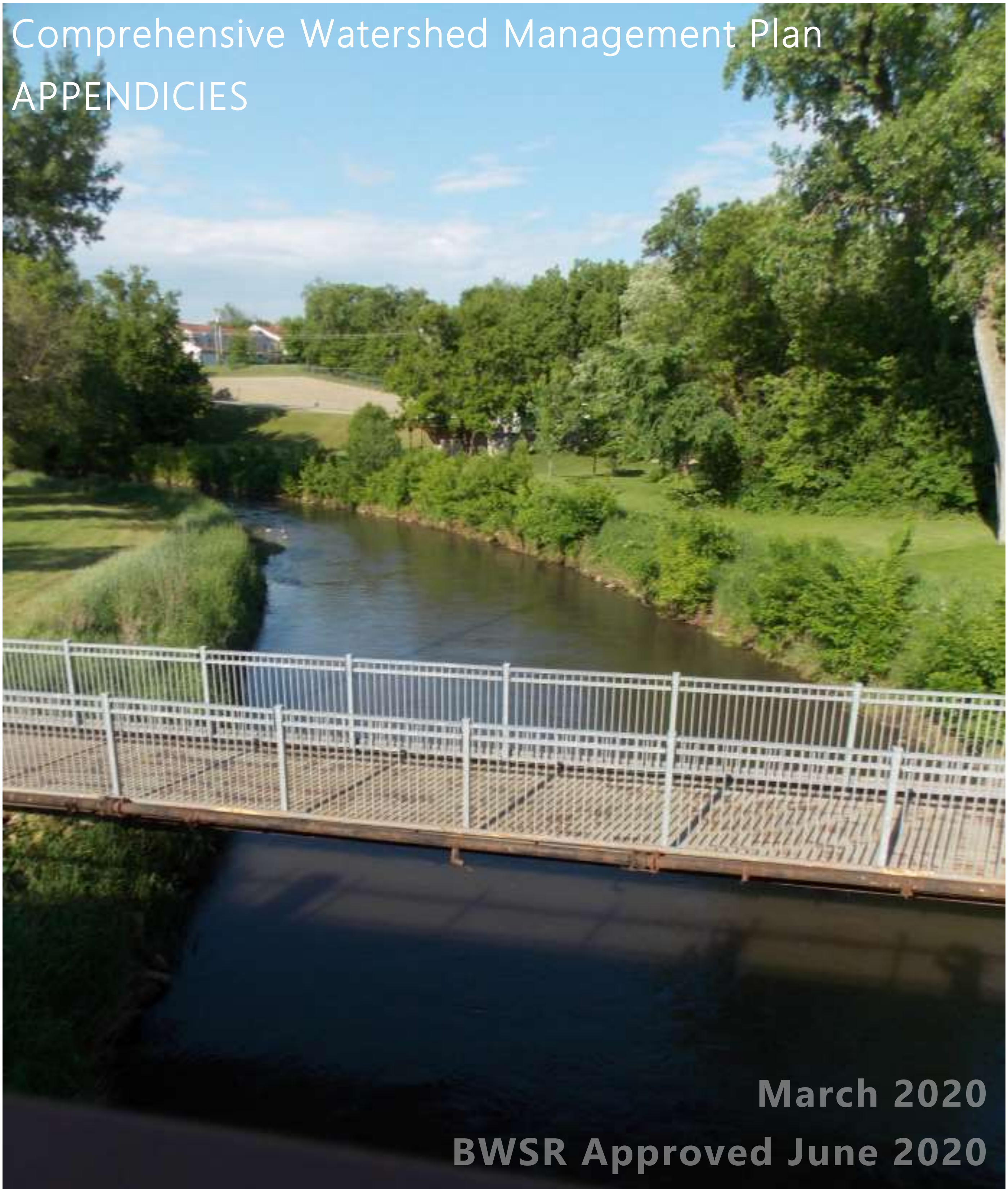
CANNON RIVER

Comprehensive Watershed Management Plan

APPENDICIES



March 2020

BWSR Approved June 2020

Dakota, Goodhue, Le Sueur, Rice, Steele, and Waseca Counties and Soil Water Conservation Districts, North Cannon River Watershed Management Organization, and the Belle Creek Watershed District.

Cover Image: Cannon River – Cannon Falls, MN. Photo Credit Sonya Carel – EOR.
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Cannon River One Watershed, One Plan

- ***Final Draft completed March 2020***
- ***Approved June 24, 2020 by the Minnesota Board of Water and Soil Resources (BWSR)***

Emmons & Olivier Resources, Inc.

This One Watershed, One Plan project has received funding support from the Minnesota Board of Water and Soil Resources, Dakota, Goodhue, Le Sueur, Rice, Steele, and Waseca Counties and Soil Water Conservation Districts, North Cannon River Watershed Management Organization, and the Belle Creek Watershed District.

LIST OF APPENDICES


Cannon River – Cannon Falls, MN

ACKNOWLEDGEMENTS

The Cannon River Comprehensive Watershed Management Plan was developed with the participation of numerous people. Partnering counties, Soil and Water Conservation Districts (SWCD), the Belle Creek Watershed District and the North Cannon Watershed Management Organization wish to acknowledge the following groups and individuals for their involvement in the planning process. Without their hard work and dedication, this Plan would not have been possible.

County Board of Commissioners

- Dakota County Board of Commissioners
- Goodhue County Board of Commissioners
- Le Sueur County Board of Commissioners
- Rice County Board of Commissioners
- Steele County Board of Commissioners
- Waseca County Board of Commissioners

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- Goodhue SWCD Board of Supervisors
- Le Sueur SWCD Board of Supervisors
- Rice SWCD Board of Supervisors
- Steele SWCD Board of Supervisors
- Waseca SWCD Board of Supervisors

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- Les Kyllo, President
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North Cannon Watershed Management Organization

- Dan Boykin, Secretary
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- Greg Langer, Manager
- Harlan Lichty, Manager
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- Tony VanDeSteeg, Manager
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Policy Committee

- James Hedeen, Belle Creek Watershed District
- Mike Slavik, Dakota County
- Kevin Chamberlain, Dakota SWCD
- Brad Anderson, Goodhue County
- Jeff Beckman, Goodhue SWCD
- Steven Rohlfing, Le Sueur County
- Cletus Gregor, Le Sueur SWCD
- Carrie Jennings and Peggy Varien, North Cannon River Watershed Management Organization
- Galen Malecha, Rice County
- Richard Cook, Rice SWCD
- John Glynn, Steele County
- Dan Hansen, Steele SWCD
- Dan Kuhns, Waseca County
- Keith Morgan, Waseca SWCD

Planning Work Group

- Brad Becker, Dakota County
- Brad Behrens, Rice County
- Haley Byron, Waseca County
- Steve Christopher, BWSR
- Ashley Gallagher, Dakota SWCD and North Cannon River WMO
- Scott Goldberg, Steele County
- Eric Gulbransen, Steele SWCD
- Shaina Keseley, BWSR
- Beau Kennedy, Goodhue SWCD and Belle Creek Watershed District
- Holly Kalbus, Le Sueur County
- Josh Mankowski, Le Sueur County
- Jennifer Mocol-Johnson, BWSR
- Dale Oolman, Steele County
- Steven Pahs, Rice SWCD
- Glen Roberson, Goodhue SWCD
- Mark Schaetzke, Waseca SWCD
- Mike Schultz, Le Sueur SWCD
- Brian Watson, Dakota SWCD

Technical Advisory Group

- Spencer Herbert, MDA
- Cole Johnson, City of Northfield
- Tom Kellogg, City of Waseca
- Melissa King, City of Faribault
- Peggy Obear, Prairie Island
- Todd Piepho, MNDNR
- Kristi Pursell, Cannon River Watershed Partnership
- Brad Rademacher, City of Owatonna
- Emily Resseger, Metropolitan Council
- Jennifer Ronnenberg, MDH
- Bob Stark, City of Red Wing
- Justin Watkins, MPCA

Advisory Group

- Nick Bancks, MN Land Trust
- Jarry Beckel, Le Sueur County
- Earl Benson, Lake Byllesby
- Matt Bester, Southern Minnesota Irrigators Association
- Randy Binder, MNDNR
- Steve Biehn, Lake Jefferson
- Jack Bushman, Le Sueur SWCD
- Carrie Christenson, MN Corn Growers Association
- Rick Cook, Rice SWCD
- Curt Coudron, Dakota SWCD
- Mark Duchene, Director of Engineering City of Waseca
- Greg Entinge, Le Sueur County
- Susan Erickson, Rice County
- Nora Felton, Rice County
- Warren Formo , Minnesota Agricultural Water Resources Center (MAWRC)
- DJ Fotes, The Trust for Public Land
- Emily Gable, Dakota County
- Joe Gehrhe, Le Sueur County
- David Gerhartz, Steele County
- Hailey Gorman, Cannon River Watershed Partnership (CRWP)
- Cletus Gregor, Le Sueur SWCD
- Rick Guery, Steele County
- Jim Hader, Belle Creek Watershed District (BCWD)
- Jayme Hager, Dakota SWCD
- Teresa Hill, Zoning Administrator City of Waterville
- Carrie Jennings, Eureka Township
- Doug Jones, Polk County
- Barb Judd, Lake Frances Association
- Beth Kallestad, Rice County
- George Kinney, Rice County
- Gregory Kliger, University of Minnesota
- Alan Kraus, Cannon River Watershed Partnership (CRWP)

Cannon River – Northfield, MN

- Gregory Langer, Greenvale Township
- Jake Langeslag, Rice County
- Tara Latozke, MNDNR
- Daniel Lee, Rice County
- Barb Matz, Cannon River Watershed Partnership (CRWP)
- Roy McIntyre, Le Sueur County
- Lynn Miller, Steele County
- Grace Miller, Steele County
- Bruce Morlan, Bridgewater Township
- Lois Nelson, Steele County
- Tony Nelson, Trout Unlimited
- Sheryl Norgaard, Rice County
- Mary Peterson, Board of Water and Soil Resources
- Becky Picha, Le Sueur SWCD
- Matt Rohn, St. Olaf College
- Nancy Sauber , Goodhue SWCD
- David Schmidt, The Nature Conservancy (TNC)
- Tim Smith, Waterville Lake Association
- Patricia Smith, Rice County
- Emma Smith, Steele County
- Sarah Smith, Le Sueur County
- Mary Ann Stark, Goodhue County
- Bob Stark, Goodhue County
- Kevin Strauss, Cannon River Watershed Partnership (CRWP)
- Dean Sunderlin, Circle Lake Association
- Ted Tuma, Rice County
- Valerie Vail, Waterville City Council
- Russ Viasai, Lonsdale
- Sandy Weber, Castle Rock
- Nicki Weber, Lake Volney Association
- Jeff Weiss, MNDNR
- Julie Westerlund, BWSR
- Scott Wheeler, Lake Byllesby Improvement Association


Cattle grazing on pasture - photo Rice SWCD

ACRONYMS

1W1P	One Watershed, One Plan
AUID	Assessment Unit Identifier (for the Impaired Waters List)
ACPF	Agricultural Conservation Planning Framework
BCWD	Belle Creek Watershed District
BMP	Best Management Practice
BWSR	Board of Water and Soil Resources
CAMP	Citizen Assisted Monitoring Program
CIP	Capital Improvement Program
CLID	Clear Lake Improvement District
CLMP	Citizen Lake Monitoring Program
CRPA	Cannon River Planning Area
CRWJPB	Cannon River Watershed Joint Powers Board
CRW	Cannon River Watershed
CRWP	Cannon River Watershed Partnership
CSMP	Citizen Stream Monitoring Program
DWSMA	Drinking Water Supply Management Area
E. coli	Escherichia coli
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
F-IBI	Fish-Based Index of Biological Integrity
FTPGW	Failing to Protect Groundwater
FWM	Flow weighted mean
FY	Fiscal year
GI	Green Infrastructure
GIS	Geographic Information Systems
GRAPS	Groundwater Restoration and Protection Strategies
H&H	Hydrologic & Hydraulic
HOA	Homeowners Association
HSPF	Hydrological Simulation Program – Fortran
HSPF-SAM	Hydrological Simulation Program – Fortran Scenario Application Manager
HUC	Hydrological Unit Code
IBI	Index of Biological Integrity
ITPHS	Imminent Threat to Public Health and Safety
IWM	Intensive Watershed Monitoring
JAA	Job Approval Authority
JPA	Joint Powers Agreement
LID	Low Impact Development
LiDAR	Light Detection and Ranging
LGU	Local Unit of Government
LTFES	Long-Term Flood Evaluation Study
LWRI	Land and Water Resource Inventory
MAWRC	Minnesota Agricultural Water Resource Center
MBS	Minnesota Biological Survey
MCL	Maximum Contaminant Level
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MDM	Multi-benefit Drainage Management

MGS	Minnesota Geologic Survey
M-IBI	Macroinvertebrate-Based Index of Biological Integrity
MIDS	Minimal Impact Design Standards
MHA	Minnesota Hydrogeology Atlas
MNDNR	Minnesota Department of Natural Resources
MNDOT	Minnesota Department of Transportation
MPARS	Minnesota Department of Natural Resources Permitting and Reporting System
MPCA	Minnesota Pollution Control Agency
MS	Minnesota Statutes
MS4	Municipal Separate Storm Sewer System
NA	Not Applicable
NCH	North Central Hardwoods
NCRWMO	North Cannon River Watershed Management Organization
NGO	Non-governmental organization
NHIS	Natural Heritage Inventory Service
NLCD	National Land Cover Database
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPFP	Nonpoint Priority Funding Plan
NRBG	Natural Resources Block Grant
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
PTMApp	Prioritize, Target and Measure Application
PWI	Public Waters Inventory
SNA	Scientific and Natural Area
SGCN	Species of Greatest Conservation Need
SSURGO	Soil Survey Geographic Data Set from the Natural Resources Conservation Service
SSTS	Subsurface Sewage Treatment Systems
STATSGO	State Soil Geographic Dataset for the Conterminous United States
SWCD	Soil and Water Conservation District
SWM	Stormwater Management
TAG	Technical Advisory Group
TDP	Total Dissolved Phosphorus
TMDLs	Total Maximum Daily Loads
TP	Total Phosphorus
TP-40	Technical Paper 40
TSI	Trophic State Index
TSS	Total Suspended Solids
U of M	University of Minnesota
USDA	United States Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geologic Survey
WCA	Wetland Conservation Act
WCBP	Western Corn Belt Plains
WD	Watershed District
WHEP	Wetland Health Evaluation Program
WMO	Watershed Management Organization
WRAPS	Watershed Restoration and Protection Strategies

GLOSSARY

AB soils – A/B soils are a mix of Hydrologic Soil Groups A and B which are generally more drained than Hydrologic Soil Groups C or D. See also the definition of Hydrologic Soil Groups.

Animal Units – Use in permitting, registration, and the environmental review process because they allow equal standards for all animals based on size and manure production. An AU is calculated by multiplying the number of animals by an animal unit factor for the specific type of animal. When more than one type of animal is planned for a feedlot, the number of AUs is the sum of the AUs for each type of animal.

Aquifer – A body of permeable rock that can contain or transmit groundwater.

Baseflow – Sustained flow of a stream in the absence of direct runoff. Natural base flow is sustained largely by groundwater discharges.

BATHTUB – A simplified volume and phosphorus mass balance model designed to facilitate application of empirical eutrophication models to reservoirs or lakes.

Benefitted Properties – "Benefits" refers either to the impact a drainage system has on land in terms of improving the market value of the land or the impact (and costs associated with that impact) that the land has on the drainage system because of land use that accelerates drainage, transports sediment or increases volume demand in a drainage system.

Best Management Practice (BMP) – Structural and non-structural practices and methods that can be used in both agricultural and urban settings that decrease runoff, erosion, and pollutants and improve water quality, soil health, and land use activities.

Calcareous Fen – A rare and distinctive wetland characterized by a substrate of non-acidic peat and dependent on a constant supply of cold, oxygen-poor groundwater rich in calcium and magnesium bicarbonates.

Chlorophyll-a – A green pigment, present in all green plants and in cyanobacteria, responsible for the absorption of light to provide energy for photosynthesis. Typically used to measure the amount of algae present in water.

Climate Change – A long-term change in climate measures such as temperature and rainfall.

Community Public Water Supply Wells – Serve more than 25 people or have more than 15 piped connections providing water to the public in their primary living space (where people live and sleep; homes, apartments, nursing homes, prisons, etc.)

Contaminants – Substances that, when accidentally or deliberately introduced into the environment, may have the potential to harm living organisms, including people, wildlife and plants.

Dissolved Oxygen – The level of free, non-compound oxygen present in water or other liquids. It is an important parameter in assessing water quality because of its influence on the organisms living within a body of water.

Drainage Authority – The board or joint county drainage authority having jurisdiction over a drainage system or project (**Minn. Stat. § 103E.005, Subd. 9**). Pursuant to **Minn. Stat. § 103D.625**, the managers of a watershed district established pursuant to **Minn. Stat. 103D** shall take over a joint county or county drainage system within the watershed district and the right to maintain and repair the drainage system if directed by a joint county drainage authority or a county board.

Drainage system – A system of ditch or tile, or both, to drain property, including laterals, improvements, and improvements of outlets, established and constructed by a drainage authority. "Drainage system" includes the improvement of a natural waterway used in the construction of a drainage system and any part of a flood control plan proposed by the United States or its agencies in the drainage system (Minn. Stat. § 103E.005, Subd. 12.).

E. coli – *Escherichia coli* (abbreviated as *E. coli*) is a fecal coliform bacteria that comes from human and animal waste. The Environmental Protection Agency (EPA) uses *E. coli* measurements to determine whether fresh water is safe for recreation.

eLINK – Web-based conservation and grants tracking system hosted by the Board of Water and Soil Resources.

Flooding – The Federal Emergency Management Agency (FEMA) defines a flood as a general and temporary condition where two or more acres of normally dry land or two or more properties are inundated by water or mudflow (Federal Emergency Management Agency, 2016).

Flow Regime – Term typically used to define the characteristic flow patterns of a stream or river.

Geomorphology – The study of the processes responsible for the shape and form, or morphology, of watercourses; describes the processes whereby sediment (e.g., silt, sand, gravel) and water are transported from the headwaters of a watershed to its mouth.

Green Infrastructure – Infrastructure that incorporates the natural environment and constructed systems in an integrated network to provide multiple benefits and support resilient communities. Green infrastructure is designed to reduce the effects of development on stormwater by maintaining or engineering some of the flood reduction functions of pre-development conditions.

Groundwater – Water located below ground in the spaces present in soil and bedrock.

Groundwatershed (also termed a Springshed) – Area that contributes groundwater flow to a given discharge point.

Groundwater Dependent Natural Resources – Natural resources, especially fens, wetlands, lakes, and streams, whose characteristics would change significantly if they were deprived of groundwater.

Groundwater Recharge – Water infiltrating through the ground surface to become groundwater.

Hotspots – An area where many restoration and protection resources are concentrated. Projects implemented in a hotspot are likely to achieve multiple watershed management benefits.

Hydro-conditioned Digital Elevation Model – An analysis of overland flow paths based on surface elevation (or topographical) data but conditioned (or modified) to account for culverts and pipe that create new flow paths not evident from surface elevations alone.

Hydrology – The movement of water. Often used in reference to water movement as runoff over the soil after a rainfall event as it contributes to surface water bodies.

Hydrologic Soil Groups – A soil classification system based on the ability to convey and store water; divided into four groups (USDA NRCS):

a) Well drained sands and gravel, high infiltration capacity, high leaching potential and low runoff potential;
b) Moderately drained fine to coarse grained soils, moderate infiltration capacity, moderate leaching potential and moderate runoff potential;
c) Fine grained, low infiltration capacity, low leaching potential and high runoff potential;
d) Clay soils, very low infiltration capacity, very low leaching potential and very high runoff potential.

For those soils in dual groups (e.g. A/D, B/D, or C/D) the first letter applies to the drained condition and the second applies to the undrained condition. A/B soils are a mix of A and B soils which are generally more drained than C or D soils.

Hydrologic & Hydraulic Model – A continuous simulation computer model that predicts natural (hydrologic) and artificial (hydraulic) flow paths, volumes, and rates in a defined area of land.

Impervious Surfaces – Surfaces that severely restrict the movement of water through the surface of the earth and into the soil below. Impervious surface typically refers to man-made surfaces such as non-porous asphalt or concrete roadways, buildings, and heavily compacted soils.

Index of Biotic Integrity (IBI) – The IBI is a biological assessment tool that provides a framework for translating biological community data into information regarding ecological integrity ("the capability of supporting and maintaining a balanced, integrated, functional organization comparable to that of the natural habitat of the region", Frey 1977). It utilizes a variety of attributes ("metrics") of the biological community, each of which responds in a predictable way to anthropogenic disturbance. The metrics are based on ecological traits of the organisms present at a given site, represent different aspects of ecological structure and function, and are scored numerically to quantify the deviation of the site from least-disturbed conditions. When the individual metric scores are summed together, the composite IBI score characterizes biological integrity (Karr et al 1986).

Infiltration – A process by which water in the ground surface enters the soil.

Invasive Species – Organisms not endemic to a geographic location they often displace native species and have the potential to cause environmental change.

Issues – Problems, risks, or opportunities for your watershed's priority resources (e.g., flood damage, groundwater contamination, protect unimpaired waters, etc.) that will be addressed in your plan.

Job Approval Authority – A component of a Technical Quality Assurance system developed and administered by the NRCS to enable more people within the conservation partnership of NRCS, SWCDs and BWSR to provide reliable conservation technical assistance and sign-off for federal conservation programs.

Karst – A terrain having distinctive landforms and hydrology created primarily from the dissolution of soluble bedrock. In karst, water dissolves fractures and joints in the bedrock forming a network of interconnected underground conduits that can easily transport surface water to the groundwater system and carry groundwater long distances at speeds up to miles per day.

Lakeshed – The area of land for which surface runoff drains to the same downstream lake.

Low Impact Development – A stormwater management strategy that seeks to mitigate the impacts of increased urban runoff and stormwater pollution by managing it as close to its source as possible. It comprises a set of site design approaches and small scale stormwater management practices that promote the use of natural systems for infiltration and evapotranspiration, and rainwater harvesting.

Macroinvertebrate – Organisms without backbones, which are visible to the naked eye without the aid of a microscope. Aquatic macroinvertebrates live on, under, and around rocks and sediment on the bottom of lakes, rivers and streams.

Measurable Goal – The quantifiable change expected in a resource after implementing the 10-year plan.

Minnesota Greenstep Cities – A voluntary challenge, assistance and recognition program to help cities achieve their sustainability and quality-of-life goals. A program of the Minnesota Pollution Control Agency and its partners.

Natural Environment Lake – The strictest of three lake classifications found in Minnesota's Shoreland Management Program. Natural Environment Lakes usually have less than 150 total acres, less than 60 acres per mile of shoreline, and less than three dwellings per mile of shoreline. They may have some winter kill of fish; may have shallow, swampy shoreline; and are less than 15 feet deep. Classification used to determine lot size, setbacks and, to a certain degree, land uses on the adjacent land.

Natural Shoreline – A shoreline with native, deep-rooted vegetation that stabilize erosion, provide wildlife habitat, and filter pollutants from overland runoff.

Nitrate – A negatively charged compound (NO_3^-) that is water soluble, available for plant uptake, and a product of both organic matter and synthetic fertilizer.

NRCS Land Capability Class IV – Soils that when cultivated require more careful management and where conservation practices are more difficult to apply and maintain. Soils in Class IV may be well suited to only two or three of the common crops or the harvest produced may be low in relation to inputs over a long period of time. Cultivation on these soils is limited as a result of the effects of one or more permanent features such as (1) steep slopes, (2) severe susceptibility to water or wind erosion, (3) severe effects of past erosion, (4) shallow soils, (5) low moisture-holding capacity, (6) frequent overflows accompanied by severe crop damage, (7) excessive wetness with continuing hazard of waterlogging after drainage, (8) severe salinity or sodium, and (9) moderately adverse climate.

Nutrients – A group of chemicals that are needed for the growth of an organism. Within surface water systems, nutrients such as phosphorus and nitrogen can lead to the excessive growth of algae.

Nutrient Reduction Strategy – A statewide assessment of nutrient sources and the magnitude of nutrient reductions needed to meet in-state and downstream water quality goals.

Pathogens – a bacterium, virus, or other microorganism that can cause disease.

Peak flows – Term typically used to define the characteristic high flow period of a stream or river.

Perennial Crops – Crops which are alive year-round and are harvested multiple times before dying (e.g. alfalfa). Conversion of annual fields into perennial fields (perennial cropland) offers many benefits including reduced soil erosion, reduced pollutant loads and reduced irrigation demand.

Pollutant – Any substance, as in chemicals or waste products, that renders the air, soil, water, or other natural resource harmful or unsuitable for a specific purpose.

Pollution Sensitivity – The time it takes recharge and contaminants at the ground surface to reach the underlying aquifer.

Prioritized – Determining the relative importance and precedence of the resources and issues you have identified in your plan. This includes not only agreeing upon which items will be tackled first, but also those that will not be included in your plan.

Protection – Strategies that protect high quality and threatened resources that are essential to preventing further degradation and future impairment of Minnesota's waters.

Public Drainage Systems – A system of ditch or tile, or both, to drain property, including laterals, improvements, and improvements of outlets, established and constructed by a drainage authority. "Drainage system" includes the improvement of a natural waterway used in the construction of a drainage system and any part of a flood control plan proposed by the United States or its agencies in the drainage system (**Minn. Stat. § 103E.005, Subd. 12.**).

Public Water Suppliers – Entities that provide water for human consumption through pipes or other constructed conveyances to at least 15 service connections or serves an average of at least 25 people for at least 60 days a year.

Radionuclides – An atom that has excess nuclear energy, making it unstable.

Resources – Natural features on the landscape that can be grouped into categories for management activities (e.g., unimpaired lakes, shallow groundwater aquifers, stream riparian corridors, productive soils).

Restoration – Strategies that seek to restore or improve the quality of a resource which is currently impaired, threatened, and/or degraded.

Riparian – A vegetated ecosystem alongside a waterbody; characteristically have a high water table and are subject to periodic flooding.

Runoff – Water from rain, snow melt, or irrigation that flows over the land surface.

Safe Drinking Water Act (SDWA) – The federal law that protects public drinking water supplies throughout the nation. Under the SDWA, EPA sets standards for drinking water quality and, with its partners, implements various technical and financial programs to ensure drinking water safety.

Secchi Depth – Used as a lake monitoring tool. The depth at which an opaque disk, called a Secchi Disk is used to gauge the transparency, and ceases to be visible from the water's surface.

Species of Greatest Conservation Need – A USGS national database that identify the species most in need of conservation action in that state or territory.

Stormwater BMPs/Infrastructure – Methods used to control the speed and total amount of stormwater that flows off a site after a rainstorm and used to improve the quality of the runoff water.

Stream Channel – A natural waterway, formed by fluvial processes, that conveys running water.

Stream Connectivity – The term used to define the longitudinal connection a stream has along its length and the lateral connection a stream has with its floodplain and adjacent uplands.

Subwatershed – A smaller geographic section of a larger watershed unit with a typical drainage area between 2 and 15 square miles and whose boundaries include all the land area draining to a specified point.

Targeted – When and where actions will be implemented within the watershed to achieve the goals within the 10-year timeframe of the plan.

Tolerable Soil Loss – Soil loss tolerance for a specific soil, also known as the T value, is the maximum average annual soil loss expressed as tons per acre per year that will permit current production levels to be maintained economically and indefinitely.

Total Maximum Daily Loads (TMDLs) – The total amount of a pollutant or nutrient that a water body can receive and still meet state water quality standards. TMDL also refers to the process of allocating pollutant loadings among point and nonpoint sources.

Total Phosphorus – A measure of the amount of all phosphorus found in a water column, including particulate, dissolved, organic and inorganic forms.

Total Suspended Solids (TSS) – A measure of the amount of particulate material in suspension in a water column.

TP-40 – Technical Paper No. 40 refers to the Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years which was published by the Soil Conservation Service, U.S. Department of Agriculture in 1961.

Trichloroethylene (TCE) – A common, man-made chemical found in the environment, used in industry to remove grease from metal parts and found in household products – such as correction fluid, paint removers, parts cleaners, and spot removers. The main health concerns from exposures to TCE are immune system effects such as hypersensitivity or risks for auto-immune disease; an increased risk of cancer (kidney and liver cancer and Non-Hodgkin Lymphoma) from long-term exposure; heart defects in the developing fetus if the pregnant mother is exposed in the first trimester. At higher levels of exposures, TCE also can harm the central nervous system, kidney, liver, and male reproductive system.

Trophic State Index – A classification system designed to "rate" individual lakes, ponds and reservoirs based on the amount of biological productivity occurring in the water, typically as measured by algal biomass. A measure of the overall productivity (or greenness) of lake water. Higher TSI means more nutrients and more algae.

Turbidity – The cloudiness of the water that is caused by large numbers of individual particles that are generally invisible to the naked eye.

Vulnerable Soil – Soils with very severe limitations that restrict agricultural production through the choice of plants, require very careful management, or both. Soils may be suited for only two or three of the common crops or the harvest produced may be low in relation to inputs over a long period of time. Cultivation on these soils is limited as a result of the effects of one or more permanent features such as (1) steep slopes, (2) severe susceptibility to water or wind erosion, (3) severe effects of past erosion, (4) shallow soils, (5) low moisture-holding capacity, (6) frequent overflows accompanied by severe crop damage, (7) excessive wetness with continuing hazard of waterlogging after drainage, (8) severe salinity or sodium, or (9) moderately adverse climate. Defined as the Soil Survey Geographic Database, Land Suited to Cultivation and Other Uses – Class IV.

Water Quality – The chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular use. In the case of surface waters, uses are typically swimming and fishing. In the case of groundwater, uses are typically drinking and irrigation.

Wellhead Protection Plan – A plan developed to prevent contaminants from entering public waters.

Zonation – A conservation prioritization software that uses geographic information and user input weighting to identify locations on the landscape that have varying degrees of environmental sensitivity or management priority.

APPENDIX A:
Land and Water Resource Inventory

PLAN APPENDIX A – LAND AND WATER RESOURCE INVENTORY (LWRI)

This Land and Water Resource Inventory (LWRI) is intended to catalog and briefly summarize the data available for the Cannon River Planning Area. The objective of the LWRI is to describe the existing health of the Planning Area, describe the issues that exist in the Planning Area and provide the justification for the actions identified in the Cannon River 1W1P. The name, location, and publisher or agency of any relevant datasets is included within each section of the LWRI. Datasets can be accessed through the URL links provided in the Datasets Referenced section or through inquiring at the agency websites or offices. In many cases, hyperlinks to the reports being referenced are provided in the body of the text. This section of the plan conforms to the requirements of Chapter 8410.0060 Land and Water Resource Inventory as revised July 13, 2015.

To help prioritize and target restoration and protection efforts in the Planning Area, a number of the data sets identified in the LWRI were used to develop the Comprehensive Watershed Priority Scheme. Maps generated for the Comprehensive Watershed Priority Scheme are identified in the relevant section of the LWRI and are included at the end of this section.

Topics covered in the LWRI:

- Planning Area Location
- Socioeconomic Information
- Land Use and Public Utility Services
- General Geology and Topographic Data
- Soil Data
- Climate and Precipitation
- Surface Water Resources
- Groundwater Resource Data
- Drainage Systems and Control Structures
- Pollutant Sources and Permitted Wastewater Discharges
- Water-Based Recreation Areas
- Fish and Wildlife Habitat
- Unique Features and Scenic Areas
- Gap Analysis
- Datasets Referenced

Cannon River - *photo Dakota SWCD*

1.1 Planning Area Location

The Cannon River Planning Area is located south of the Twin Cities Metropolitan Area and is part of the Lower Mississippi River Basin. The Cannon River Planning Area spans a portion of nine counties. The six counties with the largest land area include Dakota (9.8%), Goodhue (22.2%), Le Sueur (9.7%), Steele (24%), Rice (27.9%) and Waseca (5.3%) while small portions of Blue earth, Freeborn, and Scott dot the perimeter. The Belle Creek Watershed District and the North Cannon Watershed Management Organization are both located within the planning boundary. The norther portion of the watershed falls within the Twin Cities Metropolitan Council authority making the Cannon River 1W1P the first One Watershed, One Plan to also address the requirements of Minnesota Statutes 103B.201 Metropolitan Water Management Program.

The planning boundary includes the Cannon River watershed which drains approximately 1,460 square miles through two main channels, the Cannon and Straight Rivers, to the Mississippi River at Red Wing, MN as well as a portion of the Big River – Mississippi River watershed. The plan boundary and the watersheds comprising the plan area are shown in Figure 0-1-1.

The Cannon River winds through 4 counties (Dakota, Goodhue, LeSueur, and Rice) and its tributary, the Straight River winds through Steele County. There are 14 riparian cities along the Cannon River and the Straight River (Table 0-1). The Planning Area also contains 63 smaller towns, 27 of which are located entirely within the Planning Area.

Cannon River - *photo Dakota SWCD*

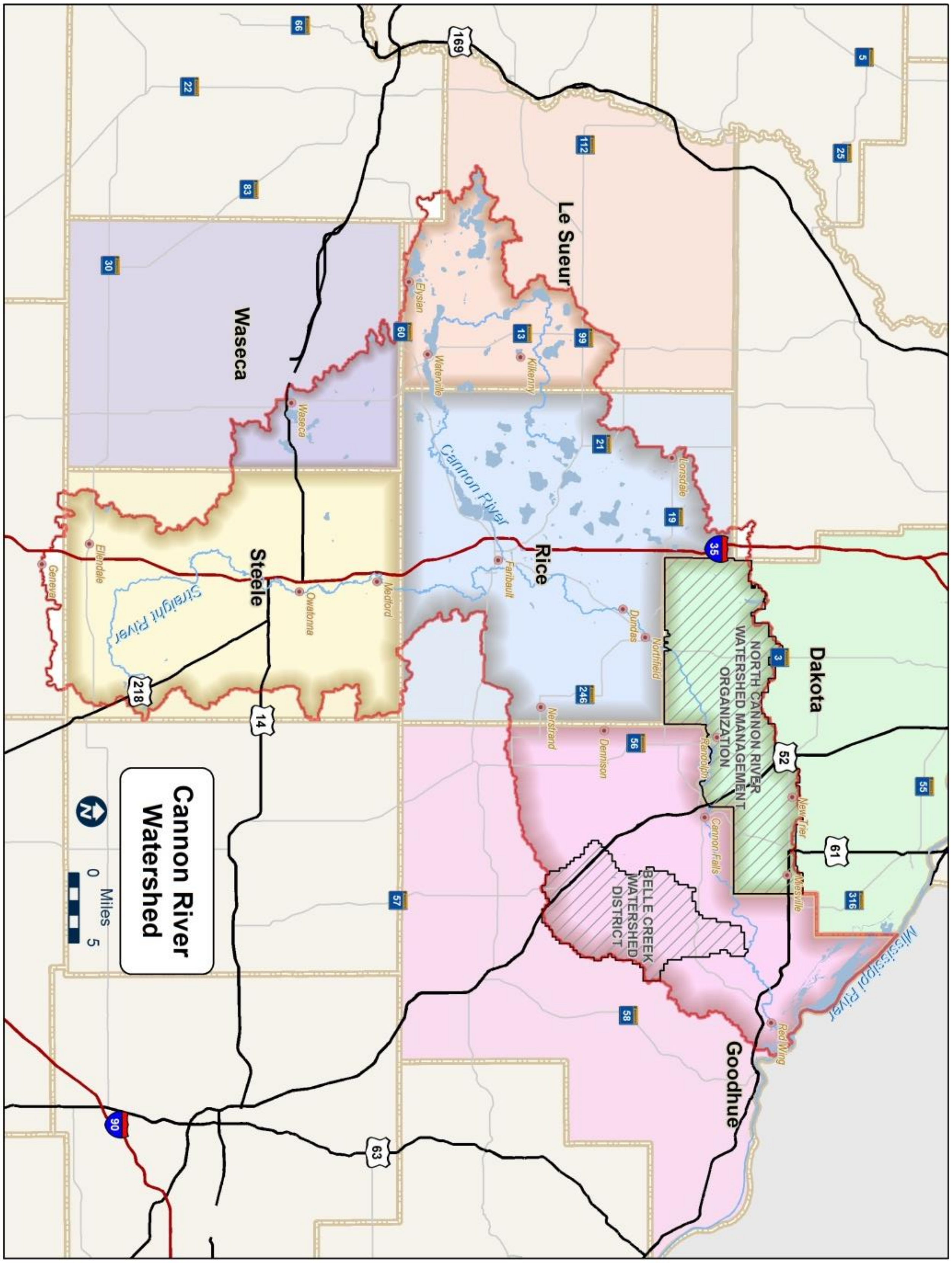


Figure 0-1. Location Map Cannon River Planning Area

Table 0-1. Cities in Cannon River Planning Area

Member Community	County	Percent Area within Cannon River Watershed	MS4 Community [Yes/No]
Cannon Falls	Goodhue	100%	No
Dennison	Goodhue, Rice	100%	No
Dundas	Rice	100%	No
Elko	Scott	24%	Yes
Ellendale	Steele	100%	No
Elysian	Le Sueur	74%	No
Faribault	Rice	100%	Yes
Kilkenny	Le Sueur	100%	No
Lonsdale	Rice	73%	No
Medford	Steele	100%	No
Miesville	Dakota	98%	No
Montgomery	Le Sueur	30%	No
Morristown	Rice	100%	No
Nerstrand	Rice	100%	No
New Trier	Dakota	100%	No
Northfield	Dakota, Rice	100%	Yes
Owatonna	Steele	100%	Yes
Randolph	Dakota	100%	No
Red Wing	Goodhue	73%	Yes
Waseca	Waseca	80%	Yes
Waterville	Le Sueur	100%	No

1.1.1 LWRI Summary by Lobe

The Cannon River Planning Area is split into four lobes that represent distinct hydrologic regions. The Straight River Lobe is located in the southern portion of the watershed and includes the catchment area of the Straight River from its headwaters to its confluence with the Cannon River in Faribault, MN. The Upper Cannon River Lobe is located in the western portion of the watershed and includes the catchment area of the Cannon River from its headwaters to its junction with the Straight River in Faribault, MN. The Middle Cannon River Lobe is located in the north-central portion of the watershed and includes the catchment area of the Cannon River from its junction with the Straight River to its outfall at Lake Byllesby. The Little Cannon River Lobe is located in the northeastern portion of the watershed and includes the catchment area of the Cannon River from its outfall at Lake Byllesby to its confluence with the Mississippi River. Planning Area lobes are shown in Figure 0-1-1. A summary of the LWRI by lobe is provided in this section of the LWRI.

Upper Cannon River Lobe

- The Upper Cannon River Lobe falls primarily in Le Sueur and Rice Counties.
- Morristown and Waterville are the largest communities and are the biggest water users in the region. Elysian, Kilkenny and Shieldsville are also located in the Upper Cannon River Lobe.
- Under pre-settlement conditions, this portion of the watershed was dominated by big woods and wet prairie.
- The Upper Cannon River Lobe is called the lake region of the Planning Area with approximately 44 named lakes. These lakes vary from deep to shallow lakes, recreational development lakes to natural environment lakes. The Cannon River originates in one of these lakes, Shields Lake.
- Over half of the Upper Cannon is in cultivated crops, 18 percent is in pasture/hay, 8 percent is in forest, 8 percent is open water and 6 percent is developed.
- The estimated historic wetland loss of the Upper Cannon is 50 to 75%.
- The highest concentration of active feedlots is located in the lower portion of the Upper Lobe and the Middle Cannon Lobe.

Middle Cannon River Lobe

- The Middle Cannon River Lobe falls primarily in Rice and Dakota Counties.
- The cities of Northfield and Faribault are two of the largest water users; however rapid growth is projected for Elko New Market with its size almost tripling from 4,110 people in 2010 to 11,900 by 2040.
- Under pre-settlement conditions, this portion of the watershed transitions from a big woods/wet prairie system to a more prairie dominant plant community.
- The Straight River enters the Cannon in Faribault which straddles the Upper Cannon River Lobe, the Middle Cannon River Lobe and the Straight River Lobe. The Cannon River is bounded by rolling hills, bluffs, farmland and woods as it traverses the Middle Cannon River Lobe before meeting the dam at Lake Byllesby upstream of Cannon Falls.
- Over half of the Middle Cannon (approximately 57 percent) in cultivated crops, 16 percent is pasture/hay, 9 percent in forest, 8 percent is developed, and 2 percent is open water.
- A signification portion of the Middle Cannon has an estimated historic wetland loss on the order of 75 to 100%.
- Karst geology and areas of high pollution sensitivity represent a large portion of this lobe, which correlates with the elevated nitrate samples detected.
- The highest concentration of active feedlots is located in the lower portion of the Upper Lobe and the Middle Cannon Lobe.

Lower Cannon River Lobe

- The Lower Cannon River Lobe falls in Goodhue and Dakota Counties.
- Red Wing and Miesville are the largest communities in this lobe of the Planning Area.
- Under pre-settlement conditions, the Lower Cannon River Lobe more closely resembled the Straight River Lobe with its oak openings and barrens, aspen-oak land and prairies. At the very bottom of the lobe the Cannon River travelled through a corridor of river bottom forest before discharging into the Mississippi River.
- The Cannon River enters a river valley below Cannon Falls where it is flanked by bluffs up to 300 feet high.
- Over half of the Lower Cannon (approximately 55 percent) in cultivated crops, 18 percent is in forest, 11 percent in grassland, 7 percent in pasture/hay, 6 percent is developed, and 1 percent is open water.
- Due in part to its topographic relied, the Lower Cannon had one of the lowest pre-settlement wetland acreage estimates and the lowest rate of wetland loss (approximately 43%) in the Planning Area.
- The majority of this lobe has karst geology with high pollution sensitivity, which correlates to the elevated nitrate samples detected.

Straight River Lobe

- The Straight River Lobe falls primarily in Steele County.
- Owatonna and Waseca are the largest communities and account for the greatest permitted water use in the region.
- In this portion of the watershed, the Straight River traveled through oak openings and barrens, prairie, aspen-oak land, wet prairie and finally big woods as it joined the Cannon River under pre-settlement conditions.
- The source of the Straight River is a slough north of Geneva Township. From its headwaters, the Straight River flows through the farmland of southeastern Minnesota, meandering approximately 30 miles north from Owatonna to Faribault, where it joins the Cannon River.
- Approximately three-quarters of the Straight River Lobe is in cultivated crops, 11 percent is developed, 7 percent is grassland, 3 percent is forest, and 1 percent is open water.
- The greatest rate of wetland loss has occurred in this portion of the Planning Area at approximately 95% of what existed under pre-settlement conditions.
- A band of karst geology and areas of high pollution sensitivity run through the center of the lobe, making these parts more vulnerable to contamination from the lands surface.

1.2 Socioeconomic Information

Social and economic information has been compiled to document baseline conditions and analyze the relationships between ecosystems and human communities. Socioeconomic information can be useful for characterizing sense of place, constituent's world-views and capacity for making change. This information informs the public engagement process, the identification of issues and concerns as well as the implementation plan.

The estimated total population of the six counties located in the Cannon River Planning Area is approximately 600,000 (Minnesota Demographic Center). The estimated current population within the Planning Area is approximately 194,000 people (Minnesota Demographic Center). There is, however, a substantial difference in the counties' populations. For instance, Dakota County has a population of nearly 500,000, while Waseca County has less than 20,000. Table 1-2 details the population of the Planning Area's counties.

Table 0-2. Population of counties in the Cannon River Planning Area (Minnesota Demographic Center)

County	Population	
	2010 Census	2016 (est)
Dakota	398,552	418,432
Goodhue	46,183	46,717
Le Sueur	27,703	27,639
Rice	64,142	65,607
Steele	36,576	36,765
Waseca	19,136	18,784
Total	**592,292**	**613,944**

The median household income in the Planning Area is approximately $48,190 annually. This is roughly 104% of the national average. Seventy two percent of the population over the age of 18 is active in the workforce, and approximately 7% of the residents in the Planning Area live below the national poverty level. Table provides information about total employment and average weekly wages in the seven watershed counties.

Table 0-3. Total employment and weekly wages in the Cannon River Planning Area

Area	Employment (Sept 2016)	Average weekly wage
Minnesota	2,849,452	1,053
Dakota	188,020	991
Goodhue	21,609	879
Le Sueur	9,636	808
Rice	25,089	868
Steele	22,126	795
Waseca	6,709	780

Residents of the watershed have high rates of educational attainment as illustrated in Table 0-4.

Table 0-4. Educational Attainment in the Cannon River Planning Area (U.S. Census Bureau ACS 2010-2015)

County	18 to 24 years				25 years and over					
	Less than high school	High school graduate	Some college or associate's degree	Bachelor's or higher	Less than high school	High school, no diploma	High school graduate	Some college, no degree	Associate's or Bachelor's degree	Graduate or professional degree
Dakota	13.4%	30.2%	43.0%	13.4%	1.9%	3.3%	21.6%	21.5%	39.2%	12.4%
Goodhue	14.8%	36.9%	38.9%	9.4%	2.4%	4.7%	33.0%	24.9%	28.4%	6.5%
Le Sueur	12.8%	38.9%	39.6%	8.7%	3.1%	6.3%	35.5%	22.7%	26.6%	5.8%
Rice	8.8%	18.6%	69.0%	3.7%	3.7%	5.8%	31.8%	20.8%	27.7%	10.0%
Steele	15.5%	32.9%	42.5%	9.1%	3.4%	4.8%	35.5%	21.7%	28.0%	6.7%
Waseca	12.6%	48.0%	34.7%	4.8%	2.8%	5.1%	35.2%	24.5%	27.4%	5.0%

Table 0-5 contains a breakdown of population by age in the six counties of the watershed.

Table 0-5. Age Distribution by County in the Cannon River Planning Area (U.S. Census Bureau ACS 2015)

Geography	Age				
	18 to 24 yrs	25 yrs and over	25 to 34 yrs	35 to 44 yrs	65 yrs and over
Dakota	32,315	272,845	54,953	55,060	47,358
Goodhue	3,392	32,356	5,178	5,237	8,289
Le Sueur	2,028	18,866	3,046	3,408	4,321
Rice	9,592	40,740	7,456	7,742	8,816
Steele	2,931	24,227	4,237	4,386	5,667
Waseca	1,290	13,357	2,798	2,365	3,005

The population of the Cannon River Planning Area has grown intensely over the past 100 years. As the Twin Cities Metropolitan Area expanded (15.4% growth rate from 1990-2000), the northern parts of the Planning Area have also expanded to become suburb communities (Metropolitan Council). Many residents commute from the Northfield area to Minneapolis and St. Paul. Growth rates are high and continue to rise. Agriculture has also intensified, as smaller farms have been consolidated into larger operations and farming techniques to enhance crop productivity are put into use. More information about population, employment, age distribution, and other socio-economic factors can be obtained through local county governments, especially comprehensive plans.

Approximately ninety seven percent of the land in the watershed is owned by private landholders (921,129 acres). The second largest ownership type is State, with approximately 18,085 acres (1.9%), followed by County with 2,738 acres (0.29%), Conservancy with 2,343 acres (0.24%), Private Major with 1,344 acres (0.14%) and Federal, with approximately 860 acres (0.09%). In addition, there are nearly 43 acres of miscellaneously owned or managed public lands. Ownership records show no major Tribal land holdings in the watershed. Table 0-6 provides the details of land ownership.

Table 0-6. Land ownership by type and percentage of Cannon River Watershed (GAP Land Cover, MNDNR, 2008 and Tribal Government, MNDOT, 2019)

Ownership Type	Acres	% of Cannon River Watershed HUC 8
Federal	2,515	0.26
State	23,543	2.44
County	2,738	0.28
Tribal	1,077	0.11
Private	930,153	96.52
Private Non-Industrial	1,338	0.14
Conservancy	2,353	0.24
Total Acres:	**963,717**	**100**

State Game Refuge - Northfield, MN

1.3 Land Uses and Proposed Development

The Cannon River Planning Area has experienced significant shifts in land use, demands on the land, and the expansions of human developments. According to the map of presettlement vegetation in Minnesota (Marschner Map of Original Vegetation) the Cannon River Planning Area was predominantly a combination of prairie, oak openings and barrens, and big woods interspersed with aspen-oak woodland, wet prairie, and river bottom forest (MN Geospatial Information Office). Prior to the European settlement in the 1800's, native peoples grew crops, set fires, and impacted the lands in other ways. After the Europeans began to settle to area, demands on the landscape drastically changed and this shift accelerated rather rapidly resulting in the modern conditions seen today (Table 0-7). Human settlement within the watershed influenced a change in how the land was utilized. Large, flat, fertile lands were converted to agriculture whereas steeper areas were typically used as pasture lands. Other human influences on land use include the suppression of fires, which has resulted in changes in fire-dependent plant communities (Cannon River Watershed Partnership).

Human settlement patterns impacted the types and ranges of large mammals. Prior to the 1800's, bison and elk were common. After Europeans settled the area, confined livestock grazing became more prevalent. Concentrated livestock grazing often led to increases in shrubs such as the eastern red cedar and sumac in prairies of oak savannas; increases of prickly ash and buckthorn in forests and woodlands areas; and increases in invasive non-native plants in all plant communities. Land uses imposed by European settlers promoted cultivation, thereby exposing light loess soils which greatly increased runoff rates (Ibid).

Land use within the watershed is largely agricultural, with crop and pasture lands accounting for approximately 76% of the overall Planning Area. Cropland is used predominantly for growing corn and soybeans. Livestock production is primarily swine and poultry. The vast majority of this land is considered "prime farmland," or "farmland of statewide importance." Approximately 3,172 farms are located in the Planning Area. Of those farms, sixty five percent (65%) of the operations are less than 180 acres in size, thirty percent (30%) are from 180 to 1,000 acres in size, and the remaining farms are greater than 1,000 acres in size. Fifty nine percent of the producers are full time operators and do not rely on off-farm income.

According to the Cannon River Watershed Restoration and Protection Strategies Report (2016) there were approximately 2,150 feedlots in the Cannon River Watershed, 38 of which are Concentrated Animal Feeding Operations (CAFOs). Figure 18 of the WRAPS identifies the location of these feedlots as of 2014. The Cannon River HSPF model indicates that local impacts to water resources could be significant as indicated by the TP Unit Area Loads. BATHTUB-estimated P budgets for several lakes in the Upper Cannon River Lobe indicate that the numerous small feedlots may be a significant source of P to the lakes. At the time the WRAPS was being developed, there were 166 feedlots located in shoreland (within 1,000 feet of a lake or 300 feet of a river/stream) and of these 166 feedlots, 147 had open lots and of these, 56 had Open Lot Agreements.

Urban development pressure is moderate to considerable in some areas, with occasional farms, timberland, and lakeshore being parceled out for recreation, lake or country homes and expanding suburban populations. Table 0-7 describes the types of land use and the ownership types of the Cannon River Planning Area.

Table 0-7. Land Use by Ownership Type (NRCS Rapid Watershed Assessment: Cannon River Watershed)

Landcover/use	Public		Private		Tribal		Total Acres	Percent
	Ac.	%	Ac.	%	Ac.	%		
Forest	5,935	0.6%	77,277	8.2%	0.00	0.0%	83,212	8.79%
Grain Crops	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.00%
Grass, etc	5,085	0.5%	147,076	15.5%	0.00	0.0%	152,161	16.08%
Orchards	0.00	0.0%	0.00	0.0%	0.00	0.0%	0.00	0.00%
Row Crops	4,131	0.4%	568,858	60.1%	0.00	0.0%	572,990	60.54%
Shrub, etc	408.97	0.0%	5,590	0.6%	0.00	0.0%	5,999	0.63%
Wetlands	4,456	0.5%	25,084	2.7%	0.00	0.0%	29,540	3.12%
Residential/Commercial	974	0.1%	75,159	7.9%	0.00	0.0%	76,133	8.04%
Open Water	729	0.1%	25,670	2.7%	0.00	0.0%	26,399	2.79%
Totals	**21,719**	**2.20%**	**924,714**	**97.70%**	**0.00**	**0.00**	**946,433**	**100%**

According to the NRCS Rapid Watershed Assessment, approximately ninety seven percent of the 946,440 acres in this watershed are privately owned. The NRCS Rapid Watershed Assessment provided a breakdown of conservation practices on privately owned land in the watershed from 1999-2007. The following resource concerns were identified by SWCD staff as top priorities for conservation and cost sharing efforts: soil and surface water quality, stormwater management, animal waste management, groundwater protection, nutrient management, wetland management, and sediment and erosion control. Available cost share programs and conservation practices available to private landowners were developed to address these top resource concerns.

Table 0-8. Cannon River Watershed Conservation Systems 1999-2007

Fiscal Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
Total Conservation Systems Planned (acres)	1,388	21,898	247	24,372	20,638	N/A	14,267	33,003	28,964	**144,777**
Total Conservation Systems Applied (acres)	1,382	17,689	236	17,437	17,437	N/A	16,818	32,357	29,152	**132,508**

Table 0-9. Cannon River Watershed Implemented Conservation Practices 1999-2007

Fiscal Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
Total Waste Management (313) (numbers)	2	1	1	2	2	0	2	1	0	**11**
Riparian Forest Buffers (391) (acres)	29	114	83	289	23	76	163	12	0	**789**
Erosion Control Total Soil Saved (tons/year)	6,349	107,525	91,872	138,219	76,851	N/A	N/A	N/A	N/A	**420,816**
Total Nutrient Management (590) (Acres)	560	6,060	590	3,473	4,752	2,520	1,773	1,773	2,415	**23,916**
Pest Management Systems Applied (595A) (Acres)	0	1,078	0	1,433	423	0	0	538	194	**3,666**
Prescribed Grazing 528a (acres)	55	208	0	0	0	131	166	246	246	**1,052**
Tree & Shrub Establishment (612) (acres)	402	456	686	738	549	139	46	337	181	**3,534**
Residue Management (329A-C) (acres)	44	9,419	9,020	6,831	4,583	7,831	7,831	20,503	7,236	**73,298**
Total Wildlife Habitat (644 - 645) (acres)	5,811	3,923	2,524	7,045	6,068	2,090	7,045	10,083	13,867	**58,456**
Total Wetlands Created, Restored, or Enhanced (acres)	63	284	669	876	1,278	864	1,053	533	857	**6,477**

Table 0-10. Cannon River Watershed Acres enrolled in Farmbill Programs 1999-2007

Fiscal Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL
Conservation Reserve Program	1,282	8,347	3,992	8,982	8,398	N/A	1,199	4,801	7,368	**44,369**
Wetlands Reserve Program	0	20	2,222	1,235	843	N/A	939	416	287	**5,962**
Environmental Quality Incentives Program	0	944	1,020	1,853	4,405	N/A	10,443	20,007	16,332	**55,004**
Wildlife Habitat Incentive Program	0	0	0	160	13	N/A	0	145	110	**428**
Farmland Protection Program	0	236	236	0	0	N/A	0	0	0	**472**

There are many MPCA-permitted sites, hazardous waste generators, and contaminated sites within the Cannon River Planning Area. The MPCA maintains a database of these sites, which includes permitted sites (air, industrial, stormwater, construction stormwater, and wastewater discharge), hazardous waste generating sites, leak sites, petroleum brownfields, tank sites, unpermitted dump sites, and sites enrolled in the Voluntary Investigation and Cleanup (VIC) program. According to this database there is one closed landfill in the Middle Cannon River Lobe. There are a number of other solid waste facilities scattered throughout the Planning Area, all of which can be found in the MPCA's database.

Further land use data can be obtained from the National Land Cover Database (NLCD) available at MN Geospatial Commons. Roadways are also included in land cover and can be obtained from MNDOT. Comprehensive Plans, published by the Local Government Units in the watershed, also include information related to land use. Specifically, these reports address and identify areas slated for development.

Comprehensive Watershed Priority Scheme Maps:

- Areas with high sediment yield (in pounds per acre per year) (Source: PTMApp)
- Cultivated crops (Source: NLCD 2011)
- Forest lands that have been identified by forestry managers as important (Source: NLCD 2011)
- Lands close to existing development may be more likely to be developed (Source: undeveloped NLCD 2011; MNDOT city boundaries)
- Land cover type is pasture or hay (areas used for livestock grazing or planted with perennial seed or hay crops) (Source: NLCD 2011)
- HSPF Total Phosphorous
- HSPF Total Nitrogen
- HSPF Total Suspended Solids
- PTMApp Sediment

Cover crop mix in corn - *photo Dakota SWCD*

1.4 General Geology and Topographic Data

Overall, the geology of the Cannon River Planning Area has soil topped plateaus of loess that are deeply dissected by river valleys (NRCS 2007). Loess is very fine glacial material that is easily erodible. Loess thickness is variable across the watershed with deposits ranging from 30 feet thick on broad ridgetops, to less than a foot on valley walls with less erodible sedimentary rock such as sandstone and limestone exposed along rivers and road cuts (NRCS 2007).

The bedrock geology in the watershed is typical of southeast Minnesota. It consists of nearly flat-lying sedimentary rock formations. A geologic cross-section of the Planning Area and a generalized map of the aquifers in the watershed can be found in the Cannon River Watershed GRAPS Report. According to this report, the most heavily used bedrock units for drinking water and irrigation are the St. Peter Sandstone, Prairie du Chien Group, and the Jordan Sandstone due to their widespread occurrence and high productivity.

The Cannon River Planning Area has karst areas primarily in Dakota, Goodhue, and Rice Counties (MDNR 2016). Karst is defined as terrain with distinctive landforms and hydrology created primarily from the dissolution of soluble rocks. It is characterized by sinkholes, caves, springs, and underground drainage dominated by rapid conduit flow. Karst tends to develop in areas where there is less than 50 feet of glacial material over carbonate (e.g. limestone) bedrock. This thin cover allows direct, very rapid exchange between surface water and groundwater and significantly increases groundwater contamination risk from surface pollutants. A map of karst features in the Planning Area can be found in the Cannon River Watershed GRAPS Report.

Cannon River Trout Lily Scientific and Natural Area Environs

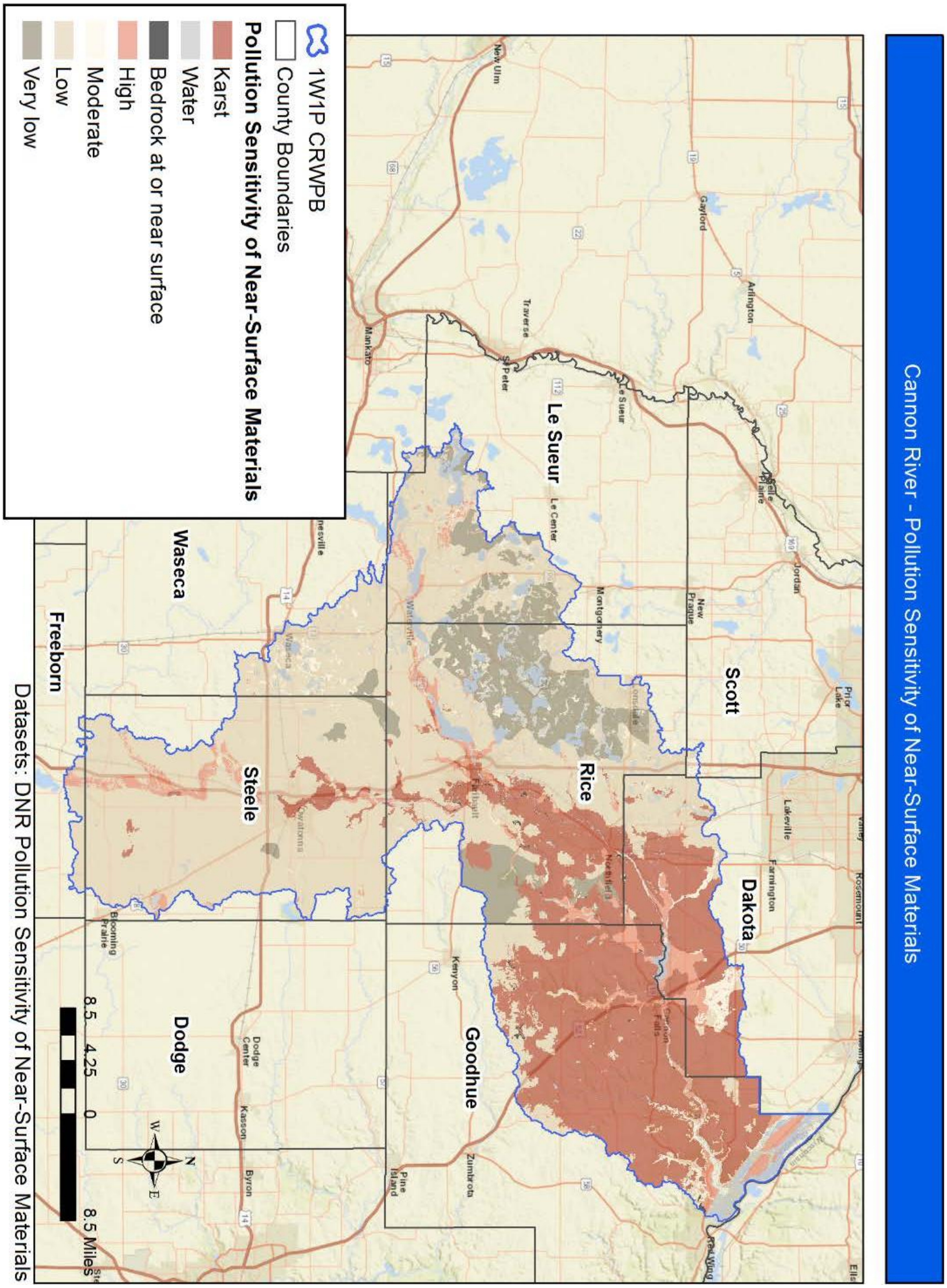


Figure 2. Cannon River Watershed-Pollution Sensitivity of Near-Surface Materials (Figure 7 of the Cannon River Groundwater Restoration and Protection Strategies Report, DRAFT September 2017)

Geologic data are available from the County Geologic Atlases developed by the Minnesota Geologic Survey and MDNR. Currently, atlases are available for Goodhue, Rice, Dakota, Steele (in progress), and Wabasha Counties.

Comprehensive Watershed Priority Scheme Maps:

- Stream Power Index: Index of channelized flow erosive potential (Source: PTMApp)
- Bluffs or steep slopes (Source: DNR/LiDAR)
- Areas with high runoff (in inches for 10-year, 24-hour event (Source: PTMApp)

1.5 Soil Data

Soils throughout the Cannon River Planning Area are generally very deep, loamy, and range from well drained to very poorly drained. Subsurface drain tile is commonly used to lower water tables and increase crop production. Soil data is available at STATSGO by the United States Geological Survey (USGS) and SSURGO by the Natural Resources Conservation Service (NRCS). Crop Productivity Index is available on the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey.

Comprehensive Watershed Priority Scheme Maps:

- Soils unsuitable for agriculture, used to identify areas for potential conservation investment in prairie or forest management (Source: NRCS)

1.6 Climate and Precipitation

It is important to understand and prepare the Cannon River Planning Area for future climatic variabilities as it may require more frequent shifting of watershed management practices. In the last thirty five years, the Cannon River Planning Area has experienced upward trends in both precipitation and temperature. Most notable is the increase in extreme temperatures and precipitation events.

1.6.1 Normal Annual Precipitation and Temperature

Since 1890, the State of Minnesota has observed an average annual temperature increase of 1.6 ˚F per century. However, over the last thirty five years, a 3.4 ˚F increase per century has been observed. The Cannon River Watershed Planning Area is no exception. As seen in **Table 0-11** below, temperature in the Cannon River Planning Area appears to be following the same upward trend. It is important to recognize that while some of these trends appear small, changes to normal weather patterns can disrupt the long established processes of a delicately balanced ecosystem. One small disruption has the potential to set off an unpredictable chain reaction that may or may not result in serious impacts to the ecosystem.

Over the past 100 years, southeast Minnesota has exhibited a statistically significant rising precipitation trend, shown below in Figure 3 through Figure 6. Rising precipitation trends are not only a concern for land and water resources; communities are also effected and must now reassess all new and aging stormwater infrastructures to insure they are able to adequately handle the precipitation increases. It is critical that well thought out stormwater management practices are implemented to handle the increase in precipitation as well as the variability in precipitation events.

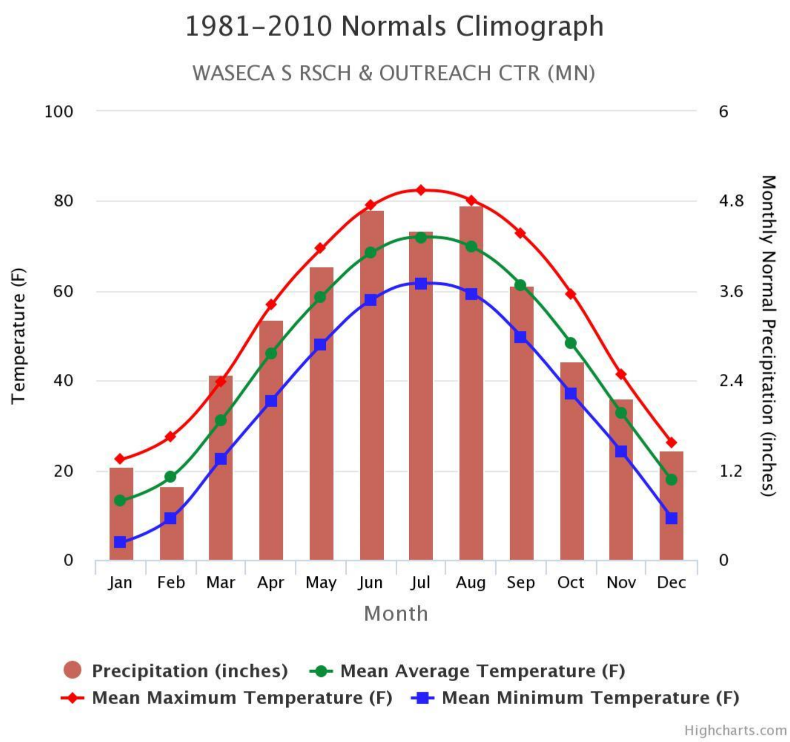


Figure 3. 1981-2010 Normals Climograph for Waseca, MN (Source: MNDNR Climate Summaries and Publications)

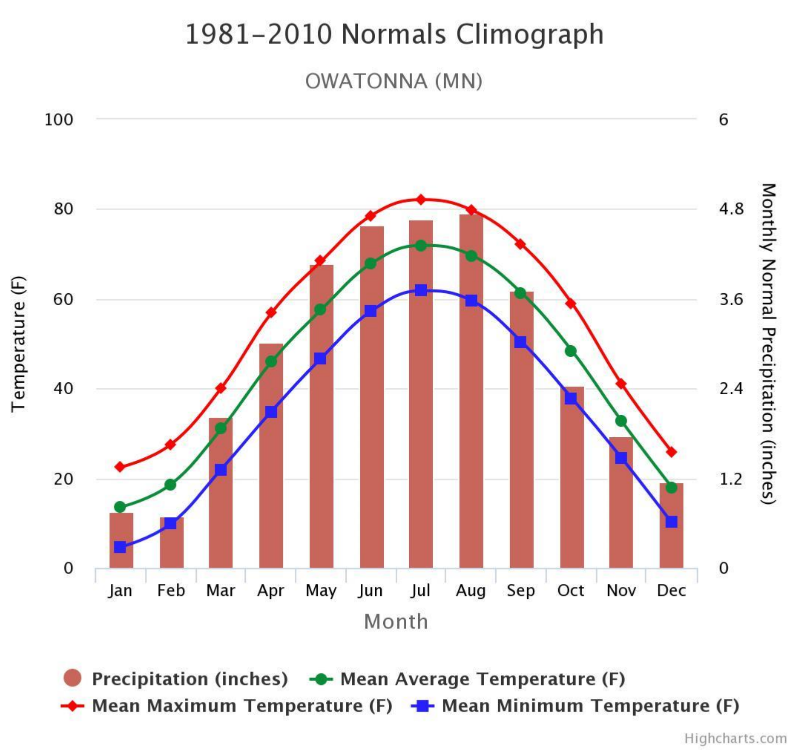


Figure 4. 1981-2010 Normals Climograph for Owatonna, MN (Source: MNDNR Climate Summaries and Publications)

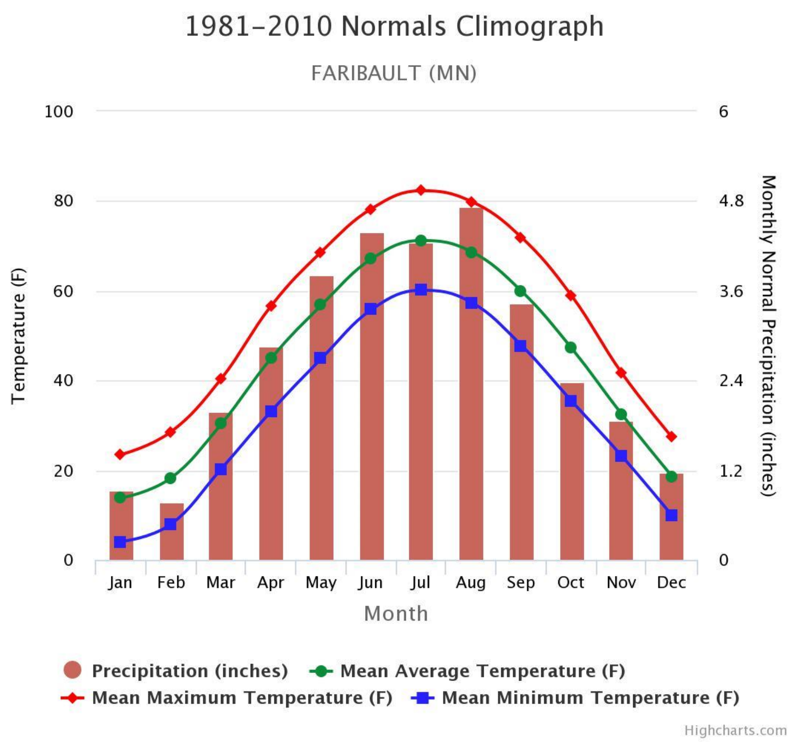


Figure 5. 1981-2010 Normals Climograph for Faribault, MN (Source: MNDNR Climate Summaries and Publications)

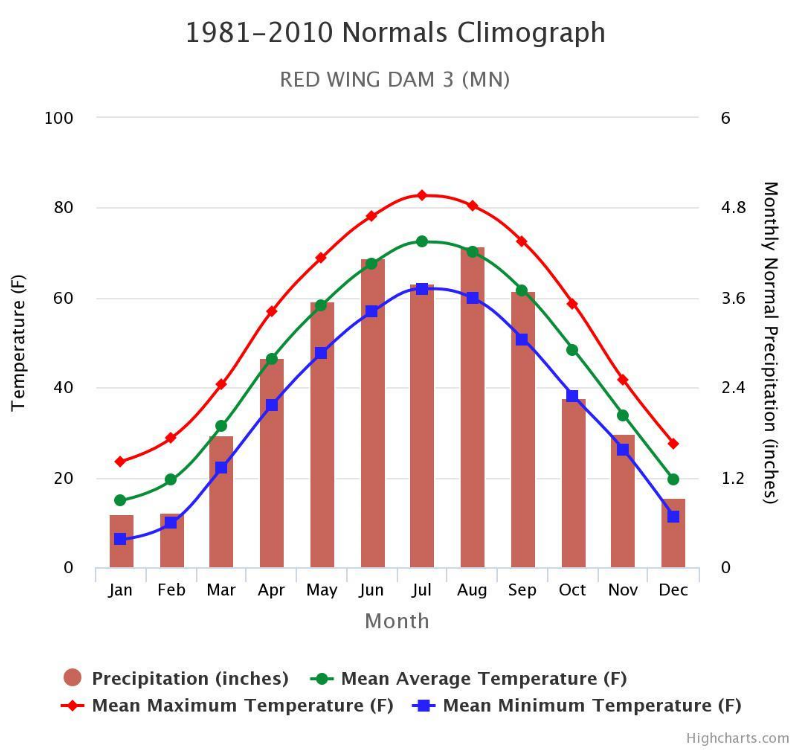


Figure 6. 1981-2010 Normals Climograph for Red Wing, MN (Source: MNDNR Climate Summaries and Publications)

Table 0-11. Average Annual Temperature & Temperature Trends in the Cannon River Planning Area

Measurement Parameter	Plan Area Average
Average Normal Annual Temperature (˚F) (1980 – 2010)	44.3 ˚F
Temperature Trend (1895 – 2017)	+0.2 ˚F/decade
Temperature Trend (1980 – 2017)	+0.4 ˚F/decade
Average Normal Annual Precipitation (in) (1980 – 2010)	32.76 (in.)
Precipitation Trend (1895 – 2017)	+ 0.48 in/decade
Precipitation Trend (1980 – 2017)	+ 1.12 in/decade

1.6.2 Precipitation and Temperature Trends

There is growing consensus that Minnesota is experiencing changes in climate, meaning that there have been changes to the average weather over a longer time period (e.g. many years). Data from the State Climatology Office has been used to demonstrate regional changes in precipitation and temperature: two climatological parameters that have a significant impact on a watershed's resources, land use activities and residents (including humans as well as flora and fauna).

Figure 7 is a comparison of 20th century precipitation averages to the period since 1990. This comparison illustrates that on average it has been 14 percent wetter over the last 20 years than it was over the last century. This figure also demonstrates that the average annual precipitation by decade has been higher for the last three decades than it has been for any decade since the 1890's.

Figure 8 is a comparison of trends in annual temperature range. The annual range is the difference between the hottest and coldest months, taking monthly mean temperatures in each case. In general terms, it is approximately the difference between the average of the January maximum and minimum temperatures and the July maximum and minimum temperatures. As Figure 8 demonstrates that the trend since 1970 shows warming of over half a degree per decade (or fiver degrees per century).

Belle Creek – ephemeral stream reach

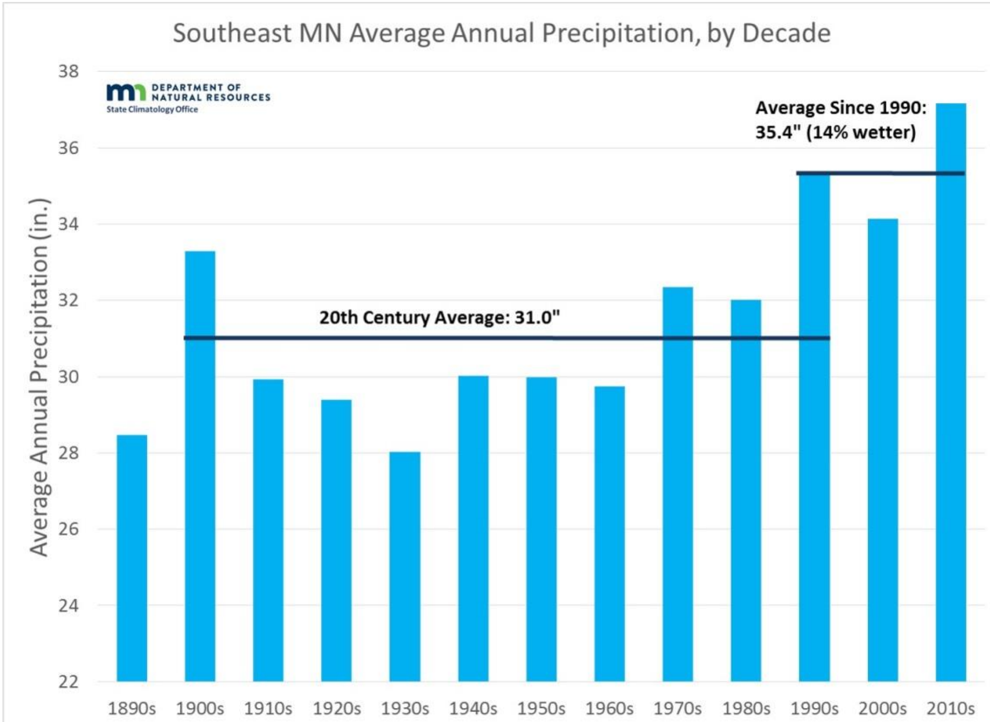


Figure 7. Comparison of 20th Century Precipitation Averages to the Period since 1990 in Southeast Minnesota (Source: Minnesota DNR, Division of Ecological Services)

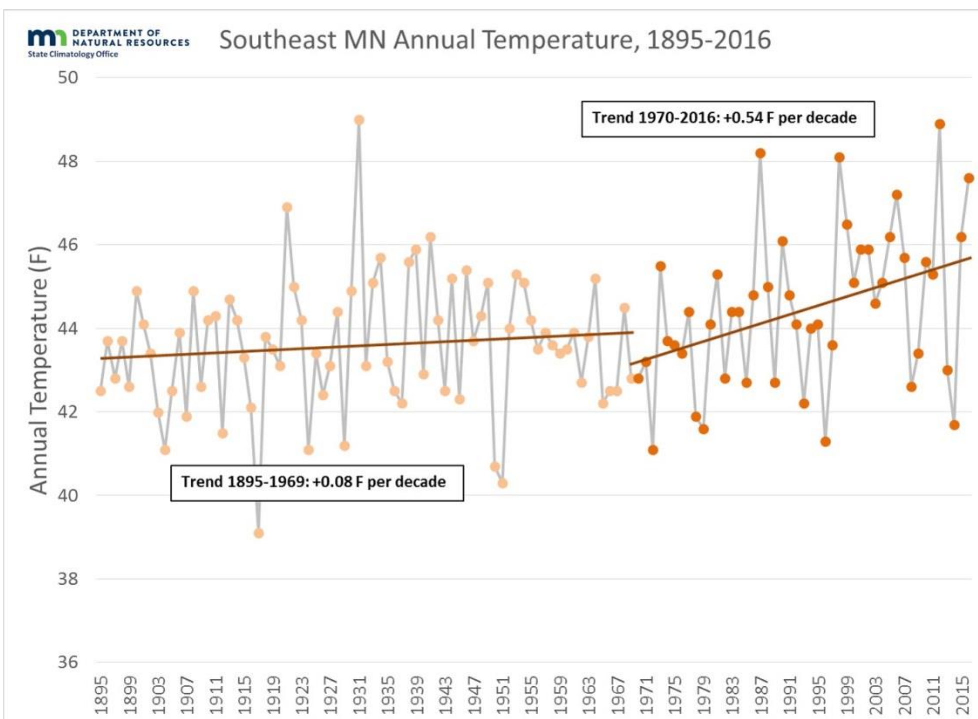


Figure 8. Comparison of Linear Statistical Trends for Annual Temperature in Southeast Minnesota (Source: Minnesota DNR, Division of Ecological Services)

In recent years, the Cannon River Planning Area has flooded on multiple occasions. Flooding frequency is now so regular along the Cannon River that communities expect the river to flood in some fashion almost yearly. The most notable events are the flash floods that occurred in 2010, 2012, and 2016. The severe flash flooding in 2010 is often used as a comparison event for all other flooding events the area experiences (NOAA).

During the fall of 2010 a series of thunderstorms fed by a high pressure system and tropical storm moisture from the south produced above average rainfall rates. The storm event started in the afternoon of September 22nd and continued through the evening of September 23. By the end of the two day event, rainfall totals ranged from 4 inches to 8 inches throughout the Cannon River Planning Area. The flooding caused severe damage to crops, homes, and businesses. The event forced the Governor of Minnesota to declare a state of emergency due to the damage caused by the flooding. Soon after, the Federal Government declared twenty nine flood affected counties in Minnesota as a major disaster area (NOAA).

Severe flooding again came to the Cannon River Planning Area in the summer of 2012. The rain event began in the afternoon of June 14th and continued throughout the evening. Rainfall totals ranged from 5 inches to 8.83 inches measured in Cannon Falls. "The 8.83 inches measured at Cannon Falls is the largest 24-hour total June rainfall measured at a Minnesota National Weather Service Volunteer Cooperative station in the history of the program" (MNDNR). The flood waters covered numerous roads in the Cannon River Planning Area and even caused Highway 52 in Goodhue County to completely close down until flood waters receded.

The Cannon River Planning Area saw significant flooding in the fall of 2016, causing many cities to declare Emergency Declarations. According to the National Weather Service, the city of Waseca accumulated 13.91 inches of rain in a 48 hour time period during the storm event (5 Eyewitness News 2016). The significant amount of precipitation caused the Cannon River, and multiple lakes and ponds to overtop their banks, flooding many surrounding areas. Much of the Stormwater infrastructure in the Planning Area was overwhelmed and caused widespread flooding. Waseca was particularly effected by wide spread flooding, with flood waters covering roads and entering residents basements.

It is reasonable to assume that extreme precipitation events will continue to occur in the future. One way to reduce the dangerous and costly impacts of flooding would be to bolster the Planning Areas natural resources. Prevalent natural resources have always been nature's way of reducing the damaging impacts of flooding events. If plants, wetlands, and soils are in a natural and functioning state, they have the ability to absorb and hold great amounts of water; both reducing and delaying runoff water before it enters surrounding creeks and rivers. This in turn reduces the severity of flooding would allow nearby communities more time to prepare for unavoidable flooding events.

1.6.3 Climate Trend Expectations

The following trends are reported for the Cannon River Planning Area as well as an explanation of the anticipated impacts: temperature, seasonal temperature, winter temperature, ice out dates, dew points, seasonal precipitation, evaporation and wind.

Temperature trend:

As shown in

Table 0-11 below, the short term temperature trend in the Cannon River Planning Area shows a positive 0.4 ˚F increase per decade. This is double the rate of the long term trend which is a positive increase of 0.2 ˚F per decade.

Impacts of increasing temperatures in the Cannon River Planning Area include a longer growing season (increased water needs for agriculture), changes to soil frost depth and duration (implications for manure spreading), warmer waters (increases instances of low DO and hypoxia, increased frequency of algal blooms, thermal resistance to vertical mixing, stresses cold water fisheries) and increases in terrestrial invasive species since warmer temperatures allow them to survive more easily, multiply and expand their ranges.

Seasonal temperature trends:

Summer (June – August):
Summer temperature trends in the Cannon River Planning Area, measuring back to 1895, shown an average temperature increase by a rate of 0.1 ˚F per decade.

Fall (September – November):
Fall temperature trends in the Cannon River Planning Area, measuring back to 1895, show an average increase in temperature of 0.1 ˚F per decade.

Winter (December – February):
The winter temperature trend in the Cannon River Planning Area is by far the fastest changing. On average, the winter season in the Cannon River Planning Area is increasing in temperature at a rate of 0.3 ˚F per decade. This increase greatly outpaces the other three season's temperature rate increases.

Spring (March – May):
Spring temperature trends shown an average temperature increase of 0.1 ˚F per decade.

Trends in average winter minimum temperature:

Trends in the average winter minimum temperature show an average increase of 0.5 ˚F per decade. This means the Cannon River Planning Area can expect to see shorter winters, with less snow, more ice, frequent rain events, and more rapid spring snowmelt.

Impacts of changes in snowfall patterns include more ice conditions which results in the application of more deicing agents (e.g. chlorides).

Average ice out dates:

The average ice out dates measured in the Cannon River Planning Area generally fall between April 1 and April 7. As winter temperatures continue to increase, it is expected that the average yearly ice out date will take place earlier and earlier as time goes on.

Impacts of earlier ice out dates include less ice coverage on surface waters (results in greater evaporation of surface waters and lower water levels, concentrating pollutant loads).

Dew points:

The Cannon River Planning area has an average annual Dew Point of 35 ˚F. As summer temperatures and evaporation rates trend higher in the Cannon River Planning Area, it is expected that higher dew point averages and extremes will be observed.

Impacts of higher dew point averages and extremes include increased need for energy production (e.g. air conditioning), higher demands on community water supplies and human and agricultural animal safety concerns such as heatstroke, heat exhaustion, decreases in performance (e.g. drop in food consumption, reduction in productivity) and increased mortality rates.

Seasonality in MN precipitation trends (comparing back to 1895):

Summer (June – August):

Summer precipitation trends in the Cannon River Planning Area shown an average rate increase in precipitation by 0.26 inches per decade.

Fall (September – November):

Fall precipitation trends in the Cannon River Planning Area show an average increase in precipitation of 0.01 inches per decade.

Winter (December – February):

The winter season in the Cannon River Planning Area is increasing in precipitation by 0.04 inches per decade.

Spring (March – May):

Spring precipitation trends show a precipitation increase of 0.18 inches per decade.

Impacts of changes in precipitation patterns and more extreme events include increased risk of flooding, increased variability of streamflows, increased velocity of water during high flow periods, soil loss, decreased groundwater recharge (rain from extreme events falls too quickly to be absorbed in the ground) and taxes existing infrastructure. Additionally, increased flooding results in increased watershed loads of sediment and nutrients.

Evaporation Trends:

As average and extreme temperatures continue to increase, evaporation rates can be expected to follow suit.

Impacts of changes in evaporation include increased water loss from the surfaces of waterbodies, water loss from the soil profile which is challenging for shallow rooted plants and other organisms that reside in the first few inches of soil and increases the need for irrigation.

Wind Trends:

The Cannon River Planning Area in general sees low to moderate wind speeds with averaging wind speeds of 4.6 miles per hour. Wind is largely dependent on the variation in air temperatures; since the poles are warming faster than the equator, there is a smaller global temperature differential, reducing the speed of wind. Global wind speeds have decreased by 5 to 15 percent over the last three decades, and are expected to decrease another 15 percent in the coming century (Barton, B.T).

Impacts of changes in wind speed include potential changes to lake thermal and mixing dynamics.

1.6.4 Design Storm Information

Design storms are a hypothetical distribution of rainfall over time. Individual design storms are developed for a given rainfall frequency (e.g. 2-year rainfall event, or an event that has a probability of occurring once in a two-year period) and duration (e.g. 24-hours). The storm depth for an individual design storm or for a given frequency and duration is distributed over time using a synthetic rainfall distribution. Design storms are used by engineers to size stormwater management facilities and for determining flood hazard areas.

The United States Weather Bureau Technical Paper 40 (TP-40), published in 1961, contained rainfall frequency maps that were universally used and widely accepted by the engineering and design community. Over time, there was concern that TP-40 was not representative of today's precipitation patterns and the information was updated. In 2013, the NOAA Atlas 14 Precipitation-Frequency Atlas of the United States, Volume 8 for the Midwestern States was published. This document contains rainfall frequency maps that were developed using a higher density rainfall network and data sets with a longer period-of-record. A comparison of TP-40 and NOAA Atlas 14 rainfall depths (for individual design storms) indicates that some rainfall depths increased, some did not change and some decreased. Table 0-12 illustrates how the rainfall depths published by TP-40 and NOAA Atlas 14 compare in the Cannon River Planning Area.

Table 0-12. Comparison of Precipitation Frequency Estimates for Faribault, MN (in inches)

Design Storm	TP-40	NOAA Atlas 14
2-year, 24-hour	2.8	2.84
10-year, 24-hour	4.3	4.25
25-year, 24-hour	4.8	5.33
100-year, 24-hour	6.3	7.30

1.7 Surface Water Resources

The Cannon River Planning Area (CRPA) includes all of the Cannon River Major Watershed (07040002) and 38 square miles of the Vermillion River Watershed located in Goodhue County, which is part of the Mississippi River-Lake Pepin Major Watershed (07040001). The surface water resources in the CRPA have been extensively monitored, assessed, and described by the Minnesota Pollution Control Agency as part of the Watershed Restoration and Protection Strategy projects for each Major Watershed.

Detailed information and reports can be found at the following MPCA Watershed websites:

- ***Cannon River Major Watershed***: https://www.pca.state.mn.us/water/watersheds/cannon-river
- ***Vermillion River Watershed***: https://www.pca.state.mn.us/water/tmdl/vermillion-river-watershed-restoration-and-protection-strategy-%E2%80%93-multiple-impairments

The Cannon and Straight River systems represent the primary surface water conveyances within the Planning Area. From west to east, the Cannon River travels 112 miles between Shields Lake and the Mississippi River north of Red Wing. From south to north, the Straight River flows 56 miles through the cities of Owatonna and Medford before connecting with the Cannon River downstream of the dam in Faribault. Several coldwater trout streams originate in the Driftless Area within the watershed and flow to the Cannon River. In the Cannon River Major Watershed, there are 800 linear miles of streams, and 90 lakes and 107 wetlands of 10 acres or more in size. The Vermillion River Watershed portion of the Planning Area contains a small stretch of the Vermillion River, several small tributaries to the Mississippi River, and a portion of the Mississippi River mainstem and connected sloughs. There has been an estimated loss of about 81% of the natural wetlands in the Planning Area since pre-settlement, including a >10,000 acre wetland complex in the headwaters of the Straight River.

1.7.1 Monitoring and Assessment

The MPCA undertook an intensive monitoring effort of the surface waters in the Vermillion River Watershed in 2008 and in the Cannon River Watershed in 2011. This effort included monitoring completed by agencies, local watershed groups, and volunteer citizen monitors. During this process, 45 lakes and 73 stream reaches were assessed for aquatic recreation and/or aquatic life beneficial uses. Lakes that do not support aquatic recreation are impaired due to excess nutrients/eutrophication (algae blooms). Streams that do not support aquatic recreation are impaired due to high levels of bacteria that may cause people to become sick. Streams that do not support aquatic life have fish and macroinvertebrate communities that are stressed (or negatively impacted) by physical or chemical factors, such as pollutants, turbidity, low dissolved oxygen, poor habitat, or altered flows.

In the Cannon River Planning Area, 36 lakes do not support aquatic recreation (nutrient impairment), 36 stream reaches do not support aquatic life (fish, macroinvertebrates, dissolved oxygen, and/or turbidity impairments, 41 stream reaches do not support aquatic recreation (bacteria impairments), and 5 trout streams do not support drinking water (nitrate impairments). See

From page 22 of the 2016 Cannon River WRAPS report:

"Most of the impaired lakes are located west of Faribault where agricultural land use dominates lake watersheds. Stream bacteria issues are widespread in the Planning Area, and in much of the Lower Mississippi River Basin. Fish and macroinvertebrate communities across the watershed are showing a loss of sensitive species due to water pollution and habitat issues. Five high quality lakes for recreation include Roemhildts, Fish, Dudley, Kelly, and Beaver. These lakes have high quality due to relatively intact, small watersheds, and deep water. There are many streams fully supporting of aquatic life or have special concern species with specific habitat requirements. The Little Cannon River Subwatershed was the only location where the Redside Dace (*Clionostomus elongates)* was collected. The Middle and Lower Cannon River Subwatersheds also have a number of high quality coldwater streams that support brook and brown trout communities, including Trout Brook, Pine Creek, Rice Creek (a.k.a., Spring Brook), Belle Creek, Spring Creek, and the Little Cannon River. And several warmwater streams (Maple Creek, Falls Creek, Turtle Creek, Mud Creek, and the Lower Cannon River) were supporting aquatic life of both fish and macroinvertebrates with many pollution sensitive species collected."

A study addressing the water quality impairments (Total Maximum Daily Load study) in the Cannon River Watershed was completed in 2016 and is available on the Cannon River Major Watershed website, and a study addressing the water quality impairments (Total Maximum Daily Load study) in the Vermillion River Watershed was completed in 2015 and is available on the Vermillion River Watershed website.\

1.7.2 Proximity to State Standards

Stream and lake water quality data were analyzed to determine proximity to water quality standards as part of the Cannon River WRAPS. From Chapter 3, page 60 of this report:

In 2013, the Minnesota Legislature added accountability language to the Clean Water Legacy Act. This new language aimed to increase accountability for the public funds used to clean up our water. The Act now defines WRAPS and requires the BWSR to prepare a Nonpoint Priority Funding Plan (NPFP).

The NPFP is a criteria-based process to prioritize Clean Water Fund investments. It provides state agencies with a coordinated, transparent and adaptive method to ensure that Clean Water Fund implementation allocations are targeted to cost-effective actions with measurable water quality results. The process may also help agencies identify gaps in programming to accelerate progress toward meeting water management goals.

The plan can be reviewed here: http://www.bwsr.state.mn.us/planning/npfp/NPFP%20Final.pdf. The plan excerpt below indicates high-level priorities for spending.

High-Level State Priorities

State agencies have identified the following three high-level state priorities for investing Clean Water Fund nonpoint implementation money in FY 2016-2017, based on the principles of asset preservation and risk-opportunity assessment:

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

Four lakes that are currently impaired but are close to meeting water quality standards are included in Table 10 below. Rice County has included these lakes as priorities in the implementation section of their 2015 water plan: http://www.co.rice.mn.us/sites/default/files/pdfs/planning/documents/Rice%20County%20Water%20Plan%202015-2019.pdf.

In addition, five lakes stand out as high quality resources for recreation: Roemhildts, Fish, Dudley, Kelly, and Beaver.

Appendix C [of the 2016 WRAPS report] includes a list of stream reaches that are above or below IBI thresholds but within the respective confidence interval. There are 33 AUIDs highlighted; this delineation helps in examining streams that are currently close to aquatic life use support goals.

Table 0-13. Impaired lakes near thresholds (Table 10 from the 2016 Cannon River WRAPS report)

Lake ID	Lake Name	TSI Phosphorus	TSI Phosphorus Goal
Deep Lakes			
66-0052-00	Cedar	62	<57
66-0029-00	Fox (strong evidence for decreasing trend in water clarity; see Chapter 2.2 and Table 3)	69	<57
Shallow Lakes			
66-0045-00	Sprague	65	<63
66-0047-00	Hunt	69	<63

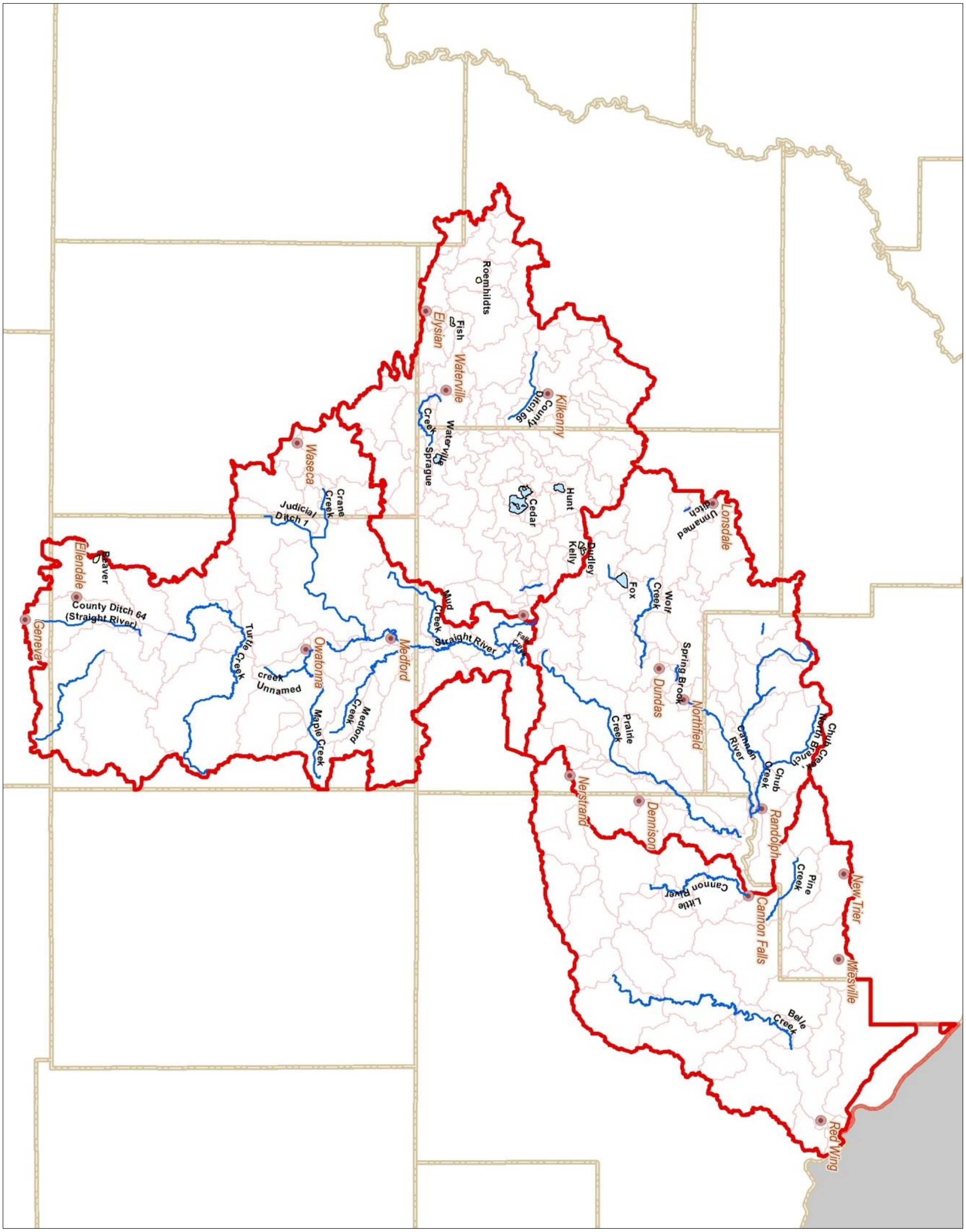


Figure 0-9. Stream reaches that are just above or below IBI thresholds, including lakes near the water quality thresholds (blue) and high quality recreation resource lakes (yellow) (Source: Cannon River Watershed Restoration and Protection Strategies 2016)

1.7.3 Stream Flow

The 2016 Cannon River WRAPS report characterized stream flows in the Cannon River Watershed as "flashy", that is to say rapidly increasing and decreasing in flow volumes following rainfall events. This flashy hydrology results from agricultural land use and associated drainage and urban development (LimnoTech 2015), and the increasing trend of larger precipitation events observed in southeastern Minnesota. Additionally, precipitation in southeast Minnesota exhibits a statistically significant rising trend over the past 100 years (p=0.001, Figure 16 in the MPCA 2014 Cannon River Monitoring and Assessment report).

The 2016 Cannon River WRAPS report identified other impacts to stream flow in the Cannon River Planning Area, including numerous dams along the Straight and Cannon Rivers and tributary streams historically built to harness the energy of flowing water for operating mills, control flooding, and manage water levels of recreational lakes and reservoirs. Many of these dams act as fish barriers, preventing fish migration between spring spawning areas and refugia during winter months and large flooding events, and limit mussel dispersal.

1.7.4 Flow and Pollutant Loading Trends

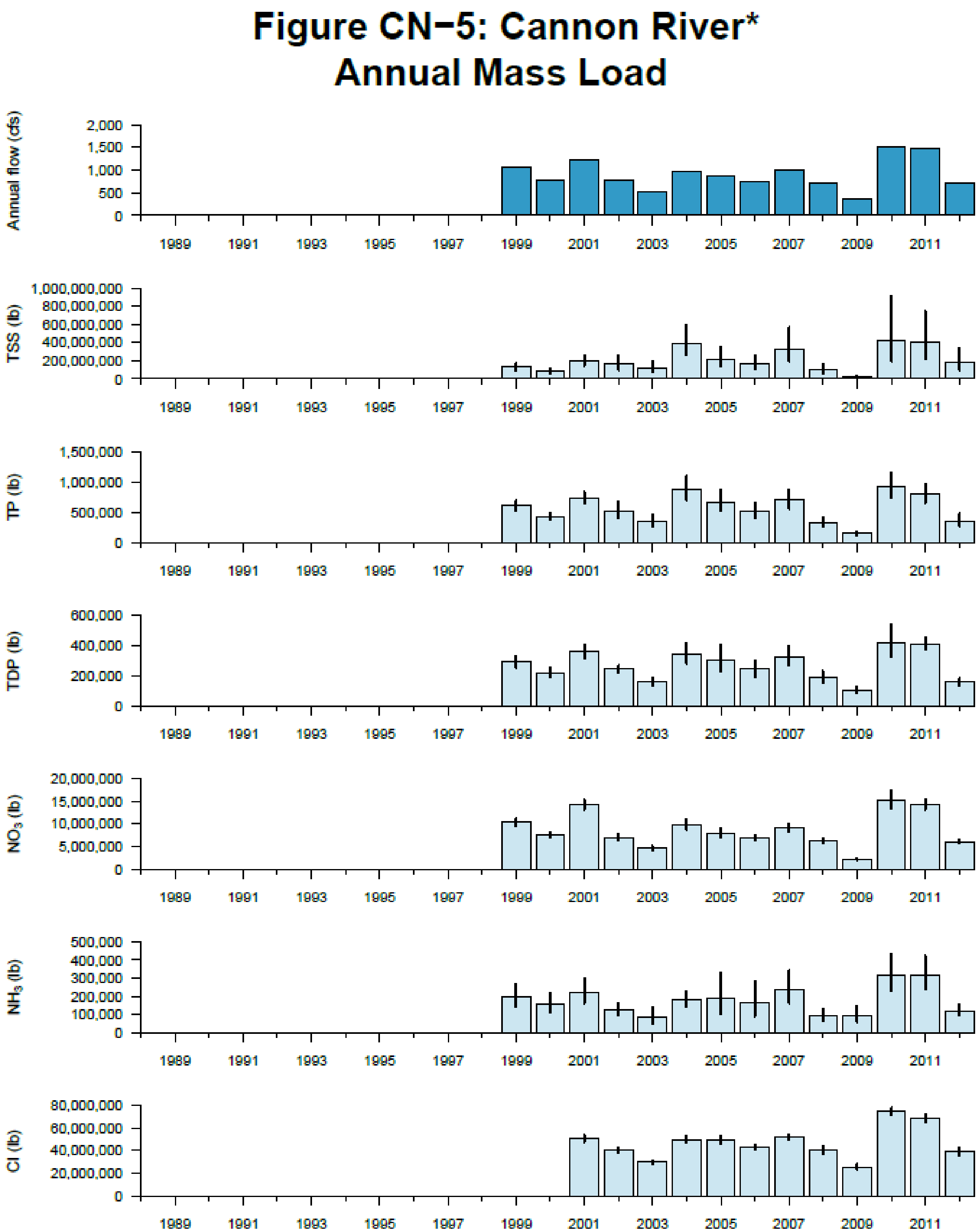
The Comprehensive Water Quality Assessment of Select Metropolitan Area Streams is a major study conducted by the Metropolitan Council that examines the water quality of 22 streams or stream segments that discharge into the metropolitan area's major rivers. The study provides a base of technical information that can support sound decisions about water resources in the metro area − decisions by the Council, state agencies, watershed districts, conservation districts, and county and city governments. The Cannon River is one of the eight Mississippi River tributaries examined in this assessment.

Excerpts from pages 17-18 of the report summarizing long-term trends in stream flow and pollutant loads at the outlet of the Cannon River are provided below:

"The flow metrics indicate year-to-year variation in annual flow rate likely driven by variation in annual precipitation amount as well as by variation in frequency of intense storm events. The runoff ratio was relatively stable throughout much of the 2000s before dropping in 2009, increasing through 2010 and 2011, and dropping back to more typical levels in 2012. Year-to-year variation was likely influenced by drought periods, by low soil moisture caused by dry periods, and by increased capacity in upland storage areas during drought periods.

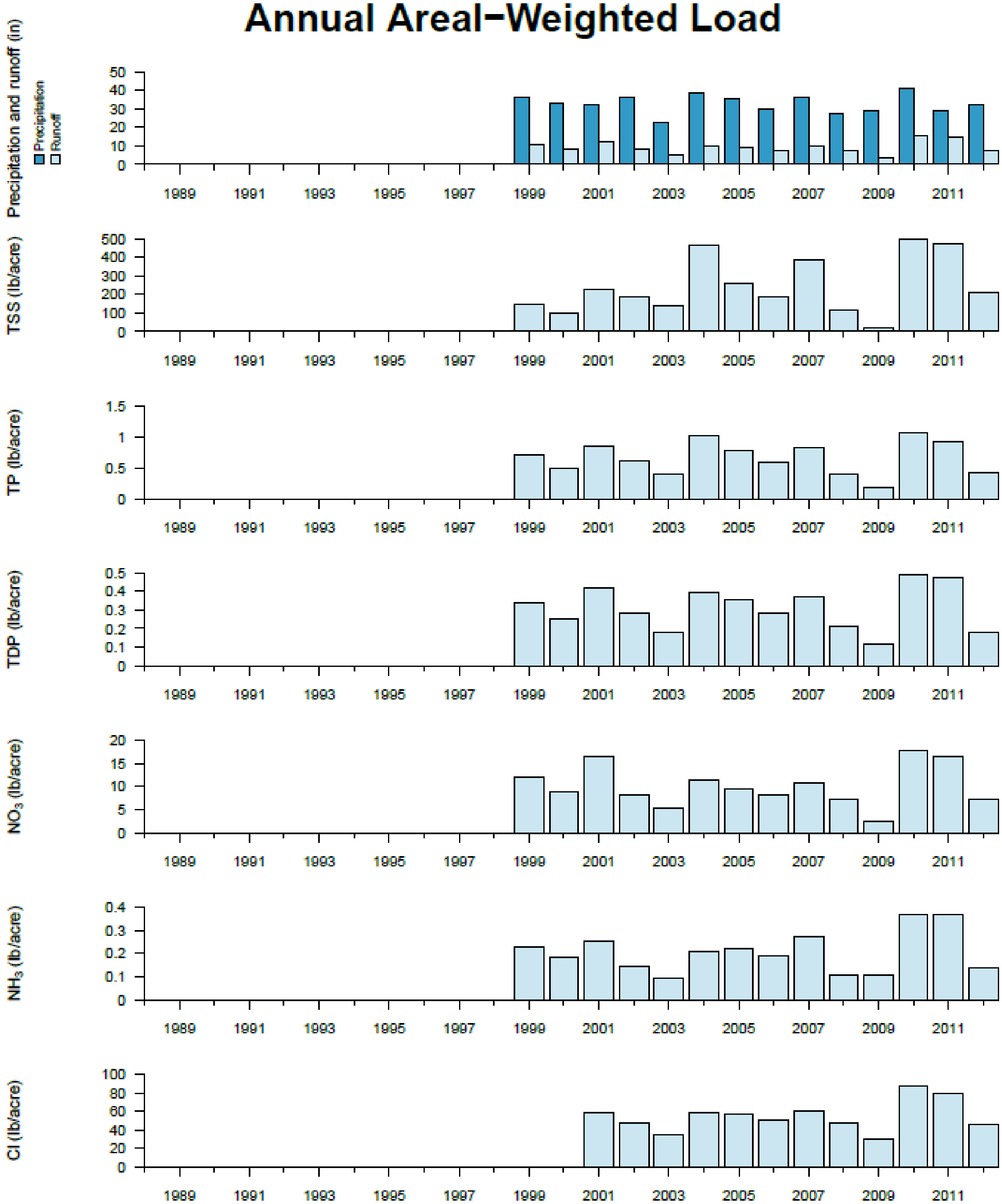
The annual mass loads for all parameters exhibited significant year-to-year variation, indicating the influence of precipitation and flow on the transport of pollutants within the watershed and the stream.

The annual FWM concentrations for all parameters also fluctuated from year-to-year and were likely influenced by annual precipitation and flow. TSS and TP concentrations peaked in 2004, decreased through 2009 (a drought year), and then increased sharply in 2010 before decreasing slightly. TDP, NO3, NH3, and Cl remained relatively stable over the monitoring period. Cl concentrations appeared to increase slightly over time."



*TSS, TP, TDP, NO3, and NH3 sampling began in 1999, Cl began in 2001.
Bars represent 95% confidence intervals as calculated in Flux32.

Figure CN−7: Cannon River* Annual Areal−Weighted Load



*TSS, TP, TDP, NO3, and NH3 sampling began in 1999, Cl began in 2001.

Additional surface resource data are available from MN Geospatial Commons including the Public Waters Inventory (PWI) of lakes, streams and wetlands, Statewide altered watercourses (i.e., ditches, channelized streams), the National Wetlands Inventory (NWI), MNDNR Hydrography Dataset (lakes, streams, and wetlands) and FEMA Floodplains. MPCA Spatial Data can be accessed to obtain current information about assessed waters, impaired waters, and water quality monitoring stations. In addition, stream gauging information can be located at DNR/MPCA Cooperative Stream Gauging.

Comprehensive Watershed Priority Scheme Maps:

- Catchments of nutrient impaired lakes (Source: MPCA)
- Relative susceptibility of a lake to phosphorus pollution (based on morphology and catchment hydrology) (Source: DNR, MPCA)
- Remaining wetlands (Source: National Wetland Inventory (NWI))
- Stream potential flood zones (based on location, elevation & soil type) (Source: DNR floodplain analysis)
- Catchments of lakes of biological significance (Source: DNR)
- Catchments of MDNR designated trout streams (Source: DNR)
- Land within 50 feet of stream or river
- Land within 1,000 feet of lake shoreline

Belle Creek

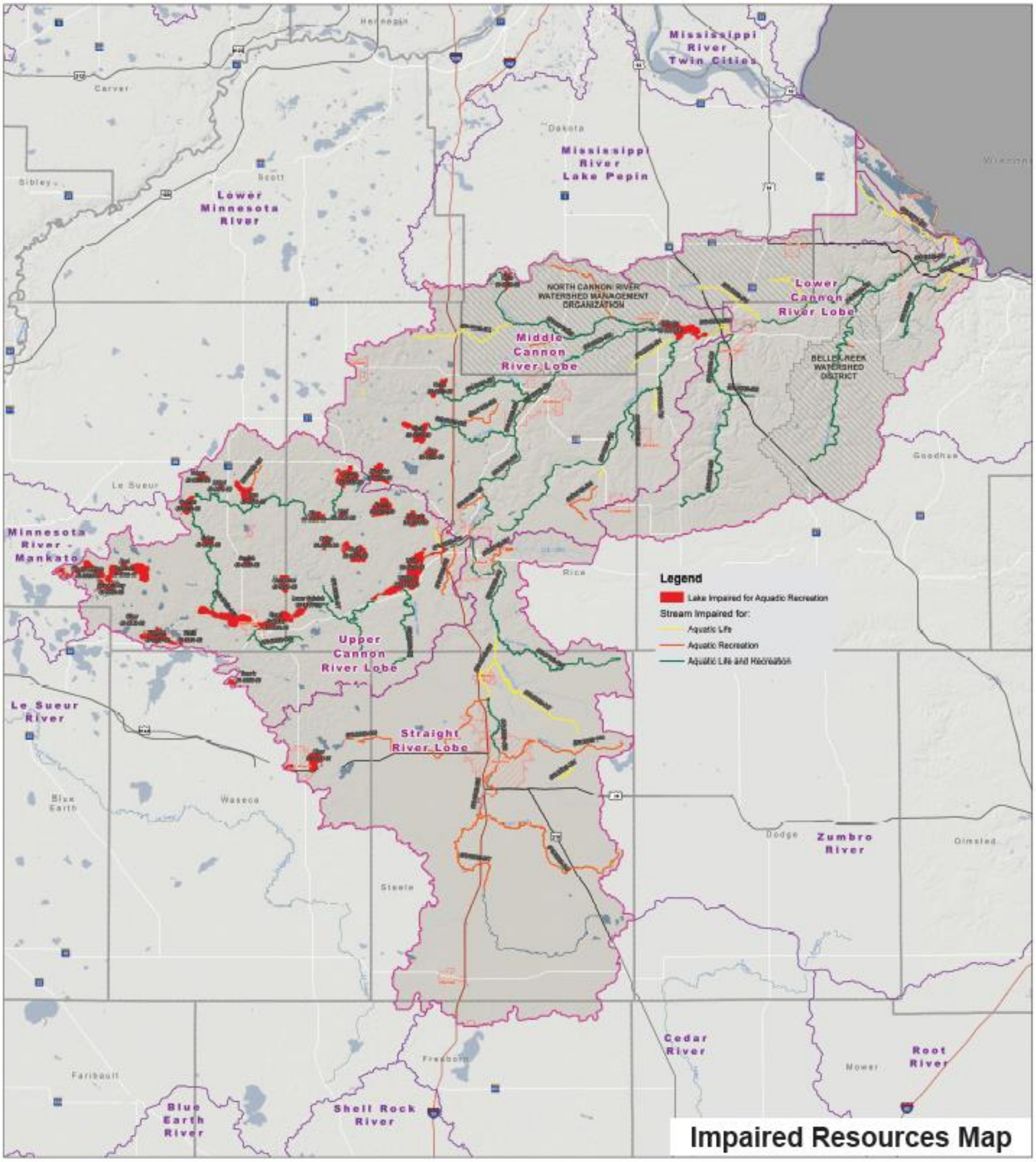


Figure 0-10. Impaired resources in the Cannon River Planning Area (Source: MPCA 2016 Impaired Waters List).

1.8 Groundwater Resource Data

Groundwater accounts for 100 percent of the Cannon River Planning Area's drinking water and it accounts for over 85 percent of the water pumped to meet agricultural, industrial, drinking water, and other water-use needs (Cannon River Watershed GRAPS). Figure 13 of the Cannon River Watershed GRAPS Report shows how permitted groundwater use has been steadily increasing since 1988. The two largest uses of water in the Planning Area are public water supplies and agricultural irrigation, both of which account for 90 percent of reported water use. More than 93 percent of reported groundwater use is derived from bedrock aquifers (Cannon River Watershed GRAPS).

The quantity and quality of groundwater resources can be put at risk from overuse and the introduction of pollutants. Groundwater pollution is of particular concern in those portions of the Planning Area that have extensive karst features, including Rice, Dakota and Goodhue counties. Karst is a geologic feature that allows a direct, very rapid exchange between surface water and groundwater and significantly increases groundwater contamination risk from surface pollutants.

The Cannon River GRAPS Report includes a figure identifying the pollution sensitivity of deeper aquifer materials which was created to inform the geologic sensitivity of aquifers below the water table. This figure identifies the northeastern portion of the Planning Area as being highly sensitive to pollution due to the presence of karst landforms overlying the aquifers and the lack of substantial clay units. The GRAPS also identifies the southwestern border of the watershed boundary in Le Sueur and Waseca Counties as being highly sensitive to pollution due to the lack of protective clay layers above the aquifer material.

According to the GRAPS, 18 of the 30 community public water supply systems in the Planning Area are in the wellhead protection planning process or are implementing their own plans. Of the twelve systems with approved plans, eight are considered to be not vulnerable to contamination from the land surface with all others exhibiting moderate and high vulnerability. The GRAPS includes a figure illustrating the state of wellhead protection planning in the watershed as well as a figure showing the vulnerability of the DWSMAs that have been delineated to date.

Nitrate, arsenic, radium, and pesticides have been detected in wells sampled in the Cannon River Planning Area (Cannon River Watershed GRAPS). According to the Cannon River Watershed GRAPS Report, approximately two percent of 1,230 wells sampled by MDH had levels of nitrate above the EPA standard. Results of MDA's Township (Nitrate) Testing Program show that more than 10 percent of the wells sampled to date in eight townships, all in Dakota County, had levels of nitrate over the EPA standard. Although the data set is limited, common detection pesticides have been detected at monitoring wells in the Cannon River Planning Area but these detections did not exceed any human health-based drinking water standards or reference values. The Cannon River Watershed GRAPS report also states that approximately five percent of the 250 arsenic samples collected from wells in the Planning Area have levels of arsenic higher than the drinking water standard of 10 micrograms/liter.

While arsenic is a naturally occurring metal, the EPA has set a goal of 10 micrograms/liter since many years of consumption at low levels can still increase the risk of cancer.

The Cannon River Watershed GRAPS Report evaluates groundwater levels from five observation wells with more than 20 years of data. All trends from observation wells in the Planning Area were either no trend or a downward trend.

There are a number of groundwater dependent natural resources in the Cannon River Planning Area. There are five listed trout streams including Spring Creek, Little Cannon River, Spring Brook, Pine Creek and Trout Brook. There are five calcareous fens, which are given special protection under Minnesota Statute 103G.223 including Red Wing 21, Holden 1 West, Rice County Wilderness Area Bridge Water 22, Rice County Wilderness Area Bridge Water 34, and Pogones WMA. In addition, the Cannon River Watershed GRAPS Report states that 98 of the 203 lakes in the Cannon River watershed are considered groundwater dependent. The GRAPS also identifies a number of critically imperiled or imperiled native plant communities that are closely associated with or influenced by groundwater in the Planning Area.

Additional groundwater resource data are available from the County Geologic Atlases referenced in Section 1.4. Groundwater/well water quality data are available from the MPCA Groundwater Monitoring and Assessment database. MDH provides maps and data for wellhead protection areas and the county well index. Pollution Sensitivity of Near-Surface Materials can be found at the Minnesota Hydrogeology Atlas (MHA). Active water use permit information can be accessed online through the MNDNR Permitting and Reporting System (MPARS) database which can be categorized according to municipality, permitted water use type, among additional attributes.

Comprehensive Watershed Priority Scheme Maps:

- Relative susceptibility of an area to groundwater contamination based on geology, aquifer transmissivity, and recharge potential (Source: MPCA)
- Risk of potential contaminant sources within a drinking water supply DWSMA to contaminate its supply (Source: MDH)
- Areas with relatively high, moderate and low probability of having elevated nitrate concentration in groundwater (Source: MDH)

Seepage wetland – Cannon River Wilderness Park, Rice County

1.9 Drainage Systems and Control Structures

1.9.1 Public Drainage Systems

The public drainage systems within the planning area are managed by drainage authorities on behalf of the landowners receiving benefit from the drainage system. The individual county governments serve as the drainage authority for the public drainage features within their jurisdiction. These drainage systems, typically open ditches or in some cases underground tiles, were established to enhance agricultural production on lands frequently too wet to produce crops. The cost for original establishment of the public drainage system and subsequent improvements is borne by the benefitted properties within the area tributary to the ditch. The drainage authority acts on behalf of all the benefitted property owners to assess fees for the level of drainage benefit each landowner receives. Chapter 103E of the Minnesota Statutes known as the Minnesota Drainage Law or Drainage Code provides the regulatory framework for managing the public drainage systems.

Benefitted property owners also frequently connect private drainage systems including both open ditches and subsurface tile lines to public ditches. These lawfully connected private drainage systems are paid for and managed by the individual landowner. Subsurface perforated tile lines are very common throughout the arable lands within the planning area.

Belle Creek dam inspection – *photo Goodhue SWCD*

Table 0-14. Public Drainage Systems

County	Public Drainage System(s)	Drainage Authority	Record Availability	Additional Comments
Dakota	County Ditch #1 (Pine Creek) *also a DNR designated Trout Stream* County Ditch #2 (Part of North Branch, Chub Creek System)	Dakota County	Limited records - no petitions to Dakota County to maintain or repair the County ditches within the last 25 years (Source January, 2017 Ditch Study)	Dakota County relies on a public petition process to address issues and does not annually set aside public funds for a few benefactors along each County ditch
Goodhue	Judicial Ditch #1	Goodhue County Public Works Department	Little, if any, maintenance efforts have been completed or records retained for the ditch located in the Cannon River Watershed	Need to address some maintenance issues and sedimentation
Le Sueur	County Ditch #9 County Ditch #15 County Ditch #36 County Ditch #40 County Ditch #46 County Ditch #57 County Ditch #59 County Ditch #63 County Ditch #68 Judicial Ditch #5 Rice Judicial Ditch #15BE Judicial Ditch #38	Le Sueur County Administrator (SWCD is Ditch Inspector)	Le Sueur County uses Drainage Database as of 2016 to record maintenance and repairs. Hard and Electronic ditch copies are available.	Future maintenance includes storage for the ditch systems to reduce flooding
Rice	County Ditch #4 – Devil Creek County Ditch #7 County Ditch #9 County Ditch #17 County Ditch #20 County Ditch #23 – Prairie Creek County Ditch #30 – Wolf Creek County Ditch #32A County Ditch #33 Judicial Ditch #6 – Mud Creek	Rice County Board of Commissioners (SWCD is Ditch Inspector)	The Auditor's office has maps, reports, etc. DrainageDB (online ditch records management system) was implemented in 2015	Implementing drainage water BMP's such as controlled drainage, 2 stage ditches, etc. Drainage authority can provide "view only" access to online drainage records after receiving a written request
Steele	County Ditch #1E County Ditch #1W County Ditch #2 County Ditch #5 County Ditch #22 County Ditch #25 County Ditch #27 Judicial Ditch #1 Judicial Ditch #2 Judicial Ditch #6 Judicial Ditch #7 Judicial Ditch #12 Judicial Ditch #24	Steele County is Drainage authority for all public ditches in the County except for Judicial Ditches shared with other counties (SWCD is Ditch Inspector).	Hardcopy and electronic maps. All records are in the process of being scanned into the DBM software program. Steele County Auditor is the point of contact for all drainage records.	The County is not aware of any specific concerns or issues related to the public drainage system at this time

County	Public Drainage System(s)	Drainage Authority	Record Availability	Additional Comments
Waseca	County Ditch #18 & 48	The Waseca County Board of Commissioners is the acting public drainage authority for public ditches in Waseca County. The Waseca County Auditor/ Treasurer acts on behalf of the Board for financial matters concerning public ditches. Each private ditch system has their own drainage authority (which is not the County Board).	Public drainage records are kept in a vault in the county courthouse. The records include hard copy maps, and (generally – depending on the ditch) records of all public hearings, records of public comment, detail on ditch construction, ditch assessments, determination of benefits and benefitting landowners. Some ditches may include maintenance and repair reports. Public ditch files are not electronic.	The best way to view the records would be to set up a time with the Auditor/ Treasurer. Records may not be "publically" available, but with consent from the Auditor/ Treasurer they may be a source of information.
	County Ditch # 22			
	County Ditch #46			
	County Ditch #15-1			
	Judicial Ditch #1			
	Judicial Ditch #24			

1.9.2 Dams

Historically, a number of dams were built along the Straight and Cannon Rivers and tributary streams in order to harness the energy of flowing water for operating mills, control flooding, and manage water levels of recreational lakes and reservoirs. Figure 11 includes dams of various types on difference stream orders, ranging from big rivers (e.g. Northfield dam on the Cannon) to small sedimentation basins or flood control projects. Many of these dams act as fish barriers, preventing fish migration between spring spawning areas and refugia during winter months and large flooding events. In addition, many species of mussels have disappeared or have had numbers greatly reduced in association with land use changes, over extraction, and dams that limit mussel dispersal since certain species of migratory fish area hosts for mussel larvae. During the last 30 years, three larger dams have been removed – on the Cannon River at Welch in 1994, at Cannon Falls in 2001 and the Morehouse dam on the Straight River in Owatonna in 2006. The Byllesby Reservoir dam, which was recently renovated, impounds the Cannon River for hydroelectric power generation.

Belle Creek dam construction 1970 – *photo Goodhue SWCD*

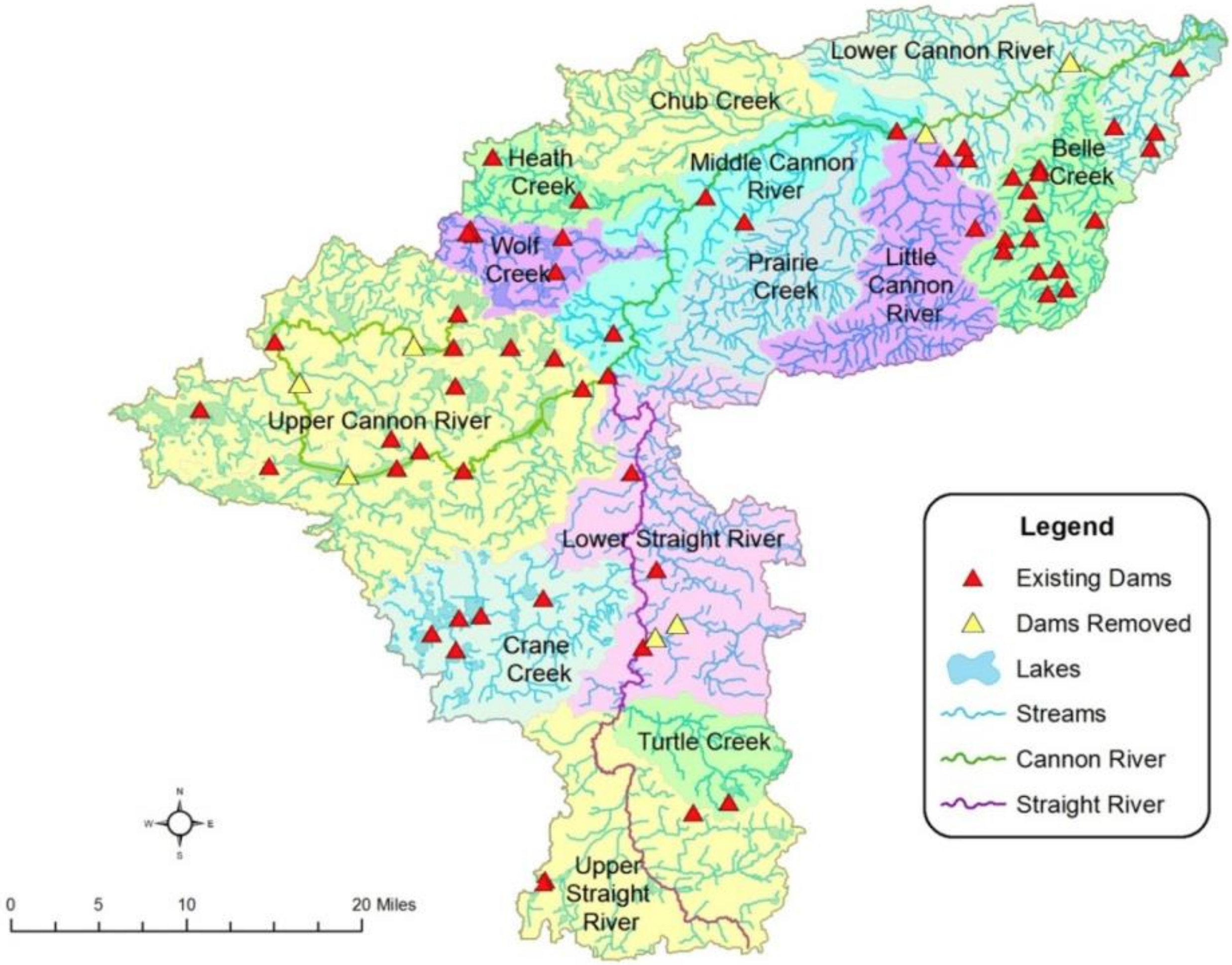


Figure 11. Subwatersheds of the Straight and Cannon Rivers with locations of existing and removed dams (Source: Cannon River Watershed Restoration and Protection Strategies Report)

Byllesby dam – *photo Dakota SWCD*

1.10 Pollutant Sources and Permitted Wastewater Discharges

NPDES permitted (point) discharges located in the Cannon River Planning Area are summarized on pages 34-36 in the 2016 Cannon River WRAPS report. Point sources account for a relatively small component of pollutant loads due to the predominantly rural nature of the landscape. However, at lower flows, point sources can play a significant role in pollutant loading and water quality conditions.

The MPCA identifies 323 active tank and 23 leak sites and one closed landfill in the Cannon River Planning Area. These types of contaminated sites are referred to as point sources and have the potential to contaminate groundwater.

Non-point sources of sediment, phosphorus and nitrogen are also discussed in detail in the 2016 Cannon River WRAPS report. Key findings include:

- Overall sediment delivery from tributaries to the Upper Mississippi River in southeast Minnesota has increased substantially since European settlement and the onset of agricultural activities in the tributary watersheds
- The relative contributions of "non-field" sources of sediment to the overall watershed sediment yield appears to be increasing over time, with a likely link to the "flashier" hydrology (i.e. rapidly increasing and decreasing flow volumes) resulting from agricultural land use and associated drainage and urban development (LimnoTech 2013).
- The primary sources of phosphorus transported to surface waters are cropland runoff, feedlot runoff, atmospheric deposition, streambank erosion, and internal loading in lakes and reservoirs.
- Monitoring data have documented significant decreases in point source loads of phosphorous from the wastewater treatment facilities (WWTFs) in the watershed, in particular those at Northfield, Faribault, and Owatonna.
- The primary sources of nitrogen transported to surface waters are agricultural groundwater (leaching loss from cropland to local groundwater), agricultural tile drainage, cropland runoff, and atmospheric deposition.
- The primary sources of bacteria transported to surface waters are failing individual sewage treatment systems, unsewered communities, feedlot runoff, manured fields, and urban stormwater.

According to the Cannon River Watershed GRAPS Report, a closed landfill (Dakhue Landfill) with a known groundwater contamination plume is located in southeast Dakota County.

To obtain additional information about potentially contaminated sites in the Cannon River Planning Area, one can visit the online application "What's in My Neighborhood?" on the MPCA website (https://www.pca.state.mn.us/data/whats-my-neighborhood), the Petroleum Remediation Program which is also on the MPCA website (https://www.pca.state.mn.us/waste/petroleum-remediation-program) as well as other sources such as the Minnesota Geospatial Commons. Data for SSTS can be obtained from each of the counties.

1.11 Water-Based Recreation Areas

The waters of the watershed provide drinking water for households and industry, habitat for aquatic life, riparian corridors for wildlife, and many recreational opportunities (MPCA 2014). Both the Cannon and Straight River are managed by the Minnesota Department of Natural Resources (DNR) as state water courses that are navigable by canoe and kayak. These rivers pass through scenic landscapes of variable terrain, from the flat wooded floodplains along the Straight River to sandstone, limestone, and dolomite blufflands in the Driftless Area in the lower reaches of the Cannon River (MPCA 2014). Other natural areas for recreational enjoyment include state parks such as Nerstrand Big Woods and Sakatah Lake, scenic and natural areas, county parks, and bike trails which provide opportunities for fishing, hiking, cross-country skiing, biking, snowmobiling, birdwatching, geocaching, morel hunting, and viewing of rare and endemic plants. The Cannon River Planning Area also contains the largest remnants of "Big Woods" in the state, and is home to rare species including the endangered Dwarf Trout Lily and Prairie Bush-Clover (MPCA 2014). Dwarf Trout Lily is only found in southeastern Minnesota, primarily in the Cannon River Planning Area. Numerous parks associated with lakes, rivers, and streams provide recreational opportunities for fishing, canoeing, swimming, hiking, bicycling, geocaching, and bird watching.

The Cannon River Planning Area has numerous water-based recreation areas, including boating, fishing, and several state parks and forests. The Cannon River supports a wide variety of fish species. The popular species include smallmouth bass, walleye, channel catfish, and flatheads. Sections of the Cannon closer to the Mississippi are known to hold various panfish, largemouth bass, and even northern pike (Johnson, 2001). In addition to the fishing opportunities on the Cannon, many of the river's tributaries are designated trout streams. A number of these trout fisheries are threatened, mostly by agriculture.

The Cannon River is a popular canoe route. The Minnesota DNR lists the Cannon River as a "State Water Trail" (MDNR 2017a). This designation has prompted the establishment of many well-maintained canoe landings along the river, and portages around the Cannon's numerous dams. Paddlers are drawn to the Cannon River largely due to the scenic quality of its river basin. Two popular stretches are the stretch from Faribault to Northfield (16 miles), and the stretch from Cannon Falls to Red Wing (26 miles).

There are numerous protected areas designed to preserve natural features of the region. There are several wildlife refuges and natural areas in the Cannon River Planning Area. Recognizing that the lower Cannon River supports a high diversity of riverine turtle species, the DNR established the Cannon River Turtle Preserve Scientific and Natural Area (SNA). Located in Goodhue County, the SNA protects nearly 900 acres of riverine turtle habitat. The dwarf trout lily is Minnesota's only federally endangered species (MN DNR). The trout lily Scientific and Natural Area, located near Faribault, contains about one-quarter of the total number of plants in existence.

Non-government organizations have also played a large role in establishing protected areas in the Cannon River Planning Area. The River Bend Nature Center near Faribault was created in 1978 as an independent, membership supported organization. The Cannon River

Wilderness Park protects two of the region's most precious natural attractions, the Cannon River and the Big Woods deciduous forest. This Rice county-owned park protects 850 acres of wooded Cannon River valley.

Additional information on water based recreation areas is available through the MN Geospatial Commons including state aquatic management areas, state administered lands, wildlife management areas, state parks, MN Water Trails, Wild and Scenic Rivers, and public water access sites. Land ownership and generalized land ownership data is also available for all the Planning Area's counties.

1.12 Fish and Wildlife Habitat

Data for fish and wildlife habitat is available primarily from the MNDNR interactive maps. Specifically, GIS data is available for Wildlife Management Areas, Wildlife Refuge Inventory, Designated Wildlife Lakes, Trout streams and lakes. Data for rare and endangered species as well as Natural Heritage Inventory Data can be obtained from MNDNR.

1.12.1 Fish Habitat

The Cannon River is designated as a Wild and Scenic River starting downstream of the confluence with the Straight River in Faribault. Three dams have been removed in the watershed over the past 25 years including the Cannon River dam at Welch in 1994, the Little Cannon River dam in Cannon Falls in 2001 and the Morehouse dam on the Straight River in 2006. A fourth dam (Ames Mill Dam) is also being evaluated for removal; removal of the dam would create a free flowing Cannon River from Faribault to Lake Byllesby. Dam removals help to remove barriers to fish migration which has positive impacts for fish diversity and overall fish population numbers. Furthermore, many mussel species rely on specific fish populations to serve as larval hosts, allowing movement to other areas in the river (Cannon River Watershed Partnership).

In the reservoirs and slow stretches above Faribault the most common game fish are northern pike, black crappies, bluegills and bullheads. Downstream from Faribault the most common species are smallmouth bass, northern pike, walleye and, in the stretch below Cannon Falls, channel catfish (MDNR). Both the Cannon River and Straight River have high levels of fish diversity. Recent fisheries surveys conducted on the Straight River found as many as 40 different fish species. Northern pike were considered the most important at-risk species in the Straight River in the 1980s due to the loss of access to connected spawning areas resulting from stream channelization and wetland loss.

Surveys conducted in the Cannon River found as many as 42 species above the Lake Byllesby dam and 47 species below the dam (Cannon River Watershed Partnership). The Cannon River watershed also contains several large lakes including the Jefferson German Chain of Lakes, Tetonka, Upper and Lower Sakatah, Shields, Cannon Lake, and Gorman amongst others which are managed for game fish recreation. Furthermore, the watershed contains four coldwater trout streams that provide habitat for coldwater fish species including Brook, Brown, and Rainbow trout. Rice Creek a.k.a. Spring Brook contains a naturally reproducing population of brook trout that is used by the DNR to restock other streams in the state (Ibid). The MPCA completed a Stressor Identification Report of the Cannon River Watershed in October of 2015 (MPCA 2015). Lack of habitat was determined as a stressor in 22 AUIDs, inconclusive in 11 AUIDs, and was not eliminated as a potential stressor in any AUID. In-stream habitat is degraded due to excess sediment moving throughout the Cannon River system. There is a loss of clean rock substrate from embeddedness of fine material and a loss of intolerant species. In general, habitat conditions are degraded watershed wide, and are contributing to degraded biological conditions (MPCA 2015).

Cannon River, Cannon Falls, MN

1.12.2 Wildlife Habitat

The Cannon River watershed is comprised of three unique ecoregions including the North Central Hardwoods (NCH), the Western Corn Belt Plains (WCBP) and the Driftless Area. Many of the natural hardwood forests, pothole wetlands, and tall grass prairies native to these ecoregions had been replaced with row crop agriculture by the 1900's. Intensive land use and surface and subsurface drainage of shallow lakes and wetlands have further contributed to the loss of valuable wildlife habitat including an 81% loss of historical wetland acreage (MPCA 2016). Significant efforts to restore wetland acreage have occurred, including the restoration of approximately 2,300 acres of a remnant 10,000 acre marsh located at the headwaters of the Straight River (MPCA 2016).

Today, although the watershed is highly fragmented and lacks naturally connected habitats, much wildlife still occurs. While much of the watershed has been developed or utilized for agricultural and residential purposes, several natural areas (e.g., Sites of Biodiversity Significance, conservation easements, and Regionally Significant Ecological Areas) are present including Lake Byllesby Regional Park which is located within five miles of several Scientific and Natural Areas, Wildlife Management Areas, and a State Park. Lake Byllesby Park itself contains a variety of natural communities and features including prairie remnants, woodland, floodplain forest, wetland, lakeshore, and bedrock outcrops.

Mink, weasel, otter, spotted skunk, coyote, and big brown bats are among a few of the 36 mammals known to occupy the Cannon River corridor. The Cannon River corridor is also home to water, shore, and game birds, and is habitat for colonial bird breeding colonies. In addition, 26 species of amphibians and reptiles are known to occur along Cannon River including three uncommon turtles (wood, map, and Blanding's) (EOR 2017).

Canada goose nest, Cannon River Wilderness Park – Rice County, MN

1.13 Unique Features and Scenic Areas

Data for unique features and scenic areas include SNAs, Natural Area Registry, Wild and Scenic Rivers, MBS Sites of Biodiversity Significance, all of which is available through the MN Geospatial Commons. Natural Heritage Inventory data was requested as part of the zonation process.

1.13.1 Federally-listed Plant and Animal Species

The US Fish and Wildlife Service (USFWS) identifies five federally-listed species within the Cannon River Planning Area including the dwarf trout lily, northern long-eared bat, Higgens eye pearlymussel, rusty patch bumble bee, and the prairie bush clover.

Table 0-15. Federally-listed species found in the Cannon River Watershed

Species Common Name *(Scientific Name)*	Status	Habitat
Dwarf trout lily (*Erythronium propullans*)	Endangered	North facing slopes and floodplains in deciduous forest
Northern long-eared bat *(Myotis septentrionalis)*	Threatened	Hibernates in caves and mines - swarming in surrounding wooded areas in autumn. Roosts and forages in upland forests during spring and summer. Townships containing northern long-eared bat roost trees and hibernacula - links to Minnesota DNR PDF
Higgins eye pearlymussel (*Lampsilis higginsii*)	Endangered	Mississippi River
Rusty patched bumble bee *(Bombus affinis)*	Endangered	Grasslands with flowering plants from April through October. underground and abandoned rodent cavities or clumps of grasses above ground as nesting sites, and undisturbed soil for hibernating queens to overwinter.
Prairie bush clover (*Lespedeza leptostachya*)	Threatened	Native prairie on well-drained soils

Sourced from USFWS (https://www.fws.gov/midwest/endangered/lists/minnesot-cty.html)

1.13.2 State-listed Plant and Animal Species

The MN DNR maintains a searchable list of endangered, threatened, and special concern species available at http://www.dnr.state.mn.us/rsg/index.html. This list identifies 168 species of plants, fungus, invertebrates, fish, amphibians, reptiles, birds, and mammals as endangered, threatened, or of special concern within the Cannon River Watershed.

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

- **"Endangered"** plants and animals are threatened with extinction throughout all or a significant portion of their ranges in Minnesota.
- **"Threatened"** plants and animals are likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges in Minnesota.
- **"Special Concern"** plants and animals are extremely uncommon in Minnesota, or have unique or highly specific habitat requirements, and deserve careful monitoring. Species on the periphery of their ranges that are not listed as threatened may be included in this category along with those species that were once threatened or endangered but now have increasing or protected, stable populations.

Table 0-16. State-listed species found in the Cannon River Planning Area

Common name	Scientific name	Group	State status
A Bristle-berry	*Rubus stipulatus*	vascular plant	endangered
A Caddisfly	*Limnephilus secludens*	insect	endangered
A Species of Fungus	*Psathyrella cystidiosa*	fungus	endangered
A Species of Fungus	*Psathyrella rhodospora*	fungus	endangered
Acadian Flycatcher	*Empidonax virescens*	bird	special concern
American Eel	*Anguilla rostrata*	fish	special concern
American Ginseng	*Panax quinquefolius*	vascular plant	special concern
Bald Eagle	*Haliaeetus leucocephalus*	bird	delisted
Beach Heather	*Hudsonia tomentosa*	vascular plant	threatened
Beaked Snakeroot	*Sanicula trifoliata*	vascular plant	special concern
Bell's Vireo	*Vireo bellii*	bird	special concern
Big Tick Trefoil	*Desmodium cuspidatum var. longifolium*	vascular plant	threatened
Black Buffalo	*Ictiobus niger*	fish	threatened
Black Redhorse	*Moxostoma duquesnei*	fish	special concern
Black Sandshell	*Ligumia recta*	mussel	special concern
Bladderpod	*Physaria ludoviciana*	vascular plant	endangered
Blanchard's Cricket Frog	*Acris blanchardi*	amphibian	endangered
Blanding's Turtle	*Emydoidea blandingii*	reptile	threatened
Blue Sucker	*Cycleptus elongatus*	fish	special concern
Butterfly	*Ellipsaria lineolata*	mussel	threatened
Butternut	*Juglans cinerea*	vascular plant	endangered
Canada Frostweed	*Crocanthemum canadense*	vascular plant	special concern
Cerulean Warbler	*Setophaga cerulea*	bird	special concern
Clasping Milkweed	*Asclepias amplexicaulis*	vascular plant	threatened
Clustered Broomrape	*Orobanche fasciculata*	vascular plant	threatened
Common Gallinule	*Gallinula galeata*	bird	special concern
Creek Heelsplitter	*Lasmigona compressa*	mussel	special concern
Creeping Juniper	*Juniperus horizontalis*	vascular plant	special concern
Crystal Darter	*Crystallaria asprella*	fish	endangered
Davis' Sedge	*Carex davisii*	vascular plant	threatened

Common name	Scientific name	Group	State status
Dwarf Trout Lily	*Erythronium propullans*	vascular plant	endangered
Eared False Foxglove	*Agalinis auriculata*	vascular plant	endangered
Eastern Spotted Skunk	*Spilogale putorius*	mammal	threatened
Ebony Spleenwort	*Asplenium platyneuron*	vascular plant	special concern
Ebonyshell	*Fusconaia ebena*	mussel	endangered
Edible Valerian	*Valeriana edulis var. ciliata*	vascular plant	threatened
Elephant-ear	*Elliptio crassidens*	mussel	endangered
Elktoe	*Alasmidonta marginata*	mussel	threatened
Ellipse	*Venustaconcha ellipsiformis*	mussel	threatened
Fawnsfoot	*Truncilla donaciformis*	mussel	threatened
Fluted-shell	*Lasmigona costata*	mussel	threatened
Glade Mallow	*Napaea dioica*	vascular plant	threatened
Goat's Rue	*Tephrosia virginiana*	vascular plant	special concern
Goldenseal	*Hydrastis canadensis*	vascular plant	endangered
Goldie's Fern	*Dryopteris goldiana*	vascular plant	special concern
Gophersnake	*Pituophis catenifer*	reptile	special concern
Gray's Sedge	*Carex grayi*	vascular plant	special concern
Great Indian Plantain	*Arnoglossum reniforme*	vascular plant	threatened
Green Dragon	*Arisaema dracontium*	vascular plant	special concern
Hair-like Beak Rush	*Rhynchospora capillacea*	vascular plant	threatened
Henslow's Sparrow	*Ammodramus henslowii*	bird	endangered
Hickorynut	*Obovaria olivaria*	mussel	delisted
Higgins Eye	*Lampsilis higginsii*	mussel	endangered
Hill's Thistle	*Cirsium pumilum var. hillii*	vascular plant	special concern
Hooded Arrowhead	*Sagittaria calycina var. calycina*	vascular plant	threatened
Hooded Warbler	*Setophaga citrina*	bird	special concern
Iowa Skipper	*Atrytone arogos iowa*	insect	special concern
James' Polanisia	*Polanisia jamesii*	vascular plant	endangered
James' Sedge	*Carex jamesii*	vascular plant	threatened
Jointed Sedge	*Carex conjuncta*	vascular plant	threatened
Kentucky Coffee Tree	*Gymnocladus dioica*	vascular plant	special concern
Kinnickinnick Dewberry	*Rubus multifer*	vascular plant	special concern
Kitten-tails	*Besseya bullii*	vascular plant	threatened
Lake Sturgeon	*Acipenser fulvescens*	fish	special concern
Lark Sparrow	*Chondestes grammacus*	bird	special concern
Late Hawthorn	*Crataegus calpodendron*	vascular plant	special concern
Leadplant Flower Moth	*Schinia lucens*	insect	special concern
Least Darter	*Etheostoma microperca*	fish	special concern
Least Weasel	*Mustela nivalis*	mammal	special concern
Leonard's Skipper	*Hesperia leonardus*	insect	special concern
Loggerhead Shrike	*Lanius ludovicianus*	bird	endangered

Common name	Scientific name	Group	State status
Louisiana Waterthrush	*Parkesia motacilla*	bird	special concern
Maidenhair Spleenwort	*Asplenium trichomanes ssp. trichomanes*	vascular plant	threatened
Mississippi Silvery Minnow	*Hybognathus nuchalis*	fish	special concern
Monkeyface	*Quadrula metanevra*	mussel	threatened
Mucket	*Actinonaias ligamentina*	mussel	threatened
Mudpuppy	*Necturus maculosus*	amphibian	special concern
Muskingum Sedge	*Carex muskingumensis*	vascular plant	special concern
Narrow-leaved Pinweed	*Lechea tenuifolia var. tenuifolia*	vascular plant	endangered
North American Racer	*Coluber constrictor*	reptile	special concern
Northern Brook Lamprey	*Ichthyomyzon fossor*	fish	special concern
Northern Long-eared Bat	*Myotis septentrionalis*	mammal	special concern
Old Field Toadflax	*Nuttallanthus canadensis*	vascular plant	special concern
One-flowered Broomrape	*Orobanche uniflora*	vascular plant	threatened
Ovate-leaved Skullcap	*Scutellaria ovata var. versicolor*	vascular plant	threatened
Ozark Minnow	*Notropis nubilus*	fish	special concern
Paddlefish	*Polyodon spathula*	fish	threatened
Pallid Shiner	*Hybopsis amnis*	fish	endangered
Peregrine Falcon	*Falco peregrinus*	bird	special concern
Pirate Perch	*Aphredoderus sayanus*	fish	special concern
Pistolgrip	*Tritogonia verrucosa*	mussel	endangered
Plains Pocket Mouse	*Perognathus flavescens*	mammal	special concern
Plains Wild Indigo	*Baptisia bracteata var. glabrescens*	vascular plant	special concern
Poweshiek Skipperling	*Oarisma poweshiek*	insect	endangered
Prairie Bush Clover	*Lespedeza leptostachya*	vascular plant	threatened
Prairie Vole	*Microtus ochrogaster*	mammal	special concern
Pugnose Shiner	*Notropis anogenus*	fish	threatened
Purple Martin	*Progne subis*	bird	special concern
Purple Rocket	*Iodanthus pinnatifidus*	vascular plant	endangered
Purple Wartyback	*Cyclonaias tuberculata*	mussel	endangered
Pygmy Plume Moss	*Cyrto-hypnum pygmaeum*	moss	special concern
Rattlebox	*Crotalaria sagittalis*	vascular plant	special concern
Rattlesnake Master	*Eryngium yuccifolium*	vascular plant	special concern
Raven's Foot Sedge	*Carex crus-corvi*	vascular plant	delisted
Red Three-awn	*Aristida purpurea var. longiseta*	vascular plant	special concern
Red-shouldered Hawk	*Buteo lineatus*	bird	special concern
Redfin Shiner	*Lythrurus umbratilis*	fish	special concern
Redside Dace	*Clinostomus elongatus*	fish	special concern
Regal Fritillary	*Speyeria idalia*	insect	special concern
Rhombic Evening Primrose	*Oenothera rhombipetala*	vascular plant	special concern
Rock Pocketbook	*Arcidens confragosus*	mussel	endangered
Rock Sandwort	*Minuartia dawsonensis*	vascular plant	threatened

Common name	Scientific name	Group	State status
Rough-seeded Fameflower	*Phemeranthus rugospermus*	vascular plant	threatened
Round Pigtoe	*Pleurobema sintoxia*	mussel	special concern
Round-stemmed False Foxglove	*Agalinis gattingeri*	vascular plant	endangered
Salamander Mussel	*Simpsonaias ambigua*	mussel	endangered
Sandy Laccaria	*Laccaria trullisata*	fungus	special concern
Sandy Stream Tiger Beetle	*Cicindela macra macra*	insect	special concern
Seaside Three-awn	*Aristida tuberculosa*	vascular plant	threatened
Sessile-flowered Yellow Cress	*Rorippa sessiliflora*	vascular plant	special concern
Sheepnose	*Plethobasus cyphyus*	mussel	endangered
Short-eared Owl	*Asio flammeus*	bird	special concern
Silvery Spleenwort	*Deparia acrostichoides*	vascular plant	special concern
Skipjack Herring	*Alosa chrysochloris*	fish	endangered
Slender Naiad	*Najas gracillima*	vascular plant	special concern
Small Green Wood Orchid	*Platanthera clavellata*	vascular plant	special concern
Small White Lady's-slipper	*Cypripedium candidum*	vascular plant	special concern
Small-leaved Pussytoes	*Antennaria parvifolia*	vascular plant	special concern
Smooth Rock Cress	*Boechera laevigata*	vascular plant	special concern
Smooth Softshell	*Apalone mutica*	reptile	special concern
Snow Trillium	*Trillium nivale*	vascular plant	special concern
Snowy Campion	*Silene nivea*	vascular plant	threatened
Snuffbox	*Epioblasma triquetra*	mussel	endangered
Spectaclecase	*Cumberlandia monodonta*	mussel	endangered
Spike	*Elliptio dilatata*	mussel	threatened
Squirrel Corn	*Dicentra canadensis*	vascular plant	special concern
Sterile Sedge	*Carex sterilis*	vascular plant	threatened
Stream Parsnip	*Berula erecta*	vascular plant	threatened
Suckermouth Minnow	*Phenacobius mirabilis*	fish	special concern
Sullivant's Milkweed	*Asclepias sullivantii*	vascular plant	threatened
Swamp White Oak	*Quercus bicolor*	vascular plant	special concern
Tall Extinguisher Moss	*Encalypta procera*	moss	special concern
Tall Nutrush	*Scleria triglomerata*	vascular plant	endangered
Timber Rattlesnake	*Crotalus horridus*	reptile	threatened
Tricolored Bat	*Perimyotis subflavus*	mammal	special concern
Trumpeter Swan	*Cygnus buccinator*	bird	special concern
Tubercled Rein Orchid	*Platanthera flava var. herbiola*	vascular plant	threatened
Tuberous Indian-plantain	*Arnoglossum plantagineum*	vascular plant	threatened
Twig Rush	*Cladium mariscoides*	vascular plant	special concern
Twinleaf	*Jeffersonia diphylla*	vascular plant	special concern
Wartyback	*Quadrula nodulata*	mussel	threatened

Common name	Scientific name	Group	State status
Washboard	*Megalonaias nervosa*	mussel	endangered
Water-willow	*Decodon verticillatus var. laevigatus*	vascular plant	special concern
Waterhyssop	*Bacopa rotundifolia*	vascular plant	threatened
Wave-leaved Crane's-bill Moss	*Atrichum crispum*	moss	special concern
Western Harvest Mouse	*Reithrodontomys megalotis*	mammal	special concern
Western Prairie Fringed Orchid	*Platanthera praeclara*	vascular plant	endangered
White Wild Indigo	*Baptisia lactea var. lactea*	vascular plant	special concern
Whorled Nutrush	*Scleria verticillata*	vascular plant	threatened
Wild Quinine	*Parthenium integrifolium*	vascular plant	endangered
Wild Sweetwilliam	*Phlox maculata*	vascular plant	special concern
Winged Mapleleaf	*Quadrula fragosa*	mussel	endangered
Wood Turtle	*Glyptemys insculpta*	reptile	threatened
Wright's Blunt Leaved True Moss	*Jaffueliobryum wrightii*	moss	special concern
Yellow Bartonia	*Bartonia virginica*	vascular plant	endangered
Yellow Pimpernel	*Taenidia integerrima*	vascular plant	special concern
Yellow Sandshell	*Lampsilis teres*	mussel	endangered
Yellow-fruit Sedge	*Carex annectens*	vascular plant	special concern

Trout lily, Cannon River Wilderness Park – Rice County, MN

1.13.3 MCBS Sites of Biodiversity Significance

The Minnesota DNR Division of Ecological and Water Resources program has developed a GIS data layer which spatially depicts unique areas with varying levels of native biodiversity that may contain native plant communities, rare plants/animals, and/or animal aggregations. Initially, boundaries of sites are determined by review of aerial photography in order to identify potential areas of native biodiversity based on native vegetation. Following the initial mapping of native plant communities from aerial photos in each county, MBS ecologists perform site visits and assign biodiversity significance ranks based on the number of rare species identified, overall quality of the native plant community, size of the site, and context within the landscape (i.e., connection or isolation to/from other high quality ecological corridors).

Within the Cannon River Planning Area, MBS identified 546 sites of biodiversity significance encompassing 68,827 acres. There are four biodiversity significance ranks - outstanding, high, moderate, and below, which are indicated on the map figure:

- **"Outstanding"** sites contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most ecologically intact or functional landscapes.
- **"High"** sites contain very good quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes.
- **"Moderate"** sites contain occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes.
- **"Below"** sites lack occurrences of rare species and natural features or do not meet MBS standards for outstanding, high, or moderate rank. These sites may include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movement, buffers surrounding higher-quality natural areas, areas with high potential for restoration of native habitat, or open space.

<u>Comprehensive Watershed Priority Scheme Maps:</u>

- Locations of species tracked by MDNR: Endangered, Threatened, and Special Concern plant & animal species. Plus animal aggregation sites
- Areas with native biodiversity that may contain high quality plants, native prairies, and rare animals and plants (Source: MN Biological Survey)
- MDNR designated high conservation value forests due to plant and animals present, and old-growth forests (Source: DNR)
- Ecological corridors between generally large intact native or semi-natural terrestrial habitat patches (Source: DNR)

1.14 Gap Analysis

The following gaps were identified during the plan development process and have been addressed in the Cannon River Comprehensive Watershed Management Plan.

- SSTS Programs – records on treatment system age, type of sewage treatment system, known unsewered communities, point of sale requirement triggering an inspection through a property sale.
- Lack of groundwater level monitoring data – A few DNR Observation Wells in the Planning Area have water-level records extending back 20 years or more. But, many of the observation wells were installed within the past year or two.


Water reclamation facility, Faribault

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APPENDIX B: Identification of Potential Watershed Concerns and Issues

PLAN APPENDIX B – IDENTIFICATION OF POTENTIAL WATERSHED CONCERNS AND ISSUES

This appendix includes the following information used to identify the priority concerns and issues addressed in the Cannon River Comprehensive Watershed Management Plan:

1. List of reports, plans, and studies reviewed as part of the Comprehensive Watershed Management Plan development process (Table 1)
2. Record of the various meetings conducted during the plan development process
    a. Summary of public engagement meetings (Table 2)
    b. First Water Conversation series invitation and meeting summary
    c. Second Water Conversation series invitation, meeting summary, and modeling tool source maps (Zonation, HSPF, PTMApp)
    d. Third Water Conversation series invitation and meeting summary
3. Plan Review Agency Notification Letters
    a. City of Faribault
    b. City of Northfield
    c. Board of Water and Soil Resources (BWSR)
    d. Metropolitan Council
    e. Minnesota Department of Agriculture (MDA)
    f. Minnesota Department of Health (MDH)
    g. Minnesota Department of Natural Resources (MNDNR)
    h. Minnesota Pollution Control Agency (MPCA)

Table 1. List of Documents Reviewed during Planning Process

Jurisdiction	Source	Document Name	Date	Document Type
County	Le Sueur	AIS Lake Action Plans - German, Jefferson, Frances, Tetonka, Volney, Ray, Sakatah	2015	Water Quality, TMDLs, and WRAPS Studies
Watershed District	Belle Creek WD	Belle Creek Watershed District Watershed Management Plan	2011	WD, County and SWCD Water Management Plans
Watershed	Cannon River WP	Cannon River Watershed SWAG Executive Summary	2010-2012	Water Quality, TMDLs, and WRAPS Studies
Watershed	Cannon River WP	Carleton College: Geomorphology and Watershed Studies of the Cannon River and Its Tributaries	2000	Natural Resources Management
Watershed	Cannon River WP	MDNR Cannon River Resource Analysis	1979	Natural Resources Management
Watershed	Cannon River WP	MDNR Freshwater Mussels of the Cannon River Drainage in SE MN	1987	Natural Resources Management
Watershed	Cannon River WP	Rice Creek Assessment Project Resources Investigation CWP	2013	Water Quality, TMDLs, and WRAPS Studies

Jurisdiction	Source	Document Name	Date	Document Type
Watershed	Cannon River WP	Rice Creek Assessment Project Resources Investigation CWP Implementation Plan	2013	Water Quality, TMDLs, and WRAPS Studies
Watershed	Cannon River WP	Signs of Progress: The State of the Cannon and Straight Rivers	2011	Water Quality, TMDLs, and WRAPS Studies
County	Dakota	Chub Creek Watershed Assessment	2001	Water Quality, TMDLs, and WRAPS Studies
County	Dakota	Dakota County Aquatic Invasive Species Plan	2017-2020	Natural Resources Management
County	Dakota	Dakota County Comprehensive Plan	2016-2025	WD, County and SWCD Water Management Plans
County	Dakota	Dakota County Farmland and Natural Area Protection Plan	2002	Known Pollutant Modeling and Assessment Efforts
County	Dakota	Dakota County Low Impact Development (LID) Standards	2012	WD, County and SWCD Water Management Plans
County	Dakota	Dakota County Natural Resource Management System Plan	2017	WD, County and SWCD Water Management Plans
County	Dakota	Dakota County SWCD Strategic Plan	2012	WD, County and SWCD Water Management Plans
County	Dakota	Dakota County Trout Brook Watershed Top 50 Implementation Grant	2016	Known Pollutant Modeling and Assessment Efforts
County	Dakota	MDA Initial Township Testing of Nitrate in Private Wells, Dakota County Summary	2013-2014	Known Pollutant Modeling and Assessment Efforts
County	Dakota	Report on Existing Conditions of Dakota County Ditch #1 & #2	2017	Known Pollutant Modeling and Assessment Efforts
County	Goodhue	Belle Creek Structure R-4 Sediment Estimation	2016	Known Pollutant Modeling and Assessment Efforts
County	Goodhue	Goodhue County Comprehensive Local Water Management Plan	2010-2020	WD, County and SWCD Water Management Plans
County	Goodhue	Little Cannon River Watershed E. coli Assessment	2008	Water Quality, TMDLs, and WRAPS Studies
County	Le Sueur	FRST Septic Inventory Project		Known Pollutant Modeling and Assessment Efforts
County	Le Sueur	Jefferson German Septic Inventory Project	2013	Known Pollutant Modeling and Assessment Efforts
County	Le Sueur	Le Sueur County Comprehensive County Water Plan	2016-2021	WD, County and SWCD Water Management Plans
County	Le Sueur	Le Sueur County Local Water Management Plan	2011-2015	WD, County and SWCD Water Management Plans
County	Modeling Files	BMP Implementation Choices in the Maple Creek Watershed Using ArcGIS and GSSHA	Draft	Known Pollutant Modeling and Assessment Efforts
Watershed Management Organization	North Cannon WMO	North Cannon River Watershed Management Organization 2015 Annual Report	2015	WD, County and SWCD Water Management Plans
Watershed Management Organization	North Cannon WMO	North Cannon River Watershed Management Organization Watershed Management Plan	2013	WD, County and SWCD Water Management Plans
County	Rice	Circle Lake Report Summary of Lake Management Plan	2011	Water Quality, TMDLs, and WRAPS Studies
County	Rice	Final Spring Park Subwatershed Analysis	2017	Known Pollutant Modeling and Assessment Efforts
County	Rice	Rice County Local Water Management Plan	2014-2019	WD, County and SWCD Water Management Plans

Jurisdiction	Source	Document Name	Date	Document Type
County	Steele	Steel County Water Plan	2017-2021	WD, County and SWCD Water Management Plans
County	Steele	Steele County SWCD Comprehensive Plan	2016-2016	WD, County and SWCD Water Management Plans
County	Waseca	Assessment Results and Management Options for Clear and Loon Lakes	2016	Water Quality, TMDLs, and WRAPS Studies
County	Waseca	City of Waseca Comprehensive Plan	2013	WD, County and SWCD Water Management Plans
County	Waseca	City of Waseca Wellhead Protection Plan	2016	WD, County and SWCD Water Management Plans
County	Waseca	Waseca County 2017 AIS Prevention Plan	2017	Natural Resources Management
County	Waseca	Waseca County Comprehensive Plan	2005	WD, County and SWCD Water Management Plans
County	Waseca	Waseca County Local Water Management Plan Amendment	2015-2018	WD, County and SWCD Water Management Plans
Multiple	Counties\ MPCA	Upper Cannon River Watershed Diagnostic Study and Implementation Plan	2010	Water Quality, TMDLs, and WRAPS Studies
Non-Profit	Freshwater Society	Protecting groundwater-sourced drinking water	2016	Water Quality, TMDLs, and WRAPS Studies
State	MDA	Nitrogen Fertilizer Management Plan	2015	Known Pollutant Modeling and Assessment Efforts
State	MDH	Cannon River Watershed Groundwater Restoration and Protection Strategies (GRAPS)	2017	Groundwater Restoration and Protection Strategies (GRAPS)
State	MDNR	Cannon River Mussel Site Reintroduction Plan	2011-2012	Natural Resources Management
State	MDNR	Minnesota Biological Survey Lakes and Aquatic Plant Data	2016	Natural Resources Management
State	MDNR	Minnesota Forest Management Guidelines	2012	Natural Resources Management
State	MDNR	Minnesota's Prairie Conservation Plan	2011	Natural Resources Management
State	MDNR	Minnesota's Wildlife Action Plan 2015-2025	2015	Natural Resources Management
State	MDNR	Rice Creek Geomorphology Assessment	2017	Known Pollutant Modeling and Assessment Efforts
State	MDNR	Upper Cannon River Watershed Geomorphology and Hydrology	2014	Known Pollutant Modeling and Assessment Efforts
State	MDNR	Watershed Health Assessment Score Sheets	Various	Known Pollutant Modeling and Assessment Efforts
State	MPCA	Cannon River Watershed Monitoring and Assessment Report	2014	Water Quality, TMDLs, and WRAPS Studies
State	MPCA	Cannon River Watershed Stressor Identification Report	2015	Water Quality, TMDLs, and WRAPS Studies
State	MPCA	Cannon River WRAPS	2016	Water Quality, TMDLs, and WRAPS Studies
State	MPCA	Cannon River WRAPS HSPF model development	2015	Known Pollutant Modeling and Assessment Efforts
State	MPCA	Jefferson-German Lake Chain TMDL	2017	Water Quality, TMDLs, and WRAPS Studies
State	MPCA	Lake Volney TMDL	2014	Water Quality, TMDLs, and WRAPS Studies

Jurisdiction	Source	Document Name	Date	Document Type
State	MPCA	Lower Mississippi River Basin Fecal Coliform Implementation Plan	2007	Water Quality, TMDLs, and WRAPS Studies
State	MPCA	Minnesota Nutrient Reduction Strategy	2014	Water Quality, TMDLs, and WRAPS Studies
State	MPCA	Revised Regional Total Maximum Daily Load Evaluation of Fecal Coliform Bacteria Impairments in the Lower Mississippi River Basin in Minnesota	2006	Water Quality, TMDLs, and WRAPS Studies
State	MPCA	TMDL Evaluation of Turbidity Impairments in the Lower Cannon River	2007	Water Quality, TMDLs, and WRAPS Studies

Table 2. Summary of Public Engagement Meetings

Meeting	Date	Location	Meeting Objectives
Planning Work Group Meeting	May 17, 2017	Rice County Government Center, Faribault, MN	Project kick-off. Review work plan and data collection.
Cannon River 1W1P Open House	May 31, 2017	South Central College, Faribault, MN	Opportunity to learn about the Planning Area, One Watershed One Plans, and provide input on priority concerns.
Planning Work Group Meeting	June 21, 2017	Rice County Government Center, Faribault, MN	Identify local and regional planning documents to review for issues and concerns. Discuss previous zonation results and evaluate need to update.
1st series of Water Conversations with Advisory Group	July 20, 2017	Cabela's Owatonna, MN	To share local knowledge of the Planning Area, identify concerns or vulnerabilities in your community, meet other people and learn how to work together to become better stewards of the watershed.
	July 25, 2017	The Archer House Inn, Northfield, MN	
Policy Committee Meeting	August 2, 2017	Rice County Government Center, Faribault, MN	Policy Committee took the Zonation survey.
Planning Work Group/Technical Advisory Group Meeting	August 16, 2017	Rice County Government Center, Faribault, MN	Review summary of issues and concerns. Review Zonation results.
2nd series of Water Conversations with Advisory Group	September 19, 2017	The Gathering Room, Cannon Falls, MN	Used maps, modeling tools and local knowledge to answer the question: "Where in the Planning Area do we want to focus restoration and protection efforts over the next 10 years?"
	September 26, 2017	The Village, Waterville, MN	
Planning Work Group /Technical Advisory Group Meeting	October 18, 2017	Rice County Government Center, Faribault, MN	Review feedback on Zonation from 2nd series of Water Conversations and begin to identify priority concerns and areas.
Policy Committee Meeting	November 8, 2017	Rice County Government Center, Faribault, MN	Update on priorities and management areas. Re-visited committee and work group roles and responsibilities. Presentations on the organizational structure of other watershed management organizations.
Planning Work Group /Technical Advisory Group Meeting	November 15, 2017	Faribault Armory, Faribault, MN	Finalize the identification of priority concerns and areas.
Policy Committee Meeting	January 10, 2018	Rice County Government Center, Faribault, MN	Reviewed priority issues and concerns. Discussed potential operational arrangements.
Planning Work Group/Technical Advisory Group Meeting	January 17, 2018	Rice County Government Center, Faribault, MN	Development of measurable goals.
Planning Work Group/Technical Advisory Group Meeting	February 21, 2018	Rice County Government Center, Faribault, MN	Development of measurable goals.
2nd series of Water Conversations with Advisory Group	March 6, 2018	Archer House Northfield, MN	Reviewed issues, measurable goals and discussed implementation activities.
	March 15, 2018	Cabela's Owatonna, MN	

Meeting	Date	Location	Meeting Objectives
Planning Work Group/Technical Advisory Group Meeting	March 21, 2018	Rice County Government Center, Faribault, MN	Development of measurable goals and Targeted Implementation Plan.
Policy Committee Meeting	April 4, 2018	Rice County Government Center, Faribault, MN	Update on final series of Water Conversations. Reviewed measurable goals. Discussed potential operational agreements.
Planning Work Group/Technical Advisory Group Meeting	April 18, 2018	Web-Ex Meeting	Finalize measurable goals and development of Targeted Implementation Plan.
Planning Work Group/Technical Advisory Group Meeting	May 16, 2018	Rice County Government Center, Faribault, MN	Discussed Targeted Implementation Schedule, reviewed accounting of local funds, and reviewed existing programs.
Subset of Planning Work Group/Technical Advisory Group	May 29, 2018	Conference call	Held small work group discussions to discuss components of the Targeted Implementation Schedule including: - Groundwater - Ag Runoff and Soil Health - Flooding & Climate Change - Drainage Management - Shoreland Management and SSTS - Socioeconomic Concerns
Planning Work Group/Technical Advisory Group Meeting	June 20, 2018	Rice County Government Center, Faribault, MN	Finalized Targeted Implementation Plan and discussed current programs and funding.
Policy Committee Meeting	June 27, 2018	Rice County Government Center, Faribault, MN	Reviewed Targeted Implementation Schedule and programmatic distribution of implementation activities. Reviewed and discussed Draft Joint Powers Agreement.
Planning Work Group/Technical Advisory Group Meeting	July 18, 2018	Rice County Government Center, Faribault, MN	Reviewed DRAFT Plan and discussed existing programs, program gaps and local priorities.

Cannon River
One Watershed, One Plan

"Aligning local water planning on major watershed boundaries with state strategies towards prioritized, targeted and measurable implementation plans"

YOUR input and knowledge is important to the future of the Cannon River Watershed. Please plan to attend Water Conversations hosted by the Cannon River One Watershed, One Plan team.

What is this?
The One Watershed, One Plan (1W1P) team is made up of local government staff across the watershed. The team is hosting a series of conversations about our water. How do we as a community want to manage resources within the Cannon River Watershed? These conversations will help us answer that question, and develop a plan of action.

Why are these conversations important?
Water is a quality of life resource and it needs to be protected. Development of 1W1P will allow local governments to access state funding to address resource protection and improvement projects.

Why should I participate?
You live, work and play in the watershed and know where the issues may be and that is why we want to hear from you!

- To share your local knowledge of the watershed.
- To share what you think is special about the lakes, streams, wetlands, rivers and other natural areas in the Cannon River Watershed.
- To help identify concerns or vulnerabilities in your community so we can figure out how best to address them in the watershed management plan.
- To meet other people in your community and learn how we all can work together to become better stewards of the watershed.

How do I get involved?
We are hosting a series of three Water Conversations over the course of the Cannon River Watershed 1W1P development process. Please join us at one of our first Water Conversations. To ensure we have enough handouts, desserts and room, please RSVP by the respective dates below. Families are welcome at both events, so help us plan accordingly by indicating in your RSVP if you plan to bring young children and we will have activity bags prepared. Join us at either of the following Water Conversations:

Water Conversation #1
Thursday, July 20th from 6:00 to 7:30 pm
Owatonna - Cabela's
3900 Cabela Drive
RSVP by: July 13th

Water Conversation #2
Tuesday, July 25th from 6:00 to 7:30 pm
Northfield – The Archer House Inn
212 Division St S
RSVP by: July 18th

To RSVP or for questions, please contact Ashley Gallagher, Dakota SWCD (651) 480-7781; ashley.gallagher@co.dakota.mn.us. You can also learn more about the process and how to get involved by visiting the project web-site at http://www.dakotaswcd.org/1w1p.html.

We look forward to seeing you!

Brad Becker (Dakota County)
Brad Behrens (Rice County)
Ashley Gallagher (Dakota SWCD)
Scott Goldberg (Steele County)
Eric Gulbransen (Steele/Waseca SWCD)
Kelly Hunt (Waseca County)
Beau Kennedy (Goodhue SWCD)
Josh Mankowski (Le Sueur County)
Steve Pahs (Rice SWCD)
Glen Roberson (Goodhue SWCD)
Michael Schultz (Le Sueur SWCD)
Brian Watson (Dakota SWCD)

memo

Project Name	Cannon River One Watershed, One Plan	**Date**	08/09/2017
To / Contact info	Planning Work Group		
Cc / Contact info	BWSR Advisory Staff		
From / Contact info	Camilla Correll, PE, Meghan Funke PhD and Spencer Peck, JD		
Regarding	Advisory Work Group July 2017 Water Conversations Summary		

Introduction

In 2016, several planning partners joined together to develop a One Watershed, One Plan (1W1P) for the Cannon River Planning Area. The goal of 1W1P is to align local water planning on major watershed boundaries with state strategies towards prioritized, targeted and measureable implementation plans. One component of the 1W1P process is stakeholder engagement and participation. In late July of 2017, the planning partners and consultants hosted two "Water Conversations" to consult with stakeholders. The goals of these Water Conversations included:

- To share local knowledge of the Cannon River Planning Area.
- To share personal perspective about the lakes, streams, wetlands, rivers and other natural areas in the Cannon River Planning Area.
- To help identify concerns or vulnerabilities for consideration in the Cannon River 1W1P development process.
- To connect stakeholders with one another, and work together to become better stewards of the watershed.

The Water Conversations were based on a "World Café" format. This large-group discussion method uses a special café-like setting, and small-groups of four to five people. The groups are tasked with answering a set of questions; each question session lasted approximately 20 minutes. In answering the questions, each small-group recorded their ideas and discussions in a visual way, and presented the results to the other groups. Both Water Conversations posed three questions to the participants:

1. How do you interact with or use water?
2. What activities or behaviors are impacting or have the potential to impact our water resources?
3. What do you think is most important to first address?

The first question is intended to warm participants up to the conversation, notetaking format, and opens the ways for deeper contemplation of the issue. The second question challenges participants to review their own and others' behaviors to identify both positive and negative impacts of those behaviors. The responses to the first two questions were organized around major themes by each group and presented at the conclusion of each question period. The third question allowed stakeholders to voice their personal interests and guide the Plan's priorities and structure.

Each small group included a Table Facilitator who helped to keep the conversation on track. Notes collected from the various conversations were transcribed, analyzed, and are summarized in the following narrative. The raw data from each group (interactions, impacts, priorities) were recorded in a spreadsheet and coded into broad themes. This summary does not review every comment made. Instead, it serves as an overview of the themes that emerged from the conversations.

Meeting Participants

As mentioned above two Water Conversations were conducted in late July of 2017. The first was held on July 20th in Owatonna, the second on July 25th in Northfield. Both meetings were led by the same experts and conducted in the manner described above. The July 20th, Owatonna meeting included 13 participants, and 11 staff from the planning Work Group and the Consultant Team. The 13 participants represented an assortment of local and state government entities, environmental advocacy groups (Trout Unlimited and Master Water Stewards), and citizens.

The July 25th meeting in Northfield included 29 participants, and 10 staff from the Planning Work Group and Consultant Team. The composition of participants was quite diverse and had very little carry-over from the first meeting. Participants were affiliated with the Metropolitan Council, the University of Minnesota, several state agencies (MDH, MDA, MPCA, DNR), and environmental advocacy groups (Trout Unlimited, Minnesota Land Trust, Master Water Stewards, and the Farm Bureau). Nine different communities (cities or townships) were represented by citizens.

Response Summary

This section presents the questions that were asked during the World Café exercise and summarizes the general themes. This summary includes select quotations, and provides examples of notable or unique responses.

Question #1: How do you interact with or use water?

Participants identified a huge range of ways water is used or interacted with. The goal of this question is to help participants recognize the role and importance of water in their lives. Moreover, it helps the Planning Work Group and the Consultant Team understand what stakeholders know and think about the Cannon River Planning Area's water resources.

In total, 200 ideas were generated by the two meetings, with over 100 distinct ideas or concepts. The responses can be categorized into four general themes (in alphabetical order): (1) Community Uses, (2) Economic Uses, (3) Natural Uses, and (4) Recreation.

Community Uses

These uses and interactions include the very human needs such as drinking, cooking, cleaning, and sanitation needs. Several responses characterized these uses as "necessity" or "needed for survival." Many responses of this type implicitly recognized that these types of uses not only remove water from the system (i.e. "Drinking"), but in some cases temporarily remove water and then return it after significant alteration ("flushing toilet" and "failing septic systems"). Other participants noted various urban uses of water, including watering gardens and lawns, washing cars, firefighting, gardening, and aesthetic uses like fountains and bird-baths. Some mentioned water management practices of communities such as stormwater management, water towers, distribution systems, and flood control. Other responses related to water management included testing, monitoring, planning, and information sharing. One participant remarked that regulations impact how communities and individuals use and interact with water. A few responses observed that water use can be "taken for granted" and politicized, which can cause water to be wasted and foment arguments among water users.

Economic Uses

Every group observed that water is used for some economic purpose. A majority of these responses focused on agricultural uses of water, especially irrigation and livestock management. Multiple comments discussed agricultural drainage, tiling, chemical and nutrient runoff from farming practices. Water use in food production was a common response. Industrial water use was another frequent response. Multiple groups noted water use in chemical production, manufacturing processes, and that water itself is an important commodity. Other unique responses that can be categorized as economic uses include water use to generate energy, water storage, touristic uses such as resorts, and transportation systems. One participant expressed water had investment value for homeowners. A few responses were phrased in a way that suggested economic uses often wasted or negatively impacted water resources.

Ecological Uses

Only a limited number of participants noted "ecological uses" of water. The most common responses involved aesthetic uses, for instance "views," "beauty," and "looking at it." One response stated that water was used for "spiritual" purposes. Another response noted that water is a resource to be "passed on to future generations." A few responses mentioned water is a part of natural cycles, including "hydrological cycles," that it supports "plant and animal life" and provides "habitat" for wildlife. Wetlands were specifically mentioned as an ecological use. A few groups noted that water can be used as an educational resource. Finally, several responses stated that monitoring or testing water was an important interaction.

Recreation

Recreation was by far the most commonly listed use or interaction across all groups. Further, as a category, it typically included the largest variety of responses. Generally, these can be divided into boating, fishing, and swimming. However, there was substantial diversity in actual response. Boating included kayaking, canoeing, and paddling. Fishing and swimming were mentioned by all but one group. Other types of recreation mentioned included biking, hiking, pools and water parks, waterfowl hunting, bird watching, socializing, and "inner tubing."

<u>What activities or behaviors are impacting, or have the potential to impact, water resources?</u>

Participants at both meetings provided more numerous and arguably more nuanced responses to this question than to the first question. The second question encourages participants to think about impacts to water resources, and what makes "healthy" water resources. The groups categorized their responses using similar terms as the first question. For instance, agriculture, business and industry, recreation, and urban land use and development may have been carried over from the first question. However, several new categories and sub-issues appear as well. Only one group from either meeting explicitly organized its comments according to whether the impact was a positive or negative impact. All other groups appear to primarily consider the actual or potential impacts as negative. The headings below review frequently mentioned impacts and a consolidation of a few related categories and summarizes the responses.

Behaviors and Best Practices

One pervasive issue that crosses nearly every category—and in some groups, a category itself—is the influence of behaviors and practices. On one hand, participants appear to believe that many of the negative impacts are a result of poor or ineffective behaviors choices. Examples of behavior choices with negative impacts include car washing, invasive species transport, excessive groundwater extraction, "mowing lawns up to lakeshore," fossil fuel use, and pouring toxic or hazardous materials down drains. On the other hand, water resource-conscious practices and behavior modification will likely have important positive impacts. For instance, several group noted the importance of education and gathering quantifiable data and other information to inform regulations and plans. Other responses emphasized the importance of awareness campaigns and watershed-scale planning. Two groups observed generational differences in desire and willingness to protect and restore water resources. Several groups also noted a basic misconception of the value of water. One group even included "ignorance" as an issue. This same group also commented on the incentives created by the convenience of tap water.

Agriculture

Impacts caused by agriculture were heavily emphasized by participants. Nearly all groups included a category titled "agriculture," or something similar. Every group mentioned at least one actual or potential impact related to agricultural systems. Drainage tile and irrigation were most commonly mentioned. Fertilizer, chemical use, and nutrient management from livestock were also frequently mentioned. Cropping practices were mentioned by a few groups. However, the participants refer to both the positive and negative impacts of agricultural practices. For instance, comments focused on the positive included implementing cover crops, buffer strips, field strips, and no/low-till practices. Some responses appeared to focus on negative impacts of practices such as two-crop rotations, "raising livestock," fertilizer, and animal waste. Still others were ambiguous and could be either negative or positive, for example, pasture management, and erosion control. Regardless, both meetings clearly expressed the importance of addressing impacts caused by or related to agricultural practices and uses.

Land Use

Nearly every group included comments related to land use and land use planning. Responses ranged from building and maintaining infrastructure, land use decisions, planning processes, sprawl and excessive development. One unexpected comment stated "the lack of diversity of elected officials." It's likely that the participants believe that more diverse leadership may result in better decisions and outcomes. "Mining" and dams were mentioned by three groups. The increased size and number of impervious surfaces is a very common comment. Lawn watering, maintenance, and fertilizing practices were also mentioned by several groups. As previously mentioned, many land use comments include an individual or group behavior component. Other responses focus on integrating various practices in land use development, such as rain gardens, septic system compliance, construction erosion control practices, green/sustainable lawns, and more aggressive landscaping and shoreland protection requirements. A few groups noted government operations that when adopted would likely have a positive impact on the watershed. Example responses include, street sweeping, reducing the impact of politics, updating zoning practices, snow and ice control or removal, wastewater and drinking water treatment.

Other Important Categories

One unique category created by one group at the Northfield meeting was titled “Funding.” This category included responses such as the “availability of funds,” treatment costs, infrastructure operations and maintenance, and reconstruction. This group likely believes that funding may have both a positive and negative impact on water resources: when funding is available practices can be implemented and facilities can be operated and maintained properly. In contrast, when money is not available, negative outcomes are more probable and common. A few groups had categories with comments regarding economic development. For instance, “population growth,” increased groundwater appropriations, development in the floodplain, the use and impacts of hydropower, and riparian commercial uses (resorts, outfitters, etc.). Finally, several participants noted wetland restoration, shoreland restoration, “river cleanup,” and climate change as important impacts.

What do you think is most important to first address?

Each meeting developed a list of priorities. Participants were asked to identify the single most important issue they thought should be addressed in the watershed management plan. These priorities are not meant to be solutions. Rather, participants were asked to identify what they think is the most important, most immediate need, considering the complete array of uses and impacts identified when answering the first two questions. The tables below include the list of priorities created at each meeting categorized by headings identified by meeting participants. Most reflect the exact language chosen by participants. A few have been paraphrased for the sake of space.

Table 1. Priorities identified at the July 20, 2017 Water Conversation hosted in Owatonna, MN

Behaviors and Best Practices	
Need for education	Community participation and buy-in
Working together to correct more, making a plan	Public participation
Developing a plan based on objective tests/assessment of water quality	Fund the plan with local control
Improved water quality monitoring	Develop a clear idea how different systems together
Identify sources of pollution and establish BMPs while not inhibiting existing projects	
Agriculture	
Nutrient management	Farm runoff directly into lakes
Nutrient loading	
Land Use	
Surface water runoff (quantity) from agricultural and urban settings	Flooding of infrastructure
Sediment	Increased flow, increased storage
Resource Concerns	
Groundwater extraction	Preserve the quality of resources
Water quality	

Table 2. Priorities identified at the July 25, 2017 Water Conversation hosted in Northfield, MN

Behaviors and Best Practices	
Municipal regulation	Understanding the severity of water conservation
Waste discharge monitoring	Outdoor recreation and engagement
Public education	Harvest/store/infiltrate rainfall as close to where it falls as possible
How social groups/people have a role to play! Involvement, values, interest	Help divergent views work collaborative to improve water quality
Agriculture	
Crop diversity or rotation	Chemical use
Chemical overuse	Nitrogen management
Minimize agricultural runoff	Nitrogen reduction (nitrate leaching less into groundwater and lakes)
Agricultural practices	Farming practices on water quality
Practices contributing to soil loss	Siltation control in the watershed
Land Use	
Erosion control	Agricultural and urban sediment reduction
Land runoff	Peak flow reduction on agricultural and urban lands
Upland storage	
Resource Concerns	
Drinking water	Flooding
Cleaner water for personal use (drinking, home, swimming)	Aesthetics: spirituality; honoring plant and animal life
Clean water	Invasive species
Pollution and excess nutrient flow into rivers and aquifers	Water levels to go down in the summer months like it always has (15+ years ago)
Control the flow of rivers and streams to ease disasters from flooding	

Cannon River
One Watershed, One Plan

"Aligning local water planning on major watershed boundaries with state strategies towards prioritized, targeted and measurable implementation plans"

You may have attended the Kick Off Event, attended one of the first Water Conversations, taken the online or written survey, or maybe you have had no participation in the Cannon River One Watershed, One Plan process. No matter your level of involvement to date, we invite you to attend the second series of Water Conversations.

This second series of Water Conversations differs from the first series. In the first series of conversations, meeting participates shared their issues and concerns for the management of the watershed's natural resources. Participants included members of lake associations, urban communities and hunting and fishing groups. In this second series of Water Conversations we will use maps, modeling tools and your knowledge of the watershed to answer the question: "Where in the watershed do we want to focus restoration and protection efforts over the next 10 years?"

If you are new to the Cannon River 1W1P process we will be hosting an open house for one hour before each Water Conversation. This is an opportunity to speak with local government staff, state agency staff, the consultants, and citizens of the watershed. If your curiosity is peaked and you would like to continue the discussion you are welcome to join us for the second series of Water Conversations.

The same materials and program will be presented at the following Water Conversations. Choose whichever is most convenient for you:

Water Conversation #1
Tuesday, September 19th
Open House- 5:00 to 6:00 pm
Meeting - 6:00 to 8:00 pm
The Gathering Room
31257 64th Ave Path
Cannon Falls, MN 55009
RSVP by: September 15th

Water Conversation #2
Tuesday, September 26th
Open House- 5:00 to 6:00 pm
Meeting- 6:00 to 8:00 pm
The Village
205 North 1st St
Waterville, MN 56096
RSVP by: September 22nd

Please feel free to pass this invite on to others you know that may be interested in attending. To RSVP or for questions, please contact Ashley Gallagher, Dakota SWCD (651) 480-7781; ashley.gallagher@co.dakota.mn.us. You can also learn more about the process, review summaries from meetings held to date and learn how to get involved by visiting the project web-site at http://www.dakotaswcd.org/1w1p.html.

We look forward to seeing you!

Brad Becker (Dakota County)
Brad Behrens (Rice County)
Ashley Gallagher (Dakota SWCD)
Scott Golberg (Steele County)
Eric Gulbransen (Steele/Waseca SWCD)
Kelly Hunt (Waseca County)
Beau Kennedy (Goodhue SWCD)
Josh Mankowski (Le Sueur County)
Steve Pahs (Rice SWCD)
Glen Roberson (Goodhue SWCD)
Michael Schultz (Le Sueur SWCD)
Brian Watson (Dakota SWCD)

memo

Project Name	Cannon River One Watershed, One Plan	**Date**	09/28/2017
To / Contact info	Planning Work Group		
Cc / Contact info	BWSR Advisory Staff		
From / Contact info	Camilla Correll, PE and Meghan Funke PhD		
Regarding	Advisory Work Group September 2017 Water Conversations Summary		

Introduction

In late September of 2017, the planning partners and consultant hosted two "Water Conversations" to gather input from stakeholders. This was the second set of Water Conversations in a series of three that are scheduled to take place as part of the Cannon River 1W1P development process. The goals of this second set of Water Conversations included:

- To gather local knowledge of the Cannon River Planning Area.
- To gather personal perspectives about the lakes, streams, wetlands, rivers and other natural areas in the Cannon River Planning Area.
- To help identify concerns or vulnerabilities for consideration in the Cannon River 1W1P development process.
- To vet the results of the Comprehensive Watershed Priority Scheme (the modeling tools used to identify hotspots and priorities in the landscape)
- To connect stakeholders with one another, and work together to become better stewards of the watershed.

The second set of Water Conversations was structured differently than the first set of conversations which were based on a "World Café" format. Both meetings of the second set of Water Conversations were led by the same experts and conducted in the manner described below.

The meetings began with an Open-House where anyone from the Planning Area could come to learn about One Watershed, One Plans, the plan development process, what has been accomplished to date, and how to participate in the planning process. Following the Open-House, Mike Schultz, Le Seuer SWCD staff gave a brief introduction and EOR gave a presentation on the prioritization process being used for the Cannon River 1W1P. Meghan Funke, PhD, described the various tools available for prioritization (including Zonation, HSPF and PTMApp) as well as the differences in the information these tools generate about the watershed and impacts to resources. Since Zonation has been selected as one of the primary tools to use in identifying hotspots for restoration and/or protection needs in the planning area, Meghan described in detail how the Zonation model was developed for the Cannon River 1W1P.

Following the presentation, meeting participants were asked to congregate around a set of four Zonation poster size maps: one for each lobe of the planning area. These maps showed the location of 13 areas in the landscape that Zonation identified as being hotspots, that is to say areas that were assigned a higher score due to a higher concentration of restoration or protection needs in the area and higher value assigned to these needs by the Planning Work Group and Policy Committee. First, Meghan described the individual data layers that most strongly influenced these areas being ranked higher for restoration or protection (see Figure 1). Once the group had a better understanding of the Zonation derived hotspots, they performed the following activities:

1. Provided feedback on whether they agreed with the hotspot areas identified through Zonation based on their local knowledge of the area.
2. Considered the need to identify additional areas that weren't identified through the Zonation process and added information to the working maps.
3. Selected what they considered to be the three most important areas in the landscape for inclusion in the 10-year timeframe of the 1W1P and noted whether these areas were restoration focused, protection focused, or a combination of both restoration and protection needs. Meeting participants added notes explaining their rationale for identifying these areas as high priority in the 1W1P.

Following the Water Conversations, information collected from the working maps were converted to a shapefile so that an additional data layer reflecting local values could be evaluated by the Planning Work Group and the Policy Committee as they prioritize issues and concerns for the 1W1P (see Figures 3 and 4).

Meeting Participants

The September 19th meeting in Cannon Falls included 20 participants, and 8 staff from the Planning Work Group and Consultant Team. The 20 participants represented an assortment of local and state government entities (MNDNR, Metropolitan Council, Watershed District, Watershed Management Organization, SWCDs, and Counties), farmer/rural producer organizations (Minnesota Agricultural Water Resource Center, SE MN Irrigation Association), environmental advocacy groups (Pheasants Forever, Trout Unlimited, and The Nature Conservancy), and producers and citizens. At least four different communities (cities or townships) were represented by staff and citizens including Elysian Township, and the cities of Madison Lake, Waterville, Waseca, and Northfield.

The September 26th meeting in Waterville included 21 participants, and 7 staff from the Planning Work Group and Consultant Team. The 21 participants represented an assortment of local and state government entities (MNDNR, SWCDs, Counties, and Lake Associations), farmer/rural producer organizations (MN Corn Growers Association), and producers and citizens. At least four different communities (cities or townships) were represented by staff and citizens including Eureka Township, and the cities of Northfield, Faribault, and Red Wing.

Response Summary

As mentioned previously, Figures 2 and 3 identify the priority hotspots for participants of the Water Conversations. Additional knowledge about the hotspot areas shared at the meeting is summarized in Table 1. This information substantiates the identification (by Zonation) of these areas as hotspots in the landscape.

Table 1. Additional comments on hotspots identified on Zonation map.

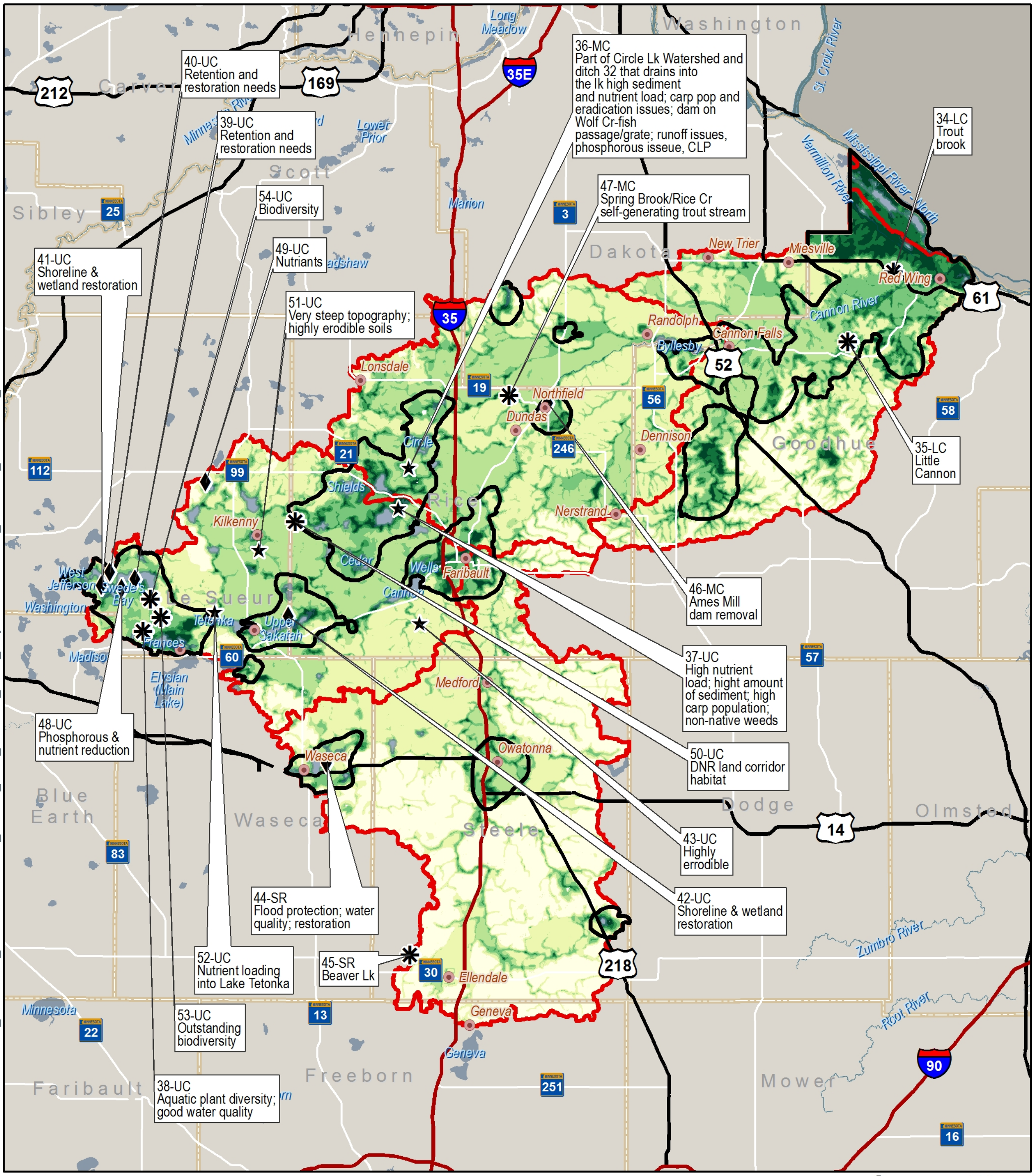
Zonation Area/ID ***Starting at the Mississippi River and heading upstream***	**Comment(s)**
1. Hotspot in the Lower Cannon Lobe containing the cities of Red Wing and Cannon Falls	None.
2. Hotspot in the Lower Cannon Lobe west of Wastedo	None.
3. Hotspot in the Middle Cannon River Lobe at Castle Rock	None.
4. Hotspot in the Middle Cannon River Lobe encompassing Chub Lake	None.
5. Hotspot in the Middle Cannon River Lobe at Northfield	Bottlenecks in the system (e.g. dams) contribute to flooding on the Cannon River.
6. Hotspot straddling the Middle and Upper Cannon River Lobes that includes Circle, Shields and Cedar Lakes	This hotspot includes the headwaters of the Cannon River. Circle Lake has carp, a fish passage/barrier of carp on Wolf Creek, and curly leaf pondweed.
7. Hotspot straddling the Middle and Upper Cannon River Lobes at the City of Faribault	Confluence of the two rivers (Cannon and Straight) which contributes to flooding in Faribault.
8. Hotspot in the Upper Cannon River Lobe at Waterville	Flooding in Waterville (on Tetonka and Sakatah). Tetonka had Eurasian Milfoil in 2016 but no cases in 2017. There are pinch points on Whitewater Creek. City stormwater runoff runs into the lakes. Highly erosive areas due to gradient differences of watershed.
9. Hotspot in the Upper Cannon River Lobe at Elysian	Flooding in Elysian. Good quality lakes with native vegetation and high recreational value. Lake Frances has a lot of carp, and a small area of Eurasian Watermilfoil which was discovered this year (2017).
10. Hotspot in the Upper Cannon River Lobe at Reeds Lake	2 creeks coming into the system at this location.
11. Hotspot in the Straight River Lobe at Waseca	Stormwater runoff discharging directly to the lake.
12. Hotspot in the Straight River Lobe at Owatonna	Flooding in 2014. A lot of clay in the area. 2 dams on Maple Creek. Dam downtown fills with sediment which required on-going maintenance. Public Works facility flooded in 2010.
13. Hotspot in the Straight River Lobe encompassing Oak Glen Lake	None.

Additional issues and concerns identified during these Water Conversations are summarized below (see Table 2). Some of the comments made at the meetings addressed the prioritization process while most of the comments addressed the issue categories.

Table 2. General comments made during the 2nd series of Water Conversations.

Prioritization Process
Should urban areas (e.g. MS4 communities) be ranked separately from other areas in the watershed since they already receive funding for implementation?
What is the value in using data layers/mapping tools that may be outdated? Agricultural practices have improved in the last 5-10 years and these improvements may not be reflected in the model output being used to prioritize issues/concerns and specific areas in the watershed.
Consider addressing issues in upstream portion of the watershed or individual resource drainage areas before addressing issues downstream.
Resource Concerns: Stream, Lakes, Rivers
Fishermen living in more rural portions of the watershed have noted that there is a lack of fish in the Cannon River, the Cannon River has an oily sheen, and turbidity appears to be increasing. This trend (between Northfield and Lake Byllesby) has been observed over the last couple of years.
Evaluate the role(s) dams play today. Residents question the need for dams and the impact they have on riverine systems. Dam in Owatonna traps a lot of sediment and requires maintenance (sediment removal) twice/year. Why not remove these dams from the system?
The Straight River is very polluted. The headwaters start in a slough.
A portion of Belle Creek is proposed to be classified as a trout stream by MDNR.
High fish quality in unimpaired lakes: Roemholts, Kelly, Dudley, Fish – groundwater fed.
Resource Concerns: Climate Change
There have been a number of significant rainfall events in the last two years that have resulted in flooding. What has changed? More extreme precipitation, how it is delivered over the course of the year, and pinch-points in the system is resulting in more flooding.
What levels should we be maintaining on lakes so there is storage capacity in the system for extreme precipitation events? Can dams/outlets be managed to increase storage in the system as one of the tools in the toolbox? Balance the need for storage with recreation.
Landscape Concerns: Agriculture
How many of the streams, rivers and lakes are monitored for water quality and at how many points along the system? It is important to see how concentration increases over the length of the system to identify sources of pollutants.
Livestock farming is a concern. How is manure managed? Is it being applied correctly? How close to the waterbody is the farm?
There aren't a lot of dairy farms in the western part of the Planning Area anymore. Size of the farm may determine the level of treatment (BMPs) being used to mitigate impacts. Perception that larger farms have more BMPs in place than smaller farms.
Examples of farmers using cover crops in the Circle Lake subwatershed results in a lot of storage in the landscape.
Farmers and organizations representing producers reluctant to attend public engagement meetings because there is often a lot of finger-pointing.
There is a need to adopt policies that recognize potential impacts to the agricultural community.
There is a need to educate municipal officials and residents of the watershed about agricultural practices. There is a misconception that agriculture is bad for the environment.

Drain tile systems move water off the landscape more quickly than under pre-settlement conditions. This compounds flooding issues.
Depending upon the design of the system, there can be benefits to tiling including water quality treatment, erosion and sediment control, and rate control. Removing tiling systems could cause bigger problems downstream.



Legend

- Cannon River 1W1P
- Lobes
- Hot Spots
- City
- County
- Lake, Pond or Reservoir
- River or Stream (polygon)

Public Concerns

- Protect
- Restore
- Protect/Restore
- ?

EOR water ecology community

Cannon River One Watershed One Plan

Comments from Waterville Meeting 9/26/17

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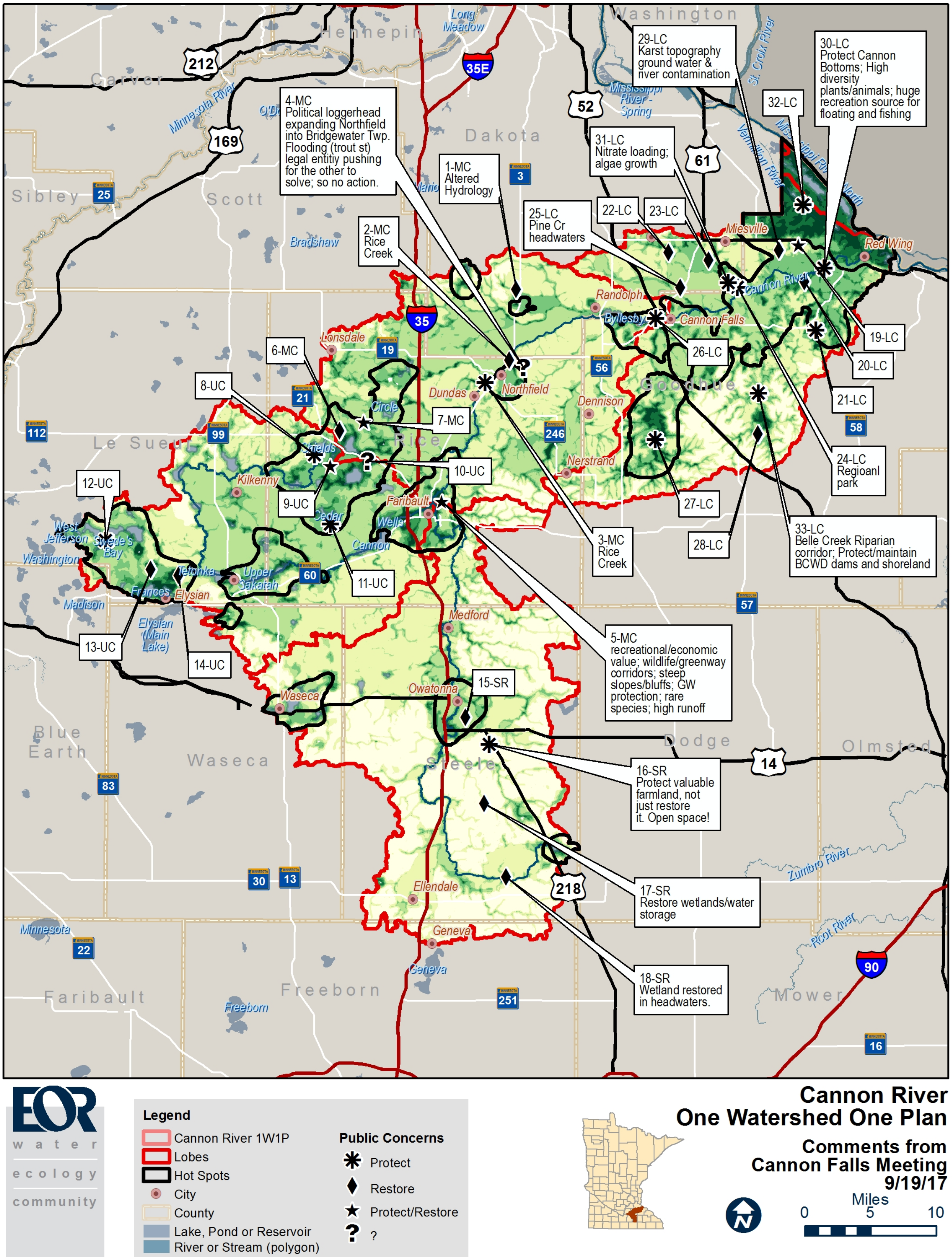
Cannon River One Watershed One Plan

Comments from Cannon Falls Meeting 9/19/17



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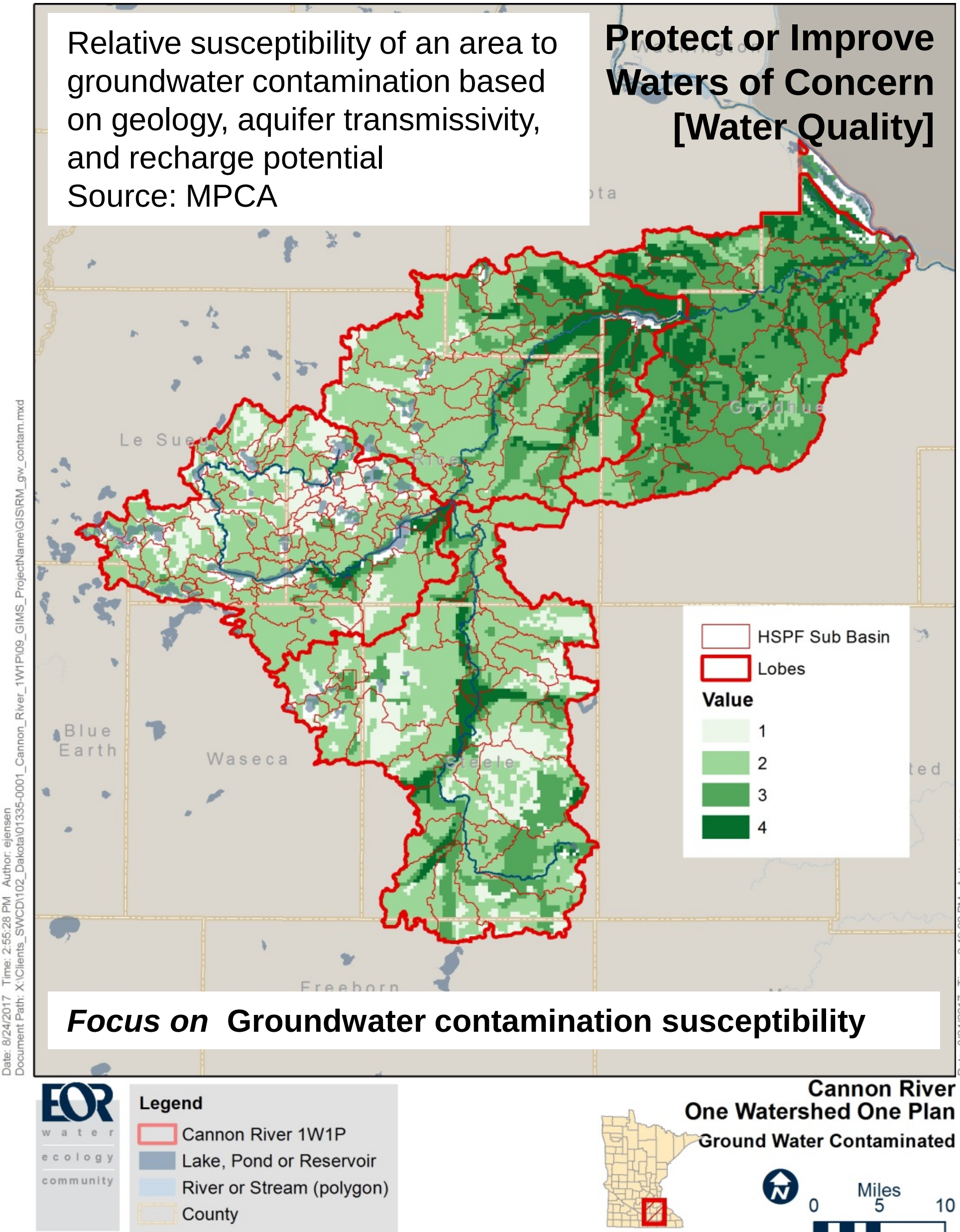
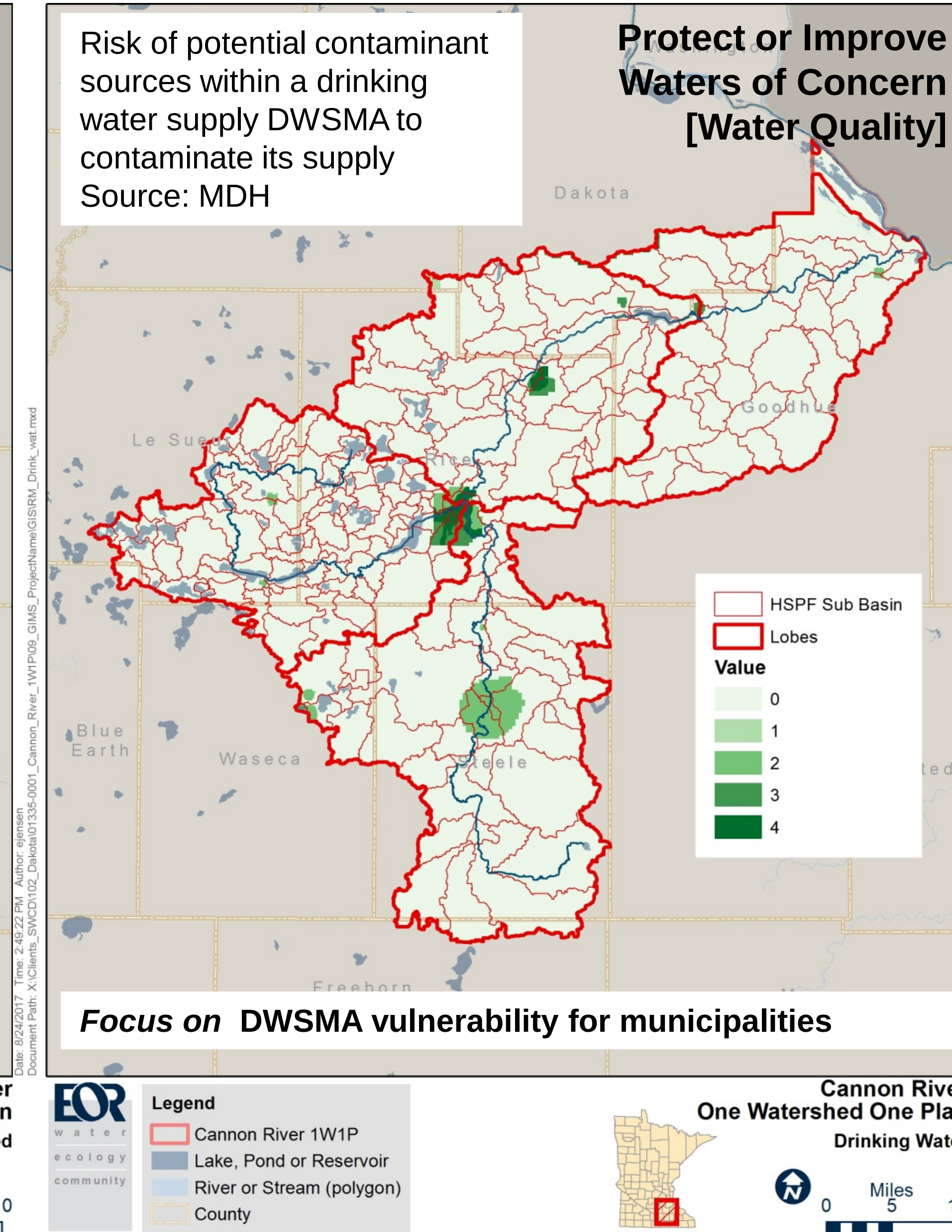
Cannon River 1W1P Zonation Inputs

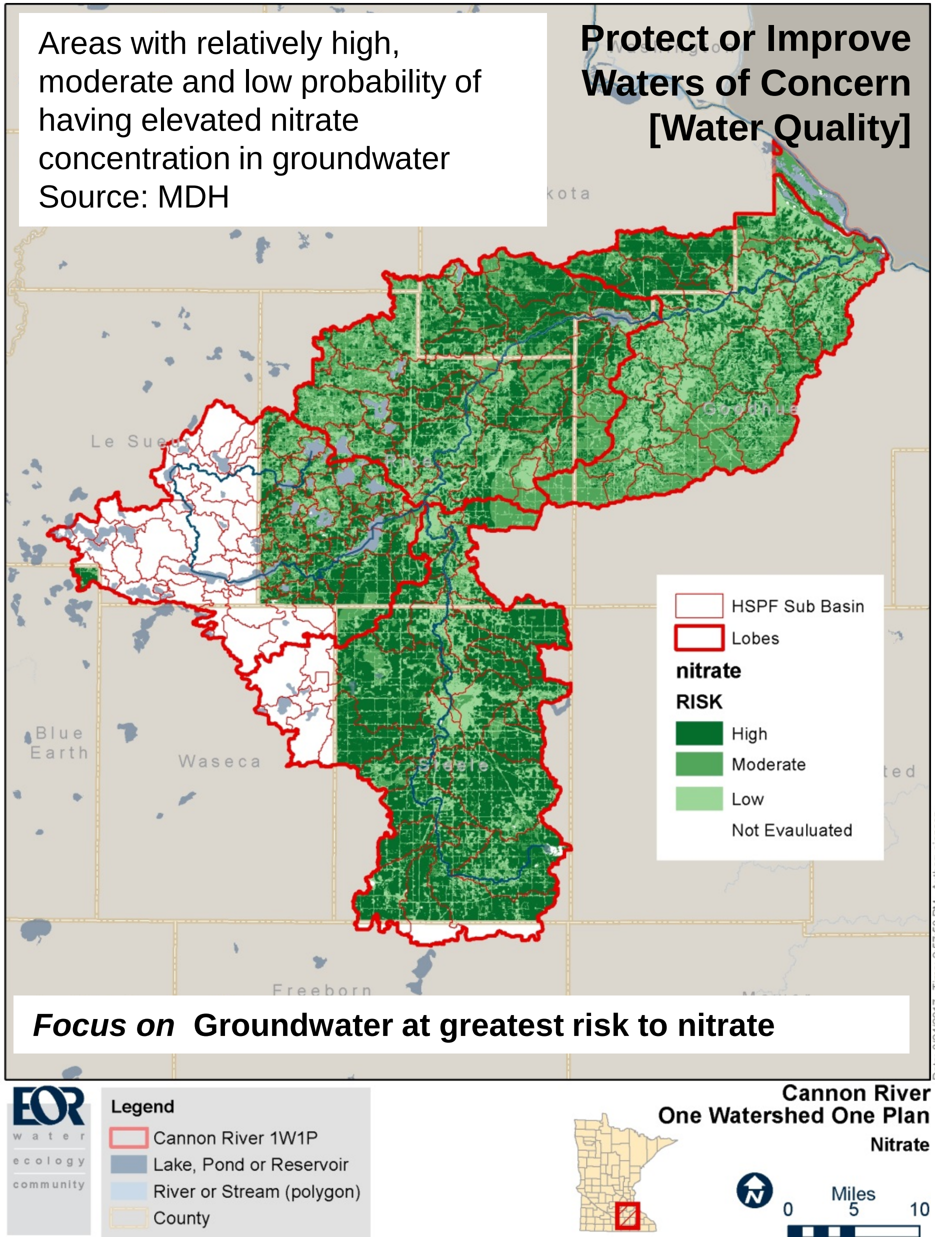




Cannon River 1W1P Zonation Inputs

Protect or Improve Waters of Concern [Water Quality]

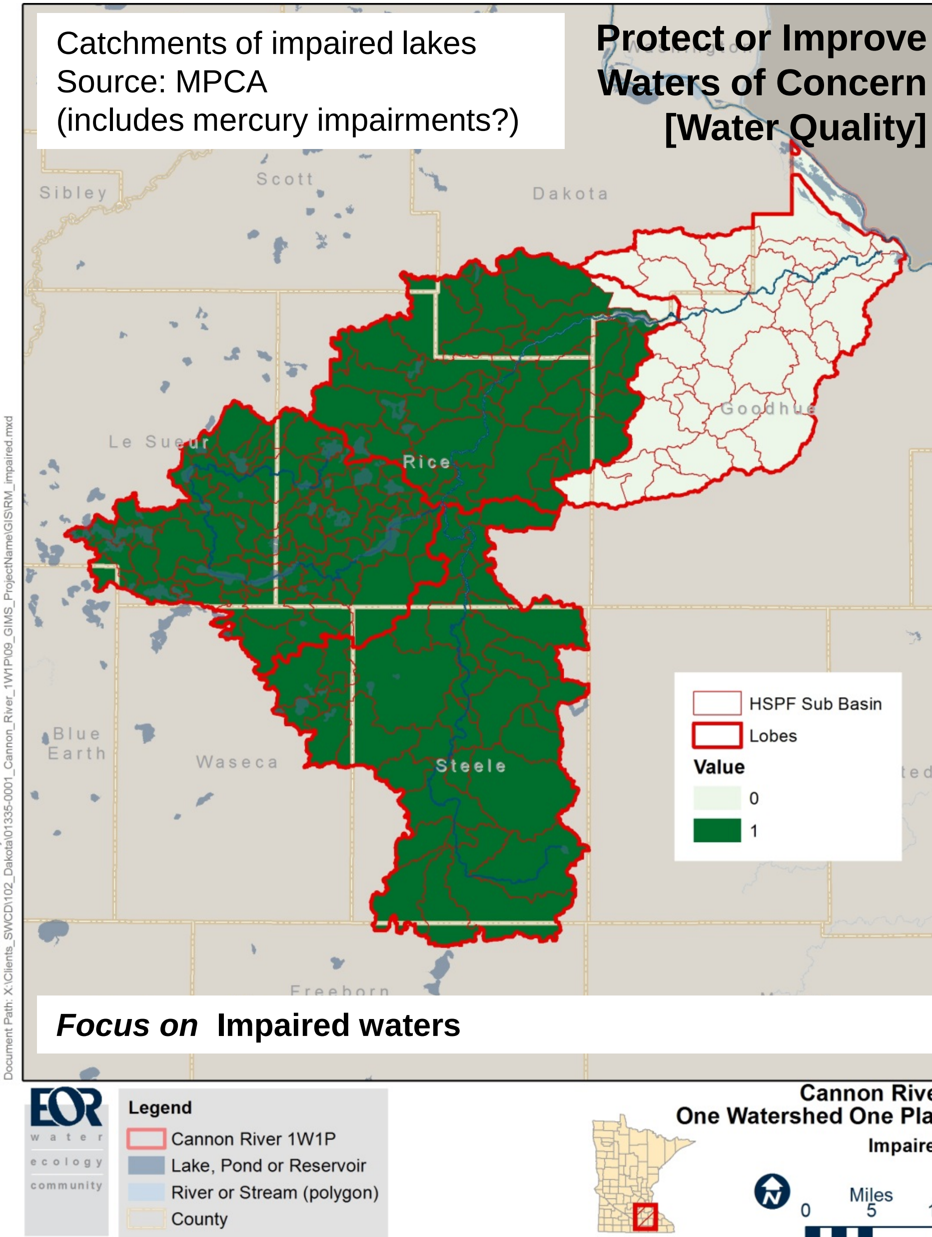
Areas with relatively high, moderate and low probability of having elevated nitrate concentration in groundwater
Source: MDH



Focus on **Groundwater at greatest risk to nitrate**

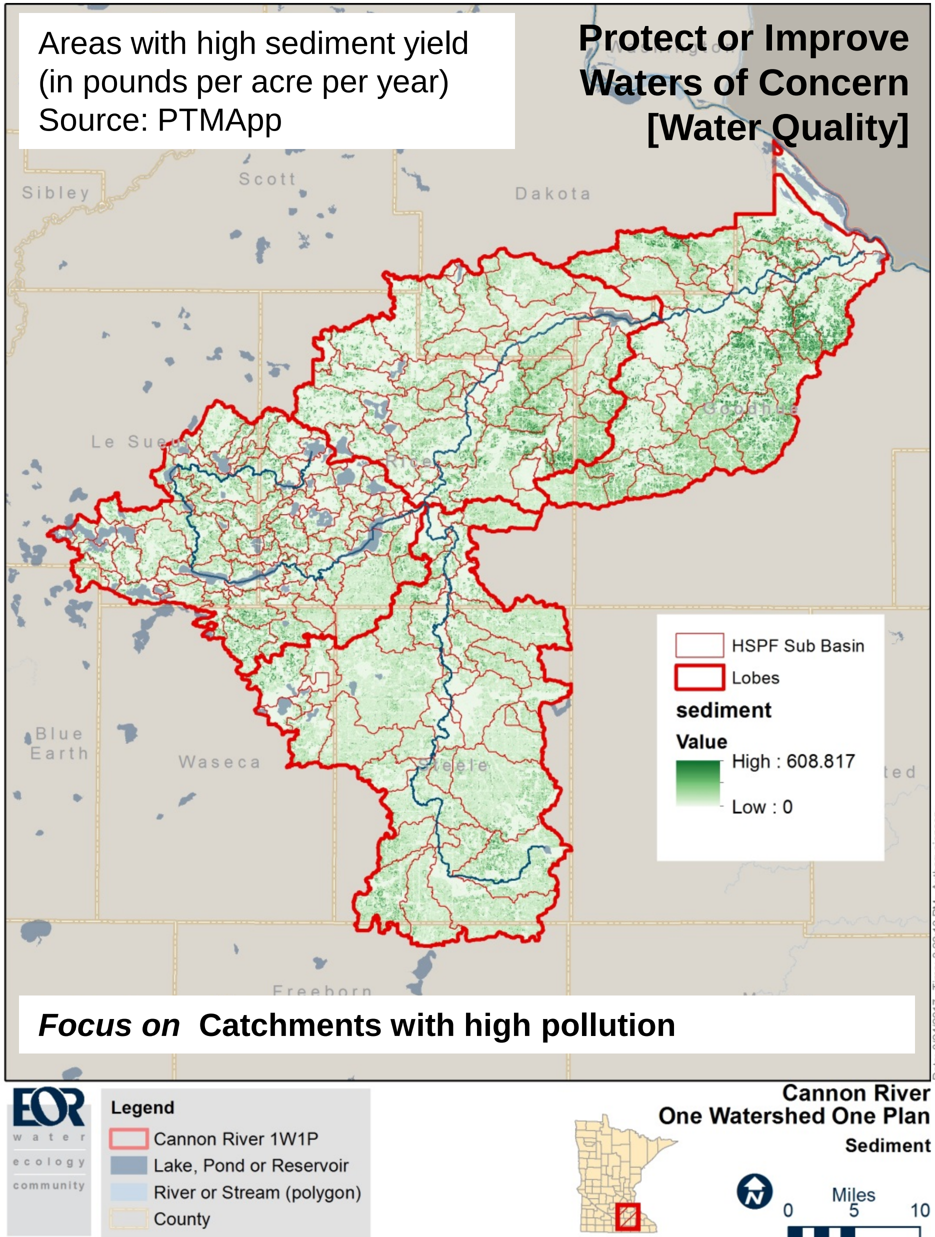
Protect or Improve Waters of Concern [Water Quality]

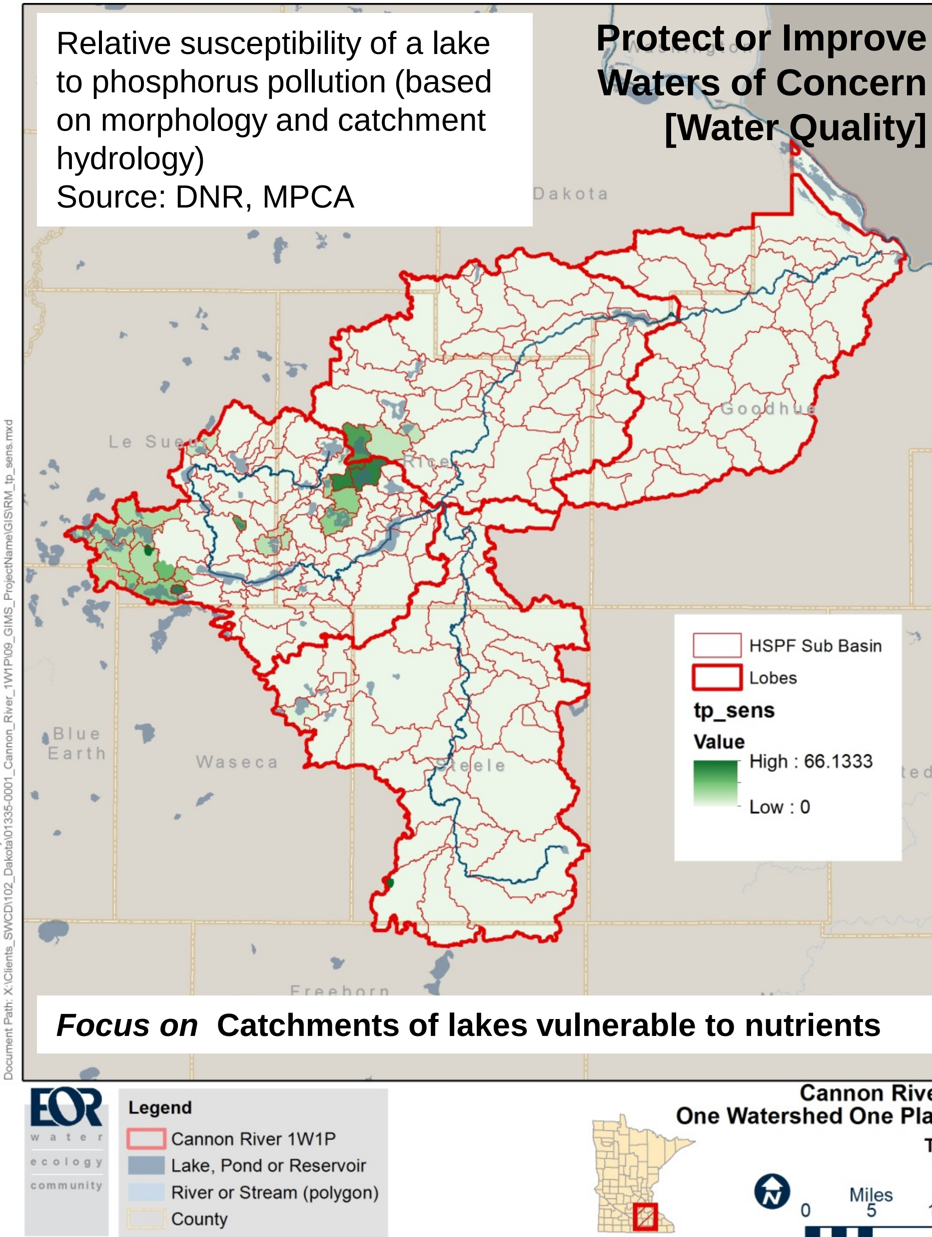
Catchments of impaired lakes
Source: MPCA
(includes mercury impairments?)



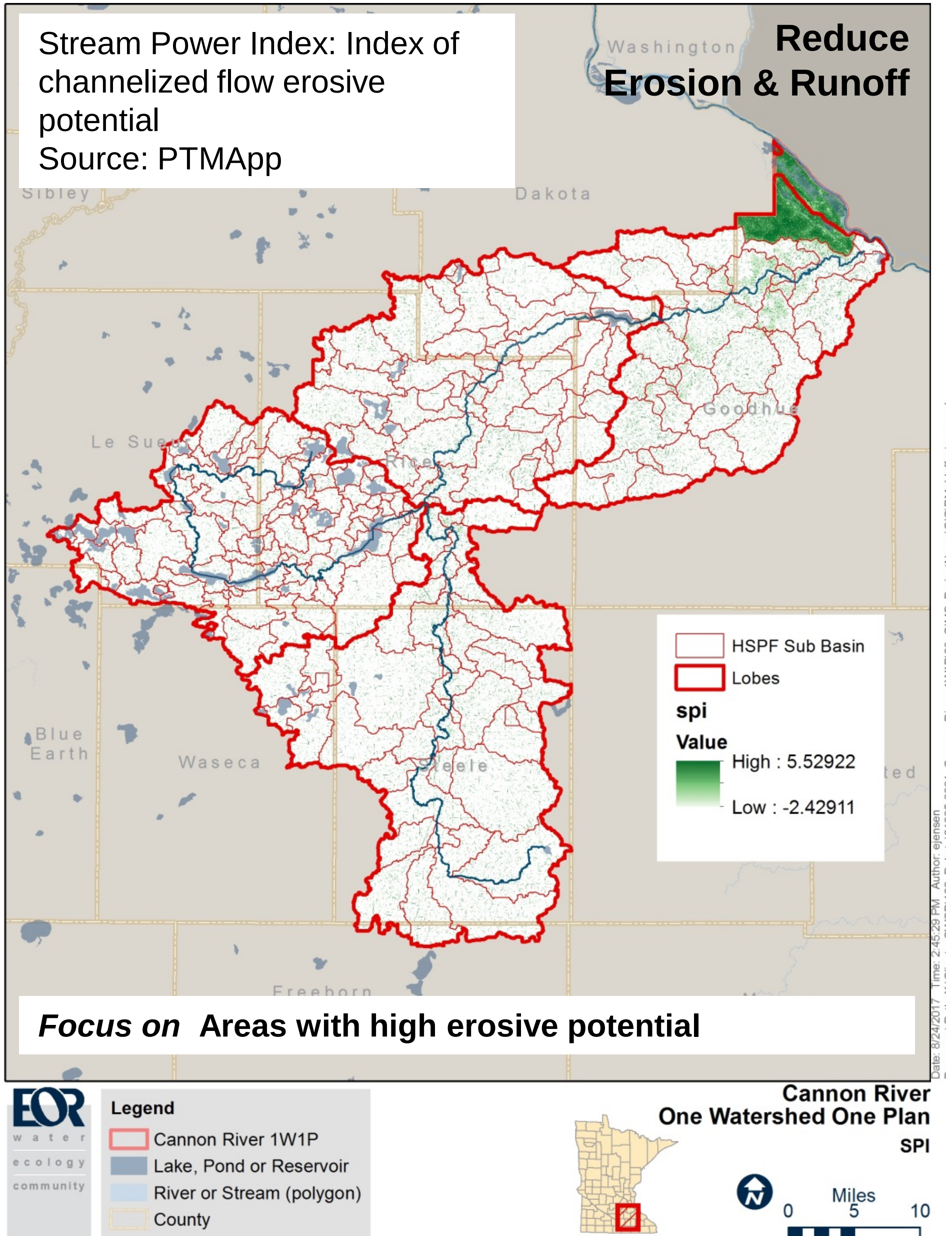
Focus on **Impaired waters**

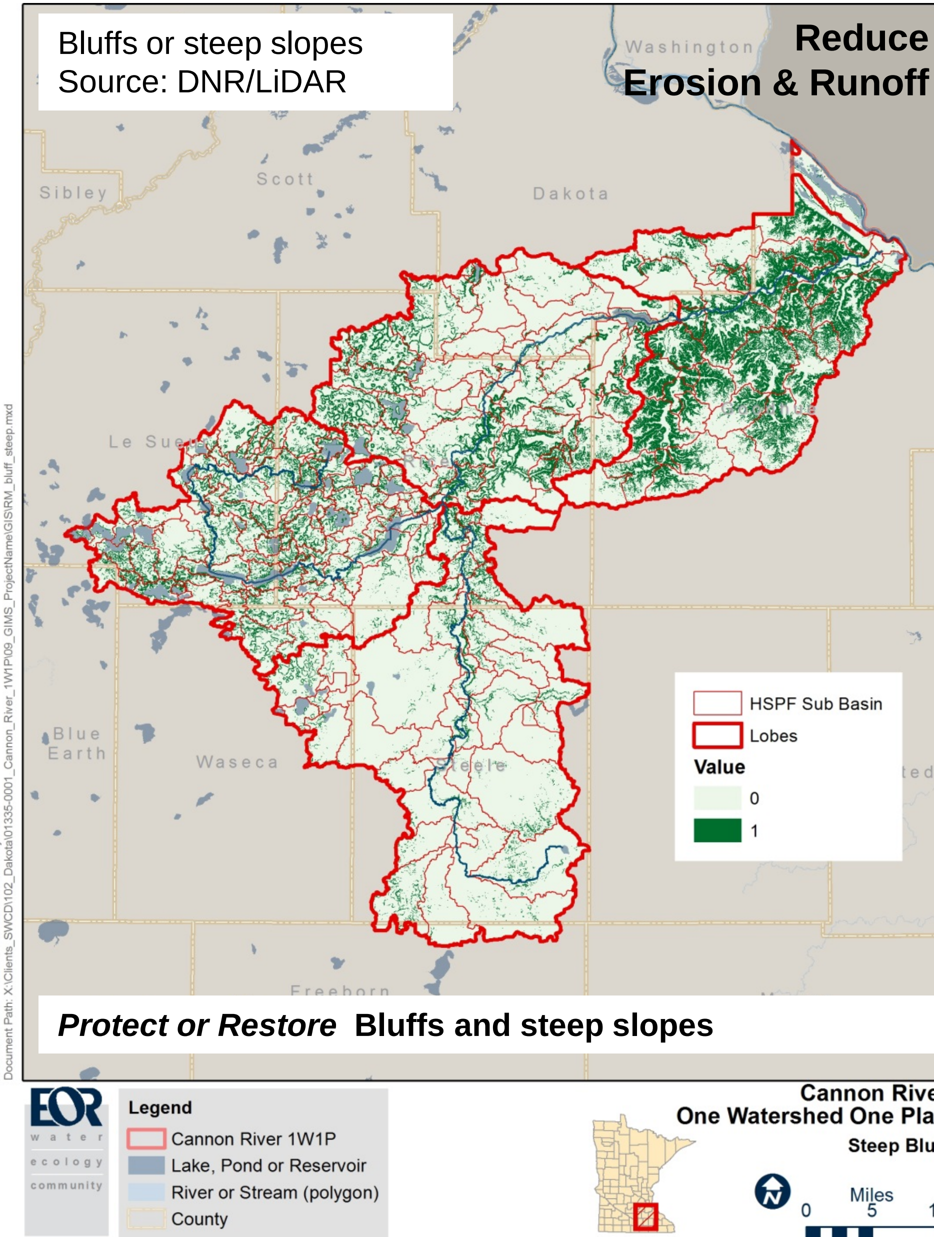
Cannon River 1W1P Zonation Inputs



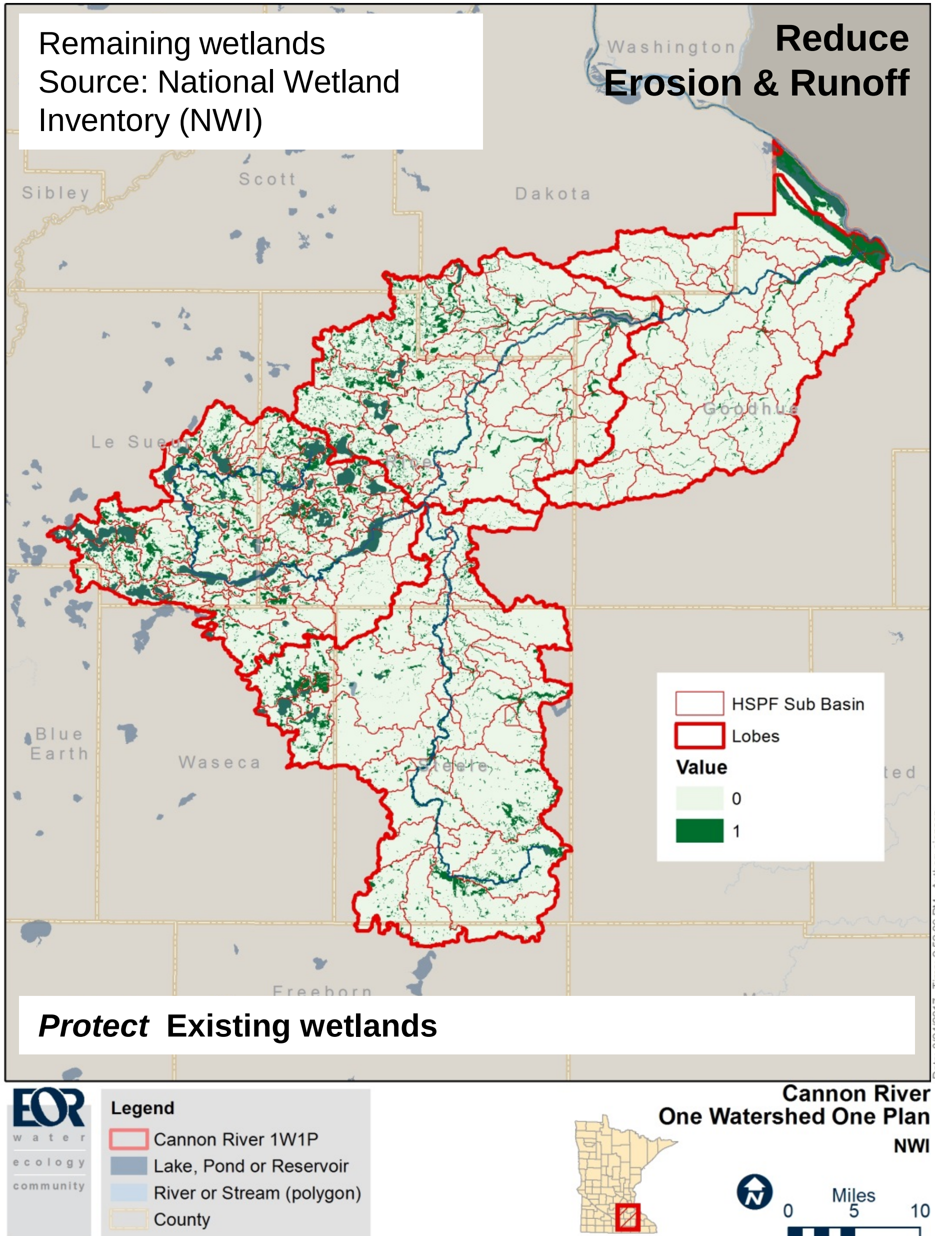


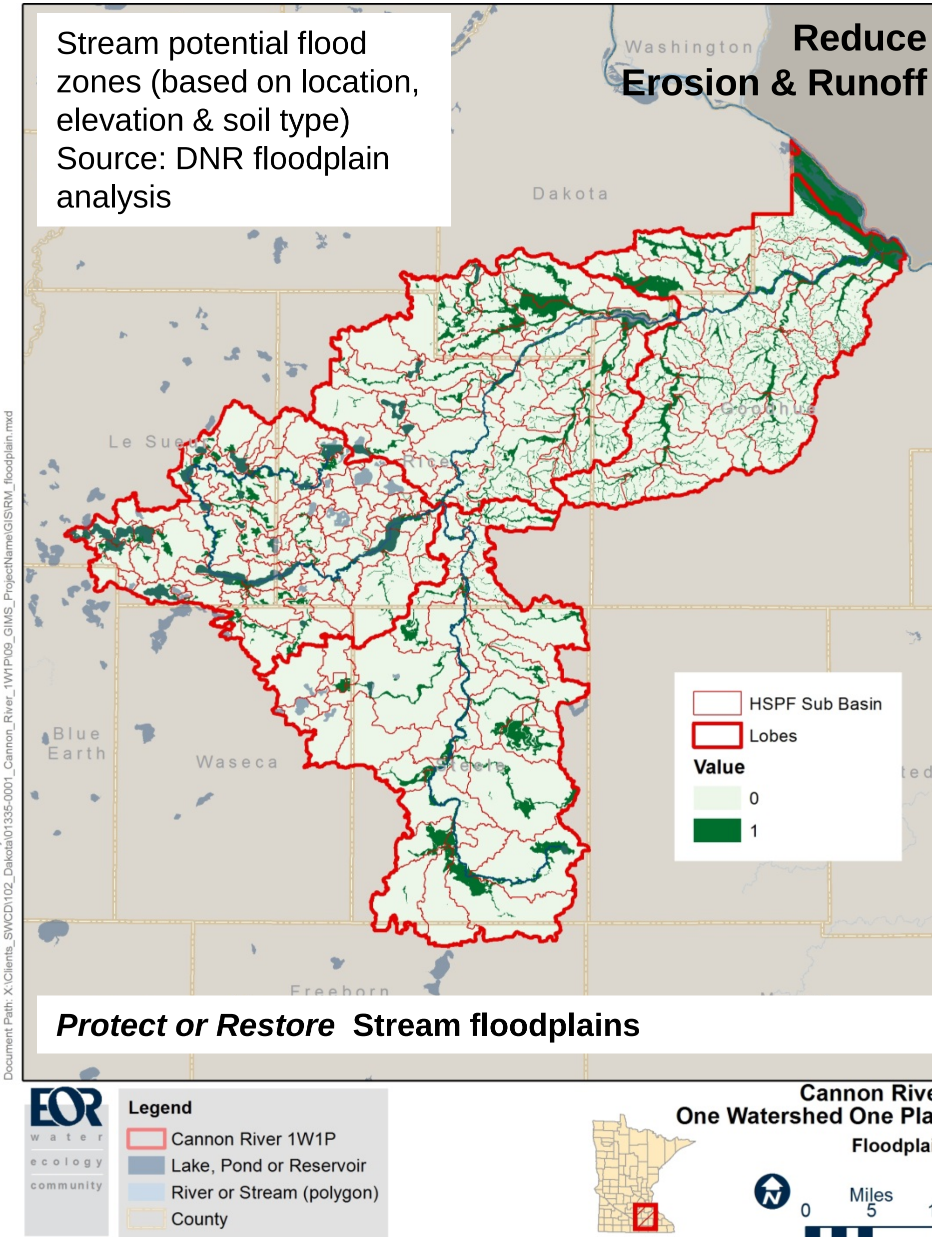
Cannon River 1W1P Zonation Inputs



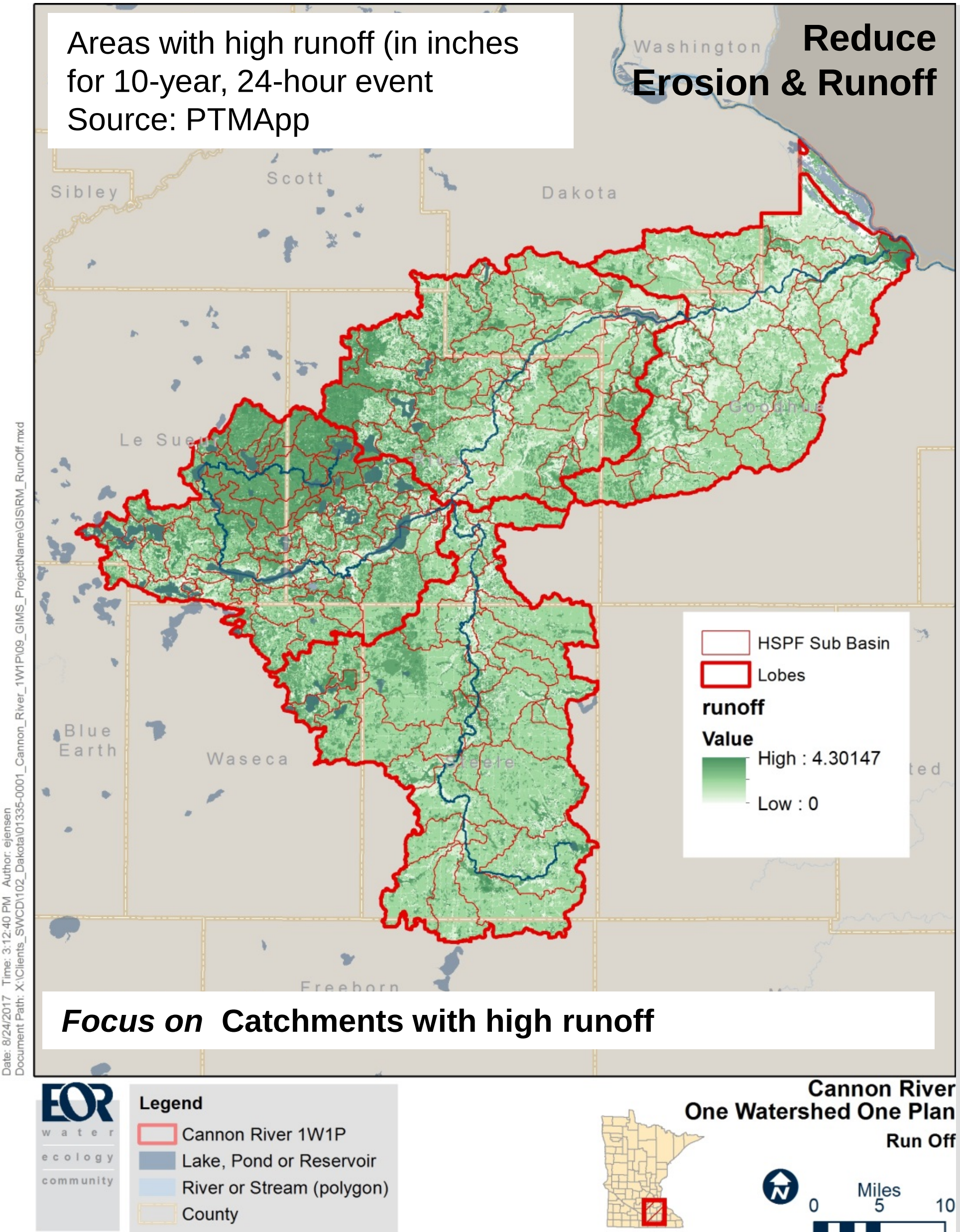


Cannon River 1W1P Zonation Inputs

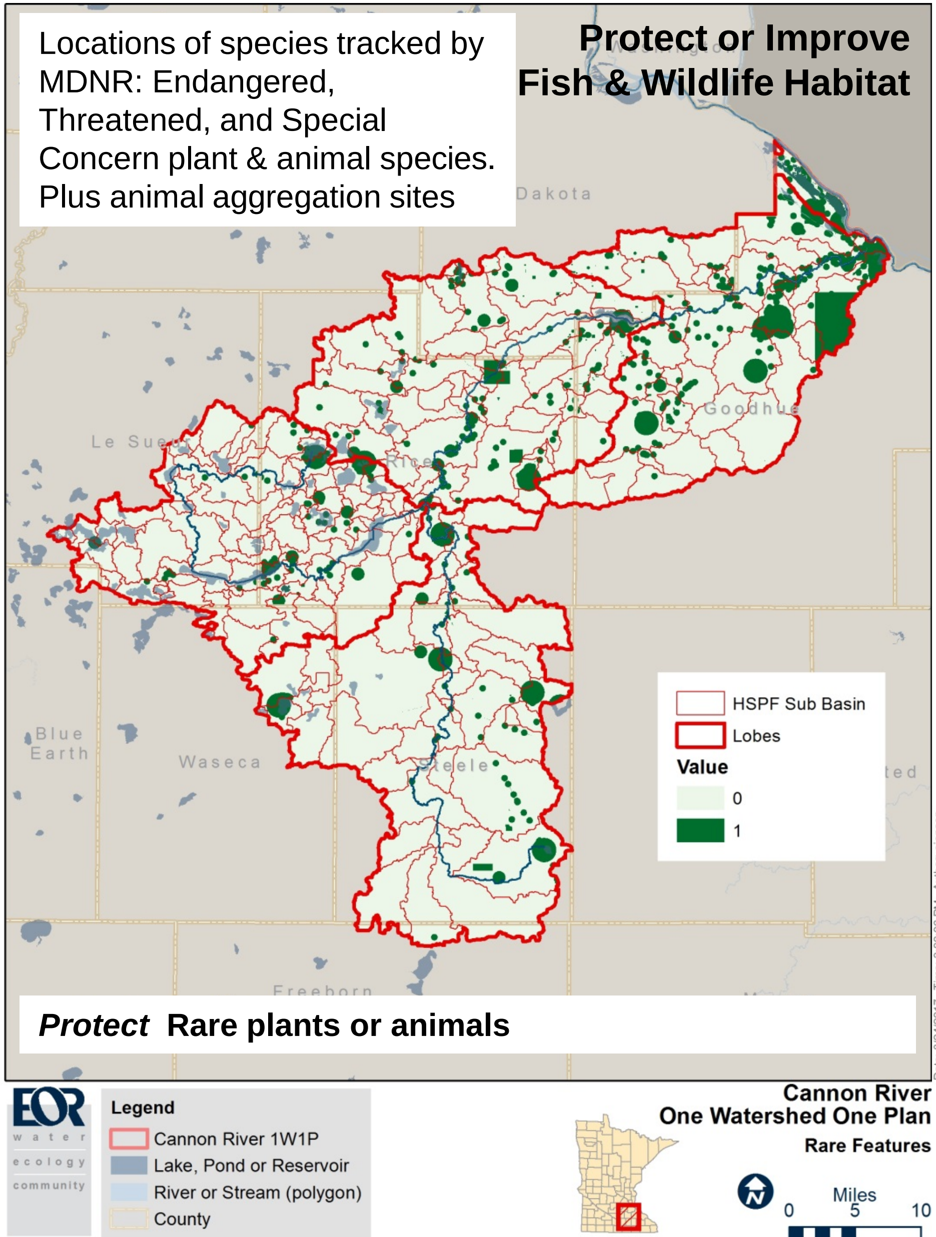


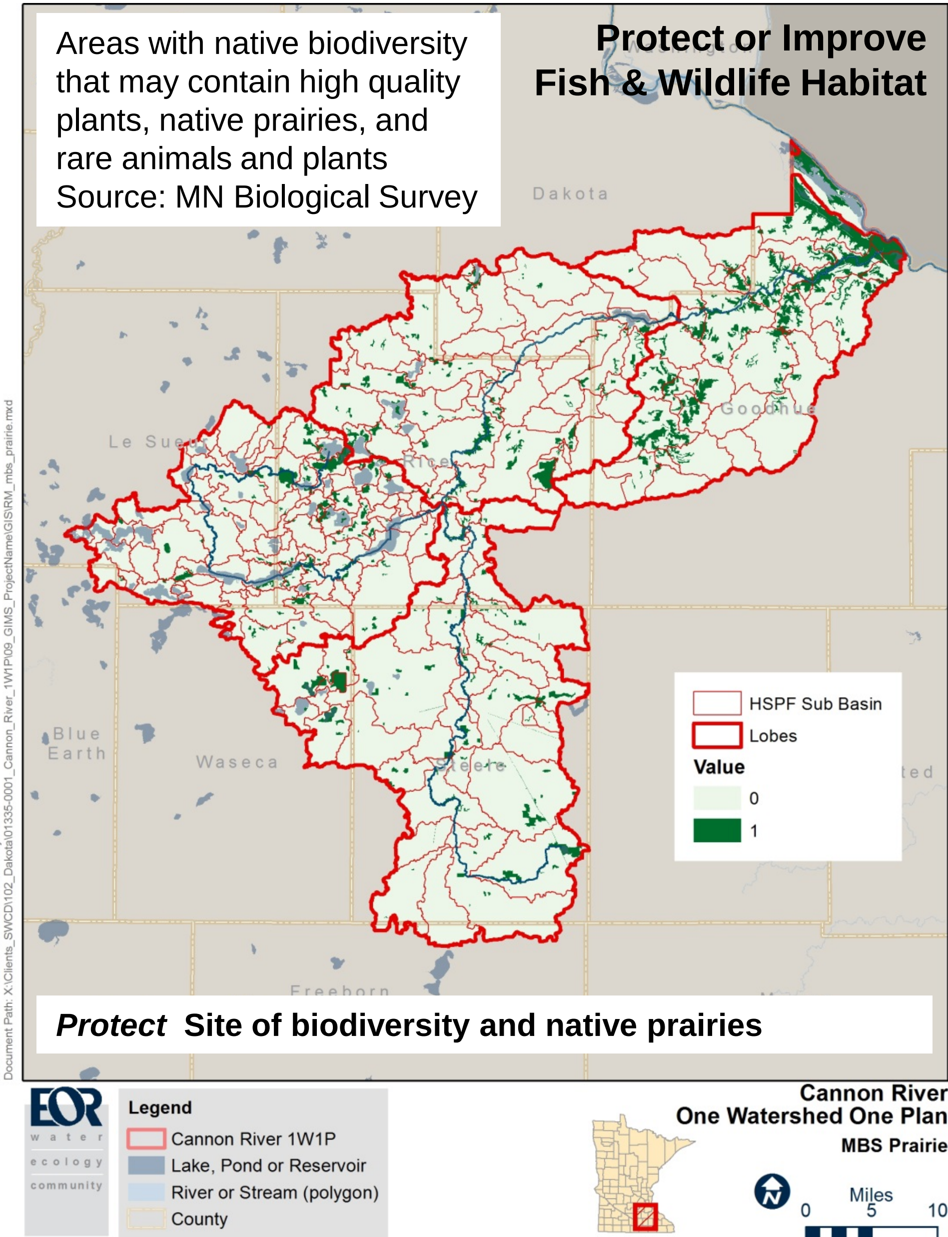


Cannon River 1W1P Zonation Inputs



Cannon River 1W1P Zonation Inputs

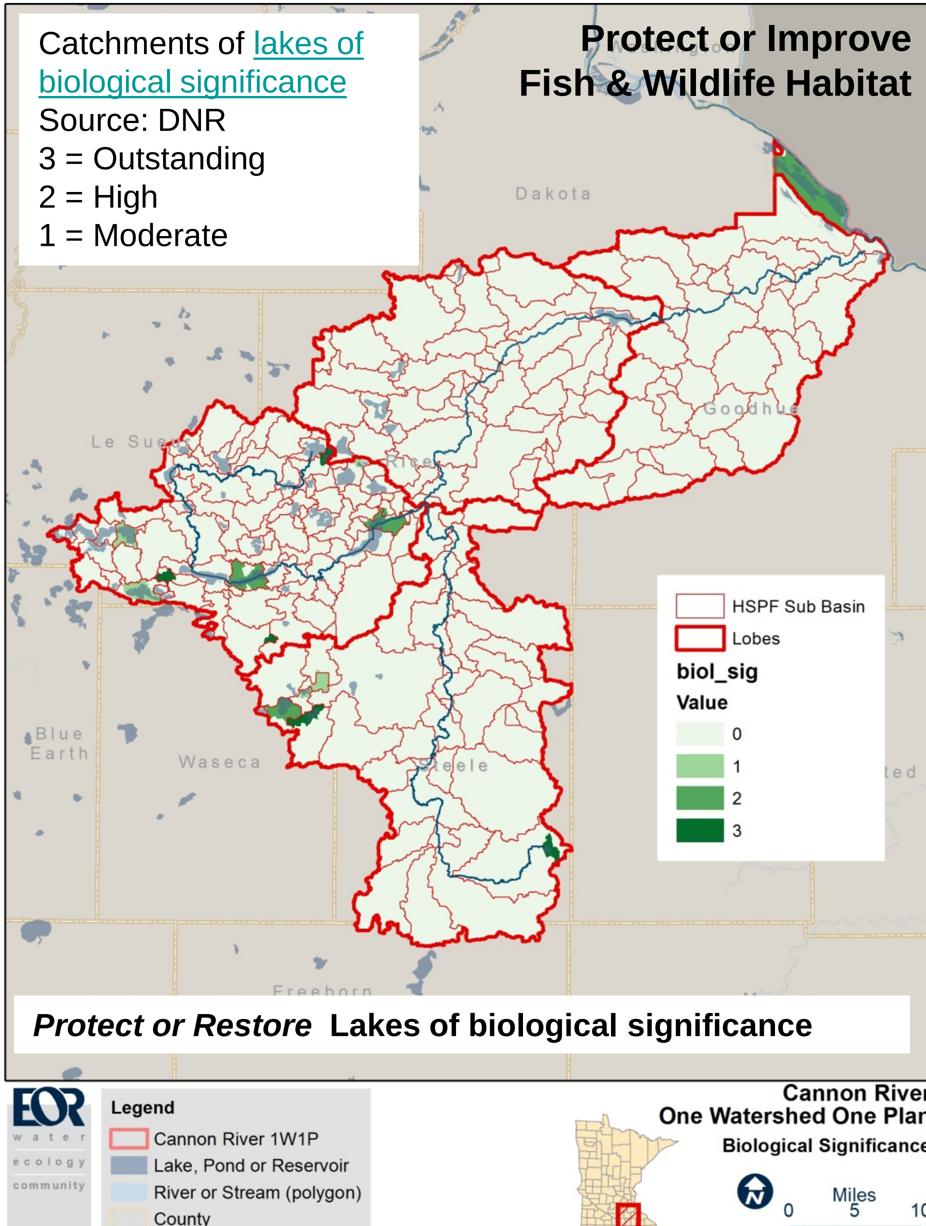




Cannon River 1W1P Zonation Inputs

Protect or Improve Fish & Wildlife Habitat

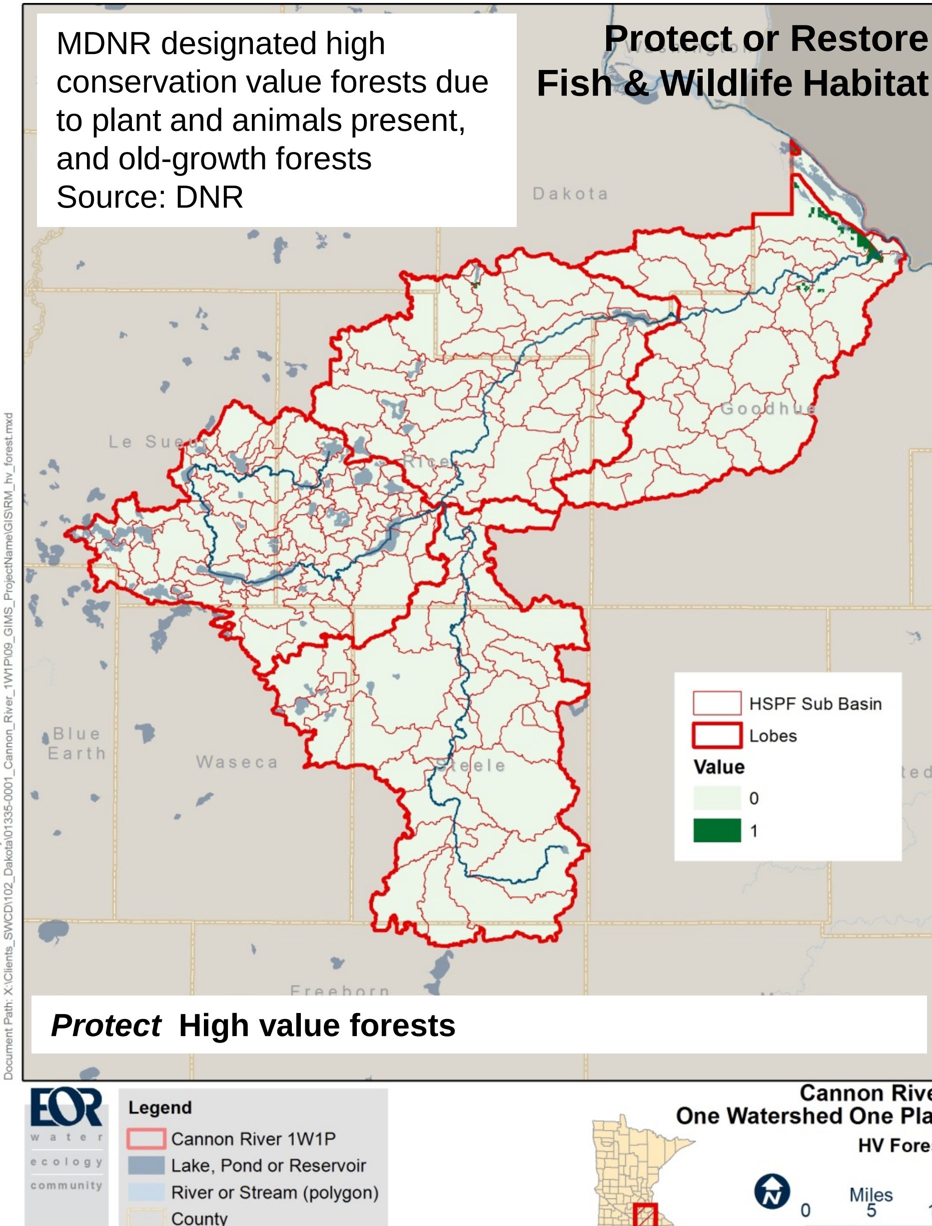
Catchments of lakes of biological significance
Source: DNR
3 = Outstanding
2 = High
1 = Moderate



Protect or Restore **Lakes of biological significance**

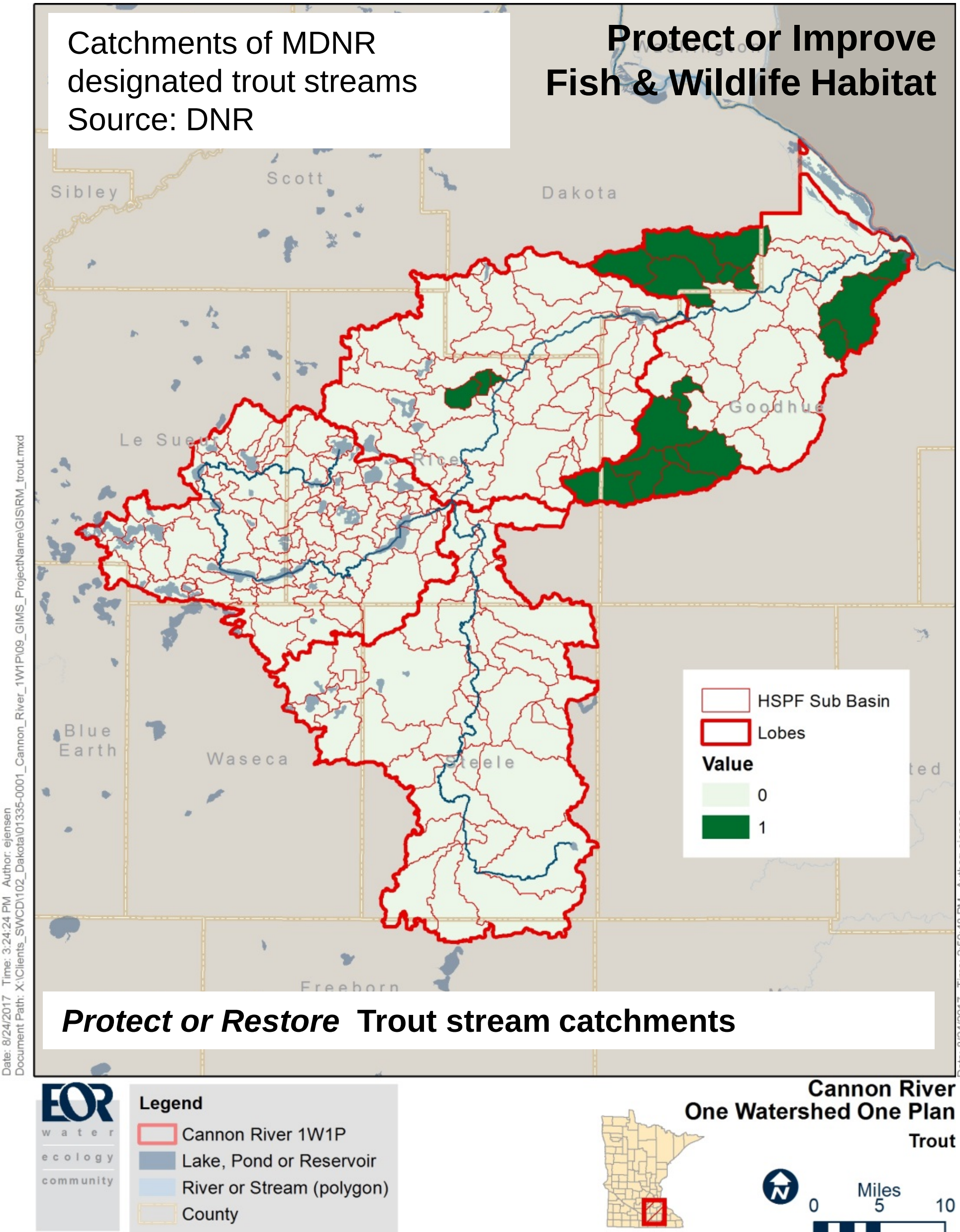
Protect or Restore Fish & Wildlife Habitat

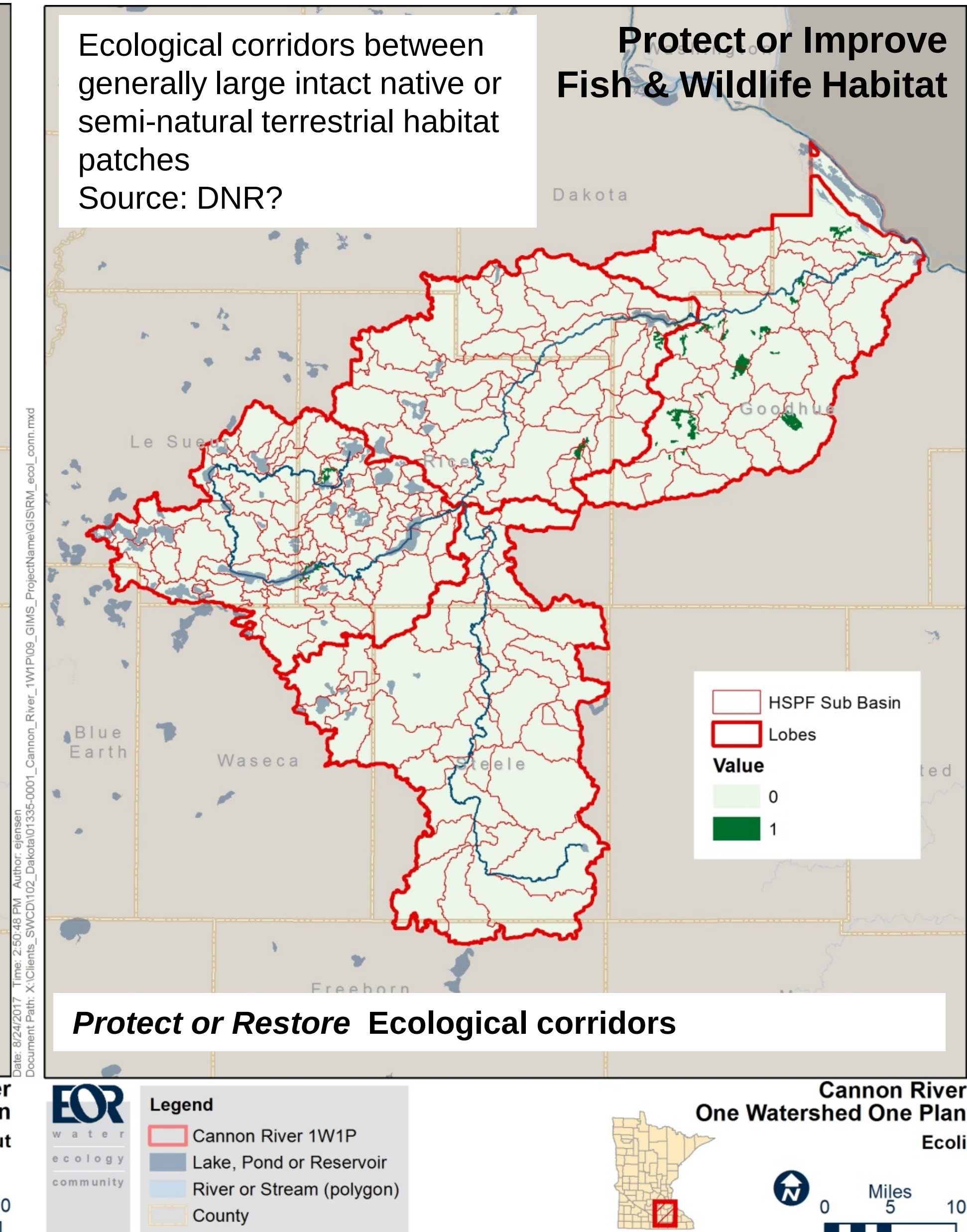
MDNR designated high conservation value forests due to plant and animals present, and old-growth forests
Source: DNR



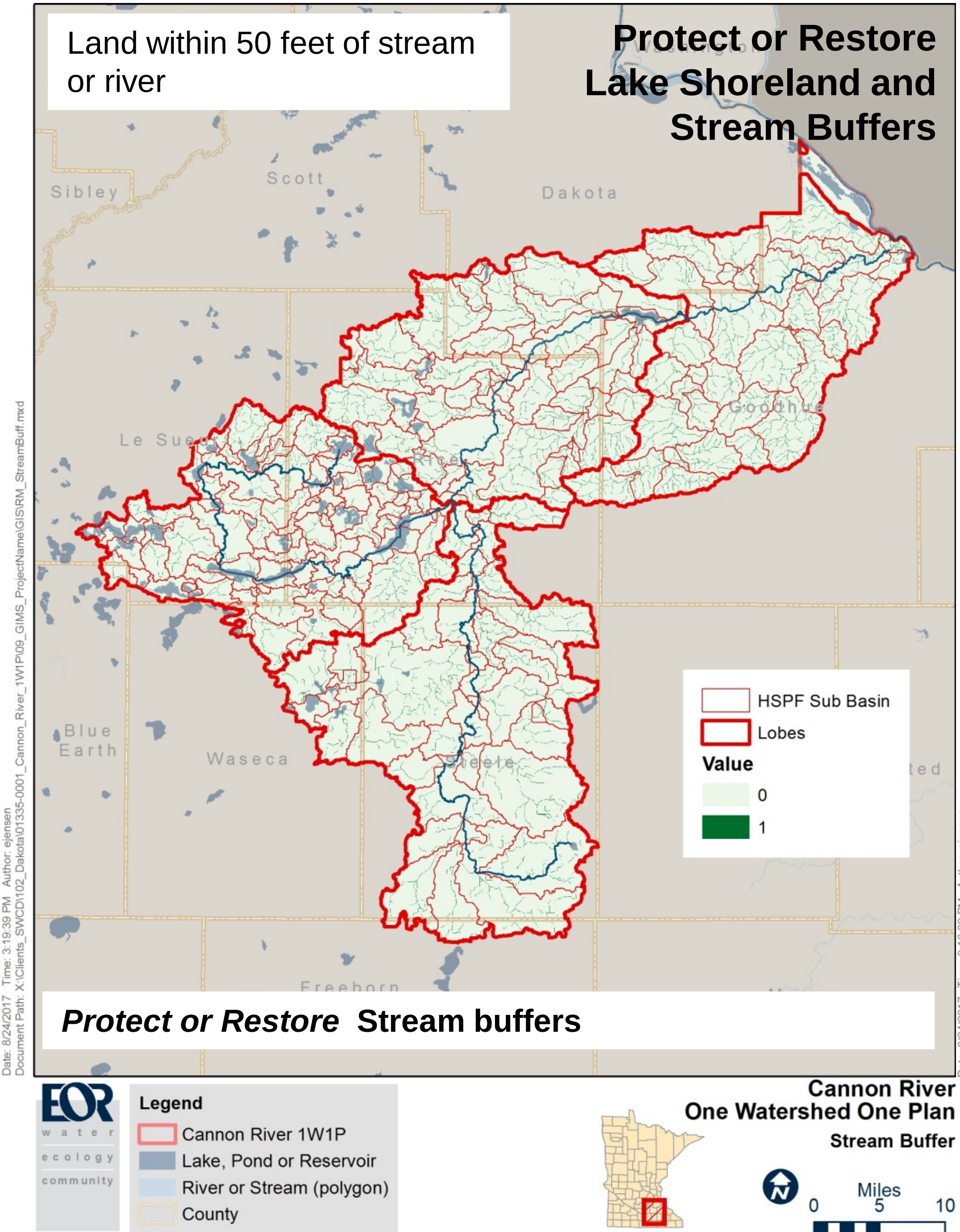
Protect **High value forests**

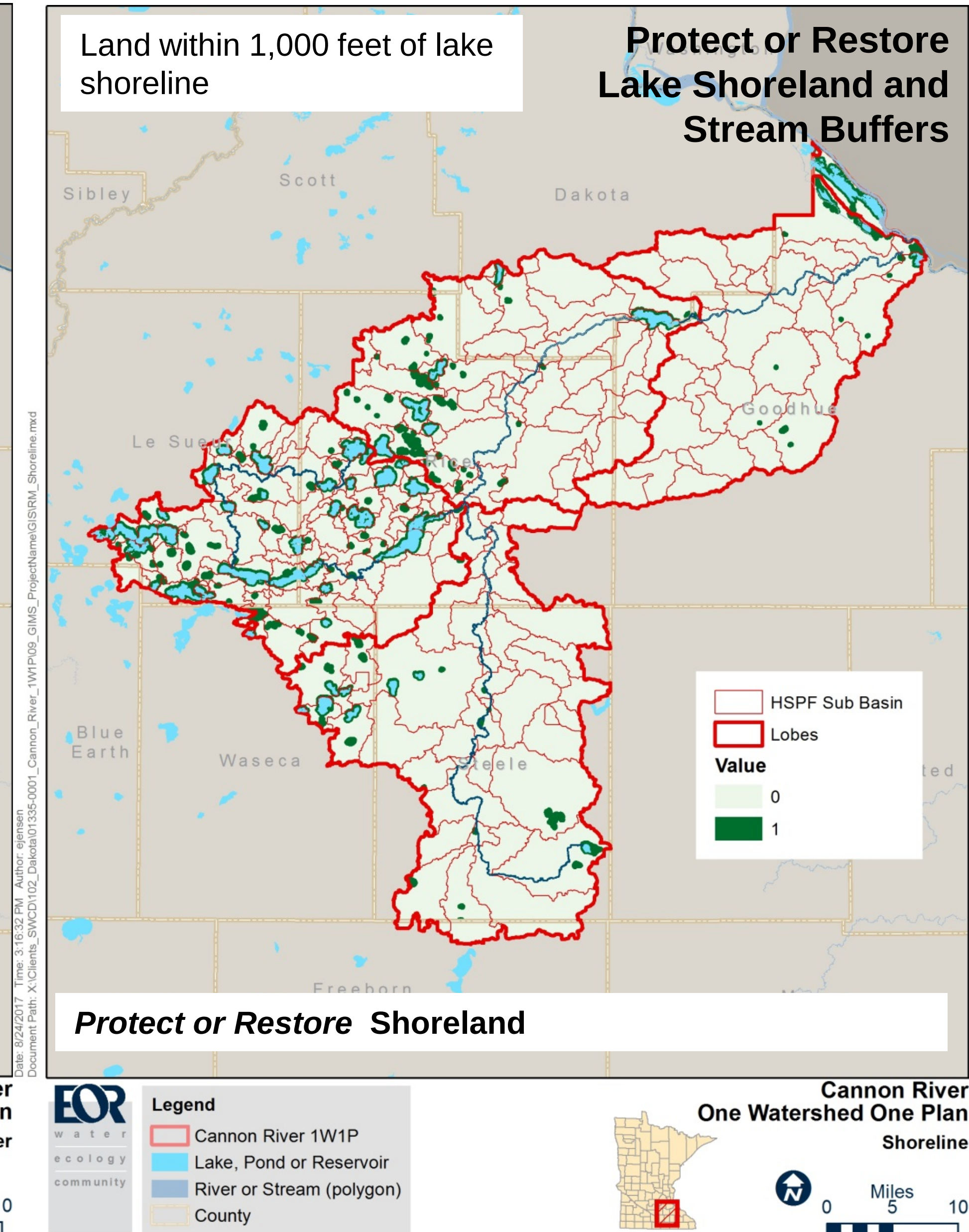
Cannon River 1W1P Zonation Inputs



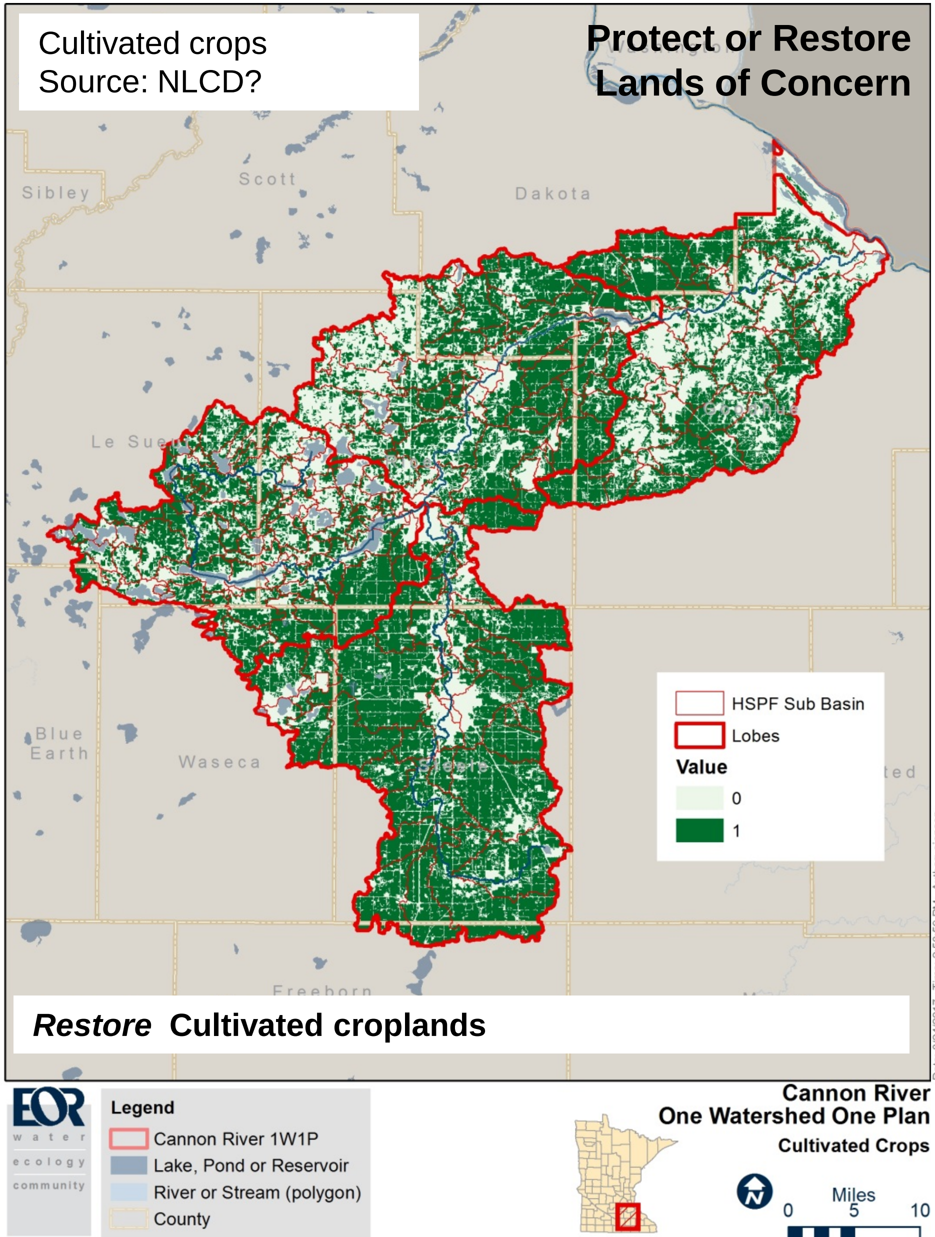


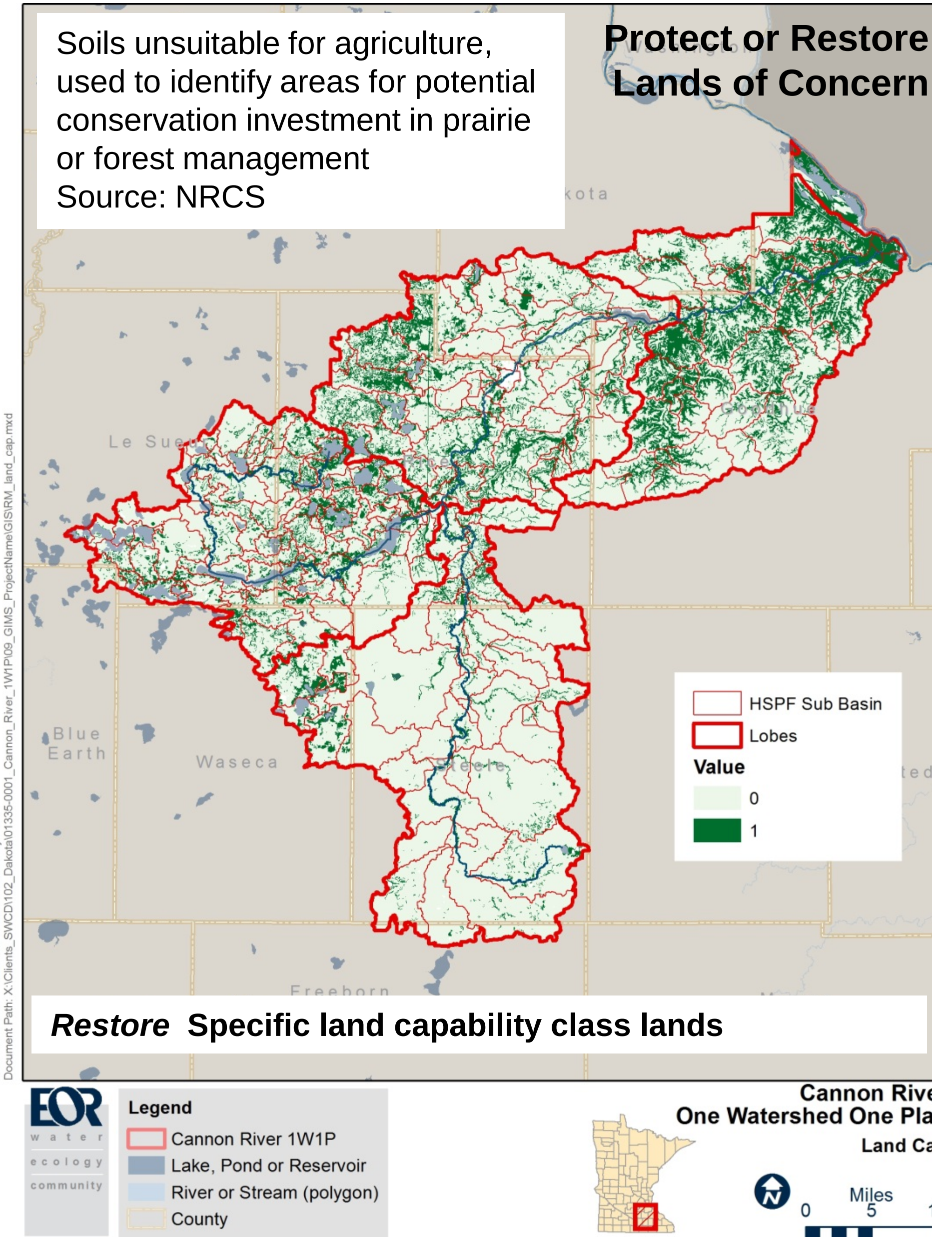
Cannon River 1W1P Zonation Inputs





Cannon River 1W1P Zonation Inputs

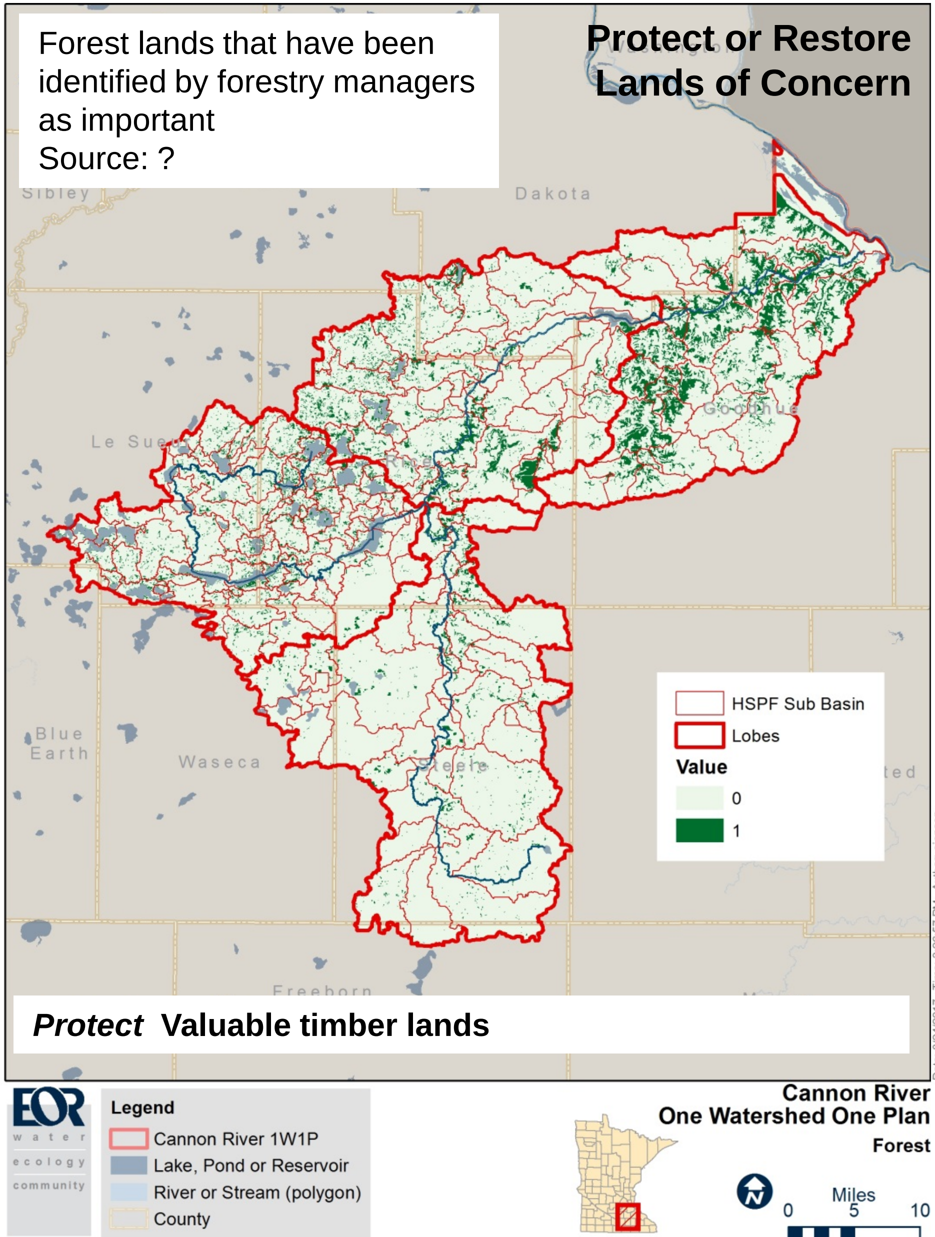




Cannon River 1W1P Zonation Inputs

Forest lands that have been identified by forestry managers as important
Source: ?

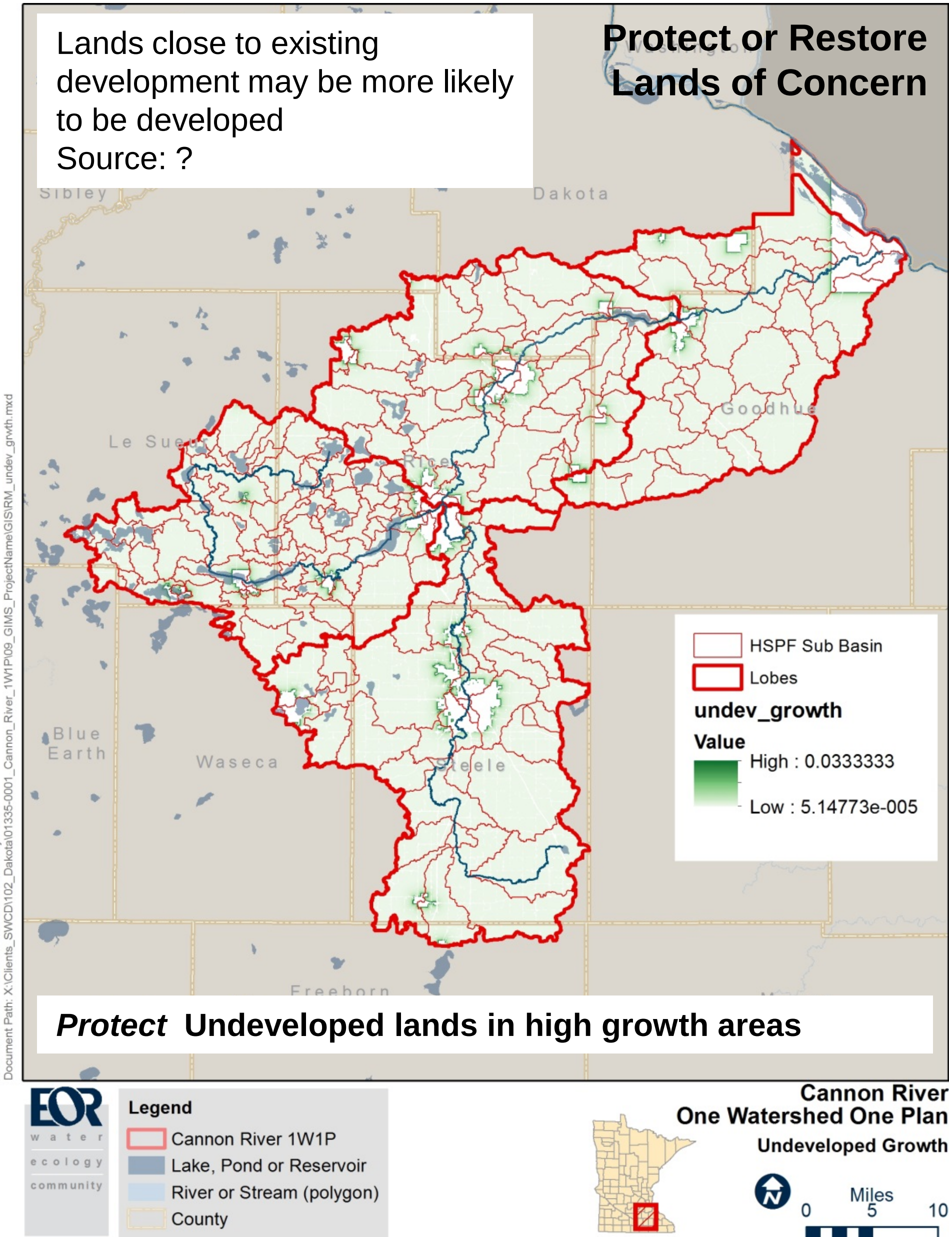
Protect or Restore Lands of Concern



Protect **Valuable timber lands**

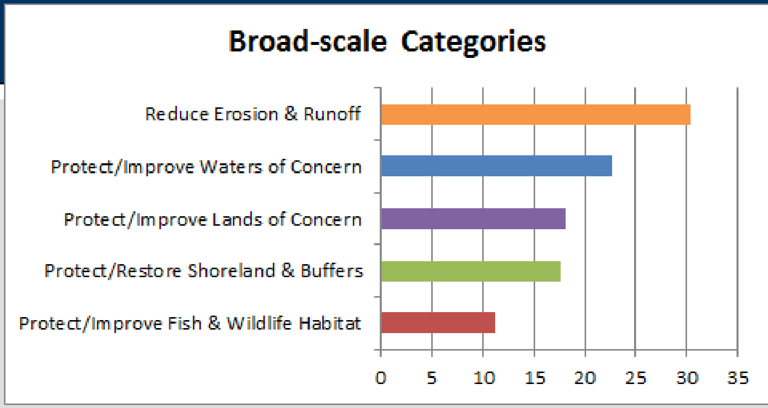
Lands close to existing development may be more likely to be developed
Source: ?

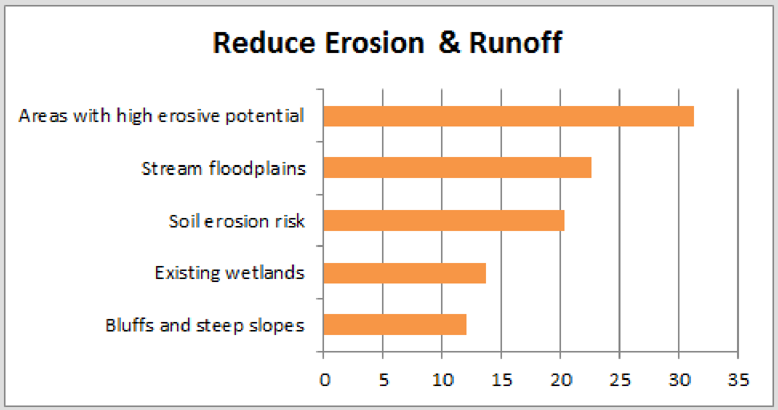
Protect or Restore Lands of Concern

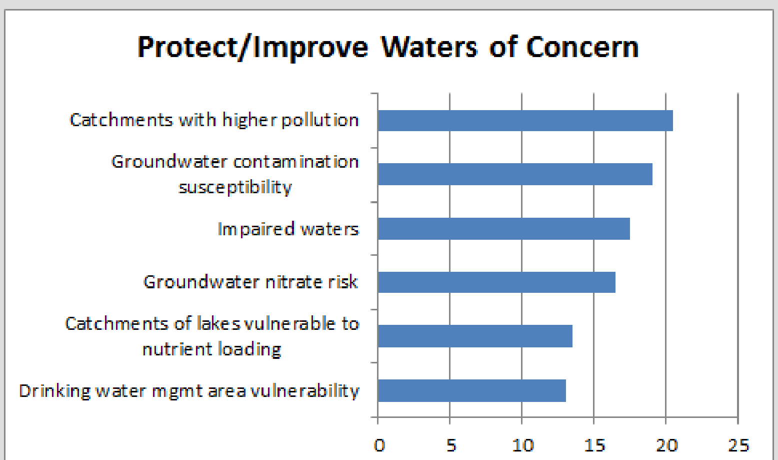


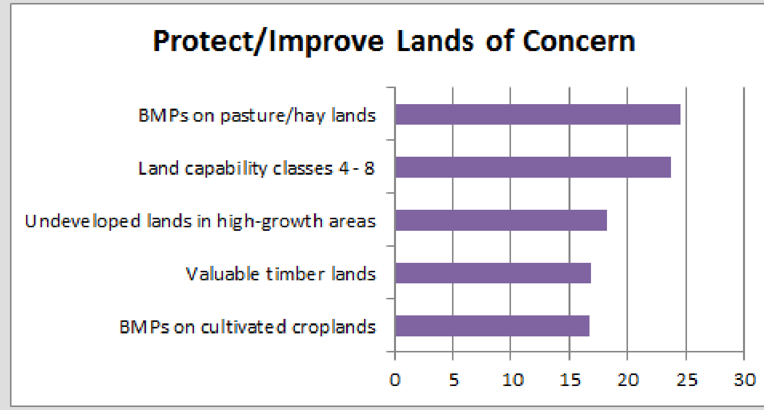
Protect **Undeveloped lands in high growth areas**

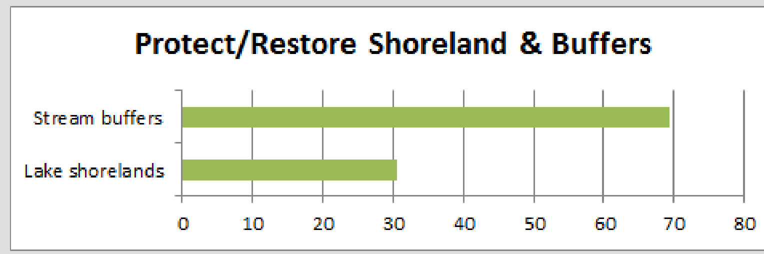
Cannon River 1W1P Zonation Survey Results

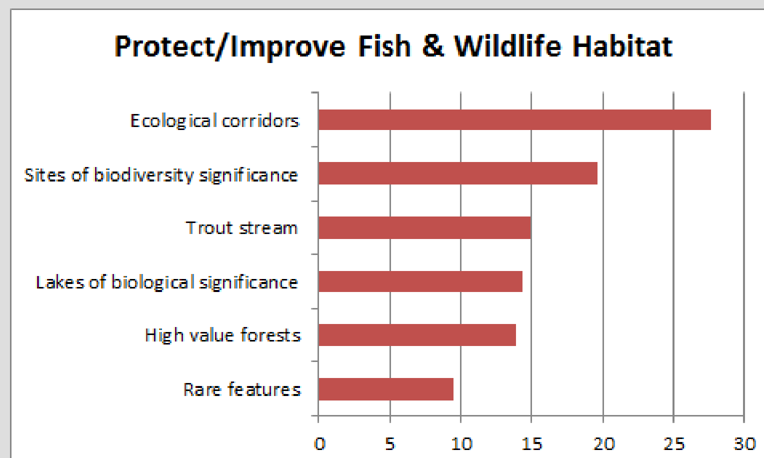




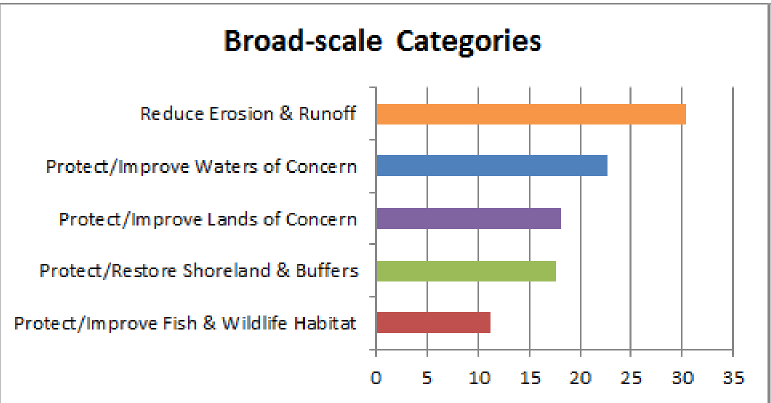


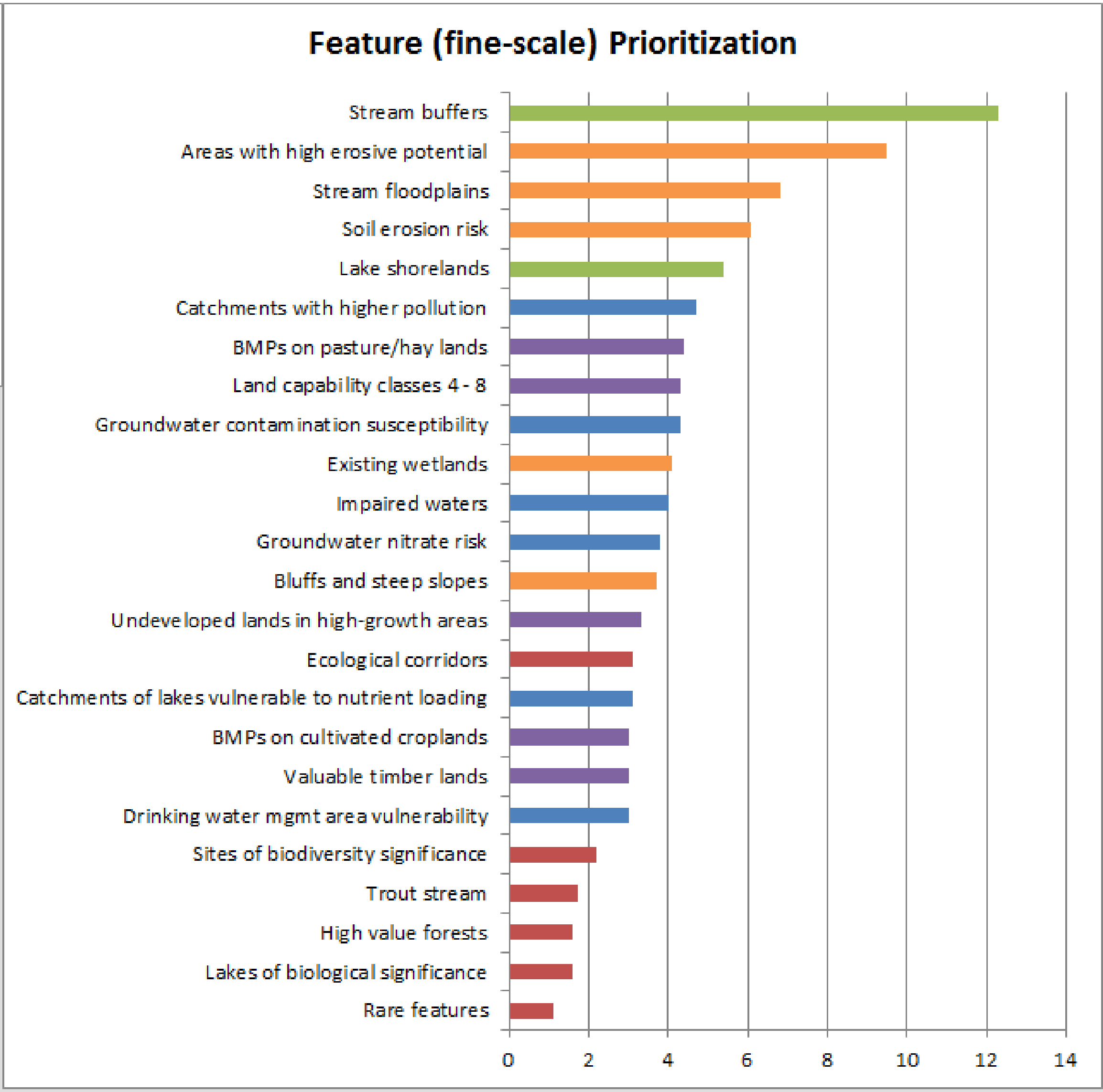




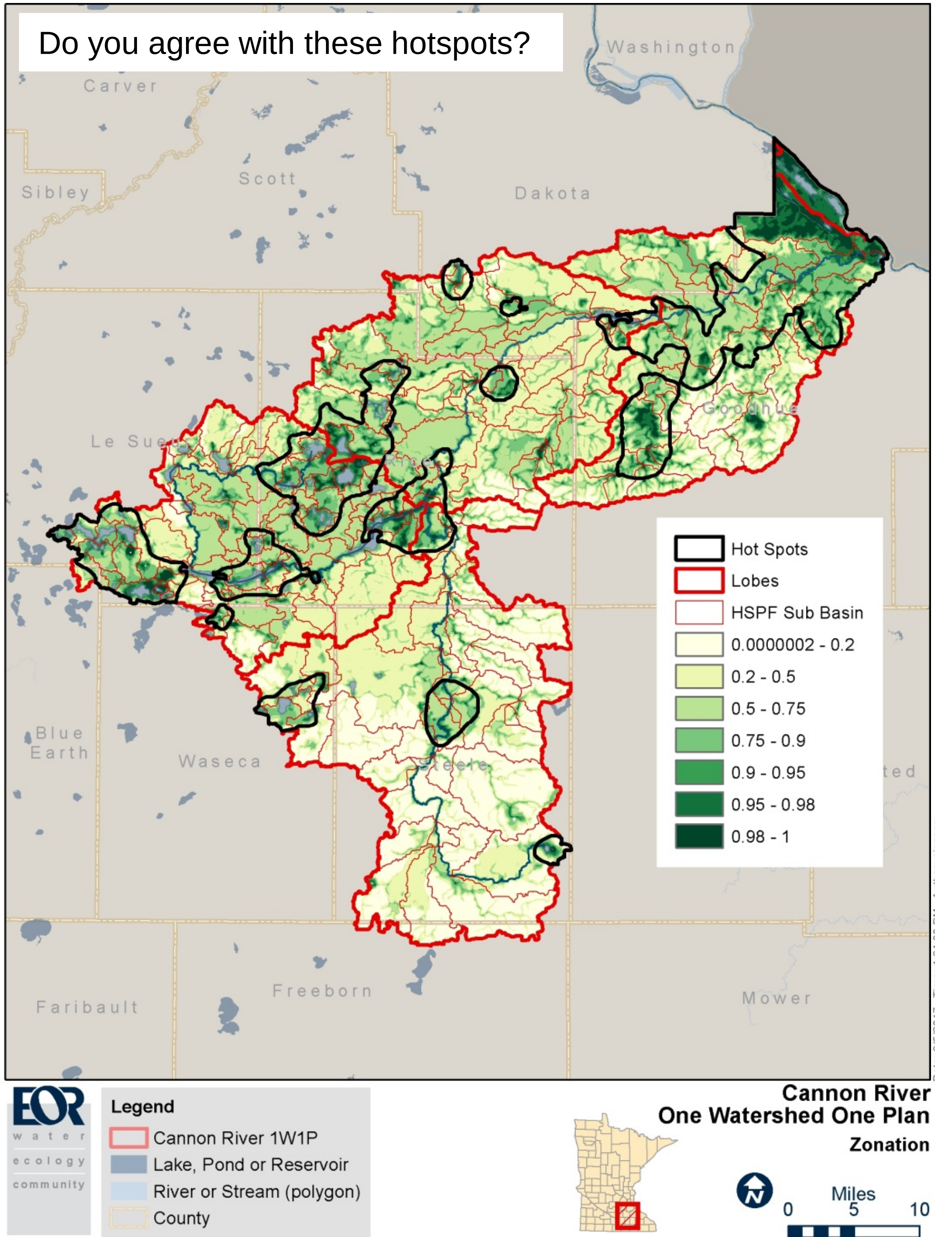


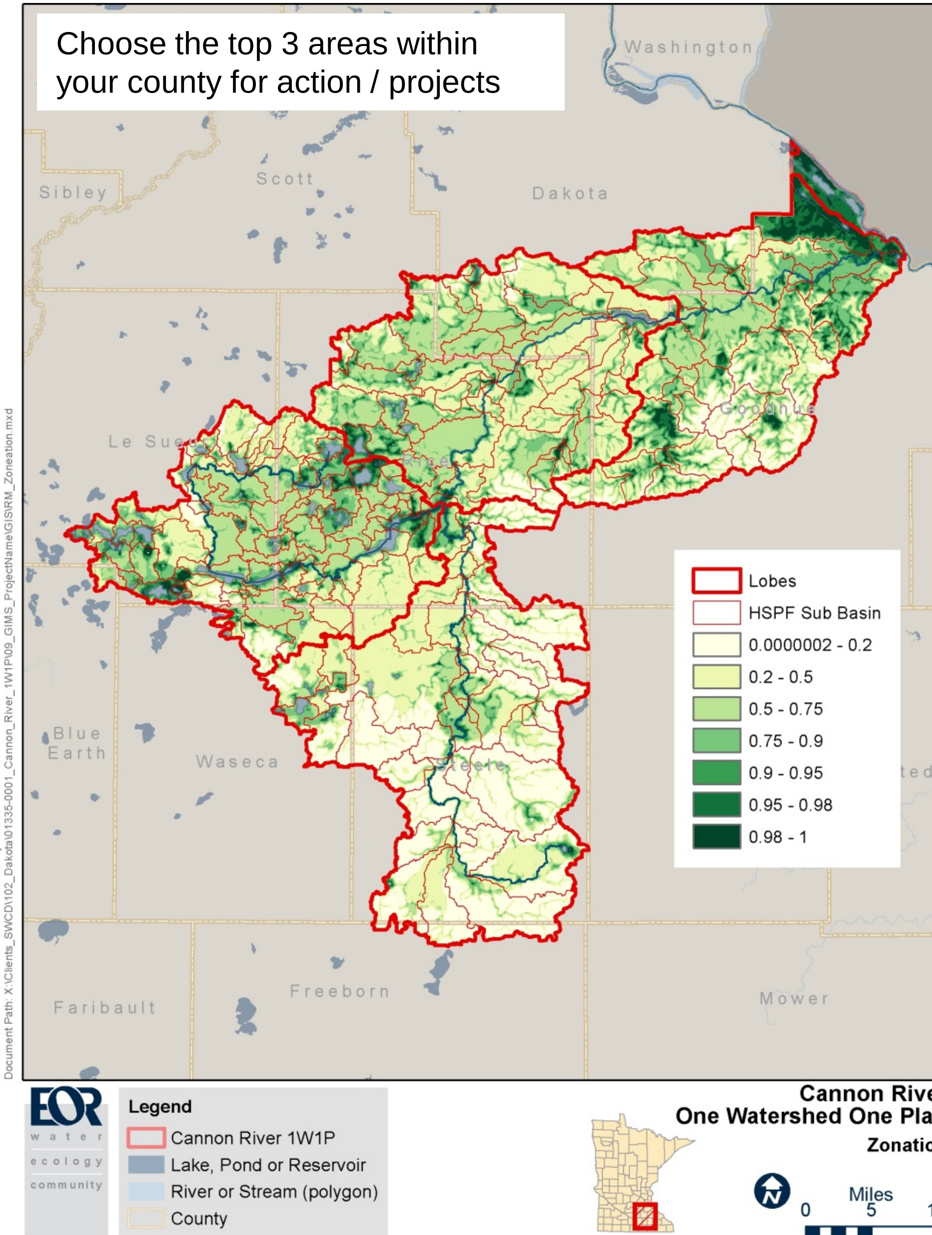
Cannon River 1W1P Zonation Weighted Survey Results





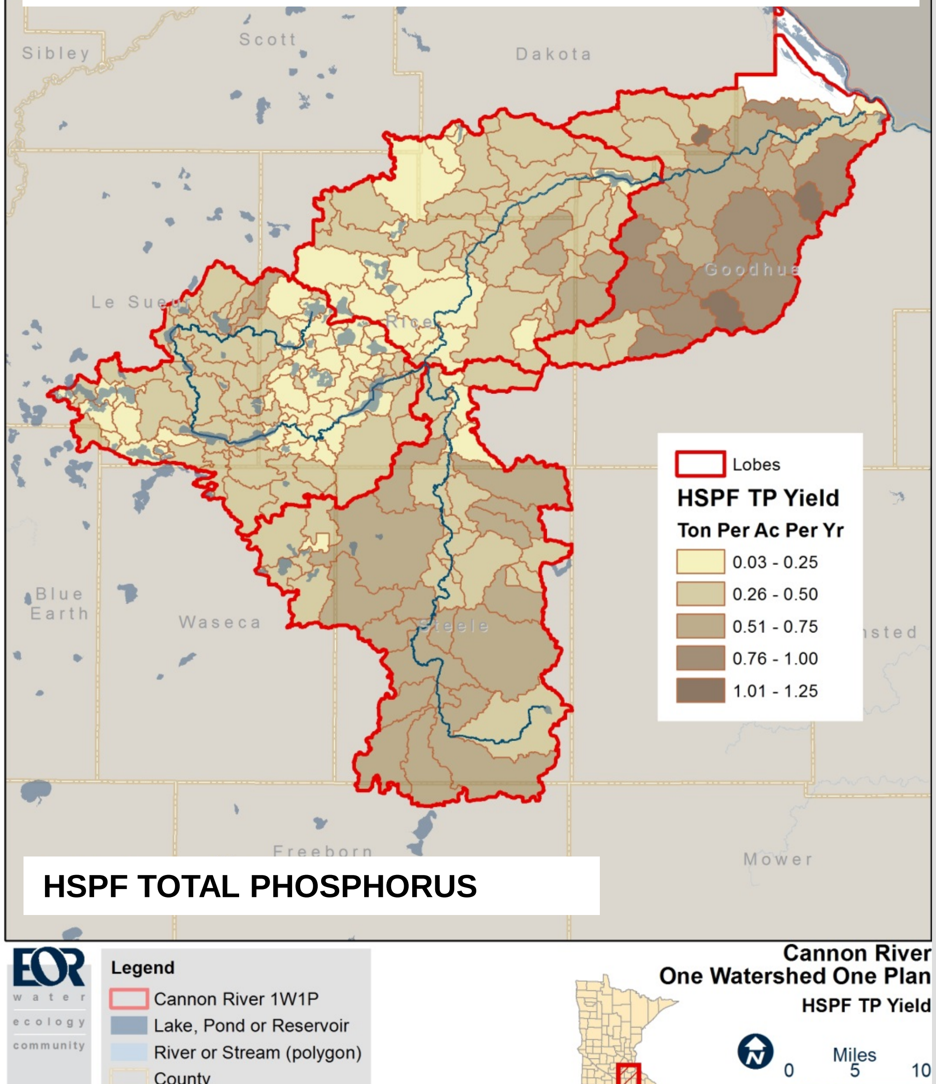
Cannon River 1W1P Zonation Results



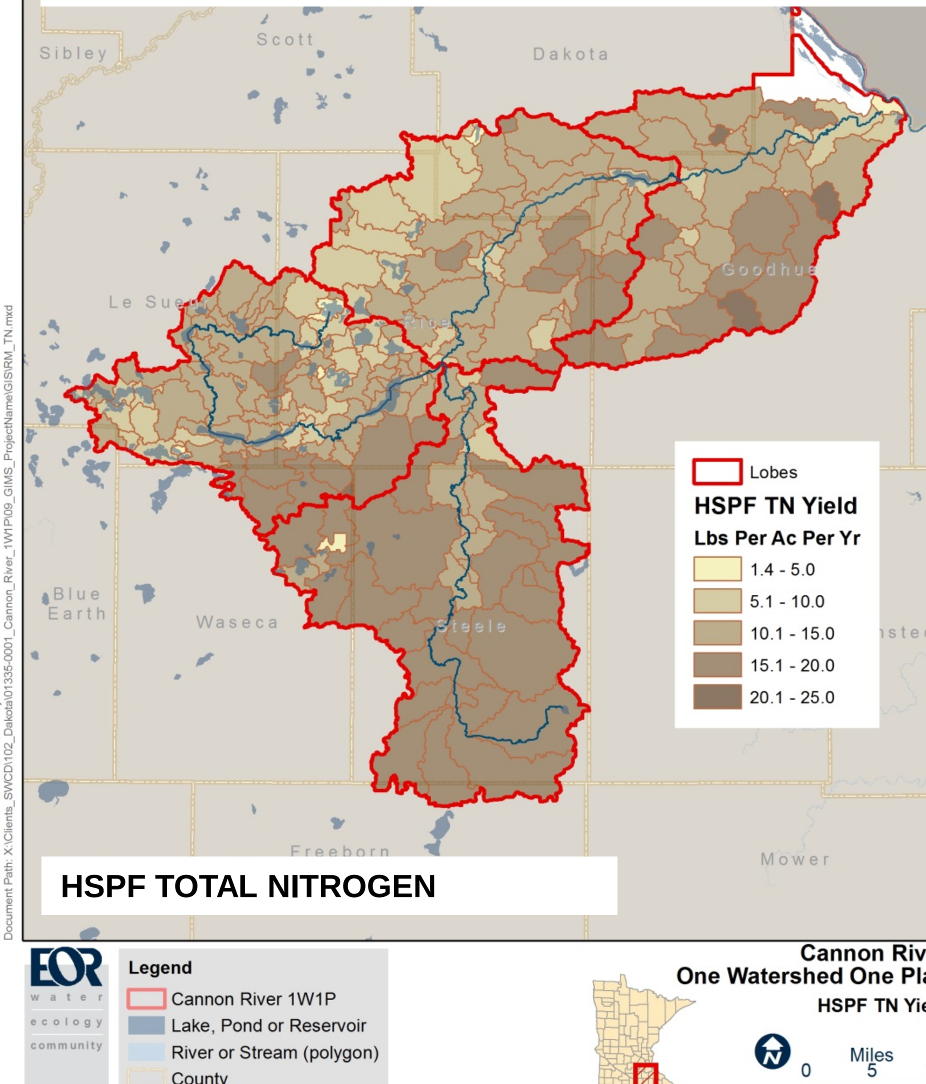


Cannon River 1W1P HSPF Model

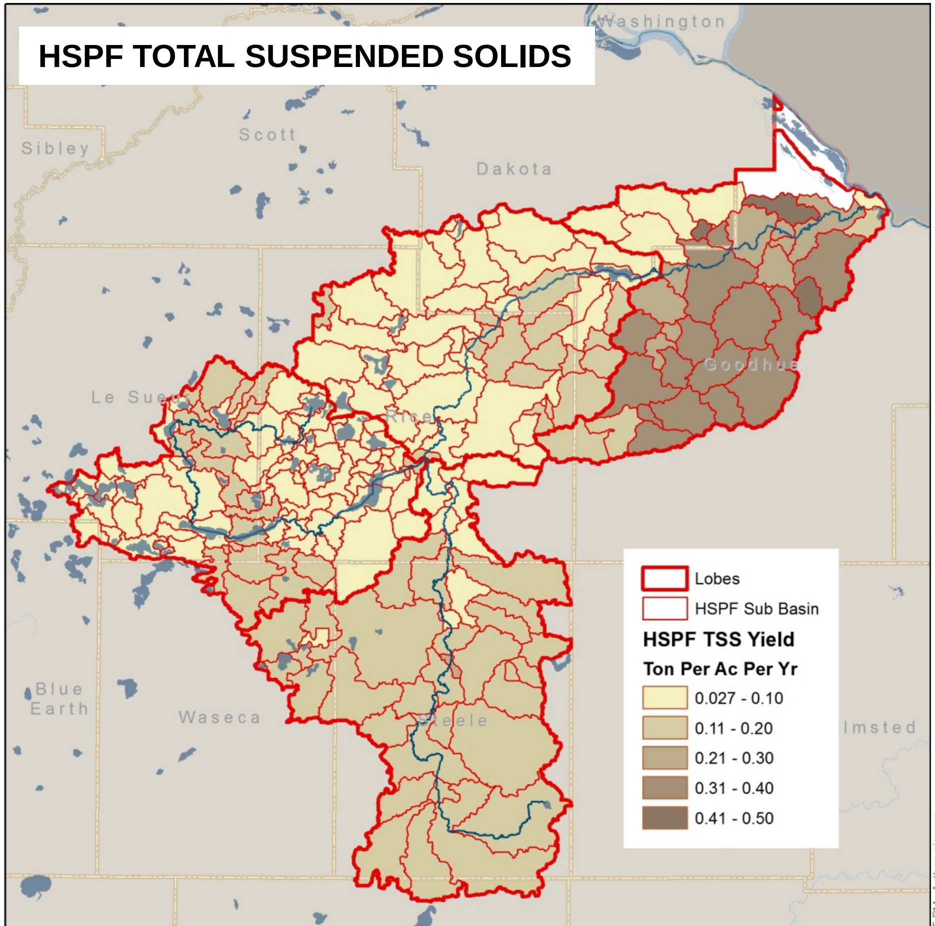
The magnitude of total phosphorus (TP) pollution generated in each subwatershed coded along a color gradient, with dark brown having greater pollutant yields than light brown.



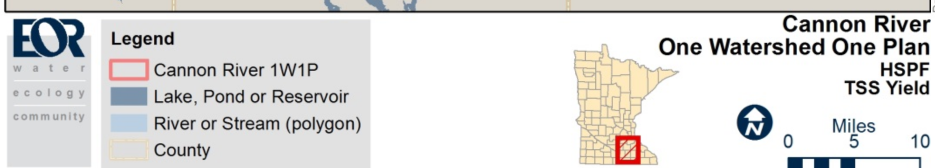
The magnitude of total nitrogen (TN) pollution generated in each subwatershed coded along a color gradient, with dark brown having greater pollutant yields than light brown.

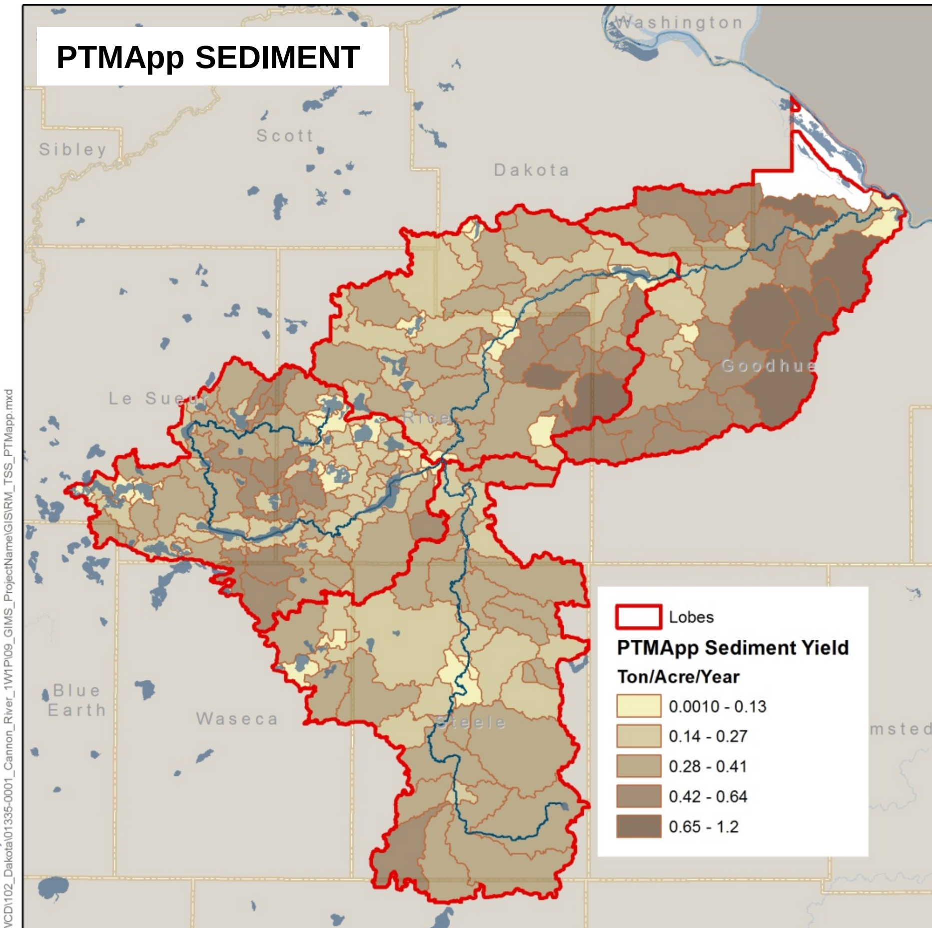


Cannon River 1W1P HSPF Model

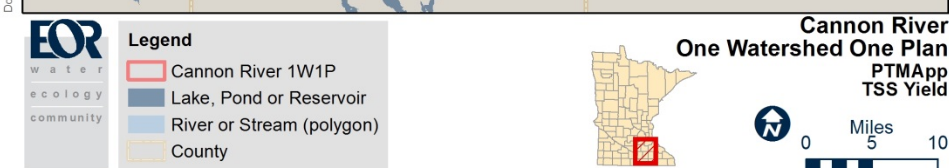


The magnitude of total suspended solids (TSS) pollution generated in each subwatershed coded along a color gradient, with dark brown having greater pollutant yields than light brown.

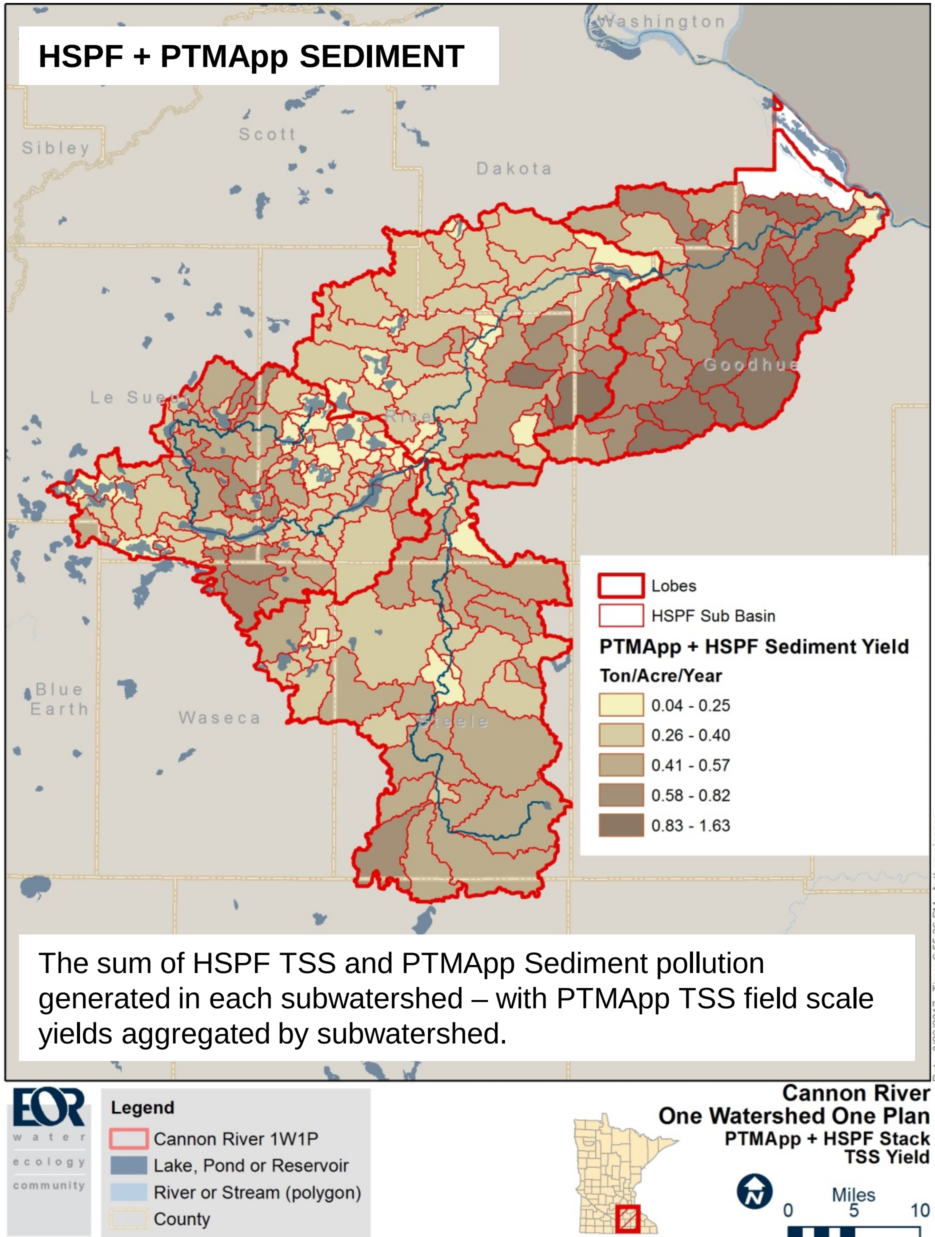




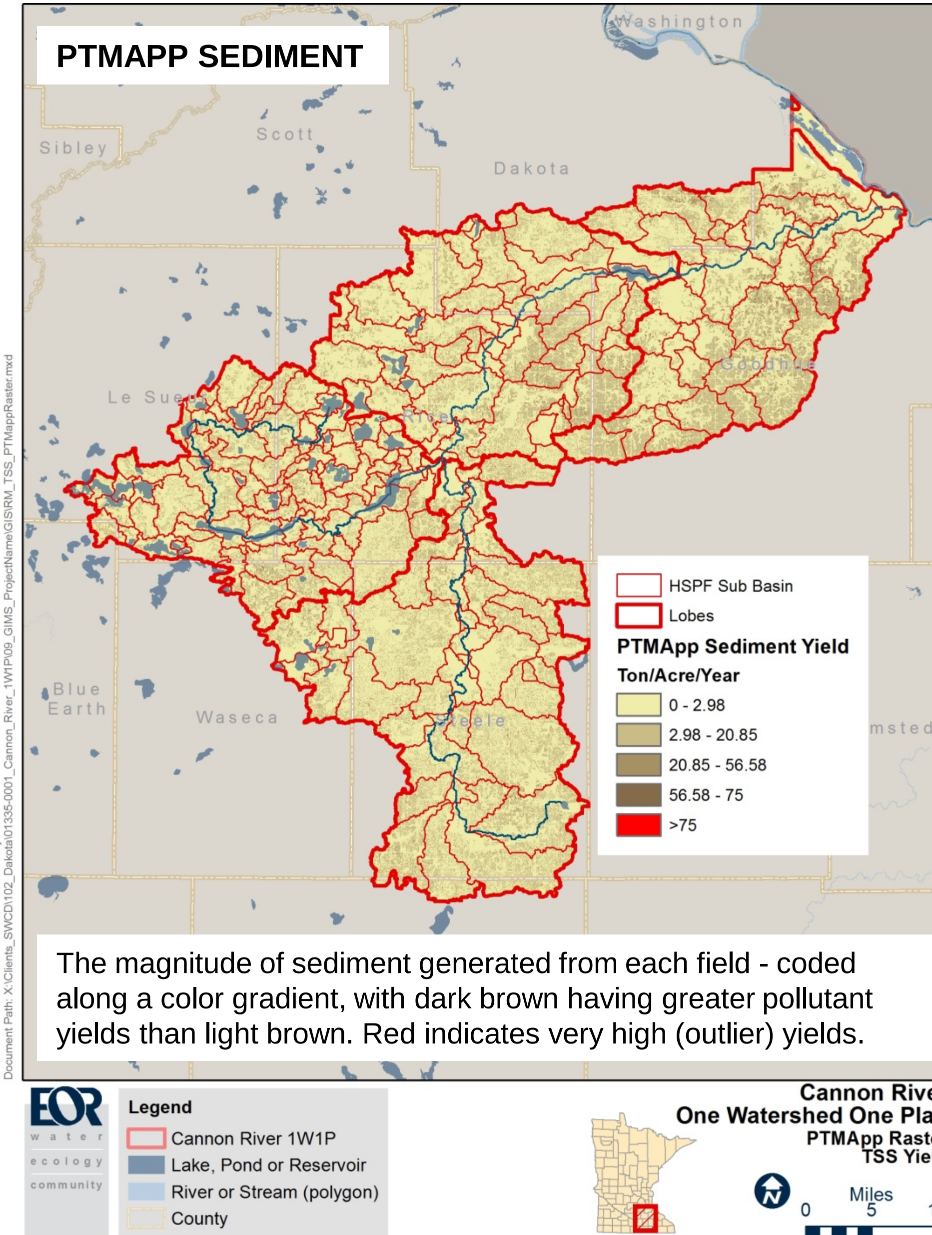
The magnitude of sediment generated from each field and aggregated by subwatershed - coded along a color gradient, with dark brown having greater pollutant yields than light brown.



Cannon River 1W1P HSPF Model



The sum of HSPF TSS and PTMApp Sediment pollution generated in each subwatershed – with PTMApp TSS field scale yields aggregated by subwatershed.



The magnitude of sediment generated from each field - coded along a color gradient, with dark brown having greater pollutant yields than light brown. Red indicates very high (outlier) yields.

Cannon River
One Watershed, One Plan

"Aligning local water planning on major watershed boundaries with state strategies towards prioritized, targeted and measurable implementation plans"

We are at an exciting point in the Cannon River One Watershed, One Plan process! We will be hosting our third and final series of Water Conversations. We want to know what activities and projects you would like to see accomplished in the planning area in the next 10 years.

This final round of Water Conversations will be different than our first two series of meetings. This time we will focus on the goals developed to address the issues identified at previous meetings and we will ask you to weigh in on the types of projects and activities you think are most important in accomplishing these goals. This will also be an opportunity for us to provide an update on the planning process, and to share how you can comment on the draft Plan this summer.

There will be an open house before each meeting, to catch up and mingle with local staff and neighbors over coffee and treats. We will have display boards with information on the Cannon River planning area and the goals developed to address issues such as water quality, flooding, land use changes and recreational opportunities. After the open house, you will have the opportunity to participate in a small group discussion to learn more about how these goals were developed, the types of projects and activities that need to be completed to achieve the goals and what you can do to participate in the solutions.

The same materials and program will be presented at the following Water Conversations. Choose whichever is most convenient for you:

Water Conversation #1
Tuesday, March 6th
Open House- 5:00 to 6:00 pm
Meeting - 6:00 to 8:00 pm
The Archer House
212 Division St S
Northfield, MN 55057

Water Conversation #2
Thursday, March 15th
Open House- 5:00 to 6:00 pm
Meeting- 6:00 to 8:00 pm
Cabela's
3900 Cabela Dr NW
Owatonna, MN 55060

Please feel free to pass this invite on to others you know that may be interested in attending!

RSVP appreciated but not necessary. Please contact Ashley Gallagher, Dakota SWCD (651) 480-7781; ashley.gallagher@co.dakota.mn.us.

If you are unable to attend but would like to learn more or provide input, feel free to contact your local County or SWCD staff. You can also learn more about the process, review summaries from meetings held to date and learn how to get involved by visiting the project web-site at http://www.dakotaswcd.org/1w1p.html.

We look forward to seeing you!

Brad Becker (Dakota County)
Brad Behrens (Rice County)
Ashley Gallagher (Dakota SWCD)
Dale Oolman (Steele County)
Eric Gulbransen (Steele/Waseca SWCD)
Mark Leiferman (Waseca County)
Beau Kennedy (Goodhue SWCD)
Josh Mankowski (Le Sueur County)
Steve Pahs (Rice SWCD)
Glen Roberson (Goodhue SWCD)
Michael Schultz (Le Sueur SWCD)
Brian Watson (Dakota SWCD)

memo

Project Name	Cannon River One Watershed, One Plan	**Date**	03/20/2018
To / Contact info	Planning Work Group		
Cc / Contact info	BWSR Advisory Staff		
From / Contact info	Camilla Correll, PE and Meghan Funke PhD		
Regarding	Advisory Work Group March 2018 Water Conversations Summary		

Introduction

In March of 2018, the planning partners and consultant hosted two "Water Conversations" to gather input from stakeholders. This was the final set of Water Conversations in a series of three that have taken place as part of the Cannon River 1W1P development process. The goals of this third set of Water Conversations included:

- To share the progress made on the development of issues, goals and implementation activities with the Advisory Group.
- To demonstrate how information collected at previous Water Conversations made its way into the planning process.
- To get feedback on issue statements, measurable goals and ideas for implementation activities that would work to address the issues in their communities.
- To connect stakeholders with one another, and work together to become better stewards of the watershed.

The meetings began with an Open-House where anyone from the Planning Area could come to learn about One Watershed, One Plans, the plan development process, what has been accomplished to date, and how to participate in the planning process. Following the Open-House, staff gave a brief introduction and EOR gave a presentation on accomplishments to date, what was covered at the previous Water Conversations, how issues, goals and implementation activities have been developed and instructions for the small group discussions.

Following the presentation, meeting participants were asked to congregate around one of the three issue categories: Resource Concerns, Landscape Alterations and Socioeconomic Factors. For the remainder of the meeting, these smaller groups reviewed worksheets for each issue within that category that identified how concerns expressed during the planning process became an issue statement, goals and potential implementation activities. Comments and ideas expressed during the small group discussions were recorded on the worksheets and later transcribed into an electronic version of the worksheet using track changes. The two sets of worksheets, with comments from the Water Conversations, are attached to this memorandum.

Meeting Participants

The March 6th meeting in Northfield included 22 participants, and 5 staff from the Planning Work Group and Consultant Team. The 22 participants represented an assortment of local and state government entities (BWSR, SWCDs, Counties, and Lake Associations), environmental advocacy groups (Trust for Public Land), non-profits (Cannon River Watershed Partnership) and producers and citizens. At least five different communities (cities or townships) were represented by staff and citizens including Castle Rock, Faribault, Northfield, Bridgewater Township, and Greenvale Township.

The March 15th meeting in Owatonna included 16 participants, and 7 staff from the Planning Work Group and Consultant Team. The 16 participants represented an assortment of local and state government entities (MPCA, MDH, SWCDs, and Counties), farmer/rural producer organizations (Corn Growers Association, Farm Bureau) and producers and citizens. At least four different communities (cities or townships) were represented by staff and citizens including Madison Lake, Owatonna, Waterville, and Waseca.

RESOURCE CONCERN: LAKES, STREAMS AND RIVERS

A. Protection Lakes

Concerns Expressed during Planning Process

Lakes with high recreational value. Lakes vulnerable to nutrient addition. Protection of high quality waters. Nonpoint pollution. High intensity use of lakes. Preserve the quality of resources. Good quality lakes with native vegetation and high recreational value. High fish quality.

Issue Statement

There are five high quality lakes in need of protection: Beaver, Dudley, Fish, Kelly, and Roemhildts. These lakes are all groundwater dependent (except Roemhildts) with a very small surface contributing drainage area, which has kept phosphorus loading to these lakes low and preserved their high water quality. While these lakes currently support recreation, they could become degraded in the future if phosphorus loads increase or there are changes to the groundwater contribution to these lakes.

Measurable Goals

Comment [MF1]: Connect Goal 2 to GW modeling and testing goals.
How do we measure progress towards achieving Goal 2 if we don't know the quantity or quality of GW?

GOAL 1

Maintain or improve water quality in the 5 high quality lakes by achieving all of the phosphorus reduction goals (lb/yr) identified in the 2016 Cannon River WRAPS.

GOAL 2

Maintain the quality and quantity of groundwater and protect springs to groundwater-dependent protection lakes (see goal under Groundwater Dependent Natural Resources –

Implementation Activities

1. Complete lake management plans to identify phosphorus sources ($5,000 per lake)
2. Implement a 50-foot buffer on 10% of the lake shoreline ($2,358) – permanent easements to prevent development
3. Convert 10% of vulnerable cropland to perennial vegetation via easements ($58,254) – focus on hunting/recreation habitat areas
4. Promote soil health through cover crops, tillage on 20% of cultivated cropland ($2,044) – someone suggested that a good example of how to describe soil health/organic matter is soils with and without earthworms. A crop rotation using turnips has really helped soil health – Rice County has the contact. They are a big producer in Northfield who uses terracing.
5. Promote shoreline septic improvements and maintenance (0.25 staff hours per year) – report # of homes per lake
6. Record lake levels
7. Include in LMP: preventing AIS in protection lakes. Include coordination with DNR as activity
8. ~~5.~~ Look at existing developed shoreline. Create ordinance for regulating shoreline development (high natural lakes), setback requirements, consider easemants that allow development.

RESOURCE CONCERN: LAKES, STREAMS AND RIVERS

B. Impaired Lakes

Concerns Expressed during Planning Process

Lakes with high recreational value. Lakes vulnerable to nutrient addition. Proximity to water quality standards. Eutrophication (algae blooms). Nonpoint pollution. High intensity use of lakes. Impaired waters.

Issue Statement

In 2016, there were 36 lakes that did not support aquatic recreation use due to elevated nutrients that cause unsightly algae blooms and can make swimming undesirable or unsafe. Some lakes are impaired because they receive excess phosphorus from watershed runoff, while other lakes are impaired due to legacy phosphorus (i.e. internal loading). Dissolved oxygen dynamics, fish communities and aquatic plants can all be a part of internal nutrient cycling.

Measurable Goals

GOAL 1

Achieve phosphorous load reduction goals identified for Cedar, Fox and Hunt based in the lake management plans.

Implementation Activities

1. Complete lake management plans to identify phosphorus sources. Cedar, Fox and Hunt lakes are all part of a Science Museum of Minnesota project designed to improve the accuracy and predictive power of lake phosphorus budgets in the upper Cannon watershed. Project field work will directly measure whole-lake sediment P-burial and combine this flux with modeled estimates of watershed P loading and P losses in lake outflow from the lake TMDLs. Together these results will allow for estimates of the degree to which external P inputs exceed losses (outflow + burial). The difference (inputs – losses) will then provide a direct estimate of load reductions needed to begin the recovery process and will help confirm modeled load reductions derived from the TMDL study. ($0) – will this study look at lake level fluctuations and unstable shorelines?
2. Implement a 50-foot buffer on 10% of the lake shoreline ($4,773)
3. Convert 10% of vulnerable cropland to perennial vegetation via easements ($405,286)
4. Promote soil health through cover crops, tillage on 20% of cultivated cropland ($27,869)
5. Promote shoreline septic improvements and maintenance (0.25 staff hours per year) – heat flyover for septics
6. Do they record lake levels?
7. Education on the science of lake WQ
8. Coordination with DNR on determining OHW
9. What are normal lake levels for this area?

RESOURCE CONCERN: LAKES, STREAMS AND RIVERS

C. Pollutant Impaired Streams

Concerns Expressed during Planning Process

Impaired waters. Impacts to cold water fisheries. Stream stressors. Bank erosion. Outstanding recreational value. Proximity to water quality standards. Low flow phosphorus issues. Sediment and nitrate.

Issue Statement

There are 45 impaired streams in the Cannon River Planning Area. Excessive bacteria that may make activities in or on the water unsafe were found in rivers and streams across the watershed, including the Straight River, Cannon River, and many smaller streams for a total of 41 impairments. Bacteria issues are widespread not only in the CRW, but much of the Lower Mississippi River Basin. Fish and macroinvertebrate communities across the watershed are showing a loss of sensitive species due to habitat loss and excess sediment and nitrate. All of the designated trout waters in the Lower Cannon Watershed lobe meet the criteria for the southeast Minnesota coldwater Fish Index of Biotic Integrity, however these streams are also impaired for nitrates, TSS, and/or Macroinvertebrate Index of Biotic Integrity. Changes in land use have the potential to adversely impact cold water fisheries (trout streams) due to increasing nitrate concentrations in groundwater, excess pollutant loads and increased water temperatures from stormwater runoff, and bank destabilization. For example, Rice Creek condition monitoring shows signs of stress from unstable banks and high nitrates, which may be contributing to degraded macroinvertebrate communities.

Measurable Goals

GOAL 1

10% reduction in the number of TSS samples exceeding the water quality standard (10 mg/L for coldwater, 65 mg/L for warmwater streams) during rainfall events and no nitrate samples exceeding the water quality standard (10 mg/L) in the Tier One impaired streams.

Implementation Activities

1. One streambank stabilization project completed every two years on Tier One impaired streams with known problems. ($500,000). – Trout Brook project has recently been completed. Discussed funding options to offset high capital costs for these projects: Trout Unlimited, Dakota County Habitat Coalition, TPL?, TNC, FMR?, Great River Greening, expert volunteer time, leverage local University, St. Olaf, Carleton, U of M students/faculty, local connections with local big businesses (Post/Malt-o-Meal; Hormal in Cedar River is an example).
2. X number of feedlot management plans/year in Belle, Little Cannon, Prairie and Rush drainage areas (0.25 FTE)
3. X number of septic system upgrades/year in Belle, Little Cannon, Prairie and Rush drainage areas (0.25 FTE)
4. Convert 10% of vulnerable cropland to perennial vegetation via easements in Tier One stream drainage areas ($2,925,630) – See Agriculture Runoff Implementation Activities
5. Promote soil health through cover crops, tillage on 20% of cultivated cropland in Tier One stream drainage areas ($441,441) – See Agriculture Runoff Implementation Activities
6. Check on status of assessment of stream corridor. Coordinate with DNR. Identify areas of future problems.
7. Promote tree cover for riparian shading – look into U of M studies

RESOURCE CONCERN: WETLANDS

A. Wetland Restoration

Concerns Expressed during Planning Process

Wetland restoration needed.

Issue Statement

The stormwater storage function is the highest valued wetland service because wetlands provide mitigation for property-damaging floods caused by high volumes of stormwater runoff exacerbated by land use alterations and extreme precipitation events.

Group discussed issue of wetland mitigation bank outside of watershed

Measurable Goals

GOAL 1

Net gain of X% or X ac-ft of wetlands restored in the priority areas.

Trees store water too, not just wetlands.

Implementation Activities

1. Develop inventory of wetlands and identify areas storage-focused restoration projects.
2. Promote and market 20 acres of wetland preservation and restoration programs such as CRP, WRP, RIM by holding 1 annual public meeting and by including discussion in the annual Farmer's Forum agenda.
3. Identify areas with low crop yields – that lose money anyway (use Iowa tools)
4. Outdoor Heritage Funds – DU, NGO conservation
5. Education that this is available and has benefits
6. Lease wetlands for hunting opportunities
7. ~~2.~~

RESOURCE CONCERN: WETLANDS

B. Wetland Protection and Enhancement

Concerns Expressed during Planning Process

Protect high quality resources.

Issue Statement

Existing wetlands deserve protection because they provide a host of services (functions) that are highly valued by society. Added benefit of enhanced spawning areas.

Measurable Goals

GOAL 1

Protect the current acreage of existing wetlands in the watershed and enhance the capacity for these wetlands to provide a full suite of services focusing on services that are most highly valued.

Implementation Activities

1. Conduct a watershed-based functional assessment to determine current level of services wetlands provided.
2. Adopt standards that protect wetlands from stressors that negatively affect highly valued services.
3. Implement wetland restoration and enhancement projects that provide functional lift.
4. Outdoor Heritage Funds (DU NGO conservation)
5. Lease for hunting opportunities
6. Complete an economic analysis: what will it cost? If you protect 100 acres of wetland how much does that protect their own cropland and local flooding issues. Cost of wetland restoration versus benefit of less flood losses.

RESOURCE CONCERN: GROUNDWATER

A. Drinking Water Protection

Concerns Expressed during Planning Process

Increased groundwater appropriations. Drinking water. Cleaner water for personal use. Pollution and excess nutrient flow into rivers and aquifers.

Issue Statement

Groundwater is the source of all drinking water in the Cannon 1W1P area. Public water suppliers provide 70% of the population's drinking water from over 200 different wells. 87 of these wells are located in highly vulnerable settings. Of these public water suppliers, 20 are larger municipal communities serving a large portion of the population. These systems are tested for over 100 contaminants, are responsible to provide treatment, and must implement an approved WHPP.

30% of the residents rely on a private well for the water they drink. However, because no public entity is responsible for water testing or management of a private well after drilling is completed, these well owners have the sole responsibility for the health and safety of their drinking water.

Contaminants of concern for all drinking water can be human sourced or naturally occurring. Of greatest concern is nitrate, which affects large regions. Other contaminants of concern include pathogens, arsenic, radium, and synthetic/organic chemicals in isolated areas. Aquifer vulnerability determines the level of management required to protect a drinking water supply and provides an opportunity to target implementation practices in accordance with the level of risk different land uses pose.

Measurable Goals

GOAL 1

In partnership with public water suppliers, provide annual education/outreach opportunities to all communities with MDH approved WHPPs, and BMP technical assistance for all moderate and high vulnerable public water suppliers.

GOAL 2

In areas of moderate or high pollution sensitivity, provide all private well owners access to well testing programs and education about water quality specific to drinking water.

Implementation Activities

1. Promote well sealing programs within WHP areas
2. Seek funding or utilize state cost-share funds to seal three unused wells within WHP areas in one town each year.
3. Education and Outreach: hosting well testing or screening clinics, providing water testing kits, promoting household hazardous waste collection, providing best practices information to private well owners.
4. BMPs should be implemented in groundwater recharge areas, specifically the surficial sands and gravels and outwash areas where the chance of groundwater contamination is highest.
5. SSTS: Township versus County enforcement: how to enforce? Local capacity as limiting resource.

RESOURCE CONCERN: GROUNDWATER

B. Groundwater Dependent Natural Resources – Protection Lakes

Concerns Expressed during Planning Process

Groundwater appropriations. Need to protect groundwater quality.

Issue Statement

Land-altering activities have the potential to impact groundwater resources as well as groundwater dependent natural resources. Without proper land-use and water resource management, the following impacts may occur: reduced groundwater recharge, reduced groundwater quality, and alterations to the functions and values of groundwater dependent natural resources. This is of particular concern to the protection lakes, many of which have been identified as being groundwater dependent.

Measurable Goals

GOAL 1

Maintain the quality and quantity of groundwater to groundwater-dependent protection lakes.

Implementation Activities

1. Maintain and restore perennial cover and wetlands to encourage recharge and reduce pollutant loads to groundwater dependent natural resources.
2. Better understand surface water – groundwater connections: continue to monitor MNDNR Observation Wells and MPCA Wells – takes time, complications, etc., should be a lower goal.
3. Identify Groundwatershed to the protection lakes.

LANDSCAPE ALTERATION CONCERN: AGRICULTURE

Identify how much of the Planning Area is agricultural in the broader description of the issue.

A. Agricultural Runoff

Concerns Expressed during Planning Process

Agricultural runoff. Feedlot runoff. Overgrazing. Tile drainage. Livestock & waste. Buffers on agricultural land. Nitrogen management. Irrigation. Sediment control. Crop production practices. Fertilizer, chemical use, and nutrient management from livestock. Cropping practices.

Issue Statement

Improper application of manure and fertilizer (rate, location, source and timing) are polluting surface water and groundwater in the Cannon River 1W1P Planning Area. The Cannon River HSPF model predicted that nutrient loss from cultivated lands accounts for 87% of the total nitrogen load and 89% of the total phosphorus load to surface water resources, highlighting the need for agricultural conservation and best management practices to reduce phosphorus and nitrogen pollution. Moreover, the Nitrogen Study and Nutrient Reduction Strategy state that cropland nitrogen losses through agricultural tile drainage and agricultural groundwater (leaching loss from cropland to local groundwater) make up the majority of nitrogen sources in Minnesota (what percentage is from Minnesota). What is the date of these references? Include this information in the issue statement. Mention that other state initiatives have started recently and articulate how these will impact the goals of the 1W1P.

Measurable Goals

GOAL 1

Achieve Nutrient Reduction Strategy goals of 12 percent reduction in phosphorus and 20 percent reduction in nitrogen pollution from cropland in the HSPF top 25% TP and TN yield subwatersheds in the next 10 years (by 2029).

GOAL 2

Create a stable funding source to increase local capacity and implement agricultural BMPs.

Implementation Activities

1. Establishment of and compliance with Nutrient Management Plans on 10% of cropland in Tier One stream drainage areas (0.5 FTE).
2. Establishment of and compliance with Manure Management Plans on 10% of cropland in in Tier One stream drainage areas (0.5 FTE)
3. Convert 10% of vulnerable cropland to perennial vegetation via easements in Tier One stream drainage areas ($2,925,630) – See Pollutant Impaired Stream Implementation Activities
4. Promote soil health through cover crops, tillage on 20% of cultivated cropland in Tier One stream drainage areas ($441,441) – See Pollutant Impaired Stream Implementation Activities.
5. Increase funding for incentive programs.
6. Monitor BMPs to demonstrate economic benefits (to farmers) of implementing conservation practices.
7. Regulate agricultural practices in highly erodible soils. These are good locations for perennial vegetation which can be implemented via working land easements, incentive programs (CRP), regulations. Can this be achieved through existing regulations (e.g. county soil loss regulations)?

LANDSCAPE ALTERATION CONCERN: AGRICULTURE

B. Soil Health

Concerns Expressed during Planning Process

Poor soil health. Practices contributing to soil loss.

Issue Statement

Soil health can be degraded due to poor agricultural practices which limits the role it plays in clean water and groundwater recharge. Soil health is typically measured by the amount of organic matter in the soil. Soil organic matter is necessary for storing water, increasing water infiltration, preventing compaction, and breaking down pesticides, heavy metals (note that heavy metals will not be broken down; rather they are being tied up or bound to the soils), and other pollutants (USDA 2016). Increased soil organic matter will improve the quality of surface water and groundwater, in addition to sustaining long-term crop yields from the land. Mention in that this is a new or emerging field.

Measurable Goals

GOAL 1

Improve soil health by increasing organic matter by 1% in 20% of cultivated cropland (how many acres does this equate to?) in Tier One stream drainage areas. Identify the baseline. Consider all lakes, streams and rivers in the Tier 1 category.

Implementation Activities

1. Promote soil health through cover crops and/or reduced tillage on 20% of cultivated cropland in Tier One stream drainage areas ($441,441) – See Pollutant Impaired Streams Implementation Activities
2. Provide education and outreach on soil health to producers since this is an emerging science and new information is being published all the time.
3. Articulate the economic benefits to the farmers t and to the public to the extent that we can.
4. Adding livestock in a sustainable way to promote increase in organic matter (grazing management, types of livestock, rotational grazing).
5. Promote more sustainable agricultural practices (going back to doing things the way our grandparents did things).
6. Pay farmers to plant over crops (some counties in Minnesota are already doing this)

MEASURABILITY

- Proxy for soil health should be organic matter. Measure the organic matter of soil to establish baseline and to ensure a minimum 1% increase. Nutrient management plans include testing soil organic matter.

LANDSCAPE ALTERATION CONCERN: DEVELOPMENT

A. Flooding of Communities

Concerns Expressed during Planning Process

Building and maintaining infrastructure. Development in the floodplain is an issue. Flooding of infrastructure. Need for upland storage. Control the flow of rivers and streams to ease disasters from flooding. Bottlenecks in system contribute to flooding.

Issue Statement

The hydrology of the watershed has been altered due to actions such as straightening stream channels, ditching, tiling, draining wetlands or depressional areas, and adding impervious surfaces. These land use changes have a number of impacts including a net increase in flows moving through the watershed and more extensive flooding events. These land use alterations, as well as changes in precipitation patterns and more extreme events, are increasing the frequency and magnitude of flooding experienced by communities in the Cannon River Planning Area.

Measurable Goals

GOAL 1

Decrease the rate and volume of water that contributes to flooding of downstream communities to limit property damage and protect public safety. This goal needs work.

Implementation Activities

1. Conduct a Long-Term Flood Solution Study (LTFSS) to provide planning partners with the tools needed to mitigate the effects of flooding in the Cannon River Planning Area and make the communities more resilient. This is a priority. Do this sooner rather than later understanding that this effort will take time but will provide critical information.
2. Install and implement additional flood reduction practices within the Watershed. Recommendations of the preceding implementation activity.-
3. Adopt stormwater management requirements that address rate, volume, water quality, and wetland bounce and duration.
4. Future maintenance that includes storage for the ditch systems to reduce flooding and managing tile system for storage.
5. Consider implementation activity for dam management. Resident between King Mill and Woolen Mill expressed concern over who is responsible for operating and maintaining the dams as well as who is responsible for notifying adjacent landowners of potential flooding conditions (staff gauges installed but no reporting of flooding conditions made available to the public.
6. Make monitoring data more accessible to the public. Where do people go to find stream flow and lake level information?
7. Soil health and storage of water in the soil profile helps with flooding. Make the connections transparent.

LANDSCAPE ALTERATION CONCERN: DEVELOPMENT

B. Shoreland Management

Concerns Expressed during Planning Process

People mowing to the shoreline. Need for shoreland protection requirements. Shoreland restoration is needed.

Issue Statement

Shorelands typically contain important habitat and erodible soils. As a result, many of these areas are highly sensitive to development. Conversion of seasonal to year-round dwellings, developments and resorts has the potential to adversely impact shoreland and the adjacent waterbody. What is the priority area? DNR waterways addressed through the buffer law.

Measurable Goals

GOAL 1

Achieve no net loss of existing natural shoreline. What does "natural shoreline" mean – has this been defined? How does the buffer law affect this goal?

GOAL 2

Achieve a natural shoreline gain through shoreline restorations compared to 2018.

Implementation Activities

1. Conduct inventory of existing natural shoreline quantity and quality.
2. Conduct buffer evaluation. Review shoreland areas to determine whether storm water runoff is discharging through a buffer system or artificial wetland.
3. Review local shoreland ordinance looking for ways to improve the protection of shoreland and revise County ordinances if necessary.
4. Educate homeowners on how to better manage lake property.
5. Education and outreach for local government officials (e.g. Board of Adjusters) to reduce the number of variances granted to shoreland ordinance.

(1-5 are an evaluation of existing resources)

6. Identify the # of restoration projects or increase the linear feet of natural shoreline restoration by X amount.
7. Identify where active development pressure is in order to target where implementation should occur (priority areas).
8. Priority habitat.
9. Management of terrestrial invasive species and carp (AIS)

LANDSCAPE ALTERATION CONCERN: DEVELOPMENT

C. Ordinance Development

Concerns Expressed during Planning Process

Land use decisions, planning processes, sprawl and excessive development. Increased amount of impervious surfaces. Need to integrate various practices in land use development (e.g. raingardens, septic system compliance, ESC, green/sustainable lawns, etc.). Need for peak flow reduction on agricultural and urban lands. Runoff from cities flows directly into lakes.

Issue Statement

Polluted stormwater runoff is often transported to municipal separate storm sewer systems (MS4) and ultimately discharged to local rivers, streams and lakes without treatment. EPA's Stormwater Phase II Rule establishes an MS4 stormwater management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events. Lack of stormwater management, regulations, and construction inspections in non-MS4 communities is having an adverse impact on surface water resources in the Planning Area. Of the 21 cities in the Cannon River Planning Area, only a handful are MS4 communities (Faribault, Northfield, Owatonna, and Waseca). The remaining 16 cities and 63 townships need to adopt stormwater management requirements to protect the surface water and groundwater resources in the Cannon River Planning Area. These smaller communities lack the staffing, funds or the resources to develop or implement ordinances and a permitting program. Increasing precipitation exacerbates the issue. Can we add HSPF pollutant loads from developed areas to this issue statement (as was provided for agricultural runoff) – would help to put the issue into perspective.

Measurable Goals

GOAL 1

Utilize the MIDS Community Assistance Package to develop ordinances that include the Minimal Impact Design Standards (MIDS) performance goals for all of the communities in the Planning Area by 2021.

GOAL 2

Work closely with local staff of non-MS4 communities to develop a program for administration, plan review, inspections and enforcement.

Implementation Activities

1. Review each community's current ordinance package looking for opportunities to improve and update to meet current standards and protect water quality and natural resources.
2. Develop a draft ordinance for each community to address stormwater management and erosion and sediment control.
3. Provide a series of workshops with elected and appointed officials and city staff to introduce the concepts and importance of stormwater management for new development and redevelopment.
4. Working closely with local staff to develop a program for administration, plan review, inspections and enforcement or explore the option of creating a Joint Powers Agreement between the SWCD's, WMO, WD and communities to perform these services on behalf of the non-MS4 communities.
5. Evaluate the need to have different design standards for stormwater management requirements/ordinances to address more extreme events.

LANDSCAPE ALTERATION CONCERN: DEVELOPMENT

D. Subsurface Sewage Treatment Systems (SSTS)

Group ran out of time and did not cover this issue.

Concerns Expressed during Planning Process

Septic system compliance.

Issue Statement

Non-compliant or failing septic systems pose a threat to public health and natural resources. The 2016 SSTS Annual Report, produced by the MPCA, indicates that statewide 80% of subsurface sewage treatment systems are in compliance while 15 percent are Failing to Protect Groundwater (FTPGW) and five percent are posing an Imminent Threat to Public Health and Safety (ITPHS). Replacement of a failing septic system can be costly and an unexpected expense for residents.

Measurable Goals

GOAL 1

Identify and address water quality problems stemming from inadequate wastewater treatment systems in the Cannon River Planning Area.

GOAL 2

Create more uniformity within existing SSTS programs across the Cannon River Planning Area to ensure consistency in implementation and enforcement.

Implementation Activities

1. Conduct SSTS Inventory in Priority Areas
2. Conduct Risk Assessment to facilitate prioritization and assist county staff and local officials with future planning
3. Inventory existing programs
4. Identify programmatic gaps and develop solutions to fill the gaps

LANDSCAPE ALTERATION CONCERN: PUBLIC AND PRIVATE DRAINAGE SYSTEMS

A. Drainage System Management

Concerns Expressed during Planning Process

Drainage tile and irrigation identified as potential impacts related to agriculture. Need for peak flow reduction on agricultural and urban lands. Drain tile systems move water off the landscape more quickly than under pre-settlement conditions. This compounds flooding issues.

Issue Statement

While public and private drainage systems were installed to remove excess water and lower the water table for agricultural production and/or development, there were unintended consequences to the hydrologic system including changes in peak flow, water quantity, water quality and groundwater recharge.

Measurable Goals

GOAL 1

Create an inventory of public and private drainage systems within 10 years. How exhaustive should this inventory be? Backbone of the system versus entire system which is a big effort and not all of the information will be available. Can we identify priority areas for this work?

GOAL 2

Incorporate projects into public drainage systems that provide hydrologic benefits to the watershed and reduce localized flooding in all areas where known by conducting X projects in X area per year

GOAL 3

Incorporate projects into the public drainage system that provide water quality benefits and promote groundwater recharge.

Implementation Activities

1. Modernization of drainage records (convert profiles to known elevation datum, update benefitted parcels mapping, etc.) Satellite imagery may provide a good footprint of the drainage system.
2. Promote the development of Comprehensive Drainage Management Plans on all public and private drainage systems and identifying funding and articulating the value of doing this.
3. Construct X BMPs in the watershed that provide water quality benefits such as tile inlet protection, and saturated buffers.
4. Conservation drainage on individual fields – doing things at the source.
5. Recognize that this takes coordination – coordinated management effort – look at all of the benefitting parties.
6. Identify funding sources to help landowners make drainage system improvements.

LANDSCAPE ALTERATION CONCERN: PUBLIC AND PRIVATE DRAINAGE SYSTEMS

B. Aging/Under-Sized Drainage Systems

Concerns Expressed during Planning Process

Drainage tile and irrigation identified as potential impacts related to agriculture. Need for peak flow reduction on agricultural and urban lands.

Issue Statement

Existing drainage systems and/or aging infrastructure may not be sized to handle volume and rate changes that cause localized flooding issues.

Measurable Goals

GOAL 1

Understand the capacity and condition of the current drainage system and implement projects that enhance the function of the existing system without causing environmental or property damage caused by too much or too little water.

Implementation Activities

1. Conduct an assessment of the drainage in areas with known flooding issues.
2. Implement X projects that enhance the function of the system without causing environmental and property damage.

LANDSCAPE ALTERATION CONCERN: PUBLIC AND PRIVATE DRAINAGE SYSTEMS

C. Drainage Education

Concerns Expressed during Planning Process

Promote multi-benefit drainage management projects.

Issue Statement

There is a lack of understanding of and/or funding for retrofitting existing drainage systems for multi-purpose and multi-benefit drainage management

Measurable Goals

GOAL 1

Develop a program that educates and incentivizes multi-benefit drainage management projects through cost-share and education program.

Implementation Activities

1. Host 2 co-op workshops per year per County regarding multi-purpose and multi-benefit drainage management
2. Build at least two demonstration projects in the watershed that can also be used for research and educational tours.
3. Explore options for getting some people to voluntarily undertake these improvements.

LANDSCAPE ALTERATION CONCERN: CLIMATE CHANGE

A. Community Resilience to Climate Change

Concerns Expressed during Planning Process

Climate change is an important impact. There have been a number of significant rainfall events in the last two years that have resulted in flooding. What has changed? More extreme precipitation, how it is delivered over the course of the year, and pinch-points in the system is resulting in more flooding.

Issue Statement

Rising global temperatures have been accompanied by changes in weather and climate. As a result, many areas are seeing changes in precipitation patterns including more floods, droughts and/or intense precipitation events. A trend analysis of local climate data indicates that the Cannon River Planning Area is experiencing changes in precipitation and temperature which presents challenges to watershed management decision-making. There is a connection to flooding of downstream communities and ordinance development.

Measurable Goals

GOAL 1

Develop a better understanding of climate change, its impacts to the Planning Area's land and water resources, and adaptive strategies to address this emerging issue.

GOAL 2

Increase the resiliency of the Planning Area by adapting to climate change, including adopting the recent update of NOAA Atlas 14 and other climatic data to ensure that design standards are kept current with the most recent climate data.

Implementation Activities

1. Conduct a vulnerability assessment in each of the communities experiencing flooding due to extreme precipitation events to identify infrastructure needs and develop adaptation strategies to make communities more resilient to the effects of a changing climate.
2. Utilize Green Infrastructure to build resiliency into the stormwater management system.
3. Don't allow development in flood-prone areas.
4. Support increased infiltration, stormwater reuse and water conservation.
5. Coordinate with other communities developing climate action plans including Red Wing and Northfield. Identify what they are doing to address water resource impacts.
6. Make people aware of climate mitigation/adaptation resources available nationwide to look to for guidance.

SOCIOECONOMIC FACTORS: EDUCATION AND OUTREACH

A. Educating Local Land Use Decision Makers

Concerns Expressed during Planning Process

Lack of diversity of elected officials. Adoption of government operations which promote/ehnace watershed management (e.g. street sweeping, reducing impact of politics, updating zoning practices, and snow and ice control or removal). There is a need to educate municipal officials and residents of the watershed about agricultural practices. There is a misconception that agriculture is bad for the environment.

Issue Statement

Decision makers (government officials) need to improve their understanding of watershed management to better understand how land-use decisions impact the watershed and its resources.

Measurable Goals

Comment [AG2]: Potential Measures:
- Policies implemented
- Pre & Post quiz
- Percent of officials attended training

GOAL 1

Educate local elected + appointed decision-makers w/ role in addressing relationship between land use and natural resource protection on watershed management/ stormwater management.

GOAL 2

Provide local elected + appointed decision-makers education + information materials on rural + agricultural land use issues including federal/state laws regulating agricultural activity, performance of BMPs, and local implementation success stories.

Implementation Activities

Comment [AG3]: Content of Education:
- Local & action based
- More brainstorming, less lecturing

1. Annually lead one community conversation on stormwater management BMPs.
2. Meeting with the County Boards, County Departments (Administration, Attorneys, Planning and Zoning, etc.) and City Councils to express the importance and potential benefits of Plan implementation and providing an annual update on Plan progress.
3. Encourage local government unit staff and local agency staff to attend trainings on newly developed technology and tools relevant to water resource management.
4. Snow management?
5. Require LGUs to report on activities and incorporate into a report (either annually or at check points during the 10 year plan).
6. ~~3.~~ Incorporate water quality updates into city progress updates such as a "State of the City Address".

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SOCIOECONOMIC FACTORS: EDUCATION AND OUTREACH

B. Citizen Engagement

Concerns Expressed during Planning Process

Negative impacts a result of poor or ineffective behavioral choices (e.g. car washing, invasive species transport, excessive groundwater extraction, and mowing to the lakeshore).

Issue Statement

Citizens in the Planning Area need to improve their water literacy and gain a basic understanding of watershed management to be better stewards of the watershed and its resources.

Measurable Goals

GOAL 1

Support progress towards achieving goals of 1W1P by encouraging behavioral changes from all sectors of the public through meaningful education and outreach experiences.

GOAL 2

Increase adoption of BMPs by increasing engagement/communication with residents, local landowners and agricultural producers to better understand implementation issues, fiscal and operational barriers and communicate the benefits of implementation.

Implementation Activities

1. Support public education and outreach initiatives that teach citizens to take action or alter traditional behaviors and practices. This could include the implementation of education and outreach programs to raise awareness on: impacts of runoff on our natural environment and water resources, identify BMPs and support of programs that help citizens to implement practices (in rural and urban areas) to reduce runoff volumes, reduce erosion and sedimentation, stabilize stream banks and shorelines, and reduce pollutant loads discharging to water resources; and properly manage and dispose of wastes.
2. Develop ~~one~~ urban storm water BMP demonstration sites in population centers to display the water quality benefits of practices that reduce runoff and treat storm water
3. Provide education to watershed residents by partnering with other entities and/or seeking funding to educate and engage agricultural producers, agricultural groups, and other residents about water resources, water conservation, and BMPs, including new and innovative practices, septic system maintenance, nutrient management, lakeshore and shoreline restoration, and buffers; through avenues such as field days, watershed councils, township officers' meetings, township newsletters, etc.

~~3.~~4. Snow management?

Comment [AG4]: Potential Measures:
- Surveys
- Participation numbers

Comment [AG5]: Goal 2 could be 'Increase awareness' instead of 'adoption', but participants also recognize this may make the goal less measureable. If it stays as 'adoption' number of projects could be counted.

Comment [AG6]: Content of Education:
- Include all issues and scale of impact
- Still tailor to group
- Cut out jargon and heavy science language
- Keep solution based
- How to communicate with government officials
- Break into lobes or some other regional basis

SOCIOECONOMIC FACTORS: EDUCATION AND OUTREACH

B. Citizen Engagement

Implementation Activities (Continued)

~~6.~~7. Partner with County schools to hold annual ~~Protect Our Waters Day.~~ K-12 education.
8. Partner with science teachers to incorporate water quality into their curriculum.
9. Utilize multiple formats for education beyond meetings including articles in newspapers, social media, or a Cannon River Newsletter.
10. Identify community leaders and partner with those individuals on projects and programs.
11. Signage on lakes and rivers with waterbody names.
12. Signage on BMPs such as raingardens that explain the function and purpose of the project.
13. Create or enhance existing awards and recognition programs for those that have contributed to water quality improvements.
14. Create graphics based information to include in city water bills.
~~7.~~15. Create a directory of water related organizations.

SOCIOECONOMIC FACTORS: COORDINATION AND PARTNERSHIPS

A. Watershed Partnerships

Concerns Expressed during Planning Process

Need for a river cleanup. Soild groups/people have a role to play in stewardship. Help divergent views work collaboratively to improve water quality.

Issue Statement

Opportunities for existing partnerships need to be enhanced and utilized in the Cannon River Planning Area.

Measurable Goals

GOAL 1

Increase collaboration with the Cannon River Watershed Partnership to leverage activities currently being performed by each other.

GOAL 2

Cultivate partnerships with agencies and organizations (including Lake Improvement Districts and Lake Associations) that have similar goals including collaborating on programs and co-sponsoring grant applications.

GOAL 3

Expand partnerships with North Cannon River Watershed Management Organization + Belle Creek Watershed District to support progress towards achieving 1W1P goals

GOAL 4

Increase collaboration amongst stakeholders and leveraging strategic partnerships for coordinated project, program and strategy implementation.

GOAL 5

Increase the use of volunteers to implement projects and programs.

GOAL 6

Continue to coordinate with cities and townships to achieve the goals of the 1W1P.

GOAL 7

Cultivate partnerships with universities and research institutes: collaborate on projects, and co-sponsoring grant applications

Comment [AG7]: When using the word 'increase' in a goal what is our baseline? Are we increasing over the 10 year plan?

Goal 2 or 3 include other statutory groups such as a Lake Improvement District or Drainage Districts. Thought is to make goal more broad incase any new organizations are created during 10 year timeframe. However, Goal 2 is probably broad enough.

Comment [AG8]: Potential Measures:
- Number of cooperative programs
- Dollars distributed

Implementation Activities

1. Assist watershed residents and landowners in the development of Watershed Advocacy groups with a focus on developing these groups within Tier One Priority Areas.
2. Partner with and provide technical assistance to lake associations/groups on projects to reduce water pollution and improve water quality.
3. In partnerships with the CRWP, create a brand for the Cannon River Planning Area that can be used on interpretive signage throughout the area.
4. In partnership with CRWP, give awards for outstanding work that supports the goals of the 1W1P (i.e. Outstanding Conservation Farmer, Outstanding Wildlife Conservationist, and Outstanding Windbreak). Goal is to not eliminate existing awards and not to duplicate efforts; possibly create new award categories.

SOCIOECONOMIC FACTORS: COORDINATION AND PARTNERSHIPS

B. Internal Capacity

Concerns Expressed during Planning Process

Importance of awareness campaigns and watershed-scale planning. Funding.

Issue Statement

Improve internal capacity and planning coordination of new organizational structure of Planning Work Group.

Measurable Goals

GOAL 1

Ensure a transparent organization that offers opportunity for public participation and feedback.

GOAL 2

Provide leadership, education, and resources to assist contractors, landowners, LGUs, etc., in developing and implementing sound BMPs.

GOAL 3

Increase municipal staff awareness of the Cannon River 1W1P, strengthen technical capacity and provide education on the regulatory framework.

Implementation Activities

1. Survey for what needs currently exist regarding capacity for specific groups including SWCDs, Counties, Cities and Townships.
2. Share demonstration sites and top projects throughout the watershed.
3. Create a directory of skills staff within the Planning Area possess and desire.
4. Host annual meeting/retreat to allow for networking and sharing of resources.

Comment [AG9]: Goal 3 would read better as 'Increase partnerships with municipal staff within the Cannon River 1W1P…'

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SOCIOECONOMIC FACTORS: RECREATION AND LIVABILITY

A. Recreational Value

Concerns Expressed during Planning Process

Use and impacts of riparian commercial uses (resorts, outfitters, etc.). Need for a river cleanup. Outdoor recreation and engagement. Aestheticss: spirituality, honoring plant and animal life. Fisherman noted lack of fish in the Cannon River: oily sheen and turbidity increasing. Balance the need for storage with recreation. Invasive species.

Issue Statement

Maintain existing and create new high-quality opportunities for recreation.

Measurable Goals

GOAL 1

Improve public access to natural environments.

GOAL 2

Enhance public recreation opportunities by promoting clean water, connecting habitat, and preventing invasive species.

Implementation Activities

1. Increase the number of access points.
2. Address barriers in the river to recreation.
3. Promote recreational rental businesses.
4. Promote waterfront parks/community spaces.
5. Complete the Mill Towns Trail.
6. Improve awareness thru the use of signage and maps. Develop ways to 'uncode public land'.
7. Encourage for-profit businesses that connect people to the natural resources.
8. Increase portages around dams or remove dams.
9. Reduce septic impact on lakes to reduce frequency of algae blooms.
10. Expand the Scenic designation of the Cannon River to more river miles.
11. Partner with River Ramblers or similar organizations to host paddling events.

Comment [AG10]: Potential Measures:
- Miles between launches
- Standards for launches
- Miles navigable or miles connected

Comment [AG11]: Goal 2 – add 'Increase and enhance public recreation…' Changing 'preventing' to 'limit' might be more achievable.

Comment [AG12]: Many of these activities should utilize Lessard-Sams or LCCMR dollars.

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RESOURCE CONCERN: LAKES, STREAMS AND RIVERS

A. Protection Lakes

Concerns Expressed during Planning Process

Lakes with high recreational value. Lakes vulnerable to nutrient addition. Protection of high quality waters. Nonpoint pollution. High intensity use of lakes. Preserve the quality of resources. Good quality lakes with native vegetation and high recreational value. High fish quality.

Issue Statement

There are five high quality lakes in need of protection: Beaver, Dudley, Fish, Kelly, and Roemhildts. These lakes are all groundwater dependent (except Roemhildts) with a very small surface contributing drainage area, which has kept phosphorus loading to these lakes low and preserved their high water quality. While these lakes currently support recreation, they could become degraded in the future if phosphorus loads increase or there are changes to the groundwater contribution to these lakes.

Measurable Goals

GOAL 1

Maintain or improve water quality in the 5 high quality lakes by achieving all of the phosphorus reduction goals (lb/yr) identified in the 2016 Cannon River WRAPS.

GOAL 2

Maintain the quality and quantity of groundwater to groundwater-dependent protection lakes (see goal under Groundwater Dependent Natural Resources – Protection Lakes).

Implementation Activities

1. Complete lake management plans to identify phosphorus sources ($5,000 per lake)
2. Implement a 50-foot buffer on 100% of the lake shoreline ($2,358)
3. Convert 10% of vulnerable cropland to perennial vegetation via easements ($58,254)
4. Promote soil health through cover crops, tillage on 20% of cultivated cropland ($2,044)
5. Promote shoreline septic improvements and maintenance (0.25 staff hours per year)
6. Assign stringent wetland protection standards within the protection lake contributory drainage areas.
7. ~~5.~~ Enforce existing or establish stringent shoreline protection standards

RESOURCE CONCERN: LAKES, STREAMS AND RIVERS

B. Impaired Lakes

Concerns Expressed during Planning Process

Lakes with high recreational value. Lakes vulnerable to nutrient addition. Proximity to water quality standards. Eutrophication (algae blooms). Nonpoint pollution. High intensity use of lakes. Impaired waters.

Issue Statement

In 2016, there were 36 lakes that did not support aquatic recreation use due to elevated nutrients that cause unsightly algae blooms and can make swimming undesirable or unsafe. Some lakes are impaired because they receive excess phosphorus from watershed runoff, while other lakes are impaired due to legacy phosphorus (i.e. internal loading). Dissolved oxygen dynamics, fish communities and aquatic plants can all be a part of internal nutrient cycling.

Measurable Goals

GOAL 1

Achieve phosphorous load reduction goals identified the lake management plans.

Implementati

1. Complete lake management plans to identify phosphorus sources. Cedar, Fox and Hunt lakes are all part of a Science Museum of Minnesota project designed to improve the accuracy and predictive power of lake phosphorus budgets in the upper Cannon watershed. Project field work will directly measure whole-lake sediment P-burial and combine this flux with modeled estimates of watershed P loading and P losses in lake outflow from the lake TMDLs. Together these results will allow for estimates of the degree to which external P inputs exceed losses (outflow + burial). The difference (inputs – losses) will then provide a direct estimate of load reductions needed to begin the recovery process and will help confirm modeled load reductions derived from the TMDL study. ($0)
2. Implement a 50-foot buffer on 100% of the lake shoreline ($4,773)
3. Convert 10% of vulnerable cropland to perennial vegetation via easements ($405,286)
4. Promote soil health through cover crops, tillage on 20% of cultivated cropland ($27,869)
5. Promote shoreline septic improvements and maintenance (0.25 staff hours per year)
6. Support formation of Lake Improvement Districts and demonstrate examples of successful LIDs such as Circe Lake.
7. Focus shoreline restoration projects on publically owned lands (Roberts Lake roadway issue needs work)
8. Implement fishery management projects
9. Implement AIS planning, management, inspection and education projects
10. Construct wetland restoration projects in the contributing drainage areas

~~5.~~11. Conduct projects that support and reestablish native aquatic vegetation.

RESOURCE CONCERN: LAKES, STREAMS AND RIVERS

C. Pollutant Impaired Streams

Concerns Expressed during Planning Process

Impaired waters. Impacts to cold water fisheries. Stream stressors. Bank erosion. Outstanding recreational value. Proximity to water quality standards. Low flow phosphorus issues. Sediment and nitrate.

Issue Statement

There are 45 impaired streams in the Cannon River Planning Area. Excessive bacteria that may make activities in or on the water unsafe were found in rivers and streams across the watershed, including the Straight River, Cannon River, and many smaller streams for a total of 41 impairments. Bacteria issues are widespread not only in the CRW, but much of the Lower Mississippi River Basin. Fish and macroinvertebrate communities across the watershed are showing a loss of sensitive species due to habitat loss and excess sediment and nitrate. All of the designated trout waters in the Lower Cannon Watershed lobe meet the criteria for the southeast Minnesota coldwater Fish Index of Biotic Integrity, however these streams are also impaired for nitrates, TSS, and/or Macroinvertebrate Index of Biotic Integrity. Changes in land use have the potential to adversely impact cold water fisheries (trout streams) due to increasing nitrate concentrations in groundwater, excess pollutant loads and increased water temperatures from stormwater runoff, and bank destabilization. For example, Rice Creek condition monitoring shows signs of stress from unstable banks and high nitrates, which may be contributing to degraded macroinvertebrate communities.

Measurable Goals

GOAL 1

10% reduction in the number of TSS samples exceeding the water quality standard (10 mg/L for coldwater, 65 mg/L for warmwater streams) and no nitrate samples exceeding the water quality standard (10 mg/L) in the Tier One impaired streams.

Implementation Activities

1. One streambank stabilization project completed every ~~two years~~year on Tier One impaired streams with known problems. ($500,000).
2. X number of feedlot management plans/year in Belle, Little Cannon, Prairie and Rush drainage areas (0.25 FTE)
3. X number of septic system upgrades/year in Belle, Little Cannon, Prairie and Rush drainage areas (0.25 FTE)
4. Convert 10% of vulnerable cropland to perennial vegetation via easements or other land conservation practices in Tier One stream drainage areas ($2,925,630) – See Agriculture Runoff Implementation Activities
5. Promote soil health through cover crops, tillage on 20% of cultivated cropland in Tier One stream drainage areas ($441,441) – See Agriculture Runoff Implementation Activities
6. Conduct a dam evaluation project to determine if there are structures that should be removed to restore stream/river health (remove Pine Creek dam).
7. Conduct wetland restoration projects in the contributory drainage areas
8. Evaluate e-coli delivery mechanisms causing bacteria impairments
~~5.~~9. Conduct one stream restoration project every two years to restore width/depth ration and increase in-stream habitat.

RESOURCE CONCERN: WETLANDS

A. Wetland Restoration

Concerns Expressed during Planning Process

Wetland restoration needed.

Issue Statement

The stormwater storage function is the highest valued wetland service because wetlands provide mitigation for property-damaging floods caused by high volumes of stormwater runoff exacerbated by land use alterations and extreme precipitation events.

Measurable Goals

GOAL 1

Net gain of X% or X ac-ft of wetlands restored in the priority areas.

Implementation Activities

1. Develop inventory of wetlands and identify areas storage-focused restoration projects.
2. Promote and market 200 acres of wetland preservation and restoration programs such as CRP, WRP, RIM by holding 1 annual public meeting and by including discussion in the annual Farmer's Forum agenda.
3. Facilitate conversations regarding taxing inequities for non cropped lands

~~2.~~4. Construct wetland restoration projects in protection lake watersheds.

RESOURCE CONCERN: WETLANDS

B. Wetland Protection and Enhancement

Concerns Expressed during Planning Process

Protect high quality resources.

Issue Statement

Existing wetlands deserve protection because they provide a host of services (functions) that are highly valued by society.

Measurable Goals

GOAL 1

Protect the current acreage of existing wetlands in the watershed and enhance the capacity for these wetlands to provide a full suite of services focusing on services that are most highly valued.

Implementation Activities

1. Conduct a watershed-based functional assessment to determine current level of services wetlands provided.
2. Adopt standards that protect wetlands from stressors that negatively affect highly valued services.
3. Implement wetland restoration and enhancement projects that provide functional lift by removing invasive species and encroachment by woody species that degrade function. ~~.~~
4. Create detention and retention projects in the priority lake watersheds.
5. Conduct an evaluation of tiling effects on wetland resources

~~3.~~

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RESOURCE CONCERN: GROUNDWATER

A. Drinking Water Protection

Concerns Expressed during Planning Process

Increased groundwater appropriations. Drinking water. Cleaner water for personal use. Pollution and excess nutrient flow into rivers and aquifers.

Issue Statement

Groundwater is the source of all drinking water in the Cannon 1W1P area. Public water suppliers provide 70% of the population's drinking water from over 200 different wells. 87 of these wells are located in highly vulnerable settings. Of these public water suppliers, 20 are larger municipal communities serving a large portion of the population. These systems are tested for over 100 contaminants, are responsible to provide treatment, and must implement an approved WHPP.

30% of the residents rely on a private well for the water they drink. However, because no public entity is responsible for water testing or management of a private well after drilling is completed, these well owners have the sole responsibility for the health and safety of their drinking water.

Contaminants of concern for all drinking water can be human sourced or naturally occurring. Of greatest concern is nitrate, which affects large regions. Other contaminants of concern include pathogens, arsenic, radium, and synthetic/organic chemicals in isolated areas. Aquifer vulnerability determines the level of management required to protect a drinking water supply and provides an opportunity to target implementation practices in accordance with the level of risk different land uses pose.

Measurable Goals

GOAL 1

In partnership with public water suppliers, provide annual education/outreach opportunities to all communities with MDH approved WHPPs, and BMP technical assistance for all moderate and high vulnerable public water suppliers.

GOAL 2

In areas of moderate or high pollution sensitivity, provide all private well owners access to well testing programs and education about water quality specific to drinking water.

Implementation Activities

1. Promote well sealing programs within WHP areas
2. Seek funding or utilize state cost-share funds to seal three unused wells within WHP areas in one town each year.
3. Education and Outreach: hosting well testing or screening clinics, providing water testing kits, promoting household hazardous waste collection, providing best practices information to private well owners.
4. BMPs should be implemented in groundwater recharge areas, specifically the surficial sands and gravels and outwash areas where the chance of groundwater contamination is highest.
5. Support the 4 R's rule for fertilizer application
6. Promote programs that encourage or require point of property transfer well testing
7. Support educational programs that inform residential land owners on proper pesticide use

RESOURCE CONCERN: GROUNDWATER

B. Groundwater Dependent Natural Resources – Protection Lakes

Concerns Expressed during Planning Process

Groundwater appropriations. Need to protect groundwater quality.

Issue Statement

Land-altering activities have the potential to impact groundwater resources as well as groundwater dependent natural resources. Without proper land-use and water resource management, the following impacts may occur: reduced groundwater recharge, reduced groundwater quality, and alterations to the functions and values of groundwater dependent natural resources. This is of particular concern to the protection lakes, many of which have been identified as being groundwater dependent.

Measurable Goals

GOAL 1

Maintain the quality and quantity of groundwater to groundwater-dependent protection lakes.

Implementation Activities

1. Maintain and restore perennial cover to encourage recharge and reduce pollutant loads to groundwater dependent natural resources.
2. Better understand surface water – groundwater connections: continue to monitor MNDNR Observation Wells
3. Identify Groundwatershed to the protection lakes.
~~3.~~4. Encourage MNDNR to install more ground water observation wells.

LANDSCAPE ALTERATION CONCERN: AGRICULTURE

A. Agricultural Runoff

Concerns Expressed during Planning Process

Agricultural runoff. Feedlot runoff. Overgrazing. Tile drainage. Livestock & waste. Buffers on agricultural land. Nitrogen management. Irrigation. Sediment control. Crop production practices. Fertilizer, chemical use, and nutrient management from livestock. Cropping practices.

Issue Statement

Improper application of manure and fertilizer (rate, location, source and timing) are polluting surface water and groundwater in the Cannon River 1W1P Planning Area. The Cannon River HSPF model predicted that nutrient loss from cultivated lands accounts for 87% of the total nitrogen load and 89% of the total phosphorus load to surface water resources, highlighting the need for agricultural conservation and best management practices to reduce phosphorus and nitrogen pollution. Moreover, the Nitrogen Study and Nutrient Reduction Strategy state that cropland nitrogen losses through agricultural tile drainage and agricultural groundwater (leaching loss from cropland to local groundwater) make up the majority of nitrogen sources in Minnesota. Trout streams require cold water temperature regimes due to their high connectivity to groundwater.

Measurable Goals

GOAL 1

Achieve Nutrient Reduction Strategy goals of 12 percent reduction in phosphorus and 20 percent reduction in nitrogen pollution from cropland in the HSPF top 25% TP and TN yield subwatersheds.

GOAL 2

Create a stable funding source to increase local capacity and implement agricultural BMPs.

Implementation Activities

1. Establishment of and compliance with Nutrient Management Plans on 10% of cropland in Tier One stream drainage areas (0.5 FTE).
2. Establishment of and compliance with Manure Management Plans on 10% of cropland in in Tier One stream drainage areas (0.5 FTE)
3. Convert 10% of vulnerable cropland to perennial vegetation via easements in Tier One stream drainage areas ($2,925,630) – See Pollutant Impaired Stream Implementation Activities
4. Promote soil health through cover crops, tillage on 20% of cultivated cropland in Tier One stream drainage areas ($441,441) – See Pollutant Impaired Stream Implementation Activities.
5. Buffer law may not impact water quality because spoils adjacent to the ditch don't allow the water to travel through the buffer; rather runoff infiltrates into the draintile and gets into the ditch (untreated).
6. Application of nitrogen is controversial. Farmers do the best they can. They are sensitive to the cost, understand the water quality impacts of over-application and are dependent up the weather.
7. Be smarter about monitoring water quality by testing at different points in the system. This will help identify where pollutants are entering the system. By looking at different parameters (e.g. fluoride) can pinpoint sources as rural or urban.

LANDSCAPE ALTERATION CONCERN: AGRICULTURE

B. Soil Health

Concerns Expressed during Planning Process

Poor soil health. Practices contributing to soil loss.

Issue Statement

Soil health can be degraded due to poor agricultural practices which limits the role it plays in clean water and groundwater recharge. Soil health is typically measured by the amount of organic matter in the soil. Soil organic matter is necessary for storing water, increasing water infiltration, preventing compaction, and breaking down pesticides, heavy metals, and other pollutants (USDA 2016). Increased soil organic matter will improve the quality of surface water and groundwater, in addition to sustaining long-term crop yields from the land. Technical assistance is available but the cost of implementation is high.

Measurable Goals

GOAL 1

Improve soil health by increasing organic matter by 1% in 20% of cultivated cropland in Tier One stream drainage areas. Group likes how this goal is written.

Implementation Activities

1. Promote soil health through cover crops and/or reduced tillage on 20% of cultivated cropland in Tier One stream drainage areas ($441,441) – See Pollutant Impaired Streams Implementation Activities
2. Provide education and outreach on soil health to producers since this is an emerging science and new information is being published all the time.
3. Expensive to implement conservation practices. Young farmers want to make changes but it's expensive and requires serious investments which are difficult to justify relative to other costs. Recommend facilitating connections/networks. Farmers helping other farmers by sharing local knowledge, lessons learned, equipment, practices, etc. SWCDs could identify critical masses of innovators to help people network and help each other out.

LANDSCAPE ALTERATION CONCERN: DEVELOPMENT

A. Flooding of Communities

Concerns Expressed during Planning Process

Building and maintaining infrastructure. Development in the floodplain is an issue. Flooding of infrastructure. Need for upland storage. Control the flow of rivers and streams to ease disasters from flooding. Bottlenecks in system contribute to flooding.

Issue Statement

The hydrology of the watershed has been altered due to actions such as straightening stream channels, ditching, tiling, draining wetlands or depressional areas, and adding impervious surfaces. These land use changes have a number of impacts including a net increase in flows moving through the watershed and more extensive flooding events. These land use alterations, as well as changes in precipitation patterns and more extreme events, are increasing the frequency and magnitude of flooding experienced by communities in the Cannon River Planning Area. Need to address loss of storage due to filling of wetlands/swamps. Locally there has been an increase in flooding on Hoffman Drive. Intense precipitation overloads sewage systems and wastewater treatment facilities introducing untreated sewage into surface waterbodies (e.g. Clear Lake).

Measurable Goals

GOAL 1

Decrease the rate and volume of water that contributes to flooding of downstream communities to limit property damage and protect public safety

Implementation Activities

1. Conduct a Long-Term Flood Solution Study (LTFSS) to provide planning partners with the tools needed to mitigate the effects of flooding in the Cannon River Planning Area and make the communities more resilient.
2. Adopt stormwater management requirements that address rate, volume, water quality, and wetland bounce and duration.
3. Install and implement additional flood reduction practices within the Watershed.
4. Future maintenance that includes storage for the ditch systems to reduce flooding.
5. Need for additional storage and slow release of runoff is a watershed-wide concern. Consider the installation of more dams in the system.

LANDSCAPE ALTERATION CONCERN: DEVELOPMENT

B. Shoreland Management

Concerns Expressed during Planning Process

People mowing to the shoreline. Need for shoreland protection requirements. Shoreland restoration is needed.

Issue Statement

Shorelands typically contain important habitat and erodible soils. As a result, many of these areas are highly sensitive to development. Conversion of seasonal to year-round dwellings, developments and resorts has the potential to adversely impact shoreland and the adjacent waterbody.

Measurable Goals

GOAL 1

Achieve no net loss of existing natural shoreline

GOAL 2

Achieve a natural shoreline gain through shoreline restorations

Implementation Activities

1. Conduct inventory of existing natural shoreline quantity and quality.
2. Conduct buffer evaluation. Review shoreland areas to determine whether storm water runoff is discharging through a buffer system or artificial wetland.
3. Review local shoreland ordinance looking for ways to improve the protection of shoreland and revise County ordinances if necessary.
4. Educate homeowners on how to better manage lake property.
5. Education and outreach for local government officials (e.g. Board of Adjusters) to reduce the number of variances granted to shoreland ordinance.

LANDSCAPE ALTERATION CONCERN: DEVELOPMENT

C. Ordinance Development

Concerns Expressed during Planning Process

Land use decisions, planning processes, sprawl and excessive development. Increased amount of impervious surfaces. Need to integrate various practices in land use development (e.g. raingardens, septic system compliance, ESC, green/sustainable lawns, etc.). Need for peak flow reduction on agricultural and urban lands. Runoff from cities flows directly into lakes.

Issue Statement

Polluted stormwater runoff is often transported to municipal separate storm sewer systems (MS4) and ultimately discharged to local rivers, streams and lakes without treatment. EPA's Stormwater Phase II Rule establishes an MS4 stormwater management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events. Lack of stormwater management, regulations, and construction inspections in non-MS4 communities is having an adverse impact on surface water resources in the Planning Area. Of the 21 cities in the Cannon River Planning Area, only a handful are MS4 communities (Faribault, Northfield, Owatonna, and Waseca). The remaining 16 cities and 63 townships need to adopt stormwater management requirements to protect the surface water and groundwater resources in the Cannon River Planning Area. These smaller communities lack the staffing, funds or the resources to develop or implement ordinances and a permitting program

Measurable Goals

GOAL 1

Utilize the MIDS Community Assistance Package to develop ordinances that include the Minimal Impact Design Standards (MIDS) performance goals for all of the communities in the Planning Area by 2021.

GOAL 2

Work closely with local staff of non-MS4 communities to develop a program for administration, plan review, inspections and enforcement.

Implementation Activities

1. Review each community's current ordinance package looking for opportunities to improve and update to meet current standards and protect water quality and natural resources.
2. Develop a draft ordinance for each community to address stormwater management and erosion and sediment control.
3. Provide a series of workshops with elected and appointed officials and city staff to introduce the concepts and importance of stormwater management for new development and redevelopment.
4. Working closely with local staff to develop a program for administration, plan review, inspections and enforcement or explore the option of creating a Joint Powers Agreement between the SWCD's, WMO, WD and communities to perform these services on behalf of the non-MS4 communities.
5. Make sure water quality standard apply to homeowners to ensure proper management of fertilizer application in an urban setting.

LANDSCAPE ALTERATION CONCERN: DEVELOPMENT

D. Subsurface Sewage Treatment Systems (SSTS)

Concerns Expressed during Planning Process

Septic system compliance.

Issue Statement

Non-compliant or failing septic systems pose a threat to public health and natural resources. The 2016 SSTS Annual Report, produced by the MPCA, indicates that statewide 80% of subsurface sewage treatment systems are in compliance while 15 percent are Failing to Protect Groundwater (FTPGW) and five percent are posing an Imminent Threat to Public Health and Safety (ITPHS). Replacement of a failing septic system can be costly and an unexpected expense for residents.

Measurable Goals

GOAL 1

Identify and address water quality problems stemming from inadequate wastewater treatment systems in the Cannon River Planning Area.

GOAL 2

Create more uniformity within existing SSTS programs across the Cannon River Planning Area to ensure consistency in implementation and enforcement.

Implementation Activities

1. Conduct SSTS Inventory in Priority Areas
2. Conduct Risk Assessment to facilitate prioritization and assist county staff and local officials with future planning
3. Inventory existing programs
4. Identify programmatic gaps and develop solutions to fill the gaps

LANDSCAPE ALTERATION CONCERN: PUBLIC AND PRIVATE DRAINAGE SYSTEMS

A. Drainage System Management

Concerns Expressed during Planning Process

Drainage tile and irrigation identified as potential impacts related to agriculture. Need for peak flow reduction on agricultural and urban lands. Drain tile systems move water off the landscape more quickly than under pre-settlement conditions. This compounds flooding issues.

Issue Statement

While public and private drainage systems were installed to remove excess water and lower the water table for agricultural production and/or development, there were unintended consequences to the hydrologic system including changes in peak flow, water quantity, water quality and groundwater recharge. Group concerned about private drainage connections to the public system. Drainage east of Owatonna contributing to flooding.

Measurable Goals

GOAL 1

Create an inventory of public and private drainage systems within 10 years.

GOAL 2

Incorporate projects into public drainage systems that provide hydrologic benefits to the watershed and reduce localized flooding in all areas where known by conducting X projects in X area per

GOAL 3

Incorporate projects into the public drainage system that provide water quality benefits and promote groundwater recharge.

Implementation Activities

1. Modernization of drainage records (convert profiles to known elevation datum, update benefitted parcels mapping, etc.)
2. Promote the development of Comprehensive Drainage Management Plans on all public and private drainage systems
3. Construct X BMPs in the watershed that provide water quality benefits such as tile inlet protection, and saturated buffers.
4. Olmstead County installed dikes in the drainage system to hold water.
5. Belle Creek WD installed structures that have prevented flooding since their installation.
6. Consider more dams and controlled systems.
7. Counties and cities need to work together.

LANDSCAPE ALTERATION CONCERN: PUBLIC AND PRIVATE DRAINAGE SYSTEMS

B. Aging/Under-Sized Drainage Systems

Concerns Expressed during Planning Process

Drainage tile and irrigation identified as potential impacts related to agriculture. Need for peak flow reduction on agricultural and urban lands.

Issue Statement

Existing drainage systems and/or aging infrastructure may not be sized to handle volume and rate changes that cause localized flooding issues.

Measurable Goals

GOAL 1

Understand the capacity and condition of the current drainage system and implement projects that enhance the function of the existing system without causing environmental or property damage caused by too much or too little water.

Implementation Activities

1. Conduct an assessment of the drainage in areas with known flooding issues.
2. Implement X projects that enhance the function of the system without causing environmental and property damage.

LANDSCAPE ALTERATION CONCERN: PUBLIC AND PRIVATE DRAINAGE SYSTEMS

C. Drainage Education

Concerns Expressed during Planning Process

Promote multi-benefit drainage management projects.

Issue Statement

There is a lack of understanding of and/or funding for retrofitting existing drainage systems for multi-purpose and multi-benefit drainage management

Measurable Goals

GOAL 1

Develop a program that educates and incentivizes multi-benefit drainage management projects through a County cost-share and education program.

Implementation Activities

1. Host 2 co-op workshops per year per County regarding multi-purpose and multi-benefit drainage management
2. Build at least two demonstration projects in the watershed that can also be used for research and educational tours.

LANDSCAPE ALTERATION CONCERN: CLIMATE CHANGE

A. Community Resilience to Climate Change

Concerns Expressed during Planning Process

Climate change is an important impact. There have been a number of significant rainfall events in the last two years that have resulted in flooding. What has changed? More extreme precipitation, how it is delivered over the course of the year, and pinch-points in the system is resulting in more flooding.

Issue Statement

Rising global temperatures have been accompanied by changes in weather and climate. As a result, many areas are seeing changes in precipitation patterns including more floods, droughts and/or intense precipitation events. A trend analysis of local climate data indicates that the Cannon River Planning Area is experiencing changes in precipitation and temperature which presents challenges to watershed management decision-making. Timing has changed as evidenced by the Waseca precipitation events that took place in September of 2016. Not the right time of year for such an extreme event.

Measurable Goals

GOAL 1

Develop a better understanding of climate change, its impacts to the Planning Area's land and water resources, and adaptive strategies to address this emerging issue.

GOAL 2

Increase the resiliency of the Planning Area by adapting to climate change, including adopting the recent update of NOAA Atlas 14 and other climatic data to ensure that design standards are kept current with the most recent climate data.

Implementation Activities

1. Conduct a vulnerability assessment in each of the communities experiencing flooding due to extreme precipitation events to identify infrastructure needs and develop adaptation strategies to make communities more resilient to the effects of a changing climate.
2. Utilize Green Infrastructure to build resiliency into the stormwater management system.
3. Don't allow development in flood-prone areas or future flood prone areas.
4. Support increased infiltration, stormwater reused and water conservation.
5. Farming practices like soil health is a good way to increase resiliency in the system.

SOCIOECONOMIC FACTORS: EDUCATION AND OUTREACH

A. Educating Local Land Use Decision Makers

Concerns Expressed during Planning Process

Lack of diversity of elected officials. Adoption of government operations which promote/ehnace watershed management (e.g. street sweeping, reducing impact of politics, updating zoning practices, and snow and ice control or removal). There is a need to educate municipal officials and residents of the watershed about agricultural practices. There is a misconception that agriculture is bad for the environment.

Issue Statement

Decision makers (government officials) need to improve their understanding of watershed management to better understand how land-use decisions impact the watershed and its resources.

Measurable Goals

GOAL 1

Educate local elected + appointed decision-makers w/ role in addressing relationship between land use and natural resource protection on watershed management/ stormwater management.

GOAL 2

Provide local elected + appointed decision-makers education + information materials on rural + agricultural land use issues including federal/state laws regulating agricultural activity, performance of BMPs, and local implementation success stories.

Implementation Activities

1. Annually lead one community conversation on stormwater management BMPs.
2. Meeting with the County Boards, County Departments (Administration, Attorneys, Planning and Zoning, etc.) and City Councils to express the importance and potential benefits of Plan implementation and providing an annual update on Plan progress.
3. ~~Encourage local government unit staff and local agency staff to attend trainings on newly developed technology and tools relevant to water resource management.~~
4. Education on Best Management Practices
5. Host annual field day or tour for policy makers
6. Develop factsheets on projects completed within the Planning Area

Comment [CC1]:
Potential Measures:
- Number of trainings
- Knowledge of officials – Perceptions – Surveys
- Number of ordinances passed

Comment [CC2]:
Content of Education:
- Broader picture – Include all issues
- Understand audience
- Talk about economics

SOCIOECONOMIC FACTORS: EDUCATION AND OUTREACH

B. Citizen Engagement

Concerns Expressed during Planning Process

Negative impacts a result of poor or ineffective behavioral choices (e.g. car washing, invasive species transport, excessive groundwater extraction, and mowing to the lakeshore).

Issue Statement

Citizens in the Planning Area need to improve their water literacy and gain a basic understanding of watershed management to be better stewards of the watershed and its resources.

Measurable Goals

GOAL 1

Support progress towards achieving goals of 1W1P by encouraging behavioral changes from all sectors of the public through meaningful education and outreach experiences.

GOAL 2

Increase adoption of BMPs by increasing engagement/communication with residents, local landowners and agricultural producers to better understand implementation issues, fiscal and operational barriers and communicate the benefits of implementation.

Implementation Activities

1. Support public education and outreach initiatives that teach citizens to take action or alter traditional behaviors and practices. This could include the implementation of education and outreach programs to raise awareness on: impacts of runoff on our natural environment and water resources, identify BMPs and support of programs that help citizens to implement practices (in rural and urban areas) to reduce runoff volumes, reduce erosion and sedimentation, stabilize stream banks and shorelines, and reduce pollutant loads discharging to water resources; and properly manage and dispose of wastes.
2. Develop one urban storm water BMP demonstration site to display the water quality benefits of practices that reduce runoff and treat storm water
3. Provide education to watershed residents by partnering with other entities and/or seeking funding to educate and engage agricultural producers, agricultural groups, and other residents about water resources, water conservation, and BMPs, including new and innovative practices, septic system maintenance, nutrient management, lakeshore and shoreline restoration, and buffers; through avenues such as field days, watershed councils, township officers' meetings, township newsletters, etc.
4. Partner with County schools to hold annual Protect Our Waters Day.
5. Partner with Community Education for a family event (with childcare).

Comment [CC3]: "Citizens" is very broad

Comment [CC4]: Potential Measures:
- Determine effectiveness – Follow-up with past students
- Teacher surveys – Keep simple

Comment [CC5]: Content of Education:
- Define stakeholder sub-groups and create content for them
- Match k-12 education with core curriculum
- Include agriculture topics
- Develop an emotional connection
- Content for students to bring home
- Stormwater stencils (ex from Faribault Co where students even presented to council)

SOCIOECONOMIC FACTORS: COORDINATION AND PARTNERSHIPS

A. Watershed Partnerships

Concerns Expressed during Planning Process

Need for a river cleanup. Soild groups/people have a role to play in stewardship. Help divergent views work collaboratively to improve water quality.

Issue Statement

Opportunities for existing partnerships need to be enhanced and utilized in the Cannon River Planning Area.

Measurable Goals

GOAL 1

Increase collaboration with the Cannon River Watershed Partnership to leverage activities currently being performed by each other.

GOAL 2

Cultivate partnerships with agencies and organizations (including Lake Improvement Districts and Lake Associations) that have similar goals including collaborating on programs and co-sponsoring grant applications.

GOAL 3

Expand partnerships with North Cannon River Watershed Management Organization + Belle Creek Watershed District to support progress towards achieving 1W1P goals

GOAL 4

Increase collaboration amongst stakeholders and leveraging strategic partnerships for coordinated project, program and strategy implementation.

GOAL 5

Increase the use of volunteers to implement projects and programs.

GOAL 6

Continue to coordinate with cities and townships to achieve the goals of the 1W1P.

GOAL 7

Cultivate partnerships with universities and research institutes: collaborate on projects, and co-sponsoring grant applications

Comment [CC6]:
General Comments on Goals:
- Lots of them and they will require a lot of time and money
- Trust not established between all groups listed

Goal 4:
- This could be priority
- Divide stakeholders into smaller groups
- Connect with 'trusted' individuals, those that others listen too

Goal 5:
- Utilize existing groups/networks, such as CRWP
- Compensate volunteers either nominally or by making sure they receive personal satisfaction
- Volunteer appreciation dinners/events/awards

Implementation Activities

1. ~~Assist watershed residents and landowners in the development of Watershed Advocacy groups with a focus on developing these groups within Tier One Priority Areas.~~
2. Partner with and provide technical assistance to lake associations/groups on projects to reduce water pollution and improve water quality.
3. In partnerships with the CRWP, create a brand for the Cannon River Planning Area that can be used on interpretive signage throughout the area (on watershed break and stream crossings).
4. In partnership with CRWP, give awards for outstanding work that supports the goals of the 1W1P (i.e. Outstanding Conservation Farmer, Outstanding Wildlife Conservationist, and Outstanding Windbreak). Goal is to not eliminate existing awards and not to duplicate efforts; possibly create new award categories.

Comment [CC7]:
- Concern that there are already enough advocacy groups
- Concern that signage is expensive and dollars are better spent on projects

SOCIOECONOMIC FACTORS: EDUCATION AND OUTREACH

B. Internal Capacity

Concerns Expressed during Planning Process

Importance of awareness campaigns and watershed-scale planning. Funding.

Issue Statement

Improve capacity and planning coordination of new organizational structure of Planning Work Group.

Measurable Goals

GOAL 1

Ensure a transparent organization that offers opportunity for public participation and feedback.

GOAL 2

Provide leadership, education, and resources to assist contractors, landowners, LGUs, etc., in developing and implementing sound BMPs.

GOAL 3

Increase municipal staff awareness of the Cannon River 1W1P, strengthen technical capacity and provide education on the regulatory framework.

Implementation Activities

1. Website with required postings as well as ability to receive public input via comments or survey
2. Welcome packets for new homeowners on who to contact for water resource related questions
3. Host an annual contractor meeting and provide incentives for attending
4. Training for staff on how to build relationships with those outside of the Planning Work Group

Comment [CC8]: Capacity comes down to fostering relationships within group, but more important is this groups connections with other groups

Comment [CC9]: Not a lot of measurability in all of the goals, but okay to count activities, trainings, etc to show progress

Goal 2:

- Need clarification on type of contractors – septic install training? Dirt work? Related to NPDES?

SOCIOECONOMIC FACTORS: RECREATION AND LIVABILITY

A. Recreational Value

Concerns Expressed during Planning Process

Use and impacts of riparian commercial uses (resorts, outfitters, etc.). Need for a river cleanup. Outdoor recreation and engagement. Aestheticss: spirituality, honoring plant and animal life. Fisherman noted lack of fish in the Cannon River: oily sheen and turbidity increasing. Balance the need for storage with recreation. Invasive species.

Issue Statement

Maintain existing and create new high-quality opportunities for recreation.

Comment [CC10]:
- Concern that there is already too much boat traffic and shouldn't create new opportunities – response that water is publicly owned
- Add 'Improving environmental stewardship' to ensure users are caring for resources they are recreating in

Measurable Goals

GOAL 1

Improve public's access to natural environments.

GOAL 2

Enhance public recreation opportunities by promoting clean water, connecting habitat, and preventing invasive species.

Comment [CC11]:
Goal 1:
- Concern that improving access will lead to degradation of natural environments
- Foster environmental stewardship
- Goal written to connect people to resource so they develop values to care for them

Goal 2:
- Invasive species – aquatic and terrestrial?
- What is meant by connecting habitat? If corridors, could prioritize connections in existing programs such as RIM

Implementation Activities

1. Increase the number of access points.
2. Address barriers in the river to recreation.
3. Promote recreational rental businesses.
4. Promote waterfront parks/community spaces.
5. Inventory condition of existing access points
6. Install webcams to allow viewing of nature
7. Aquatic invasive species education through inspections, education materials and signage
8. Define areas for recreation through use of maps or online resources

April 4, 2017

Ashley Gallagher
Dakota County Soil and Water Conservation District
4100 220th Street West
Farmington, MN 55021

RE: Response to Request for Priority Concerns for the Cannon River One Watershed, One Plan

Dear Ms. Gallagher:

The City is committed to improving the quality of water resources in our watershed to ensure our water resources are safe for recreation and consumption and provide healthy ecosystems. The City would like to thank the Cannon River One Watershed One Plan Work Group for the opportunity to provide input regarding the water management concerns that may help shape the direction of the Cannon River One Watershed One Plan. Please find a list of our concerns below.

1. Flood Mitigation. In recent years, increased occurrences of frequent and intense rainfall events have led to significant flooding of the Cannon and Straight Rivers – resulting in the increased risk of and substantial damage to municipal facilities and utility infrastructure. The City alone, has limited ability to begin a dialogue and implement meaningful change. The One Watershed One Plan process provides an excellent opportunity to establish a framework for and/or develop a flood mitigation strategy to help reduce the risk and impacts of flooding to life, property, and our natural environment.

2. Climate Resiliency. This planning process provides an opportunity to address potential hydrologic, hydraulic and water quality impacts stemming from and develop an adaptation strategy for future extreme weather events and scenarios. A greater understanding of possible future extreme weather event impacts are critical to successful implementation of watershed and water resource management strategies.

3. Surface Water Quality. Water quality impairments of surface water resources are numerous and prevalent across the Cannon River Watershed. This plan should identify a targeted approach for BMP implementation to address point and non-point source pollution for an array of stressors – not only focusing on sediment and nutrients, but also for bacteria, nitrate, chloride, eutrophication impairments, emerging contaminants, and management strategies to reduce runoff volumes and peak storm flows. It is recommended that the plan also explore non-traditional management strategies such as water re-use.

   We also recommend that the plan support public education and outreach initiatives that help drive a change for citizens to take action or alter traditional behaviors and practices. This could include the implementation of education and outreach programs to raise awareness on: impacts of runoff on our natural environment and water resources, identify BMPs and support of programs that help citizens to implement practices (in rural and urban areas) to reduce runoff volumes, reduce erosion and sedimentation, stabilize stream banks and shorelines, and reduce pollutant loads discharging to water resources; and properly manage and dispose of wastes.

4. Strategies for Point Source Pollution. Agricultural uses dominate the Cannon River Watershed landscape. The Cannon River Watershed Restoration and Protection and Strategies Report largely focused on restoration strategies for non-point source pollution centered on nitrogen and phosphorous. The City recognizes that a majority of the watershed's impairments are driven by non-point sources. However, The City's ability to leverage outside funding sources for project implementation is directly tied to the local water and watershed management plans. If management strategies fail to identify specific implementation activities for point sources of pollution, across a diverse range of stressors, the City's ability to implement capital improvement projects to reduce pollutant loads is greatly limited.

5. Groundwater Supply and Quality. The City implements a Wellhead Protection Plan and manages its drinking water supply management area (DWSMA) and public water supply system to continue to provide a safe and adequate drinking water supply to over 23,000 residents and numerous industries. It is encouraged that the plan address protection of groundwater quality and quantity through:
   - Maintaining a water supply that achieves state and federal drinking water standards. This may also include management strategies for possible emerging contaminants and groundwater recharge opportunities.
   - Supporting the implementation of public water supplier Wellhead Protection Plans.
   - Supporting public education and outreach programs and initiatives regarding water conservation and water conservation practices, water re-use, groundwater quality, water well maintenance, well sealing, waste management and spill response and reporting, and wellhead management.
   - Supporting private well testing.
   - Supporting sealing programs for abandoned and unused wells.

   The City also requests that the plan supports increased coordination amongst local regulatory authorities and partners for the protection of wellhead and DWSMA areas. Within the current framework, the City has limited ability to provide input with regards to changes in land use outside of the City's regulatory authority or when a local partner implements, or supports the implementation of structural BMPs (e.g. volume reduction) within vulnerable areas that may have the potential to adversely impact source waters.

6. Natural Resource Protection. The City's utilizes multiple planning and regulatory mechanisms to protect and restore natural features and areas within the City. It is recommended that the plan incorporate strategies and support programs for the protection and restoration of priority areas including water resources, shoreland areas, areas containing rare species and species of concern, natural resource/habitat corridors, and other high ecological value areas.

7. Recreational Value. A large portion of the Cannon River is designated as an outstanding resource value water. The many tributary creeks, streams, and rivers and lakes, trails, and parks across the watershed provide ample opportunity for recreational and physical activity. Recreation and tourism associated with these outdoor features and resources, have high economic importance to local economies. It is recommended that the plan identifies the economic value of these resources and benefits to local economies, and also supports strategies to improve and adapt the public's access to nature and mitigate stressors.

8. Coordination and Partnerships. Many local, regional, and state public and private entities have a vested interested in water resource management and the protection of our water resources and natural environment. Although the source of interest may differ, many of these entities often have overlapping or common goals. It is recommended that the plan supports increased collaboration amongst stakeholders and leveraging strategic partnerships for coordinated project, program and strategy implementation.

As previously mentioned, the City of Faribault utilizes various tools and resources to help protect and manage natural and water resources. The One Watershed One plan should have a connection to these resources or more pertinent priorities within specific local management plans, including:

- *Natural Resources Inventory and Management Plan*. This plan prioritizes local ecologically valuable areas for protection of restoration including water resources, wetlands, rare species communities, and habitat corridors/greenways,
- *Surface Water Management Plan*. This plan outlines a comprehensive strategy for surface and stormwater management with the goal of protecting the environment and preserving clean water and air, preserving scenic and environmental qualities of the Cannon and Straight Rivers and their tributaries, preserving sufficient open space to provide healthy habitats and scenic and recreational qualities, and guiding development and redevelopment in a way that protects and enhances natural resources. The plan additionally identifies priority natural resources, priority focus areas, and priority issues and areas of concern.
- *Water Supply Plan*. Public water suppliers (PWS) are required to implement this plan to develop a better understanding of and implement long-term water sustainability and conservation initiatives, and develop emergency preparedness strategies. This plan overviews the City's current groundwater demand, future demand for groundwater resources and resource sustainability, preliminary plan of water supply treatment and distribution system capital improvements, water conservation initiatives and goals, and public education and outreach activities.
- *Wellhead Protection Plan*. PWS are also required to implement this plan, to help the PWS provide adequate and safe drinking water supply to residents. The City's plan delineates the extent of wellhead protection and drinking water supply management areas, identifies vulnerable areas of the DWSMA, identifies potential contamination sources and levels of risk, identifies potential impacts from land use changes, and presents strategies and opportunities to mitigate potential adverse impacts.
- *Comprehensive Plan*. This plan is utilized to guide growth, redevelopment, and improvement of the City. It additionally builds off some strategies within the City's Natural Resources and Surface Water Management Plans with regards to the preservation of natural areas, habitat corridors, and greenways, and improving access to the natural resources and recreational opportunities. It also outlines policies with regards to the protection and enhancement of natural resources.

Additionally, the City would like to express its interest in participating on the Advisory Committee. We believe representation of and participation by the MS4 communities in the Cannon River Watershed are critical to successful local water management planning and implementation.

The City of Faribault supports the efforts of local partners and the One Watershed One Plan process. Please feel free to contact me at 507.333.0369 with any questions of if additional information is needed.

Best Regards,

Melissa King

Melissa King
Water Quality Specialist

Cc: Travis Block, Public Works Director (email)

From:	David Bennett
To:	Gallagher, Ashley
Subject:	Cannon River One Watershed
Date:	Friday, February 03, 2017 8:38:00 AM

Ashley

As the plan is developed, there are two items that we want to address for the Cannon River.

1. Water Quantity – Flooding
    a. The climate trends indicate higher intensity storm with larger rainfall amount for the watershed
    b. Reduce impacts to all land and properties impacted from flooding.
2. Water Quality
    a. Look for highest impact, lowest cost ,ways to improve water quality of the River.

Also, identify funding to assist with this.

David E. Bennett, P.E. (MN)
Public Works Director/City Engineer

801 Washington Street, Northfield, MN 55057
P: (507) 645-3006   F: (507) 645-3055
E: David.Bennett@ci.northfield.mn.us
Web: www.ci.northfield.mn.us

Minnesota Board of Water & Soil Resources

April 4th, 2017

Cannon One Watershed One Plan Planning Work Group / Cannon River Watershed
C/O Brian Watson/Ashley Gallagher, Dakota Soil and Water Conservation District
4100 220th Street West, Suite 102
Farmington, MN, 55024

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

Dear Brian and Ashley,

Thank you for providing the opportunity to provide priority issues and plan expectations for the development of the Cannon River Comprehensive Watershed Management Plan under Minnesota Statutes section 103B.101, Subd. 14. We appreciate the partner's willingness to participate in development of a watershed-based plan.

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

Process

- The planning process must follow the requirements outlined in the One Watershed, One Plan – Operating Procedures document, adopted by the BWSR Board on March 23, 2016 and available on the BWSR website: www.bwsr.state.mn.us/planning/1W1P/index.html. More specifically, the planning process must:
    - Involve a broad range of stakeholders to ensure an integrated approach to watershed management.
    - Reassess the agreement established for planning purposes when finalizing the implementation schedule and programs in the plan, in consultation with the Minnesota Counties Intergovernmental Trust and/or legal counsel of the participating organizations, to ensure implementation can occur efficiently and with minimized risk. This step is critical if the plan proposes to share services and/or submit joint grant applications.

Plan Content

- The plan must meet the requirements outlined in the One Watershed, One Plan – Plan Content Requirements document, adopted by the BWSR Board on March 23, 2016 and available on the BWSR website: www.bwsr.state.mn.us/planning/1W1P/index.html. More specifically, the plan must have:

- A thorough analysis of issues, using available science and data, in the selection of priority resource concerns.
- Sufficient measurable goals to indicate an intended pace of progress for addressing the priority issues.
- A targeted and comprehensive implementation schedule, sufficient for meeting the identified goals.
- A thorough description of the programs and activities required to administer, coordinate, and implement the actions in the schedule; including work planning (i.e. shared services, collaborative grant-making, decision making as a watershed group and not separate entities) and evaluation.

BWSR has the following specific priority issues:

Pertaining to Vegetation Management

- **Natural Habitat Protection/Restoration**: Protecting and restoring diverse natural habitats has multiple benefits including water quality protection for groundwater and surface water, stable plant composition to resist invasive species, protecting pollinator populations, wildlife habitat and resiliency to weather extremes. The plan should identify high priority natural habitats including wildlife and water quality complexes and corridors, and promote a combination of agricultural BMPs, buffer programs, conservation plantings, wetland projects and riparian activities that will protect, restore and link water quality and habitat corridors. Minnesota's Wildlife Action Plan and Prairie Conservation Plan are resources that can be used to aid planning efforts.
- **Protecting Pollinator Populations**: Projects should identify opportunities to benefit pollinator populations through creating areas of refuge and providing floral resources that can benefit a wide range of pollinators. BWSR's Pollinator Toolbox provides guidance for projects and an Interagency Plan will be finalized in spring of 2017 that is focused on meeting pollinator goals identified in Governor Dayton's Executive Order "Directing Steps to Reverse Pollinator Decline and Restore Pollinator Health in Minnesota".
- **Invasive Species and Landscape Management**: A cooperative approach across the watershed is recommended for invasive species management to address invasive species and noxious weeds or specially regulated plants across geographic and ownership boundaries. Invasive species should be prioritized based on their risk to ecosystems, agriculture, recreation, and human health, as well as focusing on emerging weed threats such as Palmer amaranth that poses a significant risk to agricultural production. Adaptive management strategies should be used to address invasive species and also maintain ecological functions and services within landscapes.
- **Soil Health:** The use of cover crops and perennial vegetation is recommended to promote good soil structure, organic content and microorganism populations that promote soil health and sustain productive ecological and agricultural landscapes. More vegetation more of the time increases evapotranspiration during the spring and fall seasons, reduces runoff and erosion and helps recycle nutrients. More roots more of the time increases organic matter in the soil profile, which increases infiltration and water holding capacity for plant available water, and also reduces runoff, erosion and nutrient transport.

- **Riparian Management:** Protecting and restoring riparian areas, including adjacent floodplains, have multiple benefits by reducing soil erosion, stream channel instability, phosphorus and nitrogen loading, and restoring flood attenuation, wildlife habitat and wetland functions. The Plan should identify high priority areas for riparian buffer easements, riparian erosion and sediment reduction, wetland restoration and other water storage and nutrient treatment opportunities, and target implementation efforts to those areas.

- **Wetland Management:** Protection and restoration of wetlands provides benefits for water quality, peak flow reduction, habitat and wildlife. The plan should support the continued implementation of the Wetland Conservation Act and look for opportunities to improve coordination across jurisdictional boundaries. The plan should also identify high priority areas for wetland restoration and strategically target restoration projects to those areas. The Restorable Wetland Prioritization Tool is one resource that can be used to help identify areas for wetland restoration.

Pertaining to Groundwater

- **Groundwater Coordination and Prioritization:** Work with BWSR staff and agency partners (MDH, DNR, MDA, MPCA) to outline any groundwater – related priority issues for the planning area. Take into account any Groundwater Management Areas, areas of groundwater concern, wellhead protection areas, and Drinking Water Supply Management Areas that have been identified. Address specific concerns about groundwater contamination and overuse that have been identified. Be sure to make use of existing groundwater data and publications. These include maps, data layers, and publications available from the Minnesota Geological Survey (MGS), DNR, MDH, US Geological Survey (USGS), and other sources.

Pertaining to Drainage Management (103E):

- **Involve Drainage Authorities:** Chapter 103E drainage authorities should be fully engaged from the early stages of the planning process. Use Section 103E.015 *CONSIDERATIONS BEFORE DRAINAGE WORK IS DONE* to capture both the extent and the limitations of drainage authority responsibility and authority for participating in the planning and implementation of conservation practices involving public drainage systems and their associated drainage areas.
- **Multipurpose Drainage Management (MDM):** Include multipurpose drainage management in the approach for targeting best management practices (BMPs) within the drainage area of Chapter 103E drainage systems.
- **Remember PTM Concepts:** Always remember Prioritize, Targeted, and Measurable.
    - Prioritization of the watershed include landscapes and identification of Chapter 103E drainage systems and their drainage areas.
    - Measurable outcomes for erosion and sediment reduction, nutrient reduction, improved instream biology, and detention storage to assist those outcomes, should include correlation to Chapter 103E drainage systems.
- **Coordinate Implementation:** Lay out a coordinated approach for how implementation of multipurpose drainage management practices identified in the plan can be coordinated with,

and/or integrated early into 103E processes and proceedings. When projecting funding needs for BMP implementation on, or within the drainage area of, public drainage systems, incorporate use of Sections 103.011, Subdivision 5. *Use of external sources of funding*, and 103E.015, Subdivision 1a. *Investigating potential use of external sources of funding and technical assistance.*

Drainage authorities should consider the permissive authority to incrementally implement permanent buffer strips of perennial vegetation or side inlet controls to control erosion and sedimentation, improve water quality, or maintain efficiency of the drainage system allowed in 103E.201 subd. 6. In addition, a drainage authority shall order a 16-1/2 feet strip of **perennial vegetation** for any proceeding to establish, construct, improve or do any work affecting a public drainage system under any law that appoints viewers to assess benefits and damages pursuit to 103E.021 subd. 1.

Pertaining to Wetlands

- **Wetland Prioritization:** The state is embarking on a wetland prioritization plan that will guide wetland mitigation in the future. Wetland restoration and preservation priorities identified in this plan may be eligible for inclusion in this statewide plan in the future.

Pertaining to Easements

- **Re-Invest in Minnesota (RIM):** The State's Re-Invest in Minnesota (RIM) Reserve easement program considers several site specific and landscape scale factors when funding applications. Though it is dependent on specific program terms, the State does consider local prioritization of areas for easement enrollment.

General Comments

- **Review of the Nonpoint Priority Funding Plan:** The state's Nonpoint Priority Funding Plan (NPFP) outlines a criteria-based process to prioritize Clean Water Fund investments—if planning partners are intending to pursue Clean Water Fund as a future source of funding, partners are strongly encouraged to consider the high-level state priorities, keys to implementation, and criteria for evaluating proposed activities in the NPFP.
- **Ordinance Review:** A review of local ordinances and regulations across the watershed should be considered with the purpose of identifying commonalities and significant differences and opportunities for coordination.
- **Climate Change Review:** Please review the document entitled: "Climate Change Trends and Action Report-Updated December 13, 2016" and incorporate climate change information within your planning effort. This document includes information related to mitigation and adaptation.

  http://www.bwsr.state.mn.us/native_vegetation/BWSR_Climate_Change.pdf

- **Cannon River WRAPS:** The Cannon River Watershed Restoration and Protection Strategies approved October 20th, 2016 contains information related to existing watershed conditions, pollutant sources and TMDL information, and management strategies pertaining to restoration and protection. This information should be reviewed and incorporated within this planning efforts.
- **Altered Hydrology/Flooding/Water Quantity**: Counties within the Cannon River Watershed have experienced increases in disaster declarations, and damaging flood events. There are several causes for the increased flooding. BWSR believes the watershed plan should examine these causes and potential mitigation and implementation efforts that would assist in the reduction of peak flow, flooding, streambank/riparian erosion and sedimentation. Artificial drainage and potential wetland restoration should also be considered.

We commend the partners for their participation in the planning effort. We look forward to working with you through the rest of the plan development process. If you have any questions, please feel free to contact Jennifer Mocol-Johnson at 507-344-2820.

Sincerely,

Jennifer A. Mocol-Johnson

Jennifer Mocol-Johnson
BWSR Board Conservationist
12 Civic Center Plaza Suite 3000B
Mankato, MN 56001
Phone# 507-344-2820
Cell# 507-430-6409
Email Address: jennifer.mocol-johnson@state.mn.us

cc: Cannon River Watershed- Planning Work Group
Ed Lenz, Board of Water and Soil Resources (via email) ed.lenz@state.mn.us
Todd Piepho, MDNR (via email)
Barbara Weisman, MDNR (via email)
Rob Collett, MDNR (via email)
Spencer Herbert, MDA (via email) spencer.herbert@state.mn.us
Pat Bailey, MDH (via email) pat.bailey@state.mn.us
Justin Watkins, MPCA (via email) justin.watkins@state.mn.us
Juline Holleran, MPCA (via email) juline.holleran@state.mn.us
Judy Sventek, Metropolitan Council (via email) judy.sventek@metc.state.mn.us

April 4, 2017

Ashley Gallagher
Dakota SWCD Resource Conservationist
4100 220th St W
Farmington, MN 55024

RE: Priority Concerns for the Cannon River One Watershed, One Plan

Dear Ms. Gallagher:

Thank you for the opportunity to submit our priority concerns for inclusion in the Cannon River One Watershed, One Plan (1W1P), as well as Council expectations for the 1W1P outcomes. I have also included a list of Council resources that may be of use in the 1W1P preparation, including data, load calculations, and assessment reports.

The Cannon River 1W1P is an inter-jurisdictional comprehensive management plan that will guide 10-year water management activities for the county and Soil & Water Conservation District (SWCD) boards in Dakota, Goodhue, Le Sueur, Rice, Steele and Waseca counties, the North Cannon Watershed Management Organization, and Belle Creek Watershed District. Dakota County is within the seven-county metropolitan area (the Council's official jurisdiction). Council concerns, comments, and suggestions should be viewed with the most weigh in the Dakota County portion of the watershed.

Council Expectations and Priorities for 1W1P Preparation and Review

Council staff will review the plan, especially for that portion of the watershed within the metropolitan area, through the lens of the Council's *Thrive MSP 2040* Regional Development Framework and the *2040 Water Resources Policy Plan*, both of which can be found on the Council's web page (www.metrocouncil.org).

In particular, the *2040 Water Resources Policy Plan* (Policy Plan) includes policies and strategies to achieve the following goal:

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

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

The Policy Plan includes policies and strategies to:

- Maximize regional benefits from regional investments in the areas of wastewater, water supply and surface water management and protection.
- Pursue reuse of wastewater and stormwater to offset demands on groundwater supplies.
- Promote greater collaboration, financial support, and technical support in working with partners to address wastewater, water quality, water quantity and water supply issues.
- Promote the concept of sustainable water resources through collaboration and cooperation, with the region taking steps to manage its water resources in a sustainable way with goals of:
    - Providing an adequate water supply for the region
    - Promoting and implementing best management practices aimed at protecting the quality and quantity of our resources
    - Providing efficient and cost effective wastewater services to the region
    - Efficiently addressing nonpoint and point sources pollution issues and solutions, and,
    - Assessment and monitoring of lakes, rivers, and streams to direct adequate management, protection, and restoration of the region's valued water resources.

In addition to being consistent with the Council's new policy plans, Council staff will be looking for the plan to address the issues and problems in the watershed and to include projects or actions and funding to address them. Minnesota Statutes, Section 103B.801, subdivision 4 should be used as a guide. At a minimum, the 1W1P should address:

1. Any problems with lake and stream water quality and quantity, including information contained in the Cannon River Watershed Restoration and Protection Strategy (WRAPS).
2. Flooding issues in the watershed.
3. Storm water rate control issues in the watershed.
4. Impacts of water management on the recreation opportunities.
5. Impact of soil erosion problems on water quantity and quality.
6. The general impact of land use practices on water quantity and quality.
7. Policies and strategies related to monitoring of area water resources.
8. Policies and strategies related to use of best management practices.
9. Issues concerning the interaction of surface water and groundwater in the watershed
10. Erosion and sediment control standards and requirements.
11. Volume reduction goals at least as restrictive as requirements in the NPDES construction general permit.
12. Capital improvement plan with itemized list of actions, estimated costs, and timeline.
13. Specifics on long-term maintenance of projects identified in the capital improvement plan, including identification of entities responsible for funding and conducting maintenance, as well as how long-term maintenance will be documented.

Specific Priority Issues for the Cannon River watershed

Long-term monitoring data collected by the Council for the Cannon River was assessed in the Council's 2014 report *Comprehensive Water Quality Assessment of Select Metropolitan Area Streams* (available at www.metrocouncil.org/streams/). Results of the report indicate the flow-weighted mean concentrations at the monitoring station at the Welch for total phosphorus, total suspended solids, nitrate, and chloride were higher than those measured at the Council monitoring station on the

Mississippi River at St. Paul; thus Cannon River discharge has likely caused a decline in water quality in the Mississippi River. Yet trend analysis of the Cannon River data indicated improving water quality, and thus declining concentration, for total phosphorus and total suspended solids. Trend analysis indicates declining water quality, and thus increasing concentration, for nitrate. Based on the results of the study and Council policies, the following issues are specific to the Cannon River and are viewed as priorities by the Council for inclusion in the 1W1P:

- Impacts and mitigation of row crop agriculture. Phosphorus source control would reduce eutrophication issues in watershed lakes, and nitrate source control would protect human health and reduce potential for drinking water well contamination.
- Downstream impacts from the Cannon River watershed: The majority of the 1W1P will be focused on waterbodies and practices within the watershed. However, the Cannon River watershed is a major contributor of sediment and nutrients to the Mississippi River and has downstream impacts on water supplies, Lake Pepin, and ultimately the Gulf of Mexico. The 1W1P should explicitly address the context of the Cannon River within the greater Mississippi River watershed.
- WWTP (wastewater treatment plant) upgrades: Council trend analysis suggests that WWTP upgrades and installation of phosphorus-removal technologies has resulted in measurable reductions in total phosphorus in the Cannon River. While it may be beyond the scope of the 1W1P, identification of WWTPs needing upgrades may help with reductions in phosphorus, nitrogen, and bacteria.
- Regional parks: The Cannon River watershed includes two regional parks in Dakota County: Lake Byllesby Regional Park Miesville Ravine Park Preserve, both of which the Council has made a substantial investment in through its park implementing powers. These parks offer opportunities for public recreation on the Cannon River and its tributaries. Improvement of water quality in the watershed would likely have a positive impact on the parks, whether by improving fisheries and wildlife, by reducing risks to public health, and by improving river aesthetics.

Available Council Resources

The Council has collected monitoring data for the following sites in the Cannon River watershed:

Site	Years data available
Cannon River at Welch (mile 11.9)	1999-present
Cannon River near Harliss (Mile 4)	1996-2007
Lake Byllesby*	1993-1995, 2013-2014
Chub Lake*	1980, 1993-1995, 2010-2011

*Included on the Council's Priority Lakes List.

River and lake data can be downloaded by visiting the Council's EIMS website: https://eims.metc.state.mn.us/.

Of specific note is the Council's monitoring site at Welch. The Council has monitored the Cannon River at Welch continuously from 1999 through present along with the Dakota county SWCD as part of its Watershed Outlet Monitoring Program (WOMP). This monitoring site is collocated with the USGS monitoring station (gage 05355200) and includes continuous temperature, conductivity, and stage, as well as regular baseflow and event samples. We have calculated monthly and annual loads for this site as well. This site is a natural location to assess impacts of this 1W1P on the Cannon River over time.

The Council compiled monitoring data, flow, annual loads, and trend analyses for the Cannon River at Welch as part of our 2014 *Comprehensive Water Quality Assessment of Select Metropolitan Area Streams*, available at www.metrocouncil.org/streams/. During preparation of the report, Council staff collected geospatial data from multiple sources. The data includes land cover, topography, soils, crop information, and estimates of drain-tiled areas. I will be happy to direct you to load spreadsheets and any other data and analyses in the report, as well as any spatial data. I would also be happy to give a presentation to the 1W1P committees on this information. Please contact me at emily.resseger@metc.state.mn.us.

Please feel free to me call at 651-602-1033 with questions about my comments or for any assistance during the plan preparation.

Sincerely,

Emily Resseger
Principal Environmental Scientist
Metropolitan Council – Environmental Services
651-602-1033
emily.resseger@metc.state.mn.us

cc: Jennifer Mocol-Johnson, Board of Soil and Water Resources

From:	Peterson, Heidi (MDA)
To:	Gallagher, Ashley
Cc:	Herbert, Spencer (MDA); Felix-Gerth, Annie (MDA); Wagner, Margaret (MDA); Sip, Rob (MDA); Redlin, Brad (MDA); VanRyswyk, Bill (MDA); Bruening, Denton (MDA)
Subject:	RE: Cannon River One Watershed, One Plan Notice
Date:	Friday, March 17, 2017 7:47:45 AM
Attachments:	image001.jpg image002.jpg image003.jpg MDA_Cannon_River_fertilizer&pesticide.pdf

Good Morning Ashley,

On behalf of the Minnesota Department of Agriculture, thank you for the Cannon River 1W1P notification letter. We appreciate the invitation to submit water management issues. As a first step to planning for the 1W1P, we have compiled the following information for use by the team.

Minnesota Department of Agriculture Pesticide Water Quality Monitoring

The Minnesota Department of Agriculture (MDA) has been conducting pesticide monitoring in ground water since 1985, and in surface waters since 1991. Annually, the MDA completes approximately 250 sample collection events from ground water and 800 sample collection events from rivers, streams, and lakes across the state. In general, the MDA collects water samples from agriculture and urban areas of Minnesota and analyzes water for up to approximately 140 different pesticide compounds that are widely used and/or pose the greatest risk to water resources. All groundwater monitoring is conducted by MDA staff. Surface water monitoring is conducted by MDA and local organizations. All monitoring is completed following annual work plans and standard operating procedures (SOP's) developed by the MDA.

The purpose of the MDA's pesticide monitoring program is to determine the presence and concentration of pesticides in Minnesota waters, and present long-term trend analysis. Trend analysis requires a long-term investments in monitoring within the MDA's established networks. The MDA releases an annual water quality monitoring report that includes all pesticide water quality data and long term trends available at www.mda.state.mn.us/monitoirng. The MDA will continue to conduct statewide pesticide monitoring in the future and will provide additional information related to the occurrence of pesticides in Minnesota waters.

Groundwater

The MDA samples one monitoring well and one spring. The well has been monitored since 2008 and the spring since 2007. Pesticide and nitrate data are available for both the well and the spring. In addition semiannual water level measurements are available from the monitoring well.

The MDA also has pesticide and nitrate data from domestic wells in the watershed. One well has been sampled annually since 2009. A number of other wells have been sampled once in 2016. The chemistry data is available for the wells however, due to privacy rules, the well locations can't be shared.

Monitoring of the monitoring well, spring, and one domestic well in the watershed is expected to continue into the future.

Surface Water

The MDA has completed 298 pesticide and/or nutrient water quality sample collection events from

15 locations within the Cannon River Watershed from 1991-2015. The MDA has also completed four pesticide water quality sample collection events from four lakes (2007-2011) and one wetland (2014). There are currently no pesticide water quality impairments in the watershed.
The MDA is actively monitoring at the Little Cannon River at CSAH-24, 3 miles SW of Cannon Falls (S004-512) since 2009 and will continue to collect pesticide water quality samples at this location through at least 2021. The MDA does not have immediate plans to add additional surface water locations in 2017.

Agricultural Edge-of-Field

The MDA has conducted edge-of-field (EOF) monitoring at two locations within the Cannon River Watershed from 2013-2015. One location was east of Northfield while the other was west of Goodhue. Both of these monitoring locations were a part of a Conservation Innovation Grant project testing two types of EOF monitoring equipment. No additional EOF monitoring sites are expected to begin in the near future.

Nitrogen and Pesticide Use

The MDA surveys farmers through the National Agricultural Statistics Service (NASS). A summary of the data is attached as a PDF to this email. The most recent nitrogen use survey was for the 2014 crop year and the most recent pesticide use survey was for the 2013 crop year. For reference, the University of Minnesota fertilizer recommendations are found here:
http://www.extension.umn.edu/agriculture/nutrient-management/nutrient-lime-guidelines/fertilizer-recommendations-for-agronomic-crops-in-minnesota/index.html

The attached nitrogen use information is from the 2014 nitrogen use report, specifically the South Central (SC) and the Southeastern (SE) BMP regions.

The attached pesticide use information is from the 2013 pesticide use report, specifically the South Central (8) and Southeast (9) Pesticide Management areas.

Township Testing Program

The Cannon River Watershed does have townships which fall within MDA's Township Testing Program. The MDA has identified townships throughout the state that are vulnerable to groundwater contamination and have significant row crop production. More than 70,000 private well owners will be offered nitrate testing in over 300 townships per 2019. The sample schedule can be found on a handout downloadable here , which includes more background information. The Dakota County report, which contains areas within the Cannon River watershed, and additional Township Testing data can be found here.

Additional MDA Resources

Since there is a significant portion of the watershed in agricultural production, we would like to bring to your attention a couple resources, listed below, that we encourage you to reference during the planning process.

The Ag BMP Handbook (*currently in the process of updating the 2012 edition*) provides a comprehensive summary of BMPs that are practical for Minnesota:
http://www.mda.state.mn.us/protecting/cleanwaterfund/research/agbmphandbook.aspx

The 2015 Nitrogen Fertilizer Management Plan (NFMP): http://www.mda.state.mn.us/nfmp

A couple opportunities for BMP funding or cost-share:

The Minnesota Agricultural Water Quality Certification Program (MAWQCP) is a voluntary opportunity for farmers and agricultural landowners to take the lead in implementing conservation practices that protect our water. Those who implement and maintain approved farm management practices will be certified and in turn obtain regulatory certainty for a period of ten years. This is a planning program that should be included in the IWIP because it is an opportunity for agricultural producers to evaluate nutrient and field management practices within the Cannon River Watershed to reduce losses. There are currently sixteen (16) certified producers in the Cannon River Watershed. http://www.mda.state.mn.us/awqcp

The AgBMP Loan Program is a water quality program that provides low interest loans to farmers, rural landowners, and agriculture supply businesses. The purpose is to encourage agricultural Best Management Practices that prevent or reduce runoff from feedlots, farm fields and other pollution problems identified by the county in local water plans. http://www.mda.state.mn.us/agbmploans

The Nutrient Management Initiative (NMI) assists farmers and crop advisers in evaluating nutrient management practices on their own fields. This is a great opportunity for crop advisers to promote new management strategies and equipment that is available to boost yields and fertilizer efficiency for farmers, which will help reduce unnecessary losses to our water resources. http://www.mda.state.mn.us/nmi

We look forward to being involved in the 1W1P process. Spencer Herbert will be the MDA representative on the team. If you have any questions please do not hesitate to contact either Spencer or myself.

Thank you for your coordination,
Heidi

Heidi Peterson, Ph.D.
Research Scientist
Clean Water Technical Assistance Unit
Minnesota Department of Agriculture
625 Robert Street North
St. Paul, MN 55155-2538
Office Phone: 651-201-6014
www.mda.state.mn.us

From: Gallagher, Ashley [mailto:Ashley.Gallagher@CO.DAKOTA.MN.US]
Sent: Thursday, February 02, 2017 4:26 PM
Subject: Cannon River One Watershed, One Plan Notice

This email and the attached letter serve as the official notice for the beginning of the Cannon River One Watershed, One Plan (1W1P) process.

Future updates will be posted to the website at: http://www.dakotaswcd.org/1w1p.html

Please forward this email on to those within your organization whose work is relevant to the watershed planning process.

This email is sent on behalf of the Cannon River 1W1P Planning Workgroup, which is comprised of staff from the 14 Local Government Units within the planning area.

We look forward to working with you!

Ashley Gallagher
Resource Conservationist
Dakota County SWCD | 4100 220th Street West | Farmington, MN 55024
651-480-7781 | www.dakotaswcd.org | ashley.gallagher@co.dakota.mn.us

Cannon River Watershed

One Watershed One Plan

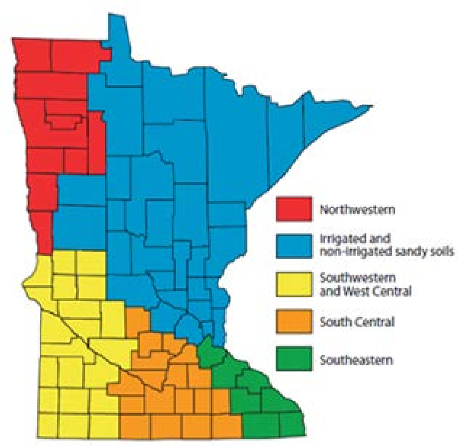
Goodhue County – Dakota County – Rice County – LeSueur County – Waseca County – Steele County

Minnesota Department of Agriculture

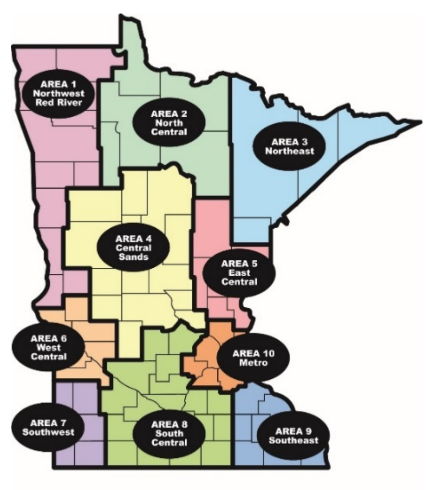
Nitrogen and Pesticide Use

The Minnesota Department of Agriculture surveys farmers through the National Agricultural Statistics Service. The most recent nitrogen use survey was for the 2014 crop year and the most recent pesticide use survey was for the 2013 crop year. The following nitrogen use information is from the 2014 nitrogen use report, specifically the South Central (SC) and the Southeastern (SE) BMP regions.

Minnesota Nitrogen Best Management Practices Regions



The following pesticide use information is from the 2013 pesticide use report, specifically the South Central (8) and Southeast (9) Pesticide Management areas.



Nitrogen use in the Cannon River Watershed: 2014 Crop Year

More than five responses are required for any individual category to be reported.
No manure fields are included in the fertilizer section.

Fertilizer section

Figure 1 details the distribution of nitrogen fertilizer rates in the SE BMP region for corn following soybeans; the corresponding corn yields are detailed in red.

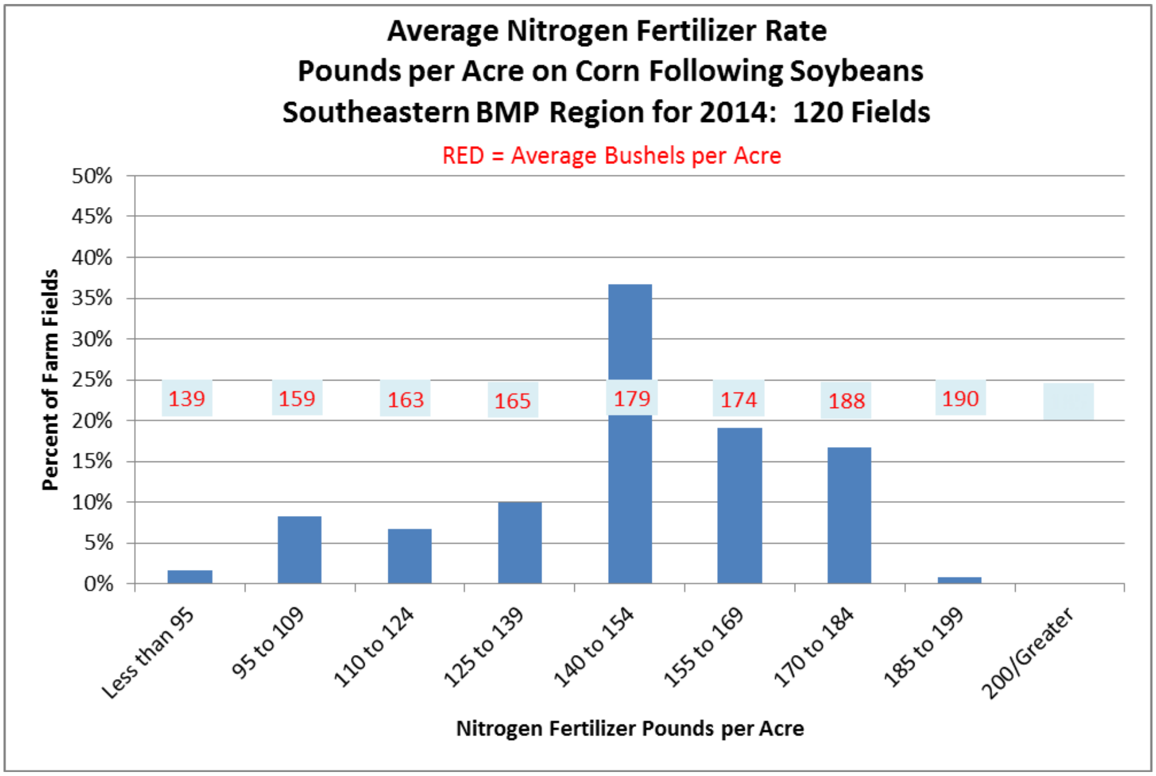


Figure 1. Average nitrogen fertilizer rates and yields on corn following soybeans in the SE BMP region for 2014: 120 fields.

In the SE BMP region, nitrogen fertilizer rates ranged from an average of 136 pounds per acre in Dakota County to 157 pounds per acre in Fillmore County as shown in Table 1.

Table 1. Average county nitrogen fertilizer rates and corn yields for the SE BMP region for corn following soybeans.

Average County Nitrogen Fertilizer Rates for the SE BMP Region for Corn Following Soybeans			
County	**Number of Farm Fields**	**Average Nitrogen Rate Pounds per Acre**	**Average Corn Yield Bushels per Acre**
Dakota	7	136	168
Fillmore	20	157	180
Goodhue	31	148	182
Houston	11	140	167

Average County Nitrogen Fertilizer Rates for the SE BMP Region for Corn Following Soybeans			
County	**Number of Farm Fields**	**Average Nitrogen Rate Pounds per Acre**	**Average Corn Yield Bushels per Acre**
Olmsted	15	145	175
Wabasha	15	143	168
Winona	21	145	169

Figure 2 details the distribution of nitrogen fertilizer rates in the SC BMP region for corn following soybeans; the corresponding corn yields are detailed in red.

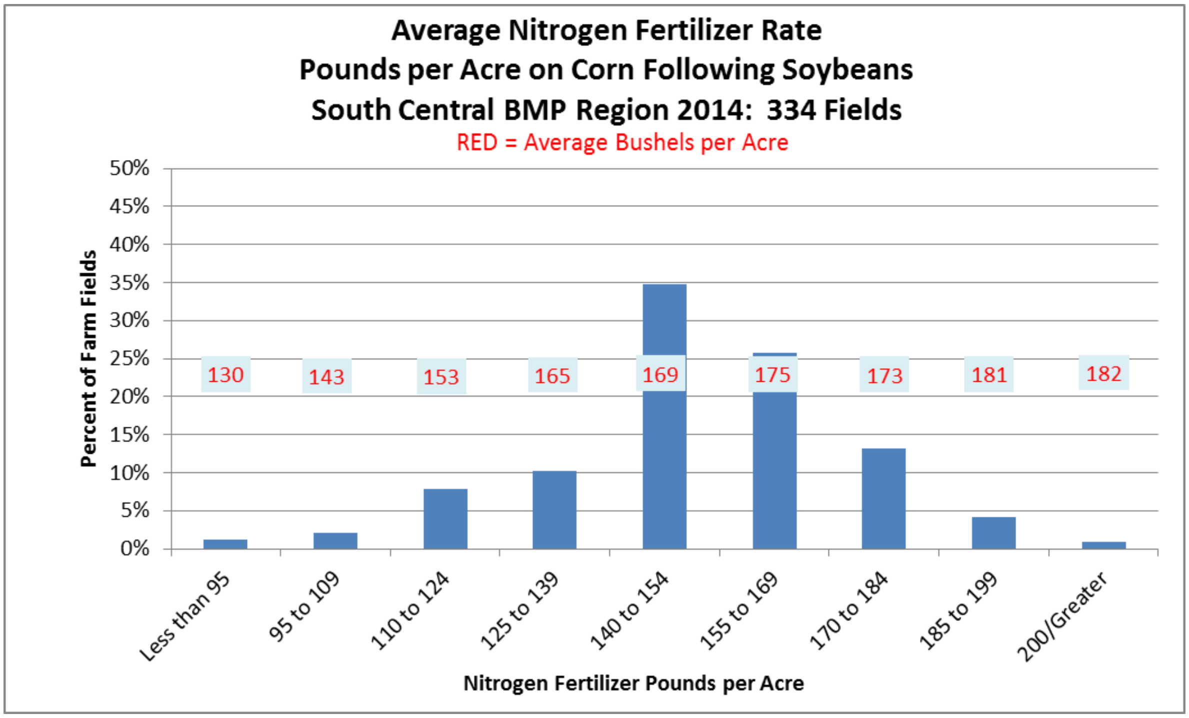


Figure 2. Average nitrogen fertilizer rates and yields on corn following soybeans in the SC BMP region for 2014: 334 fields.

In the SC BMP region, nitrogen fertilizer rates ranged from an average of 140 pounds per acre in Scott County to 163 pounds per acre in Meeker County as shown in Table 2.

Table 2. Average county nitrogen fertilizer rates and corn yields for the SC BMP region corn following soybeans.

Average County Nitrogen Fertilizer Rates for the SC BMP Region for Corn Following Soybeans			
County	**Number of Farm Fields**	**Average Nitrogen Rate Pounds per Acre**	**Average Corn Yield Bushels per Acre**
Blue Earth	31	150	172
Brown	25	150	170
Carver	11	141	157
Dodge	9	147	176
Faribault	18	154	179
Freeborn	30	155	173
Le Sueur	14	149	157
Martin	22	152	179
McLeod	16	150	158
Meeker	13	163	170
Mower	17	153	167
Nicollet	24	144	167
Rice	21	141	157
Scott	12	140	169
Sibley	28	146	165
Steele	16	158	178
Waseca	11	159	170
Watonwan	16	155	175

Figure 3 details the distribution of nitrogen fertilizer rates in the SE BMP region for corn following corn; the corresponding corn yields are detailed in red.

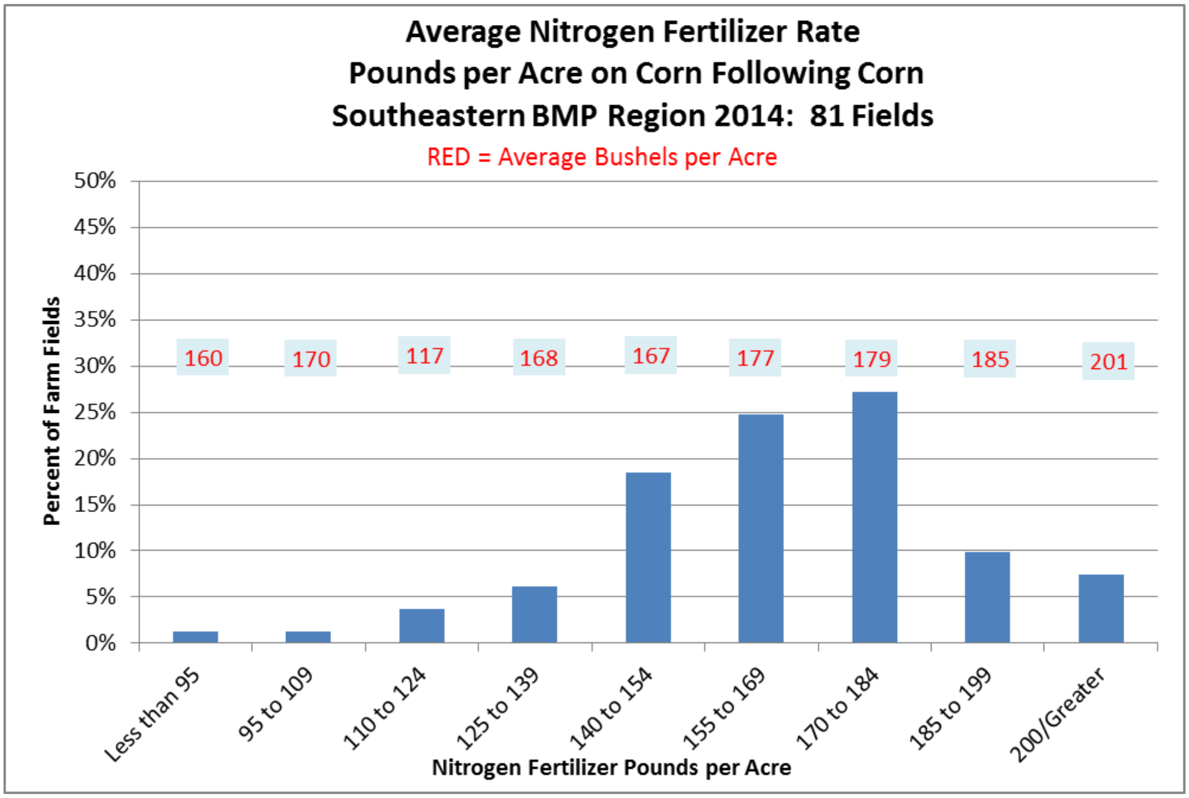


Figure 3. Average nitrogen fertilizer rates and yields on corn following corn in the SE BMP region for 2014: 81 fields.

In the SE BMP region, nitrogen fertilizer rates ranged from an average of 151 pounds per acre in Wabasha County to 169 pounds per acre in Fillmore County as shown in Table 3.

Table 3. Average county nitrogen fertilizer rates and corn yields for the SE BMP region for corn following corn.

Average County Nitrogen Fertilizer Rates for the SE BMP Region for Corn Following Corn			
County	**Number of Farm Fields**	**Average Nitrogen Rate Pounds per Acre**	**Average Corn Yield Bushels per Acre**
Dakota	7	165	173
Fillmore	15	169	174
Goodhue	19	165	179
Houston	9	165	174
Olmsted	8	169	184
Wabasha	11	151	172
Winona	12	164	172

Figure 4 details the distribution of nitrogen fertilizer rates in the SC BMP region for corn following corn; the corresponding corn yields are detailed in red.

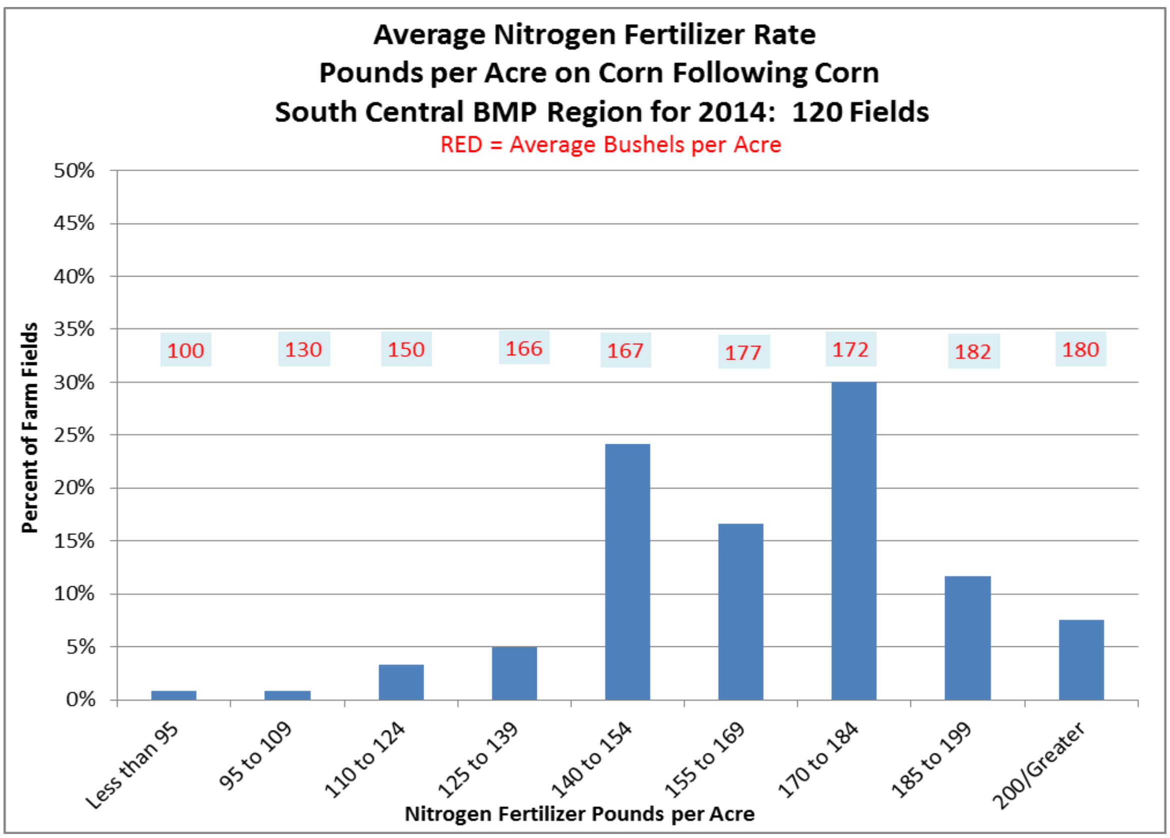


Figure 4. Average nitrogen fertilizer rates and yields on corn following soybeans in the SC BMP region for 2014: 120 fields.

Twelve counties had more than five responses in SC BMP region. Nitrogen fertilizer rates ranged from an average of 153 pounds per acre in Nicollet County to 178 pounds per acre in Sibley County as shown in Table 4.

Table 4. Average county nitrogen fertilizer rates and corn yields for the SC BMP region for corn following corn.

Average County Nitrogen Fertilizer Rates for the SC BMP Region for Corn Following Corn			
County	Number of Farm Fields	Average Nitrogen Rate Pounds per Acre	Average Corn Yield Bushels per Acre
Blue Earth	14	167	176
Brown	8	173	178
Carver	**	**	**
Dodge	5	154	184
Faribault	11	159	171
Freeborn	12	167	174
Le Sueur	5	171	157
Martin	11	173	177
McLeod	**	**	**
Meeker	7	164	161
Mower	**	**	**
Nicollet	8	153	173
Rice	9	166	172
Sibley	6	178	173
Steele	5	177	177
Waseca	**	**	**
Watonwan	**	**	**

****** Less than five responses.

Figure 5 details the distribution of nitrogen fertilizer rates in the SE BMP region for corn following alfalfa; the corresponding corn yields are detailed in red.

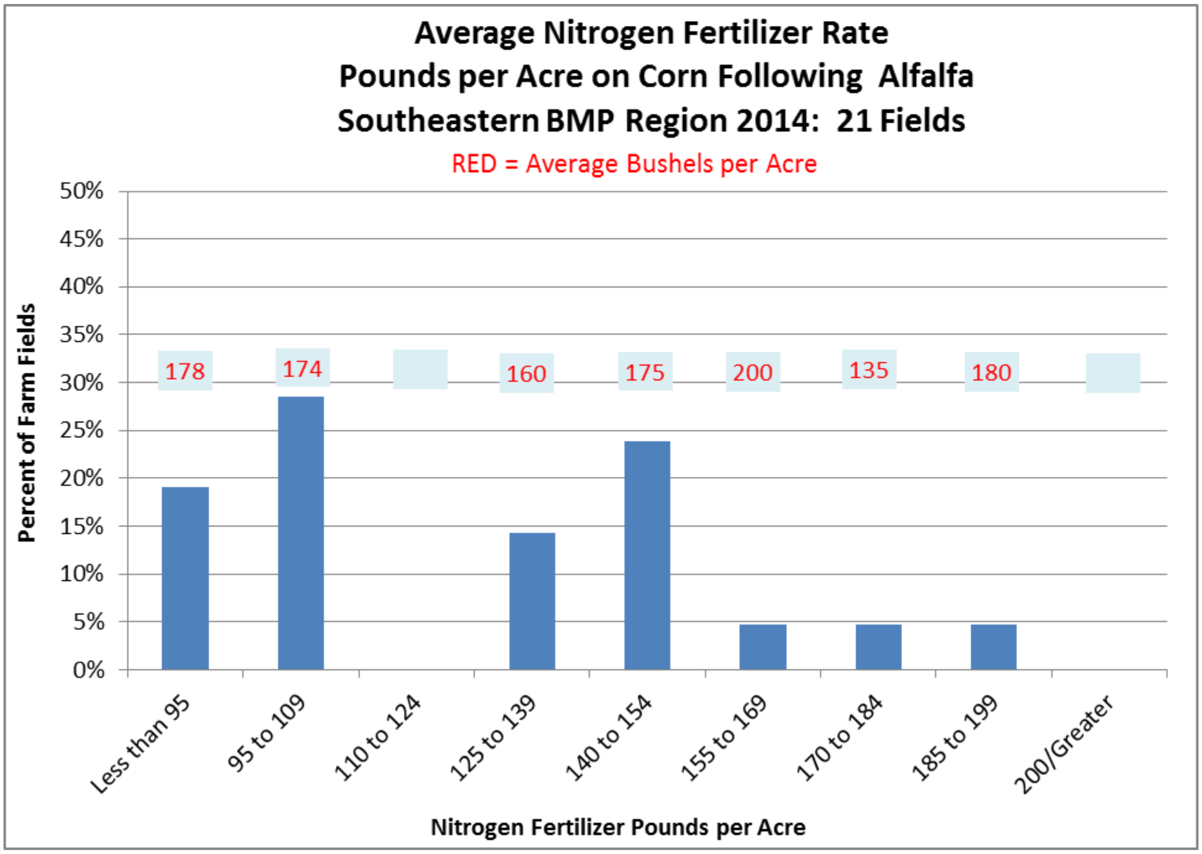


Figure 5. Average nitrogen fertilizer rates and yields on corn following alfalfa in the SE BMP region for 2014: 21 fields.

Less than five fields were included in the SC BMP Region for corn following alfalfa analysis, therefor there is no discloser of information.

Two counties had more than five responses in the SE BMP region. Nitrogen fertilizer rates were an average of 123 pounds per acre in Wabasha and Winona Counties in Table 5.

Table 5. Average county nitrogen fertilizer rates and corn yields for the SE BMP region for corn following alfalfa.

Average County Nitrogen Fertilizer Rates for the SE BMP Region for Corn Following Alfalfa			
County	**Number of Farm Fields**	**Average Nitrogen Rate Pounds per Acre**	**Average Corn Yield Bushels per Acre**
Fillmore	**	**	**
Goodhue	**	**	**
Houston	**	**	**
Olmsted	**	**	**
Wabasha	6	123	169
Winona	6	123	180

****** Less than five responses.

Manure section

Table 6 details the percentage of respondents on if the farmer knew the amount of nitrogen that is in the manure applied for the 2014 corn crop.

Table 6. The farmers' knowledge of nitrogen content of manure being applied for the 2014 corn crop.

BMP Region	Knowledge of the Actual Amount of Nitrogen Applied	Percentage of Respondents
South Central	Yes	38
South Central	No	62
Southeastern	Yes	17
Southeastern	No	83

§ Percent was calculated using only those respondents who answered yes or no to the question.

Table 7 details the nitrogen rates and corn yields in South Central and Southeastern BMP Regions on corn following various crops. These are corn fields applied with manure and commercial nitrogen fertilizer.

Table 7. Average amount of nitrogen applied from manure and commercial nitrogen fertilizer and corresponding corn yields to previous crops by BMP region.

BMP Region	Previous Crop	Average Nitrogen Rate From Manure And Commercial Fertilizer Pounds per Acre	Average Corn Yield Bushels per Acre
South Central	Soybeans	186	179
South Central	Corn	190	181
South Central	Corn/Alfalfa	**	**
South Central	Small Grains	**	**
South Central	Other	**	**
Southeastern	Soybeans	203	185
Southeastern	Corn	176	186
Southeastern	Corn/Alfalfa	**	**
Southeastern	Alfalfa	**	**
Southeastern	Other	**	**

Table 8 details the total amount of nitrogen applied to fields from both manure and commercial nitrogen.

Table 8. Average amount of nitrogen applied to fields from both commercial fertilizer and manure.

BMP Region	Main Source of Manure	Average Nitrogen Rate From Manure And Commercial Fertilizer Pounds per Acre
South Central	All	188
South Central	Dairy	178
South Central	Beef	185
South Central	Hog	**
South Central	Poultry	208
South Central	Other	180
Southeastern	All	191
Southeastern	Dairy	178
Southeastern	Beef	**
Southeastern	Other	**

Pesticide Section

Table 9 details the rates and active ingredients from pesticides applied to corn in Pesticide Management Area (PMA) 8.

Table 9. Pesticide applications and rates for corn – PMA 8

Agricultural Chemical (a.i.)	Surveyed Area Applied	Average Appli-cations	Average Rate Per Application	Average Rate Per Crop Year	Total Applied Per Crop Year[1]
	Percent	*Number*	*Pounds per Acre* (a.i.)	*Pounds per Acre* (a.i.)	*Total Pounds* (a.i.)
Herbicides					
Acetochlor	37	1.0	1.25	1.26	65,349
Atrazine	9	1.0	0.52	0.52	6,536
Clopyralid	20	1.0	0.07	0.07	2,055
Dicamba	5	1.0	0.15	0.15	1,081
Diflufenzopyr	5	1.0	0.06	0.06	419
Dimethenamid-p	9	1.0	0.61	0.61	8,193
Flumetsulam	20	1.0	0.03	0.03	835
Glufosinate-ammonium	1	1.0	0.37	0.37	302
Glyphosate	80	1.2	0.93	1.10	123,781
Mesotrione	19	1.0	0.08	0.08	2,053
Nicosulfuron	1	1.0	0.30	0.30	360
Rimsulfuron	1	1.0	0.13	0.13	184
S-metolachlor	14	1.0	0.86	0.87	17,242
Saflufenacil	4	1.0	0.07	0.07	427
Tembotrione	4	1.0	0.08	0.08	379
Topramezone	3	1.0	0.02	0.02	63
Insecticides					
Bifenthrin	11	1.1	0.06	0.07	1,032
Chlorpyrifos	1	1.0	0.40	0.40	696
Cyfluthrin	4	1.0	0.01	0.01	37
Lambda-cyhalothrin	1	1.0	0.02	0.02	18
Phostebupirim	4	1.0	0.13	0.13	742
Tefluthrin	3	1.7	0.11	0.19	931
Fungicides					
Azoxystrobin	1	1.0	0.08	0.08	89
Fluxapyroxad	2	1.0	0.67	0.67	1,488
Metconazole	2	1.1	0.03	0.04	103
Propiconazole	3	1.2	0.04	0.04	198
Prothioconazole	2	1.0	0.09	0.09	212
Pyraclostrobin	8	1.0	0.33	0.33	3,850
Tebuconazole	2	1.0	0.09	0.09	212

[1] Data in this column is calculated from “raw” data and represents the total pounds of active ingredient applied to the indicated crop(s) in 2013 by survey participants in this area. Data in this table and the selection of survey participants was not statistically "weighted" in any fashion. Thus, inappropriate extrapolation of the data may over- or under-estimate the total pounds of a.i. used at the state, area or sub-area levels.

Herbicides applied but not published included the following: 2,4-D, Bromoxynil, Cloransulam, Flumioxazin, Fluroxypyr, Fluthiacet-methyl, Pendimethalin, Primisulfuron, Sethoxydim , and Triencarbazone-methyl.
Insecticides applied but not published included the following: Gamma-cyhalothrin and Terbufos.
Fungicides applied but not published included the following: Trifloxystrobin.

Table 10 details the rates and active ingredients from pesticides applied to corn in PMA 9.

Table 10. Pesticide applications and rates for corn – PMA 9

Agricultural Chemical (a.i.)	Surveyed Area Applied	Average Appli-cations	Average Rate Per Application	Average Rate Per Crop Year	Total Applied Per Crop Year[1]
	Percent	*Number*	*Pounds per Acre* (a.i.)	*Pounds per Acre* (a.i.)	*Total Pounds* (a.i.)
Herbicides					
Acetochlor	34	1.0	1.20	1.21	16,679
Atrazine	16	1.0	0.65	0.65	4,094
Clopyralid	19	1.0	0.08	0.08	594
Dicamba	19	1.0	0.13	0.13	978
Diflufenzopyr	14	1.0	0.05	0.05	265
Dimethenamid-p	11	1.0	0.44	0.44	1,999
Flumetsulam	19	1.0	0.03	0.03	240
Glyphosate	92	1.1	0.96	1.05	38,872
Mesotrione	13	1.0	0.09	0.09	500
S-metolachlor	15	1.0	1.05	1.05	6,437
Saflufenacil	6	1.0	0.04	0.04	112
Tembotrione	3	1.0	0.07	0.07	96
Triencarbazone-methyl	2	1.0	0.01	0.01	12
Insecticides					
Bifenthrin	13	1.0	0.07	0.07	377
Cyfluthrin	2	1.0	0.01	0.01	5
Phostebupirim	2	1.0	0.12	0.12	99
Tefluthrin	9	1.0	0.11	0.11	373
Fungicides					
Propiconazole	6	1.0	0.04	0.04	96
Pyraclostrobin	6	1.2	0.13	0.16	380

[1] Data in this column is calculated from “raw” data and represents the total pounds of active ingredient applied to the indicated crop(s) in 2013 by survey participants in this area. Data in this table and the selection of survey participants was not statistically "weighted" in any fashion. Thus, inappropriate extrapolation of the data may over- or under-estimate the total pounds of a.i. used at the state, area or sub-area levels.

Herbicides applied but not published included the following: 2,4-D, Bromoxynil, Fluthiacet-methyl, Glufosinate-ammonium, Halosulfuron, Nicosulfuron, Pendimethalin, Primisulfuron, and Thifensulfuron.
Insecticides applied but not published included the following: Chlorethoxyfos, Lambda-cyhalothrin, and Terbufos.
Fungicides applied but not published included the following: Azoxystrobin, Fluxapyroxad, Metconazole, Prothioconazole, Tebuconazole, and Trifloxystrobin.

Table 11 details the rates and active ingredients from pesticides applied to soybeans in PMA 8.

Table 11. Pesticide applications and rates for soybean – PMA 8

Agricultural Chemical (a.i.)	Surveyed Area Applied	Average Appli-cations	Average Rate Per Application	Average Rate Per Crop Year	Total Applied Per Crop Year[1]
	Percent	*Number*	*Pounds per Acre* (a.i.)	*Pounds per Acre* (a.i.)	*Total Pounds* (a.i.)
Herbicides					
Clethodim	3	1.2	0.05	0.07	210
Cloransulam	13	1.0	0.02	0.02	304
Dimethenamid-p	2	1.0	0.36	0.36	765
Fluazifop	2	1.1	0.09	0.10	220
Flumioxazin	2	1.0	0.13	0.13	301
Fluthiacet-methyl	3	1.0	0.00	0.00	15
Fomesafen	8	1.0	0.18	0.18	1,390
Glufosinate-ammonium	1	1.5	0.36	0.54	549
Glyphosate	92	1.6	0.97	1.52	140,498
Imazethapyr	4	1.0	0.05	0.05	228
Lactofen	2	1.0	0.14	0.14	230
Metribuzin	2	1.0	0.29	0.29	439
S-metolachlor	3	1.0	0.91	0.91	2,683
Saflufenacil	3	1.0	0.03	0.03	101
Sulfentrazone	14	1.0	0.18	0.18	2,546
Thifensulfuron	1	1.0	0.01	0.01	4
Trifluralin	1	1.0	0.50	0.50	310
Insecticides					
Beta-cyfluthrin	3	1.0	0.02	0.02	61
Bifenthrin	9	1.0	0.06	0.06	595
Chlorpyrifos	18	1.0	0.46	0.46	8,191
Esfenvalerate	2	1.0	0.04	0.04	85
Gamma-cyhalothrin	4	1.0	0.01	0.01	36
Imidacloprid	3	1.0	0.05	0.05	123
Lambda-cyhalothrin	19	1.0	0.02	0.02	420
Thiamethoxam	1	1.0	0.03	0.03	30
Zeta-cypermethrin	4	1.0	0.02	0.02	63
Fungicides					
Azoxystrobin	4	1.0	0.11	0.11	512
Propiconazole	4	1.0	0.05	0.05	167
Pyraclostrobin	9	1.0	0.12	0.12	1,111
Tetraconazole	1	1.0	0.06	0.06	72
Trifloxystrobin	3	1.0	0.04	0.04	129

[1] Data in this column is calculated from “raw” data and represents the total pounds of active ingredient applied to the indicated crop(s) in 2013 by survey participants in this area. Data in this table and the selection of survey participants

was not statistically "weighted" in any fashion. Thus, inappropriate extrapolation of the data may over- or under-estimate the total pounds of a.i. used at the state, area or sub-area levels.

Herbicides applied but not published included the following: Acetochlor, Bentazon, Chlorimuron, Dicamba, Fenoxaprop, Flufenacet, Flumiclorac, Imazamox, Pendimethalin, and Phenmedipham.
Fungicides applied but not published included the following: Chlorothalonil and Fluoxastrobin.

Table 12 details the rates and active ingredients from pesticides applied to soybeans in PMA 9.

Table 12. Pesticide applications and rates for soybean – PMA 9

Agricultural Chemical (a.i.)	Surveyed Area Applied	Average Appli-cations	Average Rate Per Application	Average Rate Per Crop Year	Total Applied Per Crop Year[1]
Herbicides	*Percent*	*Number*	*Pounds per Acre* (a.i.)	*Pounds per Acre* (a.i.)	*Total Pounds* (a.i.)
Clethodim	7	1.0	0.04	0.04	69
Cloransulam	27	1.0	0.03	0.03	224
Fluazifop	3	1.0	0.11	0.11	74
Glyphosate	95	1.3	0.95	1.22	28,026
Imazethapyr	9	1.0	0.07	0.07	147
Saflufenacil	5	1.0	0.03	0.03	35
Sulfentrazone	27	1.0	0.27	0.27	1,756
Insecticides					
Bifenthrin	8	1.0	0.06	0.06	106
Chlorpyrifos	8	1.0	0.31	0.31	561
Esfenvalerate	2	1.0	0.03	0.03	14
Lambda-cyhalothrin	10	1.0	0.02	0.02	47
Thiamethoxam	4	1.0	0.03	0.03	27
Fungicides					
Azoxystrobin	2	1.0	0.15	0.15	63
Propiconazole	4	1.0	0.06	0.06	53
Pyraclostrobin	31	1.0	0.10	0.10	745
Trifloxystrobin	4	1.0	0.06	0.06	53

[1] Data in this column is calculated from “raw” data and represents the total pounds of active ingredient applied to the indicated crop(s) in 2013 by survey participants in this area. Data in this table and the selection of survey participants was not statistically "weighted" in any fashion. Thus, inappropriate extrapolation of the data may over- or under-estimate the total pounds of a.i. used at the state, area or sub-area levels.

Herbicides applied but not published included the following: Acetochlor, Dimethenamid-p, Fenoxaprop, Flufenacet, Flumiclorac, Fluthiacet-methyl, Fomesafen, Lactofen, Metribuzin, S-metolachlor, Thifensulfuron, and Trifluralin.
Insecticides applied but not published included the following: Gamma-cyhalothrin and Zeta-cypermethrin.
Fungicides applied but not published included the following: Chlorothalonil and Tetraconazole.

MDH
Minnesota Department of Health

PROTECTING, MAINTAINING AND IMPROVING THE HEALTH OF ALL MINNESOTANS

April 5, 2017

Ashley Gallagher
Dakota SWCD Resource Conservationist
4100 220th St W
Farmington MN 55024

Dear Ms. Gallagher and the Cannon River One Watershed, One Plan Work Group:

Subject: Initial Comment Letter – *Cannon River Watershed One Watershed, One Plan*

Thank you for the opportunity to submit comments regarding water management issues for consideration in the 1W1P planning process for the Cannon River Watershed. Our agency looks forward to working closely with the local government units, stakeholders, and other agency partners on this initiative.

The Minnesota Department of Health's (MDH) mission is to protect, maintain, and improve the health of all Minnesotans. An important aspect to protecting citizens' health is the protection of drinking water sources. MDH is the agency responsible for implementing programs under the federal Safe Drinking Water Act.

Source Water Protection (SWP) is the framework MDH uses to protect drinking water sources. The broad goal of SWP in Minnesota is to protect and prevent contamination of public and private sources of drinking water, groundwater and surface water, using best management practices and local planning. Core MDH programs relevant to watershed planning are the State Well Code (MR 4725), Wellhead Protection Program (MR 4720) and surface water intake protection planning. These programs result in a strong focus on groundwater management to protect drinking water sources.

One of the three high level state priorities in Minnesota's Nonpoint Priority Funding Plan, "Restore and protect water resources for public use and public health, including drinking water", aligns with our agency's mission and informs our recommendations to your planning process.

MDH Priority Concerns:

Protection of public water supply drinking water sources

Wellhead protection planning involves the delineation of Drinking Water Supply Management Areas (DWSMAs). The DWSMA boundary establishes a protection area through an extensive evaluation that determines the contribution area within a source aquifer to a public water supply well. In the wellhead protection planning process the vulnerability of the source aquifer to contamination from the land surface is also assessed.

Consider DWSMAs as priority areas within the watershed. The vulnerability of a DWSMA determines the level of risk posed by various land uses and potential sources of contamination. The land management needed and the implementation practices utilized to protect drinking water in a DWSMA can be targeted and tailored based on the vulnerability. The attached Public Water Supply Summary spreadsheet indicate the DWSMA and well vulnerabilities for community public water suppliers in the watershed, along with noted concerns and implementation activity focus.

Protection of drinking water sources for private wells

Many residents of the Cannon River watershed rely on private wells for the water they drink. No public entity, however, is responsible for water quality testing or management of a private well after drilling is completed. Local governments are best equipped to assist private well owners in maintaining the water quality of their wells. Land use management and ordinance development, can have significant impact on protecting private wells. Other suggested activities to protect private wells include: hosting well testing or screening clinics, providing water testing kits, working with landowners to better manage nutrient loss, promoting household hazardous waste collection, managing stormwater runoff, managing septic systems and providing best practices information to private well owners.

Prioritize the protection of private wells. Utilize information regarding pollution sensitivity of the upper most aquifers and wells, and nitrate and arsenic results from well testing to further target areas within the watershed for implementation activities.

Unused “abandoned” wells

Unused, unsealed wells can provide a conduit for contaminants from the land surface to the sources of drinking water. Sealing unused wells can be particularly important when an abandoned well penetrates a confining layer above a drinking water source aquifer.

Prioritize sealing abandoned wells. This is a central practice in protecting groundwater quality. However when resource dollars are limited it is important to further evaluate an unsealed well by examining the risk the unused well poses to active public water supply wells or to an aquifer used by many private wells (private well density) in an area.

Prioritizing Groundwater & Drinking Water Protection in the 1W1P Planning Process

Watershed models used for prioritizing and targeting implementation scenarios in the One Watershed One Plan (1W1P), whether PTMapp, HSPF SAM or others, leverage GIS information and/or digital terrain analysis to determine the flow paths of runoff across the landscape and the pour points where concentrated flow reaches surface water features. While this is an effective approach for targeting surface water contaminates, it does not transfer to groundwater concerns because it only accounts for the movement of water on the land's surface. Unfortunately, targeting tools are not currently available to model the impact on groundwater resources. Therefore, the Minnesota Department of Health suggests using methodologies applied by the agency to prioritize and target implementation activities in the Source Water Protection program.

These methodologies for public water supply systems include:

- Identifying Drinking Water Supply Management Areas (DWSMA) located in the watershed.
- Examining the vulnerability of the aquifer to contamination risk to determine the level of management required to protect groundwater quality. For example, a highly vulnerable setting requires many different types of land uses to be managed, whereas a low vulnerability setting focuses on a few land uses due to the long recharge time and protective geologic layer.

These methodologies for private wells include:

- Evaluating the vulnerability of the upper most aquifers to determine the areas within the watershed most at risk from different land uses. Geologic atlases provide this information where available, as well as the statewide geomorphology layer, or the DNR's statewide aquifer sensitivity layer.

Attached you will find a list of data and information provided by or available from MDH. Thank you for the opportunity to be involved in your watershed planning process. If you have any questions, please feel free to contact me at (507) 206-2741 or pat.bailey@state.mn.us.

Sincerely,

Pat Bailey

Pat Bailey, Planner
Source Water Protection
Environmental Health Division
18 Wood Lake Drive Southeast
Rochester, Minnesota 55904-5506

CC: Justin Blum, Source Water Protection Unit
Carrie Raber, Source Water Protection Unit
Chris Elvrum, Well Management Section

Data and information provided by or available from MDH:

- Public Drinking Water Information – Where do people get their drinking water from in the Cannon River Watershed? It can be assumed that all residents obtain their drinking water from groundwater sources. Over half of the watershed population receives drinking water from public water supply systems, the rest relying on private wells.

  There are thirty community public water supply systems that are either located in the watershed or a part of their Drinking Water Supply Management Area (DWSMA) is in the watershed. Of these public water suppliers, nineteen are municipalities and the rest are mobile home parks, water cooperatives and associations, and institutions. The attached spreadsheets provides more detailed information on the community public water supply systems.

  In addition to the community public water suppliers, there are several noncommunity public water suppliers. These public water suppliers provide drinking water to people at their places of work or play (schools, offices, campgrounds, etc.). There are ten nontransient and 171 transient noncommunity public water supply wells in the watershed.

  For additional information regarding the drinking water sources for both community and noncommunity public water suppliers review the Source Water Assessments http://www.health.state.mn.us/divs/eh/water/swp/index.htm#swa. MDH developed these assessments using existing data such as water sampling results, water system surveys, and well records. Individual DWSMA maps can be obtained for specific communities from their Source Water Assessment webpage.

  Shapefiles of the Drinking Water Supply Management Areas (DWSMA) in the watershed are located at http://www.health.state.mn.us/divs/eh/water/swp/maps/index.htm.

- A figure titled "Cannon River Watershed-Pollution Sensitivity of the Uppermost Aquifers". This map shows the ease with which recharge and contaminants from the land surface may be transmitted into the upper most aquifer on a watershed scale. This information can be used to prioritize areas and target implementation activities.

- A figure titled "Cannon River Watershed - Pollution Sensitivity of Wells". This map illustrates areas in the watershed that are most geologically sensitive based on the vulnerability of the aquifers in which wells are completed. This information can be used for targeting implementation activities based on the pollution sensitivity of drinking water sources.

- A figure titled "Cannon River Watershed-Pollution Sensitivity of Wells and Nitrate Results". This map indicates what we know about the sensitivity of wells to contamination and combines it with nitrate results to highlight areas of the watershed where there is known nitrate contamination of drinking water wells. This figure can help target implementation activities aimed at reducing nitrate levels in the sources of drinking water.

- A figure titled “Cannon River Watershed - Arsenic Results”. This map shows where wells in the watershed contain elevated arsenic levels.

- The MDH, along with its state agency partners, are developing a Groundwater Restoration and Protection Strategies (GRAPS) report for the Cannon River Watershed. GRAPS will provide information and strategies on groundwater and drinking water supplies to help inform the local decision making process of the 1W1P. This report should be available in the fall of 2017. For more details on the GRAPS report, contact Carrie Raber, MDH Planner, at 651-201-4695.

Cannon River Watershed Community Public Water Supplies -
Source Water Vulnerability, associated SWP management activities, Wellhead Protection Plan(WHP) Status, Drinking Water Protection Concerns

Aquifer Risk	Name	County	Watershed	Subwatershed	WHP Plan	DWSMA or Well Vulnerability	Drinking Water Protection Concerns
High and moderate potential contaminant risk - Focus on managing land uses and potential contaminant sources that may impact water quality							
	Faribault	Rice	Upper Cannon,Straight River, and Middle Cannon	Cannon Lake-Cannon Lake, Roberds Lake, Crystal Lake-Cannon River, Straight River	Approved	Mixed vulnerability; high, moderate and low areas	Historic contamination of municipal well field with trichloroethene. Low levels still detected in some wells.
	Northfield	Rice	Middle Cannon River	City of Northfield-Cannon River	Approved	Mixed vulerability; high and moderate	Northfield Well 2 sporadically had nitrate values over 5 mg/l NO3-N in the early 2000s, below 2 mg/l since 2009.
	Nerstrand	Rice	Little Cannon River	Upper Little Cannon	Planning started	Well considered vulerable	
	Morgedal Homeowners Association	Rice	Middle Cannon River	Crystal Lake-Cannon River	Not started	Well considered vulerable	
	South Cedar Shores MHP	Rice	Upper Cannon River	Devil Creek-Cannon	Not started	Well considered vulerable	
	Randolph	Dakota	Chub Creek	Chub Creek	Approved	Moderate	
	Cannon Falls	Goodhue	Middle Cannon River	Lake Byllesby	Amending plan	Moderate	
	Hastings	Dakota			Approved	Very southern edge of the DWSMA in the Cannon River watershed; mixed vulerability; high and moderate	Hastings treats for nitrate
Low potential contaminant risk - Focus on sealing unused old public water supply wells and unused private wells (funding available from MDH)							
	Geneva	Freeborn	Straight River	Headwaters Straight River	Not yet started	Wells considered not vulnerable	
	Thompson Oaks	Steele	Straight River	Beaver Lake	Not yet started	Wells onsidered not vulerabl;e	
	Ellendale	Steele	Straight River	Beaver Lake	Not yet started	Wells considered not vulnerable	treats for radionuclides (naturally ocuurring)
	Hope Water Cooperative	Steele	Straight River	County Ditch No 5	Not yet started	Wells considered not vulnerable	
	Owatonna	Steele	Straight River	Maple Creek	Approved	Low	
	Medford	Steele	Straight River	Rush Creek	Approved	Low	treats for radionuclides (naturally occurring)
	Lazy U Community	Steele	Straight River	Rush Creek	Not yet started	Primary well considered not	treats for radionuclides (naturally occurring)
	Waseca	Waseca	Crane Creek	Clear Lake	Approved	2 DWSMAs, North and South straddles Clear Lake and LeSueur River watershed, both Low	
	Waterville	Le Sueur	Upper Cannon River	Sakatah Lake	Approved	Low	
	Kilkenny	Le Sueur	Upper Cannon River	Gorman Lake	Approved	Low	
	Morristown	Rice	Upper Cannon River	Devil Creek	start 3/2017	Wells considered not vulnerable	
	Rolling Green First Addition	Rice	Upper Cannon River	Cannon Lake-Cannon River	Not yet started	Wells considered not vulnerable	
	Lonsdale	Rice	Middle Cannon	Heath Creek	Not yet started	Wells considered not vulnerable	treats for radionuclides (naturally occurring)
	Dundas	Rice	Middle Cannon River	City of Northfield-Cannon River	starting 3/2017	Primary well considered not	
	Carleton College	Rice	Middle Cannon River	City of Northfield-Cannon River	Not yet started	Well considered not vulnerable	
	MN Correctional Facilities-Faribault	Rice	Straight River	Straight River	Not yet started	Wells considered not vulnerable	
	Oak Lane Mobile Home Park	Goodhue	Lower Cannon River	Town of Welch-Cannon RiverLower	Not yet started	Well considered not vulnerable	
	Millstone Creek Mobile Home Park	Rice	Upper Cannon River	Roberds Lake	Not yet started	Well considered not vulnerable	
	New Trier	Dakota	Lower Cannon River	Trout Brook	start 3/2017	Wells considered not vulerable	
	Red Wing	Goodhue	Lower Cannon River	Spring Creek	Plan approval	Wells considered not vulerable	treats for radionuclides (naturally occurring)
	Elko New Market	Scott	Chub Creek	Dutch Creek	Plan approved	Just southeastern corner of DWSMA in watershed, Very Low	treats for radionuclides (naturally occurring)

From:	Bailey, Pat (MDH)
To:	Gallagher, Ashley
Subject:	Cannon River 1W1P MDH Priority Concerns - Figures referenced and PWS spreadsheet
Date:	Tuesday, April 11, 2017 2:06:58 PM
Attachments:	geosens_arsenicvf.png MDH PWS Spreadsheet for 1W1P Initial Comments Letter Cannon River.xlsx

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Dear Ashley,

Attached are the figures that were referenced in the MDH 1W1P letter. The following provides a little more detail on three of the figures. Feel free to call if you have any questions about these figures.

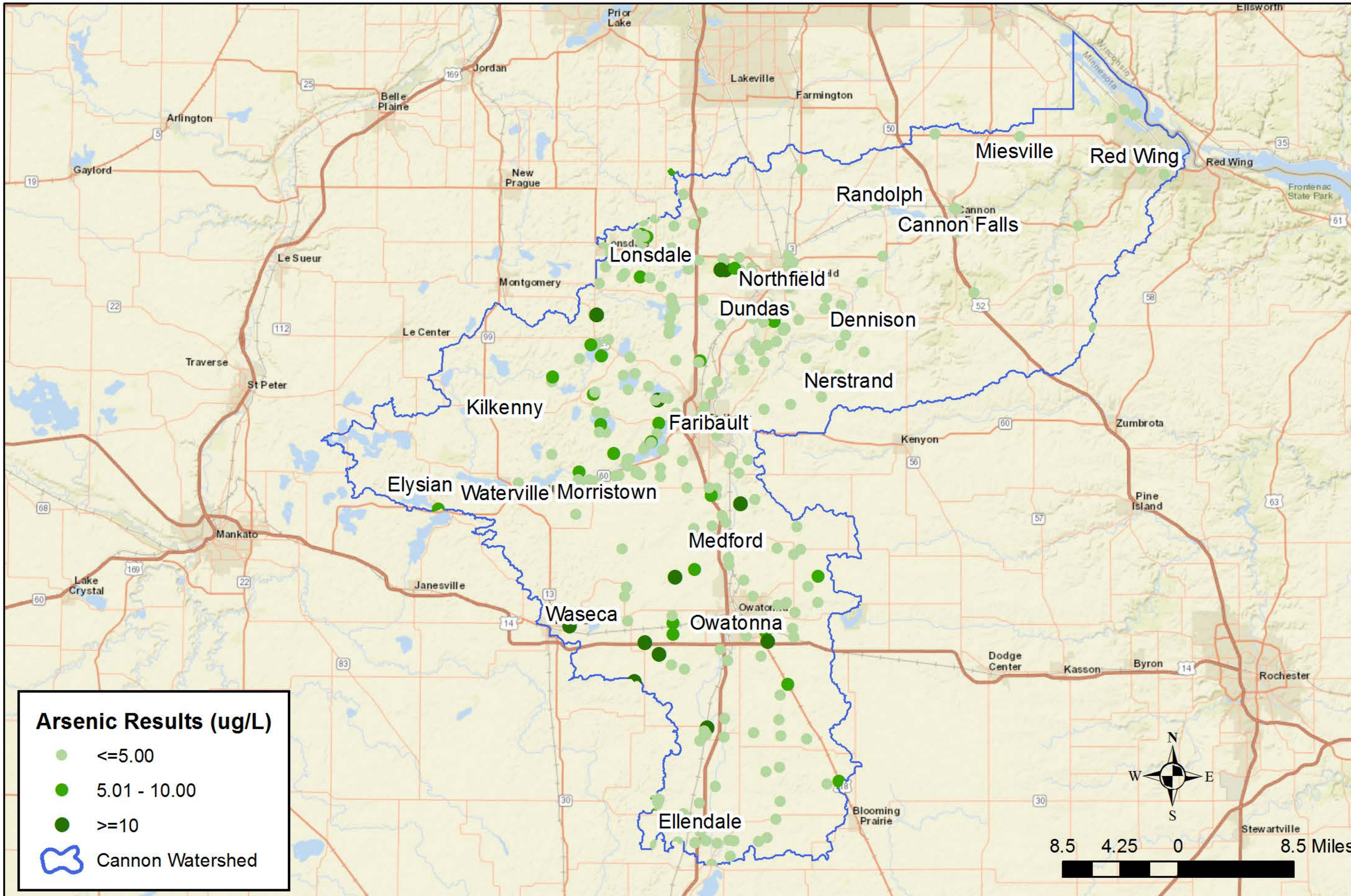
- Pollution Sensitivity of Uppermost Aquifers: this is the DNR's "pollution sensitivity of near-surface materials" dataset.
- Pollution Sensitivity of Wells: this is a figure that we developed to depict the sensitivity of deeper aquifers, in contrast to the previous figure only showing sensitivity at the near-surface. This was developed by calculating L-scores and geologic sensitivity at each well in the watershed, and then creating a gradient of sensitivity by interpolating between well points. The geologic sensitivity was determined by characteristics recorded at the time of well drilling, such as the thickness and type of materials overlying the aquifer. I can provide more information on this figure if it would be helpful to you.
- Pollution Sensitivity of Wells and Nitrate Results: this figure contains the "pollution sensitivity of wells" gradient as a backdrop, with nitrate results overlain on top.

I have also attached the actual Excel spreadsheet of Community Public Water Supplies that was part of the letter. I added in Elysian which straddles the boundary between the Cannon and the Le Sueur. I had missed it in the letter version.

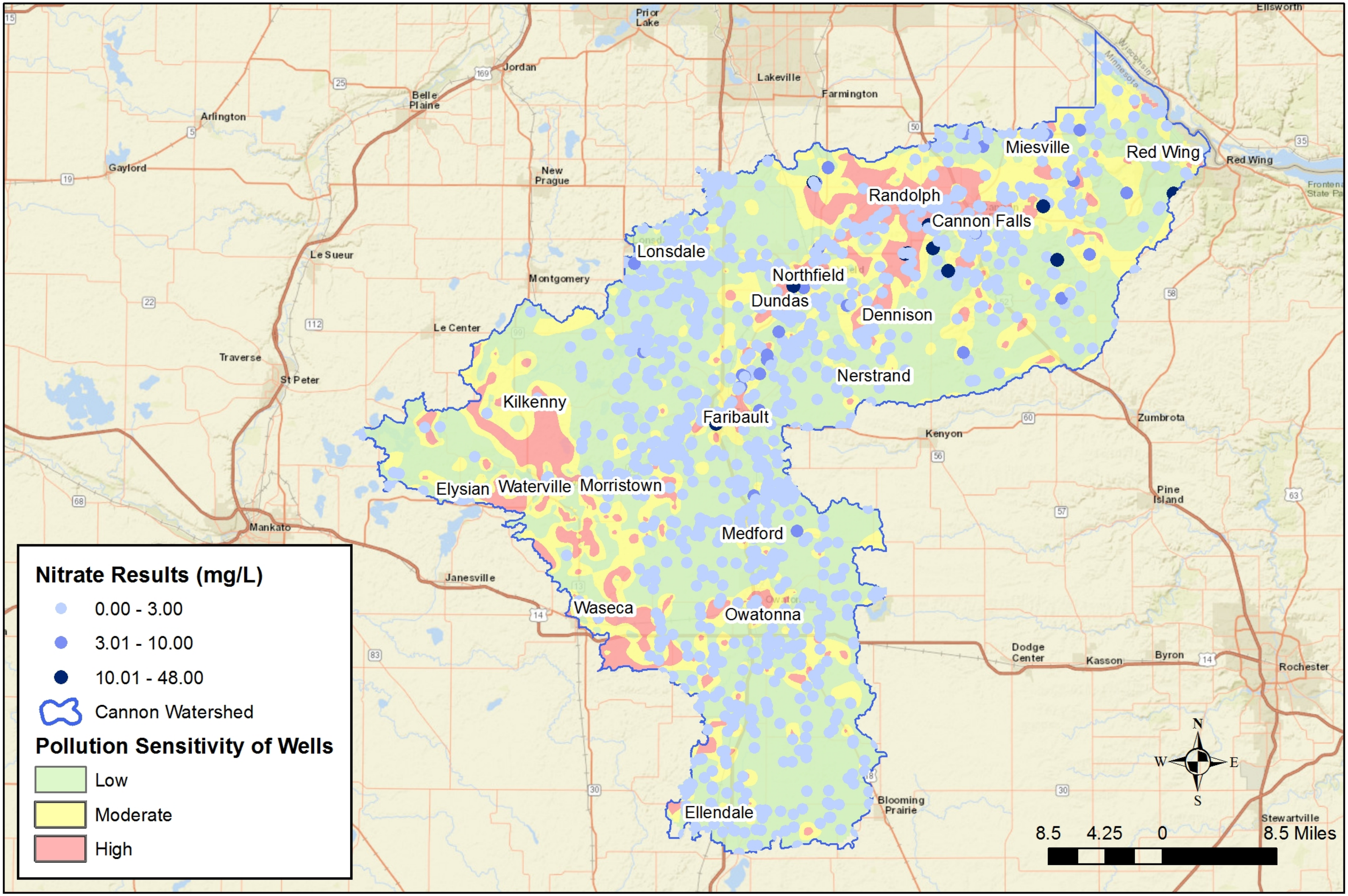
Sincerely,
Pat

PAT BAILEY
Principal Planner
Minnesota Department of Health
Source Water Protection
18 Wood Lake Drive Rochester
p 507-206-2741 | m 507-779-5700

Cannon Watershed - Arsenic Results



Cannon Watershed - Pollution Sensitivity of Wells and Nitrate Results



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	Elysian	Le Sueur	Upper Cannon River	Sakatah Lake	Approved	Low, straddles LeSueur R basin	
	Morristown	Rice	Upper Cannon River	Devil Creek	start 3/2017	Wells considered not vulnerable	
	Rolling Green First Addition	Rice	Upper Cannon River	Cannon Lake-Cannon River	Not yet started	Wells considered not vulnerable	
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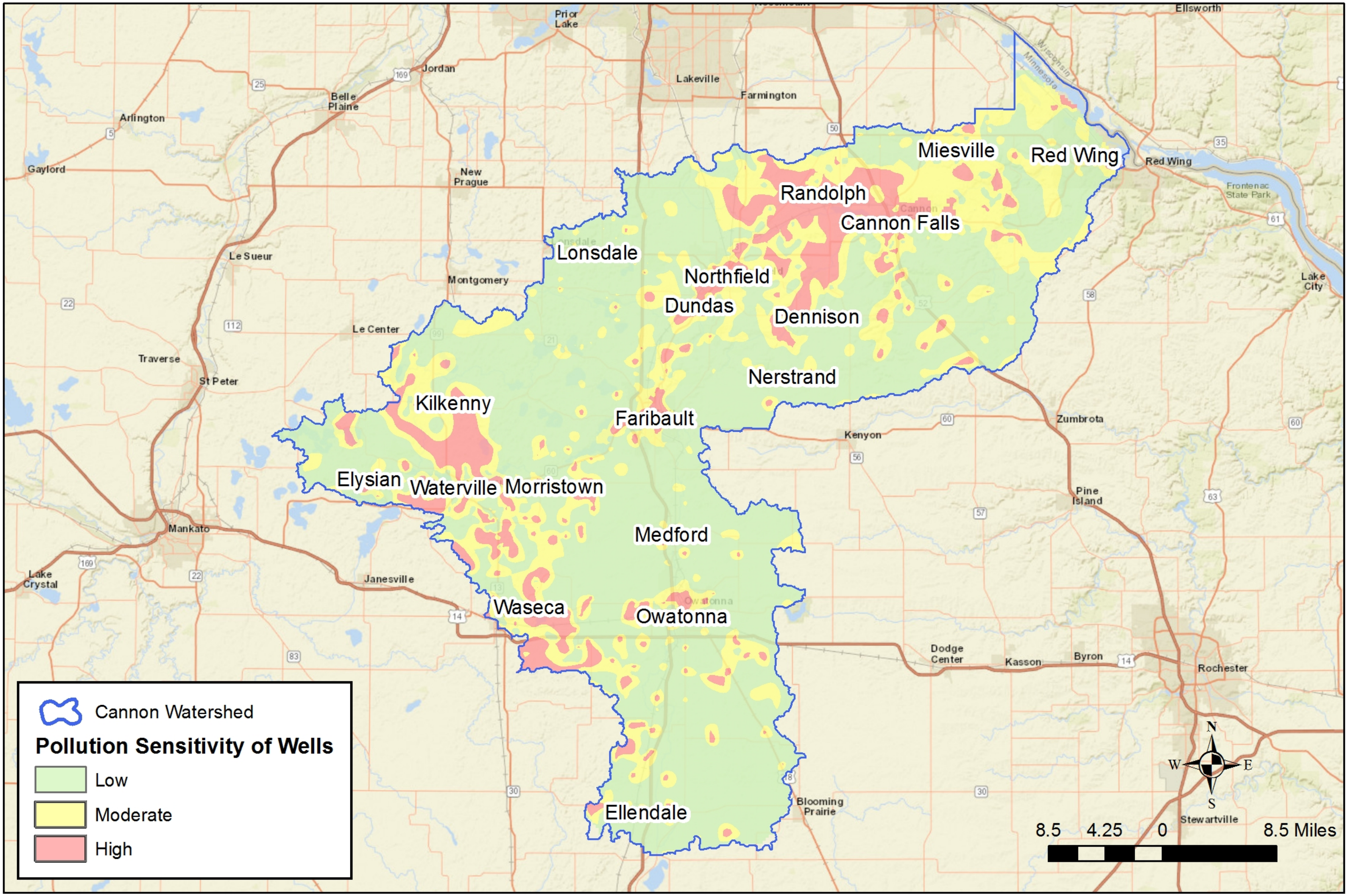
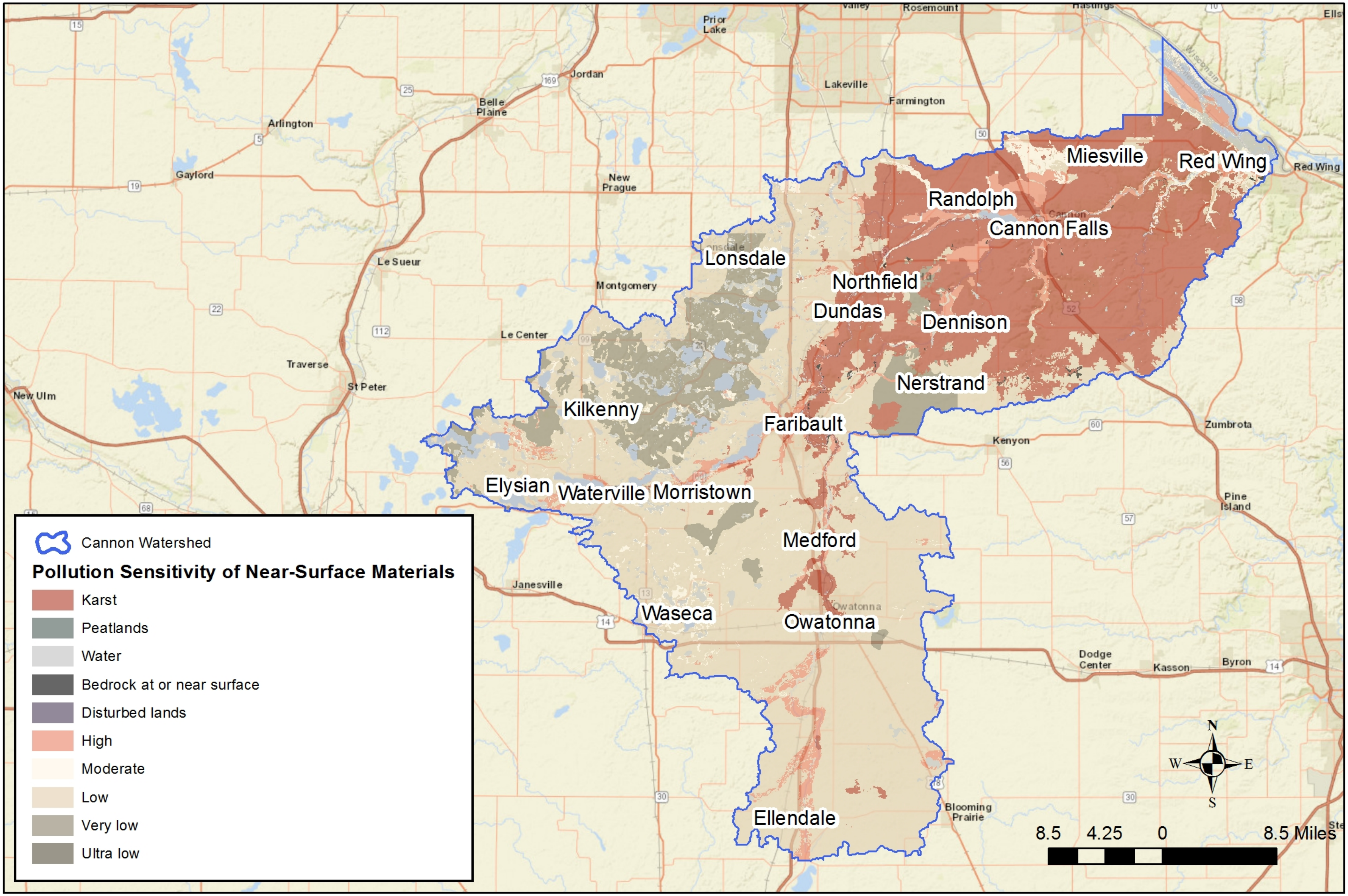
Cannon Watershed - Pollution Sensitivity of Wells



Cannon Watershed - Pollution Sensitivity of Uppermost Aquifers



DEPARTMENT OF NATURAL RESOURCES

Minnesota Department of Natural Resources
Southern Region Headquarters
21371 State Highway 15
New Ulm MN 56073

March 29, 2017

Ashley Gallagher
Dakota SWCD Resource Conservationist
4100 220th St. W
Farmington, MN 55024

Thank you for inviting input from the Minnesota Department of Natural Resources (DNR) as you and local partners begin developing a Comprehensive Watershed Management Plan for the Cannon River Watershed.

We recognize the challenge of creating a shared vision for a healthy, well-functioning watershed. Local water management and political jurisdictions can have differring perspectives, priorities and goals. The DNR can and is anxious to provide technical support in the planning process.

Attached to this letter are DNR priority concerns for the Cannon River watershed. Using sound technical science and governance strategies to sustain water resources is a top DNR priority that aligns well with the One Watershed One Plan (1W1P) effort. DNR field staff from multiple divisions helped develop specific resource priorities for the Cannon River Watershed using an approach that identified common concerns of the agency. Additional information about these priorities can be provided as you progress in developing the plan.

Priority issues play a key role in watershed health by having multiple benefits including, but not limited to environmental, social/economic, and recreational. We believe incooperating these priorities will enhance water quality, aquatic and upland habitats, species diversity, groundwater protection and recharge plus other resource benefits that will enhance the quality of life in the watershed.

Our lead DNR staff person for the Cannon River 1W1P project is Todd Piepho, Area Hydrologist at the Waterville DNR office. He can be reached by telephone at 507-362-8868, or email at Todd.Piepho@state.mn.us. Please contact Todd if you have questions or would like more information about the attached priorities or the types of support we can provide. Feel free to contact us as well if you need additional support.

Sincerely,

Dennis Frederickson

Dennis Frederickson
DNR Regional Director
Southern Region

Keith Parker

Keith Parker
DNR Regional Director
Central Region

EC: Barbara Weisman, DNR EWR Clean Water Operations
Robert Collett, DNR EWR South Manager
Jim Sehl, DNR EWR South Assistant Regional Manager
Todd Kolander, DNR EWR South District Manager
Todd Piepho, DNR Area Hydrologist
Terri Yearwod, DNR Central Region Manager
Jeanne Daniels, DNR EWR Central Region South District Manager
Jeff Weiss, DNR Area Hydrologist
Jennifer Mocol-Johnson, BWSR Board Conservationist
Shaina Kesely, BWSR
Spencer Herbert, MDA
Pat Bailey, MDH Regional Planner
Justin Watkins, MPCA

Minnesota DNR Priority Resources and Issues for the Cannon River Watershed

The Department of Natural Resources (DNR) recommends the Cannon River 1W1P planning committee consider the following priority resource concerns and opportunities, which reflect input from DNR staff in Fisheries, Wildlife, Nongame, Ecological and Water Resources, Forestry, Parks and Trails, and Lands and Minerals. These priorities include items that can be measured, mapped, and implemented realistically within the Cannon River watershed. The DNR can provide additional data around each issue as you begin developing the watershed plan, including information to help target areas for protection and restoration.

Outdoor Recreation & Natural Heritage: Enhance public recreation opportunities, promote clean water, connect habitat, and prevent invasive species by protecting, restoring, and enhancing aquatic and upland habitat in lakes, streams, wetlands, riparian zones, and uplands in ways that

- **Protecting high priority lakes:** There are many high priority lakes in the Cannon River Watershed that support diverse fisheries, offer outstanding recreational resources, abundant native aquatic plant communities with high species diversity, outstanding water quality, and support relatively abundant woodlands, grasslands and wetlands. Protection measures are needed to maintain or improve these high public recreational and resource value waters to continue to meet water quality guidelines for water recreation and fish consumption.
    - Lakes that fully support fish consumption include: Beaver, Dora, German, Jefferson, and Roberds Lakes.
    - Lakes that fully support water recreation include: Roemhildts, Fish, Dudley, Kelly, and Beaver.
- The Cannon River Watershed Restoration and Protection Strategy (WRAPS) Report identified lakes that currently meet recreational and/or fish consumption guidelines but are at risk due to their high sensitivity to land use changes. Protection measures for these sensitive lakes should focus on land use, planning and zoning to protect the lake watershed.
- The DNR can help identify many other lakes in the watershed, impaired and unimpaired, that support rare or threatened aquatic plant communities and/or unique animal species.
- **Protect high-priority warm and cold water streams:** Warm and cold water streams and rivers of high priority in the Cannon River Watershed provide unique fisheries, recreational resources, and high habitat value. Protection measures are needed to maintain the high quality value of these waters.

▫High quality cold water streams include: Trout Brook, Pine Creek, Rice Creek, Belle Creek, Spring Creek and the Little Cannon River. Rice Creek, Trout Brook, and Pine Creek are all state listed trout streams. Protection measures should be identified in the plan to maintain and enhance these unique and important fisheries. Examples include easements, stream habitat projects, reducing surface water inputs, and limiting groundwater appropriations for sources supplying the stream.

▫High quality warm water streams include: Maple Creek, Falls Creek, Turtle Creek, Mud Creek, and the Lower Cannon River. The main concerns facing these streams are excess sediment, nutrients, invasive species, altered hydrology, restricted or elevated culverts, loss of natural perennial cover, and loss of floodplain connectivity due to poor stream stability.

Riparian and upland land use practices can dramatically improve the quality of water entering both lakes and stream channels in the Cannon River watershed. Increasing the perennial/woody vegetation in riparian areas, best management practices (BMPs) on agricultural land, and implementing sustainable development within the shoreland district are DNR priorities to consider for the protection and maintainance of existing high quality water resources.

- **Protect rare and natural features.** Rare features contribute to the overall health, habitat, diversity and environmental quality in the Cannon River watershed. Because of the sensitivity of these resources each may require consideration for extra protection. These rare features also contribute directly to local economies in the form of recreation, hunting, fishing, wildlife viewing, tourism, paddling and camping. A few of the rare species in the watershed include, blanding's turtle, wood turtle, loggerhead shrike, upland sandpiper, round pigtoe mussel, milksnake, and western foxsnake. The DNR has additional information available for the species of concern, along with a complete list of rare and natural features and communities found in the Cannon River Watershed.

Shoreland and Riparian Zones: Following and implementing the shoreland ordinance will help maintain and improve water quality, provide aquatic and riparian habitat, improve fish and wildlife use, enhance aesthetic qualities, improve property values and reduce future impairments.

- **Restoring perennial vegetation in riparian areas:** Changes in vegetative cover across the watershed are a significant concern, specifically the loss of native and perennial vegetation along the lakes, wetlands and riparian corridors. The loss of perennial/woody vegetation in these areas increase the likelihood of bank and channel erosion, creates habitat fragmentation, and allows invasive species to establish. Practices that establish and maintain perennial vegetation, native prairie, and cover crops should be included in this plan. With nearly 70% of the watershed in row-crop agriculture, BMPs are essential, especially in water and habitat sensitive areas. Prime agricultural land needs to remain protected as a resource, however areas that flood frequently and consistently produce low yields should be reviewed for potential alternative crops and conservation practices. Development in and along these areas should be limited. Local zoning and floodplain ordinances should be applied in all cases to these sensitive areas.

- **Aggragrate and mineral resources**: DNR supports planning efforts by local units of government in the development and access to natural resources for supplying aggregate and other natural construction materials for building and maintaining roads, other infrastructure and environmentally sound mining.

- **Slowing the flow:** Water is flowing faster into our streams, rivers, and lakes in the Cannon River resulting from adding impervious surfaces, drain tile, ditching, piped storm water, and removal of native vegetation. Establishing grass or forested buffers throughout the watershed can help slow the flow, increase water retention and infiltration, reduce erosion, filter sediment and nutrients, stabilize streambanks and lakeshores, provide wildlife habitat, and connect habitat patches.

- **Protecting a Wild & Scenic River**: The portion of the Cannon River from the northern city limits of Faribault to the confluence with the Mississippi River is designated by the state as wild and scenic. The designation is intended to maintain and preserve the natural and esthetic quality of the river for public benefit. Protection of the designated riparian area as required by state statute is important to the protection of this natural water resource.

Water Storage and Retention: Managing surface and subsurface drainage systems, restoring wetlands, and implementing water storage projects are all ways to reduce flood damage, protect fish and wildlife habitat, maintain stream stability, support summer and winter stream base flows, filter sediment and nutrients, and improve groundwater recharge.

- **Wetland restoration and water storage projects**: Intensive land use and surface and subsurface drainage of shallow lakes and wetlands have contributed to more runoff, more water downstream, less overall water storage and reduced groundwater recharge. Wetland restoration and water retention practices, specifically in the upper reaches of the Cannon River watershed, can help decrease the impact of flood events, enhance water quality, and reduce erosion by holding and metering out the water over a longer period of time or allowing it to infiltrate through the soil. The cities of Waterville, Morristown, Faribault, Northfield and other communities along the Cannon River have experienced more frequent and extensive flooding as result of reductions in water storage and retention within the watershed and increased frequency of large rainfall events.

- **Restoring altered hydrology**: The natural hydrologic functions of streams, rivers and lakes in the Cannon River Watershed have been altered due to actions such as straightening stream channels, ditching, tiling, draining wetlands or depressional areas, and adding impervious surfaces. These changes in the landscape and water management play a large role in water quality impairments that impact the watershed as a whole. The net increase in flows leaving the watershed, more extensive flooding events, decreased aquatic habitat and species diversity, and increased nutrient and sediment loads can all be attributed to altered hydrology. This major concern should be addressed as part of this watershed plan by improving land use and water management practices targeted to reduce these impacts.

Groundwater Supply: Working to protect groundwater sources and recharge areas is essential for a sustainable water supply for today and future generations.

- **Water supply planning**: Clean drinking water is our most precious resource, but often overlooked. Increasing demand from domestic, agricultural, and industrial water users can strain water resources and municipal water supply systems. The DNR and other state agencies have resources that local units of government can use to educate and assist water users on conservation measures and practices. Planning for a sustainable water supply and implementation of water conservation measures is vital for future generations.

- **Groundwater recharge in sensitive areas**: Groundwater resources supply about 75 percent of Minnesota's drinking water and nearly 90 percent of water used for agricultural irrigation. BMPs should be implemented in groundwater recharge areas, specifically the surficial sands and gravels and outwash areas where the chance of groundwater contamination is highest.

Minnesota Pollution Control Agency

Rochester Office | 18 Wood Lake Drive SE | Rochester, MN 55904 | 507-285-7343

800-657-3864 | Use your preferred relay service | info.pca@state.mn.us | Equal Opportunity Employer

March 30, 2017

Ms. Ashley Gallagher
Dakota Soil and Water Conservation District
4100 - 220th Street West
Farmington MN 55024

RE: Response to request for priority concerns for the Cannon River Watershed One Watershed, One Plan

Dear Ms. Gallagher:

The Minnesota Pollution Control Agency (MPCA) appreciates the opportunity to provide input at the outset of the One Water, One Plan (1W1P) process in the Cannon River Watershed (CRW). The MPCA has coordinated and funded many efforts in the CRW that will provide technical information, tools and strategies for use in 1W1P. A summary of select products is included as a preface to a listing of priority concerns. Others (e.g. Little Cannon SWAT model) are summarized on the MPCA's Cannon River web page: https://www.pca.state.mn.us/water/watersheds/cannon-river).

- **Revised Regional Total Maximum Daily Load Evaluation of Fecal Coliform Bacteria Impairments in the Lower Mississippi River Basin in Minnesota (2006).** This is a regional foundational work examining pathogens in surface waters of southeast Minnesota. https://www.pca.state.mn.us/sites/default/files/wq-iw9-03b.pdf.Implementation plan: https://www.pca.state.mn.us/sites/default/files/wq-iw9-02c.pdf.
- **Cannon River Watershed Management Strategy (2011).** In partnership with the MPCA and many local partners, the Cannon River Watershed Partnership (CRWP) developed the Cannon River Watershed Management Strategy. The strategy brought together information regarding the watershed's many lakes and rivers; it also surveyed the existing plans and priorities of local government units and state agencies to create an overarching strategy for the entire watershed. The strategy was submitted to the MPCA on June 30, 2011. http://crwp.net/watershed-strategy/. It includes an in-depth examination of trends in the watershed: http://crwp.net/wp-content/uploads/2013/01/Signs-of-Progress.pdf.
- **Geologic Controls on Groundwater and Surface Water Flow in Southeastern Minnesota and its Impact on Nitrate Concentrations in Streams (Minnesota Geological Survey, 2014).** This report summarizes the results of a Minnesota Geological Survey (MGS) investigation conducted for the MPCA designed to support watershed planning efforts in southeast Minnesota. Specifically it provides better understanding of the geologic controls on nitrate transport in the region, including nitrate in groundwater that is the source of baseflow to streams. http://conservancy.umn.edu/handle/11299/162612.
- **Cannon River Watershed Monitoring and Assessment Report (2014)**. The assessment report summarizes results of intensive watershed monitoring. https://www.pca.state.mn.us/sites/default/files/wq-ws3-0704002b.pdf.
- **Cannon River Watershed Stressor Identification Report (2015).** The stressor identification report examines biota impairments in the context of probable causal factors (i.e. "stressors"). https://www.pca.state.mn.us/sites/default/files/wq-ws5-07040002a.pdf.

- **Cannon River Watershed HSPF Model Development Project (2015).** Hydrologic Simulation Program Fortran (HSPF) is a watershed model that can simulate land/runoff processes as well as in-stream dynamics. Management scenarios for both point and nonpoint pollution sources can be constructed; simulations then output resultant predicted water quality at approximately one hundred locations in the watershed. The built and calibrated model is available for use by the 1W1P and/or any contracted consultant. The Scenario Application Manager allows Local Government Units to use HSPF in a Windows/desktop environment. https://www.pca.state.mn.us/sites/default/files/wq-ws4-23d.pdf.The first set of management scenario simulations are summarized in a memorandum: https://www.pca.state.mn.us/sites/default/files/wq-ws4-23c.pdf
- **Cannon River Watershed Restoration and Protection Strategies Report (2016).** The Watershed Restoration and Protection Strategies (WRAPS) summarizes foundational technical information and stakeholder input to provide a starting point from which to develop tools that will help local governments, land owners, and special interest groups determine (1) the best strategies for making improvements and protecting resources that are already in good condition, and (2) focus those strategies in the best places to do work. The WRAPS includes goals, timelines, pollutant source information and management strategies distilled from statewide studies/strategies such as the Minnesota Nutrient Reduction Strategy (NRS) and Nitrogen in Minnesota Surface Waters. https://www.pca.state.mn.us/sites/default/files/wq-ws4-23a.pdf
- **Cannon River Watershed Total Maximum Daily Load (2016).** The Total Maximum Daily Loads (TMDLs) in the CRW address thirty lake phosphorus impairments and forty-one stream reaches impaired for bacteria, chloride, nitrate and/or total suspended solids. Wasteload allocations will be used going forward to inform point source permits in the CRW. The TMDLs were approved on February 17, 2016; the document is companion to the WRAPS document. https://www.pca.state.mn.us/sites/default/files/wq-iw9-19e.pdf.
- **Watershed Pollutant Load Monitoring Network (currently maintained website).** The Watershed Pollutant Load Monitoring Network measures and compares pollutant loads from Minnesota's rivers and streams and tracks water quality trends. A new data viewer allows for interactive examination and retrieval of load data, including sites in the CRW. https://www.pca.state.mn.us/water/watershed-pollutant-load-monitoring-network.
- **Point source phosphorus mapping tool (currently maintained website).** This tool provides via interactive map interface summaries of annual phosphorus loads and flow volumes discharged from wastewater facilities since 2005. https://www.pca.state.mn.us/water/phosphorus-loads-and-flow-volumes.

According to the findings of these and other works, the MPCA lists the following priority concerns for consideration in the 1W1P process:

- **Nitrate-nitrogen reduction.** Nitrate contamination of surface and groundwater is a long-standing issue in southeastern Minnesota. Most county water plans rank this as a top priority concern. Minnesota's NRS documented an approximate 0 percent change in the nitrogen load leaving our state since the 1990s. In the karst region, many springs show increasing nitrate concentration trends. "Moving the needle" on nitrates will be a challenge going forward; one that should be addressed in the Cannon 1W1P. The WRAPS draws on various citations to describe sources (cultivated acres are dominant source), transport (nearly all nitrogen in the CRW is loaded to surface waters via vertical leaching loss) and the best strategies for nitrate reduction (source control and vegetative scouring). It also provides stakeholder-derived example combinations of best management practices (BMPs) that (per best estimates) would result in a 20 percent reduction of the nitrogen load leaving the watershed. Nitrogen BMPs need broad application in our state and in the CRW. Because prioritization for nitrogen work in southeast Minnesota cannot be sufficiently accomplished via runoff-based Geographic Information System models, the 1W1P could consider a "layering" approach to prioritization: focus on areas that show high nitrate loading (per model), have drinking water issues (per Minnesota Department of Health and/or private well analysis) and show biota stressed by nitrate (per stressor identification). The 1W1P should also work to temper expectations regarding nitrate water quality changes in trout streams, given the lag-time in delivery from land through groundwater to surface waters (see MGS report listed above).

- **Improve and protect the watershed's lakes.** The CRW includes various lake types, most of which are enriched with phosphorus and as such do not meet water quality goals due to excessive and/or frequent algae blooms. Point source loads of phosphorus to the Byllesby Reservoir have been reduced significantly via permit requirements for Faribault, Northfield and Owatonna. Heiskary & Martin (work summarized in WRAPS) and LimnoTech, Inc. all used watershed and BATHTUB models to arrive at phosphorus budget estimates and examine potential sources and mechanisms for internal loading in the upper Cannon lakes. The 1W1P should forward efforts to better understand the nutrient budgets (i.e. watershed vs internal loads) of specific lakes, while more generally working to reduce phosphorus loading in the lakes region. Two lakes (Clear and Loon) and one reservoir (Byllesby) include permitted Municipal Separate Storm Sewer System (MS4) areas in their watersheds; 1W1P should work with state and local MS4 staff to consider strategies for these urban areas, particularly in the cases of Clear and Loon Lakes which include 40 percent and 93 percent MS4 area in their drainages (respectively). Five assessed lakes in the watershed are fully supporting recreational use (Kelly, Dudley, Fish, Roehmildts and Beaver). The 1W1P should solidify strategies (e.g. preserving perennial cover in the watersheds via easements or ordinance) to keep the quality of these lakes intact.
- **Further study and address habitat issues in streams.** Degraded and/or insufficient stream habitat is a prevalent stressor of biota (i.e. "fish and bugs") in southeast Minnesota and in the CRW (see WRAPS Appendix I for a list of 22 streams for which habitat is a conclusive stressor). The 1W1P should consider the best strategies for addressing habitat issues in various settings and at various scales. State monies are supporting natural channel design projects (strategy included in WRAPS Table 16; Little Cannon project listed in Table 12) and trout habitat improvement projects (e.g. grant dollars to Trout Unlimited for work on Rice Creek); some Soil and Water Conservation Boards are implementing low-cost projects that change channel geometry and seed banks with perennials. All are viable strategies; a thoughtful and technically supported approach to optimally applying these various habitat improvement methods would be a good outcome for 1W1P.
- **Protection of baseflow especially in Lower Cannon Trout Streams.** The distinctive landscape of the Driftless Area is characterized by craggy limestone, sandstone valleys, and steep hillsides. This ancient terrain, which was bypassed by the most recent glaciation, is characterized by one of the highest concentrations of limestone spring creeks in the world. The spring water emerging from limestone bedrock provides a near constant flow of cold water. The limestone enriches the water with essential minerals for aquatic insects and other creatures, which contributes to prime conditions for healthy populations of trout and other coldwater dependent

species. More than 600 spring creeks (exceeding 4,000 river miles) cross this 24,000 square-mile landscape. Trout anglers produce an economic benefit to the Driftless Area in excess of $1.1 billion dollars every year (Northstar Economics & Trout Unlimited 2008). All of the designated trout waters in the Lower Cannon Watershed lobe meet the criteria for the southeast Minnesota coldwater Fish Index of Biotic Integrity (IBI). While there are restoration considerations in this lobe (e.g. high nitrates in the trout streams and poor macroinvertebrate IBIs in Trout Brook, a focus of protection work should be preserving the baseflow of streams via focused monitoring and careful consideration of future water appropriations.

- **Increase perennial land acreage.** More living cover on the land reduces pollutant loads and provides wildlife habitat. This is a multiple-benefits "parent" strategy from which various specific strategies could be shaped. Examples in the WRAPS document include:
    - Keep existing pastures and rangeland; look for opportunities to convert marginal row crop acres. Pasture is a working-lands BMP that is an integral part of local economies;
    - Encourage re-enrollment of expiring CRP contracts;
    - Manage forest acres with stewardship planning;
    - Keep the watersheds of the five remaining fully supporting lakes in perennial cover (i.e. no net loss of perennial cover);

  The NRS and numerous other technical documents cite the multiple benefits of perennials. Chapter 8 of the 2011 CRW Strategy document describes a "green corridor" along the upper Cannon, noting the significant effort made to date that has resulted in acquisition of key parcels; this concept could be considered by 1W1P. The Cannon 1W1P is being composed concurrent to the buffer initiative roll-out and Minnesota's most recent Conservation Reserve Enhancement Program (CREP) funding. The plan should provide foundation for efforts going forward to increase perennial acres in the watershed.
- **Continue work to reduce pathogens in surface waters.** The presence of fecal pathogens in surface water is a regional problem in southeast Minnesota. The issue was well-described in a stakeholder driven process that culminated in approval of 39 approved fecal coliform TMDLs for streams and rivers in the region. The Revised Regional *Total Maximum Daily Load Evaluation of Fecal Coliform Bacteria Impairments in the Lower Mississippi River Basin in Minnesota* was approved in 2006. Subsequent to TMDL approval, stakeholders completed an implementation plan. According to the findings and strategies summarized in these documents, numerous projects have been executed in efforts to reduce pathogen loading to the region's surface waters. Feedlot runoff, unsewered communities and over-grazed pastures (among others) have all been addressed via grant funding. The E. coli TMDLs in the CRW should be considered (for planning purposes) an addendum to the regional TMDL work and 1W1P should support continued work to better understand E. coli indicator presence (see TMDLs document for research needs) and reduce pathogen loading to surface waters.

Sediment (and associated turbidity) is a pollutant of concern and a prevalent stressor of aquatic life in the CRW. It is implicitly addressed by the priority concerns listed above in that focusing on pollutant and pathogen load reductions and stream habitat issues will result in corresponding sediment load reductions.

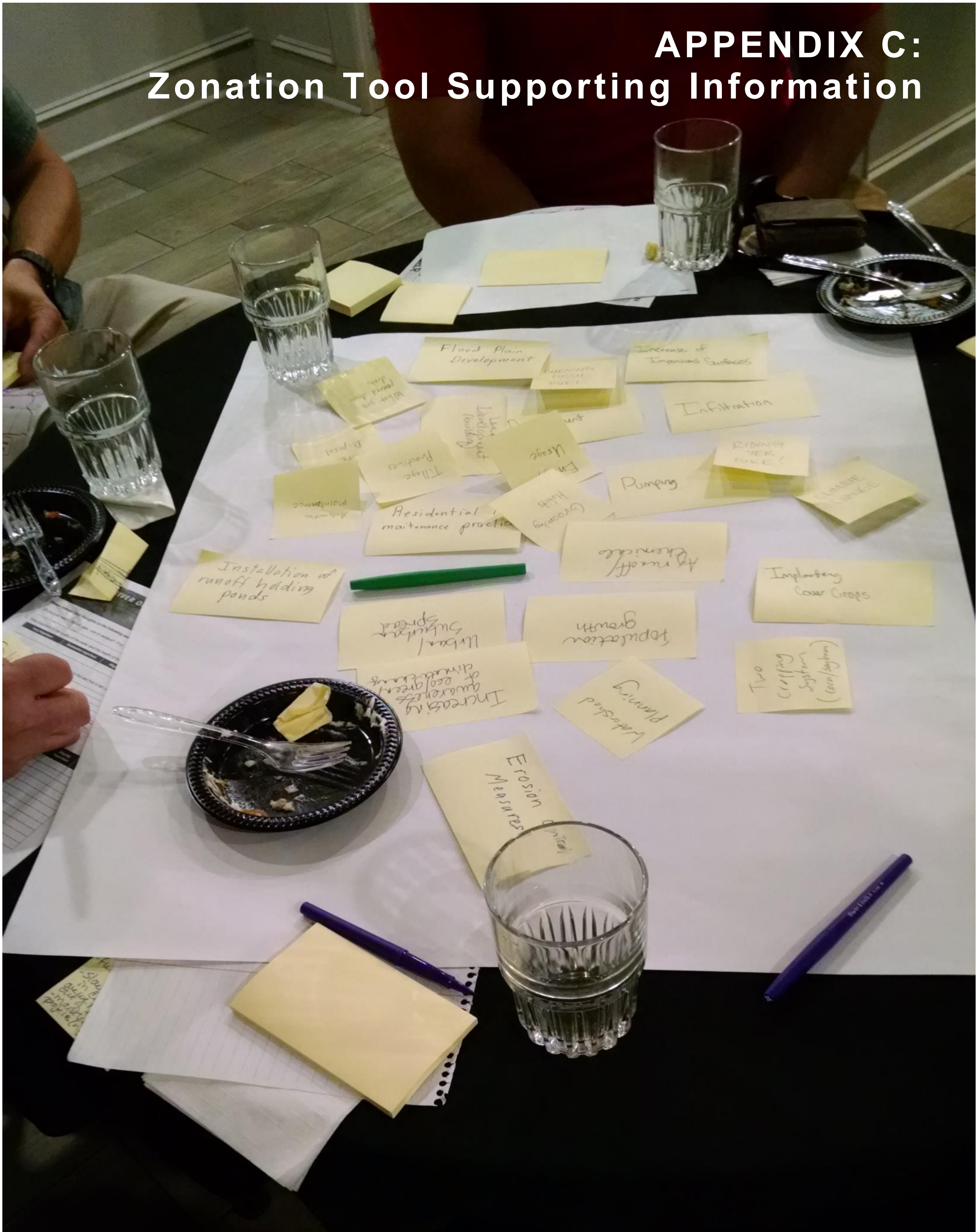
The MPCA is committed to providing assistance in interpreting and applying the substance of the WRAPS, NRS, HSPF model, Stressor Identification conclusions, etc. going forward as these and other priority concerns are installed and addressed in the 1W1P framework. Thank you again for the opportunity to provide input and for your on-going work in the CRW.

Sincerely,

Justin Watkins
Pollution Control Specialist Senior
Rochester Office
Watershed Division

JW: jw

APPENDIX C:
Zonation Tool Supporting Information



PLANS APPENDIX C – ZONATION TOOL SUPPORTING INFORMATION

1.1 Purpose of the Zonation Model Update

The Cannon River 1W1P Planning Work Group reviewed the 2014 Zonation model results (see Appendix C, Section 1.5) that were completed as part of the MPCA-funded Cannon River Watershed Restoration and Protection Strategy process during their June 2017 meeting. Only a few members of the current Planning Work Group were involved in the 2014 Zonation process, and the Planning Work Group decided that they were interested in updating the Zonation model to reflect the values of the full Planning Work Group and the Policy Committee, expand the analysis to include the Mississippi River-Lake Pepin drainage area, and to combine the protection and restoration results into one prioritization scheme. The Cannon River 1W1P work plan and budget did not originally include a Zonation model task; therefore, the Planning Work Group developed an abbreviated update strategy with input from the technical consultant (EOR) and Paul Radomski (MDNR).

1.2 Values Survey

The main purpose of the 2017 Zonation model update was to incorporate the values of the Planning Work Group and Policy Committee into the 2014 Zonation modeling process. This was accomplished by the Planning Work Group and Policy Committee taking the values survey. No changes were made to the existing values survey to maintain overall consistency with the 2014 Zonation model and other Zonation models conducted state-wide. The Zonation model was based on the 5 Components of the MN DNR Watershed Health Assessment Framework: Biology, Connectivity, Geomorphology, Hydrology, and Water Quality (http://www.dnr.state.mn.us/whaf/index.html). The 5 component approach recognizes that clean water needs are not separate from other conservation needs; and each conservation activity should provide multiple benefits. The Zonation model helps achieve this 'multiple benefits' goal by identifying areas that optimize benefits by incorporating data valued by the community (i.e., the survey).

The Zonation model used a compilation of individual (fine-scale survey; 24 components, 51 pairs) and aggregated (broad-scale survey, 5 components, 10 pairs) criteria of valuable landscape features with the objective of providing data and maps that prioritize places on the landscape for restoration or protection. The Planning Work Group completed the broad-scale and fine-scale surveys, and the Policy Committee completed the broad-scale survey. Individual components of watershed management are linked to multiple other aspects of watershed management (i.e., multiple benefits). Therefore, the objective of the pairwise survey is to help participants focus on the value they place on individual components of watershed management by considering them in pairs for all unique combination of pairs.

1.3 Zonation Data Layers

The fine-scale components from the survey are represented spatially in the Zonation model with a unique input data layer. The selection of input data layers was completed as part of the 2014 Zonation process, and these layers were reviewed and approved with some minor modifications by the Planning Work Group in June 2017 (Table 1). The BWSR Soil Erosion Risk and HSPF sediment and flow yield layers were replaced with 2017 PTMApp terrain analysis output layers. The PTMApp outputs are based on hydro-conditioned LiDAR – which has a much higher spatial resolution and accuracy compared to the 30m DEM based models. In addition, one of two soil erosion risk layers from the 2014 model were replaced with PTMApp 10-year 24-hour runoff depths to represent areas prone to flooding. DNR also updated the lake phosphorus sensitivity layer since 2014 – and the revised layer was used in the 2017 Zonation update.

Table 1. Descriptions for features (i.e., data layers) used in the 2017 Cannon River Planning Area Zonation model

Objective	Description
Protect or Improve Waters of Concern [Water Quality]	
Focus on Groundwater contamination susceptibility	The relative susceptibility of an area to groundwater contamination (based on geologic stratigraphy, aquifer transmissivity, and recharge potential). *Based on analysis from the Pollution Control Agency (PCA).*
Focus on Drinking Water Supply Management Area (DWSMA) vulnerability for Municipalities	The risk associated with potential contaminant sources within a public water supply DWSMA to contaminate its drinking water supply. This risk is based on the aquifer's inherent geologic sensitivity, the assessed vulnerability of the public water supply well(s), and the composition of the groundwater. In highly vulnerable DWSMAs, there is a strong causal relationship between land use activities on the surface and groundwater quality. *Information from the Minnesota Department of Health (MDH).*
Focus on Groundwater at greatest risk to nitrate contamination	Areas with relatively high, moderate, and low probability of having elevated nitrate concentrations in groundwater. Nitrate probability ranking was determined based on land use and hydrogeologic sensitivity. *Information from MDH.*
Focus on Impaired waters	Catchments (i.e., drainage basins) upstream of aquatic life impaired lakes within the watershed. *Identified as impaired by the Minnesota PCA.*
Focus on Catchments with high pollution	Estimated sediment yield by catchment as determined by the PTMApp model. *Source: Houston Engineering.*
Focus on Catchments of lakes vulnerable to nutrient addition	The relative susceptibility of a lake to phosphorus pollution (based on lake morphology and catchment hydrology). *Based on Lake Phosphorus Sensitivity analysis from the DNR and PCA.*
Reduce Erosion & Runoff	
Focus on Areas with high erosive potential	Stream Power Index (SPI): This is an index of the channelized flow erosive potential. *Formerly based on BWSR/UMN Environmental Benefits index. Now based on PTMApp SPI derived from LiDAR.*
Protect or Restore Bluffs and steep slopes.	Bluffs or steep slopes. *Based on LiDAR data.*
Protect Existing wetlands	Remaining wetlands as documented by the National Wetland Inventory (NWI). *NWI existing wetlands.*
Protect or Restore Stream floodplains	Stream potential flood zones (based on location, elevation and soil type). *Based on floodplain analyses from the DNR.*
Focus on Catchments with high runoff	Catchments with high runoff (in inches for 10-year 24-hour rainfall event) as identified by PTMApp. *PTMApp 10-year 24-hour runoff depth. Replaced a soil erosion risk layer from the 2014 model.*

Objective	Description
Protect or Improve Fish & Wildlife Habitat	
Protect Rare plants or animals	Locations of species currently tracked by the MDNR, including Endangered, Threatened, and Special Concern plant and animal species as well as animal aggregation sites. *Based on MDNR lists.*
Protect Sites of biodiversity significance and Native prairies	Areas with varying levels of native biodiversity that may contain high quality native plant communities, native prairies, rare plants, rare animals, and/or animal aggregations. *Minnesota Biological Survey sites of biodiversity significance + native prairie*.
Protect or Restore Lakes of biological significance	Catchments of high quality lakes. *MDNR list of high quality lakes based on dedicated biological sampling.*
Protect High value forests	MDNR designated high conservation value forests due to plant and animals present and MDNR designed old-growth forests. *MDNR designated high-value forests (HCVF + old growth).*
Protect or Restore Trout stream catchments	Catchments of MDNR designated trout streams.
Protect or Restore Ecological corridors	Ecological corridors between generally large, intact, native or "semi-natural" terrestrial habitat patches.
Protect or Restore Lake Shoreland and Stream Buffers	
Protect or Restore Stream buffers	Land within 50 feet of stream or river.
Protect or Restore Shoreland	Land within 1000 feet of lake shoreline.
Protect or Restore Lands of Concern	
Restore Pasture/hay	Land cover type is pasture or hay (areas used for livestock grazing or planted with perennial seed or hay crops). *Pasture or hay land cover type.*
Restore Cultivated croplands	Land cover type is cultivated crops (areas used for the production of annual crops or actively tilled areas). *Cultivated crop land cover type.*
Restore Specific Land capability class lands	This classification shows, in a general way, the suitability of soils for most kinds of field crops. Classes 4-8 have serious limitations for agriculture, and are used to identify areas for potential conservation investment in prairie or forest management. *NRCS land capability class (classes 4 – 8).*
Protect Valuable timber lands	Forest lands that have been identified by forestry managers as important. *Forested land cover type.*
Protect Undeveloped lands in high growth areas	Lands close to existing development may be more likely to be developed, and some of these lands that provide important ecosystem services may be of conservation value. *Inverse distance to developed areas.*

1.4 2017 Zonation Results and Methods

Targeting and Prioritization of Geographic Areas in the Cannon River Watershed
By Paul J. Radomski and Kristin Carlson

Summary

As threats to Minnesota's watersheds continue to mount, it is becoming increasingly important to identify and conserve high-priority areas. Identification of these priority areas, including sources of point and non-point pollution, will be crucial for targeting actions to improve water quality. There are multiple opportunities for protection or restoration in any watershed. Identifying which practices to implement and where in the landscape to implement them can help more effectively target efforts and more efficiently utilize limited resources.

To prioritize land within the Cannon River watershed, we used a process that included the values-based model Zonation. This process began with the identification of the goals of the watershed and concluded with a review of the results. The identification of priority areas was based on the quantitative analysis (using Zonation) of a suite of data layers. Planning team members decided on what landscape features were included in the model and set the weights on those features via a pairwise questionnaire survey. The process was framed within the DNR's healthy watershed conceptual model, and included biology, hydrology, water quality, geomorphology, and connectivity components. An additional component, designed to capture other "lands of concern" within the watershed was also included.

This approach recognized that attempts to solve clean water needs within the watershed are not separate from other natural resource needs; each priority area should provide multiple benefits. The model used in this process helps achieve this goal by identifying areas that provide multiple benefits while incorporating data valued by the community.

Results

The pairwise questionnaire survey results identified the *Reduce Erosion & Runoff* component of the value model inputs as the highest weight, followed by *Protect/Improve Waters of Concern*. The *Protect/Improve Fish & Wildlife Habitat* component was assigned the lowest weight (Figure 1 and Table 2).

The Zonation model was run using the weights derived from the questionnaire. The Zonation output map ranked lands as to their importance for land management activities that would provide greater protection of ecosystem functions, especially water quality, and to their importance for application of various land best management practices.

The priority map identified several priority areas. High rankings were given to lands near the cities of Faribault and Owatonna. Lands between the city of Cannon Falls and the northeast corner of the watershed were also ranked high. The areas surrounding Shields, Mud, Mazaska, and French Lakes were identified as high priority areas, as were lands near Sakatah Lake, and between Jefferson and Frances Lakes. Other high priority areas were scattered throughout the watershed (Figure 2 and Figure 3).

Methods

Values-based models, such as Zonation, are an efficient method for prioritizing places on the landscape for protection or restoration of water resources. These models integrate individual landscape features with context and connections, and use an objective function to identify priority resource areas. The use of an additive benefits (i.e., multiple benefits) objective function in the value model allows for the inclusion of multiple landscape features. Value models also lend themselves to collaborative efforts, by providing an opportunity for participants to decide what features are valued and the ranking of those valued features. In addition, value models and the DNR five-component healthy watershed model used to structure the content in the value model are simple concepts that are easy to explain and apply at the local government scale. Value models do not provide guidance on what practices should be implemented where, so additional analysis and/or discussion on effective and appropriate best management practices will be necessary when project planning.

The first step of the four-step process involved determining which features should be included in the Zonation model. The 1W1P team decided on 24 features (i.e., data layers), grouped within five components (Table 1). Each data layer was on the same grid with a resolution of 30 by 30m. We used high-resolution data to maximize local planning realism and for greater practicality in local government water resource planning and implementation.

Weights were used to identify which features were valued more. Within the five-component healthy watershed framework, for example, water quality features could be weighted higher than biological features. The feature-specific weights used in Zonation were set using the analytic hierarchy process (AHP; Saaty and Peniwati 2007). A hierarchical survey (components → features) comprised of pairwise comparisons was used to identify the preferences of a diverse group of individuals within the watershed. Each individual taking the survey used his or her judgment about the relative importance of all survey elements. The relative importance values included "equal," "prefer," and "strongly prefer." Individual responses were aggregated with a geometric mean, and the pairwise comparison matrix was constructed to compute the feature-specific weights consistent with the AHP. Members of the Policy Committee took a survey consisting of the broad-scale components, and Advisory Committee members provided preferences for both the broad-scale components and the fine-scale features.

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

To produce a map that identified areas on the landscape that provide multiple benefits, we used the additive benefit function within Zonation. This function aggregates values by summation across features:

$$V(P) = \Sigma w_j N_j (P)^{z_j}$$

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

Additionally, Zonation allows ranking to be influenced by neighboring parcels, so that highly valued areas can be aggregated, and fragmentation of areas can be minimized. We utilized the distribution-smoothing algorithm in Zonation, which assumes that fragmentation (low connectivity) generally should be avoided for all features. Initial analyses indicated that a connectivity distance of 200m may be appropriate for local government efforts targeted at the watershed scale. We found that very small connectivity distances made no difference in prioritization, since the connectivity effect did not extend very far, and very large connectivity distances aggregated cells across unrealistically large areas. We also found that across a modest range of connectivity distances the results were minor.

Analysis of the spatial distribution of the conservation priority scores identified clusters of high priority areas; these clusters are identified as hotspots (Figure 3).

References

Moilanen, A., H. Kujala, and J. Leathwick. 2009. The Zonation framework and software for conservation prioritization. Pages 196-210 in A. Moilanen, K. A. Wilson, and H. P. Possingham, editors. Spatial conservation prioritization: quantitative methods and computational tools. Oxford University Press, Oxford, UK.

Saaty, T.L., and K. Peniwati. 2007. Group decision-making: Drawing out and reconciling differences. Pittsburgh, PA: RWS Publications.

Table 2. Component and feature weights used in the 2017 Cannon River Planning Area Zonation model. Weights were obtained from a questionnaire using the analytic hierarchy process (AHP; weights sum to 100).

Component (broad-scale) Prioritization	Weight	Weight Used in Model
Protect/Improve Waters of Concern	22.7	
Reduce Erosion & Runoff	30.3	
Protect/Improve Fish & Wildlife Habitat	11.2	
Protect/Restore Shoreland & Buffers	17.7	
Protect/Improve Lands of Concern	18.1	
Feature (fine-scale) Prioritization		
Drinking water mgmt area vulnerability	13.0	3.0
Impaired waters	17.5	4.0
Groundwater nitrate risk	16.5	3.8
Groundwater contamination susceptibility	19.0	4.3
Catchments of lakes vulnerable to nutrient loading	13.5	3.1
Catchments with higher pollution	20.5	4.7
Areas with high erosive potential	31.3	9.5
Bluffs and steep slopes	12.1	3.7
Existing wetlands	13.7	4.1
Stream floodplains	22.6	6.8
Soil erosion risk	20.3	6.1
Rare features	9.5	1.1
Sites of biodiversity significance	19.7	2.2
Lakes of biological significance	14.3	1.6
High value forests	13.9	1.6
Trout stream	14.9	1.7
Ecological corridors	27.7	3.1
Stream buffers	69.4	12.3
Lake shorelands	30.6	5.4
Valuable timber lands	16.9	3.0
Undeveloped lands in high-growth areas	18.2	3.3
BMPs on pasture/hay lands	24.6	4.4
BMPs on cultivated croplands	16.7	3.0
Land capability classes 4 - 8	23.7	4.3

Figure 1. The component (broad-scale) weights used in the 2017 Cannon River Planning Area Zonation model. Weights were obtained from a questionnaire using the analytic hierarchy process (AHP; weights sum to 100).

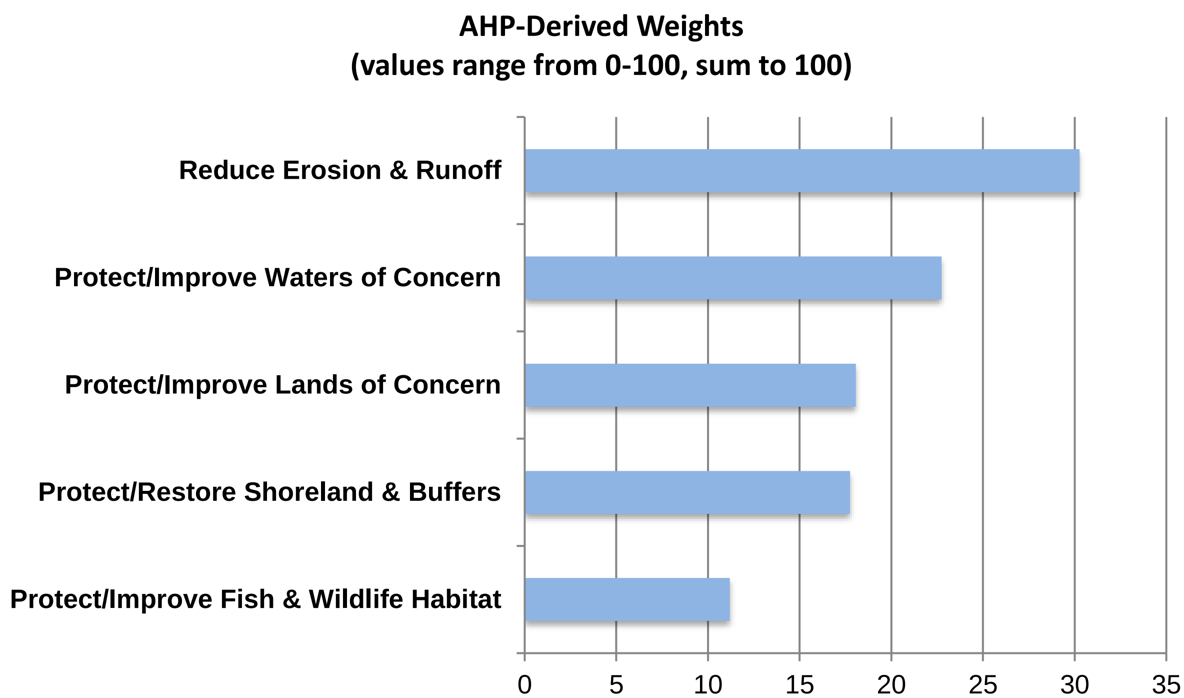


Figure 2. Priority map from 2017 Cannon River Planning Area Zonation analysis.

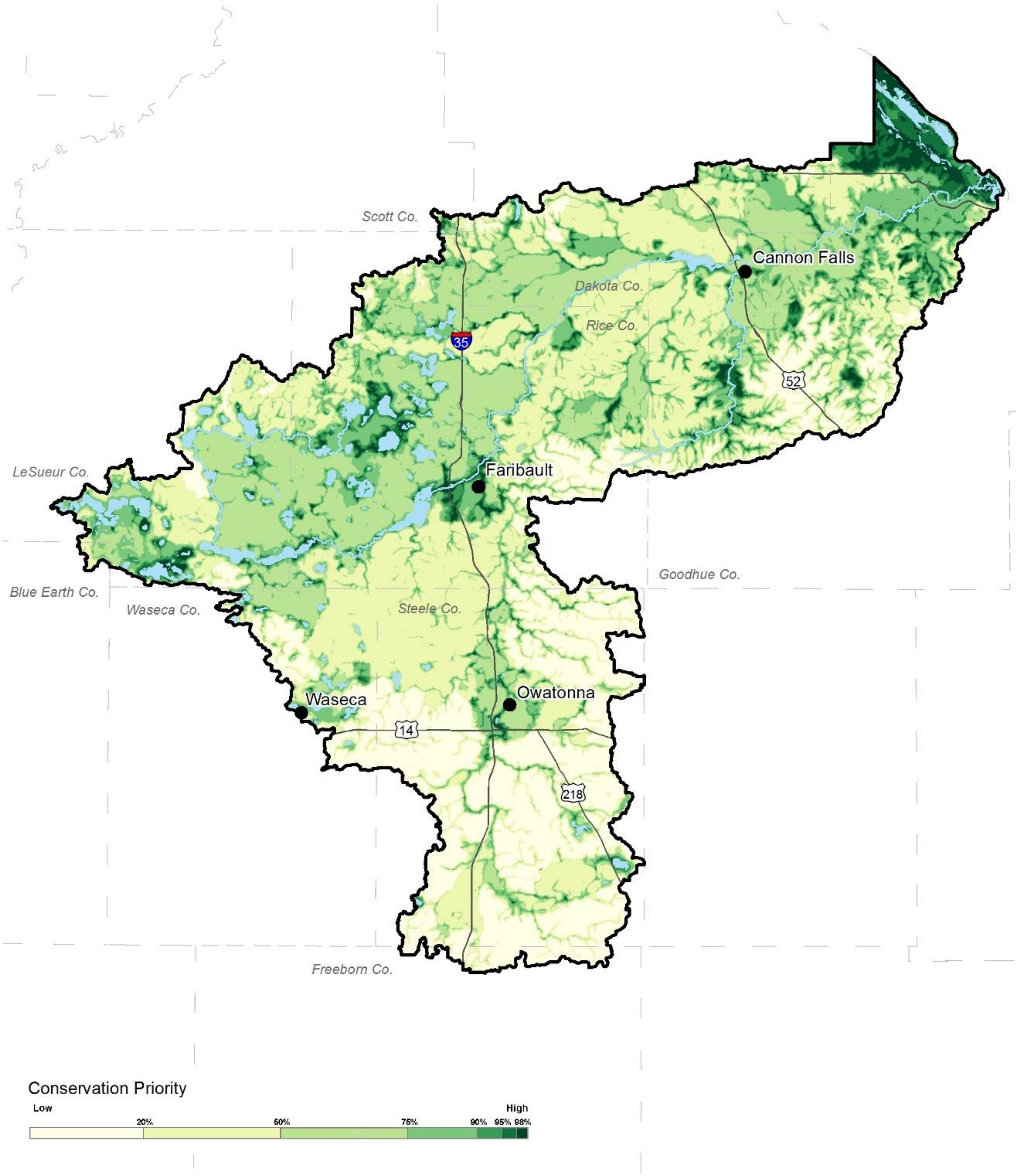
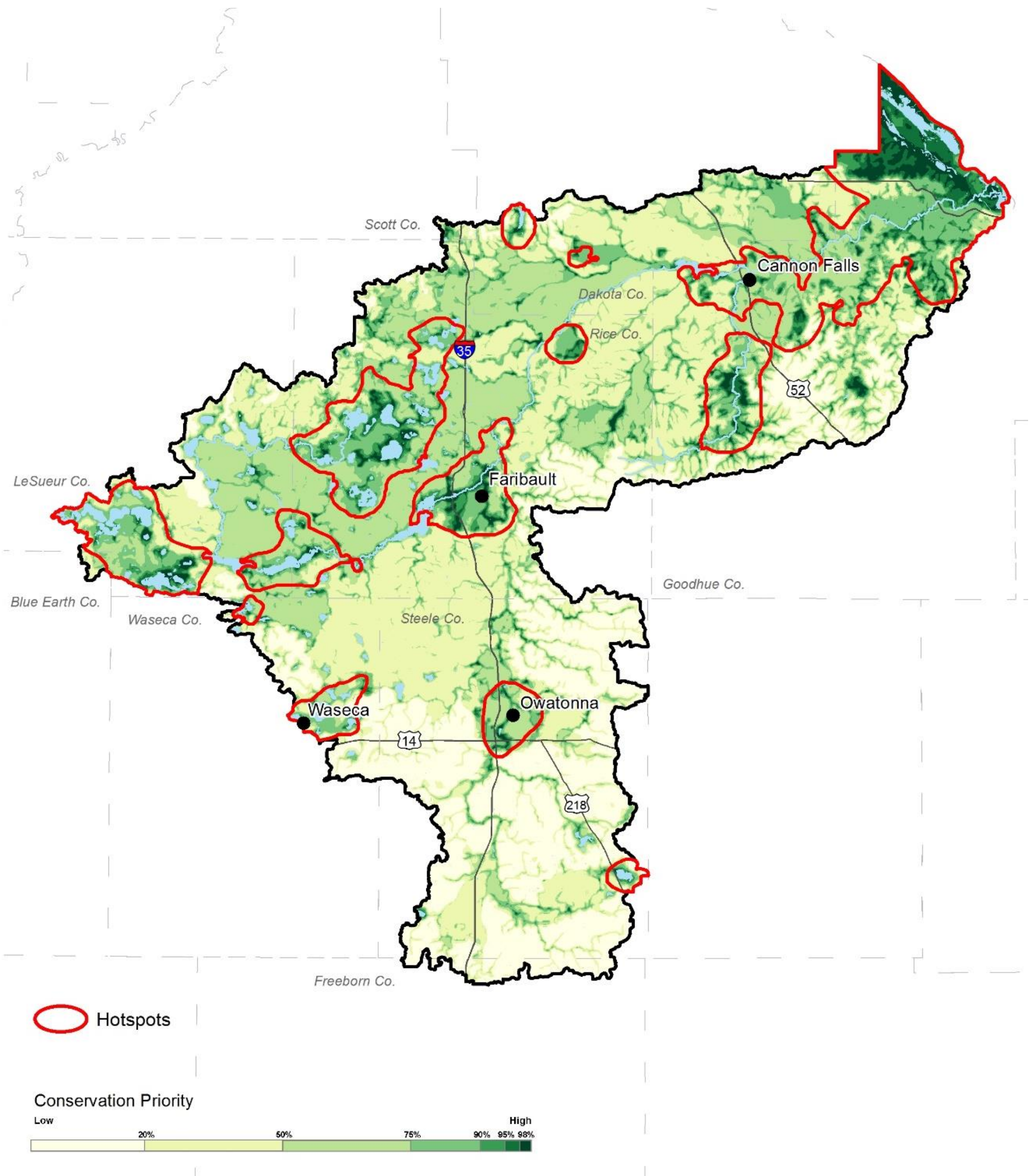


Figure 3. Priority map from 2017 Cannon River Planning Area Zonation analysis with hotspots. Hotspots derived using median conservation (WRSCR) score from Zonation output.



1.5 2014 Zonation Results and Methods

Targeting and Prioritization of Geographic Areas in the Cannon River Watershed
By Paul J. Radomski and Kristin Carlson

Prioritization Overview

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

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

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

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

Methods

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

Weights are used to influence which features are valued more. Within the five-component healthy watershed framework, for example, water quality conservation features could be weighted higher than biological features. The feature-specific weights used in the value models reflect social valuation, and they were set using the analytic hierarchy process (AHP; Saaty and Peniwati 2007). A survey comprised of pairwise comparisons was used to solicit the preferences of individuals. Features used in the comparison were based loosely on the DNR's five-component healthy watershed approach, with the addition of alternative land uses or economic features representing a social component. The pairwise survey was structured to gather value preferences for both a protection and a restoration scenario. Each individual taking the survey used his or her judgment about the relative importance of all elements at each level of the hierarchy. The relative importance values included "equal," "prefer," and "strongly prefer." The use of abbreviated pairwise importance values helped reduce the cognitive burdens associated with a large number of pairwise comparisons. Individual responses were aggregated with a geometric mean, and the pairwise comparison matrix was constructed to compute the feature-specific weights consistent with the AHP. The survey was administered to participants of the June 9th, 2015, Cannon River WRAPS Kick-off Meeting (N= 35).

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

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

$$\mathbf{V(P) = \Sigma w_j N_j(P)^{z}{}_{j}}$$

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

The conservation features used in the analysis are found in Table 3, and each layer was on the same grid with a resolution of 30 by 30m. We used high-resolution data to maximize conservation planning realism and for greater practicality in local government conservation planning and implementation.

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

2014 Results

The pairwise questionnaire survey results identified the shoreland and riparian area component of the value model inputs as the highest weight, followed by the reduction of erosion and runoff component (Figure 4 and Table 4).

Two priority maps were created with the Zonation value model. The first map was a protection priority map where lands were ranked as to their importance for land management activities that would provide greater protection of ecosystem functions, especially water quality (Figure 5). The second map was a restoration priority map where lands were ranked as to their importance for application of various land best management practices (Figure 6). We focused on the restoration map, and this map is broken into the four lobes (Figure 7 & Figure 10).

The restoration priority map from the Zonation analysis identified at least four general areas for consideration. First, high rankings were evident in the Lower Lobe associated with stream riparian areas and in areas with high-channelized flow erosive potential (Figure 7 & Figure 12). Second, riparian and shoreland areas near and west of the city of Northfield were generally high priority (Figure 8 & Figure 13). Third, lands within or surrounding the cities of Faribault, Owatonna and Waseca had high priority (Figure 9 & Figure 14). Finally, high priority areas were identified around the lakes in the Upper Cannon River Lobe and the Cannon River tributaries south of the city of Waterville (Figure 10 & Figure 15).

References

Moilanen, A., H. Kujala, and J. Leathwick. 2009. The Zonation framework and software for conservation prioritization. Pages 196-210 in A. Moilanen, K. A. Wilson, and H. P. Possingham, editors. Spatial conservation prioritization: quantitative methods and computational tools. Oxford University Press, Oxford, UK.

Saaty, T.L., and K. Peniwati. 2007. Group decision-making: Drawing out and reconciling differences. Pittsburgh, PA: RWS Publications.

Table 3. Variable descriptions for content used in 2014 Cannon River Watershed Zonation model.

Objective	Description
Protect or Improve **Waters of Concern**	Waters of special concern include vulnerable groundwater or drinking water supplies, impaired water catchments, catchments of lakes and rivers with high pollution loads, and catchments of lakes vulnerable to pollution.
Reduce **Erosion & Runoff**	Erosion and runoff can be become more prevalent and severe due to human alteration of the land. When wetlands are removed, water runs off the land faster. Also, more water runs off land with impervious surfaces in urban areas and areas that have lost vegetation.
Protect or Improve **Fish & Wildlife Habitat**	Habitat provides food, shelter, and breeding territory for animals. The size, shape, and distance between habitat parcels are all important to sustaining populations of plants and animals.
Protect or Restore **Lake Shoreland and Stream Buffers**	The use and development of lake shorelands (lands within 1000 feet of a lake) and stream buffers (lands within 50 feet of a stream or river) may have consequences on the economic and environmental values of a lake or stream. If the shoreland or stream bank is naturally vegetated, it can serve as a buffer between land and water and filter out pollutants.
Protect or Restore **Lands of Concern**	This objective may include the protection of valuable timber land and lands near high-growth areas. It also involves identification of project areas for best management practices on agricultural lands. **Timber Land**: valuable timber areas and forest lands. Maximize values in forest areas by protecting natural areas for timber production, recreation, and multiple benefits and the identification of project areas for best management practices, including forest stewardship. **High-Growth Areas:** Lands close to existing development may be more likely to be developed, and some of these lands that provide ecosystem services may be of conservation value. Protect lands in high-growth areas. **Agricultural Land**: includes pasture (grass and other plants for grazing). The identification of project areas for restoration or best management practices.

Objective	Description
Protect or Improve Waters of Concern [Water Quality]	
Focus on Groundwater contamination susceptibility	The relative susceptibility of an area to groundwater contamination (based on geologic stratigraphy, aquifer transmissivity, and recharge potential). Based on analysis from the Pollution Control Agency (PCA).
Focus on Drinking Water Supply Management Area (DWSMA) vulnerability for Municipalities	The risk associated with potential contaminant sources within a public water supply DWSMA to contaminate its drinking water supply. This risk is based on the aquifer's inherent geologic sensitivity, the assessed vulnerability of the public water supply well(s), and the composition of the groundwater. In highly vulnerable DWSMAs, there is a strong causal relationship between land use activities on the surface and groundwater quality. Information from the Minnesota Department of Health (MDH).
Focus on Groundwater at greatest risk to nitrate contamination	Areas with relatively high, moderate, and low probability of having elevated nitrate concentrations in groundwater. Nitrate probability ranking was determined based on land use and hydrogeologic sensitivity. Information from MDH.
Focus on Impaired waters	Catchments (i.e., drainage basins) upstream of aquatic life impaired lakes within the watershed. Identified as impaired by the Minnesota PCA.
Focus on Catchments with high pollution	Estimated total suspended solids, total nitrogen, and total phosphorus by catchment as determined by hydrological models. Models include HSPF and BATHTUB (PCA) and Terrain Analysis where available (Houston Engineering).
Focus on Catchments of lakes vulnerable to nutrient addition	The relative susceptibility of a lake to phosphorus pollution (based on lake morphology and catchment hydrology). Based on analysis from the DNR and PCA.
Reduce Erosion & Runoff	
Focus on Areas with high erosive potential	Stream Power index: This is an index of the channelized flow erosive potential. This variable is from the BWSR and UMN's Environmental Benefits Index. [or use Highly Erodible Area as determined by DNR analysis]
Protect or Restore Bluffs and steep slopes.	Bluffs or steep slopes. Based on analysis from the DNR or calculated from LiDAR data.
Protect Existing wetlands	Remaining wetlands as documented by the National Wetland Inventory (NWI).
Protect or Restore Stream floodplains	Stream potential flood zones (based on location, elevation and soil type). Based on floodplain analyses from the DNR.
Reduce Soil erosion risk	Susceptibility of soils to erosion. This variable is from the BWSR and UMN's Environmental Benefits Index; it was calculated from a subset of the universal soil loss equation.

Objective	Description
Protect or Improve Fish & Wildlife Habitat	
Protect Rare plants or animals	Locations of species currently tracked by the MDNR, including Endangered, Threatened, and Special Concern plant and animal species as well as animal aggregation sites.
Protect Sites of biodiversity significance and Native prairies	Areas with varying levels of native biodiversity that may contain high quality native plant communities, native prairies, rare plants, rare animals, and/or animal aggregations. Identified by Minnesota Biological Survey.
Protect or Restore Lakes of biological significance	Catchments of high quality lakes. MDNR list of high quality lakes based on dedicated biological sampling.
Protect High value forests	MDNR designated high conservation value forests due to plant and animals present and MDNR designed old-growth forests.
Protect or Restore Trout stream catchments	Catchments of MDNR designated trout streams.
Protect or Restore Ecological corridors	Ecological corridors between generally large, intact, native or "semi-natural" terrestrial habitat patches.
Protect or Restore Lake Shoreland and Stream Buffers	
Protect or Restore Stream buffers	Land within 50 feet of stream or river.
Protect or Restore Shoreland	Land within 1000 feet of lake shoreline.
Protect or Restore Lands of Concern	
Restore Pasture/hay	Land cover type is pasture or hay (areas used for livestock grazing or planted with perennial seed or hay crops).
Restore Cultivated croplands	Land cover type is cultivated crops (areas used for the production of annual crops or actively tilled areas).
***Restore* Specific** Land capability class lands	This classification shows, in a general way, the suitability of soils for most kinds of field crops. Classes 4-8 have serious limitations for agriculture, and are used to identify areas for potential conservation investment in prairie or forest management (classification from NRCS).
Protect Valuable timber lands	Forest lands that have been identified by forestry managers as important.
Protect Undeveloped lands in high growth areas	Lands close to existing development may be more likely to be developed, and some of these lands that provide important ecosystem services may be of conservation value.

Table 4. Broad-scale and fine-scale weights used in the 2014 Cannon River Watershed value models from a questionnaire using the analytic hierarchy process (AHP; weights sum to 100).

Prioritization	AHP Derived Weight	Protection Weight Used in Model	Restoration Weight Used in Model
Broad-Scale Prioritization			
Protect/Improve Waters of Concern	19.5		
Reduce Erosion & Runoff	23.9		
Protect/Improve Fish & Wildlife Habitat	16.3		
Protect/Restore Shoreland & Buffers	25.2		
Protect/Improve Lands of Concern	15.1		
Fine-scale Prioritization			
Protection			
Drink Water	22.0	4.3	
Impaired waters	15.2	3.0	
Groundwater Contamination Susceptibility	24.7	4.8	
Catchments of lakes vulnerable to nutrient loading	17.9	3.5	
Catchments with higher pollution	20.3	4.0	
Restoration			
Drink Water	17.6		3.4
Impaired waters	12.2		2.4
Groundwater nitrate risk	20.8		4.1
Groundwater Contamination Susceptibility	19.6		3.8
Catchments of lakes vulnerable to nutrient loading	13.8		2.7
Catchments with higher pollution	16.0		3.1
Protection			
Areas with high erosive potential	19.5	4.7	
Bluffs and steep slopes	13.4	3.2	
Existing wetlands	27.6	6.6	
Stream floodplains	20.0	4.8	
Soil erosion risk	19.4	4.6	
Restoration			
Areas with high erosive potential	25.0		6.0
Bluffs and steep slopes	18.9		4.5
Stream floodplains	28.3		6.8
Soil erosion risk	27.8		6.7
Protection			
Rare features	12.4	2.0	
Sites of biodiversity significance	21.7	3.5	
Lakes of Biological Significance	17.5	2.8	
High value forests	11.9	1.9	
Trout stream catchments	14.9	2.4	
Ecological corridors	21.6	3.5	

Prioritization	AHP Derived Weight	Protection Weight Used in Model	Restoration Weight Used in Model
Restoration			
Lakes of Biological Significance	57.3		9.4
Trout stream catchments	42.7		7.0
Protection & Restoration			
Stream buffers	67.7	17.0	17.0
Lake shorelands	32.3	8.1	8.1
Protection			
Valuable timber lands	38.9	5.9	
Undeveloped lands in high growth areas	61.1	9.3	
Restoration			
BMPs on Pasture/hay lands	34.6		5.2
BMPs on Cultivated croplands	22.8		3.5
Land capability 4-8 classes	42.6		6.5
TOTAL		**100.0**	**100.0**

Figure 4. The broad-scale weights used in the 2014 Cannon River Watershed value models from a questionnaire using the analytic hierarchy process (AHP; weights sum to 100).

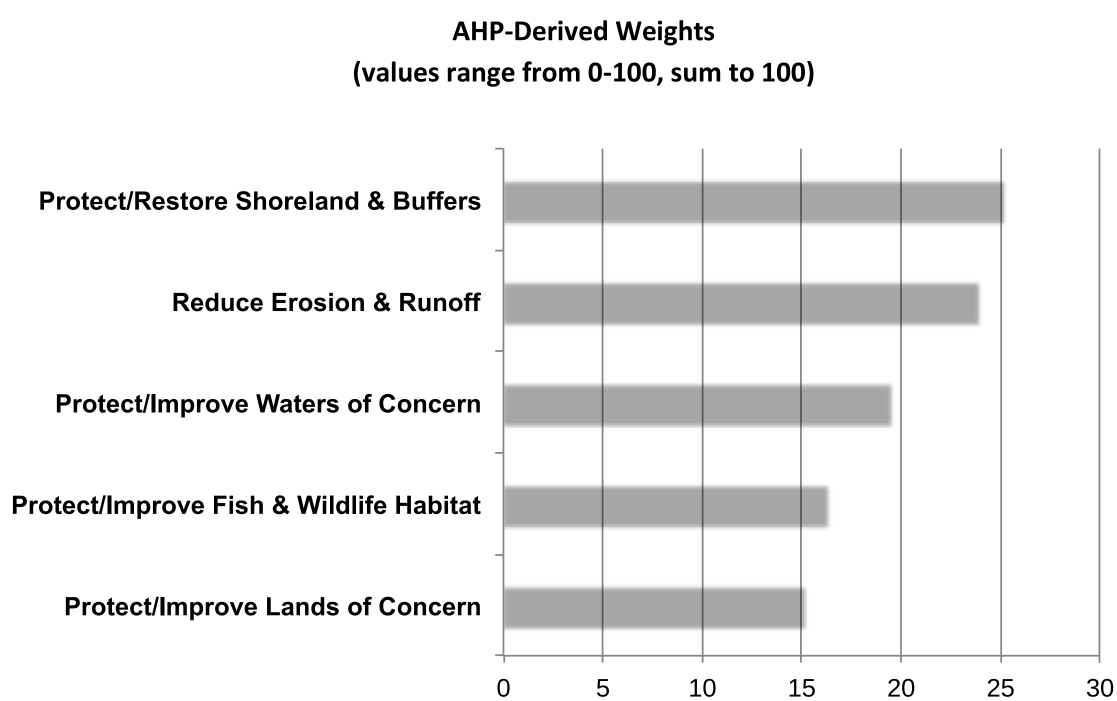


Figure 5. Protection priority map from 2014 Cannon River Watershed Zonation analysis.

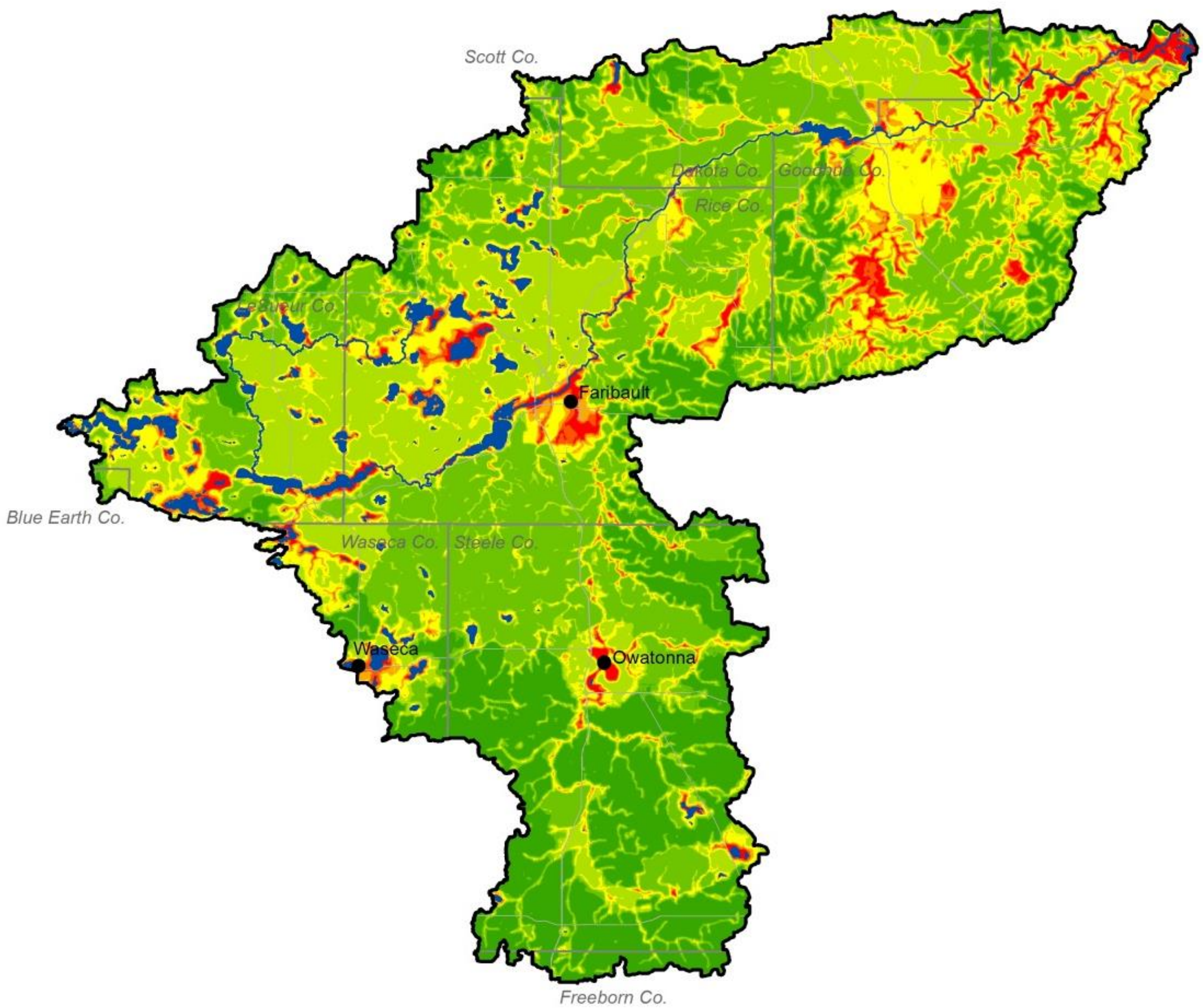


Figure 6. Restoration priority maps from 2014 Cannon River Watershed Zonation analysis.

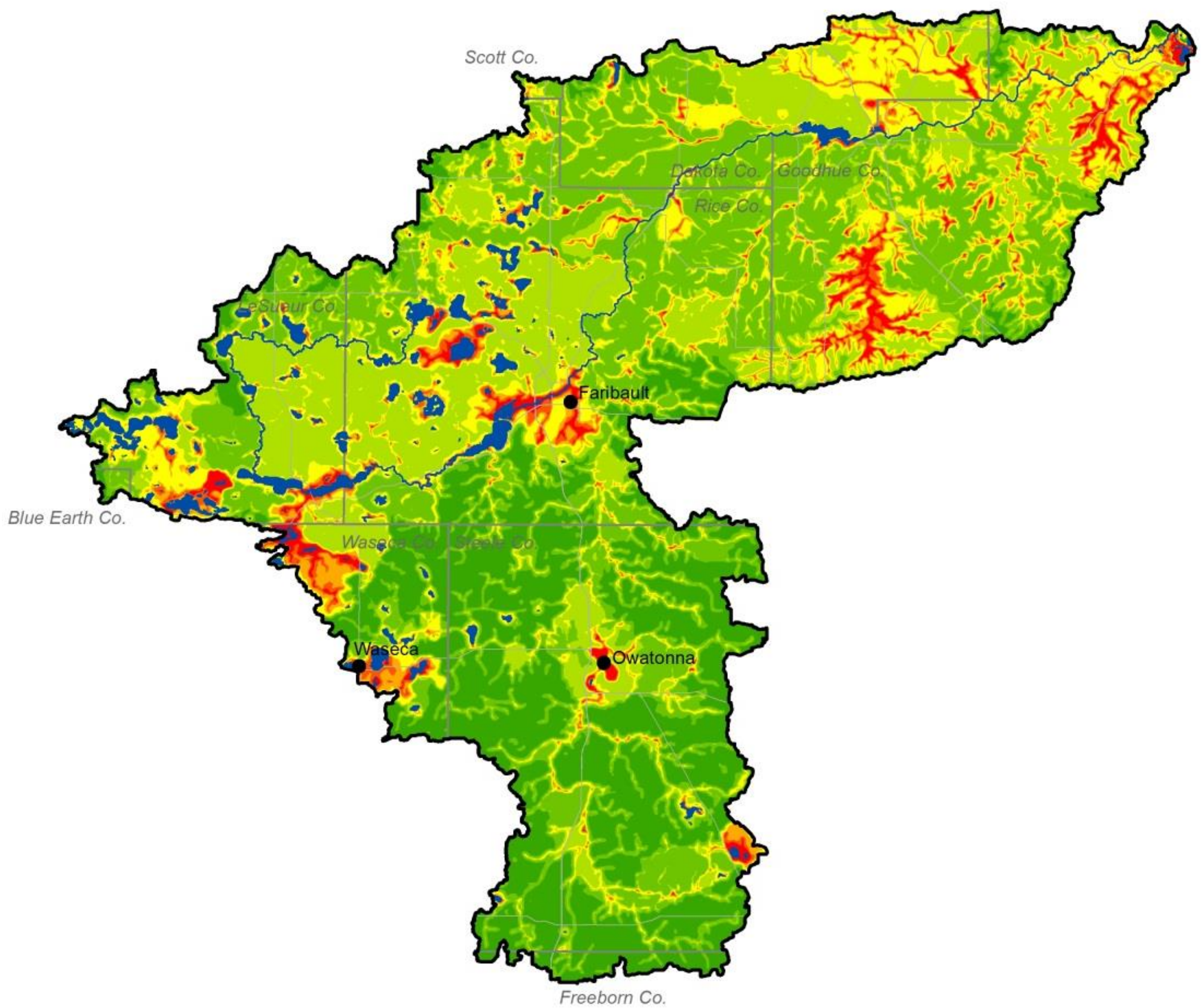


Figure 7. Restoration priority maps from 2014 Cannon River Watershed Zonation analysis – Lower Lobe.

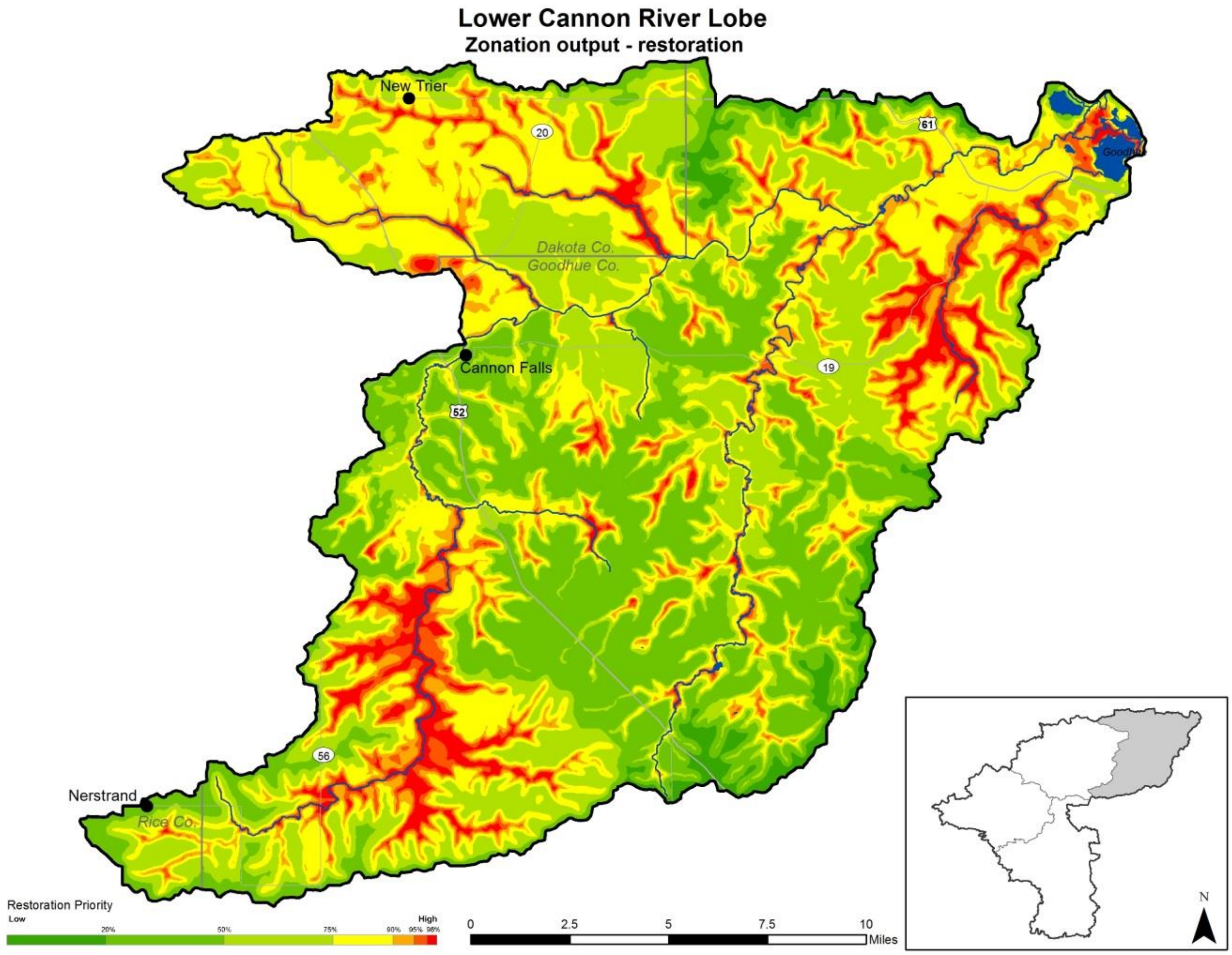


Figure 8. Restoration priority maps from 2014 Cannon River Watershed Zonation analysis – Middle Lobe.

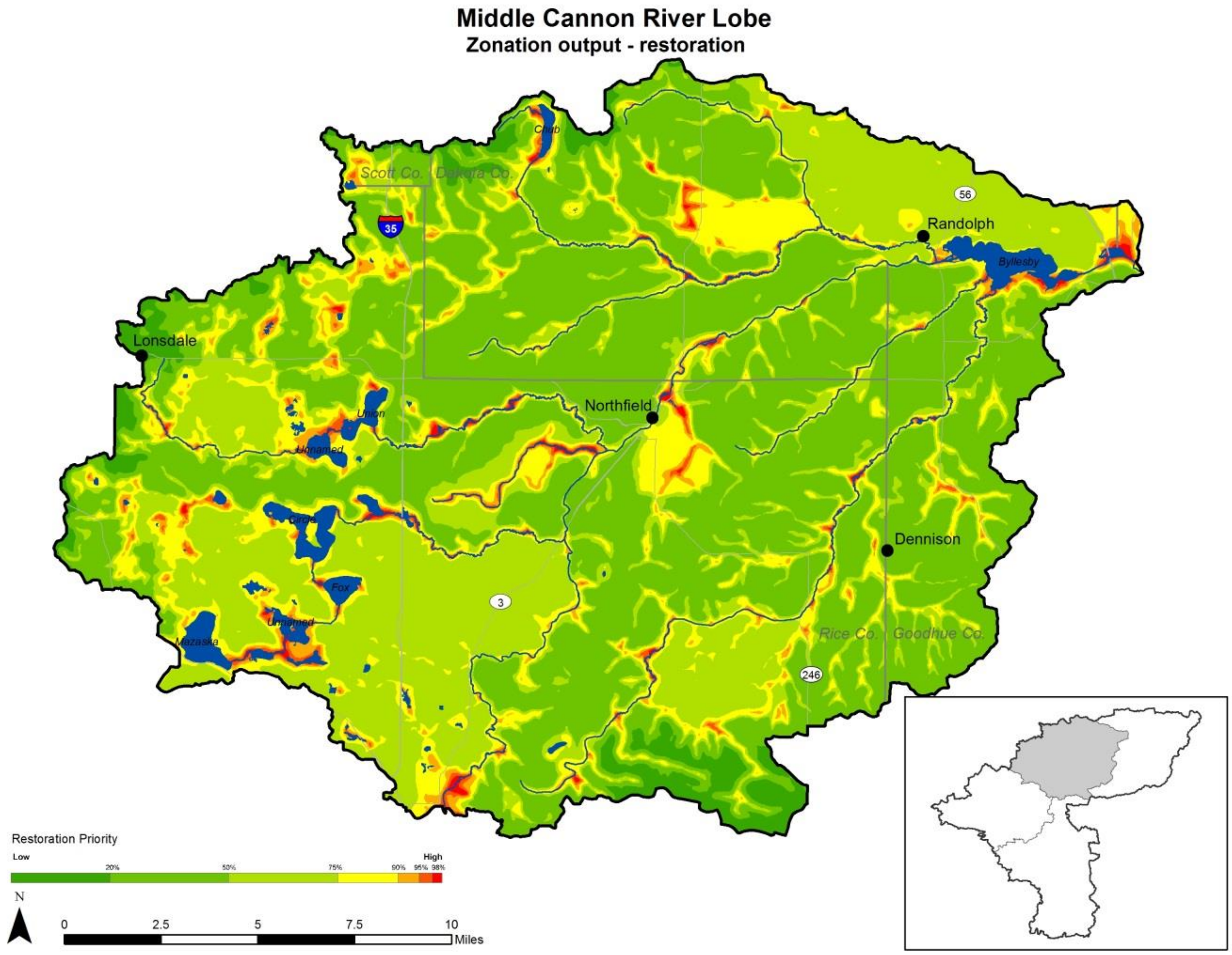


Figure 9. Restoration priority maps from 2014 Cannon River Watershed Zonation analysis – Straight River Lobe.

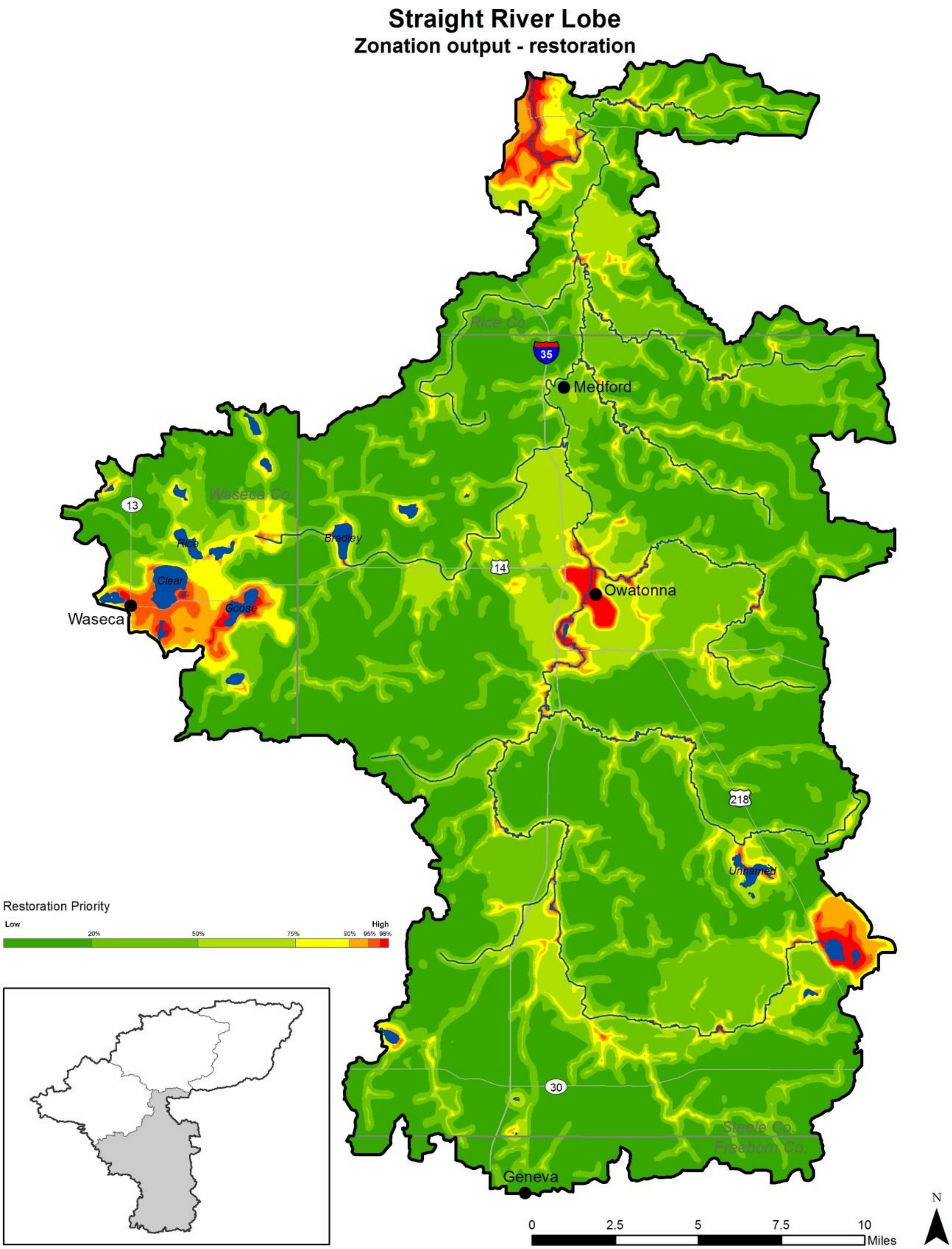


Figure 10. Restoration priority maps from 2014 Cannon River Watershed Zonation analysis – Upper Lobe.

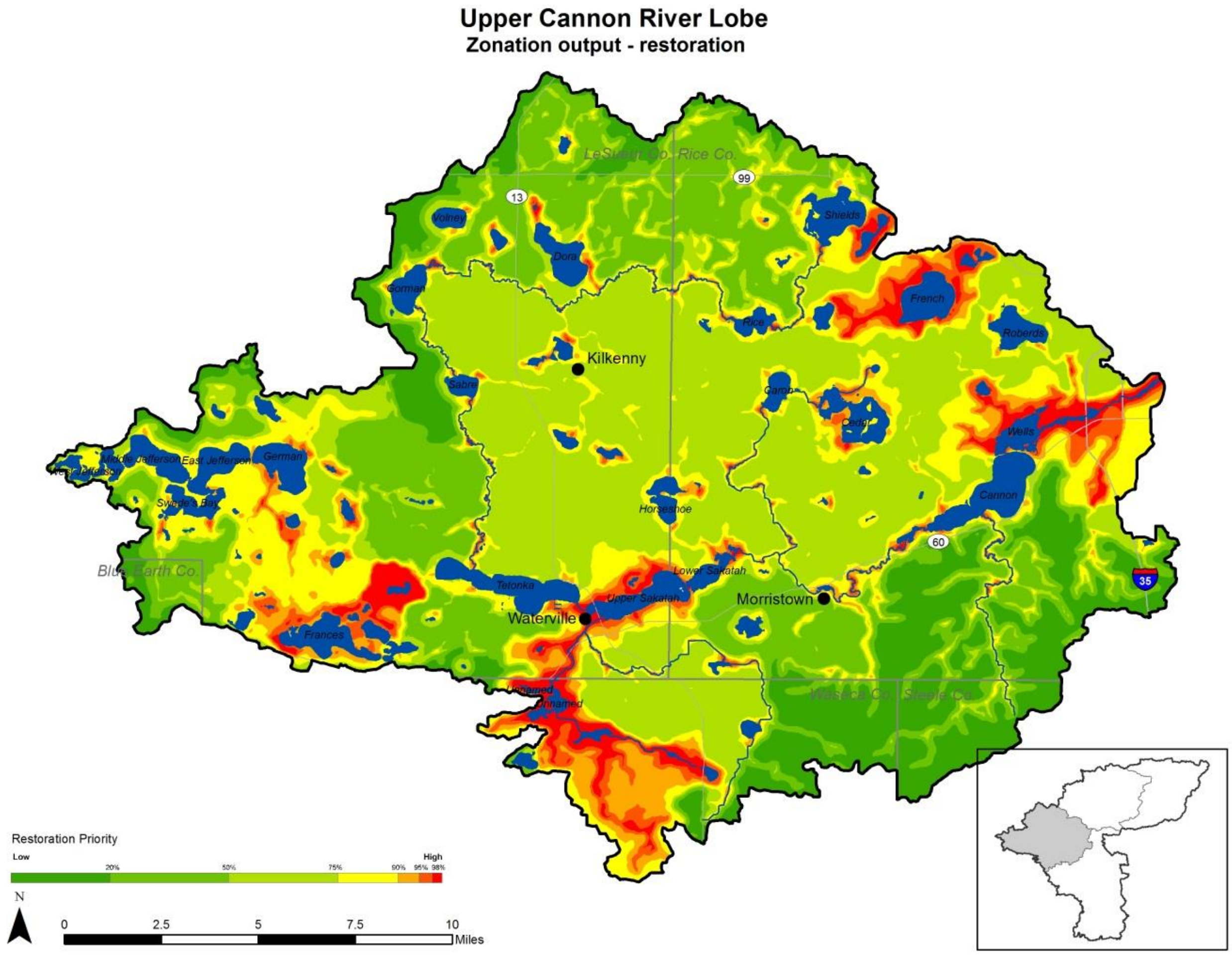


Figure 11. Restoration priority map from 2014 Cannon River Watershed Zonation analysis and land cover.

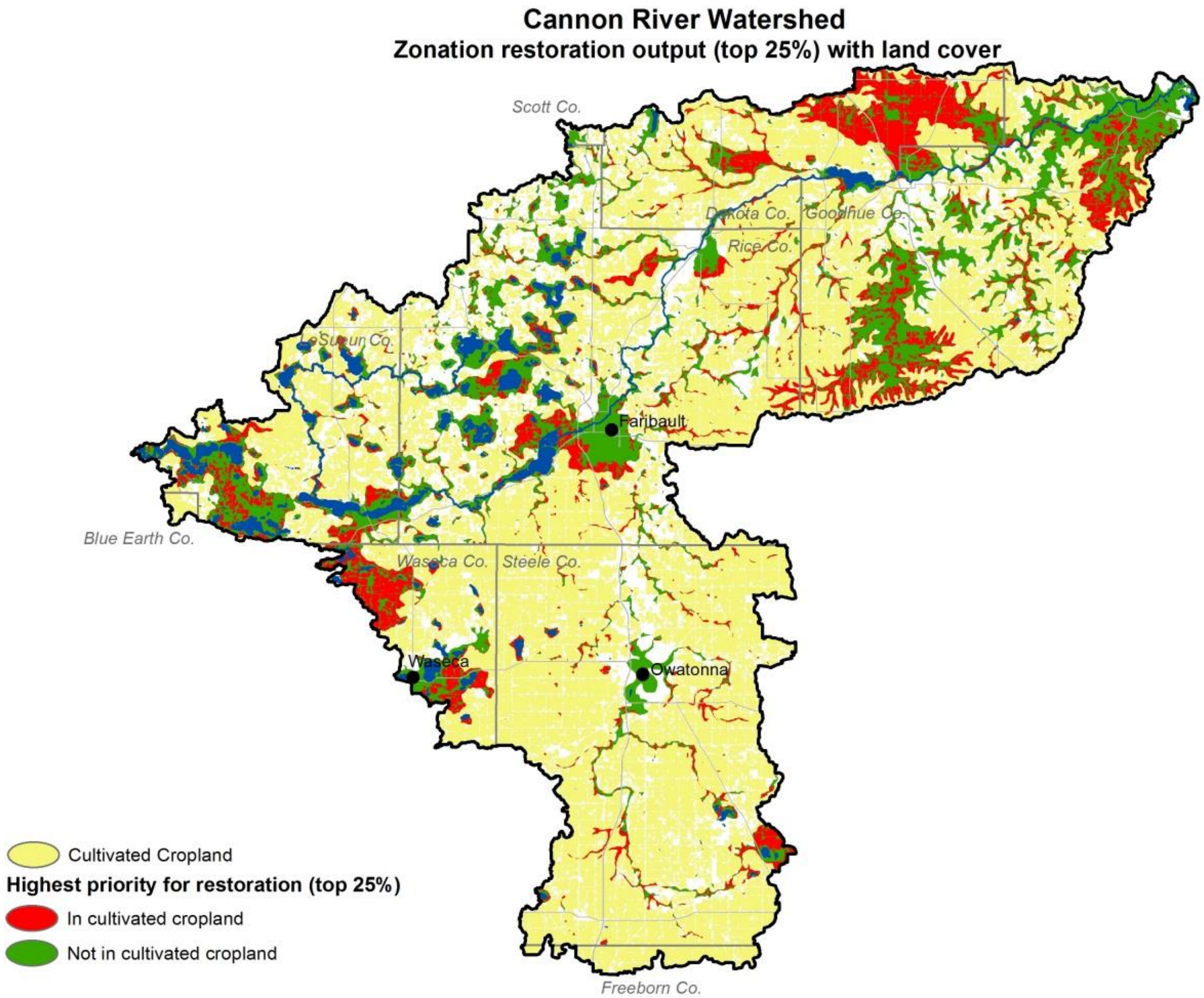


Figure 12. Restoration priority map from 2014 Cannon River Watershed Zonation and land use – Lower Lobe.

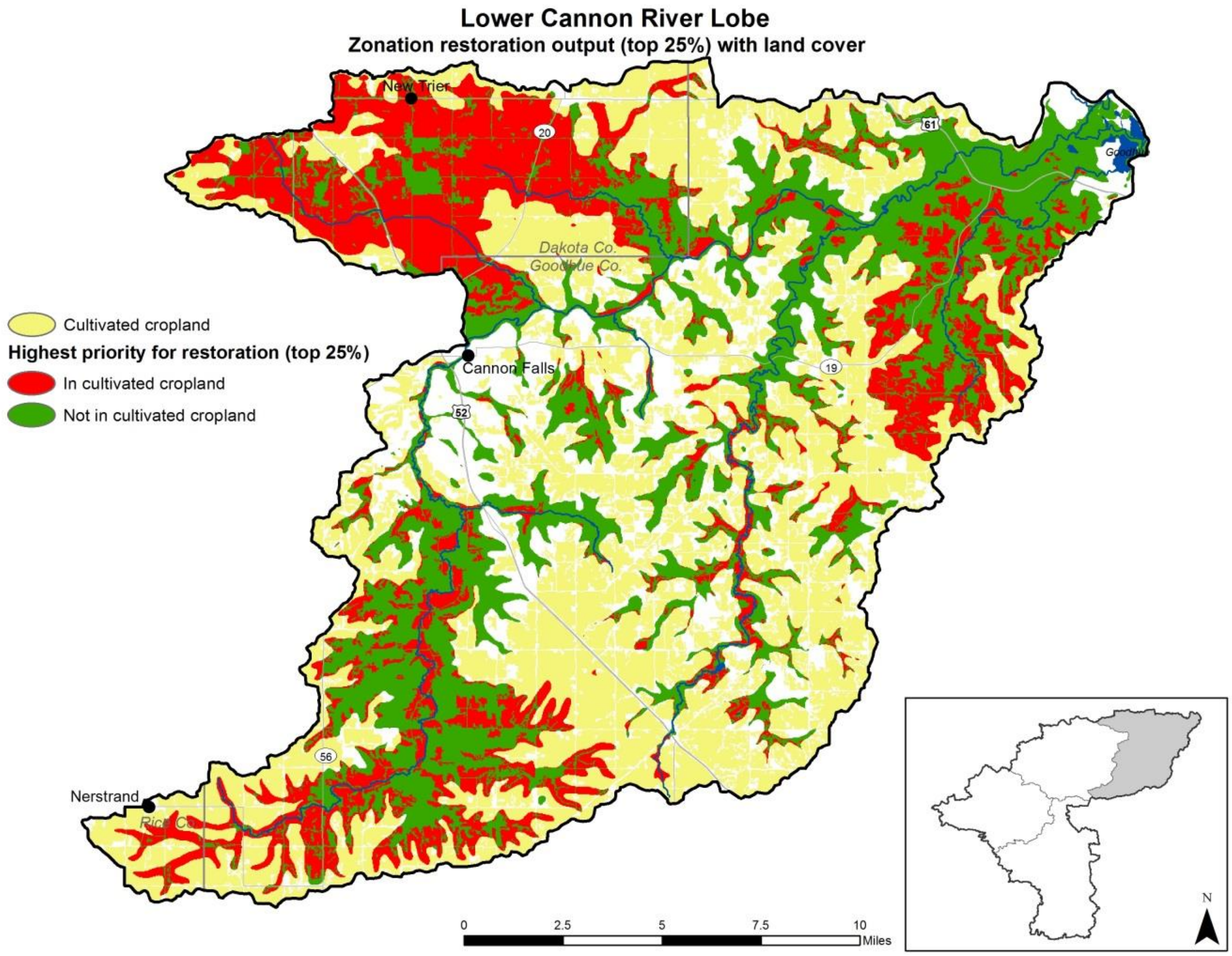


Figure 13. Restoration priority map from 2014 Cannon River Watershed Zonation and land use – Middle Lobe.

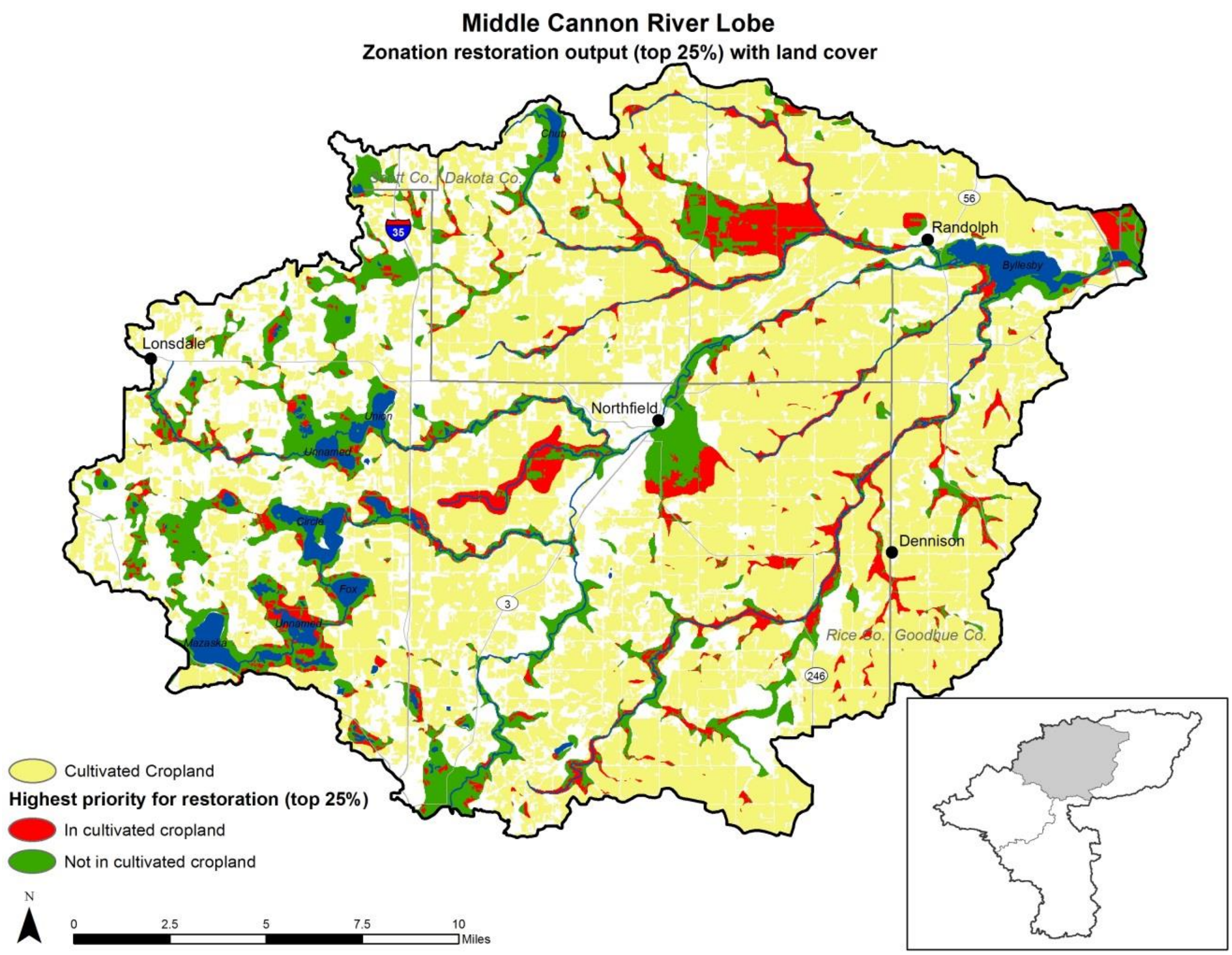


Figure 14. Restoration priority map from 2014 Cannon River Watershed Zonation and land use – Straight River Lobe.

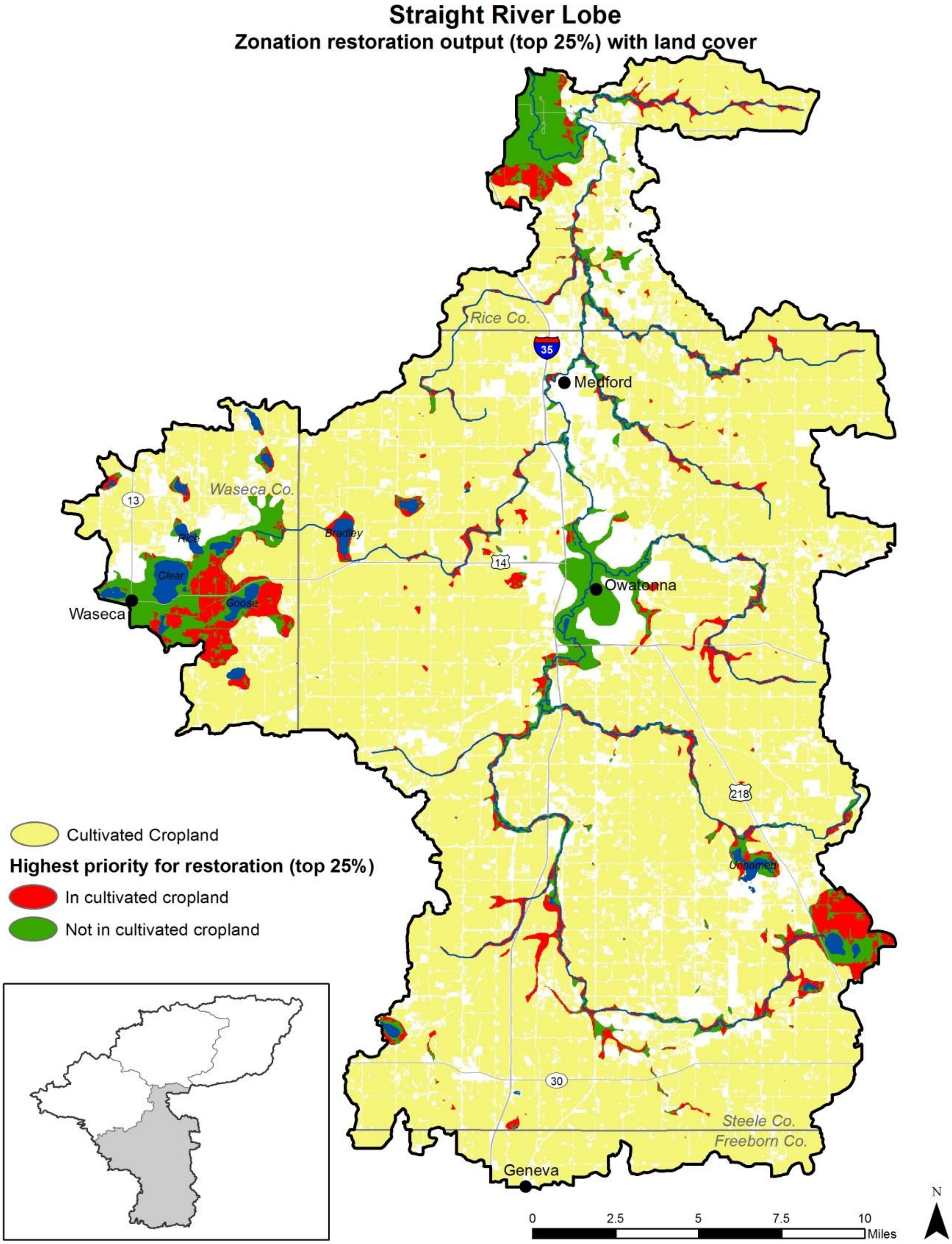
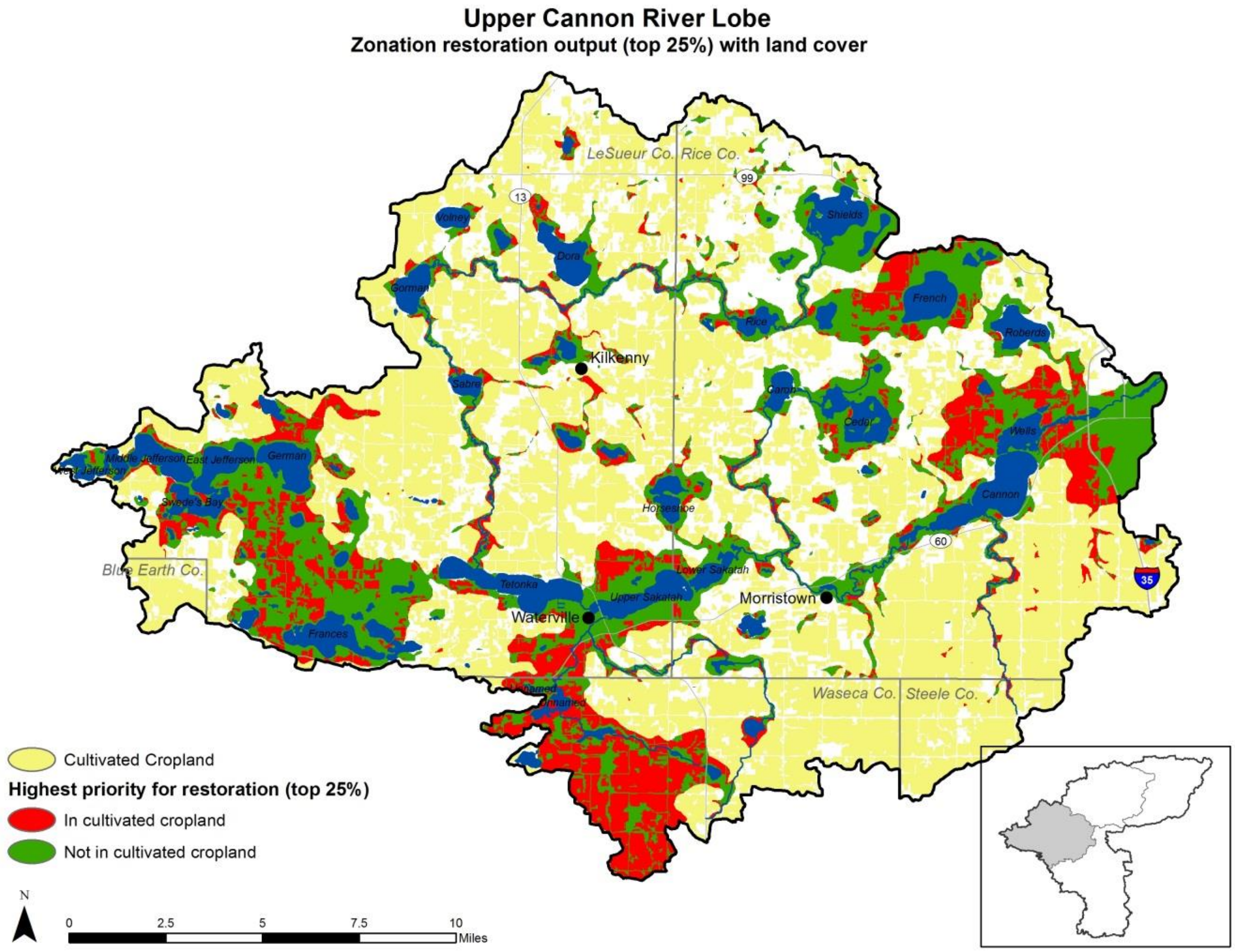


Figure 15. Restoration priority map from 2014 Cannon River Watershed Zonation and land use – Upper Lobe.



APPENDIX D:
HSPF-SAM BMP Scenario Inputs

PLAN APPENDIX D – POLLUTANT LOAD REDUCTION SCENARIO ASSUMPTIONS, ESTIMATES AND FIGURES

The Planning Partners utilized HSPF-SAM to estimate the load reductions expected from implementation of agricultural conservation practices within the Tier One Protection Lake drainage areas. Appendix D of the Plan includes a table for each of the following implementation activities:

- 3.2.1-A-1 – Table 1
- 3.2.1-A-3 – Table 2
- 3.2.1-B-2 – Table 3
- 3.2.1-B-3 – Table 4
- 3.1.1-A-3, 3.1.1-B-3, 3.1.1-C-7 – Table 5

These tables illustrate how HSPF-SAM was used to generate the estimated TP, TN and TSS load reductions reported in Tables 3-3, 3-6 and 3-10, 3-15 and 3-16 of the Cannon River Comprehensive Watershed Management Plan. Notes and assumptions unique to running each scenario (implementation activity) are provided at the bottom of each table. It should be noted that the Lower Vermillion River HSPF-SAM was not available at the time of this planning process; therefore, existing load estimates and load reductions (except for structural practices) for the Lower Vermillion River were based on applying HSPF-SAM yields for the adjacent Trout Brook drainage area over the Lower Vermillion River drainage area.

Over the course of plan implementation, the Planning Partners will continue to use HSPF-SAM to track performance towards achieving the goals. By entering the number of practices implemented annually into the spreadsheet tool, the Planning Partners can calculate progress towards the goal. The tables in Appendix D are part of a spreadsheet planning tool that has been created for the Planning Partners to track annual progress towards their goals. There are additional columns in this tool where the actual number of implementation acres for each practice can be input and another column that calculates the load reduction achieved from these implementation acres.

Planning partners recognize that it doesn't make economic sense to take high yielding cropland on good soils out of production. Therefore, the planning partners will target converting cultivated cropland to perennial vegetation on low yielding, marginal cropland which we defined as cultivated cropland on NRCS land capability class IV soils. Cultivation on these soils is limited as a result of the effects of one or more permanent features such as (1) steep slopes, (2) severe susceptibility to water or wind erosion, (3) severe effects of past erosion, (4) shallow soils, (5) low moisture-holding capacity, (6) frequent overflows accompanied by severe crop damage, (7) excessive wetness with continuing hazard of waterlogging after drainage, (8) severe salinity or sodium, and (9) moderately adverse climate. Planning partners will target nutrient management and cover crop practices on cultivated cropland on non-vulnerable soils based on the assumption that this land is likely to remain cultivated and would benefit from better management practices.

Additionally, figures highlighting the location of cultivated cropland on vulnerable soils and cultivated land either in a corn-soybean rotation or short-season crop rotation on non-vulnerable soils have been provided for the Tier One Priority Lake and Stream drainage areas. These figures were generated using land use spatial data from the following sources:

- Cultivated cropland acres from the 2011 National Land Cover Database;
- Vulnerable soils based on land capability class IV soils in the USDA-NRCS 2017 Soil Survey Geographic Database; and
- Corn, soybean, and short-season crop acres from the United States Department of Agriculture (USDA) National Agricultural Statistics Service (NASS) 2017 Census of Agriculture.

Table 1. Pollutant load reduction assumptions and estimates for Plan Implementation Activity 3.2.1-A-1: Convert 10% (2,325 acres total or 232.5 acres per year) of cultivated cropland on vulnerable soils (NRCS land capability class IV) to perennial cropland or perennial vegetation in all Tier One lake and stream drainage areas

							TOTAL PHOSPHORUS			TOTAL NITROGEN			SEDIMENT		
	Priority Resource	**AUID/ Lake ID**	**HSPF Subshed**	**Drainage Area**	**Cultivated Cropland on Vulnerable Soils**	**10% of Cultivated Cropland on Vulnerable Soils**	Existing Cropland Yield	Perennial Cropland/ Vegetation Yield	**Estimated TP Load Reduction**	Existing Cropland Yield	Perennial Cropland/ Vegetation Yield	**Estimated TN Load Reduction**	Existing Cropland Yield	Perennial Cropland/ Vegetation Yield	**Estimated Sediment Load Reduction**
	Unit			acres	acres	acres	lb/ac/yr	lb/ac/yr	**lb/yr**	lb/ac/yr	lb/ac/yr	**lb/yr**	ton/ac/yr	ton/ac/yr	**ton/yr**
	Source			Figures 3-1 through 3-18	2011 National Land Cover Database; NRCS land capability class IV	Calculated	HSPF-SAM Cropland A/B Soils	HSPF-SAM Grassland A/B Soils	Calculated	HSPF-SAM Cropland A/B Soils	HSPF-SAM Grassland A/B Soils	Calculated	HSPF-SAM Cropland A/B Soils	HSPF-SAM Grassland A/B Soils	Calculated
Protection Lakes	Beaver	74-0023-00	860	298	9	0.9	0.71	0.09	0.6						
	Dudley (and Kelly)	66-0014-00	248	581	38	3.8	0.32	0.06	1.0						
	Fish	40-0051-00	363	433	56	5.6	0.38	0.06	1.8						
	Roemhildts	40-0039-00	370	251	5	0.5	0.38	0.06	0.2						
			TOTAL	**1,563**	**109**	**11**			**3.6**						
Impaired Lakes	Cedar	66-0052-00	344	4,684	515	52	0.32	0.06	13.1						
	Fox	66-0029-00	248	8,720	731	73	0.32	0.06	18.6						
	Hunt	66-0047-00	384	641	29	3	0.00	0.00		Note: There are no cropland AB soils in HSPF Subshed 384					
			TOTAL	**14,045**	**1,276**	**128**			**31.8**						
Pollutant Impaired Streams	Lower Vermillion	07040001-504	120	14,055	1,686	169				25.7	1.9	3,998	0.45	0.19	44
	Belle Creek	07040002-735	400	50,145	6,540	654				25.7	1.9	15,512	0.45	0.19	169
	Little Cannon River	07040002-526	500	60,819	5,680	568				25.7	1.9	13,473	0.45	0.19	147
	Trout Brook	07040002-567	120	18,126	2,170	217				25.7	1.9	5,148	0.45	0.19	56
	Prairie Creek	07040002-504	600	51,035	5,226	523				16.0	1.3	7,677	0.11	0.03	39
	Rush Creek	07040002-505	825	14,351	236	24				18.8	1.5	407	0.13	0.04	2
	Medford Creek	07040002-547	832	14,234	329	33				18.8	1.5	566	0.13	0.04	3
			TOTAL	**222,765**	**21,867**	**2,187**						**46,781**			**460**
ALL				**238,373**	**23,252**	**2,325**			**35**			**46,781**			**460**

Scenario Notes and Assumptions:

1) Note that HSPF-SAM does not currently allow selection of practices on vulnerable soils. It was assumed that cropland located on AB soils was most likely to be located on steeply sloped areas (and therefore most vulnerable).

2) The total pollutant load reduction for converting cultivated cropland on vulnerable soils to perennial vegetation was estimated in HSPF-SAM as the difference in the per acre pollutant yield from converting cropland on AB soils to grassland on AB soils and applied to 10% of the cultivated cropland acres on vulnerable soils in each Tier One lake and stream drainage area.

3) There were no cropland AB soils located in HSPF subshed 384 (Hunt Lake). Given the overall low number of cultivated cropland acres on vulnerable soils in this lake drainage area, no pollutant load reduction was estimated for this practice in Hunt Lake. Note that HSPF subshed yields for Trout Brook were used for the adjacent Lower Vermillion River, which is not part of a completed HSPF model.

Table 2. Pollutant load reduction assumptions and estimates for Plan Implementation Activity 3.2.1-A-3: Implement nutrient management BMPs following U of M guidance on 10% (16,315 acres total or 1,631.5 acres per year) of cultivated cropland in all Tier One lake and stream drainage areas.

							TOTAL PHOSPHORUS		TOTAL NITROGEN		SEDIMENT	
	Priority Resource	**AUID/Lake ID**	**HUC10 Subshed**	**Drainage Area**	**Cultivated Cropland**	**10% of Cultivated Cropland**	Apply P2O5 at U of M recommended rates	**Estimated TP Load Reduction**	Corn acres receiving target N rate, no inhibitor or timing shift	**Estimated TN Load Reduction**	Nutrient management does not target sediment reductions	**Estimated Sediment Load Reduction**
	Unit			**acres**	**acres**	**acres**	lb/ac/yr	**lb/yr**	lb/ac/yr	**lb/yr**		**ton/yr**
	Source			Figure 3-1 through 3-6	2011 National Land Cover Database	Calculated	P BMP Spreadsheet	Calculated	N BMP Spreadsheet	Calculated		Calculated
Protection Lakes	Beaver	74-0023-00	-03	298	113	11.3	0.041	0.5				
	Dudley (and Kelly)	66-0014-00	-06	581	283	28.3	0.104	2.9				
	Fish	40-0051-00	-01	433	223	22.3	0.054	1.2				
	Roemhildts	40-0039-00	-01	251	110	11.0	0.054	0.6				
			TOTAL	**1,563**	**729**	**73**		**5**				
Impaired Lakes	Cedar	66-0052-00	-01	4,684	1905	191	0.054	10.3				
	Fox	66-0029-00	-06	8,720	4175	418	0.104	43.4				
	Hunt	66-0047-00	-01	641	283	28	0.054	1.5				
			TOTAL	**14,045**	**6,363**	**636**		**55**				
Pollutant Impaired Streams	Lower Vermillion	07040001-504	-09	14,055	9,788	979			4.74	4,639		
	Belle Creek	07040002-735	-08	50,145	32,856	3,286			6.11	20,082		
	Little Cannon River	07040002-526	-07	60,819	41,984	4,198			6.11	25,633		
	Trout Brook	07040002-567	-09	18,126	13,399	1,340			4.74	6,350		
	Prairie Creek	07040002-504	-05	51,035	36,246	3,625			4.17	15,117		
	Rush Creek	07040002-505	-03	14,351	11,365	1,137			4.10	4,657		
	Medford Creek	07040002-547	-03	14,234	10,421	1,042			4.10	4,270		
			TOTAL	**222,765**	**156,058**	**15,606**				**80,748**		
ALL				**238,373**	**163,150**	**16,315**		**60**		**80,748**		

Scenario Notes and Assumptions:

1) Phosphorus and nitrogen reductions per acre treated by Cannon River HUC10 were derived from the P and N BMP spreadsheets using 10% adoption of 'Apply P2O5 at U of M recommended rates' for phosphorus reductions and 10% adoption of 'corn acres receiving target N rate, no inhibitor or timing shift' for nitrogen reductions. Note that nutrient management does not target sediment reductions and therefore no sediment reductions for this BMP are reported.

2) Nutrient yield reductions were estimated based on implementing Nutrient Management on 41.6% of all HSPF identified suitable cropland acres for Nutrient Management across all priority targeted implementation areas. This yield reduction was then multiplied by the individual implementation acre goals for each Tier 1 priority resource from the CWMP to determine the total pollutant load reduction for Nutrient Management.

3) Note that the Lower Cannon HUC 10 (-09) was used for Trout Brook and the adjacent Lower Vermillion River.

Table 3. Pollutant load reduction assumptions and estimates for Plan Implementation Activity 3.2.1-B-2: Implement practices that increase organic matter (such as cover crops and tillage management) on 15% of corn/soybean acres (18,508 acres total or 1,850.8 acres per year) in the Tier One lake and stream drainage areas.

							TOTAL PHOSPHORUS				TOTAL NITROGEN				SEDIMENT			
	Priority Resource	**AUID/Lake ID**	**HSPF Subshed**	**Drainage Area**	**Corn/ Soybean**	**15% of Corn/ Soybean**	HSPF-SAM Cover Crop Acres Treated	HSPF-SAM Cover Crop Load Reduction	Cover Crop Yield Reduction	**Estimated TP Load Reduction**	HSPF-SAM Cover Crop Acres Treated	HSPF-SAM Cover Crop Load Reduction	Cover Crop Yield Reduction	**Estimated TN Load Reduction**	HSPF-SAM Cover Crop Acres Treated	HSPF-SAM Cover Crop Load Reduction	Cover Crop Yield Reduction	**Estimated Sediment Load Reduction**
	Unit			**acres**	**acres**	**acres**	ac	lb/yr	lb/ac/yr	**lb/yr**	ac	lb/yr	lb/ac/yr	**lb/yr**	ac	ton/yr	ton/ac/yr	**ton/yr**
	Source			Figure 3-1 through 3-6	USDA NASS 2017	Calculated	49.65% on all suitable acres	49.65% on all suitable acres	Calculated	Calculated	49.65% on all suitable acres	49.65% on all suitable acres	Calculated	Calculated	49.65% on all suitable acres	49.65% on all suitable acres	Calculated	Calculated
Protection Lakes	Beaver	74-0023-00	860	298	71	10.6	4,125	703	0.17	1.8								
	Dudley (and Kelly)	66-0014-00	248	581	59	8.8	195		0.05	0.5								
	Fish	40-0051-00	363	433	51	7.7	225	22	0.10	0.7								
	Roemhildts	40-0039-00	370	251	99	14.9	584	64	0.11	1.6								
			TOTAL	**1,563**	**280**	**42**				**5**								
Impaired Lakes	Cedar	66-0052-00	344	4,684	653	98	395	23	0.06	5.7								
	Fox	66-0029-00	248	8,720	2810	421	1,419	74	0.05	22								
	Hunt	66-0047-00	384	641	176	26	86	0	0.05*	1.5								
			TOTAL	**14,045**	**3,639**	**546**		***Average**	**0.05**	**29**								
Pollutant Impaired Streams	Lower Vermillion	07040001-504	120	14,055	4,400	660							6.3	4,180			0.38	249
	Belle Creek	07040002-735	400	50,145	24,494	3,674					136	821	6.0	22,182	136	46	0.34	1,235
	Little Cannon River	07040002-526	500	60,819	26,446	3,967					606	3857	6.4	25,248	606	232	0.38	1,516
	Trout Brook	07040002-567	120	18,126	12,442	1,866					284	1,799	6.3	11,821	284	107	0.38	704
	Prairie Creek	07040002-504	600	51,035	30,801	4,620					1,566	5,648	3.6	16,662	1566	124	0.08	366
	Rush Creek	07040002-505	825	14,351	10,878	1,632					5,293	22,447	4.2	6,920	5293	411	0.08	127
	Medford Creek	07040002-547	832	14,234	10,005	1,501					1,797	7,608	4.2	6,354	1797	136	0.08	114
			TOTAL	**222,765**	**119,467**	**17,920**								**93,367**				**4,311**
ALL				**238,373**	**123,385**	**18,508**				**34**				**93,367**				**4,311**

Scenario Notes and Assumptions:

1) Cover crops were applied universally across all cropland types regardless of soil type or presence/absence of tile drainage. HSPF-SAM does not have an option for treating specific cropland types when selecting the Cover Crop BMP Type

2) The total number of HSPF identified suitable cropland acres for the Cover Crop BMP across all priority targeted implementation areas was 33,656 acres. The implementation activity goal is to implement Cover Crops on 18,508 acres of corn/soybean across all priority targeted implementation areas, or 49.65% of all HSPF identified suitable cropland acres for Cover Crops on corn/soy.

3) Nutrient yield reductions were estimated based on implementing Cover Crops on 49.65% of all HSPF identified suitable cropland acres for Cover Crops on corn/soy across all priority targeted implementation areas. This yield reduction was then multiplied by the individual implementation acre goals for each Tier 1 priority resource from the CWMP to determine the total pollutant load reduction for Cover Crops on corn/soy. For some subsheds, HSPF-SAM did not identify any suitable acres for implementation; where this was the case, the average yield for the other subsheds in the priority resource category (Protection Lakes, Impaired Lakes, or Impaired Streams) was used.

4) Note that where a lake was present at the outlet of an HSPF subshed that contained a Tier 1 lake, a nearby contributing subwatershed was selected for running the Cover Crop scenario to estimate the runoff yield reduction for the Tier 1 lake. For example, Fox lake (Reach 247) looked at what the reductions were at reach 248 (Tributary to Fox Lake). HSPF did not explicitly model all Tier 1 lakes and the pollutant yield reductions in HSPF subsheds with non-Tier 1 lakes at the outlet would account for sedimentation within the non-Tier 1 lake. Note that HSPF subshed yields for Trout Brook were used for the adjacent Lower Vermillion River, which is not part of a completed HSPF model.

Table 4. Pollutant load reduction assumptions and estimates for Plan Implementation Activity 3.2.1-B-3: Implement practices that increase organic matter (such as cover crops and tillage management) on 80% of short-season crop (corn silage, small grains, peas, and sweet corn) acres (1,192 acres total or 119.2 acres per year) in the Tier One lake and stream drainage areas.

							TOTAL PHOSPHORUS				**TOTAL NITROGEN**				**SEDIMENT**			
	Priority Resource	**AUID/Lake ID**	**HSPF Subshed**	**Drainage Area**	**Short-Season Crops**	**80% of Short-Season Crops**	HSPF-SAM Cover Crop Acres Treated	HSPF-SAM Cover Crop Load Reduction	Cover Crop Yield Reduction	**Estimated TP Load Reduction**	HSPF-SAM Cover Crop Acres Treated	HSPF-SAM Cover Crop Load Reduction	Cover Crop Yield Reduction	**Estimated TN Load Reduction**	HSPF-SAM Cover Crop Acres Treated	HSPF-SAM Cover Crop Load Reduction	Cover Crop Yield Reduction	**Estimated Sediment Load Reduction**
	Unit			**acres**	**acres**	**acres**	ac	lb/yr	lb/ac/yr	**lb/yr**	ac	lb/yr	lb/ac/yr	**lb/yr**	ac	ton/yr	ton/ac/yr	**ton/yr**
	Source			Figure 3-1 through 3-6	USDA NASS 2017	Calculated	100% on all suitable acres	100% on all suitable acres	Calculated	Calculated	100% on all suitable acres	100% on all suitable acres	Calculated	Calculated	100% on all suitable acres	100% on all suitable acres	Calculated	Calculated
Protection Lakes	Beaver	74-0023-00	860	298	n/a		There were a negligible amount of short-season crops in the Protection and Impaired Lake drainage areas on which to implement cover crops.											
	Dudley (and Kelly)	66-0014-00	248	581	n/a													
	Fish	40-0051-00	363	433	n/a													
	Roemhildts	40-0039-00	370	251	n/a													
			TOTAL	**1,563**														
Impaired Lakes	Cedar	66-0052-00	344	4,684	n/a													
	Fox	66-0029-00	248	8,720	n/a													
	Hunt	66-0047-00	384	641	n/a													
			TOTAL	**14,045**														
Pollutant Impaired Streams	Lower Vermillion	07040001-504	120	14,055	31	25							7.8*	192			0.39*	10
	Belle Creek	07040002-735	400	50,145	183	146					1	6.4	6.4	929	1	0.40	0.40	59
	Little Cannon River	07040002-526	500	60,819	234	187					10	91.3	9.1	1,708	10	3.83	0.38	72
	Trout Brook	07040002-567	120	18,126	544	436					0	n/a	7.8*	3,401	0	n/a	0.39*	171
	Prairie Creek	07040002-504	600	51,035	164	131					1	7.9	7.9	1,041	1	0.00	0.39	51
	Rush Creek	07040002-505	825	14,351	182	145					0	n/a	7.8*	1,135	0	n/a	0.39*	57
	Medford Creek	07040002-547	832	14,234	123	98					0	n/a	7.8*	765	0	n/a	0.39*	38
			TOTAL	**222,765**	**1,460**	**1,168**						***Average**	**7.8**	**9,171**		***Average**	**0.39**	**457**
ALL				**238,373**	**1,490**	**1,192**				**2**				**9,171**				**457**

Scenario Notes and Assumptions:

1) Cover crops were applied universally across all cropland types regardless of soil type or presence/absence of tile drainage. HSPF-SAM does not have an option for treating specific cropland types when selecting the Cover Crop BMP Type

2) The total number of HSPF identified suitable cropland acres for the Cover Crop BMP on short-season crops across all priority targeted implementation areas was 106 acres. The implementation activity goal is to implement Cover Crops on 1,192 acres of short-season crops across all priority targeted implementation areas, more than all HSPF identified suitable cropland acres for Cover Crops on short-season crops.

3) Nutrient yield reductions were estimated based on implementing Cover Crops on 100% of all HSPF identified suitable short-season crop acres for Cover Crops across all priority targeted implementation areas. This yield reduction was then multiplied by the individual implementation acre goals for each Tier 1 priority resource from the CWMP to determine the total pollutant load reduction for Cover Crops on short-season crops. For some subsheds, HSPF-SAM did not identify any suitable acres for implementation; where this was the case, the average yield for the other subsheds in the priority resource category (Protection Lakes, Impaired Lakes, or Impaired Streams) was used.

4) Note that where a lake was present at the outlet of an HSPF subshed that contained a Tier 1 lake, a nearby contributing subwatershed was selected for running the Cover Crop scenario to estimate the runoff yield reduction for the Tier 1 lake. For example, Fox lake (Reach 247) looked at what the reductions were at reach 248 (Tributary to Fox Lake). HSPF did not explicitly model all Tier 1 lakes and the pollutant yield reductions in HSPF subsheds with non-Tier 1 lakes at the outlet would account for sedimentation within the non-Tier 1 lake.

Table 5. Pollutant load reduction assumptions and estimates for Plan Implementation Activity 3.1.1-A-3: Implement structural practices to treat 5%, or 36 acres, of cropland in the five Tier One Protection Lakes drainage areas; 3.1.1-B-3: Implement structural practices to treat 30%, or 1,909 acres, of cropland in the five Tier One Protection Lakes drainage areas; and 3.1.1-C-7: Implement structural practices to treat 5%, or 7,803 acres, of cropland in the Tier One impaired stream drainage areas.

							TOTAL PHOSPHORUS				TOTAL NITROGEN				SEDIMENT			
	Priority Resource	**AUID/Lake ID**	**HSPF Subshed**	**Drainage Area**	**Cultivated Cropland**	**30% (impaired Lakes) and 5% (Protection Lakes and Pollutant Impaired Streams) of Cultivated Cropland**	HSPF-SAM WASCOB Acres Treated	HSPF-SAM WASCOB Load Reduction	WASCOB Yield Reduction	**Estimated TP Load Reduction**	HSPF-SAM WASCOB Acres Treated	HSPF-SAM WASCOB Load Reduction	WASCOB Yield Reduction	**Estimated TN Load Reduction**	HSPF-SAM WASCOB Acres Treated	HSPF-SAM WASCOB Load Reduction	WASCOB Yield Reduction	**Estimated Sediment Load Reduction**
	Unit			**acres**	**acres**	**acres**	ac	lb/yr	lb/ac/yr	**lb/yr**	ac	lb/yr	lb/ac/yr	**lb/yr**	ac	ton/yr	ton/ac/yr	**ton/yr**
	Source			Figure 3-1 through 3-6	2011 National Land Cover Database	Calculated	30% on all suitable acres	30% on all suitable acres	Calculated	Calculated	62.17% on all suitable acres	62.17% on all suitable acres	Calculated	Calculated	62.17% on all suitable acres	62.17% on all suitable acres	Calculated	Calculated
Protection Lakes	Beaver	74-0023-00	860	298	113	6	1,634	843	0.5	3								
	Dudley (and Kelly)	66-0014-00	248	581	283	14	72	21	0.3	4								
	Fish	40-0051-00	363	433	223	11	110	32	0.3	3								
	Roemhildts	40-0039-00	370	251	110	5	206	67	0.3	2								
			TOTAL	**1,563**	**729**	**36**				**12**								
Impaired Lakes	Cedar	66-0052-00	344	4,684	1905	572	97	28	0.3	164								
	Fox	66-0029-00	248	8,720	4175	1,253	115	33	0.3	359								
	Hunt	66-0047-00	384	641	283	85	40	11	0.3	24								
			TOTAL	**14,045**	**6,363**	**1,909**				**547**								
Pollutant Impaired Streams	Lower Vermillion	07040001-504	120	14,055	9,788	489					HSPF-SAM model currently overpredicts the nitrogen reduction efficiency of WASCOBs in the Cannon River Watershed because the nitrogen loss pathways are not predominantly overland. The 2017 Iowa Nutrient Reduction Strategy and the 2017 Agricultural BMP Handbook for Minnesota do not assign nitrate reductions to WASCOB structural practices. The planning partners will work with MPCA to determine appropriate reduction efficiencies. As a result, these values are not reported in Table 3-10.							203
	Belle Creek	07040002-735	400	50,145	32,856	1,643									156	65	0.42	682
	Little Cannon River	07040002-526	500	60,819	41,984	2,099									713	332	0.47	979
	Trout Brook	07040002-567	120	18,126	13,399	670									251	115	0.46	307
	Prairie Creek	07040002-504	600	51,035	36,246	1,812									1,476	142	0.10	175
	Rush Creek	07040002-505	825	14,351	11,365	568									3,340	316	0.09	54
	Medford Creek	07040002-547	832	14,234	10,421	521									1,257	116	0.09	48
			TOTAL	**222,765**	**156,058**	**7,803**												**2,447**
ALL				**238,373**	**156,058**	**7,803**				**559**								**2,447**

Scenario Notes and Assumptions:

1) WASCOB BMPs were applied universally across all cropland types regardless of soil type or presence/absence of tile drainage. HSPF-SAM does not have an option for treating specific cropland types when selecting the WASCOB BMP Type. WASCOB Recommended reductions by flow pathway from Table A-15 of the October 2017 Draft Topical Report RSI-2742: Documentation of the Best Management Practice Database Available in the Scenario Application Manager were used in HSPF-SAM.

Parameter	Surface	Interflow	Baseflow	Reference\Term
Flow	0	0	0	Default Short Term (0-5 years)
TN	0.82	0.0001	0.0001	Custom
TP	0.85	0.72	0.48	Default Intermediate (5-10 years)
TSS	0.9	0.9	0.9	Default Intermediate (5-10 years)

2) The total number of HSPF identified suitable cropland acres for the WASCOB BMP across all priority targeted implementation areas was 11,569 acres. The implementation activity goal is to implement WASCOB BMPs on 7,803 acres of cultivated crops across all impaired stream targeted implementation areas, or 62.17% of all HSPF identified suitable cropland acres for WASCOB BMPs.

3) Nutrient yield reductions were estimated based on implementing WASCOB BMPs on 62.17% of all HSPF identified suitable cropland acres for WASCOB BMPs across all impaired stream targeted implementation areas. This yield reduction was then multiplied by the individual implementation acre goals for each Tier 1 priority impaired stream from the CWMP to determine the total pollutant load reduction for WASCOB BMPs.

4) The HSPF-SAM model currently overpredicts the nitrogen reduction efficiency of WASCOBs in the Cannon River Watershed because the nitrogen loss pathways are not predominantly overland. The planning partners will work with MPCA to determine appropriate reduction efficiencies. As a result, these values are not reported in Table 3-10.

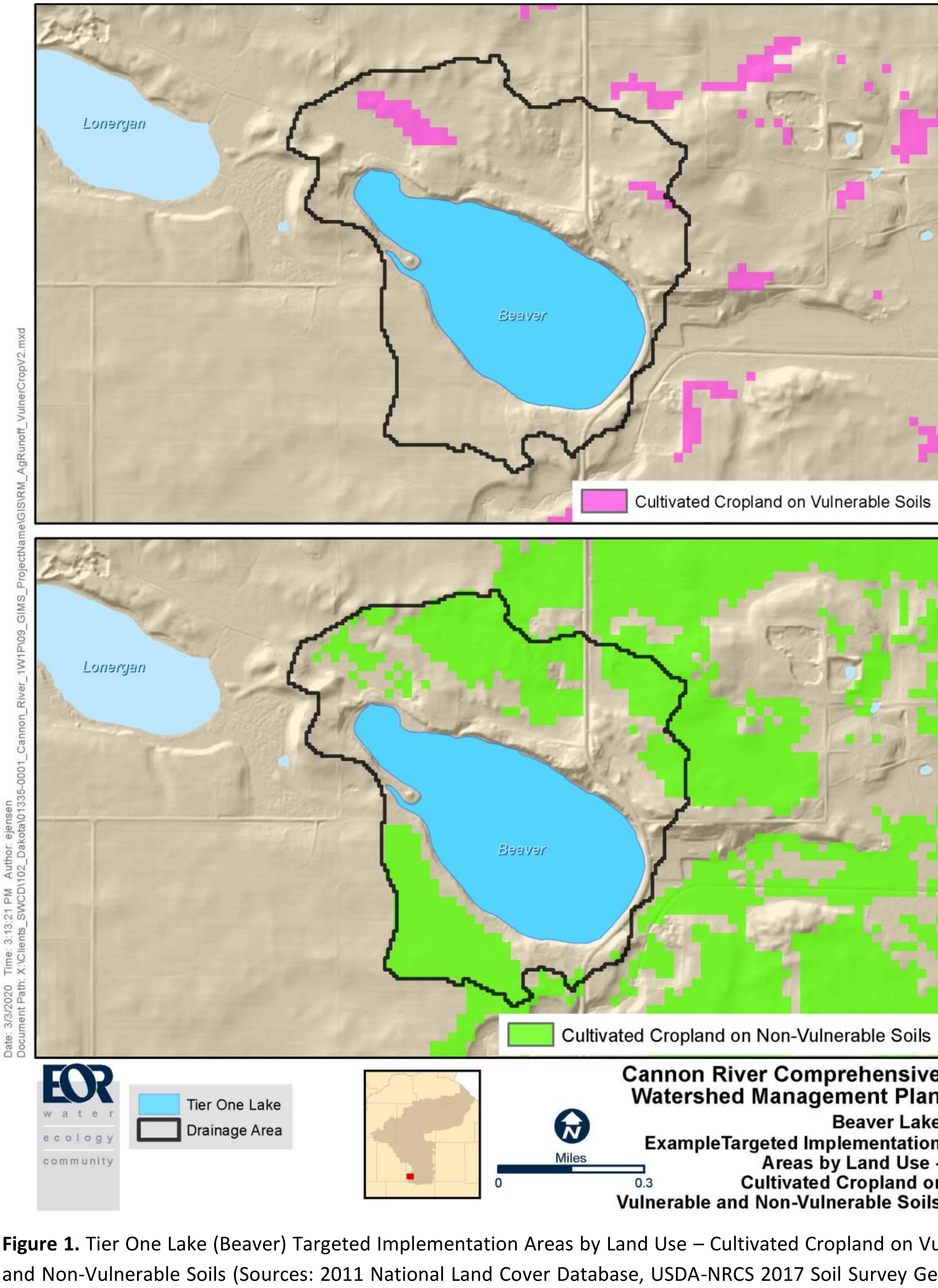


Figure 1. Tier One Lake (Beaver) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

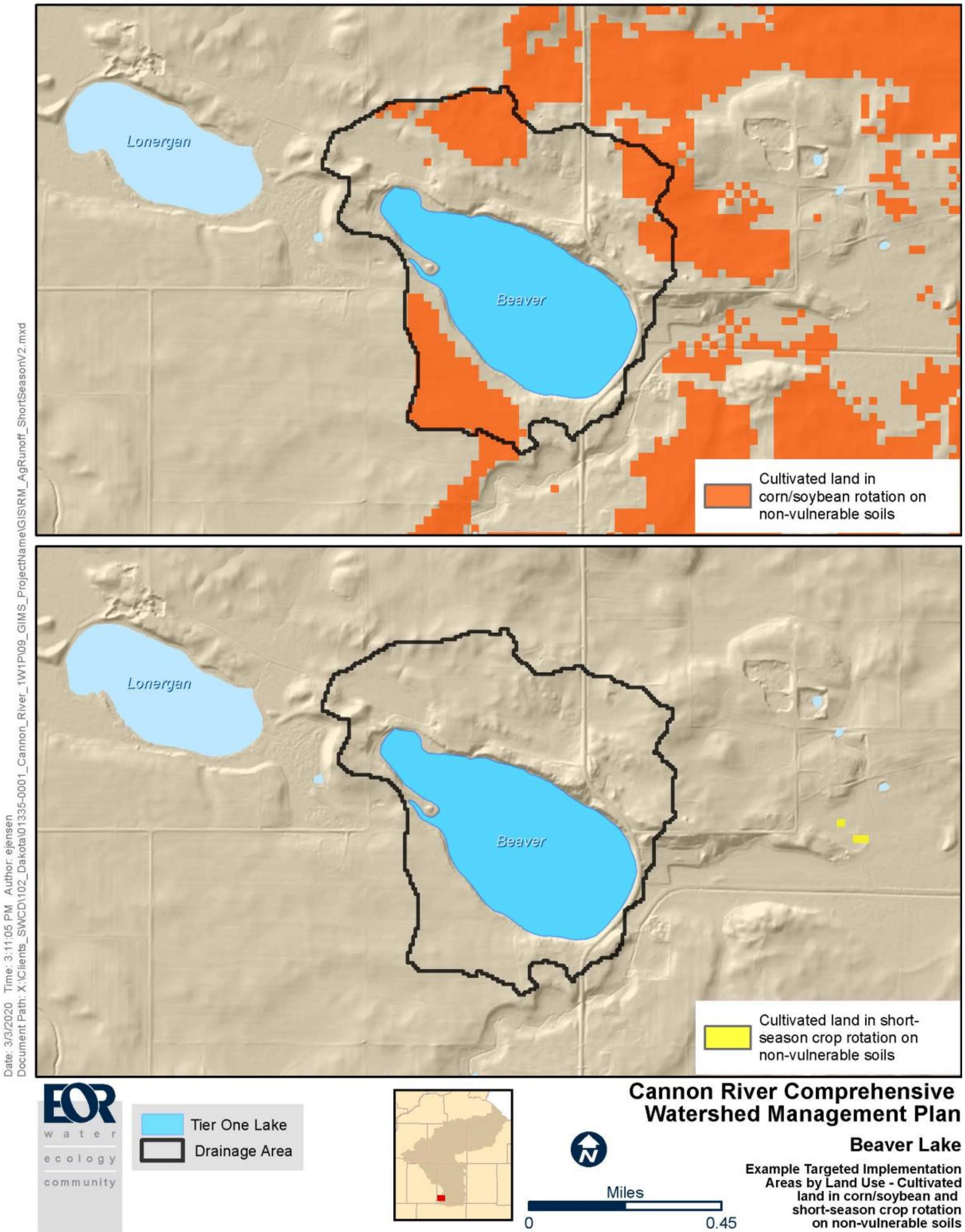


Figure 2. Tier One Lake (Beaver) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

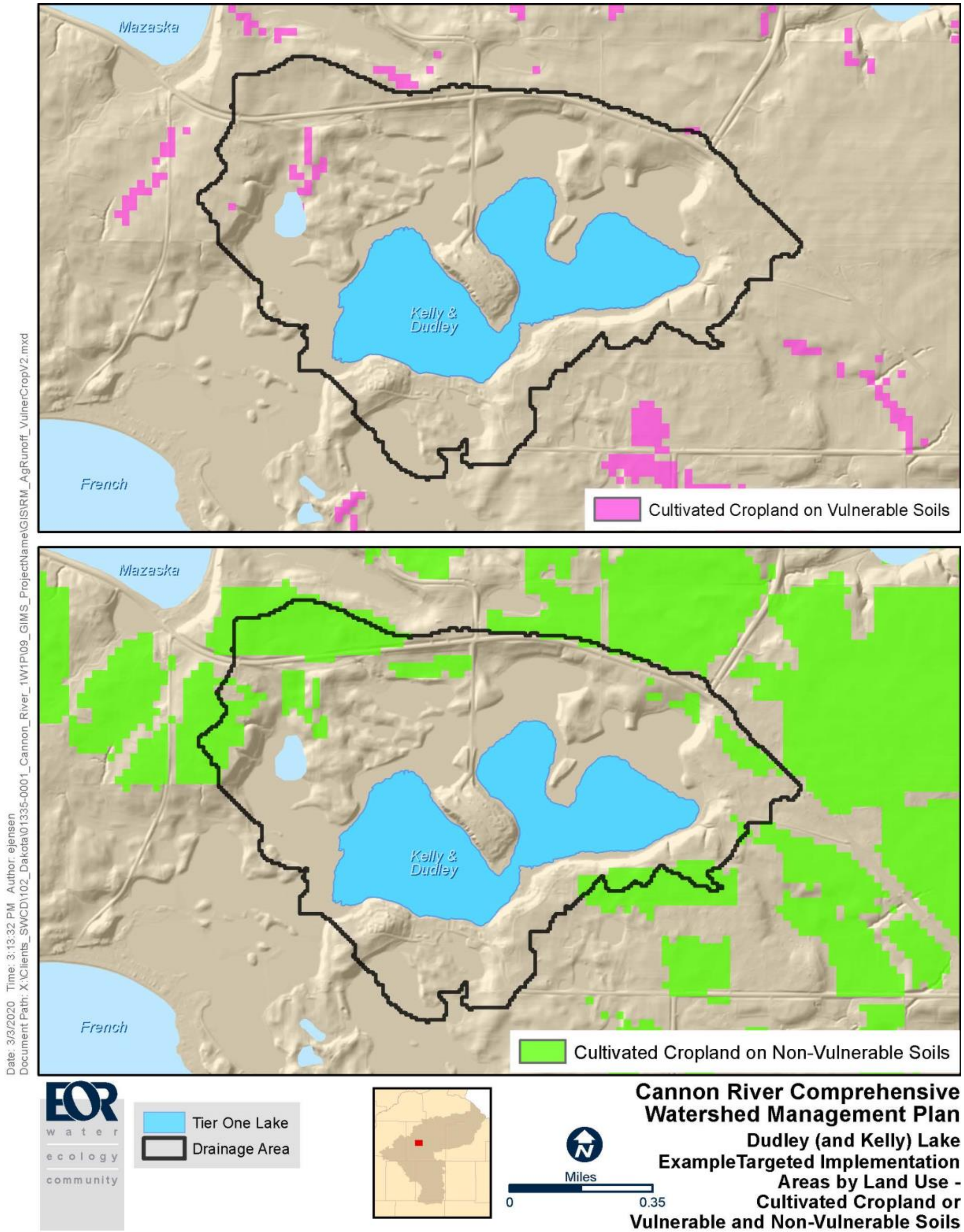


Figure 3. Tier One Lake (Dudley (and Kelly)) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

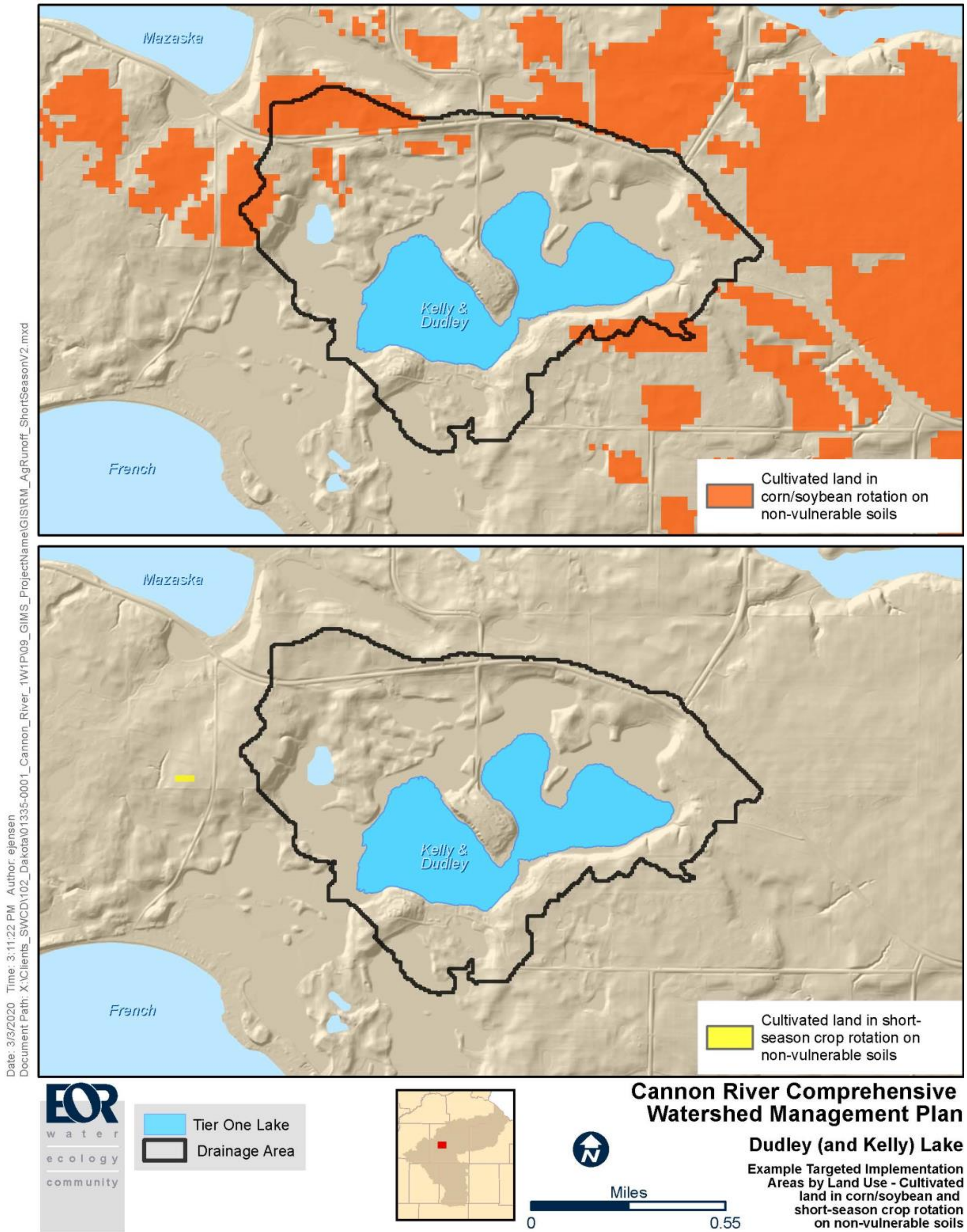


Figure 4. Tier One Lake (Dudley (and Kelly)) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

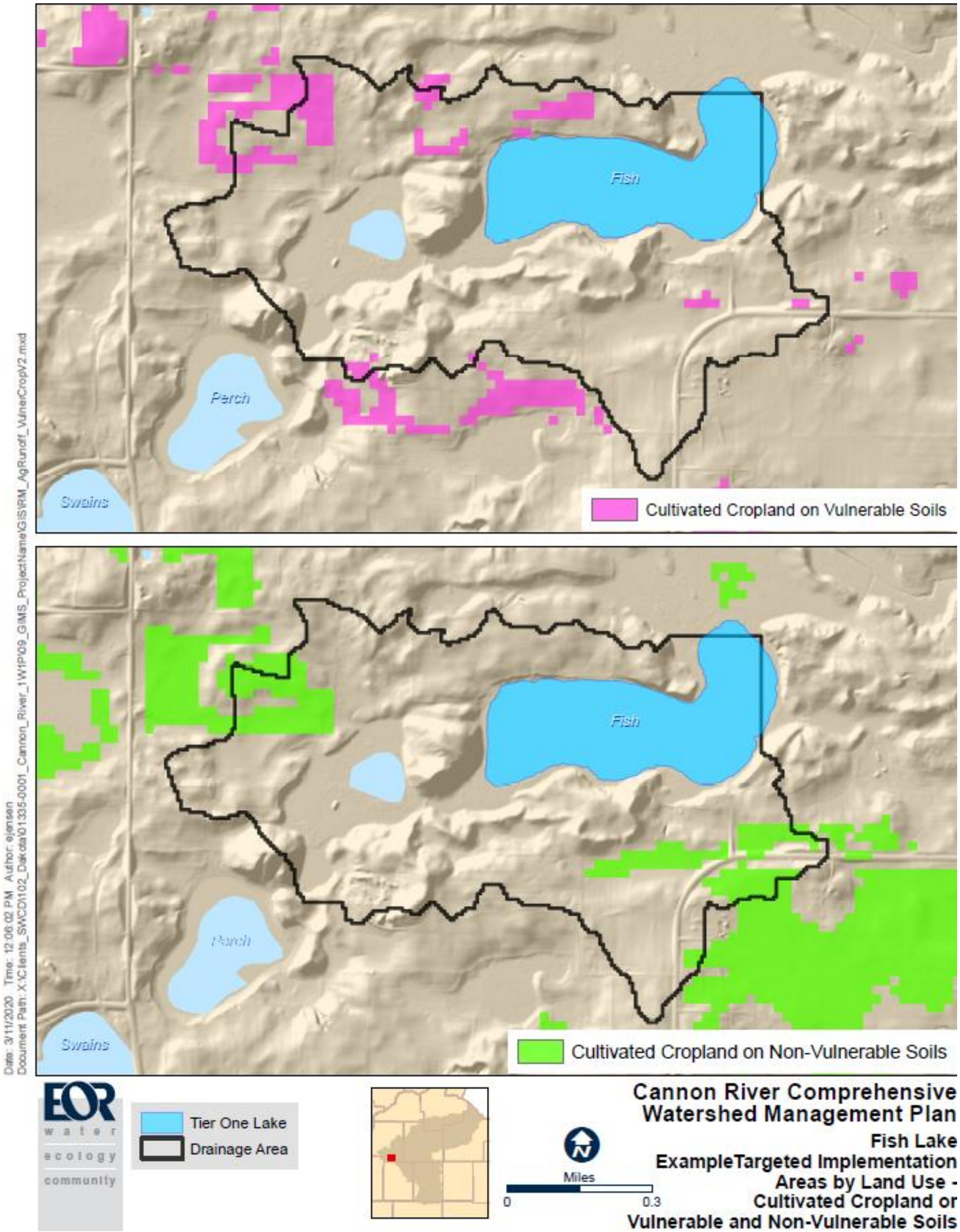


Figure 5. Tier One Lake (Fish) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

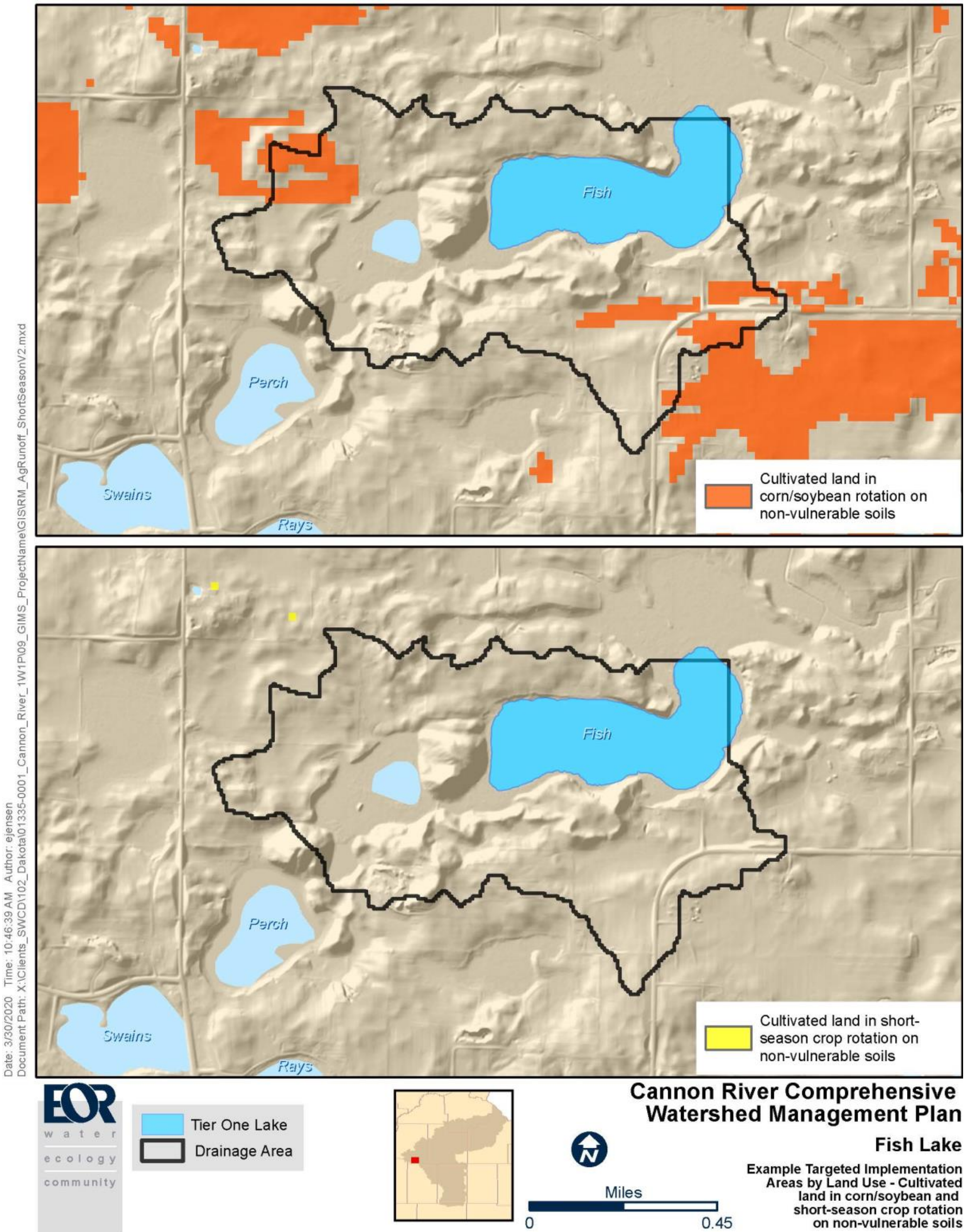


Figure 6. Tier One Lake (Fish) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

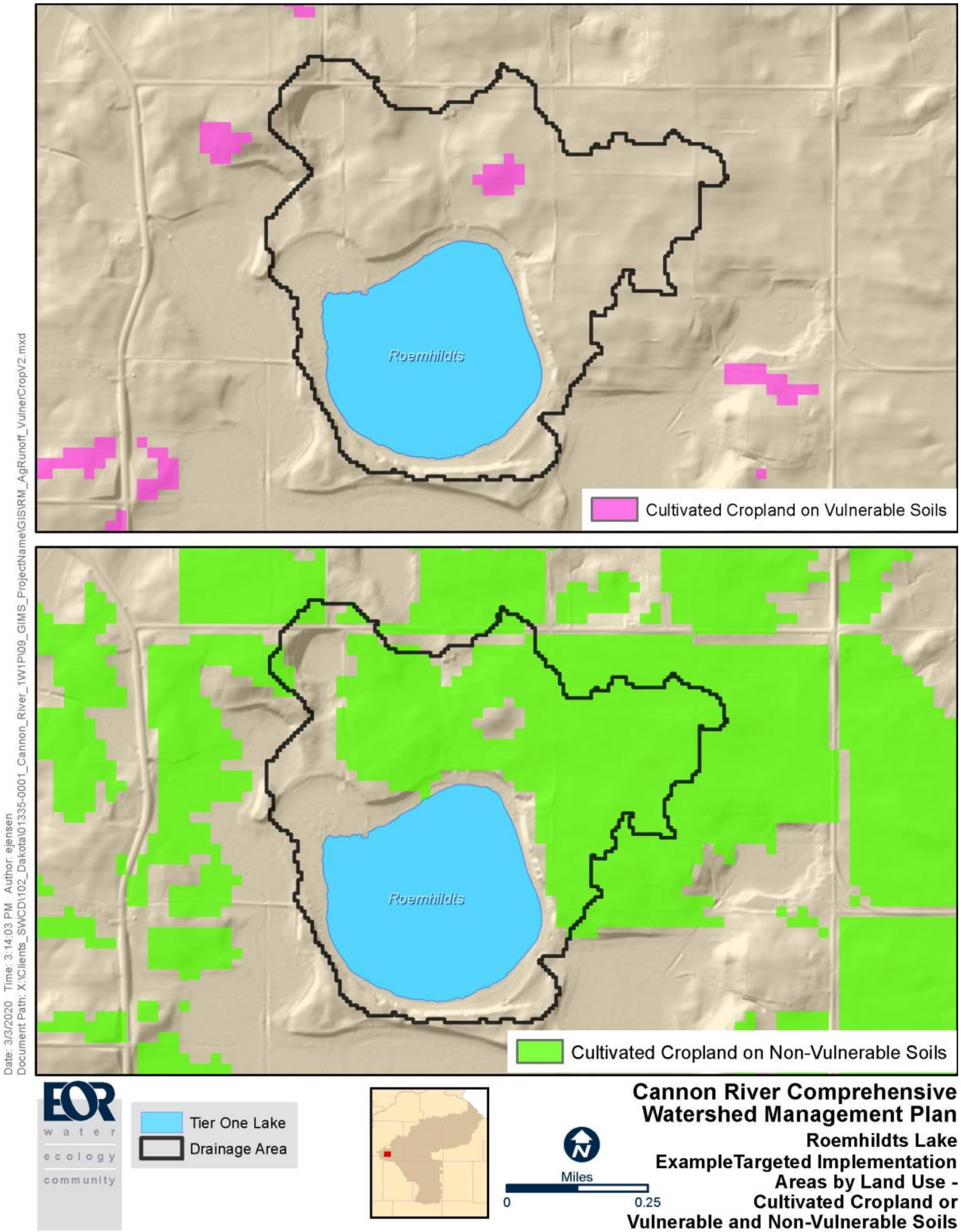


Figure 7. Tier One Lake (Roemhildts) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

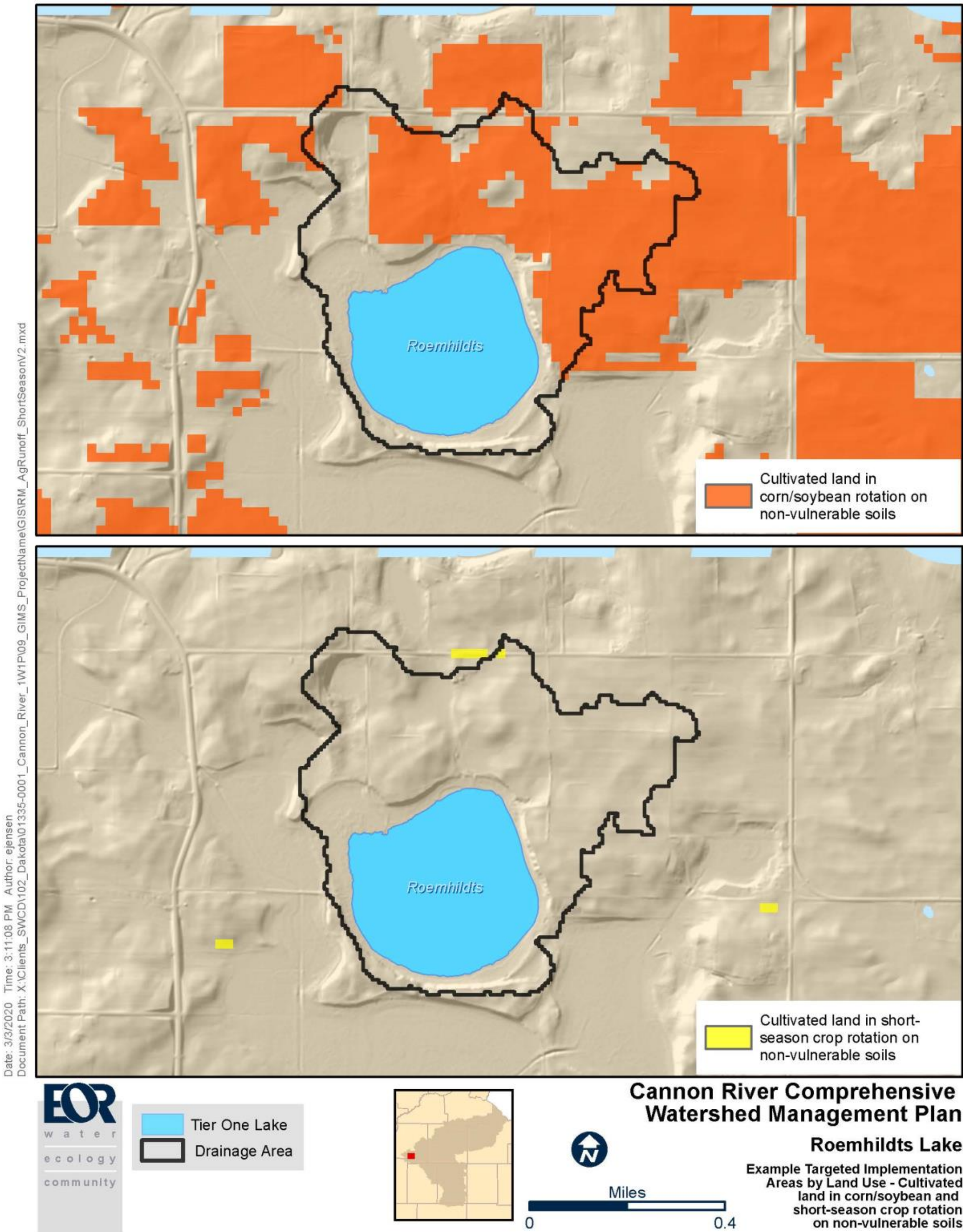


Figure 8. Tier One Lake (Roemhildts) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

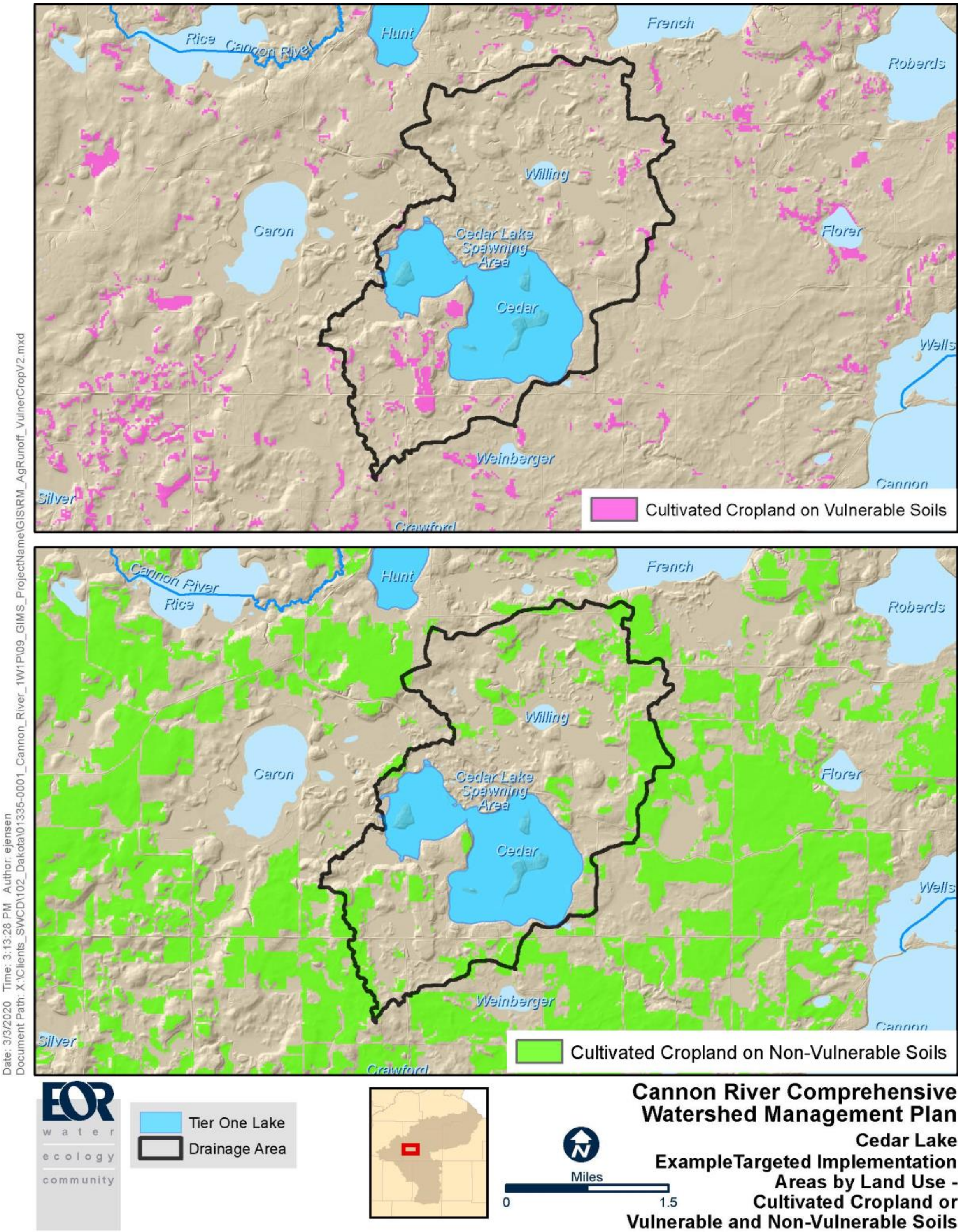


Figure 9. Tier One Lake (Roemhildts) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

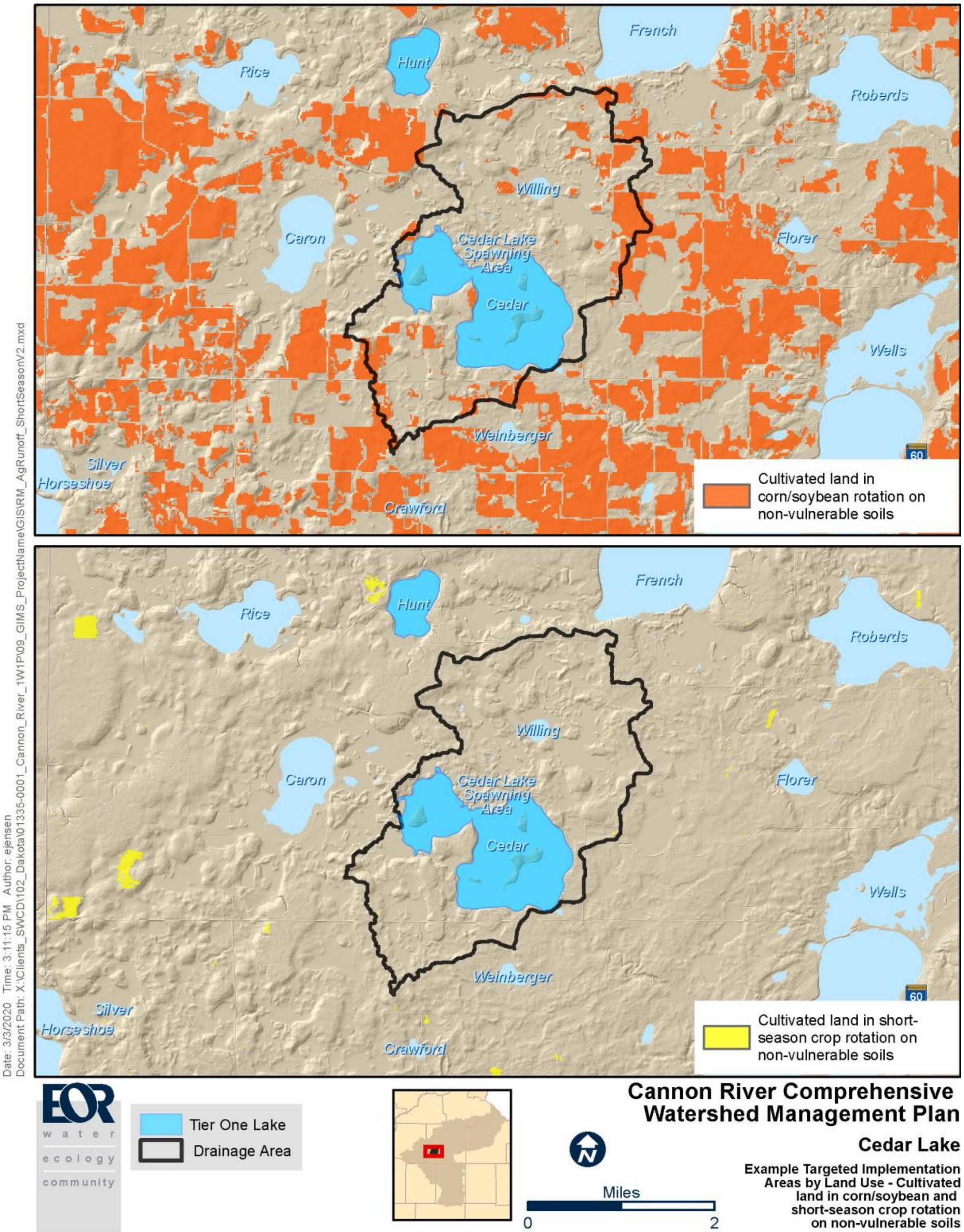


Figure 10. Tier One Lake (Cedar) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

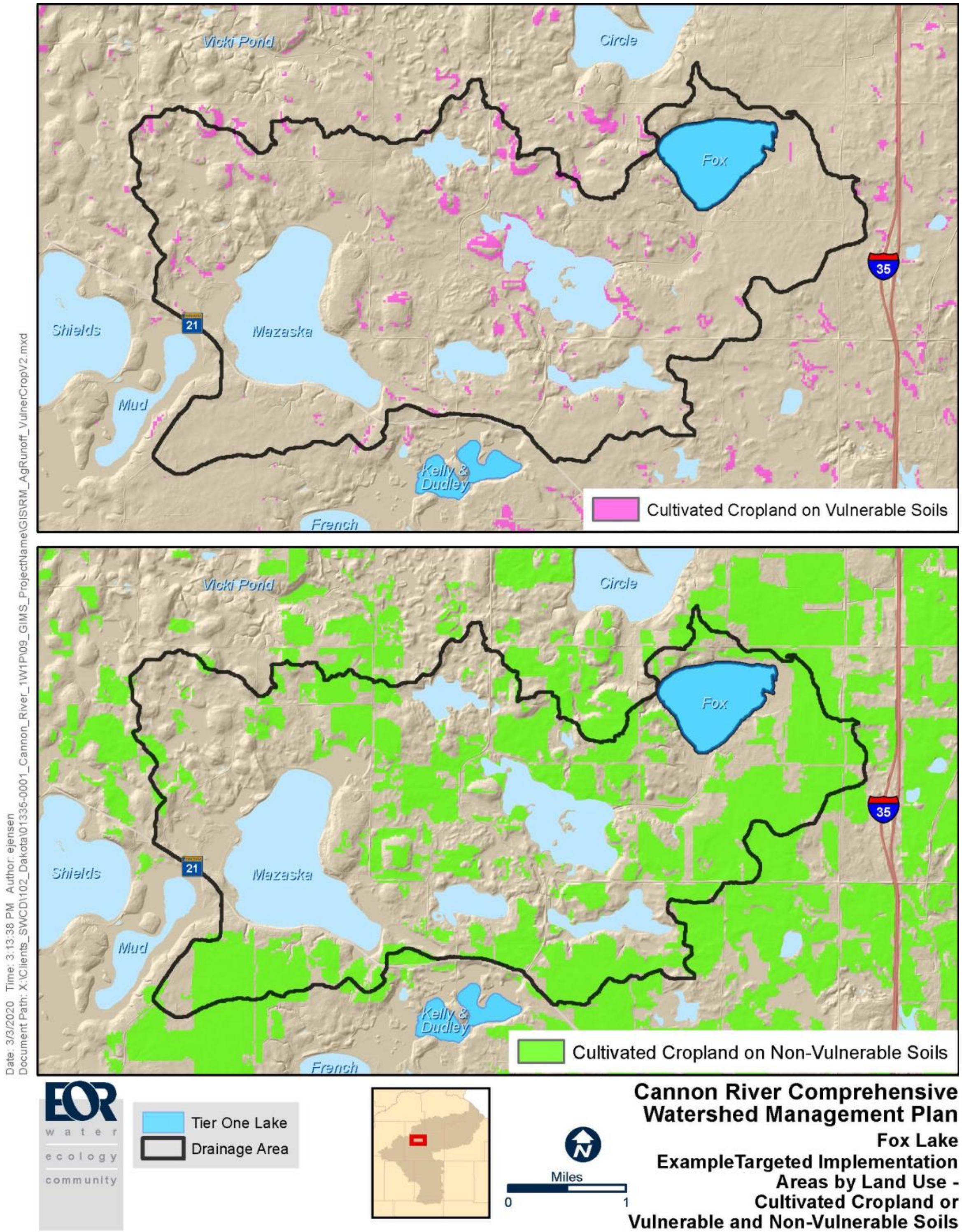


Figure 11. Tier One Lake (Fox) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

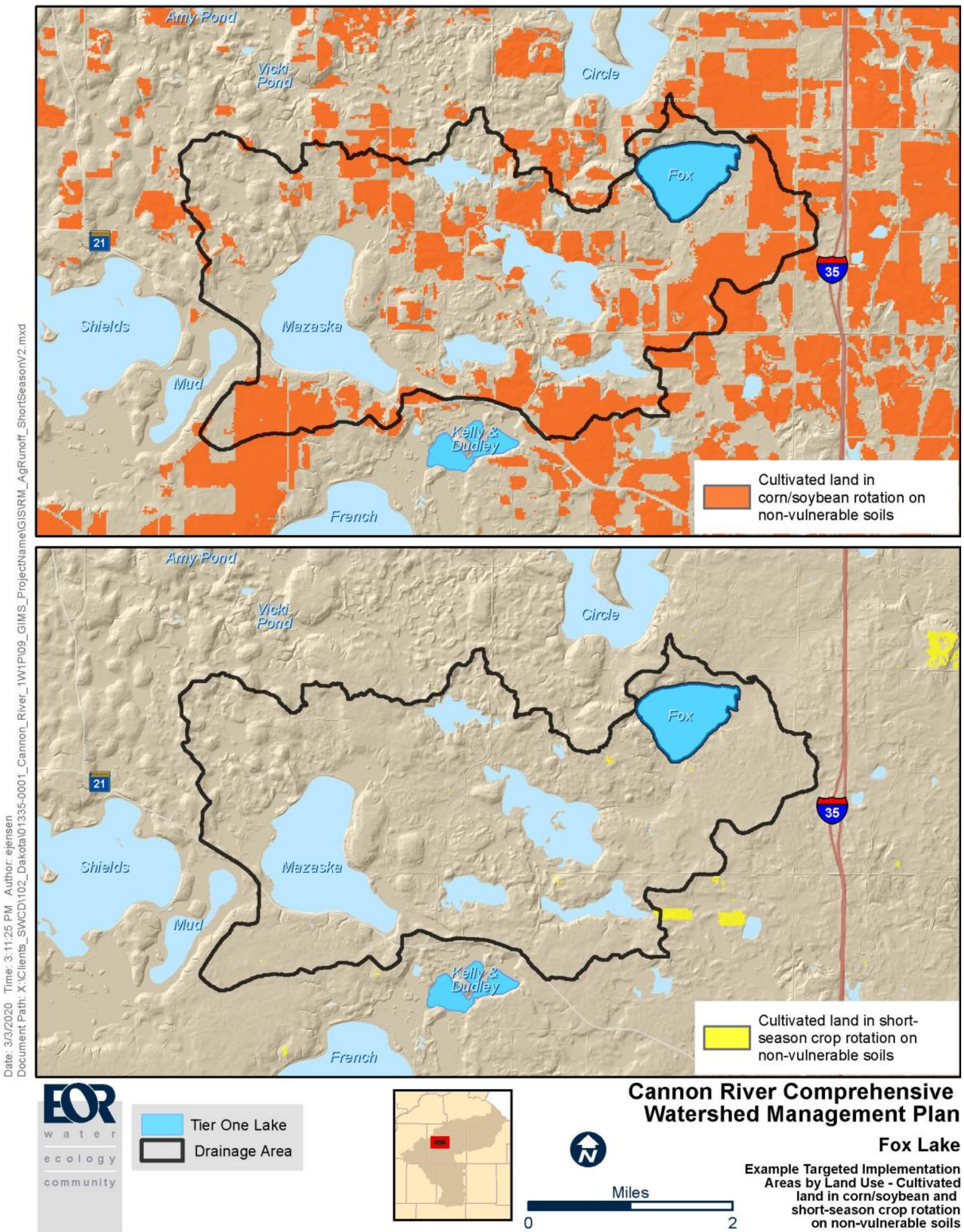


Figure 12. Tier One Lake (Fox) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

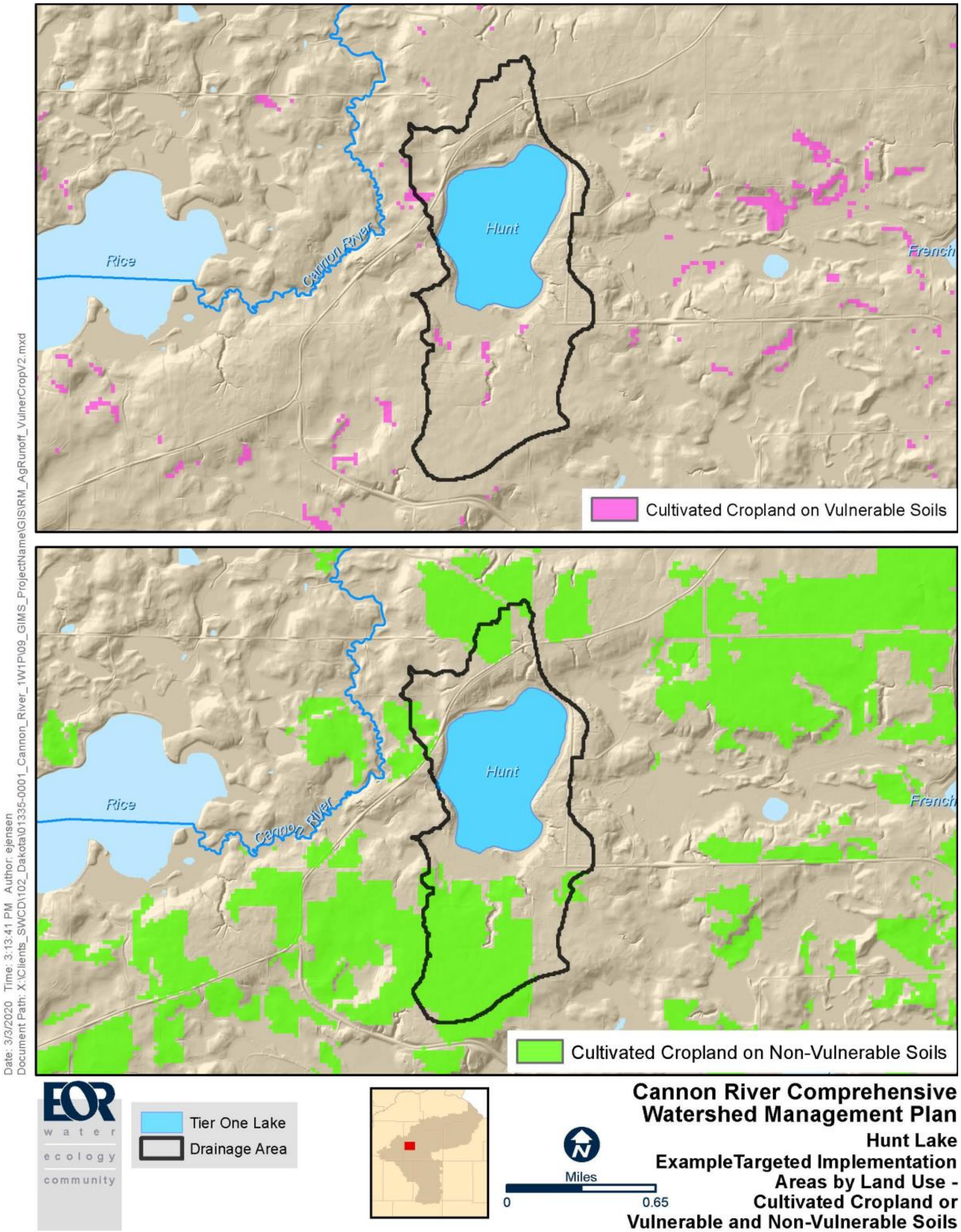


Figure 13. Tier One Lake (Hunt) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

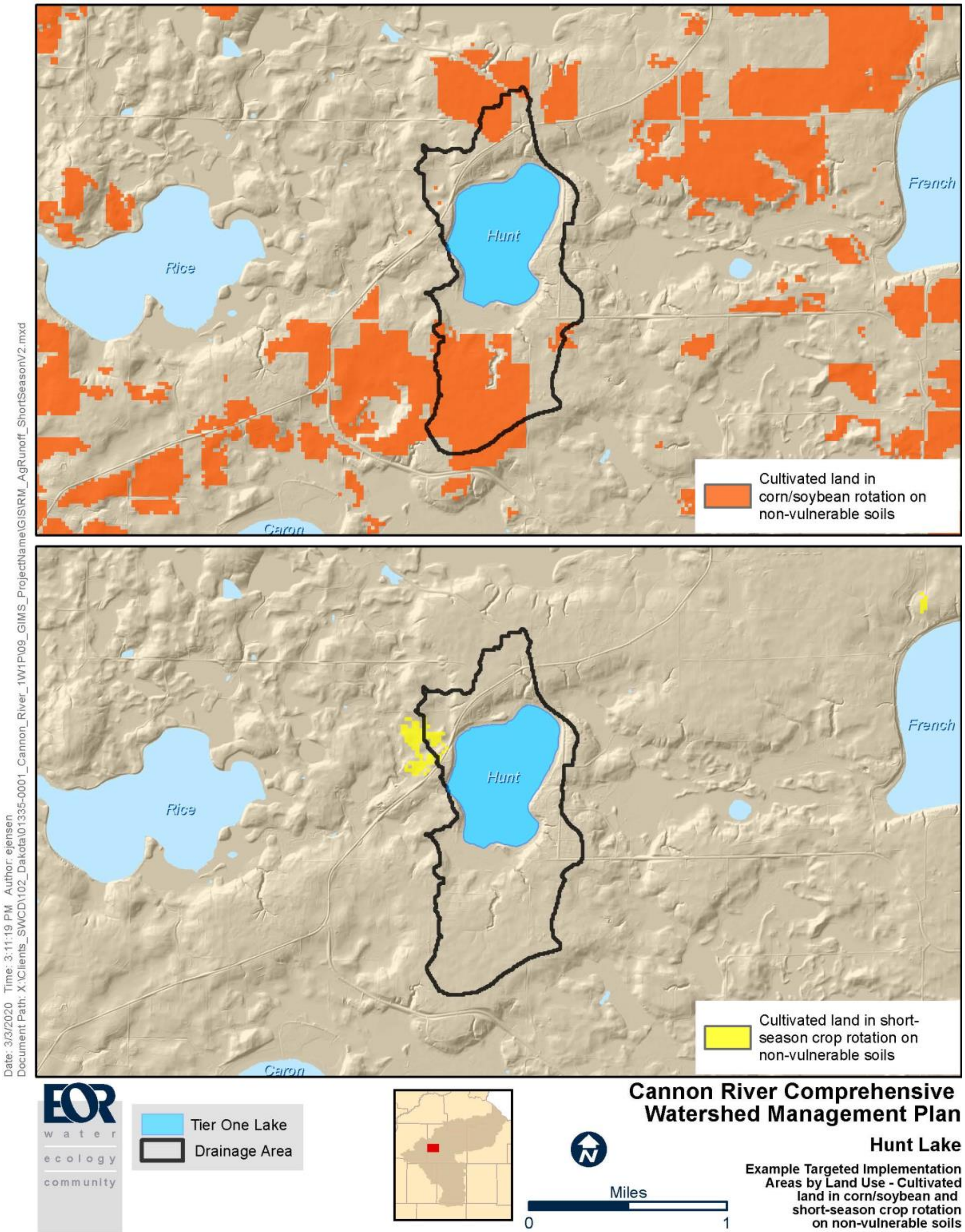


Figure 14. Tier One Lake (Hunt) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

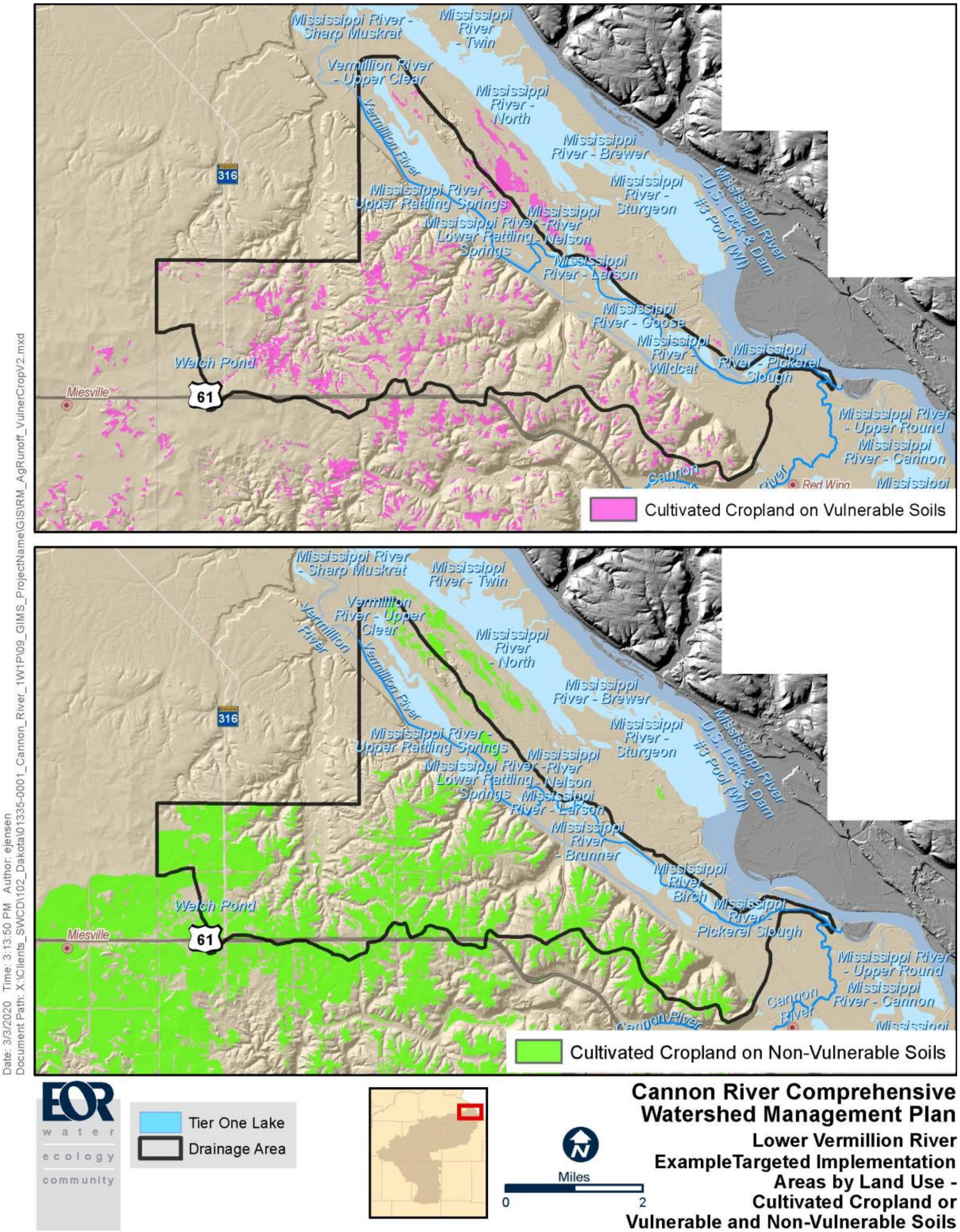


Figure 15. Tier One Stream (Lower Vermillion) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

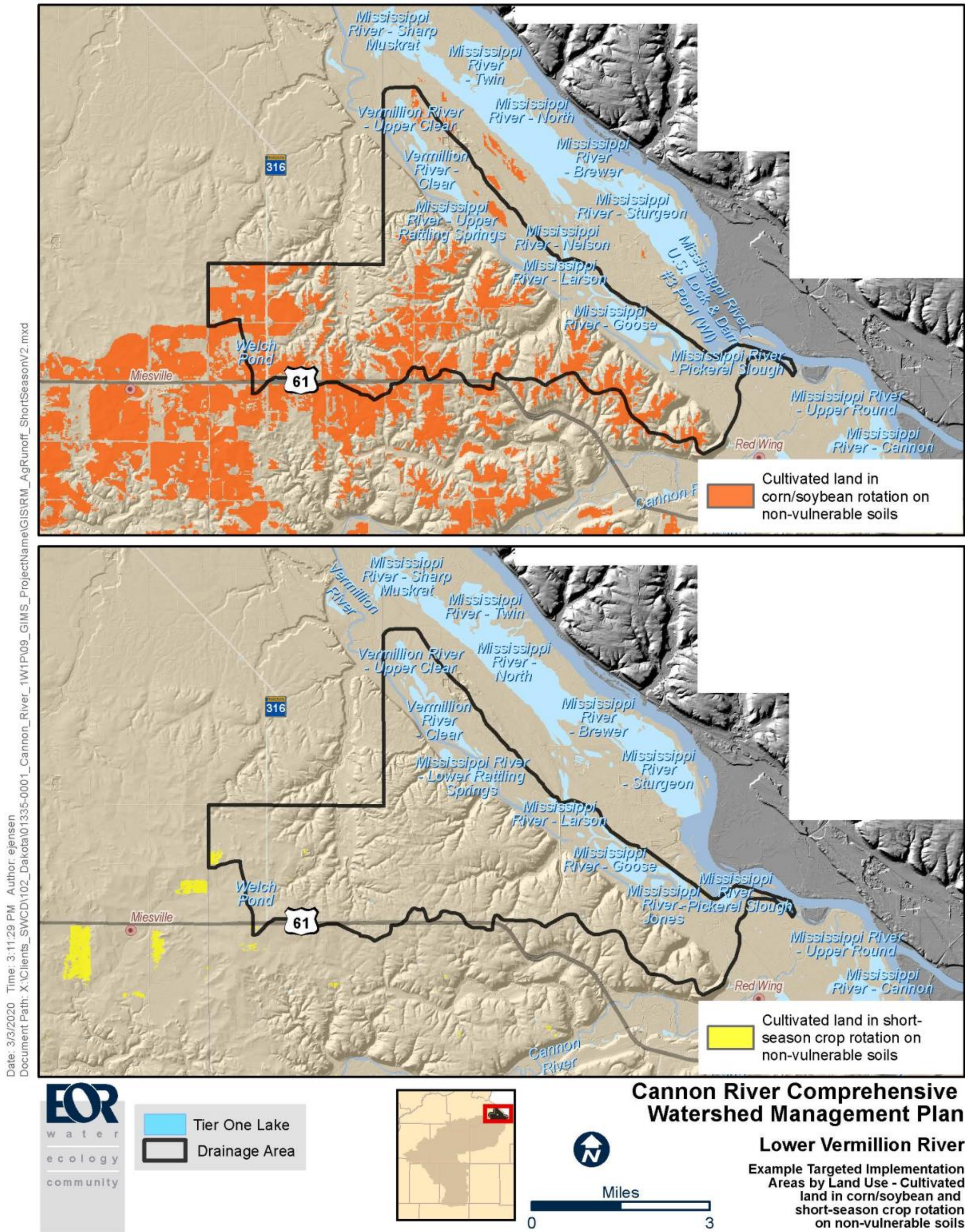


Figure 16. Tier One Stream (Lower Vermillion) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

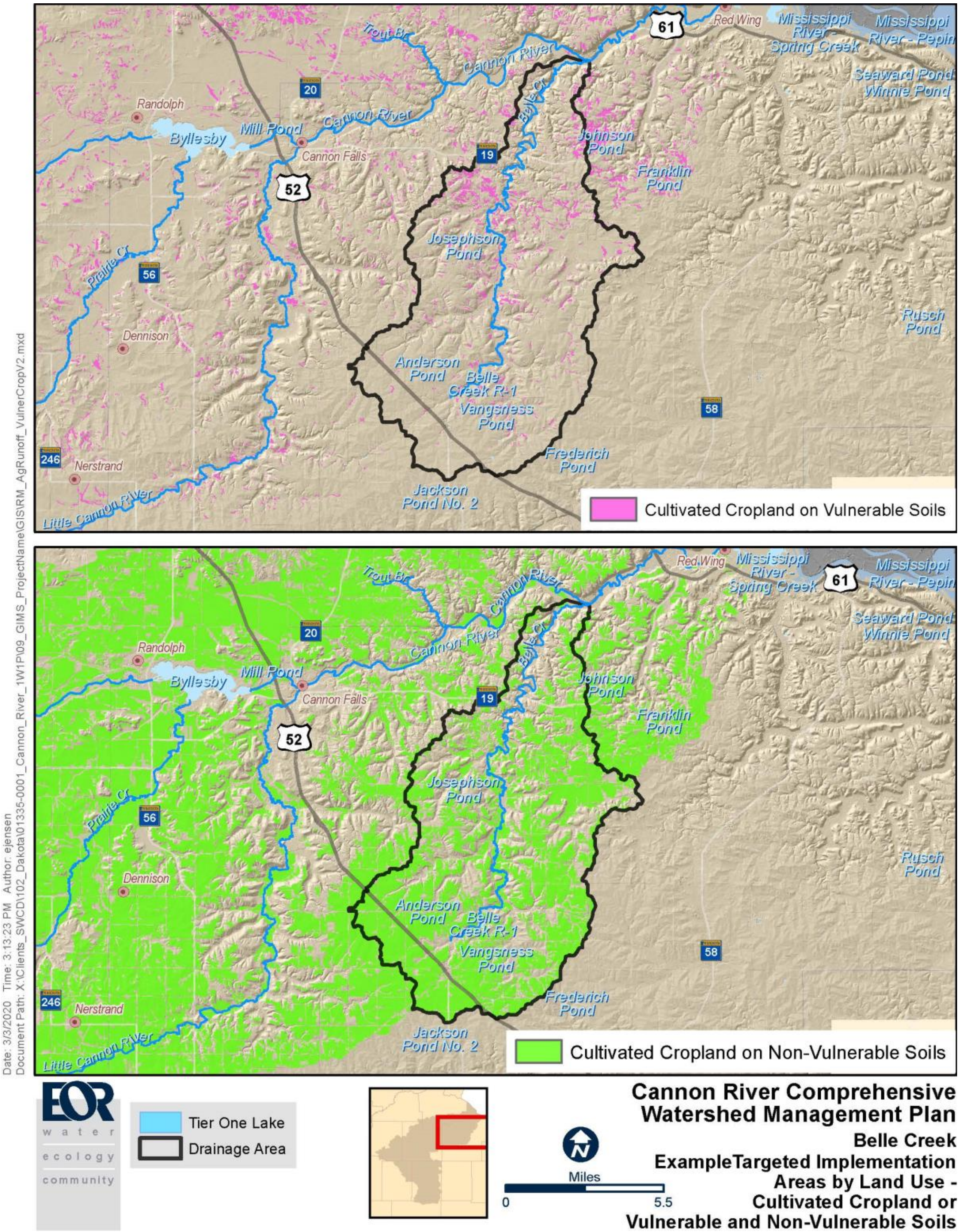


Figure 17. Tier One Stream (Belle Creek) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

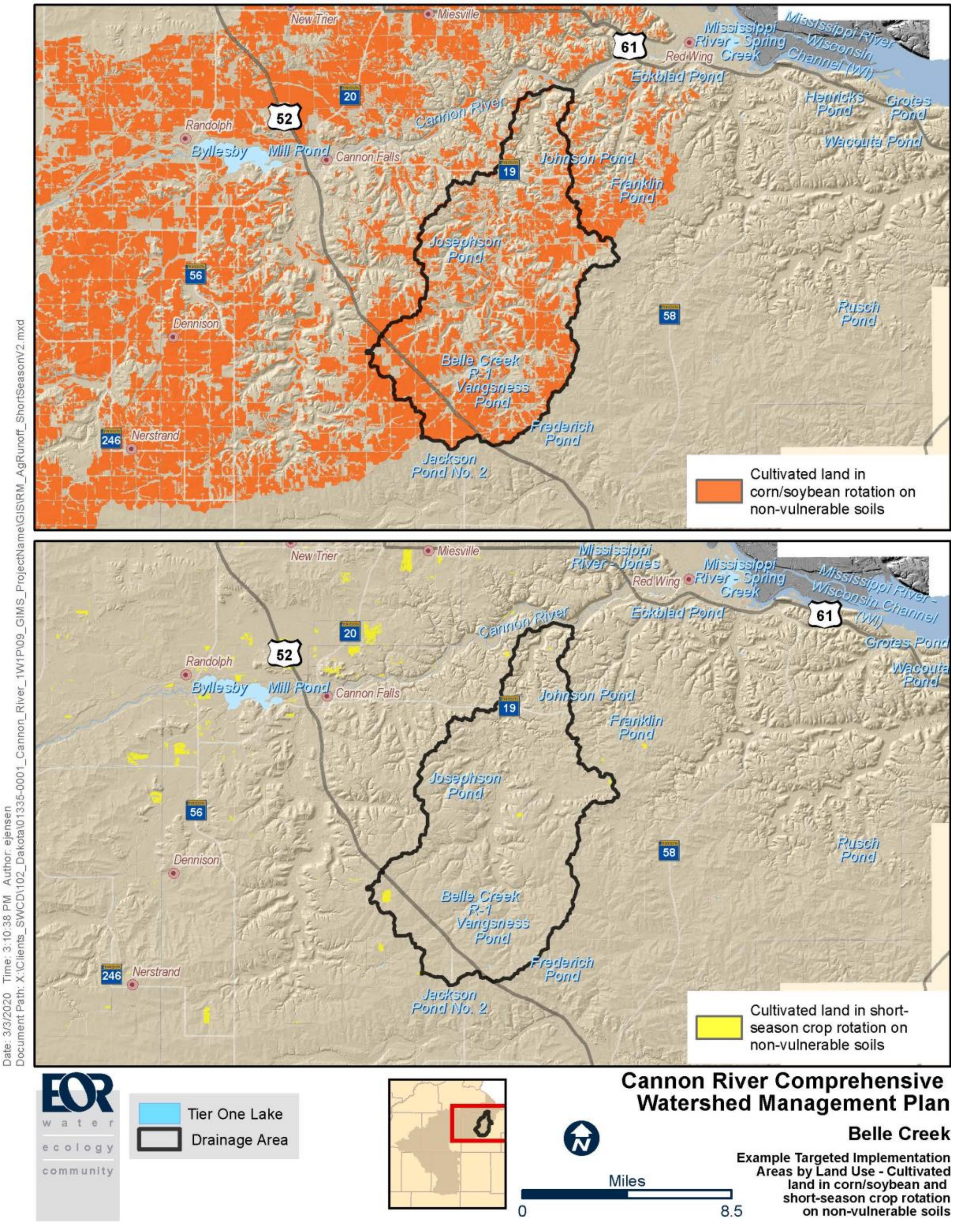


Figure 18. Tier One Stream (Belle Creek) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

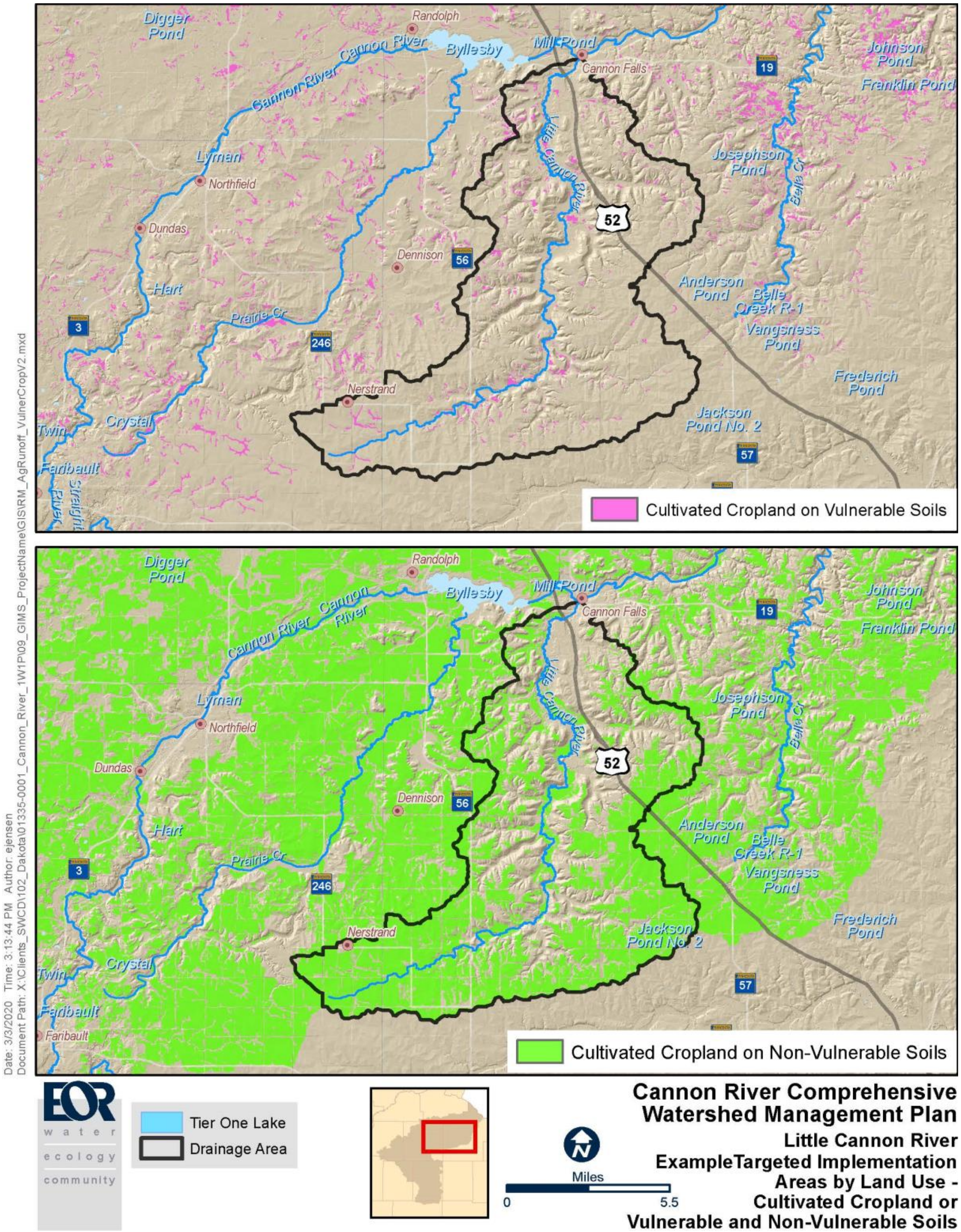


Figure 19. Tier One Stream (Little Cannon) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

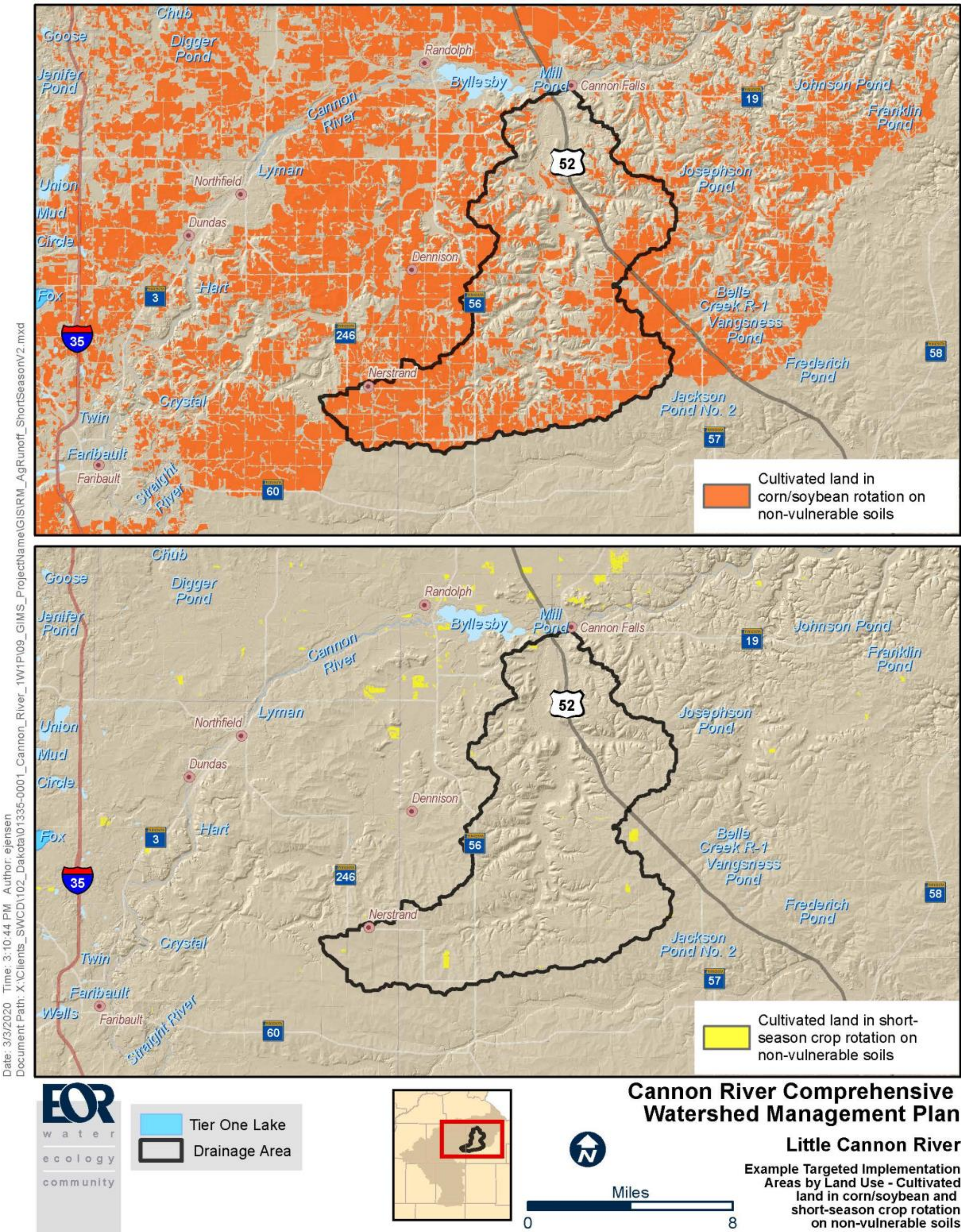


Figure 20. Tier One Stream (Little Cannon) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

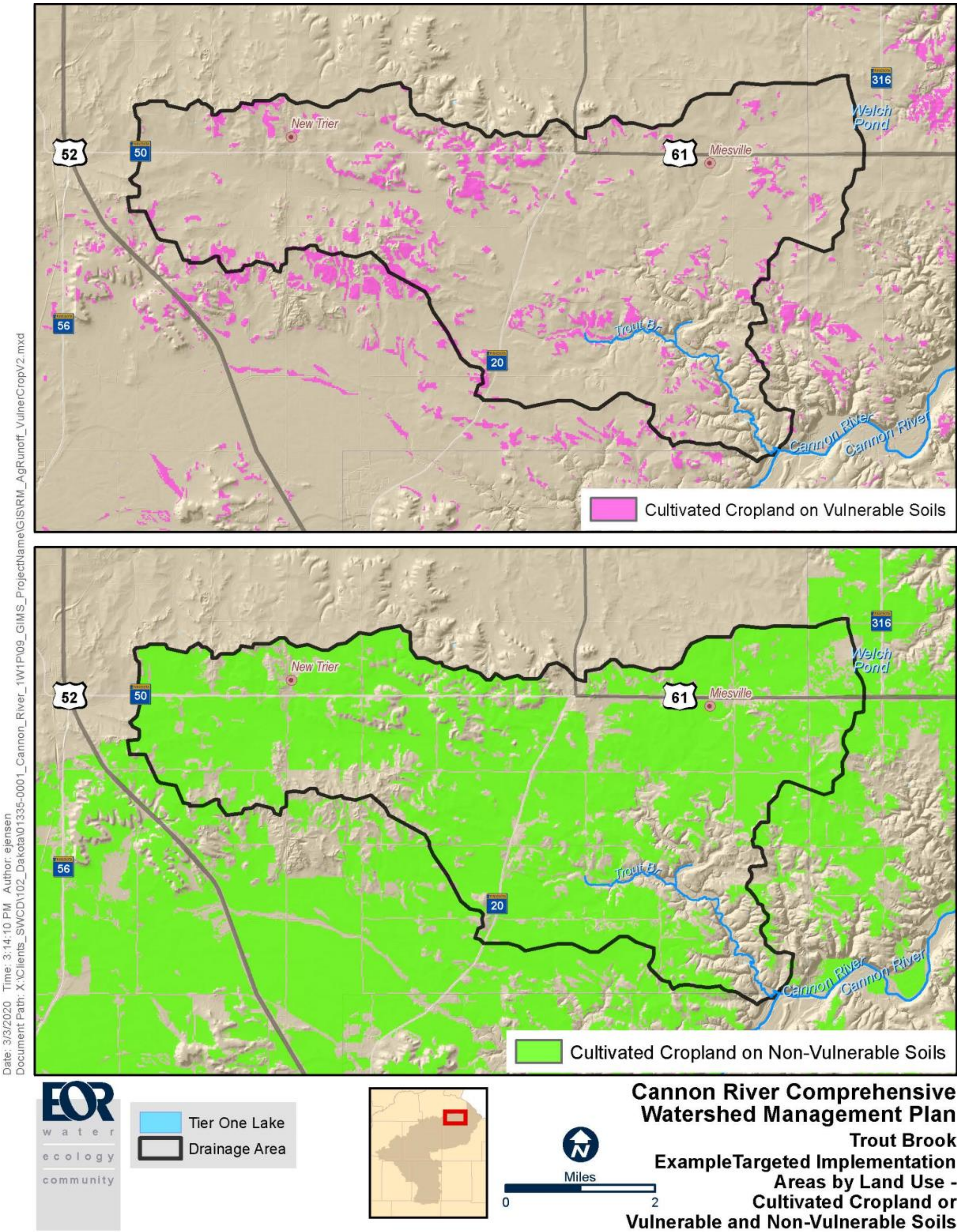


Figure 21. Tier One Stream (Trout Brook) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

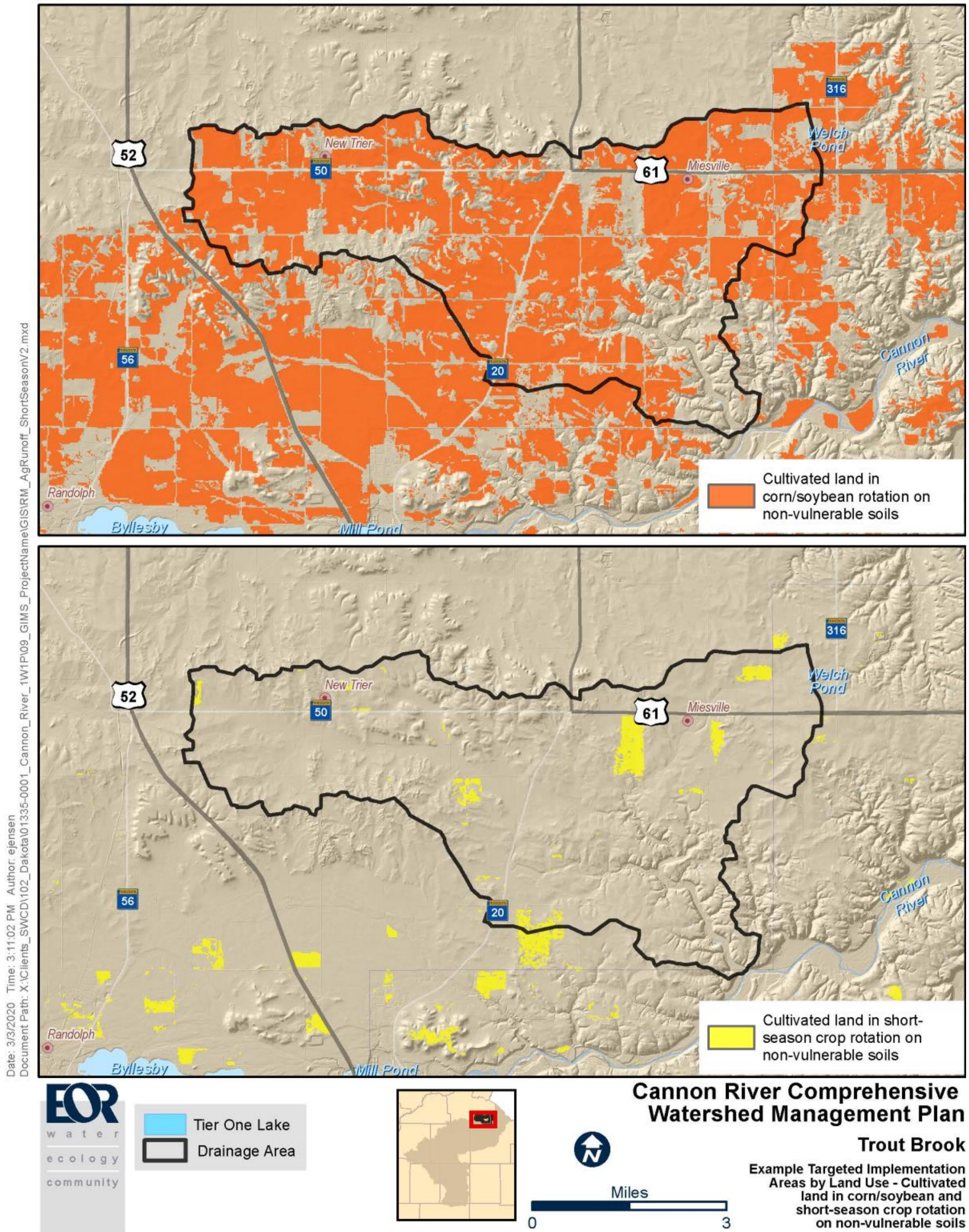


Figure 22. Tier One Stream (Trout Brook) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

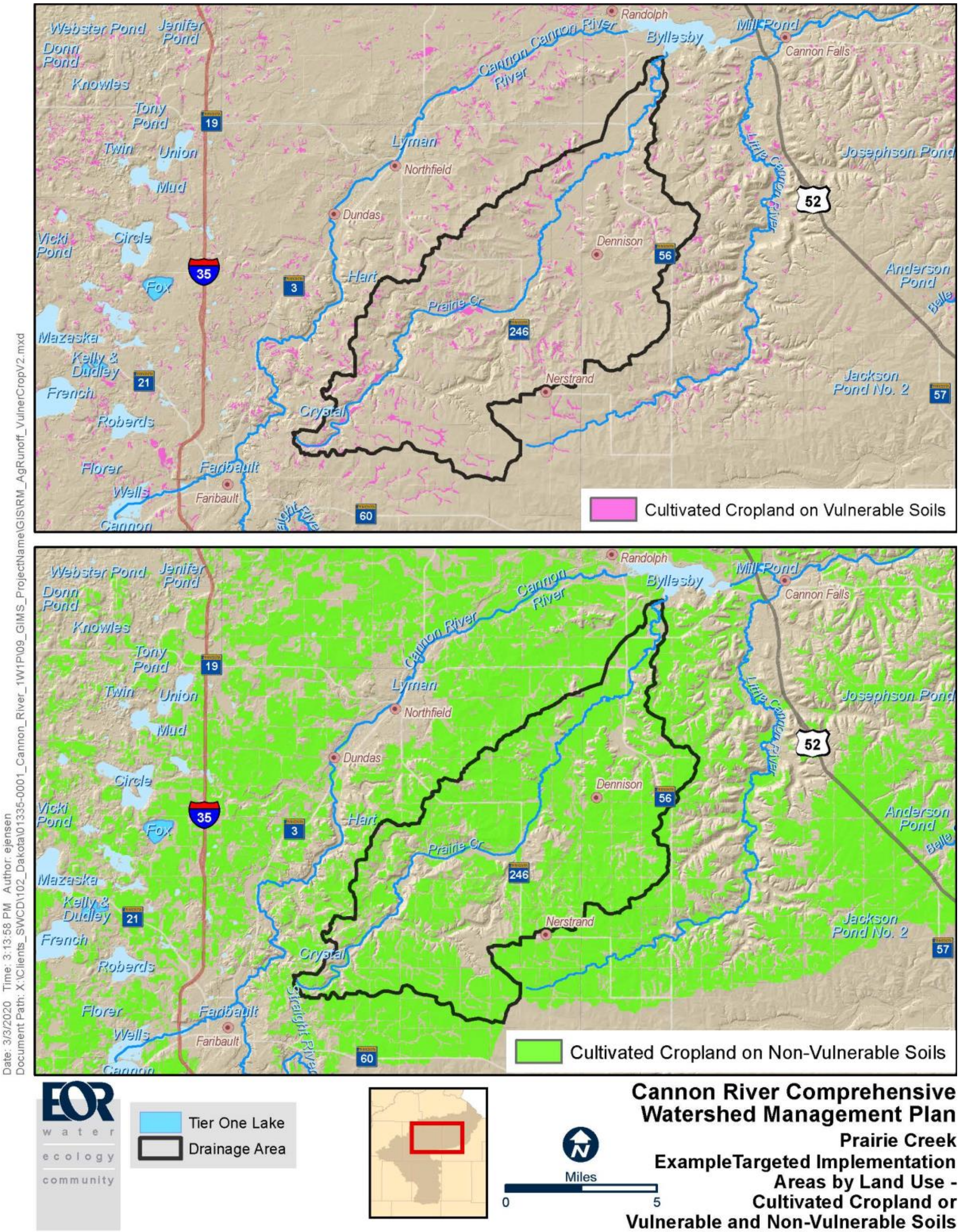


Figure 23. Tier One Stream (Prairie Creek) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

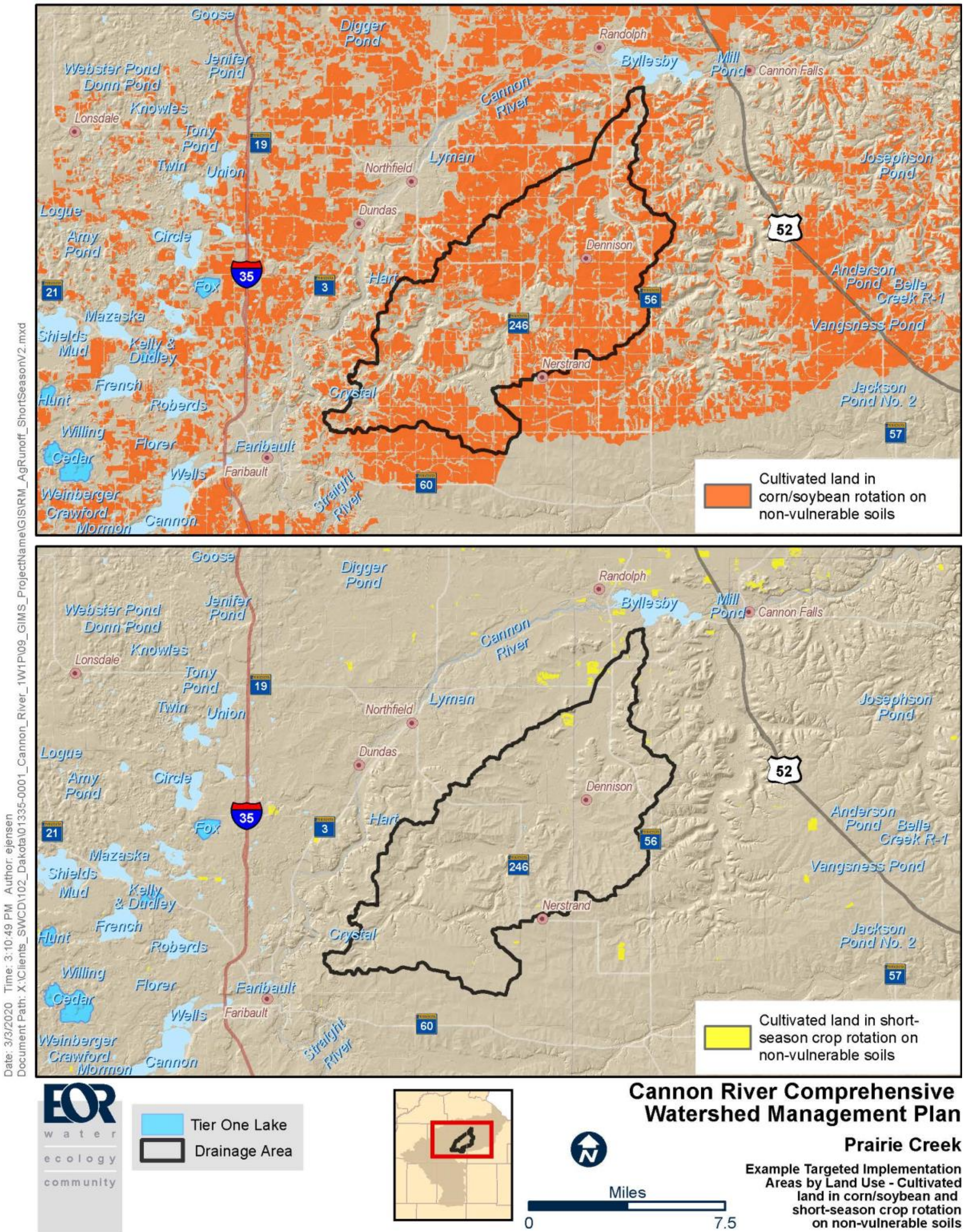


Figure 24. Tier One Stream (Prairie Creek) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

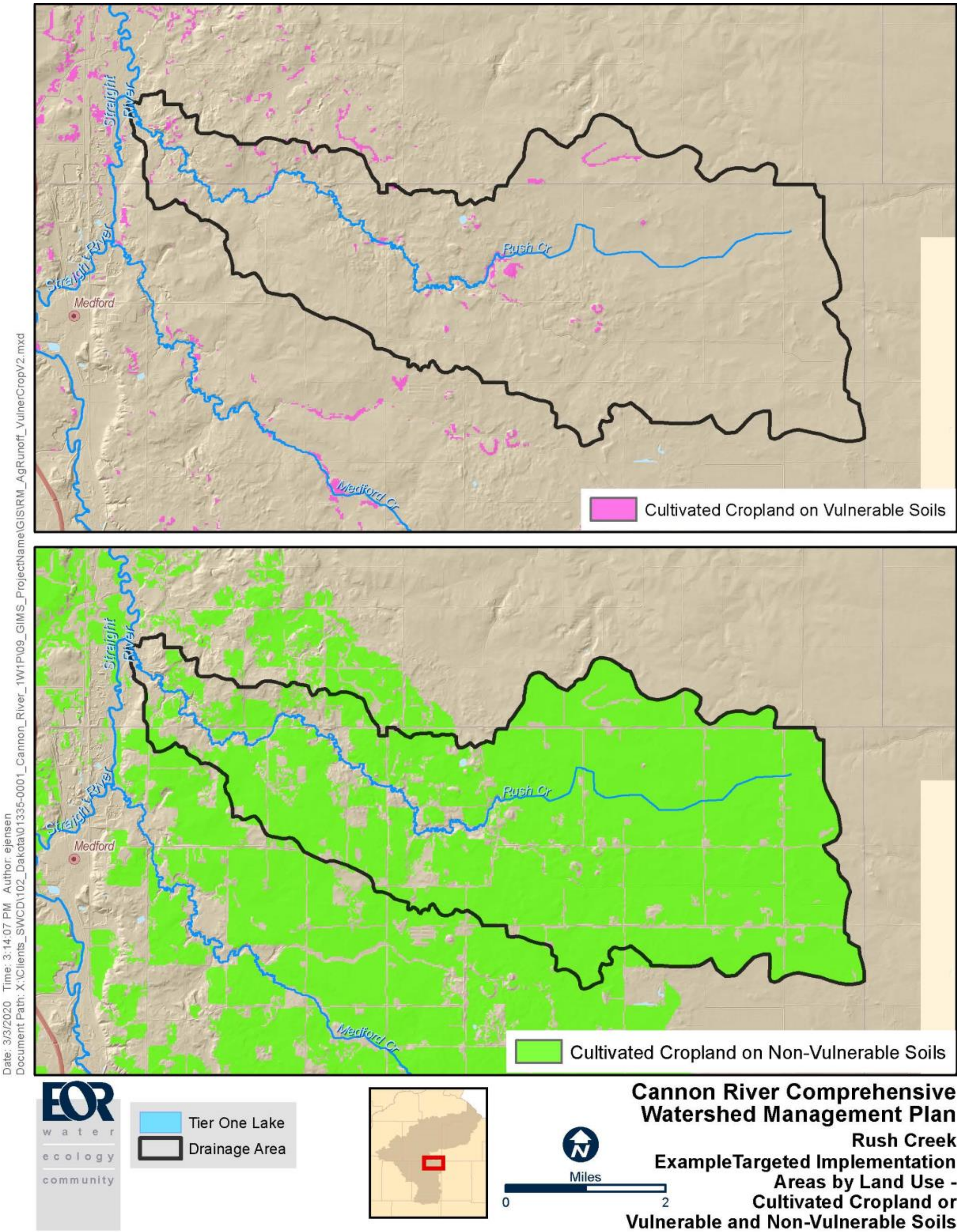


Figure 25. Tier One Stream (Rush Creek) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

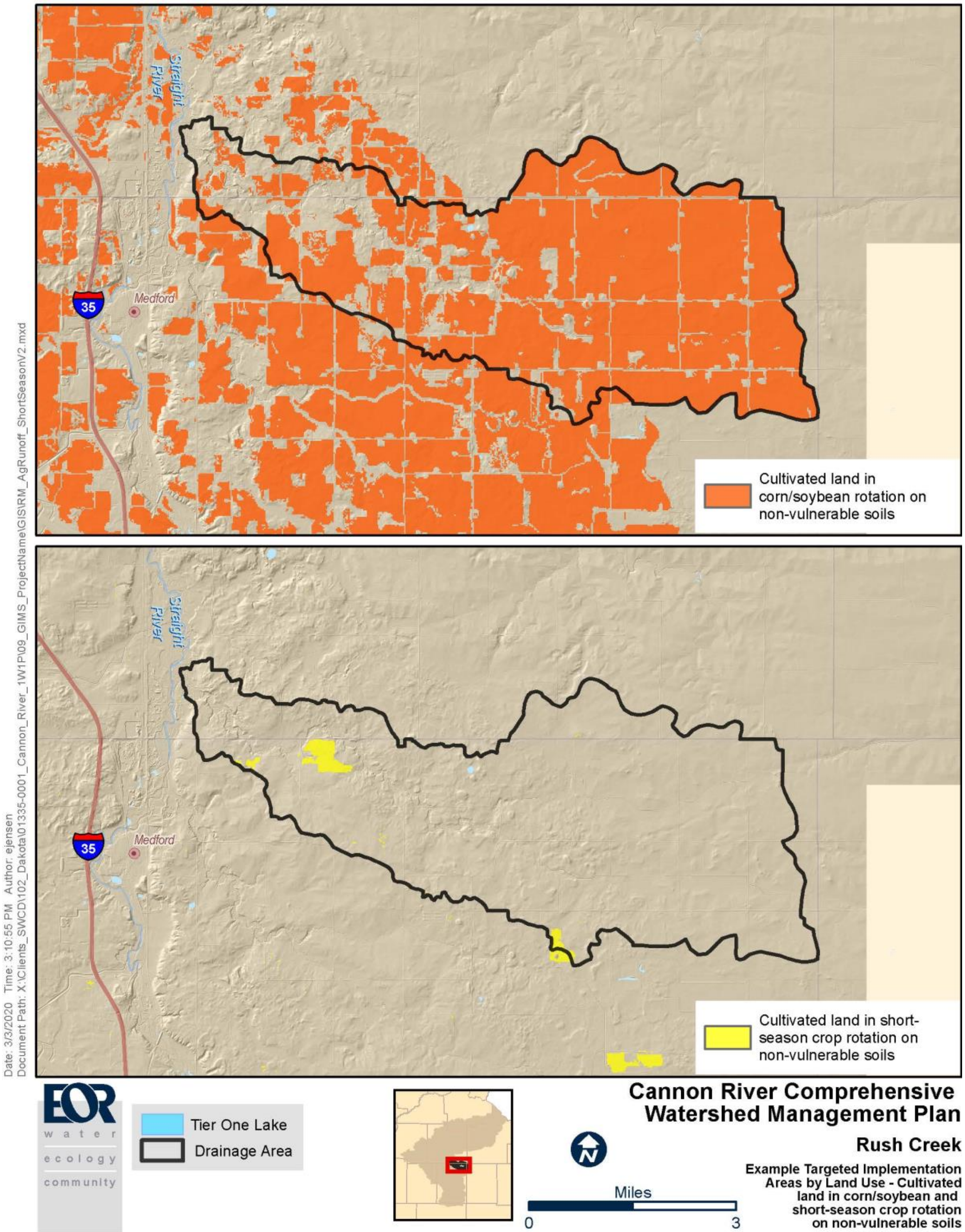


Figure 26. Tier One Stream (Rush Creek) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

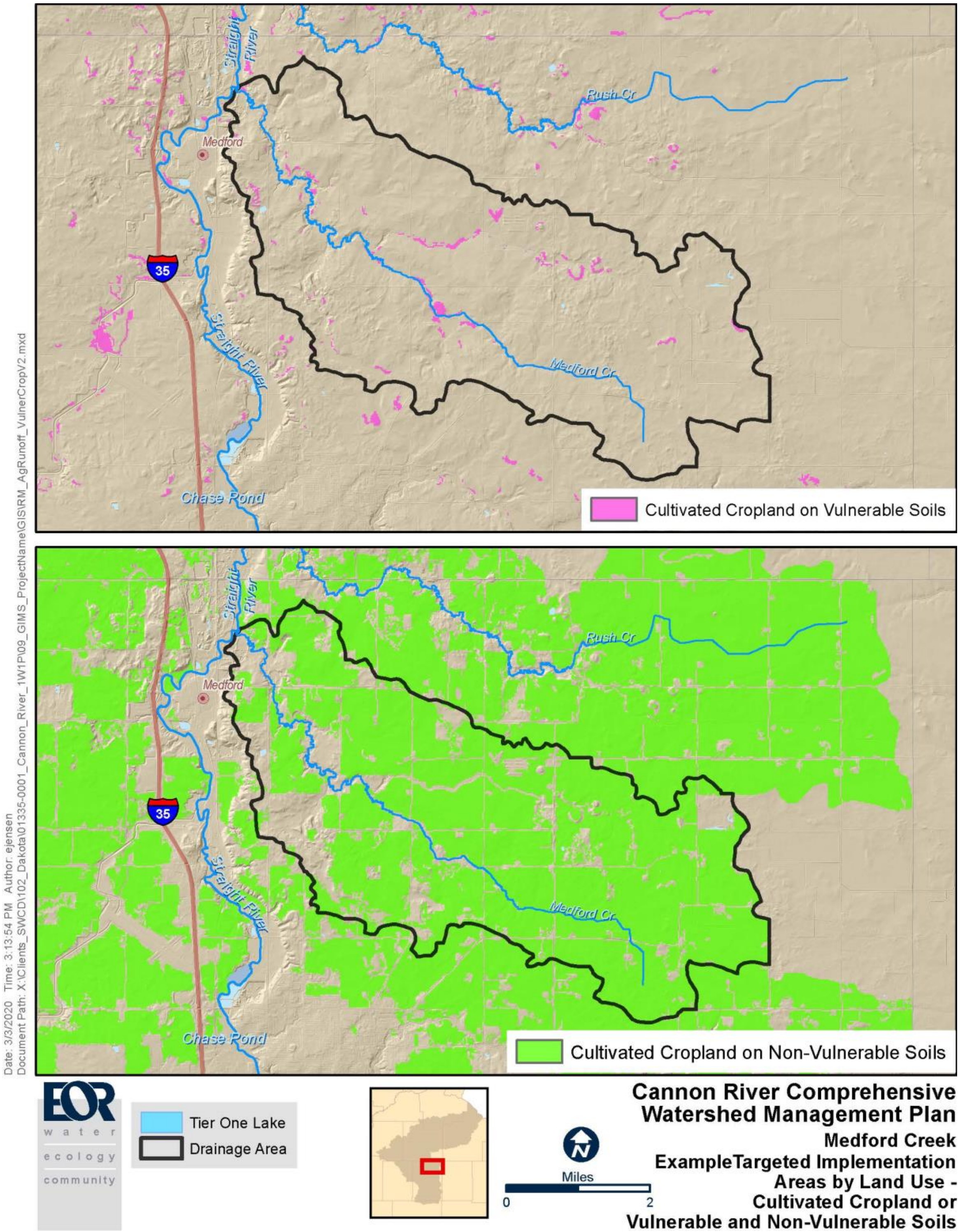


Figure 27. Tier One Stream (Medford Creek) Targeted Implementation Areas by Land Use – Cultivated Cropland on Vulnerable and Non-Vulnerable Soils (Sources: 2011 National Land Cover Database, USDA-NRCS 2017 Soil Survey Geographic Database)

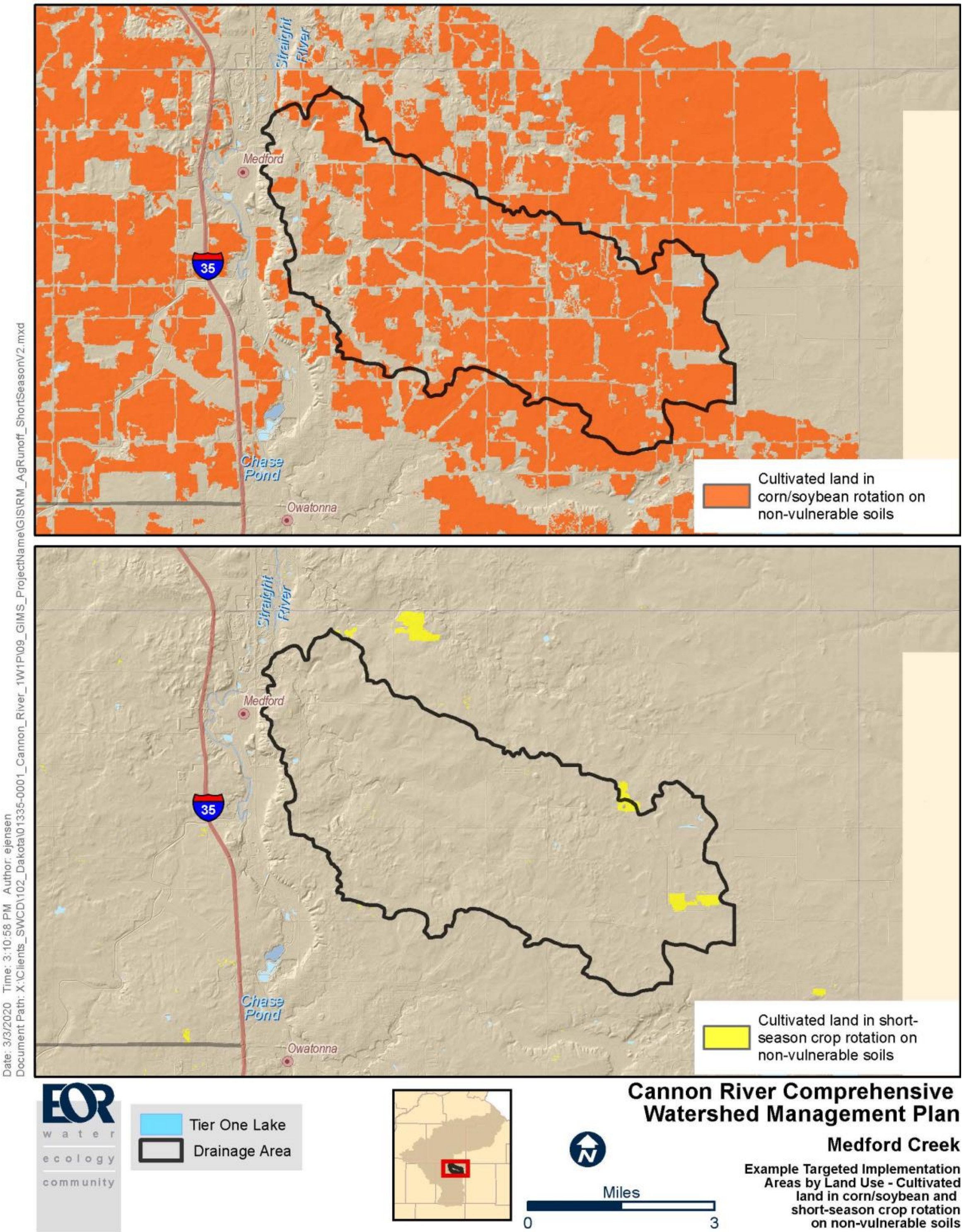


Figure 28. Tier One Stream (Medford Creek) Targeted Implementation Areas by Land Use - Cultivated land in corn/soybean and short-season crop rotation on non-vulnerable soils (Sources: USDA-NRCS 2017 Soil Survey Geographic Database, National Agricultural Statistics Service 2017 Census of Agriculture)

APPENDIX E:
BWSR Local Funding Authorities

Local Funding Authorities

Purpose: *This table provides an overview of Minnesota statutes and laws that provide authorities to local governments to fund water management projects, to be used by local governments while exploring funding options for locally funded water projects. Does not include fees, fines, or wetland banking, grants, etc. This is not a legal document and should not be considered comprehensive, complete, or authoritative.*
note: "metro" refers to Anoka, Carver, Dakota, Hennepin, Ramsey, and Washington counties or watershed organizations in the 7-county metro area.

Citation	Applies to	**Summary** *(please see details in the full text of each provision)*
§40A.152	Counties (metro)	Money from the county conservation account (see chapter 287) must be spent by the county to reimburse the county and taxing jurisdictions within the county for revenue lost under the conservation tax credit under §273.119 or the valuation of agricultural preserves under §473H.10. Money remaining in the account after reimbursement may be spent on: 1) agricultural land preservation and conservation planning and implementation of official controls under this chapter or chapter 473H; 2) soil conservation activities and enforcement of soil loss ordinances; 3) incentives for landowners who create exclusive agricultural use zones; 4) payments to municipalities within the county for the purposes of clauses 1-3.
§103B.241	Watershed districts & watershed management organizations (metro)	May levy a tax to pay for plan preparation costs & projects in the adopted plan necessary to implement the Metropolitan Water Management Program.
§103B.245	Watershed districts & watershed management organizations (metro)	May establish a watershed management tax district within the watershed to pay the costs of: planning required under §§103B.231 and 103B.235, the capital costs of water management facilities described in the capital improvement program of the plans, and normal & routine maintenance of the facilities.
§103B.251	Watershed districts & watershed management organizations (metro), counties	May certify for payment by the county all or any part of the cost of a capital improvement contained in the capital improvement program of plans developed in accordance with §103B.231. Counties may issue general obligation bonds to pay all or part of the cost of project. The county may pay the principal and interest on the bonds by levying a tax on all property located in the watershed or subwatershed in which the bonds are issued. Loans from counties to watershed districts for the purposes of implementing this section are not subject to the loan limit set forth in §103D.335.

Citation	Applies to	Summary *(please see details in the full text of each provision)*
§103B.331 Subdivisions 3 & 4	Counties	(3) May charge users for services provided by the county necessary to implement the local water management plan.
		(4) May establish one or more special taxing districts within the county and issue bonds to finance capital improvements under the Comprehensive Local Water Management Act. After adoption of the resolution, a county may annually levy a tax on all taxable property in the district.
§103B.335	Counties, municipalities, or townships	May levy a tax to implement the Comprehensive Local Water Management Act or a comprehensive watershed management plan (§103B.3363). A county may levy amounts needed to pay the reasonable costs to SWCDs and WDs of administering and implementing priority programs identified in an approved & adopted plan or comprehensive watershed management plan.
§103B.555 Subdivisions 1 & 3	Counties	(1) May establish a Lake Improvement District and impose service charges on the users of lake improvement district services within the district. May levy an ad valorem tax solely on property within the lake improvement district for projects of special benefit to the district; may impose or issue any combination of service charges, special assessments, obligations, and taxes.
		(3) A tax under Subd. 1 may be in addition to amounts levied on all taxable property in the county for the same/similar purposes.
§103C.331 Subdivision 16	County boards on behalf of soil and water conservation districts	May levy an annual tax on all taxable real property in the district for the amount that the board determines is necessary to meet the requirements of the district.
§103D.335	Watershed districts	A watershed district has the power to incur debts, liabilities, and obligations and to provide for assessments and to issue certificates, warrants, and bonds.
§103D.601	Watershed districts	May set up special taxing districts via petition to conduct larger, Capital Improvement Projects (CIP). The costs to the affected parties cannot exceed $750,000.
§103D.615	Watershed districts	May declare an emergency and order that work be done without a contract. The cost of work undertaken without a contract may be assessed against benefitted properties or raised by an ad valorem tax levy if the cost is not more than 25% of the most recent administrative ad valorem levy and the work is found to be of common benefit to the watershed district.

Citation	Applies to	**Summary** *(please see details in the full text of each provision)*
§103D.729	Watershed districts	May establish a water management district or districts in the territory within the watershed to collect revenues and pay the costs of projects initiated under §§103B.231, 103D.601, 103D.605, 103D.611, or 103D.730. (Guidelines for creating water management districts)
§103D.901	Watershed districts	County auditors assess the amount specified in an assessment statement filed by managers. The county may issue bonds (§103E.635). An assessment may not be levied against a benefited property in excess of the amount of benefits received.
§103D.905 Subdivisions 2,3, 7-9	Watershed districts	Established funds for watershed districts (not a complete list – see full statute language): **Organizational expense fund** - consisting of an ad valorem tax levy, shall be used for organizational expenses and preparation of the watershed management plan for projects. **General fund** - consisting of an ad valorem tax levy, shall be used for general administrative expenses and for the construction or implementation and maintenance of projects of common benefit to the watershed district. May levy a tax not to exceed 0.00798 percent of estimated market value to pay the cost attributable to projects initiated by petition. **Repair and maintenance funds** - established under §103D.631, Subd. 2. **Survey and data acquisition fund** - consists of the proceeds of a property tax that can be levied only once every 5 years and may not exceed 0.02418 percent of estimated market value. **Project tax levy** - a WD may levy a tax: 1. To pay the costs of projects undertaken by the WD which are to be funded, in whole or in part, with the proceeds of grants or construction or implementation loans under the Clean Water Partnership Law; 2. To pay the principal of, or premium or administrative surcharge (if any), and interest on, the bonds and notes issued by the WD pursuant to §103F.725; 3. To repay the construction or implementation loans under the Clean Water Partnership Law.
§103E.011 Subdivision 5	Drainage authorities	A drainage authority can accept and use external sources of funds together with assessments from benefited landowners in the watershed of the drainage system for the purposes of flood control, wetland restoration, or water quality improvements.
§103E.015 Subdivision 1a	Drainage authorities	When planning a "drainage project" or petitioned repair, the drainage authority must investigate the potential use of external sources of funding, including early coordination for funding and technical assistance with other applicable local government units.
§103E.601 §103E.635 §103E.641	Drainage authorities	Funding of all costs for constructed "**drainage projects"** are apportioned to benefited properties within the drainage system pro rata on the basis of the benefits determined (§103E.601). After the contract for the construction of a drainage project is awarded, the board of an affected county may issue bonds of the county

Citation	Applies to	Summary *(please see details in the full text of each provision)*
		in an amount necessary to pay the cost of establishing and constructing the drainage project. (§103E.635). Drainage authorities may issue drainage funding bonds (§103E.641).
§103E.728 §103E.731 §103E.735	Drainage authorities	Costs for drainage system **repairs** are apportioned pro rata on all benefited properties of record. The drainage authority may charge an additional assessment on property that is in violation of §103E.021 (ditch buffers) or a county soil loss ordinance (§103E.728). If there is not enough money in the drainage system account to make a repair, the board shall assess the costs of the repairs on all property and entities that have been assessed benefits for the drainage system (§103E.731). To create a repair fund for a drainage system to be used only for repairs, the drainage authority may apportion and assess an amount against all property and entities benefited by the drainage system, including property not originally assessed and subsequently found to be benefited according to law. (§103E.735).
Chapter 287	Counties	Counties participating in the agricultural land preservation program impose a fee of $5 per transaction on the recording or registration of a mortgage or deed that is subject to tax under §§287.05 and 287.21.
Chapter 365A	Towns	Townships may create subordinate service districts with special taxing authority. Requires a petition signed by at least 50 percent of the property owners in the part of the town proposed for the subordinate service district.
§373.475	Counties	A county board must deposit the money received from the sale of land under Laws 1998, chapter 389, article 16, section 31, subd. 3, into an environmental trust fund. The county board may spend interest earned on the principal only for purposes related to the improvement of natural resources.
Chapter 429	Municipalities	May levy special assessments against properties benefitting from special services (including curbs, gutters and storm sewer, sanitary sewers, holding ponds, and treatment plants).
§444.075	Municipalities	May collect stormwater utility fees to build, repair, operate & maintain stormwater management systems.
§462.358 Subdivision 2b(c)	Municipalities	May accept a cash fee for lots created in a subdivision or redevelopment that will be served by municipal sanitary sewer and water service or community septic and private wells. May charge dedication fees for the acquisition and development or improvement of wetlands and open space based on an approved parks and open space plan.
M. L. 1998, Chapter 389 Article 3, Section 29	Red River Watershed Management Board	Watershed Districts that are members of the Red River Watershed Management Board may levy an ad valorem tax not to exceed 0.04836 percent of the taxable market value of all property within their district. This levy is in excess of levies authorized by §103D.905.

APPENDIX F:
Cannon River JPA

JOINT POWERS AGREEMENT
FOR CANNON RIVER WATERSHED

This Joint Powers Agreement (Agreement) is entered into between the following parties (sometimes referred to as members):

> The Counties of Dakota, Goodhue, Le Sueur, Rice, Steele and Waseca (Counties), by and through their respective County Board of Commissioners, and the Dakota, Goodhue, Le Sueur, Rice, Steele and Waseca Soil and Water Conservation Districts (SWCDs), by and through their respective Soil and Water Conservation District Board of Supervisors, and the Belle Creek Watershed District (WD) and the North Cannon River Watershed Management Organization (WMO) by and through their Board of Managers

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

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

WHEREAS, with matters that relate to coordination of water management authorities pursuant to Minnesota Statute Chapters 103B, 103C, and 103D and with public drainage systems pursuant to Minnesota Statute 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 chapters 103B, 103C, or 103D to serve as substitutes for one another or be replaced with a comprehensive watershed management plan," also known as the "One Watershed, One Plan".

WHEREAS, it is understood by all the parties to this Agreement that the One Watershed, One Plan for the Cannon River Watershed Planning Area does not replace or supplant local land use, planning, or zoning authority, but, instead, provides a framework to provide increased opportunities for cooperation and consistency on a watershed basis.

WHEREAS, it is understood by all parties to this Agreement that the One Watershed, One Plan for the Cannon River Watershed Planning Area is intended to provide a framework for consistency and cooperation 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.

NOW, THEREFORE, in consideration of the mutual promises and benefits that the parties shall derive herefrom, all parties hereby enter into this joint powers agreement for the purposes herein.

I. Purpose.

The purpose of this Agreement is to establish a joint powers board that will (1) exercise leadership in the development of policies, programs and projects that will promote the accomplishment of the purposes found at Minn. Stat. § 103B, including the preparation, adoption and implementation of the plan required by Minn. Stat. § 103B.801 for the Cannon River Watershed Planning Area and (2) guide and assist the parties in acting jointly and individually to take actions that will promote the goals listed in Minn. Stat. §103B.801 and fulfill their responsibilities under Chapter 103B.

II. Joint Powers Board.

A. Creation and Composition of Joint Powers Board.

A joint powers board, known as the Cannon River Watershed Joint Powers Board (CRWJPB), is established for the purposes contained herein with the powers and duties set forth in this Agreement.

The CRWJPB shall be comprised of up to 14 qualifying members with membership composed of the following eligible members: one (1) County Commissioner from each qualifying County, one (1) Soil and Water Conservation District Supervisor from each qualifying County, one (1) Manager from the qualifying Watershed District, and one (1) Manager from the Watershed Management Organization with the respective individual representatives designated by the governing board of each qualifying member local unit of government.

B. Terms.

Each representative shall be appointed for a two-year term, with the ability of a member to appoint a representative for successive terms. In the event that any representative was not appointed by the governing board of each respective member or prior to expiration of the representative's term, the incumbent representative shall serve until a successor has been appointed.

C. Vacancies.

If a representative resigns or is otherwise unable to complete a term on the CRWJPB because of the circumstance outlined in Minn. Stat. §351.02 exist or if a representative fails to qualify or act as a representative, the CRWJPB will advise the appointing authority of the vacancy as soon as practicable and the vacancy will be filled according to the requirements of the respective local unit of government.

D. Chair and Vice-chair.

The CRWJPB shall elect a chair and a vice-chair from its membership for one-year terms.

The chairperson shall serve as chairperson for all meetings and sign and deliver in the name of the CRWJPB any correspondence pertaining to the business of the Cannon River One Watershed, One Plan and shall perform other duties and functions as may be determined by the CRWJPB.

The vice-chair shall discharge the chairperson's duties in the event of the absence or disability of the chairperson

E. Secretary.

The CRWJPB shall elect a secretary from its membership for a one - year term.

The secretary shall: maintain records of the CRWJPB; certify records and proceedings of the CRWJPB; ensure that minutes of all CRWJPB meetings are recorded and made available in a timely manner to the CRWJPB, and maintain a file of all approved minutes including corrections and changes; provide for proper public notice of all meetings; and the secretary may delegate a representative to record the minutes and perform other duties of the secretary. The elected secretary will sign the official minutes of all meetings following approval by the CRWJPB.

F. Treasurer:

The CRWJPB shall elect a Treasurer from its membership for a one - year term.

The Treasurer shall assist the Chair in overseeing the CRWJPB budget and finances. In absence of the Chair or Vice Chair, the Treasurer shall preside over the CRWJPB meetings.

G. Meetings.

All meetings of the CRWJPB shall comply with statutes and rules requiring open and public meetings.

The conduct of all meetings of the CRWJPB shall be generally governed by the most recent edition of Robert's Rules of Parliamentary Law.

A quorum of the CRWJPB shall consist of a simple majority of the members. A quorum shall consist of 50 percent, plus one of the total membership.

All votes by CRWJPB members or alternate member shall be made in person.

Notice of CRWJPB meetings and a proposed agenda shall be mailed to all Board members not less than five (5) days prior to the scheduled meeting date of the Policy Committee.

The minutes of any meeting shall be made available to all CRWJPB members prior to the next meeting.

All regular meetings of the CRWJPB will be held at a Rice County Government Services Building. The CRWJPB, at its own discretion, may change the location.

H. Voting.

Each representative who is present shall be entitled to one vote.

A motion or resolution shall be approved by a favorable vote of a simple majority of the members present, provided enough members are present to make a quorum.

A supermajority vote of 75 percent of those members present shall be required for final plan submittal or changes to the bylaws or Joint Powers Agreement.

I. Staff.

The CRWJPB shall not have authority to hire staff. Any staff providing services in conjunction with this Agreement shall remain an employee of the respective member entity.

J. Duties of the CRWJPB.

The CRWJPB shall have the responsibility to prepare, adopt and implement a plan for the Cannon River Watershed Planning Area that meets the requirements of Minn. Stat. § 103B.801. with the exception of separate jurisdictional authorities granted to the North Cannon River Watershed Management Organization and the Belle Creek Watershed District.

Upon adoption of a watershed plan, the CRWJPB may amend the watershed plan without approval from the governing boards of individual members

III. Powers of the CRWJPB.

A. General Powers.

The CRWJPB is hereby authorized to exercise such authority as is necessary and proper to fulfill its purposes and perform all duties described herein. Such authority shall include, but not be limited to, authority and responsibility to oversee revenues and expenditures.

B. Contracts.

The CRWJPB may enter into any contract necessary or proper for the exercise of its powers or the fulfillment of its duties and enforce such contracts to the extent available in equity or at law. Additionally, the CRWJPB may enter into agreements pursuant to Minn. Stat. § 471.59. The CRWJPB may approve any contract consistent with goals of the CRWJPB and may authorize its chair to execute these contracts.

The CRWJPB shall pay to any member services performed consistent with the purpose of this Agreement or contractors for services performed pursuant to contract. No payment on any invoice for services performed by a member, consultant, contractor, or any other person or organization providing services in connection with this Agreement shall be authorized unless approved by the CRWJPB. The CRWJPB may develop a process to expedite payment of invoices but any such payments shall be ratified by the CRWJPB at their next meeting.

C. Funds.

The CRWJPB may disburse funds in a manner which is consistent with the Agreement and with the method provided by law for the disbursement of funds by the parties to this Agreement.

D. Bylaws.

The CRWJPB shall have the power to adopt and amend such bylaws that it may deem necessary or desirable for the conduct of its business. Such bylaws shall be consistent with this Agreement and any applicable laws or regulations.

E. Grants and Loans.

The CRWJPB may apply for and accept gifts, grants or loans of money, other property or assistance from the United States government, the State of Minnesota, or any person, association or agency for any of its purposes; enter into any agreement in connection therewith; and hold, use and dispose of such money, other property and assistance in accordance with the terms of the gift, grant or loan relating thereto.

F. Property.

The CRWJPB has no authority to purchase property or equipment. Any property or equipment that is provided to the CRWJPB to accomplish the goals of the One Watershed One Plan shall continue to be owned by the entity providing such property or equipment for use by the CRWJPB.

G. Insurance.

The CRWJPB may obtain any liability insurance or other insurance it deems necessary to insure itself for any action arising out of this Agreement.

H. Exercise of Powers.

All powers granted herein shall be exercised by the CRWJPB in a fiscally responsible manner and in accordance with the requirements of law.

I. Public Participation.

The CRWJPB shall provide for such public participation in the conduct of its activities as will promote understanding of its activities among the public and local governmental units affected by its activities and the informal resolution of disputes or complaints.

IV. Reservation of Authority.

All responsibilities not specifically set out to be jointly exercised by the CRWJPB under this Agreement are hereby reserved to the respective governing bodies of the members.

V. Budgeting and Funding.

A. Budget.

Annually, the CRWJPB shall adopt a budget.

B. Funding.

The CRWJPB has no authority to levy taxes. Local funding may be provided by establishing a "membership dues" system payable by March 15 of each year.

The amount of membership dues will be based on a tiered approach established by the percentage of land each member has within the Cannon River Watershed Planning Area subject to this agreement. The CRWJPB will have the authority to establish annual dues for each Member. When establishing annual dues, the following limits shall apply:

Tier 1 Membership dues will not exceed $5,000 annually. Tier 1 shall consist of members with more than 15% of total land within the Planning Area and includes Goodhue County, Goodhue SWCD, Steele County, Steele SWCD, Rice County and Rice SWCD.

Tier 2 Membership dues will not exceed $3,500 annually. Tier 2 shall consist of members with more than 8% but less than 15% of total land within the Planning Area and includes Le Sueur County, Le Sueur SWCD, Dakota County and Dakota SWCD.

Tier 3 Membership dues will not exceed $2,000 annually. Tier 3 shall consist of members with less than 8% of land within Planning Area and includes Waseca County and Waseca SWCD.

Tier 4 Membership dues will not exceed $500 annually. Tier 4 shall consist of Belle Creek Watershed District and North Cannon River Watershed Management Organization.

C. Administrator, Fiscal Agent and Legal Counsel.

The CRWJPB may enter into agreement with one or more of its members, or select a contractor, to carry out administrative, fiscal, and legal services.

D. Accountability.

All funds shall be accounted for according to generally accepted accounting principles.

E. Debts.

The CRWJPB may not incur debts.

VI. Committees.

A. Creation.

To expedite and facilitate the business of the CRWJPB and the orderly and efficient consideration of matters coming before it, the CRWJPB may create committees as it deems necessary to review and examine specific issues or topics of concern. The Chair, or by a majority vote of the CRWJPB, may appoint standing or ad hoc committees to address issues or facilitate the CRWJPB activities.

B. Member Selection.

Any committee must include at least one CRWJPB member or proxy. A committee should also include other related service providers and subject matter experts.

C. Officers.

The CRWJPB Chair shall appoint the Chair and Vice Chair of a committee or a pair of Co-Chairs at his/her discretion.

D. Member Resignation.

A committee member may resign at any time from the subcommittee upon providing 30 days written notice.

E. Member Removal.

Any member of a committee who is not a member of the CRWJPB may be removed by a two-thirds majority vote of the members present at a scheduled CRWJPB meeting. For this purpose, each CRWJPB member is provided one vote.

F. Conflict of Interest.

Persons who have a private pecuniary or property interest in an issue(s) or topic(s) under the subject matter of a committee's work shall not serve as a member of such committee or subcommittee.

VII. 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. la(a). For purposes of Minnesota Statutes§ 471.59, subd. la(a) it is the intent of each party that this Agreement does not create any liability or exposure of one party for the acts or omissions of any other party.

VIII. Records Retention and Data Practices.

The parties agree that records created pursuant to the terms of this Agreement will be retained in a manner that meets their respective entity's records retention schedules that have been reviewed and approved by the State in accordance with Minnesota Statutes§ 138.17. The Parties further agree that records prepared or maintained in furtherance of the agreement shall be subject to the Minnesota Government Data Practices Act.

IX. Duration.

This Agreement is effective and binding on all members upon the date of the last signature required all members. All members need not sign the same copy. This Agreement may be executed in one or more counterparts, each of which shall be deemed an original and all of which when taken together shall constitute one and the same agreement. Any counterpart signature transmitted by facsimile or by sending a scanned copy by electronic mail or similar electronic transmission shall be deemed an original signature.

This signed Agreement shall be filed with the responsible authority for records retention and data practices, which shall notify all members in writing of its effective date.

This Agreement shall continue until terminated in the manner provided herein.

X. Termination, Withdrawal, Amendments.

A. Termination.

This Agreement may terminate upon the occurrence of any one of the following events, whichever occurs first:

When necessitated by operation of law as result of the decision by a court of competent jurisdiction; or

When necessary due to failure to obtain necessary funding from the members or grant funding from the State of Minnesota or the United States government or other sources, or

When a majority of members agree by resolution to terminate the agreement upon a certain date.

B. Withdrawal.

Any member may withdraw from this Agreement upon 90 days written notice.

A withdrawing member shall not be entitled to the distribution of any assets or funds.

In the event of withdrawal by any member, this Agreement shall remain in full force and effect as to all remaining members.

C. Adding Additional Parties.

A qualifying party within the Cannon River Watershed Planning Area that is responsible for water planning and resource management under Minnesota State Statutes 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 CRWJPB to join the One Watershed, One Plan for the Cannon River and a statement that the qualifying party agrees to abide by the terms and conditions of this Agreement; including but not limited to the bylaws, policies and procedures adopted by the CRWJPB.

D. Amendments.

Upon recommendation from the CRWJPB for changes to this agreement, this Agreement may be changed, amended, modified, or replaced by an amendment or addendum document or by an entirely new Joint Powers Agreement.

Any changes, amendments, or modifications to this Agreement may only be by, and are effective only when reduced to writing and approved and signed by all members hereto.

XI. Distribution of Surplus Funds and Property.

Upon termination of this Agreement, funds and property held by the CRWJPB shall then be distributed to members in proportion to their contributions.

IN WITNESS WHEREOF, the parties have executed this Agreement on the dates indicated below.

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 Date

BY: ____
District Manager/Administrator Date

APPROVED AS TO FORM *(use if necessary)*

BY: ____
County Attorney Date

APPENDIX G:
BCWD – Agreements and Rules

4-17-71
KWB

BELLE CREEK WATERSHED DISTRICT
GOODHUE COUNTY, MINNESOTA

April 5, 1971

Dear Sir:

Attached is a copy of the rules and regulations of the Belle Creek Watershed District which were adopted on April 3, 1971.

Please destroy any copy of the proposed rules previously sent to you, changes were made. The rules as adopted by the Board of Managers contain the changes.

Very truly yours,

Conrad Rapp

Conrad Rapp
Secretary, Board of Managers
Belle Creek Watershed District
RR 2 Cannon Falls, Minn. 55009

RULES AND REGULATIONS
OF
BELLE CREEK WATERSHED DISTRICT

1. Introduction:

The following rules and regulations of the Belle Creek Watershed District and any subsequent rules and regulations supplementary thereto are adopted to effectuate the purposes of M. S. Chapter 112 and the authority of the managers therein prescribed and to thereby implement and make more specific the law administered by them. It is the intention of the managers that no person shall be deprived or divested of any previously established beneficial use or right by any rule or regulation of the district without due process of law and that all rules and regulations of the district shall be construed according to said intention; and by the rules and regulations to assist in the orderly use and conservation of the waters of the district. If any rule or regulation is inconsistent with the provisions of M. S. Chapter 112 or other applicable law, the provisions of said Chapter 112 or other applicable law shall govern.

II. Rules and Regulations:

1. Surface water shall not be artifically removed from upper land to and across lower land without adequate provision being made on the lower land for its passage, nor shall the natural flow of surface water be artifically abstructed so as to cause an overflow onto the property of others.

2. Water inlets, culvert openings and bridge approaches shall have adequate shoulder and bank protection in order to minimize land and soil erosion.

Plans and specifications relating to the matters covered by this paragraph shall be submitted to the managers for their consideration and approval prior to construction and installation of any of the foregoing works.

3. In the interest of sanitation and public health and to prevent pollution to the waters of the district, all septic tanks and drainfields which outlet directly or indirectly into the waters of the district shall be constructed and maintained in accordance with the rules and recommendations of the State Board of Health and the Minnesota Pollution Control Agency as modified by the appropriate zoning ordinance of Goodhue County. No septic tank or other waste disposal facility shall outlet directly into any lake, watercourse or public or private drainage system.

4. No reservoir for the impoundment of water may be constructed, removed or abandoned without a permit from the managers; nor shall any dam be constructed to impound water without a permit from the managers.

5. No bridge or culvert and no drain for the disposal of stormwaters, public or private, shall be constructed, reconstructed, laid or maintained in, to or across any stream or public or private drain unless it has an adequate waterway opening. No bridge or culvert or drain for the disposal of storm water shall be constructed,

reconstructed or laid without the approval of the managers as to its location, the dimensions of the waterway opening, its base elevation and a permit for the installation thereof from the managers. Plans and specifications for a bridge, culvert or drain for the disposal of storm waters shall be submitted to the managers when an application for a permit is filed.

6. To prevent obstruction to flood waters a permit shall be required from the managers for the construction of any building within the flood plain of Belle Creek. All plans for the construction of any building of any kind within the flood plain shall be submitted to the managers for their approval when application for the permit is made.

7. In the interest of sanitation and public health and to prevent pollution of the waters of the district, no owner of land, his agent or tenant, and no municipality or community, incorporated or unincorporated, and no other entity or group of persons shall dispose of any waste, human, animal or industrial by casting such waste directly or indirectly into any lake or stream, public or private drainage system or road ditch within the district and thereby pollute the waters of the district. In addition to the foregoing, the applicable rules and regulations of the State Board of Health and of the Minnesota Pollution Control Agency as modified by the appropriate zoning ordinance of Goodhue County are, by reference thereto herein, hereby adopted as rules and regulations of the district within the limits of the statutory authority granted to the managers.

8. In order to preserve the same for beneficial use;

(a) No person, partnership, association, private or public corporation, shall change or diminish the course, current or cross-section of any public waters within the watershed district without a permit from the Commissioner of Natural Resources as provided by M. S. sec., 105.42 and a permit from the Managers of the Watershed District.

(b) No person, partnership, association, private or public corporation, shall alter, change, enlarge, diminish, straighten, deepen or otherwise dig in or interfere with the beds, banks and shores of any stream or watercourse within the watershed district without a permit from the Managers of the Watershed District.

9. In the interest of sanitation and public health, and to assist in regulating and conserving the flow of streams and watercourses in the district, no person, partnership, association, private or public corporation, shall abandon, deposit or dispose of any waste, litter, garbage, junk or debris from any source, of whatsoever composition, natural or artificial, directly or indirectly into the waters of the streams of the district, not to deposit and abandon the same in such a place and manner that it is capable of entering or being cast into said waters by any natural or artificial means.

10. All applications for a permit shall be substantially in the following form:

APPLICATION FOR PERMIT

To the Board of Managers of the Belle Creek Watershed District

Your applicant, ____

with residence at ____

Post Office address ____________________________, Phone No.________

______________________, represents:

1. That he is the owner of ___________________________ situated in

____.

2. That he proposes to do the following work: ____________________

____

____

3. That said work is necessary because __________________________

____

____

4. That attached hereto is all pertinent information relative thereto.

5. That said work is in accordance with the purposes and overall plan of the district.

6. That he hereby applies for a permit to proceed with said work.

Dated ______________________________

____

PERMIT

The following permit is hereby granted to ____________________

____

to do the following work of improvement to be located ____________

____

The work for which this permit is granted consists of ____________

____

____

____

____

____

This permit is subject to the following conditions:

1. That the permittee and his agents conform to all legal and other statutory requirements.

2. ____

____

3. ____

____

4. ____

____

Dated ______________________________.

BOARD OF MANAGERS
BELLE CREEK WATERSHED DISTRICT

By________________________________

____

APPLICATION FOR PERMIT

To the Board of Managers of the Belle Creek Watershed District

Your applicant, ____

with residence at ____

Post Office address __________________________, Phone No.________

______________________, represents:

1. That he is the owner of _________________________ situated in

________________________________.

2. That he proposes to do the following work: ___________________

____

____

3. That said work is necessary because __________________________

____

____

4. That attached hereto is all pertinent information relative thereto.

5. That said work is in accordance with the purposes and overall plan of the district.

6. That he hereby applies for a permit to proceed with said work.

Dated ___________________________

____