/sites/default/files/lwq-iw8-08ab.pdf), as well as the Council's 2014 document "Crow River. Comprehensive water quality assessment of select metropolitan area streams" (www.metrocouncil.org/streams/).			x	No	4	Comment acknowledged. This table was not intended to be all inclusive.
	7	2	Table 5-2: Potential capital improvement projects in the North Fork Crow River Watershed One Watershed One Plan Planning Area (page 5-7) and Table 5-3: Statutory responsibilities and regulations, rules, and ordinances (page 5-14). In Table 5-2, we recommend refining the start and end dates for implementation of capital projects. The ten-year implementation period used in the table is simply too broad to be useful in financial planning necessary to complete the projects. In Table 5-3, please complete the table and replace N/A with available information.			x	Yes	5	Please see response to BWSR Comment Section 5-1 and Section 5-2
Upper Mississippi River Source Water Protection Project	1	1	Table 2-1: Resources, potential concerns and issues affecting a potential concern for the plan area. The notation under 2.1 (Streams and Rivers) Description includes drinking water as a beneficial use. This brings the issues identified forward as helping with the quality of the drinking water resource. Under 2.4 (Drinking Water) Addresses the drinking water issues but gives the issues a level "D" prioritization - meaning these issues will not be specifically acted upon to improve the drinking water resource. We would request consideration of re-classification to a higher priority for funding of projects and/or protection of the resource. We would request consideration of higher classification in future 1WIP.			x	Yes	ES	Text added: It should be noted that many implementation efforts affecting one or more priority concerns permeate to lower level potential concerns, therefore benefiting those resources too. For example, streams and rivers emerged as a B-level priority concern, while surface drinking water emerged as a D-level concern. The Crow River is a defining water feature of the NFRC Watershed, and discharges to the Mississippi River. The Crow River discharge (which includes both the North and South Fork Watersheds) at times doubles the concentration of nutrients and sediment in the Mississippi River. The discharge location is upstream of the drinking water intakes of both the City of St. Paul Regional Water Services and the City of Minneapolis Water Treatment and Distribution Services. These utilities provide drinking water to nearly 1 million residential customers. Thus, when streams and rivers (e.g. Crow River and its tributaries) benefit from strategies addressing nutrients (phosphorus and nitrogen), sediment, and bacteria loading, so too does surface drinking water sources for many people downstream.
	2	2	Table 2-2: The ranked list of potential concerns with priority level classifications, resulting from the analysis and prioritization of issues process. Rating of "Potential" concern instead of priority concern puts the implementation strategies of direct impacts to the drinking water supply out of the plan. While the UMRSWPP recognizes that the NFRC is addressing the issues of nitrogen, phosphorus, and turbidity under other high priority concerns, we would like to see better definition of the practices as a drinking water resource protection. This would enable higher priority in grant funding opportunities.			x	No	4	There are ranked practices identified within the Planning Region Implementation Profiles that would directly benefit the Crow River, and therefore downstream drinking water resources. We look forward to future collaborations to get projects implemented to address these mutual goals (rivers and surface water). The fact that drinking surface water did not emerge as a local priority should not prevent the UMRSWPP from engaging and using this plan as a guide for effective implementation, including financial contribution.
	3	2	2.4.1.2: Contaminants of Emerging Concern. Contaminants of emerging concern should be somehow linked to the implementation schedule, either in an educational context or in the management practices themselves.			x	No	2	Identified as an emerging issue.
U of M Water Resources Center	1	1	In the areas of the watershed with high livestock density there needs to be additional consideration to the fact that manure may be applied in compliance with 7020 rules and still result in very high soil test phosphorus, since the 7020 rules limit manure application rates only to those determined by crop nitrogen need. Because of the difference in ratio between N and P in manure relative to that of crop need, that usually leads to excess phosphorus application. Phosphorus, especially dissolved phosphorus leaving in surface runoff is proportional to soil test P. PTMApp assumes a general, literature-based soil test P for cropland. If not calibrated to local conditions, this will substantially underestimate P loss to waters from these high livestock density areas. Work we did with dairy producers in that region showed soil test P (Bray P-1) could frequently be above 100ppm. Agronomic cutoff rates for fertilizer application are 20-25% of those soil test values, but the farmers need to spread their manure somewhere. If livestock operations had been permitted based on sufficient land for P application rates instead of N, this would not have been a problem.			x	No	4	Comment noted for implementation purposes.

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	2	1	Based on the information above, manure management practices need to extend beyond compliance with 7020 application rules. They need to begin with adjustment of farm-gate phosphorus input-output balances. The largest source of P to many of these farms is imported feed. Management practices that can adjust the farm-gate import-export imbalances and reduce soil test P to agronomic levels include: a. Reduce imported feeds and P supplements, producing a higher percent of feed on the farm with recycled P and reducing feed P intake to NRC recommended levels. b. Sell manure or trade manure for feedgrains from neighboring crop farms. c. Increase on-farm yields with existing recycled P by using irrigation or other techniques. d. Reduce numbers of unproductive livestock (heifers, etc.) to minimum requirements. e. Reduce feed waste. f. Eliminate P fertilizer, including starter P, on high soil test fields.			x	No	4	Comment noted for implementation purposes.
Middle Fork Crow River Watershed District	1	1	Page ES-2: Missing table ES-2		x		Yes	ES	Moved Table ES-2 to the main body of text to avoid confusion.
	2	1	Page ES-4: Paragraph 2 indicates the year 2015, yet the Table ES-4 indicates 2016.		x		Yes	ES, 4	Removed "2016" from table, and tables within Section 4.
	3	1	Page ES-4: Parties have not drafted a revised MOA—this should not be included.		x		Yes	ES, 5	Changed to: The parties are drafting a revised MOA...Change also reflected in Section 5.
	4	1	Page ES-5: CROW should include "prepare annual fiscal reports" and the Planning Work Group should have "review annual fiscal reports". Add "Review Annual Work Plan" that will be prepared by CROW.		x		Yes	ES, 5	Changes made, and carried over into Section 5.
	5	1	Page ES-6: The "Treatment Group Type & Number of Structural BMPs" numbers in the columns is for ten years? And the Annualized cost is for 1 year, with the "Progress towards 10 yr. Goal (%)" is a bit confusing. If the number of storage and filtration practices are 99 and 151 for Lake Koronis-North Fork Crow River, the Estimated Annualized costs waters the practice numbers down.			x	No	ES	Correct: Number of practices is for 10 years, annualized cost is annualized for one year, and progress towards 10 year goal is assuming all practices are implemented. Presented costs are annualized lifecycle costs, inclusive of design, construction (earthwork, piping, etc.), installation, operation and maintenance, land cost, and lost crop opportunity costs from crops removed from production. See Section 4.6.1 for more information.
	6	1	Page 1-1: Maybe Diane can verify, June 2014 or October 2014.		x		No	ES	Announced in June of 2014. http://www.bwsr.state.mn.us/news/newsreleases/06-26-14_One_Watershed_Release.pdf
	7	1	Page 1-4: Could it include local Citizen Advisory Committees as well.	x			No	1	Comment noted and will be explored during implementation.
	8	1	Page 1-4: Paragraph 3. Would it be helpful to include the following in the ES as well? "The Policy Committee retained ultimate responsibility for plan direction, decisions, and content."			x	No	N/A	For brevity, no discussion of committees is included in the Executive Summary.
	9	1	Table 2-1: 4.1 description: Could it include the term "shoreland owner" – as the plan calls out three fairly distinct groups: urban, rural, and lakeshore.			x	Yes	2	Added "shoreland owner" to description.
	10	1	2.4.1.1 – Why no disclosure of human involvement as catalyst of changing climate? Nor human ability to mitigate climate change, (i.e. soil health and its link to carbon sequestration)?			x	No	2	Reference to human involvement removed from text at request of Policy Committee.
	11	1	2.4.1.2 – Omit the word possibly, found at end of second paragraph (...and possibly human health.) Reasons for omission: 1- it is redundant as the sentence already states that contaminants of emerging concern "...may adversely affect..." & 2- it unnecessary separates us from the natural world, of which we depend for our health.			x	Yes	2	Change made: "possibly" removed from text.
	12	1	2.4.1.3 – Omit the work may from entire subsection, scientific ag. studies have repeatedly shown that: improving soil health will increase the soil's nutrient cycling capacity, and that correct management of soil health will improve organic content of soils.			x	Yes	2	Change made: "may" removed from text.
	13	1	2.4.1.6 – Grammatical error - In second paragraph an example list of irrigation conservation management practices is given using Latin abbreviation i.e. (in essence) and should be e.g. (example(s) given).			x	Yes	2	Change made: i.e. changed to e.g.
	14	1	2.4.1.7 – Omit the work "may" from: "However, these drainage systems may have impacts on the natural hydrology of the landscape." & "These changes may alter the timing and magnitude of the delivery of water... There is no question as the altered hydrology caused by tile drainage of the landscape.			x	Yes	2	Change made: However, these drainage systems can positively and/or negatively impact hydrology. These changes can potentially alter the timing and magnitude of the delivery of water, decreasing base flow of streams, and increasing peak discharge and the likelihood of flooding.
	15	2	Page 2-33 – 2-36: 2.4.1.4 Invasive Species in the only section where we call out a main stakeholder in the SCIENCE AND TECHNICAL EMERGING ISSUES.			x	Yes	2	Removed text: The Minnesota Department of Natural Resources (MnDNR) is the main stakeholder statewide that addresses aquatic invasive species issues, including educational and enforcement measures. However, involvement of local stakeholders is also needed for effective prevention and/or control efforts.
	16	2	2.4.2.2 – Grammatical error – Found in last sentence of paragraph, ... programs aimed both (insert "at") acquiring and maintaining land for the resource protection purposes.			x	Yes	2	Change made: "at" added to sentence.
	17	2	Page 2-37: 2.4.2.3 – This section should also list "urban" in the conservation practice delivery mechanism.			x	Yes	2	Change made: Added "urban residents" to text.
	18	2	Page 2-37: 2.4.2.5 – "The hand-off of responsibility is also sometimes clouded". Could this be more descriptive or specific?			x	Yes	2	Text revised: "Roles and responsibilities between agency and non-agency entities can also be clouded."
	19	2	Page 2-38: 2.4.2.7 – In what way? "This plan recognizes the impact the national and international legislation has on local agricultural production and the producer's economic vitality."			x	Yes	2	Changed text: This plan recognizes the impact the national and international legislation has on local agricultural production.
	20	2	2.4.2.7 – Grammatical error – (i.e. switchgrass) should be (e.g. switchgrass) Minor issue I will stop identifying the misuse of i.e. and e.g. in my review from here on			x	Yes	2	Change made and checked through document.

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	21	2	Page 3-23: In the altered hydrology metric, please move "(primarily by increasing soil organic matter)" to after the work rural.	x		Yes	3	Change made
	22	2	3.3 – Grammatical error - Found in first paragraph, ... attaining priority concern measurable goal (make plural "S") cannot...	x		Yes	3	Change made
	23	2	3.3 – The second bullet point describes land stewardship planning as promoting, "...and increasing modern agricultural yields". I shy away from our prevailing focus on yields, as I feel it maintains and provokes unsustainable elements of modern agriculture. Furthermore, the discussion is evolving among producers and soil health professionals who understand that regenerative farming practices, while able to maintain and even increase yields over the long term may take a slight yield reduction during the transition period from modern farming to soil health (water quality) farming. I urge all mention of "yields" in this report as potential opportunity to mention the "increased net profit", that conservation farmers are enjoying (note – not all mention of yields needs to be changed). In so doing, this report will Join the conversation that early adopters are having, (i.e. modern agriculture strives for high yields, often at the compromise of the bottom dollar (and water quality) due to added tillage passes and chemical inputs). This one understanding/mental shift can greatly empower producers to adopt Management Practice actions that will help water quality in the NFCR Watershed. From this point on my review will note all mention of yields in this plan as: "increased net profit over yields" (refer to notes on 3.3 for description).	x		Yes	3	Text revised: "An increase of soil health can be associated with increased yields."
	24	2	3.3.1 – increased net profit over yields (refer to notes on 3.3 for description).	x		Yes	3	Text revised: "An increase of soil health can be associated with increased yields."
	25		3.4.10 – A measurable goal of "...125 field walkovers, city consultations, or shoreland owner visits over the duration of the plan", is highly obtainable. I believe that Landowner, producer, and Lake Shore Owner Engagement in Water Management is a great tool and that more of an emphasize could be place on this measurable goal (i.e. a larger measurable goal than 125).		x	No	3	No change made, as number of walkovers was selected based on consensus from Planning Work Group and Advisory Committee members.
	26	3	Table 4-1: Add WD to Partner on Action #3, #6, #8, #14, #29, #33, #58, #62, & #76	x		Yes	4	WD added to "Partners" as indicated.
	27	3	Table 4-1: Addition of a general monitoring at locally established and permanent gauging sites for volume and chemistry to provide trend analysis. Maybe in conjunction with CSG network. https://www.dnr.state.mn.us/waters/csg/index.html		x	No	4	Actions agreed upon by Planning Work Group and Advisory Committee
	28	3	5.3 – This section is a good overview of existing statutory responsibilities, ordinances, and rules; demonstrating that many of the presented and analyzed (1W1P) priority concerns, and measurable goal categories are already partially covered under regulation. However, many of these statutory responsibilities, ordinances, and rules are not being enforced/administered, due to lack of political will, staffing issues, etc., I would like to see acknowledgement of this fact and action toward remedying it with in this plan (i.e. Measurable Goal and metric).		x	No	3	Plan measurable goals already established based on consensus from Planning Work Group and Advisory Committee members. Text within emerging issues (Section 2): "Local governments provide administration and enforcement of these rules and statutes. However, there is commonly inconsistent administration and enforcement of these rules between jurisdictional boundaries. Negligent administration and enforcement in one jurisdictional boundary may negatively impact water quality and quantity of jurisdictional boundaries downstream."
	29	3	5.5.5: CIPs need only be approved by local Board to be amended to the Plan, but also any changes to the Table 5-3: Statutory responsibility and regulations, rules, and ordinances.	x		Yes	5	Agree. Language revised: <i>However, the existing authorities of each local government unit within the NFCR Watershed is still maintained. Prior to implementation by a local Board, CIPs need only be approved by the local Board. CIPs approved by a local Board are considered amended to the Plan. The local Board shall notify the Policy Committee of an approved CIP.</i>
	30	3	5.5.5: This section is too confusing and we should not allow it to inhibit in any way current (or future), local statutory authorities.	x		Yes	5	See response to comment #29.
	31	3	5.5.5: As an example, if the Middle Fork Crow River Board of Managers updates their Administrative Rules, are petitioned for a capitol project or would like to establish stormwater management districts, they should only have to notify the Policy Committee.	x		Yes	5	Language revised: <i>Any activity implemented through the "normal" statutory authorities of a local unit of government, unless the activity is deemed contrary to the intent and purpose of this plan. This plan does not affect any of the normal statutory authorities of a local unit of government;</i>
	1	1	Table ES 2 is referenced and appears not to exist or is not labeled correctly? Pg ES-3.	x		Yes	ES	Change made
Stearns SWCD	2	1	Table 2-1 (pg2-4): Item 2.3.3: Water Quantity: Loss of natural water storage on the landscape, including natural digressional "depressional?" areas, wetlands, and soil organic matter.	x		Yes	2	Change made
	3	1	Table 2-1 (pg2-5): Items 5.1.1 and 6.1: Increases in the amount of impervious surface and the rate, volume and duration of runoff associated with increases in soil erosion and nutrient loading. Note: All new development or redevelopment that creates an acre of new impervious surfaces is already supposed to be offsetting the increase of runoff from the development. One thing missing from this section is the concern of existing development and being able to go in and retrofit it with stormwater BMP's to minimize the current impact to our water resources.		x	No	2	Comment noted, and encouraged to be incorporated into urban stewardship criteria.
	4	1	Rural Stewardship goal of 40% Land area increase OM by 1%. How is that going to be field measured at the starting or ending point? What if 20% of the land area increases OM by 2%?		x	No	3	SOM may be measured as part of field walkovers, which are funded through the BMP Cost Share Initiative.
	5	1	Meeting the requirement: Acres subject to no-till, ridge till, strip-till and mulch-till; assumed to increase organic matter content by 1% from current condition? Appropriate assumption?		x	No	3	Goal is to use management practices to increase SOM 1%.

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	6	1	2.4.2.6 (Pg 2-37). There is also lack of staff and resources to adequately administer and enforce the rules and statutes.	x		Yes	2	Text added
	7	1	2.4.3 (Pg 2-38). Another Data gap is the lack of high quality annual aerial imagery and the Lidar in some areas is outdated.		x	No	2	Comment noted.
	8	1	Table 3-5 (Pg 3-10). Waste No concentrated livestock with direct access to a public (add) water. Management Practice N		x	No	3	Comment noted and encouraged to be incorporated when the group develops shoreland stewardship criteria for evaluation.
	9	1	Table 3-5 (Pg 3-10). Management Shoreline utilizes low impact lawn management; i.e., proper fertilizer rates, reduced herbicide and pesticide use, proper disposal of lawn waste disposal (delete). Management Practice N		x	No	3	Comment noted and encouraged to be incorporated when the group develops shoreland stewardship criteria for evaluation.
	10	1	3.4.1 (Pg 3-11). Greater than signs switched to less than signs?	x		Yes	3	Signs changed.
	11	1	3.4.4 (Pg 3-22). The measurable goal just above 3.4.5 Surface should be a 0% increase in lakes that get infested. The metric is the number of acres/lbs. treated in infested lakes. This is just treating the symptoms of AIS and not focusing on the causes of transport of AIS.		x	No	3	That was the original goal, but it was revised to current goal based on PWG and AC input.
	12	1	3.4.6 (Pg 3-25). Block size is confusing. The measurable goal "No net loss of wetlands" Should consider "No net loss in the functions and values of wetlands"?	x		Yes	3	Changed to: No net loss in acreage and functions of wetlands.
	13	1	3.4.7 (Pg 3-25). Has the baseline of Number and type of terrestrial species been documented? Where is the methodology for this process identified?		x	No	3	No- identified data gap during planning process.
	14	1	3.4.8 (Pg 3-26). Is ecological habitat defined? You may have a buffer of 300 x 1500 but if it is only brome then it should not be considered habitat.		x	No	3	As defined in measurable goal: area within the riparian corridor providing multiple ecosystem benefits (reduced erosion; increased wildlife habitat; presence of migration corridor; water quality improvement). The area includes land subject to Minnesota Buffer Law, adjusted to meet landowner business needs. Priority given to habitat block sizes with a minimum of 300 feet in width and 1,500 feet in length with connections to other habitat blocks.
	15	1	3.4.10 (Pg 3-27). What about targeting Absentee Landowners?		x	No	3	Comment acknowledged.
	16	1	3.4.11 (Pg 3-27) Process for measuring OM. Improving OM is a good goal but it will be tough to measure 1% improvement from what is existing conditions.		x	No	3	Addressed in Comment #4
	17	1	General Note: A goal could be to create a publically available GIS layer which one could click on their property and it would identify which goals in the 1w1p apply to their parcel?		x	No	3	Comment noted for plan implementation purposes.
	18	2	3.4.12 (Pg 3-28) Urban Stormwater. 1. It is one thing to focus on the City's themselves but it is going to take all the residents at the individual lot level managing everything correctly to get where we need to go. 2. Each City should be supported in creating a surface water management plan in which all the subcatchment areas are identified and prioritize on where to focus efforts in which show best bang for the buck. 3. The Cities also need to have MIDS or equivalent in place but they also need the resources to get trained or have their staff be able to implement it as well		x	No	3	Comment noted for plan implementation purposes.
	19	2	Urban Stewardship not yet been defined (Set date on when this is to be defined). Create GIS Layer that click on lot which id which 1w1p action items apply to their parcel.		x	No	3	Comment noted for plan implementation purposes.
	20	2	Shoreland Stewardship has not yet been defined either? Set date on when this is to be defined		x	No	3	Comment noted for plan implementation purposes.
	21	2	Table 4-1 #1. (Pg 4-4). Might have skipped a step. Do all the producers within a DWSMA know they are located in a DWSMA and know what that means on how they should be managing their nutrient applications?		x	No	4	Other action items define outreach to producers.
	22	2	Table 4-1 #2. (Pg 4-4). Why would we want to maintain our existing poor soil health? We should be focused on improving/regenerative.	x		Yes	4	Change made: Implement and maintain existing BMPs that are focused on improving or maintaining soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.
	23	2	Table 4-1 #3. (Pg 4-4) help? Implement	x		Yes	4	Change made
	24	2	Table 4-1 #5. (Pg 4-4). Dept. of Ag should be lead?	x		No	4	Comment noted for implementation purposes.
	25	2	Table 4-1 #7. (Pg 4-4) Wording: Provide technical and financial assistance to landowners to implement animal waste management systems. Manage water using runoff control measures in accordance with accepted design standards and practice.	x		Yes	4	Change made.
	26	2	Table 4-1 #8.(Pg 4-4) Drip not Drop? help? Implement	x		Yes	4	Change made.
	27	2	Table 4-1 #10.(Pg 4-4) Wording: Promote BMPs that enhance hydrologic storage by restoring wetlands, increasing perennial native vegetation in upland and riparian areas that provide connections to expand riparian access. These actions also provide benefits to restoring stream stability and equilibrium where it is found to be impaired. (Hydrologic storage could most directly be increased by restoring wetlands.) Delete.	x		No	4	Comment noted for implementation purposes.
	28	2	Table 4-1 #12 (Pg 4-4) . This should be led by the LGU since it is part of the planning, zoning, stormwater requirements process and or drainage authority. This item could be interpreted to mean removal of critical habitat (woody material) in lakes in rivers. May want to clarify further.	x		Yes	4	Change made: Proactively cleanout build-up of debris from water resources and stormwater ponds
	29	2	Table 4-1 #13 (Pg 4-4). Need to include DNR as partner since some public waters are also ditches that could benefit from 2 stage.	x		Yes	4	DNR added

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	30	2	Table 4-1 #14 (Pg 4-5). Similar to #1. Educational campaign needed to educate those that are located in priority areas to know what they need to do?	x		No	4	Other action items define outreach to producers.
	31	2	Table 4-1 #15 (Pg 4-5). Add: "and improve soil health." Use managed and rotational grazing methods to manage animal wastes, prevent livestock entry into surface waterbodies and improve soil health.	x		Yes	4	Change made.
	32	2	Table 4-1 #17 (Pg 4-5). Pervious lands? (open space?). Need to include local Assessors as a partner of the Tax Credit Process? When completed what would this look like?		x	No	4	Comment noted for implementation purposes.
	33	2	Table 4-1 #18 (Pg 4-5). When completed what would this look like?		x	No	4	Comment noted.
	34	3	Table 4-1 #19 (Pg 4-5). Wording: Promote and implement practices to restore natural hydrology, such as the adoption of drainage water management, the restoration of drained wetlands and altered streams for multiple benefits. It would be beneficial to define what support means. If not in the plan have an idea if support means financial, legislative, does it mean that we find systems that can be researched, other?		x	No	4	Comment noted for implementation purposes.
	35	3	Table 4-1 #22 (Pg 4-5). Plant instead of Plan. Need to include local Assessors as a partner of the Tax Credit Process? Are there any of these areas left outside of the MBS Sites? Who is going to be in charge of identifying these areas? DNR to take the lead?	x		Yes	4	Change made.
	36	3	Table 4-1 #23 (Pg 4-5). Add a management component? Otherwise if left alone under easement things have a way of moving toward undesirable species (buckthorn)	x		Yes	4	Encourage use and management of conservation easement programs in marginal, erodible land.
	37	3	Table 4-1 #24 (Pg 4-5). Consider adding to look for retrofit opportunities as part of capital improvement projects.	x		No	4	Comment noted for implementation purposes.
	38	3	Table 4-1 #26 (Pg 4-5). Maybe add a goal to have 1 drainage management BMP available for public viewing in each of the main watershed areas. Also think there is lack of knowledge that producers have so may want to add an educational component as well? #27 may cover part of this?		x	No	4	Comment noted for implementation purposes.
	39	3	Table 4-1 #29 (Pg 4-5). How to ID Multi Aquifer wells easily? GIS Layer created?		x	No	4	Comment noted for implementation purposes.
	40	3	Table 4-1 #30 (Pg 4-6). Last part of sentence. Consider regulating other potential issues that may cause adverse effects within DWSMA? What does/would that look like?		x	No	4	Comment noted for implementation purposes.
	41	3	Table 4-1 #31 (Pg 4-6). What will this look like? NPDES Construction Stormwater Permit currently does not allow infiltration practices in DWSMA's. Modify mining ordinances to take this into consideration? Conditions of CUP?		x	No	4	Comment noted for implementation purposes.
	42	3	Table 4-1 #33 (Pg 4-6). Paying for people to pump their septic tanks as part of maintenance? Provide financial assistance to help those that need to upgrade to be compliant maybe?		x	No	4	Comment noted for implementation purposes.
	43	3	Table 4-1 #34 (Pg 4-6). MPCA is already doing this so why include it in the plan? How about working with those that have the NPDES permits (WWTF) to be more efficient (Green Step) and utilize there campus for other ecosystem services?		x	No	4	Activities from agencies are included in the targeted implementation schedule to clarify implementation roles and responsibilities.
	44	3	Table 4-1 #35 (Pg 4-6). Utilize Green Step?		x	No	4	Comment noted for implementation purposes.
	45	3	Table 4-1 #37 (Pg 4-6). Would this apply to all three stewardship categories or just ag?		x	No	4	Action does not apply to stewardship directly. It can relate to rural stewardship as an additional practice being implemented to address soil and nutrient loss. It can also be incorporated into future criteria for shoreland and urban stewardship.
	46	3	Table 4-1 #38 (Pg 4-6). If you develop and increase the resources and add it to #42 you shouldn't need this one. If left as is what is the benefit?		x	No	4	Comment noted for implementation purposes.
	47	3	Table 4-1 #39 (Pg 4-6). pervious areas? Maybe use the term open space?		x	No	4	Comment noted for implementation purposes.
	48	3	Table 4-1 #40 (Pg 4-6). Define when stewardship is met and create GIS layer to go with it?		x	No	4	Agree- the group will need to define shoreland stewardship to assess current baseline conditions and future goals. A GIS layer would be a great way to track progress towards a stated goal.
	49	3	Table 4-1 #43 (Pg 4-6). MDA and County to lead?		x	Yes	4	Added MDA as partner.
	50	3	Table 4-1 #49 (Pg 4-7). DNR and Army Corp also to lead?		x	Yes	4	US Corps of Engineers added as partner.
	51	3	Table 4-1 #55 (Pg 4-7). What is this supposed to look like when done?		x	No	4	Comment noted for implementation purposes.
	52	3	Table 4-1 #57. (Pg 4-7). When would this be necessary or what would trigger an area to be a candidate for this effort?		x	No	4	Comment noted for implementation purposes.
	53	4	Table 4-1 #58 (Pg 4-7). GIS layers to LGU's so they are aware of the plume issues and locations to make good land use decisions? How about more resources to locate and map more plumes? NPDES Construction Stormwater and MS4 Permit already require this to be considered.		x	No	4	Comment noted for implementation purposes.
	54	4	Table 4-1 #63 (Pg 4-7). Add: "and still protect the resource"	x		Yes	4	Change made.
	55	4	Table 4-1 #66 (Pg 4-8). Add gather culvert inventory data to also be able to ID locations for BMP's to store additional water on the landscape?		x	No	4	Comment noted for implementation purposes.
	56	4	Table 4-1 #67 (Pg 4-8). Isn't this already set? 0.75" reduction across the watershed? Pg 6 of pdf.		x	No	4	Comment noted for implementation purposes.
	57	4	Table 4-1 #68 (Pg 4-8). Unclear what goal would look like when completed or the benefit of such information?		x	No	4	Comment noted for implementation purposes.
	58	4	Table 4-1 #70 (Pg 4-8). Confusing. Reword? Set soil health and soil loss standards to meet... also include in Shoreland Stewardship?	x		Yes	4	Set soil health and soil loss standards to meet principles of rural, urban, and shoreland stewardship.
	59	4	Table 4-1 #72 (Pg 4-8). What is meant by barrier (Physical or social)?		x	Yes	4	Added "physical"

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	60	4	Table 4-1 #73 (Pg 4-8). Add increasing public's knowledge and ability to be able to identify AIS?		x	No	4	Comment noted for implementation purposes.
	61	4	Table 4-1 #75 (Pg 4-8). Benefit?		x	No	4	Comment noted for implementation purposes.
	62	4	Table 4-1 #76 (Pg 4-8). Why just lakes?		x	No	4	Ravines were an issue explicitly tied to local lakes in the prioritization process.
	63	4	Table 4-1 #77 (Pg 4-8). Add monitoring points above and beyond what the MPCA is doing on the 10yr cycle?		x	No	4	Comment noted for implementation purposes.
	64	4	Table 4-1 #79 (Pg 4-8). Benefit of this information?		x	No	4	Comment noted for implementation purposes.
	65	4	Table 4-1 #80 (Pg 4-8). Addressed through Buffer Law? Or is the idea to use this information to give a project a higher score when comparing to other projects as a way of prioritizing projects?		x	No	4	Comment noted for implementation purposes.
	66	4	Table 4-1 #82 (Pg 4-9). ?		x	No	4	Comment noted for implementation purposes.
	67	4	Table 4-1 #83 and #84 (Pg 4-9). Doesn't the FEMA maps already cover this?		x	No	4	Comment noted for implementation purposes.
	68	4	Table 4-1 #85 (Pg 4-9). Doesn't this get covered by the day to day activities of implementing WCA? Or is there a special need to go above and beyond WCA? Local staff could benefit from additional training to be able to identify fens in the field while out in the field to help this process along.		x	No	4	Comment noted for implementation purposes.
	69	4	Table 4-1 #90 (Pg 4-9). Is the urban stewardship category going to be created within this 10yr time frame?		x	No	4	Comment noted for implementation purposes.
	70	4	Table 4-1 #91 (Pg 4-9). This should have occurred already within MS4 communities. A storm water management plan should be created for each non-MS4 community to help them identify the best locations for retrofit or new BMP's. Create a Top 10 projects list as part of the plan. Create the inventory but come up with options.		x	No	4	Comment noted for implementation purposes.
	71	4	Table 4-1 #93 (Pg 4-9). Reword. Create a pilot area and inventory field tile locations. Then what? Or are looking at the resources it would take to create a usable inventory for modeling purposes? Fitting BMP purposes? Other?	x		Yes	4	Explore a pilot area and inventory of known field tile locations for BMP Implementation.
	72	4	Table 4-1 #94 (Pg 4-9). What are entities in the NFCRWD going to do to support research? Dedicate funding? Find locations? Legislative?		x	No	4	Comment noted for implementation purposes.
	73	4	Table 4-1 #95 (Pg 4-9). Block concept confusing.		x	No	4	Comment noted for implementation purposes.
	74	5	Table 4-1 #96 (Pg 4-9). DNR already does this. Why not come up with a strategy to help DNR find those wells that are not in system and get them permitted so we have a better understanding of the total use of the resource?		x	No	4	Comment noted for implementation purposes.
	75	5	Table 4-1 #99 (Pg 4-9). Add Army Corp as Partner?		x	Yes	4	Army Corps added as partner.
	76	5	Note: There is a large informational/educational campaign needed to help implement the goals of the 1w1p and other plans. There should be an action item to include dedicating funding and additional resources to modify our existing communication strategies. We need to make a concentrated effort to be looking for other strategies to change behavior. #120		x	No	4	Agreed, and ideally addressed during Action #120.
	77	5	Table 4-1 #102 (Pg 4-10). Utilize Green Step Program?		x	No	4	Comment noted for implementation purposes.
	78	5	Table 4-1 #105 (Pg 4-10). Add ID to the list.	x		Yes	4	"Identify" added.
	79	5	Table 4-1 #108 (Pg 4-10). Treating the symptom and not the problem?		x	No	4	Other action items address delivery of nutrients to the lake. This action item is aimed at in-lake management effort, when warranted.
	80	5	Table 4-1 #111 (Pg 4-10). Conflict-spending public dollars for a private commercial venture (wetland banking). I could see if the proposed bank included a calcareous fen then I could see helping to facilitate the process to get the resource protected.		x	No	4	Comment noted for implementation purposes.
	81	5	Table 4-1 #112 (Pg 4-10). The education, consultations, demonstrations should be about doing the correct thing on the landscape and then using the compensation and incentives only when needed to get the final push to get the project completed if needed.		x	No	4	Comment noted for implementation purposes.
	82	5	Table 4-1 #115 (Pg 4-11). How many people from the general public do you think is going to show to a meeting regarding water quality results? Not many. Need to be looking at ways to incorporate the information into lake association meetings/publications, social media, etc....		x	No	4	Comment noted for implementation purposes.
	83	5	Table 4-1 #116 (Pg 4-11). Worth the effort to host? Find other ways to get the information to the folks that need to see it where or while they doing what they are doing already.		x	No	4	Comment noted for implementation purposes.
	84	5	Table 4-1 #128 (Pg 4-11). Type of Damage?		x	No	4	Comment noted for implementation purposes.
	85	5	Add Army Corps to the items that reference Dams.		x	Yes	4	Added to #124
	86	5	There is a lot of discussion about education. What about improving e connectivity to be able to get our messages to those that need to hear it. Invest time and energy to get that to happen. (Example. If we want someone to watch a video they need a good internet connection to make that happen)		x	No	4	Agree. This is encouraged for consideration as the group develops a civic engagement program.
	87	5	Create a GIS layer map in which that when a parcel is selected it identifies what the goals identified in this plan for the property are. Put this information in front of the owner/renter so they know the goals.		x	No	4	Comment noted for implementation purposes.
	88	5	Figure 2-7. Seems they could use more information to identify wetlands than just the NWI in this day and age?		x	No	2	Agreed. The best data layers were discussed and solicited by members of the Planning Work Group and Advisory Committee. The best data layers received were used for the resource concern maps.

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	89	5	Table 3-5. Shoreland Stewardship, Disturbance — interested in how 16 feet in width was established for perennial vegetation. Seems like mowed lawn grass fits in perennial vegetation and that wording might need to be changed to establish an adequate buffer? <u>Management — same comment regarding perennial vegetation.</u>		x	No	3	The shoreland criteria presented in this plan are just potential shoreland stewardship criteria, presented to illustrate their use during plan implementation. This group can create and evaluate shoreland stewardship during plan implementation.
	90	6	For altered hydrology, the goal seems good, but is there a way to track implementation practices to determine the amount of progress being made as we move forward? This should include newly permitted drainage projects and projects that mitigate for altered hydrology. In essence we should shoot for a net gain on altered hydrology. This comment of tracking could be applied to all implementation activities and how they are working <u>toward achieving the goals laid out in the plan.</u>		x	No	3	Group can track progress through acre feet of storage created.
	91	6	Establish a watershed wide program to permanently protect conservation practices put in place to improve water resources. This could include Shoreline Restoration, Stream Restoration, Water Storage Areas and Wetland Restorations.		x	No	N/A	Comment noted for implementation purposes.
	92	6	Some of the maps show impaired lakes and streams proposed in 2016 by MPCA? These could be updated to the status of currently listed or not? I am also surprised they are listing <u>impaired waters for Mercury.</u>		x	No	2	These were the data layers available and used during development of resource concern maps.
	93	6	Cost estimates are listed from 2016. Why wouldn't they be up to date — 2018?		x	Yes	ES. 4	See response to Middle Fork Crow River Watershed District Comment #2
	94	6	Last comment is in regard to general administration of the plan once approved and implementation begins. For this to be successful, there needs to be better structure for staff to administer and implement the plan priorities. Within the current structure this <u>seems like more than the CROW would be able to handle.</u>		x	No	5	Comment noted for implementation purposes.
Wright SWCD / Water Task Force	1	1	We have a concern that the public and even government officials involved do not have an intimate understanding of the PTMAApp model and the fact that practices are chosen based on priority points. The priority points used to establish funding needs were based on subwatershed outlets to the river and therefore did not take into account other priority waters such as the major recreational lakes in this watershed. There should be a declaration or statement in the plan outlining this fact. Lakes (excluding shallow lakes) were identified as high priority in the plan but their sheer number precluded data analysis being included for each lake in the plan. Perhaps an exercise should be undertaken to identify <u>individual waterbodies, and their priority in this plan.</u>		x	No	N/A	As part of the planning process, Planning Work Group members were asked for input on where priority resource points were placed. Points were placed on high value recreational lakes, impaired AUIDs, outlets of subwatersheds, monitoring locations, and more. Practices identified are not intended to be prescriptive. This plan represents a planning assessment at a watershed scale.
	2	1	We are concerned that BMP cost estimations made by PTMAApp will skew funding availability and distribution. The plan identifies 1,750 of the "best" practices, so to some degree it recommends that those practices should get funded and built. While a model is useful to identify areas within the watershed that require attention, staff experience and recommendations should still be given consideration for funding even if the <u>proposed practice was not identified in the model.</u>		x	No	N/A	We agree! The tool results should never be the only factor for implementation. Local knowledge will be needed to refine implementation activities. Practices identified are not intended to be prescriptive. This plan represents a planning assessment at a watershed scale.
	3	1	As previously stated the "best" practices listed in the plan are the best for the North Fork Crow River neglecting another valuable water resource, our lakes. However, this causes a flaw in "best" practice selection. For example, nutrients may runoff into a lake and the lake will naturally treat the runoff. However, this may cause a reduction in lake water quality. PTMAApp is capable of determining which practices will most benefit a lake but it requires further data analysis. If an individual waterbodies are identified as priorities in the plan the "best practices for those resources in particular could be identified.		x	No	N/A	Total phosphorus load reduction benefits were considered and prioritized in lake rich planning regions (see Table 4-4). This plan represents a planning scale assessment at a watershed scale. It is not intended to be a plan for each resource. PTMAApp data is a deliverable for this project, from which resource specific implementation scenarios may be created.
	4	1	Additionally, based upon our experience in the field and work with the PTMAApp toolbar the cost estimations used as an input into PTMAApp seem inaccurate. This is in part because estimating cost based on size of a practice or volume of water treated is flawed. A storage practice when operating at capacity may hold a great deal of water and cover a large area, but if all that was required to create it was a small berm and a tile outlet, the cost may be relatively small. Additionally, PTMAApp does not consider the mobilization cost of construction and the distance of a suitable outlet. A practice may be small but getting <u>equipment out to do work has a minimum cost.</u>		x	No	N/A	Funding costs were manually adjusted for this plan to reflect Planning Work Group direction.
	5	2	For these reasons and more we understand the difficulty in estimating the cost of constructing a best management practice. However, we don't want the estimations made by PTMAApp to dictate how funding may be distributed within the watershed. We propose that disclaimer language to be added to the plan. We have provided example language as follows: Model conditions provide BMP reductions based on one location (the outlet of the planning region) and cost estimations based on best available data. The cost estimations provided herein should not solely be utilized for distribution of funds that may become available as a result of this plan.		x	Yes	4	Added text to 4.6.1: The cost estimations provided herein should not solely be utilized for distribution of funds that may become available because of this plan.

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	6	2	We are concerned that the impact of cities was not able to be quantified in the plan. While the plan acknowledges the possibility of analyzing urban stewardship it is only addressed by noting it as a data gap. This may unfairly put pressure on farming communities to change their practices to improve the condition of the watershed. It should be a priority during the first five years of the plan to close the data gaps associated with urban stewardship so the impact of cities can be address in the latter five years of the plan.		x	No	3	Comment acknowledged. The Partnership may choose to prioritize development of urban stewardship in their annual work planning efforts.
City of Corcoran	1	1	Corcoran is a member of the Elm Creek Watershed Management Commission, which is not part of the NFCRWPP coalition. How will the coalition work with the Commission to coordinate their activities?		x	No	N/A	Projects that align with the goals and objectives that benefit and are within the NFCR 1W1P will be considered. The Partnership will follow BWSR policy during implementation.
	2	1	Several structural BMP sites, source reduction areas, and sediment critical areas are identified in the Crow River planning region. How will the coalition identify and communicate with landowners who might be willing to adopt structural BMPs or improved land management practices? Will this occur through the Elm Creek Watershed Management Commission, the City, or the County, or will landowners be contacted directly by the coalition?		x	No	N/A	Projects that align with the goals and objectives that benefit and are within the NFCR 1W1P will be considered. The Partnership will follow BWSR policy during implementation.
	3	1	A Rush Creek sub-watershed assessment currently underway in Corcoran aims to identify cost-effective practices that could be adopted by willing landowners in mostly rural areas of the City. It's possible that some of the practices or locations identified in the study also could be applied outside the assessed area -perhaps in the Crow River watershed. Would these be eligible for potential funding through the coalition's BMP cost share initiative?		x	No	N/A	Projects that align with the goals and objectives that benefit and are within the NFCR 1W1P will be considered. The Partnership will follow BWSR policy during implementation.
City of Annandale	1	1	Volume Reduction and Protecting Ground Water Drinking Water Sources: The Plan lists volume reduction and protecting ground water drinking water resources as equal priorities. An action recommended by the Plan to assist in volume reduction, is adoption of Minimal Impact Design Standards (MIDS). MIDS encourages high levels of infiltration in an effort to meet a higher volume reduction rate than what is required by State and Federal standards. (1.1 inches versus 1.0 inches) Infiltration of storm water instead of runoff has many benefits, but it also has the disadvantage of potentially contaminating underground drinking water sources as storm water runoff can carry dissolved contaminants including but not limited to nutrients, pesticides, herbicides, and heavy metals. The Plan fails to discuss how drinking water sources will be protected against contaminants if regulations adopted as a result of this Plan also require and encourage high rates of infiltration. The Plan needs to discuss protections that will be put in place to balance the risk to ground water sources with potential impacts from the infiltration of storm water.		x	No	4	Correct, referencing Action #36: Encourage stormwater sediment reduction in existing and developing rural subdivisions and urban areas, including implementing existing construction stormwater permit programs and installing MIDS requirements. Promote incorporation of MIDS requirements (or similar) into local zoning ordinances. However, other action items promote protection of GW supplies in vulnerable areas (e.g. Action #1: Implement and maintain existing BMPs that reduce leaching within Drinking Water Supply Management Areas (DWSMAs) and recharge areas that are highly vulnerable to contamination. Implement and maintain existing BMPs within priority locations which reduce vertical movement of nitrate into groundwater.). Nitrate Infiltration Risk Maps were also developed to guide implementation of practices to protect GW supplies in high risk areas.
	2	1	Staff Impacts to Local Governments: The Plan discusses that responsibility for Plan implementation will fall on local agencies and may require staff increase. Specifically, the recommendation that two to three technical staff will be required for assistance in implementing the Plan. The Plan does not indicate that agency will be responsible for hiring these staff and how they will be compensated. The Plan needs to discuss the duties and responsibilities that will be required of local agencies for Plan implementation.		x	No	5	Comment acknowledged. Duties and responsibilities of agencies is included in the targeted implementation schedule.
	3	2	Plan Funding: The Plan discusses the annual and 10-year cost of the Plan. All of these costs are shown in 2016 dollars. The majority of the Plan cost is proposed to be funded with State Collaborative Grants, however, there is an anticipated local share of \$881,663 with an estimated 10-year cost of \$8,816,625. The Plan fails to discuss how these local costs will be distributed among the local agencies and does not appear to include any Plan administration costs. Adequate funding of the Plan is critical to ensure proper implementation. The Plan needs to update costs to 2018 dollars, include Plan administration costs, and discuss methodology for distributing costs among the local agencies.		x	Yes	4	Plan administration costs are included in each funding level (Table 4-6; 4-8 and 4-10). Reference to 2016 was removed from the table. 2016 costs were used to estimate structural BMP costs (4.6.1), however including this year in the table causes undue confusion.
City of Loretto	1	1	Loretto is a member of the Pioneer-Sarah Creek Watershed Management Commission (Commission). The Commission is not part of the NFCRWPP, although the plan area overlaps part of the Commission's jurisdiction. What role do you anticipate the Commission will play in implementing One Watershed, One Plan? Will any aspects of plan implementation result in increased cost to the Commission, and by extension to its members?		x	No	N/A	Projects that align with the goals and objectives that benefit and are within the NFCR 1W1P will be considered. The Partnership will follow BWSR policy during implementation.
	2	1	Figure 2-11 shows that Loretto is a wastewater discharger. As you may know, the City's wastewater plant is scheduled to close in 2020, after its sanitary sewer is connected to Metropolitan Council wastewater infrastructure.		x	No	N/A	Thank you for the comment, which will be useful as projects are targeted for implementation.

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	3	1	Loretto is fully developed, so urban stewardship is important. The City is meeting the criteria in Table 3-4 used to assess current stewardship levels. Still, the City plans several projects that will help meet its goals for MS4 permit compliance and other aspects of urban stewardship. The implementation profile for the Crow River region, however, appears to focus on rural stewardship. Will urban stormwater projects be considered for implementation and funding by the NFCRWPP in this region? If they are, should Loretto communicate potential project ideas directly with the NFCRWPP, or indirectly through the Pioneer-Sarah Creek Watershed Commission, Hennepin County, or other local government units?		x	No	N/A	Projects that align with the goals and objectives that benefit and are within the NFCR 1W1P will be considered. The Partnership will follow BWSR policy during implementation.
	4	1	Is it our correct understanding that the City may pursue various projects and funding independently, without NFCRWPP involvement?		x	No	N/A	Projects that align with the goals and objectives that benefit and are within the NFCR 1W1P will be considered. The Partnership will follow BWSR policy during implementation.
Cokato Lake Association	1	1	We are very interested in this watershed project as the algae bloom and clarity of Cokato lake is closely tied to runoff from sucker creek in the south. Some of the smaller inlet creeks have had some project work done (tiers, ponds, bank work) to control sediment and run off yet sucker creek, which is the watershed for a very large area, is untouched. This creek has all the worst components, eroding banks, agricultural run-off and is subject to flash flooding. I see that there is a defined 50' buffer from Cokato lake to the Crow but a very limited buffer on the inlet to Cokato Lake. There is some potential natural filtration on the south side of the lake (cat tail swamp) but the creek has a clear path around that area making the existing natural filtration ineffective. I have seen beavers attempt to dam the creek but even a moderate rain produces such as surge in water their dams are destroyed and blown out into the lake. Hopefully this feedback is helpful as you target projects going forward. There isical inputs). This one understanding/mental shift can greatly empower producers to		x	No	N/A	Thank you for the comment, which will be useful as projects are targeted for implementation.
Tim Robb	1	1	The county and the state must be charged with the responsibility of removing all road salt from our road de-icing plan. Way to much road salt is getting into the rivers, lakes and streams.		x	No	4	Addressed in part through Action #104
Commenter	Comment #	Public Hearing	Comment	Material Grammatical	Editorial	Plan Change Made (Yes/No)	Plan Section	Comment Response / Action
Mark Schobrich/McLeod SWCD	1		"C" Level Priority Concerns (Pg 2-20). Recommended priority concern Urban Stormwater be moved up to Level B to help implement more quickly.			No		Comment noted for implementation purposes.
	2		Best Structural BMPs (Pg 4-48). Why is Big Swan Lake Implementation Profile the only one who calls out biofiltration projects?			No		That planning region had met the cost effective for dollars per reduced nutrients and sediment.
	3		AIS County aid be used as a match with implementation funding.			No		NFCR 1W1P will consider all matching resources. The Partnership will follow BWSR policy during implementation.
	4		Look at more coordination with partners on educational activities and school events.			No		Partners have been working together on events.
	5		The way we have been doing busy has worked, but with a coordinated plan it will help make headway. McLeod may not get in the first round of funding.			No		Comment acknowledged with thanks.
Dick Anderson/Greater Lake Sylvia Association	1		Is AIS part of the plan?			No		Table 4-1: Targeted Implementaiton Schedule does address AIS issues.
	2		Is the group addressing channels and upstream drainage going into lakes?			No		Yes, local partners are addressing these issues.
	3		Through the 1W1P, will DNR still have to approve lake projects?			No		DNR's role in the 1W1P is assisting with the planning process. Projects that take place during implementation, will need to go through DNR approval process.
Sara Turrell	1		Would Koronis Lake Association be able to apply for implementation funding?			No		Koronis Lake Association would work with local partners (North Fork Crow River Watershed District or Soil and Water Conservation District) to submit an application.
Gary Berndt/North Fork Crow River Watershed District	1		Would like to have seen a better job in condensing the plan. It is rather large. In areas with no high speed internet, the plan was not able to download within 30 minutes.			No		Comment acknowledged with thanks.
	2		Is this another layer of bureaucracy? It comes down to a trust issues, things start small and grow bigger.			No		1W1P is intended to guide implementation and create more coordination in the watershed.
	3		Currently, plan states over \$6 million is being spent - where is that funding coming from?			No		Funding is coming from a variety of local, state, and federal sources such as: NRCS, BWSR, MPCA, Counties, and MN Clean Water Fund.
	4		Is this group going to raise property taxes?			No		The policy committee does not have the authority to do that. Individual Counties and Watershed Districts have that authority.
	5		Remove Lake Koronis in the Lake Koronis North Fork Crow River planning region and rename the planning region to Upper North Fork Crow River.			No		USGS names for the hydrologic unit code (HUC) have been utilized to keep consistency.
	6		Section 2 discusses ethanol. This document should not be a political document.			No		Comment acknowledged with thanks.
	7		In my area, there has been land put into habitat. Cover crop needs to be taken into consideration.			No		Comment acknowledged with thanks.
	8		There was no new ideas for implementation and how to achieve these pollutant reductions.			No		PTMAApp model and stewardship sustainability for rural, urban, and shoreland are new.
	9		The plan does not recognize what partners are doing or their accomplishments.			No		Comment acknowledged with thanks.
Bob	1		How is this plan going to determine success or what didn't work.			No		Goals have been established in the plan.

Commenter	Comment #	Comment Letter Page #	Comment	Material	Grammatical	Editorial	Plan Change Made (Yes/No)	Plan Section	Comment Response / Action
Schiefelben/Meeker SWCD	2		Funding has previously been provided to just SWCDs and Watershed Districts, this is efficient, why should we go through this process.				No		Acquiring funding from State agencies are on a competitive process. A great deal of staff time is spent trying to acquire grant funding for projects. The 1W1P process will provide a more stable funding system and remove the competitive process between partners. Funds will be applied to where it is needed the most and for the greatest reduction in pollution.
	3		How is the new process going to work for projects if it is not through a competitive process				No		Projects will be submitted by partners and will be funded based on a ranking criteria. Partners will also know where the issues are in the watershed. PTMapp results will also help identify areas where projects are needed and most effective for cost and reductions.
Art Marthaler	1		DNR has put more cubicles and generated more paperwork over the years. How is administration going to say at this size instead of getting bigger.				No		Comment acknowledged with thanks.
Virgil Fuchs	1		Tile helps increase yield. BWSR is not a friend to the tiling business. My customers are not going to like funding coming from BWSR for this plan. Tiling has created less pollution in fields, created areas for water storage, and provided cleaner water.				No		Comment acknowledged with thanks. Patterning tiling has been discussed by the Policy Committee.
Dave Martins	1		I haven't read the plan, but does it provide a historical perspective for people.				No		Comment acknowledged with thanks. Section 1.2 provides an overview of the landuse in the watershed.

KEY

Material

Grammatical

Editorial

Comments represent changes in material and content of the plan.

Comments represent grammatical changes or wordsmithing.

Comments are editorial in nature.

Informal (Working DRAFT) Comments and Responses During the NFCR 1W1P Planning Process- Advisory and Policy Committee

Note: List of comments is not all inclusive. As plan content changed throughout the planning process, text in the "resolution" column is not suggested as final. Text in final plan may not reflect draft text in "resolution" column. Comment do not include comments verbally received during planning meetings.

Commentor	Plan Section	Comment	Change Made?	Resolution
BWSR	Land and Water Resources Inventory	1. There needs to be a summary or reference in the sections on groundwater quantity to the Bonanza Valley Groundwater Management Area designation by the DNR and what groundwater related issues led to that designation and subsequent plan. The Bonanza Valley plan is mentioned in the Introduction but not in the Inventory section.	Yes	Section added (Section 7.3) relating to management area
		2. Met Council's Water Quality Assessment (http://www.metrocouncil.org/Wastewater-Water/Services/Water-Quality-Management/Stream-Monitoring-Assessment/Mississippi-River-Tributary-Streams-Assessment/Miss-River-Trib-Assessment-Reports/CROW-RIVER-SECTION.aspx) should be consulted and referenced for the most up-to-date water quality information on the NFCR. It's a December 2014 report, which is more recent than the WRAPS data.	Yes	Data saved for reference
		3. The small maps that are used in this section are often unintelligible because of their size. If the requirements of the report format do not permit putting the maps in landscape orientation, then the smaller, busier maps are colorful, but generally not useful sources of information. They should be interpreted with text that explains what the data show about the characteristics of that resource in the watershed.	Yes	Map sizes changed accordingly
DNR	Land and Water Resources Inventory	The first sections of the report all appear to be complete, with a well rounded perspective on the information. In Section 5.4, mean annual discharge for the Crow in Rockford is represented, however, the only the data from 1995-2014 is represented. This gage has a much longer period of record, with some flow data going back to 1906. Is would likely be more representative of trend information if a longer period of data is included. I would be happy to supply this information for the report. In Section 5.5, lake levels from three lakes throughout the watershed are presented. This is valuable information, and while different types of lakes are represented, the presentation of only 3 from the entire watershed gives a very incomplete picture of lake condition as a whole. If this information is to be presented, the "Selected Lakes" report from the WRAPS should also be referenced, or perhaps lake level and condition information from one of the major lakes in each of the HUC 10 study areas should be represented. This information is readily available, and I would be willing to assist in assembling it if deemed necessary for inclusion. Lake Washington is referenced as having good clarity at 3 feet, where as Green Lake is referenced as having poor clarity with an average reading of 9.7 feet. While these two are different lake types (and I understand that the text was taken from the PCA report), it would make sense to have reference clarity on these lakes on somewhat close to the same scale. In Section 5.6, the water-based recreation areas are listed, but do not mention the USFWS Waterfowl Production Areas (WPAs) or the Nature Conservancy Preserves, both of which nearly always include wetlands or other water features in similar fashion to DNR-owned WMA's. In order to represent the publicly accessible recreation areas in the watershed, it would be necessary to include these areas. Groundwater and Surface Water withdrawals are represented in Section 8.1 from 1994-2013. Water use records are currently available from 1988-2015, and should be used to update the information in this report. I have attached a draft report of water use information and sensitive groundwater features intended for inclusion in GRAPS effort that includes this updated information, so please feel free to use these figures in the appendix. Please let me know if you would like the information directly, so as to generate these figures in a different format. This report also includes updated information for Figures 35, 37, 38, and 39. In addition, information on observation well location and trends is included in the draft report, so please feel free to use this information to update any information in section 8.3. Specifically, it has been identified as important in regards to determinations involving sustainability to prioritize areas with decreasing water levels in observation wells or wells with increasing drawdowns that still recover from year to year. A number of these situations and areas have been identified in the Bonanza Valley GWMA and the NFCRW, and should be represented if possible. Once again, if you would like the background information directly, please let me know and I will get it to you.	Yes	It was a decision by the local planning group not to perform/generate additional analyses for the Appendix. New data for water based recreation (5.6) was included, and new data for groundwater quantity (Section 8.1) was also included.
Advisory Committee: DNR, MDA, BWSR	3: Measurable Goals	Extensive Comments provided. Comments available upon request.	Yes	Extensive revisions made to measurable goals
Advisory Committee: MDH	4: Targeted Implementation Schedule- Strategies and Actions	Extensive Comments provided. Comments available upon request.	Yes	Extensive revisions made to strategies and actions
Advisory Committee: MDA	4: Targeted Implementation Schedule- Strategies and Actions	Something we have identified through our monitoring and outreach with landowners is that often addressing the problem isn't solely implementing new BMPs but more importantly, maintaining the BMPs that are already on the landscape. A poorly maintained practice could become a conduit for more erosion or nutrient loading. This is often overlooked in reports when discussing strategies. It would be great if "maintaining existing BMPs" could be integrated into the strategies and actions. This could be integrated into both the GW and SW actions. For example, GW-1. Implement "new and maintain existing" BMPs that manage..... Also, fits under SW-10.1 and SW-12.3, as well as within many other strategies and actions.	Yes	Apply to all actions with BMPs: "Implement and maintain existing BMPs that..."
		1.1.1.1: When addressing GW strategies, rather than referring to surface runoff, phrase it as "reduce leaching". For example, GW-1.1: Implement BMPs that "reduce leaching" within DWSMAs Please check for this consistency throughout the report.	Yes	"reduce leaching" in all appropriate actions

		Perhaps a strategy could be inserted to encourage the adoption of the MDA Nitrogen Fertilizer Management Plan and participation in MDA's Township Testing Program? For example, GW-1.3 states "Develop nitrogen fertilizer management plans for agricultural producers" but perhaps this could be revised to include wording that specifically references implementing the MDA NFMP. Some language that can be inserted elsewhere in the report follows:		
		- The Nitrogen Fertilizer Management Plan (NFMP) outlines how the Minnesota Department of Agriculture addresses elevated nitrate levels in groundwater from nitrogen fertilizer use. The NFMP has four components: prevention, monitoring, assessment and mitigation. - The goal of MDA's Township Testing Program is to monitor nitrate levels in private drinking water wells. The Program is focused on townships around the state where groundwater nitrate contamination is more likely to occur. These townships have vulnerable groundwater areas and significant row crop acres. Between 2014 and 2019, the MDA will offer free nitrate tests to approximately 70,000 private well owners (within 250 to 300 townships).	Yes	Develop manure/nutrient management plans for agricultural producers which follow Best Practices, including the MDA Nitrogen Fertilizer Management Plan and University of Minnesota recommendations.
		Potential GW goal language could be: "No more than 10% of drinking water wells exceed the MCL of 10 mg/L nitrate-N, per Minnesota Nitrogen Fertilizer Management Plan (2015)."	Yes	Measurable goals revised
		For the GW and SW strategies, it would be nice to see additional emphasis on source reduction (following the 4R's) and perhaps vegetative cover in addition to the implementation/maintenance of BMPs.	Yes	Source reduction and vegetative cover added to actions as applicable.
		Strategy GW-3: I understand that the strategies and actions were developed by the planning committee but based on samples that MDA has collected on pesticides, it seems GW-3 should focus less on pesticides and more toward nutrients. Perhaps the stakeholder who suggested the focus on pesticides unaware of the difference between agricultural fertilizers and pesticides and the available data? Although groundwater samples have come back with some pesticide detections, these detections are well below any health risk. Nitrate levels, on the other hand, have been reported in the GW above the health standard. Therefore, it seems the strategy text for GW-3 should replace "pesticides" with either "nutrients" or more specifically "nitrates". This wording should then be reflected in GW-3.2 through GW-3.7. By making this change, then it would make sense to keep Action GW-5.4, which pertains to pesticides, since it is really a "potential" concern and not yet a health risk. Although this is a locally developed plan, it is also important that the science is understood and that the strategies consider the work that has already been completed in the watershed	No	Strategy does not necessarily indicate it is a priority. As pesticides and fertilizers were included in the Prioritization Matrix, this strategy was developed to address or protect against that potential issue.
		Unless there is data showing that these contaminants are already a concern in the watershed, Action GW-3.6 seems to fit under "potential concerns" 1.1.1.2.	Yes	Removed action
		Insert a period after watershed in Action SW-16.8.	Yes	Period added
		Action SW-16.9 should be reworded to include "...through the adoption of drainage water management" rather than the "removal of tile drainage".	Yes	"the adoption of drainage water management" replaced "removal of tile drainage"
		Action SW-17.12 should include "runoff rate and volume".	Yes	Revised to: "Implement BMPs to promote soil health and reduce runoff rate and volume."
		For Action SW-3.9, it should also be clarified that the grazing methods should also prevent livestock entry into the water bodies. Although this seems obvious, it can be overlooked.	Yes	Revised to: "Action SW-3.9: Use managed and rotational grazing methods to manage animal wastes and prevent livestock entry into surface waterbodies."
		For SW-12.2, Would it be more clear to state "Implement water storage and infiltration BMPs" rather than "infiltration and filtration"?	No	Infiltration and filtration are two different types of BMP treatment groups in PMTApp. Storage BMPs are included in SW-12.3.
Advisory Committee: Met Council	4: Targeted Implementation Schedule- Strategies and Actions	One potential concern is sheer number of strategies and actions: careful framing will be necessary to develop this document into a effective implementation plan.	Yes	Actions moved to the targeted implementation schedule
		General comment: many actions are repeated multiple times throughout document. Concern that same action, listed multiple times with different names, will complicate tracking of implementation metrics. We realize this is difficult, as many actions are obviously applicable to multiple strategies. Could the naming convention for actions be revised? Or, as we discussed at the last AC meeting, could a matrix be assembled that identifies the multiple strategies that are affected by a single action?	Yes	Repetitive actions were removed.
		Climate change/climate vulnerability is mentioned only once in strategies and actions. We suggest a stronger statement about potential vulnerabilities to water quality and quantity be included in the report.	No	Actions revised per guidance from the PWG.
		Drinking water (from surface water): at the recent Advisory Committee meeting, several of us brought up that over 2 million people in the metropolitan area rely on Mississippi River water as drinking water source, and that this should be more strongly brought forth in the report, given the Crow River discharges to the Mississippi not far upstream of both major intakes. I discussed issue with several managers at the Met Council, including Ali Elhassan, manager of our Water Supply Unit. As was stated in the AC Meeting, we recognize that many of the strategies, actions and eventual implementation items will serve to improve water quality in the Crow, thus protecting the Minneapolis and St. Paul potable source water. We suggest it is clearly stated somewhere in the report (perhaps a section that briefly summarizes "downstream benefits") that the Crow River discharge does affect the Mississippi water quality and thus the potable water source for both the St. Paul and Minneapolis water utilities, with the hope that Crow River watershed residents are mindful that any action they take to improve the Crow will improve drinking water (and potentially lower water costs) for many people downstream.	Yes	Comment noted for final plan reference.
		Action GW-1.2: Seal abandoned and unused wells, particularly those wells which may impact public or private drinking water supplies, such as those found within DWSMAs. . Note: Due to limited funds, sealing wells in DWSMAs may eat up most available money. There may be little left for protecting groundwater quality in rural residential areas. Perhaps broadening the focus beyond DWSMAs would provide more value - prioritizing multi-aquifer wells which increase the risk of aquifer cross-contamination, for example.	Yes	Changed to "Seal abandoned and unused wells, particularly those wells which may impact public or private drinking water supplies, such as those found within DWSMAs or multi-aquifer wells."
		Action GW-1.5: Use existing land use and zoning ordinances to manage possible sources of nitrate contamination (e.g., subsurface sewage treatment systems; manure management; land development). NOTE: Does "use existing land use and zoning ordinances" mean enforcing those already adopted, or does it mean adopting new ordinances that have been tested in other areas?	Yes	Administer adopted; clarified text accordingly.

Action GW-1.6: Provide financial and technical assistance for the monitoring of nitrate levels in private wells. . NOTE: Who is supposed to provide assistance, and who is supposed to monitor? Would it be simpler to say "Monitor nitrate levels in private wells"? Should this action include the phrase "targeting areas vulnerable to nitrate contamination", to make it consistent with other similar actions under different strategies?	Yes	Action changed to: "Monitor nitrate levels in private wells."
Action GW-1.7: Continue research to map and model groundwater and monitor basic flow. . Note: What is "basic flow"? Does this include surface water flow, or does this refer to groundwater flow? The interaction of both?	Yes	Action changed to: Continue research to map and model groundwater and monitor basic groundwater flow.
NEW (?) Action GW-1.10 Identify areas that are less susceptible to contaminant threats as possible future well locations to supply future drinking water needs.	Yes	Action added
NEW (?) Action GW-1.11 Consider Minneapolis and St. Paul Source Water Protection Areas as part of an evaluation of how existing or new land use activities or redevelopment may impact the quality of the Mississippi River as a drinking water source.	Yes	Action added
NEW (?) Action GW-1.12 Promote the development of a spill response plan that addresses high volume railroad corridors, pipelines, and other large contaminant threats in relation to the locations of community wells, DWSMA vulnerability and potential impacts to the Mississippi River as a drinking water source.	Yes	Action added
Action GW-2.3: Develop manure/nutrient management plans which follow Best Management Practice recommendations, for agricultural producers with land application locations that are vulnerable to groundwater contamination from bacteria. NOTE: Whose recommendations should be followed? How will locations that are "vulnerable to groundwater contamination from bacteria" be identified? Is this the same or different from areas that are "highly vulnerable to contamination" identified in Action GW-1.1 above?	Yes	Develop manure/nutrient management plans for agricultural producers which follow University of Minnesota recommendations.
Action GW-2.7: Use existing land use and zoning ordinances to manage potential risk factors from the disposal of wastes and the application of manure. NOTE: As above, does "use existing land use and zoning ordinances" mean enforcing those already adopted, or does it mean adopting new ordinances that have been tested in other areas?	Yes	Administer adopted; clarified text accordingly.
Strategy GW-3: Maintain groundwater quality by managing pesticide and other contaminant loading in areas contributing to groundwater recharge. NOTE: How will "areas contributing to groundwater recharge" be defined? Technically, all areas contribute; although some are much slower than others. Will the County hydrogeologic atlas plates for pollution sensitivity be used? Is this defined elsewhere in the document?	No	Will be defined by risk in Section 4
Action GW-3.4: Encourage the use of precision agriculture as means of efficient application of pesticides. NOTE: Through education? Financial assistance? Technical assistance	Yes	Changed to: Encourage the use of precision agriculture as means of efficient application of pesticides through education, technical, and financial assistance.
Action GW-3.5: Implement an education/outreach campaign for the responsible use, storage, and disposal of pesticides. NOTE: Use by whom? Everyone?	No	Roles to be determined in Section 4
Action GW-4.2: Use existing land use and zoning ordinances to manage potential risk factors, control certain land uses, and minimize development in Wellhead Protection Areas. Drinking Water Supply Management Areas. Does "use existing land use and zoning ordinances" mean enforcing those already adopted, or does it mean adopting new ordinances that have been tested in other areas? An example of a zoning overlay was recently adopted by the City of Burnsville. Information is online at http://www.ci.burnsville.mn.us/index.aspx?NID=1720	Yes	Administer adopted; clarified text accordingly. Text changed to "DWSMA"
Action GW-4.3: Incorporate County sensitive groundwater recharge maps into local land use decision making process. NOTE: In my experience, we need to be more clear about how to incorporate this information. How is Action GW-4.3 intended to be different than Action GW-4.2 above? What about "Plan land use patterns that facilitate groundwater recharge"? This is language in Met Council's Land Use Policy plan/Thrive MSP 2040. Or "Plan land use patterns and evaluate zoning changes and project proposals with the goal of reducing the amount of potential contaminants in sensitive groundwater recharge areas/vulnerable Drinking Water Supply Management Areas"?	Yes	Action changed to: Plan land use patterns and evaluate zoning changes and project proposals with the goal of reducing the amount of potential contaminants in sensitive groundwater recharge areas/vulnerable Drinking Water Supply Management Areas
NEW (?) Action GW-4.4: Map, monitor, and model surface water BMPs and their impacts on groundwater recharge in different land use patterns and hydrogeologic settings.	Yes	Action added
NEW (?) Action GW-4.5: Incorporate mapped contamination plumes into local land use decision making process. For example, consider groundwater contamination as part of stormwater BMP decision-making, to reduce the risk of spreading groundwater contamination. NOTE: MDH and MPCA have guidance regarding stormwater infiltration in DWSMAs, which may be useful: http://stormwater.pca.state.mn.us/index.php/Stormwater_and_wellhead_protection	Yes	Action added
Action GW-5.1: Continue to support through the permit review process the Department of Natural Resources, Water Appropriation Permit Program, to manage groundwater supply and evaluate historical and projected future permitted uses and demand. NOTE: Grammatical errors in this action description make it unclear what is intended. Should this be "Continue to manage groundwater supply, based on an evaluation of historical and projected water demand"? Other actions above do not specify agency programs. A decision should be made to consistently specify agencies or not.	Yes	Changed to "Continue to manage groundwater supply for sustainable use, based on an evaluation of historical and projected water demand"
Action GW-5.2: : Fill gaps in the groundwater level observation well network by installing additional, strategically located long-term groundwater observation wells in cooperation with the Minnesota Department of Natural Resources, to monitor water levels.	Yes	Changed to: "Action GW-5.2: Fill gaps in the groundwater level observation well network by installing additional, strategically located long-term groundwater observation wells."
Action GW-5.3: Provide financial and technical assistance for the monitoring of nitrate levels in private wells, targeting areas vulnerable to nitrate contamination. . NOTE: Who is supposed to provide assistance, and who is supposed to monitor? Would it be simpler to say "Monitor nitrate levels in private wells"? How will areas be defined as "vulnerable to nitrate contamination"?	Yes	Action changed to: "Monitor nitrate levels in private wells."
Action GW-5.4: Monitor groundwater for pesticides and/or other contaminants. NOTE: Will this monitoring be targeted or area-wide?	No	Area wide
NEW (?) Action GW-5.6 (BASED ON Action GW-1.7): Continue research to map and model groundwater and monitor basic flow. Note: What is "basic flow"? Does this include surface water flow, or does this refer to groundwater flow? The interaction of both?	Yes	Added action: Continue research to map and model groundwater and monitor basic groundwater flow.
NEW (?) Action GW-5.7: (Same as Action GW-4.4): Map, monitor, and model surface water BMPs and their impacts on groundwater recharge in different land use patterns and hydrogeologic settings.	Yes	Action added

Action GW-6.1: Continue to support through the permit review process the Department of Natural Resources, Water Appropriation Permit Program, to manage groundwater supply and evaluate historical and projected future permitted uses and demand. NOTE: Grammatical errors in this action description make it unclear what is intended. Should this be "Continue to manage groundwater supply, based on an evaluation of historical and projected water demand"? Other actions above do not specify agency programs. A decision should be made to consistently specify agencies or not.	Yes	Changed to "Continue to manage groundwater supply for sustainable use, based on an evaluation of historical and projected water demand"
Action GW-6.2: Encourage municipalities to utilize practices that promote wateruser conservation and efficiency., Some examples include such as tiered billing rates that rewards conservation, improved meters and leak detection, and rebates for water-saving appliances and irrigation technologies.	Yes	Changed to "Encourage municipalities to utilize practices that promote water conservation and efficiency. Some examples include tiered billing rates that reward conservation, improved meters and leak detection, and rebates for water-saving appliances and irrigation technologies."
Action GW-6.4: Increase acreage of conservation irrigation practices for high-volume users of groundwater supplies. NOTE: As worded, this is only an outcome. How about "Provide education, financial incentives, and technical support to reduce the amount of water used by irrigators with high-capacity wells." Or "Provide education, financial incentives, and technical support to increase the percentage of irrigated acres that employ conservation irrigation practices."	Yes	Changed to: "Provide education, financial incentives, and technical support to increase the percentage of irrigated acres that employ conservation irrigation practices."
Action GW-6.5: Implement BMPs in urban and rural areas that promote infiltration and groundwater recharge, such as soil health improvements through increased organic content of soils. . NOTE: This could be expanded – soil health improvements are not really BMPs.	Yes	Changed to: Maintain and improve soil health as a means of increasing soil organic matter and promoting infiltration and groundwater recharge.
Action GW-6.6: Fill gaps in the groundwater level observation well network by installing additional, strategically located long-term groundwater observation wells.	Yes	Changed to: Fill gaps in the groundwater level observation well network by installing additional, strategically located long-term groundwater observation wells
Action SW-1.7: Promote BMPs that enhance hydrologic storage by increasing upland perennial native vegetation in areas that provide connections to expand riparian access. These actions also provide benefits to restoring stream stability and equilibrium where it is found to be impaired. Hydrologic storage could most directly be increased by restoring wetlands.	Yes	Changed to: Promote BMPs that enhance hydrologic storage by increasing upland perennial native vegetation in areas that provide connections to expand riparian access. These actions also provide benefits to restoring stream stability and equilibrium where it is found to be impaired. Hydrologic storage could most directly be increased by restoring wetlands.
Action SW-4.4: Develop and implement nutrient management plans for agricultural producers for locations that are vulnerable to groundwater contamination from nitrates, which follow BMP recommendations. This should be the number one action for this strategy, but it should be for all agricultural producers within the watershed.	Yes	Order is not indicative of priority; revised to: "Develop and implement nutrient management plans for agricultural producers which follow University of Minnesota recommendations."
Action SW-6.1: Implement BMPs within priority locations that reduce chloride loading to waterbodies by treating surface and shallow sub-surface runoff before entering ditches and streams. (Note: there are no structural BMPs that can remove chloride. This needs to be a source control and education effort)	Yes	Changed to: Promote education about source control within rural subdivisions and urban areas to promote a reduction of chloride loading to waterbodies
Action SW-9.1: Implement BMPs at priority locations within lake drainage areas that reduce nitrate-nitrogen loading to waterbodies by treating surface and shallow sub-surface runoff before entering ditches and streams. Comment: What defines a priority location? ? I suggest adding another action item that implements a process for identifying prioritization criteria and locations. I assume that discharge from drain tiles are included in these types of surface runoff. I suggest that the treatment of discharge from drain tile be stated explicitly also.	No	These will be determined through the Predominant Hydrologic Influence evaluation and Nitrate Risk Mapping. Results will be presented by planning region in Section 4.
Action SW-9.4: Develop and implement nutrient management plans for agricultural producers for locations within lake drainage areas that are vulnerable to groundwater contamination from nitrates, which follow BMP recommendations. This should be the number one action for this strategy. Nitrogen application should be reduced before investing in BMPs to treat nitrogen in surface and tile drainage. Also: Whose BMP recommendations? E.g. USDA, MN Dept. of Ag, SWCD?	Yes	..."which follow University of Minnesota recommendations."
Action SW-9.9: Explore possibility of an ordinance prohibiting open intakes on tiles that outlet directly into lakes. I assume that discharge from drain tiles are included in these types of surface runoff. I suggest that the treatment of discharge from drain tile be stated explicitly also.	Yes	Text revised to include "drainage" tiles
Action SW-10.3: Implement BMPs at priority locations within lake drainage areas that promote soil health, thereby increasing water retention and decreasing surface runoff. Action SW-10.3 & SW-9.3, SW-10.5 & SW-9.5, SW-10.6 & SW-9.6, SW-10.7 & SW-9.7, SW-10.8 & SW-9.8, and SW-10.11 & SW-9.10 are identical actions. Could these be stated just once under a general lakes heading to reduce redundancy?	Yes	Redunant actions removed
Action SW-12.2: Implement infiltration and filtration BMPs at priority locations within lake drainage areas to slow and mitigate delivery of surface water runoff to potential ravines. Please clarify what is meant by a potential ravine.	Yes	Changed to: Implement infiltration and filtration BMPs at priority locations within lake drainage areas to slow and mitigate delivery of surface water runoff
Action SW-16.9: Promote practices to restore natural hydrology such as removal of tile drainage and restoration of altered streams. (Recommend adding restoration of drained wetlands)	Yes	Changed to: Promote practices to restore natural hydrology, such as removal of tile drainage and the restoration of drained wetlands and altered streams.
NEW (?) Action SW-18.8: Consider Minneapolis and St. Paul Source Water Protection Areas as part of an evaluation of how existing or new land use activities or redevelopment may impact the quality of the Mississippi River as a drinking water source.	Yes	Action added
NEW (?) Action SW-18.9: Promote the development of a spill response plan that addresses high volume railroad corridors, pipelines, and other large contaminant threats in relation to the locations of community wells, DWSMA vulnerability and potential impacts to the Mississippi River as a drinking water source.	Yes	Action added
Action HF-?: Promote restricted use of chemical management compounds (fertilizers, herbicides, pesticides, etc.) to support the function of healthy riparian corridors.	Yes	Action added
Action HF-?: Provide education and outreach materials online and in print to identify actions for the general public that reduce the spread or introduction of AIS	Yes	Action added
Action HF-?: Promote the limited use of chemical management compounds (fertilizers, herbicides, pesticides, etc.) to support the function of healthy upland areas.	Yes	Action added
New Action LDA ?? : An action should be added that recognizes how crucial site preparation, site design, and ongoing maintenance are to any restoration project, including prairie and wetland restorations.	No	Maintenance added to all BMPs
New Action: Not sure if this is right location for this action, but include language indicating importance of regular maintenance of stormwater BMPs, especially for green infrastructure, for long-term effectiveness of the practice.	Yes	"Implement and maintain existing" added per MDA comments

		Action WRI-1.5: Assess capacity to productively reuse stormwater runoff, through either rainwater harvesting (collection of roof runoff) or stormwater capture and reuse. May want to include reference to revised MN Plumbing code which allows rainwater harvesting to be used for toilet flushing, etc...	Yes	Action WRI-1.5: Assess capacity to productively reuse stormwater runoff through either rainwater harvesting (collection of roof runoff) or stormwater capture and reuse.
		Action WRI-3.1: Promote local, county and development proposals that incorporate Low Impact Design or Minimum Impact Design technologies. May want to include reference to the Minnesota Stormwater Manual for guidance on proper design, construction, and maintenance of green infrastructure projects.	Yes	Action WRI-3.1: Promote local, county and development proposals that incorporate Low Impact Design or Minimum Impact Design technologies. Refer to the Minnesota Stormwater Manual for guidance on proper design, construction, and maintenance of green infrastructure projects.
		Strategy WRI-9: Protect surface water quality by managing pollutant loads in water discharging from stormwater, industrial operations, and wastewater discharge pipes to surface waters. (If chlorides are a concern in Crow, may want to reference role of water softeners in discharging chloride to river. May also want to mention option of centralized softening in municipal systems as one option for reducing chloride discharge.	Yes	Added action: Educate public on role of water softeners in discharging chloride to river.
Advisory Committee: BWSR	4: Targeted Implementation Schedule- Strategies and Actions	Action GW-1.1: Implement BMPs that manage surface water groundwater interactions and protect recharge areas that are highly vulnerable to contamination manage surface runoff within Drinking Water Source Management Areas (DWSMAs) and recharge areas that are highly vulnerable to contamination.	Yes	Per MDA comments, changed to "Reduce leaching."
		Organize by subject topic; nitrates in DWSMAs, SSTS, etc. and order from first steps to later steps in logical sequence	Yes	Adjusted accordingly
		Assist landowners with nitrate testing in private wells	Yes	Changed to "Monitor nitrate levels in private wells." per MDA comment
		As a local plan, surface use of drinking water may not be a high priority, but the Crow River is an important tributary of the Mississippi where 2-3 million people get their drinking water. Strategies aimed at reducing sediment loading, nitrogen and e.coli concentrations etc. will have beneficial effects downstream as well.	Yes	Actions added addressing source water per Met Council revisions
		Who's constructing? Should it be something like: "provide technical and financial assistance to landowners to implement animal....."	Yes	Action revised to "Provide technical and financial assistance to..."
		Is there a difference in the type of system required to do GW 1.5 and 1.8? Can these be combined? If putting in both areas, what about using existing laws to manage SSTS in this section?	Yes	Added to this section as well.
		Is splitting these out by contaminant an efficient way to present these strategies? The same strategy is listed, just replace the pollutant. What about leaking fuel tanks? Or closed landfills? The common elements seem like DWSMAs, vulnerable groundwater recharge areas and areas of significant groundwater surface water interaction- maybe it could be organized that way.	Yes	Revisions made
		Different than DWSMAs? Defined somewhere?	Yes	Revised to say "DWSMA"
		It would read better if the actions were organize in sequence, Inventory, gather data if needed, model and predict, then implement.	Yes	Actions rearranged
		"Low levels of sediment"-Does that mean: acceptable levels of TSS in the River? Or low levels of sediment delivery to the river? If the river is already impaired for turbidity, is "maintaining" the proper word? Or low levels for that matter?	No	Define locally
		Implement existing construction stormwater permit program? Investigate installing MIDS requirements?	Yes	Added those examples to the action
		Assuming that there are priority locations identified somewhere, maybe reference the plan location?	No	Yes, priority locations will be identified in Section 4
		Already listed in groundwater strategies—is this for surface waters?	Yes	Yes- revised to be consistent with GW comment
		Establish bankfull elevations to determine floodplain connectivity/stream incision?	Yes	Added Action SW-16.10: Establish bankfull elevations to determine floodplain connectivity and stream incision.
		Conservation and/or flowage easements to reduce flood damages?	Yes	Text revised to: Reduce agricultural damages for lands inundated by 10-year or more frequent flood events by encouraging alternative agricultural practices, conservation and/or flowage easements.
		Promote flood insurance within 100-year flood elevations?	No	Does not address flooding issue
		Blue-green blooms have health impacts for animals/humans beyond drinking water. Surface water quality and lakes could use this strategy.	No	Actions included for streams and rivers
		Any strategies for those parcels or just identification?	No	Identify- protect is the next action item.
		WMA typically means Wildlife Management Area?	Yes	Changed to : Wildlife
		Minn Rules 7020? Feedlots	Yes	Added to action
		Buffer law	Yes	Added Action WRI-5.10: Meet all statutory requirements of the Buffer Legislation (103F.48).
		Are ssts defined as point sources?	Yes	Strategy removed.
Advisory Committee: DNR	4: Targeted Implementation Schedule- Strategies and Actions	Add "consistent with the Minnesota Nitrogen Management Plan developed by MDA.	Yes	Revised
		Perhaps add language along the lines of "Encourage implementation of BMPs to increase soil organic content, including but not limited to tillage management and cover crops.	Yes	Revised, and applied to GW 1-4 : Implement and maintain existing BMPs to increase soil organic content, including but not limited to tillage management and cover crops.
		This point could be added to Strategies, GW-1 thru GW-4.	Yes	Revised
		Include "...supply for sustainable use, and evaluate..."	Yes	Revised
		While this concept is certainly worth merit, state law no longer requires conservation rate structures as a portion of public water supply planning. As such, I don't know many communities that have been willing to implement this strategy.	No	Kept with hopes of increasing numbers through plan implementation and dollars
		Is this outcome feasible and/or reasonable? This action will affect nearly every large basin on the landscape, and will likely an extremely difficult pill to swallow for landowners.	Yes	Revised
		Do we need to include information on some of the new irrigation conservation technology (i.e. variable rate application, low flow drop nozzles, etc...)?	Yes	Revised
		To the best of my knowledge, there are not many ravines on the landscape within the NFCRW, especially within proximity to the major lakes. It may be prudent to change "ravines" in this Strategy to "steep and/or highly erodible slopes". This will likely be more applicable across the watershed.	No	Ravines were identified in the Pope local water plan, and was included in the Prioritization Matrix. Therefore, the strategy should address "ravines" explicitly.
		Please include "Prioritize them for implementation by addressing the root cause of instability, as well as on-site implementation."	Yes	Revised
		Please change to "By increasing perennial native vegetation in upland and riparian areas that..."	Yes	Revised
		Add Action SW-8.6 – Facilitate conversations with local stakeholders and LGU's in regards to increased watercraft inspections/monitoring at lake access sites to promote prevention.	Yes	Revised

		I am very uncomfortable with this action item. Very few variable crest lake outlet control in the watershed that can be manipulated in response to high water. In addition, the alteration of lake outlet structures is a very highly regulated process with significant agency oversight. Most high water levels are in response to conditions/practices/land use with the watershed of the lake, and not specifically due to lake outlet structure issues. If the action item was changed to read "Assist as needed with outlet structure reconstruction and improvements on degraded or failing structures" I think that would be fine.	Yes	Revised to : Assist as needed with outlet structure reconstruction and improvements on degraded or failing structures
		This is a good practice for watercourses, however, unless we are talking about trash and debris left over from ice fishing season, does not have the same applicability to basins.	No	No change made
		These two action items seem to fit better in Strategy SW-17.	Yes	Revised
		Add "...without increasing discharge to downstream receiving waters."	Yes	Revised
		Consider changing "acreage" to "condition and/or quality". In my experience, most of the effort surrounding shallow lake projects relates to enhancement or restoration of existing basins, over restoring previously drained large lakes.	Yes	Revised
		Consider changing to "baseline water quality and habitat conditions."	Yes	Revised
		Consider adding "...Communities for acquisition and/or protection" at the end of this action item.	Yes	Revision makes action item too similar to action below- removed this action to reduce redundancy
		Consider adding an additional strategy in regards to identification of barriers to terrestrial habitat continuity as a portion of this strategy as well.	Yes	Action added: Identify barriers to terrestrial habitat continuity
		Consider adding an action item to "Identify areas adjacent to existing public lands that contain include priority features (wetlands, MBS biodiversity sites, priority shallow lakes, etc...) and prioritize for acquisition to enhance recreational opportunities.	Yes	Action added: Identify areas adjacent to existing public lands that contain include recreational and wildlife habitat features (wetlands, MBS biodiversity sites, priority shallow lakes, etc.) and prioritize for acquisition to enhance recreational opportunities.
Policy Committee	4: Targeted Implementation Schedule- Strategies and Actions	Add a footnote to targeted implementation schedule to indicate that actions are not listed in order of importance	Yes	Footnote added
BWSR	5: Implementation Programs	language should be included within 5.5.5 Plan Amendment Process that states that the existing authorities of each local government unit is maintained. Since the watershed districts have the ability to carry out projects through a petition or unanimous vote by their Board, they would not need it within the NRCR 1W1P. The WD's will need to decide if they want to maintain a separate CIP or have new projects included in the 1W1P.	Yes	Revision made as suggested.
Policy Committee	5: Implementation Programs	Table 5-4: Add text indicating the drainage authority only applies to County ditches	Yes	Language added
		Table 5-2: Add footnote indicating items are listed in no particular order	Yes	Language added
		Table 5-6: Add MDA Water Quality Certification Program to list of financial and technical resources	Yes	Program added to table



APPENDIX F

BWSR Plan Content for Pilot Watersheds



One Watershed, One Plan

Plan Content for Pilot Watersheds

September 23, 2014



Purpose: As per Minnesota Statutes §103B.101 Subd. 14, the Board of Water and Soil Resources “*may adopt resolutions, policies, or orders that allow a comprehensive plan, local water management plan, or watershed management plan, developed or amended, approved and adopted, according to chapter 103B, 103C, or 103D to serve as substitutes for one another or be replaced with a comprehensive watershed management plan,*” also known as *One Watershed, One Plan*. This document outlines plan content requirements for implementing this statute through selected pilot watersheds.

Introduction

This document contains specific details on the content requirements for drafting a plan through the *One Watershed, One Plan* pilot program. Full operating procedures for developing the plan - including initiating the planning process through review, approval, and adoption - are contained in the *One Watershed, One Plan* Operating Procedures document on the *One Watershed, One Plan* page of the BWSR website.

The following [Guiding Principles](#) provided sideboards and direction in the plan content requirements outlined in this document:

- *One Watershed, One Plan* will result in plans with prioritized, targeted, and measurable implementation actions that meet or exceed current water plan content standards.
- *One Watershed, One Plan* will strive for a systematic, watershed-wide, science-based approach to watershed management; driven by the participating local governments.
- Plans developed within *One Watershed, One Plan* should embrace the concept of multiple benefits in the development and prioritization of implementation strategies and actions.
- *One Watershed, One Plan* planning and implementation efforts will recognize local commitment and contribution.
- *One Watershed, One Plan* is not intended to be a one size fits all model.

The requirements in this document are also supported by the vision of the Local Government Water Roundtable that future watershed-based plans will have sufficient detail that local government units can, with certainty, indicate a pollutant of concern in a water body, identify the source(s) of the pollutant, and provide detailed projects that address that particular source. This vision also includes a future of limited wholesale updates to watershed-based plans; with a streamlined process to incorporate collected data, trend analysis, changes in land use, and prioritization of resource concerns into the watershed-based plan; and an emphasis on watershed management and implementation through shorter-term workplans and budgeting. This vision includes acknowledging and building off of existing plans and data (including local and state plans and data), as well as existing local government services and capacity.

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NOTE: Operating Procedures for establishing planning boundaries, requirements for participation and formal agreement between local governments within the boundary, and procedures for plan development are provided in a separate document.

I. Overview

The requirements for plan content found in this document in general include background information and a purpose for the requirement, guidance for how the requirement can be met through the planning process, and the specific plan content requirements. The primary planning terms used are: priority issues, goals, and actions. These terms are defined within the sections they are used.

Plan development procedures and steps such as: initiating a plan, establishing a planning boundary, requirements for participation and formal agreements between local governments within the boundary, and procedures for formal review and approval can be found in the *One Watershed, One Plan Program Operating Procedures for Pilots* document found on the BWSR website. Also found in the *Operation Procedures for Pilots* is the concept of three approvable plan types within the *One Watershed - One Plan* framework:

- **Water Quality Implementation Plan:** This plan further develops the strategies identified in a Watershed Restoration and Protection Strategies (WRAPS) document or equivalent studies into a consolidated implementation plan. This plan can be used to replace the implementation section of an existing plan(s), or can be used by local government partners on its own to collaboratively apply for state grants.
- **Priority Concerns Watershed Implementation Plan:** This plan leverages the existing process for developing a plan based on priority concerns typically associated with current county water planning; but shifts the scope of the plan to a watershed boundary and elevates requirements for prioritizing, targeting, and measuring implementation actions.
- **Comprehensive Watershed Management Plan:** This all-inclusive plan leverages the existing requirements for watershed district plans and has the highest standards of the three plan options. These plans will address surface and groundwater, water quality and quantity, and land use; and implementation actions in the plan will consider the broad range of tools, including capital improvements, official controls, and other tools and programs necessary to achieve the goals of the plan.

Each plan content requirement section in this document contains a statement as to how the requirement may vary by these plan types. The Water Quality Implementation Plan type must have goals to address the water quality priority issues. The remaining plan types must have goals to address all identified priority issues such as water quality, water quantity, groundwater, etc.

Although not required, a recommendation in the planning process is to develop an overarching mission or vision statement, as well as higher-level guiding principles or purposes. The purpose of establishing a vision, mission, and/or guiding principles is to provide a sense of direction for the plan and participants in the planning process. Additionally, overall organization and format of the watershed-based plan is a local decision unless otherwise specified in these requirements as long as the plan content requirements are met. However, using planning terminology consistent with this document is recommended.

An underlying theme within these requirements is the intent for watershed-based plans developed through *One Watershed, One Plan* to be succinct, with a thorough and science-based process used in development, and an emphasis in the resulting plan on the implementation schedule and implementation programs. For example, the information found in a Land and Water Resources Inventory is extremely valuable to the planning process and ultimate implementation of the actions in the plan; however, the majority of this information can be incorporated into the final plan document by reference.

II. Plan Content Requirements

Each watershed-based plan will contain the elements outlined in the following sections.

1. Executive Summary

Each plan will have a section entitled "Executive Summary." The purpose of the executive summary is to provide a condensed and concise summary of the contents of the overall plan. A well-written executive summary is beneficial for current and future elected officials, staff, citizens, and stakeholders to achieve an understanding of the plan and its intent.

Plan Content Requirement: Executive Summary

Each plan will have a section entitled "Executive Summary." The purpose of the executive summary is to provide a brief look at the contents of the plan. The summary will include:

- A. Purpose, mission, or vision statement if developed;
- B. A general map or description of the planning boundary and smaller planning or management units if used;
- C. A summary of the priority issues and goals that are addressed in the plan;
- D. A summary of the implementation actions and programs;
- E. A brief description of the process used to identify the measurable goals and targeted implementation actions; and
- F. An outline of the responsibilities of participating local governments.

This requirement applies to all plan types; however, the requirement to have a separate Executive Summary for the plan type Water Quality Implementation Plan can be waived if this plan type is amended into an existing local water plan.

2. Analysis and Prioritization of Issues

This section of the plan is intended to summarize the process planning partners used to reach understanding of and agreement on the watershed issues and priorities that will be addressed within the lifespan of the plan. Prioritizing is recognition that not all identified issues can be addressed in the timeframe of a ten year plan—some items will be addressed before others.

Planning partners are strongly encouraged to consider the potential for more extreme weather events and their implications for the water and land resources of the watershed in the analysis and prioritization of issues. While these events cannot be predicted with certainty as to time and occurrence, the meteorological record shows increased frequency and severity of extreme weather events, which has a direct effect on issues in local water planning.

Broad issues likely to be identified through the watershed planning process include:

- | | |
|---|---|
| ▪ Soil erosion and sedimentation | ▪ Wastewater management |
| ▪ Soil health | ▪ Groundwater protection |
| ▪ Altered hydrology | ▪ Flood damage reduction |
| ▪ Shoreland and riparian management | ▪ Drought mitigation |
| ▪ Maintenance of core services; understanding of local capacity | ▪ Habitat, wildlife and fisheries |
| ▪ Water quality | ▪ Education, outreach and civic engagement |
| ▪ Water supply (protect, provide and conserve) | ▪ Contaminants of emerging concern |
| ▪ Drinking water supply | ▪ Emerging issues (e.g. land cover, climate change, etc.) |
| ▪ Wetland management | ▪ Invasive species management |
| ▪ Drainage system management | |

The list above is not all inclusive; any land and water related issue could be part of the plan. The process for considering and prioritizing issues generally has two parts: agreement on priority natural resources and agreement on priority issues impacting those resources. High quality recreational lakes, the main stem of the primary river in the watershed, or a specific groundwater aquifer that is the primary drinking water source in the watershed are all examples of priority resources. Identifying priority issues goes a step further by focusing on the issue(s) that impact the priority resources of the watershed, such as: “high quality recreational lakes showing a downward trend in water quality” or “sedimentation in the main stem of the priority river.”

Through plan development, potential priority resources and issues are reviewed, aggregated, and summarized from: existing local plans, studies, and information; modeling, data collection, and assessment completed through the WRAPS and/or TMDLs; other state plans or studies; feedback received from the initial notifications to the plan review authorities and stakeholders; and the initial planning meeting(s) held in the watershed (see *One Watershed, One Plan* Operating Procedures for Pilots). These summarized issues are then filtered through local knowledge and information, and priority issues are selected in consideration of:

- Science and data generated through modeling, data collection, and assessment such as WRAPS, TMDLs, or equivalent;
- Anticipated future impacts or landuse changes that may provide an opportunity or escalate a risk if nothing occurs;
- Understanding of trends and/or tipping points for individual water resources;
- Understanding of precipitation frequency as per National Oceanic and Atmospheric Administration (NOAA) Atlas 14;
- Understanding of citizen and local landowner willingness to participate in potential changes to watershed management;
- Local values which may incorporate specific water or landscape resources as a priority.

Additional consideration should be made of the high-level state priorities identified in the state’s Nonpoint Priority Funding Plan for Clean Water Implementation Funding. These are the priorities identified by the state agencies for investing Clean Water Fund nonpoint implementation money, based on the principles of asset preservation and risk-opportunity assessment.

- Restore those impaired waters that are closest to meeting state water quality standards.
- Protect those high-quality unimpaired waters at greatest risk of becoming impaired.
- Restore and protect water resources for public use and public health, including drinking water.

Plan Content Requirement: Analysis and Prioritization of Issues

The plan must contain:

1. A summary of the issues and resource concerns identified;
2. The steps used to consider and prioritize the identified resources and issues; and
3. A list of the agreed upon priority resources and issues for the watershed and a brief description of why the issue was selected.

Priority issues can be articulated in the plan through both a list/descriptions and map(s). The format and exact planning terminology used in the plan for presenting priority issues may vary as long as the plan covers the three requirements above, and the terminology used is defined in the plan (the summary and steps are suggested to be included as appendices). The plan is not expected to address all identified issues; however, it should include a brief explanation as to why certain issues were rejected as priorities for this planning cycle.

In the event that conflicts exist in the interpretation of issues and/or selection of priority issues, consider whether the conflict can be addressed by having both watershed-wide priorities as well as individual priorities of the participating local governments.

Plans that do not demonstrate a thorough analysis of issues, using available science and data, will not be approved. BWSR will consider the guidance and recommended tools outlined in *Section 2 Analysis and Prioritization of Issues* in assessing if analysis has been thorough.

This requirement applies to all plan types.

Through the development of the *One Watershed, One Plan* program, BWSR has partnered with the University of Minnesota to assess tools and models to assist in prioritization for the purposes of developing a watershed-based plan. Through this project, specific models and tools are recommended to be used in the pilot watersheds to assist in the identification of priority issues.

Assistance with selecting and using the models and tools will be made available to pilot watersheds through BWSR. Additional or alternative models, tools, or processes that are already in use across the state may be proposed; however, agreement between the pilot watershed and BWSR staff on whether the proposed tool, model, or process meets the specific criteria outlined in the analysis will need to be achieved before proceeding. This agreement will be outlined in the approved workplan for the pilot watersheds.

3. Establishment of Measurable Goals

The plan must contain measurable goals, sometimes called objectives in planning, to address the priority issues. Measurable goals articulate what the planning partners want to achieve and allow for future evaluation of progress. A useful method for assessing if a goal is measurable is to ask the question for each goal: “will we be able to measure / show / report that we have been successful in achieving this goal when we assess implementation of the plan in the future?”

The development of measurable goals and the resulting implementation actions will be an iterative process. Goals from existing local water plans and information should be summarized and discussed for potential inclusion as part of this process. WRAPS, TMDLs, and the models used for the prioritization process noted above should all be used in the setting of goals. The implementation programs and schedule for achieving the goals should be considered and goals adjusted to reflect those achievable within the timeframe of the plan versus those that may reflect a longer view.

Formatting, terminology, and organization in the plan to meet this requirement can vary. For example, a goal to “maintain clean drinking water for future generations” is too broad to be feasibly measured and may better serve as a

guiding principle. However, a broad goal such as this could be acceptable if it is supported by a series of measurable sub-goals or objectives similar to the examples below. The plan may contain a blend of goals common to the watershed as a whole, goals individual to a specific local government participant(s) and/or resource, and goals that persist beyond the timeframe of the plan.

Not every goal can be measurable within the timeframe of the plan; however the aggregate of goals in the plan should together articulate an intended pace of progress. For example, if a water quality standard is unable to be met within the lifespan of the plan, the plan should contain longer-term goals with interim points at which progress can be examined and methods and models to establish the goal can be reevaluated. Ideally, these interim points would use some measure to show attainment of an interim goal.

The timeframe of goals may also need to recognize unique settings and situations across the state. As an example, The Minnesota Geological Survey notes that response time of nitrate concentrations to changes in land use practices in southeast Minnesota will likely vary in different hydrogeologic settings, and may lag behind landuse changes by decades. In addition some water quality or designated use support goals may take decades to achieve (e.g. changes in stream biota, altered base flow hydrology).

Plan Content Requirement: Establishment of Measurable Goals

Each priority issue must have associated measurable goals for addressing the issue. Some goals will be watershed-wide; however, the majority should be focused on a specific subwatershed, natural resource, or local government. Goals for prevention of future water management problems should also be considered. Plans that do not contain sufficient measurable goals to indicate an intended pace of progress for addressing the priority issues will not be approved.

BWSR will consider the guidance and recommended tools outlined in *Section 2 Analysis and Prioritization of Issues*, the balance of broad versus focused goals and shorter-term versus longer-term goals, and detail in the targeted implementation schedule to assess if goals are sufficient. Additionally, the pace of progress towards achieving goals will be used in determinations of the extent or depth of future 10 year plan revisions. BWSR may consider issuing findings when a plan and associated implementation is sufficient that a complete revision will not be required.

The Water Quality Implementation Plan type must have goals to address the water quality priority issues. The remaining plan types must have goals to address all identified priority issues.

4. Targeted Implementation Schedule

Targeting takes a closer look at the priority issues and identifies cost-effective, targeted, and measurable actions necessary to achieve the goals. These actions are included in the plan in consideration of: available technical skills and capabilities, knowledge of landowner willingness, funding resources available, and implementation items or projects from existing local water plans and information and the Strategies and Actions table from the WRAPS. Actions are entered into a schedule or table that provides the details of:

- A brief description of what each action is;
- Location targeting where the action will occur;
- Identification of roles and who is responsible for the action;
- An estimate of cost and potential sources of funding for implementing the action;
- An estimate of when the implementation will occur within the 10 year timeframe of the plan; and
- How the action will be measured.

The purposes of the implementation schedule are to clearly indicate an intended pace of progress for achieving the goals, support development of shorter term workplans and budgets for the planning partners, and to support budget requests to the state through BWSR's Biennial Budget Request (BBR). A template for the targeted implementation schedule will be provided. The schedule should be supported by maps indicating the location(s) of the targeted activities.

The development of a targeted implementation schedule and associated actions is an iterative process. The same tools used for prioritization and goal setting can be used to assist with the selection of actions to be included in the targeted implementation schedule. Additionally, some actions may require prior feasibility study to determine the viability of the action.

The depth and specificity of targeted actions identified in the plan will vary. For example, capital improvement projects and best management practices to be implemented on public land can generally be specifically located and identified in the plan; whereas, conservation practices proposed for private lands may be specifically identified through the use of models and tools for purposes of developing measurable goals and the targeted implementation schedule, but those locations are only generally described in the plan itself. For these areas, the plan must overtly describe actions to work with landowners in these critical areas and tailor conservation practices.

Plan Content Requirement: Targeted Implementation Schedule

Each plan will have a targeted implementation schedule for achieving the goals with:

1. A brief description of what each action is;
2. Targeting where the action will occur;
3. Identification of roles and the responsible government unit for the action;
4. An estimate of cost and potential sources of funding for implementing the action;
5. An estimate of when the implementation will occur within the 10 year timeframe of the plan; and
6. How the action will be measured.

The schedule must clearly identify the actions the planning partners will undertake with available local funds versus the actions that will be implemented only if other sources of funds become available, and should be supported by maps indicating the location(s) of the targeted activities.

5. Implementation Programs

The implementation programs described below support the targeted implementation schedule by describing the overarching program(s) that will be used to implement actions identified in the schedule and how these programs will be coordinated between the local water management responsibilities.

- A. **Plan Administration and Coordination:** The plan must describe the following administration and coordination programs as indicated in the table *Plan Content Requirement: Implementation Programs by Plan Type* at the end of this section.
- i. **Decision-making and Staffing:** Describe how the partners will transition from a planning partnership to implementation of a watershed-based plan through descriptions of roles and responsibilities of participating local governments.
 - a. **Policy Team** (decision-making): Describe if the policy team created to develop the plan will continue through plan implementation, or clearly outline an alternative method to provide oversight and maintain accountability throughout plan implementation.

- b. **Advisory Committee** (advising): Describe if the advisory committee(s) created for plan development will continue through plan implementation and/or describe alternative methods to ensure: a dependable forum to exchange information and knowledge about the watershed and implementation of the plan, and meet the statutory requirements for ongoing advisory committees of counties (Minnesota Statutes §103B.301-103B.335) and watershed districts (Minnesota Statutes §103D.331-103D.337).

The plan should also establish procedures for engaging state agencies, and describe the ongoing role and commitments of the state agencies on project teams for plan implementation.

- c. **Identification and Coordination of Shared Services** (staffing): Describe specialized and shared service areas that will be used in the watershed to implement the actions identified in the schedule and achieve greater efficiencies in service delivery. This may include shared services for program management such as if a plan action requires forest resource management technical assistance, but the local government where the action is occurring does not have a staff forester. The watershed plan and associated formal agreements should describe how the service will be shared and/or the need met. Or it may include project management, for example if one county has history and experience in implementing a large-scale multipurpose drainage project, another county in the watershed may want to contract for services with staff of the first to implement a similar project. Shared services may also include partnership with non-governmental organizations.
- ii. **Collaboration with other Units of Government:** Describe relationships with other units of government not part of the formal agreement for plan development, including the drainage authorities within the planning boundary. For example, cities and townships are not required participants; however, recognition and inclusion of cities and townships is important and especially critical to recognize for actions involving waste water treatment plants, source water and wellhead protection for population centers, MS4s, etc. Additionally, federal government partners are not required participants; however, federal programs and partnerships are very important resources in watershed management.
- iii. **Funding:** Describe how actions in the implementation schedule will be funded. Both the state and local governments have responsibility for funding water management. All funding methods currently available to participants remain available to the participants and/or to the organization as a whole through the participants.
 - a. **Local Funding:** The local government planning partners have variable methods and options for generating funds to implement watershed management and to leverage state and other funding. These methods, options, and commitments of the participants must be clearly outlined in the plan.
 - b. **State Funding:** Describe state funding needs for implementation of the plan. This can be achieved through separation in the targeted implementation schedule of locally funded projects versus projects that will proceed only with state funds.
 - c. **Collaborative Grants:** Describe the intended approach to coordinated submittal of state grant applications. Collaborative grant making is a goal of *One Watershed, One Plan*.
 - d. **Federal Funding:** Federal sources of funds can be important to watershed management. The plan should describe what type of federal funding resources may be pursued to implement the plan, to the extent possible.
 - e. **Other Funding Sources:** Other sources of funds, such as from non-governmental organizations and private landowner funding, can be important to watershed management. The plan should describe what types of other funding resources may be pursued to implement the plan, to the extent possible.

- iv. **Work Planning:** Describe how the targeted implementation schedule and the implementation programs will be used for work planning. For example, describe if a collaborative work plan for the watershed, individual work plans for each local government participant, or some combination work planning be used; and describe how the work plan will be finalized and approved.
 - a. **Local Purpose:** Include a frequency, method, decision-making, and local purposes for work planning. Frequency is suggested to be annual in order to be incorporated into local budgeting and staffing decisions related to implementation of the plan and can be no more than every two years. Purposes depend on the extent of collaboration intended in the implementation schedule, programs, and subsequent agreements; as well as the extent of collaborative grant-making intended.
 - b. **State Purpose:** Describe a biennial commitment to collaboratively review and submit a BWSR biennial budget request (BBR) from the watershed. Future BBRs should be generated from the Targeted Implementation Schedule. Submittal of the BBR is a requirement for Soil and Water Conservation Districts and Counties to meet planning requirements associated with grants.
- v. **Assessment and Evaluation:** Describe the frequency, method(s), purposes, decision-making, and procedures for periodic assessment and evaluation of plan implementation. Periodic understanding of accomplishments—based on the targeted implementation schedule—is needed to measure progress, drive the work plan, and provide accountability.
 - a. **Annual Evaluation:** Describe an annual commitment to collaboratively review and submit to BWSR’s Level I [Performance Review and Assistance Program](#) performance standards. Additionally, describe sufficient baseline local evaluation of previous years’ work to support generation of the local work plan above (if an annual local work plan is being used) and reporting requirements below.
 - b. **Biennial Evaluation:** If the watershed chooses a biennial work plan, a biennial evaluation must be described to evaluate the previous years’ work and support the work plan. It is recommended this baseline evaluation ties to the requirement for measurability in the targeted implementation schedule and that a method for tracking implementation consistently across the watershed be described.
 - c. **Five Year Evaluation:** Include a schedule for a thorough five year assessment and potential revision to implementation schedule. The purpose of this evaluation is to determine progress and consider whether staying the course or resetting direction is necessary, and it may include revisions to models, considerations of new monitoring data, etc. Additional guidance, including BWSR involvement in this evaluation, will be developed through the pilot watersheds.
 - d. **Reporting:** Describe collaborative approaches to provide accountability to stakeholders and to meet annual reporting requirements of local governments, grant reporting requirements, and specific program and financial reporting requirements. Information on required annual reporting can be found on the BWSR website: www.bwsr.state.mn.us/grants/reporting/reporting.html. Consider a periodic ‘state of the watershed report,’ or individualized ‘waterbody report cards’ or other methods to provide accountability and demonstrate outcomes locally. See also the Education and Information requirements below.
- vi. **Plan Amendments:** Describe procedures for considering plan amendments, who can propose amendments, what criteria will be used in considering amendments, and who makes the decision to proceed with the amendment.
- vii. **Formal Agreements:** List and briefly describe any formal agreements between local governments that are pertinent to water management. This includes longstanding existing agreements and any new agreements to be implemented as part of the plan. For example, prior to completion of the plan the formal agreement between partners for planning purposes should be revisited in consultation with Minnesota Counties

Intergovernmental Trust (MCIT) and legal counsel. MCIT may recommend revising the planning agreement, establishing separate agreements or contracts for specific services or actions; and/or developing a broader, watershed-wide agreement for ongoing partnership.

- B. **Plan Implementation Programs:** Describe the following programs to support the targeted implementation schedule, including necessary feasibility studies, as indicated in the table *Plan Content Requirement: Implementation Programs by Plan Type* at the end of this section.
- i. **Incentive Programs:** Describe local voluntary cost share or grant programs necessary to achieve the goals; including the general purpose and scope, criteria that will be used to select projects/disperse funds, actions to work with landowners in these critical areas to tailor conservation practices, and how the program(s) will be implemented across the watershed to provide consistency and achieve goals. Incentive programs may be targeted to specific issues, e.g. grants for sealing abandoned wells, or specific areas, e.g. watershed of priority lakes.
 - ii. **Capital Improvements:** Describe opportunities for watershed-wide collaboration (e.g. sharing of specialized services and/or lessons learned on these large-scale projects) on capital improvements (physical/structural improvement with an extended life) identified in the targeted implementation schedule. Consider including opportunities for improved water management associated with county and township roads and within drainage systems managed through Drainage Law.
 - a. **Drainage:** Describe opportunities for enabling large-scale multi-purpose projects on a watershed basis.
 - b. **Capital Improvement Programs (CIPs) for Watershed Districts.** CIPs are required in the plan when a watershed district is included, consistent with the requirements of Minnesota statutes §103B and 103D. A CIP is an itemized program for at least a five-year prospective period, and any amendments to it, subject to at least biennial review, that sets forth the schedule, timing, and details of specific contemplated capital improvements by year, together with their estimated cost, the need for each improvement, financial sources, and the financial effect that the improvements will have on the local government unit or watershed management organization. This requirement can be incorporated into the targeted implementation schedule if the specific requirements are clearly met.
 - iii. **Operation and Maintenance:** Include a description of who is responsible for inspection, operation and maintenance of stormwater infrastructure, public works, facilities, and natural and artificial watercourses. Specify any new programs or revisions to existing programs needed to accomplish the goals or that may benefit from watershed-wide collaboration.
 - iv. **Regulation and Enforcement:** Describe existing regulations, controls, and authorities relevant to water management for the purposes of highlighting areas of duplication, gaps, and opportunities. Include description of drainage authorities and responsibilities. Use this analysis to identify areas to maximize effectiveness and build efficiencies through improved coordination and consistent application of regulations in support of meeting plan goals. Consider also opportunities for efficiencies in required annual reports related to regulation, and enforcement and connections to possible data gaps. Regulatory areas to consider include, but are not limited to: shoreland, floodplain, septic, Wetland Conservation Act, erosion control, minimum impact design standards, land use, feedlots, prescription drug drop off, etc.
 - a. **Regulation and Enforcement for Watershed Districts:** Describe the rules and associated permit programs of watershed districts in the watershed, consistent with and as necessary to meet the requirements of Minnesota statutes §103B.337-103D.345.

- b. **Comprehensive or land use plans:** Describe the land use authorities within the watershed as well as potential opportunities to achieve goals through, or potential conflicts with, comprehensive land use plans.
- v. **Data Collection and Monitoring:** Describe data collection and monitoring activities necessary to support the targeted implementation schedule and reasonably assess and evaluate plan progress.
 - a. **Inventory:** Describe additional inventories needed in the watershed to address any gaps in the land and water resources inventory support actions in the targeted implementation schedule, if applicable.
 - b. **Monitoring:** Describe the locations, frequency, and parameters of existing water quality, quantity and other monitoring programs in the watershed. Describe if these established monitoring programs are capable of producing an accurate evaluation of the progress being made toward the goals, including improved calibration of model(s), and any new monitoring needed to improve understanding of the watershed baseline or assess particular resources. State agencies are available to assist with identification of state monitoring activities.

Include a requirement for periodic analysis of the data, a commitment to collect data consistent with state compatibility guidelines, and a commitment to submit locally collected data to the appropriate state agency for entry into public databases.
- vi. **Information, Outreach, and Education Programs:** The plan must describe information, outreach, and education program(s); specifically, opportunities where there are benefits from watershed-wide collaborations and areas where focused or targeted actions will support the priority issues and goals of the plan. At a minimum, include the purpose, targeted audiences, and a description of the actions or methods. Consider development of an education plan for the overall watershed using an approach currently successfully used in Minnesota is an adaptation of the U.S. Environmental Protection Agency guidance “Getting in Step: A Guide for Conducting Watershed Outreach Campaigns” available at: www.epa.gov/owow/watershed/outreach/documents/getnstep.pdf.

Plan Content Requirement: Implementation Programs by Plan Type

The following outlines the ***minimum*** plan content requirements for implementation programs, by plan type. BWSR will use the descriptions of the programs above to determine if the requirement has been met.

	Plan Content Requirement	Water Quality Implementation Plan	Priority Concerns Implementation Plan	Comprehensive Watershed Management Plan
Plan Administration & Coordination	Decision-making and staffing	Required	Required	Required
	Collaboration with other units of government	May include	May include	Required
	Funding	Required	Required	Required
	Work Planning	Required	Required	Required
	Assessment and Evaluation	Required	Required	Required
	Plan Amendments	Required	Required	Required
	Formal Agreements	Required	Required	Required
Plan Implementation Programs	Incentive Programs	Required	Required	Required
	Capital Improvements	May include	Required if necessary to address priorities	Required
	Operation and Maintenance	May include	Required if necessary to address priorities	Required
	Regulation and Enforcement	May include	Required if necessary to address priorities	Required
	Data Collection and Monitoring	Required	Required	Required
	Information, Outreach, and Education Programs	Required	Required	Required

6. Plan Appendix - Land and Water Resources Inventory

A land and water resource inventory is simply an account of the water resources and physical factors affecting the water resources within the watershed. In most cases, adequate data, inventories, and general analysis of land and water resources already exist; new information does not necessarily need to be generated and the majority of resource information can be incorporated by reference with a brief general description. At a minimum, the plan should acknowledge the resource information from existing local water plans and the Watershed Restoration and Protection Strategies Report (WRAPS). This information is important not just to understand the historic status of the watershed, but useful to consider the future.

Going forward, wholesale updates and/or revisions to land and water resource inventories should be limited. Instead greater flexibility and a streamlined process for more frequent updates to incorporate collected data, updated trends analysis, and changes in land use typically associated with land and water resource inventories are envisioned.

Plan Content Requirement: Land and Water Resources Inventory

The plan must contain sufficient land and water resource information to inform the planning process and support actions in the plan. Specifically, the plan must include a brief general description of—and reference where to find—the typical and available land and water resource information. This information includes, but is not limited to:

- Topography, soils, general geology;
- Precipitation;
- Water Resources
 - Surface water resources; including streams, lakes, wetlands, public waters and public ditches;
 - Groundwater resources, including groundwater and surface water connections if known;
 - Water quality and quantity, including trends of key locations and 100-year flood levels and discharges, regulated pollutant sources and permitted wastewater discharges;
 - Stormwater systems, drainage systems and control structures;
 - Water-based recreation areas;
- Fish and wildlife habitat, rare and endangered species;
- Existing land uses and proposed development

Inventory information critical to supporting the priorities and actions of the plan may need to be more thoroughly described. For example, a description of results of trend analysis may need more in-depth description to support a priority issue in the plan; however, the data behind the analysis can be referenced.

If gaps in inventory information are identified through the plan development process, consider implementation action(s) to fill the gap rather than delaying the planning process to generate new data.

This requirement applies to all plan types and is suggested to be included as an appendix to the plan.



APPENDIX G

Documents Reviewed and Relied Upon During Plan Development

DOCUMENTS REVIEWED AND RELIED UPON DURING PLAN DEVELOPMENT

Board of Water and Soil Resources (BWSR), 2016. *Nonpoint Priority Funding Plan*. Available at: http://www.bwsr.state.mn.us/planning/npfp/2016_NPFP_Final.pdf

Houston Engineering Inc. (HEI), 2016. *Altered Hydrology Within the Crow Watershed*.

Kandiyohi County, 2013. *The Kandiyohi County Comprehensive Local Water Plan (2013-2023): With Five-Year Implementation Plan (2013-2018)*.

McLeod County, 2013. *The McLeod County Comprehensive Local Water Plan (2013-2023): With a Five Year Implementation Plan*.

Meeker County, 2013. *The 2013-2023 Meeker County Comprehensive Local Water Plan: With a Five-Year Implementation Program Serving the Years 2013-2018*.

Minnesota Department of Agriculture (MDA), 2015. *Minnesota Nitrogen Fertilizer Management Plan*. Available at: <http://www.mda.state.mn.us/~media/Files/chemicals/nfmp/nfmp2015.pdf>

Minnesota Department of Health (MDH), 1998. *Guidance for Mapping Nitrate in Minnesota Groundwater*. O:\DwpSwp\GROW\NITRAWG\copy-guidance.wpd

Minnesota Department of Health (MDH), 2012. Volunteer Nitrate Monitoring Network Study. Available at: <http://www.health.state.mn.us/divs/eh/water/swp/nitrate/reports/methodsresults.pdf>

Minnesota Department of Health (MDH), 2016. *Contaminants of Emerging Concern: Protecting Minnesota's Water Resources*. Available at: <http://www.health.state.mn.us/cec>

Minnesota Department of Natural Resources (MnDNR), 2016. *Lakes of Phosphorus Sensitivity Significance*. Dated: June 14, 2016.

Minnesota Department of Natural Resources (MnDNR), 2016. Wild & Scenic Rivers Program, *The Wild & Scenic North Fork of the Crow River*. Available at: http://www.dnr.state.mn.us/waters/watermgmt_section/wild_scenic/wsrivers/crow.html

Minnesota Department of Natural Resources: State Climatology Office (MnDNR), 2013. *Climate*. Available at: <http://www.dnr.state.mn.us/faq/mnfacts/climate.html>

Minnesota Department of Natural Resources (MnDNR), 2015. *Groundwater pollution sensitivity: Definition of pollution sensitivity*. Available at: http://www.dnr.state.mn.us/waters/groundwater_section/mapping/sensitivity.html

Minnesota Department of Natural Resources (MnDNR), Draft 2015. *Bonanza Valley Groundwater Management Area Plan*.

Minnesota Department of Natural Resources (MnDNR), Draft 2016. *DNR's Section for the North Fork Crow River Groundwater Restoration and Protection Strategy*.

Minnesota Pollution Control Agency (MPCA), 2011. *North Fork Crow River Watershed Monitoring and Assessment Report*. Available at: <https://www.pca.state.mn.us/sites/default/files/wq-ws3-07010204b.pdf>

Minnesota Pollution Control Agency (MPCA), 2013. *Adapting to Climate Change in Minnesota: 2013 Report of the Interagency Climate Adaptation Team*. Available at: <https://www.pca.state.mn.us/sites/default/files/p-gen4-07.pdf>

Minnesota Pollution Control Agency (MPCA), 2014. *North Fork Crow River Watershed Biotic Stressor Identification Report*. Retrieved from <https://www.pca.state.mn.us/sites/default/files/wq-ws5-07010204b.pdf>

Minnesota Pollution Control Agency (MPCA), 2014. *North Fork Crow Watershed (07010204) Watershed Restoration and Protection Strategy Report*. Available at: <https://www.pca.state.mn.us/sites/default/files/wq-ws4-06a.pdf>

Minnesota Pollution Control Agency (MPCA), 2014. *The Minnesota Nutrient Reduction Strategy*. Available at: <https://www.pca.state.mn.us/sites/default/files/wq-s1-80.pdf>

Minnesota Pollution Control Agency (MPCA), 2015. *Sediment Reduction Strategy for the Minnesota River Basin and South Metro Mississippi River*. Available at: <https://www.pca.state.mn.us/sites/default/files/wq-iw4-02.pdf>

Minnesota Pollution Control Agency (MPCA), 2016. *North Fork Crow River Watershed Groundwater Report*. Available at: <https://www.pca.state.mn.us/sites/default/files/wq-ws1-08.pdf>

Pope County, 2013. *The 2013-2023 Pope County Water Plan: With 2013-2018 Implementation Plan*.

Sands, Gary R., 2016. *University of Minnesota Extension: Drainage Fact Sheet*. Available at: https://www.extension.umn.edu/agriculture/water/science/drainage-fact-sheet/docs/u_of_m_drainage_fact_sheet_m1292_sands_2010.pdf

Stearns County, 2013. *The Stearns County Local Water Management Plan Amendment*.

Tyndall, J., and T. Bowman, 2016. *Iowa Nutrient Reduction Strategy Best Management Practice Cost Overview Series*. Department of Ecology & Natural Resource Management, Iowa State University.

United States Department of Agriculture (USDA), 2016. *Healthy Soil for Life*. Available at: <https://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>

U.S. Department of Homeland Security. FEMA website. Available at: <http://www.fema.gov/flood-zones>

Wenck Associates, Inc., 2011. *North Fork Crow River TMDL Bacteria, Nutrients, and Turbidity*. Available at: <https://www.pca.state.mn.us/sites/default/files/wq-iw8-42e.pdf>

Wright County, 2006. *Wright County Local Water Management Plan 2006-2015*.



APPENDIX H

Comment Letters



December 23, 2015

Crow River Organization of Water
c/o Diane Sander, Watershed Coordinator
311 Brighton Avenue Suite C
Buffalo, MN 55313

RE: Response to request for priority issues and plan expectations (One Watershed, One Plan)

Dear Ms. Sander,

Thank you for providing the opportunity to provide input regarding priority issues and plan expectations for the development of the North Fork Crow River Watershed, One Watershed One Plan under Minnesota Statutes Section 103B.101, Subd. 14. We appreciate the partners' willingness to participate in development of a multi-jurisdiction, watershed-based plan.

The Board of Water and Soil Resources (BWSR) has the following overarching expectations for the plan:

Process

- The planning process must follow the requirements outlined in the *One Watershed, One Plan – Operating Procedures for Pilot Watersheds* document, approved by the BWSR Board on June 25, 2014.

Plan Content

- The plan must meet the requirements outlined in the *One Watershed, One Plan – Plan Content Requirements for Pilot Watersheds* document, approved by the BWSR Board on September 24, 2014 for a Comprehensive Watershed Management Plan.

Connection to Research, Scientific Analysis, and Monitoring Data

- A Watershed Restoration and Protection Strategy (WRAPS) has been developed for the North Fork Crow River which should be referenced within the plan as well as the strategies included within the Plan's implementation Program.
- Utilize the Minnesota Nutrient Reduction Strategy (MPCA, September 2014) when considering implementation efforts to address phosphorus and nitrogen.

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403 Fourth Street NW Suite 200 Bemidji, MN 56601 (218) 755-2600	1601 Minnesota Drive Brainerd, MN 56401 (218) 828-2383	26624 N. Tower Road Detroit Lakes, MN 56501 (218) 846-8400	394 S. Lake Avenue Suite 403 Duluth, MN 55802 (218) 723-4752	12 Civic Center Plaza Suite 3000B Mankato, MN 56001 (507) 344-2821	1400 East Lyon Street Marshall, MN 56258 (507) 537-6060	261 Highway 15 South New Ulm, MN 56073 (507) 359-6074	3555 9th Street NW Suite 350 Rochester, MN 55901 (507) 206-2889

Central Office / Metro Office 520 Lafayette Road North Saint Paul, MN 55155 Phone: (651) 296-3767

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- Consideration of the Sediment Reduction Strategy for the Minnesota River and South Metro Mississippi River, January 2015 developed by the MPCA.

BWSR has identified the following focus areas:

- Nutrient enrichment in lakes: The North Fork Crow River WRAPS includes both protection lakes and restoration lakes. The MPCA/DNR listing for Lake Phosphorus sensitivity should be considered for targeting and goal setting for the lakes needing protection.
- Watershed storage capacity and the influence of connecting previously unconnected wetlands and shallow lakes as well as landscape hydrology changes including ditches and tiling and their effects on streambank stability.
- Bacteria impairments, especially on those waters that have amenities specifically to draw human use and contact; designation of the North Fork Crow as a state water trail; areas with public access and businesses (resorts, outfitters, etc.) that intentionally encourage human contact with water.
- Source water influence on the Twin Cities drinking water treatment. Water containing excess turbidity and other pollutants increase treatment and plant maintenance costs.
<http://www.health.state.mn.us/divs/eh/water/com/waterline/featurestories/mplsultrafiltration.htm>
- Nitrate levels and treatment costs for community, municipal and individual wells within the watershed.
- Soil health and cover crops and their effect on water holding capacity. Sheet and rill erosion and wind erosion deposits in drainage systems to be transported downstream, accelerated channel migration within the drainage system that increases maintenance costs for local authorities and further disturbs the landscape during maintenance activities.

The State's Nonpoint Priority Funding Plan (NPFP) outlines a criteria-based process to prioritize Clean Water Fund investments. If planning partners are intending to pursue the Clean Water Fund as a source of funding, partners are strongly encouraged to consider the high-level state priorities, keys to implementation, and criteria for evaluating proposed activities outlined in the NPFP.

We appreciate the North Fork Crow River Planning Partnership Group for your participation in the pilot. We look forward to working with you through the rest of the plan development process. The state's main water management agencies have committed to the One Watershed, One Plan approach and will be available to assist you in this process. Do not hesitate to call on them/us to participate and

provide information. If you have any questions about this letter, please feel free to contact me at 651-296-2633 or steve.christopher@state.mn.us.

Sincerely,

A handwritten signature in black ink, appearing to read 'Steve Christopher', with a long horizontal flourish extending to the right.

Steve Christopher
Board Conservationist

cc: Doug Thomas, BWSR (via email)
Jeff Hrubes, BWSR (via email)
Don Buckhout, BWSR (via email)
Melissa Lewis, BWSR (via email)
Ethan Jenzen, MDNR (via email)
Aaron Janz, MDA (via email)
Karen Voz, MDH (via email)
Maggie Leach, PCA (via email)
Karen Jensen, Met Council (via email)
Mark Deutschman, Houston Engineering Inc. (via email)



December 30, 2015

North Fork Crow River One Watershed, One Plan Policy Committee
c/o Diane Sander
CROW Organization of Water
311 Brighton Ave, Ste. C
Buffalo, MN 55313

Dear Ms. Sander

Thank you for the opportunity to comment on the priority resource concerns and issues to be assessed and addressed within the North Fork Crow River One Watershed One Plan(NFC 1W1P) process. The Department of Natural Resources (DNR) supports the development of the NFC 1W1P, and appreciates the efforts of the stakeholders involved in the planning process. The management of land and water resources on a watershed scale acknowledges the interconnected nature of all facets of a healthy ecosystem. Building on prior planning efforts and local knowledge to enhance this plan for a system-based management perspective will help drive participation and implementation into the future. We look forward to participating and providing assistance to help ensure the success of the 1W1P process, and future implementation of the plan.

DNR staff have reviewed information on the natural resources within the watershed. The following priority resource issues have been identified and must be addressed in a comprehensive plan for improved water quality and watershed health within the North Fork Crow River watershed.

Priority Resources and Issues

We recommend that the NFC 1W1P planning committees consider the following priority water resources as they focus on developing defensible, sound, and science based goals.

Groundwater sustainability: Protection of groundwater resources, both in quality and quantity, is currently a State of Minnesota priority and should be addressed in the plan.

- Groundwater resources supply the vast majority of domestic drinking water, irrigation, livestock watering, and industry within the watershed, as well as providing base flow to many significant surface water resources such as wetlands, lakes and streams. In most locations, surface water resources gain water from groundwater inflow and lose water by outflow through a lake or streambed. Many surface water resources reflect the elevation of the surrounding water table.
 - Specifically, a large portion of the Bonanza Valley Groundwater Management Area (BVGWMA) is located within the NFC watershed boundaries. Recent studies within the BVGWMA have shown that groundwater use is increasing, both in number of active well installations and total volume appropriated per year, resulting in deeper summer drawdowns of buried aquifers.
- Unsustainable withdrawal of groundwater can result in negative impacts to base flow in surrounding surface water features, resulting in a reduction of aquatic species habitat quantity and quality. Withdrawals can adversely affect recreational resources.
 - These resources within the NFC watersheds that are located on the mainstem rivers, include Green Lake, Lake Koronis, and Rice Lake.



- Trend analysis for nitrate concentrations in surficial aquifers shows increasing levels of nitrates. This could result in negative human health implications as well as increased costs for residential drinking water supplies.
- **High-Quality Lakes/Lakes at Risk:** Protection of unimpaired waters at risk of becoming impaired is one of the highest level priorities identified for lakes under the MN Non-Point Source Priority Funding Plan, and should be addressed in this plan.
 - The NFC watershed contains one of the highest concentrations of lakes in the southern portion of the state. Many of these lakes are high quality resources that support significant fisheries, diverse aquatic communities, and are regionally important recreational resources. In the recently completed MPCA WRAPS study, 41% of lakes monitored within the NFC watershed met or exceeded water quality standards, a higher percentage than any other watershed currently under review in the southern region of Minnesota.
 - These basins, while currently unimpaired, are highly sensitive to changes in land management within their respective watersheds.
 - In addition, many of these basins have additional characteristics to consider, including a designation as a lake of special biological significance due to the presence of rare or threatened aquatic communities (i.e. wild rice) and/or species (common loon nesting habitat). Some basins are considered at risk due to sensitivity to additional nutrient contributions from the upstream watersheds, or are DNR designated Priority Shallow Lakes (i.e. Pelican Lake in Wright County), all of which are indicators of high resource value.
 - Several basins currently exceeding water quality standards while supporting diverse aquatic communities with regionally significant fisheries are also located on tributaries or the NFC mainstem with large watersheds, putting these resources at significant risk to become impaired if land and water management issues are not addressed in upstream areas.
 - Many of the lakes in the NFC watershed also have significant development within the shoreland area. Several lakes in particular have large urban developments immediately adjacent to them, including the cities of Buffalo, Litchfield, Spicer, and Paynesville. Of these communities, three of the four lie on lakes that exceed water quality standards and are at risk of becoming impaired.
 - Urban stormwater contributions to the associated lakes should also be addressed in this plan.

Riparian Areas and Loss of Perennial Vegetation: The protection and restoration of continuous riparian vegetative communities is essential to maintaining a healthy watershed and should be considered as a portion of this plan.

- Changes in vegetative covers across the watershed, particularly the loss of native and perennial plants in riparian areas is a significant factor in addressing watershed health. Changes in land use and agricultural practices within the watershed over time, particularly within the headwaters area, have led to a decrease in the overall percentage of perennial vegetation in the watershed. Lack of perennial vegetation on the landscape reduces capacity to capture precipitation, facilitates wind-driven erosion, contributes to increased stream channel and bank erosion, and decreases riparian habitat connectivity.
- Perennial vegetation is of critical importance in riparian and shoreland areas, including streambank, floodplain, and lakeshore zones. Vegetative buffers reduce soil erosion, protect water quality and provide habitat for wildlife.
- Protection and management of natural vegetation in existing intact complexes is also of critical importance. Conservation of the grassland/wetland landscape is needed due to accelerating demands for clean water, energy and arable land. Many of the rare native species and communities documented within this watershed are located within the high quality existing perennially vegetated areas. Habitat fragmentation, loss of plant and animal species, degradation of soil and water resources, and invasive species are a few of the immediate threats to this system.



- The NFC watershed contains a portion of the Glacial Lakes Prairie Core Area, one of the remaining areas with significant native prairie complexes. The downstream portion of the watershed also contains a number of fragments of intact old growth forest, as well as an intact riparian corridor along the mainstem NFC.
- **Altered Hydrology:** The altered connectivity of the hydrologic systems within the watershed is also a significant issue. The current altered state facilitates the transfer of nutrients and other pollutants to receiving waters as well as creating a significant stressor for aquatic communities.
 - Recent changes in land use have changed the magnitude and timing of stream flows and contributed to accelerated runoff, resulting in more erosive streams and a much higher runoff contribution from the landscape.
 - The land use changes and extensive drainage of wetlands have resulted in increased discharge, accelerated runoff, and decreased water storage capacity, fundamentally altering the functionality of streams, floodplains, and the remaining wetlands.
 - Altered hydrology is considered a major driver of water quality impairments that adversely affect all our water resources.
 - The combination of these conditions is contributing to higher flow levels resulting in dynamic changes to near-channel stream erosion, higher sediment loads, and decreased aquatic and terrestrial habitat quality.

Please consider these issues as the planning process moves forward. We look forward to a science-based approach to watershed management that will identify system wide solutions that address the root cause of water quality issues. These solutions should offer multiple benefits and result in restoration and protection of ecosystem functionality, as well as increasing watershed resiliency in the face of climate uncertainty, changing land use and other stressors.

DNR staff will be contributing additional supporting information and resources to provide further guidance useful in addressing the issues and resource concerns listed above. We will also make available to the NFC 1W1P Planning Committees any resource the DNR can readily provide to assist with this planning process and future implementation. We acknowledge all of the hard work already being done within the watershed by all local entities and organizations in this collaborative effort, and offer our continued support as we move forward with the One Watershed One Plan process in the North Fork Crow River watershed.

Thank you again for the opportunity to provide comments regarding priority issues and resources. We look forward to working with you throughout the North Fork Crow River One Watershed One Plan process. Please contact Area Hydrologist Ethan Jenzen at (320)-796-2161 x 232 or ethan.jenzen@state.mn.us if you have questions, comments, or concerns.

Sincerely,



Dennis Frederickson
DNR Regional Director
Southern Region

cc: Ethan Jenzen, DNR Area Hydrologist
Margaret Leach, MPCA Project Manager
Steve Christopher, BWSR Board Conservationist



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December 30, 2015

Diane Sander
Crow Organization of Water
311 Brighton Avenue, Suite C
Buffalo, MN 55313

RE: Information request and issue prioritization for North Fork Crow River One Water One Plan

Dear Ms. Sander:

Thank you for the opportunity to submit a list of priorities of importance to the Metropolitan Council (Council) for inclusion in the North Fork Crow River (NFCR) One Water One Plan (1W1P), as well as Council expectations for the 1W1P outcomes. I have also included below a list of Council resources that may be of use in the 1W1P preparation, including data, load calculations, and assessment reports.

The NFCR 1W1P is a pilot inter-jurisdictional comprehensive management plan that will guide 10-year water management activities in Pope, Stearns, Kandiyohi, Meeker, and Wright Counties; Pope, Stearns, Kandiyohi, Meeker, and Wright SWCDs; the North Fork Crow River Watershed District; the Middle Fork Crow River Watershed District; and CROW (Crow River Organization of Water Joint Powers). The CROW joint powers organization consists of Kandiyohi, McLeod, Meeker, Pope, Renville, Sibley, Stearns, and Wright Counties, as well as Carver and Hennepin Counties, both of which are within the seven-county metropolitan area (the Council's official jurisdiction). For that portion of the 1W1P area outside of the metropolitan area, Council requirements, comments, and suggestions should be viewed as advisory.

Council Expectations and Priorities for 1W1P Preparation and Review

Council staff will review the plan, especially for that portion of the watershed within the metropolitan area, using the following priorities as a focus of the review:

- Direction and policy that follows comes from the Council's *Thrive MSP 2040 Regional Development Framework* and the *2040 Water Resources Policy Plan*, both of which can be found on the Council's web page (www.metrocouncil.org).
- In particular, the *2040 Water Resources Policy Plan* (Policy Plan) includes policies and strategies to achieve the following goal:

To protect, conserve, and utilize the region's groundwater and surface water in ways that protect public health, support economic growth and development, maintain habitat and ecosystem health, and provide for recreational opportunities, which are essential to our region's quality of life.

The Policy Plan takes an integrated approach to water supply, water quality, and wastewater issues. This approach moves beyond managing wastewater and stormwater only to meet regulatory requirements by viewing wastewater and stormwater as resources, with the goal of protecting the quantity and quality of water our region's needs now and for future generations.

The Policy Plan includes policies and strategies to:

- Maximize regional benefits from regional investments in the areas of wastewater, water supply and surface water management and protection.
- Pursue reuse of wastewater and stormwater to offset demands on groundwater supplies.
- Promote greater collaboration, financial support, and technical support in working with partners to address wastewater, water quality, water quantity and water supply issues.
- Promote the concept of sustainable water resources through collaboration and cooperation, with the region taking steps to manage its water resources in a sustainable way with goals of:
 - ✓ Providing an adequate water supply for the region
 - ✓ Promoting and implementing best management practices aimed at protecting the quality and quantity of our resources
 - ✓ Providing efficient and cost effective wastewater services to the region
 - ✓ Efficiently addressing nonpoint and point sources pollution issues and solutions, and,
 - ✓ Assessment and monitoring of lakes, rivers, and streams to direct adequate management, protection, and restoration of the region's valued water resources.
- The 1W1P should include policies related to the protection of area water resources with these strategies in mind with the end goal of water sustainability.
- In addition to being consistent with the Council's new policy plans, the 1W1P also should include quantifiable and measurable goals and policies that address water quantity, water quality, recreation, fish and wildlife, enhancement of public participation, groundwater, wetlands, and erosion issues.
- Council staff will be looking for the plan to address the issues and problems in the watershed and to include projects or actions and funding to address them. At a minimum the 1W1P should address:
 - 1. Any problems with lake and stream water quality and quantity including information on impaired waters in the watershed and the District's role in addressing the impairments,
 - 2. Flooding issues in the watershed,
 - 3. Storm water rate control issues in the watershed,
 - 4. Impacts of water management on the recreation opportunities,
 - 5. Impact of soil erosion problems on water quantity and quality,
 - 6. The general impact of land use practices on water quantity and quality
 - 7. Policies and strategies related to monitoring of area water resources
 - 8. Policies and strategies related to use of best management practices
 - 9. Issues concerning the interaction of surface water and groundwater in the watershed
 - 10. Erosion and sediment control standards and requirements
 - 11. Volume reduction goals at least as restrictive as requirements in the NPDES construction general permit, and,
 - 12. Capital improvement plan with itemized list of actions, estimated costs, and timeline.
 - 13. Specifics on long-term maintenance of projects identified in the capital improvement plan, including identification of entities responsible for funding and conducting maintenance, as well as how long-term maintenance will be documented.

Priority Issues

Long-term monitoring data collected by the Council for the Crow River system (both the South Fork and Main Stem) was assessed in the recent report *Comprehensive Water Quality Assessment of Select Metropolitan Area Streams* (available at www.metrocouncil.org/streams/). Results of the report indicate the flow-weighted mean concentrations at the Main Stem monitoring station at the city of Rockford for total phosphorus, total suspended solids, nitrate, and chloride were higher than those measured at the nearest Council monitoring station on the Mississippi River (the Mississippi River at Anoka); thus Crow River discharge has likely caused a decline in water quality in the Mississippi River. Yet trend analysis of the Crow River data indicated improving water quality, and thus declining concentration, for total phosphorus, sediment, and nitrate. Based on the results of the study and Council policies, the following issues are specific to the NFCR and are viewed as priorities by the Council for inclusion in the 1W1P:

- WWTP (wastewater treatment plant) upgrades: Council trend analysis suggests that WWTP upgrades and installation of phosphorus-removal technologies has resulted in measurable reductions in total phosphorus in the Crow River. While it may be beyond the scope of the 1W1P, identification of WWTPs needing upgrades may help with reductions in phosphorus, nitrogen, and bacteria.
- The Crow River flows through two regional parks in Hennepin County: Crow-Hassan and Lake Rebecca Park Reserves, which are managed by the Three Rivers Park District. Both parks offer opportunities for public recreation on the Crow River. Crow-Hassan Park Reserve has trails and two campgrounds adjacent to the river, as well as a walk-in boat landing. Lake Rebecca Park Reserve has a boat landing and riverside trails. Improvement of Crow River water quality would likely have a positive impact on the parks, whether by improving fisheries and wildlife, by reducing risks to public health, and by improving river aesthetics. Any capital projects identified within the park boundaries or otherwise projected to impact the parks should be coordinated with the Three Rivers Park District.
- The Crow River discharges to the Mississippi River upstream of the intakes of both the City of St. Paul Regional Water Services and the City of Minneapolis Water Treatment and Distribution Services. Reductions in concentrations of sediment, bacteria, pesticides, and contaminants of emerging concern in the Crow River will serve to protect the source water for both cities, as well as for communities further downstream.
- Reduction of nitrate at the source. Nitrate source control would protect human health and reduce potential for drinking water well contamination.
- Reduction of bacteria at the source. Bacterial source control will protect human health and protect recreational activities on the river.

Available Council Resources

The Council also has monitoring data, flow, annual loads, and trend analyses for the Crow River (both South Fork and Main Stem), all of which are available as part of our report *Comprehensive Water Quality Assessment of Select Metropolitan Area Streams*, available at www.metrocouncil.org/streams/. During preparation of the report, Council staff collected geospatial data from multiple sources. The data includes land cover, topography, soils, crop information, and estimates of drain-tiled areas. I will be happy to forward load spreadsheets and any other data and analyses in the report, as well as any spatial data. Please contact me at karen.jensen@metc.state.mn.us.

The Council also has monitoring data on the following lakes:

North Fork Crow River: Lake Sarah*, Laura Lake, Crowley Lake, Sylvan Lake, Haften Lake

South Fork Crow River: Berliner Lake, Braunworth Lake, Tiger Lake*, Eagle Lake*, Campbell Lake, Oak Lake, Swede Lake, Lippert Lake, Peter Lake, Ardmere Lake, Lake Independence*, Ox Yoke Lake, Little Long Lake*, Whaletail Lake*, Haughey Lake, Lake Rebecca*.

Those lakes indicated by a "*" are also on the Council's Priority Lakes List.

Please contact Terrie O'Dea at Terrie.O'Dea@metc.state.mn.us to request lake data.

Please feel free to me call at 651-602-1401 with questions about my comments or for any assistance during the plan preparation.

Sincerely,



Karen Jensen
Environmental Analyst
Metropolitan Council – Environmental Services
651-602-1401

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PROTECTING, MAINTAINING AND IMPROVING THE HEALTH OF ALL MINNESOTANS

December 29, 2015

Diane Sander
Watershed Coordinator
Crow River Organization of Water
311 Brighton Ave Suite C
Buffalo, MN55313

Dear Diane,

Thank you for the opportunity to submit comments regarding water management issues to be addressed in the 1WIP planning process for the North Fork Crow River Watershed Planning Area.

The Minnesota Department of Health's (MDH) mission is to protect, maintain, and improve the health of all Minnesotans. MDH's environmental goals include Minnesota's air, water, and soil are safe and non-toxic, and Minnesota's food and drinking water are safe. To that end, protecting and restoring sources of drinking water are a priority water management issue.

Groundwater as the Source of Drinking Water:

It can be assumed that all households within the planning area are utilizing groundwater as the source of drinking water. These households obtain their water from private wells or from wells that are managed by community public water suppliers. Of the roughly estimated 135,746 people living in the planning area, approximately 77,538(57 %) utilize 42 community public water supply systems and 43% of the households obtain water from private wells.

In addition to the community public water systems, there are 25 Noncommunity- nontransient public water systems and over 180 transient public water supply systems.

Community Public Water Supplies:

Of the 25 community public water supply systems, 19 systems are in the wellhead protection planning process or are implementing their plans. The remaining 10 systems will be brought into the wellhead protection planning process over the next few years.

Of the 19 systems, systems 7 are considered not to be vulnerable to contamination from the land surface. Where Drinking Water Supply Management Areas (DWSMA) have been delineated, the vulnerabilities of the DWSMAs can be considered Low, Moderate, High or have a Variable Vulnerability across the landscape as indicated in the accompanying table. PDF maps of the DWSMAs can be downloaded from the individual Source Water Assessment on the MDH website

<http://www.health.state.mn.us/divs/eh/water/swp/swa/> or shapefiles of the DWSMAs can be obtained at <http://www.health.state.mn.us/divs/eh/water/swp/maps/index.htm>. Part 1 and Part 2 of the

wellhead protection plans can be obtained from the communities or from MDH with permission from the communities. Water chemistry data collected from these systems can be provided by request to MDH.

The community Drinking Water Supply Management Areas (DWSMAs) should be considered priority areas within the North Fork of the Crow River Watershed 1W1P. Water management issues within the DWSMAs, however, vary with the vulnerability of the source water to contamination. Water sampling has shown contamination of the source water contamination of the following:

- City of Paynesville has a benzene contamination and remediation is occurring by natural attenuation and pumping to the North Fork of the Crow River. The current drinking water supply does not indicate any benzene contamination. Nitrate concentrations have exceeded the MCL in previous well site locations for the city of Paynesville.
- Trend analysis for nitrate concentrations in surficial aquifers shows increasing levels of nitrates. This could result in negative impacts to human health and economic impacts for drinking water supplies.

Additional priority of concerns include:

- The NCFR Watershed is located within the Priority B Area of the Source Protection Area (SWPA) for the water supply serving the cities of Minneapolis/ St. Paul.

Noncommunity Public Water Supplies:

Source water assessments have been completed for all the noncommunity public water supplies. These assessments and water chemistry data collected by MDH can be used to prioritize protection and restoration activities. Source Water assessment s are available at:

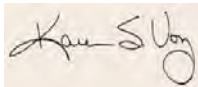
<http://www.health.state.mn.us/divs/eh/water/swp/swa/swainfo/>.

Water chemistry data from these systems wells can be obtained from MDH.

Private Wells:

There are several sources of information that can be used to further evaluate the vulnerabilities and potential contaminant sources impacting the sourcewater of private drinking water wells. These sources of information include County Geologic Atlases, Nitrate Probability Maps, well logs and water chemistry data results from newly constructed private water supply wells.

Sincerely,



Karen S, Voz, Principal Planner
Environmental Health Division, Source Water Protection Unit
3333 West Division Street Suite 212 St. Cloud, MN 56301



2017-2027 Priorities

JD3:

- Addition of feed lots of concern in area.
- Irrigation management and wetland restoration
- City of Belgrade - Stormwater management and impact on headwaters, wellhead protection plan...?
- Belgrade aquifers susceptible to groundwater contamination

JD3, Brach 6

- Wetland restoration and ground water control

CD #37

- Erosion control and wetland restoration

Monongalia Lake

- Stormwater management (NL) and erosion and sediment control

Nest Lake

- Lake/shoreland management and AIS control
- Nest Lake TMDL study

Green Lake

- Shoreland/lake management and AIS control

Lake Calhoun

- Shoreland/lake management and AIS control

Diamond Lake

- Shoreland/lake management and AIS control
- Farmland BMPs and promote French tile drains

CD #47

- Erosion sediment control and wetland restoration

Middle Fork Crow River (CD 47)

Erosion and sediment control and river/wetland restoration

2017-2027 Implementation

Goal 1: Protect and improve surface water quality.

- Very important. Cooperate, communicate with cities and counties could be better. Need more ag drainage control.
- Increase stream stabilization & BMP importance.
- Include the Middle Fork Crow River as a priority subwatershed in the reduction of sediment erosion and highly erodible lands, for enrollment of CRP and RIM.
- Focus on prevention/protection, not just after the fact.
- Stormwater infrastructure maps

Goal 2: Protect groundwater quality.

- Very important
- Whenever an opportunity arises we need to continue to get information out.
- Seems like this falls under other agency's control and WD hasn't been active in this.

Goal 3: Maintain an adequate supply of surface and groundwater for all users.

- Seems like this falls under other agency's control and WD hasn't been active in this. Very important.
- Priority and jurisdiction of DNR, should this be a primary goal of the 1W1P?
- Well head protection plan

Goal 4: Protect and restore critical areas.

- Very important. This is one of our most important jobs in the WD, in cooperation with other agencies.
- Regulations to protect wetlands (Green Belt)?
- Wetland inventory looking at who owns what wetlands.
- Waste water treatment inventory
 - Regulations

Goal 5: Promote wise land use management.

- Very important

- Need to continue to get landowners on board. I'm thinking primarily ag. Make aware of opportunities and assistance we can offer. WRAP projects.
- Important to continue monitoring construction sites for stormwater control. Encourage municipalities to improve stormwater control.
- Sustainable development policies
- Buffer strip inventory

Goal 6: Expand our knowledge and understanding for the watershed.

- Very important
- Wide range of initiatives that need to be continued to be looking at and considered.
- Important to continue monitoring programs and erosion assessments.
- Include Nest Lake as a priority subwatershed in Objective B, Initiative 59 to conduct TMDL study of Nest Lake.
- More proactive educational seminars/meetings for public & cities.
- Priority maps for wetlands, drainage, erosion control, feed lot management, ground water contamination, AIS, lake management, shoreline & stream bank, storm water and well head protection.

Goal 7: Engage residents in water resources management.

- Important to continue education activities. Somehow need to improve communication with ag community.
- AIS monitoring network (including volunteers)
- Public drainage management plan?
- Education plan that incorporates education in as many places as possible
- Coordination of district and lake association management plans

Goal 8: Provide for effective and efficient administration.

- Important to maintain a cohesive Board. Continuing education important. Somehow improve Advisory Committee participation
- Proactively reach out to cities as soon as building projects are announced, school district additions, and new economic driven businesses.
- Identify concrete areas of responsibility
 - Perhaps have project teams that reach across organization boundaries (technical committees)
- Communication avenues (chains) for specific occurrences such as when a water appropriation permit is issued. Who needs to know about it for review?
- List of contacts and specialties within and outside of district.
- Capacity assessment for participating organizations (what should they be doing but are not due to limited resources/time).
- Who is monitoring what and where. Is it possible to have comprehensive data base for all monitoring efforts? Eliminate duplicative efforts.

- GIS data base for identified issues with details on the issue
 - This could result in a project menu & developing projects that address multiple issues.



APPENDIX I

Zonation Model Methodology and Results

Targeting and Prioritization of Geographic Areas

A values-based model was used to prioritize areas for conservation investments to restore and protect lands to generate multiple benefits. This model was based on fundamental conservation principles, including biodiversity and connectivity. We used the DNR's five-component healthy watershed conceptual framework to facilitate an organized process to assess and review watershed problems and solutions. The five components for a healthy watershed are: biology, hydrology, water quality, geomorphology, and connectivity. This approach recognizes that attempts to solve our clean water needs are not separate from our other conservation needs; each conservation activity should provide multiple benefits. The values-based model used in this process helped achieve this multiple benefits goal by identifying areas that optimize benefits by incorporating data valued by the community. The prioritization goal was to obtain both clean water benefits as well as other conservation benefits. The model used a compilation of individual and aggregated criteria of valuable landscape features with the objective of providing data and maps that prioritize places on the landscape for conservation investments.

The value model was also used in a civic engagement process. As part of this process, participants provided feedback on the landscape features they valued and locations within the watershed facing conservation challenges. As a final step, planning participants were given the opportunity to revise the model results. This synthesis step captured the knowledge and experiences of the people interested in and informed about the stresses, risks, and vulnerability of water resources within the watershed. The priority map was also used to help identify general conservation priority focus areas within the watershed for future conservation investments. See Appendix X for details on methods and results.

The model output is presented in Figure 2. The value model identified several distinct high priority areas. Clusters of high priority areas include lands within and around the cities of Spicer and New London, the riparian and floodplain lands upstream and around the City of Paynesville, land and riparian areas east and north of the City of Waverly, and many lake watersheds.

The North Fork Crow 1W1P Advisory Committee reviewed these areas, and members made several changes to the value model output based on their professional understanding and experiences in the watershed. The changes to the value model conservation prioritization included the inclusion of wetlands and other protected lands (that were masked in the initial Zonation model) and the addition of a well density dataset as a Zonation model input layer. In addition, the team increased the conservation priority of the lands around the Cokato Lake pour point and increased the conservation priority of lands associated with Ditches 1, 7, and 32 in Stearns County. The result of the synthesis step was the final conservation priority map, which was approved and adopted by the North Fork Crow 1W1P Policy Committee. The final prioritization map is presented in Figure B.

Analysis of the spatial distribution of the conservation priorities identified seven large clusters of high conservation priority areas (Figure 3). In the headwaters of the watershed, one cluster of high conservation priority areas included lands within and around the cities of Spicer and New London, and lands around Green Lake, Nest Lake, and Monongalia Lake. The other headwater cluster included the lands in and around the City of Paynesville, lands around Lake Koronis and Rice Lake, and riparian and floodplains lands of North Fork Crow River downstream and substantially upstream of Paynesville. In the middle of the watershed, a large cluster of high conservation priority areas included lands around Lake John, Lake Sylvia, Twin Lake, and Lake Francis. This band of land extended south to Big Swan Lake and the City of Dassel, west to include lands around Lake Arvilla and east to include the Knapp State Wildlife Management Area. In the lower part of the watershed, three large clusters were identified. One cluster included lands around the City of Howard Lake and then extending west and south to include lands draining to various small streams and ditches in the area and the lands around Dutch Lake, Lake Ann, Lake Emma, and Lake Mary. A very large cluster of high conservation priority lands centered on the area between the cities of Buffalo and Waverly, with the highest conservation priority areas along the North Fork of the Crow River west of Highway 12 and north and east of Waverly Lake. This cluster also included lands draining to the North Fork that extended just upstream of the confluence of the South Fork of the Crow River with the North Fork and downstream toward the City of Hanover, with lands around Green Mountain Lake, Schmidt Lake, Beebe Lake, Moore Lake, and Lake Charlotte included. The final cluster in the lower part of the watershed included Pelican Lake south of Monticello and lands extending east include the City of Saint Michael and the riparian areas and floodplains of the North Fork.

Analysis of the spatial distribution of the high conservation priority areas related to cultivated cropland areas identified where the two were congruent (Figure 4, Table 3). Over 90,000 acres of high conservation areas were in cultivated cropland areas, and many of those acres are marginal agricultural lands. The largest of these congruent areas were located near the City of Montrose, north of Litchfield and Spicer, and upstream of Paynesville.

Analysis of the spatial distribution of the high conservation priority areas by catchment provided guidance on the important catchments for managing surface water runoff. Twenty catchments with the highest percent of high conservation priority areas are shown in Figure 5. Most of these catchments were lake catchments near the City of Spicer and catchments in the southeast part of the watershed. In catchments dominated by cultivated croplands the implementation of agricultural best management practices may produce greater multiple conservation benefits than in other catchments in the North Fork of the Crow River. Similarly, the implementation of stormwater best management practices in those catchments dominated by development may produce multiple conservation benefits.

From the various mapping and prioritizing exercises, the Advisory and Policy Committee identified and ranked several priority focus areas (Figure 8 NOT ADDED HERE YET).

Prioritizing Activities

The Policy Committee identified *Implement BMPs on Ag Lands*, *Protect/Restore Riparian Vegetation*, and *Protect/Restore Wetlands* as the three most important activities for this watershed (Figure 6). The following activities were also regarded as critical: implementing best management practices on developed lands; improve technical assistance & incentive programs; and improving education, outreach and civic engagement. Activities with the lowest preference included protecting areas with acquisition or easement.

Description of Prioritization Approach and Methods

Prioritization Overview

As threats to Minnesota's watersheds continue to mount, it is becoming increasingly important to identify and conserve high-priority areas. There are multiple opportunities for protection or restoration in any watershed. Identifying which practices to implement and where in the landscape to implement them can help more effectively target efforts and more efficiently utilize limited resources. A number of information technology tools are available for prioritizing and targeting land for restoration and protection efforts within a watershed.

A systematic approach aimed at optimizing environmental benefits is critical. Two of the most common approaches for conservation prioritization are system-based models and value-based models. One of the major strengths of system-based models is that they require us to think deeply about a system by writing down our mental models of how we believe the system functions. For many watersheds this has been done using the HSPF hydrologic system model, which simulates watershed hydrology and water quality at the catchment scale. However, we often do not have system models that can accurately identify where in the watershed specific good management practices should be applied or that have the ability to simulate alternative land management actions and predict consequences at specific locations in the watershed.

Values-based models use a compilation of individual criteria of valuable landscape features (heterogeneous content) and aggregated criteria (context and connections) with an objective function to prioritize places within the landscape for conservation. Although there are some shortcomings of using value models over system models (value models only allow exploration of tradeoffs and optimization, and they do not provide guidance on what practices should be implemented where), the use of value models is an efficient method for prioritizing places for protection or restoration.

The values-based model prioritization approach we used is based on fundamental conservation principles, including content, context, heterogeneity, and connectivity. We used the DNR's five-component healthy watershed conceptual model to facilitate an organized process to assess and review watershed problems and solutions. The five components are: biology, hydrology, water quality, geomorphology, and connectivity. This approach recognizes that attempts to solve our clean water needs are not separate from our other conservation needs; each conservation activity should provide multiple benefits. Value models help achieve this multiple benefits goal by identifying areas that optimize benefits by accounting for what the community values. The use of an additive benefits objective function in the value model allows for the retention of high quality occurrences of as many conservation features as possible. Value models also can be used in a public participation process, whereby participants can decide on what features are valued

and the ranking of those valued features. Addressing conservation goals effectively necessitates a collaborative approach, and value-based models provide a structure for collaborative efforts. In addition, value models and the five-component conceptual model used to structure the content in the value models are simple concepts that are easy to explain and apply at the local government scale.

Methods

The value models were developed using Zonation software (Moilanen et al. 2009). Zonation produces a nested hierarchy of conservation priorities. It begins with the full landscape and iteratively removes parcels (cells) that contribute least to conservation; therefore, the removal order is the reverse order of the priority ranking for conservation. Zonation assumes that the full watershed is available for conservation. In our models, the lakes were masked out prior to analysis. This focused the prioritization on the terrestrial parcels, in accordance with the conservation and restoration goals of our partners. Zonation's algorithms seek maximal retention of weighted normalized conservation features.

The Advisory and Policy committees identified 6 components for their value model: protect/improve waters of concern; reduce erosion and runoff and address altered hydrology; enhance fish and wildlife habitat; protect/restore shorelands and stream riparian zones; implement best management practices on agricultural lands; and protect or improve other lands of concern. Within each of these components, conservation features were selected to represent the interest of the component. In total 26 conservation features were used in the value model.

Weights are used to influence which features are valued more. Within the five-component healthy watershed framework, for example, water quality conservation features could be weighted higher than biological features. The feature-specific weights used in the value models reflect social valuation, and they were set using the analytic hierarchy process (AHP; Saaty and Peniwati 2007). A survey comprised of pairwise comparisons was used to solicit the preferences of individuals from both the Advisory and Policy Committee members. Features used in the comparison were based loosely on the DNR's five-component healthy watershed approach, with the addition of alternative land uses or economic features representing a social component. The pairwise survey was structured to gather value preferences for a restoration focused watershed plan. Each individual taking the survey used his or her judgment about the relative importance of all elements at each level of the hierarchy. The relative importance values included "equal," "prefer," and "strongly prefer." The use of abbreviated pairwise importance values helped reduce the cognitive burdens associated with a large number of pairwise comparisons. Individual responses were aggregated with a geometric mean, and the pairwise comparison matrix was constructed to compute the feature-specific weights consistent with the AHP.

There are three commonly definable objective functions possible in Zonation: core area, target-based planning, and additive benefit functions. The core area objective function aims to retain high-quality occurrences of each feature. This function is most appropriate when there is a definite set of conservation features and all of them are to be conserved. The target-based planning objective function is a prescriptive approach where requirements are specified *a priori* for each feature. This function produces a minimum set coverage solution, and is most appropriate when a defined proportion of the watershed is assigned for conservation.

We used the additive benefit function variant of Zonation, which aggregates values by summation across features:

$$V(P) = \sum w_j N_j(P)^z$$

where the value of a parcel $V(P)$ is equal to the summation of weighted w normalized conservation features of the parcel $N_j(P)$, to the power of z (set to 0.25 for all features).

The conservation features used in the analysis are found in Table 1, and each layer was on the same grid with a resolution of 30 by 30m. We used high-resolution data to maximize conservation planning realism and for greater practicality in local government conservation planning and implementation.

The additive benefit function is appropriate when tradeoffs between conservation features are allowed. Zonation allows ranking to be influenced by neighboring parcels, so that highly valued areas can be aggregated. This minimizes fragmentation of conservation within the landscape. We utilized the distribution-smoothing algorithm in Zonation, which uses an aggregation kernel α parameter. Using this algorithm assumes that fragmentation (low connectivity) generally should be avoided for all conservation features. Initial analyses indicate that an aggregation kernel α of 0.01, which corresponds to a connectivity distance of 200m, may be appropriate for conservation efforts targeted at the watershed scale. We found that very small connectivity distances made no difference in parcel prioritization, since the connectivity effect did not extend very far into neighboring parcels, and very large connectivity distances aggregated parcels across unrealistically large areas. We also found that across a modest range of connectivity distances the results were minor.

The final steps in identifying areas high conservation priority areas included a mapping exercise. First, Advisory Committee members used their professional knowledge and experiences within the watershed to revise the Zonation output map to create a final priority map used to provide guidance on the identification of high conservation priority areas for the watershed plan. This synthesis step captured the wisdom of the group of people interested and knowledgeable about the stresses, risks, and vulnerability of water resources within the watershed. Finally based on

the final conservation priority map created in the synthesis step, participants identified priority areas within the North Fork of the Crow River watershed for future conservation investments. [This Final Step Has Not Been Done Yet]

In addition, a survey was used to solicit the preferences of Policy Committee members about the types of watershed protection and restoration activities that they would like to see implemented.

Results

The pairwise questionnaire survey results varied slightly between the Policy Committee and the Advisory Committee (Figure 1). The Policy Committee weights were used to set the broad-scale weights in the value model. The Policy Committee identified the *Reduce Erosion & Runoff and Address Altered Hydrology* component of the value model inputs as the highest weight, followed by *Implement Best Management Practices on Agricultural Lands* (Figure 1 and Table 2).

The Zonation model was run using the results from the questionnaire. The output map ranked lands as to their importance for land management activities that would provide greater protection of ecosystem functions, especially water quality, and to their importance for application of various land best management practices (Figure 2). The values model identified several distinct areas with high priority lands (Figure 3). Clusters of high priority areas include lands within and around the cities of Spicer and New London, the riparian and floodplain lands upstream and around the City of Paynesville, land and riparian areas east and north of the City of Waverly, and many lake watersheds.

Analysis of the spatial distribution of the high conservation priority areas related to cultivated cropland areas identified where the two were congruent (Figure 4; Table 3). Over 90,000 acres of high conservation areas were in cultivated cropland areas, and many of those acres are marginal agricultural lands. The largest of these congruent areas were located near the City of Montrose, north of Litchfield and Spicer, and upstream of Paynesville.

Analysis of the spatial distribution of the high conservation priority areas by catchment provided guidance on important catchments. Twenty catchments with the highest percent of high conservation priority areas are shown in Figure 5.

The Policy Committee identified *Implement BMPs on Ag Lands*, *Protect/Restore Riparian Vegetation*, and *Protect/Restore Wetlands* as the three most important activities for this watershed (Figure 6). The following activities were also regarded as critical: implementing best management practices on developed lands; improving technical assistance & incentive programs; and improving education, outreach and civic engagement. Activities with the lowest preference included protecting areas with acquisition or easement.

The final prioritization map created from Zonation and synthesis analysis is presented in Figure 7. From the various mapping exercises and discussions, the Advisory and Policy Committee identified and ranked several general priority focus areas.

References

- Moilanen, A., H. Kujala, and J. Leathwick. 2009. The Zonation framework and software for conservation prioritization. Pages 196-210 in A. Moilanen, K. A. Wilson, and H. P. Possingham, editors. Spatial conservation prioritization: quantitative methods and computational tools. Oxford University Press, Oxford, UK.
- Saaty, T.L., and K. Peniwati. 2007. Group decision-making: Drawing out and reconciling differences. Pittsburgh, PA: RWS Publications.

Table 1. Variable descriptions for content used in land prioritization value models.

Objective	Description
<i>Improve or Protect Waters of Concern</i>	Waters of special concern include vulnerable groundwater or drinking water supplies, catchments of lakes and rivers with high watershed pollution loads, catchments of lakes with declining water quality, catchments of lakes vulnerable to pollution, and lakes with high water quality.
<i>Reduce Erosion & Runoff, and Address Altered Hydrology</i>	Erosion and runoff can become more prevalent and severe due to human alteration of the land. When wetlands are removed, water runs off the land faster. Also, more water runs off land with impervious surfaces in urban areas and areas that have lost vegetation.
<i>Enhance Fish & Wildlife Habitat</i>	Habitat provides food, shelter, terrestrial ecological corridors, and breeding territory for animals. The size, shape, and distance between habitat parcels are all important to sustaining populations of plants and animals.
<i>Protect or Restore Lake Shoreland and Stream Riparian Areas</i>	Management of shoreland, lakeshore, and riparian zones are important for maintaining economic and environmental values. If those zones are naturally vegetated, they can serve as a buffer between land and water and filter out pollutants. Shorelands are defined as all lands located within 1000 feet of a lake. Riparian zones include areas adjacent to streams and their potential flood zones (based on location, elevation and soil type).
<i>Implement Best Management Practices on Ag Lands</i>	Agricultural lands include row crop agriculture (corn, soybeans and other row crop cultivation), livestock feedlot agriculture (lots and/or buildings for confined feeding, breeding, raising, or holding of animals), and pasture (grass and other plants for grazing). Some of these lands would benefit with the application of best management practices or restoration to natural conditions.
<i>Protect or Improve Other Lands of Concern</i>	<u>Lands Near Protected Lands</u>: Publically owned lands, including existing Federal, State, and County lands. Increase value of existing protected land by protecting additional nearby lands. <u>Roadways</u>: Roads and road right-of-ways. Focus on these areas for potential use of best management practices related to sediment control and culvert design and installation. <u>High-Growth Areas</u>: Lands in urban expansion areas may provide ecosystem services that are of conservation value. Soil protection, stormwater controls, and application of best management practices in these areas could provide water quality benefits.

Objective	Description
Improve or Protect Waters of Concern	
<i>Focus on Drinking Water Supply Management Area (DWSMA) vulnerability</i>	The risk associated with potential contaminant sources within a public water supply DWSMA to contaminate its drinking water supply. This risk is based on the aquifer's inherent geologic sensitivity, the assessed vulnerability of the public water supply well(s), and the composition of the groundwater. In highly vulnerable DWSMAs, there is a strong causal relationship between land use activities on the surface and groundwater quality.
<i>Focus on Impaired waters</i>	Catchments (i.e., drainage basins) upstream of aquatic life impaired lakes within the watershed. Identified as impaired by the Minnesota Pollution Control Agency (MPCA).
<i>Focus on Catchments with high pollution</i>	Estimated total suspended solids, total nitrogen, and total phosphorus by catchment as determined by hydrological models (HSPF model from MPCA).
<i>Focus on Catchments of lakes with declining water quality</i>	Lakes where long-term data suggest declining water quality. Source: MPCA.
<i>Focus on Groundwater contamination susceptibility</i>	The relative susceptibility of an area to groundwater contamination (based on geologic stratigraphy, aquifer transmissivity, and recharge potential). Source: MPCA.
<i>Focus on Catchments of lakes vulnerable to nutrient addition</i>	The relative susceptibility of a lake to phosphorus pollution (based on lake morphology and catchment hydrology). Source: MDNR and MPCA.
<i>Focus on Areas with High Density of Wells</i>	The groundwater well installation density (installations per square mile). Source: MDNR

Reduce Erosion & Runoff and Address Altered Hydrology	
<i>Focus on Areas with high erosive potential</i>	Stream Power index: This is an index of the channelized flow erosive potential. Calculated from LiDAR data.
<i>Focus on Areas close to water</i>	Lands close to a stream and lake are more valuable in the protection of water quality than those farther away. The data are the inverse distance from water. <i>[if WQ risk is used, then this is not]</i>
<i>Focus on Areas close to existing wetlands</i>	Inverse distance to remaining wetlands. Wetlands documented by NWI.
<i>Reduce Soil erosion risk</i>	Susceptibility of soils to erosion. This variable is from the BWSR and UMN's Environmental Benefits Index; it was calculated from a subset of the universal soil loss equation.

Enhance Fish & Wildlife Habitat	
<i>Protect or Restore</i> Lakes of biological significance	Catchments of high quality lakes. List of high quality lakes based on dedicated biological sampling. Source: MDNR.
<i>Restore</i> Lands near rare habitats	Rare habitat includes native prairie, calcareous fens, and sites of biodiversity significance. The data are the inverse distance from a rare habitat. Source: MDNR.
<i>Protect or Restore</i> USFWS priority wetlands	Wetland complexes with the potential to impact populations of focal species (black terns, migrant shorebirds, ducks, and pheasants). Factors include integrity of the surrounding wetland complex, the juxtaposition of wetland and grassland areas, and the potential for significant water quality enhancement benefits for shallow lakes.
<i>Protect or Restore</i> USFWS priority grasslands	Grassland complexes with the potential to impact populations of focal species (nongame birds, migrant shorebirds, ducks, and pheasants). Factors include integrity of the grassland patch, the surrounding landscape context (% grassland and terrain relief), juxtaposition of grassland and wetland, the potential for significant water quality enhancement benefits for shallow lakes, and the potential to create large grassland patches with minimal cropland retirement.

Protect or Restore Lake Shoreland & Stream Riparian Areas	
<i>Protect or Restore</i> Shoreland	Land within 1000 feet of lake shoreline.
<i>Protect or Restore</i> Stream riparian areas	Stream riparian areas and potential flood zones (based on location, elevation and soil type). Source: MDNR.

Implement Best Management Practices (BMPs) on Agricultural Lands	
<i>Implement BMPs on</i> Pasture/Hay lands	Land cover type is pasture or hay (areas used for livestock grazing or planted with perennial or forage crops).
<i>Implement BMPs on</i> Cultivated Croplands	Land cover type is cultivated crops (areas used for the production of annual crops or actively tilled areas).
<i>Implement BMPs on</i> Feedlots	Feedlots used for livestock production.
<i>Restore</i> Specific Land Capability Class lands	This classification shows, in a general way, the suitability of soils for most kinds of field crops. Classes 4-8 have serious limitations for agriculture and are used to identify areas for potential conservation investment in prairie or forest management. Classification from

	NRCS.
<i>Restore</i> Low Crop Productivity lands	Crop productivity index (CPI) ratings are a relative rankings of soils based on their potential for intensive crop production (especially corn production) Classification from NRCS. Ratings range from 0 to 100 with higher numbers indicating higher production, therefore (100 – CPI) was used to identify low productivity lands.
<i>Restore</i> Drained wetlands	Drained, potentially restorable wetlands in agricultural landscapes based on an inventory and analysis.

Protect or Restore Lands of Concern	
<i>Protect</i> Lands close to protected lands	Lands close to protected lands may be more important for conservation, as larger, contiguous areas often have more value than smaller, fragmented lands. The data are the inverse distance to (but not including) existing protected lands.
<i>Focus on</i> Roadways	Roads and right-of-ways in the watershed.
<i>Improve</i> lands in Urban growth areas	Lands identified by counties may be more likely to be developed, and some of these lands that provide important ecosystem services may be of conservation value. For Hennepin County the data are the inverse distance to existing developed lands.

Table 2. Broad-scale and fine-scale weights used in the value models from a questionnaire using the analytic hierarchy process (AHP).

Broad-Scale Prioritization (from Policy Committee questionnaire results)	AHP Derived Weight	Weight Used in Model
Improve/Protect Waters of Concern	14.5	
Reduce Erosion & Runoff	21.0	
Enhance Fish & Wildlife Habitat	11.9	
Protect/Restore Shoreland & Riparian Areas	17.7	
Implement BMPs on Ag Lands	20.8	
Protect/Restore Lands of Concern	14.0	
Fine-Scale Prioritization (based on the Policy Committee's broad-scale weights & Advisory Committee questionnaire results)		
Drinking Water	14.0	2.0
Focus on impaired waters	14.9	2.2
Catchments with higher pollution	16.3	2.4
Groundwater Contamination Susceptibility	14.0	2.0
Catchments with declining water quality	19.7	2.9
Focus on catchments of lakes vulnerable to phosphorus addition	21.1	3.1
Well water installation density		2.0
Areas with high erosive potential	26.8	5.6
Areas close to water	26.7	5.6
Areas close to wetlands	19.9	4.2
Soil erosion risk	26.6	5.6
Lakes of Biological Significance	34.1	4.1
Lands near rare habitats	20.7	2.5
Priority wetlands	25.3	3.0
Priority grasslands	19.8	2.4
Stream riparian areas	52.0	9.2
Lake shorelands	48.0	8.5
BMPs on Pasture/hay lands	8.3	1.7
BMPs on Cultivated croplands	20.7	4.3
Feedlots	21.9	4.6
LCC 4-8	12.3	2.6

Low Crop Productivity	12.5	2.6
Restore Drained wetlands	24.3	5.1
Lands close to protected lands	46.4	6.5
Roadways	22.7	3.2
Urban growth areas	30.9	4.3

Table 3. Occurrence of cultivated croplands and high priority areas* in cultivated crops associated with other land features (acres). The total area of the North Fork of the Crow River watershed is 944,858 acres.

Land Feature	Cultivated Croplands	High Priority Areas in Cultivated Crop
Total Watershed	518,299	90,709
Riparian & Floodplain Areas	32,713	21,124
Land Capability Class 4-8 lands (i.e., marginal Ag Lands)	51,289	16,284
Low Crop Productivity lands (lowest 25th percentile CPI lands)	77,294	20,563

* High priority areas refer to the top 25% of lands based on Zonation rank

Figure 1. The broad-scale weights from a questionnaire using the analytic hierarchy process (AHP; weights sum to 100). The results from the Policy Committee were used to set the broad-scale weights in the values model.

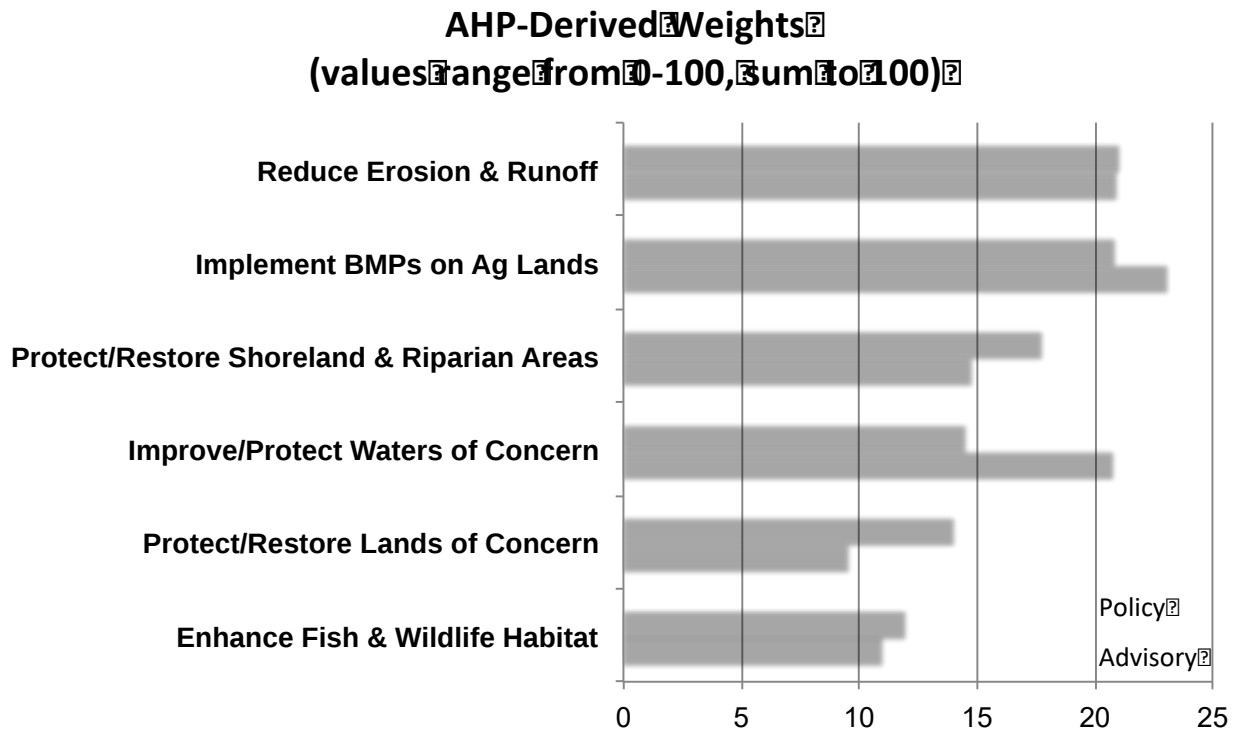


Figure 2. Priority map from Zonation analysis.

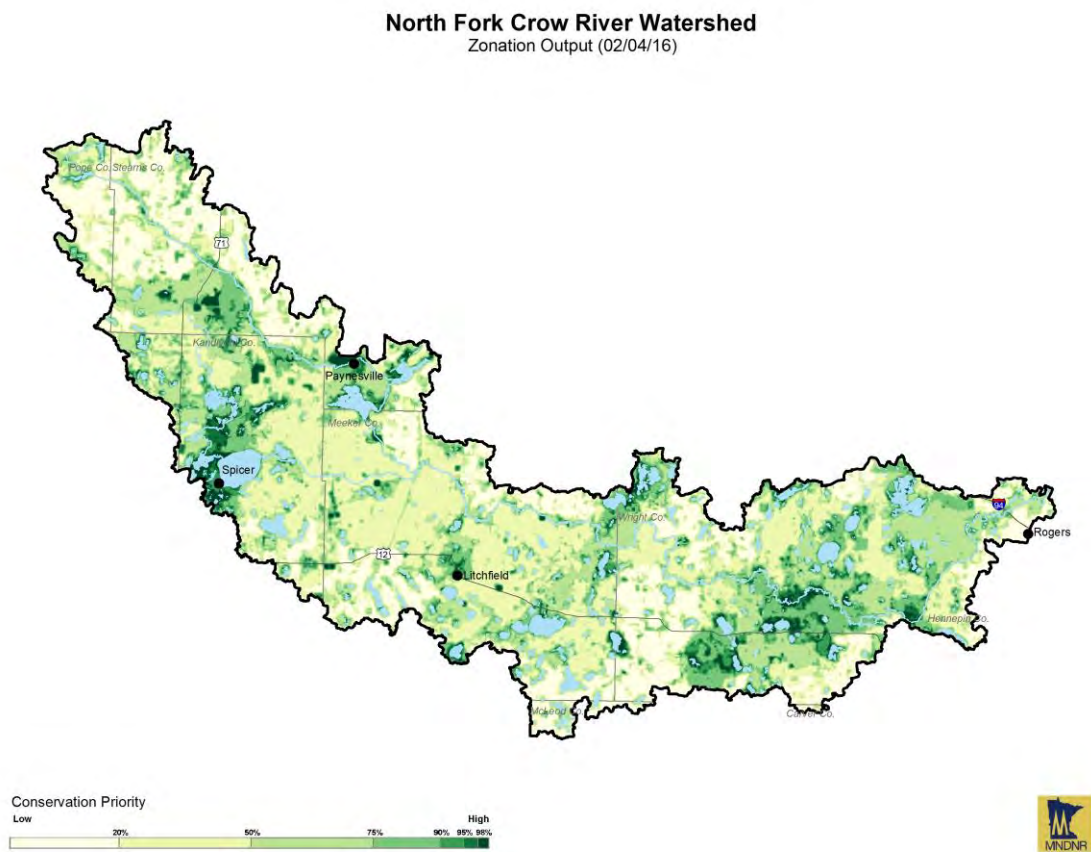


Figure 3. Large clusters of high priority areas identified by hotspot analysis.

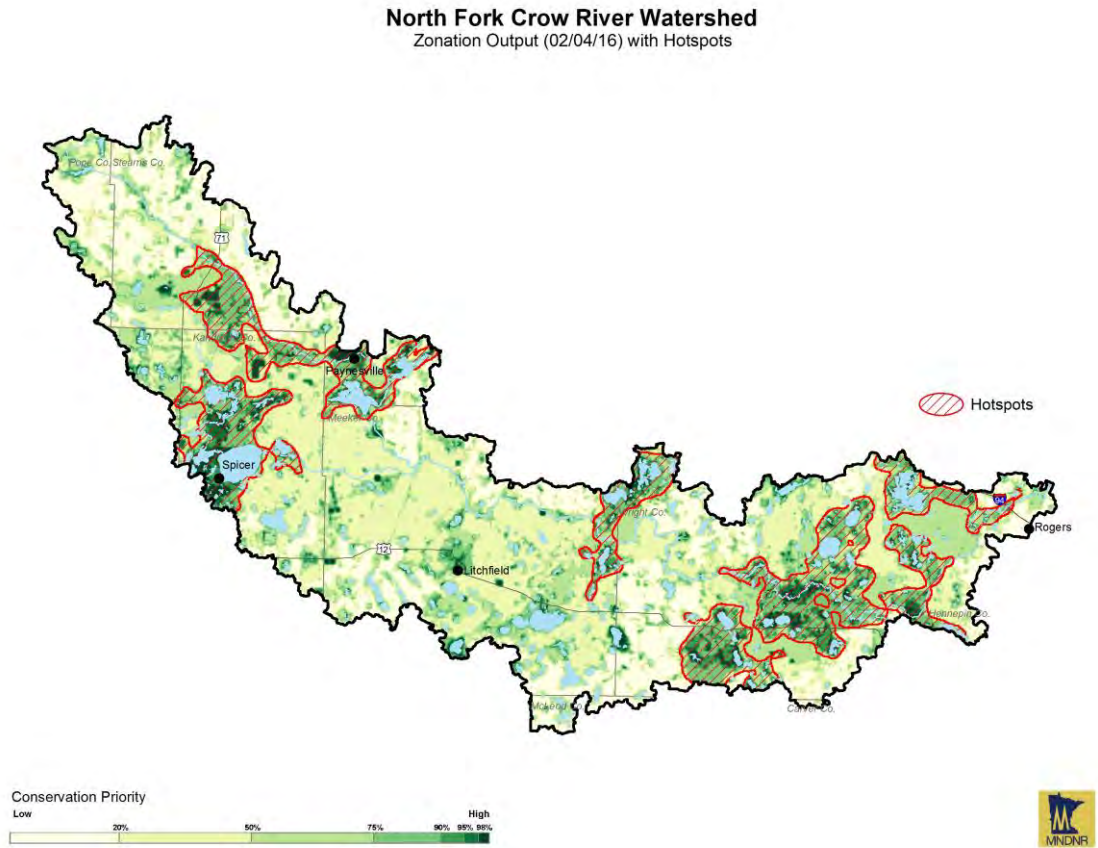


Figure 4. Priority map from Zonation and land use.

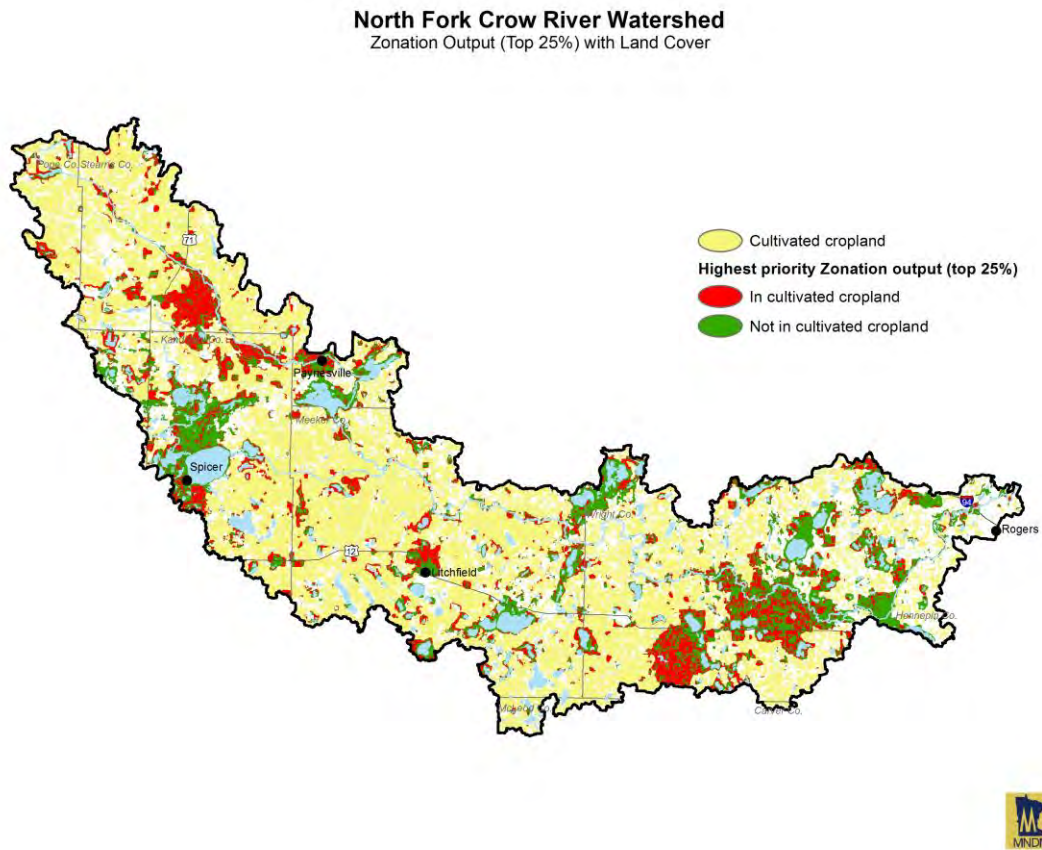


Figure 5. Catchments with the highest percent of high priority areas (top 25% Zonation output) labeled by land use. Twenty catchments with the highest percent are shown (labeled and ranked from 1 -20, with 1 being the highest percentage of high priority area).

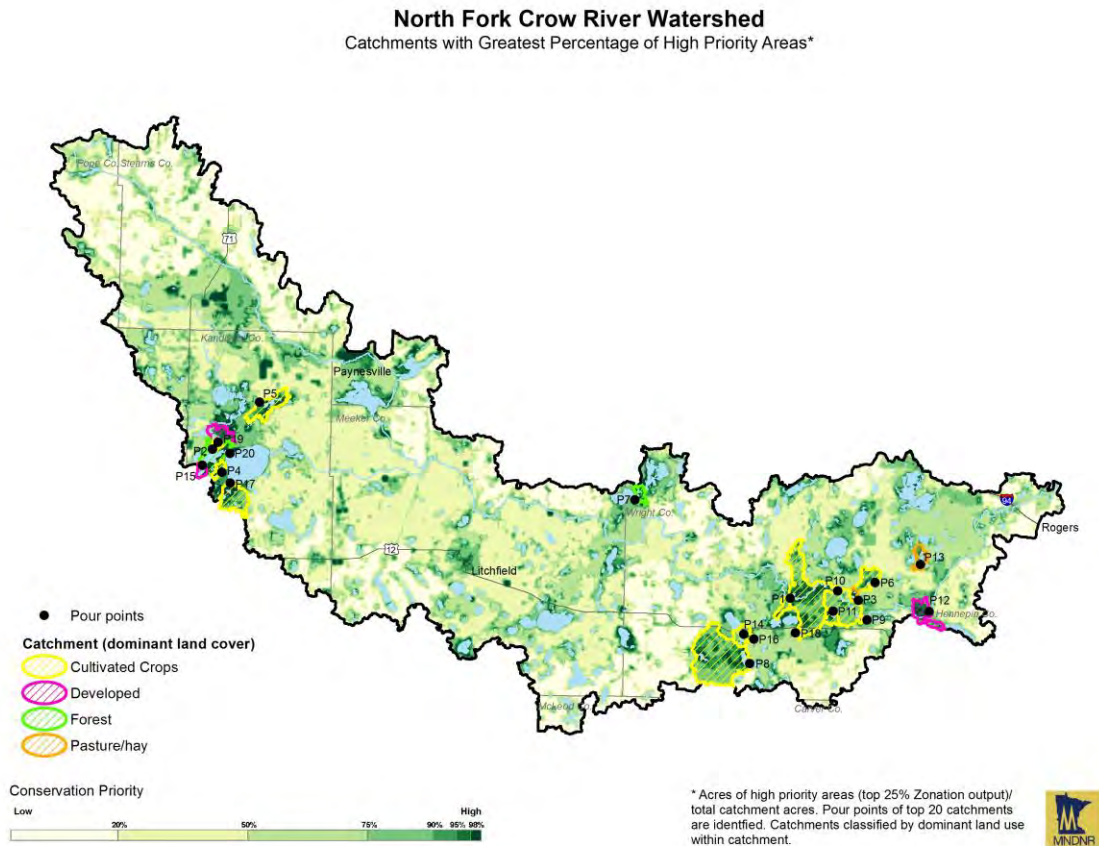


Figure 6. Results from the activities survey used to solicit the preferences of Policy Committee members. The modes of ranks and effort are presented.

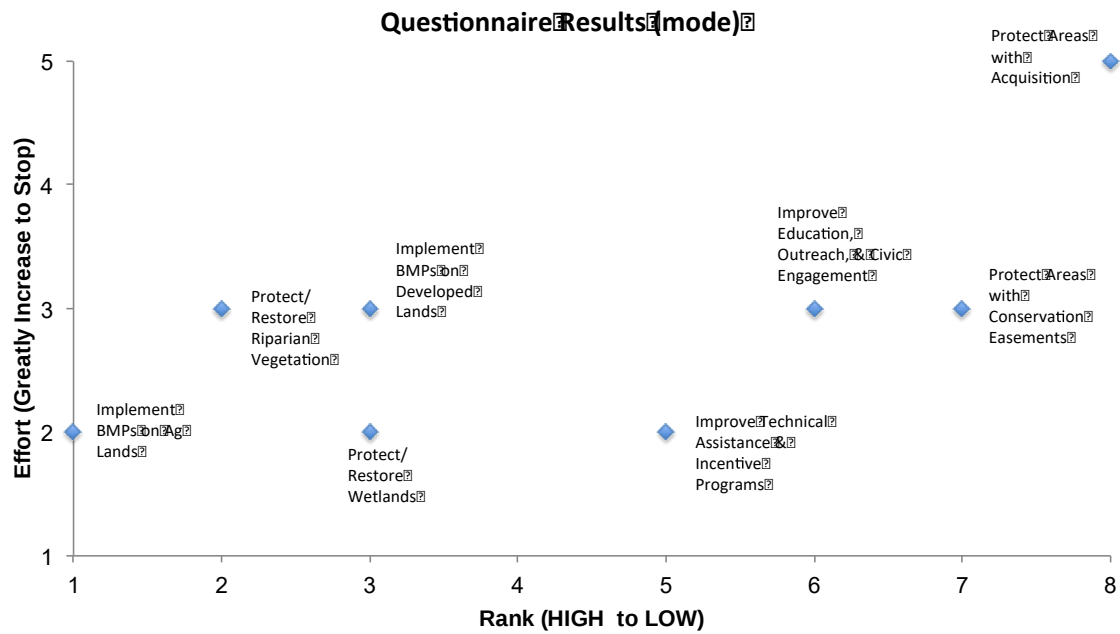
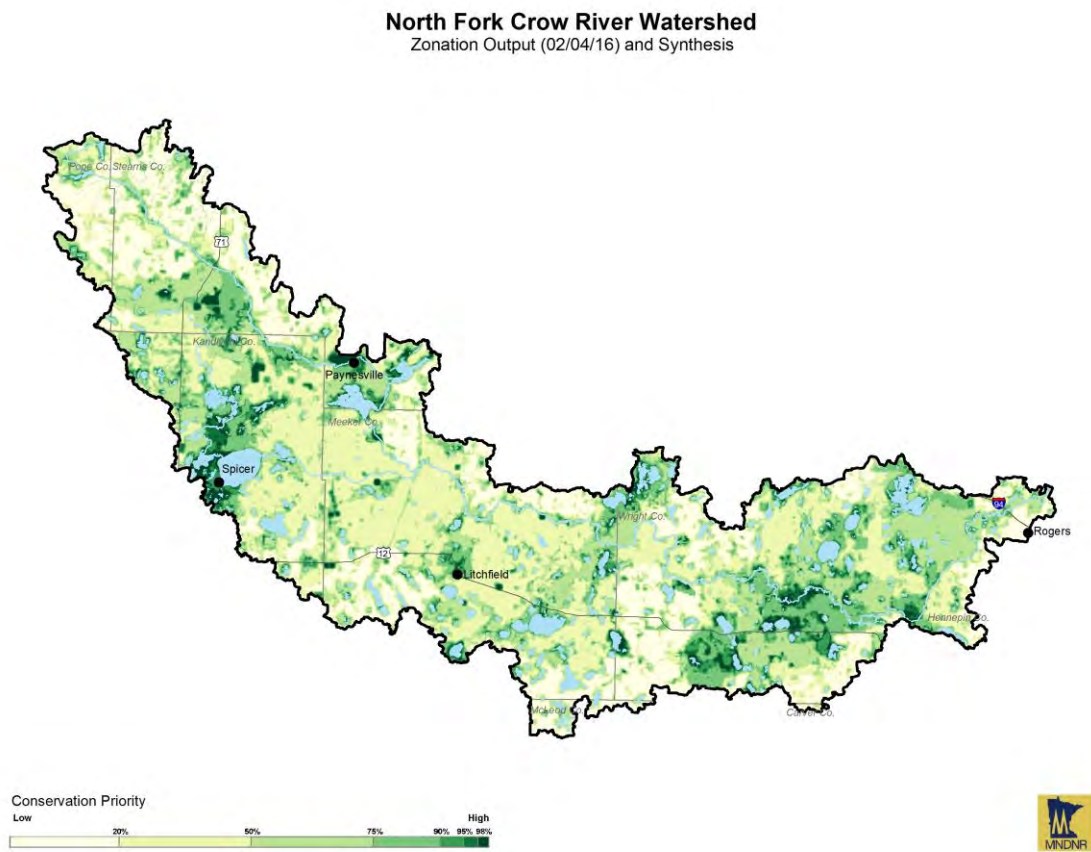
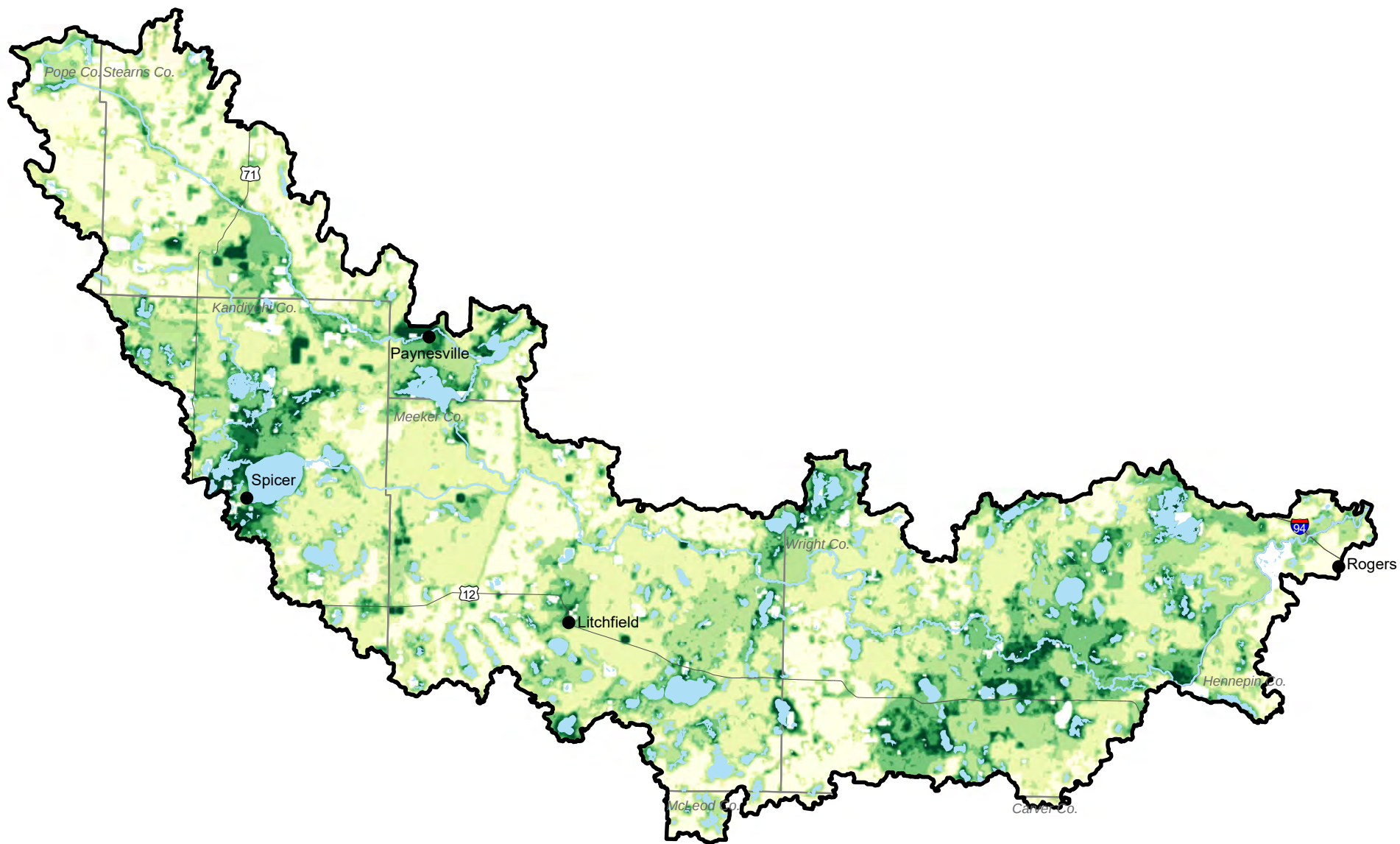


Figure 7. Final priority map from Zonation and synthesis analysis.



North Fork Crow River Watershed

Zonation Output - 09/30/15



0 2.5 5 10 15 20 Miles



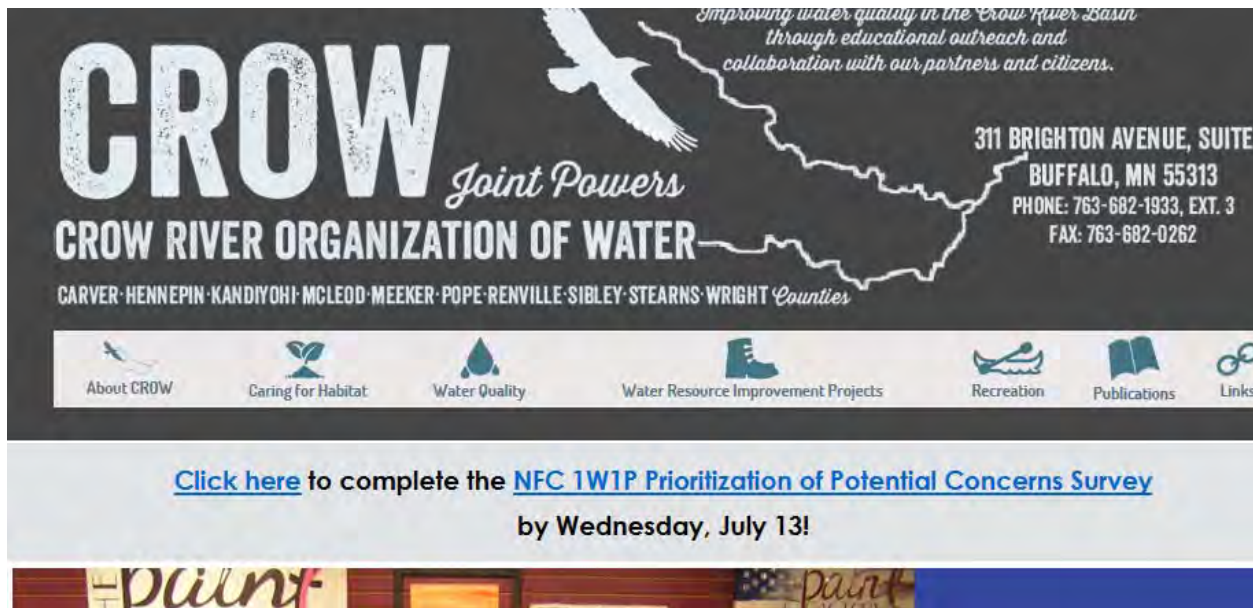


APPENDIX J

Survey Monkey Results

NFC 1W1P Prioritization of Potential Concerns Survey

- 96 Responses



CROW *Joint Powers*
CROW RIVER ORGANIZATION OF WATER

Improving water quality in the Crow River Basin through educational outreach and collaboration with our partners and citizens.

311 BRIGHTON AVENUE, SUITE
BUFFALO, MN 55313
PHONE: 763-682-1933, EXT. 3
FAX: 763-682-0262

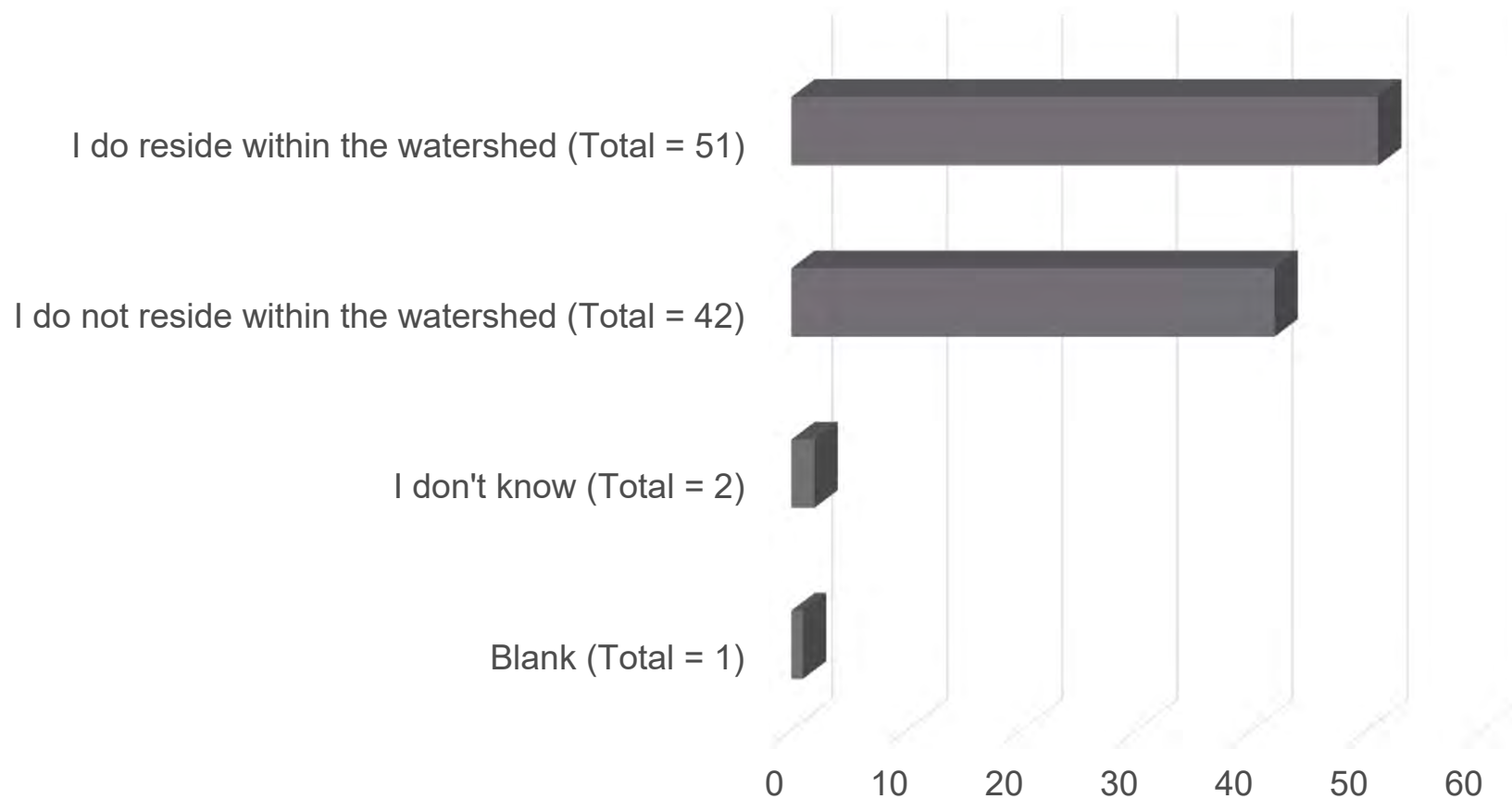
CARVER · HENNEPIN · KANDIYOHI · MCLEOD · MEEKER · POPE · RENVILLE · SIBLEY · STEARNS · WRIGHT *Counties*

About CROW Caring for Habitat Water Quality Water Resource Improvement Projects Recreation Publications Links

[Click here](#) to complete the [NFC 1W1P Prioritization of Potential Concerns Survey](#)
by Wednesday, July 13!

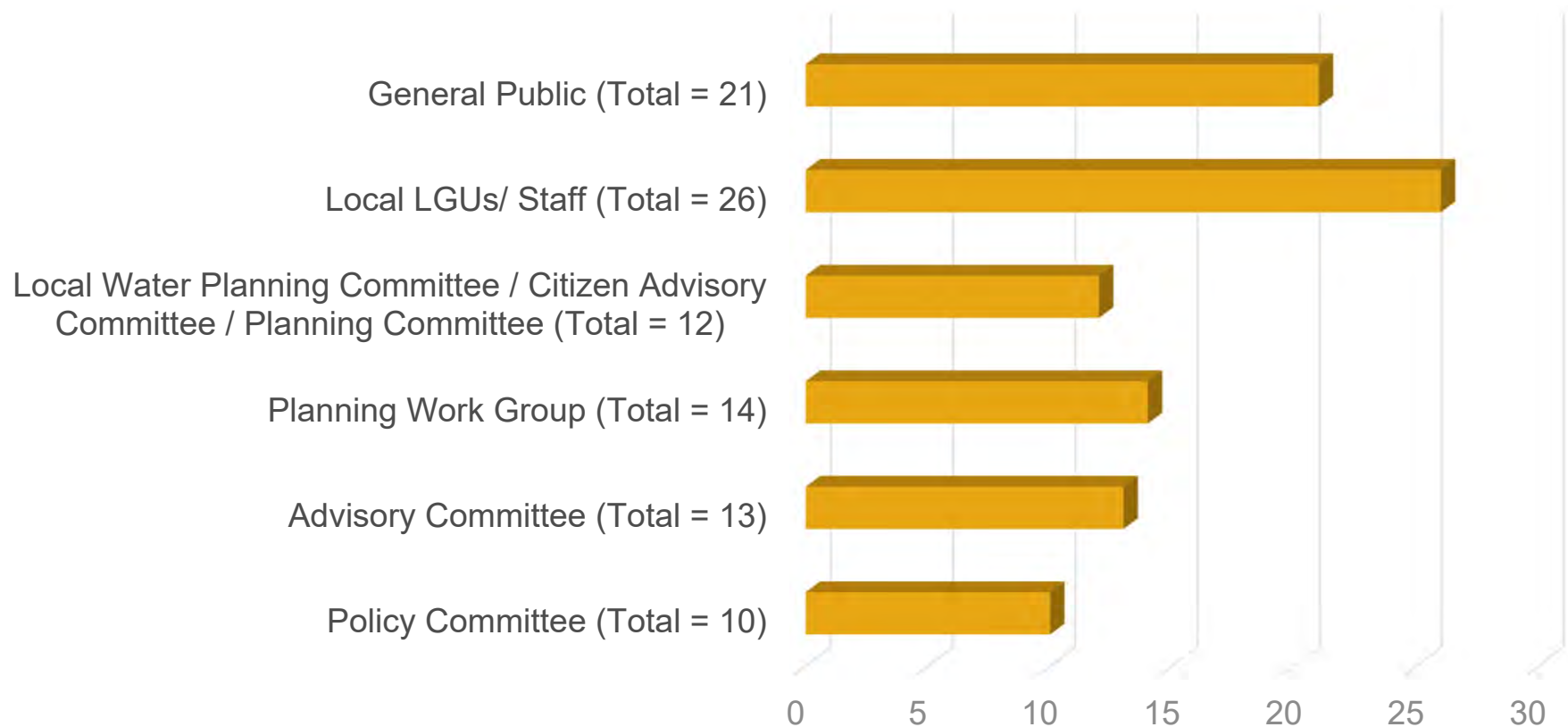
RESIDENTS VS. NON-RESIDENTS

Do you reside and/or own land within the watershed?

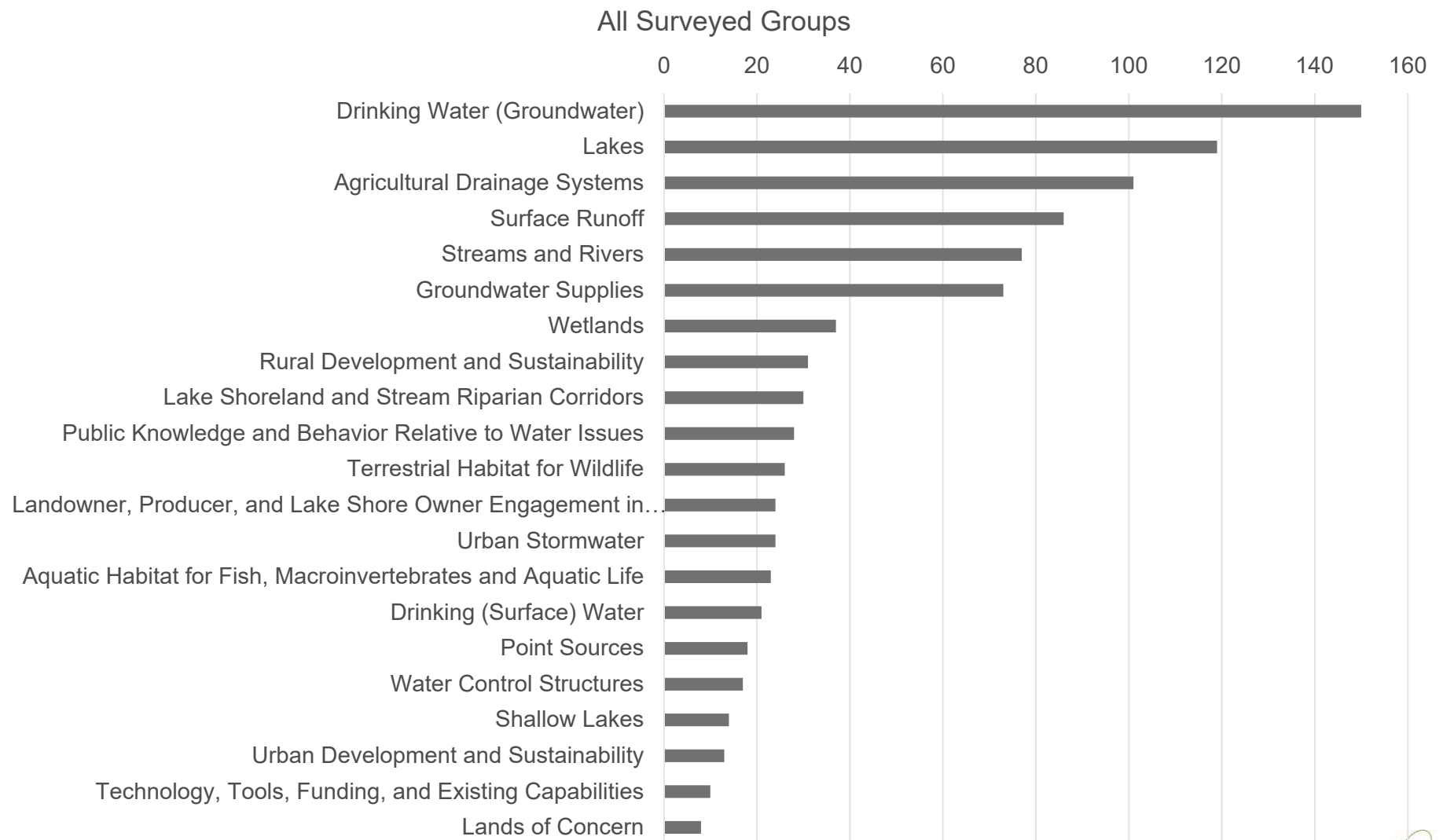


SURVEY PARTICIPANTS

What stakeholder group do you most closely relate to?



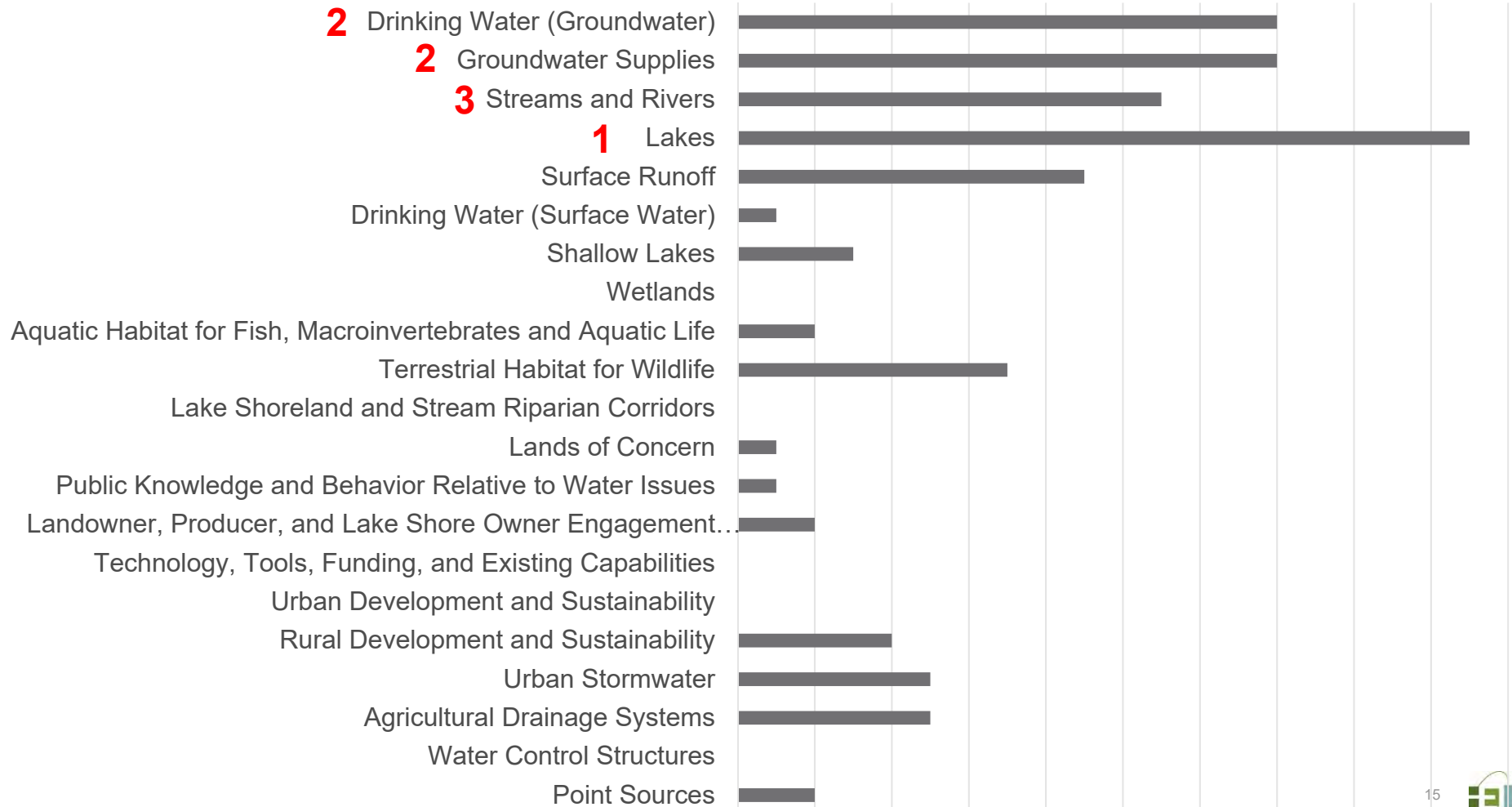
PRIORITIES: TOTAL



PRIORITIES: POLICY COMMITTEE

Policy Committee

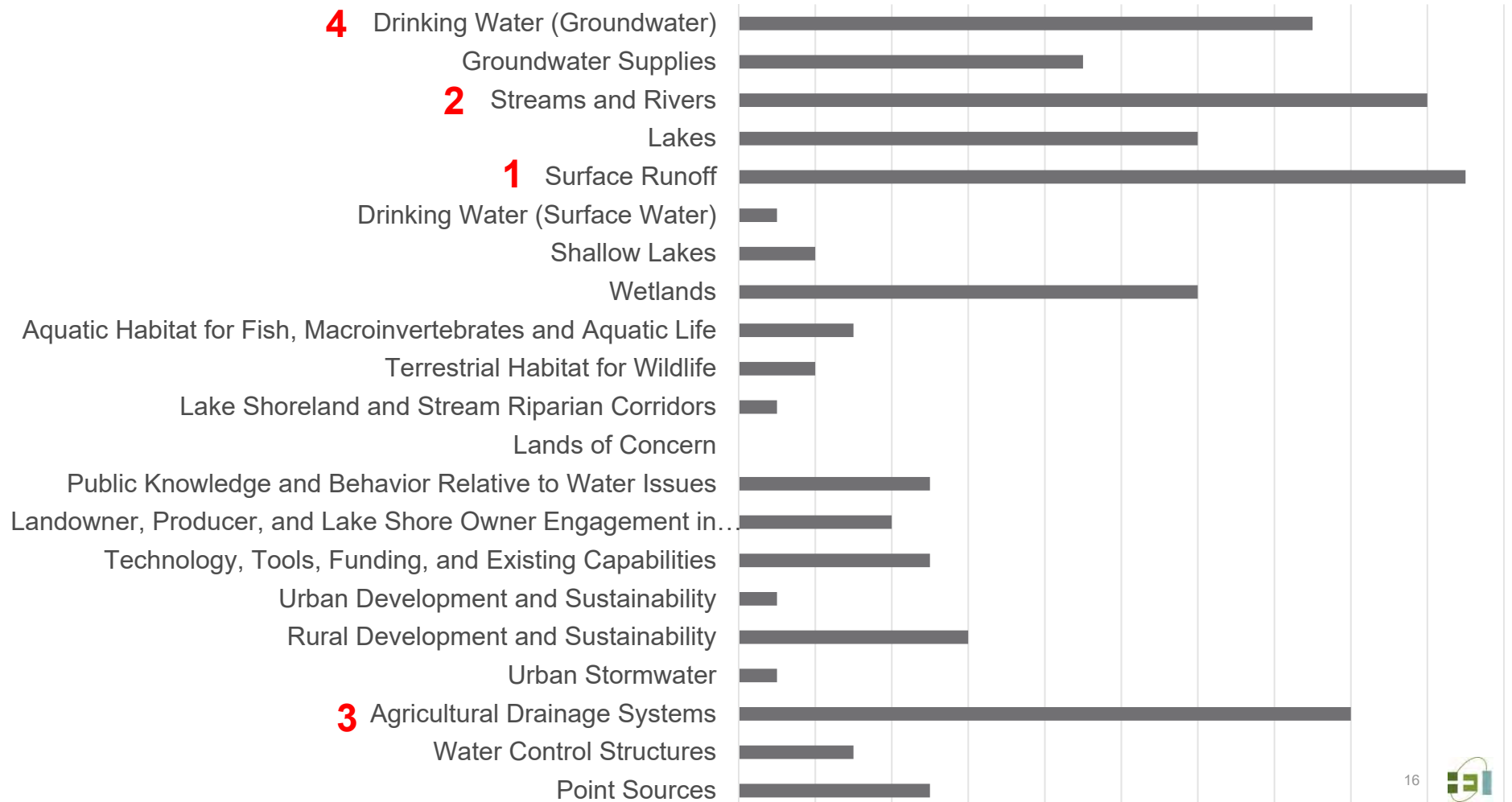
0 2 4 6 8 10 12 14 16 18 20



PRIORITIES: PLANNING WORK GROUP

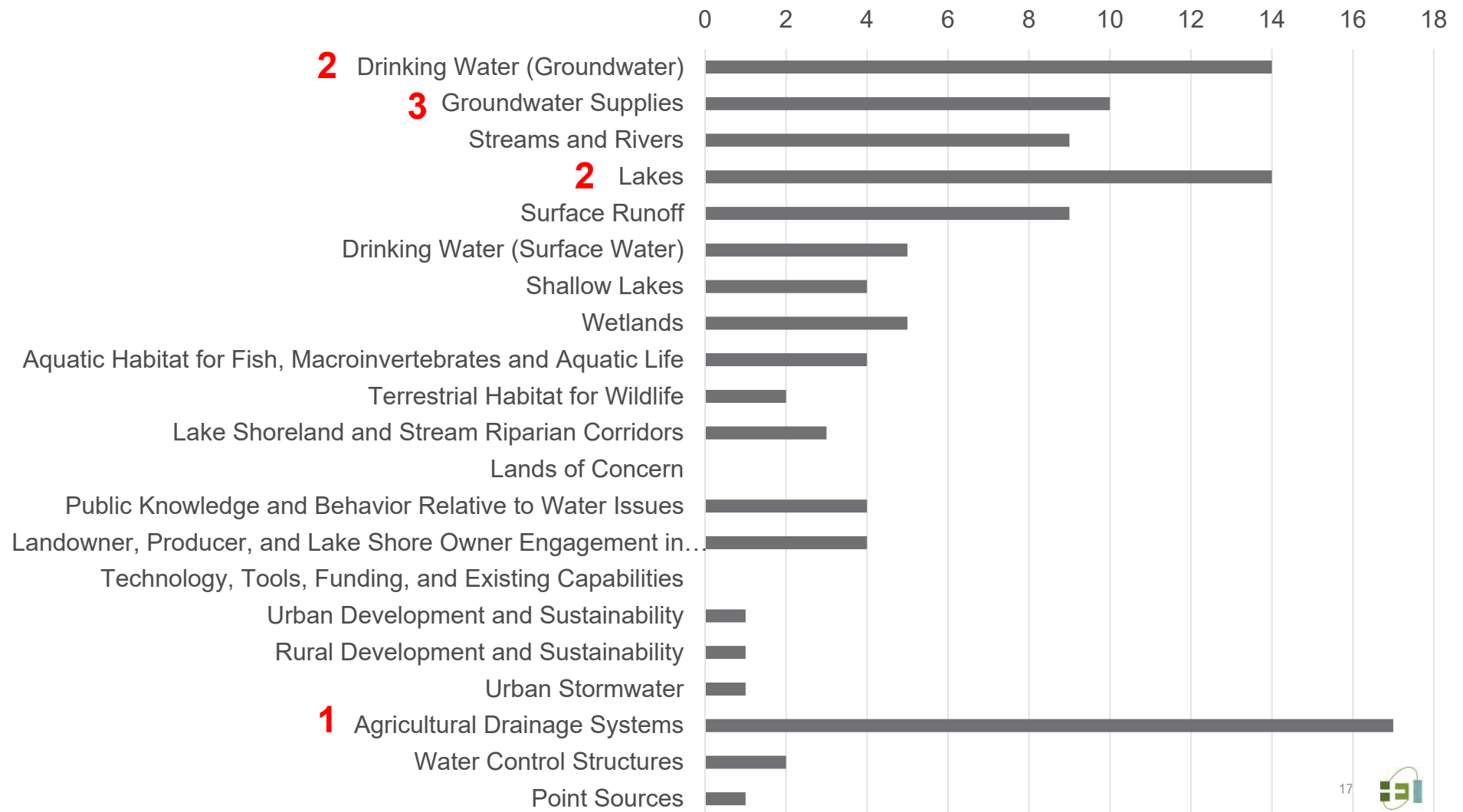
Planning Work Group

0 2 4 6 8 10 12 14 16 18 20

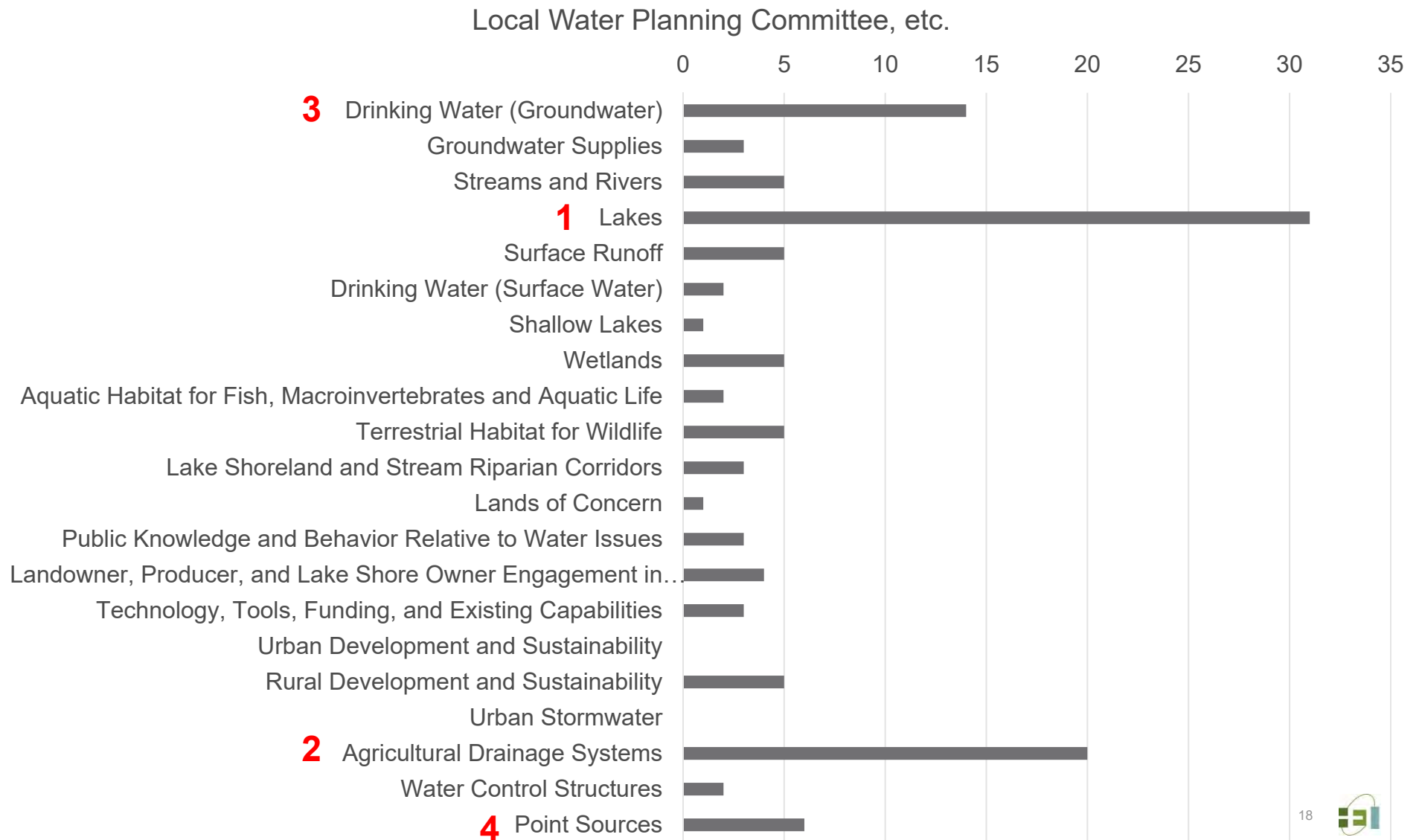


PRIORITIES: ADVISORY COMMITTEE

Advisory Committee



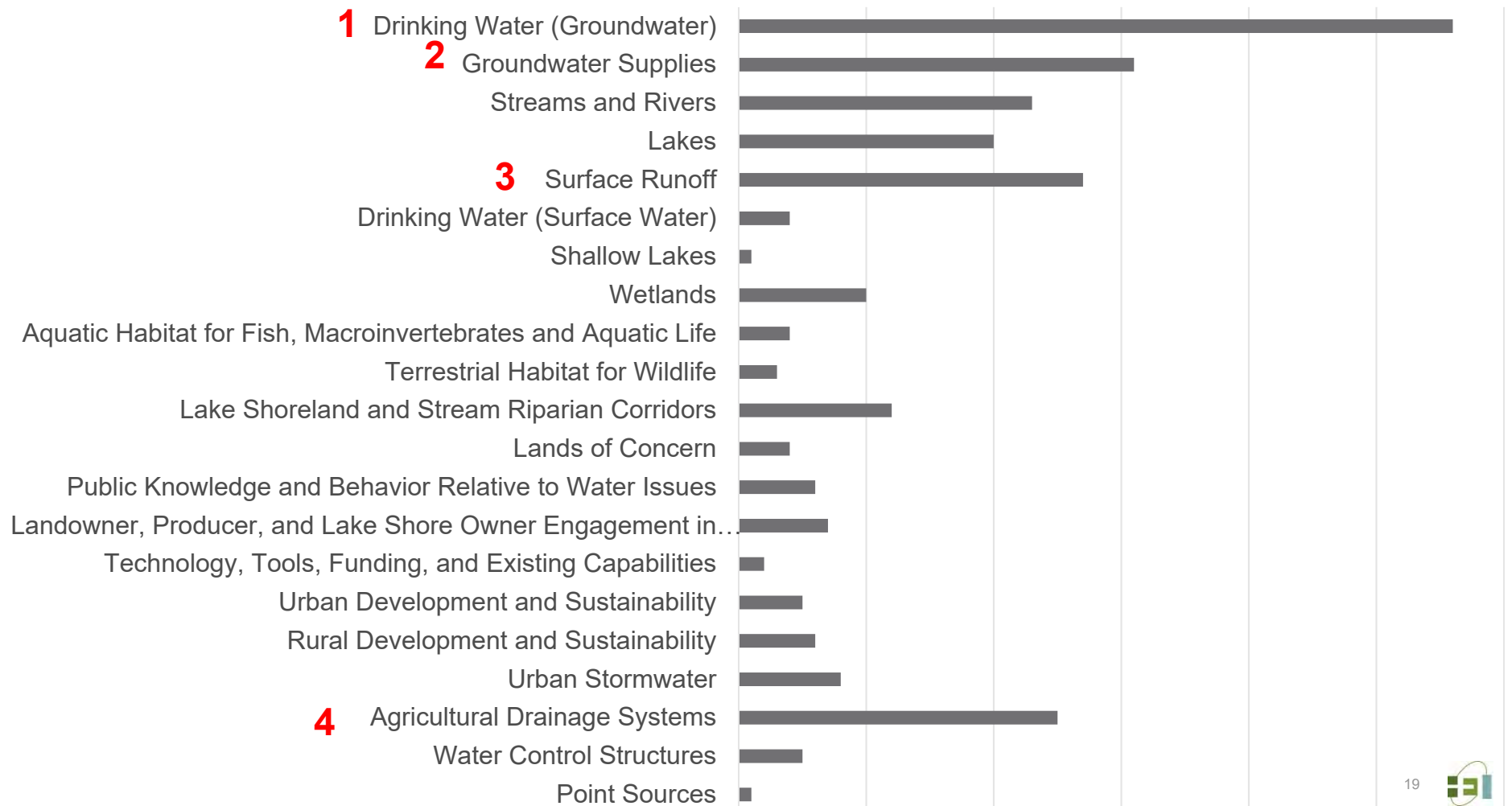
PRIORITIES: LOCAL WATER PLANNING COMMITTEES, ETC.



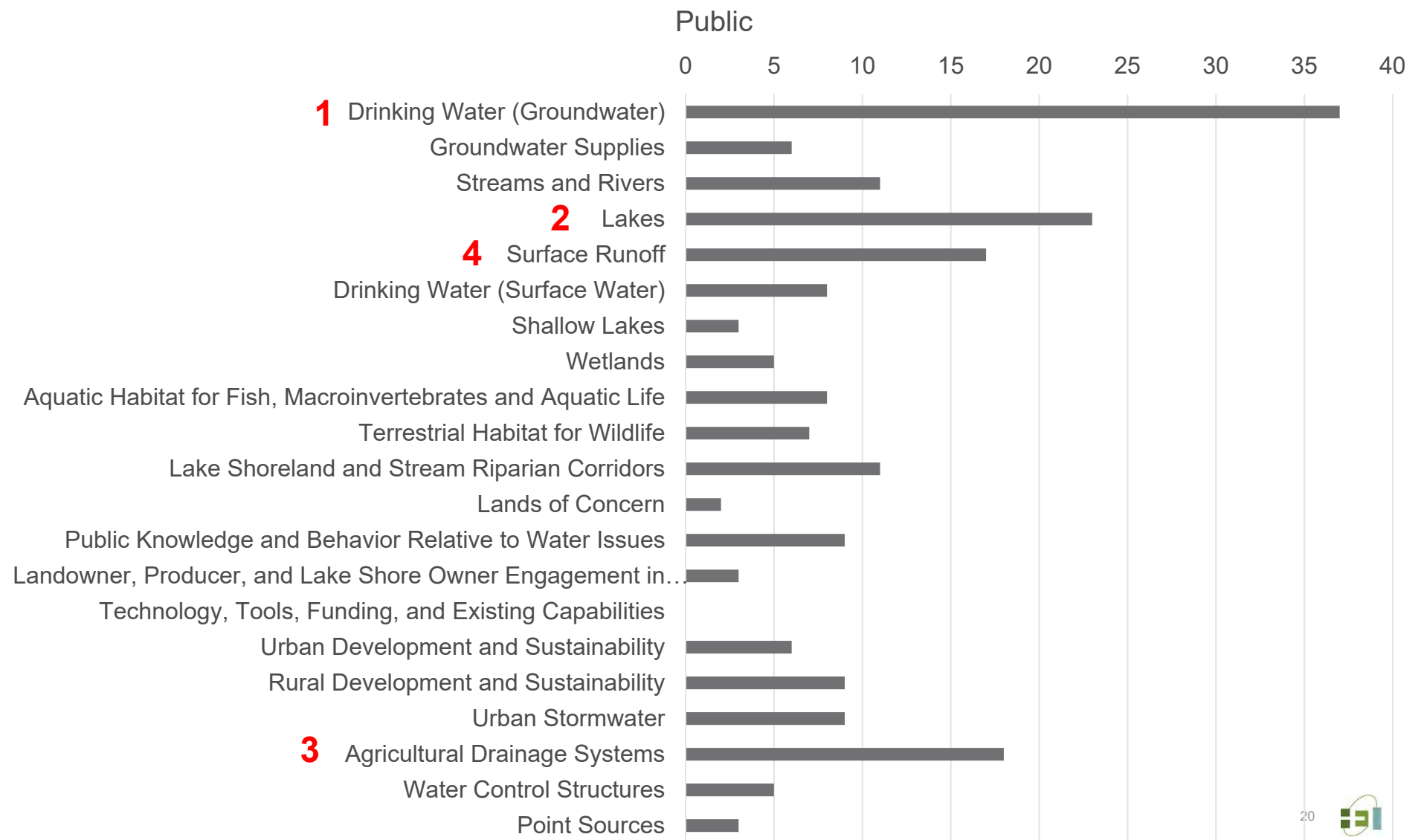
PRIORITIES: LGU STAFF

LGU Staff

0 10 20 30 40 50 60



PRIORITIES: GENERAL PUBLIC



SUMMARY: TOP 4 PRIORITIES BY GROUP

- Policy Committee
 - Lakes
 - Drinking Water
 - Groundwater Supplies
 - Streams and Rivers
- Planning Work Group
 - Surface Runoff
 - Streams and Rivers
 - Agricultural Drainage
 - Drinking Water
- Advisory Committee
 - Agricultural Drainage
 - Drinking Water
 - Lakes
 - Groundwater Supplies

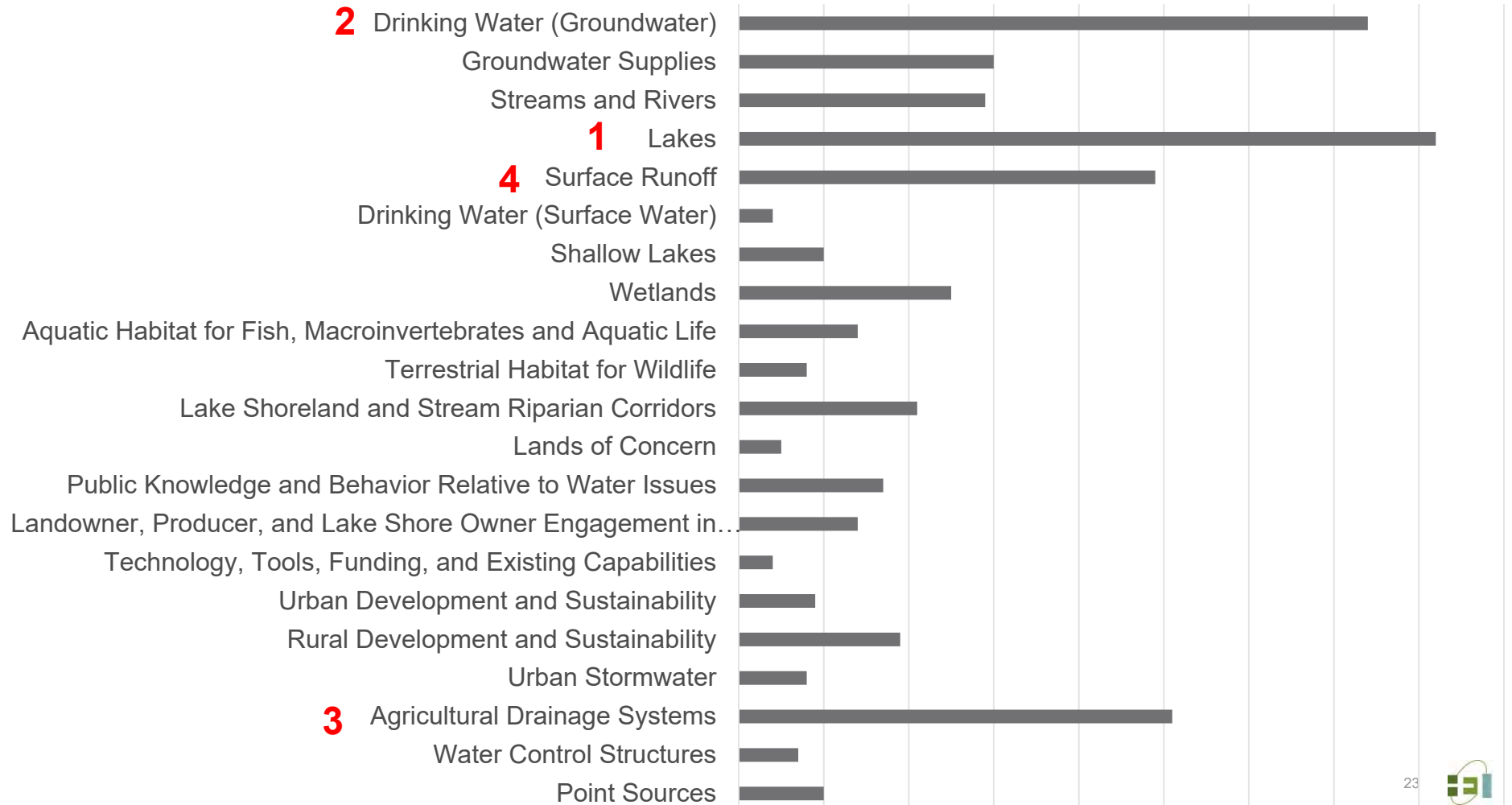
SUMMARY: TOP 4 PRIORITIES BY GROUP

- Local Water Planning Committee....
 - Lakes
 - Agricultural Drainage
 - Drinking Water
 - Point Sources
- LGU Staff
 - Drinking Water
 - Groundwater Supplies
 - Surface Runoff
 - Agricultural Drainage
- General Public
 - Drinking Water
 - Lakes
 - Agricultural Drainage
 - Surface Runoff

RESIDENTS

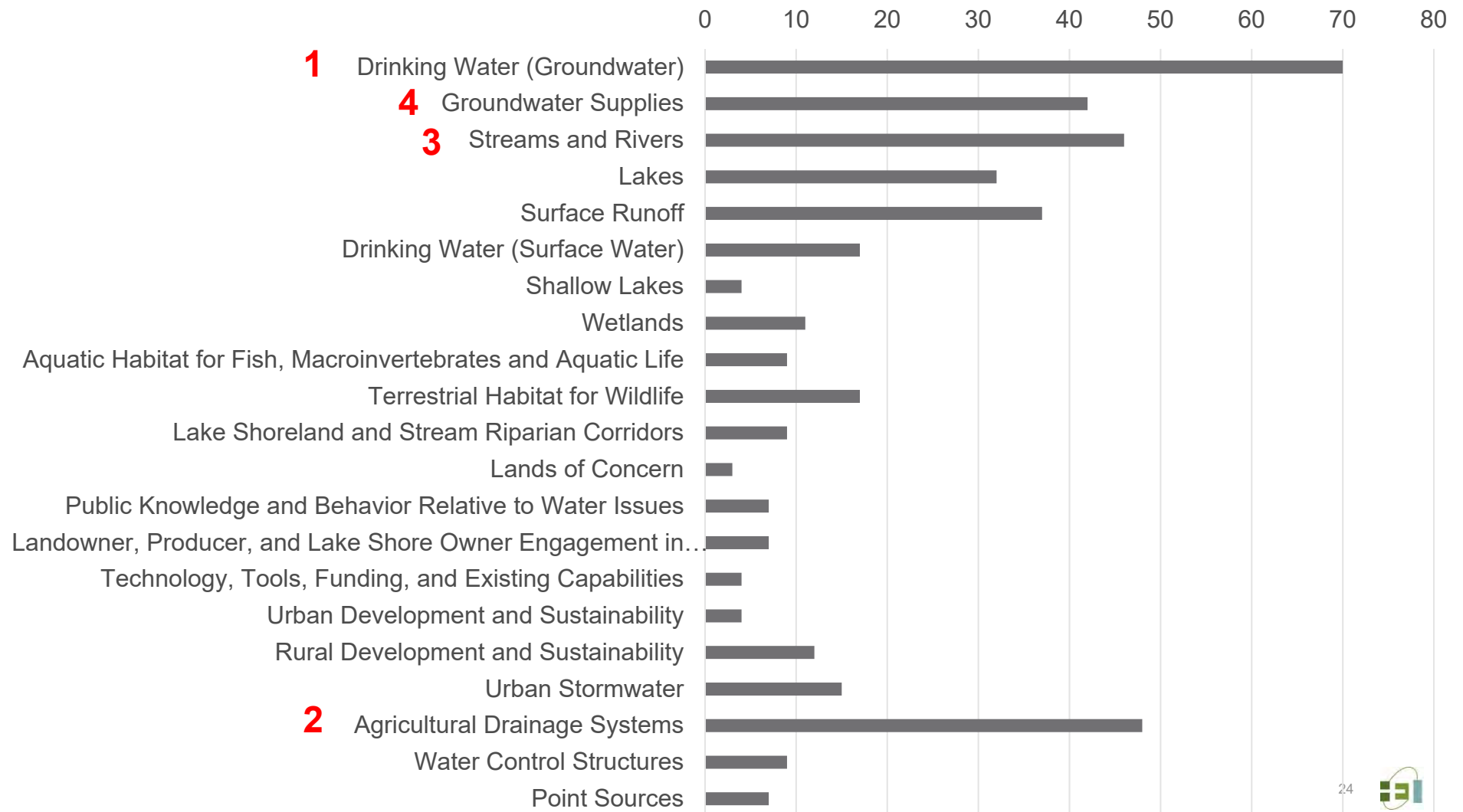
Residents

0 10 20 30 40 50 60 70 80 90



NON-RESIDENTS

Non-Residents





APPENDIX K

Strategies and Actions

APPENDIX K: STRATEGIES AND ACTIONS

The strategies and actions are organized by resource and potential concern. The strategies and actions represent the steps needed to achieve the measurable goals and are the framework for the targeted implementation schedule. As some strategies and associated actions have multiple benefits, strategies may benefit more than one potential concern.

1.1 PRIORITY CONCERNS: PRIORITY LEVEL “A,” “B,” OR “C”

1.1.1 GROUNDWATER (GW)

***Vision:** Manage groundwater to maintain or improve the quality of drinking water and quantity of groundwater supplies.*

1.1.1.1 POTENTIAL CONCERN: DRINKING WATER

Strategy GW-1: Manage ground water quality to achieve the Safe Drinking Water Act nitrate- (10 mg/L) nitrogen standard by managing nitrate-nitrogen loading within areas contributing to groundwater recharge.

Action 1: Implement and maintain existing BMPs that reduce leaching within Drinking Water Supply Management Areas (DWSMAs) and recharge areas that are highly vulnerable to contamination.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 29: Seal abandoned and unused wells, particularly those wells which may impact public or private drinking water supplies, such as those found within DWSMAs or multi-aquifer wells.

Action 3: Develop and implement nutrient management plans for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.

Action 50: Complete the delineation and mapping of DWSMAs and the boundaries of Wellhead Protection Areas.

Action 30: Administer adopted land use and zoning ordinances to manage possible sources of nitrate contamination (e.g., subsurface sewage treatment systems; manure management; land development), and pathogenic bacterial contamination (e.g., subsurface sewage treatment systems; manure management; concentrated livestock access to streams), and consider potential adverse effects within DWSMAs.

Action 51: Monitor nitrate levels in private wells.

Action 53: Continue research to map and model groundwater and monitor basic groundwater flow.

Action 32: Bring Subsurface Sewage Treatment Systems (SSTs) into compliance to reduce nutrient and bacterial loading from small, unsewered communities and homes with inadequate wastewater treatment.

Action 33: Provide educational and financial assistance to promote maintenance of compliant Subsurface Sewage Treatment Systems (SSTs).

Action 55: Consider Minneapolis and St. Paul Source Water Protection Areas as part of an evaluation of how existing or new land use activities or redevelopment may impact the quality of the Mississippi River as a drinking water source.

Strategy GW-2: Manage groundwater quality to achieve the total coliform drinking standard by maintaining appropriate bacterial loading in areas contributing to groundwater recharge.

Action 1: Implement and maintain existing BMPs that reduce leaching within Drinking Water Supply Management Areas (DWSMAs) and recharge areas that are highly vulnerable to contamination.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 29: Seal abandoned and unused wells, particularly those wells which may impact public or private drinking water supplies, such as those found within DWSMAs or multi-aquifer wells.

Action 4: Develop and implement manure management plans for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.

Action 7: Provide technical and financial assistance to landowners to implement animal waste management systems and manage water using runoff control measures in accordance with accepted design standards and practice.

Action 32: Bring Subsurface Sewage Treatment Systems (SSTs) into compliance to reduce nutrient and bacterial loading from small, unsewered communities and homes with inadequate wastewater treatment.

Action 33: Provide educational and financial assistance to promote maintenance of compliant Subsurface Sewage Treatment Systems (SSTs).

Action 30: Administer adopted land use and zoning ordinances to manage possible sources of nitrate contamination (e.g., subsurface sewage treatment systems; manure management; land development), and pathogenic bacterial contamination (e.g., subsurface sewage treatment systems; manure management; concentrated livestock access to streams), and consider potential adverse effects within DWSMAs.

Action 34: Maintain compliance with National Point Discharge Elimination System (NPDES) Permits for point sources.

Strategy GW-3: Maintain groundwater quality by managing pesticide and other contaminant loading in areas contributing to groundwater recharge.

Action 1: Implement and maintain existing BMPs that reduce leaching within Drinking Water Supply Management Areas (DWSMAs) and recharge areas that are highly vulnerable to contamination.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 5: Promote the development of pesticide management plans which follow operational best management practice recommendations, including Licensed Applicators Statute.

Action 6: Encourage the use of precision agriculture through education, technical, and financial assistance

Action 101: Implement an education/outreach campaign for the responsible use, storage, and disposal of pesticides.

Action 52: Monitor groundwater for pesticides and/or other contaminants.

Action 56: Promote the development of a spill response plan that addresses high volume railroad corridors, pipelines, and other large contaminant threats in relation to the locations of community wells, DWSMA vulnerability and potential impacts to the Mississippi River as a drinking water source.

Strategy GW-4: Manage land use and/or minimize development in areas on the landscape contributing to groundwater recharge.

Action 1: Implement and maintain existing BMPs that reduce leaching within Drinking Water Supply Management Areas (DWSMAs) and recharge areas that are highly vulnerable to contamination.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 30: Administer adopted land use and zoning ordinances to manage possible sources of nitrate contamination (e.g., subsurface sewage treatment systems; manure management; land development), and pathogenic bacterial contamination (e.g., subsurface sewage treatment systems; manure management; concentrated livestock access to streams), and consider potential adverse effects within DWSMAs.

Action 31: Plan land use patterns and evaluate zoning changes and project proposals with the goal of reducing the amount of potential contaminants in sensitive groundwater recharge areas/vulnerable DWSMAs.

Action 57: Map, monitor, and model surface water BMPs and their impacts on groundwater recharge in different land use patterns and hydrogeologic settings.

Action 58: Incorporate mapped contamination plumes into local land use decision making process. For example, consider groundwater contamination as part of stormwater BMP decision-making, to reduce the risk of spreading groundwater contamination.

Action 56: Promote the development of a spill response plan that addresses high volume railroad corridors, pipelines, and other large contaminant threats in relation to the locations of community wells, DWSMA vulnerability and potential impacts to the Mississippi River as a drinking water source.

1.1.1.2 POTENTIAL CONCERN: GROUNDWATER SUPPLIES

Strategy GW-5: Obtain, maintain, and further develop working knowledge of groundwater resource supply and conditions to facilitate evaluation of long-term and short-term trends.

Action 60: Set criteria for and manage groundwater supply for sustainable use, based on an evaluation of historical and projected water demand.

Action 61: Fill gaps in the groundwater level observation well network by installing additional, strategically located long-term groundwater observation wells.

Action 51: Monitor nitrate levels in private wells.

Action 52: Monitor groundwater for pesticides and/or other contaminants.

Action 65: Monitor precipitation and increase the number of volunteer rain gauge readers to evaluate short and long-term trends and their relationship to groundwater supplies and lake levels.

Action 53: Continue research to map and model groundwater and monitor basic groundwater flow.

Action 57: Map, monitor, and model surface water BMPs and their impacts on groundwater recharge in different land use patterns and hydrogeologic settings.

Action 78: Investigate and document surface water and groundwater known areas of interactions in the NFCR Watershed.

Strategy GW-6: Maintain sustainable supply of groundwater for water users and water dependent resources.

Action 60: Set criteria for and manage groundwater supply for sustainable use, based on an evaluation of historical and projected water demand.

Action 102: Encourage municipalities to utilize practices that promote water conservation and efficiency. Some examples include tiered billing rates that reward conservation, improved meters and leak detection, and rebates for water-saving appliances and irrigation Best Practices including turf irrigation technologies (i.e. Golf Course, Schools)

Action 103: Encourage watershed residents and businesses through educational and outreach efforts to adopt conservation and water reuse practices, such as capturing stormwater for irrigation and planting native vegetation / lawns that do not require as much water.

Action 8: Provide education, financial incentives, and technical support to increase the percentage of irrigated acres that employ conservation irrigation practices, such as variable rate application and low flow drop nozzles.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 61: Fill gaps in the groundwater level observation well network by installing additional, strategically located long-term groundwater observation wells.

1.1.2 SURFACE WATER (SW)

***Vision:** Manage surface waters to maintain or improve the quality and quantity of surface water supplies and obtain or maintain their beneficial uses.*

1.1.2.1 POTENTIAL CONCERN: STREAMS AND RIVERS

Strategy SW-1: Manage for stream stability by achieving non-point, point and in-channel sources of sediment in equilibrium with the runoff peak discharge, runoff volume, runoff depth and runoff duration.

Action 66: Develop a comprehensive hydrologic and hydraulic model for culvert and bridge design to determine timing and magnitude of peak discharge of existing conditions, the duration of discharge, and base flow conditions. Use proper hydrologic and hydraulic design standards for road crossings to provide flood protection, while considering fish passage and environmental needs.

Action 67: Set peak discharge, volume reduction goals and sediment load goals to achieve stable geomorphologic conditions.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 68: Define basic geomorphic characteristics for stable reaches including bank full discharge, channel cross sectional area, slope, and bed composition.

Action 69: Inventory the locations and cause of unstable stream and river reaches and prioritize them for implementation by addressing the root cause of instability, as well as on-site implementation

Action 10: Promote BMPs that enhance hydrologic storage by increasing perennial native vegetation in upland and riparian areas that provide connections to expand riparian access. These actions also provide benefits to restoring stream stability and equilibrium where it is found to be impaired. Hydrologic storage could most directly be increased by restoring wetlands.

Action 125: Stabilize and or restore degraded sections of stream and river reaches to provide multiple benefits, such as enhanced hydrologic function and reduced bank failure and sediment deposition into waterbodies, while also providing connectivity benefits for aquatic and terrestrial habitats.

Action 35: Meet all statutory requirements of the State of Minnesota (MN Rules 6120.250- 3900) which regulate the subdivision, use, and development of shorelands of public waters, in addition to the Buffer and Soil Erosion Legislation.

Strategy SW-2: Protect healthy and diverse aquatic biological communities by maintaining low levels of sediment.

Action 70: Obtain soil health and loss to meet principles of stewardship from a soil health and fertility perspective from urban and rural lands.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 71: Complete sufficiently detailed sediment mass balances for affected reaches, which identify the source and relative magnitude of sediment leading to impairments.

Action 35: Meet all statutory requirements of the State of Minnesota (MN Rules 6120.250- 3900) which regulate the subdivision, use, and development of shorelands of public waters, in addition to the Buffer and Soil Erosion Legislation.

Action 11: Implement and maintain existing BMPs that stabilize ravines, gullies, and gully heads.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 125: Stabilize and or restore degraded sections of stream and river reaches to provide multiple benefits, such as enhanced hydrologic function and reduced bank failure and sediment deposition into waterbodies, while also providing connectivity benefits for aquatic and terrestrial habitats.

Action 36: Encourage stormwater sediment reduction in existing and developing rural subdivisions and urban areas, including implementing existing construction stormwater permit programs and installing MIDS requirements. Promote incorporation of MIDS requirements (or similar) into local zoning ordinances.

Action 12: Proactively cleanout build-up of debris from water resources and stormwater ponds.

Action 13: Work with landowners and drainage authorities to install two-stage ditch systems for multiple benefits including improved drainage and ditch bank stability and sediment transport, increased habitat (e.g., riffle and pool habitat in low flows) and pollutant removal of nitrogen. Implement and maintain existing BMPs that provide perennial vegetative cover within the Right Of Way (ROW) of the public drainage system to increase stream roughness, and decrease bank erosion.

Strategy SW-3: Protect aquatic recreation by reducing *E. coli* concentrations.

Action 14: Implement and maintain existing BMPs that treat surface runoff within priority locations. Implement and maintain existing BMPs within priority locations that reduce nutrient loading to waterbodies by treating surface and shallow sub-surface runoff before entering ditches and streams.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 4: Develop and implement manure management plans for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.

Action 7: Provide technical and financial assistance to landowners to implement animal waste management systems and manage water using runoff control measures in accordance with accepted design standards and practice.

Action 32: Bring Subsurface Sewage Treatment Systems (SSTs) into compliance to reduce nutrient and bacterial loading from small, unsewered communities and homes with inadequate wastewater treatment.

Action 33: Provide educational and financial assistance to promote maintenance of compliant Subsurface Sewage Treatment Systems (SSTs).

Action 30: Administer adopted land use and zoning ordinances to manage possible sources of nitrate contamination (e.g., subsurface sewage treatment systems; manure management; land development), and pathogenic bacterial contamination (e.g., subsurface sewage treatment systems; manure management; concentrated livestock access to streams), and consider potential adverse effects within DWSMAs.

Action 15: Use managed and rotational grazing methods to manage animal wastes and prevent livestock entry into surface waterbodies.

Action 34: Maintain compliance with National Point Discharge Elimination System (NPDES) Permits for point sources.

Strategy SW-4: Reduce overall nitrate-nitrogen concentrations by managing delivery and loading to surface waters.

Action 14: Implement and maintain existing BMPs that treat surface runoff within priority locations. Implement and maintain existing BMPs within priority locations that reduce nutrient loading to waterbodies by treating surface and shallow sub-surface runoff before entering ditches and streams.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 3: Develop and implement nutrient management plans for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.

Action 32: Bring Subsurface Sewage Treatment Systems (SSTs) into compliance to reduce nutrient and bacterial loading from small, unsewered communities and homes with inadequate wastewater treatment.

Action 33: Provide educational and financial assistance to promote maintenance of compliant Subsurface Sewage Treatment Systems (SSTs).

Action 7: Provide technical and financial assistance to landowners to implement animal waste management systems and manage water using runoff control measures in accordance with accepted design standards and practice.

Action 30: Administer adopted land use and zoning ordinances to manage possible sources of nitrate contamination (e.g., subsurface sewage treatment systems; manure management; land development), and pathogenic bacterial contamination (e.g., subsurface sewage treatment systems; manure management; concentrated livestock access to streams), and consider potential adverse effects within DWSMAs.

Action 1: Implement and maintain existing BMPs that reduce leaching within Drinking Water Supply Management Areas (DWSMAs) and recharge areas that are highly vulnerable to contamination. Implement and maintain existing BMPs within priority locations which reduce vertical movement of nitrate into groundwater.

Strategy SW-5: Reduce overall total phosphorus concentrations by managing delivery and loading to surface waters.

Action 14: Implement and maintain existing BMPs that treat surface runoff within priority locations. Implement and maintain existing BMPs within priority locations that reduce nutrient loading to waterbodies by treating surface and shallow sub-surface runoff before entering ditches and streams.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 3: Develop and implement nutrient management plans for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.

Action 32: Bring Subsurface Sewage Treatment Systems (SSTSs) into compliance to reduce nutrient and bacterial loading from small, unsewered communities and homes with inadequate wastewater treatment.

Action 33: Provide educational and financial assistance to promote maintenance of compliant Subsurface Sewage Treatment Systems (SSTSs).

Action 7: Provide technical and financial assistance to landowners to implement animal waste management systems and manage water using runoff control measures in accordance with accepted design standards and practice.

Action 30: Administer adopted land use and zoning ordinances to manage possible sources of nitrate contamination (e.g., subsurface sewage treatment systems; manure management; land development), and pathogenic bacterial contamination (e.g., subsurface sewage treatment systems; manure management; concentrated livestock access to streams), and consider potential adverse effects within DWSMAs.

Action 34: Maintain compliance with National Point Discharge Elimination System (NPDES) Permits for point sources.

Strategy SW-6: Protect aquatic biological communities by reducing overall delivery and loading of chloride to surface waters.

Action 104: Promote education about source control within rural subdivisions and urban areas to promote a reduction of chloride loading to waterbodies. Encourage stormwater chloride source reduction in rural subdivisions and urban areas.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Strategy SW-7: Protect aquatic biological communities by maintaining appropriate levels of dissolved oxygen and temperature.

Action 16: Implement and maintain existing BMPs that provide perennial vegetative cover within the riparian corridor to decrease bank erosion, increase stream shading, and reduce water temperature.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 3: Develop and implement nutrient management plans for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.

Action 125: Stabilize and or restore degraded sections of stream and river reaches to provide multiple benefits, such as enhanced hydrologic function and reduced bank failure and sediment deposition into waterbodies, while also providing connectivity benefits for aquatic and terrestrial habitats.

The following strategies and associated actions are **also applicable**:

- **Strategy SW-2:** Protect healthy and diverse aquatic biological communities by maintaining low levels of sediment.

Strategy SW-8: Maintain the quality of native aquatic communities by minimizing the introduction and spread of aquatic invasive species.

Action 72: Determine the location and value of existing barriers relevant to fish management and aquatic invasive species (AIS) control.

Action 73: Form committee to explore collaborative efforts in dealing with aquatic invasive species including education, control, rapid response, and inspections.

Action 105: Perform education and outreach initiatives targeted to general public / lake shore owners about threats of invasive species, and ways to prevent / control them..

Action 74: Pursue funding to provide technical and financial assistance to control/manage/prevent invasive species.

Action 75: Maintain current and historical GIS records of invasive species using the MnDNR database.

Action 106: Facilitate conversations with local stakeholders and LGU's in regards to increased watercraft inspections/monitoring at lake access sites to promote prevention.

1.1.2.2 POTENTIAL CONCERN: LAKES

Strategy SW-9: Reduce overall nitrate-nitrogen concentrations by managing delivery and loading to lakes.

Action 14: Implement and maintain existing BMPs that treat surface runoff within priority locations. Implement and maintain existing BMPs within priority locations that reduce nutrient loading to waterbodies by treating surface and shallow sub-surface runoff before entering ditches and streams.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 3: Develop and implement nutrient management plans for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.

Action 32: Bring Subsurface Sewage Treatment Systems (SSTSs) into compliance to reduce nutrient and bacterial loading from small, unsewered communities and homes with inadequate wastewater treatment.

Action 33: Provide educational and financial assistance to promote maintenance of compliant Subsurface Sewage Treatment Systems (SSTs).

Action 7: Provide technical and financial assistance to landowners to implement animal waste management systems and manage water using runoff control measures in accordance with accepted design standards and practice.

Action 30: Administer adopted land use and zoning ordinances to manage possible sources of nitrate contamination (e.g., subsurface sewage treatment systems; manure management; land development), and pathogenic bacterial contamination (e.g., subsurface sewage treatment systems; manure management; concentrated livestock access to streams), and consider potential adverse effects within DWSMAs.

Action 37: Explore possibility of an ordinance restricting open intakes on drainage tiles that outlet directly into lakes.

Strategy SW-10: Reduce overall total phosphorus concentrations by managing delivery and loading to lakes.

Action 14: Implement and maintain existing BMPs that treat surface runoff within priority locations. Implement and maintain existing BMPs within priority locations that reduce nutrient loading to waterbodies by treating surface and shallow sub-surface runoff before entering ditches and streams.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 3: Develop and implement nutrient management plans for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.

Action 32: Bring Subsurface Sewage Treatment Systems (SSTs) into compliance to reduce nutrient and bacterial loading from small, unsewered communities and homes with inadequate wastewater treatment.

Action 33: Provide educational and financial assistance to promote maintenance of compliant Subsurface Sewage Treatment Systems (SSTs).

Action 7: Provide technical and financial assistance to landowners to implement animal waste management systems and manage water using runoff control measures in accordance with accepted design standards and practice.

Action 30: Administer adopted land use and zoning ordinances to manage possible sources of nitrate contamination (e.g., subsurface sewage treatment systems; manure management; land development), and pathogenic bacterial contamination (e.g., subsurface sewage treatment systems; manure management; concentrated livestock access to streams), and consider potential adverse effects within DWSMAs.

Action 14: Implement and maintain existing BMPs that treat surface runoff within priority locations. Implement and maintain existing BMPs within priority locations that reduce nutrient loading to waterbodies by treating surface and shallow sub-surface runoff before entering ditches and streams.

Action 107: Promote natural shorelands and shoreland revegetation by providing education, technical, and financial assistance to landowners for shoreland restoration

Action 34: Maintain compliance with National Point Discharge Elimination System (NPDES) Permits for point sources.

Action 108: Provide technical and financial assistance to lake associations and other stakeholders for the implementation of in-lake management efforts to improve the quality of water resources, when appropriate.

Strategy SW-11: Protect aquatic life and aquatic recreation by managing land use and/or minimizing development within lake drainage areas.

Action 39: Administer zoning regulations that encourage development practices which preserve and enhance natural and pervious areas, such as native prairies and old growth forests.

Action 17: Explore and promote protection of natural and pervious lands through such programs as acquisition, property tax credits and easements.

Strategy SW-12: Protect aquatic life and aquatic recreation by managing ravines and associated polluted runoff contributions which outlet to lakes.

Action 76: Determine the location and severity of ravines within lake drainage areas.

Action 14: Implement and maintain existing BMPs that treat surface runoff within priority locations. Implement and maintain existing BMPs within priority locations that reduce nutrient loading to waterbodies by treating surface and shallow sub-surface runoff before entering ditches and streams.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 11: Implement and maintain existing BMPs that stabilize ravines, gullies, and gully heads.

Strategy SW-13: Maintain the quality of native aquatic communities and protect aquatic recreation uses by minimizing the introduction and spread of aquatic invasive species.

Action 72: Determine the location and value of existing barriers relevant to fish management and aquatic invasive species (AIS) control.

Action 105: Perform education and outreach initiatives targeted to general public / lake shore owners about threats of invasive species, and ways to prevent / control them..

Action 74: Pursue funding to provide technical and financial assistance to control/manage/prevent invasive species.

Action 75: Maintain current and historical GIS records of invasive species using the MnDNR database.

Strategy SW-14: Protect aquatic life, aquatic recreation, and vitality of local economy by maintaining stable lake levels.

Action 77: Implement monitoring efforts to develop lake level trends for analysis.

Action 65: Monitor precipitation and increase the number of volunteer rain gauge readers to evaluate short and long-term trends and their relationship to groundwater supplies and lake levels.

Action 126: Assist as needed with outlet structure reconstruction and improvements on degraded or failing structures.

Action 78: Investigate and document surface water and groundwater known areas of interactions in the NFCR Watershed.

The following strategies and associated actions are **also applicable**:

- **Strategy SW-11:** Protect aquatic life and aquatic recreation by managing land use and/or minimizing development within lake drainage areas.

Strategy SW-15: Protect aquatic life, aquatic recreation, and vitality of local economy by managing legacy sediment levels and vulnerability to resuspension.

Action 79: Research existing conditions of lake bed sediment deposits and its interaction with native plant communities.

Action 109: Perform education and outreach initiatives targeted to general public / lake shore owners about impacts of recreational boating motors on the resuspension of lake sediment.

Action 12: Proactively cleanout build-up of debris from water resources and stormwater ponds.

1.1.2.3 POTENTIAL CONCERN: SURFACE RUNOFF

Strategy SW-16: Restore connectivity within riparian corridors, floodplains and to upstream and downstream portions of streams.

Action 66: Develop a comprehensive hydrologic and hydraulic model for culvert and bridge design to determine timing and magnitude of peak discharge of existing conditions, the duration of discharge, and base flow conditions. Use proper hydrologic and hydraulic design standards for road crossings to provide flood protection, while considering fish passage and environmental needs.

Action 72: Determine the location and value of existing barriers relevant to fish management and aquatic invasive species (AIS) control.

Action 125: Stabilize and or restore degraded sections of stream and river reaches to provide multiple benefits, such as enhanced hydrologic function and reduced bank failure and sediment deposition into waterbodies, while also providing connectivity benefits for aquatic and terrestrial habitats.

Action 80: Prepare and maintain formal maps to define the boundary of the riparian area adjacent to perennial streams and rivers, as a means to focus the implementation of incentive based initiatives.

Action 18: Implement and maintain existing BMPs within riparian areas that improve connectivity within riparian corridors and floodplains.

Action 81: Define impact of altered hydrology on surface runoff and water resources within the watershed and utilize results to generate quantitative storage goals for each planning region to mitigate impacts of altered hydrology.

Action 19: Promote and implement practices to restore natural hydrology, such as the adoption of drainage water management and the restoration of drained wetlands and altered streams for multiple benefits. Support research of modified agricultural drainage systems. Support innovative water management solutions to conventional tile drainage systems.

Action 82: Establish bankfull elevations to determine floodplain connectivity and stream incision.

Strategy SW-17: Minimize damages to agricultural crops, land, and infrastructure including roads, buildings, homes and residences as a result of flooding.

Action 83: Define, develop, maintain, and make available the most current floodplain maps.

Action 110: Use various programs to provide land owners with economically viable alternatives for use of land in flood prone areas.

Action 127: Maintain public infrastructure to provide drainage at the anticipated level of service to minimize flood damage to land both upland and downstream of the managed systems.

Action 20: Implement and maintain practices that provide a minimum 10-year level of protection for agricultural lands, including upland and floodplain storage projects, conservation, and /or flowage easements.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 41: Use the floodplain management ordinance and land use and zoning approvals to minimize the likelihood of future flood damages.

Action 128: Evaluate the need for, develop, and implement capital improvement projects to address areas currently subject to damage.

Action 66: Develop a comprehensive hydrologic and hydraulic model for culvert and bridge design to determine timing and magnitude of peak discharge of existing conditions, the duration of discharge, and base flow conditions. Use proper hydrologic and hydraulic design standards for road crossings to provide flood protection, while considering fish passage and environmental needs.

Action 67: Set peak discharge, volume reduction goals and sediment load goals to achieve stable geomorphologic conditions.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 84: Develop and maintain an inventory of urban and agricultural locations on the landscape which are prone to flood damages.

The following strategies and associated actions are **also applicable**:

- **Strategy SW-1:** Manage for stream stability by achieving non-point, point and in-channel sources of sediment in equilibrium with the runoff peak discharge, runoff volume, runoff depth and runoff duration.

1.1.2.4 RESOURCE CONCERN: WETLANDS

Strategy SW-21: Maintain or increase acreage of quality wetlands, characterized by capacity to store excess water, improve water quality, and increase habitat for wildlife.

Action 42: Implement and enforce applicable county ordinances and the Wetland Conservation Act (WCA) to retain wetland quantity, function, and value.

Action 10: Promote BMPs that enhance hydrologic storage by increasing perennial native vegetation in upland and riparian areas that provide connections to expand riparian access. These actions also provide benefits to restoring stream stability and equilibrium where it is found to be impaired. Hydrologic storage could most directly be increased by restoring wetlands.

Action 111: Provide educational and technical assistance to landowners regarding State and Federal programs to preserve and restore wetlands, including the State wetland-banking program.

Action 85: Locate, identify, and protect all calcareous fens not yet on the DNR Commissioner's List.

Action 38: Develop and apply resources to assess and estimate wetland loss.

Strategy SW-22: Maintain the quality of native aquatic and terrestrial communities and protect wetland recreation uses and biodiversity by minimizing the introduction and spread of aquatic and terrestrial invasive species.

Action 105: Perform education and outreach initiatives targeted to general public / lake shore owners about threats of invasive species, and ways to prevent / control them.

Action 75: Maintain current and historical GIS records of invasive species using the MnDNR database.

Action 74: Pursue funding to provide technical and financial assistance to control/manage/prevent invasive species.

The following strategies and associated actions are **also applicable**:

- **Strategy SW-2:** Protect healthy and diverse aquatic biological communities by maintaining low levels of sediment.
- **Strategy SW-3:** Protect aquatic recreation by reducing E. coli concentrations.
- **Strategy SW-4:** Reduce overall nitrate-nitrogen concentrations by managing delivery and loading to surface waters.
- **Strategy SW-5:** Reduce overall total phosphorus concentrations by managing delivery and loading to surface waters.

1.1.3 FISH AND WILDLIFE HABITAT AND UNIQUE NATURAL FEATURES (HF)

***Vision:** Manage fish and wildlife habitat and unique natural features to maintain or improve the water resources of the North Fork Crow River 1W1P boundary area.*

1.1.3.1 POTENTIAL CONCERN: TERRESTRIAL HABITAT FOR WILDLIFE

Strategy HF-3: Maintain habitat corridors, large blocks of native habitat, and unique habitats by managing land use, including minimizing development.

Action 39: Administer zoning regulations that encourage development practices which preserve and enhance natural and pervious areas, such as native prairies and old growth forests.

Action 21: Implement and maintain existing BMPs to manage native plant and animal communities, such as forestland, prairies, wetlands, oak savannahs, etc.

Action 22: Promote protection of lands identified as areas of moderate, high, and outstanding biodiversity and/or areas identified as MBS Sites of Biodiversity Significance and Native Plan Communities through such programs as acquisition, property tax credits and easements.

Strategy HF-4: Maintain the quality of high biodiversity areas and native plant communities by minimizing the introduction and spread of invasive species.

Action 105: Perform education and outreach initiatives targeted to general public / lake shore owners in moderate and high biodiversity areas about threats of invasive species, and ways to prevent / control them.

Action 74: Pursue funding to provide technical and financial assistance to control/manage invasive species.

Action 75: Maintain current and historical GIS records of invasive species using the MnDNR database.

Action 43: Adhere to Minnesota Statutes and Rules pertaining to invasive species (Minnesota Statute 84D and Minnesota Rules 6216) and the Noxious Weed Law (Minnesota Statutes Sections 18.76 to 18.91).

1.1.3.2 POTENTIAL CONCERN: LAKE SHORELAND AND STREAM RIPARIAN CORRIDORS

Strategy HF-5: Manage riparian corridors and lake shoreland to protect and enhance ecological functions, characterized by capacity to filter surface runoff and sub-surface lateral flow, provide stream and lake shading, act as a corridor for wildlife, provide recreational opportunities, build resilience to disturbance, and support aquatic life.

Action 80: Prepare and maintain formal maps to define the boundary of the riparian area adjacent to perennial streams and rivers, as a means to focus the implementation of incentive based initiatives.

Action 10: Promote BMPs that enhance hydrologic storage by increasing perennial native vegetation in upland and riparian areas that provide connections to expand riparian access. These actions also provide benefits to restoring stream stability and equilibrium where it is found to be impaired. Hydrologic storage could most directly be increased by restoring wetlands.

Action 112: Provide educational materials, consultations, demonstration projects, and workshops to landowners, agricultural producers, and lake shore owners about compensation and incentive programs to promote riparian BMPs and shoreland BMPs (including, shoreland restoration and shoreland revegetation).

Action 72: Determine the location and value of existing barriers relevant to fish management and aquatic invasive species (AIS) control.

Action 35: Meet all statutory requirements of the State of Minnesota (MN Rules 6120.250- 3900) which regulate the subdivision, use, and development of shorelands of public waters, in addition to the Buffer and Soil Erosion Legislation.

Action 15: Use managed and rotational grazing methods to manage animal wastes and prevent livestock entry into surface waterbodies.

Action 105: Perform education and outreach initiatives targeted to general public / lake shore owners about threats of invasive species, and ways to prevent / control them.

The following strategies and associated actions are **also applicable**:

- **Strategy SW-11: Protect aquatic life and aquatic recreation by managing land use and/or minimizing development within lake drainage areas.**

1.1.4 LOCAL KNOWLEDGE BASE AND TECHNICAL CAPACITY (LKTC)

Vision: Broaden the collective understanding of water issues and build a robust and resilient system for maintaining and improving water resources

1.1.4.1 POTENTIAL CONCERN: PUBLIC KNOWLEDGE OF AND BEHAVIOR RELATIVE TO WATER ISSUES

Strategy LKTC-1: Support progress towards measurable water quality goals by encouraging behavioral changes from area youth, residents, landowners, operators, local government units, and elected members through positive and impactful education and outreach experiences.

Action 100: Develop Education and Outreach Initiative with two campaigns: the General Public Knowledge and Behavior Campaign, and the Landowner, Producer and Lake Shore Owner Engagement Campaign

Action 120: Develop a comprehensive civic engagement plan.

Action 113: Provide school presentations and other educational efforts tailored to youth.

Action 114: Provide and distribute educational materials through various multi-media methods about local water management, the impacts of decisions, and actions the public can take to make a difference.

Action 115: Host meetings for the public regarding monitoring results and assessments from North Fork Crow River Watershed 1W1P monitoring activities.

Action 116: Host annual meetings for local government officials about the condition of water resources, progress made, and results and assessments from North Fork Crow River Watershed 1W1P monitoring activities.

1.1.4.2 POTENTIAL CONCERN: LANDOWNER, PRODUCER, AND LAKE SHORE OWNER ENGAGEMENT IN WATER MANAGEMENT

Strategy LKTC-2: Increase adoption of BMPs by increasing engagement and communication with local landowners / producers/ lake shore owners, to increase understanding of issues, identify solutions to overcome fiscal and operational hurdles to conservation practice implementation, and communicate the benefits of implementation activities.

Action 100: Develop Education and Outreach Initiative with two campaigns: the General Public Knowledge and Behavior Campaign, and the Landowner, Producer and Lake Shore Owner Engagement Campaign

Action 117: Provide cooperative education efforts and demonstration projects to promote agricultural BMP's including, but not limited to: nutrient management, conservation tillage, buffers, soil testing, pesticide application, etc..

Action 112: Provide educational materials, consultations, demonstration projects, and workshops to landowners, agricultural producers, and lake shore owners about compensation and incentive programs to promote riparian BMPs and shoreland BMPs (including shoreland restoration and shoreland revegetation).

Action 118: Develop new techniques to promote conservation efforts, such as administering a local certification training program or partnering with agribusiness retailers to recommend appropriate BMPs.

Action 27: Provide one-on-one consultations with landowners and producers about agricultural BMPs, field productivity benefits of BMPs, and available financial incentive options for funding them.

Action 87: Continue to develop and maintain a database inventory of existing BMPs with associated costs of implementation.

Action 119: Support and encourage citizen led initiatives, such as Farmer Led Councils, lake associations, farmer mentor lists, and local advisory committees, that promote conservation through peer based outreach and performance based incentives.

1.1.5 LOCAL DEVELOPMENT AND SUSTAINABILITY (LDAS)

***Vision:** Improve or maintain communities' cultural, economic, natural, and water resources through sustainable development.*

1.1.5.1 POTENTIAL CONCERN: RURAL DEVELOPMENT AND SUSTAINABILITY

Strategy LDAS-3: Promote the sustainability of the rural community characterized by sustainable development, a healthy environment, high land productivity and financial stability through enhancing soil health, managing nutrient applications, and providing BMP incentives to landowners and agricultural producers.

Action 28: Tailor recommended BMPs to each field based on the economic and environmental capacity of each area of a field, such as precision agriculture.

Action 3: Develop and implement nutrient management plans for agricultural producers which follow Best Practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.

Action 4: Develop and implement manure management plans for agricultural producers which follow operational best management practice recommendations, summarized within the MDA Nitrogen Fertilizer Management Plan and consistent with University of Minnesota recommendations.

Action 2: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action 121: Promote education and financial incentives for solid and hazardous waste disposal and existing regulations, rules, and ordinances pertaining to proper waste disposal to reduce chemical and nutrient contamination of water.

Action 23: Encourage use of conservation easement programs in marginal, erodible land.

Action 88: Promote programs that recognize and/or provide incentives to landowners for the multiple benefits resulting from implementation of BMPs, including improved water quality, resilience against flood damage, and protected/enhanced wildlife habitat and biodiversity.

Action 122: Protect the natural meandering of streams and promote the restoration of straightened streams to decrease stream velocity for reducing flood impacts and enhance recreational and fish and wildlife habitat value.

Action 35: Meet all statutory requirements of the State of Minnesota (MN Rules 6120.250- 3900) which regulate the subdivision, use, and development of shorelands of public waters, in addition to the Buffer and Soil Erosion Legislation.

Action 42: Implement and enforce applicable county ordinances and the Wetland Conservation Act (WCA) to retain wetland quantity, function, and value.

Action 44: Administer Minnesota Rules Chapter 7080 through 7083 managing Subsurface Sewage Treatment Systems (SSTS) and Minnesota Rules Chapter 7020 managing feedlots to protect surface and groundwater quality.

Action 89: Identify information sources to better classify rural stewardship within the plan area, including where existing nutrient management plans, soil health and tillage practices, and irrigation best management practices are currently being implemented.

1.1.6 WATER RESOURCES INFRASTRUCTURE (WRI)

***Vision:** Maintain or improve the natural and man-made systems used for managing the rate, volume and quality of water in the North Fork Crow River 1W1P Area.*

1.1.6.1 POTENTIAL CONCERN: URBAN STORMWATER

Strategy WRI-1: Promote the health of urban communities and water resources by maintaining and building upon urban infrastructure transporting water and treating pollutants in surface water.

Action 24: Inspect, maintain and improve the integrity of existing urban structures that route and treat stormwater runoff to prevent downstream stream erosion and flooding and improve water quality.

Action 91: Inventory urban infrastructure to assess downstream flooding and water quality degradation from storm events.

Action 122: Promote the natural meandering of streams to decrease stream velocity for reducing flood impacts and enhance recreational and fish and wildlife habitat value.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 92: Assess capacity to productively reuse stormwater runoff through either rainwater harvesting (collection of roof runoff) or stormwater capture and reuse.

Strategy WRI-2: Minimize contribution of nutrient, sediment, and chloride levels delivered to streams and water storage areas as a result of urban stormwater and construction site erosion.

Action 45: Encourage the use of BMPs on active construction sites to reduce amount of erosion. Refer to MN Rule Chapter 7090 Storm water regulatory program for guidance for activities that do not fall under permitting requirements or are in non-MS4 communities.

Action 25: Encourage implementation and maintenance of BMPs that treat urban stormwater discharge.

Action 104: Promote education about source control within rural subdivisions and urban areas to promote a reduction of chloride loading to waterbodies. Encourage stormwater chloride source reduction in rural subdivisions and urban areas.

Strategy WRI-3: Manage water quantity through low impact development techniques and methods through planning, designing, implementing, and maintaining stormwater management facilities and storage.

Action 36: Encourage stormwater sediment reduction in existing and developing rural subdivisions and urban areas, including implementing existing construction stormwater permit programs and installing MIDS requirements. Promote incorporation of MIDS requirements (or similar) into local zoning ordinances..

Action 47: Review and update local regulations that address storm water erosion and runoff control, grading plan approval, and grading drainage standards.

The following strategies and associated actions are **also applicable**:

- **Strategy SW-11: Protect aquatic life and aquatic recreation by managing land use and/or minimizing development within lake drainage areas.**

1.1.6.2 POTENTIAL CONCERN: AGRICULTURAL DRAINAGE SYSTEMS

Strategy WRI-4: Evaluate the design of private tile drainage systems and promote those systems that can have beneficial effects on the rate, volume, and duration of runoff without negatively impacting surface and groundwater resources.

Action 93: Explore a pilot area inventory and map of known field tile drainage locations in the plan area.

Action 26: Implement and maintain existing drainage management BMPs and conservation drainage practices to control ground water elevation, reduce water volume yield, and remove pollutants from tile discharge prior to entering surface waters.

Action 94: Support research that characterizes the quantity and quality of tile drainage and its impacts on recharge to local groundwater aquifers. Encourage projects that monitor the outfalls of select agricultural tile lines to better understand effects on ecosystem functions.

Strategy WRI-5: Minimize the rate of water movement, pollutant loads, and potential for downstream erosion with conservation practices within the benefit area of public drainage systems as defined by MN Statute 103E and open private drainage systems.

Action 13: Work with landowners and drainage authorities to install two-stage ditch systems for multiple benefits including improved drainage and ditch bank stability and sediment transport, increased habitat (e.g., riffle and pool habitat in low flows) and pollutant removal of nitrogen. Implement and maintain existing BMPs that provide perennial vegetative cover within the Right Of Way (ROW) of the public drainage system to increase stream roughness, and decrease bank erosion.

Action 9: Implement and maintain existing storage BMPs within priority locations.

Action 130: Identify where maintenance is needed on County ditch systems, and complete repairs in accordance with multi-purpose drainage goals as stated in MS 103E.015.

Action 66: Develop a comprehensive hydrologic and hydraulic model for culvert and bridge design to determine timing and magnitude of peak discharge of existing conditions, the duration of discharge, and base flow conditions. Use proper hydrologic and hydraulic design standards for road crossings to provide flood protection, while considering fish passage and environmental needs.

Action 67: Set peak discharge, volume reduction goals and sediment load goals to achieve stable geomorphologic conditions.

Action 23: Encourage use of conservation easement programs in marginal, erodible land.

Action 88: Promote programs that recognize and/or provide incentives to landowners for the multiple benefits resulting from implementation of BMPs, including improved water quality, resilience against flood damage, and protected/enhanced wildlife habitat and biodiversity.

Action 123: Provide educational materials, consultations, and workshops to landowners and agricultural producers about public drainage and public water statutes, including MS 103E.015 subd 1a.

1.2 POTENTIAL CONCERNS: PRIORITY LEVEL “D” AND “E”

1.2.1 SURFACE WATER (SW)

POTENTIAL CONCERN: DRINKING WATER

Strategy SW-18: Protect surface water used as the source of drinking water by managing pesticide and other contaminant loading to surface waters.

Action: Implement and maintain existing BMPs within priority locations that treat surface runoff.

Action: Promote the development of pesticide management plans which follow Best Practices, including Licensed Applicators Statute.

Action: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, thereby managing contaminant releases to groundwater, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action: Encourage the use of precision agriculture as means of efficient application of pesticides.

Action: Implement an education/outreach campaign for the responsible use of pesticides, and disposal of pesticides, chloride, VOCs, heavy metals, hazardous wastes, etc.

Action: Implement an education/outreach campaign to reduce the risk to surface waters from contaminants of emerging concerns such as proper disposal of pharmaceuticals.

Action: Monitor surface water for pesticides and/or other contaminants.

Action: Consider Minneapolis and St. Paul Source Water Protection Areas as part of an evaluation of how existing or new land use activities or redevelopment may impact the quality of the Mississippi River as a drinking water source.

Action: Promote the development of a spill response plan that addresses high volume railroad corridors, pipelines, and other large contaminant threats in relation to the locations of community wells, DWSMA vulnerability and potential impacts to the Mississippi River as a drinking water source.

Action: Educate public on role of water softeners in discharging chloride to river.

Strategy SW-19: Protect surface water used as the source of drinking water by managing nutrient loading to mitigate toxic blue green algae.

Action: Research and implement identification monitoring efforts related to blue-green (cyanobacterial) algal blooms containing toxins or other noxious chemicals.

Action: Implement an education/outreach campaign to inform public of blue-green (cyanobacterial) algal blooms containing toxins or other noxious chemicals, how to identify possible toxic algal blooms, and ways to prevent health risks for humans and domestic animals.

The following strategies and associated actions are **also applicable**:

- **Strategy SW-1:** Manage for stream stability by achieving non-point, point and in-channel sources of sediment in equilibrium with the runoff peak discharge, runoff volume, runoff depth and runoff duration.
- **Strategy SW-4:** Reduce overall nitrate-nitrogen concentrations by managing delivery and loading to surface waters.

- **Strategy SW-5:** Reduce overall total phosphorus concentrations by managing delivery and loading to surface waters.
- **Strategy SW-9:** Reduce overall nitrate-nitrogen concentrations by managing delivery and loading to lakes.
- **Strategy SW-10:** Reduce overall total phosphorus concentrations by managing delivery and loading to lakes.

POTENTIAL CONCERN: SHALLOW LAKES

Strategy SW-20: Maintain or increase condition and/or quality of shallow lakes, characterized by capacity to store excess water and increase habitat for wildlife.

Action: Identify and maintain list of all priority shallow lakes identified by MnDNR for wildlife protection.

Action: Evaluate baseline water quality and habitat conditions on priority shallow lakes.

Action: Implement and maintain existing storage BMPs within priority locations.

The following strategies and associated actions are **also applicable:**

- **Strategy SW-13:** Maintain the quality of native aquatic communities and protect aquatic recreation uses by minimizing the introduction and spread of aquatic invasive species.
- **Strategy SW-9:** Reduce overall nitrate-nitrogen concentrations by managing delivery and loading to lakes.
- **Strategy SW-10:** Reduce overall total phosphorus concentrations by managing delivery and loading to lakes.

1.2.2 FISH AND WILDLIFE HABITAT AND UNIQUE NATURAL FEATURES (HF)

POTENTIAL CONCERN: AQUATIC HABITAT FOR FISH, MACROINVERTEBRATES, AND AQUATIC LIFE

Strategy HF-1: Manage riparian corridors to support healthy and diverse aquatic biological communities and quality aquatic habitat.

Action: Determine the location and value of existing fish barriers relevant to fisheries management and AIS control.

Action: Implement and maintain existing BMPs that provide perennial and woody native vegetative cover within the riparian corridor.

Action: Define areas subject to frequent flooding as the minimum riparian area to be managed on all rivers and streams. For public waters and public ditches, the minimum area identified as frequently flooded will be targeted for additional BMP implementation.

Action: Promote lateral connectivity to the floodplain and provide financial opportunity to landowners from non-productive riparian land.

Action: Meet all statutory requirements of the State of Minnesota (MN Rules 6120.250- 3900) which regulate the subdivision, use, and development of shorelands of public waters, in addition to the Buffer and Soil Erosion Legislation.

Action: Provide educational materials, consultations, and workshops to landowners and agricultural producers about riparian BMPs, including compensation and incentive programs for land adjacent to streams.

Action: Use managed and rotational grazing methods to manage animal wastes and prevent livestock entry into surface waterbodies.

Action: Promote restricted use of chemical management compounds (fertilizers, herbicides, pesticides, etc.) to support the function of healthy riparian corridors.

Strategy HF-2: Protect healthy and diverse aquatic biological communities by maintaining low levels of sediment that balances sediment transport critical for naturally developing adequate pool and riffle topography to support a diverse fishery.

Action: Implement and maintain existing BMPs which are focused on and maintain soil health and soil organic content, including but not limited to conservation tillage and residue management, crop rotation methods, and the use of cover crops.

Action: Complete sufficiently detailed sediment mass balances for affected reaches, which identify the relative magnitude of sediment source leading to habitat degradation.

Action: Meet all statutory requirements of the State of Minnesota (MN Rules 6120.250- 3900) which regulate the subdivision, use, and development of shorelands of public waters, in addition to the Buffer and Soil Erosion Legislation.

Action: Implement and maintain existing BMPs that stabilize ravines, gullies, and gully heads.

Action: Implement and maintain existing storage BMPs within priority locations.

Action: Stabilize and or restore degraded sections of stream and river reaches to provide multiple benefits, such as enhanced hydrologic function and reduced bank failure and sediment deposition into waterbodies, while also providing connectivity benefits for aquatic and terrestrial habitats.

Action: Encourage stormwater sediment reduction in existing and developing rural subdivisions and urban areas, including implementing existing construction stormwater permit programs and installing MIDS requirements. Promote incorporation of MIDS requirements (or similar) into local zoning ordinances.

The following strategies and associated actions are **also applicable**:

- **Strategy GW-6:** Maintain sustainable supply of groundwater for water users and water dependent resources.
- **Strategy SW-1:** Manage for stream stability by achieving non-point, point and in-channel sources of sediment in equilibrium with the runoff peak discharge, runoff volume, runoff depth and runoff duration.
- **Strategy SW-7:** Protect aquatic biological communities by maintaining appropriate levels of dissolved oxygen and temperature.
- **Strategy SW-21:** Increase acreage of quality wetlands, characterized by capacity to store excess water, improve water quality, and increase habitat for wildlife.

POTENTIAL CONCERN: LANDS OF CONCERN

Strategy HF-6: Maintain public recreational opportunity and wildlife habitat by protecting and maintaining public land.

Action: Administer zoning regulations that encourage development practices which preserve public lands, such as Wildlife Management Areas (WMAs), parks, etc.

Action: Develop and maintain a public lands map.

Action: Promote the limited use of chemical management compounds (fertilizers, herbicides, pesticides, etc.) to support the function of healthy upland areas.

Action: Identify areas adjacent to existing public lands that contain include recreational and wildlife habitat features (wetlands, MBS biodiversity sites, priority shallow lakes, etc.) and prioritize for acquisition to enhance recreational opportunities.

The following strategies and associated actions are **also applicable**:

- **Strategy SW-11:** Protect aquatic life and aquatic recreation by managing land use and/or minimizing development within lake drainage areas.

Strategy HF-7: Maintain ecosystem services provided by lands close to existing developments by protecting and maintaining undeveloped land.

Action: Promote protection of undeveloped lands through such programs as acquisition, property tax credits and easements.

Action: Perform education and outreach initiatives targeted to general public / landowners about ecosystem services of undeveloped land.

1.2.3 LOCAL KNOWLEDGE BASE AND TECHNICAL CAPACITY (LKTC)

POTENTIAL CONCERN: TECHNOLOGY, TOOLS, FUNDING, AND EXISTING CAPABILITIES

Strategy LKTC-3: Enhance staff technical capacity, the coordination of roles and responsibilities, and financial sustainability for efficient plan implementation.

Action: Encourage local governmental unit staff, local agency staff, and certified crop advisors to attend trainings on newly developed technology and tools relevant to water resource management.

Action: Develop a database for sharing and maintaining water resource management data, including local GIS data layers and local monitoring data.

Action: Identify and prioritize opportunities to secure long-term and consistent funds through grants, partnerships, and other sources.

1.2.4 LOCAL DEVELOPMENT AND SUSTAINABILITY (LDAS)

RESOURCE CONCERN: URBAN DEVELOPMENT AND SUSTAINABILITY

Strategy LDAS-1: Promote decisions which enhance the sustainability of an urban community, characterized by sustainable development, a healthy environment, access to recreational and economic opportunities, high public safety, and financial stability.

Action: Solicit stakeholder input about plan activities from a diverse, interdisciplinary group that includes local planning and zoning staff in order to integrate the economic, environmental and social policies into water resource management.

Action: Identify opportunities to fund sustainable forest management, prairie, wetland and other natural area preservation and restoration through grants and partnerships.

Action: Develop public outreach and education initiatives and implementation programs dedicated to preventing urban point and nonpoint water pollution to avoid more costly restoration projects in the future.

Action: Promote the natural meandering of urban stream reaches to decrease stream velocity for reducing flood impacts and enhance recreational and fish and wildlife habitat value.

Action: Meet all statutory requirements of the State of Minnesota (MN Rules 6120.250- 3900) which regulate the subdivision, use, and development of shorelands of public waters, in addition to the Buffer and Soil Erosion Legislation.

Action: Administer zoning regulations that encourage growth near urban areas to preserve natural areas and large habitat blocks.

Action: Promote increased public access to natural features such as streams, wetlands and rivers.

Strategy LDAS-2: Promote the health of urban communities and water resources by managing pollutant sources to surface water.

Action: Promote urban BMPs for lawn and managed green spaces (parks, golf courses) that include soil testing and proper use, amount, method and timing of fertilizer/pesticide application.

Action: Implement urban BMPs that reduce the delivery of sediment, nutrients, and pesticide loads to surface water by treating runoff through infiltration, filtration, and uptake.

Action: Provide technical and financial assistance to reduce improper waste disposal from small, unsewered communities, homes with inadequate wastewater treatment, and prevent illicit discharge.

Action: Promote education and financial incentives for solid and hazardous waste disposal to reduce chemical and nutrient contamination of water and illicit discharge.

The following strategies and associated actions are **also applicable**:

- **Strategy SW-18:** Protect surface water resources and drinking water beneficial uses by managing pesticide and other contaminant loading to surface waters.
- **Strategy HF-6:** Maintain public recreational opportunity and wildlife habitat by protecting and maintaining public land.
- **Strategy HF-7:** Maintain ecosystem services provided by lands close to existing developments by protecting and maintaining undeveloped land.

1.2.5 WATER RESOURCES INFRASTRUCTURE (WRI)

POTENTIAL CONCERN: WATER CONTROL STRUCTURES

Strategy WI-6: Manage high peak flows from rural and urban sources using designed water control systems, only if land use changes and BMPs can't adequately address flooding problems.

Action: Identify and field-verify areas where GIS land cover information indicates the need for temporary flood storage, including the potential temporary storage of floodwaters using the transportation system and using best available hydrology data.

Action: Inventory and assess existing flood storage practices on landscape, including those water control structures with legacy accumulation of sediment.

Action: Repair and maintain storage capacity of existing landscape flood storage practices, including those water control structures with legacy accumulation of sediment.

Action: Implement additional flood storage practice BMPs within prioritized areas.

Action: Implement permanent plantings, preferably natives, to increase infiltration.

Action: Promote and implement practices to restore natural hydrology, such as the adoption of drainage water management and the restoration of drained wetlands and altered streams for multiple benefits. Support research of modified agricultural drainage systems. Support innovative water management solutions to conventional tile drainage systems.

Strategy WRI-7: Increase public safety and infrastructure resilience to changing precipitation trends by designing and constructing infrastructure utilizing Atlas 14.

Action: Plan for and implement updates for existing public infrastructure based on anticipated changes in weather patterns and rainfall intensity due to global climate change.

Action: Pursue funding to support construction of new BMPs and enhancement of existing BMPs to expand storm water management capacity.

Action: Work with landowners and drainage authorities to install two-stage ditch systems for multiple benefits including improved drainage and ditch bank stability and sediment transport, increased habitat (e.g., riffle and pool habitat in low flows) and pollutant removal of nitrogen. Implement and maintain existing BMPs that provide perennial vegetative cover within the Right Of Way (ROW) of the public drainage system to increase stream roughness, and decrease bank erosion.

POTENTIAL CONCERN: POINT SOURCES

Strategy WRI-8: Protect surface water quality by managing pollutant loads in water discharging from stormwater, industrial operations, and wastewater discharge pipes to surface waters.

Action: Maintain compliance with National Point Discharge Elimination System (NPDES) Permits for point sources.



APPENDIX L

Methodology: Altered Hydrology

1 NEED TO ASSESS ALTERED HYDROLOGY

One of the stressors commonly referenced as a reason for aquatic life impairments is “altered hydrology.” Altered hydrology is commonly thought to be characterized by increases in peak discharge and runoff volume for a range of precipitation events, as compared to some historic or benchmark condition. Numerous studies have suggested that this hydrologic alteration is a result of some combination of climatic variation, land use/land cover changes, or other landscape scale changes. Aquatic habitat loss, increased streambank erosion and bank failure, and increased sediment levels are some of the suggested consequences of altered hydrology. Individually and collectively these are believed to lead to the impairment of aquatic life, exhibited by lower ecological diversity.

Although a general sense of the characteristics of altered hydrology exists, a substantive challenge remains. A challenge associated with addressing altered hydrology is the lack of a common definition, including agreement on a set of science-based metrics to establish the desired (i.e., benchmark) condition, and assess whether altered hydrology has indeed occurred. **Figure 1** provides an example of hydrologic data which could be used to illustrate altered hydrology. **Figure 1** shows a flow duration curve for a streamflow gage in the Sand Hill River Watershed, within northwestern Minnesota. Two 30-year time periods are shown on the graph; i.e., 1980 – 2010 (solid line) and 1945 - 1975 (dashed line). The graph represents the likelihood of exceeding a specific daily mean discharge. The graph indicates an increase in the daily mean discharge through most of the flow range, because for the same likelihood of exceedance the daily mean discharge is greater for the more recent time periods. This suggests “altered hydrology” meaning that flow conditions in the watershed differ between the two time periods. The example illustrates one possible metric which could be used to describe altered hydrology.

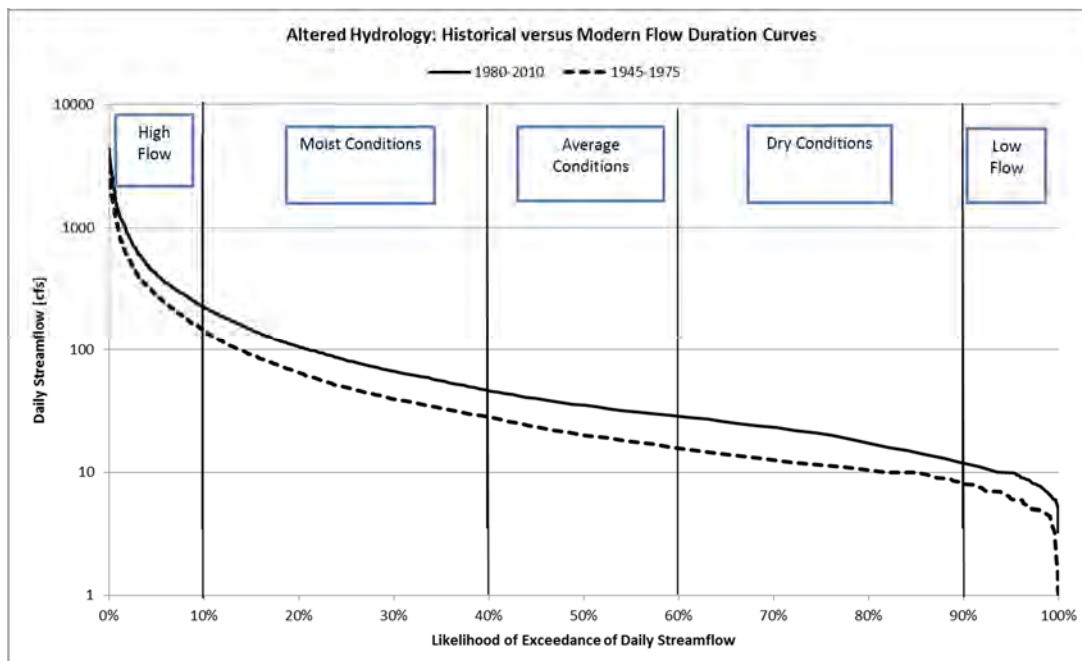


Figure 1. Flow duration curve for the Sand Hill River at Climax, Minnesota. The solid black line shows an increase in daily mean discharge for the 1980 – 2010 period, compared to the early 1945 – 1975 period.

Agreement on a set of science-based metrics to assess the extent of hydrologic alteration and the desired (i.e., benchmark) condition is needed in order to quantitatively assess changes in the hydrology of a watershed. A definition is needed to rigorously assess whether hydrology has indeed changed through time, establish goals for altered hydrology, and assess and evaluate various means, methods and projects to mitigate the adverse effects of altered hydrology.

Considerable research and technical information relative to describing altered hydrology has been completed. The recently release draft report titled “Technical Report: Protection Aquatic Life from Hydrologic Alternatives” (Novak et al., 2015) is one example. The report presents metrics which can be used to describe altered hydrology. However, causal information about how the change in hydrology results in the alteration or loss of ecological function is lacking within the report.

For the hydrology of a watershed to be altered there must be some deviation from a preferred or desired hydrologic condition; i.e., a “benchmark” condition. The benchmark for altered hydrology could be the “natural hydrologic regime” or some other condition. The natural hydrologic regime (Poff et al 1997; Arthington et al 2006; Bunn and Arthington 2002; Sparks 1995) is the characteristic pattern of water quantity, timing and variability in a natural water body. A river’s hydrologic or flow regime consists of environmental flow components (Mathews and Richter, 2007; The Nature Conservancy, 2009), each of which can be described in terms of the magnitude, frequency, duration, timing and rate of change in discharge. The integrity of an aquatic system presumably depends on the natural dynamic character of these flow components to thereby driving ecological processes.

Defining altered hydrology and the benchmark condition, identifying the metrics to describe altered hydrology and translating the information into goals to mitigate the adverse consequences is technically challenging. The approach used to evaluate whether a watershed exhibits altered hydrology is presented within this document. A definition of altered hydrology is presented. Specific quantitative metrics to assess the extent of hydrologic change and the desired (i.e., benchmark) condition are also presented. No effort is made to describe the causal relationship between hydrology and the ecological, geomorphological or water quality effects. Rather, the assumption is made that the desired condition is achieved by obtaining the benchmark condition. These results are intended to be a beginning point in addressing the topic of altered hydrology in a more rigorous manner, which no doubt will evolve through time.

2 METHODS

2.1 A BRIEF HISTORY OF CHANGING HYDROLOGY

Streamflow in Minnesota (Novotny & Stefan, 2007) and across the contentious United States (Lins and Slack 1999, McCabe and Wolock, 2002) have been changing during the past century, with flows in the period starting from the 1970s to the beginning of the 21st Century tending to be higher than during the early to mid-1900s (Ryberg et al. 2014). Numerous studies have been conducted to quantify magnitude of impact and pinpoint relative importance of potential causes of these changes, but scientific consensus has currently not been achieved. The science is not at a point where specific causes can be attributed to altered hydrology with any significant certainty and public discussion about specific causes usually leads to barriers to implementation.

In general, the leading candidate causes of altered hydrology can be categorized into two primary groups: climatic changes and changes in the landscape. Examples of climatic changes include changes in annual precipitation volumes, in surface air temperature, timing of the spring snowmelt, annual

distribution of precipitation, and rainfall characteristics (timing, duration, and intensity). Examples of changes in the landscape include changes in land use/land cover, increased imperviousness (urbanization), tile drainage, wetland removal/restoration, groundwater pumpage, flow retention and regulation, and increased storage (both in-channel and upland storage).

A brief review of the scientific literature and the current scientific debate on the causes of altered hydrology is provide in Appendix A. Although it is important to water resource management to understand the mechanics behind the changes in hydrology, the focus of this analysis is developing a definition for altered hydrology, a method for assessing whether it has occurred within a watersheds, and establishing a goal for addressing altered hydrology.

2.2 ALTERED HYDROLOGY DEFINED

Altered hydrology is defined as a *discernable* change in specific metrics derived from stream discharge, occurring through an entire annual hydrologic cycle, which exceed the measurement error, compared to a benchmark condition. For this framework, *discernable* has been used as a proxy for statistical comparisons. The metrics are typically some type of hydrologic statistic derived from the annual discharge record across a long period of time, usually a minimum of 20-years (Gan et al. 1991). The amount of baseflow, the hydrograph shape, peak discharge, and runoff volume for a range of precipitation event magnitudes, intensities, and durations are specific components of or derived from the annual hydrograph.

2.3 ESTABLISHING BENCHMARK CONDITION

A reference or “benchmark” condition is needed to complete an assessment of whether hydrology is altered. A minimum of a 20-year time-periods reasonably ensures stable estimates of streamflow predictably (Gan et al. 1991; Olden & Poff 2003), sufficient duration to capture climate variability and the interdecadal oscillation typically found in climate (McCabe et al. 2004, Novonty and Stefan 2007), and is the standard timespan used for establishing “normal” climate statistics in the United States. Where the extent data allows it, the analysis is performed for two 35-year time periods; i.e., 1940 – 1975 (benchmark called “historic”) and 1980– 2015 (current or called “modern”). The 1940 – 1975 time period used to establish benchmark conditions represents the period before shifts in hydrology are commonly thought to have begun within Minnesota as a result of land use/land cover changes, or increases in the depth, intensity, and duration of precipitation (see Appendix A for further discussion).

To illustrate the change in streamflow and validity in the breakpoint period, cumulative streamflow (using annual depth values), was plotted across time (**Figure 2**) for the USGS gage at Crow River at Rockford, MN (USGS ID: 05280000). Cumulative streamflow was used instead of straight annual streamflow because (1) it linearizes streamflow relationship where the slope of a trendline would be the average annual streamflow, (2) no assumptions about multi-year dependencies (e.g. changes in storage) or autocorrelation is necessary, and (3) changes in slope can be easily visualized, showing an altered state of hydrology.

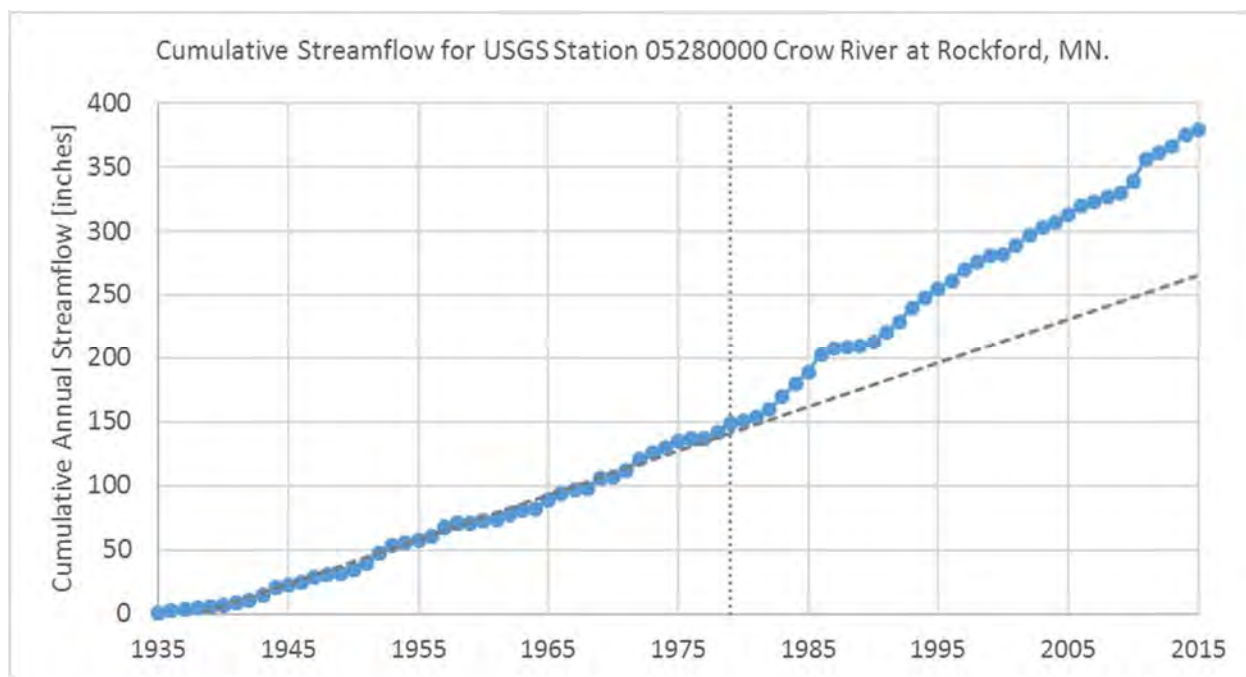


Figure 2. Cumulative streamflow for the Crow River at Rockford, MN (USGS Station 05280000).

2.4 METRICS USED TO ASSESS ALTERED HYDROLOGY

Many potential metrics can be used to describe a measurable change in the annual hydrograph. For example, the indicators of hydrologic alteration software developed by the Nature Conservancy (<https://www.conservationgateway.org/ConservationPractices/Freshwater/EnvironmentalFlows/MethodsandTools/IndicatorsofHydrologicAlteration/Pages/indicators-hydrologic-alt.aspx>) uses 67 different statistics derived from mean daily discharge to describe altered hydrology. Ideally, each indicator or metric could be causally linked to an ecological or geomorphological consequence, although this is technically challenging. Use of such a large number of indicators can be problematic as many of the metrics can be correlated and are therefore interdependent or lack ecological or geomorphological meaning.

The structure and therefore function of ecological systems are often “driven” by “non-normal” events; e.g., low flows associated with drought, higher flows which inundate the floodplain. Metrics used to complete this analysis were preferentially selected to reflect the variability in specific characteristics of the annual hydrograph, and include peak discharges, runoff volumes and hydrograph shape. Each metric was specifically selected to represent a flow condition believed to be of ecological or geomorphological importance, in the absence of causal information. **Table 1** shows the specific metrics used to complete the analysis. The use of these metrics is intended to identify: 1) whether the hydrology within a watershed is indeed altered; and 2) which resources may be at risk because of the alteration.

Table 1. Metrics used to define and assess whether hydrology is “altered” for a specific watershed.

Relevance	Hydrograph Feature	Frequency of Occurrence	Duration	Metric	Ecological or Geomorphic Endpoint
Condition of Aquatic Habitat	Baseflow	10-year	30 day	The minimum change between time periods is the accuracy of measuring streamflow discharge and estimating daily mean discharge. A discharge measurement accurate within 10% of the true value is considered excellent by the United States Geological Survey (USGS). Some additional error is induced through the conversion of these data to discharge. Therefore, a minimum change of 15% is needed between “historic” and ”modern” period for this metric to classified as “altered.”	Discharge needed to maintain winter flow for fish and aquatic life.
		Annual	30-day median (November)		
Aquatic Organism Life Cycle	Shape	Mean	Monthly average of daily means	Use the ”historic” period of record to define “normal variability.” Develop a histograms of daily mean discharges for each month within the period of record for the “historic” and “modern” time periods. Compare the histograms of the monthly average of daily means using an appropriate statistical test. Assume the histograms are from the same statistical population and text for significance at an appropriate significance level.	Shape of the annual hydrograph and timing of discharges associated with ecological cues.
	Timing	Julian day of minimum	1-day		
		Julian day of maximum			
Riparian Floodplain (Lateral) Connectivity	Peak discharge	10-year	24-hour and 10-day	The minimum change between time periods is the accuracy of measuring streamflow discharge and estimating daily mean discharge. A discharge measurement accurate within 10% of the true value is considered excellent by the United States Geological Survey (USGS). Some additional error is induced through the conversion of these data to discharge. Therefore, a minimum change of 15% is needed between “historic” period and “modern” period for this metric to classified as “altered.”	Represents the frequency and duration of flooding of the riparian area and the lateral connectivity between the stream and the riparian area. Functions include energy flow, deposition of sediment, channel formation and surface water – groundwater interactions
		50-year			
		100-year			
	Volume	10-year	Total runoff volume for those days with a daily mean discharge exceeding the 24-hour discharge		
		50-year			
		100-year			

Relevance	Hydrograph Feature	Frequency of Occurrence	Duration	Metric	Ecological or Geomorphic Endpoint
Geomorphic Stability and Capacity to Transport Sediment	Peak Discharge	1.5 year	24 - hour	The minimum change between time periods is the accuracy of measuring streamflow discharge and estimating daily mean discharge. A discharge measurement accurate within 10% of the true value is considered excellent by the United States Geological Survey (USGS). Some additional error is induced through the conversion of these data to discharge. Therefore, a minimum change of 15% is needed between "historic" period and "modern" period for this metric to classified as "altered."	Channel forming discharge. An increase is interpreted as an increased risk of stream channel susceptibility to erosion.
	Volume	1.5 year	Cumulative daily volume exceeding channel forming discharge		
		Average daily	30-year flow duration curve		

¹ Historic period is 1940-1975 and modern period is 1980-2015. Historic period refers to "benchmark" condition.

2.5 DETERMINATION OF ALTERED HYDROLOGY

A simple weight of evidence approach is used to decide whether the hydrology of a watershed is “altered” between two time periods. A “+” is assigned to each metric if it has a discernable increase from the benchmark as defined by the metric, between the historic and modern time periods. A “-” is assigned to each metric if it has a discernable decrease from the benchmark as defined by the metric, between the historic and modern time periods. An “o” is assigned to each metric if it lacks a discernable increase or decrease from the benchmark as defined by the metric, between the historic and modern time periods. If the number of “+” values exceeds the number of “-” values, an increase in the watershed response to precipitation is implied and the hydrology is considered altered between the two time periods. If the number of “-” values exceeds the number of “+” values, the a decrease in the watershed response to precipitation is implied and the hydrology is considered altered between the two time periods. The hydrologic response of the watershed is considered “altered” if the percentage of + and – signs exceeds 50%.

2.6 ESTABLISHING ALTERED HYDROLOGY GOALS

There are two types of goals; i.e., a qualitative and a quantitative goal. The qualitative goal is to return the hydrology to the benchmark condition. The qualitative goal is evaluated using a weight of evidence approach. The goal is simply to achieve the conditions for the historic period as defined by the metrics with **Table 1**. It is presumed the historic period is “better” from an ecological and geomorphological perspective.

The second type of goal is a quantitative storage goal. Several of the metrics within **Table 1** can be used to establish storage goals, which may be accomplished by a variety of types of projects. These project types include not only traditional storage, but increasing the organic matter content of soils. These goals are the change in volume between the historic and modern time periods. The volume needs to be described by the effective volume, which is the amount of storage required on the landscape.

2.7 METHODS FOR EVALUATING ALTERED HYDROLOGY MITIGATION STRATEGIES

Several methods can be used to develop strategies to mitigate the effects of altered hydrology. These methods include the use of continuous simulation hydrology models (like the Hydrologic Simulation Program Fortran) and the event-based hydrology approaches (like those within the Prioritize, Target and Measure Application).

3 ALTERED HYDROLOGY RESULTS

The altered hydrology analysis is completed for a single location within the Crow plan area using measured streamflow discharge. Fiscal limitations prevented applying the technique to each planning region, which is the preferred spatial scale.

Using mean daily discharge data from the USGS gage at Crow River at Rockford, MN (USGS ID: 05280000), the altered hydrology analysis was conducted, comparing two periods: a “historic” period and a “modern” period. Studies have identified the mid-1970s as an inflection point in the hydrologic record representing a “change” in the hydrologic conditions in the Upper Midwest, driven by a combination of changes in precipitation and land use/land cover (Frans et al., 2013; Schottler et al., 2013). Analysis of the cumulative runoff over time show this assumption is correct (see **Figure 2**). All metrics are computed

using water years, i.e. October of the previous year through September of the reporting year (e.g. water year 2015 is October 1, 2014 through September 30, 2015).

3.1 METRICS OF ALTERED HYDROLOGY

3.1.1 CONDITION OF AQUATIC HABITAT

The condition of aquatic habitat includes a group of metrics that primarily reflect the flow characteristics of the annual hydrograph, needed to maintain adequate habitat for fish and aquatic life. The 7-day low flow, the 30-day low flow, and the median November mean daily discharge are metrics used to represent changes in the availability of flow for aquatic habitat.

3.1.1.1 ANNUAL MINIMUM 30-DAY MEAN DAILY DISCHARGE

The annual minimum 30-day mean daily discharge is the minimum of the 30-day moving mean daily discharge within a year (an annual minimum series). **Figure 3** shows the annual minimum 30-day mean daily discharge for select return periods (1.01-year, 1.5-year, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year). **Table 2** summarizes the data shown in **Figure 3**. According to **Table 2**, the annual

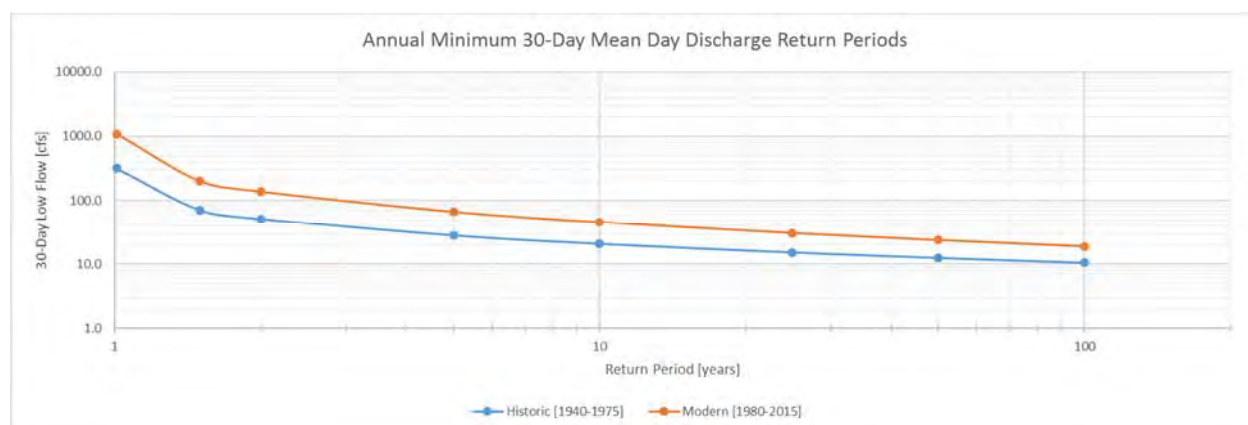


Figure 3. Historical (1940-1975) versus modern (1980-2015) annual minimum 30-day mean daily discharge versus return period for Crow River at Rockford, MN (USGS ID: 05280000).

Table 2: Summary of annual minimum 30-day mean daily discharge by return periods for the Crow River at Rockford, MN.

Return Period	Historic Period [1940-1975]	Modern Period [1980-2015]	% Diff.	Altered Hydrology Criterion
1.01	319.0	1096.1	243.6%	+
1.5	71.0	200.6	182.6%	+
2	51.6	137.5	166.7%	+
5	28.2	66.3	135.0%	+
10	20.8	45.5	118.4%	+
25	15.2	30.6	101.0%	+
50	12.5	23.7	89.9%	+
100	10.5	18.8	80.1%	+

+ symbol indicates metric exhibits altered hydrology and an increase for the modern period compared to the historic period

o symbol indicates fails to exhibit altered hydrology for the modern period compared to the historic period

- symbol indicates metric exhibits altered hydrology and a decrease for the modern period compared to the historic period

minimum 30-day mean daily discharge has increased across all return periods. **Figure 3** and **Table 2** show that the modern time period exhibits an increase in the annual minimum 30-day mean daily discharge compared to the historical period. The percentage increase is greater for more frequent return periods.

3.1.1.2 ANNUAL MINIMUM 7-DAY MEAN DAILY DISCHARGE

Like the annual minimum 30-day mean daily discharge, the annual minimum 7-day mean daily discharge is the minimum of the 7-day moving average flow in the year. **Figure 4** shows the annual minimum 7-day mean daily discharges for select return periods (1.01-year, 1.5-year, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year). **Table 3** summarizes the data shown in **Figure 4**. According to **Table 3**, the annual minimum 7-day mean daily discharge has increased across all return periods. **Figure 4** and **Table 3** show that the modern time period exhibits an increase in the annual minimum 7-day mean daily discharge compared to the historical period. The percentage increase is greater for more frequent return periods.

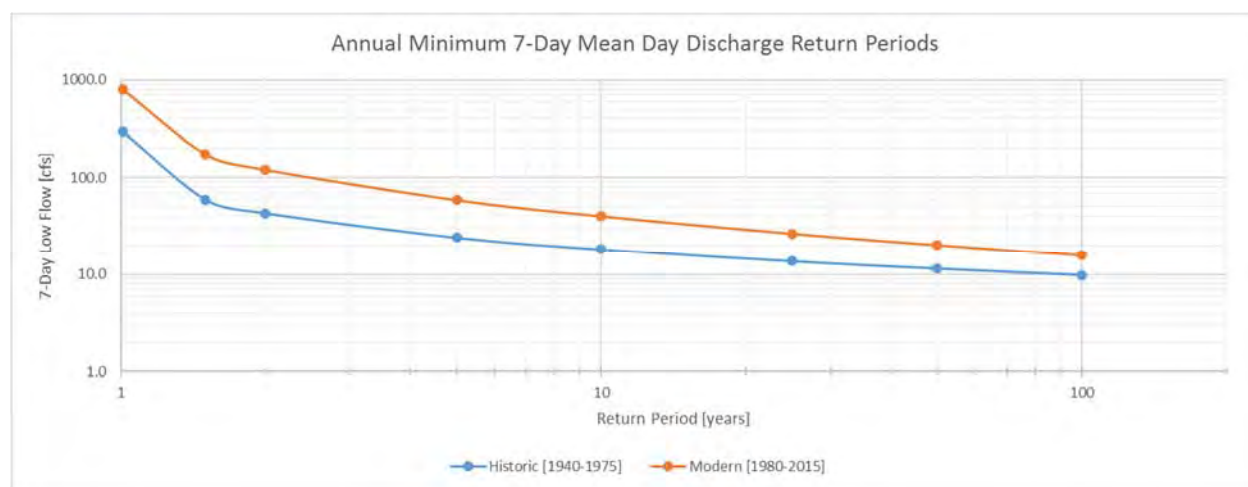


Figure 4. Historical (1940-1975) versus modern (1980-2015) annual minimum 7-day mean daily discharge return periods for Crow Rivers at Rockford, MN (USGS ID: 05280000).

Table 3: Summary of annual minimum 7-day mean daily discharge return periods for the Crow River at Rockford, MN.

Return Period	Historic Period [1940-1975]	Modern Period [1980-2015]	% Diff.	Altered Hydrology Criterion
1.0101	294.1	792.0	169.4%	+
1.5	59.4	173.3	191.7%	+
2	43.1	121.0	180.6%	+
5	24.1	59.0	145.2%	+
10	18.1	40.2	121.6%	+
25	13.7	26.6	94.5%	+
50	11.5	20.2	76.6%	+
100	9.8	15.8	60.5%	+

+ symbol indicates metric exhibits altered hydrology and an increase for the modern period compared to the historic period

o symbol indicates fails to exhibit altered hydrology for the modern period compared to the historic period

- symbol indicates metric exhibits altered hydrology and a decrease for the modern period compared to the historic period

3.1.1.3 NOVEMBER MEDIAN DAILY DISCHARGE

The median daily mean discharge for November is another indicator of baseflow in the Crow River. This metric is intended to represent baseflow condition during the winter months. **Table 4** provides the median November flow for each period. The median November flow has increased by 330% between the historic period (1940-1975) and the modern period (1980-2015).

Table 4: Historical (1940-1975) and modern (1980-2015) median November flow for the Crow River at Rockford, MN.

Return Period	Historic Period [1940-1975]	Modern Period [1980-2015]	% Diff.	Altered Hydrology Criterion
Period median November flow [cfs]	114	490	329.8 %	+

+ symbol indicates metric exhibits altered hydrology and an increase for the modern period compared to the historic period

o symbol indicates fails to exhibit altered hydrology for the modern period compared to the historic period

- symbol indicates metric exhibits altered hydrology and a decrease for the modern period compared to the historic period

3.1.2 AQUATIC ORGANISM LIFE CYCLE

The shape of the annual hydrograph and timing of discharges are associated with ecological cues. Metrics related to the aquatic organism life cycle include the shape of the annual hydrographs, timing of the annual minimum flow, and timing of the annual peak flow.

3.1.2.1 ANNUAL DISTRIBUTION OF DISCHARGES

The annual distribution of runoff is shown two ways: as average monthly runoff volume in acre-feet per month (**Figure 5**) and as a percentage of average annual runoff volume (**Figure 6**). **Figure 5** shows the magnitude of changes between the historic and modern periods and the increases of monthly average runoff volume across the year. **Figure 6** shows the distribution of volumes has changed across a year. As seen in **Figure 6**, although the magnitudes of monthly volumes (**Figure 5**) have increased the relative distribution of runoff across the year has remained relatively the same, with the exception of the increased percentage of annual flow occurring in April. **Table 5** summarized the data used to generate **Figures 5** and **6**.

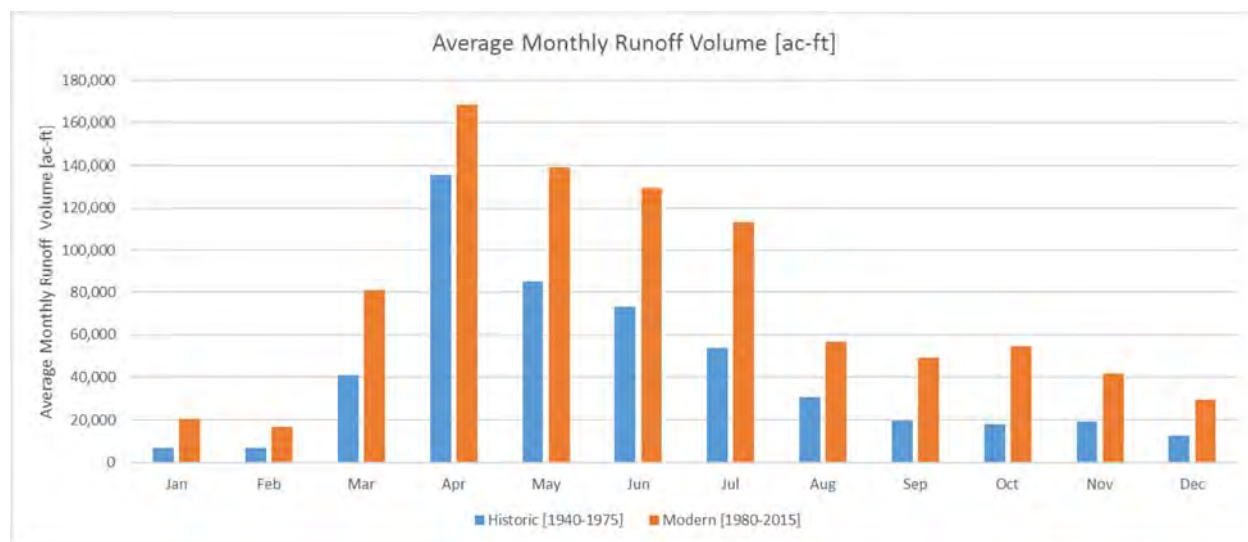


Figure 5. Average monthly runoff volume [ac-ft] in the Crow River at Rockford, MN (USGS ID: 05280000).

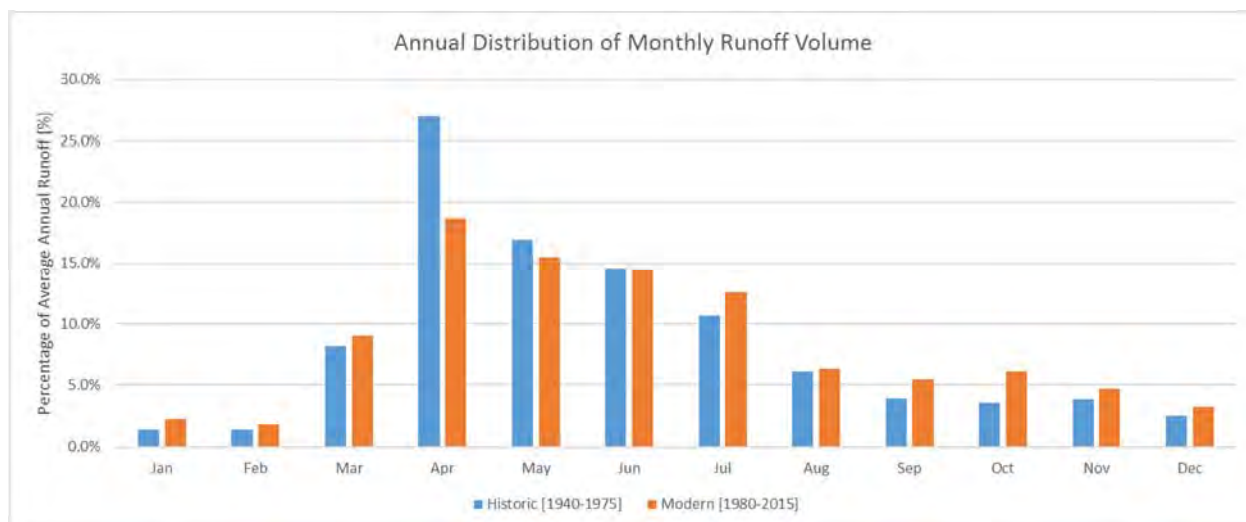


Figure 6. Annual distribution of average monthly runoff volume as a percentage of annual total volume in the Crow River at Rockford, MN (USGS ID: 05280000).

Table 5. Average monthly runoff volume and annual distribution of monthly runoff volumes in Crow River at Rockford, MN

Month	Average Monthly Volumes [ac-ft]				Distribution of Annual Volume			
	Historic Period [1940-1975]	Modern Period [1980-2015]	% diff.	AH	Historic Periods [1940-1975]	Modern Period [1980-2015]	% diff.	AH
Jan	6,981	20,361	191.7%	+	1.4%	2.3%	62.6%	+
Feb	7,017	16,773	139.0%	+	1.4%	1.9%	33.2%	+
Mar	40,782	80,849	98.2%	+	8.1%	9.0%	10.5%	+
Apr	135,456	168,368	24.3%	+	27.0%	18.7%	-30.7%	-
May	84,974	139,401	64.1%	+	16.9%	15.5%	-8.6%	O
Jun	73,102	129,509	77.2%	+	14.6%	14.4%	-1.3%	O
Jul	53,535	113,382	111.8%	+	10.7%	12.6%	18.0%	+
Aug	30,685	56,547	84.3%	+	6.1%	6.3%	2.7%	O
Sep	19,701	49,077	149.1%	+	3.9%	5.5%	38.8%	+
Oct	17,758	54,655	207.8%	+	3.5%	6.1%	71.5%	+
Nov	19,130	41,912	119.1%	+	3.8%	4.7%	22.1%	+
Dec	12,637	29,391	132.6%	+	2.5%	3.3%	29.6%	+

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o symbol indicates fails to exhibit altered hydrology for the modern period compared to the historic period

- symbol indicates metric exhibits altered hydrology and a decrease for the modern period compared to the historic period

AH means altered hydrology criterion

3.1.2.2 TIMING OF ANNUAL MAXIMUM AND MINIMUM FLOWS

The timing of the annual maximum daily discharge and annual minimum daily discharge are important metrics of the annual distribution of flows. The timing of the annual maximum typically occurs during the spring flood and the timing of the annual minimum usually occurs during the winter months. **Table 6** provides statistics on the Julian day of the annual maximum flow and **Table 7** provides the Julian day for the annual minimum flow. The statistics include the average, the median, and the mode. The mode is the Julian day that occurs the most during the period. These data suggest the maximum peak discharge is occurring later, but no change has occurred in the timing of the minimum peak discharge.

Table 6. Julian Day of annual maximum in the Crow River at Rockford, MN.

Statistic	Historic Period ¹ [1940-1975]	Modern Period ¹ [1980-2015]	% diff.	AH
Average	May 5	May 18	10.7%	+
Median	April 16	May 7	19.8%	+
Mode	March 18	April 1	18.2%	+

¹Based on 365-day year.

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- symbol indicates metric exhibits altered hydrology and a decrease for the modern period compared to the historic period

AH means altered hydrology criterion

Table 7. Julian Day of annual minimum flow in the Crow River at Rockford, MN.

Statistic	Historic Period ¹ [1940-1975]	Modern Period ¹ [1980-2015]	% diff.	AH
Average	July 9	July 17	4.5%	o
Median	Sept 10	Sept 6	-1.4%	o
Mode	Sept 30	Sept 30	0.0%	o

¹Based on 365-day year.

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- symbol indicates metric exhibits altered hydrology and a decrease for the modern period compared to the historic period

AH means altered hydrology criterion

3.1.3 RIPARIAN FLOODPLAIN (LATERAL) CONNECTIVITY (PEAK FLOWS)

The riparian floodplain connectivity metrics represent the frequency and duration of flooding of the riparian area and the lateral connectivity between the stream and the riparian area. Functions include energy flow, deposition of sediment, channel formation and surface water – groundwater interactions. The riparian floodplain connectivity metrics include the discharge rates for the 10-year, the 25-year, the 50-year, and the 100-year peak discharges. The annual peak discharge rates for select return periods (1.01-year, 1.5-year, 2-year, 5-year, 10-year, 25-year, 50-year, 100-year, and 200-year) are shown in **Figure 7**. It should be noted that the discharge rates in **Figure 7** were computed using the USGS's annual maximum flow rates and not the daily average discharge rates.

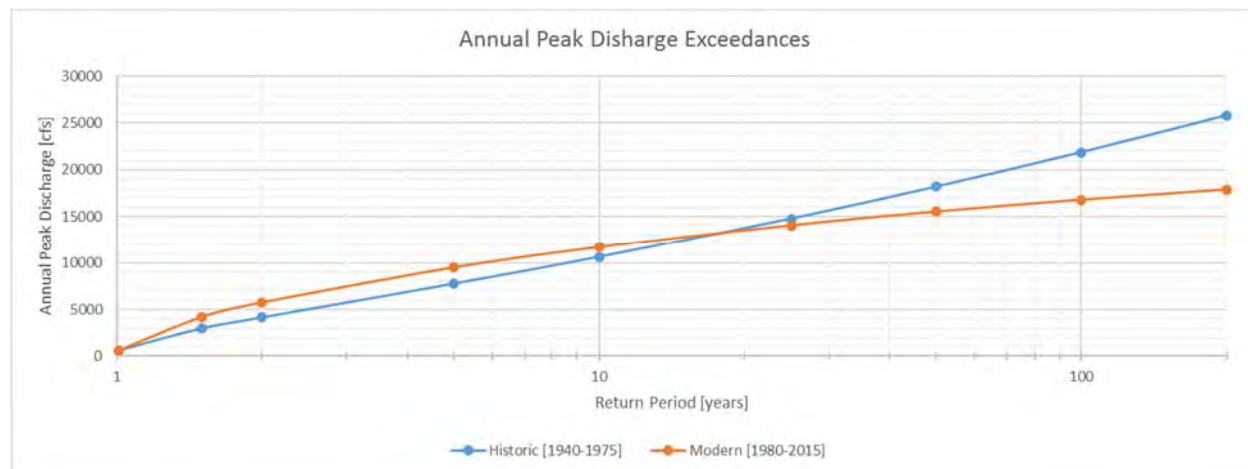


Figure 7. Historical (1940-1975) versus modern (1980-2015) peak discharge return periods for Crow Rivers at Rockford, MN (USGS ID: 05280000).

In addition, the number of years with discharges exceeding the historic peak discharge within a period, the average number of days above the historic peak discharge rates, and the average cumulative volume of discharge above the historic peak discharges are provide (**Table 8**). The data provided in **Table 8** were computed using the daily mean discharge time series and may show slight differences from **Figure 7**.

Table 8. Riparian floodplain connectivity metrics for the Crow River at Rockford, MN

Flow Metric	Historic Period [1940-1975]	Modern Period [1980-2015]	% Diff.	Altered Hydrology
5-Year Peak Discharge, $Q(5)$ [cfs]	7,710	9,432	22.3%	+
Number of years with Discharge (Q) > $Q_{pre}(5)$	5	10	100%	+
Average number of days per year $Q > Q_{pre}(5)$	13	13	1.6%	o
Average annual cumulative volume > $Q_{pre}(5)$ [ac-ft]	104,469	49,795	-52.3%	-
10-Year Peak Discharge, $Q(10)$ [cfs]	10,569	11,388	7.7%	o
Number of years with Discharge (Q) > $Q_{pre}(10)$	4	6	50.0%	+
Average number of days per year $Q > Q_{pre}(10)$	9	7	-22.2%	-
Average annual cumulative volume > $Q_{pre}(10)$ [ac-ft]	62,945	12,440	-80.2%	-
25-Year Peak Discharge, $Q(25)$ [cfs]	14,646	13,431	-8.3%	o
Number of years with Discharge, (Q) > $Q_{pre}(25)$	2	0	NA ¹	o
Average number of days per year $Q > Q_{pre}(25)$	5	0	NA ¹	o

Flow Metric	Historic Period [1940-1975]	Modern Period [1980-2015]	% Diff.	Altered Hydrology
Average annual cumulative volume > Q_{pre} (25) [ac-ft]	34,352	0	NA ¹	o
50-Year Peak Discharge, $Q(50)$ [cfs]	17,983	14,676	-18.4%	-
Number of years with Discharge (Q) > Q_{pre} (50)	1	0	NA ¹	o
Average number of days per year $Q > Q_{pre}$ (50)	5	0	NA ¹	o
Average annual cumulative volume > Q_{pre} (50) [ac-ft]	26,153	0	NA ¹	o
100-Year Peak Discharge, $Q(100)$ [cfs]	21,550	15,719	-27.1%	-
Number of years with Discharge (Q) > Q_{pre} (100)	1	0	NA ¹	o
Average number of days per year $Q > Q_{pre}$ (100)	2	0	NA ¹	o
Average annual cumulative volume > Q_{pre} (100) [ac-ft]	1,784	0	NA ¹	o

¹No events occurred above return period discharge.

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3.1.4 GEOMORPHIC STABILITY AND CAPACITY TO TRANSPORT SEDIMENT

The geomorphic stability and capacity to transport sediment metrics are related to the channel forming discharge. An increase in these metrics would be interpreted as an increase in the risk of the stream channel susceptibility to erosion. These metrics include changes to the flow duration curves, the 1.5-year peak flow, the 2-year peak flow. The 1.5-year to 2-year peak flows are generally consider the range of channel forming flow. In addition, the number of years within a period exceeding the historic peak flows, the average number of days above the historic peak flow rates, and the average volume of flow above the historic peak flows are provide (Table 9).

Figure 8 is the flow duration curves for the historic (1940-1975) and modern (1980-2015) periods and Table 9 provides a summary of flows for select percent exceedances. Both show that discharges across

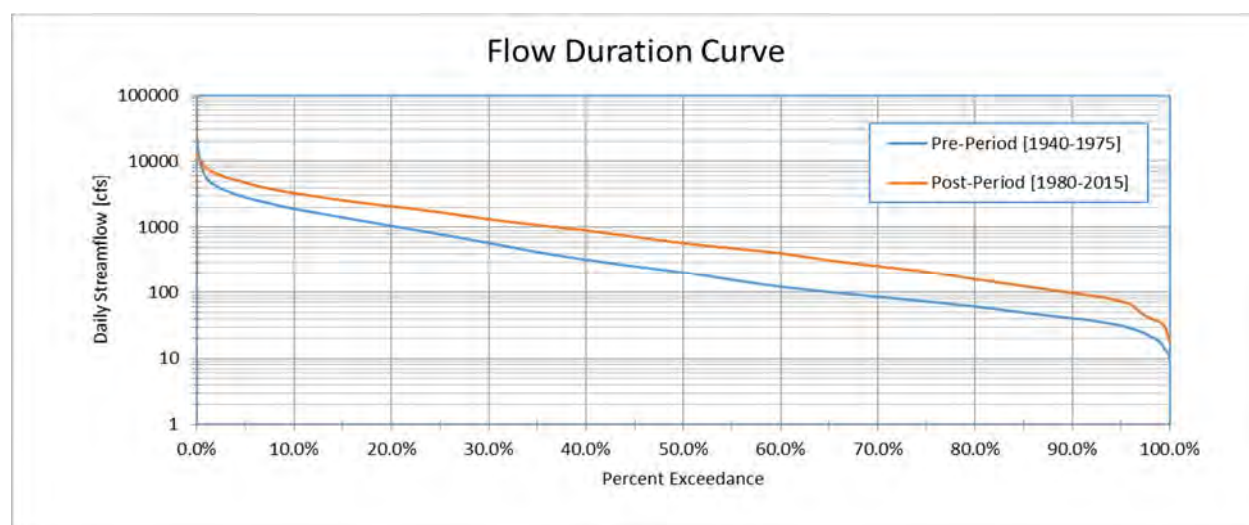


Figure 8. Historical (1940-1975) versus modern (1980-2015) flow duration for Crow Rivers at Rockford, MN (USGS ID: 05280000).

Table 9. Select summary of the flow duration curves for the Crow River at Rockford, MN

Percent Exceedance	Historic Period [1940-1975]	Modern Period [1980-2015]	% Diff.	Altered Hydrology
0.1%	13,785	11,700	-15.1%	-
1.0%	5,500	7,580	37.8%	+
10.0%	1,920	3,260	69.8%	+
25.0%	793	1,670	110.6%	+
50.0%	207	569	174.9%	+
75.0%	87	253	190.8%	+
90.0%	41	97	136.6%	+
99.0%	18	35	94.4%	+
99.9%	12	20	66.7%	+

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the flow spectrum have increased substantially, with the exception of the very high flows. **Table 10** provides the 1.5-year and 2-year annual peak flows and flow statistics. It shows that the magnitude, the occurrences, and durations of the channel forming flows have significantly increased between the two periods. This may lead to increase instability of the channel and lead to increase erosion risk.

Table 10. Geomorphic stability and capacity to transport sediment metrics for the Crow River at Rockford, MN

Flow Metric	Historic Period [1940-1975]	Modern Period [1980-2015]	% Diff.	Altered Hydrology
1.5-Year Peak Discharge, $Q(1.5)$ [cfs]	2,937	4,435	51.0%	+
Number of years with Discharge (Q) > $Q_{pre}(1.5)$	24	29	20.8%	+
Average number of days per year $Q > Q_{pre}(1.5)$	26	54	108.0%	+
Average annual cumulative volume > $Q_{pre}(1.5)$ [ac-ft]	102,304	205,439	100.8%	+
2-Year Peak Discharge, $Q(2)$ [cfs]	4,109	5,942	44.6%	+
Number of years with Discharge (Q) > $Q_{pre}(2)$	14	27	92.9%	+
Average number of days per year $Q > Q_{pre}(2)$	14	31	125.2%	+
Average annual cumulative volume > $Q_{pre}(2)$ [ac-ft]	73,250	121,132	65.4%	+

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3.2 SUMMARY OF ALTERED HYDROLOGY IN THE CROW RIVER AT ROCKFORD, MN

Table 11 provides a summary of the altered hydrology metrics. Overall, the streamflow metrics in the Crow River at the USGS gaging station at Rockford have increased, with the exception of peak discharge with a return period greater than 10-years. **Table 12** shows that the hydrology of the watershed has been altered for the modern period compared to the historic (benchmark) period.

Table 11. Summary of altered hydrology metrics.

Group	Metric	% Difference	Altered Hydrology Metric	Evidence of Altered Hydrology for Group
Aquatic Habitat	10-year, Annual Minimum 30-day Mean Daily Discharge	118.40%	+	Yes - increase
	10-year, Annual Minimum 7-day Mean Daily Discharge	121.60%	+	
	Median November (Winter Base) Flow	329.80%	+	
Aquatic Organism Life Cycle	Magnitude of Monthly Runoff Volumes	77.2% - 207.8%	+	Maybe - increase
	Distribution of Monthly Runoff Volumes	-30.7% - 71.5%	O	
	Timing of Annual Peak Discharge	10.70%	+	
	Timing of Annual Minimum Discharge	4.50%	O	
Riparian Floodplain (Lateral) Connectivity	10-year Peak Discharge Rate	7.70%	O	Yes - decrease
	50-year Peak Discharge Rate	-18.4%	-	
	100-year Peak Discharge Rate	-27.1%	-	
	Average Cumulative Volume above the Historic 10-year Peak Discharge	-52.3%	-	
	Average Cumulative Volume above the Historic 50-year Peak Discharge	-100%	-	
	Average Cumulative Volume above the Historic 100-year Peak Discharge	-100%	-	
Geomorphic Stability and Capacity to Transport Sediment	1.5-year Peak Discharge Rate	51.0%	+	Yes - increase
	2-year Peak Discharge Rate	44.6%	+	
	Average Cumulative Volume above the Historic 1.5-year Peak Discharge	100.8%	+	
	Average Cumulative Volume above the Historic 2-year Peak Discharge	65.4%	+	
	Duration above the Historic 1.5-year Peak Discharge	108.0%	+	
	Duration above the Historic 2-year Peak Discharge	125.2%	+	
	Flow Duration Curve	-15.1% - 190.8%	+	

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O symbol indicates fails to exhibit altered hydrology for the modern period compared to the historic period

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Table 12. Summary of altered hydrology metrics. Hydrology is considered altered if percent of the total metrics exceeding the altered hydrology metrics is greater than 50%.

Category	Number (% of total)
No. of Metrics Used	20
No. of Positive Metrics Exceeding Altered Hydrology Criteria	12 (60%)
No. of Neutral Metrics	3 (15%)
No. of Negative Metrics Exceeding Altered Hydrology Criteria	5 (25%)
No. of Metric Exceeding Altered Hydrology Criteria	17 (85%)

4 ALTERED HYDROLOGY GOAL

Goals for addressing the change in hydrology were estimated using three methods. Each method is based on different assumptions and altered the metrics for a specific “altered hydrology” group (see Table 11). The first method is focused on the aquatic habitat and geomorphic and ability to transport sediment metric group and uses the change in the cumulative volume for mean daily discharges, exceeding the 1.5-year return period event. The cumulative total volume when the daily average discharge exceeds the 1.5-year peak discharge includes all flows above the 1.5-year peak, i.e. can include storms with much larger return periods. The change in average annual cumulative volume above the 1.5-year peak flow for the Crow River is ~104,000 acre-feet (see **Table 10**) or 0.75 inches across the entire watershed draining to the gage. This method is based on the changes in the observed data and since it includes all flows above the 1.5-year flow relies on the two periods to have a similar distribution of flows. Since the flow record in the Crow River includes flow above the 10-year flow in the historic period only, this estimate may be underestimated.

The second method is based on the changes in hydrology across the entire annual hydrograph, and integrates the differences in return period discharges between the modern and historic period (see **Table 13**) and finding a probability-weighted representative change in flow rate. A volume is then found by assuming a flow period equal to the change in flow period for the 1.5-year flow (i.e. the change in the number of days above the 1.5-year flow, 28 days; see **Table 10**). The estimated goal for the Crow River upstream of Rockford using the second method is ~130,000 acre-feet (**Table 13**). This corresponds to an average depth of 0.93 inches across the watershed. This method assumes a constant flow over a representative duration to estimate the storage goal. Since a hydrograph typically changes over time, this method may over-estimate the storage goal.

Table 13. Estimated goal for the Crow watershed upstream of Rockford, MN using method 2.

Return Period	Historic Period Discharges (cfs)	Modern Period Discharges (cfs)	Difference (cfs)	Probability of Occurrence	Difference* Probability (cfs)
1.5	2,937	4,435	1,498	0.67	1,003.7
2	4,109	5,942	1,834	0.5	917.0
5	7,710	9,432	1,722	0.2	344.3
10	10,569	11,388	819	0.1	81.9
25	14,646	13,431	-1,215	0.04	-
50	17,983	14,676	-3,307	0.02	-
100	21,550	15,719	-5,831	0.01	-
				Sum	2,346.9 cfs
					4,656.2 ac-ft/day
Change in average number of days above the Q(1.5)			28	Total Volume Goal	130,373 ac-ft (0.93-inch)

The third method is also based on addressing the effects through the entire flow range and is a revision to Method 2. Method 3 considers incorporates the observed change in the timing of the peak discharge for each return period event. This method uses the probability-weighted representative change in flow rate and multiplies the flow rates by the change in the number of days exceeding the return period flow for each return period (see **Table 14**). Using this method, the storage goal for the Crow River at Rockford is ~96,500 acre-feet or 0.7 inches across the watershed.

This analysis presents a preliminary framework for defining altered hydrology, applying a method to determine whether altered hydrology has occurred, and establishing a goal for relating to proposed projects. The goal ranges from 96,500 acre-feet to 130,000 acre-feet or depths of 0.69 inches to 0.93 inches across the watershed. For planning purposes, we recommend a preliminary goal of 0.75 inches across the watershed, realizing that the altered hydrology goals should ideally be established at the 12-digit HUC scale. The actual amount of mitigation needed may exceeds the estimated range, as the methods used to achieve the goal are not expected to be 100% effective in removing volume from peak of the hydrograph. The means to achieve the estimated mitigation goal may include the use of structural practices and management practices and should be specifically evaluated through completion of a hydrologic study or the use of appropriate tools and models.

Table 14. Estimated goal for the Crow watershed upstream of Rockford, MN using method 3.

Return Period (Years)	Change in flow ($Q_m - Q_h$) (cfs)	Probability of Occurrence	Change in flow* Probability (cfs)	Probability weighted flow (AF/Day)	Change in the number of days above flow (days)	Storage Volume (AF)
1.5	1,498	0.67	1,004	1,991	28	55,757
2	1,834	0.5	917	1,819	17	30,928
5	1,722	0.2	344	683	0.2	137
10	819	0.1	82	162	0	0
					Total Volume Goal	96,469 AF 0.69 inches

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APPENDIX A: A CHANGING HYDROLOGY-THE SCIENTIFIC DEBATE

It is the position of the authors that, although as helpful as it would be, understanding the causes of altered hydrology is not needed to quantify level of changes and develop mitigation goals. Although not necessary to quantify altered hydrology and set mitigation goals, understanding the causes of altered hydrology can be useful for water resources managers and stakeholders within a watershed. The following summarizes the ongoing discussion on the potential causes of altered hydrology in order to provide background on the research that has been conducted on the subject.

Numerous studies have investigated the links between changes in climate and the landscape to changes in the hydrologic response in a variety of watersheds (see References Section) but the science is not at point where causes of the alterations can be definitively linked to specific causes and quantified. The scientific discussion has circulated around two opposing viewpoints: altered hydrology is mainly driven by climatic changes, or is mainly driven by changes to the landscape, i.e. man-made or anthropomorphic changes. The complex nature of the relationship between precipitation and streamflow drives these conflicting viewpoints. *Poff et al. (1996)* summarizes the complex nature of streamflow as: *All river flow derives ultimately from precipitation but in any given time and place a river's flow is derived from some combination of surface water, soil water, and groundwater. Climate, geology, topography, soils, and vegetation help to determine both the supply of water and the pathways by which precipitation reaches the channel.*

Even though the main drivers of altered hydrology are still being debated, all agree that streamflow in Minnesota's streams, as well as the contiguous United States, have been increasing since the middle of the twentieth century (*Novotny and Stefan 2007, Lins and Slack 1999 & 2005*). *McCabe and Wolock (2002)* noticed a discernable step change in streams across the conterminous United States during the 1970s. The mid-1970s is typically viewed as the breakpoint in hydrology and corresponds to numerous compounding factors occurring, in general, around the same period. Those factors include the widespread replacement of grasses and small grains as the predominate crops to row crops, such as corn and soybeans in the Midwest (*Schilling, 2003, 2005; Zhang and Schilling, 2006; Foufoula-Georgiou et al.; 2016*), as well as the conversion of forest and wetlands to agricultural lands, and was accompanied by wide spread adoption of plastic tile drainage (*Gupta et al, 2015*). Artificial surface and subsurface drainage is viewed by many as a major contributor to increased streamflow (see *Shilling & Libra 2003; Raymond et al, 2008; Schottler et al, 2014* as examples). In addition, the following decades have seen documented climatic trends, including of warmer temperatures, earlier snowmelt, increased annual precipitation, and rainfall events of higher intensity and shorter duration (*Karl et al., 1996; Karl and Knight, 1998; Groisman et al., 2004; Villarinni et al., 2011; Danesh-Yazdi et al., 2016*). The following will discuss the literature linking climate changes to altered hydrology, followed by the literature linking anthropomorphic changes to altered hydrology, and a brief description of some issues within the current science.

Climate, specifically precipitation, is the main driver (over both space and time) for the generation of runoff, as all other components of runoff generation translate precipitation into runoff (see *Poff et al. 1996*). Increases in intensity, duration, and frequency of precipitation, changes in the timing of the spring snowmelt, and increases in magnitude and timing of seasonal temperatures can all play a role changing hydrology in a watershed. *Novonty and Stefan (2007)* correlated trends seen in Minnesota's streamflows to changes in observed climate. *Tomer and Schilling (2009)* concluded that climate change has been the

larger of the two main drivers (climate change and land use change) for increased streamflows in the Midwestern United States. Using a non-linear water-balance approach, *Ryberg et al.* (2014) show that changes in precipitation and potential evapotranspiration explain the majority of multidecadal spatial/temporal variability in runoff and flood magnitudes, with precipitation being the main driver, and that historical changes in climate and runoff appear to be more consistent with complex transient shifts in seasonal climate conditions than with gradual climate changes. According to Fofoula-Georgiou et al. (2015), two major trends have been observed: (1) higher temperatures leading to earlier snowmelt and a longer growing season and (2) an increase in precipitation with an intensification of extreme storms (e.g., Lettenmaier et al., 1994; Changnon and Kunkel, 1995; Karl et al., 1996; Angel and Huff, 1997; Michaels et al., 2004; Groisman et al., 2004, 2012; Pryor et al., 2009; Villarini et al., 2011; Higgins and Kousky, 2013; Walsh et al., 2014). Changes in evaporative and radiative cooling have also been reported and attributed to the enhanced seasonal precipitation signal (Milly and Dunne, 2001).

In addition to climatic changes, researchers have stipulated that streamflows have been increasing more than the increased precipitation alone can explain (*Raymond et al.*, 2008; *Zhang and Schilling*, 2006; *Schillings et al.*, 2010). Raymond et al. (2008) argued that changing agricultural practices have led to a 50 km³ yr⁻¹ increase in water flux from the Mississippi River from a pre- to post-disturbance period (before and after 1940). Zhang and Schilling (2006) concluded that increasing discharge since the 1940s was mainly due to an increase in baseflow resulting from the rapid expansion of soybean cultivation that occurred in the Mississippi River basin during the middle of the 20th century (343% increase from 1950 to 1992; Donner et al., 2003). Agricultural landscape changes can significantly change seasonal evapotranspiration (ET) potential (Zhang and Schilling, 2006; Schilling et al., 2008). Wang and Hejazi (2011) found human activities contributed more to increasing flows than climate and showed the increases were correlated with the fractional area in cropland. Given the extent of past wetland drainage and current widespread use of tile drainage (Sugg, 2007; Blann et al., 2009), artificial drainage networks have the potential to alter the plumbing in a watershed. Schottler et al. (2014) examined the residuals of the water budget for 21 agricultural watersheds and determined that climate and crop conversion could explain less than half of the observed changes in streamflow and concluded that artificial tile drainage was the main driver behind increasing streamflows. In addition to agricultural landscape changes, numerous other factors may play a role in a changing hydrology, including impoundments and flow regulation (e.g. dams), increased imperviousness and urbanization, groundwater pumpage, and changes in alternative supplies (i.e. wastewater outflows or irrigation), to name a few.

Gupta et al. (2015) evaluated the findings of numerous papers claiming of the importance of landscape changes and the impacts of artificial drainage driving the observed changes in streamflow. The authors indicated that the majority of the research showing the impacts of agricultural influences (*Schilling*, 2003; *Schilling and Libra*, 2003; *Schilling et al.*, 2008; *Zhang and Schilling*, 2006) are strictly based on empirical approaches that fail to account for the underlying principles of soil water storage, water infiltration, and surface runoff. *Schottler et al.* (2014) showed that runoff ratios increased primarily due to landscape modification, but failed to recognize that the changes could be due to increased soil wetness from the increased precipitation, leading to increased runoff (*Gupta et al.*, 2015). The findings that wide spread adoption of soybeans reduced the ratio of annual ET to annual precipitation, leading to increased streamflows, is based on two observations: (1) an empirical relationship relating baseflow to fractional area under soybean production (*Zhang and Schilling*, 2006), and (2) an ET analysis that showed a decrease in the ratio of ET to precipitation. However, Baker et al (2012) showed that ET has remained relatively similar since the 1960s in the Upper Mississippi River Basin. Gupta et al. (2015) questioned

why ET has remained relatively constant over time even though there have been substantial changes in the landscape, including tile drainage, drainage of wetlands, cultivation of prairies, and adoption of different crops in the cropping system? Gupta et al. (2015) tested the assumptions of these papers and concluded, among others, that linear regression models showed no significant shift in the slope and intercept when comparing two periods (before and after 1975) and that added regression coefficients did not add statistical significance, concluding no significant change in the relationship between precipitation and streamflow and that the increases in streamflows are mainly due to increased precipitation, consistent with the principles of higher soil moisture conditions. But it is unknown how Gupta et al. (2015) accounted for the inter-annual dependency of streamflow (e.g. storages such as soil moisture) in their regressions. In addition, it is not surprising that precipitation is the only regression coefficient with statistical significance. Precipitation can be thought of as the only “independent” variable, in a physical sense all other potential variables are dependent on precipitation to generate runoff (e.g. soil moisture relies on the history of precipitation and evapotranspiration).

A common theme of, and a potential common problem with, most studies that have investigated the causes of the increased streamflow, regardless if it is a statistical analysis, developing empirical relationships, or a regression analysis, is the reliance and use of seasonal and annual relationships between precipitation and streamflow. On a large scale (both spatial and temporal), most runoff generation is ultimately driven by precipitation, and all other mechanisms in a watershed just translate precipitation into streamflow. In a sense, precipitation is the only independent variable and all other factors are part of the error in any regression equation. The large natural variation in annual climate and annual streamflow make it difficult to tease out any other potential causes of altered hydrology, leading the current debate on direct causes and lack of consensus in the science. The scientific debate has focused on which of the two leading candidate causes (climate or anthropomorphic changes) of altered hydrology. The science debate should continue to work towards a more rigorous understanding of altered hydrology causes. However, this paper provides a methodology to quantify changes in hydrology and sets mitigation goals without attempting to investigate causes .



APPENDIX M

Methodology: Nitrogen Risk Map

Nitrogen Infiltration Risk

Purpose and Method

A risk based map, showing the relative risk of areas on the landscape with regard to the amount of nitrogen potentially reaching groundwater, is needed as an implementation aide and to guide the placement of structural practices. Currently available geo-spatial products (e.g., pollution sensitivity of near surface materials

(http://www.dnr.state.mn.us/waters/programs/gw_section/mapping/platesum/mha_ps-ns.html) are solely based upon hydrologic consideration; (e.g., potential groundwater recharge rates or thickness of the surficial material and estimated travel time to a depth of 10-feet). Currently available geo-spatial products fail to consider land use and specifically the nitrogen input on the landscape. This analysis includes specific consideration of the total estimated nitrogen (mass) input based on land use and the potential for denitrification as water infiltrating from the surface travels through surficial materials. Improvement to the risk map is possible with the investment of additional resource to reflect the fate and transport of nitrate-nitrogen. A limitation of the analysis is it fails to estimate the fate and transport of nitrate-nitrogen and uses total nitrogen as a surrogate.

The method used to develop the risk map and assess the susceptibility of groundwater to nitrogen is based upon three factors; 1) the potential groundwater recharge magnitude; 2) the estimated annual total nitrogen input (in a mass balance term) based on a crop rotation or in the absence of a defined rotation, the land cover type and; 3) the denitrification potential as water carrying nitrogen (assumed to be in part nitrate-nitrogen) moves through the soil horizon. **Table 1** shows the sources of the geo-spatial information used in developing the risk map.

Table 1. Data type, source and spatial resolution of the data used to develop the Nitrogen Infiltration Risk Map.

Data Type	Data Source	Spatial Resolution	Additional Information
Groundwater Recharge	US Geological Survey (USGS)	1 kilometer	Data represents mean annual potential recharge rates (inches/year) for years 1996-2010
Crop Rotation	MN Soybean and Research Promotion Council	Common Land Area Unit	Represents a 4-year period.
Land Cover Crop Type	US Department of Agriculture (USDA) National Agricultural Statistics Service (NASS) Cropland Data Layer (CDL)	30 meter	Crop rotations determined for years 2011-2014, years without data were backfilled with previous (or most recent year's) crop type
Soil Hydrologic Group	USDA Natural Resource Conservation	10 meter	Cells without data overlay water and were not analyzed

	Service (NRCS) Gridded Soil Survey Geographic Database (gSSURGO)		
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Generating the risk map requires a two step process. The first step is applying Equation 1 to the geo-spatial data layers:

EQ 1
$$\frac{(\text{Estimated Total N Input} * \text{Potential Annual Groundwater Recharge Rate})}{[\% \text{ Potential Denitrification} * (\text{Estimated Total N Input} * \text{Potential Annual Groundwater Recharge Rate})]}$$

The estimated Total N Input (4-year average in lb/yr) is based on the cropland nitrogen balance data of Mulla et al. (2013) and represent the total nitrogen input mass applied to a 4-year crop rotation. **Table 2** shows typical total N values for single crop types (see **Table 2**). The potential annual groundwater recharge rate (in/yr) is based on a 1-km scale water balance model completed by the United States Geological Survey (2015). Using data which represents the depth of water estimated to reach the surficial aquifer can improve the risk map. The first term although dimensionally meaningless is intended to represent the potential mass of nitrogen reaching groundwater carried by water.

Table 2. Estimated Total Nitrogen Inputs (lb – N/acre/year) (derived from Mulla et al. 2013).

Crop	Planted Seeds (Elemental N)	Atmospheric Deposition (inorganic N)	Symbiotic Nitrogen Fixation (elemental N)	Nonsymbiotic Fixation (elemental N)	Mineralization	Inorganic Fertilizer (non manure)	Total
Potatoes	23.40	8.40	50.00	2.00	64.50	195	343.30
Corn	0.30	8.40	50.00	2.00	64.50	140	265.20
Spring Wheat	3.46	8.40	50.00	2.00	64.50	107	235.36
Sugar Beets		8.40	50.00	2.00	64.50	83	207.90
Barley	1.49	8.40	50.00	2.00	64.50	66	192.39
Oats	2.80	8.40	50.00	2.00	64.50	48	175.70
Alfalfa		8.40	50.40	2.00	64.50	10	135.30
Other Hay		8.40	50.00	2.00	64.50	10	134.90
Soybean	4.00	8.40	50.00	2.00	64.50	3	131.90
Grass / Legume			43.5				43.50

The second term in the equation represents the potential for denitrification within the surficial materials as water travels vertically from the land surface to the surficial aquifer. The % potential denitrification term is applied as a function of hydrologic soil group, which can be used as a surrogate for the depth to the surficial aquifer and the travel time. No land was assumed to be tiled and the % of inorganic nitrogen denitrified by hydrologic soil group is shown in **Table 3**.

Table 3. Percent potential denitrification (used in Equation 1) as a function of hydrologic soil group.

Hydrologic Soil Group(s)	Mulla et al. Soil Characterization	% of Inorganic N Denitrified (non-tile)
A	Excessive to well drained (sandy, loam, muck)	3
B	Somewhat poorly drained (loam)	20
C,D	Poorly and very poorly drained	30

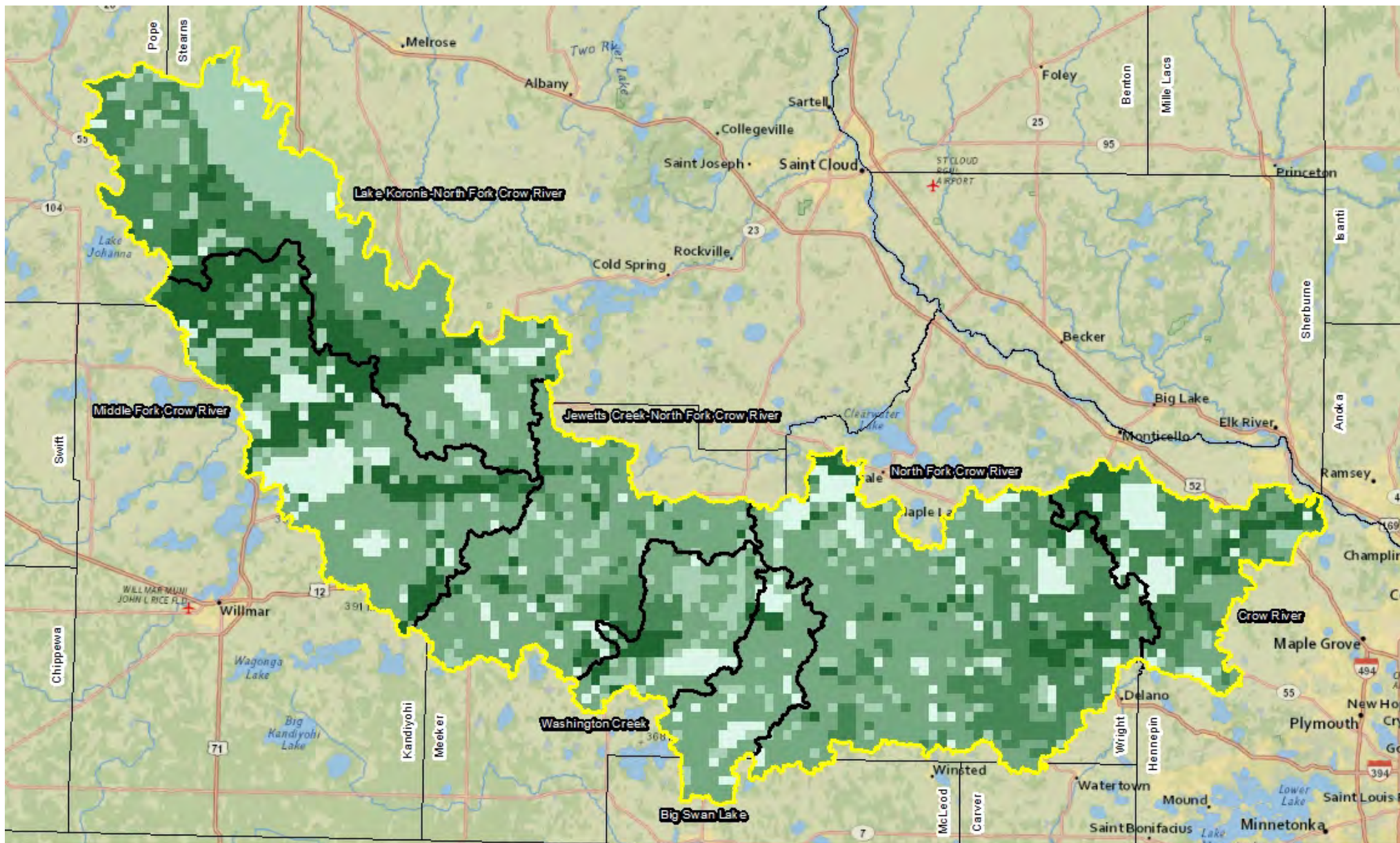
The second step in the process is placing the values computed using Equation 1, into a relative risk category as shown in **Table 4**. The relative risk categories were binned using the values computed using Equation 1.

Table 4. Assignment of Relative Risk Category based on Equation 1

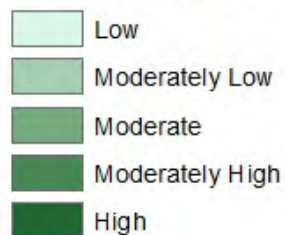
Relative Risk Category	Percentile Range (for value in Eq. 1)
High Risk	> 80%
Moderately High Risk	60 to < 80%
Moderate Risk	40 to < 60%
Moderately Low Risk	20 to < 40%
Low Risk	< 20%

Product Results and Use

Figures 1, 2 and 3 show the specific input values used in Equation 1 for the plan area. **Figure 4** shows the final Nitrogen Infiltration Risk Map. Use of the information in **Figure 4** can be used to screen the applicability of specific structural practices and guide implementation. For example, infiltration structural practices can be targeted to those areas with low risk to encourage groundwater recharge, and their use minimized on areas with high risk.

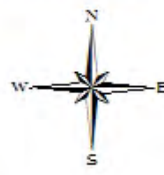


Potential Annual Groundwater Recharge



Plan Boundary

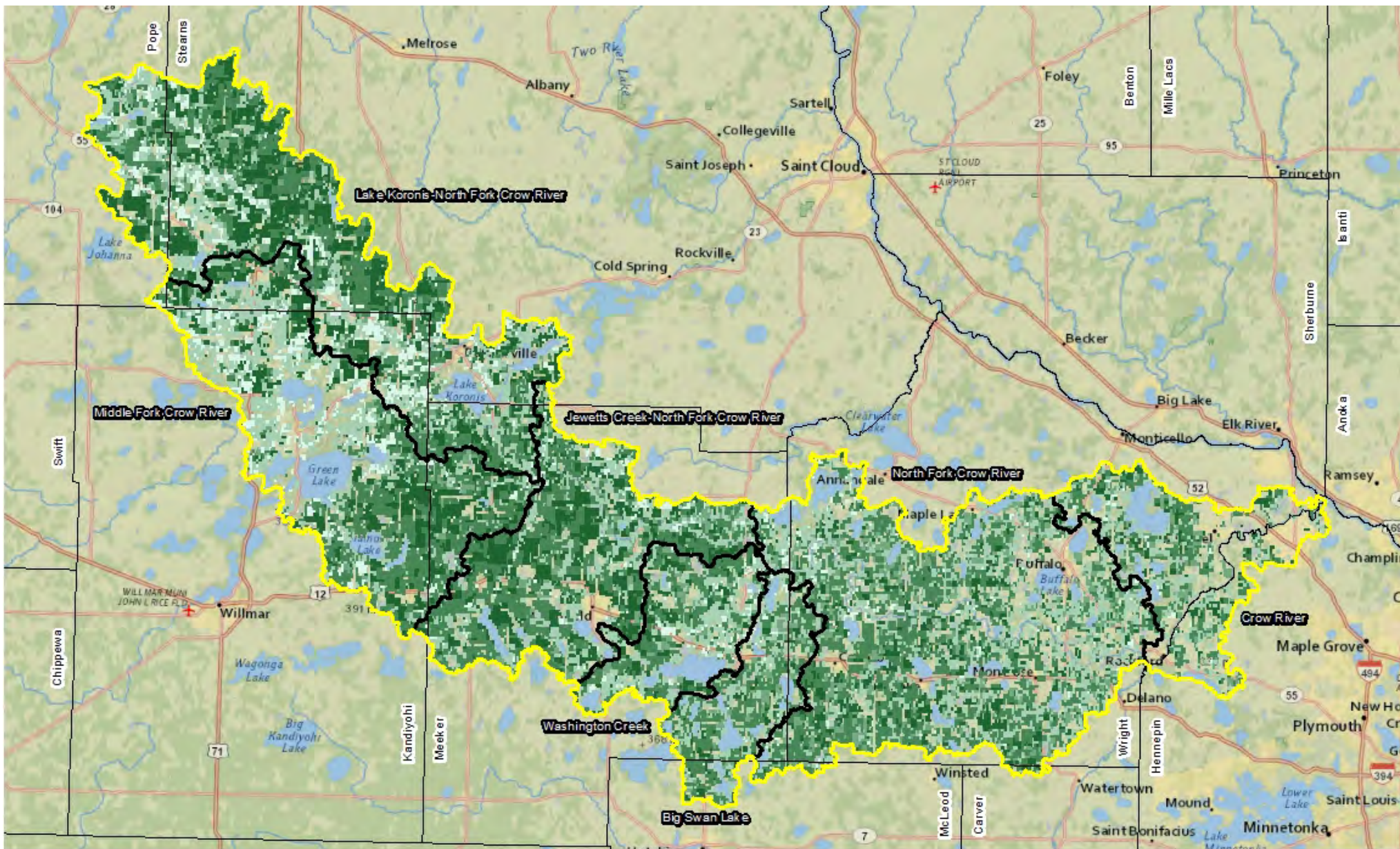
HUC 10 Planning Regions



0 5 10 20 Miles

Figure 1. North Fork Crow One Watershed One Plan Potential Annual Groundwater Recharge

Scale: AS SHOWN	Drawn by: LUT	Checked by:	Project No.: 8488-003	Date: 5/7/2016	Sheet:
 Houston Engineering Inc.			Maple Grove P: 763.493.4522 F: 763.493.5572		



Estimated Total Nitrogen Input

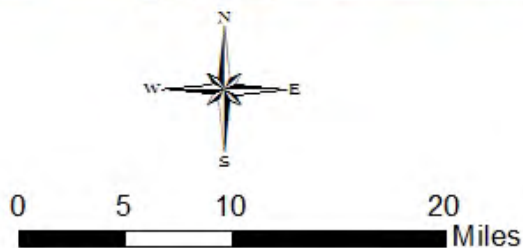
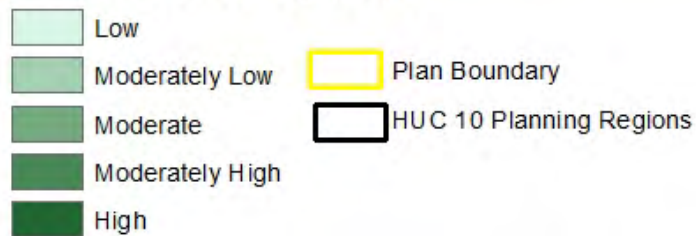
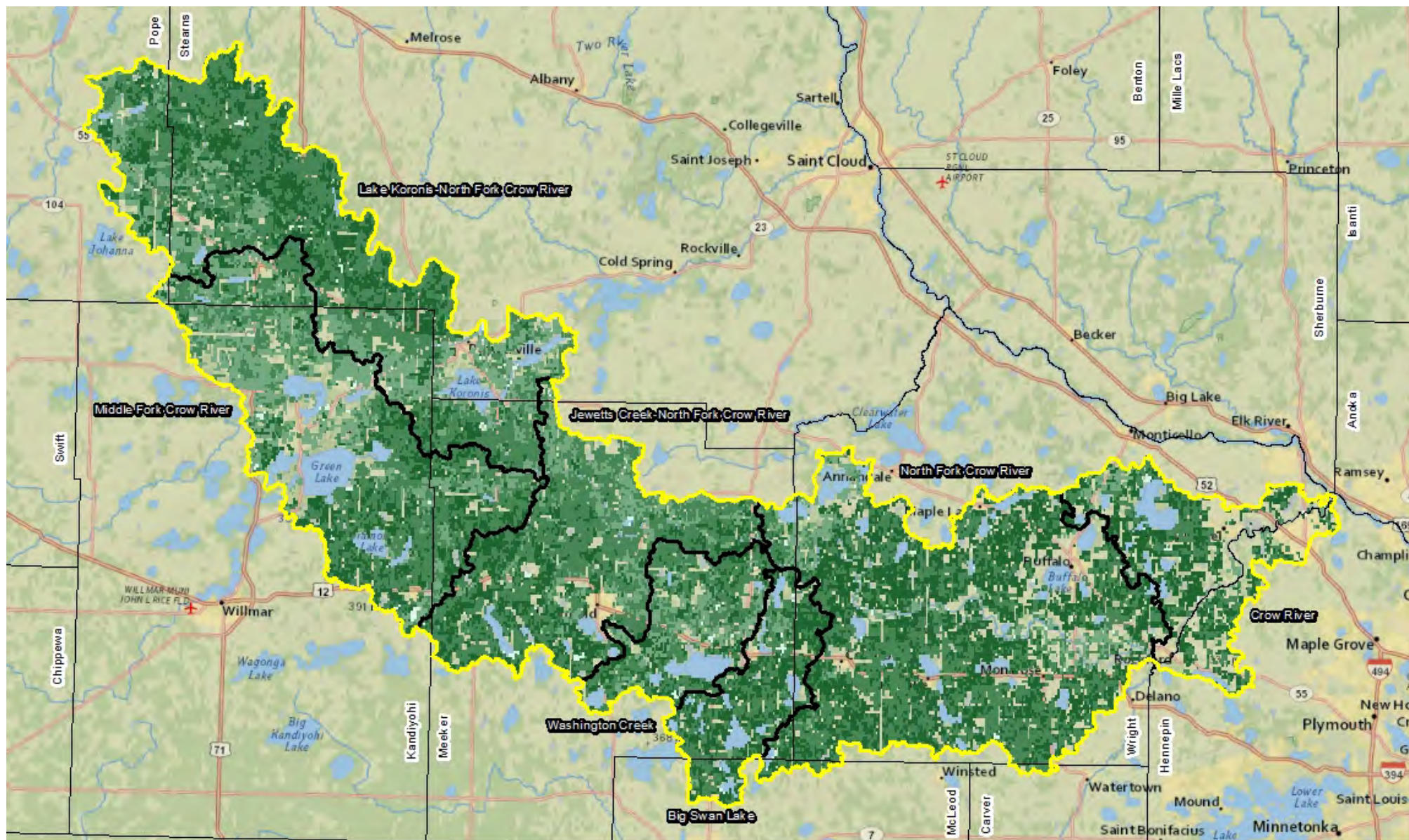


Figure 2. North Fork Crow One Watershed One Plan
Estimated Total Nitrogen Input

Scale: AS SHOWN	Drawn by: LJT	Checked by:	Project No.: 6486-003	Date: 5/7/2016	Sheet:
 Houston Engineering Inc.			Maple Grove P: 763.493.4522 F: 763.493.5572		



Potential Denitrification

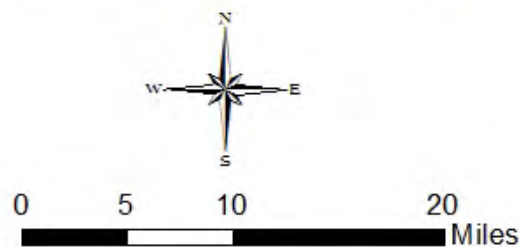
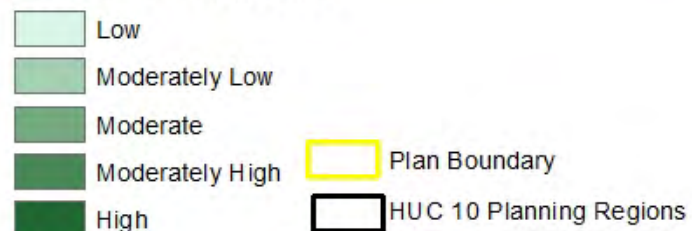


Figure 3. North Fork Crow One Watershed One Plan Potential Denitrification

Scale: AS SHOWN	Drawn by: LJT	Checked by:	Project No.: 6488-003	Date: 5/7/2016	Sheet:
			Maple Grove P: 763.493.4522 F: 763.493.5572		

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APPENDIX N

Watershed District Rules

MIDDLE FORK CROW RIVER WATERSHED DISTRICT ADMINISTRATIVE RULES

SECTION 1. INTRODUCTION, PURPOSES, AND GENERAL POLICY GOALS.

Middle Fork Crow River Watershed District (District) has enacted these rules to carry out the purposes for which the District was created under Minnesota Statutes Chapter 103D and to implement the policies of the Board of Managers (Board). Certain terms have been given specific meanings which can be found in Section 3 of these rules.

The District's statutory purposes are to protect water quality and quantity within the watershed. As required by Minnesota Statutes Chapter 103D, the District has adopted a watershed management plan. The watershed management plan identifies certain issues that are central to the District's overarching purposes. Specifically, the District is concerned about protecting and improving surface water quality; protecting groundwater quality; maintaining adequate surface and groundwater supplies for all users; protecting and restoring critical areas; promoting wise land use management; expanding knowledge and understanding of the watershed; engaging residents in water resource management; and providing effective and efficient administration of the District. The District's watershed management plan identifies objectives and initiatives necessary to address these issues.

The District is required by Minnesota Chapter Statutes 103D to promulgate administrative rules. The District's watershed management plan identifies several areas where District rules are necessary to effectuate the District's statutory purposes. These areas are agricultural drainage, erosion and sediment control, and storm water management. The District's rules are intended to fill gaps in existing federal, state, and local regulations. The District's rules are not intended to duplicate existing regulations.

SECTION 2. ADOPTION AND AMENDMENT OF RULES.

Subd. 1. Procedure for Adopting and Amending Rules. The following procedures shall apply to rule adoption and rule amendments:

- a.** Any District property owner, Board Member, or the District Administrator may propose rules or amendments to the Board. A copy of the proposed rules or amendments shall be submitted to each Manager.
- b.** At the Board's discretion, depending on the potential impact of the proposed rule, District staff may be directed to conduct stakeholder meetings to solicit input from persons and political subdivisions likely to be affected by the proposed rule or amendment.

- c. In accordance with Minnesota Chapter Statutes 103D, the District shall submit the proposed rules or amendments to the Board of Soil and Water Resources and transportation authorities within the District for comments 45 days before the Board vote to adopt the proposed rules.
- d. Before adopting any proposed rules or amendments, the Board shall hold a public hearing on them. The time, date, and location of the public hearing shall be determined by the Board; and they shall give notice of the public hearing by publication in a legal newspaper of general circulation in each county with territory in the District.
- e. The Managers shall adopt or reject the proposed rules or amendments based on a majority vote of the Board. After public hearing, a majority vote of the Board, and upon being signed by the District's President and Secretary, the proposed rules or amendments are deemed adopted.
- f. The adopted rules or amendments shall become effective and have the full affect and force of law after publication in a legal newspaper of general circulation in each county having territory in the District.
- g. A copy of adopted rules or amendments shall be forwarded to each of the following persons: the County Auditor and the County Commissioners of each county having jurisdiction in the District; every Township Board Clerk, City Clerk, and Regional Development Commission Chairman within the District; the Director of the Board of Soil and Water Resources; the Commissioner of the Minnesota Department of Natural Resources; the Commissioner of the Minnesota Pollution Control Agency; the Commissioner of the Minnesota Department of Health, Soil Water Conservation Districts, all Zoning and Planning Boards in the district, the Chairman of the Minnesota Environmental Quality Board, all public transportation authorities within the District and other entities that the Board deems appropriate.

Subd. 2. Validity. All rules adopted and amended by the District shall have the force and effect of law. If for any reason a section or subdivision of these rules should be held invalid, such decision shall not affect the validity of the remaining rules. These rules shall conform to Minnesota Law and if inconsistent therewith, Minnesota Law shall govern.

SECTION 3. DEFINITIONS.

For the purpose of these rules, unless a different meaning clearly appears from the context, certain terms are defined as follows:

Agricultural land: any land that is actively cultivated, planted or enrolled in an agricultural conservation program as part of an on going farming operation.

BMPs (Best Management Practices): practices to prevent or reduce the pollution of waterbodies and wetlands, including schedules of activities, prohibitions of practices, and other management practices.

Board: the District Board of Managers.

Board Meeting: the District Board of Managers regular meeting typically held once a month at the District Office or a special meeting as may be called from time to time.

District: the Middle Fork Crow River Watershed District.

Drainage Facilities: open ditches and drain tile systems collectively.

Drain Tile System: any privately owned underground conduit used to conduct the flow of water.

Impervious Surface: means 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.

Land Disturbing Activity: any disturbance to the ground surface that may result in soil erosion from water or wind and the movement of sediments into or upon waterbodies or wetlands within the watershed. Land-disturbing activity includes but is not limited to the demolition of a structure or surface, soil stripping, clearing, grubbing, grading, excavating, filling, the storage of soil or earth materials, and the removal or replacement of impervious surfaces other than public roadways. This includes a disturbance to the land that results in a change in the topography, existing soil cover, or vegetation that may result in accelerated storm water runoff which may lead to soil erosion and movement of sediment. The term does not include normal farming practices as part of an ongoing farming operation.

MPCA: the Minnesota Pollution Control Agency.

Open Ditch: any privately owned open channel used to conduct the flow of water in order to drain agricultural lands.

Ordinary High Water Mark: means the boundary of waterbodies and wetlands, and shall be an elevation delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape, commonly that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial.

Person: any individual, partnership, company, corporation, but does not include any political subdivision.

Political subdivision: any city, township, county, school district, or political subdivision of the State of Minnesota.

PUD (Planned Unit Development): a type of development characterized by a unified site design for a number of dwelling units or dwelling sites on a parcel, usually involving clustering of these units or sites to provide areas of common open space, density increases, and a mix of structure types, land uses, and form of ownership.

Redevelopment: any change in use of a property or permanent physical change to a property that alters the drainage pattern of the property or causes an increase in pollutants in storm water runoff from the property.

Resort: a building or group of buildings located adjacent to any waterbody for purposes of providing convenient access to the waterbody, and held out to the public to be a place where sleeping accommodations are furnished to the public, primarily to those seeking recreation.

Shoreland: means land located within the shore impact zone as defined in Minnesota Rule 6120.2500.

Waterbody: any body of water including lakes, rivers, streams, watercourses, or water basins.

Watershed: means the boundaries of Middle Fork Crow River Watershed District. See map in **Appendix B**.

Wetland: lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water and where hydric soils and hydrophytic vegetation are present under normal circumstances. This definition includes public waters wetlands (Chapter 6115) as designated by the Minnesota Department of Natural Resources and wetlands under the jurisdiction of the Wetland Conservation Act (Chapter 8420).

SECTION 4. PERMIT PROCESS.

Any permit required by these rules will be issued in accordance with the procedural process of this Section. Work that requires a permit from the District may not be undertaken until a permit is issued. Obtaining a District permit does not relieve an applicant from the responsibility of obtaining all other required federal, state and local permits.

- Subd. 1. Application.** All applications for a District permit are subject to the following requirements:
- a.** Prior to the submission of any application, the applicant must meet with District Staff for a scoping meeting. This may be conducted in-person or over the telephone. The purpose of the meeting is to ensure that the applicant is aware of the scope of the District's rules, the application requirements, and the standards for the approval of an application.
 - b.** All applications for a District permit must be submitted on the application form as shown in **Appendix A**.
 - c.** All applications must be accompanied by a fee of \$10 to cover the administrative costs of processing the permit. No permit fee shall be charged to the federal government, the State, or a political subdivision.
 - d.** Any application that requires Board review under Subd. 3 of this Section must be submitted, and deemed complete, 10 business days prior to the next regularly scheduled Board Meeting in order to be on the agenda.
 - e.** Drawings or plans are required to be submitted with every permit application. The drawings or plans are not required to be prepared by an engineer, but they must adequately depict the information required by the application form in **Appendix A**.
 - f.** An initial site inspection, in-progress site inspections, final site inspection, and post-project monitoring inspections may be required as part of the approval of a permit application. A site inspection fee is charged to the applicant and shall be equal to the District's actual costs, starting at \$35. The District will adopt policies for calculating inspection costs.

Subd. 2. Administrative Review and Approval. It is administratively burdensome for the Board to review every District permit application. Therefore, the District Administrator shall review all applications and make recommendations for approval or denial, including proposed conditions. Certain permit applications may be reviewed and approved administratively by the District Administrator.

- a.** The following permit applications may be approved administratively:
 - i.** Storm water permit applications under Section 5 that involve the expansion of a structure on an existing resort, so long as the structure is not increased more than 2,000 square feet or 200 percent, whichever is less.
 - ii.** Erosion control permit applications under Section 6 that involve the disturbance of less than 20,000 square feet of land.
 - iii.** Drainage permit applications under Section 7 that involve the drainage of less than 640 acres, the installation of less than 2,000 linear feet of drain tile; or the expansion of an open ditch that increases the volume of discharge by less than 30 percent.
- b.** The District Administrator may work with consultants on the administrative review of a permit.
- c.** The District Administrator may add reasonable conditions to the approval of a permit to address site-specific or activity-specific concerns.
- d.** If a permit meets the administrative approval requirements but the District Administrator determines that administrative approval is inappropriate due to an unusual circumstance, the permit application shall be brought before the Board for approval.
- e.** All administratively approved permits shall be deemed issued when signed by the District Administrator and all conditions of the permit have been satisfied.
- f.** The District Administrator shall provide reports to the Board of all administratively approved permits.

- g.** District Staff may not deny a permit. District Staff must instead bring the permit application before the Board with a recommendation to deny the permit application including proposed written reasons for denial.

Subd. 3. Board Approval. The Board shall review the Staff recommendations for all permit applications that are not administratively approved.

- a.** The Board shall review permit applications at regularly scheduled meetings.
- b.** The applicant or a representative of the applicant must be present at the meeting to answer questions about the permit application.
- c.** The Board may add reasonable conditions to the approval of a permit to address site-specific or activity-specific concerns.
- d.** All Board approved permits shall be deemed issued when signed by the Board and all conditions of the permit have been satisfied.
- e.** If the District denies an application, written reasons for the denial will be provided.

Subd. 4. Conditions. A permit may be approved subject to reasonable conditions necessary to ensure compliance with the requirements and intent of these rules. All conditions of the permit, to the extent possible, must be satisfied before the permit is deemed to be issued and the applicant can begin work.

- a.** In conformance with Subdivision 1.f. of this Section, in-progress site inspections, a final site inspection, and post-project monitoring inspections may be required at any time to ensure that the applicant has complied with the conditions of the permit. Applicants are responsible for all inspection fees for such site inspections, which must be paid as a condition of any permit.
- b.** The requirements of any other permit (National Pollutant Discharge Elimination System (NPDES) permit, wetland permit, public water permit, etc) required for the proposed activity are incorporated into the District permit. A violation of other required permits is a violation of the District permit.
- c.** By requesting and receiving a District permit, an applicant affirmatively grants the District a right of entry onto the applicant's property for the purpose of performing required site inspections.

Subd. 5. Deadlines for Action. The District will seek to approve or deny a permit application within 60 days after receipt of a complete application and full payment of fees.

- a.** An application that requires a site inspection is not deemed complete until a site inspection is completed by District Staff. When weather, or other uncontrollable natural conditions, makes a site inspection temporarily impossible, then the timeline under this Section and Minnesota Statute 15.99 is tolled until conditions allow for the site inspection. Within 10 business days of receiving an application, the District will notify the applicant if the application is incomplete. Within 10 days, the District will also notify the applicant if the application requires a site inspection and is therefore incomplete until the site inspection is performed.
- b.** The District will comply with Minnesota Statutes Section 15.99 where it is applicable. Failure to meet an approval deadline shall not authorize any activity for which a permit cannot be granted because the activity is unlawful under applicable law.
- c.** If a state or federal law or court order requires a process to occur before the District acts on an application, or if an application requires prior approval of a state or federal agency, any applicable deadline for the District to approve or deny is extended to 60 days after completion of the required process or the required prior approval is granted.
- d.** The District may extend any applicable initial 60-day period to 120 days by providing written notice of the extension to the applicant.

Subd. 6. Performance Surety. In accordance with Minnesota Statute 103D.345 Subd. 4, the Board may require a performance surety, such as a bond or an irrevocable letter of credit, to secure performance of permit conditions and compliance with District rules. The federal government, state, and political subdivisions are exempt from the requirements of this subdivision.

- a.** When the Board requires a performance surety, it shall be for an amount sufficient to cover the potential costs to restore that may result from a violation of the permit. The District Engineer shall assist in determining this amount.

- b. The performance surety must be in a form acceptable to the District and from a surety company licensed to do business in Minnesota.
- c. The performance surety must be in favor of the District and conditioned on the applicant's compliance with the terms of the permit. The performance surety must allow the District to claim the performance surety if the conditions are not met.
- d. The District will release the performance surety in writing after all work is completed in compliance with the permit and District rules. The District, in writing, may release a portion of the surety if the entire surety, in the District's sole discretion, is no longer necessary to secure compliance with the permit and District rules.
- e. When a permit is conditionally approved upon the applicant providing a performance surety, the surety must be provided to the District before the permit is deemed to be issued and the applicant can begin work.

Subd. 7. Applicant Agreement. The Board may require that an applicant and owner, including any mortgagee, enter into an agreement with the District. The agreement must specify responsibility for the construction and future maintenance of approved structures; document other continuing obligations of the applicant or owner; and grant reasonable access to the proper authorities for inspection, monitoring and enforcement purposes. The agreement must require the applicant to affirm that the District or other political subdivisions can require or perform necessary repairs or reconstruction of such structures; require indemnification of the District for claims arising from issuance of the permit or construction and use of the approved structures; and require reimbursement of the reasonable costs incurred to enforce the agreement. Permits and agreements may be filed for record to provide notice of the conditions and continuing obligations. When a permit is conditionally approved upon the applicant entering into an agreement with the District, the agreement must be executed before the permit is deemed to be issued and the applicant can begin work.

Subd. 8. Assignment and Transfer of District Permits. An assignment or transfer of a District permit without a change in the approved plans may be approved by the District Administrator. No assignment or transfer of a District permit is allowed where the approved plans are changed. Changes to approved plans require approval by the District Administrator. The District Administrator may determine that significant changes require Board approval. No assignment or transfer, regardless of whether the

assignment or transfer is approved by the District Administrator, shall relieve the original applicant from liability under the District permit.

- Subd. 9. Expiration of District Permits.** District permits are valid for 18 months from the date of issue. Permit extensions may be granted by the District Administrator or the Board, whoever approved the original permit. Extension requests must be made in writing at least 30 days before the expiration of the permit. Additional conditions may be added to the permit when an extension is requested.
- Subd. 10. Appeal.** Any person adversely affected by the approval or denial of a permit by the District may appeal the District's decision in accordance with the appellate procedure provided by Minnesota Statutes Sections 103D.537 and 103D.539.
- Subd. 11. Special Meetings.** The applicant may request a special meeting of the Board to expedite a permit application. If the request is granted, the applicant is responsible for paying all costs associated with the special meeting, including but not limited to per diems, notice costs, and consultant fees.
- Subd. 12. Exemption.** The Board may hear requests for an exemption from the literal provisions of these rules in the rare circumstances where strict enforcement would cause undue hardship because of conditions unique to the property under consideration. The Board may grant an exemption in the rare circumstances where it is demonstrated that such action will be consistent with the spirit and intent of these rules. Such a request must be addressed to the Board as part of a permit application. In order to grant an exemption, the Board must find that the request meets **ALL** of the following four standards:
- a.** Special conditions apply to the applicant's property that do not apply generally to other property within the District;
 - b.** Because of the unique conditions of the property involved, undue hardship to the applicant will result, as distinguished from mere inconvenience, if the strict letter of the rules is carried out. Economic considerations alone shall not constitute undue hardship if any reasonable use of the property exists under the terms of the District's rules;
 - c.** The proposed activity for which the exemption is sought will not adversely affect the public health, safety, welfare; will not create

extraordinary public expense; and will not adversely affect water quality, water control, or drainage in the District; and

- d.** The intent of the District's rules is met.
An exemption expires when the permit it is associated with expires. A violation of any condition for a permit where an exemption has been granted shall automatically terminate the exemption.

SECTION 5. STORM WATER.

- Subd. 1. Purpose.** The District intends to manage storm water runoff within the watershed to protect surface water and groundwater resources, promote infiltration, encourage pretreatment, and minimize peak flows after storm events and spring snow melt.

- Subd. 2. Permit Required for Certain Development and Redevelopment.** A District permit is required for the following:

- a.** Any land disturbing activity one acre or greater, excluding individual lots within a residential development which has an approved storm water plan by the District.
- b.** The development of any new resort or PUD;
- c.** The expansion or replacement of a structure at an existing resort;
- d.** The redevelopment of a parcel that currently exceeds impervious surface limits imposed by Minnesota Rules Chapter 6120 or by any political subdivision within the watershed.

- Subd. 3. Standard.** A storm water permit application under this Section must meet the following standards:

- a.** Runoff rates for the proposed development or redevelopment of a property shall not exceed existing runoff rates for the 2-year, 10-year, 100-year, and 7.2-inch snow melt critical storm events. The runoff rate for the property after development or redevelopment must not exceed the runoff rate for the predominant land use over the last 10 years.
- b.** All development or redevelopment of property shall treat 0.5 inch of runoff from all newly created or redeveloped impervious surface on the property such that implemented storm water BMPs provide

water quality treatment consistent with MPCA guidance documents.

- c. If the development or redevelopment drains to a discharge point within one mile of a special or impaired as defined by the MPCA NPDES permit the property shall treat 1.0 inch of runoff from all newly created or redeveloped impervious surface on the property such that implemented storm water BMPs infiltrate $\frac{1}{2}$ of the volume if possible in addition to meeting requirements consistent with the MPCA NPDES permit.
- d. A site plan must be submitted with the permit application in accordance with Appendix A. The applicant must submit runoff calculations for 2-year, 10-year, 100-year, and 7.2-inch snow melt critical storm events. The applicant must also submit calculations demonstrating that water quality standards will be met. Approved models are noted in **Appendix A**.

SECTION 6. EROSION CONTROL.

- Subd. 1. Purpose.** The District intends to prevent erosion and sedimentation into surface waters within the watershed by regulating land disturbing activities. The District requires that erosion control measures be in place for all land disturbing activities above specific thresholds. The erosion control measures must minimize erosion and sedimentation to the greatest extent practicable.
- Subd. 2. Permit and Plan Required for Certain Land Disturbing Activity.** A District permit is required for any person or political subdivision undertaking a land disturbing activity that is greater than 300 square feet within 300 feet of the ordinary high water mark or a stormwater conveyance system (curb and gutter).
- Subd. 3. Agricultural Exemption.** The ordinary agricultural practices of cultivating and planting, or activities required as part of an agricultural conservation program, performed as part of an ongoing farming operation, are exempt from this Section.
- Subd. 4. Standards.** An erosion and sediment control plan must be submitted and approved before a permit may be issued. The plan must minimize erosion and sedimentation to the greatest extent practicable. The plan must include the following standards:

- a. The project must be phased to the greatest extent possible to minimize the area of disturbed land at any given time;
- b. Site specific topography and soil conditions must be specifically addressed;
- c. BMPs must be utilized in a manner consistent with MPCA guidance documents such as the Minnesota Stormwater Manual as amended; and
- d. A site plan must be submitted with the permit application in accordance with **Appendix A**.

SECTION 7. DRAINAGE.

Subd. 1. Purpose. The District intends to preserve drainage capacity, prevent flooding, and improve water quality by regulating certain agricultural drainage facilities and shoreland drainage facilities within the watershed.

Subd. 2. Permit Required for Certain New or Expanded Drainage Facilities. A District permit is required before the following new or expanded drainage facilities may be constructed or improved by any person:

- a. Any new or expanded open private ditch; or
- b. Any new or expanded drain tile system with a diameter greater than 12 inches that drains agricultural land.
- c. Any new or expanded drain tile system with a diameter greater than 6 inches that drains shoreland.
- d. The repair or replacement of existing private drainage facilities, so long as the replacement is not an expansion, is exempt from this Section, but may be subject to Section 6 of these rules.
- e. This Section does not apply to municipal or public drainage facilities.

Subd. 3. Standards. A drainage facility permit application under this Section must meet the following standards:

- a. Demonstrate that downstream capacity exists for the additional water discharged by the drainage facility in accordance with **Appendix A**;
- b. No illicit discharges are connected to the drainage facility including but not limited to septic overflow, wash stations, and household discharges.
- c. Provide and maintain stable outfall that minimizes erosion and sedimentation in accordance with the MPCA guidance documents;
- d. Design and maintain drain tile system intakes in a way that minimizes the introduction of sediments to the drainage facility;
- e. Demonstrate that the drainage facility complies with all federal, state and local wetland regulations; and
- f. A site drawing with the location of all drainage facilities and associated elevations must be submitted with the permit application. As-built elevations for the drainage facility shall be provided after construction. Where the exact location of drain tiles is unknown, an approximate location is sufficient.

SECTION 8. WATERSHED NOTICE.

- Subd. 1. Purpose.** The District must focus its regulatory efforts due to limited resources. Other political subdivisions within the watershed regulate activities relevant to water quality and water quantity in the watershed. Where these other regulated activities are outside of the scope of the District's rules, the District requires notice and, if applicable an opportunity to comment in the permitting process for these other regulated activities.
- Subd. 2. Applicable Review Processes and Permits.** This Section applies to the following review processes and permits issued within the watershed:
 - a. Any review required under the Minnesota Environmental Protection Act (Minnesota Statutes Chapter 116D and corresponding Minnesota Rules Chapter 4410), or other environmental review required by Minnesota law.
 - b. NPDES permits, any pollution discharge permits required under Minnesota Statutes Chapter 115, Minnesota Rules Chapter 7070, or other state law.

- c. Wetland applications under Minnesota Statutes Chapter 103G and Minnesota Rules Chapter 8420, U.S. Army Corp of Engineers permits under Sections 404 or 401 of the federal Clean Water Act.
- d. Public waters permits required under Minnesota Statutes Chapter 103G and Minnesota Rules Chapter 6115.
- e. Approval of any nutrient management plan related to land application as required by state law or by any political subdivision within the watershed.
- f. Approval of any application for a PUD within the watershed.
- g. Approval of any application for shoreland development within the watershed including variance requests, conditional use permit requests, or other permit requests.
- h. Notice of public ditch clean outs, maintenance, expansion, improvements and redetermination of benefits (Minnesota Statutes 103E).

Subd. 3. Notice. Political subdivisions within the watershed shall provide the District, as soon as practical, with a copy of environmental review documents and permit applications listed in Subd. 2 of this Section. The political subdivision shall also provide the date and time of any public hearings related to the environmental review or permit application.

Subd. 4. Comment. The District Administrator will provide the political subdivision, as soon as practical, with comments on behalf of the District.

Subd. 5. Copy for District Files. A copy of the documents provided by the political subdivision will be maintained in the District's files.

SECTION 9. ENFORCEMENT.

Subd. 1. Violation is a Misdemeanor. A violation of a District rule, or a permit issued under District rules, is a misdemeanor subject to the maximum penalty provide by Minnesota law.

Subd. 2. Court Action. The District may exercise all powers conferred upon it by Minnesota Statutes Chapter 103D in enforcing these rules, including criminal prosecution, injunction, or an action to compel performance, restoration, or abatement.

- Subd. 3. Administrative Order.** The District may enforce its rules by issuing a cease and desist order when it finds that an activity violates any rule of the District or permit issued by the District.
- Subd. 4. Order to Show Cause.** The Board may require a person or political subdivision in violation of a District rule or permit to appear at a District meeting to show cause why the violation should be allowed to continue.
- Subd. 5. Future Permits.** No future permit shall be issued to any person or political subdivision in violation of a District rule or a previously issued District permit until the violation has been remedied to the sole satisfaction of the District.

SECTION 10. EXEMPTION FOR EXISTING REGULATION.

- Subd. 1. Purpose.** The District does not intend to duplicate the regulations of other political subdivisions where other political subdivisions have regulations that are equally as stringent or more stringent than the District's regulations. The District intends to enter into agreements with political subdivisions that have regulations that are equally as stringent or more stringent than the District's regulations that allow for the exemption of regulation by the District.
- Subd. 2. Agreement to Regulate and Enforce.** All agreements that allow for the exemption of District rules when other political subdivisions have sufficient existing regulations shall contain the following terms:
- a.** The political subdivision must agree to enforce its regulations.
 - b.** The agreement must terminate if the political subdivision amends its regulations in a way that causes them to be less stringent than the District's rules.
 - c.** The agreement must be amended and signed by the District and the political subdivision when the District amends its rules.
 - d.** The political subdivision must provide the District with notice of all permits issued within the watershed by the political subdivision subject to the agreement.

Permit Application Form

Appendix A

Map of District boundaries

Appendix B

RULES OF THE NORTH FORK CROW RIVER WATERSHED DISTRICT

ADOPTED February 14, 1989 North Fork Crow River Watershed District Board of Managers

1. INTRODUCTIONS

The North Fork Crow River Watershed District was established under the authority of Minnesota Statutes, Chapter 112, The Watershed Act, on May 10, 1985. The District's primary purpose is conservation of the quality and quantity of water within the watershed. The District's boundary is shown on Map 1 on the last page.

1.1 Purpose

These rules are intended to effectuate the purposes of the District and the powers of the Managers under the Minnesota Watershed Act, Minnesota Statutes, Chapter 11.2.

1.2 General Policy

It is the Managers intent to use these rules as a management tool in carrying out their responsibility to provide wise and provident management of the District's water resources. The overall water management goal of the District is to ensure that development, use, control, and conservation of the District's water resources is done in a manner that is most beneficial to the general welfare of its present and future residents. It is the intention of the Managers that no person shall be deprived or divested of any previously established beneficial uses or rights by any District rule without due process of the law.

1.2A Coordination with Other Units of Government

It is the intention of the Managers to coordinate the administration of their rules by all interested federal, state, and local governmental units and agencies having jurisdiction in the District. The Board of Managers request that each county and city having territory in the District forward to the District a copy of all preliminary plats and accompanying drainage and grading plans whenever all or part of such plans affect land within the District. The District may provide recommendations to the county and cities on the site's suitability for the proposed land use based on soil and water conditions.

1.2B Review of Local Ordinances

The Board of Managers request that a copy of any proposed county, municipal, or township ordinance relating to drainage, flood plains, shoreland, or to any other water related topic be submitted to the Managers at least 30 days prior to the first public hearing for District review and comment; and, in addition, any such ordinance be submitted to the Managers within 30 days of its effective date.

1.3 Procedures for Adopting Rules and Amendments

The following procedures shall apply to rule adoption and rule amendments:

- A. Any District property owners may propose rules or amendments to the Board of Managers.
- B. A copy of the proposed rules or amendments shall be submitted to each Manager.
- C. The Managers shall accept or reject the proposed rules or amendments based on a majority vote of the Managers.

D. Before adopting any proposed rules or amendments, the Managers shall hold a public hearing on them. The time, date and location of the public hearing shall be determined by the Managers; and they shall give notice by publication in a legal newspaper of general circulation in each county with territory in the District.

E. After public hearing, a majority vote of the Managers, and upon being signed by the District's President and Secretary, the proposed rules or amendments are deemed adopted.

F. The adopted rules or amendments shall become effective and, thereafter, have the full affect and force of law, after publication in a legal newspaper of general circulation in each county having territory in the District.

G. A copy of adopted rules or amendments; shall be forwarded to each of the following persons:

- The County Auditor of each county having territory in the District,
- the County Commissioners,
- the Township Board Clerk,
- the Regional Development Commission Chairman,
- the Executive Secretary of the Minnesota Water Resources Board,
- the Commissioner of the Minnesota Department of Natural Resources Board,
- the Executive Director of the Minnesota Pollution Control Agency,
- the Commissioner of the Minnesota Department of Health,
- SCS Office,
- SWCD,
- County Extension Agent,
- all Zoning and Planning Boards in the District,
- and the Administrator of the Minnesota Environmental Quality Board.

1.4 Consistence with Count State and Federal Law

If any District rule is inconsistent with county, state and federal law, the provisions of county, state and federal state law shall govern.

1.5 Severability

If any part of these rules is declared invalid by a court of competent jurisdiction, such declaration shall not affect the validity of these rules as a whole, but only the part declared invalid.

1.6 Appeals

Any person aggrieved by the adoption or enforcement of these rules may appeal under the appellate procedures and review provided in Minnesota Statutes, Chapter 112.

1.7 Variances

A. Variances Authorized: The Board of Managers may hear request for variances from the literal provisions of these rules in instances where their strict enforcement would cause undue hardship because of circumstances unique to the property under consideration and having made public notice of such hearings. The Board of Managers may grant variances where it is demonstrated that such action will be in keeping with the spirit of these rules.

B. Standard: In order to grant a variance, the Board of Managers shall determine that the special conditions which apply to the structure of land in question do not apply generally to other land or structures in the district,

that, in granting of such variance, will not merely serve as a convenience to the applicant and that the variance will not impair or be contrary to the intent of these rules.

C. Term: A variance shall become void after one year after it is granted unless used

D. Violation: A violation of any condition set forth in a variance shall be a violation of the district rules. The Managers shall ask the variance applicants to appear in front of the Board to show cause why the variance should not be terminated.

2. DEFINITIONS

For the purposes of these rules, certain words and terms are herein defined as follows. In the absence of a definition hereinafter, the definitions established for the State of Minnesota by statute or by case law shall apply to these rules unless clearly in conflict, clearly inapplicable, or unless the context makes such meaning repugnant thereto:

BOARD OR BOARD OF MANAGERS shall mean the Board of Managers of the North Fork Crow River Watershed District

DEPARTMENT OF NATURAL RESOURCES or DNR shall mean the Minnesota Department of Natural Resources.

DISTRICT shall mean the North Fork Crow River Watershed District.

DRAINAGEWAY shall mean any natural or artificial channel which provides a course for the flow of water, whether that flow be continuous or intermittent.

MANAGERS shall mean the Managers of the North Fork Crow River Watershed District acting as a board and not as individuals, unless specifically stated to the contrary.

NPDES shall mean National Pollutant Discharge Elimination System.

ORDINARY HIGH WATER LEVEL shall mean that elevation where the level of water in a water basin has been maintained for a sufficient period of time to leave evidence upon the landscape; commonly that elevation where the natural vegetation changes from predominantly aquatic to predominantly terrestrial.

PERMIT, WATERSHED DISTRICT shall be the permit document issued by the Watershed District for the purposes of permitting the applicant or permit holder to perform work in the District.

PERSON shall mean any individual, firm, partnership, association, or corporation, including public or political subdivisions or governmental subdivisions.

SHORELAND shall mean land located within the following distances from the ordinary high water elevation of public waters:

(1) Land within 1000 feet from the ordinary high water mark of a lake, pond, or flowage; and

(2) land within 300 feet of a river or stream or the landward side of the flood plain delineated by ordinance on such a river or stream, whichever is greater.

SCS shall mean Soil Conservation Service as a branch of the United States Department of Agriculture.

SWCD shall mean Soil and Water Conservation District.

WATER BASIN shall mean all protected wetlands and Lakes identified in the Protected Waters Inventory for each county.

WATER COURSE shall mean any drainageway that has a drainage area greater than 320 acres, including natural and artificial water courses.

NORTH FORK CROW RIVER WATERSHED DISTRICT OR WATERSHED DISTRICT shall mean the legally established agency named and referred to as the North Fork Crow River Watershed District when the first letters are capitalized. When the first word "District" appears without capitalization, it shall mean the lands gathered within the governmental unit, the North Fork Crow River Watershed District, as established by the Minnesota Water Resources Board. "SHALL AND MAY", as used in these rules, shall be construed to indicate a mandatory and a permissive state or condition, respectively.

3. PERMIT REQUIREMENTS

The Managers find that a permit program is needed to help ensure wise development and conservation of the District's water resources in accordance with the overall plan.

3.1 Actions Requiring a District Permit

A. Work in any water course or water basin, whether or not open water is present at the time of the work-- including but not limited to excavation, filling, dredging, and the placement of structures. In the case of agriculture drainage, a permit is required for: a. Surface or open ditch drainage of a drainage area greater than 160 A.'s b. Tile drainage of a drainage area greater than 320 A.'s.

B. Construction, installation or alteration of any water control structure in any water course or water basin that is of greater or lesser capacity than is reasonable considering the upstream and water control structures.

C. Work in the right of way of any legal drainage system within the jurisdiction of the District.

D. Diversion of water into a public drainage system from land not assessed for the public system.

D.I Diversion of water from a drainage area of larger than 40 acres into a different sub watershed.

E. Any work to restrict the normal or natural drainage of land or to enlarge wetlands that will cause flooding of adjacent land or public or private roadways.

F. Cultivating any area that is closer than one rod from the top edge of any water course that is part of a public drainage system.

G. The land owner shall be responsible for acquiring all required permits.

H. At the discretion of the Board of Managers, any permit required by Section 3.1, A through F. may be waived if a similar permit is required by another State Agency, County, or City; and provided that the approval of the Managers or their designee is obtained by the State, County or City prior to issuance of their permit.

3.2 General Permit Procedures

- A. Applicant obtains and completes a permit application form, which is available by contacting any Manager.
- B. Application form is sent or delivered to any Manager. The Managers shall act on all permit applications within 30 days of receiving the application and all data required in accordance with Sections 3.2, C, D and G.
- C. The Managers review the permit application and assess the impact that the proposal would have on the District's water resources. Managers may approve the work, disapprove the work, approve the work with conditions, or, based on their preliminary assessment, may require the applicant to appear at a Board meeting to explain the proposal and may decide to review the site or may require that a technical analysis of the proposed work be done to better gauge its potential impacts.
- D. The Board of Managers may accept the engineering and technical analysis set forth by the following agencies: MPCA, SCS, DNR and EPA. If the Board of Managers determine that additional technical analysis is required, they may seek the analysis and assess the reasonable costs to the applicant. Costs in excess of \$100.00 will not be incurred without notifying applicant.
- E. If a permit is issued, the applicant shall abide by all the terms and conditions in the permit or the permit may be withdrawn by the Managers. Subject to these rules, each permit issued must be signed by the President and Secretary or the designees.
- F. If a permit is denied, the Managers shall] state the reasons for such denial to the applicant.
- G. No work requiring a permit shall commence until a permit, signed by the President and Secretary of the Board of Managers or their designees, is issued.
- If required by the Managers, the applicant shall file a bond or approved escrow deposit, with the District before issuance or reissuance of a permit, in an amount set by the Managers and conditioned on performance by the applicant of authorized activities in conformance with the terms and conditions of the permit. If the work is not performed in accordance with the conditions and specifications of the permit, the Managers may complete the work, using the forfeited funds from the bond or escrow account. If the bond or escrow account funds are insufficient, the permit holder may be assessed for the balance. Unused funds shall be returned to the applicant.
- H. Unless otherwise specified in the permit or unless time is extended by the Board, work for which the permit is given must be completed within one year or else a new permit is required.
- I. If the Managers determine that it is necessary to monitor any work authorized by permit, such monitoring costs shall be paid by the District.
- J. Any District landowner may, within ten days of action by the Board, request a public hearing on the action the Managers have taken on a permit application. Notice of such a hearing shall be given by the Managers by a publication in a legal newspaper of general circulation in each county having territory in the District.
- K. Obtaining a district permit does not relieve the applicant from the responsibility of obtaining any other needed permits from any other governmental units or agencies. The District will endeavor to inform the applicant of permits which may be required. The District will not be responsible if the applicant fails to obtain any required permits.

4. CRITERIA FOR REVIEWING PERMIT APPLICATIONS

The Managers will use the general criteria listed below in assessing the impact of proposals requiring a District permit. The criteria will also be used by the Managers to help determine the conditions that may be placed on

permits. The Managers may also consider other factors in the review of the permit application.

4.1 Drainage

A. Surface water shall not be artificially moved from upper land to and across lower land without adequate provisions being made on the lower land for its passage, nor shall the natural flow of surface water be artificially obstructed so as to cause an overflow onto the property of others.

B. Every person shall use his land reasonably in disposing of surface water and may turn into a water course all the surface water that would naturally drain there; but he may not artificially discharge into a water course more water than it has capacity to carry nor burden the lower land owner with more water than is reasonable under the circumstances.

C. Areas that have a significant value to the District in recharging ground water, as wildlife habitat, as settling basins, or which serve other important conservation purposes shall be preserved to the extent practicable.

D. Temporary water detention schemes using natural or artificial holding ponds, underground storage, or other methods shall be incorporated into any new or revised storm water drainage plans whenever, in the judgment of the Managers, the proposed plan could cause increased flooding or pollution of the receiving water course or basin.

4.2 Work in Water Courses and Water Basins

A. Waterway openings in new or reconstructed crossings shall have a capacity that is compatible with the nearest crossings upstream or downstream in the water course or their planned placement and follow District Engineer recommendations.

B. Side inlets shall be constructed, wherever possible, so as to protect water courses from serious erosion and increased flooding.

4.3 Flood Plain Shoreland, and General Land Development

A. The District hereby adopts, by reference, the Shoreland and Flood-plain Management, Minnesota Rules, Chapter 6120. The Board of Managers request that all plats and plans for work, any part of which are within any designated floodplain or shoreland, be submitted to the Managers. The Managers intend to review these plans and provide comments and recommendations to all cities and counties with the District.

B. The Managers encourage all land owners to retain non- agricultural land for wildlife habitat purposes. The Managers may cooperate with private and public efforts to develop improved fish and wildlife habitat in the District.

4.4 Erosion and Sedimentation

Run-off of needed moisture from sloping lands, eroding and carrying with it sediment from those lands and from the banks of drainageways constitutes a serious problem. It shall be the policy of the Managers to encourage the use of the SWCD Engineer and the adaptation of proper land use practices and other methods to help reduce said erosion and sedimentation. To control and alleviate soil erosion and siltation of the drainageways and lakes of the District:

A. All drainageways therein shall be constructed so as to reasonably minimize soil erosion, giving the due consideration to the intended capacity of the drainageway, its depth, width and grade, and the character of the

soils through which the drain passes.

B. Sloping lands abutting drainageways, lakes, ponds, or reservoirs shall be used in such a manner so as to provide reasonable control of sediment.

C. Individuals or developers carrying out the erosion control measures, with permit, and all subsequent owners of the property involved, shall effectively maintain all erosion control features.

D. Conditions placed on any permit granted pursuant to this regulation shall include, but not be limited to, the following:

(1) Work in or near public waters and drainage systems shall be conducted so as to minimize increases in suspended solids and turbidity of run-off or receiving waters.

(2). Materials used in erosion prevention, such as riprap, shall be non-polluting under any foreseeable conditions and shall be installed consistent with good engineering practices and in such a way to assure effectiveness and permanence.

(3) Fill material shall be non-polluting.

(4) Spoils shall be prevented from entering public waters or drainageways.

4.5 Water Quality

A. No refuse, garbage, untreated wastes, or other pollutants shall be dumped or discharged directly into any water course or water basin, or placed in a location where run-off waters would carry them into any water course or water basin

B. All trees and brush cut from water courses and the rights of way of drainage systems shall be removed and properly disposed of.

C. All new or reconstructed sewage and solid waste disposal systems shall conform to minimum state standards. Efforts should be made to exceed minimum state standards.

D. The Managers may test the quality of any discharge under NPDES permit for compliance with permit conditions. Violations will be reported to the Minnesota Pollution Control Agency; and if the discharger fails to comply with the NPDES permit conditions within a reasonable time, the Managers may require the discharger to appear at a District meeting to show cause why the violation should be allowed to continue.

5. ENFORCEMENT POWERS OF MANAGERS

5.1 Manner of Enforcement

Any provisions of these rules, any order or stipulation agreement made or any permit issued by the Board of Managers of the Watershed District may enforced by criminal prosecution, by injunction pursuant to Section 112.43, subdivision 2, of the Minnesota Statutes, by action to compel performance, restoration, abatement, and other appropriate action Any violation of these rules, or any order of stipulation agreement made, or a violation of any permit issued by the Board of Managers of the Watershed District is a misdemeanor in accordance with Section 112.89 of the Minnesota Statutes.

5.2 Notification Regarding Violations

The Watershed District, at its discretion, may file notification of a violation or threatened violation of any part of these rules by any person, governmental subdivision, or governmental agency with the Pollution Control Agency or the Minnesota Department of Health, however, such notification shall not preclude any right of the Watershed District to prevent or continue to prevent any act now allowed or any action required to be performed by these rules, nor shall it prevent simultaneous actions to be taken against any violator by the Watershed District, the department of Natural Resources, the Minnesota Pollution Control Agency, the Minnesota Department of Health, the courts, or any other person or authority having jurisdictional powers or interest to take such action.

5.3 Powers of Rules

Pursuant to Chapter 112.43, Subdivision 1 (17), the Managers shall have a limited authority to adopt rules to control encroachments, the changing of land contours, the placement of fill and structures of any type, to prevent the placement of encumbrances or obstructions, and to require the land owner to remove such fill, structures, encumbrances, or other obstructions and to restore the previously existing land contours and vegetation. The Managers may, by ordinance, provide a procedure whereby the Watershed District can do the work required and access the cost thereof against the affected property by a special assessment. Such ordinance shall be applicable only in the absence of county or municipal ordinances for the regulation of these items listed above herein.

5.4 Contractor's Liability

Any individuals, firms, corporations, partnerships, associations, or other entities contracting to perform services regulated by these rules shall perform all work in compliance with the conditions and specifications of the permit and the rules. Contractors in violation shall be subject to all sanctions or penalties, criminal or civil, imposed by these rules.

5.5 Due Process of Law

No person shall, under these rules, be deprived or divested of any previously established beneficial use or rights without due process of law.

6. PUBLIC MEETINGS, HEARINGS AND RECORDS

6.1 Meetings

All meetings of the Watershed District, whether regular or special, shall be open to the public and shall be held at a time, date, and place, as determined from time to time by the Managers.

6.2 Hearings

Notice of a public hearing shall be given as required by statute. Testimony given and received at such public hearings may be recorded, and witnesses may be sworn as required by statute or at the discretion of the Board.

6.3 Waiver of Hearing

Unless required by statute, the Managers, in their discretion, may waive a public hearing on any application for a permit and make their order granting or refusing such application. If said application is refused or granted subject to conditions, the applicant may, within 10 days, demand a hearing on the application.

6.4 Records

The records of the Watershed District shall be public records, as required by state statute and shall be available to the public for inspection to that extent required. It is the stated intention of the Board of Managers to cooperate with all persons, governmental subdivisions, and governmental agencies in the promotion of conservation of the natural resources of the District and to share information with the public for the common good.

7. EFFECTIVE DATE

After completion of the required public hearing the provisions of these rules shall become effective upon the passage by the Board of Managers and the publication in a legal newspaper of general circulation in Stearns, Meeker, Pope and Kandiyohi Counties.

8. ADOPTION

These rules are hereby adopted pursuant to Minnesota Statute Chapter 112, on the 14th day of February, 1989, by the Board of Managers of North Fork Crow River Watershed District.

BY: Chairman

BY: Secretary

Permit Form

PERMIT NO. _____

Application for permit: to work in the North Fork Crow River Watershed District.

(Print or Type Applicant's Name)

(Applicant's mailing address or box number)

(City) (State) (Zip Code)

(Area Code) (Telephone No.)

Applies pursuant to North Fork Crow River Watershed District rules and regulations and other applicable statutes for a permit to work in the watershed, named above, in accordance with all data, maps, plans and any other information submitted herewith and made a part hereof.

A. PROPOSAL

1. It is proposed to: Construct Fill or Install Repair Excavate Abandon e Improve Restore Remove Other

2. The following: Dam Dike Road Shore or bank protection Shoreline Channel ne Ditch Bridge Culvert Tile Beach Irrigate Wetland Other

B. SITE

1. County Town or Township Section Subdivision 1/4 Section n or Lot Meeker Pope Kandiyohi hi Stearns

2. or Legal Description.

C. JUSTIFICATION: PURPOSE OR BENEFITS D. ENVIRONMENTAL IMPACT

1. Anticipated changes in water and related land resources:

2. Unavoidable but anticipated detrimental effects:

3. Alternatives to the action proposed:

E. PROJECT SITE DATA

1. Describe the proposed work in detail:

2. Attach an ASCS photograph appropriately marked:

3. If applicable attach a county ditch map outlining which county ditch the proposed work will affect.

4. Attach any other information which would be helpful in reviewing this permit.

F. EASEMENTS

Attach all necessary easements required for the proposed work.

G. OTHER PERMITS

Attach copies of other permits which have been approved that would be required to complete the proposed project.

H. AGREEMENT

Applicant agrees to use BMP for erosion and sediment control during construction activities. Applicant hereby declares that all information submitted herewith and statements made herein are true and correct representation of the facts and that the filing of this application and information with the Board of Managers of the North Fork Crow River Watershed District is evidence of the correctness thereof.

Dated this _ day of , 19 _

Signed: (Applicant) (Lessee)

Action by Board of Managers of North Fork Crow River Watershed District Permit granted.

Permit granted subject to the following conditions:

Held for additional information.
Permit denied.

NORTH FORK CROW RIVER WATERSHED DISTRICT

By: (President) (Secretary)

Dated this day of day of _, 19

Copies to the following:

North Fork Crow River Watershed District (Secretary)

North Fork Crow River Watershed District (Engineer)

North Fork Crow River Watershed District (Attorney)

Applicant County Auditor County Soil Conservation Service



APPENDIX O

Combined Benefits of PTMApp
Targeted Implementation Approach

PTMAApp Priority Resource Point	Resource Type or Common Name	Sediment					Total Nitrogen					Total Phosphorus				
		Existing Estimated Annual Load (tons/yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (tons/yr.)	Load Reduction Expected from Implementation (tons/yr.)	Progress towards Goal (%)	Existing Estimated Annual Load (lbs./yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (lbs./yr.)	Load Reduction Expected from Implementati on (lbs./yr.)	Progress towards Goal (%)	Existing Estimated Annual Load (lbs./yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (lbs./yr.)	Load Reduction Expected from Implementation (lbs./yr.)	Progress towards Goal (%)
1	AUID Stream	706	25%	177	0	0.0%	4,337	45%	1,952	0	0.0%	209	12%	25	0	0.0%
2	AUID Stream	2,804	25%	701	0	0.0%	19,468	45%	8,760	0	0.0%	1,003	12%	120	0	0.0%
3	AUID Stream	5,941	25%	1,485	0	0.0%	28,779	45%	12,950	0	0.0%	1,522	12%	183	0	0.0%
4	AUID Stream	5,456	25%	1,364	0	0.0%	22,822	45%	10,270	0	0.0%	1,242	12%	149	0	0.0%
5	AUID Stream	4,643	25%	1,161	0	0.0%	28,793	45%	12,957	0	0.0%	1,509	12%	181	0	0.0%
6	AUID Stream	3,786	25%	947	0	0.0%	22,798	45%	10,259	0	0.0%	1,238	12%	149	0	0.0%
7	AUID Stream	6,584	25%	1,646	0	0.0%	24,974	45%	11,238	0	0.0%	1,343	12%	161	0	0.0%
8	AUID Stream	6,722	25%	1,680	18	1.1%	33,422	45%	15,040	0	0.0%	1,781	12%	214	0	0.0%
9	AUID Stream	3,389	25%	847	241	28.4%	20,587	45%	9,264	525	5.7%	1,102	12%	132	24	17.8%
10	AUID Stream	3,176	25%	794	197	24.8%	25,301	45%	11,385	886	7.8%	1,378	12%	165	36	21.7%
11	AUID Stream	12,137	25%	3,034	946	31.2%	82,514	45%	37,131	2,292	6.2%	4,343	12%	521	90	17.3%
12	Monongalia Lake	10,185	25%	2,546	1,309	51.4%	86,424	45%	38,891	3,043	7.8%	4,166	15%	621	122	19.6%
13	AUID Stream	7,010	25%	1,752	1,380	78.8%	53,585	45%	24,113	2,020	8.4%	414	12%	50	87	175.8%
14	Green Lake	12,967	25%	3,242	1,406	43.4%	117,240	45%	52,758	1,884	3.6%	4,921	21%	1,038	83	8.0%
15	AUID Stream	4,899	25%	1,225	0	0.0%	19,986	45%	8,994	0	0.0%	1,146	12%	138	0	0.0%
16	Nest Lake	7,358	25%	1,839	1,380	75.0%	63,766	45%	28,695	1,837	6.4%	3,327	13%	433	79	18.4%
17	Elkhorn Lake	3,043	25%	761	0	0.0%	10,206	45%	4,593	0	0.0%	511	9%	46	0	0.0%
18	HUC 12 outlet	20,706	25%	5,176	0	0.0%	72,395	45%	32,578	0	0.0%	3,916	12%	470	0	0.0%
19	HUC 12 outlet	16,509	25%	4,127	561	13.6%	1,949	45%	877	709	80.8%	2,471	12%	296	28	9.4%
20	AUID Stream	3,690	25%	923	339	36.8%	14,775	45%	6,649	626	9.4%	806	12%	97	24	24.9%
21	AUID Stream	3,381	25%	845	819	96.9%	15,636	45%	7,036	1,279	18.2%	860	12%	103	50	48.3%
22	Calhoun Lake	14,601	25%	3,650	2,292	62.8%	105,345	45%	47,405	2,857	6.0%	4,850	11%	538	120	22.2%
23	HUC 12 outlet	16,334	25%	4,083	2,396	58.7%	97,757	45%	43,991	2,365	5.4%	4,669	12%	560	96	17.1%
24	AUID Stream	1,003	25%	251	0	0.0%	4,744	45%	2,135	0	0.0%	224	12%	27	0	0.0%
25	AUID Stream	3,341	25%	835	0	0.0%	9,342	45%	4,204	0	0.0%	500	12%	60	0	0.0%
26	AUID Stream	7,413	25%	1,853	0	0.0%	27,849	45%	12,532	0	0.0%	1,336	12%	160	0	0.0%
27	Diamond Lake	8,553	25%	2,138	0	0.0%	43,038	45%	19,367	0	0.0%	1,690	44%	744	0	0.0%
28	AUID Stream	5,525	25%	1,381	0	0.0%	15,597	45%	7,018	0	0.0%	841	12%	101	0	0.0%
29	AUID Lake	7,434	25%	1,858	0	0.0%	27,987	45%	12,594	0	0.0%	1,348	12%	162	0	0.0%
30	AUID Lake	882	25%	221	0	0.0%	5,144	45%	2,315	0	0.0%	207	12%	25	0	0.0%
31	AUID Stream	5,359	25%	1,340	635	47.4%	22,129	45%	9,958	1,341	13.5%	1,189	12%	143	46	32.0%
32	HUC 12 outlet	9,577	25%	2,394	153	6.4%	33,928	45%	15,267	219	1.4%	1,851	12%	222	8	3.8%
33	Planning Region Outlet: Lake Koronis- North Fork Crow River	20,245	25%	5,061	4,685	92.6%	68,489	45%	30,820	3,223	10.5%	3,608	12%	433	117	27.0%
34	Planning Region Outlet: Middle Fork Crow River	26,855	25%	6,714	3,274	48.8%	93,922	45%	42,265	1,474	3.5%	315	12%	38	58	153.1%
35	AUID Stream	3,431	25%	858	95	11.1%	12,173	45%	5,478	213	3.9%	691	12%	83	8	10.2%
36	Grove Creek	10,616	45%	4,777	219	4.6%	34,622	45%	15,580	232	1.5%	1,830	12%	220	9	4.3%
37	AUID Stream	7,858	25%	1,964	0	0.0%	24,060	45%	10,827	0	0.0%	1,249	12%	150	0	0.0%
38	Long Lake (47017700)	9,862	25%	2,466	34	1.4%	40,383	45%	18,172	59	0.3%	1,765	89%	1,571	2	0.1%
39	Hope Lake	3,003	25%	751	0	0.0%	16,047	45%	7,221	0	0.0%	667	85%	567	0	0.0%
40	Youngstrom	188	25%	47	1	3.1%	2,749	45%	1,237	176	14.2%	82	18%	14	6	41.2%
41	Ripley (west portion)	2,328	25%	582	220	37.8%	20,109	45%	9,049	407	4.5%	925	16%	146	15	10.2%
42	AUID Stream	38,174	25%	9,543	9,111	95.5%	108,731	45%	48,929	3,006	6.1%	5,701	12%	684	111	16.3%
43	AUID Stream	8,147	25%	2,037	656	32.2%	36,337	45%	16,352	1,188	7.3%	1,851	12%	222	44	19.7%
44	AUID Stream	8,327	25%	2,082	948	45.5%	44,719	45%	20,123	1,563	7.8%	2,649	12%	318	59	18.6%
45	Minnie-Belle Lake	251	25%	63	0	0.0%	3,318	45%	1,493	0	0.0%	101	20%	21	0	0.0%
46	AUID Stream	821	25%	205	3	1.6%	5,682	45%	2,557	29	1.1%	256	12%	31	1	4.8%
47	Manuella	5,770	25%	1,443	506	35.1%	30,329	45%	13,648	1,050	7.7%	1,292	14%	180	41	22.7%
48	Stella	8,488	25%	2,122	574	27.0%	38,555	45%	17,350	1,180	6.8%	1,760	15%	271	48	17.6%
49	Washington	6,712	25%	1,678	858	51.1%	44,284	45%	19,928	1,535	7.7%	1,641	16%	258	61	23.7%
50	Arvilla	11,060	25%	2,765	3,327	120.3%	37,883	45%	17,047	3,735	21.9%	1,809	17%	313	146	46.6%
51	Planning Region Outlet: Washington Creek	19,689	25%	4,922	7,363	149.6%	60,708	45%	27,319	6,827	25.0%	3,070	12%	368	264	71.7%
52	AUID Stream	9,764	25%	2,441	2,929	120.0%	30,426	45%	13,692	2,894	21.1%	1,557	12%	187	107	57.5%
53	AUID Stream	1,900	25%	475	124	26.0%	10,284	45%	4,628	400	8.6%	557	12%	67	15	22.7%
54	AUID Stream	2,633	25%	658	224	34.0%	14,620	45%	6,579	661	10.1%	780	12%	94	25	26.5%
55	Richardson Lake	2,848	25%	712	294	41.3%	16,183	45%	7,282	775	10.6%	824	57%	470	29	6.2%

PTMApp Priority Resource Point	Resource Type or Common Name	Sediment					Total Nitrogen					Total Phosphorus				
		Existing Estimated Annual Load (tons/yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (tons/yr.)	Load Reduction Expected from Implementation (tons/yr.)	Progress towards Goal (%)	Existing Estimated Annual Load (lbs./yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (lbs./yr.)	Load Reduction Expected from Implementati on (lbs./yr.)	Progress towards Goal (%)	Existing Estimated Annual Load (lbs./yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (lbs./yr.)	Load Reduction Expected from Implementation (lbs./yr.)	Progress towards Goal (%)
56	Dunns Lake	2,544	25%	636	296	46.5%	16,312	45%	7,341	778	10.6%	787	73%	575	29	5.1%
57	AUID Stream	5,609	25%	1,402	655	46.7%	26,035	45%	11,716	1,332	11.4%	1,320	12%	158	50	31.6%
	Planning Region Outlet: Jewetts Creek-North Fork Crow River	32,688	25%	8,172	13,249	162.1%	75,566	45%	34,005	3,328	9.8%	4,102	12%	492	123	25.0%
58	AUID Stream	30,067	25%	7,517	13,249	176.3%	70,440	45%	31,698	2,541	8.0%	97	12%	12	94	808.0%
	Planning Region Outlet: Big Swan Lake	20,404	25%	5,101	6,936	136.0%	54,122	45%	24,355	5,032	20.7%	2,655	12%	319	196	61.6%
61	Mud (47004000)	846	25%	211	0	0.0%	4,557	45%	2,051	0	0.0%	239	9%	22	0	0.0%
62	Jennie Lake	5,990	25%	1,497	587	39.2%	29,626	45%	13,332	977	7.3%	1,199	12%	144	38	26.8%
63	Wolf	6,464	25%	1,616	735	45.5%	28,638	45%	12,887	1,035	8.0%	1,167	17%	195	39	19.9%
64	AUID Stream	12,497	25%	3,124	1,418	45.4%	24,646	45%	11,091	1,141	10.3%	1,272	12%	153	44	28.8%
65	AUID Stream	8,304	25%	2,076	917	44.2%	28,249	45%	12,712	995	7.8%	1,245	12%	149	37	24.5%
66	Collinwood Lake	20,034	25%	5,009	2,483	49.6%	56,551	45%	25,448	2,331	9.2%	2,575	72%	1,854	87	4.7%
67	Long (47002600)	292	25%	73	31	42.1%	2,063	45%	928	134	14.4%	87	17%	14	5	34.1%
68	Spring Lake	824	25%	206	35	16.9%	6,243	45%	2,809	166	5.9%	370	57%	211	7	3.3%
69	AUID Stream	20,969	25%	5,242	4,974	94.9%	51,942	45%	23,374	3,834	16.4%	2,669	12%	320	149	46.5%
70	Big Swan Lake	22,338	25%	5,584	6,577	117.8%	62,566	45%	28,155	5,439	19.3%	3,072	63%	1,935	210	10.9%
71	HUC 12 outlet	2,256	25%	564	0	0.0%	15,322	45%	6,895	0	0.0%	632	12%	76	0	0.0%
72	Francis	645	25%	161	0	0.0%	13,328	45%	5,998	0	0.0%	412	14%	59	0	0.0%
73	West Lake Sylvia	702	25%	176	0	0.0%	11,580	45%	5,211	0	0.0%	386	39%	149	0	0.0%
74	John	1,705	25%	426	0	0.0%	10,280	45%	4,626	0	0.0%	477	11%	53	0	0.0%
75	Dans	722	25%	180	0	0.0%	4,610	45%	2,075	0	0.0%	218	17%	37	0	0.0%
76	AUID Stream	3,450	25%	863	0	0.0%	8,981	45%	4,042	0	0.0%	461	12%	55	0	0.0%
77	French Lake	2,892	25%	723	0	0.0%	12,965	45%	5,834	0	0.0%	560	13%	73	0	0.0%
78	AUID Stream	4,002	25%	1,001	0	0.0%	13,732	45%	6,180	0	0.0%	671	12%	80	0	0.0%
79	HUC 12 outlet	34,899	25%	8,725	27,863	319.4%	62,630	45%	28,183	1,850	6.6%	3,618	12%	434	72	16.5%
80	Granite Lake	1,053	25%	263	0	0.0%	6,233	45%	2,805	0	0.0%	250	50%	125	0	0.0%
81	AUID Stream	17,845	25%	4,461	571	12.8%	44,330	45%	19,948	451	2.3%	2,476	12%	297	18	5.9%
82	Cokato Lake	20,733	25%	5,183	571	11.0%	57,501	45%	25,875	633	2.4%	3,205	34%	1,090	25	2.3%
83	AUID Stream	14,828	25%	3,707	180	4.8%	41,303	45%	18,586	181	1.0%	2,455	12%	295	6	2.2%
84	Smith Lake	90	25%	22	0	0.0%	1,950	45%	878	0	0.0%	50	86%	43	0	0.0%
85	Brooks Lake	17	25%	4	0	0.0%	491	45%	221	0	0.0%	14	57%	8	0	0.0%
86	AUID Stream	2,604	25%	651	81	12.5%	8,818	45%	3,968	114	2.9%	474	12%	57	4	7.5%
87	AUID Stream	9,507	25%	2,377	245	10.3%	35,032	45%	15,764	347	2.2%	1,855	12%	223	14	6.1%
88	AUID Stream	2,672	25%	668	0	0.0%	9,434	45%	4,245	0	0.0%	499	12%	60	0	0.0%
89	AUID Stream	13,519	25%	3,380	373	11.0%	40,886	45%	18,399	303	1.6%	2,253	12%	270	12	4.3%
90	AUID Stream	16,279	25%	4,070	778	19.1%	49,853	45%	22,434	818	3.6%	2,718	12%	326	33	10.0%
91	Ann	15,006	25%	3,751	853	22.7%	48,958	45%	22,031	951	4.3%	2,556	82%	2,096	39	1.8%
92	Emma	14,737	25%	3,684	891	24.2%	51,330	45%	23,099	1,013	4.4%	2,597	60%	1,558	40	2.6%
93	AUID Stream	13,517	25%	3,379	991	29.3%	43,360	45%	19,512	971	5.0%	2,197	12%	264	39	14.7%
94	AUID Stream	1,542	25%	385	96	25.0%	7,106	45%	3,198	230	7.2%	384	12%	46	8	17.1%
95	AUID Stream	379	25%	95	0	0.0%	2,575	45%	1,159	0	0.0%	162	12%	19	0	0.0%
96	Howard Lake	1,189	25%	297	172	58.0%	11,293	45%	5,082	359	7.1%	525	69%	363	15	4.0%
97	Dutch Lake	1,151	25%	288	172	60.0%	13,130	45%	5,908	342	5.8%	656	87%	571	14	2.5%
98	AUID Stream	13,385	25%	3,346	1,197	35.8%	44,742	45%	20,134	967	4.8%	2,961	12%	355	38	10.8%
99	Waverly Lake	557	25%	139	23	16.3%	4,987	45%	2,244	131	5.8%	229	9%	21	5	25.0%
100	Little Waverly Lake	16,303	25%	4,076	1,523	37.4%	62,424	45%	28,091	1,693	6.0%	3,159	85%	2,685	67	2.5%
101	AUID Stream	12,622	25%	3,156	1,625	51.5%	39,586	45%	17,814	1,119	6.3%	2,020	12%	242	45	18.4%
102	HUC 12 outlet	42,386	25%	10,597	30,483	287.7%	80,097	45%	36,044	2,330	6.5%	4,357	12%	523	91	17.4%
103	AUID Stream	2,772	25%	693	214	30.9%	9,113	45%	4,101	379	9.3%	520	12%	62	15	24.5%
104	Upper Maple	470	25%	117	2	1.8%	5,771	45%	2,597	96	3.7%	224	7%	16	7	44.9%
105	Ramsey	2,035	25%	509	84	16.6%	15,450	45%	6,952	235	3.4%	762	47%	358	12	3.4%
106	AUID Stream	9,146	25%	2,287	789	34.5%	26,444	45%	11,900	608	5.1%	1,461	12%	175	24	13.5%
107	Buffalo Lake	8,139	25%	2,035	878	43.1%	43,935	45%	19,771	625	3.2%	2,927	66%	1,932	26	1.4%
108	Deer Lake	7,778	25%	1,945	878	45.1%	41,434	45%	18,646	569	3.1%	2,676	55%	1,472	24	1.6%
109	Mill Creek	10,878	33%	3,590	1,256	35.0%	39,874	45%	17,943	828	4.6%	2,433	12%	292	34	11.5%
110	AUID Stream	40,713	25%	10,178	32,452	318.8%	78,385	45%	35,273	2,400	6.8%	4,208	12%	505	93	18.4%
111	Fountain Lake	136	25%	34	127	373.2%	2,185	45%	983	214	21.7%	53	87%	46	7	16.3%
112	AUID Stream	8,642	25%	2,160	839	38.8%	29,360	45%	13,212	1,161	8.8%	1,615	12%	194	46	23.9%

PTMApp Priority Resource Point	Resource Type or Common Name	Sediment					Total Nitrogen					Total Phosphorus				
		Existing Estimated Annual Load (tons/yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (tons/yr.)	Load Reduction Expected from Implementation (tons/yr.)	Progress towards Goal (%)	Existing Estimated Annual Load (lbs./yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (lbs./yr.)	Load Reduction Expected from Implementati on (lbs./yr.)	Progress towards Goal (%)	Existing Estimated Annual Load (lbs./yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (lbs./yr.)	Load Reduction Expected from Implementation (lbs./yr.)	Progress towards Goal (%)
113	AUID Stream	8,094	25%	2,023	918	45.4%	26,624	45%	11,981	850	7.1%	1,554	12%	186	35	18.9%
114	Malardi Lake	226	25%	57	89	156.6%	2,098	45%	944	216	22.9%	76	95%	72	9	12.6%
115	Dean Lake	434	25%	108	156	143.5%	3,430	45%	1,544	237	15.4%	152	91%	139	10	7.4%
116	AUID North Fork Crow / Planning Region Outlet: North Fork Crow River	41,097	13%	5,343	37,503	702.0%	90,397	45%	40,679	3,244	8.0%	5,071	12%	609	132	21.6%
117	AUID Stream	2,683	25%	671	172	25.7%	7,248	45%	3,262	261	8.0%	480	12%	58	12	20.1%
118	AUID Stream	1,308	25%	327	19	5.9%	4,646	45%	2,091	32	1.6%	333	12%	40	2	4.4%
119	Sarah	2,078	25%	519	196	37.8%	10,525	45%	4,736	281	5.9%	543	16%	85	13	14.9%
120	AUID Stream	2,151	25%	538	312	58.1%	8,672	45%	3,902	297	7.6%	493	12%	59	13	21.5%
121	Wilhelm	36	25%	9	0	0.0%	754	45%	339	0	0.0%	57	17%	10	0	0.0%
122	HUC 12 outlet	37,128	25%	9,282	39,911	430.0%	89,251	45%	40,163	3,235	8.1%	5,961	12%	715	141	19.8%
123	AUID Stream	6,354	25%	1,588	945	59.5%	31,330	45%	14,098	767	5.4%	2,237	12%	268	38	14.1%
124	Foster Lake	2,978	25%	745	471	63.3%	11,756	45%	5,290	304	5.7%	1,006	87%	876	12	1.4%
125	Crow River AUID/ Planning Region Outlet: Crow River	29,597	41%	12,135	41,736	343.9%	85,265	45%	38,369	2,401	6.3%	7,088	12%	851	108	12.8%
126	HUC 12 outlet	5,576	25%	1,394	1,123	80.6%	19,384	45%	8,723	1,298	14.9%	1,011	12%	121	50	41.6%
127	HUC 12 outlet	18,608	25%	4,652	1,822	39.2%	62,181	45%	27,981	1,491	5.3%	3,415	12%	410	57	14.0%
128	Other	1,332	25%	333	32	9.5%	10,164	45%	4,574	156	3.4%	593	12%	71	5	7.2%
129	Other	17,960	25%	4,490	1,300	28.9%	65,049	45%	29,272	1,624	5.5%	3,834	12%	460	69	14.9%
130	Other	29,741	25%	7,435	3,271	44.0%	110,011	45%	49,505	1,745	3.5%	5,614	12%	674	69	10.2%
131	Other	43,057	25%	10,764	37,194	345.5%	103,176	45%	46,429	3,597	7.7%	5,218	12%	626	144	23.0%
132	Zonation	7,498	25%	1,874	1,380	73.6%	59,606	45%	26,823	2,321	8.7%	3,232	12%	388	100	25.9%
133	Woodcock	35	25%	9	0	0.0%	838	45%	377	0	0.0%	21	17%	4	0	0.0%
134	Moose	785	25%	196	0	0.0%	11,547	45%	5,196	0	0.0%	422	4%	18	0	0.0%
135	Zonation	2	25%	0	0	0.0%	204	45%	92	0	0.0%	4	12%	0	0	0.0%
136	Zonation	47,695	25%	11,924	33,714	282.7%	117,769	45%	52,996	2,861	5.4%	5,958	12%	715	112	15.7%
137	Crawford	14	25%	3	0	0.0%	595	45%	268	0	0.0%	26	5%	1	0	0.0%
138	Zonation	1,021	25%	255	37,825	14820.9%	92,021	45%	41,410	3,482	8.4%	5,377	12%	645	154	23.8%
139	Grove	3,275	25%	819	0	0.0%	29,165	45%	13,124	0	0.0%	1,353	16%	218	0	0.0%
140	AUID Lake	610	25%	152	10	6.3%	2,833	45%	1,275	19	1.5%	136	12%	16	1	6.4%
141	Rice	18,841	25%	4,710	1,805	38.3%	63,393	45%	28,527	1,484	5.2%	3,483	53%	1,846	57	3.1%
142	Mud (73020001)	17,946	25%	4,487	1,899	42.3%	57,939	45%	26,072	1,347	5.2%	3,146	16%	491	51	10.4%
143	Koronis (main lake)	25,600	25%	6,400	3,223	50.4%	109,628	45%	49,333	3,867	7.8%	5,682	16%	881	143	16.2%
144	Long (34006600)	55	25%	14	15	108.1%	3,534	45%	1,590	250	15.7%	155	9%	15	11	74.8%
145	George	1	25%	0	0	0.0%	381	45%	172	0	0.0%	10	25%	3	0	0.0%
146	AUID Lake	275	25%	69	0	0.0%	2,437	45%	1,096	0	0.0%	94	12%	11	0	0.0%
147	AUID Lake	64	25%	16	0	0.0%	656	45%	295	0	0.0%	21	12%	3	0	0.0%
148	Horseshoe	1,094	25%	274	18	6.5%	6,606	45%	2,973	30	1.0%	314	18%	58	2	3.0%
149	Peterson	427	25%	107	0	0.0%	3,906	45%	1,758	0	0.0%	142	17%	24	0	0.0%
150	Round	459	25%	115	0	0.0%	5,046	45%	2,271	0	0.0%	191	21%	39	0	0.0%
151	Erie	111	25%	28	0	0.0%	1,057	45%	475	0	0.0%	25	13%	3	0	0.0%
152	Hook Lake	1,897	25%	474	89	18.7%	10,965	45%	4,934	201	4.1%	456	66%	301	7	2.4%
153	AUID Lake	336	25%	84	109	129.7%	1,875	45%	844	172	20.4%	64	12%	8	6	82.6%
154	Little Swan	165	25%	41	198	480.8%	770	45%	346	253	73.2%	34	8%	3	11	398.6%
155	East Lake Sylvia	1,003	25%	251	0	0.0%	10,052	45%	4,524	0	0.0%	358	23%	82	0	0.0%
156	Camp Lake	205	25%	51	0	0.0%	1,379	45%	621	0	0.0%	50	70%	35	0	0.0%
157	Dog	96	25%	24	0	0.0%	1,482	45%	667	0	0.0%	44	17%	7	0	0.0%
158	Mary	28	25%	7	0	0.0%	762	45%	343	0	0.0%	19	13%	2	0	0.0%
159	Rock Lake	317	25%	79	0	0.0%	2,552	45%	1,149	0	0.0%	97	44%	43	0	0.0%
160	Tamarack	116	25%	29	0	0.0%	868	45%	391	0	0.0%	30	17%	5	0	0.0%
161	Deer	133	25%	33	0	0.0%	654	45%	294	0	0.0%	28	17%	5	0	0.0%
162	Albert Lake	337	25%	84	0	0.0%	1,844	45%	830	0	0.0%	82	87%	71	0	0.0%
163	Light Foot Lake	10,969	25%	2,742	789	28.8%	35,294	45%	15,882	852	5.4%	1,917	84%	1,610	33	2.1%
164	Sullivan	421	25%	105	0	0.0%	2,064	45%	929	0	0.0%	91	15%	14	0	0.0%
165	Pulaski	260	25%	65	31	48.0%	5,358	45%	2,411	97	4.0%	318	16%	50	4	7.5%
166	Constance Lake	284	25%	71	0	0.0%	2,150	45%	967	0	0.0%	100	75%	75	0	0.0%
167	Pelican Lake	4,475	25%	1,119	662	59.2%	27,881	45%	12,547	1,006	8.0%	982	74%	727	40	5.5%
168	Green Mountain	245	25%	61	31	50.9%	2,060	45%	927	63	6.8%	76	17%	13	2	18.1%

PTMApp Priority Resource Point	Resource Type or Common Name	Sediment					Total Nitrogen					Total Phosphorus				
		Existing Estimated Annual Load (tons/yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (tons/yr.)	Load Reduction Expected from Implementation (tons/yr.)	Progress towards Goal (%)	Existing Estimated Annual Load (lbs./yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (lbs./yr.)	Load Reduction Expected from Implementati on (lbs./yr.)	Progress towards Goal (%)	Existing Estimated Annual Load (lbs./yr.)	Load Reduction Goal* (%)	Target Load Reduction Goal (lbs./yr.)	Load Reduction Expected from Implementation (lbs./yr.)	Progress towards Goal (%)
169	AUID Lake	1,142	25%	286	286	100.0%	6,441	45%	2,898	394	13.6%	266	12%	32	15	46.6%
170	Beebe Lake	125	25%	31	0	0.0%	1,518	45%	683	0	0.0%	40	48%	19	0	0.0%
171	Charlotte	1,237	25%	309	331	107.0%	7,170	45%	3,227	338	10.5%	306	13%	41	14	35.0%
172	Rattail	23	25%	6	0	0.0%	299	45%	135	0	0.0%	14	17%	2	0	0.0%
173	Haften Lake	845	25%	211	59	28.0%	3,508	45%	1,579	80	5.1%	148	34%	50	4	7.1%
174	Prairie	22	25%	6	3	60.9%	1,249	45%	562	43	7.7%	48	4%	2	1	66.1%
175	Sylvan	74	25%	18	1	7.9%	892	45%	401	7	1.6%	31	17%	5	0	4.2%
176	Cowley	511	25%	128	61	47.8%	3,164	45%	1,424	196	13.7%	192	18%	35	12	33.4%
177	Laura	67	25%	17	4	22.0%	385	45%	173	0	0.2%	19	18%	3	0	0.5%
178	Schwappauf	206	25%	52	0	0.0%	1,022	45%	460	0	0.0%	34	10%	3	0	0.0%
179	Shakopee	1,256	25%	314	0	0.0%	6,699	45%	3,014	0	0.0%	298	18%	54	0	0.0%
180	Towers	5	25%	1	0	0.0%	185	45%	83	0	0.0%	4	18%	1	0	0.0%
181	Other	2,562	25%	640	0	0.0%	13,224	45%	5,951	0	0.0%	598	12%	72	0	0.0%
182	Martha	33	25%	8	0	0.0%	490	45%	220	0	0.0%	19	17%	3	0	0.0%

* Load Reduction Goal = Total Maximum Daily Load (TMDL) % Load Reduction for mid range flow (stream) or lake; or total phosphorus target for Lakes of Phosphorus Sensitivity Significance (LPSS). In the absence of an approved TMDL or LPSS, load reduction goal stated as follows:

Sediment: 25% per Sediment Reduction Strategy

Total Nitrogen: 45% per Nutrient Reduction Strategy

Total Phosphorus: 12% per Nutrient Reduction Strategy

Values in *italics* reference loading values, load goals, and progress to goals in the absence of lake routing.