Cedar-Wapsipinicon Comprehensive Watershed Management Plan

Prepared for
Cedar-Wapsipnicon Watershed Partnership

December 2019

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Certifications

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the Laws of the State of Minnesota.

Greg Williams
PE #: 47642

November 26, 2019
Date

Acronyms

Acronym	Description
1W1P	One Watershed One Plan
AIS	Aquatic Invasive Species
ARS	USDA Agricultural Research Service
AUAR	Alternative Urban Area Wide Reviews
BBR	Biennial Budget Request
BMP	Best Management Practice
BWSR	Minnesota Board of Water and Soil Resources
Chl-*a*	Chlorophyll-*a*
CIG	Conservation Innovation Grant
CIP	Capital Improvement Program
CPI	Crop Productivity Index
CRP	Conservation Reserve Program
CRWD	Cedar River Watershed District
CRWP	Cedar River Watershed Partnership (public-private-nonprofit collaboration)
CWF	Clean Water Fund
DWSMA	Drinking Water Supply Management Area
E. coli	*Escherichia coli*
EAW	Environmental Assessment Worksheet
EDA	Environmental Data Access
EIS	Environmental Impact Statements
EQB	Minnesota Environmental Quality Board
EQIP	Environmental Quality Incentives Program
EQuIS	Environmental Quality Information System
FEMA	Federal Emergency Management Agency
FIBI	Fish Index of Biological Integrity
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GRAPS	Groundwater Restoration and Protections Strategies
GSSHA	Gridded Surface Subsurface Hydrologic Analysis
HSPF	Hydrologic Simulation Program-Fortran
IBI	Index of Biotic Integrity
IWM	Intensive Watershed Monitoring
LA	Load Allocation
LGU	Local Governmental Unit
LIWG	Local Implementation Work Group
LTBM	Long-term Biological Monitoring
MBS	Minnesota Biological Survey
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Heath

MDNR	Minnesota Department of Natural Resources
MGS	Minnesota Geological Survey
MHA	Minnesota Hydrogeology Atlas
MIBI	Macroinvertebrate Index of Biological Integrity
MINLEAP	Minnesota Lake Eutrophication Analysis Procedure
MLCCD	Minnesota Land Cover Classification Dataset
MnDOT	Minnesota Department of Transportation
MOA	Memorandum of Agreement
MOS	Margin of Safety
MOSH	Minnesota Office of Soil Health
MPCA	Minnesota Pollution Control Agency
MS4	Municipal Separate Storm Sewer System
NAPP	National Aerial Photography Program
NED	National Elevation Dataset
NHIS	Natural Heritage Information System
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OHWL	Ordinary High Water Level
ORVW	Outstanding Resource Value Water
PAC	Policy Advisory Committee
PWI	Public Waters Inventory
PWS	Public Water System (Community PWS - where people live, including municipal and non-municipal systems; Non-community PWS - where people work and play, including transient and non-transient)
RCPP	Regional Conservation Partnership Program
RCTC	Riverland Community and Technical College
SAM	Scenario Application Manager
SHPO	Minnesota State Historic Preservation Office
SSTS	Subsurface Sewage Treatment System
SWAT	Surface Water Assessment Tool
SWCD	Soil and Water Conservations District
SWMP	Surface Water Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TAC	Technical Advisory Committee
TCWD	Turtle Creek Watershed District
TMDL	Total Maximum Daily Load
TN	Total Nitrogen
TP 40	Technical Paper 40
TP 49	Technical Paper 49

TP	Total Phosphorus
TSS	Total Suspended Solids
UCRSWMP	Upper Cedar River Surface Water Management Plan
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WCA	Wetland Conservation Act
WD	Water Districts
WHPPs	Wellhead Protection Plans
WLA	Wasteload Allocation
WPLM	Watershed Pollutant Load Monitoring
WRAPS	Watershed Restoration and Protection Strategy

Acknowledgements for the Cedar-Wapsipinicon Comprehensive Watershed Management Plan

Approved by the Minnesota Board of Water and Soil Resources (BWSR) _____ XX, 2019

Adopted by the Cedar-Wapsipinicon Watershed Partnership Policy Committee on _____ XX, 2019

The Cedar-Wapsipinicon Comprehensive Watershed Management Plan (Plan) was prepared with the dedicated assistance of its Planning Work Group (PWG), Advisory Committee, and Policy Committee.

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...and all members of the Planning Work Group

1.0 Executive Summary

The Cedar-Wapsipinicon Watershed Partnership (Partnership) is a group of Counties, Soil and Water Conservation Districts (SWCDs), Watershed Districts, and the City of Austin located within southern Minnesota and covering an area herein referred to as the "Cedar-Wapsipinicon watershed planning area" or "planning area." The partnership was formed as part of the One Watershed, One Plan (1W1P) program detailed in Minnesota Statutes 103B.101. Through the 1W1P program, the Partners prepared this document – the Cedar-Wapsipinicon Comprehensive Watershed Management Plan (Plan).

1.1 Introduction

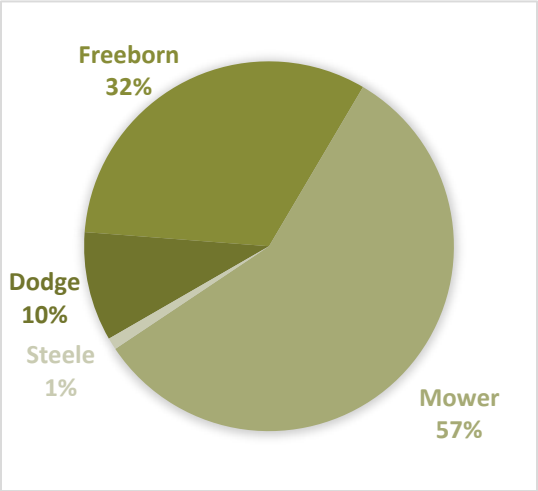
This Plan outlines a cooperative and coordinated strategy by which the Partners will protect, maintain, and restore the water and natural resources under their jurisdiction. Through prioritized and targeted implementation, the Partners will make progress towards mutually beneficial measurable goals, while considering the issues and interests of local communities, residents, and partners. This Plan provides a framework for the Partners to operate as a local, coordinated partnership while effectively leveraging the resources of local governments (i.e., the Partners) and supporting organizations (e.g., State and Federal agencies). The Plan is a local plan emphasizing the interests of local water managers, policy makers, and affected stakeholders (see Section 2.5). The Plan was developed through the efforts of:

- Planning Work Group – comprised of technical staff of the Partners organizations
- Advisory Committee – including staff from state and local cooperators and invited stakeholders
- Policy Committee – comprised of elected officials representing the Partner organizations

This Plan will be executed through a Memorandum of Agreement (MOA) between the Partners (see Appendix A). The MOA recognizes the importance of partnerships to implement protection and restoration efforts for the Cedar River watershed planning area on a cooperative and collaborative basis pursuant to the authority contained in Minnesota Statutes Section 471.59.

1.2 Planning Boundary and Subwatersheds

The planning area includes the portion of the following watersheds in Minnesota: Cedar River, Turtle Creek, Little Cedar River, Deer Creek, and Wapsipinicon River (see Figure 1-1). The planning area is located in the Cedar River basin and includes areas in Minnesota within the Upper Cedar River 8-digit HUC watershed (07080201) and the Wapsipinicon River 8-digit HUC watershed (07080102). The Minnesota-Iowa border defines the southern boundary of the planning area (both 8-digit HUC watersheds extend south into Iowa). The planning area has been subdivided into 15 planning subwatersheds (for consistency with other Cedar River planning documents, see Section 3.1.1).

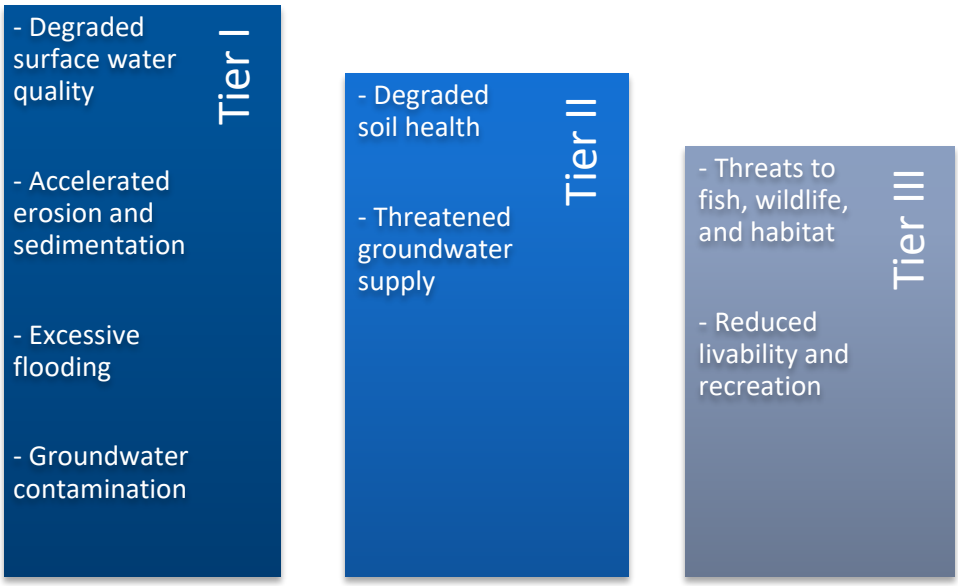


Four counties are located within the Cedar River watershed planning area. The planning area is primarily agricultural land with mostly row crops and some pasture. The watershed includes natural areas of bur oak savanna, tallgrass prairie and maple basswood forest providing wildlife habitat and recreation opportunities. The major hydrologic feature in the watershed is the Cedar River, which collects inflow from several tributary streams as it flows from north to south through the watershed. The Cedar River passes through the City of Austin; Austin is the largest city in the planning area with a population of approximately 25,000. Additional information about the physical and environmental characteristics of the planning area are presented in Section 3.0.

1.3 Issue Prioritization

Section 4.0 of the Plan summarizes the issue identification and prioritization process used by the Partners and documents the resulting issue priorities. Prioritization of spatial areas for targeted implementation is described in Section 6.0. The Partnership implemented an iterative process to identify and prioritize watershed issues. Several tools were explored during the issue prioritization process, including MDNR Zonation analysis, literature review, and paired analysis ranking. The final issue prioritization incorporates some elements of each tool/process.

The Partnership ultimately established a three-tiered issue prioritization, with four issues areas categorized as Tier I (top priority), two issue areas categorized as Tier II (medium priority), and two issue areas categorized as Tier III (lower priority). While emphasis for implementation has been placed on Tier I issues, the implementation schedule includes activities to address all tiers of issue priority. It is worth noting that the Partners classified "degraded soil health" as a Tier II issue in part because that issue will be addressed by many of implementation activities targeting Tier I issues.



1.4 Measurable Goals

The development of measurable goals to address the issues prioritized by the Partners is described in Section 5.0 of the Plan. In developing measurable goals, the Partners considered a range of available information, including:

- Goals from existing management plans, studies, reports, data and information, including:
    - Cedar River WRAPS report
    - Cedar River TMDL report (includes load allocations)
    - Cedar River hydrologic and hydraulic modeling and analysis
    - SWAT modeling and digital terrain analysis
- Existing implementation programs and schedules
- Input received during public meetings
- Input from the Planning Work Group
- Input from Advisory Committee members
- Input from Policy Committee members

In situations where existing data was not sufficient to develop a quantitative goal, the goals focus on collecting and interpreting information to support developing more quantitative future goals. Measurable outputs for each goal were selected appropriate to the level of quantification. Emphasis was given to goals that address Tier I priority issues, although measurable goals were developed to address all eight priority issue areas.

Notable Plan goals to address Tier I issues include:

- Implement structural and non-structural projects and practices to reduce watershed phosphorus, nitrogen, and sediment loading in the 15 planning subwatersheds (numeric load reductions vary by pollutant and planning subwatershed, see Table 5-3)

- Increase average runoff retention by increasing watershed storage by 0.25 inches (~9,600 acre-feet)

- Reduce nitrogen loading to groundwater through the implementation of field practices and reduction of fertilization rates

- Reduce *E. coli* loading through management of SSTS, un-sewered discharges, and feedlots

A complete list of measurable goals developed by the Partners are presented in Table 5-2. Some goals are applicable watershed wide, while others focus on specific spatial areas (e.g., DWSMAs), natural resources (e.g., Dobbins Creek), or target audiences (e.g., private well owners).

A combination of SWAT modeling results, HSPF modeling results, and the HSPF-SAM watershed assessment tool were used to establish realistic, quantitative pollutant reduction goals to address degraded surface water quality in the 15 planning subwatersheds (see Section 6.4). Goals to address degraded surface water quality are broken down by pollutant and subwatershed in Table 5-3.

1.5 Implementation

The Plan includes a targeted and measurable implementation schedule (see Table 7-2 and Section 7.1) that outlines the projects, programs, and strategies the Partnership will implement over the next 10 years. The implementation schedule provides sufficient direction and milestones while maintaining flexibility to adapt to developing opportunities and/or immediate concerns. The targeted implementation schedule includes a range of strategies and tools, including capital improvements, local controls, and new and expanded programs necessary to achieve the goals of the Plan.

1.5.1 Targeting of Practices for Implementation

Recognizing that financial and staff resources limit the ability of the Partnership to address priority issues in the watershed, the Partners developed a methodology to prioritize and target actions at the watershed scale, and at field scale (i.e., within each planning subwatershed).

Subwatershed scale targeting – portions of the 15 planning subwatersheds were identified as priority areas for project or program implementation, based on an overlay of geospatial datasets corresponding to Tier I priority issues (i.e., degraded surface water quality, contaminated groundwater, accelerated erosion and sedimentation, and excessive flooding). Areas were classified as the following priority based on the number of issues applicable to that subwatershed area (see Figure 6-3):

- Level 5 (high priority)
- Level 4 (high priority)
- Level 3 (medium priority)
- Level 2 (medium priority)
- Level 1 (low priority)
- Level 0 (low priority)

While the implementation schedule (see Section 7.1) includes projects more heavily targeted in high priority (i.e., Level 5 and Level 4) areas, projects and programs are planned for all areas of the watershed, including areas with little existing data and areas targeted for specific implementation activities (see Table 7-2).

Field scale targeting – the potential location of field practices (BMPs) to address Tier I issues (e.g., vegetated buffers, WASCOBs, stormwater practices) were identified or estimated based on the results of digital terrain analysis, modeling results, and other technical analysis (see Section 6.3). Potential BMP locations were identified throughout the planning area, regardless of subwatershed priority level (see Figure 6-5).

1.5.2 Implementation Schedule

The Plan implementation program is presented in Table 7-2. The activities included in the implementation program are intended to leverage the existing roles, capacities, and expertise of the Partners and provide a framework for the Partners to perform expanded roles to achieve Plan goals. The activities and projects

described in this Plan will be implemented through existing programs of the Partners. Programs and activities may be adjusted based on the associated funding source.

Activities included in Table 7-2 are assigned to the following four categories:

- Projects and project support
- Monitoring and studies
- Education and public involvement
- Regulation and administration

The proposed timeframe, estimated cost (local and non-local contributions), measurable outputs, and lead and cooperating entities are identified for each implementation activity.

Projects and Project Support

Project and project support activities represent approximately 90% of the overall Plan implementation costs (see Section 7.3). This category includes constructed improvements and field practices designed primarily to address issues related to surface water quality, groundwater quality, erosion and sedimentation, and flooding. This category also includes feasibility studies, planning, and design work necessary to design and construct these projects.

A significant portion of the implementation program is tied to activity SWQ-1:

> *Implement BMPs at very high priority and high priority sites identified through SWAT modeling and GIS terrain analyses (see* Figure 6-5*) to reduce erosion and filter pollutants; specific BMPs to be determined based on site-specific feasibility, with target implementation by subwatershed as follows…*

Table 7-2 includes the planned implementation of 198 such projects spread over the planning subwatersheds and 10 year planning window. Note that the planned number of projects to be implemented in each planning subwatershed is less than the number of potential project locations shown in Figure 6-5. Specific projects will be implemented locally by the Partners with consideration for local priorities, opportunities, and limitations.

Many of the projects included in the implementation schedule are cross referenced to activity SWQ-1. The Partners anticipate that many of the projects implemented as part of activity SWQ-1 will be **multi-benefit projects**. BMPs that provide benefits related to flooding, groundwater quality, soil health, and other concerns, in addition to directly addressing the issue of degraded surface water quality will be prioritized.

Other project and project support activities addressing Tier I priority issues included in Table 7-2 include:

- SWQ-2: Implement and/or expand cost share assistance programs to promote the use of BMPs focused on soil health (e.g., cover crops, conservation tillage - defined as no-till and strip-till)
- SWQ-3: Implement projects to reduce phosphorus and sediment loading in urban stormwater runoff (above and beyond current minimum requirements)

- SWQ-4: Provide financial assistance to implement animal waste management systems to reduce waste loading to streams
- SWQ-5: Meet with Partners to coordinate implementation of water quality and soil health best management practices (cross referenced to SWQ-1, SWQ-2, and SWQ-3)
- SWQ-11: Cooperate with agricultural producers to develop site-specific nutrient management plans
- SWQ-12: Cooperate with agricultural producers to develop site-specific manure management plans
- SWQ-15: Establish a 10-year CIP for planning area specific to the CRWD
- SWQ-16: Establish a 10-year CIP for planning area specific to the TCWD
- GWQ-1: Seal abandoned or unused private wells, with an emphasis on wells located within DWSMAs
- GWQ-2: Seal abandoned or unused high-capacity wells, with an emphasis on wells located within DWSMAs
- GWQ-3: Implement practices to reduce or limit nitrate movement into groundwater (e.g., nutrient management, cover crops, saturated buffers, two-stage ditches, wetland restoration) (cross-referenced to SWQ-1 and SWQ-2)
- GWQ-4: Provide financial assistance for repair, or replacement of non-functioning SSTS
- GWQ-5: Implement projects to provide adequate wastewater treatment to un-sewered communities/areas.
- ESC-1: Implement projects to stabilize or restore degraded streambank areas (in addition to project sites identified in item SWQ-1)
- FLD-1: Implement projects to increase headwater storage and/or reduce peak flow rates at priority locations identified in planning subwatersheds
- FLD-2: Work with the City of Austin to identify remaining flood-prone areas and perform feasibility study to identify preferred solutions
- FLD-3: Provide cost-share or incentive program for residents to implement stormwater capture and reuse practices

Monitoring and Studies

Table 7-2 includes several implementation activities categorized as "monitoring and studies." These activities include those necessary to evaluate Plan progress and address data gaps related primarily to Tier I issues (and soil health). Collected data may also be used to identify future, or modify current, Plan implementation activities and priorities. Ongoing monitoring activities are also necessary to assess progress relative to Plan measurable goals.

Monitoring and study activities are generally scheduled early in Plan implementation to maximize the benefit over the 10-year planning window. Monitoring and study activities included in Table 7-2 will leverage past and present programs operated in the watershed (described in Section 3.7). The Partnership sees opportunities for greater coordination and alignment of state monitoring programs with local implementation priorities (e.g., evaluating trends at smaller watershed scales) through the implementation of this Plan.

Significant monitoring and studies activities in the implementation schedule include:

- Monitor private groundwater wells for nitrate, bacteria, and other emerging contaminants with focus on aquifers 200-300 feet deep; initiate special study on emerging contaminants
- Update existing hydrologic and hydraulic modeling using most current precipitation data and develop models for previously un-modeled watersheds (Deer Creek, Elk River, Wapsipinicon River, Little Cedar River, Otter Creek)
- Assess/quantify the runoff reduction, water quality, and groundwater protection benefits of cover crops, perennial vegetation, and other soil health practices

Education and Public Involvement

Table 7-2 includes several implementation activities categorized as "education and public involvement." The Partners recognize that public awareness and support is necessary to successfully implement this Plan and achieve meaningful progress towards Plan goals. The education and public involvement activities included in the implementation schedule are generally geared towards promoting soil, water, and natural resource stewardship through increased public understanding of priority issues and providing varying levels of technical assistance. The Partners will leverage existing relationships and public outreach methods as a foundation to implement the activities in Table 7-2, further developing capacity and methods through the assistance of cooperating entities and the targeting performed as part of this Plan.

A complete list of education and public involvement activities is included in Table 7-2 and includes items such as, but not limited to:

- SWQ-13: Host workshops to provide education regarding nutrient management plans and manure management plans
- GWQ-11: Provide educational materials regarding proper function and maintenance of SSTS systems (targeting non-compliant landowners)
- GWQ-16: Provide technical assistance and cost share for well capping
- FLD-8: Encourage the use of low impact design (LID) techniques to reduce stormwater runoff from developed areas through technical assistance to residents and developers

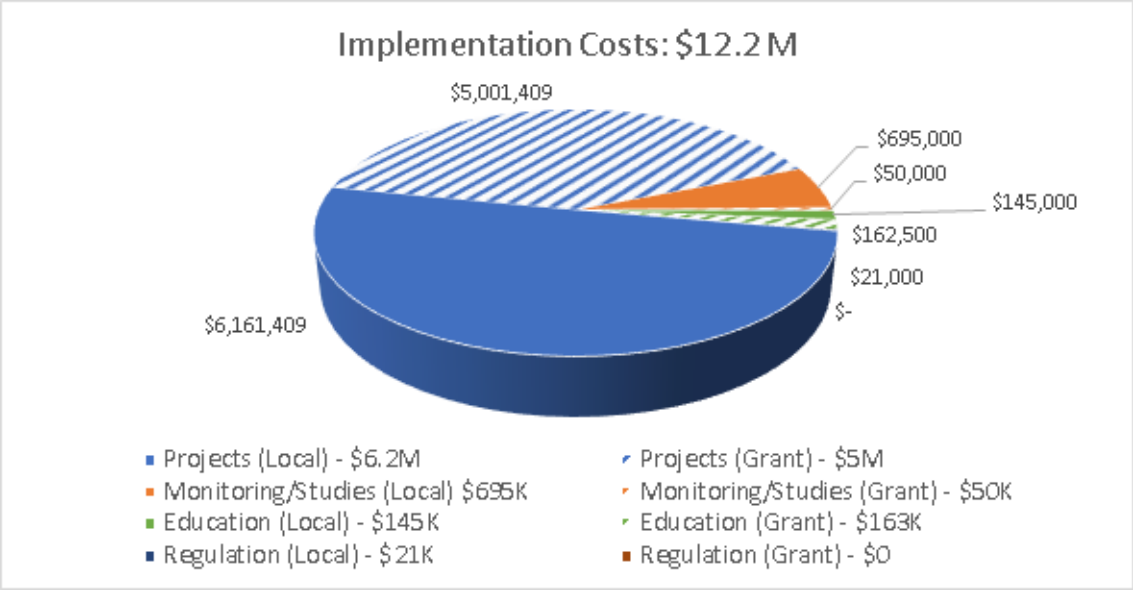
Regulation and Administration

The priority issues identified by the Partners are addressed in part through Federal, State and local regulations. Table 7-2 includes implementation activities categorized as "regulation and administration." These activities include those actions related to the development and enforcement of rules, ordinances, or other official controls. The activities included in the implementation schedule include those administered by the Partners and do not include State and Federal regulatory programs administered by others. Regulatory programs administered at a local level by the Partners are summarized in Section 7.2.

1.5.3 Implementation Costs

The implementation schedule includes planning level cost estimates for individual activities. Planning level costs are split between local funding sources and external funding sources. Local funding sources include

funding borne by the Partners, while external funding sources include all other funding sources (e.g., cost-share with non-Partner entities, State grants). Costs are subtotaled by category and funding source as shown below:



This Plan includes an ambitious implementation schedule. Total estimated annual costs (approximately $1.2M) exceed current local funding allocated to existing and similar programs within the planning area. The annual amount of funding needed from local sources to perform the activities included in the implementation schedule is approximately $7M over the 10-year planning period, or approximately $700,000 annually. Organizational capacity of the Partners (including staff time and expenses) to address the issues identified in this Plan was estimated at approximately $400K during Plan development. Thus, additional local funding and funding through State, Federal, and private grant or cost-share dollars will be necessary to accomplish Plan goals.

Additional non-governmental funding sources may be used to fund Plan implementation. The Partners will coordinate with NGOs to explore potential partnerships and cost-share opportunities surrounding shared goals. The Partners will seek additional partnerships with private sector businesses as such opportunities arise. Future opportunities may include working with agra-business on incentives that provide opportunity for water resources improvements. Incentives may not be implemented through the Partnership, but instigated through Partnership actions.

Additional information about Plan costs and funding sources is included in Section 7.3.

1.5.4 Implementation Roles and Responsibilities

The Parties will implement this Plan according to the governance structure established in the implementation Memorandum of Agreement (MOA, see Appendix A). The MOA does not create a new entity. Instead, the MOA is a formal and outward commitment to work together as a partnership and specifies mutually-accepted expectations and guidelines between partners. Per the MOA, the Parties will

establish committees to carry out the coordinated implementation of this Plan. During implementation, the Plan will be executed through the coordinated effort of the following committees:

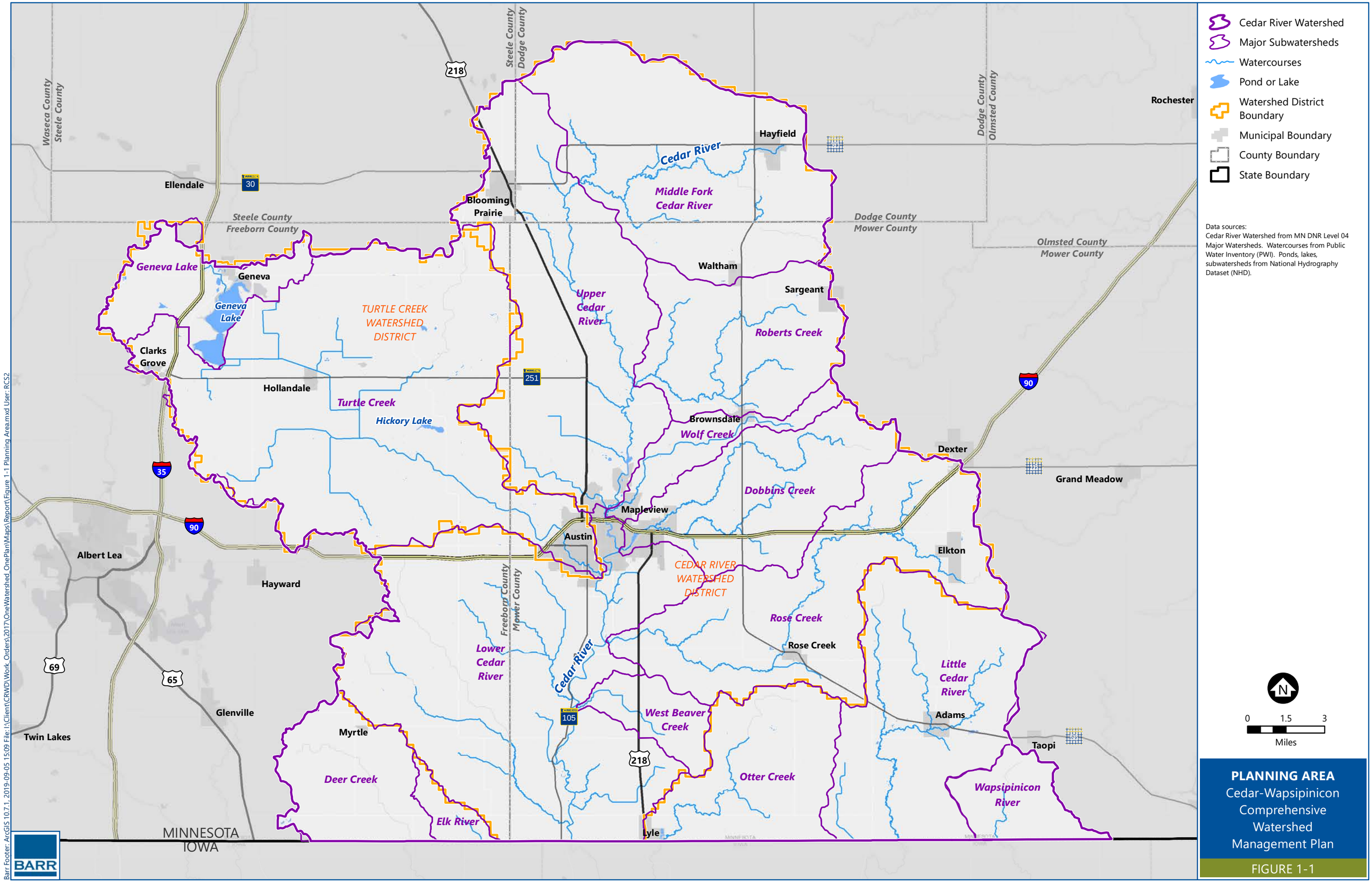
- Policy Committee
- Technical Advisory Committee
- Local Implementation Work Group

These groups are described in greater detail in Section 7.4; their roles are summarized in Table 1-1.

Annual work planning will be performed by the Local Implementation Work Group. Planning will be based on prioritized implementation activities planned, the availability of funds, and the roles and responsibilities for implementation. Coordination and communication are critical for a partnership operating under an MOA. The Partners will continue to coordinate with BWSR, MDA, MDH, MDNR, and MPCA as required through State-legislated programs and to accomplish the many Plan activities that identify State agencies as cooperating entities. The Partners will also coordinate with Federal partners where appropriate, including NRCS, FSA, USACE, EPA, and USFWS. Similarly, continued coordination and communication with local governmental units, such as cities, township boards, county boards, watershed district boards, joint powers boards, drainage authorities, and other water management authorities is necessary to facilitate watershed wide activities. The Parties will also collaborate with non-governmental organizations where mutual benefit may be achieved.

Table 1-1 Plan administration and implementation roles

Policy Committee	Technical Advisory Committee	Local Implementation Work Group
• Local funding commitments for implementation • Recommend approval of annual fiscal reports by MOA boards • Recommend approval of annual reports by MOA boards • Annually review/approve of work plan • Recommend approval of grant applications by MOA boards • Provide direction and input to Local Implementation Work Group regarding: o emerging issues o change in priority issues and resources • Recommend approval of Plan amendments by MOA boards • Implement county ordinances and statutory responsibilities	• Provide review and input on annual work plan • Identify collaborative funding opportunities • Provide recommendations to Local Implementation Work Group on program adjustments • Assist in carrying out targeted implementation schedule (in partner role)	• Identify local funding needs for implementation • Prepare the annual work plan • Prepare annual fiscal reports • Prepare annual reports • Review and confirmation of priority issues/implementation • Evaluate and recommend response to emerging issues • Prepare Plan amendments • Prepare and submit grant applications • Carry out the targeted implementation schedule • Assess progress towards Plan goals



Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:09 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 1-1 Planning Area.mxd User: RCS2

2.0 Introduction

The Cedar-Wapsipinicon Watershed Partnership (Partnership) is a partnership of Counties, Soil and Water Conservation Districts (SWCDs), Watershed Districts, and the City of Austin located within the Cedar River and Wapsipinicon River watersheds. The partnership was formed as part of the One Watershed, One Plan (1W1P) program detailed in Minnesota Statutes 103B.101. Through the 1W1P program, the Partners prepared this document – the Cedar-Wapsipinicon Comprehensive Watershed Management Plan (Plan).

2.1 Purpose and Scope

The purpose of this Plan is to develop and document coordinated, prioritized, and targeted practices and programs to achieve the water and natural resource management goals established by the Partnership (see Section 5.0). This Plan provides a framework for the Partners to operate as a local, coordinated partnership while effectively leveraging the resources of local governments (i.e., the Partners) and supporting organizations (e.g., State and Federal agencies).

The Plan includes a prioritized, targeted, and measurable implementation program (see Section 7.0) that outlines the projects, programs, and strategies the Partnership will implement over the next 10 years. The implementation program provides sufficient direction and milestones while maintaining flexibility to adapt to developing opportunities and/or immediate concerns. Plan development is based on a systematic, watershed-wide, science-based approach to resource and watershed management. The targeted implementation program includes a range of strategies and tools, including capital improvements, local controls, and new and expanded programs necessary to achieve the goals of the Plan.

The Plan is a local plan emphasizing the interests of local water managers, policy makers, and affected stakeholders (see Section 2.5). This Plan was developed under and through a Memorandum of Agreement (MOA) between the Partners and will be executed through an implementation MOA (see Appendix A). The implementation MOA recognizes the importance of partnerships to implement protection and restoration efforts for the Cedar River watershed on a cooperative and collaborative basis pursuant to the authority contained in Minnesota Statutes Section 471.59.

Much of the information contained within this Plan is compiled from existing water and natural resource management plans, studies, reports, modeling, and other sources. Most notably, this Plan draws from the *Cedar River Watershed Total Suspended Solids, Lake Eutrophication, and Bacteria Total Maximum Daily Load* study (Cedar River TMDL, MPCA, 2019) and the *Cedar River Watershed Restoration and Protection Strategy Report* (Cedar River WRAPS, MPCA, 2019). A complete list of documents referenced in the development of this Plan is included in Section 8.0.

2.2 One Watershed, One Plan Program

The One Watershed, One Plan (1W1P) program is an evolution of Minnesota's watershed management strategy that emphasizes management of water resources according to hydrologic boundaries instead of political boundaries. In 2011, members of the Local Government Water Roundtable (Association of Minnesota Counties, Minnesota Association of Watershed Districts, and Minnesota Association of Soil and

Water Conservation Districts) determined that it is in the public interest to manage groundwater and surface water resources on a watershed scale to achieve protection, preservation, enhancement, and restoration of these resources. The Roundtable recommended that local governments charged with water management responsibility should organize and develop focused implementation plans on a watershed scale.

The State passed legislation in 2012 (Minnesota Statutes §103B.101, subd.14), based on the recommendation of the Roundtable, giving the Board of Water and Soil Resources (BWSR) the authority to develop and implement a comprehensive watershed management planning approach emphasizing coordination on a watershed basis. This legislation led to the establishment of the One Watershed, One Plan (1W1P) program at BWSR. Additional legislation was passed in 2015 (Minnesota Statutes §103B.801) that outlines the purpose of and requirements for comprehensive watershed management plans developed through the 1W1P program.

The 1W1P vision is to align local planning and implementation with state strategies over a ten-year transition period into plans built largely around the state's major watersheds. The BWSR *One Watershed, One Plan Operating Procedures* is a policy document that outlines processes to achieve this vision. Additional information about the 1W1P program can be found on the BWSR website: http://www.bwsr.state.mn.us/planning/1W1P/index.html

As part of the 2012 legislation, BWSR was granted funding to initiate the 1W1P program. This Plan has been developed through a grant provided by BWSR.

2.3 Watershed Characteristics

The planning area subject to this Plan is predominantly comprised of productive agricultural land with mostly row crops and some pasture. The watershed includes natural areas of bur oak savanna, tallgrass prairie and maple basswood forest providing wildlife habitat and recreation opportunities. Topography includes moraine ridges, gently rolling hills, and level plains common to the Drift Plains ecoregion of Minnesota. The major hydrologic feature in the watershed is the Cedar River, which collects inflow from several tributary streams as it flows from north to south through the watershed. The Cedar River passes through the City of Austin; Austin is the largest city in the Cedar-Wapsipinicon planning area with a population of approximately 25,000. Additional information about the physical and environmental characteristics of the planning area are presented in Section 3.0.

2.4 Plan Boundary

The area included in this Plan (planning area) is presented in Figure 1-1. The planning area is located in the Cedar River basin and includes areas in Minnesota within the Upper Cedar River 8-digit HUC watershed (07080201) and the Wapsipinicon River 8-digit HUC watershed (07080102). The Minnesota-Iowa border defines the southern boundary of the planning area (both 8-digit HUC watersheds extend south into Iowa). Four counties are located within the planning area, with contributing areas as presented in Table 3-1. Approximately 82% of the planning area (590 square miles) drains to the Cedar River before crossing the Minnesota-Iowa Border. The remaining 18% (132 square miles) drains to the Minnesota-Iowa

border via tributaries before discharging to the Cedar River in Iowa. Tributary watersheds delineated at approximately the 11-digit HUC level (for consistency with other Cedar River planning documents) are presented in Section 3.1.1.

2.5 Planning Partners and Plan Development

The Cedar-Wapsipinicon Watershed Partnership includes the following 11 entities that committed to the implementation of this Plan through execution of the MOA included in Appendix A:

- The Counties of Dodge, Freeborn, Mower, and Steele (i.e., the Counties) by and through their respective County Board of Commissioners.

- The Dodge, Freeborn, Mower, and Steele Soil and Water Conservation Districts (i.e., SWCDs) by and through their respective SWCD Board of Supervisors.

- The Cedar River, and Turtle Creek Watershed Districts (i.e., WDs) by and through their respective Board of Managers.

- The City of Austin (i.e., the City) by and though their City Council Members.

The above entities collectively form the Cedar-Wapsipinicon Watershed Partnership, and are referred to within this Plan as the "Partners." Steele County and Steele County SWCD are included among the Partners signed to the MOA. Due to the limited portion of the planning area located within Steele County (less than 2 percent) and concurrent participation in the Cannon River 1W1P process, participation of Steele County and Steele County SWCD in the development of this Plan was limited.

In addition to the primary implementation responsibilities of the Partners, implementation of this Plan will rely on the involvement and cooperation of other federal, state, and local entities. Several of these cooperators were involved in the development of this Plan through the establishment and participation of the following committees:

- The **Policy Committee** served as the decision-making authority for the planning process. The committee was composed of one County Commissioner and one SWCD Supervisor appointed from each of the counties in the Cedar-Wapsipinicon 1W1P planning area, one manager from each WD, and a City Council member from the City of Austin. While the Policy Committee nominally includes 11 members, a quorum of at least 5 members was agreed to for Policy Committee meetings based on the limited participation by Steele County and Steele County SWCD

- The **Advisory Committee** served to provide input to the Policy Committee regarding the planning process and Plan content, including supplying technical information throughout Plan development. The committee was composed of local, State, and Federal agency staff, representatives from agricultural and conservation groups, and other stakeholders. A complete list of participating organizations is included in the Acknowledgements section.

- The **Planning Work Group** guided the logistics of the planning process and drafted the Plan. The Planning Work Group was composed of local governmental staff from the counties and SWCDs in the planning area, as well as BWSR staff. A complete list of participating organizations is included in the Acknowledgements section.

Individuals who participated in these committees during Plan development are noted in the "Acknowledgements" section located at the beginning of the Plan. The Advisory Committee included participants from Iowa, as hydrologic and water quality issues in the planning area will affect downstream portions of the Cedar River in Iowa.

Input from the Partners, cooperators, and public served a critical role during Plan development and contributed to a Plan that prioritizes local interests in coordination with broader goals. The Partnership performed the following stakeholder engagement activities to kick-off the planning process:

- **Notification of Plan Update** – February 2017 – The Partnership solicited input from state agencies regarding issues to be addressed by the Plan and data relevant to Plan development. The Partnership received input from the following agencies:
    - Minnesota Board of Water and Soil Resources (BWSR)
    - Minnesota Department of Agriculture (MDA)
    - Minnesota Department of Health (MDH)
    - Minnesota Department of Natural Resources (MDNR)
    - Minnesota Pollution Control Agency (MPCA)

- **Public Kickoff Meeting** – May 31, 2017 – The Partnership advertised and hosted an open house at the Hormel Nature Center in Austin, Minnesota. Members of the Planning Work Group, Policy Committee, Advisory Committee, and the public were invited to attend. BWSR staff, state agencies and the Partnership's planning consultant, Barr Engineering Co. (Barr), presented relevant data in poster format. The Partnership solicited input from attendees regarding priority concerns and resource use.

Throughout the planning process, stakeholder input was shared, received, and considered through frequent meetings of the Planning Work Group, Advisory Committee, and Policy Committee. **Table 2-1** presents a timeline of key committee meetings held during the Plan development process.

Table 2-1 Meetings held during Plan development

Date	Committee	Major agenda items
May 10, 2017	Advisory Committee	MPCA presentation; governance structure
June 19, 2017	Advisory Committee	MDNR Zonation process information
July 24, 2017	Planning Work Group	Governance structure, Plan inventory content; MDNR Zonation survey,
July 24, 2017	Policy Committee	Governance structure; MDNR Zonation survey
September 25, 2017	Policy Committee	Governance workshop
October 3, 2017	Planning Work Group	Governance structure
October 3, 2017	Advisory Committee	Review MDNR Zonation results; data aggregation
October 18, 2017	Planning Work Group	Governance structure/MOA; MDNR Zonation results
November 15, 2017	Planning Work Group	Governance structure/MOA; MDNR Zonation results
November 15, 2017	Policy Committee	MDNR presentation; Governance structure/MOA; MDNR Zonation
December 6, 2017	Planning Work Group	Issue identification (Zonation, studies) and prioritization methodology
December 13, 2017	Advisory Committee	Issue prioritization methodology
January 3, 2018	Policy Committee	Issue identification and prioritization; paired comparison exercise
January 18, 2018	Planning Work Group	Review paired comparison results
February 20, 2018	Advisory Committee	Review and prioritize paired comparison results
March 7, 2018	Policy Committee	Issue prioritization; measurable goals
March 9, 2018	Planning Work Group	Measurable goals; WRAPS
April 2, 2018	Advisory Committee	Issue prioritization results; issue statements; WRAPS and goals
April 25, 2018	Planning Work Group	Measurable goals; targeted areas
May 2, 2018	Policy Committee	Measurable goals; targeted areas
May 23, 2018	Planning Work Group	Targeted areas; ranking criteria; WRAPS
May 27, 2018	Policy Committee	MDH presentation; governance structure; responses to notification
June 18, 2018	Planning Work Group	Measurable goals; targeted areas
June 18, 2018	Advisory Committee	Measurable goals; targeted areas
June 26, 2018	Planning Work Group	Groundwater measurable goals and targeted areas
July 11, 2018	Planning Work Group	Targeted areas for groundwater; ranking criteria; implementation
July 11, 2018	Policy Committee	Measurable goals; priority areas for groundwater and flood reduction
August 6, 2018	Advisory Committee	Targeted priority areas; implementation table
September 11, 2018	Planning Work Group	Targeted priority areas; implementation table; organizational capacity
September 24, 2018	Advisory Committee	Targeted priority areas; implementation table; organizational capacity
October 25, 2018	Planning Work Group	Targeted priority areas; implementation table; measurable outputs
October 25, 2018	Advisory Committee	Targeted priority areas; implementation table; measurable outputs
November 1, 2018	Planning Work Group	Implementation table

Table 2-1 Meetings held during Plan development

Date	Committee	Major agenda items
November 7, 2018	Policy Committee	Targeted priority areas; measurable outputs
November 8, 2018	Planning Work Group	Implementation table
November 26, 2018	Planning Work Group	Draft Plan section review
December 3, 2018	Advisory Committee	Draft Plan section review; implementation programs
December 19, 2018	Policy Committee	Draft Plan section review
January 14, 2018	Planning Work Group	Draft Plan section review
January 29, 2018	Planning Work Group	Draft Plan section review
January 31, 2018	Advisory Committee	Draft Plan section review
February 6, 2019	Policy Committee	Draft Plan section review
March 7, 2019	Planning Work Group	Discuss tools assessing pace of progress
March 12, 2019	Advisory Committee	Draft Plan section review
March 26, 2019	Planning Work Group	Review Advisory Committee comments
March 27, 2019	Planning Work Group	Review Advisory Committee comments
April 3, 2019	Planning Work Group	Review Advisory Committee comments
April 16, 2019	Advisory Committee	Review complete draft of Plan for 60-day review submittal
April 23, 2019	Planning Work Group	Address comments from April 16, 2019 Advisory Committee meeting
May 8, 2019	Policy Committee	Review draft Plan and approve submittal for 60-day review
August 9. 2019	Planning Work Group	Address comments received during 60-day review
August 12, 2019	Planning Work Group	Address comments received during 60-day review
September 17, 2019	Policy Committee	Host public hearing and approve Plan submittal for final review

3.0 Land and Water Resources Inventory

This section of the Cedar-Wapsipinicon Comprehensive Watershed Management Plan (Plan) summarizes the physical land, water, and natural resources within the planning area. The planning area boundary – all within the State of Minnesota – follows the boundary of the Cedar River watershed (HUC 07080201) with the inclusion of the Wapsipinicon River watershed (see Figure 3-1). The planning area drains approximately 722 square miles of Dodge, Freeborn, Mower, and Steele counties (see Table 3-1).

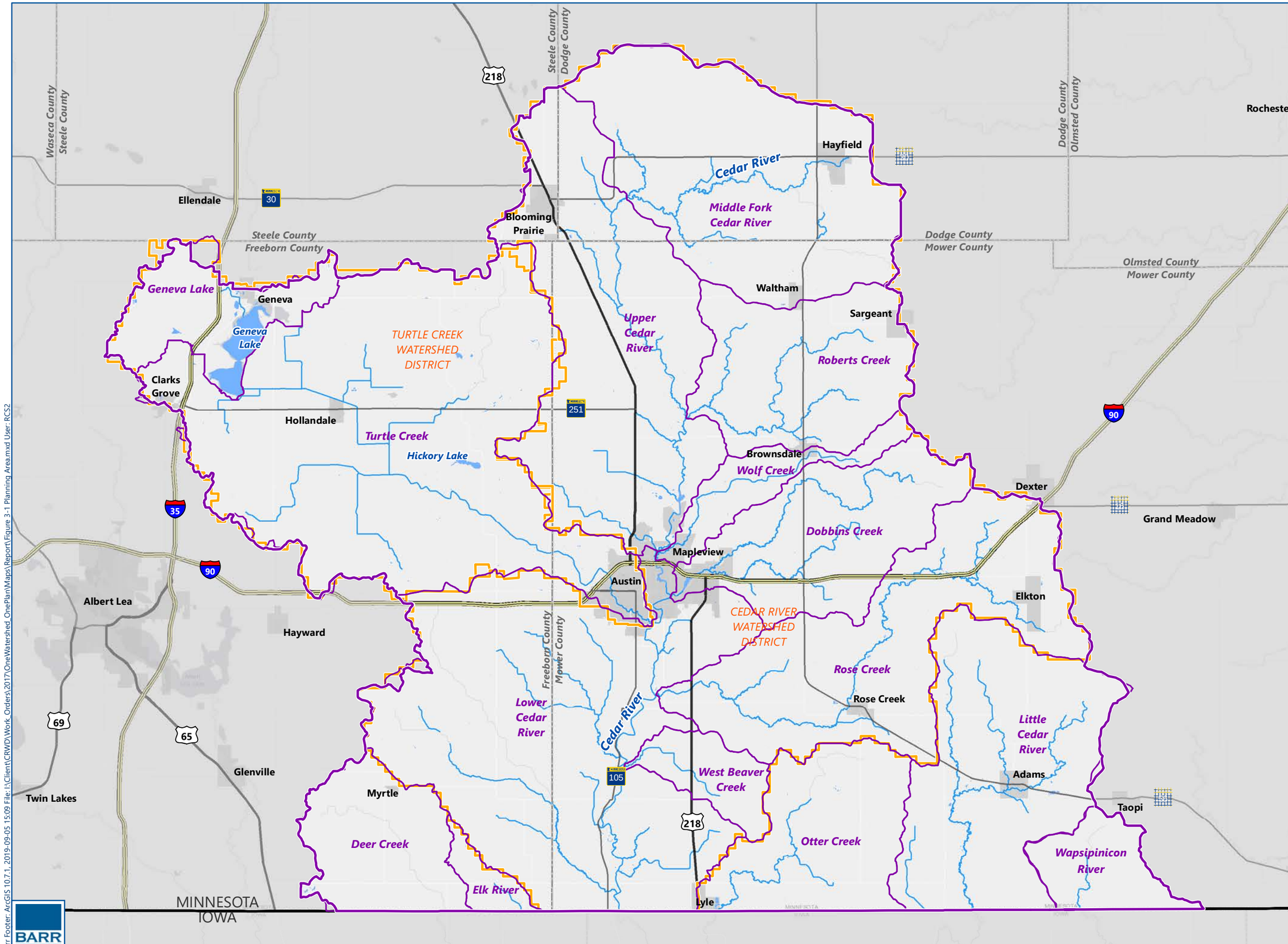
Table 3-1 Counties located within the Planning area

County	Area within Cedar River Watershed (mi^2)	Percent of Watershed within County (%)	Percent of County within Watershed (%)
Dodge	69.0	9.6%	15.7%
Freeborn	233.1	32.3%	32.3%
Mower	412.7	57.1%	58.0%
Steele	7.5	1.0%	1.7%
Total	722.3	100.0%	NA

Data presented in this section includes:

- Topography and drainage patterns
- Climate and precipitation
- Land cover and land use
- Soils
- Geology and groundwater
- Surface water resources (streams, lakes, and wetlands)
- Surface water quality
- Water quantity and flooding
- Wildlife habitat and rare features

Information presented in this section is a compilation intended for summary purposes. Much of the data presented herein is based on more complete data documented in other sources. These sources are referenced in the appropriate subsections of this section.



PLANNING AREA
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-1

Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:09 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-1 Planning Area.mxd User: RCS2

3.1 Topography and Drainage Patterns

The topography of the Cedar River watershed may generally be described as gently rolling terrain. Figure 3-2 presents elevation information within the Cedar River watershed based on the National Elevation Dataset (NED) in NAVD88 datum. The east and west sides of the watershed generally drain towards the Cedar River, which runs from north to south through the center of the watershed. The lowest point in the watershed is approximately 1,140 feet above mean sea level (NAVD88 datum) at the border of Iowa and Minnesota on the Cedar River and the highest point in the watershed is approximately 1,440 feet (NAVD88 datum) in the southeastern corner of the watershed near Elkton, Minnesota. A flat, low area approximately 1,200 feet (NAVD88 datum) is located around the town of Hollandale in the Turtle Creek subwatershed.

3.1.1 Drainage Patterns

The planning area includes the area tributary to the Cedar River in Minnesota as well as areas that drain to the Iowa-Minnesota border before draining into the Cedar River in Iowa. South of the Minnesota-Iowa border, the Cedar River continues to flow southeast through Iowa and merges into the Iowa River, which discharges into the Mississippi River.

Within Minnesota, the planning area was subdivided into 15 subwatersheds generally corresponding to those delineated at the HUC11 scale. These subwatersheds are presented in Figure 3-1 and are summarized in Table 3-2. Drainage areas are presented in this report at the HUC11 subwatershed level for consistency with the *Cedar River Watershed Total Suspended Solids, Lake Eutrophication, and Bacteria Total Maximum Daily Load* study (Cedar River TMDL, MPCA, 2018) and the Cedar River Watershed Restoration and Protection Strategy Report (Cedar River WRAPS, MPCA, 2018). Finer-scale drainage patterns are delineated at the HUC12 level; HUC12 watersheds define the smallest federal drainage units. Watershed delineation data maintained by the Minnesota Department of Natural Resources (MDNR) is available from: https://www.mngeo.state.mn.us/chouse/water_watersheds.html

Drainage areas located within the Turtle Creek Watershed District (TCWD) and Cedar River Watershed District (CRWD, see Figure 3-1) have been further subdivided into minor subwatersheds (e.g., on the order of 1-2 square miles) for the purposes of hydrologic and hydraulic modeling, water quality modeling, and other resource management activities.

Table 3-2 Subwatersheds within the planning area

Planning Subwatershed	Subwatershed Code (HUC11)	Drainage Area (mi^2)	County	Downstream Subwatershed
Upper Cedar River	07080201030[1]	80.3	Dodge, Freeborn, Mower, Steele	Lower Cedar River
Wolf Creek	07080201030[1]	11.7	Mower	Lower Cedar River
Dobbins Creek	07080201030[1]	38.6	Mower	Lower Cedar River
Turtle Creek	07080201040	131.8	Freeborn, Mower	Lower Cedar River
Geneva Lake	07080201040[1]	21.9	Freeborn, Steele	Turtle Creek
Middle Fork Cedar River	07080201010	72.3	Dodge, Mower	Upper Cedar River
Roberts Creek	07080201020	39.0	Mower	Upper Cedar River
Rose Creek	07080201050	66.1	Mower	Lower Cedar River
West Beaver Creek	07080201060	10.5	Mower	Lower Cedar River
Lower Cedar River	07080201065	116.6	Freeborn, Mower	Iowa border
Otter Creek	07080201075	33.4	Mower	Iowa border
Deer Creek	07080201095	25.0	Freeborn	Iowa border
Little Cedar River	07080201240	58.7	Mower	Iowa border
Elk River	07080201085	4.5	Freeborn	Iowa border
Wapsipinicon River	07080102020[2]	12.9	Mower	Iowa border

Note(s):

(1) Dobbins Creek and Wolf Creek are located within the Upper Cedar River HUC11 subwatershed; the Geneva Lake subwatershed is within the Turtle Creek HUC11 subwatershed

(2) The drainage area of the Wapsipinicon River within the Planning area is a subset of a larger HUC11 subwatershed

3.1.1.1 Cedar River Watershed District Subwatersheds

The watersheds within the CRWD have been further subdivided into 11 major subwatersheds and 36 minor subwatersheds for CRWD management purposes, as shown in Figure 3-3 (CRWD, 2009). Major subwatersheds as defined in the 2009 CRWD Watershed Management Plan differ slightly from the 15 planning watersheds presented in Figure 3-1. Major CRWD subwatersheds are described in the following sections and include:

- Upper Cedar River watershed
- Roberts Creek watershed
- Wolf Creek watershed
- Dobbins Creek watershed
- Schwerin Creek watershed *(part of the Rose Creek planning subwatershed)*
- Rose Creek watershed

- Orchard Creek watershed *(part of the Lower Cedar River planning subwatershed)*
- Woodbury Creek watershed *(part of the Lower Cedar River planning subwatershed)*
- Mud Lake Creek watershed *(part of the Lower Cedar River planning subwatershed)*
- West Beaver Creek watershed
- Lower Cedar River watershed

The Upper Cedar River, Roberts Creek, Wolf Creek, Dobbins Creek and Turtle Creek watersheds, and some small portions of the Lower Cedar River watershed were included in the Upper Cedar River Surface Water Management Plan (UCRSWMP) completed in September 2007 (Upper Cedar River Ad Hoc Committee, 2007). The UCRSWMP plan divided these watersheds into 435 subwatersheds delineated to every major creek and river crossing such as roads, railroads and dams. Turtle Creek is a major tributary to the Cedar River that discharges into the Cedar River just south of Austin, Minnesota. However, as the Turtle Creek Watershed District was formed in 1968, separately from the CRWD, Turtle Creek and its watershed are not under the jurisdiction of the CRWD. The remaining subwatersheds outside of the UCRSWMP study area (Schwerin Creek, Rose Creek, Orchard Creek, West Beaver Creek, Mud Lake Creek, Woodbury Creek and the remaining portions of the Lower Cedar River Watershed watersheds) have not been further delineated beyond the larger subwatersheds already delineated by the Minnesota Department of Natural Resources (MDNR).

Upper Cedar River Watershed

The Upper Cedar River watershed, as delineated by the MDNR, is the largest subwatershed in the CRWD, covering 97,652 acres in Freeborn, Steele, Dodge and Mower counties. It includes the Ramsey Mill Pond. The subwatersheds were further delineated at road and railroad crossings in the Upper Cedar River Surface Water Management Plan (UCRSWMP) completed in September 2007. This watershed includes the towns and cities of Blooming Prairie, Hayfield, Lansing and portions of Mapleview and Waltham. The upper Cedar River flows into the lower Cedar River just north of Austin.

Roberts Creek Watershed

The Roberts Creek watershed covers 24,980 acres in Mower County. The subwatersheds were further delineated at road and railroad crossings in the UCRSWMP. This watershed includes portions of Brownsdale, Sargeant, and Waltham. Roberts Creek flows into the Cedar River approximately six miles north of Austin.

Wolf Creek Watershed

The Wolf Creek watershed covers 7,605 acres in Mower County. The subwatersheds were further delineated at road and railroad crossings in the UCRSWMP. This watershed includes portions of Austin, Brownsdale and Mapleview. Wolf Creek flows into the Cedar River approximately one mile north of downtown Austin.

Dobbins Creek Watershed

As delineated by the MDNR, the Dobbins Creek watershed covers 24,645 acres in Mower County. It includes East Side Lake in Austin. The East Side Lake Water Quality Improvement Study was completed in

October 1992. The study aimed to characterize water quality, sediment and nutrient loading to East Side Lake and Dobbins Creek and to develop an implementation plan to improve water quality in order for the lake to be suitable for swimming. Mower SWCD conducted the Dobbins Creek Watershed Project Streambank Inventory in 1993 to study the causes of sedimentation of East Side Lake. The study found that almost all of the Dobbins Creek stream banks are somewhat eroded and areas with direct traffic from livestock are the most eroded. The subwatersheds were further delineated at road and railroad crossings in the UCRSWMP. This watershed includes portions of the city of Austin. Dobbins Creek flows into the Cedar River in Austin.

Schwerin Creek Watershed (part of the Rose Creek planning subwatershed)

The Schwerin Creek watershed, as delineated by the MDNR, is the smallest subwatershed in the CRWD, covering 5,984 acres in Mower County. This watershed includes the town of Elkton. Schwerin Creek flows into Rose Creek approximately 2 miles northwest of Elkton, near I-90 and County Highway 13.

Rose Creek Watershed

The Rose Creek watershed covers 36,326 acres in Mower County. This watershed includes the town of Rose Creek and portions of Dexter. Rose Creek flows into the Cedar River approximately four miles south of downtown Austin.

Orchard Creek Watershed (part of the Lower Cedar River planning subwatershed)

The Orchard Creek watershed covers 20,413 acres in Mower and Freeborn counties. This watershed includes the southwestern-most portions of the city of Austin. Orchard Creek flows into the Cedar River approximately 6.5 miles south of downtown Austin.

Woodbury Creek Watershed (part of the Lower Cedar River planning subwatershed)

The Woodbury Creek watershed covers 17,613 acres in Mower and Freeborn counties. This watershed includes unincorporated portions of Oakland, London and Lyle Townships. Woodbury Creek flows into the Cedar River just north of the Iowa border.

Mud Lake Creek Watershed (part of the Lower Cedar River planning subwatershed)

The Mud Lake Creek watershed covers 9,256 acres in Mower and Freeborn counties. This watershed includes unincorporated portions of Oakland, London, Hayward and Shell Rock Townships. Mud Lake Creek flows into Woodbury Creek at the county line, near Mower County Highway 5.

West Beaver Creek Watershed

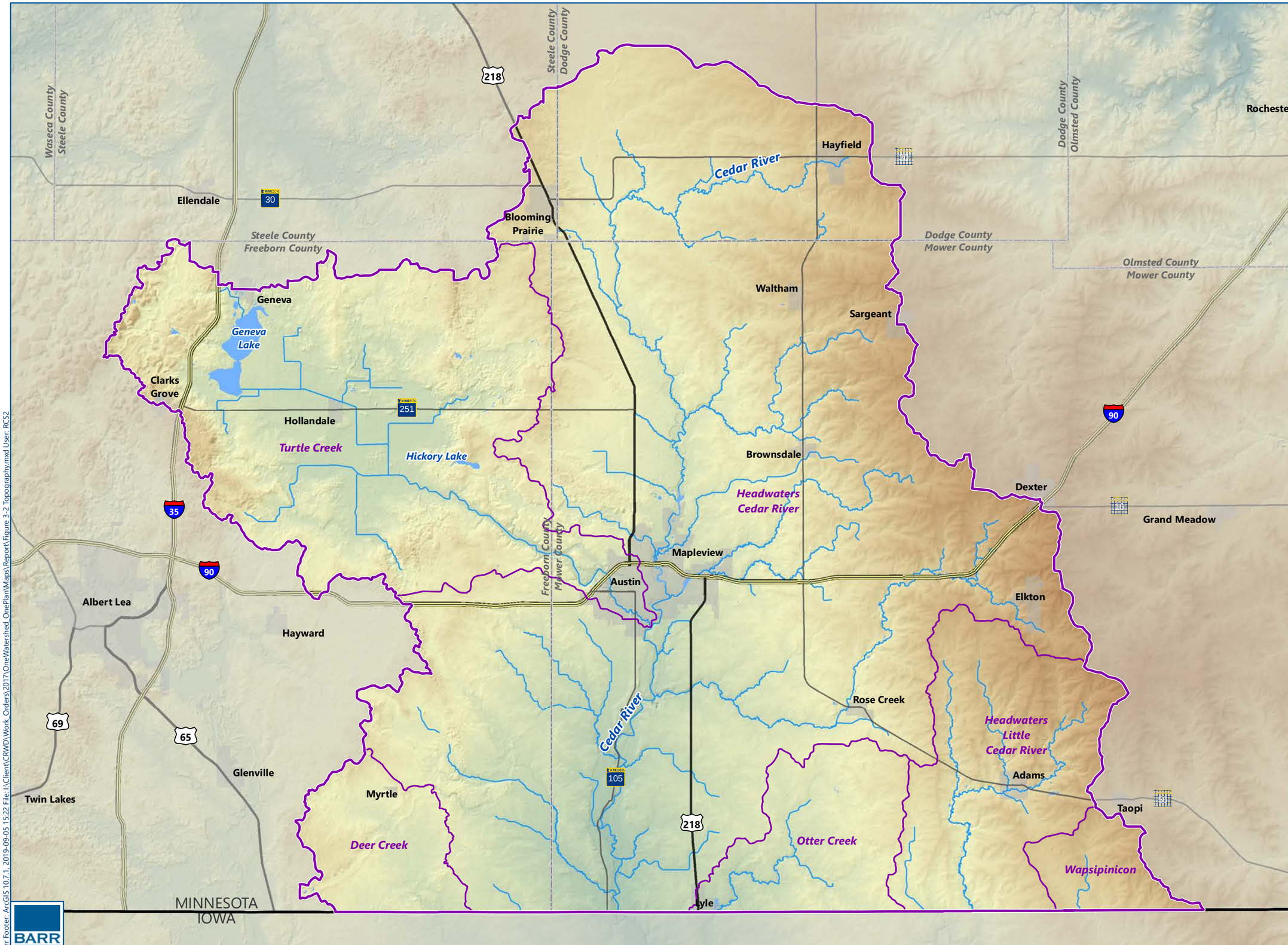
The West Beaver Creek watershed covers 6,723 acres in Mower County. This watershed includes unincorporated portions of Nevada, Windom, Austin and Lyle Townships. West Beaver Creek flows into the Cedar River less than a half of a mile south of the confluence with Orchard Creek, less than seven miles south of Austin.

Lower Cedar River Watershed

The Lower Cedar River watershed, as delineated by the MDNR, covers 27,355 acres in Mower County. It includes Mill Pond in Austin. The northernmost portions of this watershed located in the city of Austin were further delineated at road and railroad crossings in the UCRSWMP. This watershed includes portions of the cities of Austin and Lyle. The upper Cedar River flows into the lower Cedar River just north of Austin. The lower Cedar River leaves the watershed district at the Iowa border.

3.1.1.2 Turtle Creek Watershed District Subwatersheds

Major subwatersheds within the Turtle Creek Watershed District (TCWD) have been established by the TCWD and are presented in Figure 3-3 (TCWD, 2003). There is an unnamed creek which outlets into Lake Geneva in Section 18 of T 104 N., R 20 W. This creek drains about 10,240 acres. This acreage is the headwaters area above Lake Geneva and is located in the northwest corner of the District. Deer Creek and Mud Creek, located in the northeast quadrant of the watershed provides drainage of approximately 30,080 acres to Turtle Creek. By far the largest sub-watershed unit in the watershed is Turtle Creek. This watershed drains about 65,920 acres through natural channels and a high percentage of channelized streams and drainage diches. It is located generally in the south half of the watershed. The outlet of Turtle Creek itself and of the watershed is into the west side of the Cedar River on the south side of the City of Austin in Mower County.

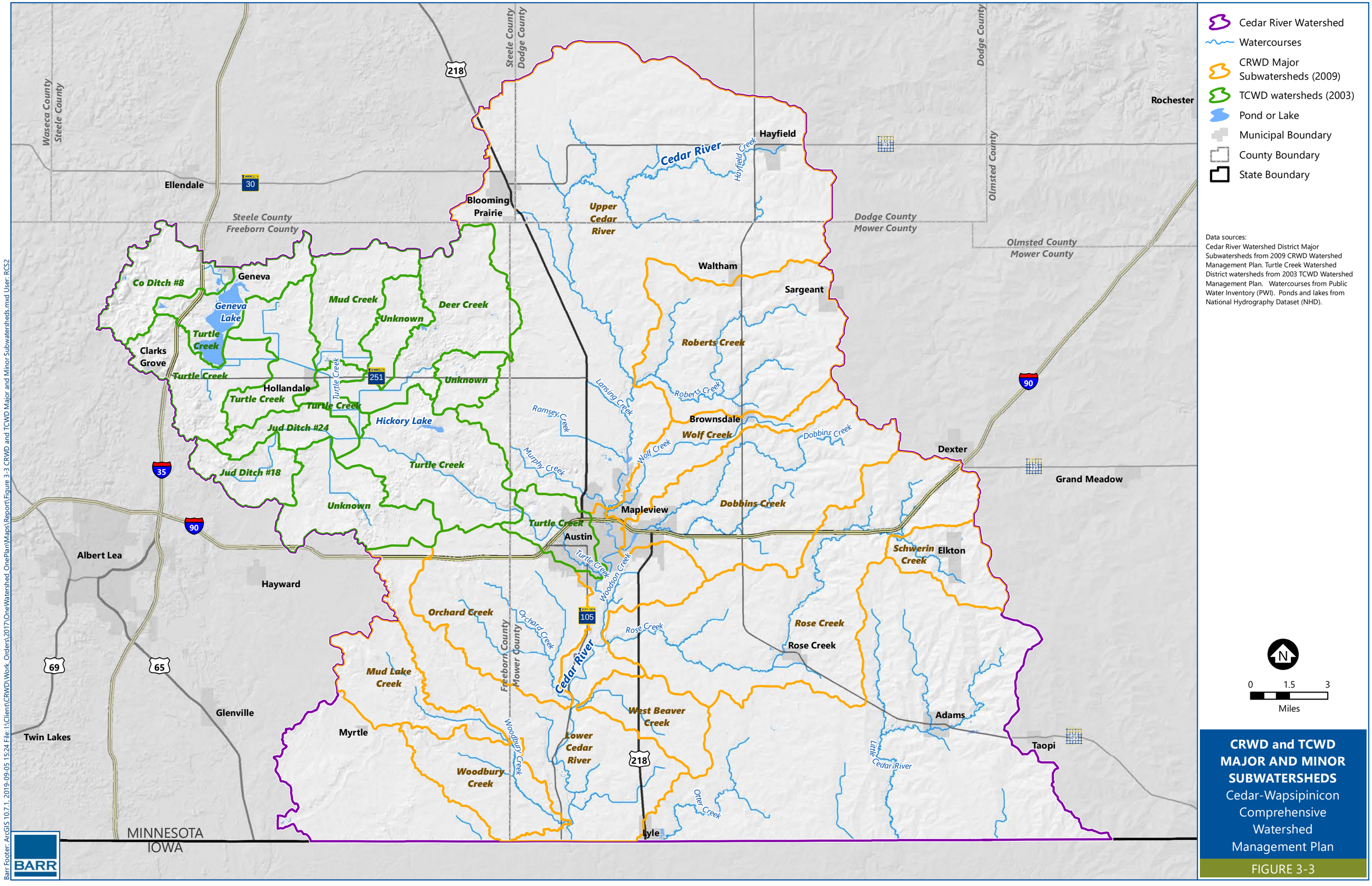


Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds, lakes, subwatersheds from National Hydrography Dataset (NHD). Topography from National Elevation Dataset (NED).

TOPOGRAPHY
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-2

Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:22 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-2 Topography.mxd User: RCS2


Cedar River Watershed
Watercourses
CRWD Major Subwatersheds (2009)
TCWD watersheds (2003)
Pond or Lake
Municipal Boundary
County Boundary
State Boundary
Data sources:
Cedar River Watershed District Major Subwatersheds from 2009 CRWD Watershed Management Plan. Turtle Creek Watershed District watersheds from 2003 TCWD Watershed Management Plan. Watercourses from Public Water Inventory (PWI). Ponds and lakes from National Hydrography Dataset (NHD).
0 1.5 3
Miles
CRWD and TCWD MAJOR AND MINOR SUBWATERSHEDS
Cedar-Wapsipinicon Comprehensive Watershed Management Plan
FIGURE 3-3
Waseca County
Steele County
Steele County
Dodge County
Dodge County
Olmsted County
Rochester
Ellendale
Blooming Prairie
Hayfield
Cedar River
Hayfield Creek
Upper Cedar River
Steele County
Freeborn County
Dodge County
Mower County
Olmsted County
Mower County
Waltham
Sargeant
Geneva
Co Ditch #8
Geneva Lake
Mud Creek
Unknown
Deer Creek
Turtle Creek
Clarks Grove
Roberts Creek
Turtle Creek
Hollandale
Turtle Creek
Turtle Creek
Turtle Creek
Unknown
Lansing Creek
Roberts Creek
Ramsey Creek
Hickory Lake
Jud Ditch #24
Brownsdale
Wolf Creek
Dobbins Creek
Wolf Creek
Dexter
Jud Ditch #18
Turtle Creek
Murphy Creek
Grand Meadow
Unknown
Mapleview
Dobbins Creek
Turtle Creek
Austin
Schwerin Creek
Elkton
Albert Lea
Hayward
Turtle Creek
Woodson Creek
Orchard Creek
Orchard Creek
Rose Creek
Rose Creek
Rose Creek
Freeborn County
Mower County
Cedar River
Mud Lake Creek
Glenville
West Beaver Creek
Adams
Twin Lakes
Myrtle
Woodbury Creek
Lower Cedar River
Little Cedar River
Taopi
Woodbury Creek
Otter Creek
Lyle
MINNESOTA
IOWA
218
30
251
35
90
105
69
65
BARR
Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:24 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-3 CRWD and TCWD Major and Minor Subwatersheds.mxd User: RCS2

3.2 Climate and Precipitation

Because of its location near the center of the North American continent, the Cedar River watershed has a continental climate characterized by moderate precipitation (normally sufficient for crops), wide daily temperature variations, and large seasonal variations in temperature (warm humid summers, and cold winters with moderate snowfall).

The mean annual temperature for Austin is 44.2°F, as measured at the Austin Wastewater Treatment Facility for the time period of 1981-2010 (National Oceanic and Atmospheric Administration (NOAA) Cooperative Station Austin 3 S, ID 210355, in service since December 1, 1948). Mean monthly temperatures vary from 13.4°F in January to 70.7°F in July (1981-2010). For the period 1981-2010, the average date for latest occurrence of freezing temperatures is April 30, while the average date for the first autumn frost is September 30. The average frost-free period (growing season) is approximately 151 days.

Average total annual precipitation (1981-2010) is 34.55 inches at the Austin station, and has ranged from a low of 17.73 inches in 1976, to a high of 48.35 inches in 2016 (for the period of record since 1948). Average annual precipitation (1981-2010) ranges from approximately 32 inches in the northwest part of the Planning area to 35 inches in the southeast part (MDNR, 2012). The mean monthly precipitation (1981-2010) varies from 4.87 inches in June to 0.92 inches in January. From May to September, the growing season months, the average rainfall (1981-2010) is 21.82 inches at Austin or about 63 percent of the average annual precipitation. Average annual lake evaporation is about 33 inches according to the Minnesota Hydrology Guide (NRCS, 1975).

Additional climate information can be obtained from a number of sources, such as the following:

- For a range of Minnesota climate information: http://climateapps.dnr.state.mn.us/index.htm
- For climate normal (1981-2010) data: https://www.ncdc.noaa.gov/cdo-web/datatools/normals

3.2.1 Precipitation-Frequency Data (Atlas 14)

While average weather poses little risk to human health and property, extreme precipitation events may result in flooding that threatens infrastructure and public safety. NOAA published Atlas 14, Volume 8, in 2013. Atlas 14 is the primary source of information regarding rainfall amounts and frequency in Minnesota. Atlas 14 provides estimates of precipitation depth (i.e., total rainfall in inches) and intensity (i.e., depth of rainfall over a specified period) for durations from 5 minutes up to 60 days. Atlas 14 supersedes publications Technical Paper 40 (TP-40) and Technical Paper 49 (TP-49) issued by the National Weather Bureau (now the National Weather Service) in 1961 and 1964, respectively. Atlas 14 improvements in precipitation estimates include denser data networks, longer (and more recent) periods of record, application of regional frequency analysis, and new techniques in spatial interpolation and mapping. Comparison of precipitation depths between TP-40 and Atlas 14 indicates increased precipitation depths for more extreme (i.e., less frequent) events.

Snowmelt and rainstorms occurring during snowmelt in early spring are significant in this region. The volumes of runoff generated, although they occur over a long period, can have significant impacts where

the contributing drainage area to a lake or pond is large and the outlet is small. Runoff from spring snowmelt is not provided in Atlas 14. The Soil Conservation Service (now the National Resource Conservation Service (NRCS)) *National Engineering Handbook*, Hydrology, Section 4, presents maps of regional runoff volume. This information is summarized in the *Minnesota Hydrology Guide*, published by the USDA's Soil Conservation Service (now the NRCS) in 1975. Table 3-3 lists selected rainfall and snowmelt runoff events for the region.

Table 3-3 Selected Precipitation and Runoff Events Used for Design Purposes

Type	Frequency	Duration	Depth (in)
Rainfall[1]	2-year	24 hour	2.97
	5-year	24 hour	3.78
	10-year	24 hour	4.54
	25-year	24 hour	5.70
	50-year	24 hour	6.71
	100-year	24 hour	7.79
	10-year	10 day	7.35
	100-year	10 day	11.1
Snowmelt[2]	10-year	10 day	4.3
	25-year	10 day	5.2
	50-year	10 day	5.9
	100-year	10 day	6.5

Note(s):
(1) NOAA Atlas 14 – Volume 8. Station: Austin WWTP – Station 21-0355.
(2) Snowmelt depth reported as liquid water based on *Minnesota Hydrology Guide* (USDA Soil Conservation Service)

3.2.2 Climate Trends and Future Precipitation

Even with wide variations in climate conditions, climatologists have found four significant recent climate trends in the Upper Midwest (NOAA, 2013):

- Warmer winters—decline in severity and frequency of severe cold
- Higher minimum temperatures
- Higher dew points
- Changes in precipitation trends – more rainfall is coming from heavy thunderstorm events and increased snowfall

According to NOAA's 2013 assessment of climate trends for the Midwest, annual and summer precipitation amounts in the Midwest are trending upward, as is the frequency of high intensity storms. Higher intensity precipitation events typically produce more runoff than lower intensity events with similar

total precipitation amounts; higher rainfall intensities are more likely to overwhelm the capacity of the land surface to infiltrate and attenuate runoff. NOAA climate normal data indicates increasing precipitation trends locally, as presented in Figure 3-4.

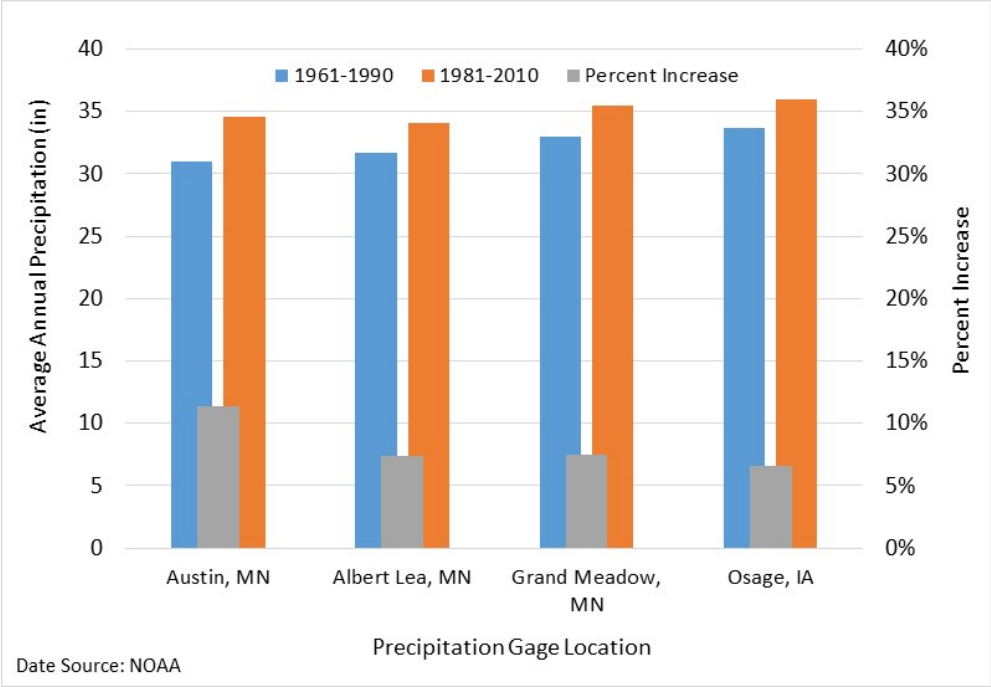


Figure 3-4 Precipitation Trends at Select Gage Locations

The study of long-term extreme weather trends found that precipitation amounts are predicted to increase significantly over what is historically used in floodplain assessments and infrastructure design. Recent work completed by the University of Minnesota (Moore et al., 2016) provides information useful to consider long-term extreme weather trends in the region. A range of estimates for the mid-21st century 100-year 24-hour rainfall event were identified. The lower estimate for the mid-21st century 100-year 24-hour rainfall estimate was approximately 7.3 inches, which is similar to the current mean 100-year rainfall depth published in Atlas 14 (7.8 inches). The middle estimate is 10.2 inches, which is similar to the upper limits of the Atlas 14 90-percent confidence limits for the 100-year rainfall depth (10.4 inches). Upper estimates of mid-21st century 100-year 24-hour rainfall exceed the 90-percent confidence limits of Atlas 14.

The Partnership recognizes recent precipitation trends and expects that increases in precipitation amount and intensity may continue. The Partnership has developed this Plan, including goals and implementation activities, with consideration for these trends.

3.3 Land Cover and Land Use

Historically, the land within the planning area was covered by tall grasslands, wetlands, oak savanna, and maple-basswood woodlands. Tallgrass prairie was concentrated on level to gently rolling topography. Bur oak savanna was found on rolling moraine ridges. Maple-basswood forest was found in areas protected

from fire, typically in steep ravines or near streams. Much of the watershed was converted to agricultural land by European settlers and western expansion during the late 1800's. A number of wetlands, including a large wetland complex in the Turtle Creek watershed were drained to create suitable farm lands during that time (MPCA, 2012). An extensive drainage system has been developed in the watershed consisting of ditches as well as underground tile lines.

As of the development of this Plan, over 80 percent of the Cedar River watershed is used for agricultural production, primarily corn and soybean crops. Urban development accounts for approximately 8.5 percent of land use, with the largest population center in Austin, MN. Open water and wetland makes up about 2.1 percent of the watershed. A majority of the remaining land is grasslands or pastures. Figure 3-5 presents major land cover classifications within the planning area based on the Minnesota Land Cover Classification Dataset (MLCCD). The breakdown of other land cover and land use within the watershed is summarized in Table 3-4.

Table 3-4 Summary of Land Use/Land Cover within the Planning Area

Land Cover	Acres	Percent of Watershed
Barren Land	123	0.03%
Cultivated Crops	379,179	82.02%
Deciduous Forest	6,877	1.49%
Developed, High Intensity	556	0.12%
Developed, Low Intensity	7,986	1.73%
Developed, Medium Intensity	2,206	0.48%
Developed, Open Space	28,674	6.20%
Emergent Herbaceous Wetlands	2,582	0.56%
Evergreen Forest	56	0.01%
Hay/Pasture	6,806	1.47%
Herbaceous	19,610	4.24%
Mixed Forest	8	0.00%
Open Water	2,885	0.62%
Shrub/Scrub	21	0.00%
Woody Wetlands	4,738	1.02%

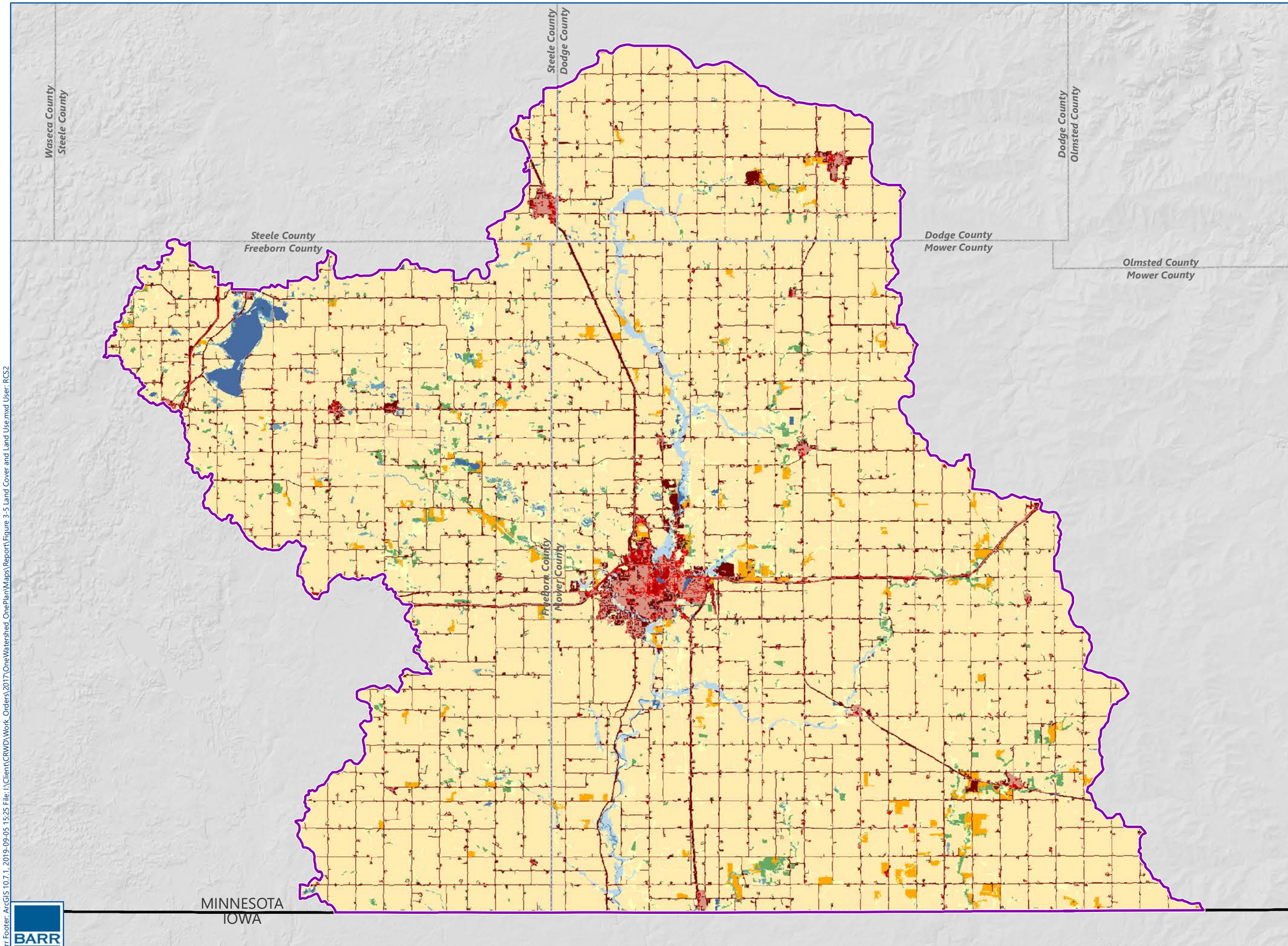
Source: Minnesota Land Cover Classification Dataset (MLCCD)

Land use and land cover are important considerations for managing surface water, groundwater, and upland natural resources. The hard or impervious surface areas associated with each land use greatly affect the amount of runoff generated from an area. Significant changes in land use can increase runoff due to added impervious surfaces, soil compaction and changes to drainage patterns. Row crops, such as

corn and soy beans, increase the risk of erosion and of elevated total suspended solids levels in streams because the land can be without vegetation cover for major periods of time due to the short Minnesota growing season.

Although additional urbanization is expected to accompany growing populations within the watershed, it is expected that the land use in the planning area will remain primarily agricultural for at least the next 30 years.

The City of Austin adopted a Comprehensive Growth Plan in 2016 that focuses on the planned growth of the City for the subsequent 10 years.



Cedar River Watershed
County Boundary
State Boundary

NLCD 2011

- Barren Land
- Cultivated Crops
- Deciduous Forest
- Developed, High Intensity
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, Open Space
- Emergent Herbaceuous Wetlands
- Evergreen Forest
- Hay/Pasture
- Herbaceuous
- Mixed Forest
- Open Water
- Shrub/Scrub
- Woody Wetlands

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Land cover from National Land Cover Database 2011.

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LAND COVER AND LAND USE
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-5

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Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:25 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-5 Land Cover and Land Use.mxd User: RCS2

3.4 Soils

Most of the soils within the Planning area consist of silty loam or clay loam (NRCS, 2018). Soil types (grouped according to soil parent material) are presented in Figure 3-6. The eastern portion of the watershed is generally loam to clay-loam textured glacial till. The central portion of the watershed adjacent to the Cedar River is predominantly silty glacio-fluvial deposits over loamy till. Soils in the western portion of the watershed are more heterogeneous and include loamy till, sandy-loam, and sand/gravel outwash (southeast of Geneva Lake). The soils present in the watershed are generally some of the highest quality for agricultural production. Figure 3-7 presents the crop productivity index (CPI) for agricultural land use in the watershed. CPI ratings provide a relative ranking of soils based on their potential for intensive crop production and can be used to rate the potential yield of one soil against that of another soil over time. Ratings range from 0 to 100; higher numbers indicate higher production potential.

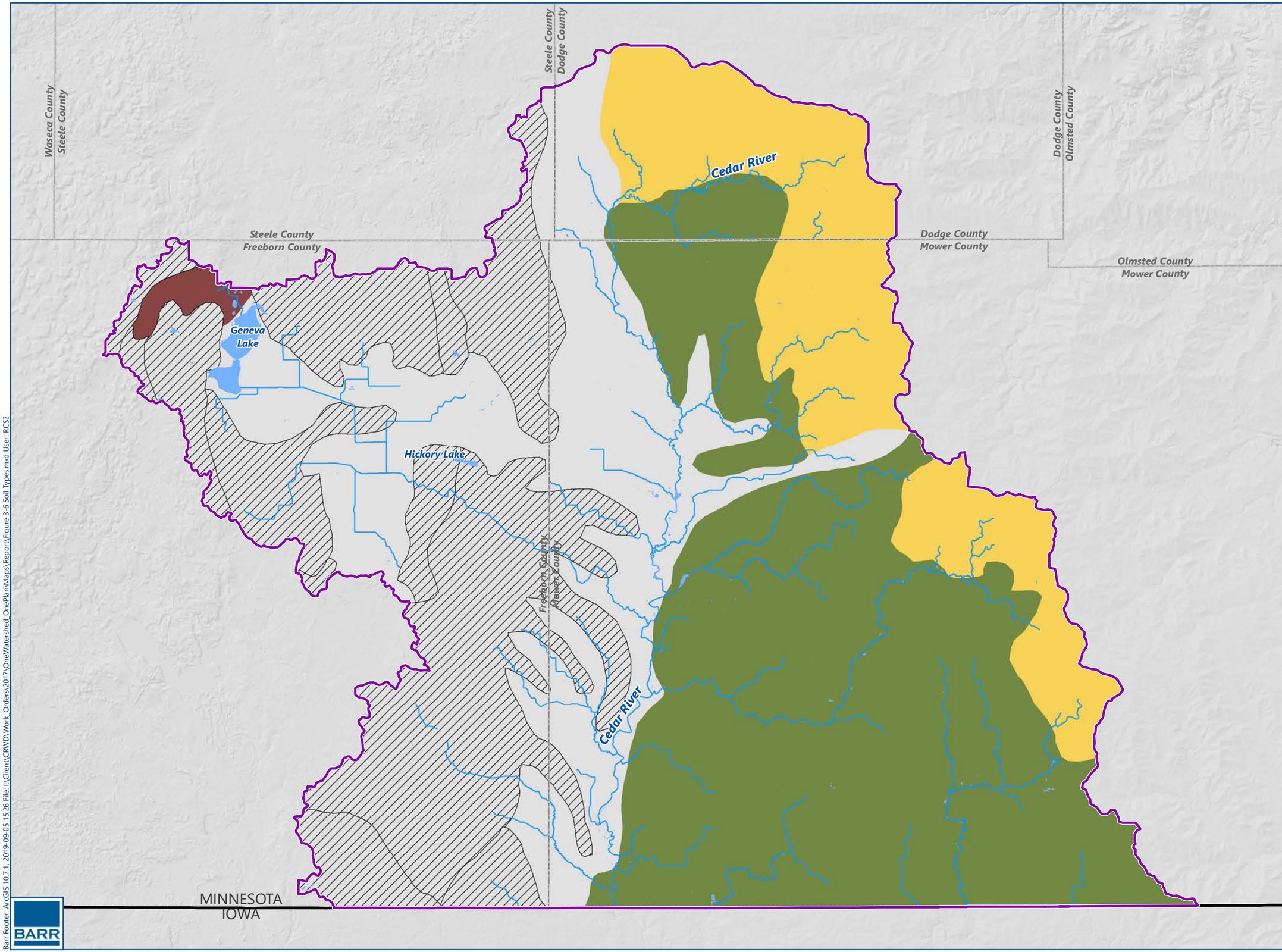
The thickness of the glacial drift in Cedar River watershed generally varies between 0 and 200 feet deep. Bedrock is generally shallower in the southern portion of the watershed adjacent to the Cedar River, while deeper depths to bedrock occur in the north and northwestern portion of the watershed

More detailed information about the soils present in the Planning area are available from the NRCS soil survey dataset. The NRCS updates information presented in soil surveys on a continuing schedule. The NRCS

The most current information may be found on the NRCS soil survey webpage at: https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

Infiltration capacities of soils affect the amount of direct runoff resulting from rainfall. The higher the infiltration rate is for a given soil, the lower the runoff potential. Conversely, soils with low infiltration rates produce high runoff volumes and high peak discharge rates. According to the NRCS soil surveys, most of the underlying soils in Mower, Dodge, Freeborn and Steele Counties are classified as hydrologic soil group B, with moderate infiltration rates. Some soils are classified as group C and D, with lower infiltration rates and very few soils are classified as group A, with high infiltration rates. While hydrologic soil group mapping is useful for generally assessing infiltration capacity, field verification of infiltration rates is recommended to obtain reliable data.

Degraded soils may be subject to increased runoff and erosion (see Section 4.2.5). Soil erosion risk in the Cedar River watershed is presented in Figure 3-8; this dataset was used as an input to the MDNR's Zonation process (see Section 4.1).



Cedar River Watershed
PWI Watercourses
Pond or Lake (NHD)
County Boundary
State Boundary

Soil Parent Material

Gray outwash
Gray till
Loess or loamy sediments and erosional lag over dense gray till
Loess or loamy sediments over dense gray till
Mixed gray and red outwash

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds, lakes, subwatersheds from National Hydrography Dataset (NHD).
Soil Parent Material from Soil and Land Surfaces from the University of Minnesota - Department of Soil, Water and Climate.

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SOIL TYPES
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-6

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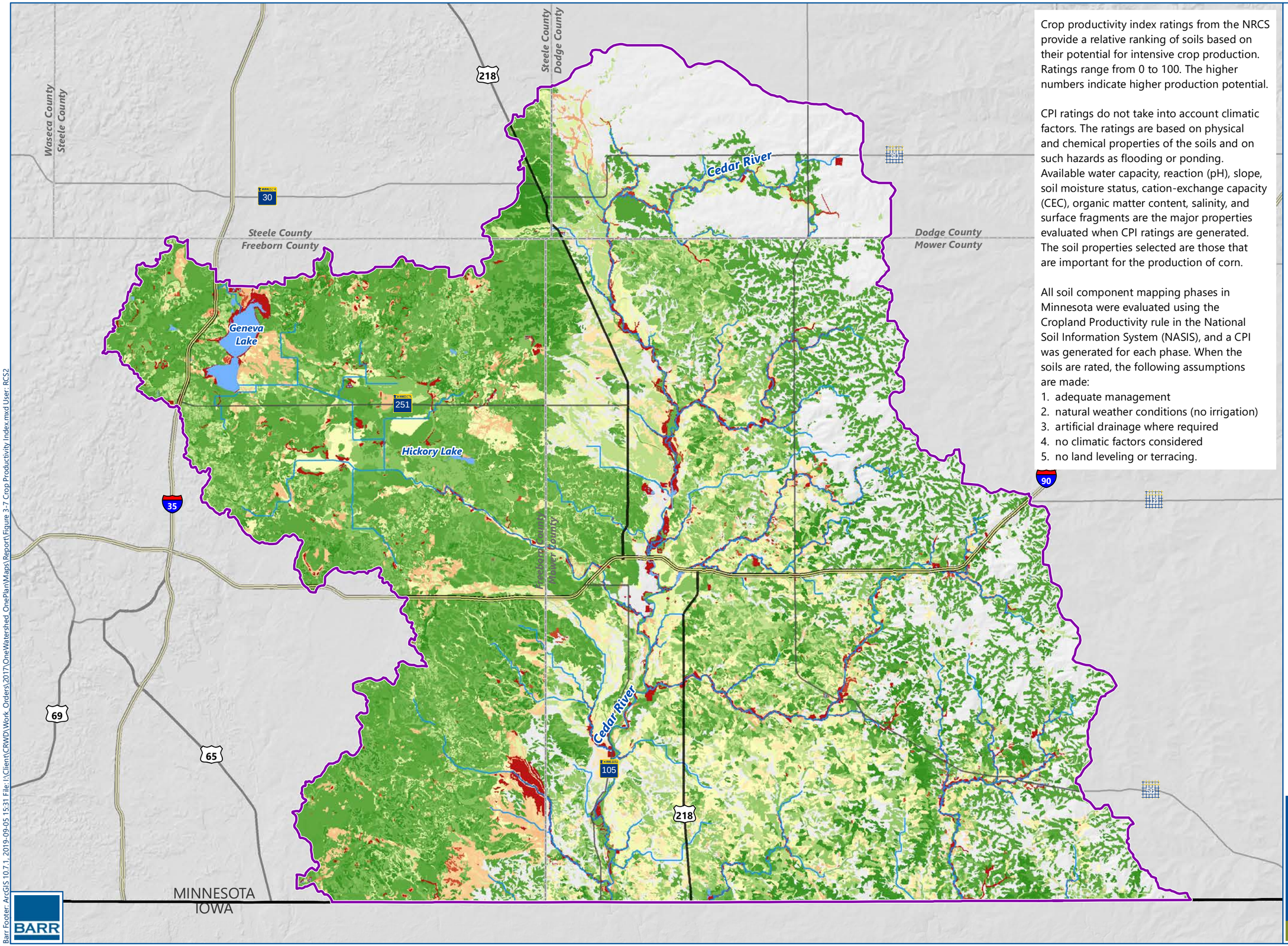
Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:26 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-6 Soil Types.mxd User: RCS2



Crop productivity index ratings from the NRCS provide a relative ranking of soils based on their potential for intensive crop production. Ratings range from 0 to 100. The higher numbers indicate higher production potential.

CPI ratings do not take into account climatic factors. The ratings are based on physical and chemical properties of the soils and on such hazards as flooding or ponding. Available water capacity, reaction (pH), slope, soil moisture status, cation-exchange capacity (CEC), organic matter content, salinity, and surface fragments are the major properties evaluated when CPI ratings are generated. The soil properties selected are those that are important for the production of corn.

All soil component mapping phases in Minnesota were evaluated using the Cropland Productivity rule in the National Soil Information System (NASIS), and a CPI was generated for each phase. When the soils are rated, the following assumptions are made:

1. adequate management
2. natural weather conditions (no irrigation)
3. artificial drainage where required
4. no climatic factors considered
5. no land leveling or terracing.

Cedar River Watershed
Watercourses
Pond or Lake
County Boundary
State Boundary

Crop Productivity Index

Less Productive
More Productive

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds and lakes from National Hydrography Dataset (NHD). Crop Productivity Index from MN DNR Zonation Analysis. No data in white.

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CROP PRODUCTIVITY INDEX

Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-7

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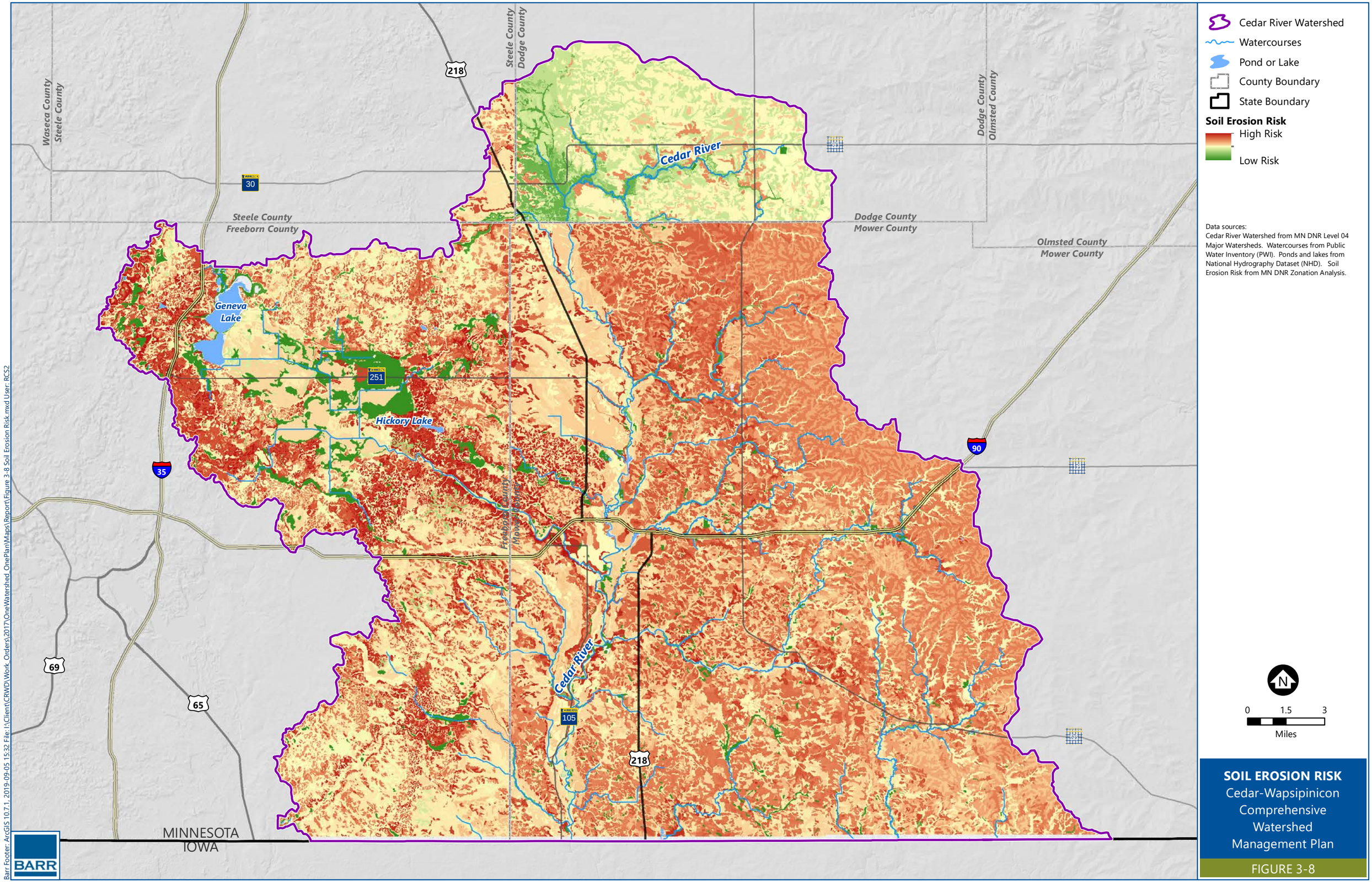
Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:31 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-7 Crop Productivity Index.mxd User: RCS2



Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:32 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-8 Soil Erosion Risk.mxd User: RCS2

3.5 Geology and Groundwater

The bedrock underlying the Cedar River watershed is part of the Upper Devonian and Upper Ordovician Series, which formed 375-450 million years ago. The Cedar Valley Group underlies the southern portion of the watershed. The Wapsipinicon Group and Maquoketa and Dubuque Formations are mostly found in the northern portion of the watershed. These groups and formations are composed of mainly limestone, dolostone, and shale. More information about geology is available in the Geologic Atlas of Mower County (atlases for Dodge, Freeborn, and Steele Counties are not yet complete) from the Minnesota Geological Survey (MGS), available at: https://www.dnr.state.mn.us/waters/groundwater_section/mapping/index.html.

Groundwater is an important resource within the Planning area because it is the source of drinking water for all watershed residents. The infiltration of water from the ground surface to the surficial and, ultimately, bedrock aquifers (i.e., groundwater recharge) is critical for sustaining groundwater resources. The potential for groundwater recharge varies across the watershed, based on local soil and land use characteristics. Groundwater recharge in the watershed was mapped as part of the MDNR Zonation analysis (see Section 4.1) and is presented in Figure 3-9.

Near the Cedar River, surficial aquifers are categorized by glacial outwash and alluvium of sand and gravel. The surficial aquifer (i.e., water table) is within 10 feet of the ground surface throughout much of the watershed. Some residential wells draw water from the surficial aquifer.

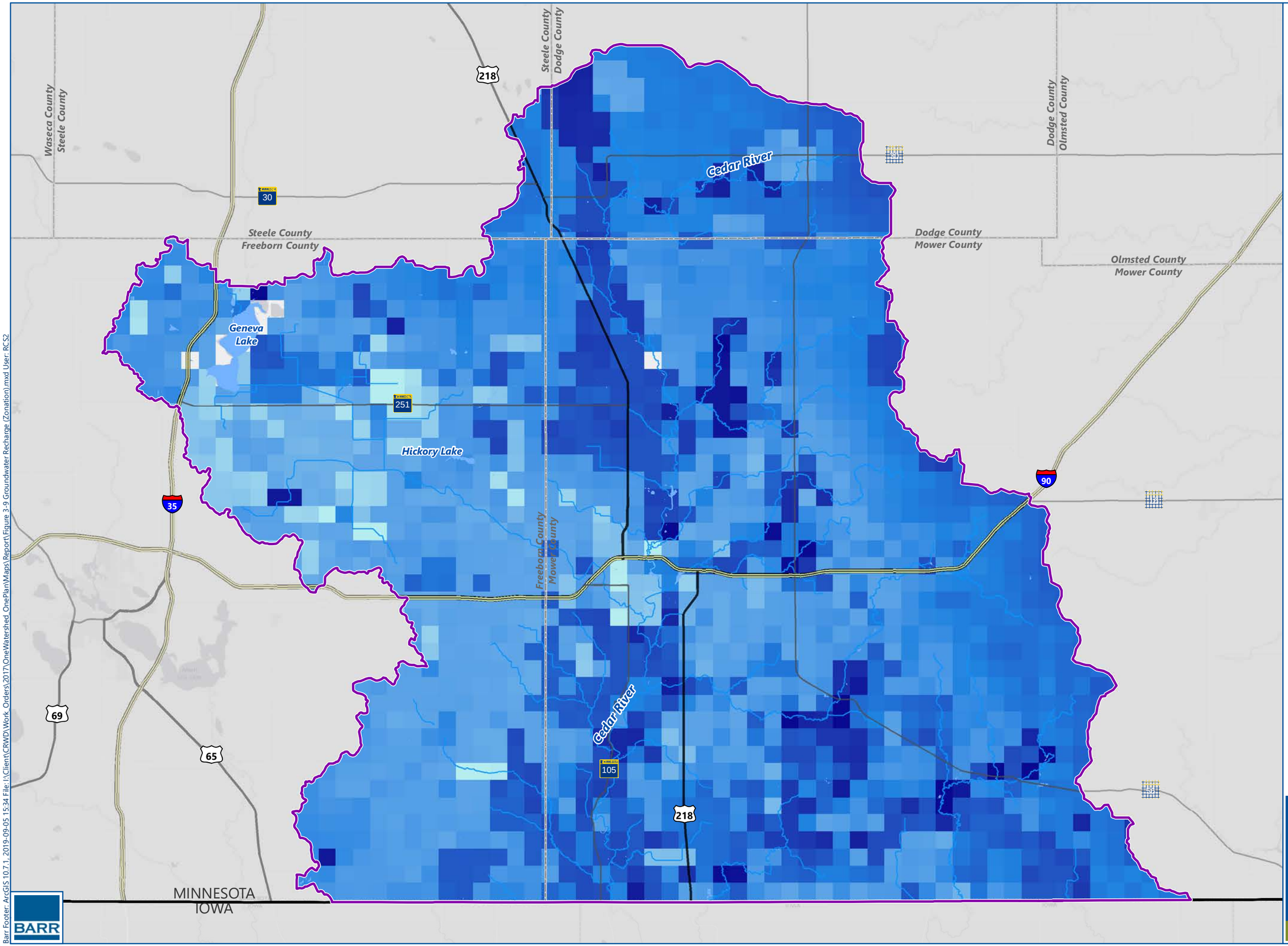
Many of the wells in the watershed tap into the Cedar Valley-Maquoketa-Dubuque-Galena bedrock aquifer that underlies the entire watershed. All of the municipalities in the Planning area rely on groundwater from bedrock aquifers for their drinking water supply. Austin Utilities provides drinking water to their residents from eight wells ranging from 110 to 1,075 feet deep that draw water from the Prairie Du Chien-Jordan, Spillville, and St. Peter aquifers (Austin Public Utilities, 2017). Several municipalities have developed wellhead protection plans (WHPPs) under the guidance of the Minnesota Department of Health (MDH). WHPPs are intended to limit the potential for groundwater contamination of public water supply wells and include the delineation and vulnerability assessment of Drinking Water Supply Management Areas (DWSMAs). Figure 3-10 presents the extent of DWSMAs and active wells within the Planning area.

Table 3-5 lists the number and depths of wells for select municipalities in the watershed and the status of each community's Wellhead Protection Plan (WHPP). In addition to these municipalities, the Minnesota Department of Health also conducted source water assessments for privately owned water supply systems that serve water to the public, such as campgrounds, churches, golf courses, industrial facilities, etc.

Table 3-5 Municipal and non-municipal community well depths for select communities

Municipality	Number of Wells	Depths of Wells (feet)	Status of WHPP
Adams	1	487	Approved
Austin Mobile Home Park	1	100	Not yet started
Austin Utilities	8	110, 132, 578, 960, 992, 1010, 1017 and 1075	Actively planning (as of 2018)
Blooming Prairie	2	213 and 249	Actively Planning
Brownsdale	2	150 and 171	Approved
City Limits Apartments	1	unknown	Actively planning (as of 2019)
Clarks Grove	2	350 and 350	Not yet started
Elkton	2	324 and 324	Approved
Hayfield	2	341 and 678	Approved
Hollandale	2	219 and 220	Not yet started
Lansing Township	1	379	Actively planning (as of 2018)
Lyle	2	252 and 911	Approved
Mapleview	1	383	Approved
Myrtle	1	173	Not yet started
Rose Creek	2	179 and 197	Approved
Sargeant	2	340 and 400	Approved
Waltham	1	275	Approved

Source: CRWD 2009 WMP and MDH response to Plan update notification



Cedar River Watershed
Subwatersheds
Watercourses
Pond or Lake
Municipal Boundary
County Boundary
State Boundary

Groundwater Recharge
High
Low

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds and lakes from National Hydrography Dataset (NHD). Groundwater Recharge from MN DNR Zonation Analysis.

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GROUNDWATER RECHARGE (ZONATION)
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-9

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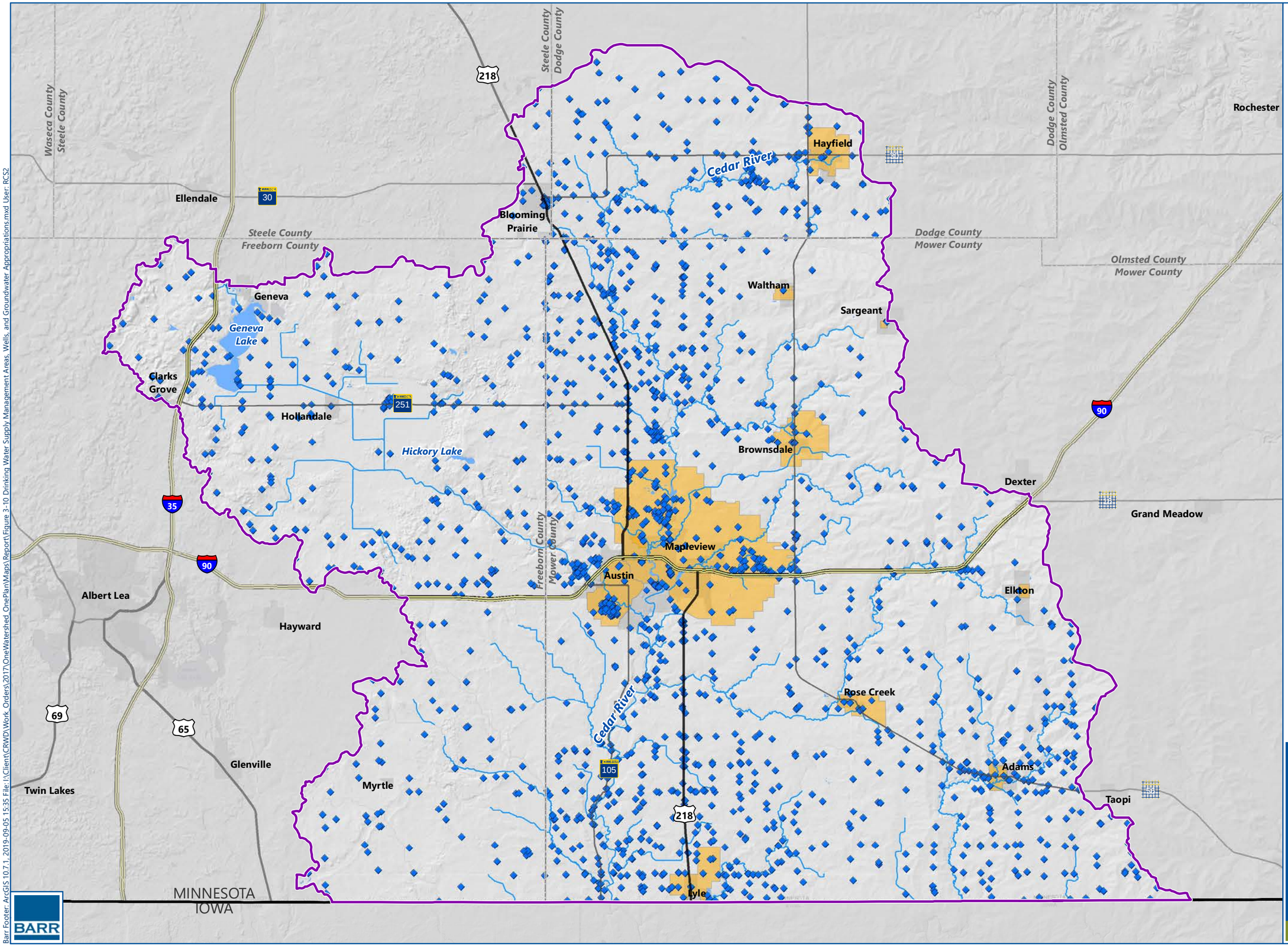
Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:34 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-9 Groundwater Recharge (Zonation).mxd User: RCS2



Active Wells (CWI)
DWSMA Boundary
Cedar River Watershed
Watercourses
Pond or Lake
Municipal Boundary
County Boundary
State Boundary

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds and lakes from National Hydrography Dataset (NHD). Active Wells from MN County Well Index (CWI). MPARS Active WA Permits from MN DNR. DWSMA from Minnesota Department of Health (MDH).

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DRINKING WATER SUPPLY MANAGEMENT AREAS, WELLS, AND GROUNDWATER APPROPRIATIONS

Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-10

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Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:35 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-10 Drinking Water Supply Management Areas, Wells, and Groundwater Appropriations.mxd User: RCS2

3.5.1 Groundwater Quality

The quality of groundwater resources within the Planning area is important to preserving public health and quality of life. Groundwater quality data is collected by several entities within the watershed, including, but not limited to:

- Minnesota Department of Agriculture (MDA)
- Minnesota Department of Health (MDH)
- Minnesota Department of Natural Resources (MDNR)
- Minnesota Pollution Control Agency (MPCA)
- United States Geological Survey (USGS)

Groundwater monitoring locations and data are available from the MPCA's Environmental Data Access (EDA) website at: https://pca-gis02.pca.state.mn.us/eda_groundwater/index.html

Public water suppliers are required to perform periodic water quality monitoring. Owners of private wells are not required to monitor well water quality. The MDH and other organizations promote the sampling of private wells through education and subsidized sampling programs. The MDH maintains a database of water quality results from sampling of private and public wells. Contaminants of primary concern in groundwater include arsenic, nitrates, and bacteria.

Under a partnership between LGUs (County and/or SWCD) and the MDA, some Township testing for nitrate has been done within the watershed. Results from township testing for nitrate may be used by private homeowners for information on their wells. Additional information regarding the MDA's township well testing is available at: https://www.mda.state.mn.us/township-testing-program

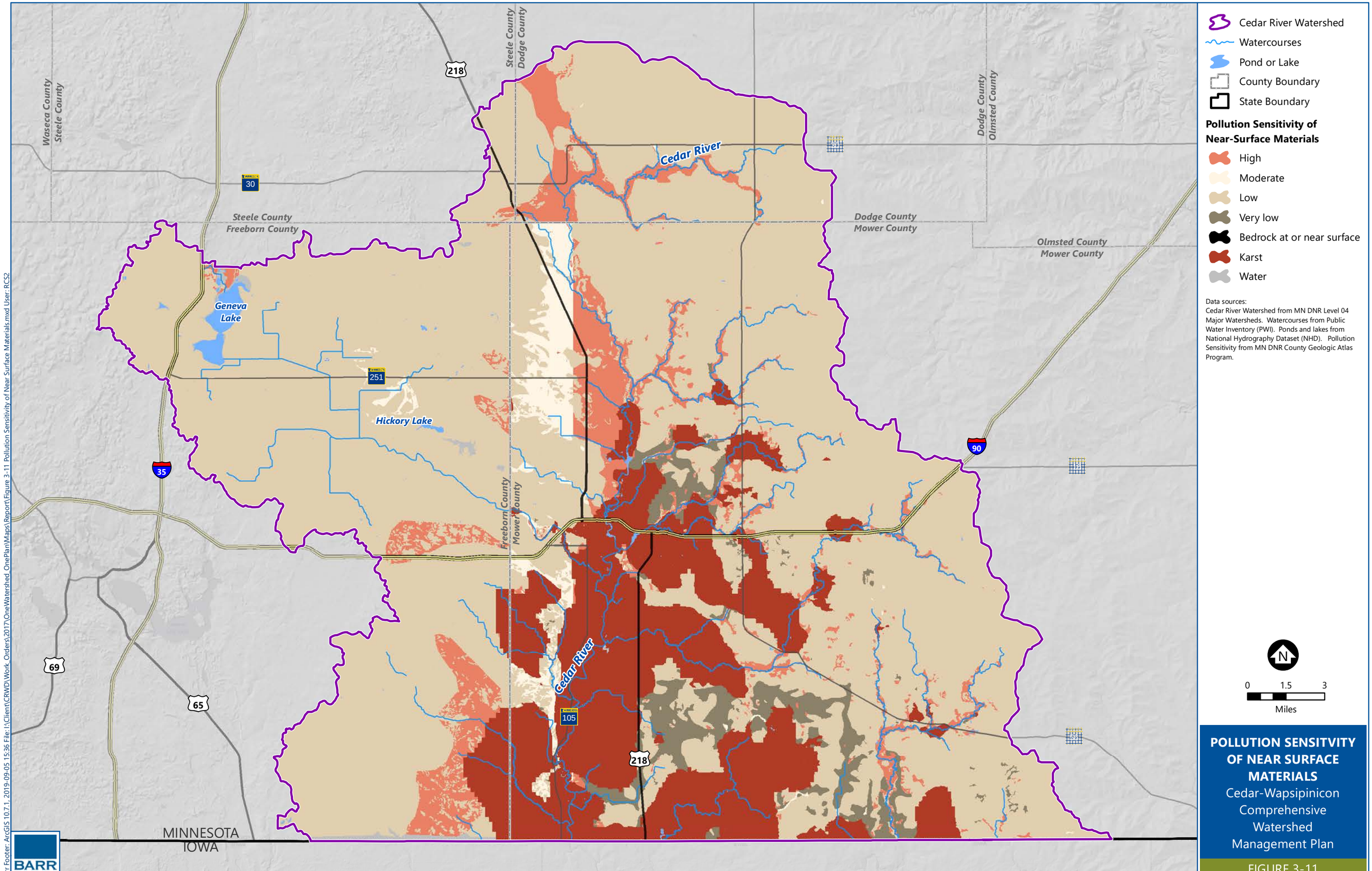
Data provided by the MDH during the development of this Plan indicates that most sampled private wells within the planning area tested below 5 mg/L for nitrate, although some wells tested above the drinking water quality standard of 10 mg/L. This represents a very limited data set of recently constructed wells. Additional data is needed to be confident in on overall assessment of the quality of water used by private well owners. Actions to address these data gaps are included in the Plan implementation program (see items GWQ-6 and GWQ-7 in Table 7-2).

3.5.2 Groundwater Sensitivity to Pollution

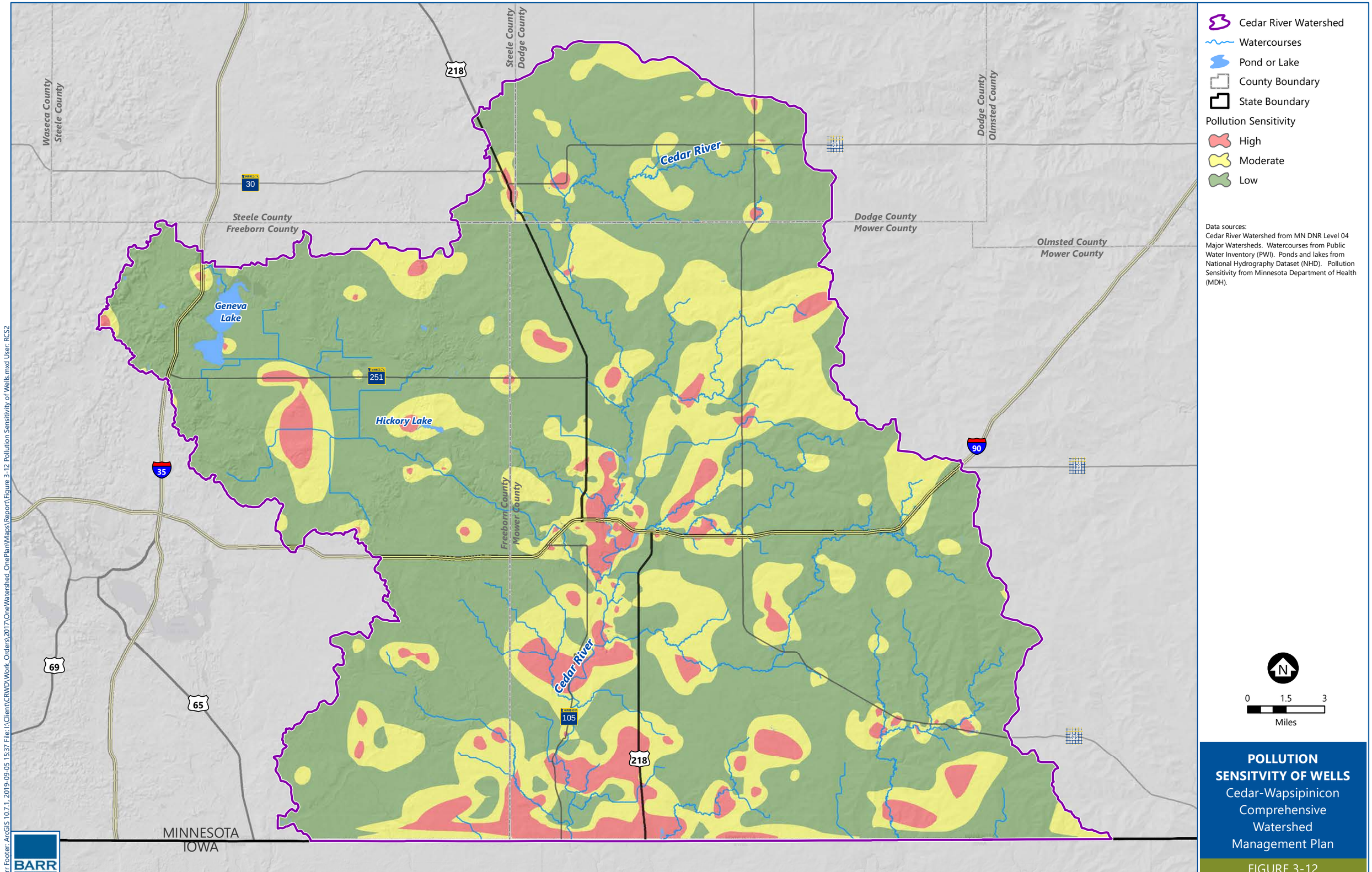
The MDNR assessed the sensitivity of near-surface materials and the uppermost bedrock aquifer to groundwater contamination. The MDNR defines a sensitive area as a geologic area characterized by natural features where there is significant risk of groundwater degradation from activities conducted at or near the land surface. The MDNR designated five classes of geologic sensitivity (very high, high, moderate, low, and very low). This information is documented in the Minnesota Hydrogeology Atlas (MHA) and is available from the MDNR at:
https://www.dnr.state.mn.us/waters/groundwater_section/mapping/status_mha.html

The MDH has further estimated the pollution sensitivity of wells based on the sensitivity of near surface materials and well characteristics. The pollution sensitivity of near surface materials is presented in Figure

3-11. The pollution sensitivity of wells is classified by MDH as low, medium, or high and is presented in Figure 3-12. Groundwater sensitivity to pollution is also affected by local features such as sinkholes and the presence of Karst features (i.e., limestone that has been eroded, increasing groundwater conductivity) in the watershed. Karst feature datasets vary by county. Karst features within Mower County are presented in detail in Figure 3-13. Karst features throughout the planning area are generally shown in Figure 3-11.



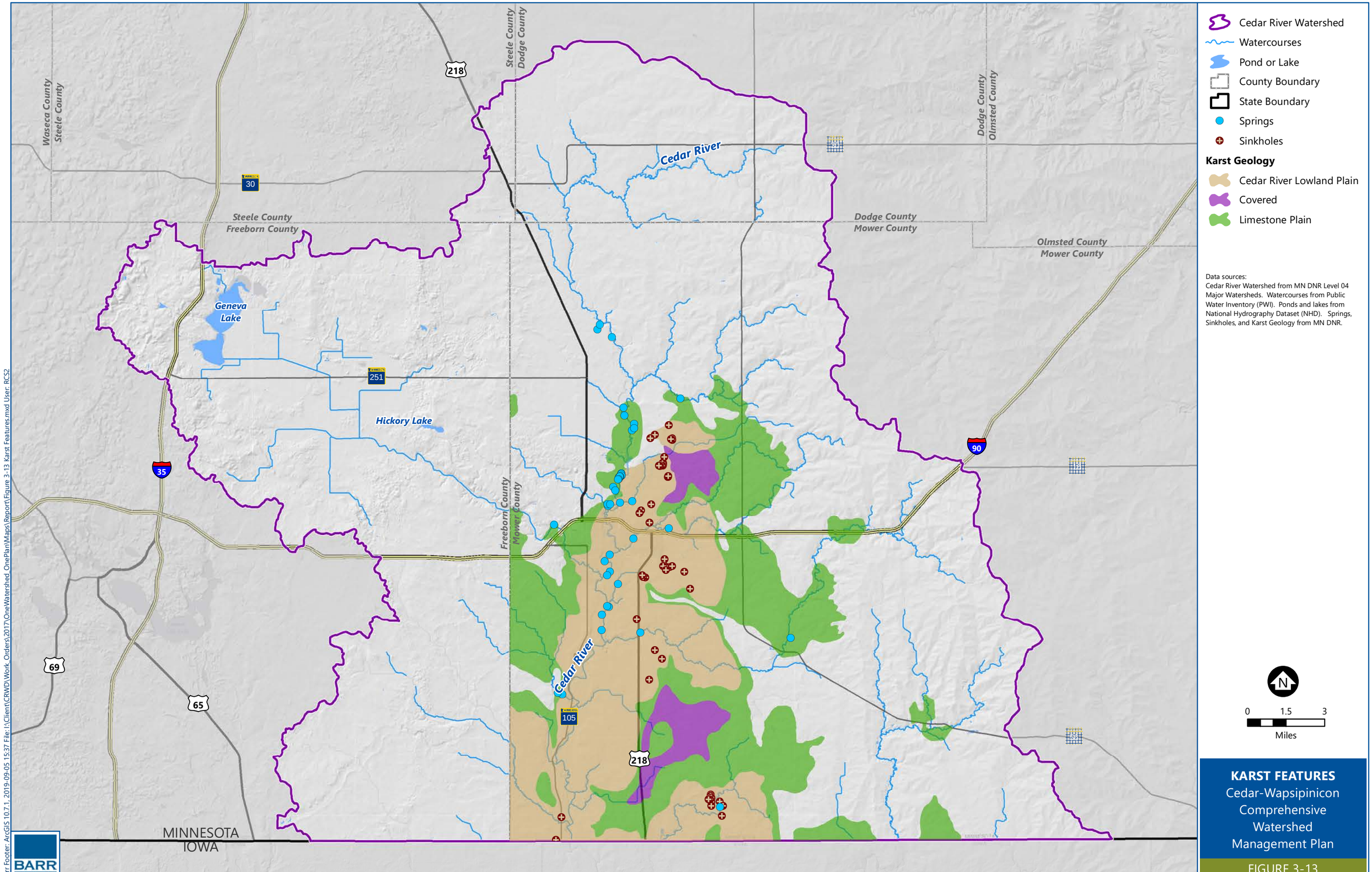
Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:36 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-11 Pollution Sensitivity of Near Surface Materials.mxd User: RCS2



POLLUTION SENSITVITY OF WELLS
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-12

Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:37 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-12 Pollution Sensitivity of Wells.mxd User: RCS2



KARST FEATURES
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-13

Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:37 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-13 Karst Features.mxd User: RCS2

3.6 Surface Waters

The Cedar River watershed is characterized by numerous streams, wetlands, ponds, and other surface waters. Figure 3-14 presents surface water features within the Planning area.

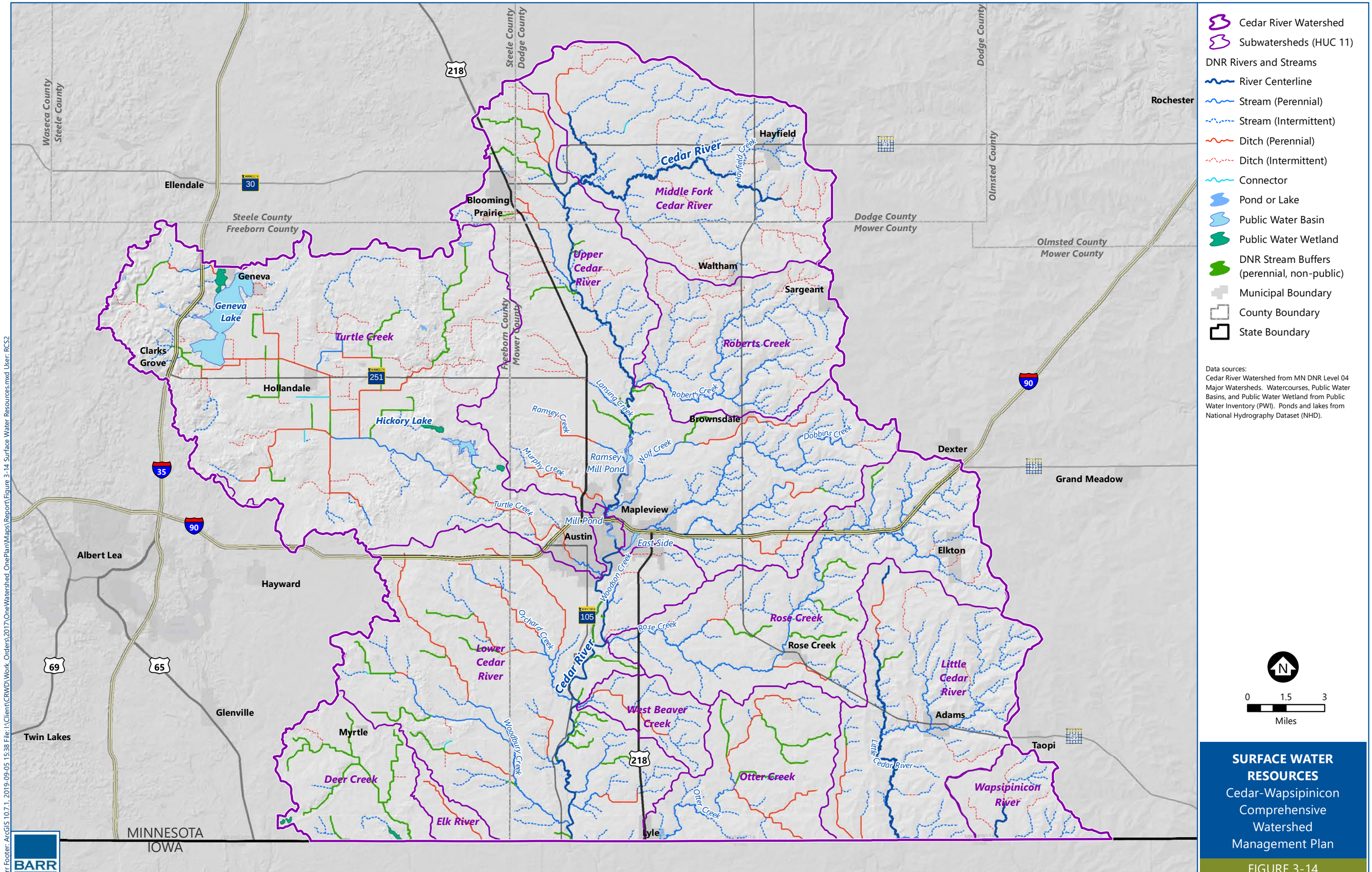
3.6.1 MDNR Public Waters

The MDNR designated many of the streams, rivers, lakes, basins, and wetlands within the watershed as "public waters" to indicate those lakes, wetlands, and watercourses over which the MDNR has regulatory jurisdiction. MDNR public waters are all water basins and watercourses, natural or altered, that meet the criteria set forth in Minnesota Statutes, Section 103G.005, subd. 15 that are identified on PWI maps and lists authorized by Minnesota Statutes, Section 103G.201. In addition to public water lakes, this includes:

- Public water wetlands – MDNR public waters wetlands include all type 3, type 4, and type 5 wetlands (as defined in U.S. Fish and Wildlife Service Circular No. 39, 1971 edition) that are 10 acres or more in size in unincorporated areas or 2 ½ acres or more in size in incorporated areas (see Minnesota Statutes Section 103G.005, subd. 15a and 17b).

- Public water watercourses – MDNR public waters include natural and altered watercourses with a total drainage area greater than two square miles (see Minnesota Statutes Section 103G.005, subd. 15a9). This definition can include ditches that are privately managed or publically-administered (county or watershed district) drainage ditches (see Minnesota Statutes Section 103E).

There are 354 miles of public waters watercourses and 2,470 acres of public waters lakes within the planning area. The MDNR uses county-scale maps to show the general location of the public waters and public waters wetlands (lakes, wetlands, and watercourses) under its regulatory jurisdiction. These maps are commonly known as Public Waters Inventory (PWI) maps. The regulatory "boundary" of these waters and wetlands is called the ordinary high water level (OHWL). Public waters within the Planning area are presented in Figure 3-14. PWI maps are available from the MDNR website at: https://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html



SURFACE WATER RESOURCES
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-14

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Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:38 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-14 Surface Water Resources.mxd User: RCS2

3.6.2 Rivers and Streams

The Cedar River is the defining surface water feature within the Cedar River watershed. The Cedar River drains approximately 590 square miles of land before crossing the Minnesota-Iowa border. Streams tributary to the Cedar River upstream of the Minnesota-Iowa border include, but are not limited to:

- Turtle Creek
- Roberts Creek
- Rose Creek
- West Beaver Creek

The drainage areas to these streams are presented in Figure 3-1. Approximately 135 square miles of the Planning area drains to the Minnesota-Iowa border before joining the Cedar River in Iowa. Streams draining directly to the Minnesota-Iowa border include:

- Deer Creek
- Elk River
- Little Cedar River
- Otter Creek
- Wapsipinicon River

With the exception of Deer Creek, all of the streams listed above are classified as public water watercourses by the MNDR. Several other named creeks are tributary to the Cedar River and its tributaries; many of these streams are shown in Figure 3-14.

3.6.3 Drainage Systems

In addition to the natural streams and rivers, there are many altered watercourses and ditches within the Planning area. Many ditches were constructed in the early 1900s to aid in land development for agriculture. The goal of these ditches is to remove water from agricultural lands. Many of the drainage ditches within the watershed are identified as MDNR public waters and shown on Figure 3-14.

Ditches identified as public waters may be part of private drainage systems or public drainage systems (also known as judicial or county ditches). Public drainage systems administered under Chapter 103E of Minnesota Statutes are under the jurisdiction of a drainage authority (e.g. county, watershed district). The land associated with an open ditch that is part of a public drainage system remains privately held. Some ditches identified by the MDNR as public waters due to their drainage area are part of private drainage systems and are not under the jurisdiction of the county drainage system.

For any new ditches or ditch improvements, the land adjacent to public ditches is required by the MNDR to include a buffer strip of permanent vegetation that is usually 1-rod (16.5 feet) wide on each side (Minnesota Statutes, Section 103E.021). Additional requirements for public drainage systems are included in Minnesota Statutes 103E.015, 103E.215, 103E.411, and 103E.701 Subdivision 6. Minnesota Statutes 103E also includes environmental considerations, including elements for flow mitigation, wetlands, and water quality.

Several public drainage ditches are concentrated in the Turtle Creek subwatershed (TCWD, 2003). Public drainage ditches within the planning area are listed in the Cedar River WRAPS (MPCA, 2019) and are summarized in Table 3-6.

Table 3-6 Public Drainage Systems within the Planning Area

System	Location	Size/Acres (if known)	Outlet	Drainage Authority
County 4	Austin			Mower County
County 5	Lansing			Mower County
County 8	NW Corner of District above Lake Geneva, mostly Bath Township	6,180 acres	Lake Geneva	TCWD
County 17	Austin			Mower County
County 26	Austin			Mower County
County 30	NE Corner of Bancroft Township, West edge of Riceland Township	6,250 acres	Judicial 24	TCWD
County 31	SW corner of Moscow Township	2,950 acres	Judicial 24	TCWD
County 36	Along SW boundary in Riceland Township	2,310 acres	Judicial 24	TCWD
County 57	Above Geneva Lake, Bath Township		County 8	TCWD
County 61	Above Geneva Lake, Bath Township		County 8	TCWD
County 77	Lyle			Mower County
County 79	Lyle			Mower County
County 81	Part of Section 21 of Riceland Township, Bath Township		Section 26, Bath Township	TCWD
Judicial 7	Above Geneva Lake, Bath Township		County 8	TCWD
Judicial 12	Sections 4 & 5 and parts of contiguous sections in Riceland Township	1,570 acres	Judicial 24	TCWD
Judicial 18	Most all of sections 19, 20, 28, 29 and parts of contiguous sections Riceland Township	3,600 acres	Judicial 24	TCWD
Judicial 22	Hayward and Riceland			TCWD
Judicial 24	Greater part of Geneva, Newry, and Moscow Townships and NE half of Riceland Township	80,000 acres	Turtle Creek, Cedar River	TCWD
Judicial 27	Parts of Section 18, 19, and 30 of Newry Township North of Turtle Creek	1,190 acres	Judicial 24	TCWD
Judicial 28	Parts of Section 22,23, 26, 27 of Geneva Township, north of Turtle Creek	1,240 acres	Judicial 24	TCWD
Judicial 29	Part of Section 21 of Riceland Township	110 acres	Judicial 24	TCWD
Judicial 30	Newry Township		Deer Creek	TCWD
Judicial 67	Above Geneva Lake, Bath Township		County 8	TCWD

Sources: Cedar River WRAPS (MPCA, 2019); TCWD Watershed Management Plan (TCWD, 2003)

3.6.4 Lakes

Figure 3-14 presents the public waters lakes located in the Planning area. Significant named lakes within the watershed include:

- Geneva Lake (Turtle Creek subwatershed)
- Ramsey Mill Pond (Upper Cedar River subwatershed)
- East Side Lake (Upper Cedar River subwatershed)
- Mill Pond (Lower Cedar River subwatershed)

Of those listed above, only Geneva Lake is a natural lake; the others are the result of impoundments. Local stakeholders continue to work to increase and improve connectivity between these lakes and their respective streams, while maintaining the integrity and public value of existing structures. The following subsections summarize information about the lakes listed above. Additional information is available from the MDNR Lakefinder website at: https://www.dnr.state.mn.us/lakefind/index.html

3.6.4.1 Geneva Lake

Geneva Lake (public water ID 24-0015) is located in the headwaters of the Turtle Creek subwatershed and is the only naturally occurring lake in the Cedar River watershed. The MNDR designated Geneva Lake as a wildlife lake, under the authority of Minnesota Statutes 97A.101 subd. 2. This designation allows the MDNR to temporarily lower lake levels periodically to improve wildlife habitat, and to regulate motorized watercraft and recreational vehicles on the lake. Additional information about the wildlife lake designation is available from the MDNR at: https://www.dnr.state.mn.us/wildlife/shallowlakes/designation.html.

Geneva Lake is a large and shallow lake, consisting of a north and south basin with a total surface area of 2,212 acres. A 140-acre sub-basin along the east side of the lake's northern bay had been drained and farmed. In recent decades it has been reconnected to the lake and water permanently restored. The overall lake surface area includes this sub-basin. Geneva Lake outlets through a dam at the southeast side of the lake to Turtle Creek. The predominantly agricultural watershed of about 13,541 acres is entirely within Freeborn County, which includes some rolling topography that is part of a glacial moraine. The small town of Geneva (population 544 in 2015) lies directly north of the lake. The town's municipal wastewater discharges via a ditch to the north, and into the Cannon River Watershed. Table 3-7 provides some key morphometric and lake classification statistics for Geneva Lake.

Table 3-7 Geneva Lake summary

Category	Value
MDNR Lake ID	24-0015-00
MPCA 7050 use classification	2B (aquatic life), 3C (industrial consumption)
Total surface area	2,212 acres
Watershed area	13,541 acres
Watershed to lake area ratio	6.3:1
Mean depth	1.1 m (3.6 ft)
Maximum depth	2.4 m (7.9 ft)
Shoreline length	16.6 miles
Impairments (stressor)	Aquatic recreation (excess nutrients);

Source: Cedar River TMDL Report (MPCA, 2018)

There is a public water access on the southwest side of the main basin, which is operated by the MDNR Parks and Trails Division. Freeborn County owns the dam at the outlet of the lake. This dam allows for water level manipulations for lake management. The normal runout is 1210.5 feet, the ordinary high water elevation is at 1211.1 feet, and pool elevations fluctuate several feet above and below the OHW elevation.

Freeborn County and the MDNR established a management plan for Geneva Lake in 2002 (Freeborn County, 2002). The management plan identifies management practices to improve aquatic communities within Geneva Lake. In 2006 and 2007, a major artificial draw down of the lake was performed to replace the dam, to regenerate aquatic vegetation and to reduce rough fish abundance. In early July of 2007, the lake level was 2.8 feet below the normal runout. A fish toxicant (rotenone) was applied under the ice in early 2008 to kill more rough fishes. Water levels were fully restored by precipitation and snowmelt that spring. In 2014, a minor winter drawdown was conducted to encourage winter hypoxia to reduce rough fishes (MDNR, 2017). In winter 2018, the MDNR performed a drawdown (lowering water levels 18 inches below normal run-out) to control rough fishes; the drawdown transitioned to major growing season drawdown in late winter. The growing season drawdown will be maintained through late summer 2019 pending a positive habitat response.

Local stakeholders continue to work with the MDNR to maximize storage opportunities on Geneva Lake while maintaining the overall habitat goals of the lake. The MPCA listed Geneva Lake on its impaired waters list for excessive nutrients/eutrophication in 2011 (see Section 3.8.6.3).

3.6.4.2 Ramsey Mill Pond

Ramsey Mill Pond is a flow-through pond located on the Cedar River north of Austin. It has a surface area of 52 acres and a maximum depth of 18 feet. Access to the Ramsey Mill Pond is maintained by the

Ramsey Golf Club. The Ramsey Dam was originally constructed in 1872 for mill power. The dam was modified in the 1920s, 1940s, and 1960s. The original mill was turned into the Old Mill restaurant in 1948. The length of the overflow structure is 138 feet and the height from the top of the dam to the streambed at the centerline of the dam is approximately 10 feet. The dam is privately owned. The U.S. Army Corps of Engineers (USACE) 1978 Dam Inspection Report reports the hazard classification as significant.

3.6.4.3 East Side Lake

East Side Lake is approximately 40 acres and is located on Dobbins Creek, approximately one mile upstream of the confluence with the Cedar River. The maximum depth of the lake is 10 feet. The City of Austin maintains a boat landing and fishing dock on this lake in East Side Lake Park. The concrete East Side Lake Dam (MN No. 13) was constructed in 1934 by the Federal Civil Works Administration and Works Progress Administration programs. The lake was filled with water in 1939 after excavation of the pasture land behind the dam. Repairs and modifications were made in 1962, 1969, and 1975. The length of the dam is 70 feet and the height is 11 feet. The dam is owned by the City of Austin. The National Dam Safety Program 1980 Inspection Report reports the hazard classification as significant. After the July 2000 flood, the dam was inspected by Short Elliott Hendrickson, Inc. (SEH) for damage. SEH recommended that a 13-foot deep scour hole immediately downstream of the dam and horizontal cracking of the downstream right abutment wall be repaired.

3.6.4.4 Austin Mill Pond

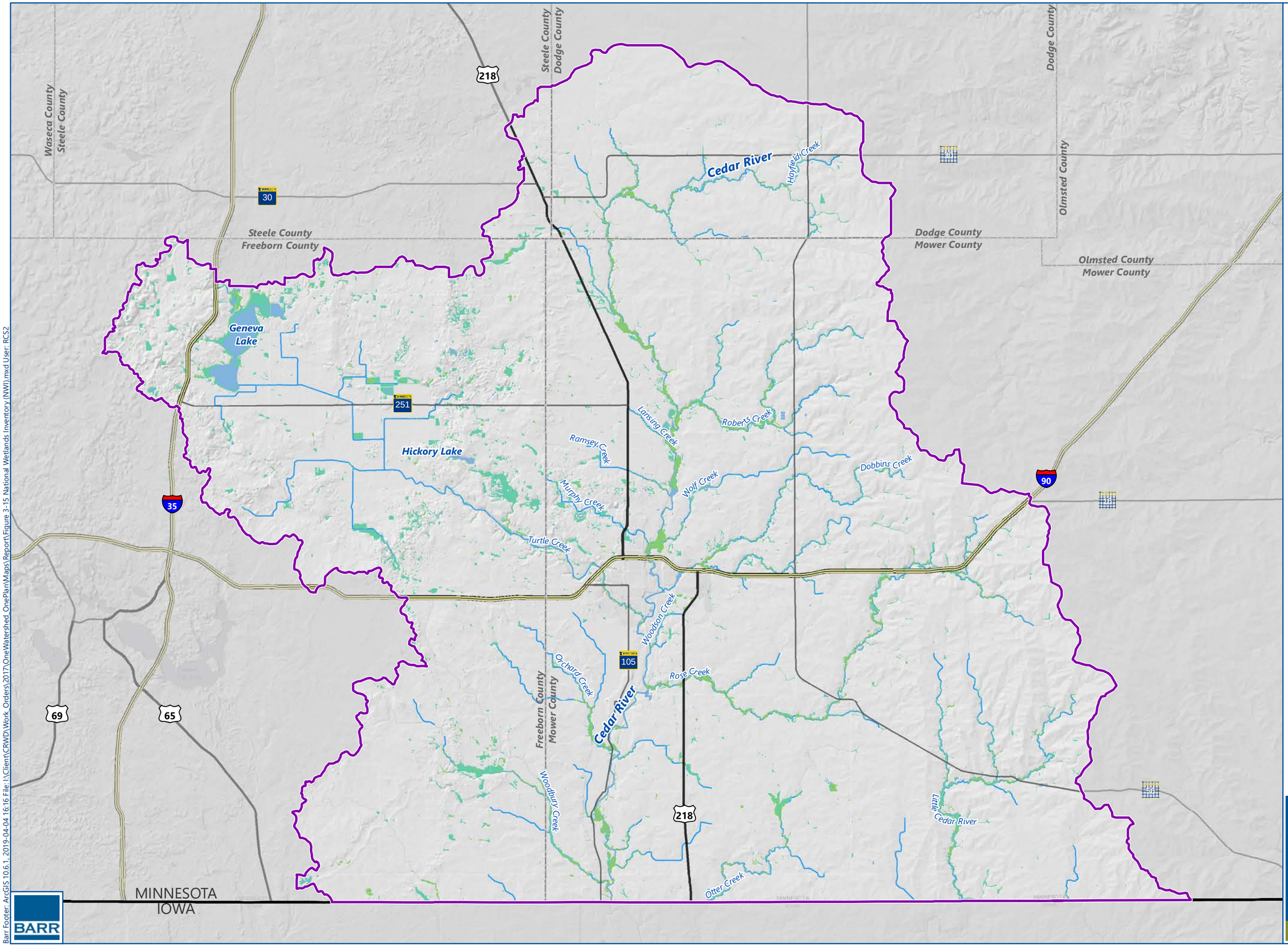
Austin Mill Pond is approximately 19 acres and is located in downtown Austin on the Cedar River and has a maximum depth of 17 feet. The City of Austin maintains a boat ramp on the north side of the pond in Horace Austin Park. Austin Mill Pond is impounded by the concrete Cedar River Dam (MN No. 256) that was constructed in the 1918 to provide hydropower for an adjacent mill. The impoundment presently provides water supply for the City of Austin power plant and recreational opportunities. Modifications were made to the dam in 1924, 1961 and 1975. The dam is a concrete gravity type structure 22 feet high and 200 feet long and has 3 spillways. The dam is owned by the City of Austin. The April 1983 National Dam Safety Program Inspection Report reports the hazard classification of the Cedar River Dam as significant. After the July 2000 flood, the dam was inspected by SEH for damage; the inspection identified needed repairs.

3.6.5 Wetlands

Wetlands in the Planning area are important community and ecological assets. These resources provide significant wildlife habitat and refuge, while also supplying, recreational, runoff retention, and water quality treatment benefits. Many wetlands in the Cedar River watershed were drained for agricultural development prior to the establishment of regulations protecting wetlands. Still, several wetland areas remain throughout the watershed.

Nationally, the U.S. Fish and Wildlife Service (USFWS) is responsible for mapping wetlands across the country, including those in Minnesota. Using the National Aerial Photography Program (NAPP), in conjunction with limited field verification, the USFWS identifies and delineates wetlands, produces detailed maps on the characteristics and extent of wetlands, and maintains a national wetlands database

as part of the National Wetlands Inventory (NWI). The NWI is periodically updated based on available imagery. Figure 3-15 shows the location of NWI wetlands within the Cedar River watershed that are classified as emergent, forested or shrub wetlands, pond wetlands, or lake/riverine wetlands. Freshwater emergent wetlands are concentrated primarily in the Turtle Creek subwatershed. Freshwater forested/shrub wetland occur throughout the planning area adjacent to streams and rivers (see Figure 3-15). There may be additional wetlands (especially those smaller than 0.5 acre) in the watershed that are not included in the NWI. More information about the NWI is available from the USFWS at: https://www.fws.gov/wetlands/. Additional information about updates to the NWI in Minnesota is available from the MDNR at: https://www.dnr.state.mn.us/eco/wetlands/nwi_proj.html.



Cedar River Watershed

Watercourses

NWI (MN DNR NWI East Central Update)

Freshwater Forested/Shrub Wetland

Freshwater Emergent Wetland

Freshwater Pond, Lake, River

County Boundary

State Boundary

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds and lakes from National Hydrography Dataset (NHD). Wetlands from MN DNR National Wetlands Inventory (NWI) East Central Update.

N

0 1.5 3
Miles

NATIONAL WETLANDS INVENTORY (NWI)
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-15

BARR

Barr Footer: ArcGIS 10.6.1, 2019-04-04 16:16 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-15 National Wetlands Inventory (NWI).mxd User: RCS2

3.7 Watershed Monitoring

Several agencies have focused monitoring efforts in the Cedar River Watershed north of the Iowa border. Several types of monitoring are taking place including stage, flow, continuous and discrete water chemistry, load monitoring, fish IBI, and macroinvertebrate IBI monitoring. Below is a summary of the majority of the monitoring efforts that are being carried out in the Cedar River Watershed. Monitoring locations are presented in Figure 3-16. Additional discussion of watershed monitoring during Plan implementation is included in Section 7.1.1.1.

3.7.1 Hydrologic Monitoring

There are four continuous stage and flow monitoring sites in the Cedar River Watershed (see Figure 3-16 and Table 3-8). Besides flow monitoring, stream gages are very critical in assisting with load monitoring and flood prediction.

Table 3-8 Current Stream Gages in the Cedar-Wapsipinicon Watershed

Gage Location	MDNR ID	USGS ID	Period of Record	Drainage Area (mi^2)
Cedar River near Austin	48020001	05457000	1909-1914 1945-2019	399
Cedar River near Lansing	48023001	05455940	2001-2010 2015-2019	160
Turtle Creek at Austin	48027001	05456500	1998-2010 2014-2019	146
Dobbins Creek at Austin	48005001	05455970	1998-2007 2009-2010 2015-2019	36.9

Source: MDNR Cooperative Stream Gaging, US Geological Survey

A stream gage is currently maintained by the USGS on the Cedar River near Austin. Continuous stage and flow measurements are collected every 15 minutes at the USGS gage located south of the City of Austin. A very unique partnership came together in 2017 between the CRWD, USGS, and MPCA. MPCA was able to deploy a DTS-12 turbidity and temperature probe along with a Nitratax Nitrogen probe. The nitrogen and turbidity probes measure continuous data from approximately March through November. The CRWD covered the cost of electrical installation, USGS allowed MPCA to access their shelter and tie in with their existing equipment, and also displays all data live on their website via telemetry. MPCA does annual calibration, maintenance, repair, and data analysis on the data that these probes provide. Live data along with summaries can be found online at https://waterdata.usgs.gov/mn/nwis/uv?site_no=05457000.

The MDNR operates and maintains three stream gages in the Cedar River Watershed at the following locations (see Figure 3-16 and Table 3-8):

Live and historical data can be found for these gages online at:
https://www.dnr.state.mn.us/waters/csg/index.html

3.7.2 Water Quality and Biological Monitoring

Several different agencies are also conducting water chemistry monitoring in the Cedar River Watershed. The USGS collected and analyzed suspended sediment concentrations from 335 samples at their gage site downstream of Austin between 1971 and 1981. The MPCA conducts annual load monitoring at Turtle Creek just upstream of Austin at MDNR gage 48027001, and at the Cedar River just downstream of Austin at USGS gage 05457000 as part of its Watershed Pollutant Load Monitoring (WPLM) program. The MPCA samples for total suspended solids (TSS), total phosphorus (TP), dissolved orthophosphorus, nitrate and nitrite, and total Kjeldahl nitrogen (TKN). MPCA staff typically collect over 30 samples per year at each site over a wide variety of flow conditions and rain events. All of the streamflow and pollutant concentration data are compiled and analyzed with FLUX32 software. The final products are annual load concentrations for each parameter at each site that can be compared from year to year and analyzed for long term trends.

The CRWD has established ten different ongoing water quality monitoring sites in the Cedar River Watershed including all major tributaries and three sites on the main stem of the Cedar River. Ten grab samples are collected at each of the ten sites annually for TSS, TP, dissolved orthophosphorus, nitrate and nitrite, and *Escherichia coli* (*E. coli*) along with other non-chemical parameters. Results are analyzed to evaluate annual conditions and priorities for targeting. Long term trend analysis is also a goal with the data. The CRWD was also awarded a Surface Water Assessment Grant (SWAG) for condition monitoring at nine additional sites in the Cedar River Watershed in 2019 and 2020. Sites will be monitored for TSS, TP, dissolved orthophosphorus, nitrate and nitrite, chlorophyll *a*, chloride, hardness, and *E. coli*. Results will be used for condition and impairment assessment.

The Dobbins Creek Watershed has been targeted as a high priority through various studies and modeling projects resulting in CRWD identifying it as a high priority for flow reduction and sediment and nutrient pollution reduction. Consequently, millions of dollars have been spent on BMP and other large-scale project implementation in the Dobbins Creek Watershed since 2014. The CRWD, in partnership with the University of Minnesota, has been evaluating the effectiveness of BMP implementation through discrete sampling, load monitoring, and biological monitoring. ISCO automated water samplers have been deployed at four different sites in the Dobbins Creek Watershed. Samples are being collected for TSS, TP, dissolved orthophosphorus, and nitrate and nitrite. The data has been tabulated into annual loads with an intention of doing long term trend analysis over time. Fish Index of Biotic Integrity (IBI) data has been collected by MPCA, CRWD, or the University of Minnesota at thirteen sites across the Dobbins Creek watershed since 2014. Macroinvertebrate IBI data has also been collected by the MPCA, CRWD, or the University of Minnesota at five sites since 2014. CRWD Macroinvertebrate IBI monitoring locations on Dobbins Creek are shown in Figure 3-16. IBI data were also collected in 2009 by the MPCA. Baseline data has been collected for all of the previously mentioned parameters as BMP implementation continues. The CRWD will continue to prioritize the existing chemistry and biological monitoring sites as a high priority as more funding becomes available to continue this monitoring in the future.

The Cedar River Watershed is also home to two of MPCA's Long-Term Biological Monitoring (LTBM) stations at the outlets of Roberts Creek and Woodbury Creek (see Figure 3-16). These stations are monitored every other year on average. Fish and macroinvertebrate community data along with physical habitat and water chemistry data are collected. The long term data will be used to see if conditions are changing over time and to see if the biological communities are impaired.

The MPCA also conducts Intensive Watershed Monitoring (IWM) at several sites in the Cedar River Watershed for two-year spans every 10 years. The MPCA performed IWM in the Cedar River Watershed in 2009-2010 and began IWM again in 2019. Water chemistry data, along with fish and macroinvertebrate data, are collected during IWM. This data is used for condition and impairment assessments. There are also volunteer monitoring efforts that take place in the Cedar River Watershed that are not mentioned in this report. Local monitoring data inputs are added to a shared database (i.e., EQuIS – environmental quality information system) when relevant, to share data with stakeholders.

Water quality and biological monitoring data are available from the MPCA's Environmental Data Access (EDA) website at: https://www.pca.state.mn.us/quick-links/eda-surface-water-data

3.8 Surface Water Quality

The water quality of surface water resources within the Planning area is important to the recreational, economic, and ecological functions of those resources. Historically, surface water quality data in the Cedar River and the surrounding watershed has been collected by entities including, but not limited to:

- Minnesota Pollution Control Agency (MPCA)
- United States Geological Survey
- Mower County Soil and Water Conservation District (Mower SWCD)
- Cedar River Watershed District (CRWD)
- Turtle Creek Watershed District (TCWD)

Surface water monitoring locations are presented in Figure 3-16. Locations presented in Figure 3-16 include sites of biological monitoring, water chemistry monitoring, and data reported in for discharges subject to National Pollution Discharge Elimination System (NPDES) permits.

Monitoring locations and data are also available from the MPCA's Environmental Data Access (EDA) website at: https://www.pca.state.mn.us/quick-links/eda-surface-water-data

Much of the surface water quality information summarized in this section is based on the Cedar River Watershed Restoration and Protection Strategies (Cedar River WRAPS) study (see Section 3.8.1.1) and/or the Cedar River Watershed Total Suspended Solids, Lake Eutrophication, and Bacteria Total Maximum Daily Load (Cedar River TMDL).

3.8.1 Cedar River Watershed Restoration and Protection Strategies (WRAPS)

The MPCA competed a Watershed Restoration and Protection Strategies (WRAPS) study for the Cedar River watershed in 2019. The Cedar River WRAPS addresses the entire Planning area, with the exception of the Wapsipinicon River subwatershed (see Figure 3-1).

Intensive watershed monitoring by the MPCA was conducted in 2009. Sixty-five sites were sampled for biology at the outlets of variable-sized subwatersheds within the Cedar River watershed. These locations included the mouth of the Cedar River at the Iowa border, the upstream outlets of major tributaries, and the headwater outlets of smaller streams. As part of this effort, MPCA staff joined with the CRWD to complete stream water chemistry sampling at the outlets of seven of the Cedar River's subwatersheds. In 2011, a holistic approach was taken to assess all of the watershed's surface waterbodies for support of aquatic life, recreation, and fish consumption, where sufficient data was available. Thirty-five streams and one lake were assessed in this effort. Not all lake and stream AUIDs could be assessed due to insufficient data, modified channel condition or their status as limited resource value waters.

Information from the Cedar River WRAPS is summarized in this document. Additional information may be obtained from the MPCA website at: https://www.pca.state.mn.us/water/watersheds/cedar-river

3.8.2 Surface Water Quality Assessments

The Cedar River TMDL summarizes assessments of stream and lake water quality to determine if those resources are achieving designated uses. Designated uses include a waterbody's ability to support aquatic life, aquatic recreation, and aquatic consumption. The state of Minnesota, consistent with the Clean Water Act, adopted water quality standards corresponding to a waterbody's designated uses. Minnesota water quality standards are published in Minnesota Rules 7050, available at:
https://www.revisor.mn.gov/rules/7050/

Minnesota water quality standards applicable to the waterbodies assessed as part of the Cedar River TMDL are summarized in Section 2 of the Cedar River TMDL (MPCA, 2018). Waterbodies that fail to meet water quality standards applicable to its designated uses are identified by the MPCA as "impaired" and placed on the MPCA's impaired waters 303(d) list. Impaired waterbodies within the Planning area are presented in Figure 3-17.

3.8.2.1 Stream Assessments

The WRAPS study and TMDL study summarize streams assessed for aquatic life and aquatic recreation designated uses. Aquatic life use impairments include:

- Low fish index of biotic integrity (Fish IBI) – which means an unhealthy fish community is present
- Low macroinvertebrate (i.e., aquatic bugs) index of biotic integrity (Invertebrate IBI) – which means an unhealthy macroinvertebrate community is present
- Turbidity/total suspended solids (TSS) levels too high to support fish or macroinvertebrate life

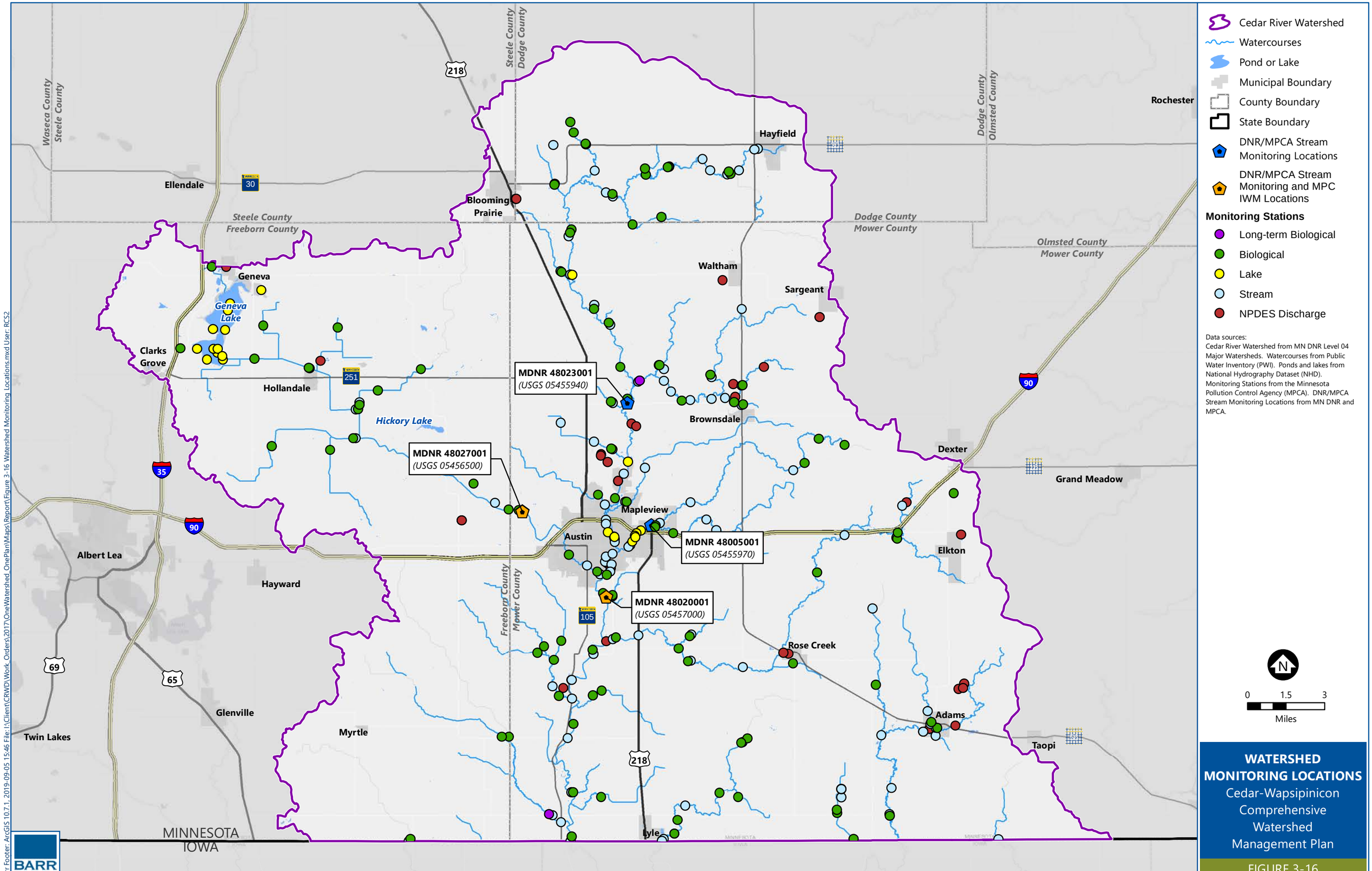
Aquatic recreation use impairments include: *Escherichia coli* (*E. coli*); a bacteria, found in the intestinal tracts of warm-blooded animals. The results of the stream assessments are presented in Table 3-8. Many

of the subwatersheds listed in Table 3-8 include several stream reaches and/or tributaries. Appendix A of the Cedar River WRAPS includes a complete summary of the stream impairment assessment by designated use and pollutants for all assessed AUIDs in each planning subwatershed except the Wapsipinicon River. The *Winnebago River and Upper Wapsipinicon River Watersheds Monitoring and Assessment Report* (MPCA, 2018) includes a summary of stream impairments in the Wapsipinicon River watershed in Minnesota. Existing efforts in the Dobbins Creek watershed seek to assess the effectiveness of BMPs using IBI scores for the watershed.

Table 3-9 Stream aquatic life and aquatic recreation impairments summarized in the Cedar River WRAPS and Wapsipinicon River WRAPS

Watershed	Area (acres)	# Total AUIDs	# Assessed AUIDs	# Supporting Aquatic Life	# Supporting Aquatic Recreation	# Not supporting Aquatic Life	# Not supporting Aquatic Recreation	Insufficient Data
Cedar River HUC 8	**410,064**	**122**	**35**	**11**	**0**	**21**	**9**	**30**
Middle Fork Cedar River	6,720	12	5	2	0	3	1	2
Roberts Creek	16,000	13	5	1	0	4	1	1
Upper Cedar River[1]	21,376	26	9	3	0	6	3	8
Turtle Creek	24,960	21	2	0	0	2	1	10
Rose Creek	30,592	7	3	0	0	3	0	1
West Beaver Creek	37,568	2	1	1	0	0	0	0
Lower Cedar River	42,304	24	6	2	0	4	2	4
Otter Creek	46,272	4	1	1	0	0	0	1
Deer Creek	60,926	6	0	0	0	0	0	1
Little Cedar River	63,441	6	3	1	0	2	1	1
Elk River	65,792	1	0	0	0	0	0	1
Wapsipinicon River	**8,264**	**6**	**3**	**0**	**0**	**1**	**1**	**2**

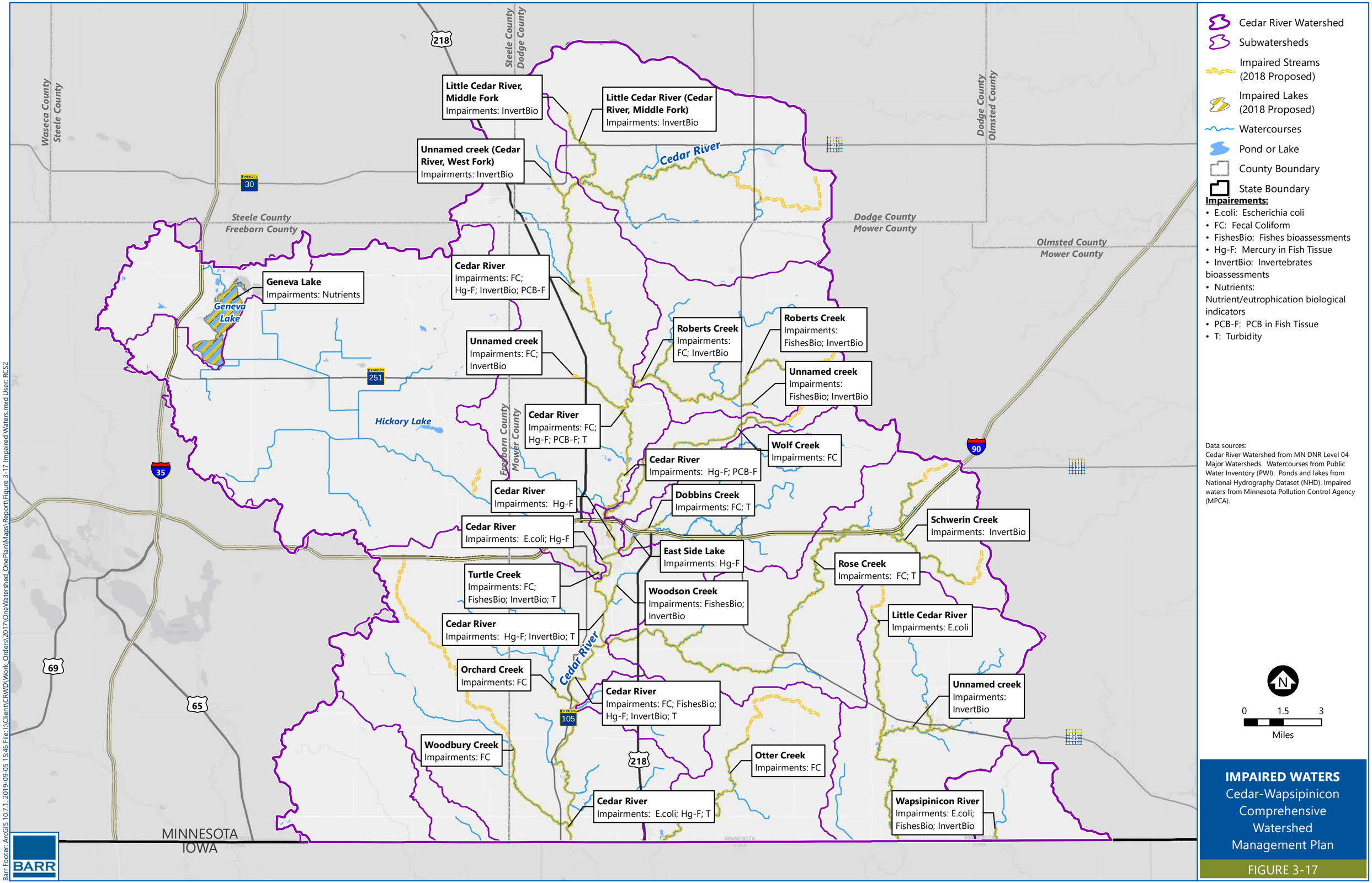
(1) Upper Cedar River HUC11 watershed includes Dobbins Creek and Wolf Creek subwatersheds.



Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:46 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-16 Watershed Monitoring Locations.mxd User: RCS2

WATERSHED MONITORING LOCATIONS
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-16



IMPAIRED WATERS
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-17

Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:46 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-17 Impaired Waters.mxd User: RCS2

3.8.2.2 Lake Assessments

Lakes are assessed for aquatic recreation uses based on ecoregion specific water quality standards for total phosphorus (TP), chlorophyll-a (chl-*a*) (i.e., the green pigment found in algae), and Secchi transparency depth. To be listed as impaired, a lake must not meet water quality standards for TP and either chl-*a* or Secchi depth.

There are seven lakes in the Cedar River Watershed. The Upper Cedar River Subwatershed includes East Side Lake and the Ramsey Mill Pond. The Turtle Creek Subwatershed includes Unnamed (Hickory) and Geneva Lake. The Deer Creek Subwatershed includes three small unnamed lakes (MDNR 24-0079-00, 24-0070-00, 24-0072-00). Lake Geneva was assessed and found to be impaired for aquatic recreation due to excessive nutrients/eutrophication in 2011. The MPCA reported a 10-year summer average for lake TP of about 153 ug/L. The southern Minnesota shallow lakes water quality standard for TP is 90 ug/L for eutrophication.

The remaining lakes were not assessed due to their size and/or lack of available data. MPCA's monitoring approach is described in more detail in the Cedar River Watershed Monitoring and Assessment Report (MPCA, 2012).

3.8.3 Cedar River Water Quality Trends

The Cedar River WRAPS summarizes water quality trends in the Cedar River at Lansing and below Austin. There were significant increases in nitrite/nitrates during the long-term period of record for both stations and additionally for the shore term period for the river below Austin. Conversely, there were significant decreases in total suspended solids, total phosphorus, ammonia, and biological oxygen demand for the long-term period of record while there was no trend with the near-term period. No trend was observed for chloride; however, this may be the result of insufficient data, especially within the most recent time period. These trends are summarized in Table 3-9. Further details can be found in the *Cedar River Watershed Monitoring and Assessment Report* (MPCA, 2012).

Table 3-10 Water quality trends in the Cedar River

Trend Period	Total Suspended Solids	Total Phosphorus	Nitrite/Nitrate	Ammonia	Biochemical Oxygen Demand	Chloride
At CSAH-2, 0.5 Miles E of Lansing (CD-24) – Site ID 48023001 in Figure 3-16						
Overall trend (1967 - 2009)	Decrease	Decrease	Increase	Decrease	Decrease	No trend
Recent trend (1995 - 2009)	No trend	No trend	No trend	No trend	No trend	Little data
At CSAH-4, 3 Miles S of Austin (CD-10) – Site ID 48020001 in Figure 3-16						
Overall trend (1967 - 2009)	Decrease	Decrease	Increase	Decrease	Decrease	No trend
Recent trend (1995 - 2009)	No trend	No trend	Increase	No trend	No trend	Little data

3.8.4 Stressor Identification

In order to develop appropriate strategies for restoring or protecting waterbodies the stressors and/or sources impacting or threatening them must be identified and evaluated.

A **stressor** is something that adversely impacts or causes fish and macroinvertebrate communities in streams to become unhealthy. Biological stressor identification is done for streams with either fish or macroinvertebrate biota impairments and encompasses both evaluation of pollutants (such as phosphorus, bacteria or sediment) and non-pollutant-related factors as potential stressors (e.g., altered hydrology, fish passage, habitat).

Stressor identification studies have been completed for the Cedar River watershed (MPCA, June 2016) and the Wapsipinicon River watershed (MPCA, March 2018). These studies identify the factors (i.e., stressors) that are causing the fish and macroinvertebrate community impairments within the planning area, including both pollutants and non-pollutants. Additional discussion of pollutant/stressors is summarized in Section 2.4 of the Cedar River WRAPS. Table 3-10 summarizes the primary stressors identified in streams with aquatic life impairments in the Cedar River (HUC 8) watershed and the Wapsipinicon River watershed. Common stressors were:

- **Lack of Habitat/Bedded Sediment:** excess fine sediment that deposits on the bottom of stream beds negatively impacts fish and macroinvertebrates that depend on clean, coarse stream bottoms for feeding, shelter, and reproduction.
- **Elevated nitrate:** elevated levels of nitrate in streams can be toxic to fish and macroinvertebrates, especially for certain species of caddisflies, amphipods, and salmonid fishes.
- **Low Dissolved Oxygen**: when dissolved oxygen drops below optimal levels, desirable aquatic organisms, such as fish, may suffer stress or die off.
- **Elevated nutrients (phosphorus)**: very low or highly fluctuating dissolved oxygen levels due to excess nutrients (phosphorus) fertilizing stream algae growth.
- **Sediment/turbidity**: increased turbidity of water harms fish and macroinvertebrates through gill abrasion, loss of visibility, and reduced sunlight penetration needed for plants.
- **Altered hydrology**: flow alteration is the change of a stream's flow volume and/or flow pattern (low flows, intermittent flows, increased surface runoff, and highly variable flows) typically caused by anthropogenic activities, which can include channel alteration, water withdrawals, land cover alteration, wetland drainage, agricultural tile drainage, urban stormwater runoff, and impoundment.

Table 3-11 Stressors for impairments in the Cedar River and Wapsipinicon River watersheds

HUC 11 Subwatershed	Stream	AUID Last 3 digits	Biological Impairment	Stressor: Lack of Habitat/ Bedded Sediment	Elevated Nitrate	Low Dissolved Oxygen	Elevated Nutrients Phosphorus	Sediment/Turbidity	Altered Hydrology
• Determined to be a direct stressor		o Inconclusive candidate cause		■ Not an identified stressor					
Middle Fork Cedar River	Cedar River, Middle Fork	549	Macroinvertebrates	●	○	○	○	○	●
	Cedar River, Middle Fork	530	Macroinvertebrates	●	●	●		○	●
Roberts Creek	Unnamed creek	531	Fish, Macroinvertebrates	●	●	○	○	○	●
	Roberts Creek	506	Fish, Macroinvertebrates	●	●	○		○	●
	Unnamed creek	593	Macroinvertebrates	●	●	○	○	○	●
	Roberts Creek	504	Macroinvertebrates	●	●	○	●	○	●
Upper Cedar River	Unnamed creek (Cedar River, West Fork)	591	Macroinvertebrates		○	○	○	○	●
	Unnamed creek	577	Macroinvertebrates	●	●	○	○	○	●
	Cedar River	503	Macroinvertebrates	●	●	●	●	●	●
	Unnamed creek	533	Macroinvertebrates	●	●		●	●	●
Turtle Creek	Unnamed creek	547	Macroinvertebrates		○	○	○	○	●
	Turtle Creek	540	Fish, Macroinvertebrates	●	●	●	●	●	●
Rose Creek	Schwerin Creek	523	Macroinvertebrates	●	●	○	○	○	●
	Unnamed creek	583	Macroinvertebrates	●	●	○	●	●	●
Lower Cedar River	Unnamed creek	554	Fish, Macroinvertebrates	●			○	○	●
	Cedar River	515	Macroinvertebrates	●	●	●	●	○	●
	Cedar River	501	Fish, Macroinvertebrates	●	●		●	●	●
Little Cedar River	Unnamed creek	520	Macroinvertebrates	●	●	○	○	○	●
	Unnamed creek	519	Macroinvertebrates	●	●	○	○	○	●
Wapsipinicon River	Wapsipinicon River	507	Fish, Macroinvertebrates	●	●	○	○	○	●

3.8.5 Pollutant Sources

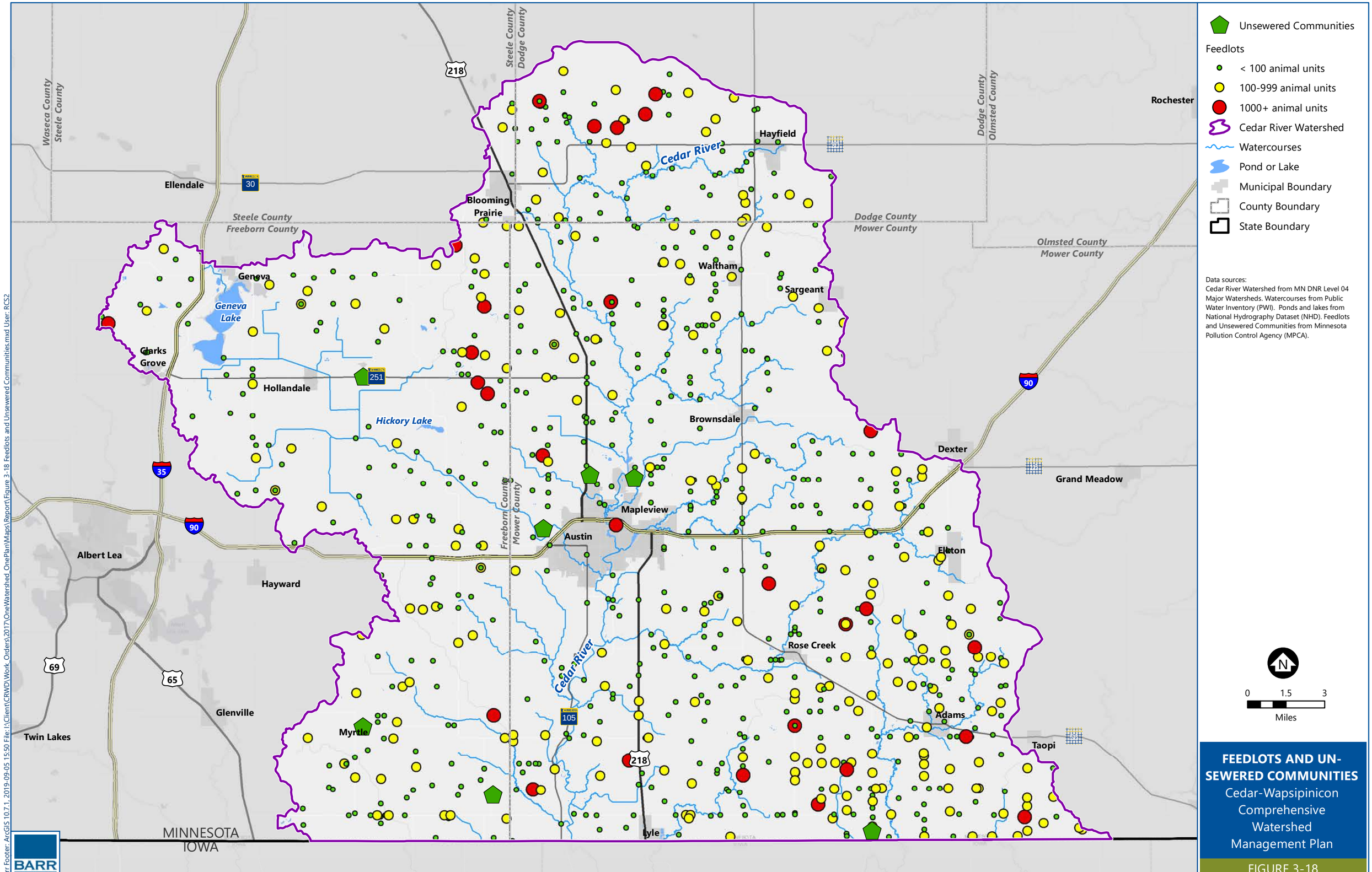
The Cedar River WRAPS and Cedar River TMDL describe pollutant sources to impaired waters. These sources include point sources and non-point sources of pollutants. Section 2.4 of the Cedar River WRAPS provides additional detail regarding the source breakdown of individual pollutants/stressors (e.g., nitrate, bacteria).

Point sources are defined as facilities that discharge stormwater or wastewater to a lake or stream and have a National Pollutant Discharge Elimination System or State Disposal System (NPDES/SDS) permit. There are ten municipal wastewater facilities and two industrial wastewater facilities that require NPDES permitting located in the Cedar River Watershed (see Section 2.3 of the Cedar River WRAPS).

Nonpoint sources of pollution, unlike pollution from industrial and sewage treatment plants come from many diffuse sources. Nonpoint source pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes and streams. Common non-point pollutant sources in the Cedar River Watershed are:

- **Cropland runoff:** Cropland runoff can deliver sediment, nitrogen and phosphorus when soil is disturbed or exposed to wind and rain.
- **Near-stream/ditch erosion:** Near-stream/ditch erosion can deliver excess sediment and nutrients from destabilized banks or transport deposited sediment in the stream during very high flows. While streams naturally transport water and sediment, erosion issues occur when the streams are out of balance /equilibrium.
- **Manure runoff:** Fertilizer and manure contains high concentrations of phosphorus, nitrogen, and bacteria that can runoff into lakes and streams when not properly managed. Animal feedlots that are not properly managed may become significant sources of bacteria and nutrients, depending on proximity to surface waters and manure application methods. Feedlots located within the Planning area are presented in Figure 3-18.
- **Failing septic systems:** Septic systems that are not maintained or failing near a lake or stream can contribute excess phosphorus, nitrogen, and bacteria.
- **Internal loading:** Lake sediments contain large amounts of phosphorus that can be released into the lake water through physical mixing or under certain chemical conditions.
- **Upstream lakes and streams:** Some lakes and streams receive most of their pollutants from upstream waterbodies. For these lakes, restoration and protection efforts should focus on improving the water quality of the upstream contributing lake or stream.
- **Wildlife fecal runoff:** Dense or localized populations of wildlife, such as beavers or geese, can contribute phosphorus and bacteria pollutants to streams or ponds.
- **Urban stormwater:** Runoff from impervious surfaces common to developed areas may collect phosphorus, sediment, and other pollutants prior to discharging to downstream waters.
- **Unsewered communities:** Unsewered or undersewered areas have wastewater treatment methods that are not adequate to protect public health or the environment; this may include communities with failing SSTS or inadequate collection and treatment infrastructure.

The MPCA maintains a database which includes the locations of potential pollutant sources (e.g., underground storage tanks). This data is available from the MPCA at: https://www.pca.state.mn.us/data/whats-my-neighborhood



FEEDLOTS AND UN-SEWERED COMMUNITIES

Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-18

Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:50 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-18 Feedlots and Unsewered Communities.mxd User: RCS2

3.8.6 TMDL Analyses

Figure 3-17 presents the impaired waters in the planning area. Waterbodies on the impaired waters list are required to have an assessment completed that addresses the causes and sources of the impairment. This process is known as a total maximum daily load (TMDL) analysis. The TMDL analysis includes target goals for water quality improvement. The MPCA is in the process of completing the *Cedar River Watershed Total Suspended Solids, Lake Eutrophication, and Bacteria Total Maximum Daily Load* (Cedar River TMDL). Information from the Cedar River TMDL is summarized in this document. Additional information may be obtained from the MPCA website at: https://www.pca.state.mn.us/water/watersheds/cedar-river

Additionally, the MPCA is in the process of completing a WRAPS and TMDL study for the Wapsipinicon River watershed. Additional information may be obtained from the MPCA website at: https://www.pca.state.mn.us/water/watersheds/upper-wapsipinicon-river

Generally, the TMDL methodology relies on water quality monitoring data and water quality modeling to estimate the TMDL, defined as the maximum amount of pollutant that a waterbody can receive and still meet water quality standards and/or designated uses. The TMDL is comprised of three components:

- Wasteload Allocation (WLA) – the portion of the TMDL allocated to existing or future point sources of the relevant pollutant
- Load Allocation (LA) – the portion of the TMDL allocated to existing or future nonpoint sources of the relevant pollutant. The LA may also encompass "natural background" contributions, internal loading and atmospheric deposition;
- Margin of Safety (MOS) – accounting of uncertainty about the relationship between pollutant loads and receiving water quality

The Cedar River TMDL addresses the impairments and stressors identified in Table 3-11; these include impairments for total suspended solids (TSS), bacteria, and eutrophication. The CRWD is collecting biological monitoring data at select sites in support of strategies to address TMDLs (see Section 7.1.2). Impairments to be addressed by the future Wapsipinicon River TMDL are also included in Table 3-11.

Table 3-12 Cedar River watershed 303(d) impairments addressed by Cedar River TMDL and future Wapsipinicon River TMDL

Waterbody	HUC12	AUID	Impairment(s)
Cedar River – Rose Cr to Woodbury Cr	JD No. 77 – Cedar River	07080201-501	Turbidity/TSS
Cedar River – Roberts Cr to Upper Austin Dam	Green Valley Ditch & City of Austin–Cedar River	07080201-502	Turbidity/TSS
Cedar River – Turtle Cr to Rose Cr	City of Austin–Cedar River	07080201-515	Turbidity/TSS
Unnamed Creek – Unnamed Cr to Rose Cr	Lower Rose Creek	07080201-583	Turbidity/TSS*
Cedar River – Woodbury Cr to MN/IA border	Town of Otranto–Cedar River	07080201-516	Turbidity/TSS Bacteria/E. coli
Cedar River – Headwaters to Roberts Cr	Headwaters & Green Valley Ditch–Cedar River	07080201-503	Turbidity/TSS* Bacteria/E. coli
Rose Creek – Headwaters to Cedar R	Upper & Lower Rose Creek	07080201-522	Turbidity/TSS Bacteria/E. coli
Unnamed Creek – Unnamed Cr to Cedar R	City of Austin–Cedar River	07080201-533	Turbidity/TSS* Bacteria/E. coli
Dobbins Creek – T103 R18W S36, east line to East Side Lk	Dobbins Creek	07080201-535	Turbidity/TSS Bacteria/E. coli
Dobbins Creek – East Side Lk to Cedar R	Dobbins Creek	07080201-537	Turbidity/TSS Bacteria/E. coli
Turtle Creek – T102 R18W S4, north line to Cedar R	Turtle Creek	07080201-540	Turbidity/TSS Bacteria/E. coli
Orchard Creek – T101 R18W S5, north line to Cedar R	Orchard Creek	07080201-539	Bacteria/E. coli
Woodbury Creek – Headwaters to Cedar R	Woodbury Creek	07080201-526	Bacteria/E. coli
Otter Creek – Headwaters to MN/IA border	Otter Creek	07080201-517	Bacteria/E. coli
Little Cedar River – Headwaters to MN/IA border	Village Of Meyer–Little Cedar River	07080201-518	Bacteria/E. coli
Cedar River – Dobbins Cr to Turtle Cr	City of Austin–Cedar River	07080201-514	Bacteria/E. coli
Wolf Creek – Headwaters to Cedar R	City of Austin–Cedar River	07080201-510	Bacteria/E. coli
Roberts Creek – Unnamed Cr to Cedar R	Roberts Creek	07080201-504	Bacteria/E. coli
Geneva Lake	Geneva Lake	24-0015-00	Excess Nutrients/ Eutrophication
Wapsipinicon River – 92.6732, 43.5073 to MN/IA border	Wapsipinicon River	07080102-507	E. coli/Fishes bio/ macroinvertebrate bio

Source: Table 1 of the Cedar River TMDL (MPCA, 2018); MPCA online impaired waters viewer: https://www.pca.state.mn.us/water/impaired-waters-viewer-iwav

*Denotes AUIDs with a conclusive TSS stressor to biota, all resulting in MIBI impairments.

3.8.6.1 Total Suspended Solids Impairments

The Cedar River TMDL includes detailed analysis of TSS loading to impaired reaches (see Section 4.2 of the Cedar River TMDL). Overall conclusions from that analysis are summarized here:

- TSS impairments in the watershed are significant. While some site differences do exist, a significant portion of data from the wet-weather and higher runoff periods are above the standard at all of the monitoring sites.

- Five TSS-listed reaches on the mainstem Cedar River cover 47 miles of stream, out of a total stream length in Minnesota of 54 miles.

- For stream sites with large datasets (which utilize continuous turbidity measurements), exceedances occur under all flow regimes except low flow, and in some cases under low flow as well. Reaches with moderate size datasets, which utilize transparency and Secchi tube sampling show exceedances predominately in the moderately high to high flow zones.

- Primary sources contributing TSS within this watershed are streambank/bed erosion, sheet and rill erosion from row cropland, ravine and gully erosion, and channelization of streams, impervious areas, concentrated flow in riparian zones and buffers near streams and waterways, and overgrazed pasture in close proximity to surface waters. Depending on the flow conditions and landscape of the various subwatershed areas, each one of these primary sources may be contributing significant amounts of TSS at localized scales. There may also be seasonally significant contributions from algae to the TSS conditions downstream of reservoirs or impoundments (such as Ramsey Mill Pond and East Side Lake) and Geneva Lake, in localized areas of the watershed.

- Biological monitoring of creeks, streams and rivers in the Cedar River watershed has shown that habitats are degraded, and that bedded sediments are frequently the critical factor affecting that condition (MPCA 2016). Seventeen of the eighteen sites listed in the stressor identification report include a confirmed stressor for "habitat/bedded sediment." TSS was a confirmed biological stressor in 27% of the stream reaches, and was an inconclusive stressor in the remainder of the stream reaches studied. Because the TSS measurement system underestimates the actual suspended sediment load by a substantial degree (i.e. around 50%), larger sediment loads would be quantified under a more rigorous monitoring and analytical protocol.

3.8.6.2 Bacteria Impairments

The Cedar River TMDL includes detailed analysis of bacteria loading to impaired reaches (see Section 4.3 of the Cedar River TMDL). Overall conclusions from that analysis are summarized here:

- The 14 bacteria impairments in the watershed are significant when assessed across the various flow conditions. A significant portion of the wet-weather and dry-weather concentrations are above the standard at almost all of the monitoring sites; however, some site differences do exist where mid-range flows are meeting the criteria.

- Where sufficient data is available, it appears that the existing bacteria load exceeds the target under all flow conditions.

- Eighty-six percent (86%) or 46 river miles of the Cedar River in Minnesota are impaired for bacteria. This includes the three stream reaches included in the Cedar River TMDL, and the two included in the 2006 Regional TMDL Evaluation of fecal coliform bacteria impairments in the Lower Mississippi River Basin report.

- The stream reaches that show bacteria exceedances across all flow zones include the upper Cedar River, Roberts Creek, and Woodbury Creek.

- There are an additional six stream segments, which also show exceedances to the monthly geometric mean water quality standard, for the summer months of June, July and August, when recreational usage is higher. These streams are Turtle Creek, Rose Creek, the Little Cedar River, Upper Dobbins Creek, Otter Creek, and Orchard Creek.

- The three mainstem Cedar River reaches have median bacterial loads above the TMDL bacterial load standard under very high, high and low flow zones. There are no medians exceeding the TMDL bacterial load standard under mid flows and very low flows. This suggests either a runoff-associated source, or re-introduction of bacteria into the water column, when stream flows increase and water velocities create more turbulence in the channel

- Under moderate flows, the minimum LA percentage is 75%. As stream flows increase in the Cedar River, this increases to 85% or more.

- Except for the very low flow zone in the Cedar River's 1.9 mile reach in the south district of Austin (AUID 514, which includes the city's WWTP discharge), the nonpoint bacterial load is always 50% or more, for the entire Cedar River in Minnesota.

- The highest WLA in the Cedar River is 66% of the loading capacity in AUID-514 under very low stream flows, and this is the result of Austin's WWTP permitted discharge.

- The 11 tributary stream reaches have median bacterial loads above the TMDL bacterial load standard under all flow regimes, with a higher tendency at low flows. Of all the tributaries, Roberts Creek and Woodbury Creek display higher median values, across more flow zones, than the other nine tributary streams.

- Primary sources contributing bacteria within this watershed can include animal agriculture sources such as feedlots and runoff from manure applications, or overgrazed pasture in close proximity to surface waters. Other sources include impervious areas, failing septic systems, and the persistence of bacteria in streams and in algal mats. Depending on the flow conditions and land use/land management conditions present in the various subwatershed areas, each one of these primary sources may be contributing significant amounts of bacteria at localized scales.

3.8.6.3 Eutrophication Impairment – Geneva Lake

The Cedar River TMDL includes detailed analysis of nutrient loading to Geneva Lake (see Section 4.4 of the Cedar River TMDL). The upper subwatersheds that drain to Geneva Lake are critical zones for reducing

runoff and phosphorus export. Cooperative conservation implementation projects in the JD-8 public drainage system continue to make progress to address these needs. This project is led by the Freeborn SWCD and involvement from the Freeborn County drainage authority, and the Turtle Creek Watershed District. Numerous other voluntary conservation efforts are implemented on farmlands including reduced tillage, cover crops, permanently vegetated buffers, wetland restorations with some additional shoreland protections.

The Cedar River TMDL found that aquatic plants are a critical part of the overall Geneva Lake water quality condition, and will need to be more fully incorporated into the standard lake water quality criteria and standards, in the coming years. Historically, the lake has been dominated by common carp and/or black bullhead and other tolerant species. The presence of rough fish in the lake have the potential to increase internal loading of TP from lake sediment (Huser et al., 2016).

A Hydrologic Simulation Program-Fortran (HSPF) watershed simulation model was used to estimate phosphorus loading to Geneva Lake from the surrounding watershed (RESPEC, 2014). The Minnesota Lake Eutrophication Analysis Procedure (MINLEAP) model (Wilson and Walker, 1989) was also used to determine the loading capacity of Geneva Lake for total phosphorus. The resulting TP TMDL allocations for Geneva Lake are presented in Section 4.4 of the Cedar River TMDL. The Cedar River TMDL estimates that the current total phosphorus load of about 28 lbs/day will need to be reduced by 51%, to about 14 lbs/day – to meet the in-lake water quality standards.

3.8.7 Water Quality Modeling

Water quality modeling has been used to estimate pollutant loading within the Planning area. The type, extent, and level of detail vary among different modeling efforts. Past modeling efforts are summarized in this section.

3.8.7.1 HSPF Modeling – Nitrogen and Phosphorus Loading

In support of the Cedar River WRAPS and Cedar River TMDL studies, HSPF modeling was performed for the entire planning area (with the exception of the Wapsipinicon River subwatershed). HSPF is a large-basin, watershed model that simulates runoff and water quality in urban and rural landscapes. HSPF focuses on a generalized, larger scale perspective of watershed processes. The HSPF model provides estimation of river flows and water quality in areas where limited or no observed data has been collected. The HSPF model also provides estimations of the locations and proportions of watershed sources -- specific combinations of land use, slopes and soils -- comprising pollutant loading at downstream locations where more substantial observed data are available.

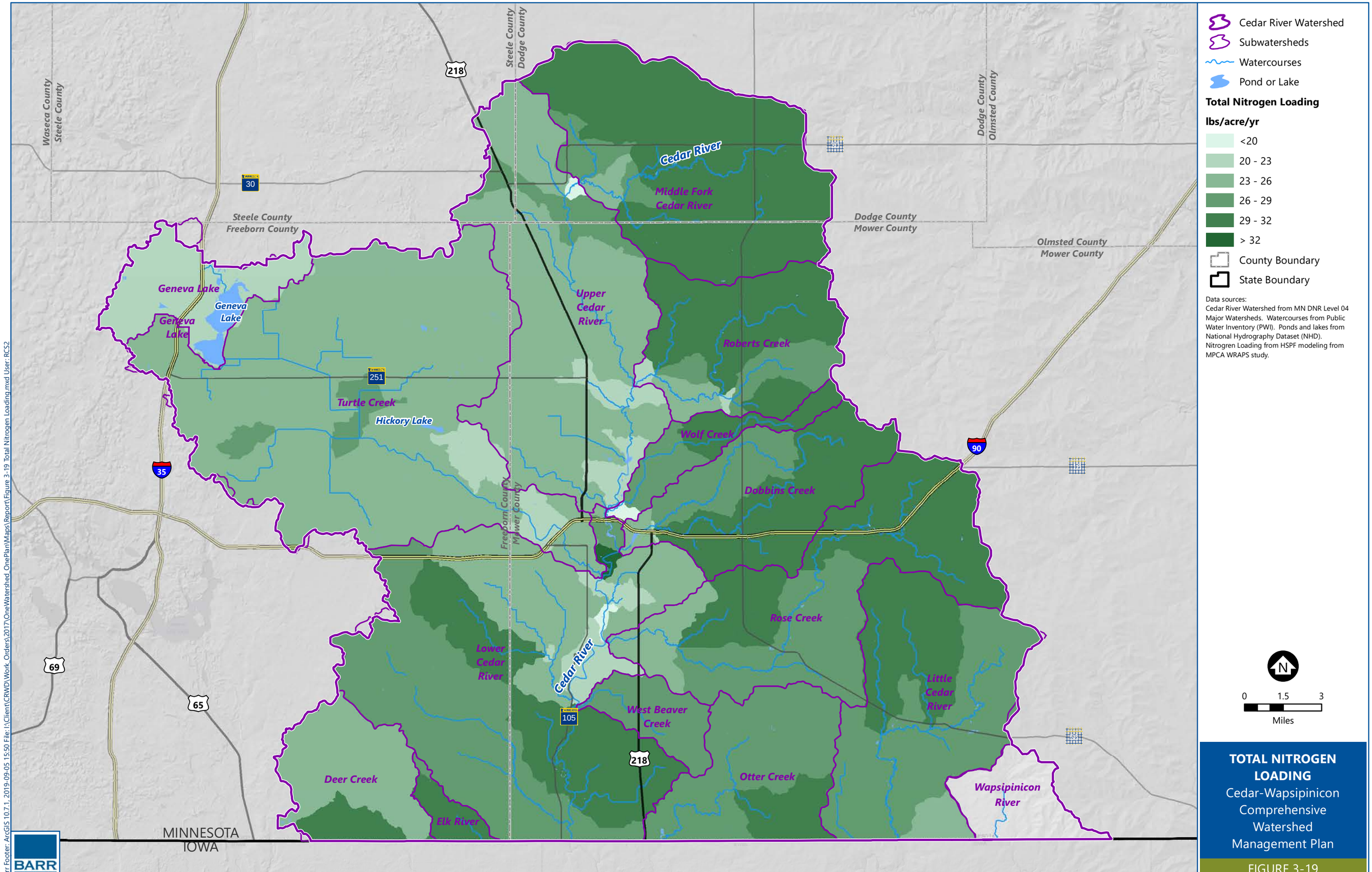
Estimated total nitrogen (TN) loading and TP loading from relatively large-scale watersheds (as estimated by HSPF) are presented in Figure 3-19 and Figure 3-20, respectively. HSPF modeling results were used in estimating potential benefits from targeted field practices (see Section 0 and Section 6.4.4.1).

3.8.7.2 SWAT modeling – Sediment Loading

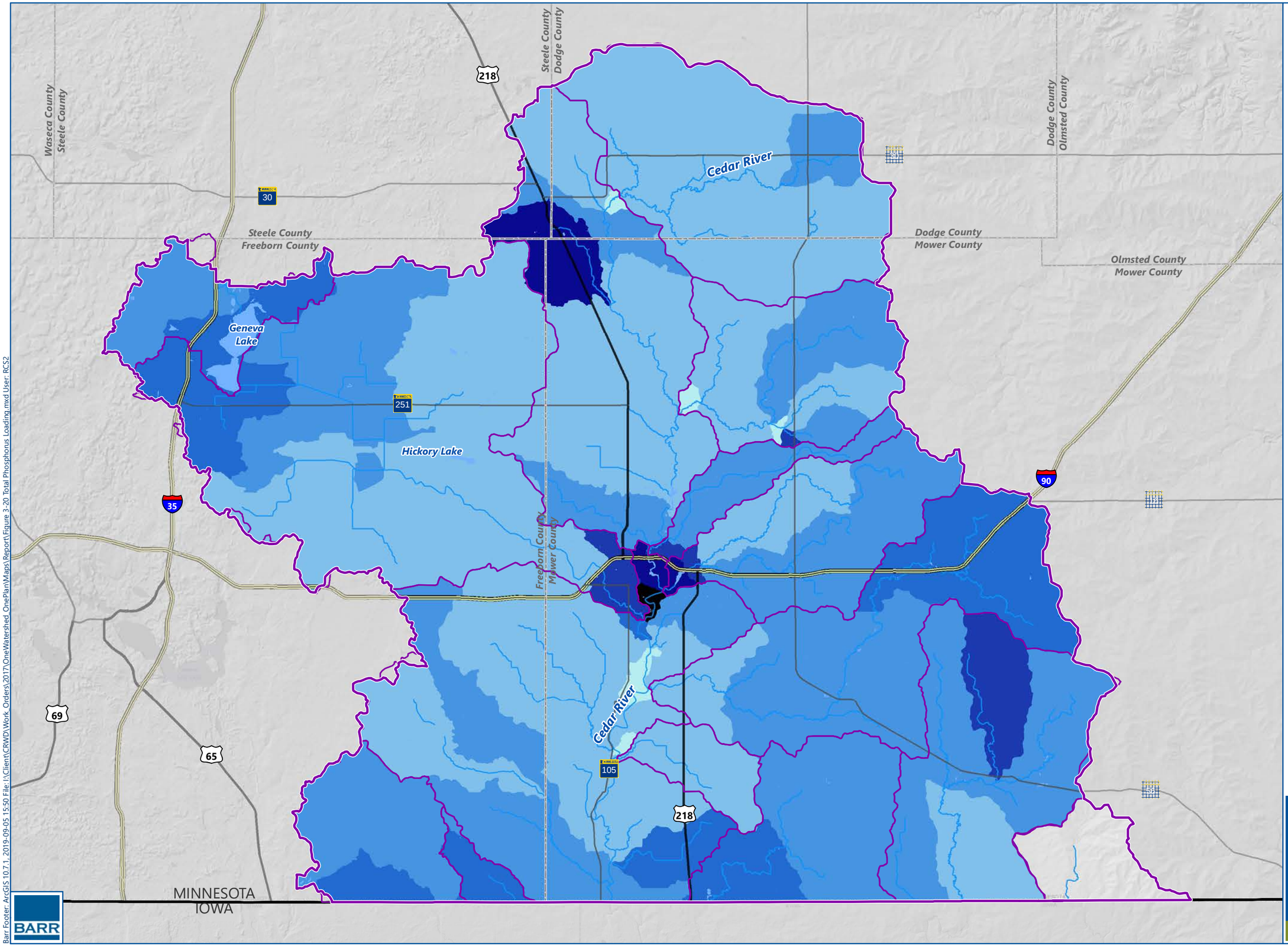
The Surface Water Assessment Tool (SWAT) is a physically-based watershed model developed by Dr. Jeff Arnold for the USDA Agricultural Research Service (ARS) in Temple, Texas (Arnold et al., 1993). SWAT was developed to predict the impact of land management practices on water, sediment, nutrients, dissolved oxygen, and agricultural chemical yields in large watersheds with varying soils, land use, and management conditions over long periods of time. SWAT is noted for accuracy in agricultural land management simulations. SWAT explicitly simulates crop management practices and urban impervious runoff. Simulated hydrologic processes include surface runoff, tile drainage, snowmelt runoff, infiltration, subsurface flow and plant uptake. The model allows for consideration of reservoirs and ponds/wetlands, as well as inputs from point sources.

An existing SWAT watershed model (created in 2014) for the Cedar River basin was updated with current information about soils data and locations of existing agricultural best management practices (BMPs) based on data collected by Mower SWCD and watershed staff for the Cedar River and Turtle Creek Watershed Districts. Through these refinements, the model was used to provide greater insight into identifying and prioritizing the critical sediment source areas within each subwatershed including a review of subwatershed sediment loads with and without best management practices. As part of the development of this Plan, SWAT modeling was performed for the previously un-modeled portions of the planning area. Additional, focused SWAT modeling performed at a finer spatial resolution has been performed for the Roberts Creek and Otter Creek subwatersheds (Barr, 2013).

SWAT estimates of sediment loading from subwatersheds are presented in Figure 3-21. SWAT modeling results were used in estimating potential benefits from targeted field practices (see Section 0).



Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:50 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-19 Total Nitrogen Loading.mxd User: RCS2



Cedar River Watershed
Subwatersheds
Watercourses
Pond or Lake
County Boundary
State Boundary

Total Phosphorus Loading

lbs/acre/yr

- < 0.20
- 0.20 - 0.25
- 0.25 - 0.30
- 0.30 - 0.40
- 0.40 - 0.60
- >0.60

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds and lakes from National Hydrography Dataset (NHD). Phosphorus Loading from HSPF modeling from MPCA WRAPS study.

N

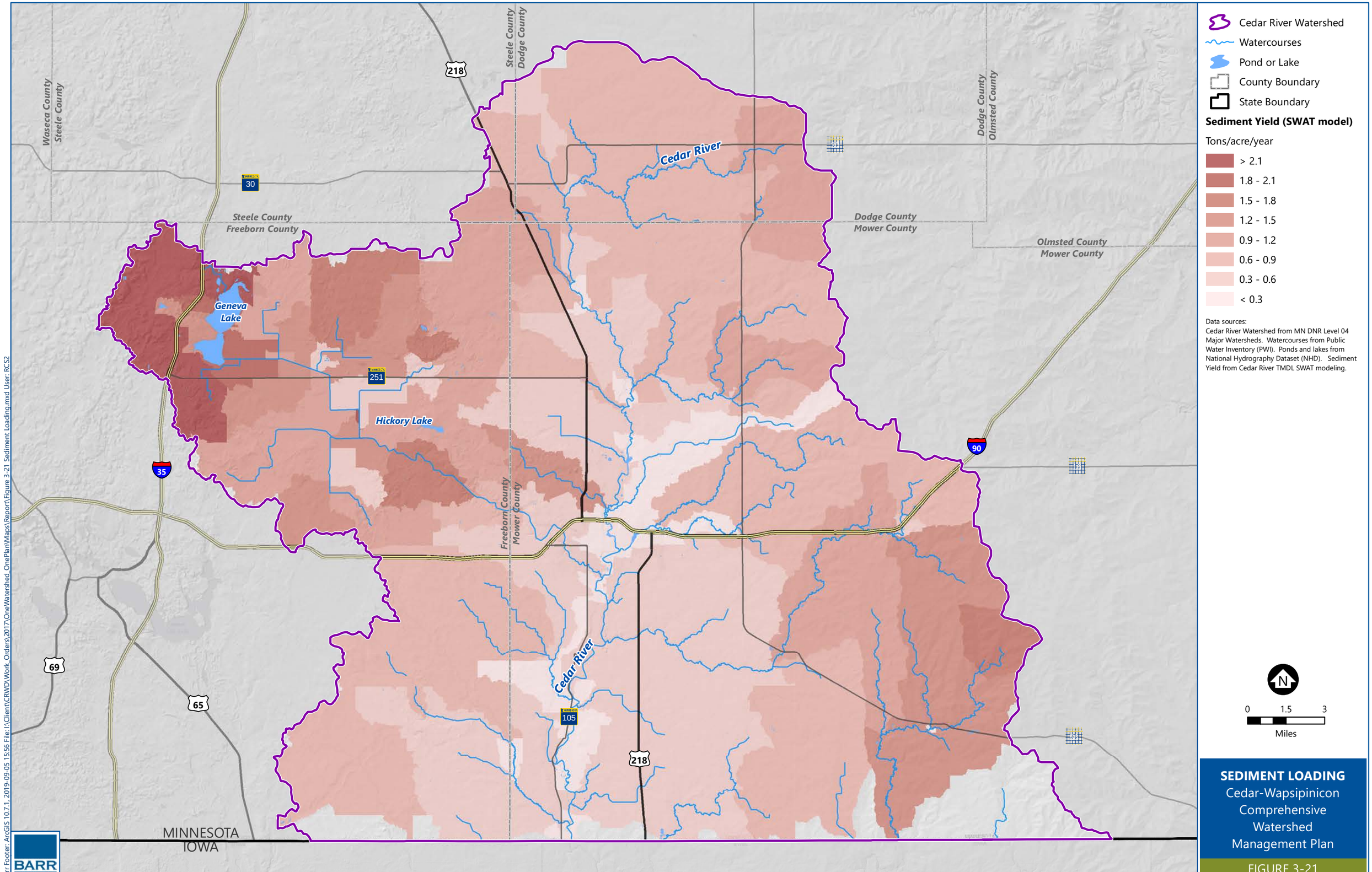
0 1.5 3
Miles

TOTAL PHOSPHORUS LOADING
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-20

BARR

Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:50 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-20 Total Phosphorus Loading.mxd User: RCS2



SEDIMENT LOADING
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FIGURE 3-21

Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:56 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-21 Sediment Loading.mxd User: RCS2

3.9 Water Quantity and Flooding

The Cedar River is the defining surface water feature within the Cedar River watershed. The Cedar River drains approximately 590 square miles before crossing the Minnesota-Iowa border. The USGS maintains a flow gage near the City of Austin (USGS 05457000). The USGS gage has a drainage area of 399 square miles and a continuous flow record dating back to 1944 (the earliest data from 1909). Current and historical flow data is available from the USGS website at: https://waterdata.usgs.gov/nwis/uv?site_no=05457000

The MDNR also maintains the following flow gages (see Figure 3-16) through its cooperate stream gaging program:

- Cedar River near Lansing (48023001) – 2001 to present
- Dobbins Creek at Austin (48005001) – 1998 to present
- Turtle Creek at Austin (48027001) – 1997 to present

Flow data for the above gages (as well as USGS 05457000) is available from the MDNR cooperative stream gaging website at: https://www.dnr.state.mn.us/waters/csg/index.html

Since 1945, the average annual flow near Austin has been about 276 cubic feet per second. Continuous gage data suggests that average flows have increased since the beginning of the record. Although average flow fluctuates widely from year to year, Figure 3-22 shows the average flow over the previous 10 years has increased since 1955.Average flow during the 1981-2010 climate normal period corresponds to approximately 11.5 inches of runoff. In addition to increased average flows, hydrologic trend analysis in the *Cedar River WRAPS* indicates the amount of runoff per unit of precipitation has also increased over this period (MPCA, 2019).

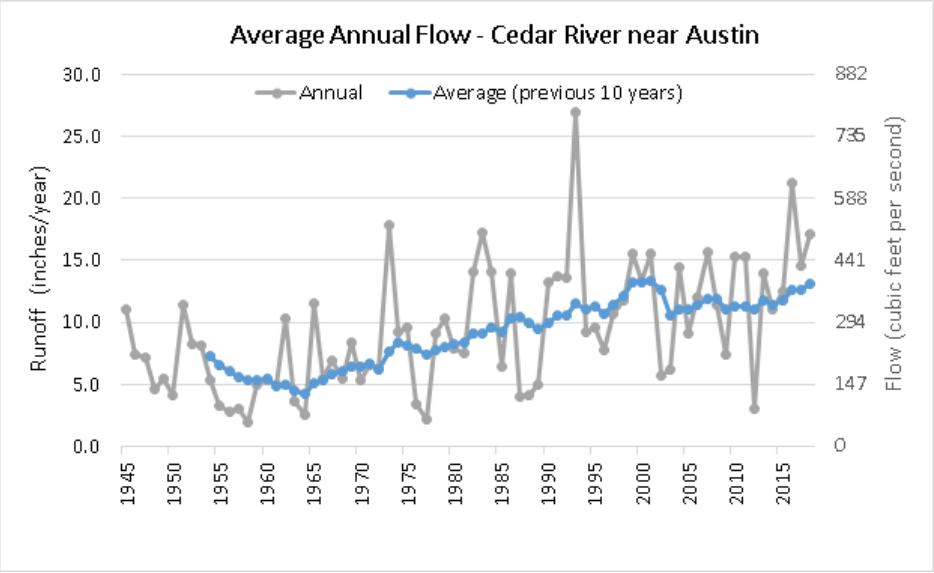


Figure 3-22 Average annual flow in Cedar River near Austin

Similarly, annual maximum daily flow data shows more frequent occurrence of high flows since approximately the year 2000 (see Figure 3-23).

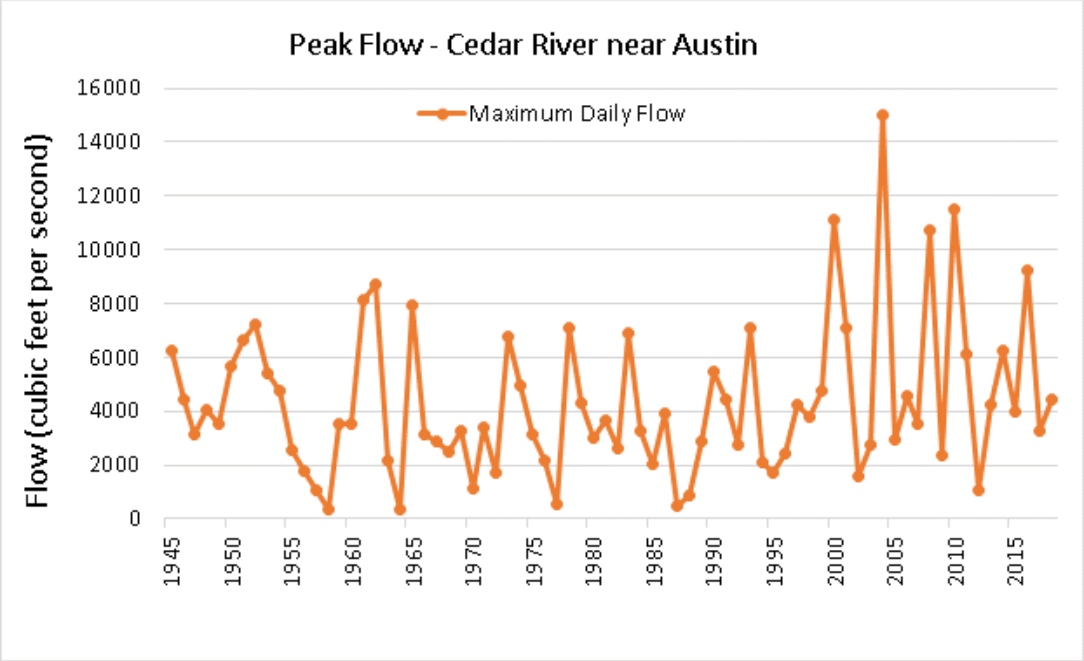


Figure 3-23 Annual peak flow in Cedar River near Austin

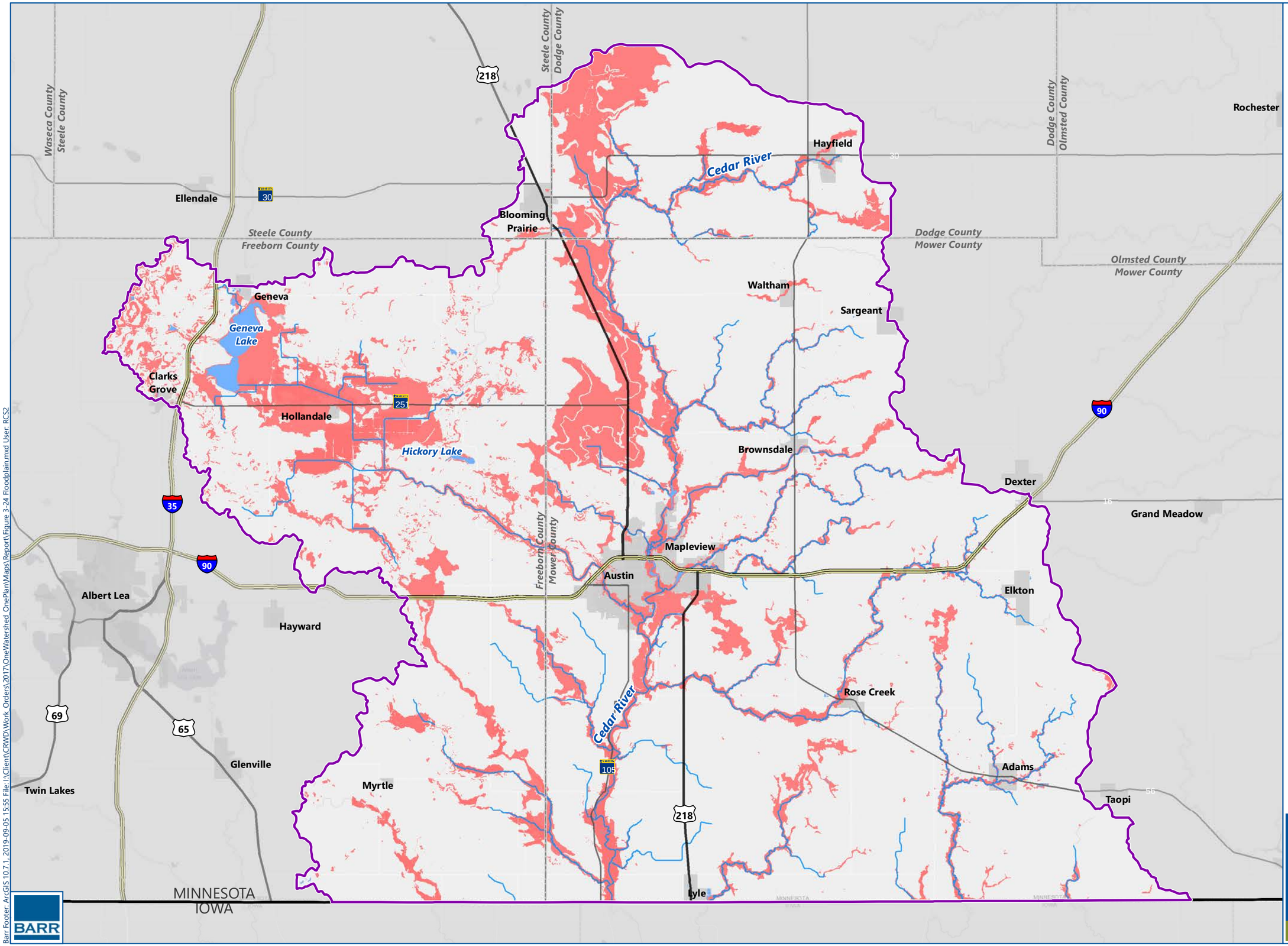
A United States Army Corps of Engineers (USACE) study of the Cedar River basin in Iowa and Minnesota included a flood frequency analysis that estimated a 100-year peak flow in the Cedar River near Austin of 17,300 cfs (USACE, 2016). This is an increase from the estimated 100-year peak flow near Austin of 12,500 cfs included in the Austin Flood Insurance Study (FIS, FEMA, 1992).

3.9.1 Floodplains

High flows (or flood flows) are typically of greater concern than average flow conditions due to the potential risk to public safety and infrastructure. The Cedar River Watershed District (CRWD) and the Turtle Creek Watershed District (TCWD) were both formed in part to address flooding issues within their respective jurisdictions. Several Flood Insurance Studies (FIS) have been performed for areas located within the Planning area. An FIS contains information regarding flooding in a community, including flood history of the community and information on engineering methods used to develop Flood Insurance Rate Maps (FIRM) for a community. Homeowners within Federal Emergency Management Agency (FEMA) designated floodplains are required to purchase flood insurance. Homeowner and renters outside of the official floodplain can also qualify for flood insurance.

The FIS identifies areas that are expected to be inundated in a flood event having a 1 percent chance of occurring in a given year (also commonly referred to as the 100-year event). In some areas, the estimated water level is identified (e.g., FEMA zones AE, AH, AO). In some cases, no estimated flood depths or flood elevations are shown because detailed analysis has not been performed (e.g., FEMA zone A). Figure 3-24 presents the mapped 100-year (1 percent) floodplain within the Cedar River watershed.

Within the Planning area, each county has adopted a floodplain ordinance that regulates land disturbing activity within the floodplain. Additionally, the City of Austin maintains floodplain zoning regulations as part of the city code of ordinances. The Partners have also performed capital projects to minimize the risk and consequence of flooding.



Cedar River Watershed
Watercourses
Pond or Lake
Floodplain (Zonation and FEMA)
Municipal Boundary
County Boundary
State Boundary

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds and lakes from National Hydrography Dataset (NHD). Floodplain data from FEMA DFIRM mapping and MN DNR Zonation Analysis.

N

0 1.5 3
Miles

FLOODPLAIN
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-24

BARR

Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:55 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-24 Floodplain.mxd User: RCS2

3.9.2 Hydrologic and Hydraulic Modeling

Hydrologic and hydraulic models have been developed for portions of the planning area; these models vary in extent and level of detail. These include an XP-SWMM model covering the area of the CRWD and TCWD (see Section 3.9.2.1) and a Gridded Surface Subsurface Hydrologic Analysis (GSSHA) model covering the Dobbins Creek subwatershed (see Section 3.9.2.2). As part of Plan implementation, the Partnership seeks to update the existing XP-SWMM model to include the entire planning area and the most current input data (e.g., precipitation, infrastructure) (see Table 7-2). Watershed runoff has been estimated at the subwatershed scale using the HSPF model for the watershed; results are presented in Figure 6-3.

3.9.2.1 HEC-HMS and XP-SWMM Modeling of the Upper Cedar River

Prior to the formation of the CRWD, and in response to chronic flooding on the Cedar River and some of its tributaries, an Ad Hoc Committee was formed to develop a Surface Water Management Plan (SWMP) for the Upper Cedar River Watershed. The Committee included representatives of the Mower SWCD, Mower County, TCWD and the City of Austin. The prime goal for the Upper Cedar River SWMP was to provide for flood protection throughout the entire Upper Cedar River watershed through a 20 percent reduction in the Cedar River's peak 100 year flood discharge rate at the Austin USGS gage. Therefore, only areas upstream of Austin were evaluated in that study, including the Turtle Creek watershed.

The Upper Cedar River Watershed was delineated into 435 subwatersheds with divides delineated to every major creek and river crossing such as roads, railroads, and dams. A HEC-HMS model was developed using spatially distributed inputs and calibrated to the USGS gage 05457000. In order to reduce the 100-year flood discharge rate, 104 regional detention basin locations were ultimately modeled. The SWMP recommended creating these regional detention basins through flow restrictions at culverts or bridges; with these restrictions accomplished by 1) creating a ring dike upstream of the existing culvert or bridge through which a reduced sized culvert would be constructed; or 2) removing or filling in the existing bridge or culvert and replacing it with the necessary reduced sized culvert.

The SWMP estimated that these basins would reduce the peak flow of the 100-year 24-hour storm event by 17.5 percent (from 17,100 cfs to 14,100 cfs) at the Austin USGS gage and included flow rate goals for select subawatershds. The study suggested that significant peak flow reduction could be achieved through the prioritized construction of regional detention basins in the Wolf Creek and Dobbins Creek subwatersheds. Flow rate goals included in the SWMP are incorporated into this Plan (see Appendix B) and will be updated as future modeling efforts (planned as part of Plan implementation, see Section 7.0),are completed.

The original HEC-HMS model was subsequently converted to the XP-SWMM hydrologic and hydraulic modeling software, and has been occasionally updated to reflect constructed improvements. The XP-SWMM model is used to perform site-specific analysis of potential detention practices incorporating current (as of 2018) Atlas 14 precipitation data (see Section 3.2.1). An update to the XP-SWMM model to establish current flow rate goals is planned as part of Plan implementation (see Section 7.0).

3.9.2.2 Gridded Surface Subsurface Hydrologic Analysis (GSSHA)

The Gridded Surface Subsurface Hydrologic Analysis (GSSHA) model is a tool that integrates subsurface and surface hydrology at a small subwatershed level. GSSHA is a continuous, distributed-parameter, two-dimensional, hydrologic watershed model developed by the Hydrologic Systems Branch of the USACE. GSSHA offers the capability of determining the value of any hydrologic variable at any grid point in the watershed at the expense of requiring significantly more input than traditional approaches.

MDNR staff have developed a GSSHA model for several scales in the Dobbins Creek subwatershed. This modeling found that stream flow peaks are higher when no tiles are present in the watershed, there is increased flow in the receding limbs of several of the storm hydrographs, but that total annual flow (measured as inches of runoff) is about one inch higher when tiles are included in the model (Solstad, 2017).

The GSSHA modeling serves to illustrate that reductions in both peak flow and overall volumes can be achieved, at this scale, with a combination of management (soil health) and structural management practices. The Dobbins Creek GSHHA model was used to simulate sediment loads to the channel. The model estimated that installation of WASCOBS can reduce sediment loading by about 25%. A modeled reduction around 50% is predicted when both WASCOBS and soil health practices are combined, for this time period.

The Dobbins Creek GSSHA modeling suggests that a robust combination of structural and agricultural management practice implementation can reduce peak flows, total discharge, and sediment delivery to the channels. Additional information about the Dobbins Creek GHSSA model is included in Appendix B of the Cedar River WRAPS.

3.9.2.3 Upper Wapsipinicon Watershed Hydrologic Assessment

In 2018, the Iowa Flood Center and Iowa Institute of Hydraulic Research (IIHR) completed a hydrologic assessment of the Upper Wapsipinicon Watershed. The assessment and associated report will help guide the implementation of small-scale flood mitigation projects in the Upper Wapsipinicon River watershed to reduce the magnitude of downstream flooding and improve water quality during and after flood events.

The modeling was performed using the physically-based integrated model GHOST (Generic Hydrologic Overland-Subsurface Toolkit) developed at IIHR to simulate the hydrologic response at watersheds ranging in area from 100 to 2,500 square miles over time periods on the order of decades. GHOST couples surface and subsurface water systems to predict streamflow and groundwater movement for normal and extreme rainfall and snowmelt events. Best management practices (BMP) are resolved or modeled in GHOST depending on the structure scale. Model structure, inputs, and calibration are described in greater detail in the *Upper Wapsipinicon Watershed Hydrologic Assessment Report* (IFC and IIHR, 2018).

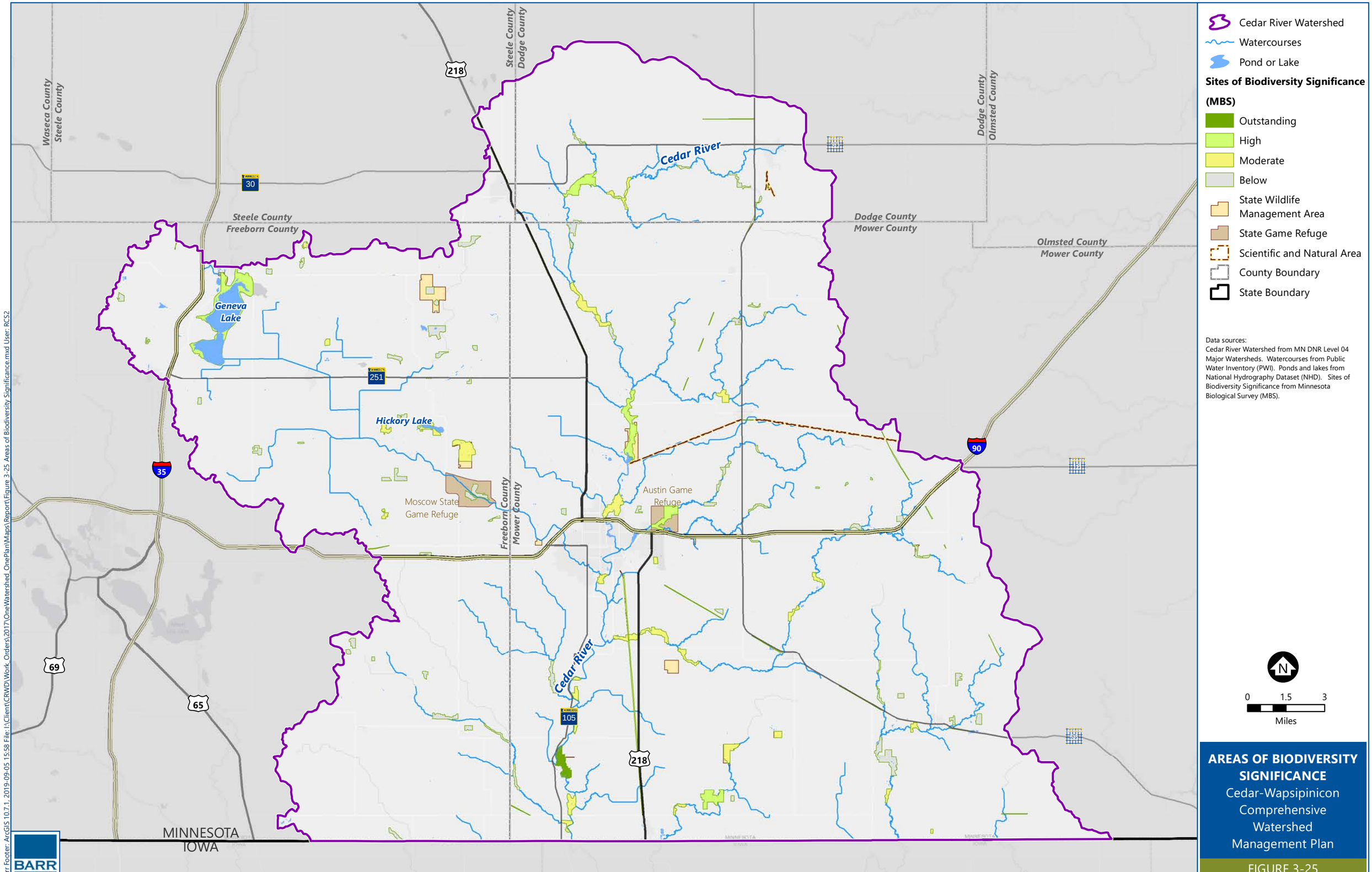
The GHOST model was used to identify areas in the watershed with high runoff potential and run simulations to help understand the potential impact of alternative flood mitigation strategies in the watershed as well as the consequences of projected increases in extreme precipitation events. The analysis

seeks to understand the impacts of (1) increasing infiltration in the watershed (e.g., native vegetation or cover crops/no-till practices) and (2) implementing a system of distributed storage projects (ponds) across the landscape. Model results estimated peak flow reductions on the order of 20% (relative to baseline conditions) with the implementation of cover crops/no-till practices. Peak flow reductions of approximately 5% were estimated with the implementation of additional storage alone.

3.10 Wildlife Habitat and Rare Features

The MDNR maintains a database of rare plants, animals, native plant communities and other rare features in its Natural Heritage Information System (NHIS). The NHIS database contains historical records from museum collections, published information, and field work observations, especially from the MDNR Minnesota Biological Survey (MBS). More information about the NHIS can be found on the MDNR website at: https://www.dnr.state.mn.us/nhnrp/nhis.html

The MBS has identified some areas as having "outstanding," "high," "moderate," or "below" biodiversity significance according to the assemblage of rare species and natural features. Figure 3-25 presents areas of biodiversity significance within the Planning area. With the watershed, Geneva Lake is classified as an area of "high" biodiversity significance. There are native plant communities that help support waterfowl, other water birds, and other wildlife including rare species and species of greatest conservation need (MDNR, 2017). Additional information about the MBS sites of biodiversity significance is available from the MDNR website at: https://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html



AREAS OF BIODIVERSITY SIGNIFICANCE
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 3-25

Barr Footer: ArcGIS 10.7.1, 2019-09-05 15:58 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 3-25 Areas of Biodiversity Significance.mxd User: RCS2

3.10.1 Rare Species

The MDNR completed a statewide mussel survey in 1999 that included the Cedar River and its tributaries. While many streams in southern Minnesota do not support their historical assemblage of mussel species, Rose Creek was found to contain 10 of the 17 historically-supported mussel species. Otter Creek was found to contain 8 of the 10-historically supported mussel species. More information about freshwater mussels is available from the MDNR at: https://www.dnr.state.mn.us/mussels/index.html

The Cedar River is also habitat to the Wood Turtle and represents the western limit of this species in Minnesota. The Wood Turtle was designated as a threatened species by the MDNR in 1984. This species occupies forested rivers and streams and adjacent upland habitats. Threats to this population include loss of forest habitat, reduced water quality, and flooding of nesting and feeding areas. The Blanding's Turtle, also listed as a threatened species in Minnesota, is found along the Cedar River. This species relies on both wetland and upland habitats, and is threatened primarily by loss of wetland habitat. Additional information is available from the MDNR at:

- Wood Turtle: https://www.dnr.state.mn.us/eco/nongame/projects/wood_surveys.html
- Blanding's Turtle: https://www.dnr.state.mn.us/eco/nongame/projects/blandings_survey_conservation.html

Three plant species listed as federally endangered or threatened are found within the watershed. The endangered Minnesota dwarf trout lily (*Erythronium propullans*), historically observed in Dodge and Steele Counties, is typically found on north-facing slopes and floodplains in deciduous forest. The threatened prairie bush clover (*Lespedeza leptostachya*), historically observed in Dodge and Mower Counties, is typically found in native prairies on well-drained soil. The threatened western prairie fringed orchid (*Platanthera praeclara*), historically observed in Mower County, is typically found in wet prairies and sedge meadows. More information regarding threatened or endangered plant species in the region is available from the USFWS at: https://www.fws.gov/midwest/endangered/plants/

3.10.2 Fisheries

Game fish species found in the Cedar River and tributaries include largemouth bass, northern pike, carp, catfish, walleye, smallmouth bass, redhorse sucker, white bass, white crappie, black crappie, bluegill, and yellow perch. In 2009, the MPCA reported finding an Ozark minnow and Redfin shiners in Turtle Creek for the first time since 1964. Ozark minnows were also found in large numbers in the main stem of the Cedar River south of Austin.

A survey of fish species removed from the USFWS threatened and endangered species list and of fish species of special concern was completed in southeastern Minnesota in 1998 and 1999 (Schmidt, 2000). A species of special concern is classified by MDNR as extremely uncommon in Minnesota or as requiring unique habitat that deserves careful monitoring of its status. Two redfin shiners (*Lythrurus umbratilis*) were found in the Cedar River near Austin. Numerous species of special concern and recently delisted species were observed in Otter Creek, including the least darter (*Etheostoma microperca*), Ozark minnow (*Notropis nubilis*), slender madtom (*Noturus exilis*), and largescale stoneroller (*Campostoma oligolepis*).

Groundwater seeps occur along the Cedar River and tributaries such as Wolf Creek and Dobbins Creek with the potential to support coldwater species such as trout. Woodson Creek (in the Lower Cedar River subwatershed, see Figure 3-14) is the only state-listed trout stream in the Planning area. Brook trout have been stocked in Wolf Creek in the past, but the introduction was not successful in part due to intensive agricultural land use in the watershed (MPCA, 2012). Historically, trout have also been stocked in Orchard Creek, Woodson Creek, Dobbins Creek, Adams Creek, and portions of the Cedar River.

The MDNR conducted fish surveys of East Side Lake, Mill Pond, and Ramsey Mill Pond in 2012. The MDNR last conducted a fish survey of Geneva Lake in 2009. Fish species identified in each lake are summarized in Table 3-12. The MDNR stocked East Side Lake with walleye in 2015 and 2011 and Geneva Lake with northern pike in 2008, 2009, and 2014.

Additional fish surveys have been performed in support of establishing indices of biological integrity (IBI) as part of the Cedar River WRAPS (see Section 3.7). Additional detail regarding the status of the fishery in each lake is available from the MDNR Lakefinder website at:
https://www.dnr.state.mn.us/lakefind/index.html

Table 3-13 Fish species present in watershed lakes

Species	East Side Lake (2012)	Geneva Lake (2009)	Mill Pond (2012)	Ramsey Mill Pond (2012)
Black bullhead	X	X	X	X
Black crappie	X		X	X
Bluegill	X		X	X
Channel catfish			X	
Common carp	X	X		X
Creek Chub		X		
Fathead minnow		X		
Golden shiner	X			
Golden redhorse				X
Green sunfish	X	X		
Hybrid sunfish				X
Largemouth bass	X			X
Northern pike		X	X	X
Orange spotted sunfish	X			
Pumpkinseed			X	
Rock bass			X	
Shorthead redhorse			X	
Walleye	X			
White crappie	X			
White sucker	X	X	X	X
Yellow bullhead			X	X
Yellow perch		X	X	X

Source: MDNR Lakefinder website: https://www.dnr.state.mn.us/lakefind/index.html

4.0 Identification and Prioritization of Resources and Issues

This section summarizes the issue identification and prioritization process used by the Partners and memorializes the prioritized issue statements used as input to develop measurable goals (see Section 5.0) and a targeted implementation plan (see Section 7.0). The Partnership implemented an iterative process to identify and prioritize watershed issues. Several tools were utilized during the issue prioritization process, including MDNR Zonation analysis, review of existing planning documents, and paired analysis ranking. The final issue prioritization incorporates some elements of each tool/process.

4.1 MDNR Zonation Analysis

The MDNR Zonation process overlays geospatial datasets (inputs) to identify spatial areas of high priorities as a "heat map." In this process, the spatial inputs are not given equal weight. Each input is assigned a weight according to the relative importance of defined "priorities" identified by the Partnership. In this case, the Advisory Committee and the Policy Committee identified four priorities. The relative importance of each priority was calculated based on results of a survey that included paired analysis of each priority compared to all other priorities. The results of the survey are presented in Figure 4-1.

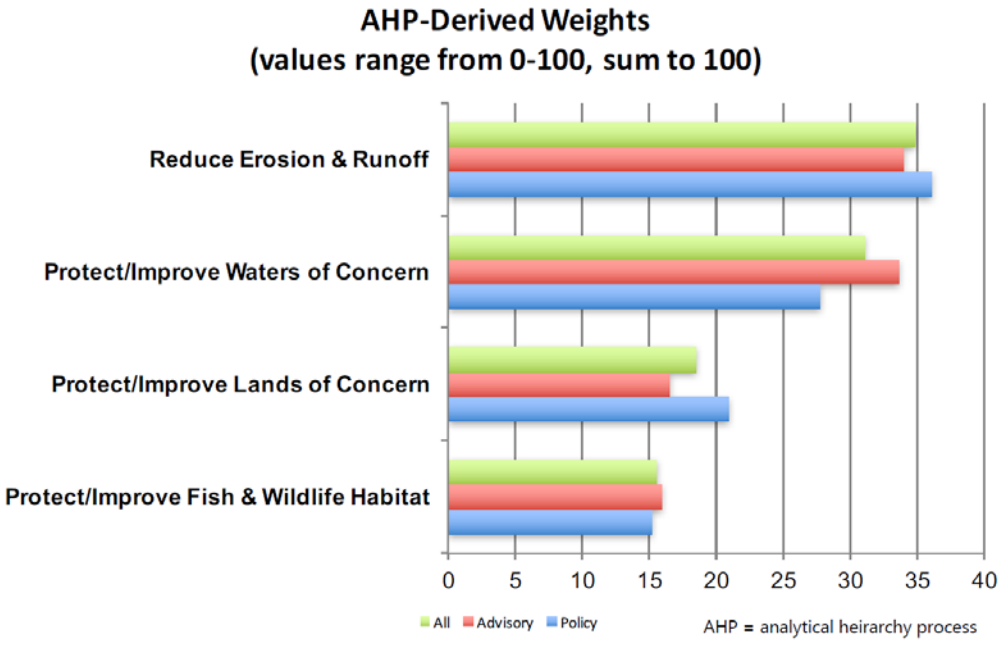


Figure 4-1 Results of Zonation priority survey completed by the Advisory Committee and Policy Committee

The relative weight calculated for each of the four priorities presented in Figure 4-1 was then applied to the geospatial input datasets correlated to that priority, as presented in Table 4-1. Maps of the geospatial datasets used as input for the Zonation process are presented in Appendix C.

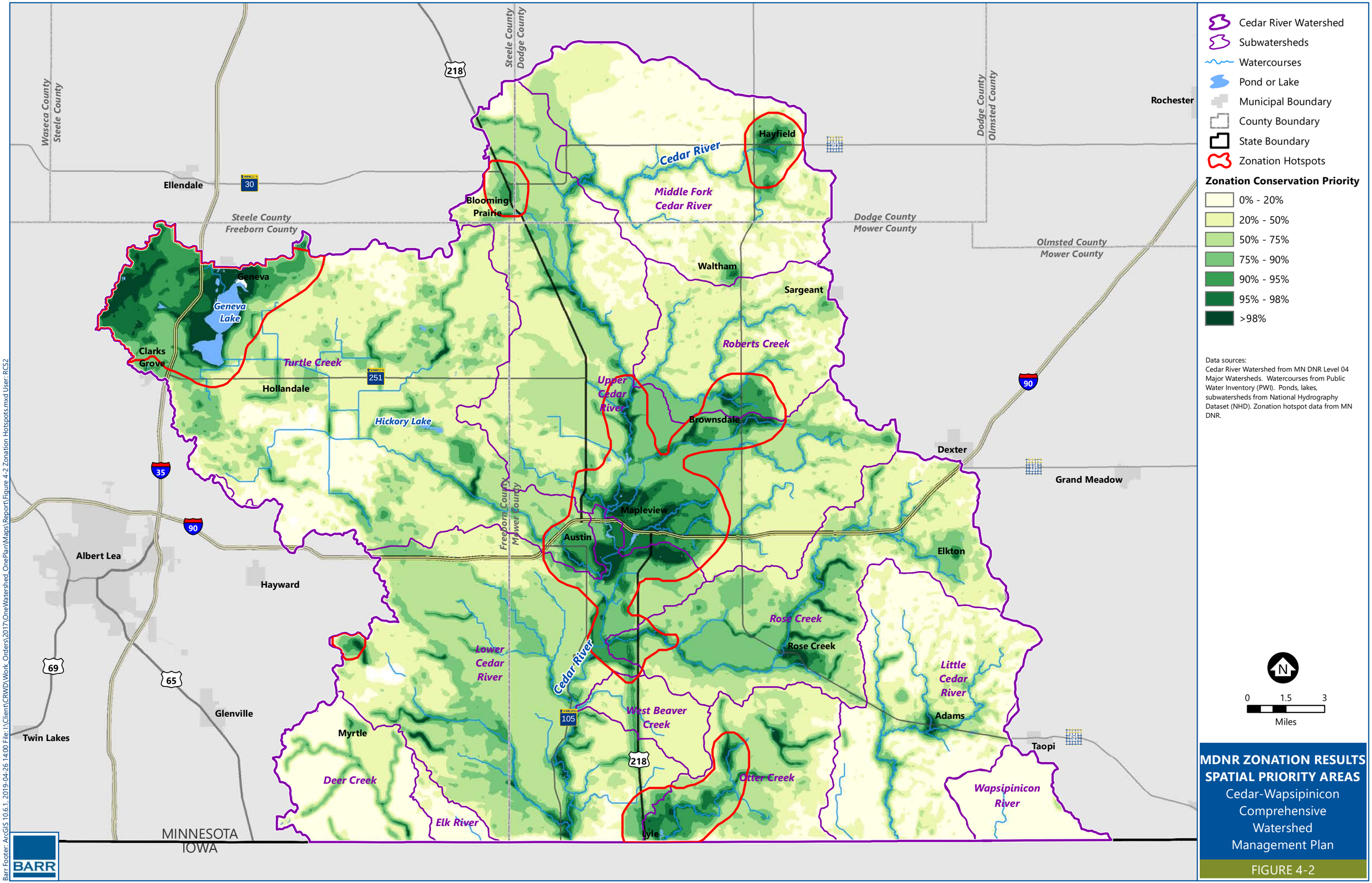
Table 4-1 Geospatial Zonation inputs categorized by Zonation priorities

Zonation Priority	Geospatial Data Inputs
Reduce Erosion & Runoff	• Stream power index • Stream floodplains • Soil erosion risk • National wetlands inventory (NWI) • Topographic position index • Water yield (HSPF model results)
Protect or Improve Waters of Concern	• Drinking water supply management areas (DWSMAs) • Groundwater contamination susceptibility • Groundwater recharge • Total phosphorus loading (HSPF model results) • Total nitrogen loading (HSPF model results) • Sediment loading (SWAT model results)
Protect or Improve Lands of Concern	• Cultivated crops • Crop productivity index • Urban lands • Public lands • Stream buffers
Protect or Improve Fish & Wildlife Habitat	• Sites of biodiversity significance • Rare plants/animals • Lakes of biological significance • Fisheries priority streams

4.1.1 Zonation Heat Map Results

Results of the initial Zonation mapping were presented to the Planning Work Group, Advisory Committee and Policy Committee. There was consensus among the participants that the initial Zonation mapping placed too much significance on groundwater resources, resulting in priority spatial areas too closely focused on urban areas. The MDNR reduced the weights of some groundwater-related inputs and performed a second Zonation mapping.

Ultimately the Partnership agreed that the Zonation results had potential use in targeting practices and activities, but that additional issue prioritization was needed (see Section 4.2).



Barr Footer: ArcGIS 10.6.1, 2019-04-26 14:00 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 4-2 Zonation Hotspots.mxd User: RCS2

4.2 Issue Identification

Parallel to the Zonation process (see Section 4.1), the Partnership reviewed existing regional natural resource management plans, the responses to the Plan development notification letter, and feedback received at the Plan public kickoff meeting to identify issues relevant to the Planning area. The Planning Work Group identified approximately 60 unique issues, many of which are characterized by the spatial data included in Zonation. The issues identified from these sources were grouped into eight general issue groups in cooperation with the Planning Work Group and Advisory Committee. These groupings are presented in Table 4-2.

Based on the eight general issue groups, the Planning Work Group and the Advisory Committee developed draft issue statements to describe the problems that will be addressed by the Plan. The draft issue statements were refined through iterative feedback from the Planning Work Group, Advisory Committee, and Policy Committee. The final issue statements for each priority issue group are included in Table 4-2 and summarized in the following sections. The draft issue statements are, as a result of their brevity, broad in scope. Specific problems, risks, and opportunities within each general issue area are included in Table 4-3 to provide additional context for the issue statements.

Table 4-2 Priority Issue Statements

Issue Group	Issue Statement
Accelerated Erosion & Sedimentation	Excessive erosion and sedimentation diminishes agricultural productivity, damages riparian areas, and degrades surface water quality and stream habitats.
Surface Water Quality Degradation	Surface water quality is threatened or impaired by pollutant loading and altered hydrology.
Excessive Flooding	Excessive flooding threatens public safety, property, and riparian ecology.
Groundwater Contamination	Groundwater quality is threatened by pollutant loading.
Degraded Soil Health	Degraded soil health diminishes agricultural productivity and limits the beneficial ecological functions of soil.
Threatened Groundwater Supply	Groundwater sustainability is at risk from consumptive use and loss of recharge.
Threats to Fish, Wildlife, and Habitat	Natural areas providing habitat and other ecological functions are threatened by land use conversion and other human activities.
Reduced Livability & Recreation	Connection to nature, outdoor recreation, and overall quality of life are reduced by the loss and degradation of natural resources.

Table 4-3 Grouping of priority issues identified from natural resource management plans, notification responses, and public meeting feedback

Issue Group	General Issue Statement	Specific issues provided as examples of this category *(Italic text indicates issue statement from agency response to notification letter)*
Degraded Soil Health	Degraded soil health diminishes agricultural productivity and limits the beneficial ecological functions of soil.	- areas of degraded soil health may be more susceptible to erosion - poor soil health may limit the soil's ability to filter nutrients and other pollutants - poor soil health may require additional fertilizer applications, increasing nutrient loading - agricultural productivity is less than may be achieved with improved soil health - best practices to enhance/preserve soil health (e.g., no till, cover crops) are underutilized - degraded soil health results in reduced infiltration and permeability of the soil profile, resulting in increased runoff and accelerated soil erosion
Accelerated Erosion & Sedimentation	Excessive erosion and sedimentation diminishes agricultural productivity, damages riparian areas, and degrades surface water quality and stream habitats.	*- accelerated soil erosion leads to turbidity and other water quality issues (BWSR)* - development activity increases stormwater runoff and erosion *- erosion of streambank areas may pose risk to property and infrastructure (MDNR)* *- erosion of streambank areas eliminates or degrades riparian wildlife and fisheries habitat (MDNR)*
Surface Water Quality Degradation	Surface water quality is threatened or impaired by pollutant loading and altered hydrology.	- several waterbodies are listed as impaired by the MPCA because beneficial uses are impaired by one or more stressors; *there are 11 stream reaches impaired due to sediment, 14 reaches impaired for bacteria, and Lake Geneva impaired for excess nutrients/eutrophication (MPCA)* - total maximum daily load studies may result in required actions - fertilizer application may contribute to nutrient loading to lakes and streams - pesticide application may contribute to pollutant loading to lakes and streams - use of best practices to improve water quality runoff from agricultural lands may need to be increased - non-point sources may contribute to nutrient, pollutant, and bacterial loading to lakes and streams (e.g., non-functioning SSTS) - point sources may contribute to nutrient, pollutant, and bacterial loading to lakes and streams (e.g., feedlots, WWTPs) *- flow alteration and altered hydrology are significant stressors to aquatic biology (MPCA)*
Excessive Flooding	Excessive flooding threatens public safety, property, and riparian ecology.	- homes, property, and public infrastructure are at risk of damage from flooding *- artificial drainage that has occurred in the watershed may impact peak flows and flooding (BWSR)* *- altered hydrology contributes to more extensive flooding (MDNR; MPCA)* - urbanization/development increases rate of runoff - municipal stormwater systems may be undersized for current/future precipitation patterns - existing floodplain mapping/modeling may not accurately reflect current flood risk *- changing precipitation patterns resulting in more frequent, more intense precipitation has implications for future stormwater management design (BWSR)*

Table 4-3 Grouping of priority issues identified from natural resource management plans, notification responses, and public meeting feedback

Issue Group	General Issue Statement	Specific issues provided as examples of this category *(Italic text indicates issue statement from agency response to notification letter)*
Groundwater Contamination	Groundwater quality is threatened by pollutant loading.	- private and public drinking water wells show high levels of nitrate in several areas - non-functioning subsurface sewage treatment systems (SSTS) and wastewater treatment facilities (WWTF) leach excessive nutrients and pathogens - hazardous waste generators, landfills, or other point sources have the potential to leach pollutants - feedlot sites and manure application sites may contribute to nutrient and pathogen contamination of groundwater *- unused, unsealed wells can provide a conduit for contaminants from the land surface to the sources of drinking water (MDH)* - infiltration of runoff containing pollutants can impact drinking water in areas with vulnerable wells and aquifers
Threatened Groundwater Supply	Groundwater sustainability is at risk from consumptive use and loss of recharge.	- groundwater levels show gradual decline over time - infiltration and recharge are decreased by development, tiling, and other human activity *- increasing demand from domestic, agricultural, and industrial users can strain municipal water supply systems (MDNR)*
Threats to Fish, Wildlife, and Habitat	Natural areas providing habitat and other ecological functions are threatened by land use conversion and other anthropogenic stressors.	*- benefits of wetlands (habitat, floodplain, water quality) are eliminated through conversion or development of wetland areas to other land uses (MDNR)* *- habitat and other benefits are reduced by loss of natural space connections (i.e., "corridors") (MDNR)* *- altered ecologies may be susceptible to undesirable invasive species (MDNR)* - loss of habitat may negatively impact populations (fish and wildlife) *- emerging invasive weed threats pose risk to agricultural production (BWSR)* *- rare features and species may require consideration for extra protection (MDNR)* *- loss of riparian vegetation increases sediment runoff, stream bank erosion, and nutrient loading (MDNR)*
Reduced Livability & Recreation	Connection to nature, outdoor recreation, and overall quality of life are reduced by the loss and degradation of natural resources.	- preservation of natural resources is necessary to sustain recreational activities (e.g., hunting, fishing, bird watching) *- protection and restoration of priority warm and cold water streams is necessary to maintain public value of these waters (MDNR)* - degraded resources negatively affect property values and community pride - residents are not aware of or lack access to recreational and/or natural areas - degraded natural resources may negatively impact public health

4.2.1 Accelerated Erosion and Sedimentation (Tier I)

Issue Statement: Excessive erosion and sedimentation diminishes agricultural productivity, damages riparian areas, and degrades surface water quality and stream habitats.

Although erosion and sedimentation are natural processes, they can be accelerated by human activities such as development and agriculture. Excessive or accelerated erosion and sedimentation can lead to a variety of negative economic and environmental consequences. Erosion of topsoil from farmlands can reduce soil health and productivity, increasing costs to landowners. Streambank erosion and sediment deposition can pose risk to infrastructure; while streambank failure can undermine roadways and utilities and can result in loss of valuable land. Sediment deposition can wholly or partially block culverts, manholes, storm sewers, and navigational channels, requiring more frequent maintenance and/or increasing flood risk to nearby properties.

Sediment is a major contributor to surface water pollution, and excessive amounts of suspended sediment are carried by stormwater runoff when erosion occurs. Regardless of its source, sediment deposition decreases water depth and degrades water quality, riparian fish and wildlife habitat, and aesthetics. Sediment often carries nutrients and other pollutants bound to sediment particles, and increases turbidity (i.e. cloudiness or opaqueness of water caused by suspended particles), which reduces light penetration and affects aquatic life. Several reaches of the Cedar River and its tributaries are considered impaired for aquatic life due to high turbidity (see Figure 3-17). Reducing near-channel sources of sediment, especially, can mitigate negative impacts to downstream channel areas, aquatic habitats, and aquatic biota. Section 3.3 of the Cedar River WRAPS includes strategies to mitigate accelerated erosion of ditches and streams.

Soil erosion risk in the Cedar River watershed is presented in Figure 3-8; this dataset was used as an input to the MDNR's Zonation process (see Section 4.1).

4.2.2 Surface Water Quality Degradation (Tier I)

Issue Statement: Surface water quality is threatened or impaired by pollutant loading and altered hydrology.

Pollutants are discharged into surface waters as either point sources or non-point sources. Point source pollutants discharge to receiving surface waters at a specific point from a specific identifiable source. Examples of point source pollution include feedlots and wastewater treatment plants. Unlike point sources, non-point source pollution cannot be traced to a single source (i.e. geographically targeted) or pipe. Instead, pollutants that are carried from land to water in stormwater or snowmelt runoff, in seepage through the soil (non-functioning septic systems), and in atmospheric transport make up non-point source pollution. Both point sources and non-point sources can contribute to nutrient, pollutant, and bacterial loading to lakes and streams.

For lakes, ponds, and wetlands, phosphorus is often a pollutant of major concern. Point sources of phosphorus typically come from municipal and industrial discharge to surface waters, whereas non-point sources of phosphorus come from urban and agricultural runoff, construction sites, and subsurface septic

treatment systems. Nitrates, fecal coliform bacteria, and sediment cause additional issues, especially in agricultural areas. Nitrates and sediment are commonly found in agricultural runoff and urban stormwater. Fecal coliform bacteria are usually associated with septic systems, feedlot operations, and concentrated wildlife, such as flocks of waterfowl. Fertilizer and pesticide application also contribute to pollutant loading in lakes and streams. Sources of nitrates, phosphorus, and bacteria in the planning area are summarized in Section 2.4 of the Cedar River WRAPS (MPCA, 2019).

The addition of pollutants into surface waters and altered hydrologic patterns can pose significant stress to aquatic biota. Altered hydrologic patterns can also negatively impact aquatic biota. These contaminants can impair the ability of waterbodies to support beneficial uses such as aquatic life, recreation, and consumption. Several waterbodies in the Cedar River watershed are listed as impaired by the MPCA because beneficial uses are impaired by one or more stressors, including: stream reaches impaired due to turbidity, bacteria, fisheries bioassessments, macroinvertebrate bioassessments, PCB in fish tissue, and mercury in fish tissue; Lake Geneva is impaired for excess nutrients/eutrophication.

Impaired waters are presented in Figure 3-17. Total maximum daily loads (TMDLs) are required to be developed for all impaired waters to determine the amount of a pollutant that the water may receive and still meet water quality standards. TMDLs may require actions by local governments to limit pollutant loading from point and non-point sources. Information from draft versions of the Cedar River TMDL (MPCA, 2018) and Cedar River WRAPS (MPCA, 2018) were referenced during the development of this Plan.

4.2.3 Excessive Flooding (Tier I)

Issue Statement: Excessive flooding threatens public safety, property, and riparian ecology.

Impacts from flooding can include damages to structures (such as homes), property, utilities and transportation infrastructure. Excessive flooding carries a high cost for affected communities and individuals, including: flood fighting costs; post-flood cleanup costs; business and agricultural losses; increased expenses for normal operating and living during a flood situation; and benefits paid to owners from flood insurance.

Increases in development/urbanization, increased use of artificial drainage, and alteration of natural hydrology can exacerbate flooding concerns by elevating peak flows and runoff rates. Conversion of wetlands and other natural areas to other land uses throughout the watershed can diminish watershed storage, contributing to local and downstream flooding issues.

The amount, rate, and type of precipitation received are important in estimating stormwater runoff rates and associated flood implications. Changing regional precipitation patterns are resulting in more frequent, intense precipitation events. Existing stormwater management systems may be undersized for evolving precipitation patterns, further exacerbating flooding. In light of changing precipitation patterns, existing floodplain mapping/modeling may not accurately reflect current flood risk. Over time, a combination of factors have led to increase flow rates and runoff in the Cedar River watershed (see Section 3.9). Floodplains within the planning area are presented in Figure 3-24.

4.2.4 Groundwater Contamination (Tier I)

Issue Statement: Groundwater quality is threatened by pollutant loading.

Groundwater is the primary source of drinking water, industrial, and agricultural uses within the watershed. Pollutants in groundwater, including nitrates and bacteria, pose a risk to human health. Private and public drinking water wells in the Cedar River watershed have shown high levels of nitrate contamination in several areas. Nitrate in groundwater may be naturally occurring, but elevated levels are influenced by human activities (MDH, 2018). A complete assessment of groundwater quality and associated potential health risks is limited by the large spatial extent of aquifers and limited monitoring data.

Many factors affect the vulnerability of drinking water to pollution from the surface. One of these is porous soils. In the Cedar River watershed, drinking water quality is threatened by activities occurring below the land surface as well as activities on the land surface that may infiltrate contaminants to the subsurface. Infiltration of pollutant-laden runoff can reach groundwater, potentially impacting drinking water sources in areas with vulnerable wells and aquifers. Additionally, unused or unsealed wells provide a conduit for surface contaminants to reach drinking water sources. Pollution sensitivity of near surface materials and wells are presented in Figure 3-11 and Figure 3-12, respectively. Table 4-4 lists the potential sources of groundwater contamination that may negatively impact the quality of drinking water.

Table 4-4 Potential sources of groundwater contamination

Location	Source	Contaminants of concern		
		Nitrate	Bacteria	Chemicals[1]
Subsurface	Improperly functioning SSTS	X	X	
	Leaking underground storage tanks			X
	Buried waste			X
Surface	Improperly functioning wastewater facilities	X	X	
	Nonconforming feedlot operations	X	X	
	Manure application	X		
	Landfills			X
	Fertilizer and chemical application to crops	X		X

(1) e.g., petroleum, pesticides

4.2.5 Degraded Soil Health (Tier II)

Issue Statement: Degraded soil health diminishes agricultural productivity and limits the beneficial ecological functions of soil.

The majority of land in the Cedar River watershed is farmed, and agriculture is a primary component of the regional economy. Good soil health is very important as healthy soils are necessary to achieve sustainable agricultural production (crop productivity data is presented in Figure 3-7). Healthy soils promote a number of environmental benefits, including allowing for increased infiltration following precipitation events, resulting in lower levels of overland runoff and associated soil erosion. Healthy soils are better able to filter and break down nutrients and other pollutants from the landscape.

Conversely, degraded soils may require higher than normal fertilizer applications to create/maintain productive farmland, increasing potential nutrient loading in the watershed while increasing costs to the landowner. After farmland has been tilled, it is often left bare from fall to spring. This means there are no plants available to intercept rainfall to hold it on the surface for later evaporation, or to reduce the erosive impact as raindrops strike the ground. In addition to increased runoff, erosion is more likely to occur due to the lack of roots holding the soil in place. The upper soil layers are the most fertile and the most likely to be eroded. Erosion of these top soil layers contributes to high levels of turbidity and total suspended solids in streams and rivers (see Section 4.2.1). Soil erosion risk in the Cedar River watershed is presented in Figure 3-8; this dataset was used as an input to the MDNR's Zonation process (see Section 4.1).

Improving soil health can be accomplished through increased commitment to using other land management practices, including no-till/strip-till rotations, cover crops, perennial crops, crop-diversity, etc. These practices promote infiltration and limit the amount of runoff and erosion from croplands when not in active production. Some farmers within the Planning area have started implementing soil health best management practices (BMPs) that are intended to limit erosion and soil loss and improve soil productivity. In the Cedar River watershed, there are opportunities to further realize the agricultural and environmental benefits of healthier soils through broader use of such practices.

The Plan implementation workgroup will work with all agriculture partners to develop research and tools that inform on the economic and water resource related values of soil health practices. Current data suggests that increased organic matter improves agricultural economics, while providing a number of water resource benefits. Implementers will track these developments and utilize the data to inform the public on the values of soil health over the 10-year implementation period.

4.2.6 Threatened Groundwater Supply (Tier II)

Issue Statement: Groundwater sustainability is at risk from consumptive use and loss of recharge.

Groundwater serves many consumptive uses in the Cedar River watershed. It is the primary source of water for agriculture and irrigation, industrial uses, and drinking water. Drinking water supply management areas (DWSMAs) and wells within the planning area are presented in Figure 3-10. Competing demands from domestic, agriculture, an industrial uses can strain municipal water supply systems. Data published by the Minnesota Department of Natural Resources shows a gradual decline in

the groundwater table, suggesting the current and projected consumptive use of groundwater is not sustainable. In addition, naturally occurring infiltration and groundwater recharge is limited by development, agricultural drainage, and other land use activities. Conservation and management of groundwater is necessary to promote the sustainability of the resource for future use.

4.2.7 Threats to Fish, Wildlife, and Habitat (Tier III)

Issue Statement: Natural areas providing habitat and other ecological functions are threatened by land use conversion and other human activities.

Natural, undeveloped landscapes, such as woods, wetlands, and stream corridors, serve many ecological functions, including habitat for fish and wildlife. Over time, many of these natural areas have been converted to other land uses. The loss of habitat negatively impacts wildlife populations, including rare and endangered species; these impacts may be exaggerated when the remaining habitat areas are no longer connected. Altered landscapes are more susceptible to aquatic and terrestrial invasive species that can threaten native vegetation, alter habitats, and negatively impact agricultural production. The loss of wetlands and riparian buffer areas increases sediment runoff, stream bank erosion, and nutrient loading. Diminished flood storage provided by these areas may increase flood risk in downstream areas. Benefits provided by wetlands and other natural features, including ecological, habitat, and others, must be recognized and considered as part of land use decisions. Areas of biodiversity significance in the planning area are presented in Figure 3-25.

4.2.8 Reduced Livability and Recreation (Tier III)

Issue Statement: Connection to nature, outdoor recreation, and overall quality of life are reduced by the loss and degradation of natural resources.

Natural resources, including lakes, streams, and prairies, are an important part of life in the Cedar River watershed. Many residents and visitors interact with nature through recreational activities like hunting, fishing, hiking, and other activities. Others find stress-relief and sanctuary by simply being in nature. The loss or degradation of these resources (or access to these resources) limits recreational opportunities and diminishes the public health benefits these areas provide. Degraded resources can negatively impact property values and sense of community pride.

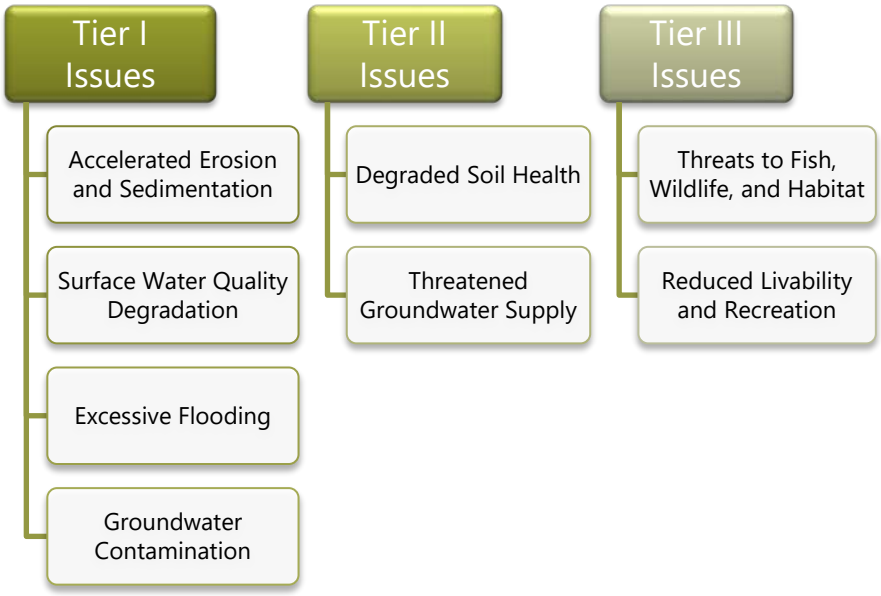
4.3 Issue Prioritization

Following the development of issues statements (see Section 4.2 and Table 4-2), the Policy Committee and Advisory Committee used a paired comparison matrix to rank the eight issue groups. Six members of the Policy Committee and 25 members of the Advisory Committee completed the sample matrix shown in Figure 4-3. Possible scores for each issue range from 0 to 7, with higher numbers indicating a higher relative priority. Scores for each issue were calculated giving equal weight to the average Policy Committee score and the average Advisory Committee score. The results are presented in Figure 4-4.

In general, there is consistency between the scores assigned to each issue group by the Policy Committee versus those assigned by the Advisory Committee. The largest issue scoring discrepancies apply to the

issues of groundwater quality and groundwater supply; the Policy Committee scored both issues as a higher priority than the Advisory Committee. Additional discussion with Advisory Committee and Policy Committee, in combination with the weighted average scoring, ultimately led to a consensus determination of Tier I, Tier II, and Tier III issues.

The Policy Committee and Advisory Committee jointly reviewed the results of the issue scoring exercise and qualitatively separated the eight issue areas into three tiers of decreasing priority as shown below:



While the Partnership successfully achieved consensus regarding issue prioritization, there was initially some disagreement regarding whether the issue of "degraded soil health" should be considered a Tier I or a Tier II issue. Soil health is a significant issue affecting the primary industry within the watershed: agriculture. However, several survey participants noted during discussion that many possible activities that address the issues of accelerated erosion and sedimentation, threatened groundwater supply, and degraded surface water quality will directly or indirectly improve soil health. Thus, degraded soil health was ultimately classified as a Tier II priority.

Figure 4-3 Issue Group Paired Comparison Exercise - **EXAMPLE**

Instructions:

1. Work your way through each open square in the matrix one at a time.

2. For each open square:

2A. Consider only the **TWO** issue statement corresponding to its Row and Column.

2B. Decide which of the two issues statements (the row, and the column) is a higher priority, in your opinion, to address in this 1W1P.

2C. Indicate the higher priority issue in the square using the abbreviation (e.g., "ES" for the issue of excessive erosion and sedimentation).

3. In the "Total Occurrences" column, record the total number of times your selected that issue in a blank square (they should sum to 28).

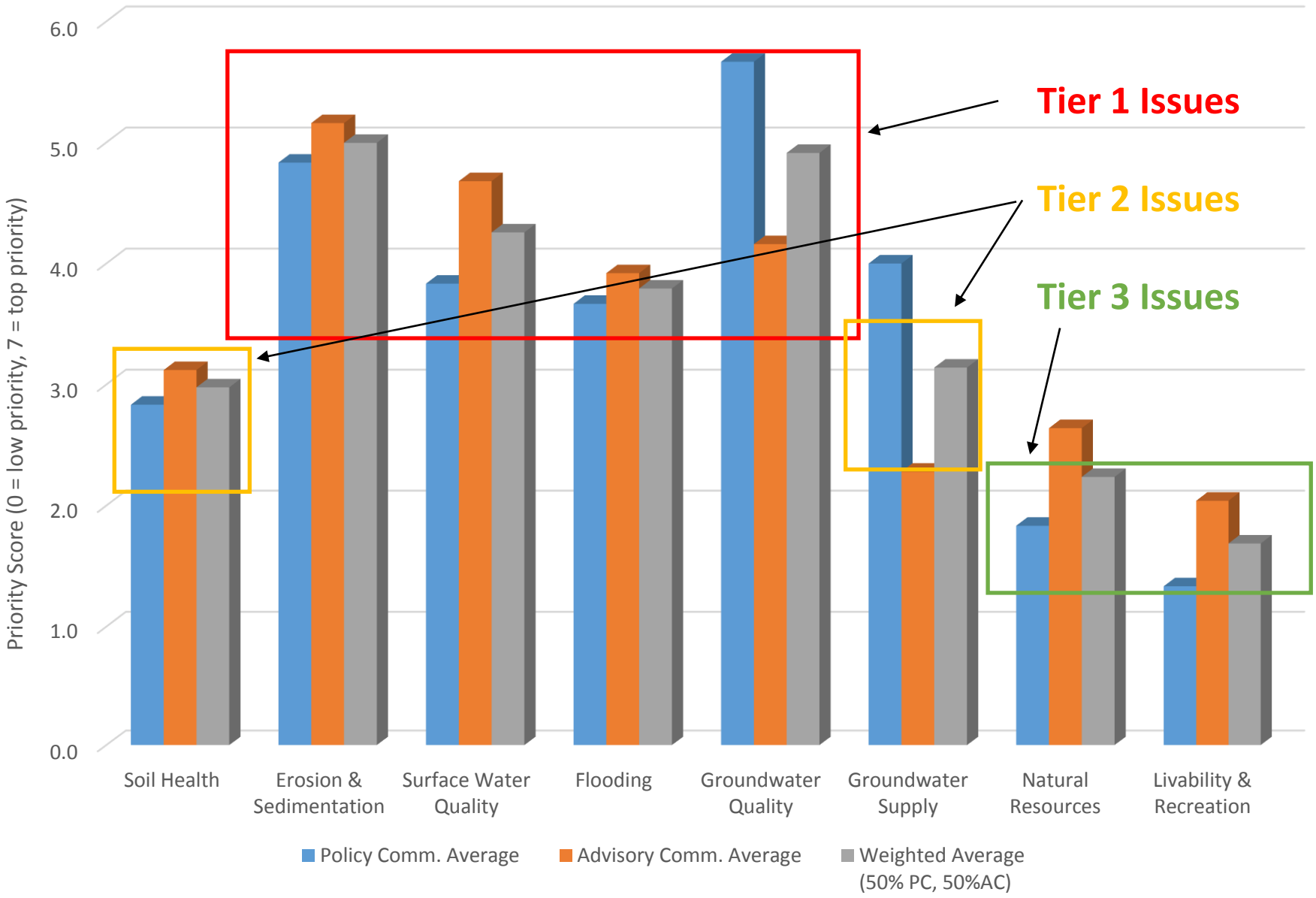
Issue Statement	**Code**	Degraded soil health diminishes agricultural productivity and limits the beneficial ecological functions of soil.	Excessive erosion and sedimentation diminishes agricultural productivity, damages riparian areas, and degrades surface water quality and stream habitats.	Surface water quality is threatened or impaired by pollutant loading and altered hydrology.	Excessive flooding threatens public safety, property, and riparian ecology.	Groundwater quality is threatened by pollutant loading.	Groundwater sustainability is at risk from consumptive use and loss of recharge.	Natural areas providing habitat and other ecological functions are threatened by land use conversion and other anthropogenic stressors.	Connection to nature, outdoor recreation, and overall quality of life are reduced by the loss and degradation of natural resources.
Issue Statement	**Code**	SH	ES	SWQ	FL	GWQ	GWS	NR	LV
Degraded soil health diminishes agricultural productivity and limits the beneficial ecological functions of soil.	SH		ES	SH	SH	GWQ	SH	SH	SH
Excessive erosion and sedimentation diminishes agricultural productivity, damages riparian areas, and degrades surface water quality and stream habitats.	ES			ES	ES	GWQ	ES	ES	ES
Surface water quality is threatened or impaired by pollutant loading and altered hydrology.	SWQ				SWQ	GWQ	SWQ	SWQ	SWQ
Excessive flooding threatens public safety, property, and riparian ecology.	FL					GWQ	GWS	NR	FL
Groundwater quality is threatened by pollutant loading.	GWQ						GWQ	GWQ	GWQ
Groundwater sustainability is at risk from consumptive use and loss of recharge.	GWS							NR	LV
Natural areas providing habitat and other ecological functions are threatened by land use conversion and other anthropogenic stressors.	NR								LV
Connection to nature, outdoor recreation, and overall quality of life are reduced by the loss and degradation of natural resources.	LV								

For example: I think degraded soil health (issue in this row) is a higher priority for the watershed to address than the threat to natural areas (issue in this column),

Therefore, I indicate "degraded soil health" as the higher priority using the issues statement abbreviation of "SH."

Total Occurrences	
SH =	5
ES =	6
SWQ =	4
FL =	1
GWQ =	7
GWS =	1
NR =	2
LV =	2

Figure 4-4 Issue Prioritization Scoring by Advisory Committee and Policy Committee



5.0 Establishment of Measurable Goals

This section summarizes the development of measurable goals to address the issues prioritized by the Partners (see Section 4.0). Per the *1W1P Plan Content Requirements* (BWSR, 2017) and supporting guidance, the Plan must include measurable goals to address each priority issue identified in the Plan. Goals may be applicable watershed-wide or focused on specific spatial areas, natural resources, or target audiences. Goals should also consider the prevention of future water and natural resource management issues.

The measurable goals developed for the Cedar River 1W1P are presented in Table 5-2 and Table 5-3.

5.1 Goal Development Process

The Partners developed measurable goals through an iterative process performed over several meetings involving the Planning Work Group, Advisory Committee, and Policy Committee (see Table 2-1).

In developing measurable goals, the Partners considered a range of available information, including:

- Goals from existing management plans, studies, reports, data and information, including:
    - Cedar River WRAPS report
    - Cedar River TMDL report (includes load allocations)
- Results from previous modeling efforts:
    - Cedar River hydrologic and hydraulic modeling and analysis
    - SWAT modeling and digital terrain analysis
- Existing implementation programs and schedules
- Input received during public meetings
- Input from the Planning Work Group
- Input from Advisory Committee members
- Input from Policy Committee members

Generally, goals were developed first at a qualitative level and refined to include quantifiable elements where existing data allowed. In situations where existing data was not sufficient to develop a quantitative goal, the goals focus on collecting and interpreting information to support developing more quantitative future goals. Measurable outputs for each goal were selected appropriate to the level of quantification. Emphasis was given to goals that address Tier I priority issues, although measurable goals were developed to address all eight priority issue areas. To address the "degraded surface water quality" issue area, the Partners developed goals that are specific to particular water resources and pollutants of concern; these goals were separated into a second table specific to surface water quality (Table 5-3).

The Plan goals are divided into long-term and short-term (i.e., 10-year) goals. **Long-term goals** describe desired future conditions (e.g., achieve applicable water quality standards) that may not be achievable within the 10-year life of the Plan. Therefore, the Plan identifies **10-year goals** as reasonable progression towards the ultimate desired condition. The Partners may refine long-term and 10-year goals as they evaluate progress during Plan implementation.

In some cases, goals are anticipated to be refined or added to over the 10-year life of this Plan. For example, the Plan includes a goal to reduce runoff by an average of 0.25 inches across the watershed (goal FLD-1 in Table 5-2). More specific runoff reduction/storage goals will be developed for individual subwatersheds based on future hydrologic and hydraulic modeling to be completed during Plan implementation (goal FLD-2 in Table 5-2). Modeling results will further inform the overall watershed runoff reduction goal and allow the Partners to pursue the overall goal in a manner that maximizes available opportunities and achieves associated goals (e.g., reducing flood risk, goal FLD-4).

5.2 Measurable Goals and Associated Details

The measurable goals developed for this Plan are presented in Table 5-2 and Table 5-3. Table 5-2 includes goals to address all priority issues. Table 5-3 presents a subset of goals to address the "degraded surface water quality" issue area specific to the 15 planning subwatersheds and applicable pollutants and/or stressors.

Table 5-2 and Table 5-3 includes the following information:

Priority Issue – Goals are grouped according to priority issues. Tier I issues appear first in Table 5-2, followed by Tier II and Tier III issues. Table 5-3 includes goals addressing the Tier I issue area of degraded surface water quality.

Subwatershed or Area – This field identifies the spatial area (e.g., subwatershed) or natural resource (e.g., wetlands) where the goal applies.

Specific Issue, Pollutant, or Stressor – This field groups or subdivides goals at a level that is more specific than Tier I, Tier II, or Tier III. For example, degraded surface water quality is subdivided into goals applicable to specific stressors that contribute to water quality impairments (e.g., phosphorus, total suspended solids). Similarly, groundwater contamination is subdivided into goals addressing nitrate and goals addressing *E. coli*.

Long-term Goal – This field presents the desired future condition for a resource or area that is likely to be achieved beyond the 10-year life of this Plan. For priority issues related to water quality, the long-term goal includes achieving applicable water quality standards.

Long-term Goal Rationale – This field presents the origin or basis for the long-term goals that extend beyond the life of this Plan. This field may reference existing documents (e.g., State water quality standards) or input from the Planning Work Group, Advisory Committee, and/or Policy Committee.

10-year Goal – This field presents goals estimated to be achieved within 10 years through the implementation of this Plan. Where existing data and analyses allow, quantitative goals have been assigned. Qualitative goals have been identified where data gaps exist, with an emphasis on filling those data gaps.

10-year Goal ID– This field presents an identifier unique to each goal such that implementation tasks presented in Table 7-2 may be cross-referenced to applicable goals.

10-year Goal Rationale or Source– This field presents the origin or basis for the 10-year goal. This field may reference existing documents (e.g., Cedar River WRAPS report) or input from the Planning Work Group, Advisory Committee, and/or Policy Committee.

10-year Goal Measures – This field includes quantitative measures or outputs that will be used to assess progress towards the 10-year goal and long-term goal. Measures may include number of implemented practices, inventory results, modeling results, reports or other measures tailored to the individual goal. Measure are cross-referenced to items included in the implementation schedule (Table 7-2).

Related Implementation Items – This field includes the "Item ID(s)" of items included in the implementation schedule (Table 7-2) that are related to the 10-year goal. In many cases, multiple implementation items are associated with the goal.

5.2.1 Degraded Surface Water Quality Goals

Long-term surface water quality goals presented in Table 5-2 applicable watershed-wide are based on applicable water quality standards (MN Rules 7050) and the Minnesota Nutrient Reduction Strategy (MPCA, 2014). Goals are defined for individual pollutants/stressors, including:

- Total phosphorus (TP)
- Total nitrogen (TN)
- Total suspended solids (TSS)
- *Escherichia coli (E. coli)*
- Fish Index of Biological Integrity (FIBI)
- Macroinvertebrate Index of Biological Integrity (MIBI)

Long-term goals specific to individual subwatersheds (see Table 5-3) are similar but also incorporate target load reductions based on the Cedar River TMDL (MPCA, 2019) where available.

Plan (i.e., 10-year) surface water quality goals are specific to the 15 planning subwatersheds and are presented in Table 5-3. 10-year goals include cumulative target load reductions for nitrogen, phosphorus, and sediment for each subwatershed based on existing pollutant loading and estimated number of projects to be implemented. These goals were developed using established water quality tools and following the methodology described in Section 6.4. Note that while the discussion of surface water quality degradation (see Section 4.2.2) specifically references nitrate, goals are presented as total nitrogen for consistency with available modeling tools.

The applicability of existing tools to estimate benefits relative to *E. coli* loading, FIBI, and MIBI is limited; thus, quantitative goals related to these parameters are not defined in this iteration of the Plan. Instead, 10-year goals for these pollutants/stressors focus on the implementation of strategies/practices

specifically identified to address these issues, including those identified in the Cedar River WRAPS (MPCA, 2019).

5.2.2 Accelerated Erosion and Sedimentation Goals

Long-term goals related to accelerated erosion and sedimentation include minimizing the loss of property from erosion and reducing TSS concentrations in streams and rivers to achieve water quality standards (see Table 5-2). 10-year goals include increasing runoff retention and storage within the watershed and compliance with the State buffer law (see Section 7.2.1.2). Accelerated erosion and sedimentation issues are closely linked to degraded surface water quality. As such, additional 10-year goals include reductions in TSS loading in individual subwatersheds (see Section 5.2.1 and Table 5-3).

5.2.3 Excessive Flooding Goals

Long-term goals related to excessive flooding include reducing runoff and increasing storage within the planning area, reducing peak flows in the Cedar River, and reducing flood risk to structures and infrastructure. These long-term goals are based on the CRWD 2009 Watershed Management Plan, but are similar to goals identified in the TCWD Plan (2003) and Mower County water management plan. 10-year goals are focused on steps needed to achieve long-term goals, including the following (see Table 5-2):

- increasing watershed storage (i.e., retention) by 9,600 acre-feet (equivalent to 0.25 inches of runoff over the watershed)
- establishing subwatershed-specific storage and peak flow goals based on modeling results
- characterizing flood risk throughout the watershed
- reducing the number of structures in the floodplain

The Partnership has established a long-term goal to reduce peak flows in the Cedar River by approximately 20% relative to 2016 conditions (see Section 3.9 and Table 5-2). Increased stormwater retention (i.e., the long-term storage of stormwater on-site) and detention (the short-term storage and delayed discharge of stormwater) are critical components of the overall strategy to reduce peak flows in the Cedar River and minimize the impacts of associated flooding. Increased hydrologic storage is a an opportunity to reduce the impacts of flooding; hydrologic storage refers to places in the landscape that provide temporary or permanent water storage, including surface depression storage, floodplain storage, and soil storage.

Although reductions in runoff volume are not necessarily proportional to reductions in peak flows, significant storage volumes likely occupying large areas will be necessary to achieve the Partnership's long term goals. A range of potential watershed storage values were considered by the Partnership in establishing the 0.25-inch (i.e., 9,600 acre-feet) retention goal (see Table 5-1). Table 5-1 presents a range of runoff retention (in inches) as a percentage of average annual runoff (for the 1981-2010 climate normal period), an equivalent storage volume, and corresponding footprints and depths.

Through discussion with the Advisory Committee, the PWG ultimately recommended an initial storage (i.e., retention) goal of 0.25 inches (9,600 acre-ft); the Partners believe this goal is achievable within the

10-year planning timeline while maintaining progress towards long-term goals related to excessive flooding.

Table 5-1 Potential watershed storage depths, volumes, and equivalent runoff

Inches of Runoff	Percent of Annual Runoff (1981-2010)	Storage Volume (acre-ft)	Storage Area (acres and % of total watershed) based on Average Depth (in feet)							
			0.5 ft		1 ft		2 ft		4 ft	
			acres	% area	acres	% area	acres	% area	acres	% area
0.25	2.1%	9,627	19,253	4.2%	9,627	2.1%	4,813	1.0%	2,407	0.5%
0.5	4.3%	19,253	38,507	8.3%	19,253	4.2%	9,627	2.1%	4,813	1.0%
0.75	6.5%	28,880	57,760	12.5%	28,880	6.3%	14,440	3.1%	7,220	1.6%
1.0	8.7%	38,507	77,013	16.7%	38,507	8.3%	19,253	4.2%	9,627	2.1%
1.5	13.0%	57,760	115,520	25.0%	57,760	12.5%	28,880	6.3%	14,440	3.1%
2.0	17.4%	77,013	154,027	33.3%	77,013	16.7%	38,507	8.3%	19,253	4.2%

Past hydrologic and hydraulic modeling efforts (see Section 3.9.2) were used by the CRWD to establish flow rate goals for select subwatersheds and identify potential locations for projects to reduce peak flows (CRWD, 2009). Possible locations for flood risk reduction projects (identified from past modeling) are included in the targeting described in Section 6.3 and possible project locations presented in Figure 6-5. This analysis, however, is based on outdated precipitation data and is limited to the CRWD and TCWD portions of the planning area. Updating and expanding existing hydrologic and hydraulic modeling to cover the entire planning area is planned to allow the Partnership to establish specific, local flow reduction goas; this activity is included in the Plan implementation schedule (see Table 7-2). The

The GSSHA model developed for the Dobbins Creek subwatershed (see Section 3.9.2.2) quantifies the impact of watershed BMPs on peak flows. The Partnership will establish a work group with stakeholders to extrapolate and incorporate results of the GSSHA modeling into the watershed-wide hydrologic and hydraulic model. In the interim, the Partnership recognizes and will reference previously established flow rate reduction goals from the 2009 CRWD hydrologic and hydraulic modeling (CRWD, 2009); these locations and flow rate goals are included in Appendix B.

5.2.4 Groundwater Contamination Goals

Long-term goals addressing groundwater contamination in Table 5-2 are based on Federal and State drinking water standards and Minnesota Department of Health (MDH) health risk limits (HRLs) for nitrate and *Escherichia coli* (*E. coli*). 10-year goals (see Table 5-2) are focused on monitoring, education, and other activities needed to fill data gaps and address sources of *E. coli* and nitrates within the planning area. 10-year Plan goals were developed by the Partnership with significant input from the Advisory Committee, including the MDA, MDH, and MPCA in particular.

Goals addressing groundwater contamination are generally applicable throughout the planning area. Specific activities to address groundwater contamination in the implementation schedule (see Table 7-2) are targeted to specific geographic areas and/or audiences where the most benefit is anticipated (see also groundwater priority areas presented in Figure 6-2 and discussed in Section 6.2.2). The MDA has developed the Minnesota Nitrogen Fertilizer Management Plan which outlines how the state will address nitrate in groundwater. This includes working at the local level to implement nitrogen fertilizer management and other practices to protect and mitigate nitrate in groundwater.

See: https://www.mda.state.mn.us/pesticide-fertilizer/minnesota-nitrogen-fertilizer-management-plan

5.2.5 Tier II Goals – Degraded Soil Health and Threatened Groundwater Supply

Table 5-2 includes long-term and 10-year goals addressing the Tier II issues of degraded soil health and threatened groundwater supply. Goals addressing these issues acknowledge existing data gaps while simultaneously recognizing the opportunity to achieve benefits through proactive action by the Partners. 10-year goals include further study to quantify the use and benefit of soil health practices (such as cover crops, perennial vegetation, and crop residue management) and assess trends in local groundwater supplies. Plan goals also include goals to increase the use of groundwater conservation practices and soil health practices through both educational programs and implementation of practices (including implementing soil health practices on an additional 5,600 acres over 10 years).

The Partners recognize that some the activities performed to address issues of degraded surface water quality, accelerated erosion and sedimentation, and excessive flooding may indirectly make progress towards Tier II goals. For example, increase runoff retention achieved through select water quality field practices may simultaneously improve soil health and increase infiltration, benefitting groundwater supply.

5.2.6 Tier III Goals – Threats to Fish, Wildlife, and Habitat and Reduced Livability and Recreation

Table 5-2 presents long-term and 10-year goals addressing the Tier III issues of threats to fish, wildlife, and habitat and reduced livability and recreation. Goals addressing threats to fish, wildlife, and habitat are established to address specific issues including:

- Wetlands
- Sites of biological significance
- Aquatic invasive species (AIS)
- Stream buffers
- Fish and macroinvertebrates

The 10-year goal addressing fish and macroinvertebrates references degraded surface water quality goals established for FIBI and MIBI in individual subwatersheds and included in Table 5-3. Goals addressing threats to fish, wildlife, and habitat are based, in part, on applicable State rules and MDNR program guidance. The MDNR provided watershed-specific guidance in goal development through staff participation in the Advisory Committee.

The long-term goal and 10-year goals addressing the issue of reduced livability and recreation include increasing access to natural and recreational areas. The implementation schedule identifies education, outreach, and project activities to achieve these goals (see Table 7-2).

Table 5-2 Measurable Goals for the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan

Issue Level	Priority Issue	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures (and associated item from Implementation Schedule)	Related Actions (from Implementation Schedule)
Tier I	Degraded Surface Water Quality	Phosphorus	Meet Western Corn Belt Plains water quality standards in Geneva Lake (TP≤90 ug/L, chl a≤30 ug/L, SD≥0.7 m) by reducing total phosphorus loading by 51% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0222 Subp.3); Cedar River Watershed TMDL (MPCA, 2019)	Reduce phosphorus loading through implementation of practices identified in the Cedar River Watershed TMDL and WRAPS studies	SWQ-2	Load reduction estimates from TMDL/WRAPS	Implemented projects (number and/or estimated benefit); see **Table 5-3** for values	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ-14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
			Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	See **Table 5-3** for subwatershed-specific goals addressing degraded surface water quality, including load reduction and project implementation targets	SWQ-1	See **Table 5-3** for rationale and sources informing subwatershed-specific goals addressing degraded surface water quality	Implemented projects (number and/or estimated benefit); see **Table 5-3** for values	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ-14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids	Reduce TSS concentrations in watershed streams to <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)				Implemented projects (number and/or estimated benefit); see **Table 5-3** for values	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ-14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)				Implemented projects (number and/or estimated benefit); see **Table 5-3** for values	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli	Reduce *E. coli* concentrations in the Cedar River to monthly geometric means <126 CFU/100 mL (April 1 - October 31)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D)				Implemented projects (number and/or estimated benefit); see **Table 5-3** for values	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Biological Integrity	Achieve the following Fish Indices of Biological Integrity for streams: - Southern Rivers: 49 - Southern Streams: 50 - Southern Headwaters: 55 - Southern Coldwater: 50	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016)				Implemented projects (number and/or estimated benefit); see **Table 5-3** for values	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve the following Macroinvertebrate Indices of Biological Integrity for streams: - Southern Streams (high gradient): 37 - Southern Forest Streams (low gradient): 43 - Southern Coldwater: 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016)				Implemented projects (number and/or estimated benefit); see **Table 5-3** for values	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
Tier I	Accelerated Erosion and Sedimentation	Property loss from erosion	Target the tolerable soil loss goal on all land within the watershed	Advisory Committee	Increase average runoff retention by increasing watershed storage by 0.25 inches (~9,600 acre-feet)	ESC-1	Runoff reduction goal based on PWG and AC discussion; recommendation for increased runoff retention is included in the WRAPS report	Estimated increase in watershed storage (9,600 acre-feet) resuting from implemented projects (FLD-1)	SWQ-1, SWQ-2, FLD-1, SWQ-6, SWQ-7, FLD-6, SLH-2, ESC-3, SWQ-14
					Achieve compliance with state buffer rule	ESC-2	State buffer rule	Length of stream in compliance/out of compliance with buffer rule (ESC-4); Ongoing education and outreach (ESC-3)	ESC-1, SWQ-6, SWQ-7, ESC-2, ESC-3, ESC-4
		Total Suspended Solids	Reduce TSS concentrations in watershed streams to <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	See **Table 5-3** for subwatershed-specific goals	ESC-3	See **Table 5-3** for rationale and sources informing subwatershed-specific goals	Implemented projects (number and/or estimated benefit), see **Table 5-3** for values; Number of projects to stabilize/restore degaded streambanks (10 projects, 5000 feet, ESC-1)	SWQ-1, SWQ-2, SWQ-3, ESC-1, REC-1, ESC-2, SLH-2, SWQ-14, ESC-4
					Provide annual education/outreach opportunities to all communities with MDH approved Wellhead Protection Plans, and BMP technical assistance for all moderate and high vulnerable public water suppliers	GWQ-2	These areas usually serve the majority of the population. Education and outreach assistance is helpful to all suppliers, regardless of vulnerability. Technical assistance is important for vulnerable systems.	5 workshops (SWQ-13) 10 articles/handouts (GWQ-12) Ongoing technical assistance/communication (GWQ-13, GWQ-14, GWQ-15)	GWQ-12, GWQ-13, GWQ-14, GWQ-15, SWQ-13,

Table 5-2 Measurable Goals for the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan

Issue Level	Priority Issue	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures (and associated item from Implementation Schedule)	Related Actions (from Implementation Schedule)
Tier I	Groundwater Contamination	Nitrate	Achieve less than 10 mg/L nitrate in all public drinking water supplies and private wells	US EPA Drinking Water Standards and Health Advisory Tables (2018); MDH Drinking Water Standards and Guidance	In targeted sub-watersheds and aquifer formations, provide all private well owners access to well testing programs and education about water quality specific to drinking water	GWQ-3	Targets the most sensitive private wells; population is often underserved due to staff and resource limitations. Targeting can be done by assessing well chemistry data, geologic protection in relation to source water aquifers used, and known hydrogeologic recharge-discharge trends	Number of tested wells (700 wells over 10 years - GWQ-7) Groundwater quality monitoring report (GWQ-6) 10 educational articles/handouts (GWQ-12) Ongoing communication/education (GWQ-14)	GWQ-6, GWQ-7, GWQ-12, GWQ-14
					Establish nitrate-nitrogen trends for all monitored systems with average concentrations ≥3ppm over the last 10 years; identify systems with chronically high nitrate concentrations relative to the MCL	GWQ-4	Lack of available data; helps target existing nitrate-nitrogen threatened systems to establish priority areas	Monitoring plan (GWQ-9); Groundwater monitoring report (GWQ-6); Nitrate trend analysis and identification of priority areas (GWQ-8); GRAPS report (in coordination with partner agencies, GWS-3)	GWQ-6, GWQ-8, GWQ-9, GWS-3
					Reduce nitrogen loading to groundwater through the implementation of field practices and reduction of fertilization rates	GWQ-5	Advisory Committee and Planning Work Group; goal reflects recommended practices identified in the WRAPS report	Implementation of applicable BMPs (e.g., cover crop, reduced fertilizer application) - number of projects and estimated nitrogen load reduction (SWQ-1, see Table 5-3); Number of nutrient management plans (20 plans, SWQ-11); Increased acres of cover crops/perennial vegegation (5,700 acres, SWQ-2); Ongoing education and outreach (GWQ-12, GWQ-13)	GWQ-3, SWQ-2, SWQ-11, SWQ-7, GWQ-12, GWQ-13, GWS-15
		E. coli	Reduce the occurrence of *E. coli* contamination of groundwater supplies	US EPA Drinking Water Standards and Health Advisory Tables (2018); MDH Drinking Water Standards and Guidance	In targeted sub-watersheds and aquifer formations, provide all private well owners access to well testing programs and education about water quality specific to drinking water (repeated from GWQ-3)	GWQ-6	Targets the most sensitive private wells; population is often underserved due to staff and resource limitations. Targeting can be done by assessing well chemistry data, geologic protection in relation to source water aquifers used, and known hydrogeologic recharge-discharge trends	Number of tested wells (700 wells over 10 years - GWQ-7); Groundwater quality monitoring report (GWQ-6); Ongoing communication/education (GWQ-14)	GWQ-6, GWQ-7, GWQ-14
					Reduce *E. coli* loading through management of SSTS, un-sewered discharges, and feedlots	GWQ-7	Advisory Committee and Planning Work Group; goal reflects recommended practices identified in the WRAPS report	Inventory of SSTS within the watershed (GWQ-10); Projects to address non-functioning SSTS (200 over 10 years, GWQ-4); Projects to address un-sewered discharges (4 over 10 years, GWQ-5); Projects to address non-conforming feedlots (10 over 10 years, SWQ-4); Ongoing eductation and outreach (GWQ-11, GWQ-14, see Implementation Schedule Table 7-2)	SWQ-4, GWQ-4, GWQ-5, GWS-10, GWQ-11, GWQ-14
					Reduce risk of *E. coli* and other contamination through sealing of abandoned private and public wells	GWQ-9	MDH best practice	Number of sealed private wells - 100 private wells (GWQ-1) and 2 high capacity wells (GWQ-2); Ongoing education and outreach (GWQ-14)	GWQ-1, GWQ-2, GWQ-14
		Emerging contaminants	Understand and minimize the environmental and public health risks from emerging contaminants in groundwater	Advisory Committee and Planning Work Group; MDH guidance	Increase understanding of emerging contaminant presence in the watershed through groundwater quality monitoring and education efforts.	GWQ-10	Lack of available data	Number of tested wells (700 wells over 10 years - GWQ-7); Groundwater quality monitoring report (GWQ-6); Ongoing communication/education (GWQ-14)	GWQ-6, GWQ-7, GWQ-14
		Well Management	Reduce risk to public health through appropriate well management and maintenance	Advisory Committee and Planning Work Group; MDH guidance	Reduce risk to public health from poorly maintained wells through well capping, sealing, and education	GWQ-11	Advisory Committee, Planning Work Group, Policy committee, MDH best practice	Number of sealed private wells - 100 private wells (GWQ-1) and 2 high capacity wells (GWQ-2); Number of capped wells (10 per year, GWQ-16) Ongoing education and outreach (GWQ-14)	GWQ-1, GWQ-2, GWQ-14, GWQ-16
		Storage	Increase storage and reduce runoff in the Cedar River watershed	CRWD Flood Reduction Strategies (from CRWD Watershed Management Plan, 2009)	Increase storage in the watershed corresponding to 0.25 inches of runoff (approximately 9,600 acre-ft), prioritizing headwater watersheds	FLD-1	10-year goal established by Planning Work Group and Advisory Committee	Estimated increase in watershed storage (9,600 acre-feet) resuting from implemented projects (FLD-1); Number of stormwater capture/reuse projects (50 projects, FLD-3); Outreach events to promote low impact design (10 events, FLD-8)	FLD-1, SWQ-1, SWQ-2, SWQ-3, FLD-3, GWS-1, SWQ-6, SWQ-7, FLD-6, FLD-7, SLH-2, FLD-8, SWQ-14

Table 5-2 Measurable Goals for the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan

Issue Level	Priority Issue	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures (and associated item from Implementation Schedule)	Related Actions (from Implementation Schedule)
Tier I	Excessive Flooding	Peak flows	Reduce peak flows in the Cedar River by 20% relative to 2016 flow frequency analysis (i.e., ~17,000 cfs near Austin)	CRWD Flood Reduction Strategies (from CRWD Watershed Management Plan, 2009); 2016 Silver Jackets study for Iowa USACE	Develop storage and discharge goals at a subwatershed level (e.g., <10 square miles) based on hydrologic and hydraulic analysis, to inform planned implementation activities	FLD-2	Lack of data availability; CRWD 2009 Watershed Management Plan	Development of hydrologic and hydraulic models (FLD-4, FLD-10); Development of subwatershed specific flow reduction goals (FLD-6)	FLD-4, FLD-10, FLD-6, FLD-7
		Floodplains	Reduce flood risk to structures and major infrastructure	CRWD Flood Reduction Strategies (from CRWD Watershed Management Plan, 2009)	Characterize flood risk in un-modeled areas and identify priority areas	FLD-3	Lack of available data	Development of hydrologic and hydraulic models (FLD-4, FLD-A); Development of subwatershed specific flow reduction goals (FLD-6); Prioritized inventory of flood risk areas (FLD-2, FLD-5)	FLD-2, FLD-4, FLD-5, FLD-10
					Reduce number of structures and critical infrastructure located within the floodplain (or reduce risk to infrastructure remaining in floodplain)	FLD-4	Known flooding issues as identified by stakeholders; City of Austin Comprehensive Plan	Number of projects to stabilize/restore degaded streambanks (10 projects, 5000 feet, ESC-1); Feasibility study to address high risk flood areas (FLD-2); Updates to floodplain and related ordinances, as needed (FLD-9)	ESC-1, FLD-1, FLD-2, FWH-2, FLD-5, FLD-9
Tier II	Degraded Soil Health	Cover crops & perennial vegetation	Maintain and improve soil health to increase productivity while protecting and improving the environment	Planning Work Group and Advisory Committee	Quantify the use and benefit (e.g., water storage, reduced runoff, increased organic matter) of cover crops, perennial vegetation, till strategies, and residue management throughout the watershed	SLH-1	Lack of available data; Planning Work Group and Advisory Committee	Increased acres of cover crops/perennial vegetation (5,700 acres, SWQ-2); Inventory of soil health best practices (SLH-1); Study and quantification of soil health practice benefits (e.g., reduced runoff, water storage, increased organic matter) (SLH-2)	SWQ-1, SWQ-2, SLH-2, SWQ-11, SWQ-13, GWQ-13
					Implement educational programs to increase awareness of soil health best practices and community capacity to implement BMPs	SLH-2	Planning Work Group and Advisory Committee; WRAPS strategies call for improving soil health to address water quality and other issues	Inventory of land cover (SLH-3); 10 outreach events with agra-business (SLH-4);	SLH-4, SWQ-10
					Increase the use of cover crops, perennial vegetation, and conservation till strategies relative to established baseline (see Goal SLH-1)	SLH-3	Planning Work Group and Advisory Committee; WRAPS strategies call for improving soil health to address water quality and other issues;	Increased acres of cover crops/perennial vegetation (5,700 acres, SWQ-2); Inventory of soil health best practices (SLH-1); Inventory of land cover (SLH-3); 10 outreach events with agra-business (SLH-4); 20 workshops to promote soil health BMPs (SQW-10)	SLH-1, SLH-3, SLH-4, SWQ-1, SWQ-2, GWS-1, SWQ-10
Tier II	Threatened Groundwater Supply	Groundwater sustainability	Maintain sustainable groundwater supply for future use	Conservation goal based on MDNR Draft Groundwater Strategic Plan (2013)	Promote the implementation of groundwater conservation practices	GWS-1	Conservation goal based on MDNR Draft Groundwater Strategic Plan (2013)	Implementation of BMPs incorporating groundwater conservation (e.g., increased infiltration, reduced irrigation) (GWS-1, SWQ-1); Projects to capture and reuse stormwater (50 projects, FLD-3); Ongoing education and outreach (GWS-4, GWS-5)	SWQ-1, FLD-3, GWS-1, GWS-4, GWS-5
					Characterize the state and trend of groundwater supplies in the watershed	GWS-2	Lack of available data	Study and quantification of soil health practice benefits (SLH-2); Collected data/monitoring reports (GWS-2); GRAPS report (in coordination with partners, GWS-3)	SLH-2, GWS-2, GWS-3
Tier III	Threats to Fish, Wildlife, and Habitat	Wetlands	Preserve the quality and quantity of natural areas	Planning Work Group and Advisory Committee; Wetland Conservation Act; MDNR Aquatic Invasive Species Program	Preserve the quality and quantity of wetlands through continued administration of WCA	FWH-1	Wetland Conservation Act	Compliance with WCA (ESC-4); Enforcement of wetland ordinances (ESC-4); Updates to ordinances, as needed (FWH-6)	FWH-3, FWH-5, ESC-4, FLD-9, FWH-6
		Sites of biological significance			Preserve sites of biological significance	FWH-2	MN Biological Survey Program	Technial assistnace for conservation projects (5 over 10 years, FWH-3); Educational activities (20 over 10 years, FWH-5); Updates to ordinances, as needed (FWH-6)	FWH-3, FWH-5, FWH-6
		Aquatic invasive species			Characterize the presence and impact of aquatic invasive species	FWH-3	MDNR Aquatic Invasive Species Program	Projects to address AIS (10/year, FWH-1); Database of AIS presence (FWH-4)	FWH-1, FWH-4

Table 5-2 Measurable Goals for the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan

Issue Level	Priority Issue	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures (and associated item from Implementation Schedule)	Related Actions (from Implementation Schedule)
		Fish and Macroinvertebrates	See fish and macroinvertebrate IBI goals above under degraded surface water quality	see Goal SWQ-1 above	see Goal SWQ-1 above	FWH-5	see Goal SWQ-1 above	See Goal SWQ-1 above	SWQ-1, FWH-2, SWQ-6, SWQ-7, SWQ-8, SWQ-9, FWH-6
Tier III	Reduced Livability and Recreation	Recreation	Increase access opportunity points to natural and recreational areas	Planning Work Group and Advisory Committee	Incorporate access opportunities into Partnership projects	REC-1	Cedar 1W1P PWG and Advisory Committee	Projects to incorporate access to natural areas (5 over 10 years, REC-1); Inventory of potential recreation opportunities (REC-2); Public events to promote stewardship (10 events, REC-3); Volunteer actvities (20 over 10 years, REC-4)	SWQ-1, FLD-2, FWH-1, FWH-2, FWH-3, FWH-4, REC-1, REC-2, SWQ-6, SWQ-7, REC-3, REC-4

Table 5-3 Measurable Goals Addressing Degraded Surface Water Quality

Issue Area	Subwatershed	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures	Related Implementation Items (from Implementation Schedule)
Degraded Surface Water Quality	Upper Cedar River	Phosphorus	Reduce phosphorus loading by 45% (from average 1980-1996 conditions) by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 166 lbs/yr (as estimated at field scale) and 267 lbs/year in the Upper Cedar River	SWQ-1.1	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 10 implemented projects; watershed TP load reduction up to 166 lbs/yr (as estimated at field scale) and 267 lbs/year in the Upper Cedar River	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids	Reduce TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30) by reducing TSS loading in the watershed by 15% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 540 tons/yr (as estimated at field scale) and 49 tons/year in the Upper Cedar River	SWQ-1.1	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 10 implemented projects; cumulative sediment load reduction up to 540 tons/year (as estimated at field scale) and 49 tons/year in the Upper Cedar River	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% (from average 1980-1996 conditions) by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 12,400 lbs/year (as estimated at field scale) and 44,000 lbs/year in the Upper Cedar River	SWQ-1.1	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 10 implemented projects; cumulative N load reduction up to 12400 lbs/yr (as estimated at field scale) and 44,000 lbs/year in the Upper Cedar River	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli	Reduce *E. coli* concentrations to monthly geometric means <126 CFU/100 mL (April 1 - October 31) by reducing *E. coli* loading in the watershed by 72% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); Cedar River Watershed TMDL	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.1	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Biological Integrity	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Streams: 50 - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.1	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Forest Streams (low gradient): 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.1	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
Degraded Surface Water Quality	Wolf Creek	Phosphorus	Reduce phosphorus loading by 45% (from average 1980-1996 conditions) by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 4.5 lbs/yr (as estimated at field scale) and 3 lbs/year in Wolf Creek	SWQ-1.2	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 3 implemented projects; watershed TP load reduction up to 4.5 lbs/year (as estimated at field scale) and 3 lbs/year in Wolf Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids	Reduce TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30) by reducing TSS loading in the watershed by 15% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 18 tons/yr (as estimated at field scale) and 0.9 tons/year in Wolf Creek	SWQ-1.2	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 3 implemented projects; cumulative sediment load reduction up to 18 tons/year (as estimated at field scale) and 0.9 tons/year in Wolf Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% (from average 1980-1996 conditions) by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 480 lbs/year (as estimated at field scale) and 500 lbs/year in Wolf Creek	SWQ-1.2	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 3 implemented projects; cumulative N load reduction up to 480 lbs/year (as estimated at field scale) and 500 lbs/year in Wolf Creek	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli	*Reduce E. coli* concentrations to monthly geometric means <126 CFU/100 mL (April 1 - October 31) by reducing *E. coli* loading in the watershed by 72% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); load reduction estimated from Cedar River TMDL	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.2	Load reduction estimates from TMDL/MPCA correspondence	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Streams: 50 - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.2	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Forest Streams (low gradient): 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.2	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2

Table 5-3 Measurable Goals Addressing Degraded Surface Water Quality

Issue Area	Subwatershed	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures	Related Implementation Items (from Implementation Schedule)
Degraded Surface Water Quality	Dobbins Creek	Phosphorus[1]	Reduce phosphorus loading by 45% (from average 1980-1996 conditions) by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 94 lbs/yr (as estimated at field scale) and 61 lbs/year in Dobbins Creek	SWQ-1.3	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; watershed TP load reduction up to 94 lbs/year (as estimated at field scale) and 61 lbs/year in Dobbins Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids	Reduce TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30) by reducing TSS loading in the watershed by 15% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4); load reduction estimate from MPCA memo	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 320 tons/yr (as estimated at field scale) and 18 tons/year in Dobbins Creek	SWQ-1.3	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; cumulative sediment load reduction up to 320 tons/year (as estimated at field scale) and 18 tons/year in Dobbins Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% (from average 1980-1996 conditions) by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 9900 lbs/year (as estimated at field scale) and 9900 lbs/year in Dobbins Creek	SWQ-1.3	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; cumulative N load reduction up to 9900 lbs/year (as estimated at field scale) and 9900 lbs/year in Dobbins Creek	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli[1]	Reduce *E. coli* concentrations to monthly geometric means <126 CFU/100 mL (April 1 - October 31) by reducing *E. coli* loading in the watershed by 72% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); load reduction estimate from MPCA memo	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.3	General strategies from WRAPS	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity[1]	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Streams: 50 - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.3	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Forest Streams (low gradient): 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.3	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
Degraded Surface Water Quality	Turtle Creek	Phosphorus	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 176 lbs/yr (as estimated at field scale) and 161 lbs/year in Turtle Creek	SWQ-1.4	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; watershed TP load reduction up to 176 lbs/year (as estimated at field scale) and 161 lbs/year in Turtle Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids	Reduce TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30) by reducing TSS loading in the watershed by 16% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4); load reduction estimated from Cedar River TMDL	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 1170 tons/yr (as estimated at field scale) and 53 tons/year in Turtle Creek	SWQ-1.4	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; cumulative sediment load reduction up to1170 tons/year (as estimated at field scale) and 53 tons/year in Turtle Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 15,400 lbs/year (as estimated at field scale) and 18,300 lbs/year in Turtle Creek	SWQ-1.4	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; cumulative N load reduction up to 15400 lbs/year (as estimated at field scale) and 18,400 lbs/year in Turtle Creek	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli	Reduce *E. coli* concentrations to monthly geometric means <126 CFU/100 mL (April 1 - October 31) by reducing *E. coli* loading in the watershed by 46% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); load reduction estimated from Cedar River TMDL	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.4	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Streams: 50 - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.4	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Streams (high gradient): 37 - Southern Forest Streams (low gradient): 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.4	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2

Table 5-3 Measurable Goals Addressing Degraded Surface Water Quality

Issue Area	Subwatershed	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures	Related Implementation Items (from Implementation Schedule)
Degraded Surface Water Quality	Geneva Lake	Phosphorus	Meet Western Corn Belt Plains water quality standards in Geneva Lake (TP≤90 ug/L, chl a≤30 ug/L, SD≥0.7 m) by reducing total phosphorus loading by 51% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0222 Subp.3); load reduction estimated from Cedar River TMDL	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 43 lbs/yr (as estimated at field scale) and 61 lbs/year to Geneva Lake	SWQ-1.5	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 5 implemented projects; watershed TP load reduction up to 43 lbs/year (as estimated at field scale) and 61 lbs/year in Geneva Lake	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids[1]	Achieve TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 430 tons/yr (as estimated at field scale) and 10 tons/year to Geneva Lake	SWQ-1.5	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 5 implemented projects; cumulative sediment load reduction up to 430 tons/year (as estimated at field scale) and 10 tons/year in Geneva Lake	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 3200 lbs/year (as estimated at field scale) and 3100 lbs/year in Geneva Lake	SWQ-1.5	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 5 implemented projects; cumulative N load reduction up to 3200 lbs/year (as estimated at field scale) and 3100 lbs/year in Geneva Lake	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli	Reduce *E. coli* concentrations to monthly geometric means <126 CFU/100 mL (April 1 - October 31) by reducing *E. coli* loading in the watershed by 25% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); load reduction estimated from Cedar River TMDL	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.5	Strategies included in WRAPS tables specific to this resource/watershed	Up to 20 implemented projects; cumulative N load reduction up to 15,400 lbs/yr (as estimated at field scale)	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity[1]	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Streams: 50 - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.5	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Streams (high gradient): 37 - Southern Forest Streams (low gradient): 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.5	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
Degraded Surface Water Quality	Middle Fork Cedar River	Phosphorus	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 138 lbs/yr (as estimated at field scale) and 65 lbs/year in the Middle Fork Cedar River	SWQ-1.6	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; watershed TP load reduction up to 138 lbs/year (as estimated at field scale) and 65 lbs/year in the Middle Fork Cedar River	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids[1]	Achieve TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 650 tons/yr (as estimated at field scale) and 9 tons/year in the Middle Fork Cedar River	SWQ-1.6	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; up to 650 ton/year cumulative TSS reduction (as estimated at field scale) and 9 tons/year in the Middle Fork Cedar River	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 16300 lbs/year (as estimated at field scale) and 11000 lbs/year in the Middle Fork Cedar River	SWQ-1.6	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; up tp 16300 lbs/year cumulative TN loading reduction (as estimated at field scale) and 11000 lbs/year in the Middle Fork Cedar River	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli	Reduce *E. coli* concentrations to monthly geometric means <126 CFU/100 mL (April 1 - October 31) by reducing *E. coli* loading in the watershed by 25% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); load reduction estimated from Cedar River TMDL	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.6	Load reduction estimates from TMDL/MPCA correspondence	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity[1]	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Streams: 50 - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.6	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Streams (high gradient): 37 - Southern Forest Streams (low gradient): 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.6	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2

Table 5-3 Measurable Goals Addressing Degraded Surface Water Quality

Issue Area	Subwatershed	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures	Related Implementation Items (from Implementation Schedule)
Degraded Surface Water Quality	Roberts Creek	Phosphorus	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 147 lbs/yr (as estimated at field scale) and 108 lbs/year in Roberts Creek	SWQ-1.7	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; watershed TP load reduction up to 147 lbs/year (as estimated at field scale) and 108 lbs/year in Roberts Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids	Reduce TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 710 tons/yr (as estimated at field scale) and 19 tons/year in Roberts Creek	SWQ-1.7	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; cumulative sediment load reduction up to 710 tons/year (as estimated at field scale) and 19 tons/year in Roberts Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 16500 lbs/year (as estimated at field scale) and 16700 lbs/year in Roberts Creek	SWQ-1.7	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 20 implemented projects; cumulative N load reduction up to 16500 lbs/year (as estimated at field scale) and 16700 lbs/year in Roberts Creek	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli	Reduce *E. coli* concentrations to monthly geometric means <126 CFU/100 mL by reducing *E. coli* loading in the watershed by 86% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); load reduction estimated from Cedar River TMDL	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.7	Load reduction estimates from TMDL/MPCA correspondence	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Streams: 50 - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.7	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Streams (high gradient): 37 - Southern Forest Streams (low gradient): 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.7	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
Degraded Surface Water Quality	Rose Creek	Phosphorus[1]	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 221 lbs/yr (as estimated at field scale) and 164 lbs/year in Rose Creek	SWQ-1.8	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 30 implemented projects; watershed TP load reduction up to 221 lbs/year (as estimated at field scale) and 164 lbs/year in Rose Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids	Reduce TSS concentrations in the Cedar River to <10% of samples exceeding 65 mg/L (April 1 – September 30) by reducing TSS loading in the watershed by 44% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4); load reduction estimate from MPCA memo	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 960 tons/yr (as estimated at field scale) and 58 tons/year in Rose Creek	SWQ-1.8	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 30 implemented projects; 960 ton/year cumulative TSS reduction (as estimated at field scale) and 58 tons/year in Rose Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 22100 lbs/year (as estimated at field scale) and 22000 lbs/year in Rose Creek	SWQ-1.8	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 30 implemented projects; 22100 lbs/year cumulative TN reduction (as estimated at field scale) and 22000 lbs/year in Rose Creek	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli[1]	Achieve *E. coli* concentrations with monthly geometric means <126 CFU/100 mL (April 1 - October 31) by reducing E. coli loading in the watershed by 68%	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); load reduction estimate from MPCA memo	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.8	General strategies from WRAPS	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity[1]	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Streams: 50 - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.8	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Streams (high gradient): 37 - Southern Forest Streams (low gradient): 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.8	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2

Table 5-3 Measurable Goals Addressing Degraded Surface Water Quality

Issue Area	Subwatershed	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures	Related Implementation Items (from Implementation Schedule)
Degraded Surface Water Quality	West Beaver Creek	Phosphorus[1]	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 19 lbs/yr (as estimated at field scale) and 14 lbs/year in West Beaver Creek	SWQ-1.9	General strategies from WRAPS; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 3 implemented projects; watershed TP load reduction up to 19 lbs/year (as estimated at field scale) and 14 lbs/year in West Beaver Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids[1]	Achieve TSS concentrations of <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 42 tons/yr (as estimated at field scale) and 1.8 tons/year in West Beaver Creek	SWQ-1.9	General strategies from WRAPS; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 3 implemented projects; watershed TSS load reduction up to 42 ton/year (as estimated at field scale) and 1.8 tons/year in West Beaver Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate[1]	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 2200 lbs/year (as estimated at field scale) and 2100 lbs/year in West Beaver Creek	SWQ-1.9	General strategies from WRAPS; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 3 implemented projects; watershed TN load reduction up to 2200 lbs/year (as estimated at field scale) and 2100 lbs/year in West Beaver Creek	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli[1]	Achieve *E. coli* concentrations with monthly geometric means <126 CFU/100 mL (April 1 - October 31)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D)	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.9	General strategies from WRAPS	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity[1]	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.9	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity[1]	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Streams (high gradient): 37	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.9	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
Degraded Surface Water Quality	Lower Cedar River	Phosphorus	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 108 lbs/yr (as estimated at field scale) and 704 lbs/year in the Lower Cedar River	SWQ-1.10	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 15 implemented projects; watershed TP load reduction up to 108 lbs/year (as estimated at field scale) and 704 lbs/year in the Lower Cedar River	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids	Reduce TSS concentrations in the Cedar River to <10% of samples exceeding 65 mg/L (April 1 – September 30) by reducing TSS loading in the watershed by 15% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4); load reduction estimate from MPCA memo	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 310 tons/yr (as estimated at field scale) and 203 tons/year in the Lower Cedar River	SWQ-1.10	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 15 implemented projects; watershed TSS load reduction up to 310 ton/year (as estimated at field scale) and 203 tons/year in the Lower Cedar River	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 13600 lbs/year (as estimated at field scale) and 108000 lbs/year in the Lower Cedar River	SWQ-1.10	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 15 implemented projects; watershed TN load reduction up to 13600 lbs/year (as estimated at field scale) and 108000 lbs/year in the Lower Cedar River	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli	Reduce *E. coli* concentrations in the Cedar River to monthly geometric means <126 CFU/100 mL (April 1 - October 31) by reducing *E. coli* loading in the watershed by 36% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); load reduction estimate from MPCA memo	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.10	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Rivers: 49 - Southern Streams: 50 - Southern Headwaters: 55 - Southern Coldwater: 50	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.10	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Prairie Forest Rivers: 31 - Southern Streams (high gradient): 37 - Southern Forest Streams (low gradient): 43 - Southern Coldwater: 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.10	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2

Table 5-3 Measurable Goals Addressing Degraded Surface Water Quality

Issue Area	Subwatershed	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures	Related Implementation Items (from Implementation Schedule)
Degraded Surface Water Quality	Otter Creek	Phosphorus[1]	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 38 lbs/yr (as estimated at field scale) and 27 lbs/year in Otter Creek	SWQ-1.11	General strategies from WRAPS; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 8 implemented projects; watershed TP load reduction up to 38 lbs/year (as estimated at field scale) and 27 lbs/year in Otter Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ-14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids[1]	Achieve TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 130 tons/yr (as estimated at field scale) and 7.8 tons/year in Otter Creek	SWQ-1.11	General strategies from WRAPS; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 8 implemented projects; watershed TSS load reduction up to 130 ton/year (as estimated at field scale) and 7.8 tons/year in Otter Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ-14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate[1]	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 3800 lbs/year (as estimated at field scale) and 3800 lbs/year in Otter Creek	SWQ-1.11	General strategies from WRAPS; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 8 implemented projects; watershed TN load reduction up to 3800 lbs/year (as estimated at field scale) and 3800 lbs/year in Otter Creek	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli	Reduce *E. coli* concentrations to monthly geometric means <126 CFU/100 mL (April 1 - October 31) by reducing *E. coli* loading in the watershed by 58% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); load reduction estimate from MPCA memo	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.11	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity[1]	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Streams: 50 - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.11	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity[1]	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Streams (high gradient): 37	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.11	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
Degraded Surface Water Quality	Deer Creek	Phosphorus[1]	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 32 lbs/yr (as estimated at field scale) and 23 lbs/year in Deer Creek	SWQ-1.12	General strategies from WRAPS; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 4 implemented projects; watershed TP load reduction up to 32 lbs/year (as estimated at field scale) and 23 lbs/year in Deer Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ-14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids[1]	Achieve TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 120 tons/yr (as estimated at field scale) and 9.9 tons/year in Deer Creek	SWQ-1.12	General strategies from WRAPS; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 4 implemented projects; watershed TSS load reduction up to 120 ton/year (as estimated at field scale) and 9.9 tons/year in Deer Creek	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ-14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate[1]	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 3000 lbs/year (as estimated at field scale) and 2700 lbs/year in Deer Creek	SWQ-1.12	General strategies from WRAPS; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 4 implemented projects; watershed TN load reduction up to 3000 lbs/year (as estimated at field scale) and 2700 lbs/year in Deer Creek	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli[1]	Reduce *E. coli* concentrations to monthly geometric means <126 CFU/100 mL (April 1 - October 31)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D)	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.12	General strategies from WRAPS	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity[1]	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.12	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity[1]	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Streams (high gradient): 37	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.12	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2

Table 5-3 Measurable Goals Addressing Degraded Surface Water Quality

Issue Area	Subwatershed	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures	Related Implementation Items (from Implementation Schedule)
Degraded Surface Water Quality	Little Cedar River	Phosphorus	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 121 lbs/yr (as estimated at field scale) and 95 lbs/year in the Little Cedar River	SWQ-1.13	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 30 implemented projects; watershed TP load reduction up to 121 lbs/year (as estimated at field scale) and 95 lbs/year in the Little Cedar River	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids	Reduce TSS concentrations in the Cedar River to <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4); load reduction estimate from Cedar River TMDL	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 870 tons/yr (as estimated at field scale) and 17 tons/year in the Little Cedar River	SWQ-1.13	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 30 implemented projects; watershed TSS load reduction up to 870 ton/year (as estimated at field scale) and 17 tons/year in the Little Cedar River	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 13300 lbs/year (as estimated at field scale) and 13400 lbs/year in the Little Cedar River	SWQ-1.13	Strategies included in WRAPS tables specific to this resource/watershed; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 30 implemented projects; watershed TN load reduction up to 13300 lbs/year (as estimated at field scale) and 13400 lbs/year in the Little Cedar River	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli	Reduce *E. coli* concentrations in the Cedar River to monthly geometric means <126 CFU/100 mL (April 1 - October 31) by reducing *E. coli* loading in the watershed by 81% (see TMDL)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D); load reduction estimate from MPCA memo	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.13	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity	Achieve applicable Fish Indices of Biological Integrity for streams: - Southern Streams: 50 - Southern Headwaters: 55	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.13	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: - Southern Streams (high gradient): 37 - Southern Forest Streams (low gradient): 43	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.13	Strategies included in WRAPS tables specific to this resource/watershed	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
Degraded Surface Water Quality	Elk River	Phosphorus[1]	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading	SWQ-1.14	General strategies from WRAPS	Implemented projects (if identified) and implementation of applicable eduction and/or incentive programs (see Implementation Schedule)	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids[1]	Achieve TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	Implement structural and non-structural projects and practices to reduce watershed sediment loading	SWQ-1.14	General strategies from WRAPS	Implemented projects (if identified) and implementation of applicable eduction and/or incentive programs (see Implementation Schedule)	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ 14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate[1]	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading	SWQ-1.14	General strategies from WRAPS	Implemented projects (if identified) and implementation of applicable eduction and/or incentive programs (see Implementation Schedule)	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli [1]	Reduce *E. coli* concentrations to monthly geometric means <126 CFU/100 mL (April 1 - October 31)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D)	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.14	General strategies from WRAPS	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity[1]	Achieve applicable Fish Indices of Biological Integrity for streams: TBD	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.14	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity[1]	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: TBD	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.14	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2

Table 5-3 Measurable Goals Addressing Degraded Surface Water Quality

Issue Area	Subwatershed	Specific Issue, Pollutant, or Stressor	Long-term Goal	Long-term Goal Rationale	10-year Goal	10-year Goal ID	10-year Goal Rationale or Source	10-year Goal Measures	Related Implementation Items (from Implementation Schedule)
Degraded Surface Water Quality	Wapsipinicon River	Phosphorus[1]	Reduce phosphorus loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed TP loading by up to 40 lbs/yr (as estimated at field scale); in-resource goal TBD pending modeling of Wapsipinicon River watershed	SWQ-1.15	General strategies from WRAPS; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 10 implemented projects; watershed TP load reduction up to 40 lbs/year (as estimated at field scale); in-resource goal TBD pending modeling of Wapsipinicon River watershed	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ-14, FLD-8, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Total Suspended Solids[1]	Achieve TSS concentrations to <10% of samples exceeding 65 mg/L (April 1 – September 30)	MN Water Quality Standard (MN Rules 7050.0222 Subp. 3, Subp. 4)	Implement structural and non-structural projects and practices to reduce watershed sediment loading by up to 290 tons/yr (as estimated at field scale); in-resource goal TBD pending modeling of Wapsipinicon River watershed	SWQ-1.15	General strategies from WRAPS; field scale load reductions are based on SWAT model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 10 implemented projects; watershed TSS load reduction up to 290 ton/year (as estimated at field scale); in-resource goal TBD pending modeling of Wapsipinicon River watershed	SWQ-1, SWQ-2, SWQ-3, ESC-1, SWQ-14, FLD-8, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Nitrate[1]	Reduce total nitrogen loading by 45% by 2040	MN Nutrient Reduction Strategy (MPCA, 2014)	Implement structural and non-structural projects and practices to reduce watershed N loading by up to 4400 lbs/year (as estimated at field scale); in-resource goal TBD pending modeling of Wapsipinicon River watershed	SWQ-1.15	General strategies from WRAPS; field scale load reductions are based on HSPF model results and DTM analysis; in-resource goals are based on HSPF-SAM and DTM analysis; see Section 6.4	Up to 10 implemented projects; watershed TN load reduction up to 4400 lbs/year (as estimated at field scale); in-resource goal TBD pending modeling of Wapsipinicon River watershed	SWQ-1, SWQ-2, GWQ-3, SWQ-11, GWQ-15, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		E. coli [1]	Reduce *E. coli* concentrations to monthly geometric means <126 CFU/100 mL (April 1 - October 31)	MN Water Quality Standard (MN Rules 7050.0220 Subp. 3a.D, Subp. 4a.D, and Subp. 5a.D)	Implement structural and non-structural practices to reduce *E. coli* loading	SWQ-1.15	General strategies from WRAPS	Implementation of projects and practices to address non-functioning SSTS (200 over 10 years watershed-wide), un-sewered discharges (4 over 10 years watershed-wide), and feedlots (10 over 10 years watershed-wide); see Implementation Schedule	SWQ-4, GWQ-4, GWQ-5, SWQ-12, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Fish Index of Bological Integrity[1]	Achieve applicable Fish Indices of Biological Integrity for streams: TBD	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.2 (MPCA, 2012)	Implement structural and non-structural practices to improve FIBI	SWQ-1.15	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-1, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2
		Macroinvertebrate Index of Biological Integrity[1]	Achieve applicable Macroinvertebrate Indices of Biological Integrity for streams: TBD	Biological Criteria for Tiered Aquatic Life Uses (MPCA, 2016); Cedar River Watershed Assessment and Monitoring - Appendix 4.3 (MPCA, 2012)	Implement structural and non-structural practices to improve MIBI	SWQ-1.15	General strategies from WRAPS	Implementation of projects and practices to address stressors including TP, TSS, N, and altered hydrology (see related Implementation Schedule Items)	SWQ-1, SWQ-2, SWQ-3, ESC-1, FLD-1, FWH-2, ESC-4, SWQ-6, SWQ-7, SWQ-8, SWQ-9, SLH-2

Notes:

(1) Stressor was not specifically identified, or was assigned a "low priority", in WRAPS or TMDL report; overall goal to achieve applicable water quality standard(s) applies.

Green highlight indicates there are reach/watershed specific strategies included in the WRAPS to address this pollutant

Orange highlight indicates the stressor is not identified for this watershed; watershed-specific strategies are not identified in the WRAPS

6.0 Targeting of Practices and Priority Areas

Recognizing that financial and staff resources limit the ability of the Partnership to address priority issues in the watershed (see Section 4.0), the Partnership developed a methodology to prioritize and target their actions. The following sections describe the methodology used to target practices and the results of this process.

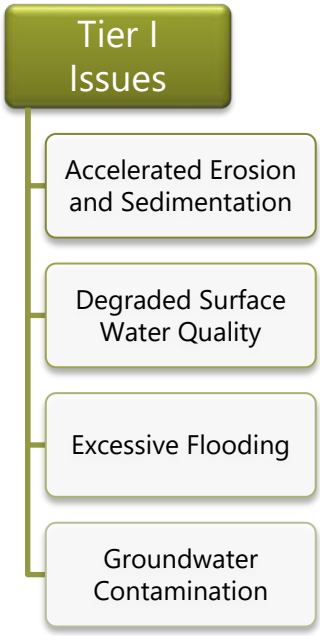
6.1 Targeting of Practices to Address Tier I Issues

Through the issues identification and prioritization process described in Section 4.0, the Partnership identified four Tier I priority issues. The spatial extent and severity of these issues vary across the watershed and prevent a one-size-fits-all approach to implementing practices and programs addressing these issues. The Partnership used available geospatial data, modeling results, and existing technical knowledge of the Planning area to identify physical areas for prioritized and targeted implementation.

In this Plan, **targeting** refers to locating projects, practices, or programs within a geographic area. Targeting may be performed at various levels of geographic specificity according to available information. Targeting of practices described in this section include "subwatershed scale" and "field scale" targeting.

Subwatershed scale targeting – subwatersheds (at the HUC 11 level) or portions of subwatersheds are identified as priority areas project or program implementation, although the location of proposed projects is not specified.

Field scale targeting – the location of potential field practices (e.g., vegetated buffers, WASCOBs, stormwater practices) are identified or estimated based on the results of available monitoring data, modeling results, or other technical analysis (see Section 6.3).



6.2 Subwatershed Scale Targeting

The Planning Work Group and Advisory Committee identified geographic areas of the watershed for targeted implementation. Understanding that many of the projects and programs implemented by the Partnership may address several priority issues and goals, the Partnership considered Tier I issues in its identification of priority areas, as described in the following sections. Data used as input to this process is presented in Figure 6-1, Figure 6-2, and Figure 6-3 and described in the following sections. Input data was consolidated into five spatial datasets, including:

- Subwatersheds with numeric TMDL load reductions for total suspended solids (TSS)
- Subwatersheds with numeric TMDL load reductions for *Escherichia coli* (*E. coli*)

- Subwatersheds with numeric TMDL load reductions for total phosphorus (TP)
- Groundwater quality priority areas based on:
    - Drinking water supply management areas (DWSMAs)
    - Karst geology
    - Aquifer sensitivity to pollution
- Watershed storage/runoff reduction priority areas based on:
    - HSPF estimates of watershed runoff
    - Headwater locations within the 15 planning subwatersheds

The five spatial datasets listed above and presented in Figure 6-1, Figure 6-2, and Figure 6-3 were overlain to create the composite priority presented in Figure 6-4. Using these inputs, the Partnership classified portions of the watershed as:

- Level 5 (highest priority) – areas overlain by five issue input datasets
- Level 4 – areas overlain by four issue input datasets
- Level 3 – areas overlain by three issue input datasets
- Level 2 – areas overlain by two issue input datasets
- Level 1 – areas overlain by one issue input dataset
- Level 0 (lowest priority) – areas outside of all issue input datasets

The resulting priority areas for implementation are shown in Figure 6-4. The Partnership recognizes that this classification method is limited by the availability of existing data. As additional data is collected and evaluated throughout Plan implementation, the Partnership will re-assess its priority area classifications and adjust them, as necessary, through a planned biennial review. The results are consistent with the CRWD CIP targeted areas (prioritized practices and projects from the CRWD CIP are included among the locations identified in Figure 6-5). Note that while the implementation schedule (see Section 7.1) includes projects more heavily targeted in very high and high priority areas, projects and programs may be considered for all areas of the watershed, including areas with little existing data and areas targeted for specific implementation activities (see Table 7-2).

6.2.1 Accelerated Erosion and Sedimentation and Degraded Surface Water Quality

Several of the goals related to accelerated erosion and sedimentation and degraded surface water quality address the water quality impairments within the planning area (see Section 5.0). Water quality impairments include impairments for aquatic life and aquatic recreation due to total suspended solids (TSS), *E. coli*, and total phosphorus (TP) (see also Section 3.8.2). Based on work performed as part of the Cedar River WRAPS and Cedar River TMDL studies, numeric load reduction goals for TSS, *E. coli*, and TP have been established for several of the subwatersheds within the Planning area. Figure 6-1 identifies theses subwatersheds (at the HUC11 level). The Wapsipinicon River has been assessed for water quality impairments and a WRAPS and TMDL are in progress, although numeric load reductions goals have not yet been established. The Wapsipinicon River Watershed Stressor Identification Report (MPCA, March 2018) identifies TSS and *E. coli* as stressors within the watershed.

The Deer Creek and Elk River subwatersheds have not been assessed for TSS, TP, or *E. coli* water quality impairments due to lack of data. The Partners acknowledge that surface water quality and sedimentation issues present in these subwatersheds are likely similar to the remainder of the watershed. Activities to collect additional data for these "gap" areas are included in the implementation schedule (Table 7-2).

While numeric load reduction goals have not been established for all watersheds, reduction of TSS, nutrient, and *E. coli* loading is a goal across the entire Planning area; the Cedar River WRAPS includes general actions to address pollutant loading in all assessed subwatersheds. Similarly, projects to address degraded water quality are planned throughout all subwatersheds (see Table 7-2).

6.2.2 Groundwater Contamination

The Partnership identified groundwater contamination as a Tier I issue. During Plan development, the Planning Work Group and Advisory Committee reviewed available groundwater quality data and natural resource datasets to assess the scope of the issue (see Section 3.5). Data considered included:

- Soils data
- Wellhead protection areas and drinking water supply management areas (DWSMAs, see Figure 3-10)
- Private well water quality data (nitrate and bacteria)
- Geologic formations including location of Karst geology (see Figure 3-13)
- Groundwater recharge (see Figure 3-9)
- Bedrock surface pollution sensitivity
- Pollution sensitivity of near-surface materials (see Figure 3-11)
- Pollution sensitivity of wells (see Figure 3-12)

The Partners delineated two levels of groundwater priority based on qualitative and quantitative assessment of the above data, including overlay of geospatial datasets. These areas are referred to as:

1. High/very high vulnerability
2. Medium vulnerability

The groundwater priority areas generally follow the vulnerability of DWSMAs, the pollution sensitivity of bedrock and near surface materials, and karst geology. Geology and soils features were used to determine priority areas (to address potential groundwater contamination from nitrate). Though some private well data is available, it is limited in numbers and area. The available well data, although limited, is generally consistent with the priority areas based on the spatial data listed above (i.e., most high-nitrate samples occur within the priority areas). Therefore, well data was not used to additionally prioritize areas.

For the purposes of geographically targeting projects and field practices with multiple benefits (see Section 6.3), areas of high/very high vulnerability and areas of medium vulnerability are both classified as "Groundwater priority areas" as shown in Figure 6-2. The groundwater priority areas presented in Figure 6-2 will be used to guide future implementation, including development of a comprehensive groundwater monitoring plan (implementation item GWQ-9) Tasks in the implementation schedule addressing specific

groundwater quality issues differentiate between high/very high vulnerability and medium vulnerability areas for prioritized implementation, where appropriate (see Table 7-2).

Development of a comprehensive groundwater monitoring plan (implementation item GWQ-9) will consider groundwater priority areas presented in Figure 6-2 in addition to existing monitoring data. Outcomes of groundwater monitoring plan development, and subsequent monitoring results, may result in revisions to groundwater priority areas and/or targeting of groundwater-related implementation activities.

6.2.3 Excessive Flooding

Excessive flooding was identified by the Partnership as a Tier I issue. During Plan development, the Planning Work Group and Advisory Committee reviewed available hydrologic and flood risk datasets to assess the scope of the issue (see Section 3.9), including estimates of watershed runoff, results of past modeling, and floodplain delineation.

The Partnership recognizes that increased flow, river stage, and flood risk at Austin and other downstream locations on the Cedar River are the cumulative result of increased runoff throughout the watershed. Thus, the Partners seek to focus projects to increase watershed storage and reduce runoff in headwaters or upstream subwatersheds in order to positively benefit the largest area. In addition, the Partners considered estimates of runoff from the HSPF model (see Figure 6-3). Subwatersheds with estimated runoff in excess of 12 inches per year were prioritized for runoff reduction projects in addition to the previously-identified headwater subwatersheds. The resulting priority areas are presented in Figure 6-3. The Wapsipinicon River subwatershed has been identified as a priority area because of its position as a headwater subwatershed, despite the lack of runoff estimates or hydrologic modeling.

Estimates of runoff are not necessarily correlated with flood risk or impacts. Additional hydrologic and hydraulic modeling performed using current precipitation data is needed to comprehensively assess flood risk throughout the watershed and estimate the potential benefit of implementation actions (see Table 7-2). When the additional hydrologic and hydrology data is available, the Partnership may identify priority areas for flood risk reduction and revise the priority implementation areas, as needed. Presently, existing modeling results and the CRWD CIP have been used to target specific locations for proposed flood risk reduction projects (see Section 6.3.2).

6.3 Field Scale Targeting of Practices

The geographic prioritization performed at the subwatershed scale (see Section 6.2) is intended to focus the Partnerships efforts over the next 10 years. Within prioritized spatial areas, additional analyses are needed to identify, ground-truth, and prioritize individual project opportunities at a finer scale (i.e., project targeting). During Plan development, the Planning Work Group and Advisory Committee considered the results of existing water quality modeling, hydrologic and hydraulic modeling, and other watershed assessments to identify targeted potential project opportunities. Application of these assessments to identify potential project locations is summarized in the following sections. The potential project locations are presented in Figure 6-5.

6.3.1 SWAT Modeling and Digital Terrain Mapping

The majority of the Cedar River planning area was modeled using the SWAT water quality model prior to the development of this Plan (see Section 3.8.7.2). The SWAT model provides estimates of sediment loading from individual catchments delineated at field scale (typically less than 1,000 acres). The SWAT modeling considered the presence of existing BMPs, tiling systems, and soils data to identify critical source areas for excess sediment loading. More detailed information about SWAT model development, inputs, and calibration is included in the *Technical Memorandum - Updated SWAT Watershed Modeling* (Barr, 2013). For consistency, areas not previously modeled (Wapsipinicon River subwatershed, portions of the Deer Creek subwatershed) were assessed with digital terrain analysis as part of Plan development to identify potential project locations, although complete SWAT modeling was not performed as part of Plan development.

SWAT modeling results were combined with digital terrain analysis to identify catchment outlet locations where beneficial field practices (e.g., filter strips, water and sediment control basins) could likely be implemented. These project opportunities are presented watershed-wide in Figure 6-5. Figure 6-6 presents a high-resolution example of this analysis applied to the Roberts Creek subwatershed. Note that the Partnership does not intend to address all of these potential project locations within the next 10 years; these projects represent a set of potential opportunities that the Partners may draw on as opportunities and local priorities dictate, emphasizing those located in priority areas. The estimated number, benefit, and cost of projects anticipated to be implemented at these locations are included in Table 7-2.

Estimates of sediment loading and area draining to these practice locations were used to develop planning level estimates of project costs and pollutant reduction benefits (see Section 6.4). Desktop analysis using GIS datasets provides a useful screening tool. However, field verification of potential project locations is ultimately necessary to determine feasibility and project design, as well as verify that existing, un-mapped BMPs are not already present.

6.3.2 Hydrologic and Hydraulic Modeling

The portion of the planning area within the Cedar River Watershed District (CRWD) and Turtle Creek Watershed District (TCWD) were modeled using the XP-SWMM hydrologic and hydraulic model prior to this planning effort (see Section 3.9.2). That modeling was performed using precipitation data from TP-40 that predates Atlas 14 precipitation data (see Section 3.2.1). In its 2009 Plan, the CRWD identified flow reduction goals for selected subwatershed areas in the CRWD and TCWD based on model results (see Section 5.2.3). The 2009 CRWD Plan identified, at a planning level, potential locations where culvert downsizing or other actions may reduce peak flows from the selected subwatersheds. These locations are presented among the potential project locations in Figure 6-5.

The implementation schedule described in Table 7-2 includes tasks to expand the hydrologic and hydraulic modeling to include the entire Planning area, update the modeling to reflect the most current precipitation data, and establish runoff and/or peak flow reduction goals based on updated modeling results. The Partnership will update the proposed locations of water storage (retention and detention) and flood risk reduction projects based on those efforts and revise Figure 6-5, as necessary. In the meantime,

the previously identified project locations will serve as a starting point for the Partnership to address excessive flooding issues.

6.3.3 Cedar River Watershed District Capital Improvement Program

The CRWD developed a 10-year capital improvement program (CIP) in 2015 to address priority issues identified in the 2009 CRWD Plan (CRWD, 2015). The first iteration of the CRWD CIP included projects generally related to stormwater detention, ravine stabilization, and flood risk reduction. The projects were prioritized based on a semi-quantitative assessment of benefits and "opportunity" factors affecting feasibility (Barr, 2015). Assessment of project benefits included a qualitative evaluation of multi-benefit potential. Assessment of "opportunities" included consideration of the criteria shown below on a weighted scale.

Benefits criteria

- Flood risk reduction
- Water quality improvement
- Groundwater protection
- Ecology/habitat benefit

Opportunities criteria

- Addresses 303(d) impairment/CRWD priority area
- Public land/willing landowners
- Impacts to/presence of public waters
- Diversity of project location
- Project located upstream in Watershed
- Project located upstream of Austin
- Cost effectiveness (bang for the buck)
- Cost-share/grant opportunities
- Positive CRWD exposure

Projects were prioritized based on the combined benefit and opportunity scores. Tools used or referenced in identifying and evaluating potential CRWD CIP projects included SWAT water quality modeling, XP-SWMM hydrologic and hydraulic modeling, and existing reports. The projects range in size, complexity, and location. Some of these projects have been completed or initiated prior to the development of this Plan. Some of the projects included in the first iteration of the CRWD CIP have been constructed. As the CRWD CIP projects generally address the same issues prioritized by the Partnership, remaining CRWD CIP projects have been included among the potential project locations presented in Figure 6-5. Annual work planning for the implementation of this Plan will include coordinating and prioritizing CRWD CIP projects relative to the implementation schedule included in this Plan.

6.4 Estimating Benefits and Costs of Targeted Field Water Quality Practices

Targeted locations for water quality improvement best management practices (BMPs) were developed based on the results of SWAT water quality modeling and digital terrain analysis (see Section 6.3.1). These locations include catchment outlets where field practices (e.g., filter strips, water and sediment control basins) could likely be implemented. These potential project opportunities are presented watershed-wide

in Figure 6-5. Figure 6-6 presents a high-resolution example of this analysis applied to the Roberts Creek subwatershed, including the estimated drainage area tributary to each potential project location.

Water quality modeling output (see Section 3.8.7) and digital terrain analysis were combined to estimate the potential benefit and cost of projects implemented at the locations shown in Figure 6-5, as described in the following sections.

6.4.1 Estimated Pollutant Loading to Proposed BMP Locations

The HSPF modeling performed for the planning area (excluding the Wapsipinicon River subwatershed) provides unit area total nitrogen (TN) and total phosphorus (TP) loading rates as presented in Figure 3-19 and Figure 3-20, respectively. SWAT model results include unit area sediment loading rates (e.g., tons/acre/year) presented watershed-wide in Figure 3-21. (Note: more specific, field scale estimates of sediment and total phosphorus loading are available in the Roberts Creek and Otter Creek subwatersheds – see Section 6.4.1.1). The watershed divides used in the HSPF and SWAT modeling efforts are more refined relative to the planning subwatersheds used in Plan development (see Figure 3-1). For planning level estimates of project benefits, average unit area loading rates for the 15 planning subwatersheds were calculated using GIS and are presented in Table 6-1. The number of potential project locations and corresponding tributary drainage area in each planning subwatershed, as estimated from SWAT modeling and digital terrain analysis, are also included in Table 6-1.

Table 6-1 Estimated pollutant loading to planning subwatersheds

Planning Subwatershed	TN loading[1] (lbs/acre/yr)	TP loading[1] (lbs/acre/yr)	Sediment loading[1] (tons/acre/yr)	Potential BMP Locations	Treated Area (acres)
Upper Cedar River	24.7	0.33	1.78	27	3,400
Wolf Creek	28.6	0.27	1.82 [2]	5	70
Dobbins Creek	29.6	0.28	1.57	94	3,930
Turtle Creek	24.4	0.28	3.06	108	8,500
Geneva Lake	22.4	0.30	4.89	10	720
Middle Fork Cedar River	29.4	0.25	1.94	76	5,260
Roberts Creek	29.2	0.26	2.07	88	6,230
Rose Creek	29.0	0.29	2.07	155	9,860
West Beaver Creek	26.1	0.23	0.82	6	420
Lower Cedar River	31.6	0.25 [3]	1.20	66	4,740
Otter Creek	29.1	0.29	1.62	39	1,610
Deer Creek	26.8	0.29	1.81	4	280
Little Cedar River	28.5	0.29	3.06	139	5,400
Elk River	30.6	0.33	1.21	0	0

Planning Subwatershed	TN loading[1] (lbs/acre/yr)	TP loading[1] (lbs/acre/yr)	Sediment loading[1] (tons/acre/yr)	Potential BMP Locations	Treated Area (acres)
Wapsipinicon River	28.5 [4]	0.26 [4]	3.06 [4]	29	1,130
Total	27.8	0.28	2.1	846	51,560

(1) Unit area loading is based on HSPF model results for TN and TP and SWAT model results for sediment.
(2) Wolf Creek is not included in SWAT modeling of sediment loading; sediment loading rates for this subwatershed are estimated as the average of loading rates from the adjacent Dobbins Creek and Roberts Creek subwatersheds.
(3) The City of Austin urban area has been removed from the TP loading calculation for the Lower Cedar River subwatershed to prevent overestimation of pollutant reduction benefits from projects implemented outside the urban area.
(4) HSPF and SWAT model results do not include the Wapsipinicon River subwatershed; for this area, loading values have been assumed equivalent to the Little Cedar River watershed (adjacent to the Wapsipinicon River watershed) until modeling is completed during Plan implementation.

6.4.1.1 Pollutant Loading to Proposed BMP Locations – Roberts Creek Example

The data presented in Table 6-1 is aggregated to the 15 planning subwatersheds within the planning area. Within the planning area, "focused" SWAT modeling has been performed for the Roberts Creek and Otter Creek subwatersheds. The focused SWAT modeling estimates the sediment and phosphorus loadings to proposed BMP locations at a higher resolution (i.e., pollutant loading rates vary between and within drainage areas tributary to proposed BMPs). This analysis is detailed in a 2013 technical memorandum *Focused SWAT Watershed Modeling* prepared for the CRWD (Barr, 2013).

The output of the focused SWAT modeling allows site-specific estimates of sediment and total phosphorus loading to each individual BMP and may be especially useful for tracking the estimated benefit of constructed projects (see Section 6.4.4). Similar analysis for the remaining planning subwatersheds is planned to be completed early in the Plan implementation schedule (see Table 7-2).

6.4.2 Potential Pollutant Reduction (estimated at field scale) and Associated Costs

Potential pollutant reduction realized by the implementation of BMPs at locations shown in Figure 6-5 was estimated using values from the *Documentation of the BMP Database Available in the Scenario Application Manager* (RESPEC, 2017). The Scenario Application Manager (SAM) is a publically available tool to estimate and aggregate pollutant reduction from various BMPs. A subset of the BMPs included in SAM applicable to the Cedar-Wapsipinicon planning area were selected and grouped by type as presented in Table 6-2.

In practice, one or more specific BMPs may be implemented at many of the individual proposed BMP locations identified in Figure 6-5 (or additional sites yet to be identified). At the planning stage, however, the specific BMPs and location of implementation are unknown. Therefore, an approximate average pollutant removal efficiency was assumed for each pollutant based on the six BMP groups presented in Table 6-2.

The estimated total load reduction for each pollutant in a given catchment may be estimated as:

$$\Delta W_j = \sum_{n=88}^{i} A_i * W_{i,j} * \%_{reduction\ j}$$

Where:

ΔW_j	=	total change in load of pollutant *j*
A_i	=	area tributary to BMP *i*
$W_{i,j}$	=	unit area load of pollutant *j* tributary to BMP *i*
$\%_{reduction\ j}$	=	approximate average removal efficiency for pollutant *j*

Performed for the 88 potential project locations within the Roberts Creek subwatershed, for example, this analysis results in the pollutant load reduction estimates presented in Table 6-3. The corresponding cost is estimated using the present value (or annualized) cost averaged for the six BMP groups in Table 6-2 and multiplying by the total treated area in the Roberts Creek watershed tributary to the 88 potential BMP locations. For the purposes of developing planning level costs associated with these practices to be included in the implementation schedule (see Table 7-2), an additional 50% has been added to the cost estimates derived from the SAM documentation and presented in Table 6-2. The additional 50% is intended to account for engineering and design, permitting, maintenance, and other associated costs that are excluded from the cost values included in the SAM documentation (RESPEC, 2017).

Table 6-2 Summary of BMP pollutant removal efficiencies and unit costs

BMP Group	Specific BMP	Average TN Reduction	Average TP Reduction	Average Sediment Reduction	Annualized Cost per treated acre	Present Value Cost per treated acre
Nutrient Management	Nutrient Management	12%	8%	0%	$ 10.03	$ 85.52
	Nutrient Management and Manure Incorporation					
Tile Management	Alternative Tile Intakes	27%	27%	45%	$ 25.79	$ 219.95
	Controlled Tile Drainage					
Buffers & Filter Strips	Riparian Buffers, 16 ft wide (replacing row crops)	53%	55%	76%	$ 2.30	$ 19.65
	Riparian Buffers, 50 ft wide (replacing row crops)					
	Riparian Buffers, 100 ft wide (replacing row crops)					
	Riparian Buffers, 50 ft wide (replacing pasture)					
	Filter Strips, 50 ft wide (cropland field edge)					
Crop Management	Conservation Crop Rotation	49%	41%	74%	$ 68.43	$ 583.69
	Conservation Cover Perennials					
	Corn & Soybeans to Cover Crop					
	Short-Season Crops to Cover Crop					

	Corn & Soybeans to Rotational Grazing					
Till Practices	Reduced Tillage (30% + residue cover) Reduced Tillage (no till)	49%	44%	65%	$ 14.77	$ 125.95
WASCB	Water and Sediment Control Basin (cropland)	72%	75%	90%	$ 5.10	$ 43.47
Average		**~40%**	**~40%**	**~60%**	**$ 21.07**	**$ 179.70**

Notes: Pollutant removal efficiencies are averaged according to BMP Group based on Table 6-3 in SAM documentation (RESPEC, 2017); annualized costs are presented per impacted acre based on Table 5-1 in SAM documentation (RESPEC, 2017); present value costs assume a 10-year BMP life and 3% annual interest rate.

Table 6-3 Summary of estimated pollutant removal in the Roberts Creek subwatershed

Pollutant	Total Load to all potential BMPs[1]	Total Reduction	Reduction per BMP location
Total Nitrate	181,900 lbs/yr	72,800 lbs/yr	830 lbs/yr
Total Phosphorus	1,620 lbs/yr	650 lbs/yr	7.4 lbs/yr
Sediment	12,900 tons/yr	7,740 tons/yr	88 tons/yr

(1) Sediment loading based on SWAT model results; TN and TP loading based on HSPF model results

6.4.3 Establishing Field Scale Pollutant Load Reduction Goals for Subwatersheds

The methods described in Sections 6.4.1 and 6.4.2 provide estimates of pollutant loading, pollutant reduction, and associated cost averaged over a range of possible BMP types implemented at the locations identified in Figure 6-5. In practice, water quality improvement practices will not be implemented at all locations identified in Figure 6-5. Some potential BMP locations identified in Figure 6-5 may not be suitable for field practices, while additional projects may be identified at other locations with different pollutant loading and spatial characteristics. In addition, finite fiscal resources make it cost-prohibitive to implement practices at all locations within the 10-year life of this Plan.

Therefore, the Partners established pollutant reduction goals corresponding to the planned implementation of a given number of projects within each planning subwatershed. The number of planned projects is shown distributed among the planning area in item SWQ-1 of the Implementation Schedule (see Table 7-2). The corresponding pollutant load reduction goals are presented in Table 5-2. The number of projects planned for each planning subwatershed and timing of implementation are based on the determination of priority areas (see Section 6.2) and implementation budget (see Section 7.3).

6.4.4 Establishing Resource-specific Pollutant Load Reduction Goals

The methods described in Section 6.4.2 and Section 6.4.3 allow the Partners to estimate the potential pollutant reduction achieved by a BMP at the point of implementation. These reductions may be summed to estimate the total pollutant load reduction at field scale. However, this method may not accurately reflect the cumulative pollutant reduction achieved at a location downstream in (or beyond) the

catchment or planning subwatershed. Modeling tools that consider the spatial location of BMPs and flow routing are necessary to realistically estimate cumulative pollutant load reductions (and corresponding pollutant concentrations) in streams, lakes, and other resources located downstream of the implemented BMP(s).

6.4.4.1 Estimating Pollutant Reduction using HSPF-SAM

The Partnership used the HSPF-SAM watershed assessment tool to estimate the cumulative in-stream pollutant load reduction at the outlet of the 15 planning subwatersheds in the planning area. The HSPF-SAM tool allows the user to select the type of BMP, extent of implementation (e.g., acres, stream reach length) applied to each planning subwatershed to evaluate potential future implementation scenarios. Multiple BMPs may be applied to each planning subwatershed, and the user may adjust BMP treatment effectiveness if so desired.

At the planning level, the specific type and number of BMPs to be implemented is unknown. However, digital terrain analysis of the watershed was used to estimate an average treated area per potential BMP location for each planning subwatershed. The average treated area per BMP was multiplied by the number of planned BMPs in each planning subwatershed (see item SWQ-1 in Table 7-2) to determine the estimated area treated in each planning subwatershed over the 10-year Plan implementation period.

The inputs of HSPF-SAM were adjusted to replicate the total treated area (Note: the subwatersheds in the HSPF model are smaller-scale than the 15 planning subwatersheds; the total treated area in each planning subwatershed was subdivided proportionally among the corresponding subwatersheds in the HSPF model). A single BMP was applied to each HSPF subwatershed with treatment effectiveness equivalent to the average pollutant removal effectiveness presented in Table 6-2. The HSPF model was run for the estimated future condition and pollutant loading values were reported at the outlet of each of the 15 planning subwatersheds. These values were compared to model results reflective of the existing condition to determine the estimated reduction in pollutant loading. The resulting estimates of pollutant load reductions for total phosphorus, total suspended solids, and total nitrogen are presented in Table 5-3 under "10-year Plan Goals."

6.4.5 Tracking Pollutant Reduction Benefits through Implementation

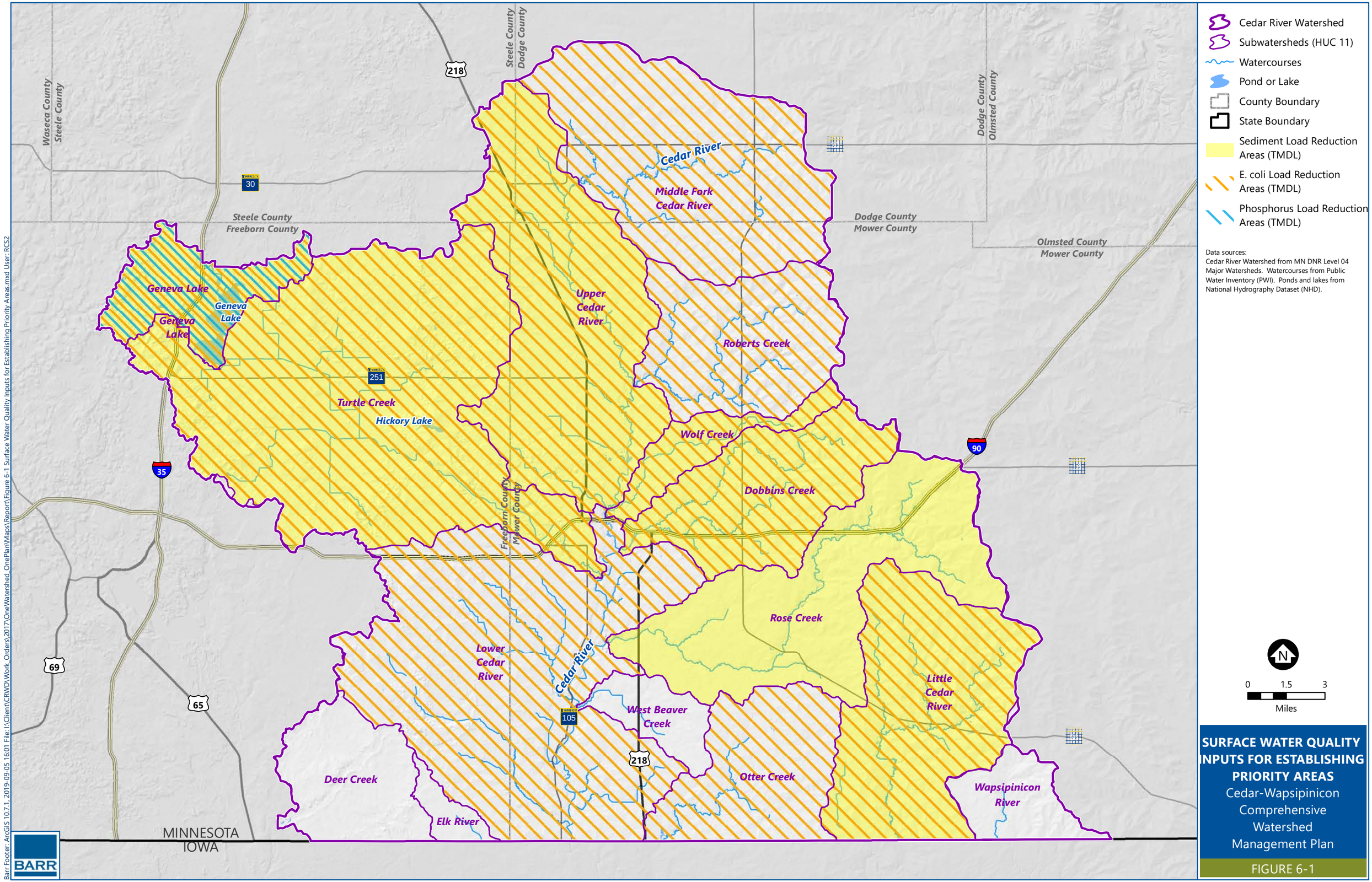
The methods described in Section 6.4.1 result in a tabular output for each planning subwatershed. The tabular output includes the following information for each proposed BMP location as a separate row within a spreadsheet:

- Drainage area (i.e., treated area)
- Sediment loading (tons/year)
- Total nitrogen loading (lbs/year)
- Total phosphorus loading (lbs/year)

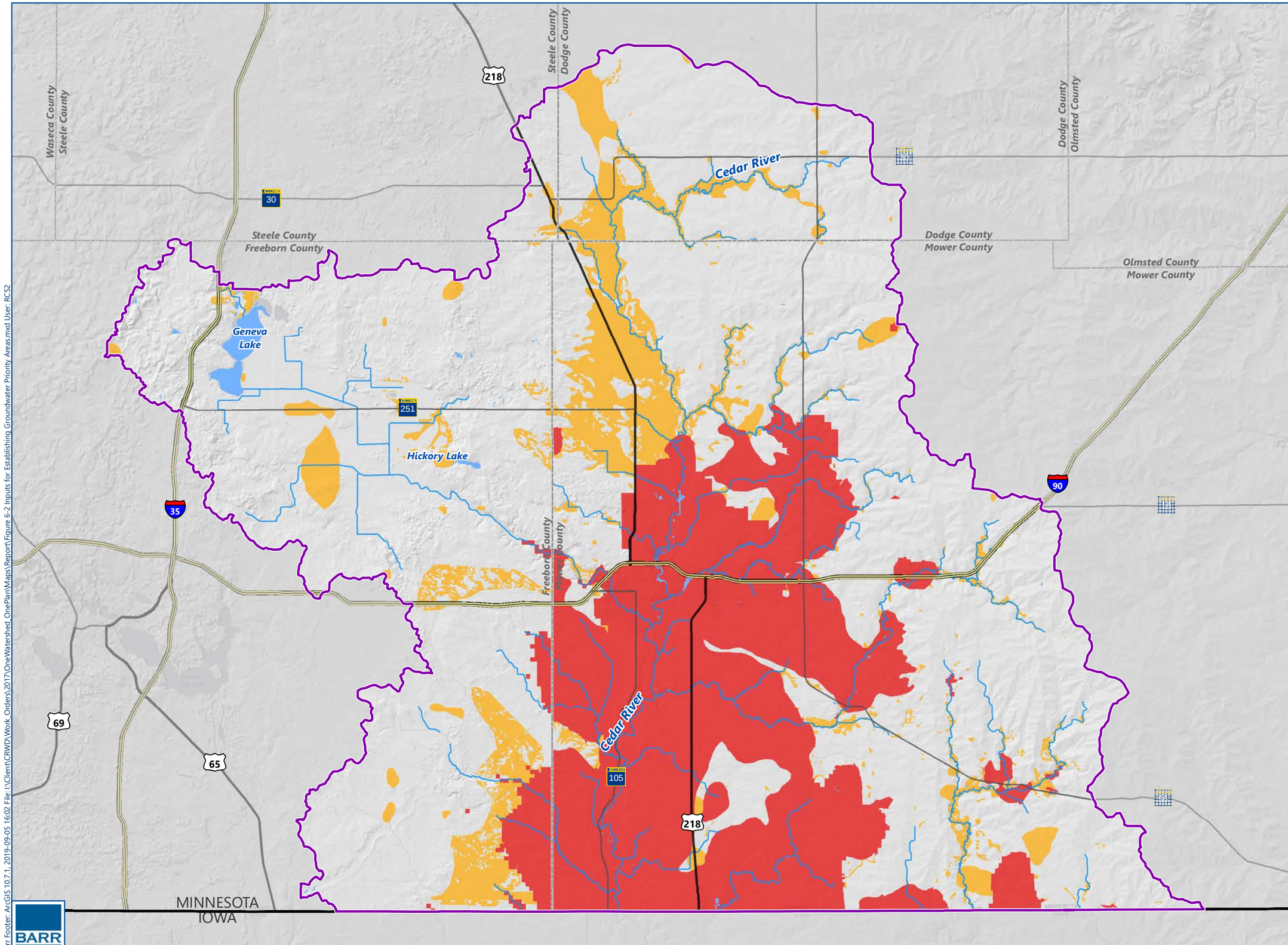
When a BMP is implemented, the user may select the specific BMP and associated pollutant reduction estimates (i.e., percent reduction relative to existing load) based on SAM documentation (i.e., Tables 6-1

through 6-3 in the Documentation of the BMP Database Available in the Scenario Application Manager (RESPEC, 2017), and summarized in Table 6-2 of this Plan), or enter user-defined pollutant reduction estimates based on case-specific considerations. The user may also enter an "effective treated area" that differs from the total drainage area based on site-specific BMP design. The spreadsheet will calculate the corresponding load reduction (i.e., mass/time) estimated for the BMP (based on existing field-scale load estimates from HSPF and/or SWAT modeling). The spreadsheet will sum the cumulative benefit of BMPs implemented at multiple locations throughout the planning subwatershed. The Partners may use this tool to track BMP implementation over time and compare the cumulative benefits to the field-scale pollutant reduction goals presented in Table 5-3.

State agencies may have interest in overall pollutant load reductions achieved by BMPs and pace of progress relative to surface water quality goals established for individual resources (e.g., Dobbins Creek). The Partnership will track project implementation (location, practice, estimated field-scale pollutant reduction) as projects are implemented. This data will be compiled approximately 5 years into Plan implementation to allow HSPF (or similar) water quality modeling to be performed to estimate cumulative in-resource pollutant reduction (and corresponding pace of progress towards meeting in-resource water quality goals). Cumulative pollutant reduction relative to TMDL goals will be assessed at the in-resource level. Modeling will be performed by an entity yet to be determined.



Barr Footer: ArcGIS 10.7.1, 2019-09-05 16:01 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 6-1 Surface Water Quality Inputs for Establishing Priority Areas.mxd User: RCS2



Cedar River Watershed
Watercourses
Pond or Lake
County Boundary
State Boundary

Groundwater Priority

High
Moderate

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds and lakes from National Hydrography Dataset (NHD). Composite Groundwater Sensitivity derived from publicly available data relating to depth to bedrock, DWSMA vulnerability, and karst geology. Data for pollution sensitivity of surface bedrock, near-surface materials, and deeper aquifers was also used.

N

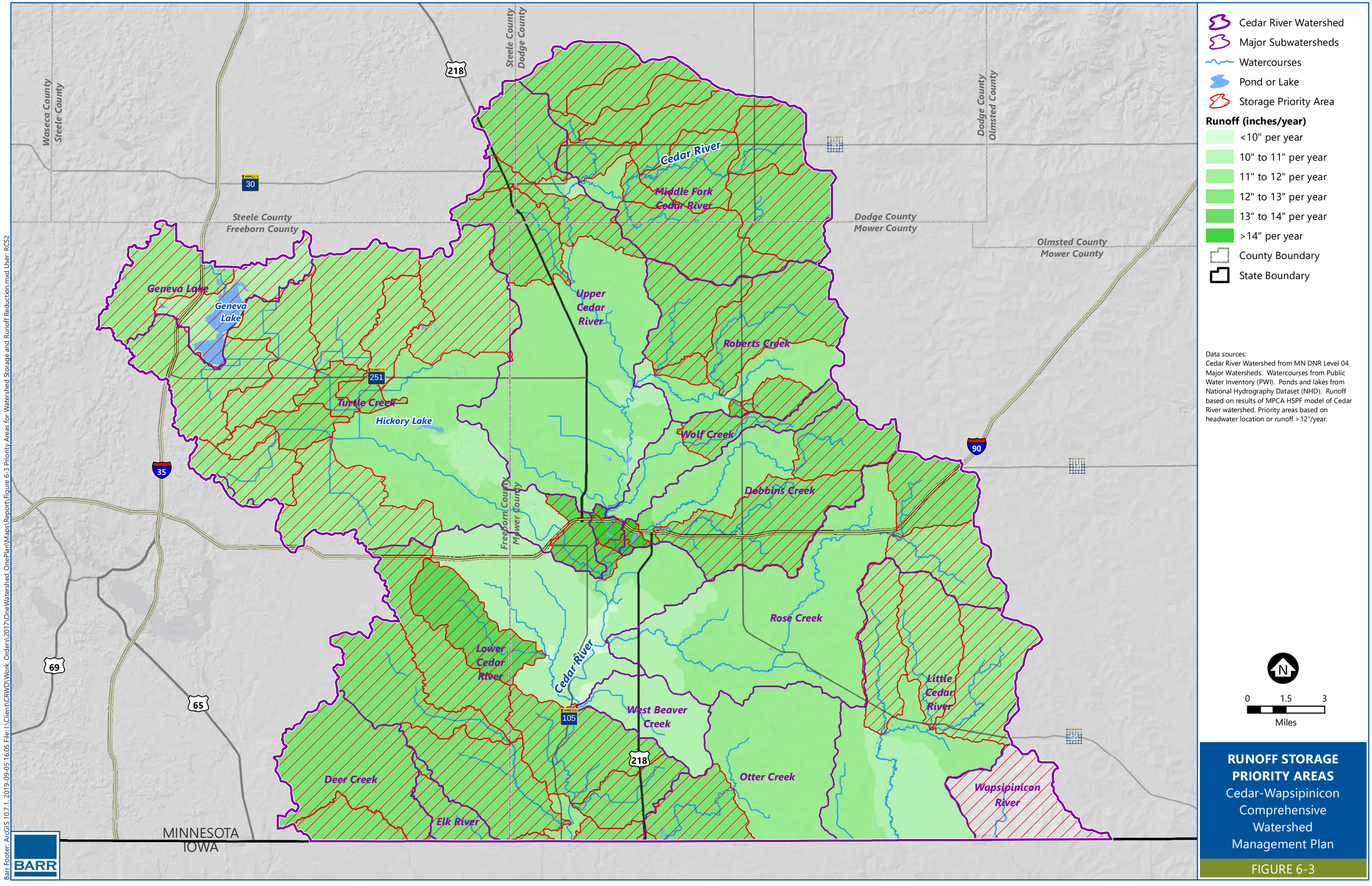
0 1.5 3
Miles

INPUTS FOR ESTABLISHING GROUNDWATER PRIORITY AREAS
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

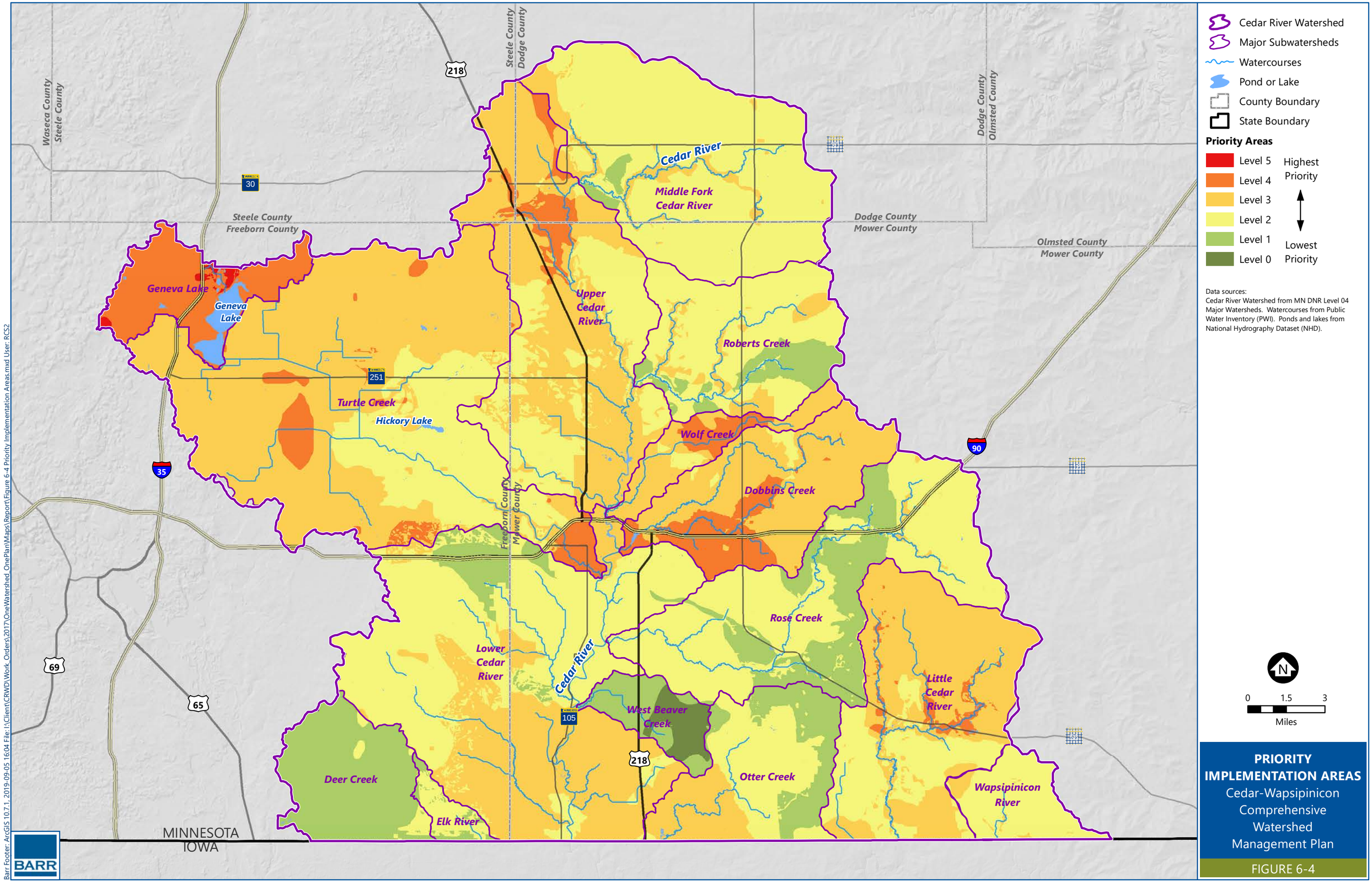
FIGURE 6-2

BARR

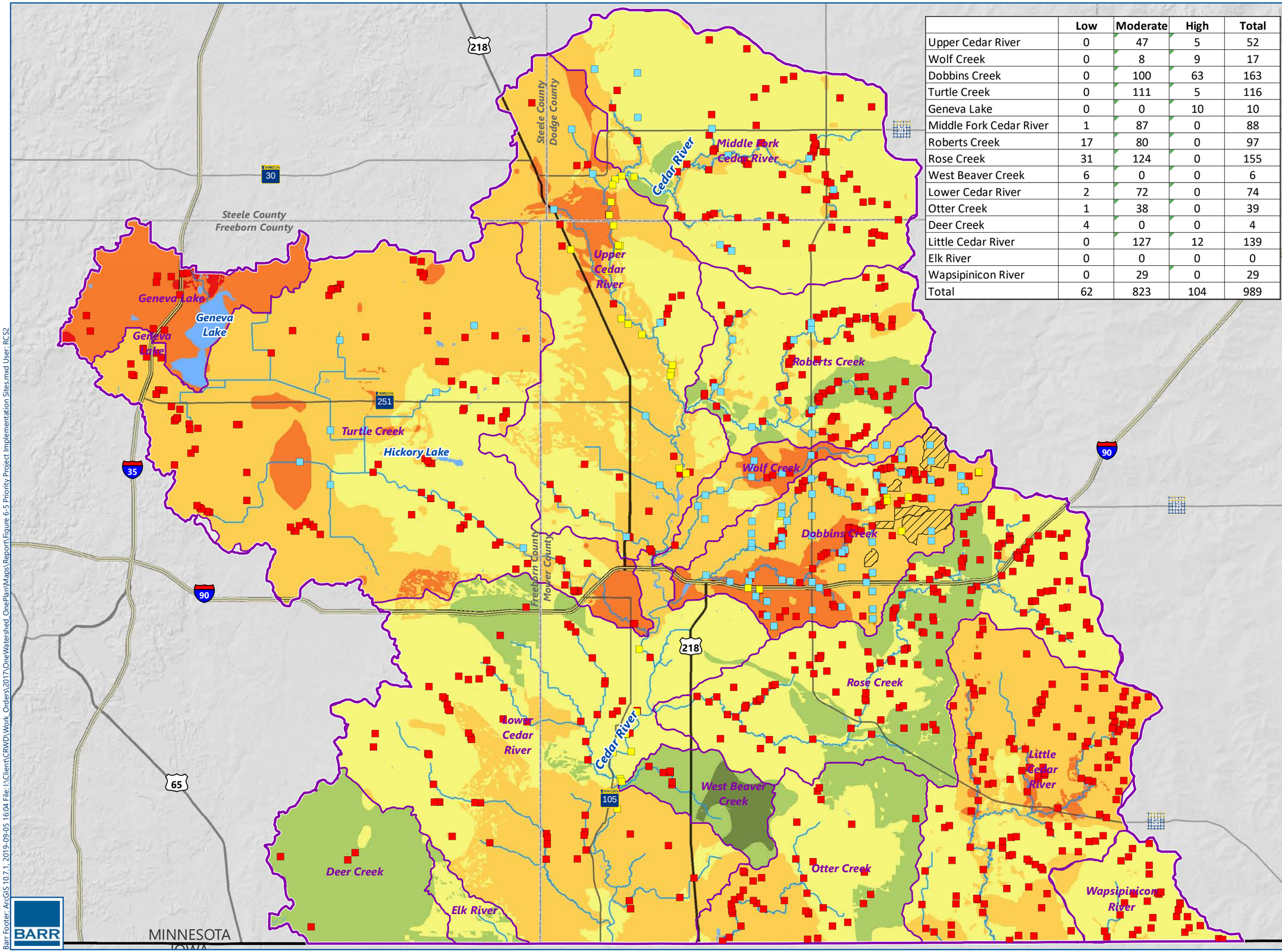
Barr Footer: ArcGIS 10.7.1, 2019-09-05 16:02 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 6-2 Inputs for Establishing Groundwater Priority Areas.mxd User: RCS2



Barr Footer: ArcGIS 10.7.1, 2019-09-05 16:05 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 6-3 Priority Areas for Watershed Storage and Runoff Reduction.mxd User: RCS2



Barr Footer: ArcGIS 10.7.1, 2019-09-05 16:04 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 6-4 Priority Implementation Areas.mxd User: RCS2



	Low	Moderate	High	Total
Upper Cedar River	0	47	5	52
Wolf Creek	0	8	9	17
Dobbins Creek	0	100	63	163
Turtle Creek	0	111	5	116
Geneva Lake	0	0	10	10
Middle Fork Cedar River	1	87	0	88
Roberts Creek	17	80	0	97
Rose Creek	31	124	0	155
West Beaver Creek	6	0	0	6
Lower Cedar River	2	72	0	74
Otter Creek	1	38	0	39
Deer Creek	4	0	0	4
Little Cedar River	0	127	12	139
Elk River	0	0	0	0
Wapsipinicon River	0	29	0	29
Total	62	823	104	989

- Cedar River Watershed
- Subwatersheds (HUC 11)
- Watercourses
- Pond or Lake
- County Boundary
- State Boundary
- Priority Projects (from SWAT)
- Priority Projects (CRWD 2015 CIP)
- Priority Projects (from H&H Study)
- CRWD 2020 projects

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds and lakes from National Hydrography Dataset (NHD).

N

0 1.5 3
Miles

PRIORITY PROJECT IMPLEMENTATION SITES
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 6-5

BARR

Barr Footer: ArcGIS 10.7.1, 2019-09-05 16:04 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 6-5 Priority Project Implementation Sites.mxd User: RCS2

Cedar River Watershed
Watercourses
Pond or Lake
Priority Project (from SWAT)
Potential Project Catchments

Existing Conservation Practices

Basin
Other
Filterstrip

Data sources:
Cedar River Watershed from MN DNR Level 04 Major Watersheds. Watercourses from Public Water Inventory (PWI). Ponds and lakes from National Hydrography Dataset (NHD).

N

0 500 1,000
Feet

DETAIL OF FIELD SCALE PRIORITY PROJECT LOCATION
Cedar-Wapsipinicon Comprehensive Watershed Management Plan

FIGURE 6-6

BARR

Barr Footer: ArcGIS 10.7.1, 2019-09-05 16:05 File: I:\Client\CRWD\Work_Orders\2017\OneWatershed_OnePlan\Maps\Report\Figure 6-6 Detail of Field Scale Priority Project Location.mxd User: RCS2

7.0 Implementation Programs

This section describes the Partners' implementation program. The implementation program is a combination of projects, studies, programs and practices intended to achieve the measurable goals described in Section 5.0. Recognizing that financial and staff resources limit the ability of the Partnership to completely address priority issues in the watershed (see Section 4.0), the Partnership prioritized and targeted (see Section 6.0) the implementation program described herein to achieve benefits consistent with the Partnership's locally-driven priorities and goals.

The activities and projects described in this Plan will be implemented through existing programs of the Partners. Programs and activities may be adjusted based on the associated funding source (see Section 7.3). Funding sources may have specific requirements that may dictate program requirements. The implementation MOA (see Appendix A) details the distribution of program funding and fiscal agency of the Partnership.

7.1 Implementation Schedule

The Plan implementation program is presented in Table 7-2. The activities included in the implementation program are intended to leverage the existing roles, capacities, and expertise of the Partners and provide a framework for the Partners to perform expanded roles to achieve Plan goals. Each activity in the implementation program is cross-referenced to one or more goals (see Table 5-2 and Table 5-3) that the activity is designed to support.

Activities included in Table 7-2 are assigned to the following four categories:

- Projects and project support
- Monitoring and studies
- Education and public involvement
- Regulation and administration

These categories are described in greater detail in the following sections. Information included in Table 7-2 includes:

Item ID – Each activity in the implementation schedule is assigned a unique alphanumeric identifier. The letters identify the primary priority issue (see Section 4.0) that the activity is intended to address.

Implementation Action Description – This field provides a brief description of the planned implementation activity.

Applicable Goals – Each activity is cross-referenced to one or more applicable Plan goals (see Table 5-2 and Table 5-3). Many activities address multiple Plan goals.

Priority Issues Addressed – These fields indicate whether the implementation activity directly (as indicated by "●") or indirectly (as indicated by "o") addresses each of the eight priority issues identified in Section 4.0. Many activities are intended to address multiple issue areas.

Target or Focus Area – This field identifies the physical area or resource for each implementation activity. Some activities are applicable watershed-wide. This field may reference targeting maps that identify priority project areas (Figure 6-4 and Figure 6-5).

Measurable Output – This field identifies how performance of the implementation activity will be measured. The unit may be based on a spatial measurement (e.g., feet of stream restoration) or actions performed (e.g., number of educational workshops).

Timeframe – These fields indicate when the implementation activity will be performed. The 10-year planning window is subdivided into 2-year periods. Where applicable, numbers corresponding to activity measurable outputs are included in each two year window (e.g., "20 projects in 2021-2022").

Estimated Total Cost – This field represents the total estimated cost (in 2018 dollars) to implement the activity over the 10-year planning window. This cost includes:

> **Estimated Local Contribution** – This field represents the portion of the total estimated cost (in 2018 dollars) borne by members of the Partnership.
>
> **Estimated External Contribution** – This field represents the portion of the total estimated cost (in 2018 dollars) estimated to come from external sources, including but not limited to: State funding, Federal funding, cost-share, and private partners.

Lead Local Governmental Unit (LGU) – This field designates the entity responsible for leading each activity. The lead LGU is limited to members of the Partnership. The lead LGU assumes responsibility to move the activity forward with assistance from cooperating entities, as needed.

Supporting Entities – This field identifies members of the Partnership and any State, Federal, or private entities that are anticipated to cooperate with the lead LGU in the completion of an activity. Supporting entities identified for an activity may not be limited to those included in Table 7-2.

7.1.1 Projects and Project Support

Activities in Table 7-2 categorized as "project and project support" represent approximately 90% of the overall Plan implementation costs (see Section 7.3). This category includes constructed improvements and field practices designed primarily to address issues related to surface water quality, groundwater quality, erosion and sedimentation, and flooding. This category also includes feasibility studies, planning, and design work necessary to design and construct these projects.

A significant portion of the implementation program is tied to activity SWQ-1:

Implement BMPs at very high priority and high priority sites identified through SWAT modeling and GIS terrain analyses (see Figure 6-5*) to reduce erosion and filter pollutants; specific BMPs to be determined based on site-specific feasibility, with target implementation by subwatershed as follows…*

Table 7-2 outlines the number of planned surface water quality projects planned for each of the 15 planning subwatersheds within the planning area. Information regarding the prioritization and estimation of costs and benefits for projects related to SWQ-1 is described in Section 6.4. Note that the planned number of projects to be implemented in each planning subwatershed is less than the number of potential project locations shown in Figure 6-5. Specific projects will be implemented locally by the Partners with consideration for local priorities, opportunities, and limitations. Many of the cost-share implementation contracts will be held with private landowners and the local entity to plan, develop, and install practices onto the land. These practices include traditional conservation practices that retain and control runoff to improve water quality. The watershed initiative accelerates the implementation of these practices and efficiently works with the entity that is sponsoring implementation in targeted locations. This method assures continuity with landowners and the traditional service model. Accelerated implementation will go through the sponsoring entity implementing the practice. Contracts will be held with the fiscal agent and subcontracted to the respective local entities.

Many of the projects included in the implementation schedule are cross referenced to activity SWQ-1. The Partners anticipate that many of the projects implemented as part of activity SWQ-1 will be **multi-benefit projects**. BMPs that provide benefits related to flooding, groundwater quality, soil health, and other concerns, in addition to directly addressing the issue of degraded surface water quality will be prioritized.

Other project and project support activities addressing Tier 1 priority issues included in Table 7-2 include:

- SWQ-2: Implement and/or expand cost share assistance programs to promote the use of BMPs focused on soil health (e.g., cover crops, conservation tillage - defined as no-till and strip-till)
- SWQ-3: Implement projects to reduce phosphorus and sediment loading in urban stormwater runoff (above and beyond current minimum requirements)
- SWQ-4: Provide financial assistance to implement animal waste management systems to reduce waste loading to streams
- SWQ-5: Meet with Partners to coordinate implementation of water quality and soil health best management practices (cross referenced to SWQ-1, SWQ-2, and SWQ-3)
- SWQ-11: Cooperate with agricultural producers to develop site-specific nutrient management plans
- SWQ-12: Cooperate with agricultural producers to develop site-specific manure management plans
- SWQ-15: Establish a 10-year CIP for planning area specific to the CRWD
- SWQ-16: Establish a 10-year CIP for planning area specific to the TCWD

- GWQ-1: Seal abandoned or unused private wells, with an emphasis on wells located within DWSMAs
- GWQ-2: Seal abandoned or unused high-capacity wells, with an emphasis on wells located within DWSMAs
- GWQ-3: Implement practices to reduce or limit nitrate movement into groundwater (e.g., nutrient management, cover crops, saturated buffers, two-stage ditches, wetland restoration) (cross-referenced to SWQ-1 and SWQ-2)
- GWQ-4: Provide financial assistance for repair, or replacement of non-functioning SSTS
- GWQ-5: Implement projects to provide adequate wastewater treatment to unsewered communities/areas.
- ESC-1: Implement projects to stabilize or restore degraded streambank areas (in addition to project sites identified in item SWQ-1)
- FLD-1: Implement projects to increase headwater storage and/or reduce peak flow rates at priority locations identified in planning subwatersheds
- FLD-2: Work with the City of Austin to identify remaining flood-prone areas and perform feasibility study to identify preferred solutions
- FLD-3: Provide cost-share or incentive program for residents to implement stormwater capture and reuse practices

Project and project support activities will be funded through a combination of local and external funds (see Section 7.3).

7.1.1.1 Multi-benefit Storage Program

The Cedar-Wapsipinicon planning area is an agriculture landscape that has drain tile and ditching that has been installed on approximately 90% of the agricultural land. This has resulted in a number resource changes over the years, resulting in the following impacts:

- Water quality degradation: Increased flows through the system result in overland flow runoff and high flows that erode streambanks and increase sediment loading to the stream.
- Water quantity impacts: Increased flows raise peak flows which impact road infrastructure and private land/property. This results in safety issues, which has caused a loss of life in the Cedar River Basin.
- Biological habitat degradation: Increased flows disrupt the biological habitat opportunities in the uplands and in the stream. The CRWD is working with MPCA to do intensive biological monitoring on Dobbins Creek watershed to measure the impact of storage on biological indicators such as bugs and macroinvertebrates.

Members of the Partnership have been working with partners to develop a program that addresses the multiple opportunities that storage related projects may have to improve the resource concerns listed above. The Partners support the development of storage projects that will provide an opportunity to develop criteria for targeting, design, and program administration (developed in the Cedar-Wapsipinicon planning area) to be replicated in other areas around the state.

7.1.2 Monitoring and Studies

Table 7-2 includes several implementation activities categorized as "monitoring and studies." These activities include those necessary to evaluate Plan progress and address data gaps related primarily to the Tier I issues of degraded surface water quality, groundwater contamination, and excessive flooding. Additionally, several activities address the Tier II issue of degraded soil health as these activities have direct and indirect benefits across a range of Tier I issues.

Information collected through monitoring and studies will be used to identify future, or modify current, Plan implementation activities and priorities. For example, water quality monitoring of resources not previously assessed (e.g., Wapsipinicon River, activity SWQ-9) may identify additional priority areas for project implementation (activity SWQ-1). Updates to watershed-wide hydrologic and hydraulic modeling (activity FLD-4) may identify preferred locations to implement flood risk reduction projects (activity FLD-1). Ongoing monitoring activities are also necessary to assess progress relative to Plan measurable goals. The Partnership will review available monitoring data as part of its biennial review to assess and evaluate Plan progress and to evaluate whether programmatic changes are needed.

Monitoring and study activities included in Table 7-2 will leverage past and present programs operated in the watershed. These include, but are not limited to:

- MPCA water quality monitoring and analyses:
  - Cedar River Total Maximum Daily Load (TMDL) study
  - Cedar River Watershed Restoration and Protection Strategies (WRAPS) study
  - Cedar River Watershed Assessment (2013)
  - Data collected/used in MPCA analyses include:
    - Water chemistry (chloride, DO, E. coli, nitrate + nitrite, TKN, temperature, TP, TSS)
    - Biological monitoring (fish and macroinvertebrate)
    - Fish contaminants (mercury and polychlorinated biphenyls (PCBs))
    - Flow monitoring
- MDH groundwater monitoring and analyses:
  - Groundwater Restoration and Protection Strategies (GRAPS)
- MDA/SWCD township private well water quality testing
- MDA Cedar River pesticide/water quality testing
- USGS/MDNR stream gaging
- CRWD monitoring of edge-of-field practices in Dobbins Creek subwatershed
- County/SWCD volunteer nitrate monitoring
- County septic/SSTS monitoring
- County well inspection/monitoring

Data collected as part of existing, new, and expanded monitoring will be used in support of other implementation tasks (e.g., implementation item GWQ-8: establishing trends in nitrate concentrations in wells).

Additional information about existing monitoring programs are described in Section 3.7. Monitoring locations are presented in Figure 3-16. Monitoring data collected within the watershed includes, generally:

- Surface water chemistry: nitrogen, phosphorus, TSS/turbidity, *E. coli*, fecal coliform
- Groundwater quality: nitrates, fecal coliform, arsenic, septic and well inspections
- Biological: invertebrate surveys (MIBI), fish surveys (FIBI), threatened species surveys
- Hydrologic: stream gaging, precipitation

Available monitoring data is available from the MPCA's Environmental Data Access (EDA). This data is derived from the MPCA, with input from some other entities, and is not a comprehensive database of all monitoring activity. The EDA database is available online at: https://www.pca.state.mn.us/quick-links/eda-surface-water-data

Monitoring and study activities are generally scheduled early in Plan implementation to maximize the benefit over the 10-year planning window. Monitoring and studies are anticipated to be funded primarily through local funds, due in part to limited State grant eligibility (see Section 7.3). The Partnership sees opportunities for greater coordination and alignment of state monitoring programs with local implementation priorities through the implementation of this Plan. . Current monitoring efforts are not reflective of the scale at which projects are being implemented within the planning area. The Partnership sees a need for surface and groundwater monitoring at scales that reflect BMP effectiveness. Groundwater monitoring may also be needed to demonstrate trends and better understand the dynamic of water quality locally. The State of Minnesota has an existing network of monitoring programs. These programs may need to be expanded to meet the local monitoring needs.

7.1.3 Education and Public Involvement

Table 7-2 includes implementation activities categorized as "education and public involvement." The Partners recognize that public awareness and support is necessary to successfully implement this Plan and achieve meaningful progress towards Plan goals. Public input was solicited at the initial public meeting hosted as part of Plan development. Additional stakeholder input received through a diverse Advisory Committee, including local residents and business owners, was considered throughout Plan development.

The education and public involvement activities in Table 7-2 are generally geared towards promoting soil, water, and natural resource stewardship through increased public understanding of priority issues and providing varying levels of technical assistance. Planned levels of engagement include:

- Site visits and site-specific technical assistance (e.g., nutrient management plans)
- Workshops (e.g., to promote implementation of soil health BMPs to agricultural producers)
- Demonstration projects/research sites
- Volunteer events (e.g., river clean-ups)
- Targeted mailings (e.g., information targeting owners of non-functioning SSTS)
- News articles/press releases (project- or initiative-specific)
- Educational flyers (e.g., information about vegetated buffers, groundwater conservation)

Plan implementation presents an opportunity to increase and optimize the existing education and public involvement roles of the Partners. The Partners will leverage existing relationships and public outreach methods as a foundation to implement the activities in Table 7-2, further developing capacity and methods through the assistance of cooperating entities and the targeting performed as part of this Plan. Existing education and public involvement programs include:

- Public presentations in schools
- Canoe-mobile
- Hormel Nature Center 7th grade "Water Day"
- Dodge County Expo
- County fair booths
- Enviro-thon
- Riverland Technical College Cover Crop 101 classes
- Field Days
- Workshops
- Citizen Advisory Committee
- Water Planning Committee
- Template education materials (e.g., information on vegetated buffers, groundwater conservation)
- Photo contest/social media engagement
- Annual reports

The Partner organizations will continue to coordinate with the Cedar River Watershed Partnership (CRWP) as it seeks to implement this Plan. The CRWP is a public-private-nonprofit collaboration that provides tools and resources to help farmers adopt farm management strategies that improve the soil, water and economic health of their farms and address water quality challenges in the watershed. The CRWP includes Environmental Initiative, Central Farm Service, Mower County SWCD, Land O' Lakes SUSTAIN, Hormel Foods and the MDA. The partnership engages with farmers, provides information and resources on improved farming strategies, and works with them to address water quality risks through achieving certification in the Minnesota Agricultural Water Quality Certification Program.

Template education and outreach materials will be developed for use within each County and be hosted online. Activities will be locally administered and implemented, with individual Partners tailoring administration to the particular needs of their jurisdictions.

7.1.4 Regulation and Administration

The priority concerns identified by the Partners and discussed in Section 4.0 are addressed in part through federal, state and local regulations. Table 7-2 includes implementation activities categorized as "regulation and administration." These activities include those actions related to the development and enforcement of rules, ordinances, or other official controls.

The activities included in Table 7-2 include those administered by the Partners and do not include State and Federal regulatory programs administered by others (e.g., MDNR administration of public waters

rules). Item ESC-4 is intended to capture the ongoing administration of existing State, Federal, or local regulatory programs that are administered at a local level by the Partners. These programs are summarized in Section 7.2.

7.2 Regulatory Roles and Responsibilities

State, Federal, and local entities implement regulatory programs, permit programs, and other official controls (e.g., ordinances) to manage select activities that may impact water and natural resources. In some cases, regulatory programs are designed at the State or Federal level but administered by local governmental units (e.g., Wetland Conservation Act). Programs applicable to the resources and issues addressed by this Plan (see Section 4.0) are summarized in the following sections. Note that this Plan does not include the authority to increase the regulatory responsibilities of any of the Partners.

7.2.1 Local Administration of Official Controls

The Partners locally administer several programs to regulate activities impacting water and natural resources. These programs include, but are not limited to, those described in the following subsections. Within their respective jurisdictions, the Partners implement and enforce various project reviews, permits, and approvals to ensure that development, redevelopment, and other land-disturbing activities are performed consistent with locally implemented controls. The regulatory roles of the Partners are summarized in Table 7-1.

Table 7-1 Summary of local regulatory authorities

Jurisdiction	Resource Regulation or Ordinance								
	Wetland Conservation Act	Stormwater Management	Shoreland Management	Floodplain Management	Subsurface Sewage Treatment Systems	Feedlots	State Buffer Law	Land Use /Zoning	Drainage Authority
City of Austin		X		X				X	
Dodge County	X		X	X	X		X	X	X
Dodge SWCD							X		
Freeborn County	X		X	X	X	X	X	X	X
Freeborn SWCD							X		
Mower County			X	X	X	X	X	X	X
Mower SWCD	X						X		X
Steele County			X	X	X	X	X	X	X
Steele SWCD	X						X		

Jurisdiction	Resource Regulation or Ordinance								
	Wetland Conservation Act	Stormwater Management	Shoreland Management	Floodplain Management	Subsurface Sewage Treatment Systems	Feedlots	State Buffer Law	Land Use /Zoning	Drainage Authority
Cedar River Watershed District		X		X					X*
Turtle Creek Watershed District				X			X		X

* The CRWD is the local drainage authority, but there are no applicable drainage systems within the CRWD jurisdiction.

7.2.1.1 Wetland Conservation Act

Wetlands in Minnesota are regulated under the Wetland Conservation Act (WCA) of 1991, which is intended to result in "no net loss" of wetlands. Anyone proposing to drain, fill, or excavate a wetland must first try to avoid disturbing the wetland; second, try to minimize any impact on the wetland; and, finally, replace any lost wetland acres, functions, and values. Certain wetland activities are exempt from the act, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

Within the planning area, the Dodge County, Freeborn County, Mower SWCD, and Steele SWCD serve as the local government units (LGUs) that implement the WCA locally. The Minnesota Board of Water and Soil Resources (BWSR) administers the WCA statewide, and the MDNR enforces the WCA.

7.2.1.2 Buffers and Soil Loss

The State of Minnesota passed the Buffer and Soil Loss Legislation (Minnesota Statute 2014, section 103B.101) in 2015; this legislation is commonly referred to as the Minnesota Buffer Law. The statute requires a continuous buffer of perennial vegetation with a 50-foot average width and 30-foot minimum width around all public waters and a 16.5-foot minimum width continuous buffer of perennial vegetation along all public drainage systems.

Within the planning area, the SWCDs are tasked with implementing and assessing compliance with the buffer legislation and applicable city ordinances. SWCDs provide technical assistance, along with financial assistance options, for landowners to implement buffers. Landowners also have the option of working with their local SWCD to determine if alternative practices aimed at protecting water quality can be used, rather than a buffer.

7.2.1.3 Shoreland Management

The State of Minnesota established shoreland rules (MN Rules 6120.2500 - 6120.3900) to regulate land use and development of shoreland areas. These rules establish minimum standards to protect habitat and

water quality and preserve property values. The rules include zoning provisions that require a 50-foot buffer around public waters and include structure height limits, impervious surface limits, lot requirements, and vegetation removal guidance. Permits are required from the local unit of government for intensive vegetation removal and excavations occurring in shoreland overlay areas.

These standards are implemented through local shoreland ordinances. Within the planning area, shoreland regulation is implemented through County zoning ordinances. The MDNR's role is to ensure that local shoreland ordinances comply with the state shoreland rules and to provide technical assistance and oversight to these local governments.

7.2.1.4 Floodplain Management

Within the planning area, local governmental units regulate development and land disturbing activities within the floodplain to minimize risk to infrastructure, property, and health and safety resulting from flood events. Floodplain regulations are generally included as part of City and County zoning ordinances or watershed district rules and may apply to FEMA-designated floodplains (see Section 3.9.1) or floodplain areas designated by local entities (e.g., City of Austin, CRWD).

Floodplain ordinances require, at a minimum, that minimum building elevations (i.e., lowest floor) be at least 1 foot above the 100-year water surface elevations (this elevation is known as the regulatory flood protection elevation). Floodplain ordinances also prohibit or limit allowable land use and development within the floodplain. Some local units of government implement higher standards than the minimums required.

The CRWD implements a floodplain rule in addition to County and City regulations. Within the jurisdiction of the CRWD, a permit is required from the CRWD for 1) alteration or filling of land below the projected 100 year high water elevation of a waterbody or detention area, or 2) construction of a structure with a low floor elevation lower than the 100 year floodplain.

7.2.1.5 Subsurface Sewage Treatment Systems (SSTS)

At the State level, the Minnesota Pollution Control Agency administers programs regulating the design, construction, and maintenance of subsurface sewage treatment system (SSTS) through MN Rules 7080 – 7083 (see Section 7.2.2.5). Locally, the Counties administer SSTS programs consistent with MN Rules 7080 – 7083, including an inspection program. County programs provide technical assistance, education, plan review, and SSTS inspections to protect water quality, prevent and control water-borne diseases, and prevent or eliminate nuisance conditions.

The Partners will prioritize activities to address SSTS systems classified as imminent health threats (IHTs) above activities to respond to non-compliant systems not classified as IHTs. An SSTS may be classified as an IHT if there is (1) sewage discharge to surface water; (2) sewage discharge to ground surface; (3) sewage backup; or (4) any other situation with the potential to immediately and adversely affect or threaten public health or safety. The Partners will continue to work towards compliance of all systems, as resources allow.

7.2.1.6 Well Management and Wellhead Protection

Through its Well Management Program, the MDH administers and enforces the Minnesota Water Well Code, which regulates activities such as well abandonment and installation of new wells (see Section 7.2.2.5). The MDH also administers the Wellhead Protection Program, which is aimed at preventing contaminants from entering public water supply wells. Cities within the planning area have completed or will be completing wellhead protection plans consistent with MDH guidance (see Table 3-5).

Well maintenance is an important aspect of protecting wells from contamination. Examples of well maintenance protection include: proper installation, well caps, and inventory and location of private wells. Sealing wells that are unused or vulnerable is also an important part of protecting groundwater and managing a well network.

7.2.1.7 Feedlots

Minnesota Rules 7020 establishes rules, regulations, and programs applicable to feedlots. At the State level, feedlot regulations and programs are administered by the MPCA. Within the planning area, Freeborn County, Mower County, and Steele County serve as delegated partners to the MPCA to provide feedlot regulatory oversight, implement technical assistance programs, and maintain a feedlot inventory within their respective jurisdictions. Within Dodge County, Minnesota Rules 7020 is administered by the MPCA.

7.2.1.8 Stormwater Runoff and Erosion Control

Stormwater management and erosion control for land disturbing activities of an area one acre or more are regulated at the State level by the MPCA's construction stormwater permit (see Section 7.2.2.4). Additionally, land disturbing activity above or below the MPCA threshold may be subject to local stormwater management and erosion control requirements enforced via City or County ordinance. The City of Austin maintains a stormwater management ordinance. The TCWD and CRWD also implement project review and permit programs that address stormwater runoff and erosion control (see Section 7.2.1.11)

7.2.1.9 Drainage Management

Activities affecting public drainage systems (i.e., public ditches) are subject to Minnesota Statutes 103E and fall under the jurisdiction of a local drainage authority (e.g., county, watershed district). Generally, the counties maintain jurisdiction over the ditches. Within the planning area, drainage authorities include:

- Dodge County
- Freeborn County
- Mower County
- Steele County
- Turtle Creek Watershed District

The Partnership includes all drainage authorities within the planning area. As part of their respective roles in overseeing public drainage system, each drainage authority will seek to ensure that proposed

modifications and improvements to public drainage systems are consistent with the goals of this Plan, including increased storage.

Through the drainage authorities, the Partnership will consider opportunities to coordinate Plan implementation activities with drainage improvements, leveraging programs like BWSR's multipurpose drainage management grants. This non-local source of public funding could enhance a project, with on-system BMPs (e.g., alternative side inlets) with off-system (cover crops, tillage), wetland treatment/storage systems, or modified channel design. A coordinated plan for public drainage systems within the planning area (see implementation item FLD-7) will promote drainage system improvements with multiple benefits. When working on these for public drainage system projects, the drainage authorities know it is important to consider the timing element, especially for synching-up effort with the multi-purpose drainage grant program. The Partnership will offer technical and financial assistance for private ditch construction consistent with the goals of this Plan, including increased storage.

For any new ditches or ditch improvements, the land adjacent to public ditches is required by the MDNR to include a buffer strip of permanent vegetation that is usually 1-rod (16.5 feet) wide on each side (Minnesota Statutes, Section 103E.021). Additional information regarding public drainage systems are included in Section 3.6.3.

7.2.1.10 Land Use Planning

Counties and Cities within the planning area regulate the development and redevelopment of land through land use planning and zoning. Land use planning is necessary to balance economic development with appropriate management of natural resources. Land use regulations are typically implemented through zoning ordinances.

Among the Partners, each County and the City of Austin maintain zoning ordinances to regulate land use and development with consideration for natural resources (see Table 7-1). Each Partner zoning ordinance includes additional development and land disturbance requirements applicable to shoreland and floodplain areas, including:

- Restrictions on permitted land uses
- Requirements for permanent vegetation
- Minimum setbacks from the OHWL of lakes and rivers for structures and SSTS
- Minimum building elevations relative to flood water levels
- Maximum allowable percent impervious surface
- Requirements for stormwater outfalls to public waters (except Mower County)

Cities and townships within the planning area have individual authority with respect to zoning and land use planning. Cities within the planning area that regulate land development through their own planning and/or zoning ordinances include:

- Adams (Mower County)
- Brownsdale (Mower County)

- Hayfield (Dodge County)
- Lyle (Mower County)

City and township land use planning and zoning requirements must be at least as restrictive as County ordinances. Cities without land use planning guidance may rely on County ordinances for guidance.

Land use planning and development present opportunities for the Partners to implement activities in pursuit of Plan goals, both within their jurisdiction and in coordination with the cities that have adopted their own land use planning requirements. Examples may include ensuring compliance with shoreland zoning requirements to limit the potential for future erosion issues or minimizing impervious area to reduce stormwater runoff volumes.

As part of Plan implementation, the Partners will review existing ordinances and suggest revisions to minimize impacts to water and natural resources (see Table 7-2). The Partners will continue to offer technical assistance related to land use planning and development project review, as requested by local jurisdictions. The Partners will seek opportunities to collaborate with local jurisdictions as they amend, update, or adopt local land use controls.

7.2.1.11 Watershed District Rules and Permit Programs

Per the authority given to watershed districts in Minnesota Statutes 103D, the CRWD and TCWD have adopted rules applicable within their respective jurisdictions. The CRWD and TCWD enforce their rules through project review and permit programs. CRWD and TCWD Rules are summarized in this section, but shall be maintained and updated by the respective watershed districts as separate documents outside of this Plan.

TCWD Rules

The TCWD Rules (2004, as amended) require a permit issued by the TCWD for proposed projects meeting any of the following criteria:

- The plans include a parcel greater than 2.5 acres for industrial, commercial, or multi-family residential land development.
- The project may affect a wetland (filling, excavation, drainage).
- The proposed activity involves altering or manipulating an existing public or private drainage system (open ditch and/or tile system) greater than 500 feet in length.
- The project involves constructing or installing a new open ditch or tile drainage system
- The project involves installation and/or removal of a pump station.
- Work in any watercourse or water basin, whether or not water is present at the time of work; including but not limited to excavation, filling, dredging and the placement of structures of any type.
- Work in the right of way of any public drainage system.
- Operation or alteration of any water control structure in any watercourse or water basin.

- Diversion of water into a different sub-watershed or into a public drainage system from land not assessed for the system.
- Installation of new storm sewers, culverts or bridges, or replacement of existing storm sewers culverts or bridges with structures having a greater flow capacity.
- Any other act that, as judged by the Managers, may have a significant impact on the District's water resources.

Additional information is available from the TCWD at: https://turtlecreekwd.org/

CRWD Rules

The CRWD Rules (amended 2019) require project review and, in some cases, a permit issued by the CRWD. CRWD review is required for projects addressing the following:

- **Stormwater (Rule 4)** – A review of the MPCA, NPDES Application and is required for any development of property or a series of projects in close proximity resulting in the creation of one acre or more of Impervious Surface ("Impervious Surface Property"). Within 5 days of submitting the MPCA, NPDES application to MPCA, the applicant must submit a copy of the application to the District for review. A copy of the approved permit must be submitted to the CRWD office.
- **Erosion Control (Rule 8)** – No CRWD-issued permits are required, but the following conditions must be met:
    - Land disturbing activities greater than one acre must submit copies of MPCA stormwater permit applications including erosion and stormwater runoff control plans. Before work begins, the District must have an opportunity to review and comment on plans.
    - All land disturbing activities less than one acre and greater than 2500 square feet are required to have erosion and sediment control best management practices in place. See rules for list of best management practices.
    - Agricultural land within the District must control erosion to rates no greater than soil loss tolerances as defined by NRCS /RUSLE 2.

The CRWD requires permits for activities meeting any of following criteria:

- **Drainage (Rule 5)** – A permit is required for:
    - Cleaning a ditch (public or private) including trees, shrubs and sediment.
    - Construction, reconstruction or laying of any bridge or culvert (driveway culverts may not require a permit; project proposers should contact the office to clarify).
    - Improvements, "enlarging, extending, straightening, or deepening of existing Open Ditch or Public Drainage System."
- **Floodplain (Rule 6)** – A permit is required for:
    - Alteration or filling of land below the projected 100-year high water elevation of a waterbody or detention area.
    - Construction of a structure with a low floor elevation lower than the 100-year floodplain. Floodplain line is defined by FEMA or another source as acceptable to the CRWD.

- **Waterbody Alterations (Rule 7)** – A permit is required for:
    - Intentional flooding of land, enlarging a wetland or other Waterbody by means of diversion, detention or impoundment.
    - Constructing, installing, or altering of a Water Control Structure in any Waterbody.
    - Diverting water into a different Hydrological Unit.

Additional information is available from the CRWD at: https://www.cedarriverwd.org/

7.2.2 State and Federal Agency Responsibilities

Various units of state and federal government are involved in regulating water and natural resource management within the Planning area. The roles of these agencies are described in this section.

7.2.2.1 Minnesota Department of Natural Resources (MDNR)

The MDNR Division of Ecological and Water Resources manages water resources through a variety of programs related to lakes, rivers and streams, watersheds, wetlands, groundwater, and climate. The MDNR Waters administers the Public Waters Work Permit Program, the Water Use (Appropriations) Permit Program, and the Dam Safety Permit Program. MDNR Fisheries administers the Aquatic Plant Management Program and other fishery related permits. The MDNR supports the WCA by providing technical and coordination assistance and by providing recommendations in the development of state wetland regulations, programs, and policies. The MDNR's shoreland program provides technical assistance to local governments in the adoption of shoreland ordinance controls and comments on land use applications with shoreland districts. The MDNR also has model shoreland ordinances that cities and counties can adopt.

Public Waters

The MDNR's Public Waters Work Permit Program (Minnesota Statutes 103G) requires an MDNR permit for any work below the Ordinary High Water Level (OHWL) or any work that will alter or diminish the course, current, or cross-section of any protected water, including lakes, wetlands and streams. For lakes and wetlands, the MDNR's jurisdiction extends to designated U.S. Fish and Wildlife Service Circular #39 Types 3, 4, and 5 wetlands which are 10 acres or more in size in unincorporated areas, or 2.5 acres or more in size in incorporated areas. The program prohibits most filling of public waters and public waters wetlands for the purpose of creating upland areas. The Public Waters Work Permit Program was amended in 2000 to minimize overlapping jurisdiction with the WCA. Under certain conditions, work can be performed below the OHWL without a Public Waters Work Permit. Examples include docks, watercraft lifts, beach sand blankets, ice ridge removal/grading, riprap, and shoreline restoration. The MDNR public waters in the planning areas are shown in Figure 3-14.

Water Appropriations and Transport

The MDNR regulates surface water and groundwater usage rate and volume as part of its charge to conserve and use the waters of the state. Water appropriations are regulated under Minnesota Rule 6115.0620. Generally, all appropriations of more than 10,000 gallons per day, or one million gallons per

year, including construction dewatering, flood control, emptying storm water ponds for maintenance, and stormwater use for irrigation, need to be approved under a MDNR water appropriation permit. Appropriation permits from the MDNR are not required for domestic uses serving less than 25 persons for general residential purposes. An additional permit is required to appropriate or transport water from waters designated as infested with invasive species, regardless of the volume appropriated or transported.

Groundwater

In addition to regulating appropriations from groundwater, the MDNR is also responsible for mapping sensitive groundwater areas, conducting groundwater investigations, addressing well-interference problems, and maintaining the observation well network.

Dam Safety

The MDNR administers the state's Dam Safety Program (MN Rules 6115.0300 – 6115.0520), which applies to all impoundments that pose a potential threat to public safety or property. Dams 6 feet or lower in height and dams that impound 15 acre-feet or less of water are exempt from the rules. Dams less than 25 feet high that impound less than 50 acre-feet of water are also exempt, unless there is a potential for loss of life. The dam safety rules require that the downstream impacts of a dam failure be analyzed under high-flow conditions (i.e., greater than a 100-year flood).

Other Regulations

In addition to permit programs, the MDNR oversees the Floodplain Management Program, the Public Waters Inventory Program, the Shoreland Management Program, the Flood Damage Reduction Grant Program, the Wild and Scenic Rivers Program, various surface and groundwater monitoring programs, and the Climatology Program.

Questions concerning the MDNR's role in water resource management should be directed to the MDNR Division of Ecology and Water Resources, Metro Region, 1200 Warner Road, St. Paul, MN 55106 (651-259-5774). More information is available at the MDNR website: http://www.dnr.state.mn.us.

7.2.2.2 Minnesota Department of Agriculture (MDA)

The Minnesota Department of Agriculture (MDA) is the lead agency for all aspects of pesticide and fertilizer environmental and regulatory functions as directed in the Groundwater Protection Act (Minnesota Statute 103H). These include but are not limited to the following:

- Serve as lead agency for groundwater contamination from pesticide and fertilizer nonpoint source pollution
- Conduct monitoring and assessment of agricultural chemicals (pesticides and nitrates) in ground and surface waters
- Oversee agricultural chemical remediation sites and incident response
- Regulate use, storage, handling and disposal of pesticides and fertilizer

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

The MDA also administers the Minnesota Agricultural Water Quality Certification Program (MAWQCP). MAWQCP is a voluntary opportunity for farmers and agricultural landowners to take the lead in implementing conservation practices that protect water resources. Those who implement and maintain approved farm management practices will be certified and in turn obtain regulatory certainty for a period of ten years and receive priority for technical assistance to implement practices that promote water quality.

Beginning in 2020, the MDA will oversee implementation of the Groundwater Protection Rule, adopted by the Minnesota Legislature in 2019. The rule will restrict application of fertilizer in areas of the state where soils are prone to leaching and where drinking water supplies are threatened (as defined by the MDA). The Partnership will consider the rule in future updates to this Plan.

Questions concerning MDA's role in water resource management should be directed to the Minnesota Department of Agriculture, 625 Robert Street North, St. Paul, MN 55155 (651-201-6000). More information is available at the MDA website: https://www.mda.state.mn.us/

7.2.2.3 Minnesota Board of Water and Soil Resources (BWSR)

BWSR oversees the state's watershed management organizations (joint powers, county and watershed district organizations), oversees the state's Soil and Water Conservation Districts (SWCDs), and administers the rules for the WCA and metropolitan area watershed management. BWSR, in cooperation with the MDNR and soil and water conservation districts, administers the statewide buffer rule (MN Statutes 103F.48) which establishes minimum buffer requirements for certain public waters. BWSR also administers the Clean Water Fund (CWF) grant program, funded by the Clean Water Land and Legacy amendment passed in 2008. The purpose of the CWF is to protect, enhance, and restore water quality in lakes, rivers, and streams and to protect groundwater and drinking water sources from degradation. Applicants eligible for CWF grants include counties, watershed districts, watershed management organizations, soil and water conservation districts, and cities working under a current BWSR-approved and locally adopted local water management plan.

Questions concerning BWSR's role in water resource management should be directed to the Minnesota Board of Water and Soil Resources, 520 Lafayette Road North, St. Paul, MN 55107 (651-296-3767). More information is available at the BWSR website: http://www.bwsr.state.mn.us.

7.2.2.4 Minnesota Pollution Control Agency (MPCA)

The MPCA administers the State Discharge System/National Pollutant Discharge Elimination System (NPDES) Permit program (point source discharges of wastewater), the NPDES General Stormwater Permit for Construction Activity, the NPDES General Industrial Stormwater Permit Program, the NPDES Storm Water Permit program, and the individual sewage treatment system regulations (7080 Rules). The MPCA also reports the state's "impaired waters" to the U.S. Environmental Protection Agency. Spills should be reported directly to the MPCA.

The MPCA administers and enforces laws relating to pollution of the state's waters, including groundwater. The MPCA monitors ambient groundwater quality and administers subsurface sewage treatment system (SSTS) design and maintenance standards. The MPCA is responsible for administering the programs regulating construction and reconstruction of SSTS. The MPCA requires an inspection program for SSTS that meets MPCA standards. Minnesota Rules 7080 govern administration and enforcement of new and existing SSTS. The Tanks and Spills Section of the MPCA regulates the use, registration, and site cleanup of underground and above-ground storage tanks.

The MPCA resumed selective administration of Section 401 of the Clean Water Act Water Quality Certification program in 2007. The program is primarily administered by the U.S. Army Corps of Engineers (USACE). Section 401 Certification is required to obtain a federal permit for any activity that will result in a discharge to navigable waters of the United States. Formal applications for 401 Certification must be sent to the MPCA.

Construction Stormwater Permitting

Proposers of construction activity disturbing more than 1 acre of soil (or less than 1 acre if that activity is part of a larger common plan of development or sale that is more than 1 acre) must also obtain permit coverage. The NPDES General Stormwater Permit for Construction Activity (construction stormwater permit), which went into effect in 2003, regulates discharges of stormwater affected by construction activity to waters of the state. The MPCA updated the construction stormwater permit in 2013. A key permit requirement is the development and implementation of a stormwater pollution prevention plan (SWPPP) with appropriate best management practices (BMPs). The SWPPP must be a combination of narrative and plan sheets that address foreseeable conditions, include a description of the construction activity, and address design requirements including temporary and permanent BMPs to control the discharge of stormwater, sediment, and/or other potential pollutants from the site. The project's plans and

specifications must incorporate the SWPPP before applying for NPDES permit coverage. The permittee must also ensure final stabilization of the site, which includes final stabilization of individual building lots.

The SWPPP must address the following construction activity requirements (from Section IV of the construction stormwater permit):

- Temporary and permanent erosion prevention practices
- Sediment control practices
- Dewatering and basin draining
- Inspections and maintenance
- Pollution prevention management measures
- Final stabilization

A significant change in the 2013 update of the construction stormwater permit is the inclusion of a volume control requirement. For projects that replace vegetation or other pervious surfaces with 1 or more acres of cumulative impervious surface, the permittee must retain on-site a volume of stormwater equal to 1 inch of runoff over the new impervious surface. In situations where infiltration is prohibited, the construction stormwater permit requires stormwater treatment using wet ponds, filtration, regional ponding, or other equivalent methods.

Municipal Separate Storm Sewer System (MS4) Permitting

The federal Clean Water Act (CWA) established the National Pollutant Discharge Elimination System (NPDES) to regulate point sources of pollution, with the MPCA as the delegated permitting authority. This program was later expanded to include both point and non-point sources of pollution, including the regulation of stormwater runoff, and created a two-phase comprehensive national program to address stormwater runoff. After its initial implementation, the program was expanded to include construction sites, municipally owned or operated industrial activities, and municipalities with populations over 10,0000 (MS4s).

In 2013, the MPCA reissued the MS4 General Permit. The permit focus shifts from permit program development to increasing emphasis on measured progress and beginning some of the implementation measures. Some of the requirements of the reissued MS4 permit include:

- More stringent construction related erosion control
- Post-construction controls to reduce volume, total phosphorus, and total suspended solids
- Documented enforcement response procedures
- Submittal of additional information on all stormwater ponds and outfalls
- Inventories of municipal facilities that could contribute pollutants to stormwater discharges

The City of Austin is the only City in the planning area required to maintain an MS4 permit from the MPCA. As part of the permit program, the City must annually submit an MS4 report to the MPCA.

More information about the MPCA's stormwater program can be found at the MPCA's website: http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/index.html.

Impaired waters and Total Maximum Daily Loads (TMDLs)

In administering the CWA in Minnesota, the MPCA also maintains a list of impaired waters (see also Section 3.7). The CWA requires the development of a total maximum daily load (TMDL) study for impaired waterbodies. A TMDL is a threshold calculation of the amount of a pollutant that a waterbody can receive and still meet water quality standards. A TMDL establishes the pollutant loading capacity within a waterbody and develops an allocation scheme amongst the various contributors, which include point sources, non-point sources, and natural background levels, as well as a margin of safety. As a part of the allocation scheme a waste load allocation (WLA) is developed to determine allowable pollutant loadings from individual point sources (including loads from storm sewer networks). A load allocation (LA) establishes allowable pollutant loadings from non-point sources and natural background levels in a waterbody.

A watershed restoration and protection strategy (WRAPS) is similar to a TMDL and may examine other waterbodies in the watershed in addition to impaired waterbodies. Both TMDLs and WRAPSs may result in implementation plans to address water quality issues of the affected waterbodies. The MPCA completed TMDL and WRAPS studies for the Cedar River watershed in 2019 (see also Section 3.7) and is currently completing a WRAPS for the Wapsipinicon River watershed.

Guidance for Dredged Materials

The MPCA considers material excavated below the OHW level of waterbasins, watercourses, public waters, or public waters wetlands (as defined by Minnesota Statutes 103G.005) to be dredged material. Dredged material is defined as waste and regulated by the MPCA. The MPCA provides guidance for the management of dredged material on its website: http://www.pca.state.mn.us/index.php/water/water-types-and-programs/wastewater/dredged-materials-management.html.

More information is available at the MPCA website: http://www.pca.state.mn.us.

7.2.2.5 Minnesota Department of Health (MDH)

The MDH is the official state agency responsible for addressing all public health matters, including drinking water protection. The MDH administers the Well Management Program, the Wellhead Protection Program, and the Safe Drinking Water Act rules. The MDH also issues fish consumption advisories. The MDH is responsible for ensuring safe drinking water sources and limiting public exposure to contaminants. Through implementation of the federal Safe Drinking Water Act, the MDH conducts the Public Water Supply Program, which allows the MDH to monitor groundwater quality and train water supply system operators. The 1996 amendments to the federal Safe Drinking Water Act require the MDH to prepare source water assessments for all of Minnesota's public water systems and to make these assessments available to the public.

Through its Well Management Program, the MDH administers and enforces the Minnesota Water Well Code, which regulates activities such as well abandonment and installation of new wells. The MDH also administers the Wellhead Protection Program, which is aimed at preventing contaminants from entering public water supply wells.

The Wellhead Protection Program rules (Minnesota Rules 4720.5100 to 4720.5590) went into effect in 1997. These rules require all public water suppliers that obtain their water from wells to prepare, enact, and enforce wellhead protection plans (WHPPs, see Section 3.5.2). The MDH prepared a prioritized ranking of all such suppliers in Minnesota. Regardless of the ranking, Minnesota Rules 4720 required all public water suppliers to have initiated wellhead protection measures for the inner wellhead management zone prior to June 1, 2003. If a city with an existing WHPP drills a new well and connects it to the distribution system, the WHPP must be amended.

Wellhead protection plans include: delineation of groundwater "capture" areas (wellhead protection areas), delineation of drinking water supply management areas (DWSMA), an assessment of the water supply's susceptibility to contamination from activities on the land surface, management programs such as identification and sealing of abandoned wells, and education/public awareness programs. As part of its role in wellhead protection, the MDH developed the guidance document *Evaluating Proposed Stormwater Infiltration Projects in Drinking Water Supply Management Areas* (MDH 2016).

See the Minnesota Department of Health website for more information about these programs: http://www.health.state.mn.us/divs/eh/water/index.html.

7.2.2.6 Minnesota Environmental Quality Board (EQB)

The EQB administers the state's environmental review program, including Environmental Assessment Worksheets (EAW), Environmental Impact Statements (EIS), and Alternative Urban Area-wide Reviews (AUAR). With respect to water resources, the EQB is responsible for developing the state water plan, a state water monitoring plan, biennial water policy and priorities reports, and biennial reports on trends in water quality and availability and research needs.

More information is available at the EQB website: http://www.eqb.state.mn.us

7.2.2.7 Minnesota State Historic Preservation Offices (SHPO)

Following the National Historic Preservation Act of 1966, Minnesota's State Historic Preservation Office (SHPO) was established by state statute in 1969. The director of the Minnesota Historical Society serves as State Historic Preservation Officer. The mission of the SHPO is to preserve and promote Minnesota history by identifying, evaluating, registering, and protect Minnesota's historic and archaeological properties and assisting government agencies in carrying out their historic preservation responsibilities. The SHPO maintains the National Register of Historic Places (NRHP) for the state. This includes listed or eligible to be listed places within the planning area. To ensure the protection of places eligible for listing or listed in the NRHP, SHPO review is required for all state and federally funded projects, and all United States Army Corps of Engineers (USACE) projects.

More information is available at the SHPO website: http://www.mnhs.org/shpo/.

7.2.2.8 Minnesota Department of Transportation (MnDOT)

The MnDOT is responsible for major maintenance and reconstruction of stormwater infrastructure associated with state highways. In the planning area, these locations include Interstate 90, Interstate 35, US Highway 218, State Highway 30, State Highway 56, and State Highway 105. MnDOT is also a partner in safety as Interstate 90 is periodically impacted by flooding. The Partnership will cooperate with MnDOT to identify water storage opportunities that reduce flood flows in the watershed to protect infrastructure and public safety.

More information is available at the MnDOT website: http://www.dot.state.mn.us.

7.2.2.9 U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)

The NRCS works in close partnerships with farmers and ranchers, local and state governments, and other federal agencies to maintain healthy and productive working landscapes. The NCRS manages conservation programs that help people reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. The NRCS offers technical and financial assistance services.

NRCS Technical Assistance

The NRCS is the USDA's principal agency for providing conservation technical assistance to private landowners, conservation districts, tribes, and other organizations. NRCS delivers conservation technical assistance through its voluntary Conservation Technical Assistance Program (CTA). CTA is available to any group or individual interested in conserving natural resources and sustaining agricultural production. The CTA program functions through a national network of locally-based, professional conservationists.

This assistance can help land users:

- Maintain and improve private lands and their management
- Implement better land management technologies
- Protect and improve water quality and quantity
- Maintain and improve wildlife and fish habitat
- Enhance recreational opportunities on their land
- Maintain and improve the aesthetic character of private land
- Explore opportunities to diversify agricultural operations and
- Develop and apply sustainable agricultural systems

This assistance may be in the form of resource assessment, practice design, resource monitoring, or follow-up of installed practices. Although the CTA program does not include financial or cost-share assistance, clients may develop conservation plans, which may serve as a springboard for those interested

in participating in USDA financial assistance programs. CTA planning can also serve as a door to financial assistance and easement conservation programs provided by other Federal, State, and local programs.

All owners, managers, and others who have a stake and interest in natural resource management are eligible to receive technical assistance from NRCS. To receive technical assistance, the individual may contact their local NRCS office or the local conservation district.

NRCS Financial Assistance

The NRCS provides financial assistance to its partners through a variety of programs. Not all programs are available in all states or regions. A complete list of available financial assistance programs is available from the NRCS website at: https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/

A popular financial assistance program available within the Cedar River watershed is the Environmental Quality Incentives Program (EQIP). Through EQIP, NRCS provides agricultural producers with financial assistance to plan and implement conservation practices. Financial assistance covers part of the costs from implementing conservation practices. NRCS offers about 200 practices depending on location. These practices are geared towards working farms, ranches and forests and provide producers with many options for conservation. Payment rates for conservation practices are reviewed and set each fiscal year. The EQIP program is implemented through local NRCS offices.

Easement Programs

The Agricultural Conservation Easement Program (ACEP) provides financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits. Under the Agricultural Land Easements component, NRCS helps Indian tribes, state and local governments and non-governmental organizations protect working agricultural lands and limit non-agricultural uses of the land. Under the Wetlands Reserve Easements component, NRCS helps to restore, protect and enhance enrolled wetlands.

The Healthy Forests Reserve Program (HFRP) helps landowners restore, enhance and protect forestland resources on private lands through easements and financial assistance. Through HRFP, landowners promote the recovery of endangered or threatened species, improve plant and animal biodiversity and enhance carbon sequestration.

Contact information for the NRCS offices in Minnesota may be found from the NRCS website at: https://offices.sc.egov.usda.gov/locator/app?agency=nrcs

7.2.2.10 U.S. Department of Agriculture (USDA) Farm Service Agency (FSA)

The Farm Service Agency (FSA) is an agency of the USDA that provides services to farm operations. The FSA administers farm commodity loan and purchase programs, farm ownership and operating loans, and the conservation reserve program, in order to maintain a self-sustaining food supply in the United States. It also provides disaster assistance and administrative support to the Commodity Credit Corporation, which funds most of the commodity and export programs of the USDA. Programs in the FSA include:

- Farm Loan Programs
- Conservation Programs
- Disaster Assistance Programs
- Energy Programs
- Financial Management Programs
- Farm Payment Programs
- Commodity Operations

The FSA Minnesota office is located at 375 Jackson Street, Suite 400, St. Paul, MN 55101 (651-602-7700). Additional information about FSA programs is available from the FSA website at: https://www.fsa.usda.gov/programs-and-services/index

7.2.2.11 U.S. Army Corps of Engineers (USACE)

The USACE administers several regulatory permit programs, including Section 10 of the Rivers and Harbors Act permit program, the Section 404 permit program, and Section 401 Certifications. The USACE updated Section 10 of the Rivers and Harbors Act Permit and the Section 404 Permit in March 2012 to streamline the requirements of the Clean Water Act (CWA). The updated permits provide expedited review of projects that have minimal impact on the aquatic environment. These projects may include linear transportation projects, bank stabilization activities, residential development, commercial and industrial development, aids to navigation, and some maintenance activities. Permit programs are described briefly in this section.

Through Section 10 of the Rivers and Harbors Act, the USACE is responsible for administering this program, which regulates the placement of structures and/or work in, or affecting, navigable waters of the United States.

The Federal Clean Water Act requires that anyone who wants to discharge dredged or fill material into U.S. waters, including wetlands, must first obtain a Section 404 Permit from the USACE. Examples of activities that require a Section 404 Permit include: construction of boat ramps, placement of riprap for erosion protection, placing fill in a wetland, building a wetland, construction of dams or dikes, stream channelization, and stream diversion. When Section 404 Permit applications are submitted to the USACE, the applications are typically posted for the U.S. Fish and Wildlife Service, the U.S. Forest Service, the U.S. EPA, and other federal agencies to review and provide comments. The USACE evaluates permit requests for the potential impact to various functions and values of the wetland.

Section 401 Certification is required to obtain a federal permit for any activity that will result in a discharge to navigable waters of the United States. The program is primarily administered by the USACE along with the MPCA. A Section 401 Water Quality Certification may be granted if the applicant demonstrates that the proposed activity "will not violate Minnesota's water quality standards or result in adverse long-term or short-term impacts on water quality." Greater protection is given to a category of waters designated by the MDNR as Outstanding Resource Value Waters (ORVW). The waters in this

category have received this designation because of their exceptional value. These waters include such groups as scientific and natural areas, wild, scenic and recreational river segments, and calcareous fens.

More information is available at the USACE website: http://www.usace.army.mil/.

7.3 Plan Implementation Costs and Funding

The implementation schedule (Table 7-2) includes planning level cost estimates for individual activities. Planning level costs are split between local funding sources and external funding sources. Local funding sources include funding borne by the Partners, while external funding sources include all other funding sources (e.g., cost-share with non-Partner entities, State grants). Costs are presented in 2018 dollars for planning purposes. More detailed cost estimates may be required for individual activities prior to execution. Costs presented in Table 7-2 are subtotaled by category and summarized in Figure 7-1 (total cost) and Figure 7-2 (local costs).

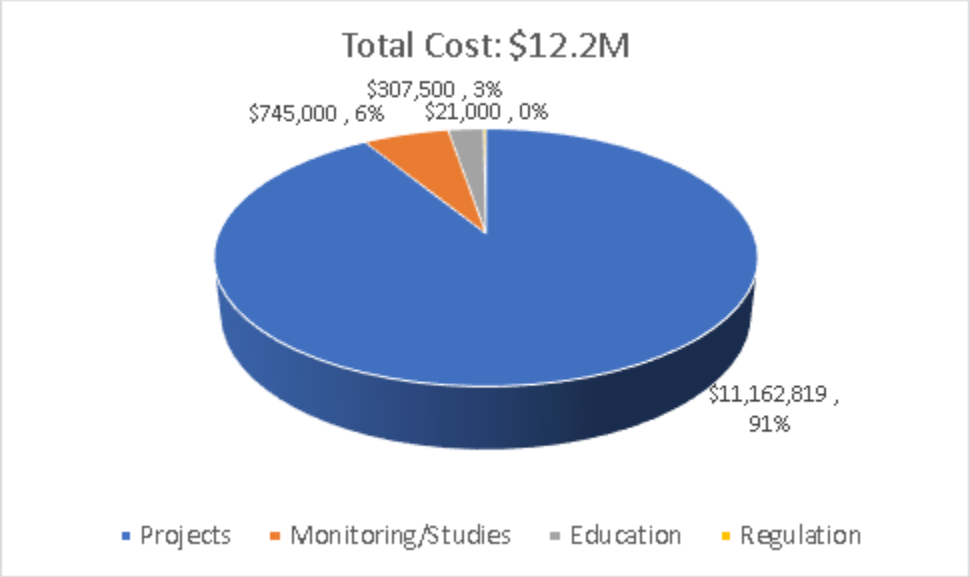


Figure 7-1 Summary of Implementation Schedule Total Costs

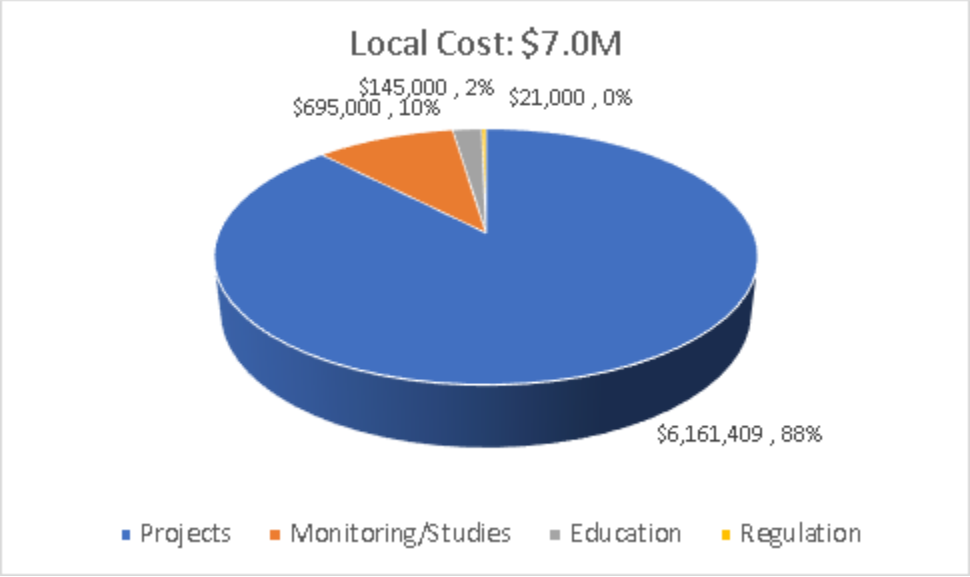


Figure 7-2 Summary of Implementation Schedule Local Costs

This Plan includes an ambitious implementation schedule. Total estimated annual costs (approximately $1.2M) exceed current local funding allocated to existing and similar programs within the planning area. Organizational capacity of the Partners (i.e., staff time and expenses currently expended to address the issues addressed by this Plan) was estimated during Plan development at approximately $400,000 per year (or approximately $4M over the 10-year planning period). The current level of Partner funding to address Plan issues is less than the estimated total annual cost of implementation. Thus, additional local funding and funding through State, Federal, and private grant or cost-share dollars will be necessary to accomplish Plan goals.

7.3.1 Federal Funding Sources

Federal funding includes all funds derived from the Federal tax base. For example, this includes programs such as the Environmental Quality Incentives Program (EQIP), Conservation Reserve Program (CRP), Conservation Innovation Grants (CIG), and Fish and Wildlife Service (FWS) funding for habitat projects. Federal funding excludes general operating funds obtained from BWSR, counties, fees for service and grants or partnership agreements with state government or other conservation organizations.

Federal Funding has been utilized and implementation work has been supported in targeted areas in the watershed. Mississippi River Watershed Basin Initiatives, National Water Quality Initiative and other funding opportunities have been utilized. Federal 319 implementation funds are also being used to implement BMPs and measure effectiveness of practices. Implementation will be addressed by expanding these efforts, along with other federal initiative opportunities.

No funding from Federal sources for Plan implementation has been explicitly assumed in the current Plan iteration (Note that reduced local costs afforded by Federal programs like EQIP are implicitly considered in the per-unit cost estimates created for field practices, see Section 6.4). However, the Partners will seek Federal funding during Plan implementation, where appropriate. The Partners anticipate that the NCRS Regional Conservation Partnership Program (RCPP) may be a funding source that can be targeted during implementation.

7.3.2 State Funding

The amount of funding needed for Plan implementation from State sources is approximately $520K annually and $5.2M over the 10-year planning period. State funding includes funds derived from the State tax base. State funds also include money derived from all State-implemented grant programs (e.g., accelerated implementation grants, targeted watershed demonstration program grants, state easement programs, etc.). The Partners anticipate that this will include State funded watershed based funding if and when they become available.

State funding excludes general operating funds obtained from BWSR, counties, fees for service and grants or partnership agreements with the Federal government or other conservation organizations.

7.3.3 Local Funding

This Plan does not create any additional taxing authority among the Partners. The annual amount of funding needed from local sources to perform the activities included in the implementation schedule is approximately $7.0M over the 10-year planning period, or approximately $700,000 annually. Local revenue includes money derived from the local property tax base, and in-kind services of any personnel funded from the local tax base. Locally generated money for water management activities may include:

- County or watershed district (WD) support of Soil and Water Conservation Districts (SWCDs)
- Funds generated through the sale of services and products such as SWCD tree sales
- Fees for services performed by local SWCDs
- Local costs to administer ordinances including state rules and programs (e.g. shoreland, feedlots, SSTS , Wetland Conservation Act)
- Landowner contributions toward conservation implementation, including cash and in-kind services used as matching funds for state and federal cost-share programs
- Funds from locally-based partnerships with non-governmental organizations (NGOs), corporations, local businesses, etc. that contribute to Plan activities
- Local funds for capital improvement projects that are initiated by local governments and that benefit water resources as described in the Plan (e.g., stormwater improvements, water quality treatment, flood risk reduction)
- Donated easements that have a primary or secondary purpose of water quality improvements
- City funds for stormwater management, drinking water supply, etc., if they are Plan activities
- County, City, Township, and Watershed District funding generated through levy authority
- City of Austin local sales tax aimed at flood damage reduction

Local funds will be used for activities where opportunities for State and Federal funding are limited (e.g., monitoring and studies) or where local funds are required for grant-matching.

7.3.4 Other Funding Sources

Additional non-governmental funding sources may be used to fund Plan implementation. Possible examples include Pheasants Forever and Ducks Unlimited. The Partners will coordinate with such NGOs to explore potential partnerships and cost-share opportunities surrounding shared goals. The Partners will continue to work with Riverland Technical College and other educational organizations to solicit in-kind services to support community education and outreach related to soil health, water quality, and other topics.

Private sector companies, including those specifically engaged in agribusiness, may also be a potential source of funding for implementation. Ongoing examples of such partnerships include the collaboration between Hormel and the CRWD to implement water quality improvement projects within the watershed, and the ongoing work of the CRWP, a partnership of government and private companies collaborating in the Cedar River Watershed to help farmers address water quality problems while improving farm profitability (see Section 7.1.3).

The Partners will seek additional partnerships with private sector businesses as such opportunities arise. Future opportunities may include working with agri-business (e.g., seed companies, tool manufacturers) on incentives that provide opportunity for water resources improvements. Incentives may not be implemented through the Partnership, but instigated through Partnership actions.

7.3.5 Collaborative Grants

The Partners recognize the importance of securing grant funding in completing the implementation activities identified in this Plan (see Table 7-2). The Partners will leverage this Plan in applying for competitive state and federal grants. As part of annual work planning (see Section 7.4.4), the Plan Implementation Work Group (LIWG) will identify planned activities suited to available grant opportunities and make recommendations for pursuit of grants to the Policy Advisory Committee (PAC).

7.4 Plan Administration and Coordination

The Parties will implement this Plan according to the governance structure established in the Memorandum of Agreement (MOA, see Appendix A). The MOA does not create a new entity. Instead, the MOA is a formal and outward commitment to work together as a partnership and specifies mutually-accepted expectations and guidelines between partners. The MOA is not legally enforceable (if not being used as a contract or when MN Statute §471.59 is not referenced).

Per the MOA, the Parties will establish committees to carry out the coordinated implementation of this Plan. These committees will include:

> **Policy Advisory Committee (PAC)** – The Policy Advisory Committee (PAC) will operate cooperatively and collaboratively, but not as a separate entity. Each governing entity agrees to

appoint one representative to the PAC who must be an elected or appointed member of each governing entity. Each governing entity may choose to appoint one alternate to serve on the PAC, as needed, in the absence of the appointed member. Each appointed member will serve as a liaison to their respective governing entity, and act on behalf of their governing entity in all matters before the PAC. PAC members agree to keep their respective governing entities regularly informed on the implementation of the Plan. Each representative shall have one vote, subject to the authority delegated by their respective governing entity. The PAC will establish bylaws to describe the functions and operations of all committee(s). Once established, the PAC will follow the adopted bylaws, and have the power to modify the bylaws. The Policy Advisory Committee will meet, as needed, to decide on Plan implementation. The PAC shall recommend approval of grant applications, grant agreements, payment of invoices, and professional contracts with the Fiscal Agent and Day to Day Contact. The PAC shall also review an annual work plan and budget consisting of an itemized statement of the Plan revenues and expenses for the ensuing calendar years, and shall be presented to the respective governing entities that are represented on the PAC.

Technical Advisory Committee (TAC)– The PAC may appoint technical representatives to a Technical Advisory Committee (TAC) to provide support and make recommendations on implementation of the Plan, in consideration of the BWSR Operating Procedures. The TAC will consist of the Local Implementation Work Group (LIWG) members, contacts for the State's main water agencies and/or plan review agencies, and area stakeholders. The TAC will meet as needed and as directed by PAC or LIWG.

Local Implementation Work Group (LIWG) – The Parties agree to establish a Local Implementation Work Group (LIWG), which shall consist of, but not be limited to, local staff, including local county water planners, local watershed staff, local SWCD staff, and local City staff, for the purposes of logistical, and day-to-day decision-making in the implementation of the Plan. The LIWG shall prepare a draft annual work plan and budget consisting of an itemized statement of the Plan revenues and expenses for the ensuing calendar year, which shall be presented to the PAC for review. The LIWG will meet as needed (see implementation activity SWQ-5).

7.4.1 Fiscal Agent and Administration

A partnership established with an MOA cannot receive funds directly or hold funds or agreements that have a financial connection. One member of the Partnership must be designated as a fiscal agent for each grant or project in order to hold funds and agreements. The PAC shall appoint, annually, a fiscal agent to hold funds and agreements for the Partnership. Roles and responsibilities of the fiscal agent are specified in the implementation MOA (see Appendix A). Grants obtained outside of the Partnership will be administered by the local governmental unit, as is currently done.

The PAC shall appoint, annually, one of the parties to the MOA to be the Day-to-Day Contact, being the point of contact for, and handling of the day-to-day administrative work of the Plan. The Day-to-Day Contact will handle this function and continue thereafter until and unless thePAC appoints an alternate

Day-to-Day Contact. Roles and responsibilities of the Day-to-Day Contact are specified in the implementation MOA (see Appendix A).

7.4.2 Watershed District Plan Adoption

The CRWD and TCWD are watershed districts subject Minnesota Statutes 103D and are required to adopt a watershed management plan. In adopting the Cedar-Wapsipinicon Comprehensive Watershed Management Plan (this Plan), the CRWD and TCWD intend this document to serve as the watershed management plan for their respective watershed districts.

The CRWD and TCWD shall maintain their respective Rules (see Section 7.2.1.11) as separate documents outside of this Plan and independent of the Partnership. The CRWD and TCWD also intend to maintain separate capital improvement programs (CIPs) informed by the implementation schedule included in this Plan. The CRWD and TCWD CIPs shall be integrated with the implementation schedule included in this Plan, as appropriate, by the LIWG through the annual work planning process.

7.4.3 Coordination and Shared Services

Coordination and communication are critical for a partnership operating under an MOA. The Partners will coordinate and collaborate with local, State, and Federal governments throughout the implementation of this Plan. The Partners seek to develop and maintain relationships that will promote effective coordination to accomplish Plan goals. As part of this coordination, the Partners will also consider opportunities for shared services (e.g., shared staff positions) to provide mutually beneficial and efficient service to multiple Partners in pursuit of Plan goals. Such opportunities will be considered by the Plan Implementation Work Group as part of annual work planning.

Many governmental units have roles and responsibilities related to water and natural resource management within the planning area and have established plans, goals, and actions to manage these resources. Input from State and local governmental agencies was considered and incorporated in the development of this Plan, including information submitted to the Partners in response to Plan notification (see Section 2.5).

Many of the priority issues and associated goals included in this Plan directly or indirectly support the goals, objectives, and responsibilities of other governmental units. The Partners will continue to coordinate with BWSR, MDA, MDH, MDNR, and MPCA as required through State-legislated programs and to accomplish the many Plan activities that identify State agencies as cooperating entities. Similarly, continued coordination and communication with local governmental units, such as cities, township boards, county boards, watershed district boards, joint powers boards, drainage authorities, and other water management authorities is necessary to facilitate watershed wide activities. The Parties will also collaborate with non-governmental organizations where mutual benefit may be achieved. Many of these collaborations are intended to increase habitat, recreational opportunities, and improve water quality within the Plan area, while providing education and outreach opportunities.

For those activities identified in the implementation schedule (Table 7-2), one or more Partners will serve as the lead for implementation. Specific opportunities for coordination with other units of government not part of the Partnership are identified in the implementation schedule (Table 7-2). The "supporting entities" field notes those other governmental units or parties that the Partners will coordinate with in performing each activity.

7.4.4 Work Planning

Implementation of this Plan is based on coordinated action by the members of the Partnership. Therefore, annual work planning will be based on prioritized implementation activities planned, the availability of funds, and the roles and responsibilities for implementation.

An annual work plan will be developed following the generalized process presented in Figure 7-3. The LIWG will develop a draft annual work plan based on the targeted implementation schedule (see Table 7-2) updated to reflect the current status each activity. Factors the LIWG will use to develop and prioritize the annual work plan may include:

- Annual commitments from previous years
- Implementation of planned activities previously delayed
- Funding availability and/or partnering/cost-share opportunities
- Degree of benefit (e.g., water quality, flood relief) relative to other activities
- Consistency with Plan goals
- Distribution of activities to address Tier I, Tier II, and Tier III goals
- Feasibility (e.g., can the activity be implemented?)

In prioritizing field practices planned as part of implementation activity SWQ-1, the PIWG will consider the above factors with an emphasis on feasibility (e.g., willing landowners) and degree of benefit. Analysis of the degree of benefit may include estimates of pollutant load reduction based on SWAT, HSPF, or similar model results, project location within the watershed (i.e. headwater versus downstream, location relative to priority areas presented in Figure 6-4), and/or project location relative to issue-specific priority areas (e.g., groundwater or excessive flooding priority areas presented in Figure 6-2 and Figure 6-3, respectively.

The annual work plan will then be presented to the PAC and TAC for review. Members of the TAC may use this review to promote the inclusion of planned activities that may be high priority to local, state, or other partnering entities. The LIWG may revise the annual work plan prior to final approval by the PAC and approval by the board of each Partner. The intent of the annual work plans will be to maintain coordinated and collaborative progress toward completing the targeted implementation schedule.

The LIWG will also develop and submit (following PAC approval) a work plan and budget request for Watershed-Based Funds (WBF) to BWSR based on this Plan (this submittal will be in lieu of the BBR referenced in the BWSR Plan Content Requirements). The work plan and budget request will promote local water management priorities for state funding requests. The Partners intend to pursue block grant requests and other funding based on the work plan to accomplish the Plan implementation schedule.

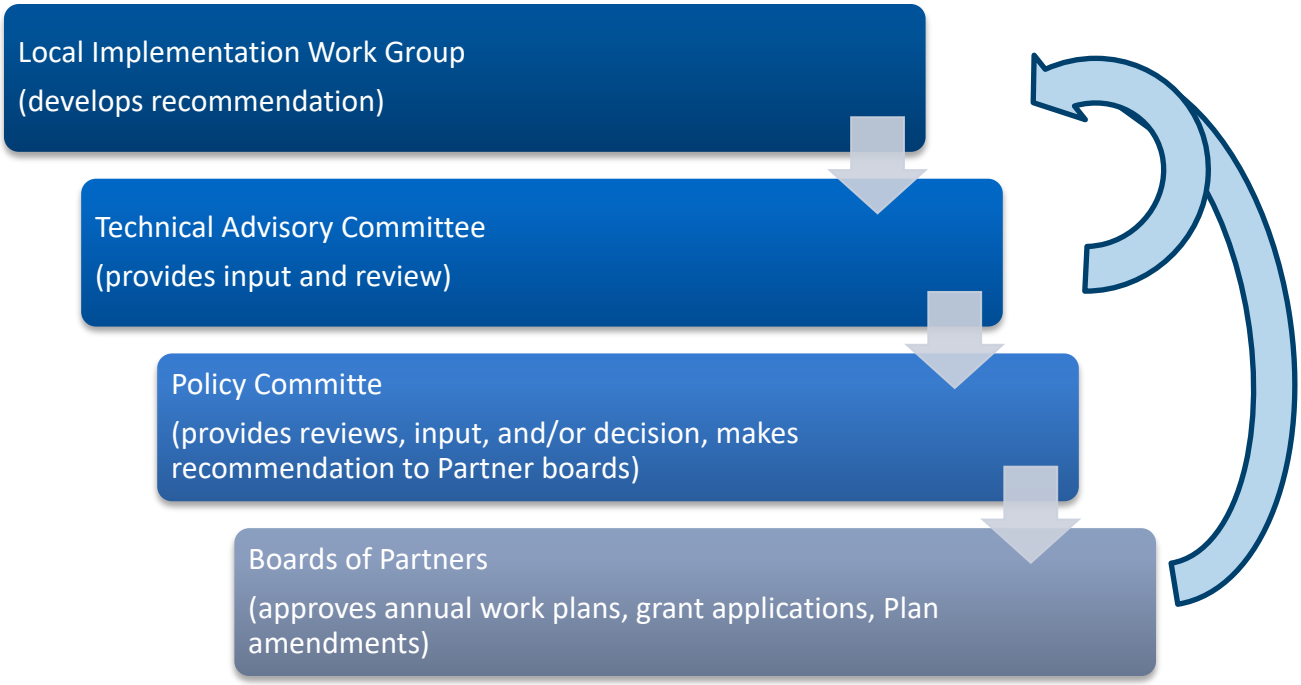


Figure 7-3 Generalized work flow for Plan implementation

7.4.5 Evaluation and Reporting

The LIWG will annually provide the PAC with an update on progress of Plan implementation. As part of this process, the LIWG will request input and feedback on progress from the PAC and TAC. The LIWG will take this feedback into consideration when developing the annual work plan for the following year, including reevaluating priority for implementation schedule activities and pursuit of grants. Plan progress and feedback will be documented in an annual summary.

Some items in the implementation schedule will provide additional data that may impact Plan priorities and help define future implementation activities (e.g., using results of hydrologic and hydraulic modeling to identify opportunities for increased storage, see implementation item FLD-6). Results of planned studies and similarly relevant activities will be considered and incorporated into the annual evaluation process. The Partnership will review all available monitoring data as part of a biennial review to assess and evaluate Plan progress and to evaluate whether programmatic changes are needed. Updates to the targeted implementation maps (see Section 6.0) will be performed during this process, if necessary.

A more thorough evaluation of Plan progress is planned after five years (half way through the 2019-2028 period covered by this Plan). Over the 10-year life of the Plan, developments may arise that warrant revisions to the Plan. New priority issues may emerge. The relative importance of existing issues may change based on monitoring data, modeling results, or shifting priorities of the Partners. Progress towards Plan goals and the implementation schedule may deviate from that anticipated. Thus, a 5-year evaluation will be performed to assess whether revisions to priority issues, goals, and implementation schedule are needed.

Local governmental units have a number of annual reporting requirements; their reporting responsibilities will be conducted per state agency requirements. Reporting related to grants and programs developed collaboratively and administered under this Plan will be reported by the LIWG. The LIWG will also develop an annual report documenting progress toward completing the implementation schedule and achieving Plan goals and any changes in Plan priorities. The information to be included in the annual report will be developed through the annual evaluation process described above.

The LIWG will track projects and practice locations. State agencies may have interest in overall pollutant load reductions achieved by BMPs and pace of progress relative to surface water quality goals. The project sponsor will provide BMP location and estimated pollution reduction of each practice installed. Partner entities may use that data to perform model runs (e.g., HSPF-SAM) that provide cumulative results and pace of progress (see also Section 6.4.5). The LIWG may use resources to assist in this effort, at the discretion of the Policy Committee.

7.5 Plan Updates and Amendments

The Partners understand that this Plan and its targeted implementation schedule are a guide. The Plan provides a roadmap for the next 10 years while maintaining flexibility for the Partners to use their local expertise to ensure that Plan resources are used efficiently and responsibly to address priority issues. The Partners will annually assess progress towards Plan implementation and adjust the implementation schedule through the development of its annual work plan (see Section 7.4.3).

Prior to a scheduled Plan update, the Partners may wish to make significant revisions to the Plan through a Plan amendment. A Plan amendment may be required to significantly change Plan priority issues, goals, targeted implementation schedule, or administrative processes.

Amendments to this Plan will follow the procedures described herein. This Plan will remain in full effect until an amendment is completed and approved by the PAC and BWSR (if necessary). The Plan amendment process shall be initiated only by the PAC. However, Plan amendments may be proposed by any agency, person, or local government, including the LIWG and TAC.

All recommended Plan amendments must be submitted to the Policy Committee along with an explanation of why the Plan amendment is needed.

In recognizing the need to maintain flexibility during implementation, a Plan amendment is not required for the following situations:

- Revising of estimated cost for an individual project or program
- Adding or removing activities from the implementation schedule, provided that:
    - The activity is consistent with Plan goals, and
    - The action is performed through the annual work plan update
- Altering the timeline for planned activities within the implementation schedule
- Including new or updated monitoring data, model results, or other technical information

- Revising proposed priority project locations presented in Figure 6-5 in response to modeling results, site visits, feasibility studies, or other technical evaluations

If it is unclear whether a proposed revision to the Plan requires an amendment, the PAC will coordinate with BWSR staff to determine the need for a Plan amendment. Examples of situations where a Plan amendment may be required include:

- Addition of capital improvement projects that are not described in the Plan;
- Establishment of a water management district(s) to collect revenues and pay for projects initiated through, MS 103D.601, 605, 611 or 730. To use this funding method, MS 103D.729 requires a Plan amendment
- Addition of new projects or programs with significant financial impact relative to existing estimated costs

7.5.1 Plan Amendment Format and Procedure

Draft Plan amendments presented to the PAC for consideration shall be prepared and formatted as described herein. Amendments must be provided (printed or digitally) in the form of replacement pages for the plan, each page of which must:

- Show deleted text as stricken and new text as underlined
- Be renumbered as appropriate (unless the entire Plan is reproduced)
- Include the effective date of the amendment (unless the entire Plan is reproduced)

If the PAC, in coordination with BWSR, determine that a Plan amendment is needed, the LIWG will complete the amendment according to the following procedure:

- Submit the proposed amendment to the all cities, townships, counties, watershed districts and SWCDs within the Plan boundary and applicable state review agencies (BWSR, MDA, MDH, MDNR, and MPCA) for a 60-day review
- Respond in writing to address comments submitted by the reviewers
- Hold a public hearing on the proposed amendment
- Submit the final revised amendment, with the written comments received and the comment responses, a record of the public hearing and a summary of the changes incorporated into the Plan to BWSR for approval

At the discretion of the PAC drafts of proposed Plan amendments may be sent to all plan review authorities for input before beginning the formal review process.

The PAC will maintain a distribution list for copies of the plan and within 30 days of adopting an amendment distribute copies of the amendment to the distribution list. Electronic copies of the amendment will be provided or documents made available for public access on the SWCD websites. Printed copies will be made available upon written request, and printed at the cost of the requester.

Table 7-2 Cedar-Wapsipinicon Comprehensive Watershed Management Plan Implementation Schedule

Item ID	Implementation Action Description	Applicable Goals (see Table 4-1)	Priority Issues Addressed: Tier I: Degraded Surface Water Quality	Tier I: Accelerated Erosion and Sedimentation	Tier I: Groundwater Contamination	Tier I: Excessive Flooding	Tier II: Degraded Soil Health	Tier II: Threatened Groundwater Supply	Tier III: Threats to Fish, Wildlife, and Habitat	Tier III: Reduced Livability and Recreation	Target or Focus Area	Measurable Output	Timeframe (Values are incremental for each 2-year period): 2020-21	2022-23	2024-25	2026-27	2028-29	Estimated Total Cost	Estimated Local Contribution	Estimated External Contribution	Lead LGU	Supporting Entities	Notes
Projects and Project Support																							
SWQ-1	Implement **BMPs** at very high priority and high priority sites identified through SWAT modeling and GIS terrain analyses (see **Figure 6-5**) to reduce erosion and filter pollutants; specific BMPs to be determined based on site-specific feasibility, with target implementation by subwatershed as follows:	SWQ-1, SWQ-2, ESC-1, ESC-2, GWQ-5, FLD-1, SLH-3, GWS-1, FWH-5, REC-1	●	●	O	O	O	O	O	O	Priority Project Areas (see Figure 6-4)	Number of projects implemented and corresponding reduction in pollutant loading	Numbers below indicate planned number of projects per biennium, by watershed					See below	See below	See below	SWCD CRWD TCWD County	MDNR NRCS BWSR MDA	
	Upper Cedar River	SWQ-1.1	●	●	O	O	O	O	O	O	Level 2, 3, 4	10 projects over 10 years	2	2	2	2	2	$ 340,000	$ 170,000	$ 170,000			
	Wolf Creek	SWQ-1.2	●	●	O	O	O	O	O	O	Level 2, 3, 4	3 projects over 10 years	1	1	1			$ 11,340	$ 5,670	$ 5,670			
	Dobbins Creek	SWQ-1.3	●	●	O	O	O	O	O	O	Level 3, 4	20 projects over 10 years	4	4	4	4	4	$ 225,766	$ 112,883	$ 112,883			
	Turtle Creek	SWQ-1.4	●	●	O	O	O	O	O	O	Level 2, 3, 4	20 projects over 10 years	4	4	4	4	4	$ 425,000	$ 212,500	$ 212,500			
	Geneva Lake	SWQ-1.5	●	●	O	O	O	O	O	O	Level 4, 5	5 projects over 10 years	3	1	1			$ 97,200	$ 48,600	$ 48,600			
	Middle Fork Cedar River	SWQ-1.6	●	●	O	O	O	O	O	O	Level 1, 2, 3	20 projects over 10 years		5	5	5	5	$ 373,737	$ 186,868	$ 186,868			
	Roberts Creek	SWQ-1.7	●	●	O	O	O	O	O	O	Level 1, 2, 3	20 projects over 10 years		5	5	5	5	$ 382,295	$ 191,148	$ 191,148			
	Rose Creek	SWQ-1.8	●	●	O	O	O	O	O	O	Level 1, 2, 3	30 projects over 10 years	10	5	5	5	5	$ 515,265	$ 257,632	$ 257,632			
	West Beaver Creek	SWQ-1.9	●	●	O	O	O	O	O	O	Level 0, 1	3 projects over 10 years			1	1	1	$ 56,700	$ 28,350	$ 28,350			
	Lower Cedar River	SWQ-1.10	●	●	O	O	O	O	O	O	Level 1, 2, 3	15 projects over 10 years	3	3	3	3	3	$ 290,864	$ 145,432	$ 145,432			
	Otter Creek	SWQ-1.11	●	●	O	O	O	O	O	O	Level 1, 2, 3	8 projects over 10 years	2	2	2	2		$ 89,169	$ 44,585	$ 44,585			
	Deer Creek	SWQ-1.12	●	●	O	O	O	O	O	O	Level 1, 2	4 projects over 10 years		1	1	1	1	$ 75,600	$ 37,800	$ 37,800			
	Little Cedar River	SWQ-1.13	●	●	O	O	O	O	O	O	Level 2, 3, 4	30 projects over 10 years	10	5	5	5	5	$ 314,676	$ 157,338	$ 157,338			
	Elk River	SWQ-1.14	●	●	O	O	O	O	O	O	Level 1, 2	0 projects over 10 years						$ -	$ -	$ -			
	Wapsipinicon River	SWQ-1.15	●	●	O	O	O	O	O	O	Level 2, 3	10 projects over 10 years	2	2	2	2	2	$ 105,207	$ 52,603	$ 52,603			
	Total												**41**	**40**	**41**	**39**	**37**						
SWQ-2	Implement and/or expand cost share assistance programs to promote the use of BMPs focused on soil health (e.g., cover crops, conservation tillage - defined as no-till and strip-till)	SWQ-1, ESC-1, ESC-3, FLD-1, SLH-1, SLH-2, SLH-3, GWS-1	O	●	O	O	●	O			Agricultural Areas (emphasizing Upper Cedar, Lower Cedar, Otter Creek, West Beaver Creek, and Elk River)	Number of acres; Percent increase in coverage	370 acres added	540 acres added	830 acres added	1,370 acres added	2,630 acres added	$ 200,000	$ 100,000	$ 100,000	SWCD CRWD TCWD	NRCS MDA	
SWQ-3	Implement projects to reduce phosphorus and sediment loading in urban stormwater runoff (above and beyond current minimum requirements)	SWQ-1, ESC-3, FLD-1, GWS-1	●	●		O		●			Urban priority areas identified by City of Austin (and others)	Number of urban BMPs implemented (1 per year)	2	2	2	2	2	$ 80,000	$ 40,000	$ 40,000	Cities CRWD SWCD	MPCA MDA	Projects may include stormwater reuse, infiltration practices , disconnected impervious, etc.
SWQ-4	Provide financial assistance to implement animal waste management systems to reduce waste loading to streams	SWQ-1, GWQ-7	●		●						Feedlots	Number of assisted feedlots (1 per year)	2	2	2	2	2	$ 3,500,000	$ 875,000	$ 2,625,000	County SWCD	NRCS MPCA MDA	
SWQ-5	Meet with Partners to coordinate implementation of water quality and soil health best management practices (see SWQ-1, SWQ-2, and SWQ-3)	SWQ-1, SWQ-2, ESC-1, ESC-2, GWQ-5, FLD-1, SLH-3, GWS-1, FWH-5, REC-1	●	●	O	O	●	O	O	O	Watershed-wide	Number of meetings	5	5	5	5	5	$ 25,000	$ 25,000	$ -	SWCD CRWD County Cities TCWD	MDNR NRCS BWSR MDA MPCA	
SWQ-11	Cooperate with agricultural producers to develop site-specific nutrient management plans	SWQ-1, GWQ-1, GWQ-2, SLH-1	●		●		O				Agricultural Lands	Site nutrient management plans (2 per year); Site visits (10 per year)	4 plans 20 visits	4 plans 20 visits	4 plans 20 visits	4 plans 20 visits	4 plans 20 visits	$ 200,000	$ 200,000	$ -	SWCD CRWD TCWD	NRCS MDA Private Sector	$10,000 per plan; separated from item SWQ-12
SWQ-12	Cooperate with agricultural producers to develop site-specific manure management plans	SWQ-1, GWQ-7	O		●		O				Agricultural Lands (focus on bacteria impairments)	Site manure management plans (2 per year); Site visits (10 per year)	4 plans 20 visits	4 plans 20 visits	4 plans 20 visits	4 plans 20 visits	4 plans 20 visits	$ 100,000	$ 100,000	$ -	SWCD CRWD TCWD	NRCS MDA Private Sector	$10,000 per plan; separated from item SWQ-11; leverage MPCA MMP planner where appropriate
SWQ-15	Establish a 10-year CIP for planning area specific to the CRWD	SWQ-1, SWQ-2, ESC-1, ESC-2, GWQ-5, FLD-1, SLH-3, GWS-1, FWH-5, REC-1	●	●	O	●	O	O	O	O	CRWD	Implementation schedule	x					$ 5,000	$ 5,000	$ -	CRWD		
SWQ-16	Establish a 10-year CIP for planning area specific to the TCWD	SWQ-1, SWQ-2, ESC-1, ESC-2, GWQ-5, FLD-1, SLH-3, GWS-1, FWH-5, REC-1	●	●	O	●	O	O	O	O	TCWD	Implementation schedule	X					$ 5,000	$ 5,000	$ -	TCWD		
GWQ-1	Seal abandoned or unused **private wells**, with an emphasis on wells located within DWSMAs	GWQ-9			●						Groundwater Target Areas (see Figure 6-2)	Number of sealed wells (10 per year)	20	20	20	20	20	$ 100,000	$ 100,000	$ -	County SWCD	MDH	
GWQ-2	Seal abandoned or unused **high-capacity wells**, with an emphasis on wells located within DWSMAs	GWQ-9			●						Groundwater Target Areas (see Figure 6-2)	Number of sealed wells (2 over 10 years)	2 high capacity wells over 10 years					$ 20,000	$ 10,000	$ 10,000	Cities County	MDH	
GWQ-3	Implement practices to reduce or limit nitrate movement into groundwater (e.g., nutrient management, cover crops, saturated buffers, two-stage ditches, wetland restoration)	SWQ-1, GWQ-1, GWQ-5	O		●						Groundwater Target Areas (see Figure 6-2)	Number of SWQ-1, SWQ-2, and SWQ-4 projects incorporating nitrogen reduction	See SWQ-1, SWQ-2, SWQ-4					See SWQ-1, SWQ-2, SWQ-4	See SWQ-1, SWQ-2, SWQ-4	See SWQ-1, SWQ-2, SWQ-4	SWCD CRWD TCWD	County NRCS MDA	Practices incorporated into item SWQ-1

Table 7-2 Cedar-Wapsipinicon Comprehensive Watershed Management Plan Implementation Schedule

Item ID	Implementation Action Description	Applicable Goals (see Table 4-1)	Priority Issues Addressed: Tier I: Degraded Surface Water Quality	Tier I: Accelerated Erosion and Sedimentation	Tier I: Groundwater Contamination	Tier I: Excessive Flooding	Tier II: Degraded Soil Health	Tier II: Threatened Groundwater Supply	Tier III: Threats to Fish, Wildlife, and Habitat	Tier III: Reduced Livability and Recreation	Target or Focus Area	Measurable Output	Timeframe (Values are incremental for each 2-year period): 2020-21	2022-23	2024-25	2026-27	2028-29	Estimated Total Cost	Estimated Local Contribution	Estimated External Contribution	Lead LGU	Supporting Entities	Notes
GWQ-4	Provide financial assistance for repair, or replacement of non-functioning SSTS	SWQ-1, GWQ-7	●		●					O	Unsewered Areas; ITPHS systems; Groundwater Target Areas (see Figure 6-2)	Number of treated SSTS (20 per year)	40	40	40	40	40	$ 2,000,000	$ 2,000,000	$ -	County SWCD	MPCA	Est. cost of $20,000 per SSTS
GWQ-5	Implement projects to provide adequate wastewater treatment to unsewered communities/areas.	SWQ-1, GWQ-7	●		●					O	Unsewered Areas	Communities connected to treatment	Four over the next 10 years					$ 500,000	$ 500,000	$ -	County	MPCA	Est $200,000 per community; Dodge estimates 25-30 properties; try to treat 50% in 10 years?
ESC-1	Implement projects to stabilize or restore degraded streambank areas (in addition to project sites identified in item SWQ-1)	SWQ-1, ESC-2, ESC-3, FLD-4	O	●		O			O		Areas targeted by inventory (see ESC-2)	Number of projects; total restored feet	10 projects totaling 5,000 feet					$ 750,000	$ 375,000	$ 375,000	CRWD TCWD SWCD County	MDNR MPCA	Reference ditch and stream strategies in Section 3.3 of Cedar River WRAPS
FLD-1	Implement projects to increase headwater storage and/or reduce peak flow rates at priority locations identified in below subwatersheds	SWQ-1, ESC-1, FLD-1, FLD-4, SLH-3	O	O		●	O				Areas to be identified by FLD-6; Priority Storage Areas (see Figure 6-3)	Volume reduction (acre-feet); Peak flow reduction	Numbers below indicate storage anticipated per biennium, by watershed					See SWQ-1	See SWQ-1	See SWQ-1	CRWD SWCDs County TCWD	MDNR MPCA	Practices incorporated into item SWQ-1; need SH practices in addition to structural projects
	Upper Cedar River	FLD-1, FLD-4	O	O		●	O					1260 ac-ft	Specific quantity and location of increased storage will be updated based on results of implementation item FLD-6					Costs included with SWQ-1 and other implementation items	Costs included with SWQ-1 and other implementation items	Costs included with SWQ-1 and other implementation items	CRWD SWCDs County TCWD	MDNR MPCA	Storage volumes in each planning watershed are based on overall storage goal (9,600 ac-ft) distributed per unit area to planning watersheds that included high priority storage areas (see Figure 6-3); Note that Otter Creek, Rose Creek, and West Beaver Creek have no area within priority storage areas (see Figure 6-3)
	Wolf Creek	FLD-1, FLD-4	O	O		●	O					180 ac-ft											
	Dobbins Creek	FLD-1, FLD-4	O	O		●	O					600 ac-ft											
	Turtle Creek	FLD-1, FLD-4	O	O		●	O					2060 ac-ft											
	Geneva Lake	FLD-1, FLD-5	O	O		●	O					340 ac-ft											
	Middle Fork Cedar River	FLD-1, FLD-4	O	O		●	O					1130 ac-ft											
	Roberts Creek	FLD-1, FLD-4	O	O		●	O					610 ac-ft											
	Rose Creek	FLD-1, FLD-4	O	O		●	O					0 ac-ft											
	West Beaver Creek	FLD-1, FLD-4	O	O		●	O					0 ac-ft											
	Lower Cedar River	FLD-1, FLD-4	O	O		●	O					1830 ac-ft											
	Otter Creek	FLD-1, FLD-4	O	O		●	O					0 ac-ft											
	Deer Creek	FLD-1, FLD-4	O	O		●	O					390 ac-ft											
	Little Cedar River	FLD-1, FLD-4	O	O		●	O					920 ac-ft											
	Elk River	FLD-1, FLD-4	O	O		●	O					70 ac-ft											
	Wapsipinicon River	FLD-1, FLD-4	O	O		●	O					200 ac-ft											
FLD-2	Work with the City of Austin to identify remaining flood-prone areas and perform feasibility study to identify preferred solutions	FLD-3, FLD-4, REC-1				●				O	Areas to be identified by FLD-2	Inventory of priority flood risk areas (in 2 years); feasibility study (in 6 years)	X	X	X			$ 50,000	$ 50,000	$ -	City of Austin CRWD	MDNR	
FLD-3	Provide cost-share or incentive program for residents to implement stormwater capture and reuse practices	SWQ-1, FLD-1, GWS-1	O			●		●			Residential Areas	Number of implemented practices (5 per year)	10	10	10	10	10	$ 50,000	$ 25,000	$ 25,000	City of Austin CRWD TCWD	MPCA	Projects may include rain barrels, or gray water reuse systems
GWS-1	Incorporate infiltration best management practices into projects to address surface water quality and/or flooding issues, where appropriate	SWQ-1, FLD-1, SLH-3, GWS-1	O			●	O	●			See SWQ-1, SWQ-2	Number of SWQ-1 (and other) projects incorporating infiltration; est. volume reduction	See SWQ-1, SWQ-2					See SWQ-1	See SWQ-1	See SWQ-1	See SWQ-1	See SWQ-1	Practices incorporated into item SWQ-1
FWH-1	Cooperate with the DNR and other agencies in efforts to minimize the spread and/or adverse impact of aquatic and terrestrial invasive species (e.g., signage, volunteer activities)	FWH-3, REC-1							●	O	Watershed-wide	Number of Projects (10 per year)	20	20	20	20	20	$ 175,000	$ -	$ 175,000	County CRWD TCWD SWCD	MDNR	
FWH-2	Incorporate practices to improve fish and macroinvertebrate habitat into projects that address surface water quality and/or flooding issues	SWQ-1, FLD-4, FWH-5, REC-1	O			O			●	O	See SWQ-1	See SWQ-1	See SWQ-1, SWQ-2					See SWQ-1	See SWQ-1	See SWQ-1	See SWQ-1	See SWQ-1	See SWQ-1 and other applicable project items
FWH-3	Cooperate with partners to provide technical assistance and/or funding assistance in conservation projects with wildlife habitat benefits (e.g., CRP)	FWH-1, FWH-2, REC-1							●	O	Watershed-wide (emphasizing areas of biological significance)	Number of projects for which assistance provided (1 every 2 years)	1	1	1	1	1	$ 50,000	$ 50,000	$ -	CRWD TCWD SWCD	MDNR FSA NRCS	
REC-1	Incorporate public access to natural areas	SWQ-1, ESC-3, FLD-1, REC-1	O	O		O				●	See SWQ-1	Number of projects (1 every 2 year)	1	1	1	1	1	$ 50,000	$ 50,000	$ -	See SWQ-1	See SWQ-1	See SWQ-1 and other applicable project items
																PROJECTS TOTAL		$ 11,162,819	$ 6,161,409	$ 5,001,409			
Monitoring Activities and Studies																							
SWQ-6	Perform field verification of very high priority and high priority project sites identified through SWAT modeling and GIS terrain analyses (see Figure 6-5) to verify problem areas and evaluate feasibility	SWQ-1, SWQ-2, ESC-1, ESC-2, GWQ-5, FLD-1, SLH-3, GWS-1, FWH-5, REC-1	●	●	O	O	O	O	O	O	Very High and High Priority Project Areas (see Figure 6-5)	Inventory of feasibility sites for future implementation	X	X				$ 50,000	$ 50,000	$ -	SWCD CRWD TCWD	MDNR MPCA	

Table 7-2 Cedar-Wapsipinicon Comprehensive Watershed Management Plan Implementation Schedule

Item ID	Implementation Action Description	Applicable Goals (see Table 4-1)	Priority Issues Addressed: Tier I: Degraded Surface Water Quality	Tier I: Accelerated Erosion and Sedimentation	Tier I: Groundwater Contamination	Tier I: Excessive Flooding	Tier II: Degraded Soil Health	Tier II: Threatened Groundwater Supply	Tier III: Threats to Fish, Wildlife, and Habitat	Tier III: Reduced Livability and Recreation	Target or Focus Area	Measurable Output	Timeframe (Values are incremental for each 2-year period): 2020-21	2022-23	2024-25	2026-27	2028-29	Estimated Total Cost	Estimated Local Contribution	Estimated External Contribution	Lead LGU	Supporting Entities	Notes
SWQ-7	Perform subwatershed/site specific SWAT (or similar) modeling to estimate nutrient, sediment, and volume reduction benefits of field-verified priority project sites (see item above)	SWQ-1, SWQ-2, ESC-1, ESC-2, GWQ-5, FLD-1, SLH-3, GWS-1, FWH-5, REC-1	●	●	O	O	O	O	O	O	Very High and High Priority Project Areas (see Figure 6-5)	Estimates of nutrient, sediment, and volume reduction	X	X				$ 10,000	$ 10,000	$ -	SWCD CRWD TCWD	MPCA BWSR	
SWQ-8	Develop monitoring plan focusing on critical stressors (e.g., nutrients, sediment, bacteria, biological impairments).	SWQ-1, SWQ-2, FWH-5, REC-1	●						●	●	Watershed-wide	Monitoring Plan	X					$ 10,000	$ 10,000	$ -	CRWD TCWD SWCD	MPCA	
SWQ-9	Monitor the water quality of select waterbodies focusing on critical stressors; additional focus will be placed on watersheds not assessed in Cedar River Watershed WRAPS.	SWQ-1, SWQ-2, FWH-5, REC-1	●						●	●	Watershed-wide (emphasizing Deer Creek, Elk River, Little Cedar River, Wapsipinicon River)	Annual monitoring report(s)		X	X	X	X	$ 200,000	$ 200,000	$ -	CRWD TCWD SWCD	MPCA	
GWQ-6	Monitor private groundwater wells for nitrate, bacteria, and other emerging contaminants with focus on aquifers 200-300 feet deep; initiate special study on emerging contaminants	GWQ-3, GWQ-4, GWQ-6			●						Watershed-wide	Groundwater monitoring report (and mapping)	X	X				$ 100,000	$ 50,000	$ 50,000	County	MDH MDA	Coordinate with MDA township well testing; Program may be modified pending outcome of item GWQ-8
GWQ-7	Support testing of private wells for nitrate, bacteria, and other contaminants	GWQ-3, GWQ-6			●						Watershed-wide	Number of wells sampled	100	100	150	150	200	$ 70,000	$ 70,000	$ -	County	MDH MDA	Coordinate with MDA township well testing
GWQ-8	Work with MDH to identify trends in nitrate concentrations in residential wells and identify priority action areas	GWQ-4, GWS-2			●			●		O	Watershed-wide	Trend analyses; priority action areas		X				$ 10,000	$ 10,000	$ -	SWCD	County MDH MDA	
GWQ-9	Develop a comprehensive strategy for groundwater monitoring and assessment within the watershed	GWQ-4, GWS-2			●			●			Watershed-wide	Monitoring Plan	X					$ 10,000	$ 10,000	$ -	SWCD CRWD TCWD	County MDH MDA	Coordinate with GRAPS study
GWQ-10	Continue to inventory SSTS systems	GWQ-8	●		●						Watershed-wide	Percent of systems inventoried in watershed	20%	20%	20%	20%	20%	$ 70,000	$ 70,000	$ -	County	MPCA	Build on existing data
ESC-2	Develop an inventory of floodplain reconnection opportunities, critical habitat opportunities, and completed upstream projects	ESC-2, ESC-3, FWH-4		●		O					Watershed-wide	Inventory of areas			X			$ 20,000	$ 20,000	$ -	County SWCD CRWD TCWD	MDNR	
FLD-4	Update existing hydrologic and hydraulic modeling using most current precipitation data and develop models for previously un-modeled watersheds (Deer Creek, Elk River, Wapsipinicon River, Little Cedar River, Otter Creek)	FLD-2, FLD-3				●					Watershed-wide (emphasizing Deer Creek, Elk River, Little Cedar River, Wapsipinicon River, Otter Creek)	Updated hydrologic model	X					$ 40,000	$ 40,000	$ -	CRWD TCWD	MDNR	
FLD-10	Establish work group to incorporate GSSHA modeling into updates of watershed-wide hydrologic model	FLD-2, FLD-3	O	O	O	●					Watershed-wide	Updated hydrologic model	x					$ 10,000	$ 10,000	$ -	CRWD TCWD	MDNR MPCA	
FLD-5	Use modeling results to define floodplain and identify properties and infrastructure subject to flood risk and prioritize areas for feasibility studies to reduce risk	FLD-3, FLD-4				●					Watershed-wide	Prioritized inventory of flood risk areas		X				$ 10,000	$ 10,000	$ -	CRWD TCWD	MDNR	
FLD-6	Use results of H&H modeling to refine storage and flow rate reduction goals for subwatersheds and identify priority locations for storage practices	ESC-1, FLD-1, FLD-2	O	O	O	●					Watershed-wide (initial focus on Turtle Creek, Middle Fork Cedar River, and Roberts Creek)	Subwatershed storage and flow rate goals			X			$ 20,000	$ 20,000	$ -	CRWD TCWD County SWCD	MDNR	
FLD-7	Maintain an inventory of tile and other drainage systems within the watershed to apply for multipurpose drainage management (MDM) grants; the inventory may include opportunities for multibenefit improvements, as identified by the Partnership	FLD-1, FLD-2	O	O	O	●					Watershed-wide	Inventory of tile drainage areas	X	X	X	X	X	$ 50,000	$ 50,000	$ -	SWCD County	CRWD TCWD	
SLH-1	Develop and maintain inventory to quantify and track extent of soil health practices used in the watershed (e.g., cover crops, perennial vegetation)	SLH-2	O	●	O	O	●				Watershed-wide	Inventory of soil health best practices	X	X	X	X	X	$ 15,000	$ 15,000	$ -	SWCD	NRCS MDA	
SLH-2	Assess/quantify the runoff reduction, water quality, water storage, and groundwater protection benefits of cover crops, perennial vegetation, and other soil health practices	SWQ-1, ESC-1, ESC-3, FLD-1, SLH-1, GWS-2	●	●	O	●	●	●			Soil health focus areas (to be determined)	Study; numeric benefit estimates	X	X	X	X	X	$ 50,000	$ 50,000	$ -	SWCD	NRCS MDA RCTC MOSH	
SLH-3	Track land cover in the watershed using MLCCS and other data sources	SLH-2	O	●	O	O	●				Watershed-wide	Inventory of land cover	X	X	X	X	X	$ 15,000	$ 15,000	$ -	SWCD	NRCS MMDNR	

Table 7-2 Cedar-Wapsipinicon Comprehensive Watershed Management Plan Implementation Schedule

Item ID	Implementation Action Description	Applicable Goals (see Table 4-1)	Priority Issues Addressed: Tier I: Degraded Surface Water Quality	Tier I: Accelerated Erosion and Sedimentation	Tier I: Groundwater Contamination	Tier I: Excessive Flooding	Tier II: Degraded Soil Health	Tier II: Threatened Groundwater Supply	Tier III: Threats to Fish, Wildlife, and Habitat	Tier III: Reduced Livability and Recreation	Target or Focus Area	Measurable Output	Timeframe (Values are incremental for each 2-year period): 2020-21	2022-23	2024-25	2026-27	2028-29	Estimated Total Cost	Estimated Local Contribution	Estimated External Contribution	Lead LGU	Supporting Entities	Notes
GWS-2	Cooperate with state agencies to monitor groundwater levels within the watershed and assess trends	GWS-2						●			Watershed-wide	Data collected; annual monitoring report(s)	X	X	X	X	X	$ 25,000	$ 25,000	$ -	County SWCD	MDH MDNR	Coordinate with GRAPS study
GWS-3	Cooperate in groundwater strategic planning efforts initiated by state agencies or other entities	GWQ-4, GWQ-8, GWS-2			●			●			Watershed-wide	GRAPS report			X			$ 5,000	$ 5,000	$ -	SWCD CRWD TCWD	County MDH MDNR	
FWH-4	Characterize the presence and impacts of aquatic invasive species	FWH-3, REC-1							●	O	Watershed-wide	Database of AIS	X	X	X	X	X	$ 10,000	$ 10,000	$ -	County SWCD CRWD TCWD	MDNR	
REC-2	Develop and maintain an inventory of potential water resource recreation opportunities/access points in the watershed	REC-1								●	Watershed-wide	Inventory of potential recreation opportunities and access points	X	X	X	X	X	$ 5,000	$ 5,000	$ -	CRWD TCWD	SWCD	
																STUDIES TOTAL		$ 745,000	$ 695,000	$ 50,000			
Education and Public Involvement Activities																							
SWQ-10	Promote the use of BMPs focused on soil health (e.g., cover crops, perennial vegetation, conservation tillage) through education and outreach	SWQ-1, SLH-2	O	●	O	O	●		O		Agricultural Lands	Handouts; Workshops (2 per year)	4	4	4	4	4	$ 50,000	$ 25,000	$ 25,000	SWCD CRWD TCWD	NRCS MDA	
SWQ-13	Host workshops to provide education regarding nutrient management plans and manure management plans	SWQ-1, GWQ-1, GWQ-2, GWQ-7, SLH-1	●		●		O				Agricultural Lands	Workshops (1 per year)	2	2	2	2	2	$ 20,000	$ 20,000	$ -	SWCD CRWD TCWD	NRCS MDA UMN Ext Private Sector	
GWQ-11	Provide educational materials regarding proper function and maintenance of SSTS systems (targeting non-compliant landowners)	GWQ-7	●		●						Unsewered areas and Priority GW Areas (see Figure 6-2)	Handouts; Pamphlets; News Articles; Newsletters	2	2	2	2	2	$ 5,000	$ 5,000	$ -	County	MPCA I. Walton	
GWQ-12	Distribute education materials increasing resident awareness of, and promoting practices to reduce, nitrogen loading to groundwater in DWSMAs	GWQ-2, GWQ-3, GWQ-5			●						DWSMAs	Handouts; Pamphlets; News Articles	2	2	2	2	2	$ 5,000	$ 5,000	$ -	County	MDH MDA	
GWQ-13	Provide educational materials regarding the Minnesota Agricultural Water Quality Certification Program	SWQ-1, GWQ-1, GWQ-2, SLH-1	O		●		O				Agricultural Lands	Handouts; Pamphlets; News Articles	X	X	X	X	X	$ 5,000	$ 5,000	$ -	SWCD	MDA	
GWQ-14	Distribute education materials regarding private well maintenance, capping, and closure	GWQ-2, GWQ-3, GWQ-5			●						Watershed-wide	Handouts; Pamphlets; News Articles	X	X	X	X	X	$ 5,000	$ 5,000	$ -	County	MPCA I. Walton	
GWQ-16	Provide technical assistance and cost share for well capping	GWQ-2, GWQ-3, GWQ-5			●						Watershed-wide	Technical assistance (as needed); 10 well caps/year	20	20	20	20	20	$ 2,500	$ 2,500		County	SWCD MDH	
ESC-3	Increase public awareness and promote the use of vegetated buffers and runoff reduction practices through education and outreach	SWQ-1, ESC-1, ESC-2, FWH-4,	●	●							Watershed-wide; Riparian areas	Handouts; Newsletters; Articles	X	X	X	X	X	$ 5,000	$ 5,000	$ -	SWCD CRWD TCWD	NRCS MDA Private Sector	
FLD-8	Encourage the use of low impact design (LID) techniques to reduce stormwater runoff from developed areas through technical assistance to residents and developers	SWQ-1, FLD-1	O			●				O	Developed and developing areas	Outreach event (1 per year)	2	2	2	2	2	$ 10,000	$ 10,000	$ -	City of Austin CRWD TCWD	SWCD MPCA	Leverage partnerships with nurseries, landscape companies, and master water stewards programs where appropriate
SLH-4	Work with agriculture retailers and crop consultants on workshops / field days / other outreach activities.	SLH-2	O	O	O	O	●				Agricultural Lands	Outreach event (1 per year)	2	2	2	2	2	$ 10,000	$ 10,000	$ -	SWCD	MDA	
GWS-4	Provide educational materials regarding groundwater conservation practices used within the watershed, seeking feedback from existing practitioners	GWS-1, GWS-2						●			Watershed-wide	Handouts; Newsletters; Articles	X	X	X	X	X	$ 5,000	$ 5,000	$ -	County	MDH MDNR	Practices may include irrigation scheduling, water use monitoring, use of low pressure, drip-, or micro-irrigation systems
GWS-5	Increase public awareness about groundwater conservation through education and outreach activities	GWS-1						●			Watershed-wide	Handouts; Newsletters; Articles	X	X	X	X	X	$ 100,000	$ -	$ 100,000	SWCD County	MDNR I. Walton	
REC-3	Promote public interaction with nature through environmental stewardship education and outreach efforts	REC-1								●	Watershed-wide	Host events to promote stewardship (1 per year)	X	X	X	X	X	$ 25,000	$ 12,500	$ 12,500	SWCD CRWD TCWD	MDNR I. Walton Hormel	
REC-4	Develop and maintain a list of volunteer activities/opportunities for community groups, conservation groups, and other residents, and recruit such groups to perform identified activities (e.g., river cleanup, enviro-thon)	REC-1								●	Watershed-wide	Volunteer database; Volunteer activities (2 per year)	X	X	X	X	X	$ 50,000	$ 25,000	$ 25,000	SWCD CRWD TCWD	MDNR	

Table 7-2 Cedar-Wapsipinicon Comprehensive Watershed Management Plan Implementation Schedule

Item ID	Implementation Action Description	Applicable Goals (see Table 4-1)	Priority Issues Addressed: Tier I: Degraded Surface Water Quality	Tier I: Accelerated Erosion and Sedimentation	Tier I: Groundwater Contamination	Tier I: Excessive Flooding	Tier II: Degraded Soil Health	Tier II: Threatened Groundwater Supply	Tier III: Threats to Fish, Wildlife, and Habitat	Tier III: Reduced Livability and Recreation	Target or Focus Area	Measurable Output	Timeframe (Values are incremental for each 2-year period): 2020-21	2022-23	2024-25	2026-27	2028-29	Estimated Total Cost	Estimated Local Contribution	Estimated External Contribution	Lead LGU	Supporting Entities	Notes
FWH-5	Expand participation in the Minnesota Conservation Reserve Enhancement Program (CREP), RIM, and CRP through targeted solicitation of high-value habitat areas	FWH-1, FWH-2	O	O					●		High value habitat areas	Educational activities (2 per year)	4	4	4	4	4	$ 10,000	$ 10,000	$ -	SWCD	BWSR USDA	
																EDUCATION TOTAL		$ 307,500	$ 145,000	$ 162,500			
Regulatory and Administrative Activities (see note regarding costs)																							
SWQ-14	Update local ordinances to adopt Minimal Impact Design Standards (MIDS) for projects creating or reconstructing one acre or more of impervious area.	SWQ-1, ESC-1, ESC-3, FLD-1	●	●		O					Watershed-wide (emphasis on developing areas and redevelopment)	Updated Ordinance(s)		X				$ 10,000	$ 10,000	$ -	City of Austin	MPCA	
GWQ-15	Review land use and/or zoning ordinances in vulnerable DWSMA areas to identify opportunities to limit nitrogen loading	SWQ-1, GWQ-2, GWQ-5	●		●						DWSMA	Reviewed Ordinance(s)		X				$ 1,000	$ 1,000	$ -	City of Austin County	MDH MDA	
ESC-4	Continue to implement and enforce rules and regulatory programs required by the State of Minnesota but implemented at the local level (e.g., NPDES General Construction Stormwater Permit, Wetland Conservation Act, Buffer Law, Soil Loss)	SWQ-1, ESC-2, ESC-3, FWH-1, FWH-4	●	●	O	O	O	O	O	O	Watershed-wide	Continued enforcement and administration	X	X	X	X	X	Included in existing operating budgets	Included in existing operating budgets	Included in existing operating budgets	County SWCD CRWD TCWD	MDNR BWSR MPCA	
FLD-9	Review and update, as needed, floodplain and zoning ordinances; develop floodplain ordinances in areas where not currently existing	FLD-4, FWH-1, FWH-4				●			O		Floodplain	Updated Ordinance(s)	X					$ 5,000	$ 5,000	$ -	City of Austin County	CRWD TCWD MDNR	
FWH-6	Review and update, as needed, zoning and land use regulations to promote the protection of sites of biological significance and habitat areas (e.g., trout streams)	FWH-1, FWH-2, FWH-4, FWH-5							●		Watershed-wide	Updated Ordinance(s)	X					$ 5,000	$ 5,000	$ -	City of Austin County	MDNR	
																REGUL. TOTAL		$ 21,000	$ 21,000	$ -			
																PLAN TOTAL:		$ 12,236,319	$ 7,022,409	$ 5,213,909			

Notes: Estimated costs for Regulatory and Administrative Activities include only the estimated incremental/additional cost relative to the implementation of current programs

● = implementation activity directly benefits the priority issue

O = implementation activity may indirectly benefit the priority issue

SWQ = Degraded Surface Water Quality

ESC = Accelerated Erosion and Sedimentation

GWQ = Groundwater Contamination

FLD = Excessive Flooding

SLH = Degraded Soil Health

GWS = Threatened Groundwater Supply

FWH = Threats to Fish, Wildlife, and Habitat

8.0 References

Austin Daily Herald. October 2017. *Study: Cover crops, less tillage key to water goal.* Online available: https://www.austindailyherald.com/2017/10/study-cover-crops-less-tillage-key-to-water-goals/

Austin Public Utilities. 2017. Water Quality Report. Online available: http://www.austinutilities.com/files/pdf/AU_WaterQualityBooklet_2017_preview.pdf

Barr Engineering Co. (Barr). 2013. *Focused SWAT Watershed Modeling.* Prepared for the Cedar River Watershed Restoration and Protection Strategies.

Barr Engineering Co. (Barr). March 2015. *Prioritization of Water Quality and Water Quantity Improvement Projects to Establish a Capital Improvement Program, draft 3*. Prepared for the CRWD.

Cannon River Watershed Partnership and Minnesota Pollution Control Agency (MPCA). September 2007. *REVISED REGIONAL TOTAL MAXIMUM DAILY LOAD: Fecal Coliform Bacteria Impairments in the Lower Mississippi River Basin Of Southeast Minnesota IMPLEMENTATION PLAN.*

Cedar River Watershed District (CRWD). 2009. *Cedar River Watershed District Watershed Management Plan*. Prepared by Barr Engineering Co.

Cedar River Watershed District (CRWD). 2015. *Cedar River Watershed District Five-year Capital Improvement Plan.*

City of Austin. December 2014. *Ordinance Regarding Stormwater Pollution Prevention.* Chapter 20: Stormwater Management.

Dodge County Water Planning Task Force. April 2006. *Dodge County Water Management Plan 2006-2016.*

Freeborn County. 2002. *Management Plan for Geneva Lake.*

Freeborn County. 2016. *Freeborn County Comprehensive Water Plan Amendment to Implementation 2016-2021.*

Huser, B.J., Przemyslaw, G., Bajer, G., Chizinski, C.J., and Sorensen, P.W. 2016. *Effects of common carp (Cyprinus carpio) on sediment mixing depth and mobile phosphorus mass in the active sediment layer of a shallow lake*. Hydrobiologia (2016) 763:23-33.

Iowa Department of Natural Resources Watershed Improvement Section. 2006. *Total Maximum Daily Load for Nitrate Cedar River Linn County, Iowa.*

Iowa Silver Jackets. January 2016. *Non-Structural Landuse Change Impacts on Structure Losses in Cedar River Communities.* Prepared for USACE National Flood Risk Management Program.

Iowa Flood Center and IIHR – Hydroscience & Engineering. November 2018. *Upper Wapsipinicon Watershed Hydrologic Assessment Report.* Prepared for the Upper Wapsipinicon Watershed Management Authority.

Minnesota BWSR. June 2016. *2016 Nonpoint Priority Funding Plan.*

Minnesota Board of Water and Soil Resources (BWSR). April 2018. *Cedar River Watershed Parcels with eLINK BMPs and RIM Easements Map.*

Minnesota Climatology Working Group. State Climatology Office, Minnesota Department of Natural Resources Division of Ecological and Water Resources: www.climate.umn.edu

Minnesota Department of Agriculture (MDA). September 2012. *The Agricultural BMP Handbook for Minnesota.*

MDA. March 2015. *Minnesota Nitrogen Fertilizer Management Plan*. Online available: https://www.mda.state.mn.us/pesticide-fertilizer/minnesota-nitrogen-fertilizer-management-plan

Minnesota Department of Health (MDH). 2018. *Nitrate in Drinking Water*. Online available: https://www.health.state.mn.us/communities/environment/water/contaminants/nitrate.html

Minnesota Department of Natural Resources (MDNR). 2012. *Climate Summaries and Publications: 1981-2010 Normals Map Portal*. Online available: https://www.dnr.state.mn.us/climate/summaries_and_publications/normalsportal.html

MDNR, Division of Ecological and Water Resources. October 2017. *Altered Hydrology: Going Beyond Best Management Practices (BMPs) to Clean Water.* [Presentation Slides].

MPCA. January 2006. *Revised Regional Total Maximum Daily Load Evaluation of Fecal Coliform Bacteria Impairments in the Lower Mississippi River Basin in Minnesota.* Pages 13, 22-27, 104-107, 114-119. Prepared for U.S. Environmental Protection Agency Region 5.

MPCA. February 2008. *Small Community Wastewater Needs in Minnesota.* Pages 11-13.

MPCA. July 2012. *Cedar River Watershed Monitoring and Assessment Report.*

Minnesota Pollution Control Agency (MPCA), MDNR, MDA, MDH, Minnesota BWSR, Minnesota Public Facilities Authority (PFA), Metropolitan Council, and University of Minnesota – Water Resource Center. 2014. *Minnesota's Clean Water Roadmap.*

MPCA, MDNR, MDA, MDH, BWSR, Minnesota Public Facilities Authority (MPFA), Metropolitan Council, University of Minnesota, Natural Resources Conversation Service (NRCS), Farm Service Agency (FSA), and United States Geological Survey (USGS). September 2014. *The Minnesota Nutrient Reduction Strategy.*

MPCA. 2019. *Cedar River Watershed Restoration and Protection Strategy Report.*

MPCA. June 2016. *Cedar River Watershed Stressor Identification Report: A study of local stressors limiting the biotic communities in the Cedar River Watershed.*

MPCA. June 2016. *Development of Biological Criteria for Tiered Aquatic Life Uses: Fish and macroinvertebrate thresholds for attainment of aquatic life use goals in Minnesota streams and rivers.*

MPCA. March 2018. *Wapsipinicon River Watershed Stressor Identification Report: A study of local stressors limiting the biotic communities in the Wapsipinicon River Watershed.*

MPCA. July 2018. *Winnebago River and Upper Wapsipinicon River Watersheds Monitoring and Assessment Report*.

MPCA. May 2019. *Cedar River Watershed Total Suspended Solids, Lake Eutrophication, and Bacteria Total Maximum Daily Load.*

MPCA. May 2019. *Cedar River Watershed Restoration and Protection Strategy Report.*

Moore, Trisha L., John S. Gulliver, Latham Stack, and Michael H. Simpson. 2016. Stormwater management and climate change: vulnerability and capacity for adaptation in urban and suburban contexts. *Climate Change*. Volume 138, Issue 3-4, pages 491-504.

Mower County. 2010. *Mower County Local Water Management Plan 2006 – 2015.*

Mower Soil and Water Conservation District. *Proposed grant for soil health research project to help improve water quality in Cedar River Watershed.*

National Oceanic and Atmospheric Administration. 2013. *NOAA Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 8 Version 2.0: Midwestern States (Colorado, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin).*

RESPEC. 2017. *Documentation of the BMP Database Available in the Scenario Application Manager.* Draft Topical Report RSI-2742. Prepared for the MPCA.

Solstad, J. 2017. *Dobbins Creek Subwatershed GSSHA Modeling* (presentation).

Steele County. July 2016. *Steele County Water Plan Amendment (Draft).*

Turtle Creek Watershed District (TCWD). 2003. *Turtle Creek Watershed District Watershed Management Plan.* Prepared by Mower Soil and Water Conservation District.

Upper Cedar River Ad Hoc Committee, *Upper Cedar River Surface Water Management Plan, Executive Summary Report,* prepared by Barr Engineering Co., September 2007.

Appendix A

Memorandum of Agreement (MOA) for Plan Implementation

TURTLE – LITTLE CEDAR – CEDAR – DEER COMPREHENSIVE WATERSHED MANAGEMENT PLAN
MEMORANDUM OF AGREEMENT

This Agreement is made and entered into by and between:

The Counties of Dodge, Freeborn, Mower, and Steele by and through their respective County Board of Commissioners, and

The Dodge, Freeborn, Mower, and Steele Soil and Water Conservation Districts, by and through their respective Soil and Water Conservation District Board of Supervisors, and

The Cedar River, and Turtle Creek Watershed Districts, by and through their respective Board of Managers, and

The City of Austin, by and through their Council of Members;

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 and land use controls, pursuant to Minnesota Statutes Chapter 375 and as otherwise provided by law; 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 Chapters 103B, 103D and as otherwise provided by law; and

WHEREAS, the city of this Agreement is a political subdivision of the State of Minnesota, with statutory authority to control or eliminate stormwater pollution along with soil erosion and sedimentation within the boundary, and to establish standards and specifications for conservation practices and planning activities that minimize stormwater pollution, soil erosion and sedimentation, pursuant to Minnesota Rules Chapter 7001 and 7090; and

WHEREAS, the parties to this Agreement have a common interest and/or statutory authority to implement the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan 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 and conserve 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.

WHEREAS, pursuant to Minn. Stat. Section 103B.101 Subd. 14, the Board of Water and Soil Resources (BWSR) "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."

WHEREAS, it is understood by all the parties to this Agreement that the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan does not replace or supplant local land use, planning, zoning authority, but, instead, provides a framework to provide increased opportunities for cooperation and consistency on a watershed basis, and to allow local governments to cooperatively work together to implement projects with the highest return on investment for improving water quality/quantity issues on a watershed basis.

WHEREAS, the Parties have formed this Agreement for the specific goal of implementing the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan pursuant to Minnesota Statutes § 103B.801.

NOW, THEREFORE, the Parties hereto agree as follows:

1. **Purpose of the Agreement:** The Parties to this Agreement recognize the importance of partnerships to implement protection and restoration efforts for the Turtle – Little Cedar – Cedar – Deer area *(see Attachment A with a map of the planning area)* on a cooperative and collaborative basis together under this Agreement pursuant of the authority contained in Minn. Stat. Section 471.59. The purpose of this Agreement is to collectively implement, as local government units, the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan while providing assurances that decision-making spanning political boundaries is supported by an in-writing commitment from participants.

   This Agreement does not establish a Joint Powers Entity but sets the terms and provisions by which the parties "may jointly or cooperatively exercise any power common to the contracting parties or any similar powers, including those which are the same except for the territorial limits within which they may be exercised." Minnesota Statues § 471.59. This Agreement does not include a financial obligation, but rather an ability to share resources.

2. **Term:** This Agreement is effective upon signature of all Parties, in consideration of the Board of Water and Soil Resources (BWSR) operating procedures; and will remain in effect until canceled according to the provisions of this Agreement.

3. **Adding Additional Parties:** A qualifying party within the Turtle – Little Cedar – Cedar – Deer area desiring to become a member of this Agreement shall indicate its intent by adoption of a governing board resolution that includes a request to the Policy Advisory Committee to join the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan. 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 Policy Advisory Committee.

4. **Withdrawal of Parties:** A party desiring to leave the membership of this Agreement shall indicate its intent, in writing, to the Policy Advisory Committee in the form of an official board resolution. Notice must be made at least 30 days in advance of leaving the Agreement. Any party that leaves the membership of the Agreement remains obligated to complying with the terms of any grants the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan has at the time of the party's notice to leave membership, and is obligated until the grant has expired or has been closed out.

5. **General Provisions**:

   a. **Compliance with Laws/Standards:** The Parties agree to abide by all federal, state, and 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 any 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." 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 § 471.59, subd. 1a(a), and does not create any liability or exposure of one party for the acts or omissions of any other party.

   c. **Employee Status:** The parties agree that the respective employees or agents of each party shall remain the employees or agents of each individual respective party.

   d. **Records Retention and Data Practices:** The Parties agree that each respective party will be responsible for any records prepared or maintained, and shall be subject to the Minnesota Government Data Practices Act. The records retention will follow the Fiscal Agent's and Day to Day Contact Agent's records retention schedules in accordance with Minnesota Statutes § 138.17. If this agreement is terminated, all records will be turned over to the Fiscal Agent for continued retention. (See 7. e. and 8. e.)

   e. **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.

   f. **Termination:** This Agreement will remain in full force and effect until canceled by all parties, unless otherwise terminated in accordance with other provisions of this Agreement. The parties

acknowledge their respective and applicable obligations, if any, under Minn. Stat. Section 471.59, Subd. 5 after the purpose of the Agreement has been Terminated.

6. **Administration:**

   a. **Establishment of Committees for Implementation of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan:** Committees will be established to carry out the coordinated implementation of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan. The parties agree to establish, under this Agreement, a Policy Advisory Committee, a Technical Advisory Committee, and a Local Implementation Work Group.

      i. **The Policy Advisory Committee:** The parties agree to establish a Policy Advisory Committee for the purpose of implementing the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan. The Policy Advisory Committee will operate cooperatively and collaboratively, but not as a separate entity. Each governing entity agrees to appoint one representative, who must be an elected or appointed member of each governing entity to the Policy Advisory Committee. Each governing entity may choose to appoint one alternate to serve on the Policy Advisory Committee, as needed, in the absence of the appointed member. Each appointed member will serve as a liaison to their respective governing entity, and act on behalf of their governing entity in all matters before the Policy Advisory Committee. Policy Advisory Committee members agree to keep their respective governing entities regularly informed on the implementation of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan. Each representative shall have one vote, subject to the authority delegated by their respective governing entity. The Policy Advisory Committee will establish bylaws to describe the functions and operations of all committee(s). Once established, the Policy Advisory Committee will follow the bylaws adopted, and have the power to modify the bylaws. The Policy Advisory Committee will meet, as needed, to decide on implementation of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan. The Policy Advisory Committee shall recommend approval of grant applications, grant agreements, payment of invoices, professional contracts to the Fiscal Agent and Day to Day Contact. The Policy Advisory Committee shall also review an annual work plan and budget consisting of an itemized statement of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan, revenues and expenses for the ensuing calendar years, and shall be presented to the respective governing entities that are represented on the Policy Advisory Committee.

      ii. **The Technical Advisory Committee:** The Policy Advisory Committee may appoint technical representatives to an Technical Advisory Committee to provide support and make recommendations on implementation of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan, in consideration of the BWSR Operating

Procedures. The Technical Advisory Committee may consist of the Local Implementation Work Group, contacts for the state's main water agencies, and/or plan review agencies, and area stakeholders. The Technical Advisory Committee will meet, as needed.

iii. **The Local Implementation Work Group:** The parties agree to establish a Local Implementation Workgroup, which shall consist of, but not limited to, local staff, including local county water planners, local watershed staff, local SWCD staff, and local city staff, for the purposes of logistical, and day-to-day decision-making in the implementation of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan. The Local Implementation Workgroup shall prepare a draft annual work plan and budget consisting of an itemized statement of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan revenues and expenses for the ensuing calendar year which shall be presented to the Policy Advisory Committee for review. The Local Implementation Workgroup will meet as needed.

7. **Implementation of the Plan.** The Parties agree to adopt and begin implementation of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan within 120 days of receiving notice of state approval, and provide notice of plan adoption pursuant to Minnesota Statutes Chapters 103B and 103D.

8. **Fiscal Agent:** If a party is not designated for a specific grant or project, the Policy Advisory Committee shall appoint, annually, one of the parties to the Agreement to be the Fiscal Agent for the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan. Mower Soil and Water Conservation District will be the initial Fiscal Agent for the purposes of this Agreement, and agrees to:

   a. Accept all responsibilities associated with any grant agreements received for the implantation of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan where no fiscal agent has been designated.

   b. Perform financial transactions as part of any grant agreements, and contract implementation.

   c. Provide for strict accountability of all funds, report all receipts and disbursements, and annually provide a full and complete audit report.

   d. Provide the Policy Advisory Committee with the records necessary to describe the financial condition of all grant agreements.

   e. Maintain the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan website.

   f. Retain fiscal records consistent with the Fiscal Agent's records retention schedule (See 5. c.).

9. **Grant Administration**: If a party is not already designated for a specific grant or project, the Policy Advisory Committee shall appoint, annually, one of the parties to the Agreement to be the Day-to-Day Contact, being the point of contact for, and handling of the day-to-day administrative work of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan. The, Dodge Soil and Water Conservation District will be the initial Day to Day Contact for the purposes of this Agreement, and will handle this function and continue thereafter until and unless the Policy Advisory Committee appoints an alternate Day-to-Day Contact. The Day-to-Day Contact agrees to:

    a. Accept all day-to-day responsibilities associated with the implementation of grants received for implementing the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan, including being the primary contact for any grant agreements, and any reporting requirements associated with any grant agreements not otherwise stated.

    b. Provide the Policy Advisory Committee with the records necessary to describe the implementation of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan.

    c. Provide for proper public notice of all meetings.

    d. Ensure that minutes of all Policy Advisory 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.

    e. Retain records consistent with the Day to Day Contact's records retention schedule until termination of the agreement (at that time, records will be turned over to the Fiscal Agent) (See 5. c.).

    f. Perform any other duties to keep the Policy Advisory Committee, the Technical Advisory Committee, and the Local Implementation Workgroup informed about the implementation of the Turtle – Little Cedar – Cedar – Deer Comprehensive Watershed Management Plan.

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

<u>Dodge County</u>
Jim Elmquist or successor
County Administrator
721 Main St. N.
Mantorville, MN 55955
Telephone: (507) 635-6239

<u>Dodge Soil and Water Conservation District</u>
Adam King or successor
District Manager
916 2nd St. S.E.
Dodge Center, MN 55927
Telephone: (507) 374-6364

Freeborn County
Thomas Jensen or successor
County Administrator
411 S. Broadway
Albert Lea, MN 55009
Telephone: (507) 377-5116

Mower County
Craig Oscarson or successor
County Coordinator
201 1st St. N.E.
Austin, MN 55912
Telephone: (507) 437-9494

Steele County
Scott Golberg or successor
Environmental Services Director
630 Florence Ave.
Owatonna, MN 55060
Telephone: (507) 444-7431

Cedar River Watershed District
Justin Hanson or successor
District Administrator
1408 21st Ave. N.W., Suite 2
Austin, MN 55912
Telephone: (507) 434-2603

City of Austin
Craig Clark or successor
City Administrator
500 4th Ave. N.E.
Austin, MN 55912
Telephone: (507) 437-9940

Freeborn County Soil and Water Conservation District
Mark Schaetzke or successor
District Manager
1400 W. Main St.
Albert Lea, MN 56007
Telephone: (507) 373-5607

Mower Soil and Water Conservation District
Justin Hanson or successor
District Manager
1408 21st Ave. N.W., Suite 2
Austin, MN 55912
Telephone: (507) 434-2603

Steele County Soil and Water Conservation District
Eric Gulbransen or successor
District Manager
235 Cedardale Dr.
Owatonna, MN 55060
Telephone: (507) 451-6730

Turtle Creek Watershed District
Steve Lawler or successor
District Administrator
1408 21st Ave. N.W., Suite 2
Austin, MN 55912
Telephone: (507) 434-2603

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

PARTNER: _____

APPROVED:

BY: _____
Board Chair/Mayor Date

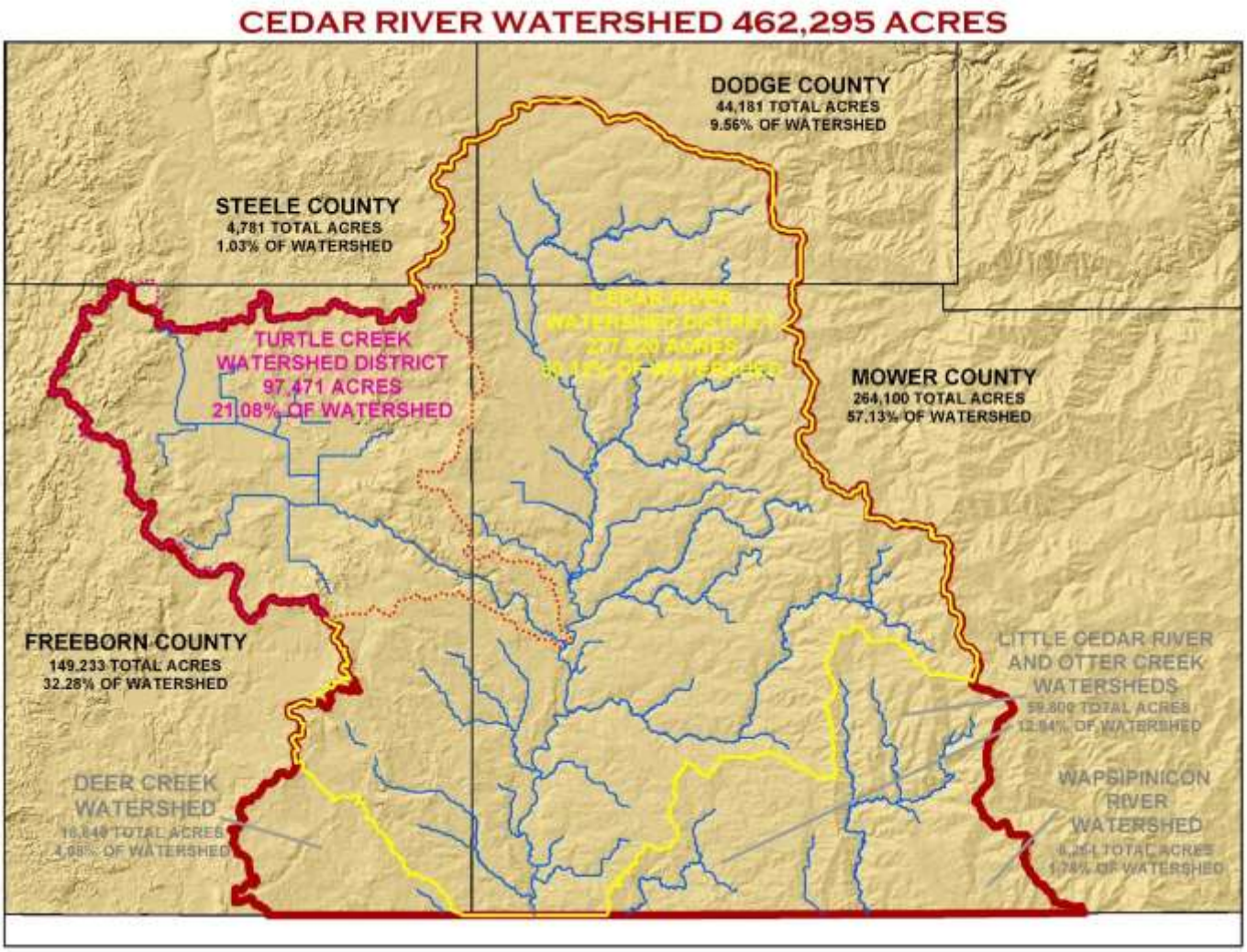
BY: _____
District Manager/Administrator Date

APPROVED AS TO FORM

BY: _____
County Attorney Date

Attachment A

Map of the Cedar River Watershed Planning Area



Appendix B

Hydrologic Modeling Results and Flow Rate Goals from the Cedar River Watershed District 2009 Watershed Management Plan

Table 4-1 Subwatershed Flow Rate Goals (As Set by CRWD)

Subwatershed #	Existing Conditions 100-Year, 24-Hour Storm Peak Discharge (cfs) [1,2]	Proposed Conditions 100-Year, 24-Hour Storm Peak Discharge (cfs) [1,2]
Cedr-13	3,526	2,558
Cedr-29	2,030	1,863
Cedr-34	4,873	3,994
Cedr-47	1,018	220
Cedr-60	1,435	994
Cedr-61	1,312	932
Cedr-66	7,094	4,766
Cedr-79	446	243
Cedr-85	1,858	1,311
Cedr-96	781	398
Cedr-111	761	233
Cedr-123	1,034	950
Cedr-129	11,476	10,381
Cedr-144	2,412	1,865
Cedr-148a	12,182	11,062
Cedr-148b	17,092	14,126
Dbbn-1	138	106
Dbbn-2	212	190
Dbbn-3	295	124
Dbbn-4	785	465
Dbbn-5	98	86
Dbbn-6	114	100
Dbbn-7	1,109	777
Dbbn-8	116	72
Dbbn-9	67	29
Dbbn-10	1,443	576
Dbbn-11	1,394	583
Dbbn-12	127	45
Dbbn-13	1,836	737
Dbbn-15	2,378	809
Dbbn-16	2,431	822
Dbbn-17	2,029	846
Dbbn-18	226	54
Dbbn-19	2,266	838
Dbbn-20	29	12
Dbbn-21	20	10
Dbbn-22	36	6
Dbbn-23	138	68
Dbbn-24	2,338	844
Dbbn-25	180	119
Dbbn-26	2,283	975

Table 4-1 Subwatershed Flow Rate Goals (As Set by CRWD)

Subwatershed #	Existing Conditions 100-Year, 24-Hour Storm Peak Discharge (cfs) [1,2]	Proposed Conditions 100-Year, 24-Hour Storm Peak Discharge (cfs) [1,2]
Dbbn-27	75	69
Dbbn-28	66	18
Dbbn-29	255	192
Dbbn-30	3,742	1,987
Dbbn-31	139	89
Dbbn-32	134	90
Dbbn-33	458	427
Dbbn-34	734	493
Dbbn-35	850	539
Dbbn-36	103	36
Dbbn-37	428	418
Dbbn-38	405	391
Dbbn-39	113	113
Dbbn-40	55	38
Dbbn-41	38	8
Dbbn-42	763	296
Dbbn-43	827	196
Dbbn-44	805	197
Dbbn-48	1,816	920
Dbbn-49	1,775	837
Dbbn-50	85	33
Dbbn-51	409	346
Dbbn-52	57	8
Dbbn-53	23	14
Dbbn-54	451	359
Dbbn-55	2,079	1,121
Dbbn-56	1,755	823
Dbbn-57	1,680	820
Dbbn-58b	3,776	2,010
Mrph-7	1,428	900
Rbrts-6	1,657	1,184
Rbrts-12	865	437
Rbrts-26	1,383	1,094
Rbrts-27	1,986	728
Rbrts-33	3,904	1,606
Rbrts-38	6,996	3,612
Rbrts-46	1,957	496
Rbrts-52	2,631	856
Rbrts-57	550	347
UpCdr-7	754	229
UpCdr-13	585	225
UpCdr-24	1,533	787

Table 4-1 Subwatershed Flow Rate Goals (As Set by CRWD)

Subwatershed #	Existing Conditions 100-Year, 24-Hour Storm Peak Discharge (cfs) [1,2]	Proposed Conditions 100-Year, 24-Hour Storm Peak Discharge (cfs) [1,2]
Wolf-1	370	356
Wolf-2	86	53
Wolf-3	446	386
Wolf-5	760	414
Wolf-6	888	412
Wolf-7	1,093	456
Wolf-8	183	41
Wolf-9	175	38
Wolf-10	1,674	492
Wolf-11	1,744	968
Wolf-12	1,769	653
Wolf-13	103	30
Wolf-14	2,351	931

[1] Flow rate goals were set based on the modeling results given in the *Upper Cedar River Surface Water Management Plan*

[2] Rates listed are for planning purposes only and are subject to change with future study.

Total of 96 subwatersheds

Table 4-2 Subwatersheds Without Set Flow Rate Goals, but Subwatersheds Have Been Modeled

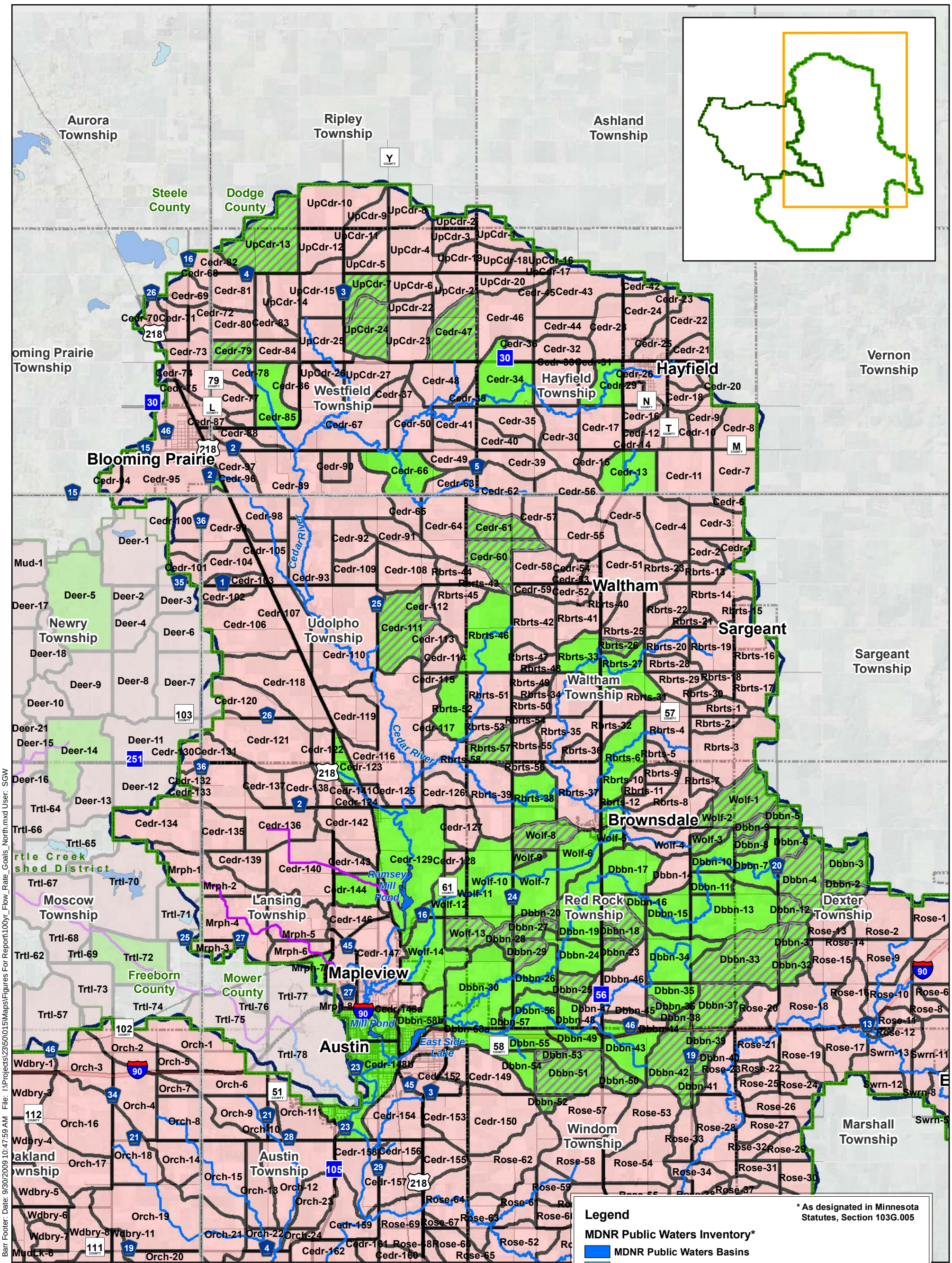
Subwatershed #
Cedr-1 - Cedr-12
Cedr-14 - Cedr-28
Cedr-30 - Cedr-33
Cedr-35 - Cedr-46
Cedr-48 - Cedr-59
Cedr-62 - Cedr-65
Cedr-67 - Cedr-78
Cedr-80 - Cedr-84
Cedr-86 - Cedr-95
Cedr-97 - Cedr-110
Cedr-112 - Cedr-122
Cedr-124 - Cedr-128
Cedr-130 - Cedr-143
Cedr-145 - Cedr-147
Cedr-149 - Cedr-158
Dbbn-14
Dbbn-45 - Dbbn-47
Dbbn-58a
Mrph-1 - Mrph-6
Mrph-8
Rbrts-1 - Rbrts-5
Rbrts-7 - Rbrts-11
Rbrts-13 - Rbrts-25
Rbrts-28 - Rbrts-32
Rbrts-34 - Rbrts-37
Rbrts-39 - Rbrts-45
Rbrts-47 - Rbrts-51
Rbrts-53 - Rbrts-56
Rbrts-58
UpCdr-1 - UpCdr-6
UpCdr-8 - UpCdr-12
UpCdr-14 - UpCdr-23
UpCdr-25 - UpCdr-27
Wolf-4

Total of 229 subwatersheds

Table 4-3 Subwatersheds Without Set Flow Rate Goals, and No Modeling has been Completed

Subwatershed #
Cedr-159 - Cedr-206
MudLk-1 - MudLk-14
Orch-1 - Orch-26
Out-1 - Out-3
Rose-1 - Rose-69
Swrn-1 - Swrn-13
Wdbry-1 - Wdbry-25

Total of 198 subwatersheds



Sources:
Flow Rate Goals - Barr, Upper Cedar River Surface Water Management Plan (2007)
Public Waters Inventory - MN Department of Natural Resources
County Boundary - MN Department of Transportation (2003)
City and Township Boundaries - MN Department of Transportation (2001)
Turtle Creek Watershed District Boundary - Minnesota Board of Water and Soil Resources (2003)
Cedar River Watershed District Hydrologic Boundary - MN Department of Natural Resources (1999)
Cedar River Watershed District Legal Boundary - Jones, Haugh & Smith Inc. (2007)
Roads - MN Department of Transportation (2003)

BARR

Figure 4-1A

Subwatersheds and 100-Year Flow Rate Goals: North

Cedar River Watershed District

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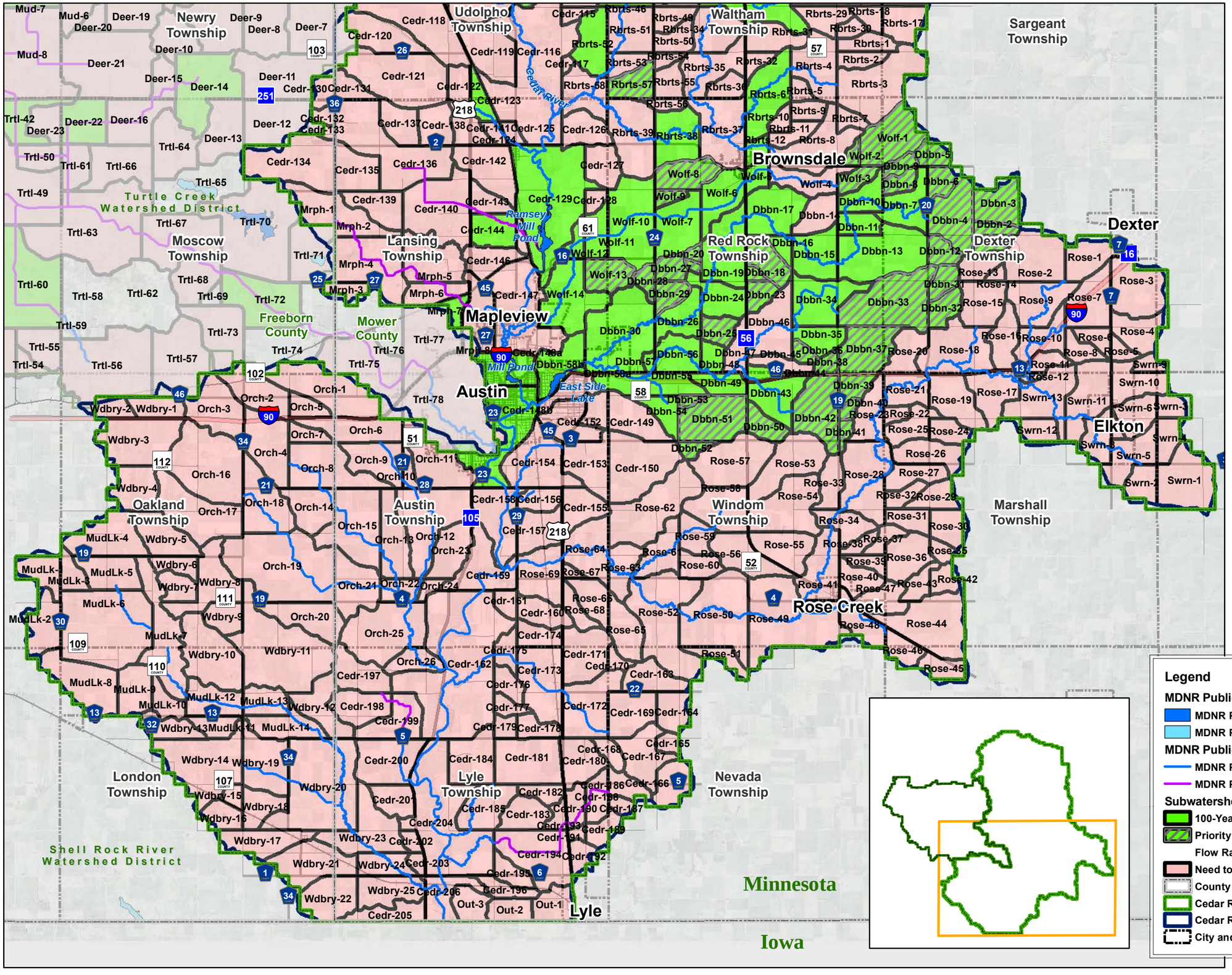

Figure 4-1B

Subwatersheds and 100-Year Flow Rate Goals: South

Cedar River Watershed District

BARR

Miles

0 1 2 4 6

Sources:
Flow Rate Goals - Barr, Upper Cedar River Surface Water Management Plan (2007)
Public Waters Inventory - MN Department of Natural Resources
County Boundary - MN Department of Transportation (2003)
City and Township Boundaries - MN Department of Transportation (2001)
Turtle Creek Watershed District Boundary - Minnesota Board of Water and Soil Resources (2003)
Cedar River Watershed District Hydrologic Boundary - MN Department of Natural Resources (1999)
Cedar River Watershed District Legal Boundary - Jones, Haugh & Smith Inc. (2007)
Roads - MN Department of Transportation (2003)

Legend

* As designated in Minnesota Statutes, Section 103G.005

MDNR Public Waters Inventory*
- MDNR Public Waters Basins
- MDNR Public Waters Wetlands

MDNR Public Watercourse*
- MDNR Public Waters Stream
- MDNR Public Waters Ditch (publicly or privately held)

Subwatersheds and Flow Rate Goals
- 100-Year Flow Rate Goal Set
- Priority Subwatershed for Project Implementation – Flow Rate Goal Set & No MDNR Public Waters in Subwatershed
- Need to Develop 100-Year Flow Rate Goal
- County Boundary
- Cedar River Watershed District Legal Boundary
- Cedar River Watershed Hydrologic Boundary
- City and Township Boundaries

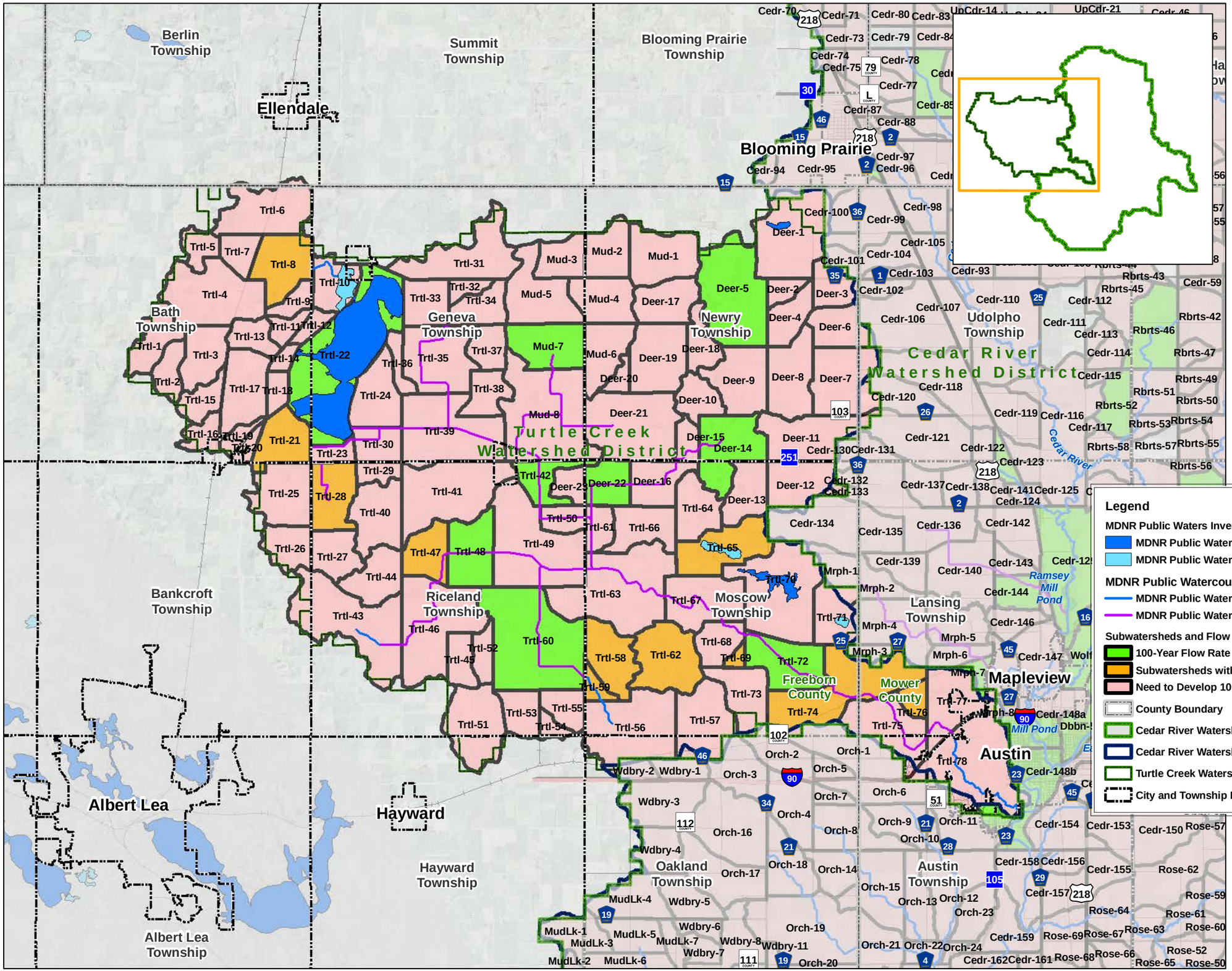

Figure 4-2

Subwatersheds and 100-Year Flow Rate Goals within Turtle Creek Watershed District

Cedar River Watershed District

BARR

Miles

0 1 2 4 6

Legend

* As designated in Minnesota Statutes, Section 103G.005

MDNR Public Waters Inventory*

- MDNR Public Waters Basins
- MDNR Public Waters Wetlands

MDNR Public Watercourse*

- MDNR Public Waters Stream
- MDNR Public Waters Ditch (publicly or privately held)

Subwatersheds and Flow Rate Goals

- 100-Year Flow Rate Goal Set
- Subwatersheds with Potential Water Storage Site from 1970 Turtle Creek Plan
- Need to Develop 100-Year Flow Rate Goal
- County Boundary
- Cedar River Watershed District Legal Boundary
- Cedar River Watershed Hydrologic Boundary
- Turtle Creek Watershed District
- City and Township Boundaries

Sources:
Flow Rate Goals - Barr, Upper Cedar River Surface Water Management Plan (2007)
Public Waters Inventory - MN Department of Natural Resources
County Boundary - MN Department of Transportation (2003)
City and Township Boundaries - MN Department of Transportation (2001)
Turtle Creek Watershed District Boundary - Minnesota Board of Water and Soil Resources (2003)
Cedar River Watershed District Hydrologic Boundary - MN Department of Natural Resources (1999)
Cedar River Watershed District Legal Boundary - Jones, Haugh & Smith Inc. (2007)
Roads - MN Department of Transportation (2003)

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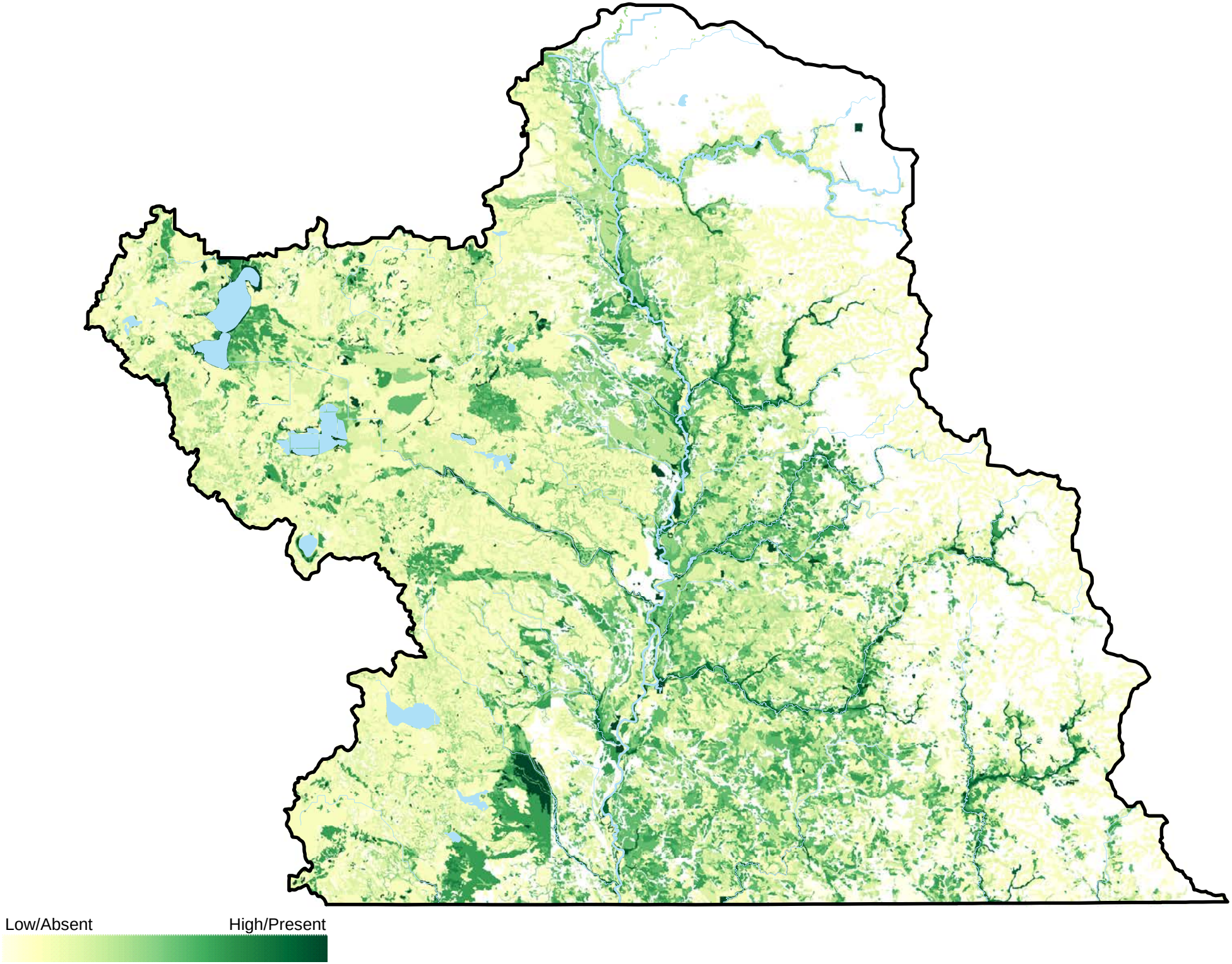
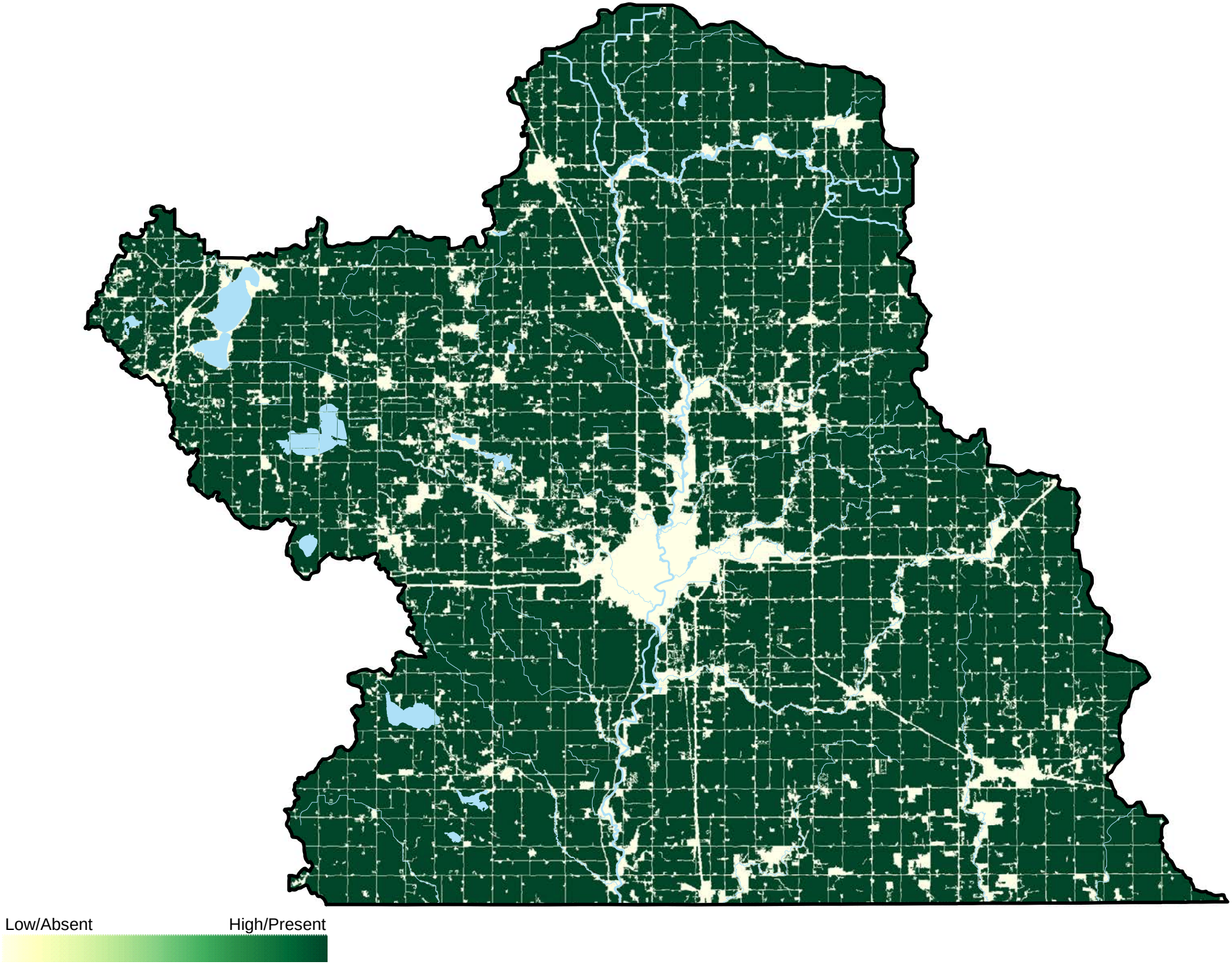
Appendix C

Minnesota Department of Natural Resources (MDNR) Zonation Input Data

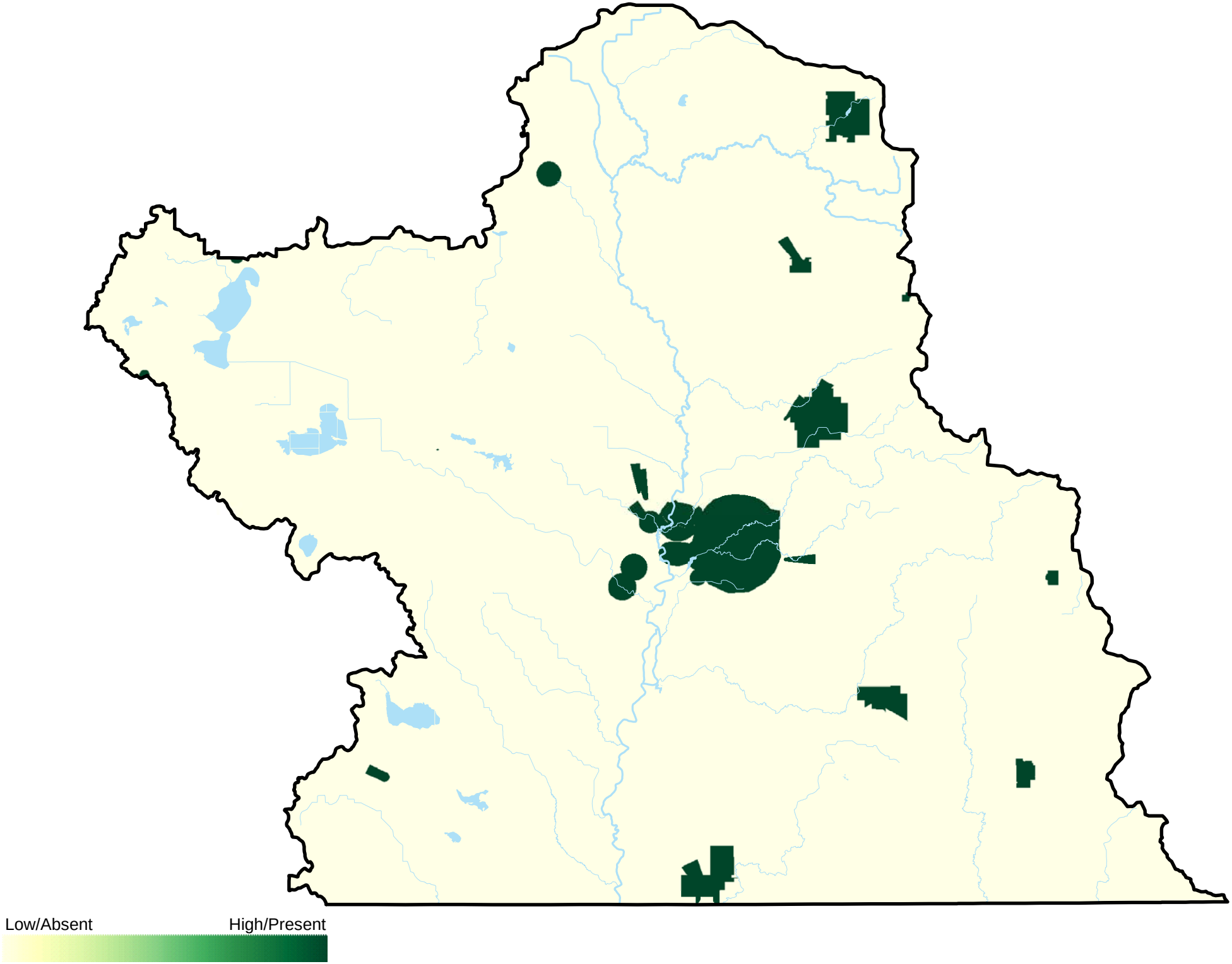
Low Crop Productivity Index



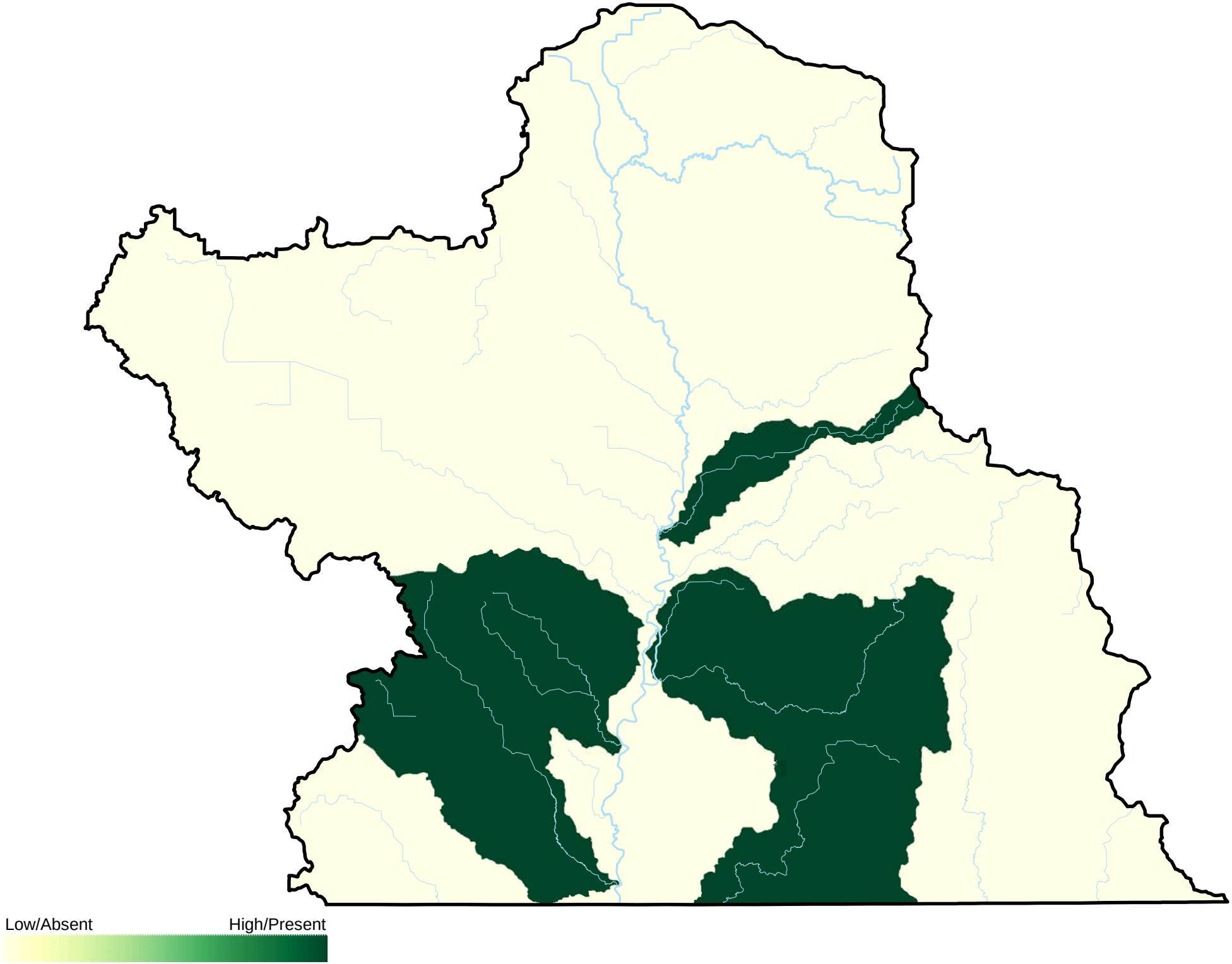
Cultivated Cropland



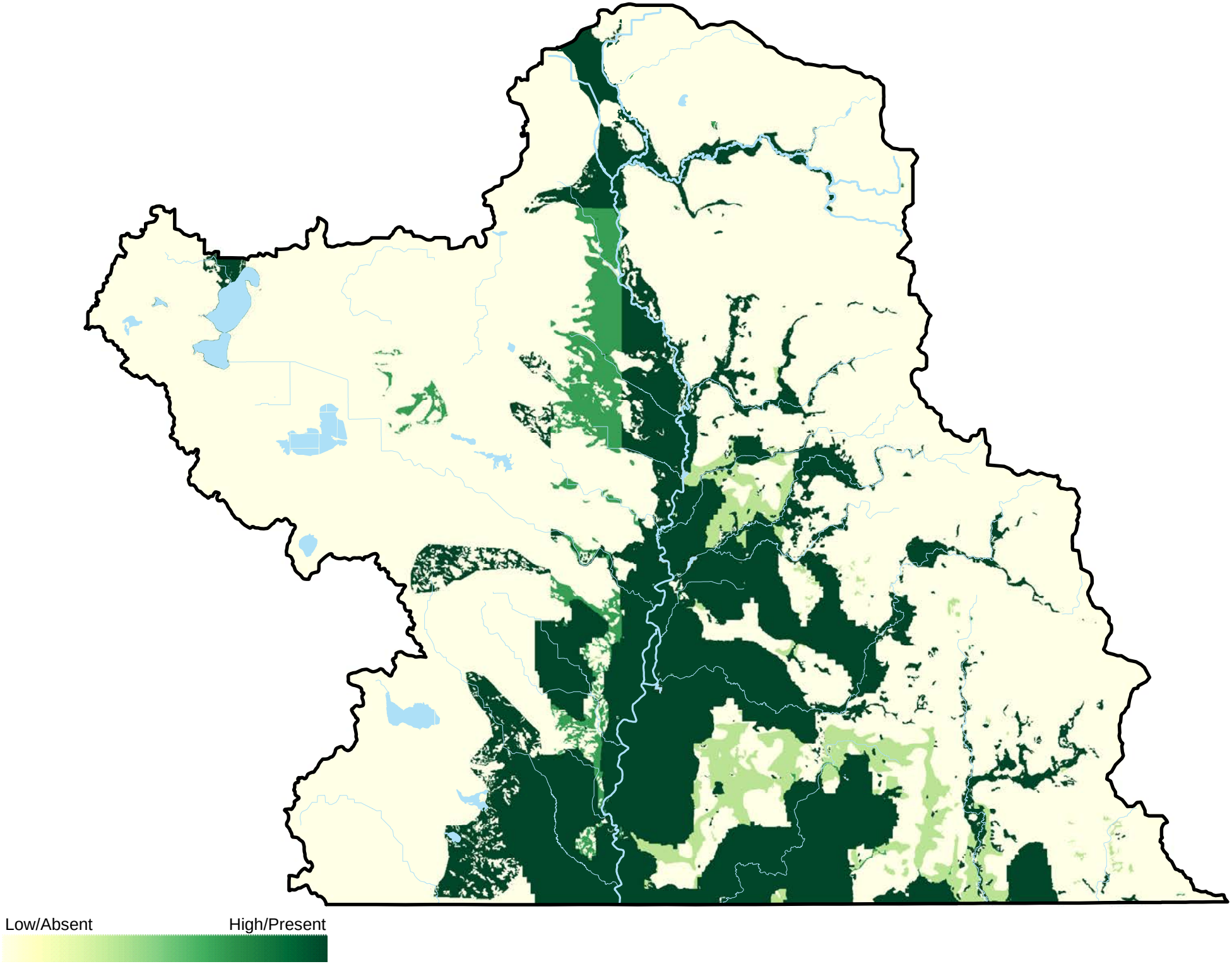
Drinking Water Supply Mgmt Areas/Source Water Assessment Areas



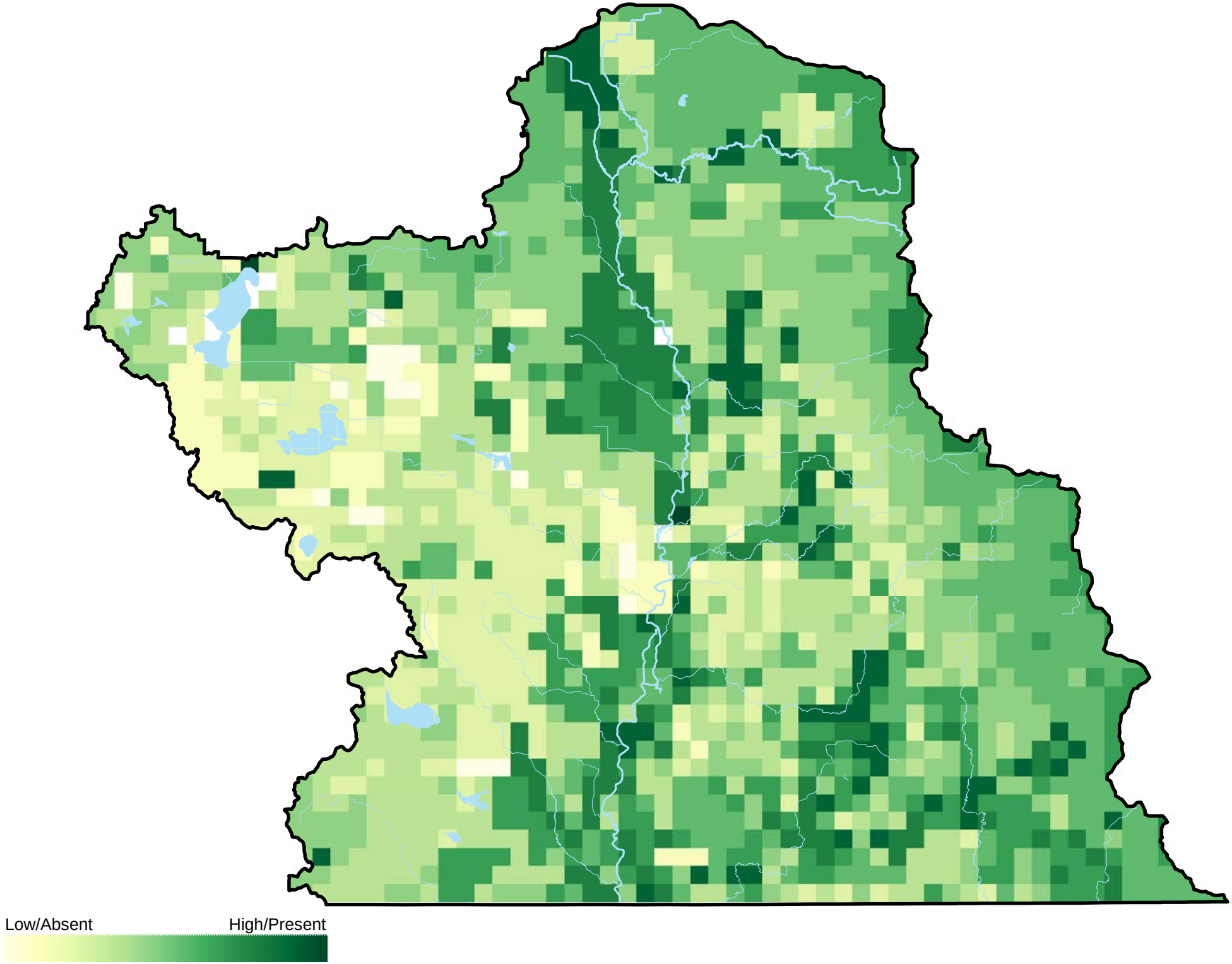
Fisheries Priority Areas



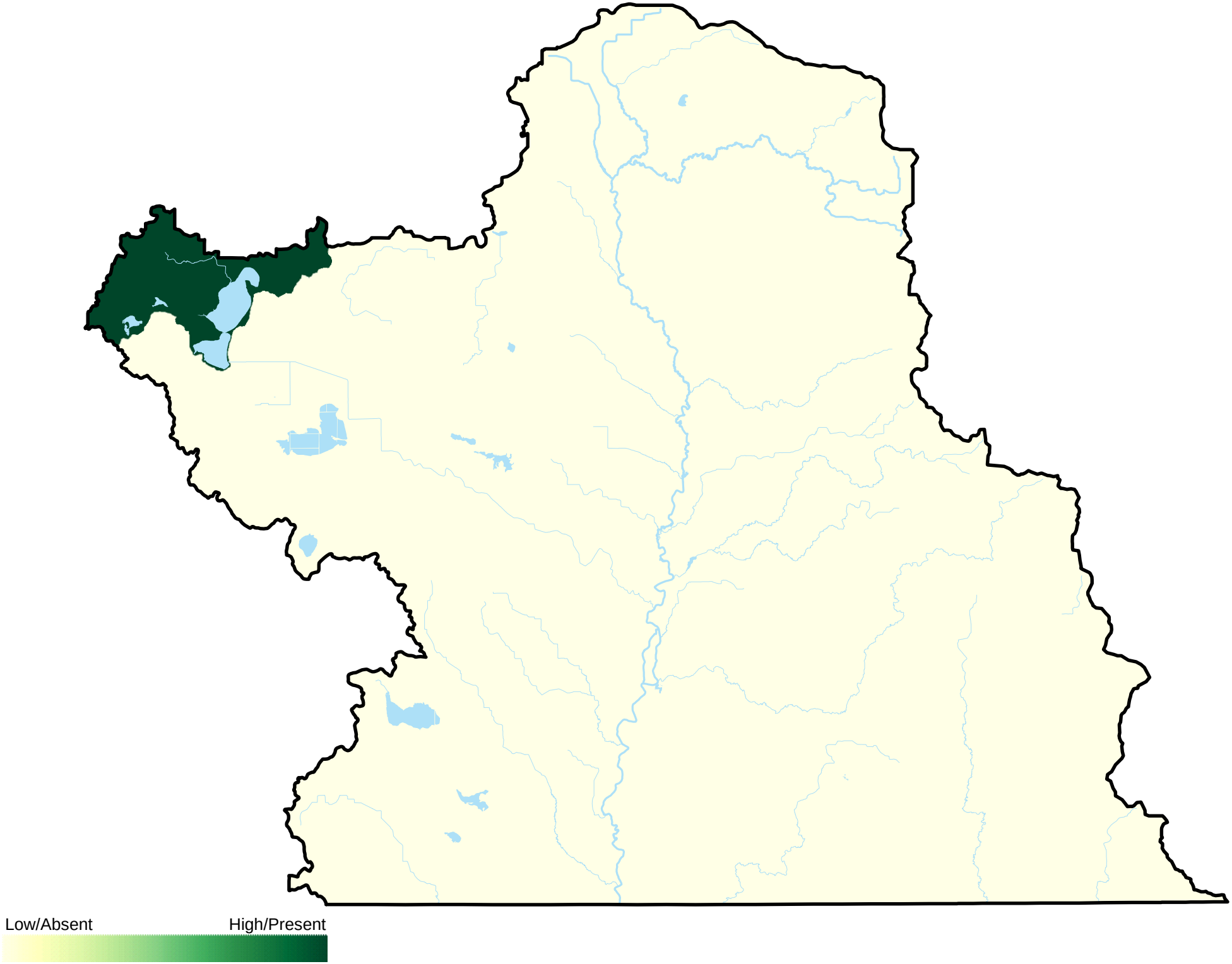
Groundwater Contamination Susceptibility



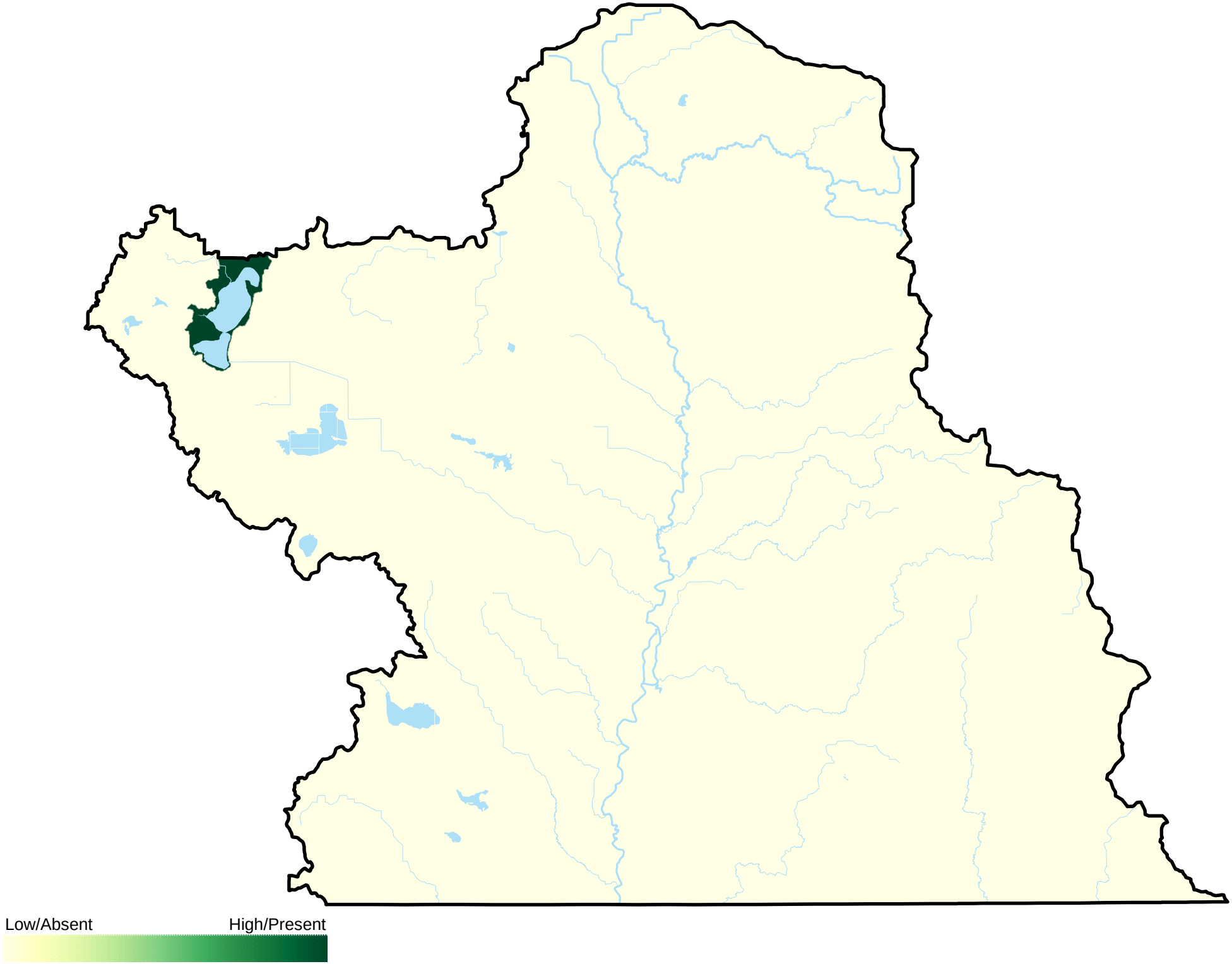
Groundwater Recharge



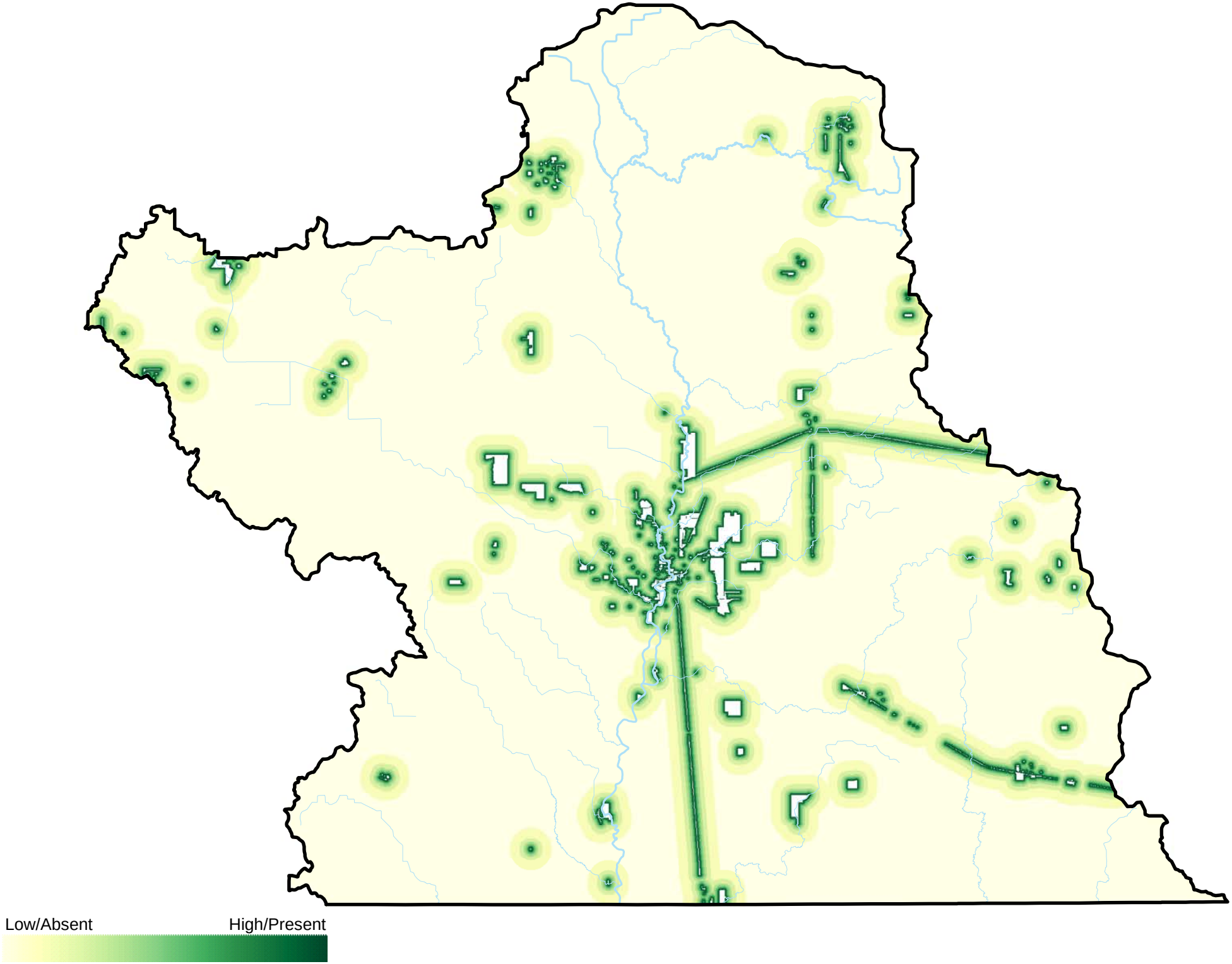
Impaired Waters (catchments)



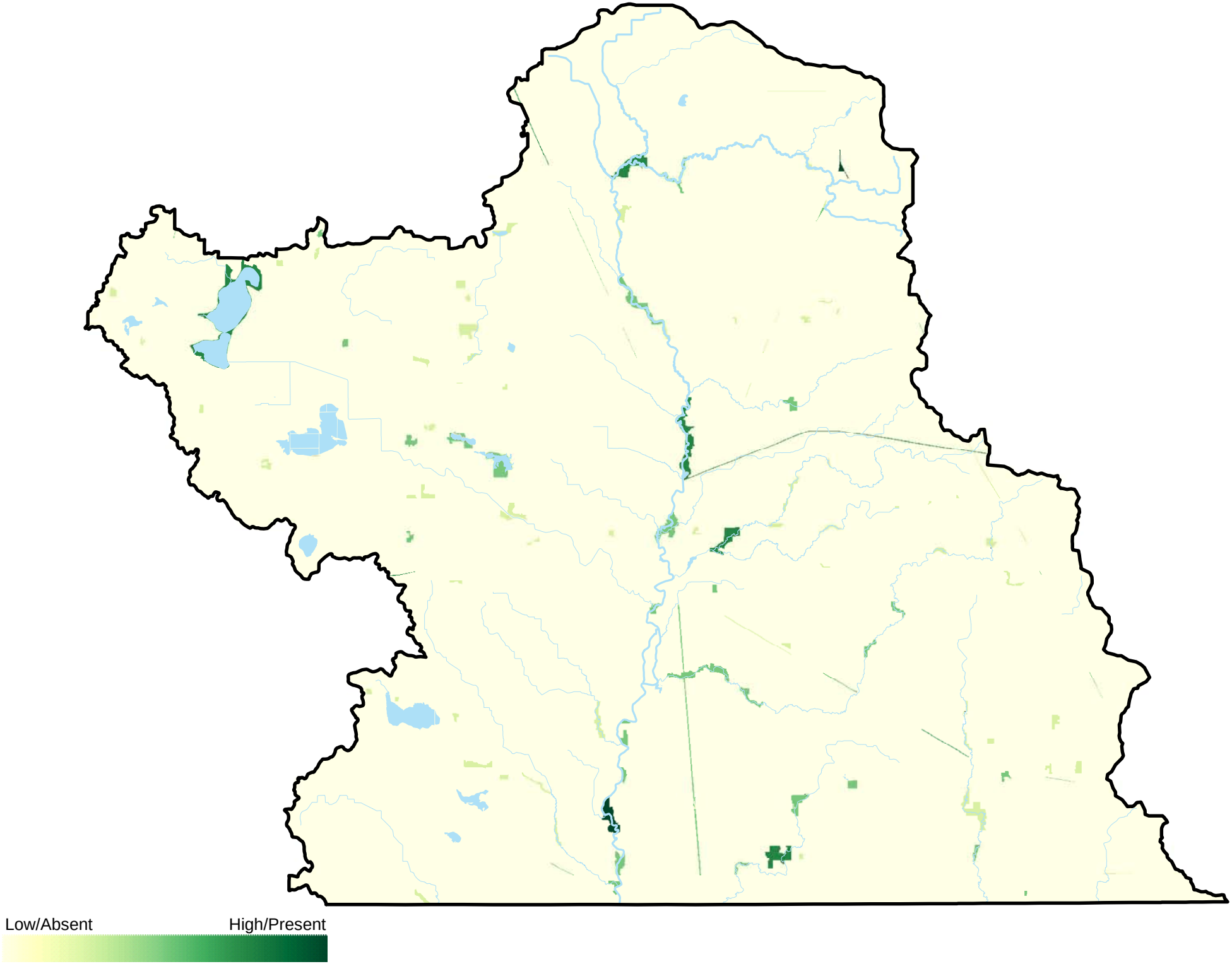
Lakes of Biological Significance



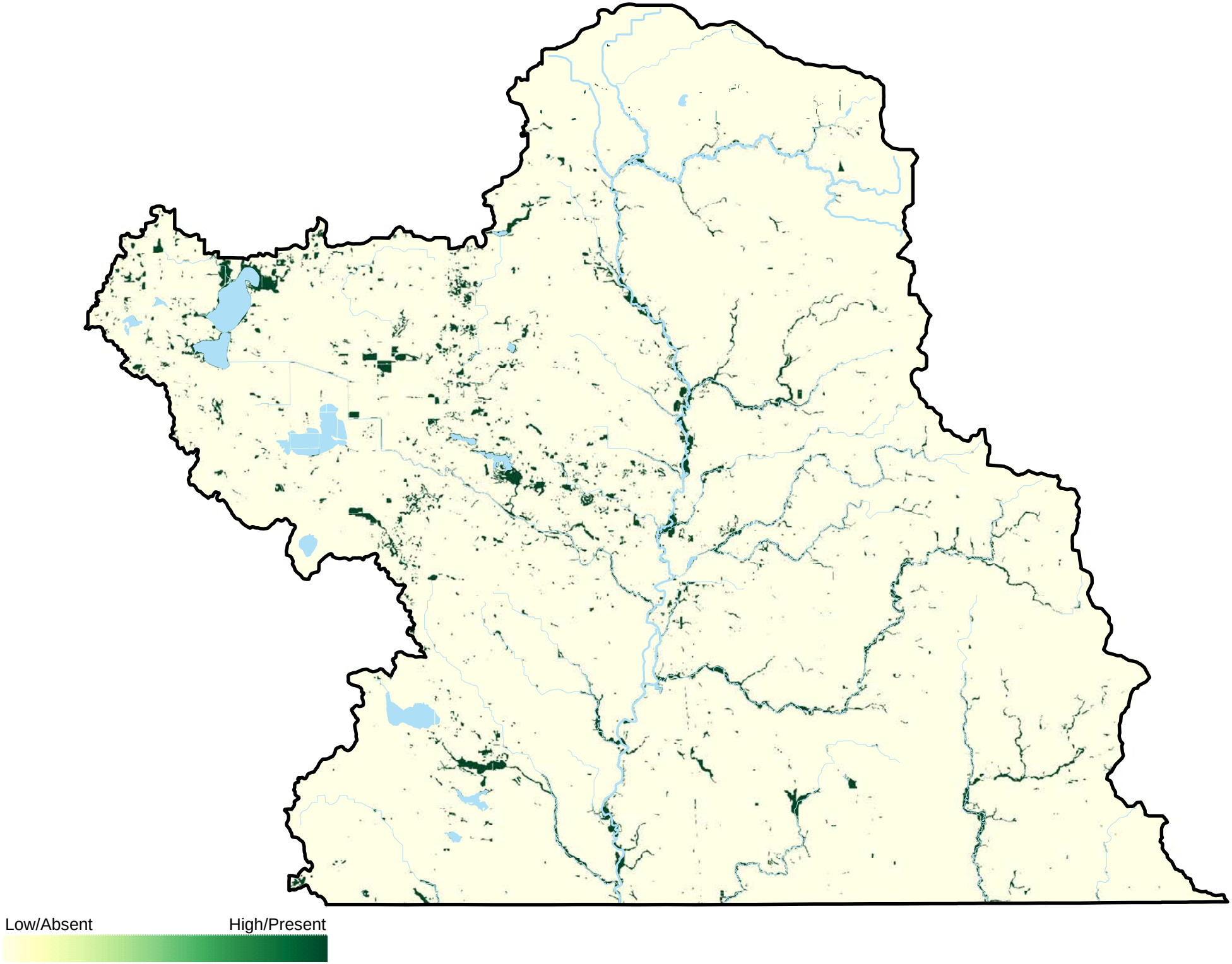
Lands Close to Public Lands



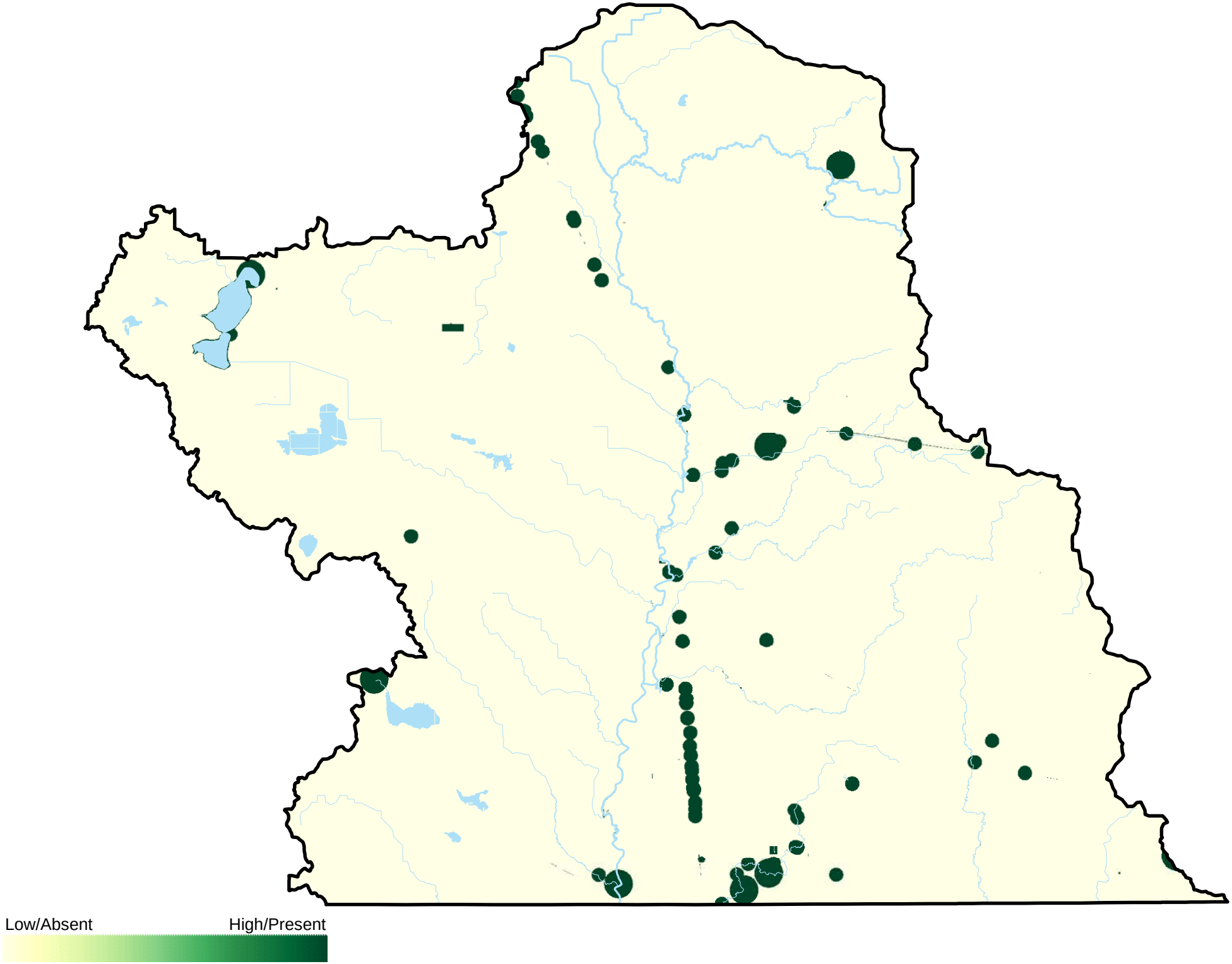
MBS Sites of Biodiversity Significance



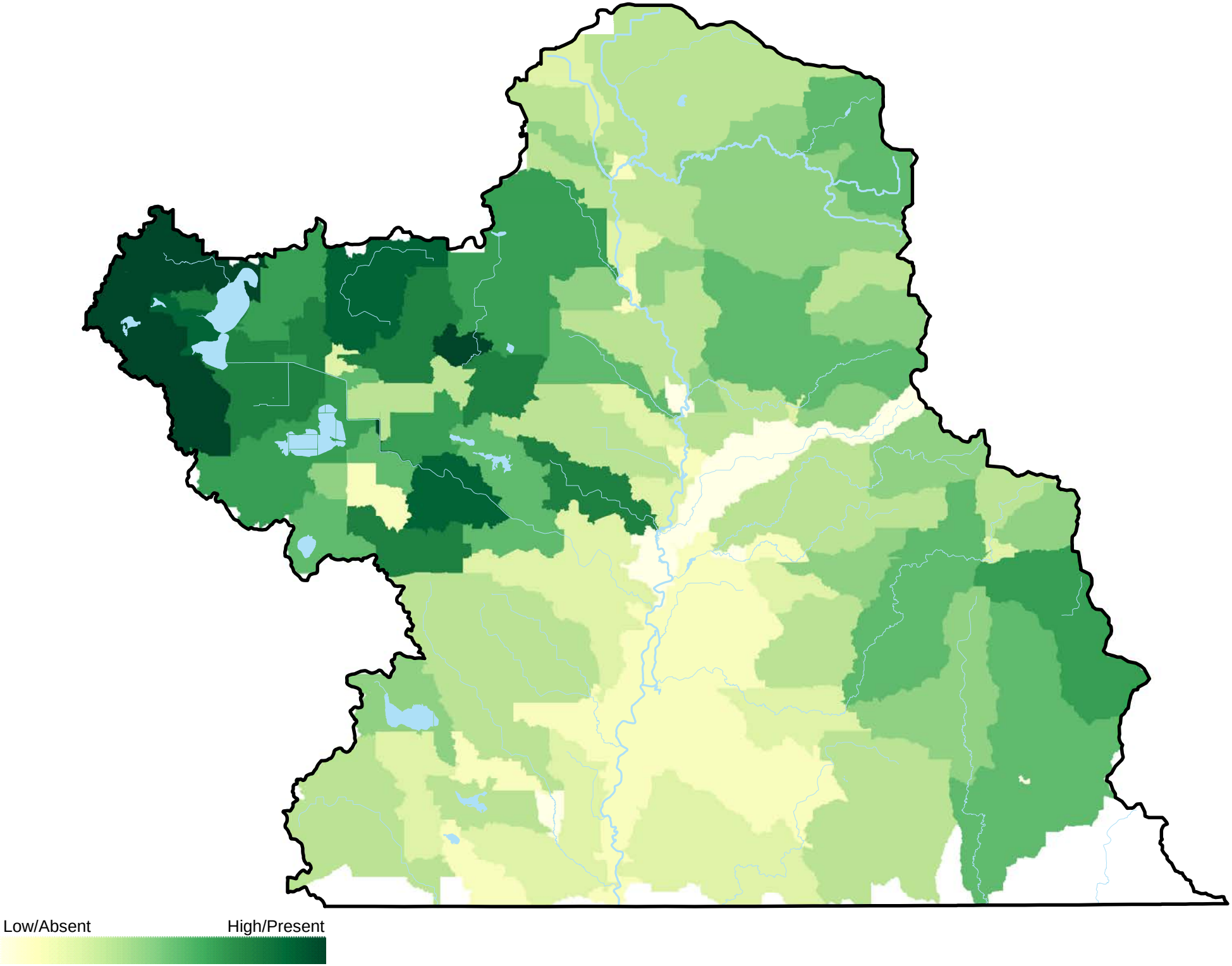
Wetlands (NWI)



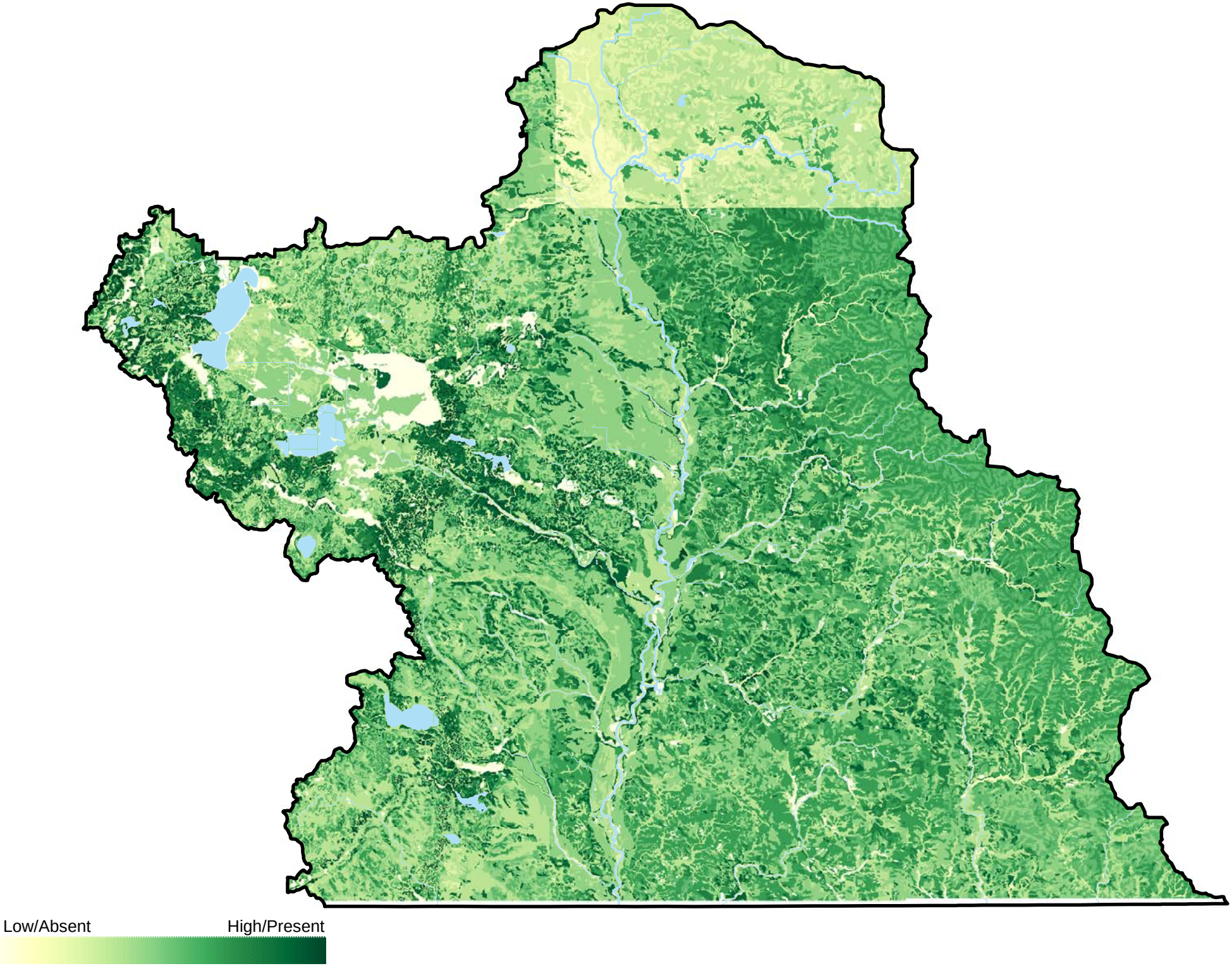
Rare Features



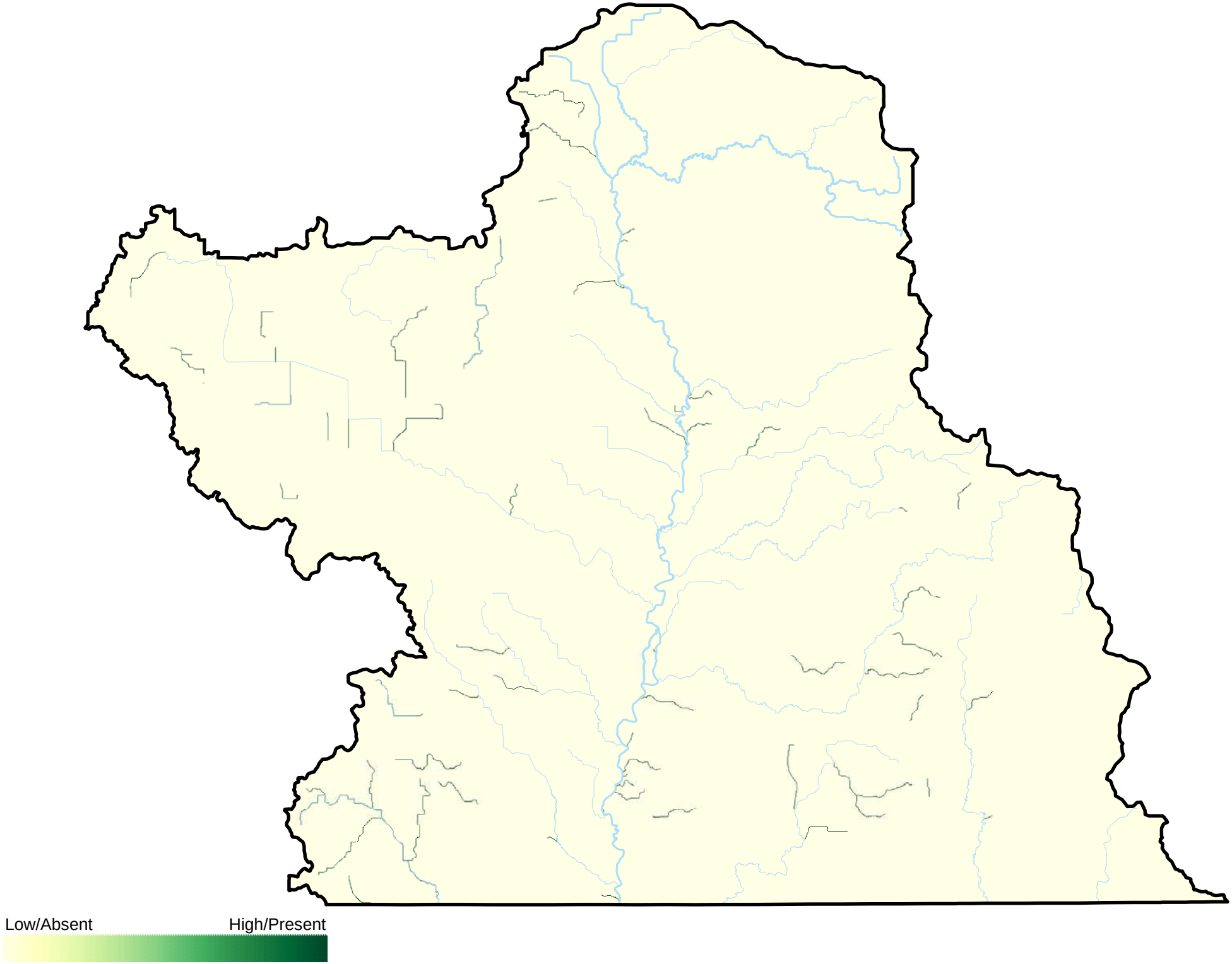
Sediment (catchment)



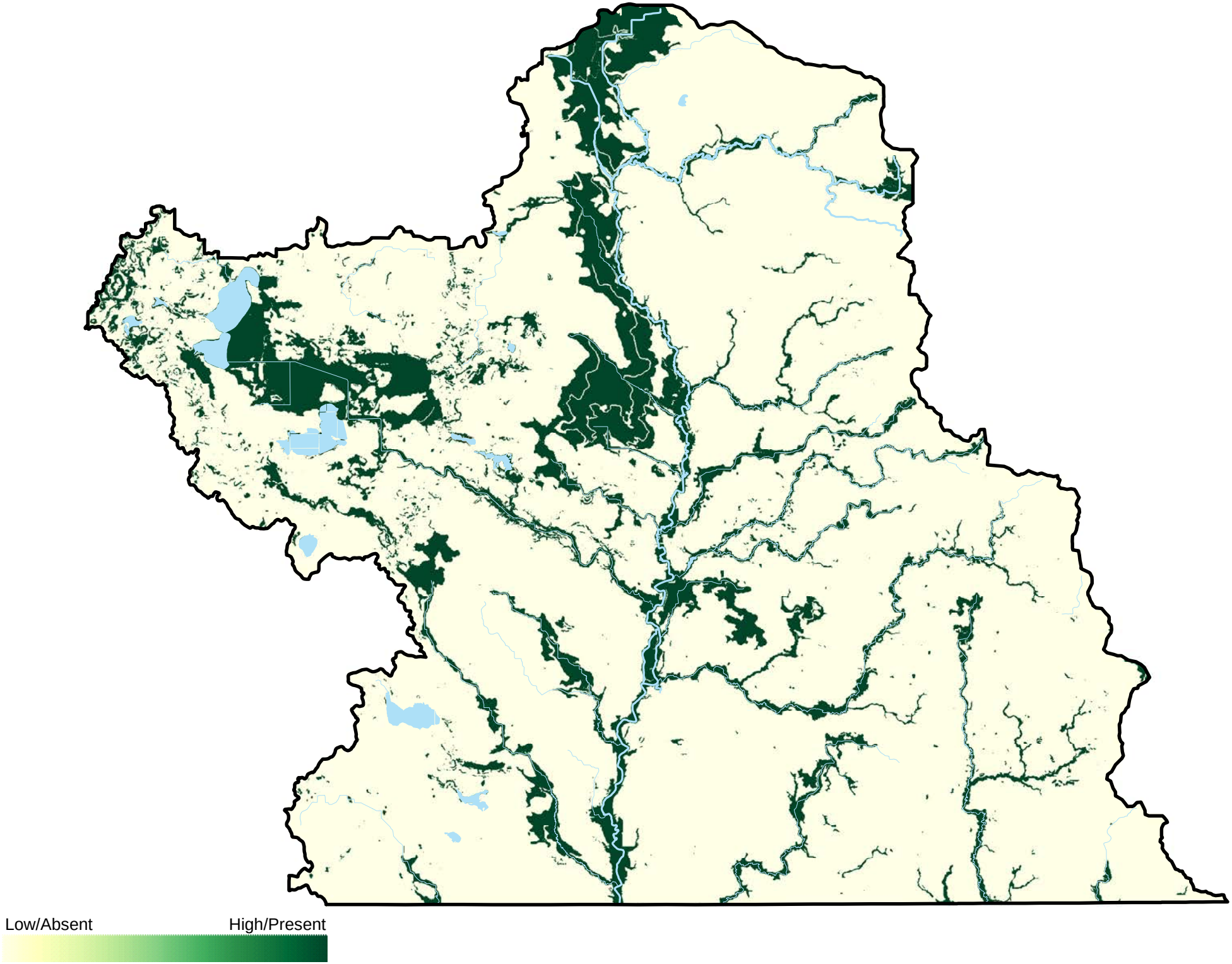
Soil Erosion Risk



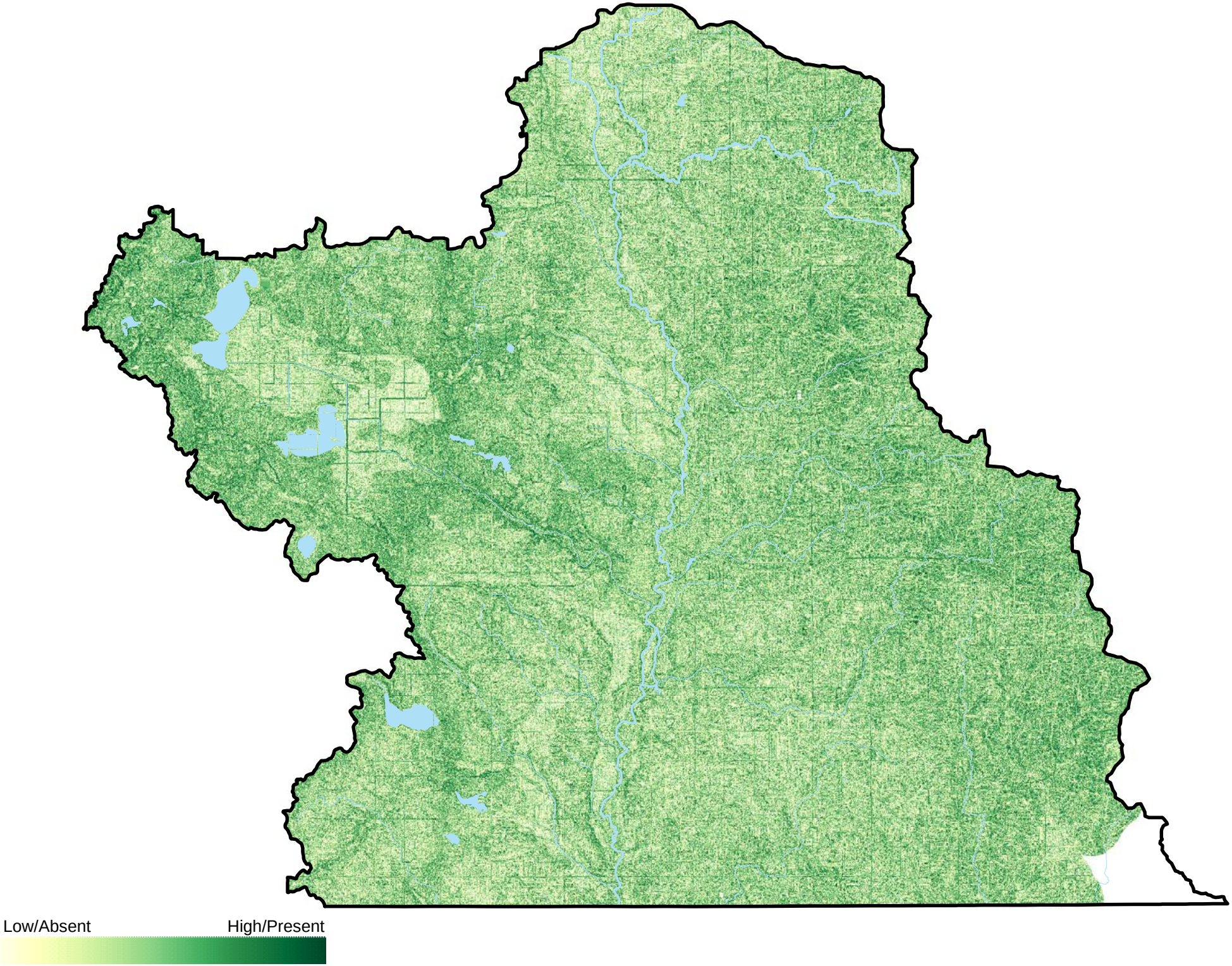
Stream Buffers (perennial, non-public)



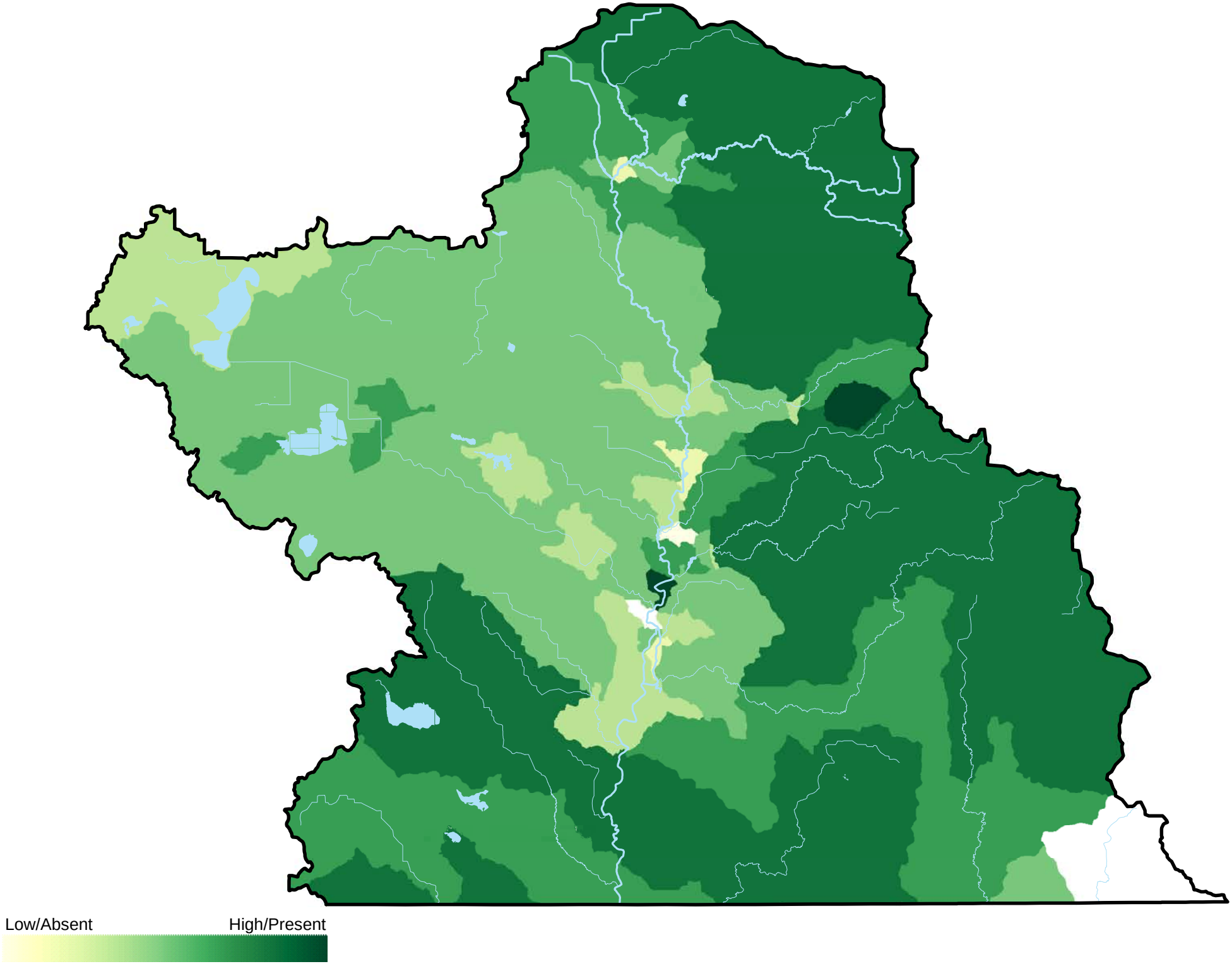
Stream Floodplains



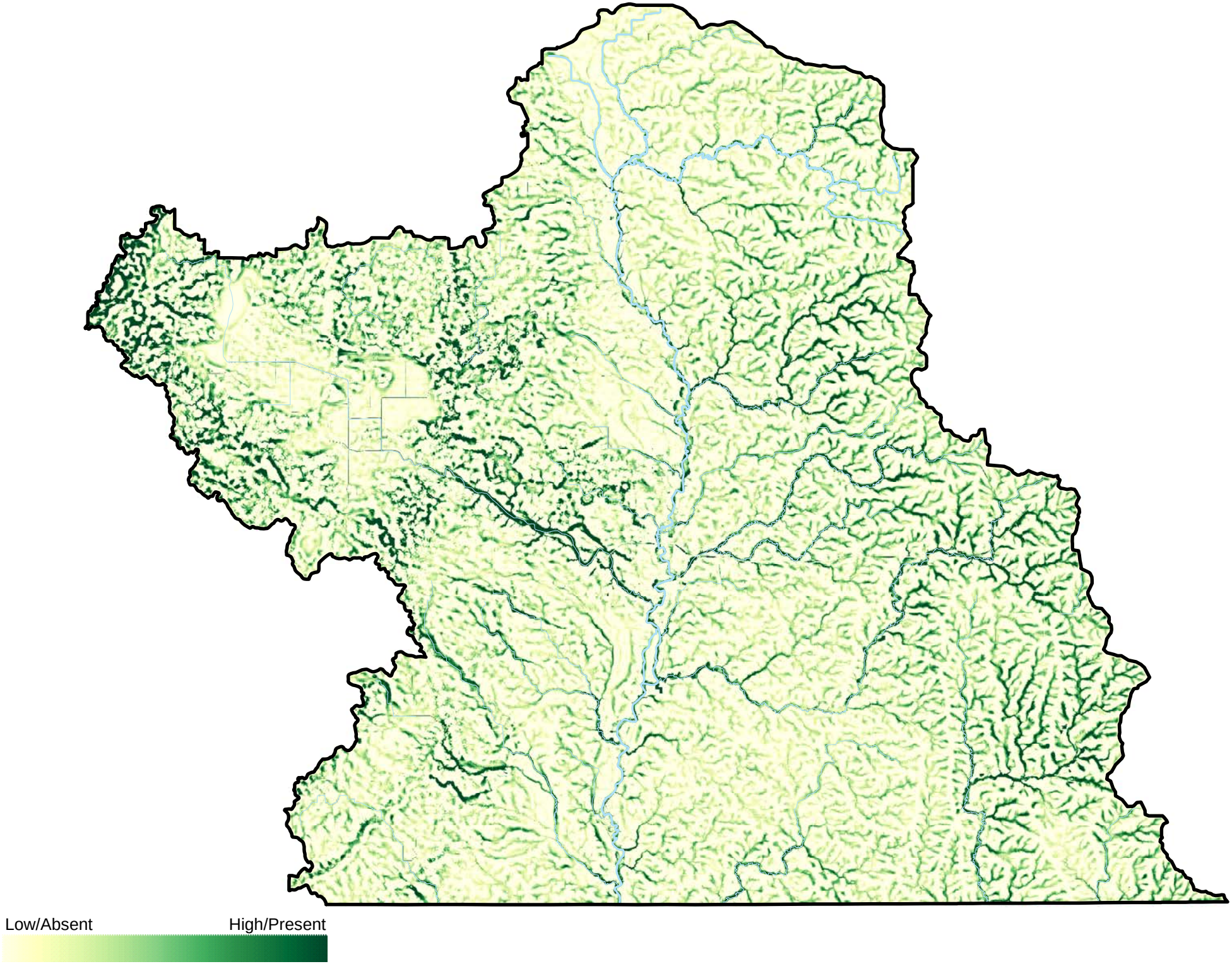
Stream Power Index



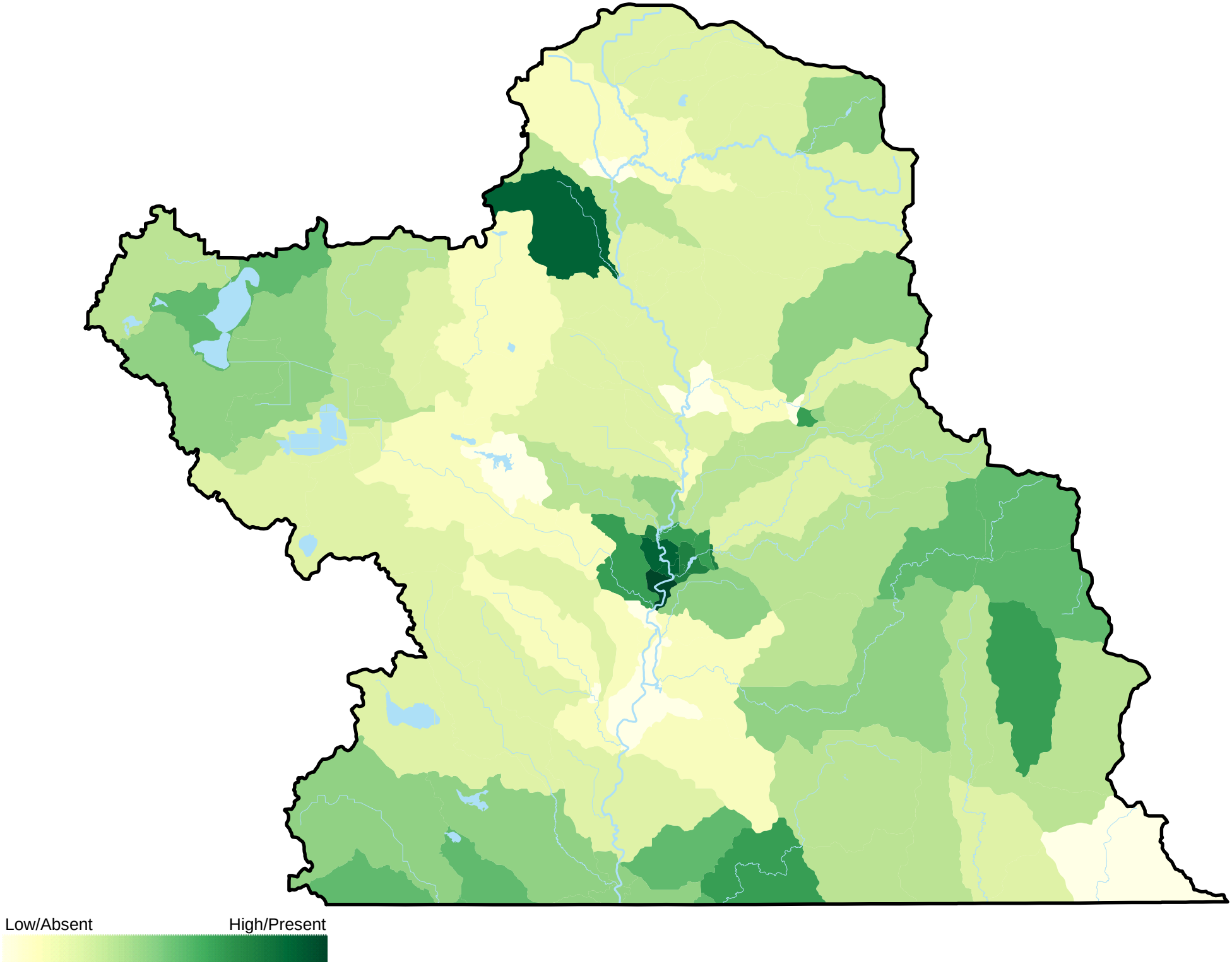
Total Nitrogen (catchment)



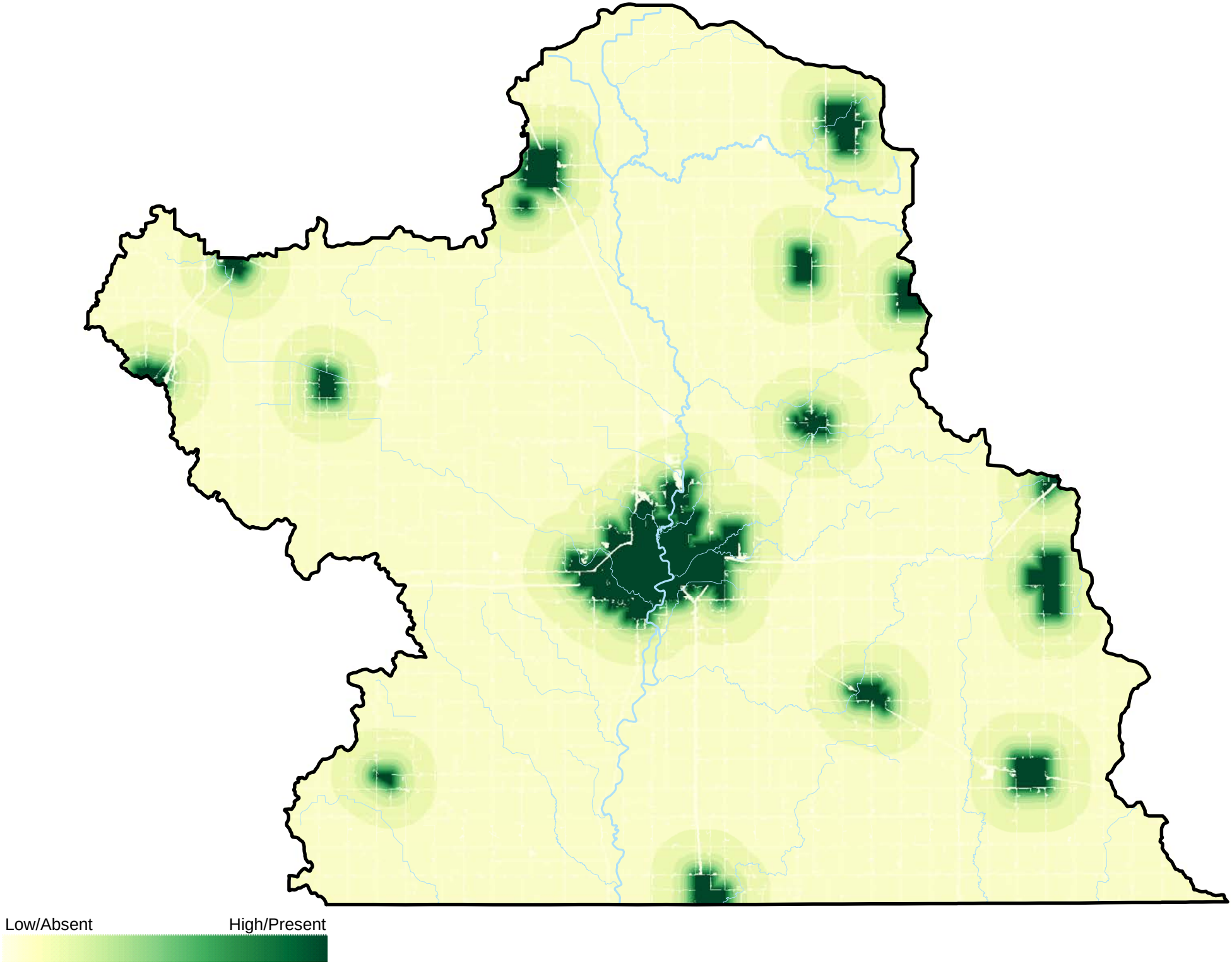
Topographic Position Index



Total Phosphorus (catchment)



Urban Areas/Adjacent Undeveloped



Water Yield (Runoff)