M.L. 2014 Project Abstract
For the Period Ending June 30, 2017

PROJECT TITLE: Southeast Minnesota Watershed Protection Plan
PROJECT MANAGER: Richard L. Biske
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FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2014, Chp. 226, Sec. 2, Subd. 06e

APPROPRIATION AMOUNT: $200,000
AMOUNT SPENT: $150,624
AMOUNT REMAINING: $49,376

Overall Project Outcomes and Results

Despite extensive watershed planning in Minnesota, much of the efforts to date have focused on the restoration of impaired waters. Many watersheds in Minnesota have relatively healthy, unimpaired minor watersheds or sub-watersheds. These watersheds often have considerable private ownership with upland habitat, perennial vegetation or compatible land use that is resulting in clean, unimpaired waters. Yet, these landowners with existing habitat on their properties can be overlooked for conservation assistance for water quality purposes.

This project completed healthy watershed plans or Landscape Stewardship Plans (LSPs) for the Cannon and Zumbro Rivers in Southeastern Minnesota. The LSPs for the watersheds included several GIS analyses identifying ecosystem services of natural communities and priority habitat complexes within a watershed context. This information was used to prioritize Conservation Opportunity Areas (COAs) within each watershed. The plans identified a combined 589,396 priority acres out of 1,849,500 acres studied across 11 COAs encompassing minor watersheds. Four COAs were selected within the Cannon River covering 277,196 acres or roughly 30% of the watershed. Seven smaller COAs were identified within the Zumbro River watershed covering 312,200 acres or 34% of the watershed. These COAs provide guidance on protecting and restoring the most important watersheds and identified properties within them to meet multiple watershed conservation goals including water quality, upland and aquatic habitat and recreation.

The project resulted in 20 property-wide stewardship plans covering 3,000 acres listing a range of management practices for unique zones on each property. In addition to the stewardship plans 20 Conservation Action Plans (CAP) for 168 acres were developed. The CAPs can be used to apply for and implement state and federal cost-share programs for activities like prescribed fire, invasive species control and tree thinning for forest stand improvement.

The 2014 Clean Water Accountability Act and subsequent Nonpoint Funding Prioritization Plan directed state agencies to target restoration activities to those impaired waters that are closest to meeting Minnesota water quality standards and to protect those high - quality unimpaired waters at greatest risk of becoming impaired. The watershed planning approach utilized in this project prioritizes functional landscapes for healthy watershed protection as an important component to the Watershed Restoration and Protection Strategies and One Water One Plans developed by state and local partnerships. To date watershed planning has focused on the more costly aspect of restoring highly degraded waters, not those in need of protection to prevent impairment. By focusing limited technical and financial resources on intact functional landscapes and the clean waters they support, costly restoration can be avoided and ecosystem services can be maintained. This project provides an actionable plan for the

Cannon and Zumbro Rivers and a process for other watersheds to achieve the goals of the Clean Water Accountability Act and Nonpoint Funding Prioritization Plan.

Project Results Use and Dissemination

Plans along with supplemental materials have been prepared to disseminate the most important content of the LSPs to relevant stakeholders and conservation planners. Landscape Stewardship Planning is being recognized as a valuable resource in watershed based plans in SE Minnesota, including the Cannon and Zumbro Watersheds. Both LSPs have been incorporated by reference into the corresponding Watershed Restoration and Protections Strategies (WRAPS) documents for the Cannon and Zumbro Watersheds. The Cannon River Watershed is now beginning the process of adopting a One Watershed One Plan (1W1P), and the technical committee has already been given a presentation on the LSP. The contributions of key partners and stakeholders in developing the plans will also increase their dissemination, as future partners recognize their own contributions and “buy in” to the process.

While the LSPs themselves are targeted at a more technical audience for use in conservation planning, the goals and themes of good stewardship of natural communities for watershed protection have been distributed to a general audience through landowner field days held in the Cannon River Watershed.

Environment and Natural Resources Trust Fund (ENRTF)
M.L. 2014 Work Plan

Date of Report: 8/15/17 revised 12/14/17

Date of Next Status Update Report: None

Date of Work Plan Approval: June 4, 2014

Project Completion Date: June 30, 2017

Does this submission include an amendment request? No

PROJECT TITLE: Southeast Minnesota Watershed Protection Plan

Project Manager: Richard Biske

Organization: The Nature Conservancy

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Location: Rice, Dakota, Goodhue, Olmsted, Wabasha, Winona,

Total ENRTF Project Budget:	**ENRTF Appropriation:**	**$200,000**
	Amount Spent:	**$150,624**
	Balance:	**$49,376**

Legal Citation: M.L. 2014, Chp. 226, Sec. 2, Subd. 06e

Appropriation Language:

$200,000 the second year is from the trust fund to the commissioner of natural resources for an agreement with The Nature Conservancy to provide a framework and plans for the protection and stewardship of unimpaired waters in southeast Minnesota. The result will be a template for watershed protection in Minnesota. This appropriation is available until June 30, 2017, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Southeast Minnesota Watershed Protection Plan

II. PROJECT STATEMENT: To date the majority of watershed conservation efforts are directed toward impaired waters. At a time when agricultural lands within the region are managed more intensively, the ecosystem services provided by the region's natural areas cannot be understated. Protection and proper stewardship of the region's natural areas is important for maintaining what is left of the region's unimpaired waters. It is much more cost-effective to protect habitat and water resources before they are degraded.

The Blufflands of Southeast Minnesota are home to more Species of Greatest Conservation Need than any other ecological subsection in Minnesota. The unique habitats like oak savannas and hickory forests, have been recognized for the wildlife habitat they provide. These same unique habitats when protected and managed responsibly, can maintain healthy rivers. Ecologically sensitive lands continue to be converted to rural residential housing and expanded agricultural production while many private lands are subject to poor management. Each of Southeast Minnesota's major rivers is impaired for turbidity and has suffered from significant flood events in recent years. The project will utilize existing datasets including the Minnesota Biological Survey, the Ecological Ranking Tool and Geologic Atlas to develop a watershed protection framework and tools necessary to keep healthy waters healthy. This project will use a process supported by the US Forest Service and will provide strategic direction for existing state and federal cost-share programs while increasing likelihood of new/additional federal cost-share from the USDA NRCS' Driftless Area Landscape Conservation Initiative.

III. PROJECT STATUS UPDATES:

Project Status as of: January 31, 2015

The new TNC SE Minnesota Conservation Coordinator, who will carry out most of this work plan has been brought on-board. The Watershed Partnerships for each watershed have been contacted, we will leverage their contacts to facilitate outreach to other key partners. The process of acquiring water quality data has been started for each watershed.

Project Status as of: July 31, 2015

Most of the core spatial data have been gathered. Active River Analysis (ARA) is nearly complete for the Zumbro River Watershed and in progress for the Cannon River Watershed. Core partners in each watershed (PCA staff and watershed partnerships) have been engaged, and broader partner engagement is ongoing. The TNC SE MN Conservation Coordinator is engaged in the Cannon River WRAPS process to ensure the LSP strategies will be integrated into the WRAPS and future local water plans/1W1P.

Amendment Approved by the LCCMR 8-4-2015):
The Nature Conservancy respectfully requests to divide the program manager responsibilities into two positions effective January 1, 2015. In fall of 2014 the original program manager was promoted to a director level position. His old position was filled with a conservation coordinator level position. Thus, the responsibilities under the original program manager position were divided into two positions to accomplish this work plan, the program director and conservation coordinator. So, this is not a programmatic or budget change, the grant scope of work and budget remains the same.

Project Status as of: January 31, 2016
Geospatial analysis of priority areas is complete in preliminary form, and meetings with stakeholders for feedback and input are ongoing. ARA for Zumbro River Watershed is being revised with better fitting elevation data. Cannon River Watershed ARA is nearly complete. Work on Cannon River Watershed LSP has been coordinated with the WRAPS process in order to include priorities developed into the local water planning process. Engagement with local partners is in progress to develop strategies for priority area protection and coordination.

Amendment Request (01/31/2016): Amendment approved by LCCMR 2-10-2016
The Nature Conservancy respectfully requests to move some of the activities proposed for Contract Landscape Ecologist to be performed by The Nature Conservancy's staff Ecologist effective February 1, 2016. At the time of the original work plan development TNC's ecologist was committed for research projects elsewhere and can now work on this project. So, this is not a programmatic or budget change, the grant scope of work and budget remains the same except for a shift of some contract funds to personnel.

Project Status as of: July 31, 2016

Draft Conservation Opportunity Areas (COAs) have been delineated for the Cannon River Watershed. Cannon River Active River Area is complete. An initial Zumbro River priority analysis, and is now being discussed with partners in order to delineate COAs for that watershed as well. Some language has been drafted for the reports. Sub-contracts are being developed to draft the final Landscape Stewardship Plan/Watershed Protection Plan. Contracts are also being developed to write additional site level plans for private lands within Conservation Opportunity Areas.

Project Status as of: January 31, 2017

Watershed plan drafts are in progress. Watershed overview and draft goals are in place for the Cannon Landscape Stewardship Plan (LSP). Work on those sections is in progress on the Zumbro. Draft Conservation Opportunity Areas (COAs) for both watersheds have been chosen, and are being shared with partners for review. Steering committees for each watershed to review and provide additional input for LSPs are close to final. Four stewardship plans have been finished for landowners in the West Indian Creek watershed, one of the COAs for the Zumbro River. Additionally, a consultant forester is under contract and making progress getting commitments from other landowners in the Cannon and Zumbro watersheds for the remaining stewardship plans. Field work for one plan is completed, and two other landowners have committed to having a plan prepared. Additionally, there are 12 other landowners with identified plan needs that will be contacted by the end of February. The Nature Conservancy's Southeast Minnesota Conservation Coordinator is now working with watershed partnership groups to schedule landowner workshops in both watersheds.

Amendment Request (04/28/2017):
The Nature Conservancy respectfully requests to contract for assistance organizing public workshops and field days as described in Activity 2, Outcome 3. The Nature Conservancy will contract with the Cannon River Watershed Partnership and Zumbro Watershed Partnership the first and second project partners identified in Section VII of the proposal. So, this is not a programmatic or budget change, the grant scope of work and budget remain the same except for a shift of personnel funds to contract.

In addition to the above amendment, due to increased cost for technical assistance to landowners, we request an increase in the contract amount to Consulting Forester/Steward Activity 2, Outcome 1 & 2. This too is not a programmatic change; the grant scope of work and budget remains the same except for a shift of personnel funds to contract.
Amendment Approved: [05/08/2017]

Amendment Request (01/16/2018)
The Nature Conservancy respectfully requests an amendment to shift funds from personnel to Professional/Technical/Service Contracts. The contracted Landscape Ecologist was able to provide extra services, specifically the creation of companion documents to each Landscape Stewardship Plan, to help spread awareness of both plans and their goals and strategies, as well as a "lessons learned" document to provide guidance for additional LSP development in future watersheds. These extra services increased the cost, which we failed to adjust in our LCCMR project budget at the time.

Project Status as of: July 31, 2017

The project is now complete. Landscape Stewardship Plans (LSP) have been completed for both the Cannon and Zumbro River Watersheds. The Landscape Stewardship Plans benefit from several GIS analyses performed by TNC staff, as well as St. Mary's University of Winona Geospatial Services (GSS), including Active River Area Analyses, protection priority complex identification, and an analysis of ecosystem services provided by natural lands with the Blufflands subsection. Within each LSP are Conservation Opportunity Area plans that do a more spatially precise analysis to identify specific features for protection and the most important parcels for action. Additionally, accompanying documents for each LSP have been completed, including a one-page tri-fold brochure describing the plans and their contents, and a long 6 page executive summary document that provides a more in-depth introduction to the plans, their goals, and their contents. These accompanying documents will greatly aid plan distribution, providing short summaries that will be made available to local water planning staff and stakeholders, as well as other relevant local conservation planners and decision makers. A review document of the Landscape Stewardship Planning process in SE Minnesota was also produced to capture some lessons learned from doing this collaborative, watershed based protection planning.

Implementation of these LSPs began with the Phase Two activities of this grant. TNC contracted with a consulting forester to prepare 20 site-level private stewardship plans for landowners in priority areas in the Cannon and Zumbro River Watersheds, and 20 more detailed Conservation Action Plans (CAPs). These were completed in June of 2017. Through a partnership with the Cannon River Watershed Partnership (CRWP), three landowner field days were also held within three different COAs within the Cannon River Watershed. These field days featured examples of several different stewardship practices of beneficial perennial plant communities on properties owned for a range of purposes, from recreation and natural community restoration to a working farm producing pasture-raised beef cattle.

In lieu of the 3 planned landowner field days, Conservancy staff made a decision to prioritize several public events held in the Zumbro Watershed over the past two years that have provided opportunities to highlight the practices and priorities called out in the LSPs. TNC staff has given presentations relating to good private land stewardship at the 2016 and 2017 Wabasha County Forestry Day. Additionally, the Southeast Landscape Committee of the Minnesota Forest Resources Council organized a site tour of several land management practices that benefit natural communities in places critical to water quality. While these presentations were not organized as a part of this project, TNC was involved in their execution, and they resulted in landowner discussions about good land stewardship.

Overall Project Outcomes and Results:

Despite extensive watershed planning in Minnesota, much of the efforts to date have focused on the restoration of impaired waters. Many watersheds in Minnesota have relatively healthy, unimpaired minor watersheds or sub-watersheds. These watersheds often have considerable private ownership with upland habitat, perennial vegetation or compatible land use that is resulting in clean, unimpaired waters. Yet, these landowners with existing habitat on their properties can be overlooked for conservation assistance for water quality purposes.

This project completed healthy watershed plans or Landscape Stewardship Plans (LSPs) for the Cannon and Zumbro Rivers in Southeastern Minnesota. The LSPs for the watersheds included several GIS analyses identifying ecosystem services of natural communities and priority habitat complexes within a watershed context. This information was used to prioritize Conservation Opportunity Areas (COAs) within each watershed. Four COAs were selected within the Cannon River covering 277,196 acres or roughly 30% of the watershed. Seven smaller COAs were identified within the Zumbro River watershed covering 312,200 acres or 34% of the watershed.

The project resulted in 20 property-wide stewardship plans covering 3,000 acres listing a range of management practices for unique zones on each property. In addition to the stewardship plans 20 Conservation Action Plans (CAP) for 168 acres were developed. The CAPs can be used to apply for and implement state and federal cost-share programs for activities like prescribed fire, invasive species control and tree thinning for forest stand improvement.

This watershed planning approach prioritizing functional landscapes for healthy watersheds protection is an important component to the Watershed Restoration and Protection Strategies and One Water One Plans developed by state and local partners. By focusing limited technical and financial resources on intact functional landscapes and the clean waters they support costly restoration can be avoided and ecosystem services can be maintained.

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Landscape Stewardship Plans (Lower Mississippi River Tributaries including Cannon and Zumbro Rivers)

Description:

Complete landscape stewardship plans for each watershed with detailed ecological assessments and protection strategies for high biodiversity sub-basins and associated habitats. Landscape Stewardship Plans (LSPs) have been recognized and supported by the US Forest Service and MN Forest Resources Council (MFRC) in the Root River, Camp Ripley and Whitewater River watersheds. LSPs serving as watershed protection plans will be developed for the Cannon and Zumbro watersheds. LSPs developed will inform MPCA's Watershed Restoration and Protection (WRaP) strategy and local water plans as the protection component. WRaPs are intended to identify watershed protection strategies for unimpaired waters in addition to restoration and source reduction strategies for impaired waters. To date protection strategies for unimpaired waters are often lacking in watershed plans.

Landscape Stewardship Plans will provide a framework for the long-term stewardship and protection of priority sub-watersheds. The landscape stewardship approach is predicated on the likelihood that different stakeholders will be satisfied by common solutions. This approach follows five general principles in developing and applying these solutions:

- Invest in priority areas – be strategic.
- Build a collaborative network – create ownership in the process and leverage resources.
- Appeal to self-interest – understand stakeholder motivations and needs.
- Manage for results – align actions with objectives and evaluate outcomes.
- Encourage flexibility at all levels – be adaptive; every situation is unique.

Activities:

Stakeholder Engagement – The Nature Conservancy Staff

The Nature Conservancy's Southeast Minnesota Conservation Coordinator will meet individually and collectively with stakeholders in the project areas. Primary stakeholders include: Minnesota Pollution Control Agency, Soil and Water Conservation Districts, Department of Natural Resources Forestry, Ecological and Water Resources and Fisheries, Watershed Partnerships, citizen groups, user groups, non-government conservation groups and individual watershed landowners. TNC staff will conduct an Active River Area analysis and a contract plan writer will conduct some of the watershed analysis using Geographic Information System (GIS) mapping. Resource prioritization and attribute weighting will be done with the influence of the above mentioned stakeholders to prioritize areas and strategies. Conservancy staff will facilitate discussions related to analysis and prioritization, ensuring stakeholder input is recognized. Conservancy staff will ensure input, analysis and products are compatible with complementary efforts and plans including Watershed Restoration and Protection Plans, 1 Water 1 Plan or Local Water Plans. Each minor watershed (approximately 10,000 to 15,000 acres in size) within the large major watershed will be ranked for protection and restoration.

Landscape Stewardship Plan –TNC Ecologist

A contracted plan writer will conduct watershed analysis that includes several datasets, including, but not limited to:

Environment and Natural Resources Trust Fund (ENRTF)
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GIS Products	Land Ownership	Aquatic Attributes	Terrestrial Attribute
Active River Area analysis	State Land	Index of Biotic Integrity (IBI)	land cover/use
LiDAR derived terrain analysis	Parcel Size	Trends in Nitrogen, Phosphorous, Bacteria	Existing Conservation Practices
Environmental Benefits Index (EBI)	Conservation Easements	Trends in Turbidity and Suspended Solids	Native Plant Communities
	Existing Stewardship Plans	Natural Heritage Data Element Occurrence (fish and mussels)	Natural Heritage Data Element Occurrence
		Hydrology (where available)	
		Spring Shed Maps	
		Karst Features	
		Vulnerable Groundwater Zones	

Ecological Assessment and Sub-basin Protection Plan – The Nature Conservancy Staff
Priority sub-basins within the larger watersheds will be ranked in order based on relative watershed health. Priority watersheds will be described in greater detail in this section. Each of the watershed attributes listed above will be described in greater detail, quantified and function/interconnectedness described for each minor watershed. The sub-basin assessments and protection plans will include parcel specific conservation activities as a means of estimating conservation needs and costs associated with outreach, technical assistance and implementation.

Summary Budget Information for Activity 1:

ENRTF Budget: **$ 161,000**
Amount Spent: **$ 119,654 revised final based on final fringe benefits**
Balance: **$ 41,346 revised final based on final fringe benefits**

Activity Completion Date: June 30, 2016

Outcome	Completion Date	Budget
1. *Engage stakeholders:* *Zumbro and Cannon River Watershed Partnerships will be contacted for a summary of existing data, plans and activities. DNR Fisheries, Eco Waters and Forestry will be contacted for GIS data and MPCA will be contacted for summarized water resources data. Each agency and partner will asked for relevant data and expert opinion. Additional partners, including SWCDs, active landowners, NRCS and others will be sought for input on the plan activities and input on review*	*January 2015*	$ 15,000
2. *Landscape Stewardship/Watershed Protection Plans for Cannon and Zumbro Watersheds:*	*January 2016*	$ 100,000

Stewardship plans will include watersheds ranked from protection to restoration and a description of watershed function.		
3. Ecological Assessment and Sub-basin Protection Plan: Detailed plans for priority sub-basins including recommended protection and management activities based on aquatic and terrestrial assessments.		$46,000

Project Status as of: January 31, 2015

1. Some of the data for each watershed has been collected, however more will be collected in the next month. Existing watershed and county water plans and reports have been collected for use in the Landscape Stewardship Plan. More partner engagement will be required in the next month.

Project Status as of: July 31, 2015

2. The majority portion of necessary data for each watershed has been collected. ARA analysis is nearly complete for the Zumbro River and in progress for the Cannon River Watersheds. Primary partner engagement has been completed, with each watershed partnership being included in early process planning, and PCA staff involved in provided data and discussions of analysis. The TNC Southeast MN Conservation Coordinator is also engaged in the Cannon River WRAPS process, ensuring that the Landscape Stewardship Plan will integrate well with the WRAPS document and future local water plans/1W1P (1 Watershed 1 Plan). The Southeast MN Conservation Coordinator has reviewed the most relevant plans to incorporate previous planning work into the LSPs as well. Ongoing engagement efforts to a broader suite of desired participants is in progress, and should be very active in the next month.

Project Status as of: January 31, 2016

3. Priority conservation area mapping for Cannon River Watershed is complete in preliminary form, with the results being discussed with local stakeholders and partners for feedback. Local partners are being engaged to develop strategies for identified priority areas. The Zumbro River ARA is currently being revised using a new elevation dataset to address some data flaws in the original analysis. The Cannon River ARA analysis is nearly complete, with riparian zones delineated, leaving wetflat areas to be designated according to connected stream order. Data organization for the Zumbro river priority mapping has begun and, that analysis will begin in earnest in the next few months, in order to be ready for use when the Zumbro Watershed begins its WRAPS process this year.

Project Status as of: July 31, 2016

4. Draft COAs have been designated for the Cannon River Watershed. Several meetings have occurred with key partners and reception has been positive, with one county discussing including the final plan into its County water plan. Meetings regarding COAs and the resources they contain have generated discussion on potential for future collaborative projects and programs. The Cannon River Active River Area is also now complete. Some report language has been drafted, though a sub-contractor will be hired for full plan composition. The Zumbro River priority analysis has preliminary results that are being discussed with partners in order to use them to delineate COAs in that watershed. This is occurring simultaneously with the WRAPS process in that watershed.

Project Status as of: January 31, 2017

5. Cannon River: A first draft of the main Landscape Stewardship Plan (LSP) has been completed by the contractor drafting the report. It is being reviewed by TNC staff, and will be sent to partners for review in the next two weeks. Four Conservation Opportunity Areas (COA) have been identified in the Cannon River Watershed, representing over 277,000 acres (total watershed area is 940,540 acres). See below for a description of Conservation Opportunity Areas.

Zumbro River: The first draft of the Landscape Stewardship Plan is currently in progress. Completion is expected by early March. Eight Conservation Opportunity Areas have been identified, representing nearly 300,000 acres (total watershed area is 900,000 acres).

These represent areas where the watershed remains healthiest. More specifically, where natural communities and other perennial vegetation are most prevalent, connected, and occur on the most critical areas for water quality protection, including riparian areas, steep and erodible slopes, and wetlands. The selection process also weighted catchments based on water quality, giving preference to areas protecting waters that are 1) above impairment but near the threshold, 2) below impairment but near the threshold, or 3) in very good condition. These priority areas will be targeted for protection and landowner outreach activities, as well as the focus of increased partner coordination.

Most or all of the COAs in each watershed will have smaller, individual protection strategies developed. This will be informed by a parcel-level analysis of conservation value to habitat and water quality of both protection and restoration currently being developed by a Nature Conservancy scientist. This will be used to identify the 10 to 20 most important parcels in each COA for outreach.

GIS analysis will estimate the value of ecosystem services currently being provided by the natural communities of the karst regions of the watersheds. This valuation will help demonstrate the necessity of protecting the ecological functions that are currently in place that help protect water quality in the region.

Final Report Summary:

6. The Landscape Stewardship Plans for both the Cannon and Zumbro River Watersheds are complete. They contain watershed wide strategies for natural community protection, as well as spatial analyses that identify the areas where those natural communities are in place in key positions within the watersheds. These priority areas represent places where conservation efforts will benefit multiple ecological and conservation interests, and appeal to a variety of environmental stakeholders, providing opportunities for collaboration and efficient use of resources.

   Several GIS analyses were performed that informed the development of the LSPs. Some, such as the above mentioned priority complex identification process, are central to the plan and are heavily represented within the text. Others, such as the analysis of ecosystem services of natural communities performed by St. Mary's University Geospatial Services (GSS), are mentioned more briefly in the plan, but were instrumental in adding scientific input into our goals and the prioritization of our strategies.

   In addition to the watershed wide strategies outlined in the main body of the LSPs, each also contain more detailed analyses and plans of some or all of the identified priority areas (called Conservation Opportunity Areas, or COAs). In the Cannon River Watershed, priority areas were more concentrated in four areas, and each COA received a detailed COA plan. In the Zumbro Watershed, complexes of conservation targets were more spread out, causing several (7) smaller COAs to be identified. Three COA plans were prepared, with some COAs being grouped together to get better coverage.

   In the Cannon River Watershed, four COAs were identified, totaling 277,196 acres, roughly 30% of the watershed. The largest of the four was the 98,306 acre Lakes/Headwaters region, which covers several minor watersheds in the headwaters of the Cannon river, as well as the upper reaches of two direct tributaries to the Cannon River. This area is distinct in having a high concentration of lakes. The smallest COA in the Cannon LSP is the 51,053 acre Big Woods COA, which includes Nerstrand Big Woods State Park, subwatersheds of Prairie Creek where intact riparian areas provide connected natural areas around the state park, and other important areas for biodiversity such as River Bend Nature Center near Fairbault.

In the Zumbro River Watershed, seven COAs were identified totaling 312,200 acres, or 34% of the total watershed, ranging in size from 19,462 acres to 61,463 acres. The largest is the Zumbro Falls COA, which includes and Lake Zumbro, as well as the confluences of both the Middle and North Forks of the Zumbro River with the main stem. The smallest is Rice Lake COA, which covers a small subwatershed surrounding Rice Lake on the western edge of the watershed, and represents an opportunity for headwaters protection and restoration around an important lake.

These COAs will help direct TNC's habitat protection and restoration funds in the two watersheds, providing our target areas for an ongoing program of protection, restoration, and enhancement funded by the outdoor heritage funds. The detailed plans prepared for the COAs included identification of the most important parcels within each, and these parcel lists can help local SWCDs and state agencies direct their outreach efforts for private landowner cost share programs to the most important tracts.

In describing Landscape Stewardship Planning, we identified five criteria which will help drive their success:

- Invest in priority areas – be strategic.
- Build a collaborative network – create ownership in the process and leverage resources.
- Appeal to self-interest – understand stakeholder motivations and needs.
- Manage for results – align actions with objectives and evaluate outcomes.
- Encourage flexibility at all levels – be adaptive; every situation is unique.

These plans accomplish those goals. The priority areas identified in the GIS analyses mentioned above will help us focus our resources where they are most needed, and can pay the most dividends. The selection of those areas was done collaboratively, be seeking out and receiving feedback from key partners such as multiple divisions of MN DNR, local Soil and Water Conservation Districts, watershed partnerships, and Minnesota Pollution Control Agency, to name a few. The collaborative network, with a stake in the identified priority areas, will help ensure implementation, as the priority areas are places where multiple stakeholder's self-interests intersect.

The specific numeric goals listed in the plans will allow us to manage for results, as we will be measuring our success against real targets that will work towards the plans ultimate goals. However, they leave room for the flexibility in implementation that will let us be adaptive as we respond to changing threats or opportunities.

Several companion documents were also prepared to complement the LSPs. These include two summary documents of different lengths- one two-sided single page brochure that provide a broad overview of the plans to be widely distributed to local conservation partners and planners, and a more detailed four page summary to be used as an introductory handout to stakeholders interested in helping implement the plans or use them in their own internal planning documents. Additionally, we produced a document that reviews the Landscape Stewardship Planning process, and includes reflections on best practices and lessons learned from these early efforts at applying the Landscape Stewardship framework to conservation planning in Minnesota.

Activity 2: Private Land Restoration/Protection **Budget: $ 39,000**

Private Land Stewardship: Consulting Foresters with Guidance from TNC Staff

Private land stewardship plans will be completed for priority properties identified in LSPs where necessary. However, emphasis will be placed on developing conservation practice plans with technical assistance directed to priority lands aligning stewardship needs with existing cost-share programs and leveraging new cost-share funds for accelerated conservation practice implementation. If more conservation practice plans are needed,

fewer Forest Stewardship Plans will be developed, including tributaries to the Lower Mississippi River in Minnesota where Landscape Stewardship Plans have been completed. Site level plans include a description of the property focusing on natural features and an identification of conservation needs/opportunities. Specific activities to address conservation needs/opportunities are described along with the means to accomplish the work; either through an existing program, private contractor or local resource group.

Field Days or Workshops will be hosted in at least 3 of the priority watersheds. Private land habitat stewardship activities will be highlighted along with important stewardship plan elements. These events will be an opportunity for landowners to meet local resource staff available, agency and private, and learn first-hand activities they can conduct on their property.

Habitat/Watershed Protection: TNC Staff facilitating Stakeholder Implementation Team
Plans will guide implementation of conservation activities in priority watersheds using Clean Water Funds and federal cost-share programs. New watershed protection tools will be developed to protect critical upland and groundwater recharge zones identified by LSPs. Specific activities identified in private land stewardship plans will provide guidance to agency and conservation stakeholders when modifying technical assistance programs and seeking implementation funds, particularly BWSR Clean Water Funds for practice and implementation, the Reinvest in Minnesota Easement Program and land acquisition.

Summary Budget Information for Activity 2:

ENRTF Budget: $ 39,000
Amount Spent: $ 30,970 revised final based on final fringe benefits
Balance: $ 8,030 revised final based on final fringe benefits

Activity Completion Date: June 30, 2017

Outcome	Completion Date	Budget
1. 20 Site level comprehensive stewardship plans (2,000 acres of private land)	*June 2017*	$ 25,000
2. 20 Conservation activity plans and associated cost-share (200 acres of practices)	*June 2017*	$ 8,000
3. 6 workshops/field days	*June 2017*	$ 6,000

Project Status as of: January 31, 2015

1. An example comprehensive stewardship plan has been developed, reviewed by area partners and will be used for stewardship plans.

Project Status as of: July 31, 2015

2. No further progress has been made. Effort on this activity will begin in earnest once LSPs have been developed enough to identify priority parcels

Project Status as of: January 31, 2016

3. In January, a member of TNC's field staff began reaching out to landowners in the West Indian Creek sub-watershed of the Zumbro River to write management plans and present options for better land stewardship. This early landowner outreach will continue through March.

Project Status as of: July 31, 2016

4. Four landowners within the West Indian Creek Conservation Opportunity Area were contacted by the TNC staffer and stewardship plans are nearly completed. Contracts for a sub-contractor to begin landowner outreach and plan writing are nearly developed to begin in fall 2017 to reach out to priority landowners within COAs.

Project Status as of: January 31, 2017

5. Stewardship plans have been completed for four landowners within the West Indian Creek watershed, all of which are within a draft Conservation Opportunity Area (COA) of the Zumbro Watershed. Additionally, a consultant forester is under contract to prepare 20 stewardship and conservation activity plans for landowners in priority areas of the two watersheds. He has field work completed for three plans covering 340 acres, with 12 other interested landowners waiting. A second consultant forester may be brought on to help finish additional plans based on landowner interest and available funding.

Final Report Summary:

6. Comprehensive land stewardship plans have been completed for landowners in identified priority areas within the Cannon and Zumbro River Watersheds, as well as Conservation Action Plans that describe projects at a detail sufficient for securing cost share resources. The 20 stewardship plans cover just over 3,000 acres, with individual plans covering a minimum of 25 acres and a maximum of 971 acres (average: 150 acres). The Conservation Action Plans apply to specific projects that total 168 acres, with a minimum of 1 acre and a maximum project size of 27 acres (average 8.4 acres). The most common project prescription was for invasive species control, with several thinning and prescribed fire projects also receiving plans. These plans will qualify landowners to apply for cost share programs from DNR Division of Forestry. Additional cost share assistance could be sought from NRCS programs like EQIP, local assistance from counties with designated Cooperative Weed Management Areas, or other programs administered by locals Soil and Water Conservation Districts.

   Three landowner field days were held during June, through a partnership with the Cannon River Watershed Partnership (CRWP) that presented several different land management strategies and practices on key parcels within the watershed for water quality and biodiversity. The lands that were displayed included a range of ownership goals and land uses from recreation/natural community restoration to a working farm with a large rotational grazing system in place.

   There have been several landowner events in the Zumbro watershed recently, that provided similar content to what would have been accomplished through the originally intended Zumbro Watershed field days. TNC staff have given presentations on the importance of good land stewardship and resources available to landowners at the last two Wabasha Forestry Day events (in 2016 and 2017), which were well attended. Additionally, The Southeast Landscape Committee of the Minnesota Forest Resources Council (MFRC) organized a tour of several land stewardship practices in 2016. While these events were not organized through this project, TNC staff were involved in all of them.

V. DISSEMINATION:

Description: Copies of Landscape Stewardship/Watershed Protection Plans will be provided to each stakeholder within the respective watersheds, including, but not limited to: watershed organizations, Soil and Water Conservation Districts (SWCD), Board of Water and Soil Resources, Minnesota Pollution Control Agency, MN DNR Divisions and NGOs operating in the watershed. TNC's Project Manager will also provide updates and final results via presentations to watershed boards and regional partnerships.

Site level comprehensive stewardship and conservation activity plans will be provided to the landowners and land managers of each site. Site plans will also be provided to the relevant program staff including SWCDs,

Natural Resources Conservation Service and DNR Forestry. Private Forest Management (PFM) Plans approved by a DNR Forester will be entered into the DNR's PFM module that tracks landowner outreach and conservation needs.

Project Status as of: January 31, 2015

1. No final report or material for dissemination has been developed.

Project Status as of: July 31, 2015

2. TNC Southeast MN Conservation Coordinator introduced the effort to Cannon River Watershed stakeholders at the WRAPS kick-off meeting on 9 June 2015.

Project Status as of: January 31, 2016

3. Significant time has been invested coordinating the Landscape Stewardship Plan preparation with the Cannon River WRAPS process making sure that it can be easily incorporated into local water planning. This effort should also benefit adoption of the Zumbro plan, as similar staff will begin working on that plan this year.

Project Status as of: July 31, 2016

4. TNC priority analysis was used in the Cannon River WRAPS report, and similar coordination efforts are ongoing for the Zumbro River watershed, which is in the process of developing its WRAPS report currently.

Project Status as of: January 31, 2017

5. Preparations are being made to finalize plans for publication and distribution of the final plan, as well as several companion documents, including brochures describing priority areas and suitable protection strategies as well as a guide to watershed protection planning to share the lessons learned and best practices of the process with other interested entities.

   The Landscape Stewardship Plans (LSPs) have also been referenced as strategies for protection in the Watershed Restoration and Protection Strategies (WRAPS) documents for each watershed. The WRAPS, produced by the Minnesota Pollution Control Agency, is meant to outline strategies for both restoration and protections for each major watershed in the state that could result in meeting numerical water quality objectives. The LSPs are referenced for their value in prioritizing and directing protection efforts that will help maintain the natural communities in each watershed that are most impactful in protecting water quality. Because protection is focused on preventing degradation, as opposed to reversing it, its impacts are harder to quantify, and so are often given less emphasis in the WRAPS document. The LSPs are useful companion documents to the WRAPS, because they represent a science based strategy for maximizing the impact of protection work for water quality. The GIS analysis being conducted by Saint Mary's Geospatial Services will help further quantify what that impact is.

Final Report Summary: July 31, 2017

6. Plans have been fully completed, along with supplemental materials that have been prepared for the purpose of disseminating the most important content of the LSPs to relevant stakeholders and conservation planners. Landscape Stewardship Planning is being recognized as a valuable resource in watershed based plans in SE Minnesota, including the Cannon and Zumbro Watersheds. Both LSPs have been incorporated by reference into the corresponding Watershed Restoration and Protections Strategies (WRAPS) documents for the Cannon and Zumbro Watersheds. The Cannon River Watershed is now beginning the process of adopting a One Watershed One Plan (1W1P), and the technical committee

has already been given a presentation on the LSP. The contributions of key partners and stakeholders in developing the plans will also increase their dissemination, as future partners recognize their own contributions and "buy in" to the process.

While the LSPs themselves are targeted at a more technical audience for use in conservation planning, the goals and themes of good stewardship of natural communities for watershed protection have been distributed to a general audience through landowner field days held in the Cannon River Watershed in June, as described for Activity 2.

VI. PROJECT BUDGET SUMMARY:

A. ENRTF Budget Overview:

Budget Category	$ Amount	Explanation
Personnel:	92,000	TNC Program Director: approximately $4,000.00, .04 FTE on Activity 1 and approximately .01 FTE on Activity 2 to assist with final plan development and editing, contracts management, and other as necessary. Conservation Coordinator: approximately $58,000.00, .55 FTE annually for coordination, plan elements. TNC Regional GIS Specialist: Active River Area Analysis. Approximately $9,000.00, .05 FTE annually Ecologist: Will conduct healthy watershed analysis using GIS data and biological data to determine criteria for healthy watersheds and necessary natural features to maintain aquatic health. .25 FTE approximately $21,000, 70% for salary and 30% for benefits.
Professional/Technical/Service Contracts:	108,000	2 Watershed plans, up to20 site level plans Site level plans will meet Forest Stewardship Plan requirements of the MN DNR Division of Forestry and approved by a DNR Forester. Each plan will include an assessment of the entire property broken down by forest stand or habitat type. Specific management recommendations with schedule and applicable cost-share program will be included. Additionally, 20 conservation practice plans will be written making specific conservation activities eligible for state or federal cost-share. Note, if the need for more conservation practice plans is identified, more conservation practice plans will be developed and fewer forest stewardship plans will be developed. Public Workshop and Field Day support will be contracted.
TOTAL ENRTF BUDGET:	**$200,000**	

Explanation of Use of Classified Staff: N/A
Explanation of Capital Expenditures Greater Than $5,000: NA

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 1.5

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: 2.0

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state			
	$44,000	$32,850 approximate unrecovered indirect	TNC staff for analysis that goes into plan Unrecoverable indirect.
	141,000	$23,307. USFS grant is 16% spent and half way through award period	US Forest Service Grant for use implementing watershed protection plans/Landscape Stewardship Plans in SE Minnesota
State			
	$0	$	
TOTAL OTHER FUNDS:	**$44,000**	**$ 56,157**	

VII. PROJECT STRATEGY:

A. Project Partners:

Project Partners Not Receiving Funds:

- Minnesota Pollution Control Agency
- Goodhue Soil and Water Conservation District
- Board of Water and Soil Resources
- MN DNR Divisions of Forestry and Ecological and Water Resources
- Wabasha Soil and Water Conservation District

Project Partners Receiving Funds:

- Contract Plan Writer TBD: $73,000 for production of the watershed protection plan.
- Consulting Forester: $28,000 for site level conservation plans
- Cannon River Watershed Partnership: $2,000 for assistance organizing landowner workshop logistics
- Zumbro Watershed Partnership: $2,000 for assistance organizing landowner workshop logistics

B. Project Impact and Long-term Strategy:

The project will provide guidance on assessing healthy watersheds within Southeast Minnesota and the attributes that contribute to healthy watersheds including clean water and stable flows. Strategies for maintaining clean water, healthy flows and aquatic habitat through land management will be identified and described in a way that can be integrated with existing programs with state and local agencies. Understanding what makes healthy watersheds healthy and conditions contribute to healthy waters is a significant step in watershed management in Minnesota. To date, much of the watershed assessment, planning and

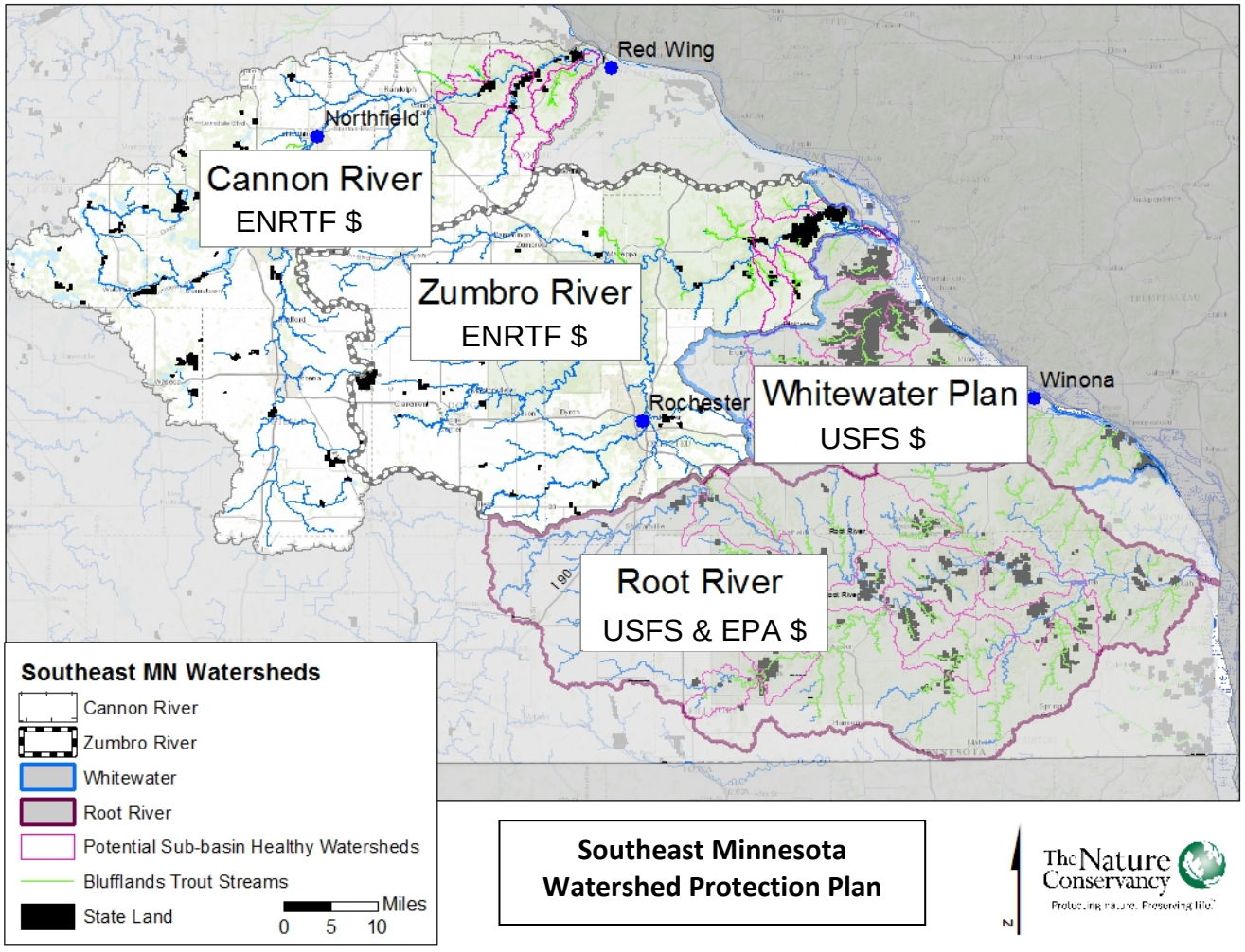
implementation work that is done has focused on impaired or degraded waters. It is important to prevent healthy lakes, rivers and streams from becoming degraded in the first place. This project will develop a process for keeping healthy waters healthy for the Cannon and Zumbro Rivers while providing a framework for other watersheds to replicate.

C. Spending History:

Funding Source	M.L. 2008 or FY09	M.L. 2009 or FY10	M.L. 2010 or FY11	M.L. 2011 or FY12-13	M.L. 2013 or FY14
US Forest Service				$40,000	
US Forest Service				$30,000	

VIII. ACQUISITION/RESTORATION LIST: NA

IX. VISUAL ELEMENT or MAP(S):



X. ACQUISITION/RESTORATION REQUIREMENTS WORKSHEET: NA

XI. RESEARCH ADDENDUM: NA

XII. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than January 31, 2015, July 31, 2015, January 31, 2016, July 31, 2016, January 31, 2017. **A final report and associated products will be submitted between June 30 and August 15, 2017.**

Environment and Natural Resources Trust Fund

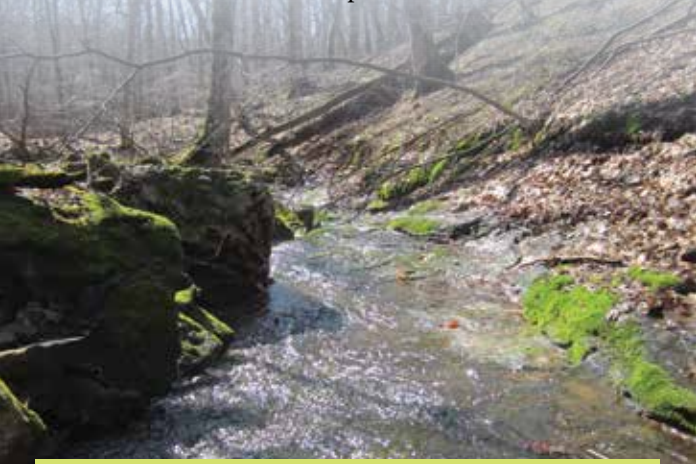
M.L. 2014 Project Budget

Project Title: *Southeast Minnesota Watershed Protection Plan*
Legal Citation: *M.L. 2014, Chp. 226, Sec. 2, Subd. 06e*
Project Manager: *Richard Biske*
Organization: *The Nature Conservancy*
M.L. 2014 ENRTF Appropriation: $ *200,000*
Project Length and Completion Date: *3 Years, June 30, 2017*
Date of Report: 1/16/2018

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Revised Activity 1 Budget 4-28-2017	Revised Activity 1 budget 1/16/18	Amount Spent	Activity 1 Balance	Revised Activity 2 Budget 4-28-2017	Revised Activity 2 Budget 1/16/18	Amount Spent	Activity 2 Balance	Revised TOTAL BUDGET 4-28-2017	Revised TOTAL BUDGET 1/16/18	TOTAL BALANCE
BUDGET ITEM											
Personnel (Wages and Benefits) **TNC Project Manager** TNC Project Manager will: 1) Administer contracts associated with the project, 2) Provide final edits and oversight of the watershed plan documents. .05 FTE total approximately $4,000.00 **Conservation Coordinator (1/1/15):** 1) coordinate the development of Landscape Stewardship Plans with Ecological Assessments 2) Coordinate site based stewardship plans, 3) Organize and lead field days, educational events and landowner outreach activities .55 FTE/yr, 70% for salary and 30% for benefits for grant funded position. approximately $58,000.00 **TNC Regional GIS Specialist** will: 1) Conduct Active River Area Analysis and associated GIS products .05 FTE/yr, 70% for salary and 30% for benefits for grant funded position Approximately $9,000.00 Ecologist: Will conduct healthy watershed analysis using GIS data and biological data to determine criteria for healthy watersheds and necessary natural features to maintain aquatic health. .25 FTE approximately $21,000, 70% for salary and 30% for benefits.	~~$85,000.00~~	$83,120.00	$41,774	$41,345.98	$7,000	$7,000	$970	$6,030	~~$92,000~~	$90,120	$47,376
Professional/Technical/Service Contracts										$0	
Landscape Ecologist, Contractor has not been identified. An RFP will be distributed and bids will be reviewed based on qualifications and price. Contractor is responsible for production for review by partners, plan writing, editing and plan formating and production	~~$76,000~~	$77,880	$77,880	$0					~~$76,000~~	$77,880	$0
Consulting Forester/Steward: Contractor has not been identified. An RFP will be distributed and bids will be reviewed based on qualifications and price. There may be multiple contractors selected depending on interest and geographic scope. Consulting foresters will be asked to conduct property assessments, meet with landowners to discuss management history and landowner goals, develop stand/habitat type presriptions, write specific conservation activity to address conservation needs/opportunities and produce final plans for the landowner and relevant agency.					$28,000	$28,000	$28,000	$0	$28,000	$28,000	$0
Watershed Partnership (04/28/2017): Public Workshops and Field Days					$4,000	$4,000	$2,000	$2,000	$4,000	$4,000	$2,000
COLUMN TOTAL	**~~$161,000~~**	**$161,000**	**$119,654**	**$41,346**	**~~$39,000~~**	**$39,000**	**$30,970**	**$8,030**	**$200,000**	$200,000	**$49,376**

Healthy Lands, Healthy Waters

The Cannon River Landscape Stewardship Plan focuses on protecting water quality by maintaining and enhancing the health of the lands in its watershed. It is based on the premise that the quality of a water body reflects the integrity of its watershed. Stewardship efforts that maintain forests, wetlands, and other natural communities will not only benefit the biodiversity and ecological health of the region, but also weaken floods, improve infiltration, and remove nutrients from runoff as it makes its way to our streams. Implementing best management practices and expanding perennial cover in agricultural and residential areas will benefit both the natural habitat of the landscape and the water quality in the watershed. This plan proposes a vision, desired future conditions, and strategies that utilize a landscape approach to natural resource stewardship.



The landscape stewardship plan can be used in:

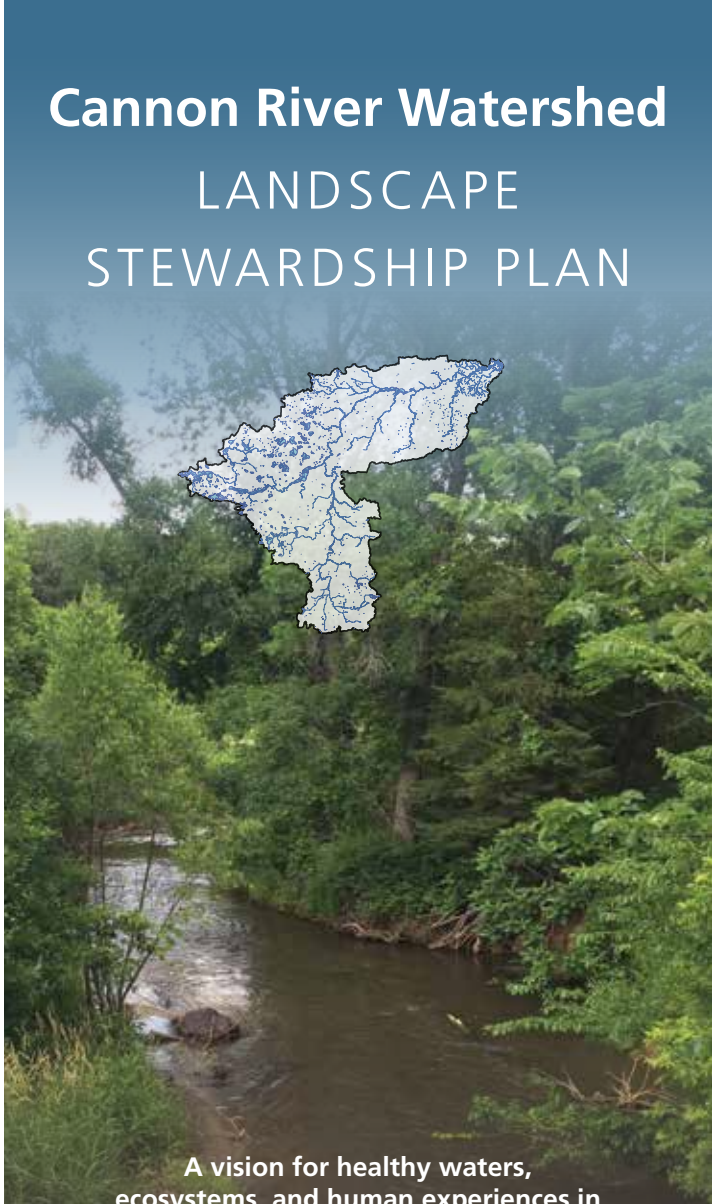
- Water and Natural Resource Planning
- Community Land Use Planning
- Conservation Project Prioritization and Funding
- Connecting with Policy and Decision Makers
- Guiding Private Land Stewardship
- Other Projects in and Around the Watershed

The Nature Conservancy

Weaver Dunes Preserve
60042 County Rd 84,
Kellogg, MN 55945

Cannon River Watershed

LANDSCAPE STEWARDSHIP PLAN



A vision for healthy waters, ecosystems, and human experiences in the Cannon River watershed.

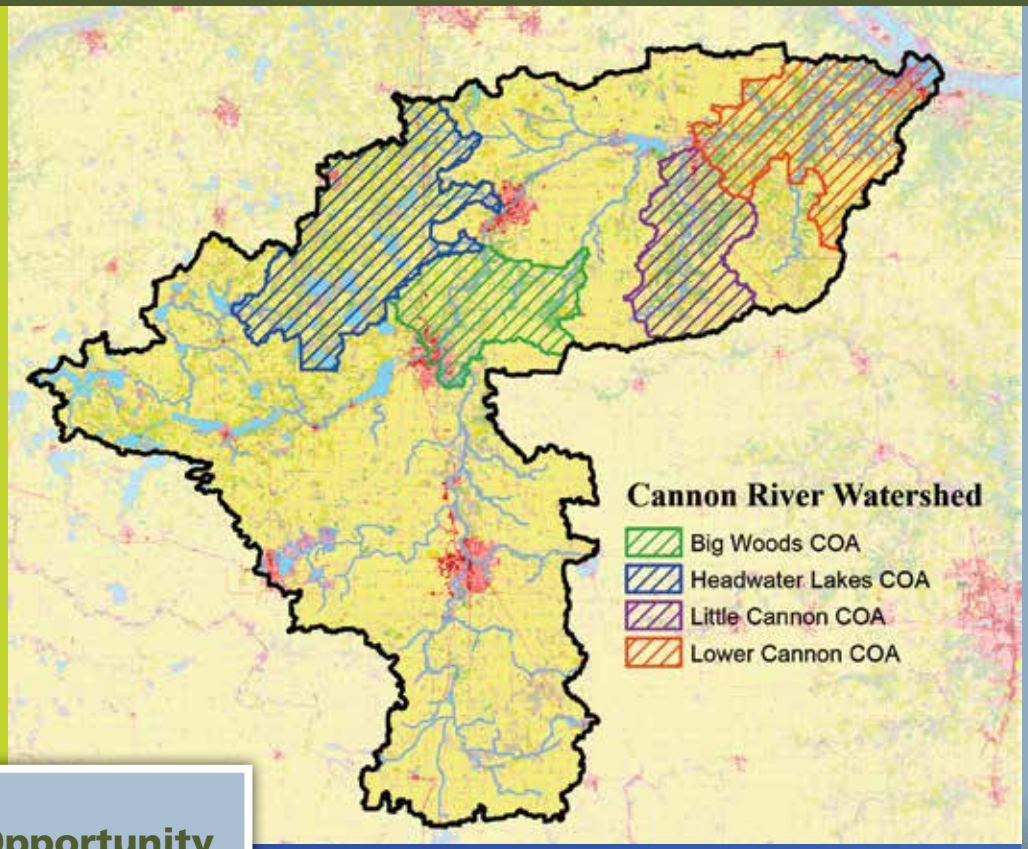
Watershed stewardship takes a collaborative effort by public and private partners. Learn how you can play a part in the stewardship of this watershed's ecological services.

The Nature Conservancy

Minnesota Forest Resources Council

Cannon River Watershed

- 940,500 acres
- Dakota, Goodhue, Le Sueur, Rice, Steele, and Waseca counties
- Deep fertile glacial-tills in the upper portion and steep bluffs in the lower reaches
- 18% forest, wetland, or grassland (green and tan), 10% pasture (dark yellow), 61% row-crop agriculture (yellow) and 9% residential/ urban development (red)
- Many remaining areas of outstanding biodiversity significance and high importance to regional water quality
- Designated Wild and Scenic River



Conservation Opportunity Areas (COAs)

The plan identifies four focal areas to help direct conservation efforts within the watershed in strategic and cost effective ways.

More information on how you can contribute to achieving this vision can be found in the Landscape Stewardship Plan at:

https://mn.gov/frc/southeast-committee.html

Vision for the Watershed:

- High quality streams and healthy groundwater resources
- Stabilized and increasing populations of rare and threatened species
- Streams with rehabilitated banks and native floodplain vegetation
- Large habitat buffers and corridors around and between core biodiversity areas
- Fire is used as a management tool in appropriate ecosystems
- Consistent funding for cost share assistance associated with various landowner activities such as invasive species control and native plant community restoration
- A more robust hardwood timber market supporting sustainable private timber management
- Improved landowner education
- Active comprehensive conservation planning on priority sites
- Regional land use plans recognize and protect rare features

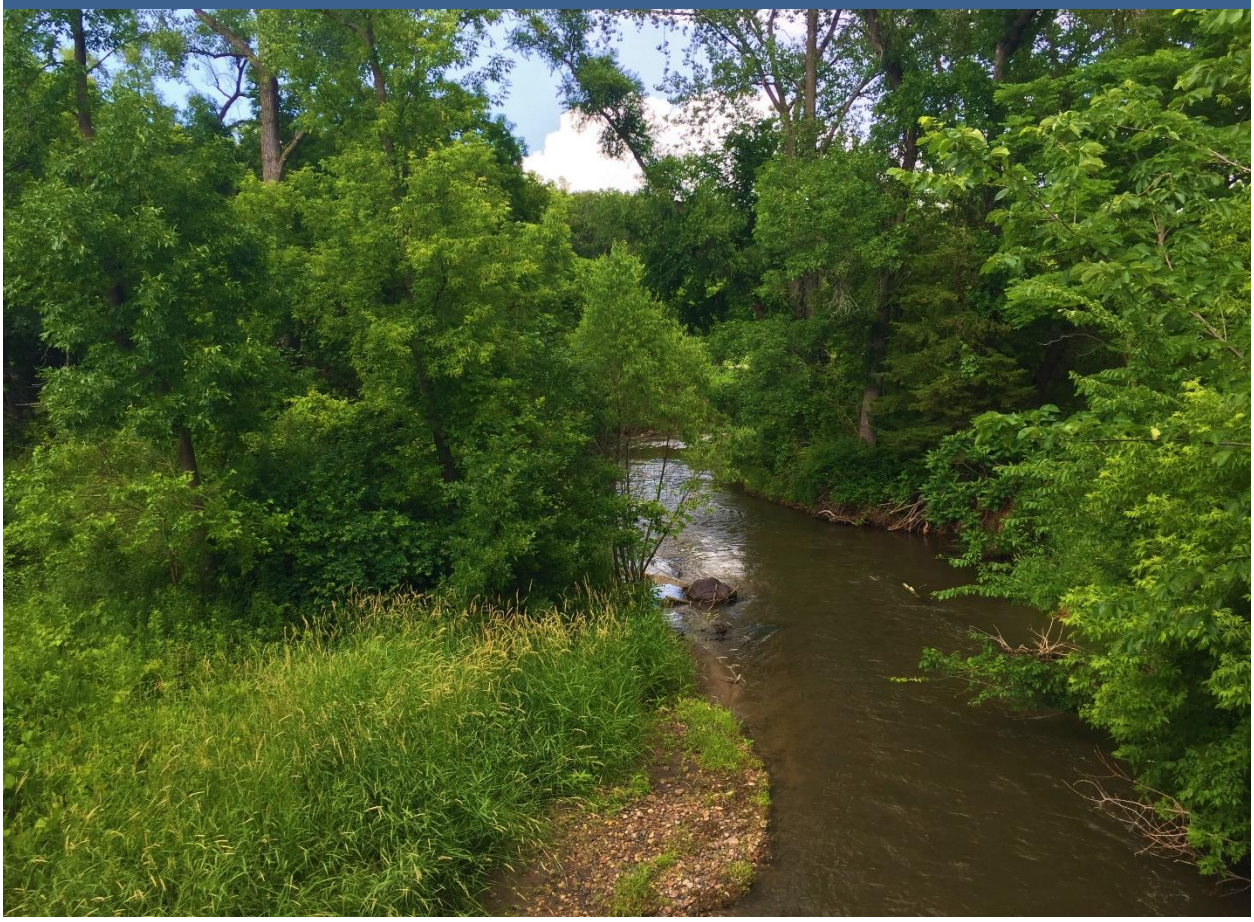
Environment and Natural Resources Trust Fund

Forest Stewards Guild

The Nature Conservancy

Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund and the U.S. Forest Service.
Developed by The Nature Conservancy and the Forest Stewards Guild.

Cannon River Watershed Landscape Stewardship Plan



June 25, 2017

A vision for healthy waters, ecosystems, and human experiences in the Cannon River watershed.

The Nature Conservancy

Minnesota Forest Resources Council

The Cannon River Watershed Landscape Stewardship Plan was prepared by:

The Nature Conservancy
David Schmidt
60042 County Rd 84, Kellogg, MN 55945
Phone: (507) 261-4954

Forest Stewards Guild
Michael Lynch
612 W. Main St., Suite 300, Madison, WI 53703
Phone: (608) 333-0551

The Cannon River Watershed Landscape Stewardship Plan can be found online at:
https://mn.gov/frc/southeast-committee.html

The Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR) provided funding for this project. The Trust Fund is a permanent fund constitutionally established by the citizens of Minnesota to assist in the *protection, conservation, preservation, and enhancement of the state's air, water, land, fish, wildlife, and other natural resources.* Currently 40% of net Minnesota State Lottery proceeds are dedicated to growing the Trust Fund and ensuring future benefits for Minnesota's environment and natural resources.

The Northeastern Area State and Private Forestry division of the U.S. Forest Service also provided funding for this project.

Table of Contents

Plan Overview

Healthy Lands, Healthy Waters

This plan focuses on protecting water quality by maintaining and enhancing the health of land in the watershed. It is based on the premise that the quality of a water body reflects the integrity of its watershed. Stewardship efforts that maintain forests, wetlands, and other natural communities benefit the biodiversity and ecological health of the region. They also weaken floods, improve infiltration, and remove nutrients from runoff as it makes its way to our streams. Implementing best management practices and expanding perennial cover in agricultural and residential areas will benefit both the natural habitat of the landscape and the water quality in the watershed. This plan proposes a vision, desired future conditions, and strategies that utilize a landscape approach to natural resources stewardship.

Landscape Approach to Natural Resources Stewardship

This Landscape Stewardship Plan (LSP) is based on the recognition that many, if not all, of our conservation and environmental challenges are interrelated. Yet, practicality requires a division of activities and expertise in addressing them. As a result, private landowners, city planners, and experts in hydrology, forests, game and non-game wildlife management all work to achieve diverse, but interrelated, goals from their own specialized angle. For example, additional perennial cover in an upland agricultural area can improve soil health while also reducing erosion on the forested hillside below it, and improved conditions in both areas will benefit the hydrology, water quality, and associated biodiversity in the stream below them. Recognizing how these efforts can reinforce each other, and identifying areas where coordination will add the most benefit, will allow greater synthesis of all our efforts, making all our goals for the landscape easier to achieve. To do so, the LSP embraces an "all lands" approach that identifies shared objectives across public and private natural areas as well as urban and agricultural areas.

While there are many ways to divide a region into landscapes, using watersheds as the organizing feature emphasizes the link between natural resource management and water. It also parallels other state planning trends, such as the move to One Watershed One Plan (1W1P) plans to replace local water plans. Planning natural community stewardship by watersheds increases the value of Landscape Stewardship Plans as resources for other water planning exercises.

Project Area Background

This landscape stewardship plan covers the 1,460 square mile Cannon River Watershed in southeastern Minnesota (Figure 1). This landscape includes over 800 linear miles of streams in Dakota, Goodhue, Le Sueur, Rice, Steele, and Waseca counties. The Cannon and Straight Rivers are the two largest rivers in the watershed and flow through the cities of Owatonna, Fairbault,

Northfield, and Red Wing. These rivers drain a diverse landscape that ranges from glacial derived lakes, moraines, and drumlin fields in the rolling farm fields of their headwaters, to the steep bluffs overlooking deep river valleys, sinkholes, caverns, and cold-water spring-fed streams before empting into the Mississippi River near Red Wing.

This southeastern Minnesota watershed has seen significant change in the last 150 years. Today, only 18% of the landscape remains as forest, wetland, or grassland and many of these areas have been degraded in some fashion. Despite these changes, the watershed retains relatively high water quality and areas of outstanding biodiversity significance that warrant special protection, maintenance, and restoration to sustain their function on the landscape.

This area is also home to the only federally endangered plant found exclusively in Minnesota: the dwarf trout lily. This three-inch tall spring ephemeral's entire wild population is restricted to 600 acres in Rice, Goodhue, and Steele counties; primarily in the moist maple-basswood forests along the Cannon River and its tributaries. More contextual information on the watershed is included in Section 5.

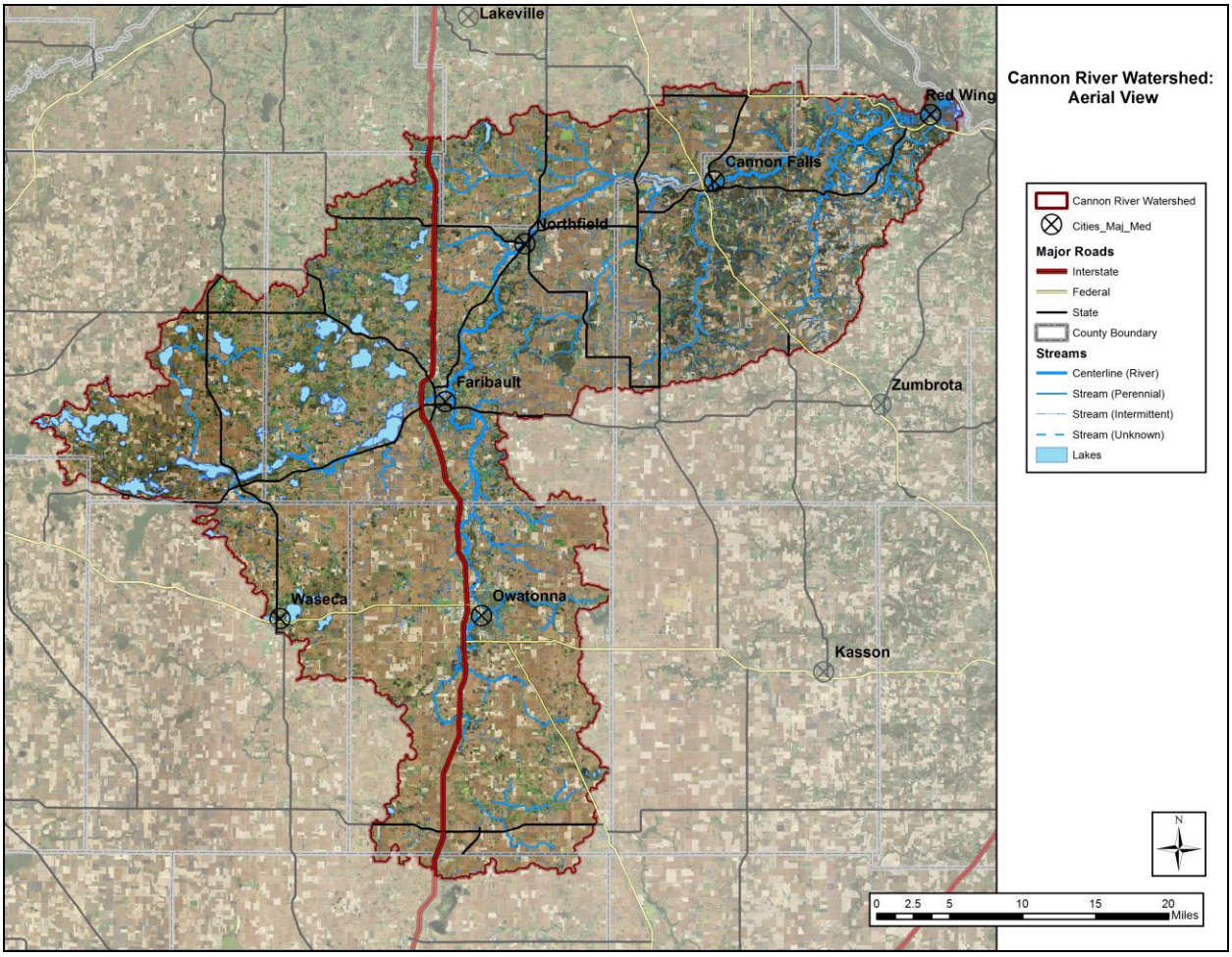


Figure 1. Aerial view of the Cannon River Watershed.

Organization of Plan

The Cannon River Watershed Landscape Stewardship Plan is organized into seven sections. Individuals unfamiliar with the landscape are encouraged to review Section 5 for context on the state of the watershed prior to Section 1.

- Section 1. Landscape Vision and Strategies
- Section 2. Implementing the Plan
- Section 3. Action Plan Template
- Section 4. Monitoring and Evaluation
- Section 5. Landscape Context
- Section 6: Implementation Resources
- Section 7: Conservation Opportunity Area Plans

Plan Audience

This landscape stewardship plan is intended to benefit:

- Local Water Resource Management Plans and Implementation, including the Cannon River One Watershed One Plan (1W1P).
- Forest Stewardship Plans and Implementation
- Fish & Wildlife Management Plans
- Community Land Use Planning and Implementation
- Collaborative Project and Funding Development
- Connections to Forest and Water Resource Policy Decision Makers

These are just a few of the plan's applications and uses. This plan is not intended to incorporate other planning efforts; it is meant to supplement and inform those efforts in a manner that promotes increased and improved collaboration among current and future partners and stakeholders to achieve plan's vision for the watershed.

Process

The Nature Conservancy of Minnesota and the Forest Stewards Guild lead the development of the Cannon River Watershed Landscape Stewardship Plan with input and review from several local stakeholders throughout the process (Table 1). These partners represented a variety of specialties and interests, from both the county and state level.

Table 1. Cannon River Watershed Landscape Stewardship Advisory Committee

Name	Organization	Email
Beth Kallestad	Former Cannon River Watershed Partnership, current U of M Extension	bckall@umn.edu
Steven Pahs	Rice County SWCD	steven.pahs@mn.nacdnet.net
Glen Roberson	Goodhue County SWCD	groberson@goodhueswcd.org
Nicole Schaffer	Natural Recourses Conservation Service	nicole.schaefer@mn.usda.gov
John Stelzner	Dakota County SWCD	john.stelzner@co.dakota.mn.us
Jeanine Vorland	MN DNR Wildlife	jeanine.vorland@state.mn.us
Justin Watkins	MN Pollution Control Agency	justin.watkins@state.mn.us
Jeff Weiss	MN DNR Water Resources	jeffrey.weiss@state.mn.us

Additionally, this plan was developed concurrently with the Minnesota Pollution Control Agency's Watershed Restoration and Protection Strategies (WRAPS) process (see below). Plan developers participated in the WRAPS process, and the stakeholder feedback from that advisory group was also considered in the development of this plan.

Why a Landscape Stewardship Plan

There are a variety of plans and planning efforts in the Cannon River. This plan is unique because it focuses on achieving and maintaining healthy water and biodiversity through land stewardship. While this plan was being written, the Minnesota Pollution Control (MPCA) was concurrently developing a Watershed Restoration and Protection Strategies (WRAPS) plan for the Cannon River Watershed. The focus of the two planning processes were not identical, however they shared several key goals and they helped inform each other in several ways.

With the diverse array of stakeholders in the Cannon River Watershed, a wide variety of plans and planning efforts also cover the region (see Section 2). This plan is not intended to replace those. Instead, it serves as a reference for future and concurrent planning efforts, and to set a framework for coordinated implementation of the multiple conservation efforts those plans represent. For example, the Landscape Stewardship Plan (LSP) was developed at the same time as the Minnesota Pollution Control Agency (MPCA) was developing their Watershed Restoration and Protection Strategies (WRAPS). The two efforts were similar in many ways: both were organized on the watershed boundary, both involved input from multiple stakeholders, and both contained goals for water quality. The WRAPS, however, gives stronger consideration than the LSP to the restoration needs of the watershed, with a strong focus on nutrient load reductions in heavily farmed portions of the watershed. The LSP meanwhile focuses on providing a framework for protecting landscape features like native plant communities that help maintain healthy water.

The WRAPS process provided strong input from multiple partners that was helpful in developing this LSP, and the LSP has been referenced in the WRAPS as a useful tool in developing and coordinating water protection strategies for the in the Cannon River Watershed.

Section 1. Landscape Vision and Strategies

Landscape Vision

The Basin Alliance for the Lower Mississippi in Minnesota (BALMM) is a locally led alliance of land and water resource agencies that coordinates efforts to protect and improve water quality in the Lower Mississippi River Basin. As a key watershed in this region, the Cannon River Watershed Landscape Stewardship Plan adopts the BALMM Vision as the overarching landscape guidance for the watershed.

The BALMM envisions the following to sustain water health and support vibrant rural communities:

- Water resources with safe drinking water from its aquifers and surface water supporting thriving aquatic ecosystems.
- Land uses supporting healthy, resilient, and diverse terrestrial ecosystems and abundant outdoor recreational opportunities.
- Productive and sustainable agricultural resources including ruminant livestock, local food production, managed woodlands, and biomass production.

Desired Future Conditions

The following Desired Future Conditions (DFCs) focus the overarching BALMM landscape vision on the Cannon River Watershed. Many of these DFCs closely align with those of other regional plans and highlight the confluence of objectives between stakeholders in the watershed. Like the rest of the plan, these DFCs are subject to revision and refinement by partner organizations but serve as an overall unifying vision. They include:

- High quality streams and healthy groundwater resources
- Stabilized and increasing populations of rare and threatened species
- Streams with rehabilitated banks and native floodplain vegetation
- Large habitat buffers and corridors around and between core biodiversity areas
- Fire is used as a management tool in appropriate ecosystems
- Consistent funding for cost share assistance associated with various landowner activities such as invasive species control and native plant community restoration
- A more robust hardwood timber market supporting sustainable private timber management
- Improved landowner education
- Active comprehensive conservation planning on priority sites
- Regional land use plans recognize and protect rare features

Achieving the Landscape Vision

This plan was not created to be the guiding document of any organization and its implementation is based on the coordination of voluntary efforts by a wide range of stakeholders that are trying to accomplish their own organizational or individual goals. Therefore, this plan focuses on a list of strategies that can be used by implementing organizations instead of developing goals and objectives that do not have a specific entity accountable for their achievement. The strategies outlined below can be used by individuals and organizations to move the landscape towards the overall vision and desired future conditions. This plan recognizes that not all strategies will work for all organizations but that organizations need to work together in a coordinated effort to accomplish the overall watershed vision. We have organized strategies for achieving the landscape vision around three primary areas of focus: Public Land, Private Land, and Education/Outreach. There is considerable opportunity for overlap between these categories and many activities will take advantage of strategies in multiple categories.

Category	Summary	Principle Actors
Public Land	Strategies under this heading are primarily focused on the region's state and conservancy owned and managed lands. These areas are generally the most protected from conversion threats but often still face the risk of habitat degradation. When well maintained, these areas often provide a tremendous effect on regional biodiversity and water quality. Strategies under this heading include actions that can be done to restore these protected lands or expand these public spaces by acquiring private lands and adding them to the regional public land management portfolio. Permeant conservation easements also fall in this category.	Minnesota DNR Divisions, The Nature Conservancy, MN Land Trust, Trust for Public Land
Private Land	The majority of land in the Cannon River Watershed is in private ownership and only in rare situations are these lands candidates for public land acquisition. Private landowners will manage the rest of this land and their actions will be key to increasing and maintaining regional water quality. This section outlines steps that can be taken to support these landowners in successful stewardship of their lands.	DNR Forestry, Soil and Water Conservation Districts, Board of Water and Soil Resources, Natural Resources Conservation Service, Farm Service Agency
Education & Outreach	Strategies under this heading focus on efforts to increase both the knowledge base and stewardship ethic of landowners, citizens, and whole communities in the region. It recognizes that the foundation of all conservation efforts is the value placed on natural resources by the community.	Cannon River Partnership, UMN Extension

Public Land Strategies

- Hold, manage, and restore currently protected blocks of native habitats. Utilize management tools that, to the extent possible, approximate natural disturbance regimes and strengthen these natural communities. Use public and conservation lands as an anchor point to initiate functional landscape management across ownerships. Utilize sound management on public lands to demonstrate ecological management principles and catalyze improved management on private lands. In addition to standard land management practices, this plan encourages public land managers to expand the following land management tools:
    - Utilize prescribed fire as a key tool in the management and restoration of protected lands. This form of management should imitate pre-suppression era fire-disturbance patterns and increase the presence, and competitiveness, of fire dependent communities.
    - Increase forest cover and forest health through sustainable forest management practices and site and climate appropriate plantings.
    - Integrate climate change projections into management planning. Demonstrate forest management for forest resiliency with a changing climate.
    - Control invasive species through management, monitoring, and outreach.

- Support and pursue opportunities for increased protection through conservation easements and public acquisition in strategically important areas. Focus future acquisitions within targeted Conservation Opportunity Areas (COAs) but continue to look for key opportunities throughout the watershed. Focus acquisition efforts on:
    - The rarest or highest quality natural areas and opportunities to develop natural community buffers around these sites.
    - Protection of karst features and other key water resource areas. Couple these efforts with the installation of native plant community buffers to reduce pollutant run-off entering groundwater.
    - Sites that increase connectivity between natural areas, such as habitat corridors and riparian areas.
    - Sites that expand upon currently protected areas to fully include functioning habitat complexes.

- Agencies and nongovernment conservation organizations engage in productive coordination and collaboration to accomplish the goals and visions outlined in this plan.
    - Seek funding for enhancement projects that will be economical to maintain after completion (e.g. bluff prairie enhancement, forest understory improvement).
    - Seek funding for projects that can be carried out across public land boundaries with cooperation of neighboring landowners.

Private Land Strategies

- Increase the extent of perennial vegetation focusing on critical areas, while improving the condition and function of existing perennial vegetation for the benefit of water quality, quantity, and wildlife habitat.

- Identify opportunities to work with landowners to increase habitat corridors and connectivity. Focus efforts on landowners around publicly owned natural areas to ensure

greater connectivity of native plant communities into a larger matrix of well-managed private forest and grasslands.
    - Contact landowners near important natural areas to assess interest in conservation easements and agricultural set-aside programs such as the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), and Reinvest in Minnesota (RIM).

- Encourage landowner participation in programs that promote the restoration and maintenance of native habitats.
    - Increase CRP acreage availability and landowner enrollment. Work with local seed suppliers to produce and distribute native perennial grass and forb seed that can be utilized on CRP and other conservation planting acres.
    - Increase awareness and funding for cost share programs focused on the management of natural communities on private land. Particular focus is needed on cost share opportunities for invasive species management.
    - Support and promote annual tree sale. Encourage landowners to plant seedlings from appropriate seed zones.

- Ensure professional assistance is readily available to landowners for resource management. This results in management that optimizes resources, meets landowner objectives, and maintains ecological and habitat benefits.
    - Coordinate technical assistance from multiple agencies and stakeholders.
    - Promote consulting businesses who have local forestry and natural community knowledge that can develop forest management plans for landowners.

- Work with area producers to expand the use of low-intensity conservation grazing. Encourage the addition of lightly grazed perennial cover on the upslope woodlands to reduce the rate at which overland flow reaches wooded ravines.
    - Seek funding for enhancement projects that will be economical to maintain after completion (e.g. bluff prairie enhancement, forest understory improvement).
    - Seek funding for projects that can be carried out across public land boundaries with cooperation of neighboring landowners.

- Identify areas and funding for engineering projects that will improve the region's water quality and groundwater recharge.
    - Wetland restoration
    - Water and sediment basins at the wooded bluff edge to reduce ravine head cutting
    - Farm pond improvements
    - Stream bank restoration
    - Grassed waterways
    - Floodplain reconnection and restoration

- Encourage producers to implement best management practices to improve soil health and reduce runoff.

- Collaboration between partners on funding applications.

Education and Outreach Strategies

- Use outreach and education to foster a 'land ethic' about the value of natural resources in the watershed among land managers, landowners, community and citizen groups, and local communities.

- Integrate information on social benefits of sustainable forestry, prairies, buffers, and pastures in outreach documents.

- Educate landowners on, and encourage proper management of, their native plant communities as well as Best Management Practices (BMPs) agricultural and residential areas.

- Inform local officials and elected representatives of the benefits of perennial vegetation for water quality, flood retention, and local quality of life.

- Increase understanding for the role fire once played, and can continue to play, as a land management tool.

- Early identification and management techniques for forest health issues and invasive species.

- Work with local forest products businesses to identify new technologies for under-utilized species and potential markets

- Increase awareness about cost-share, incentive, and tax break programs that provide economically viable options to promote sustainable forest and natural community management by private landowners in priority areas for water quality or habitat enhancement.

- Recognize outdoor recreation and tourism as economic priorities in the landscape.

- Hold annual stakeholder meetings to coordinate completed, ongoing, and planned activities.

- Encourage community and citizen group participation in resource management, monitoring, and restoration.

Section 2. Implementing the Plan

Effective implementation of this plan will take a combination of efforts by an assortment of organizations and individuals at a diversity of spatial and temporal scales. This section outlines the process used to select focal areas for the implementation of this plan called Conservation Opportunity Areas (COAs). It also highlights the wealth of government agencies, non-profit organizations, conservation groups, and stakeholders working in the watershed and their assorted plans. These partners and related conservation plans will be key to implementing the strategies outlined in Section 1. Additional information on implementation resources and funding opportunities can be found in Section 6.

Scaling Project Implementation

The potential strategies and techniques for protecting and managing natural communities and associated waterways are broad and varied. Options on private lands range from providing information and advice to interested landowners all the way to full fee title acquisition and management by a state or non-governmental conservation organization. The "Private Land Stewardship Implementation Tool Box" illustrates how many of these options fall along a spectrum from least to most permanent and beneficial.

Private Land Stewardship Implementation Tool Box

Range of Options

#1	#2	#3	#4	#5	#6	#7	#8
Technical Advice and Assistance	**Stewardship Plans**	**Cost Share Programs**	**Property Tax Programs**	**Construction Projects**	**Conservation Easements**	**Land Trades and Exchanges**	**Fee Title Acquisition**
– Information – Site Visits – Tree Sales – Equipment	– Forest – Agricultural – Grazing	– Federal – State – Local	– Credit – Deferral	– Wetland Restorations – Stream Bank Restoration – Floodplain Reconnection	– Donated – Purchased	– Public – Industrial	– Federal – State – Local

Costs and Benefits

Generally…
- Lower cost
- Less permanent
- Fewer social benefits

Generally…
- Higher cost
- More permanent
- Greater social benefits

Adapted from the "PFM Implementation Tool Box: Foundation to Service Delivery to Private Woodland Owners" originally developed by Dan Steward, Minnesota Board of Water and Soil Resources

As the diagram suggests, services provided to landowners on the left tend to be less costly, but are also less permanent and less explicitly connected with societal benefits. In contrast, techniques listed further to the right side of the spectrum, while more costly, generally tend to be more permanent and produce more easily recognized benefits to society. While less permanent, the options on the left can be implemented at broader scales across the landscape, while the expense of the more permanent solutions requires them to be much more targeted. An efficient strategy recognizes that different options will be appropriate on different scales and in different places, depending on the human, economic, and natural communities involved. This is especially true in a landscape like the Cannon River, where the majority of the land is privately owned.

Conservation Opportunity Areas

To help direct conservation efforts within the watershed in strategic and cost effective ways, several Conservation Opportunity Areas (COAs) have been identified to focus efforts on to have the greatest impact protecting habitat and water quality. In general, these areas have not been seriously degraded or developed, and support quality natural communities and habitat, but lack a significant amount of long-term protection or management planning. Landforms most closely connected to the rivers and streams are particularly important to protect and improve, as these areas will play a larger role in maintaining water quality in the watershed. Identification of these areas relied on a combination of data analysis and the firsthand knowledge of local natural resource professionals and stakeholders.

Overview- What to look for in a COA

Across a landscape, the quality of local areas in terms of habitat and ecosystem function is likely to be spread across a general continuum ranging from high-functioning intact ecosystems to heavily altered and degraded ones. In the most seriously degraded systems, their condition is practically irreversible, and mitigation of broader landscape impacts (e.g. pollution, energy use, water consumption) should be the focus of environmental policies. There will also be highly degraded areas for which restoration to functioning native plant community states could be possible, but would take unreasonably large investments. In the Cannon River watershed, many areas of agricultural row crops fall into this category. When these lands exist in places of remarkable importance in the landscape, restoration efforts may be appropriate. Over a large scale, however, restoration is not practical, and efforts should focus on sustainable practices to maintain soil fertility and prevent pollution and erosion.

On the other end of the spectrum, high functioning ecosystems exist which have avoided serious degradation or alteration from human activities, and which are most commonly publicly managed and protected from future development or degradation. The historical reasons for their preservation can vary. In the Cannon River watershed, such areas are often found on steep forested hillsides along the region's rivers and lakes which would have been impractical to plow,

and where fire would not have been a crucial part of the disturbance regime prior to suppression. After several waves of renewed national and state interest in conservation over the past century, many of these areas have been protected in some manner. Their impressive natural condition has made them preferred targets of conservation and enhancement activities, which has increased their overall quality relative to nearby areas. Continued protection and proper management is important to preserve these special areas. However, the added benefit to the overall ecology of the landscape of additional funding or enhancement efforts is likely to be less than work done in areas with more room for improvement.

Between these two extremes will be the areas for which routine conservation efforts will have the greatest impact on the landscape scale. Examples could include existing high quality habitat that is not sufficiently protected from development, areas where natural conditions have recovered from historical damage but important plant or animal populations have not yet returned, or areas that have not been degraded, but require additional management to maintain high levels of ecosystem function.

Prioritization Methodology

GIS analysis was used to determine priority areas for conservation focus within the Cannon River Watershed. Several spatial data layers were used to quantify the water and habitat quality, and conservation assets, priorities, and threats that exist within each of the 45 HUC-12 sub-watersheds in the CRW. An analysis of development and agricultural conversion risk was also used to quantify which HUC-12s were most likely to experience habitat loss or water quality degradation.

Habitat and Water Quality:

These layers were selected to rate HUC12 sub-watersheds based on the presence and abundance of features likely to be a focus of multi-benefit protection efforts.

Data Set	Scoring Method
MBS Biodiversity Significance Rankings	A raster was created scoring cells of "Outstanding" biodiversity significance 4 points, "High" 3 points, "moderate" 2 points, and "Below" 1 point. All "No Data" areas were 0 points. The zonal mean for each HUC12 sub-watershed was calculated, and scores were standardized to 10 points by dividing each sub-watershed by the max score and multiplying by 10.
Public Ownership (GAP Stewardship 2008)	Total area of public and conservation land in each sub-watershed was calculated. Scores were standardized to 10 points as follows: Less than 500 acres = 2 points; 500-1,000 acres = 4 points, 1,000-1,500 acres = 7 points, more than 1,500 acres = 10 points. [selection of these thresholds was based on visual histogram analysis]
Stream Quality Thresholds	Monitoring stations reporting values within the Minnesota Pollution Control Agency's confidence interval of relevant water quality thresholds were given the following points: Above threshold, but within CI: 10 Points Below threshold, and within ½ of the CI: 4 points More than ½ the CI below threshold, within one CI: 2 points

EBI Habitat Quality Index	The zonal mean of each sub-watershed was calculated for the EBI Habitat Quality layer. Sub-watersheds were then classified into quintiles, with the top quintile receiving 10 points, the 2nd highest 8 points, the third highest 6, etc.
Perennial Cover in Critical Areas (EBI Water Quality; NLCD 2011)	Overlapped National Land Cover Database (NLCD) 2011 land cover data and the EBI Water Quality layer to pick out areas scoring over 60 in the EBI data for their impact on water quality that were mapped as having perennial landcover in the NLCD data. The total area in each HUC12 was calculated and standardized to 10 points.

The **Biodiversity Significance Rankings** from the Minnesota Biological Survey (MBS) provide categorical assessments of a sites importance in sustaining the natural biodiversity of Minnesota. A site's biodiversity significance rank is based on the presence of rare species populations, the size and condition of native plant communities within the site, and the landscape context of the site. Sites are ranked as either "Outstanding," "High," "Moderate," or "Below." (http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html)

The **GAP Stewardship 2008** data layer is a map of land ownership in Minnesota. Attributes are available for both ownership and administrator. It was used to determine what percentage of each minor watershed is under private ownership, not counting non-governmental conservation organizations. (http://www.mngeo.state.mn.us/chouse/land_own_general.html)

Minnesota Pollution Control Agency's (MPCA) **Index of Biological Integrity** assesses biological communities, specifically invertebrate or fish communities, to measure the health of those communities as they reflect the integrity of the stream ecosystem. Populations are sampled at monitoring stations along streams, and the community health is scored based on the relative tolerances of the organisms found. Different stream types have thresholds for acceptable quality, along with confidence intervals surrounding those thresholds. (https://www.pca.state.mn.us/water/index-biological-integrity)

The **EBI Habitat Quality Index** is one of three component parts of the Environmental Benefits Index (EBI) compiled by the MN Board of Water and Soil Resources (BWSR) and the University of Minnesota. It is developed using data from several datasets mapping habitat for biodiversity, game species, birds, and species of greatest conservation need.

(http://www.bwsr.state.mn.us/ecological_ranking/)

The **EBI Water Quality Risk Index** is one of three component parts of the Environmental Benefits Index (EBI) compiled by the MN Board of Water and Soil Resources (BWSR) and the University of Minnesota. It uses an area's Stream Power Index (SPI) and its proximity to water to assess the likelihood of it contributing runoff from overland flow.

(http://www.bwsr.state.mn.us/ecological_ranking/)

The **National Land Cover Database** was created through a cooperative project conducted by a partnership of federal agencies called the Multi-Resolution Land Characteristics (MRLC) Consortium. NLCD 2011 is the most up-to-date iteration of the National Land Cover Database and provides 30-meter resolution land cover for the entire country. (www.mrlc.gov)

Conversion Risk:

The **Agricultural Conversion Risk Layer** and **Development Risk Layer** were developed by Kristin Blann, Freshwater Ecologist for The Nature Conservancy. The Agricultural Conversion layer uses soil type, slope class, cover type, and distance from other agricultural land to determine the likelihood of a parcel or field being converted from perennial cover to row crops. The development risk layer predicts likelihood of conversion from perennial cover for development based on township growth projections and proximity to major roads. Both layers are raster data on a 1 to 100 scale. The zonal mean for each sub-watershed was standardized to a 10-point scale.

Watershed Health Assessment Framework (WHAF):

A subset of the layers available from the WHAF was also included in the analysis (all scores standardized to 10 points for each HUC12 for each of the main categories below):

The Watershed Health Assessment Framework was developed by the Minnesota DNR as a set of statewide metrics that measure various components of watershed health. HUC-12 sub-watersheds are ranked on 100-point scales on a number of criteria. A subset of those criteria was included in this analysis. The criteria used were separated by WHAF component, and the component scores for each sub-watershed were divided by 10, resulting in a 10-point scale.

Component	Scoring Method
Hydrology	– Perennial cover index (2011) – Impervious cover index (2011) – Storage, straightened-meandering stream ratio index
Biology	– Aquatic invertebrate IBI – Fish IBI – Mussel score
Connectivity	– Riparian connectivity – Aquatic connectivity
Water Quality Metric	– Non-point sources: phosphorous risk – Wastewater treatment plants – Superfund sites – Septic systems – Potential contaminants – Animal units

Analysis and Results

Final scores for each sub-watershed were calculated by taking the sum of the average component score within each scoring category (Protection Value, Conversion Risk, and WHAF Metrics). Since each component within the categories had a max score of 10, this resulted in combined scores for each HUC12 having a max of 30. Each sub-watershed was then ranked by percentile. Figure 2 shows those sub-watersheds that scored in the top four deciles (60th percentile and above).

Based on those combined rankings, COAs were designated to capture contiguous, high scoring sub-watersheds that contained recognizable ecological complexes. COA boundaries were primarily based on sub-watersheds, with the edges expanded in places to fully capture ecologically significant natural communities (as mapped by either the Minnesota Biological

Survey's Biodiversity Significance layer or DNR Wildlife's Wildlife Action Network) that straddle a watershed divide. The final COA shapes are shown in Figure 3.

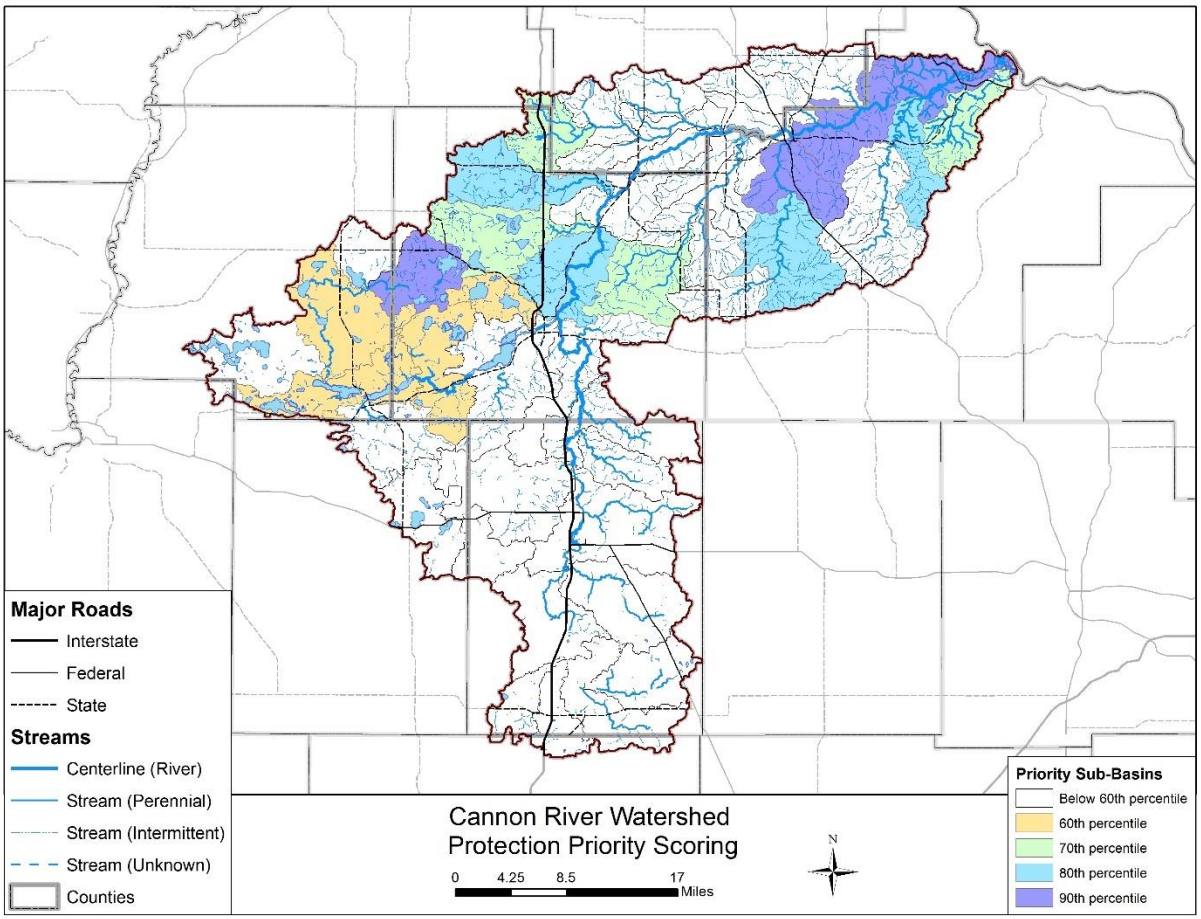


Figure 2. Combined priority-ranking scores for the Cannon River Watershed.

Selected Conservation Opportunity Areas

Four COAs were selected in the Cannon River Watershed based on the assessment information (Figure 3).

- The Big Woods COA covers 51,053 acres in the headwaters of Prairie Creek and the Crystal Lake section of the Cannon River north and east of Faribault and south of Northfield. The Big Woods COA includes several key natural areas such as Nerstrand Big Wood State Park, Cannon River Trout Lily State Scientific and Natural Area, Rice County's Cannon River Wilderness, and The Nature Conservancy's Trout Lily Preserve. It also includes several privately owned tracts protected through the Forest Legacy easement program.

- The Headwater Lakes COA is the largest COA in the Cannon River Watershed at 98,306 acres. It covers the Cannon River's headwaters northwest of Faribault, east of Lonsdale, and west of Northfield. This area features rolling topography that is pocketed with numerous small lakes, wetlands, and patches of forest.

- The Little Cannon COA lies south of Cannon Falls encompassing 51,163 acres in the Little Cannon watershed. The COA is entirely privately owned and contains several high quality natural areas. The lack of public-land in this COA puts and even higher onus on the need to support private landowner stewardship for the maintenance of these natural areas and associated water quality.

- The Lower Cannon COA encompasses the bottom 76,673 acres of the watershed between Cannon Falls and the Cannon River's confluence with the Mississippi River near Red Wing. In addition to the Cannon main stem, the COA includes all or portions of the Lower Belle Creek, Pine Creek, Spring Creek, and Trout Brook watersheds that support cold-water fisheries. Key natural areas in the Lower Cannon COA include Cannon River Turtle Preserve SNA, Spring Creek Prairie SNA, portions of the Richard J. Dorer Memorial Hardwood State Forest, and Dakota County's Miesville Ravine Regional Park.

These four COAs represent places of emphasis for the conservation actions outlined in Section 1 of the plan. Individual stewardship plans for each COA are found in Section 7. These plans focus on specific resources and needs, as well as strategies that are appropriate to the different social resources and ownership patterns within each COA.

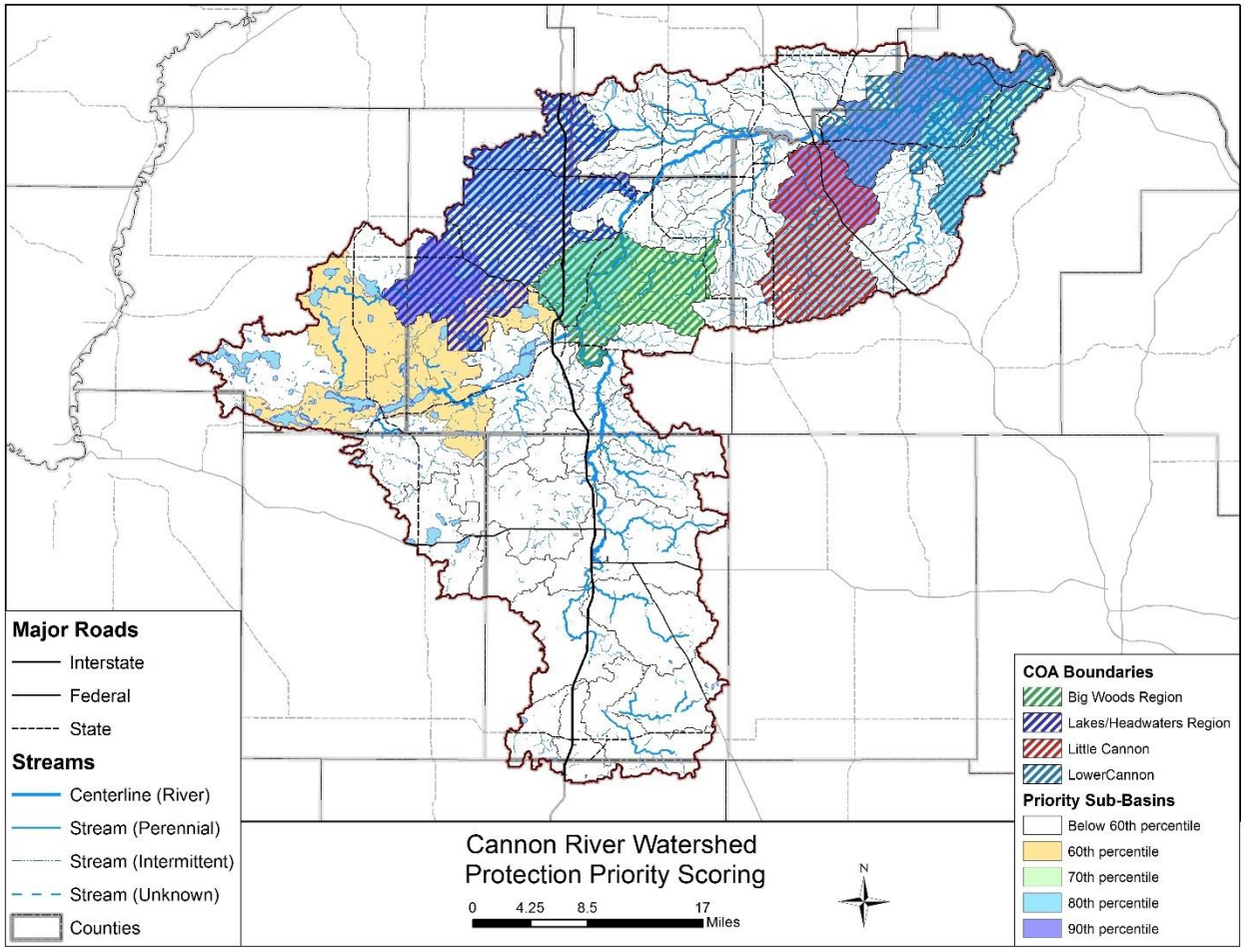


Figure 3. Conservation Opportunity Areas shown with the combined priority-ranking scores in the Cannon River Watershed.

Partners and Partnerships

With the wealth of government agencies, non-profit organizations, conservation groups, and stakeholders working in the watershed, coordinating efforts can make efficient use of time and resources. Thus increasing the impact each group makes on the ecological health of the watershed. These coordination efforts are important across the entire watershed and within the focal COAs. Experience has taught us that focusing coordination for healthy lands and waters within, and between, these COAs often has higher viability and can be a crucial step in achieving buy-in for coordination efforts across the landscape.

Achieving the goals of this plan will require a wide variety of groups and agencies to provide seamless service to private landowners interested in managing their land, while also performing public land management in a manner and sequence that makes the biggest impact. All agencies involved should complement each other's efforts towards the common goal of implementing sustainable natural resource management.

Conservation and stewardship of natural communities, ecosystem health, and water quality require sustainable behaviors and attitudes from numerous private individuals and public agencies that affect economic, cultural, and recreational resources of the community. As such, it is an inherently collaborative effort. The potential partners for conservation in the Cannon River watershed include a number of state and federal agencies, as well as non-governmental conservation groups. The adjacent list includes many, but not necessarily all, such partners.

State Agencies:
- Board of Water and Soil Resources
- DNR Ecological & Water Resources
- DNR Fish and Wildlife
- DNR Forestry
- DNR Parks and Trails
- MN Dept. of Agriculture
- MN Forest Resources Council
- MN Pollution Control Agency
- University of Minnesota

Local Government:
- County and City
- SE MN Water Resource Board
- Soil and Water Conservation Districts

Federal Agencies:
- Natural Resources Conservation Service
- U.S. Fish and Wildlife Service
- U.S. Forest Service

Non-governmental Organizations:
- Basin Alliance for the Lower Mississippi in Minnesota
- Cannon River Watershed Partnership
- Land Management Consultants
- Minnesota Land Trust
- Pheasants Forever
- The Nature Conservancy
- Trout Unlimited
- Trust for Public Land

Related Conservation Plans

Minnesota has a long history of taking this "landscape" approach to natural resource planning and this plan builds off efforts by the Minnesota Forest Resource's Council's Landscape Program and previous watershed based landscape stewardship plans developed for the Kettle, Root, Zumbro, and Mississippi River – Winona watersheds. While there are many ways to divide a region into landscapes, using watersheds as the organizing feature emphasizes the link between natural resource management and water. It also parallels other state planning trends, such as the move to One Watershed One Plan (1W1P) plans to replace local water plans. Planning natural community stewardship by watersheds increases the value of Landscape Stewardship Plans as resources for other water planning exercises.

The list below highlights several conservation or development plans covering portions of the watershed whose goals or actions may overlap and influence conservation efforts outlined in this Landscape Stewardship Plan.

- MPCA Cannon River Watershed Restoration and Protections Strategies (WRAPS)
- Cannon River One Watershed, One Plan
- Dakota, Goodhue, Le Sueur, Rice, Steele, and Waseca Counties' Comprehensive Plans and Water Management Plans
- MFRC Southeast Landscape Plan
- MN DNR Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) and Extension
- MN DNR State Wildlife Action Plan, 2015-2025
- MN DNR Minnesota Scientific and Natural Areas (SNA) Program Strategic Land Protection Plan
- MN DNR Aquatic Management Area Acquisition Plan
- MN DNR Division of Fisheries Strategic Plan for Coldwater Resources Management in Southeast Minnesota
- Northern Cannon River Watershed Management Organization
- Basin Alliance for the Lower Mississippi in Minnesota 2001 Basin Plan Scoping Document

Watershed Restoration and Protection Strategies (WRAPS)

This plan is intended to support the efforts outlined in the 2016 Cannon River WRAPS Plan. The WRAPS plan was developed concurrently with the development of the Landscape Stewardship Plan and should be referenced along with this plan for projects in the watershed. The WRAPS process occurs on a 10-year cycle for each HUC8 watershed in the state with the Cannon River effort concluding in 2016. Periods of elevated water quality monitoring lead to analysis of collected data to determine the stressors and impairments of watershed streams. That information is then incorporated into a table and document outlining the water quality issues facing the watershed and necessary strategies to both restore impaired areas and protect healthy areas. Data collected during this WRAPS process were used in the development of this plan, and it is intended that the objectives and strategies it lists will inform the protection strategies outlined in the WRAPS process.

One Watershed One Plan

Stakeholders began developing a One Watershed One Plan (1W1P) for the Cannon River Watershed while the Landscape Stewardship Plan was being developed. The vision of the 1W1P program is to align local water planning on major watershed boundaries with state strategies towards prioritized, targeted and measurable implementation plans. The Cannon River is one of the first watersheds in the state to go through this Minnesota Board of Water and Soil Resources (BWSR) coordinated process. This approach to local government water management implementation plans focused watershed boundaries helped lead the Landscape Stewardship Plan to base its boundaries on the watershed and it is intended that these two plans can inform each other in their development and implementation.

Cannon River Watershed Partnership

The Cannon River Watershed Partnership (CRWP) is a nonprofit organization that strives to engage people to protect and improve the water quality and natural systems of the Cannon River watershed. The organization focuses on improving water-quality, reducing sedimentation and flooding, and improving habitat for all plants and animals through their three main program areas: Agriculture, Community Engagement, and Small Community Wastewater. A 25 member Board of Directors governs the CRWP. Twelve are public officials (six county commissioners and six Soil and Water Conservation District Supervisors from the six counties of the watershed) and thirteen are citizen members.

CRWP will be a valuable partner in efforts moving forward, for both their outreach and educational capacity and their ability to convene important stakeholders in the watershed. Additionally they have a diversity of plans, reports, and publications that will be useful in any future efforts in the watershed.

Minnesota Forest Resources Council Southeast Landscape Plan

The MFRC Landscape Program fulfills the MFRC's charge to "encourage cooperation and collaboration between public and private sectors in the management of the state's forest resources." This grass-roots effort builds relationships, strengthens partnerships, and identifies collaborative forest management projects that address local needs and represent concrete steps in determining and reaching citizen-identified short-term and long-term goals for broad landscape regions. Committee members represent forest industry, natural resource agencies, individual landowners, non-profit organizations, educational institutions and concerned citizens. The Southeast Landscape Committee completed a revised landscape plan, Southeast Landscape Plan: A Regional Plan to Guide Sustainable Forest Management, in November 2014.

Future Plan and Policy Integration

Land and water resources can be directly impacted by management plans and policies that govern land use, economic development, transportation, utilities, water resources, forest resources and other natural resources. To better influence future policy and minimize issues, partners and key stakeholders must be aware of existing and proposed plans and policies and how they may impact natural resources stewardship planning efforts. They must also be engaged early in policy discussions to integrate sustainable resource management into the planning process. Landscape stewardship can provide reliable and relevant information for local officials to help define the context and value of natural resources in a community.

Section 3. Action Plan Template

The purpose of this section is to outline steps that would be required to accomplish the vision outlined in Section 1 of the plan. This section delineates a generalized action plan for those items that call for measurable on-the-ground actions to be taken in the watershed with targets for the levels of action to be taken after five and ten years (Table 2). These targets are based off information on what is currently happening in the landscape, and what may be possible under a realistic growth scenario. Targets are listed either as 5- or 10-year totals or as annual averages for the first five years and second five years. These general targets set measureable goals for the landscape with the caveat that individuals and organizations will set their own targets that, when combined, will move the entire landscape towards these targets. No one entity will be responsible for attaining all of these targets. With any effort, there is year-to-year variability and annual values are expected to fluctuate.

Other strategies are not as conducive to measureable targets but are no less important to achieving the landscape vision. Many of these will be implemented through structures of collaboration and data management that are not listed in this table. Additionally, several strategies refer to social or legislative changes for which measurable actions are not immediately apparent, but which the plan nevertheless wishes to endorse as positive directions for the future health of native communities and water quality in the region.

Table 2. Benchmark targets for implementing the Cannon River Watershed LSP.

Strategy to Achieve the Landscape Vision	5-Year Target	10-Year Target
Utilize prescribed fire as a tool in management and restoration.	600 acres of natural areas burned annually	600 acres of natural areas burned annually
Increase forest cover through site and climate appropriate plantings.	1,000 new acres of forestland	2,000 new acres of forestland
	50,000 seedlings sold by SWCDs annually	50,000 seedlings sold by SWCDs annually
Control invasive species through management, monitoring, and outreach.	2,000 acres treated	5,000 acres treated
Pursue opportunities for increased protection through conservation easements and public acquisition in strategically important areas.	600 acres acquired	1,500 acres acquired
Protection of karst features and other key water resource areas. Focus these efforts through installation of native plant community buffers to reduce pollutant run-off entering groundwater.	80% of karst features protected with	100% of karst features protected with

	appropriate buffers	appropriate buffers
Identify opportunities to work with landowners to increase habitat corridors and connectivity. Focus efforts on landowners around publicly owned natural areas to ensure greater connectivity of native plant communities into a larger matrix of well-managed private forest and grasslands.	100 landowners contacted	200 landowners contacted
Encourage landowner participation in programs that promote the restoration and maintenance of native habitats. Increase CRP acreage availability and landowner enrollment.	3,000 acres added to conservation programs	9,000 acres added to conservation programs
Promote consulting businesses who have local forestry and natural community knowledge that can develop forest management plans for landowners	50 new stewardship plans	100 new stewardship plans
Work with area producers to expand the use of rotational or conservation grazing. Encourage the addition of sustainably grazed perennial cover on the upslope woodlands to reduce the rate at which overland flow reaches wooded ravines.	500 new acres of conservation grazing	3,000 new acres of conservation grazing
Identify areas and funding for engineering projects such as wetland restorations and farm pond improvements that will improve the region's water quality and groundwater recharge.	30 new projects implemented	60 new projects implemented
Identify areas and funding for engineering projects such as water and sediment basins at the wooded bluff edge to reduce ravine head cutting.	10 new projects implemented	20 new projects implemented
Identify areas and funding for engineering projects such as stream bank restoration.	10 new miles of streambank stabilization	20 new miles of streambank stabilization
Encourage producers to implement best management practices to improve soil health and reduce runoff	BMPs implemented on 5,000 new acres in COAs through programs like EQIP	BMPs implemented on 10,000 new acres in COAs through programs like EQIP
Use outreach and education to foster a 'land ethic' among land managers, landowners, community and citizen groups, and local communities	3 outreach events per year	3 outreach events per year

Agency and Organization Recommendations

Outreach and Community Engagement Organizations

Examples: Cannon River Watershed Partnership, SWCDs, U of M Extension

1. Host General and Targeted Outreach Events. The majority of landowners and the public value healthy natural communities, but may not be informed about the full benefits they provide to society, or the ways they can help protect and enhance them. Educating landowners on sustainable forest management, invasive species control methods, and best management practices for forestry and agriculture can help them take measures to protect and enhance the ecological health of their property. Informing the broader public on the value of natural communities, and ways to prevent the spread of invasive species can also be helpful.

2. Natural Area Management Techniques. Develop online content and host events showcasing natural area management techniques. Often landowners would like to undertake land stewardship projects but often lack the confidence to do them or awareness of the best techniques. Information on vegetation selection, planting techniques, and ways to limit herbivore damage are topics to consider.

3. Connections with Elected Officials. Encourage the connection of elected officials with their constituent groups through education programs. Promote and support sustainable resource education programs that connect informed citizens with elected officials.

Technical and Financial Assistance Organizations

Examples: SWCDs, Private Consultants, DNR Forestry, NRCS, FSA, BWSR

1. One-on-one Technical Assistance. The adoption of sustainable natural area practices and best management practices are improved when landowners are provided with technical assistance needed to properly implement them. This can be done directly by professionals within agencies, such as DNR Forestry and SWCDs, or through local consultants and contractors with the necessary skills.

2. Financial Assistance. Incentive programs provide technical and financial assistance that is designed to help achieve goals and policies established by Federal, State, and local agencies. Incentive programs have long been the foundation for promoting land stewardship among landowners. Examples include the EQIP program from NRCS and CRP from FSA. BWSR also provides financial assistance programs through local SWCDs. These and other financial assistance programs should be maintained or expanded.

3. Increase Awareness of Technical Assistance Options. Many landowners may not be aware of the numerous programs and resources to help them with their land stewardship. Increased

advertising and awareness should increase the utilization of the great services offered by consultants, agencies, and non-profit organizations.

Natural Resource Agencies

Examples: DNR Fish and Wildlife, DNR Forestry, US Fish and Wildlife Service, County Land Departments

1. Commitment to Sustainable Natural Resources Management. Many private landowners will look to public lands as a model for land management, and when done well, management on these lands often provides a tremendous effect on regional biodiversity and water quality. Natural Resource Agencies should be aware of this and undertake efforts to expand prescribed burning, invasive species control, sustainable silviculture, and other activates that will benefit local biodiversity and water quality as well as serving as a model for private landowners.

2. Service to Landowners. Continue to improve the delivery of technical and financial assistance on forest and prairie management to private landowners. Continue to promote native plant communities using the Ecological Classification System (ECS) as a guide to developing land management strategies when working with landowners and local officials. Refer to this Landscape Plan and its COA Plans.

3. Important and Critical Areas. Continue to identify and protect important or critical ecological areas in the landscape, particularly focused within the COAs, though conservation easements or strategic acquisition. Put an emphasis on NPCs, identified biodiversity sites, and impacts on water quality in these areas.

4. Public Investments. Local, State, and Federal investments are made in all communities on a regular basis. Public investments are made to construct public facilities and support public lands, but their location and operation across the watershed can significantly impact, positively or negatively, private land use decisions. Roads, bridges, and waterways support public good but also encourage and support private investment. Partners and stakeholders concerned about conserving natural communities should consider strategies that help shape relevant decision-making processes related to public investments.

5. Data Gathering. Support the collection, organization and evaluation of data collected relating to natural resources at the local level on private lands. Encourage the coordination and sharing of data with other resource agencies and local officials.

6. Fund Restoration Projects. Natural resource management is a long-term commitment and requires long term funding to reach the desired future conditions. Contribute staff time or direct funding to support projects.

Board of Water and Soil Resources

1. Support healthy watershed protection easements in Southeast Minnesota. Healthy Watershed RIM easement programs are being piloted in other areas of Minnesota. Similar programs targeting managed grassland and forestland on key landforms in the Southeast would be a powerful tool to help protect both water quality and existing native plant communities. One possible example would be a CREP style arrangement providing CRP payments for 10 years and placing a permanent RIM easement on highly erodible or moderately steep cropland converted to grassland that slopes towards hillside forest communities.

Clean Water Fund Advisory Council

1. Healthy Forests for Healthy Waters. Continue to support programs that target natural community protection for water quality benefits. The Healthy Forests for Healthy Waters (HFHW) program managed by DNR Forestry's CFM program provides a good example. These programs enable stewardship specifically targeted for multiple benefits on the landscape.

Conservation and Non-governmental Organizations

Examples: The Nature Conservancy, Minnesota Land Trust, Pheasants Forever, Trust for Public Land

1. Commitment to Sustainable Natural Resources Management. Many private landowners will look to public lands as a model for land management, and when done well, management on these lands often provides a tremendous effect on regional biodiversity and water quality. Conservation organizations should be aware of this and undertake efforts to expand prescribed burning, invasive species control, sustainable silviculture, and other activates that will benefit local biodiversity and water quality as well as serving as a model for private landowners.

2. Important and Critical Areas. Continue to identify and protect important or critical ecological areas in the landscape, particularly focused within the COAs, though conservation easements or strategic acquisition. Put an emphasis on NPCs, identified biodiversity sites, and impacts on water quality in these areas.

3. Reference Document. Conservation groups and NGOs are encouraged to use this Plan as a reference document when developing their plans and strategies.

4. Collaboration. Encourage the partnering of conservation and non-governmental organizations to address major resource management issues.

5. Fund Restoration Projects. Natural resource management is a long-term commitment and requires long term funding to reach the desired future conditions. Contribute staff time or direct funding to support projects.

6. Connections. Connect members and citizens with resources on sustainable natural resource management topics.

Local Officials

1. Reference Document. Local officials are strongly encouraged to use this Plan as a reference document when developing their resource management plans including county water plans, local land use plans, and state resource plans. They are further encouraged to adopt this landscape stewardship plan as an appendix to their plans to provide more detailed guidance on sustainable natural resource management and support more proactive and collaborative funding development.

2. Consider Forests, Prairies and Riparian Areas in Local Land Use Decisions. Local officials are encouraged to consider the values and benefits that natural areas can bring to their communities. Healthy and sustainable forests and prairies promote a high quality of life for citizens and can support increased economic opportunities as well. Forests, prairies, and streams should be included in the land use decision making process.

3. Resource-Based Planning. Local officials are encouraged to incorporate a more comprehensive consideration of natural resources into their land use planning process.

4. Alternative Development Options. There are alternative ways that land can be developed to provide for both economic growth and the protection of natural resources. Local officials are encouraged to use forestry as a way to improve their communities and their future development. Zoning should take into account impacts on natural areas and water quality.

DNR Forestry Cooperative Forest Management Program

1. Local CFM Foresters. Maintain support and funding for local CFM foresters. Continue to provide cost share services to private landowners for appropriate forestry activities. Direct local CFM foresters to engage in direct outreach with key landowners in COAs identified in this plan.

2. Target Cost Share Funding. Place priority on funding cost share programs targeted to strategic locations within watersheds, including the COAs identified in this plan. Emphasize funding for activities that will maximize the multiple benefits of forests.

Minnesota Forest Resources Council

1. Convening Body. Serve as a convening body for data and accomplishment sharing though the Southeast Landscape Committee. Support the increased sharing of ideas and experiences between the individuals and organizations involved with implementing the plan. Provide updates on sustainable natural resource management activities taking place with other watersheds.

2. Staff Support to the SE Committee. Provide additional staff support to the efforts of the Southeast Committee that can help in the ongoing implementation of this plan and coordination of its recommended activities.

3. PFM Funding. Find ways to increase funding support for the private forest management program administered by the DNR to serve more landowners.

Forestry and Natural Area Consultants

1. Reference Document. Private land consultants are encouraged to use this plan as a reference document when developing Forest Stewardship Plans and other landowner materials. Reference the connection between the actions landowners take on their land and the larger landscape in written and verbal communication with clients.

2. Engage with Public Land Managers. Stay connected with public land managers and see if there are cross-boundary projects that can benefit public and private landowners while moving towards the overall landscape vision.

Private Landowners

1. Become Informed. The organizations mentioned in this document have numerous programs and resources to help landowners become more informed about sustainable forestry and the benefits of forests and natural areas to our communities. All landowners are encouraged to become more knowledgeable about natural resources. Learning about best management practices (BMPs) is one easy way to get started. Recognize that forestry and natural area management is a long-term endeavor and that changes on the land will generally take several years to become realized.

2. Seek Technical Assistance. While there are numerous sources of information available, landowners are encouraged to seek technical assistance to help manage their forestlands. Often a landowner may need assistance from many technical service providers.

3. Get Involved. All citizens and landowners are encouraged to get involved in their communities and help promote sustainable forestry and natural area management. Voicing your concerns and sharing your ideas will help generate many new opportunities to improve forests, waters, and the quality of life in the region.

Section 4. Monitoring and Evaluation

The purpose of this section is to provide an initial outline for monitoring and evaluating the implementation of this Plan over the next ten to twenty years. The Southeast Landscape Committee will work with partner agencies and conservation organizations to develop this monitoring program. They will periodically review progress made towards the implementation of this plan based on information provided by partners in the watershed and report their findings to the Minnesota Forest Resources Council.

Overview

A critical portion of any management plan is the effort to monitor what has been accomplished as well as evaluate the effectiveness of the project's approach to natural area stewardship over time. The effects of plan implementation on ecological, economic, and social goals should all be tracked in an iterative process of assessing/identifying problems and recommending a series of solutions. Monitoring effects and adapting recommendations accordingly allows a plan to remain relevant in responding to the changes in landscape condition, scientific knowledge, and social needs over time.

The monitoring framework of this plan is based on the Desired Future Conditions and Strategies outlined in Section 1. Short-term efforts will focus on the strategies, and these will provide the basis for monitoring success in implementing the plan. Long-term monitoring will focus on how effective implemented plan projects are at bringing the condition of the watershed close to meeting the overall Desired Future Conditions.

Short-Term: Monitor Performance and Evaluate Process

Annual monitoring should focus on rates of implementation for recommended programs and actions. Different measurements and criteria will be appropriate for different activities. For some activities, especially those focused on creating data management networks or building community engagement, narrative descriptions will be the best reporting method. Management or restoration activities are best measured by acres affected or landowners assisted. The Southeast Landscape Committee will coordinate the tracking of annual results for each strategy. A sample of a few metrics is included in the table below.

Strategy to Achieve the Landscape Vision	Metric
Utilize prescribed fire as a tool in management and restoration.	Acres burned
Increase forest cover and forest health through sustainable forest management practices and site and climate appropriate plantings.	Trees planted
Control invasive species through management, monitoring, and outreach.	Acres treated
Pursue opportunities for increased protection through conservation easements and public acquisition in strategically important areas.	Acres acquired, Easements added

Protection of karst features and other key water resource areas. Focus these efforts through installation of native plant community buffers to reduce pollutant run-off entering groundwater.	Percent of karst features with adequate vegetation buffers
Identify opportunities to work with landowners to increase habitat corridors and connectivity. Focus efforts on landowners around publicly owned natural areas to ensure greater connectivity of native plant communities into a larger matrix of well-managed private forest and grasslands.	Landowners contacted
Encourage landowner participation in programs that promote the restoration and maintenance of native habitats. Increase CRP acreage availability and landowner enrollment.	Acres added to conservation programs
Promote local consulting businesses who meet CEU requirements and have local forest resource knowledge to develop forest management plans for local landowners	Number of new stewardship plans
Work with area producers to expand the use of low-intensity conservation grazing. Encourage the addition of lightly grazed perennial cover on the upslope woodlands to reduce the rate at which overland flow reaches wooded ravines.	Acres of conservation grazing
Identify areas and funding for engineering projects such as wetland restorations, sediment basins, farm pond improvements, stream bank restorations, grassed waterways, and floodplain reconnections that will improve the region's water quality and groundwater recharge.	Number of new projects implemented and miles of streambank stabilized
Encourage producers to implement best management practices to improve soil health and reduce runoff	Acres added to EQIP BMPs
Use outreach and education to foster a 'land ethic' among land managers, landowners, community and citizen groups, and local communities	Number of outreach events and number of attendees

Long-Term: Assess Results and Evaluate Effectiveness

As the strategies outlined in this plan are being implemented, periodic assessment of the progress toward the long-term vision for the watershed is also necessary. At least twice during the intended 10-year life of this plan, the Southeast Landscape Committee should convene regional stakeholders to discuss the state of the watershed relative to those desired future conditions, and determine what progress has been made, and what improvements could be made to the plan strategies or their implementation. Below are a few initial assessment questions. The committee will want to add to and refine these questions as well as evaluate whether the data necessary to assess watershed conditions are being collected; and if not, what additional data are needed? All of this information will be useful in determining what can be done to improve this plan, and conservation efforts overall within the watershed.

Desired Future Condition	**Assessment Questions:**
High quality streams and healthy groundwater resources	Is surface water quality improving or degrading? Is groundwater quality improving or degrading?

Populations of rare and threatened species are stabilized and increasing	What is the status of species and communities of concern within the watershed?
Streams that have rehabilitated banks and native floodplain vegetation	What is the status of floodplain forests? Have 50-foot stream buffers been applied to all streams in the watershed?
Large habitat buffers and corridors around and between core biodiversity areas	How has connectivity of natural communities improved across the watershed
Fire is used as a management tool in appropriate ecosystems	To what degree is fire being utilized in the watershed?
Consistent funding for cost share assistance associated with various landowner activities such as invasive species control and native plant community restoration	Are landowners receiving the financial support they need to implement conservation activities?
A more robust hardwood timber market supporting sustainable private timber management	Have markets in the area improved? Are landowners able to sell the wood they have grown? What new industries have become established?
Improved landowner education	How has landowner engagement changed or improved? Do landowners have access to necessary information, and do they know where to get it? How are we tracking landowner involvement and reaching out to those with interest in conservation?
Active comprehensive conservation planning on priority sites	How has collaboration improved between agencies and stakeholders within the watershed? How has communication and collaboration helped make conservation efforts more effective? How has the identification of priority areas improved conservation planning?
Regional land use plans recognize and protect rare features	Are rare features being protected in the watershed? How has the approach to protecting these rare features changed?

Section 5. Landscape Context

This southeastern Minnesota watershed has seen significant change in the last 150 years. Today, only 18% of the landscape remains as forest, wetland, or grassland and many of these areas have been degraded in some fashion. Despite these changes, the watershed retains relatively high water quality and areas of outstanding biodiversity significance that warrant special protection, maintenance, and restoration to sustain their function on the landscape.

This section provides an overview of the ecological, geological, and social aspects of the watershed. The information included here is intended to be a contextual starting point for interpreting the landscape but plan users are encouraged to also refer to other regional plans and reports for a more detailed exploration of this material.

Ecological Setting

The Ecological Classification System (ECS) developed by the Minnesota DNR provides a system for classifying plant communities in the state, as well as broad geographic ranges for those communities. It recognizes ecological regions at three nested scales: Provinces, Sections, and Subsections. The Cannon River Watershed lies entirely with in the Eastern Broadleaf Forest Province and contains portions of the Minnesota and NE Iowa Morainal (MIM) and the Paleozoic Plateau sections (Figure 4). The portion of the MIM occupied by the watershed includes areas of the Big Woods and Oak Savanna subsections while the Rochester Plateau and the Blufflands are the subsections found in the Paleozoic Plateau.

Big Woods (MIM): (Adapted from: http://www.dnr.state.mn.us/ecs/222Mb/index.html)

The Big Woods subsection coincides with a large block of deciduous forest present at the time of Euro-American settlement, lying predominantly on a loamy mantled end moraine from the Des Moines lobe of the Late Wisconsin glaciation. The topography is commonly gently to moderately rolling, with the typical landscape consisting of level topped hills bounded by smooth sides interspersed with closed depressions containing lakes and peat bogs. Oak woodland and maples-basswood forest were the most common vegetation types prior to Euro-American settlement. Today, more than 75% of the subsection is cropland, with an additional 5 to 10% in pasture. Unlike many surrounding subsections, fire likely played a smaller role in the disturbance regime, likely due to the topography and presence of lakes.

Oak Savanna (MIM): (Adapted from: http://www.dnr.state.mn.us/ecs/222Me/index.html)

The Oak Savanna subsection lies generally south and east of the Big Woods subsection on a rolling loess plain over bedrock or till. The hydrology is relatively mature, with the few lakes in the subsection occupying end moraines that extend from the Big Woods subsection, but are generally smaller. Fire has been the dominant disturbance, with landforms that disrupted prairie fires from the South, West, and East, but not enough to allow the development of mature forest. As a result, prior to Euro-American settlement, bur oak savanna was the primary vegetation, with areas of

tallgrass prairie and maple-basswood forest also common. Today most of the area is farmed, though urban development is accelerating along the northern boundary.

Rochester Plateau: (Adapted from: http://www.dnr.state.mn.us/ecs/222Lf/index.html)

The Rochester Plateau subsection is a level to gently rolling plateau of bedrock overlain by loess in the east and pre-Wisconsin age glacial till in the central and west. Tallgrass prairie and bur oak savanna were the major pre-settlement vegetative communities. Presently the majority of the unit is heavily farmed. Before its suppression, fire was an important component of the disturbance regime. Tornados and ice storms also had local impacts on forested communities.

The Blufflands: (Adapted from: http://www.dnr.state.mn.us/ecs/222Lc/index.html)

The Blufflands subsection is a transition area between the Rochester Plateau and the Mississippi River. The loess-covered Plateau is deeply dissected by dendritic stream networks that cut down through bedrock on their way to the Mississippi River, forming bluffs and deep stream valleys. Pre-settlement vegetation varied by landform. On ridge-tops and dry upper slopes, burr oak savanna and tallgrass prairie were major vegetation types. Moister slopes supported Red oak-white oak-shagbark hickory-basswood forests, and red oak-basswood-black walnut forests occupied protected valleys. Presently, roughly 30% of the Blufflands is cropped, 20% is in pasture, and 50% is woodland.

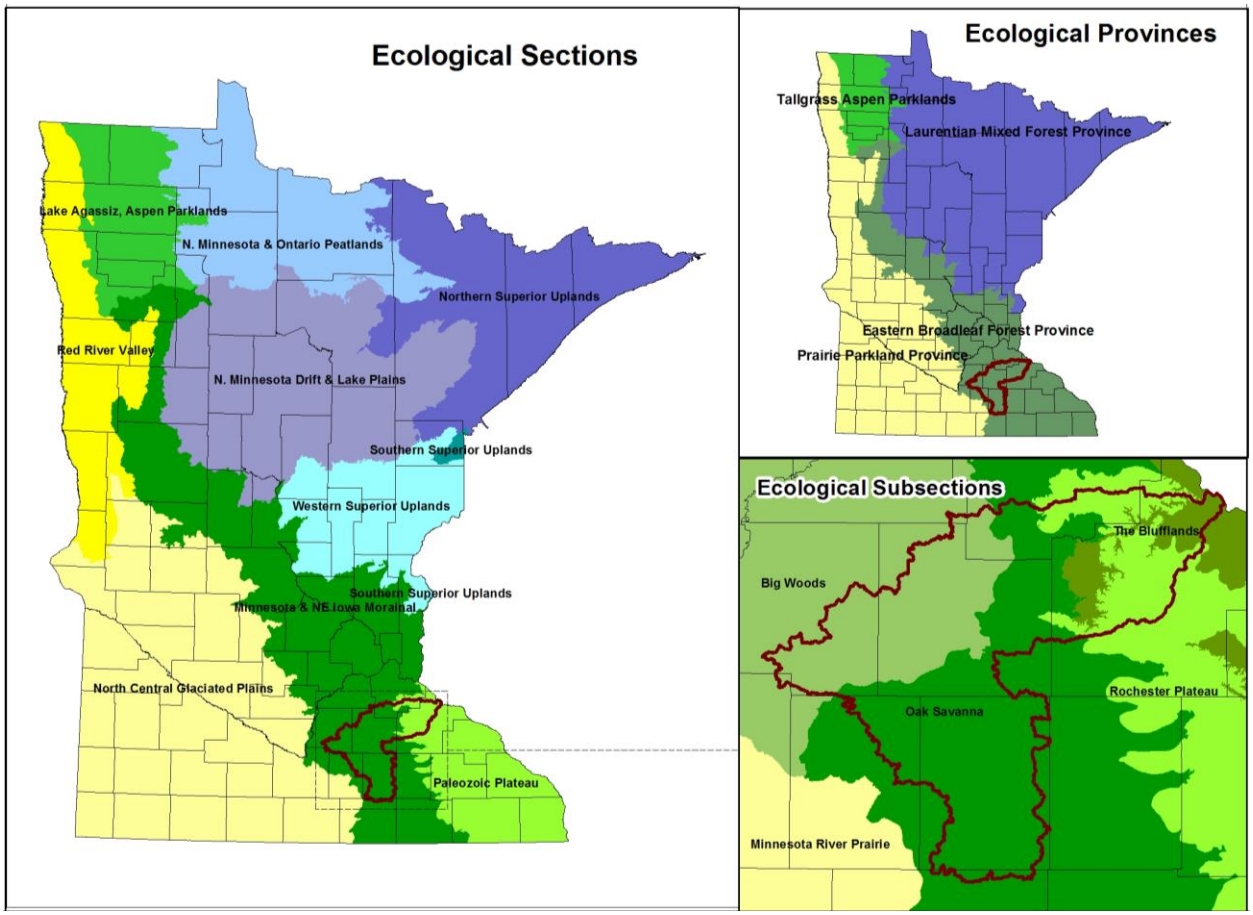


Figure 4. The Cannon River Watershed lies in two sections of the Eastern Broadleaf Forest Province: the Minnesota and NE Iowa Morainal (MIM) and Paleozoic Plateau. It covers portions of the Big Woods and Oak Savanna subsections of the MIM section and the Blufflands and Rochester Plateau subsections of the Paleozoic Plateau.

Hydrology

The Cannon River Watershed is large and diverse, with hydrological characteristics that vary across the watershed. It is made up of two river systems: The Cannon River, which runs 112 miles roughly east-to-west and empties into the Mississippi River near Red Wing; and the Straight River, which runs 56 miles south-to-north, meeting the Cannon River in Fairbault. In describing the watershed, it is helpful to break it into sections, or lobes, with roughly similar characteristics (Figure 5). The upper portion of the Cannon River (Upper Lobe) contains far more lakes than the rest of the watershed, with the river passing through an alternating chain of streams and lakes leading to the Cannon lake reservoir in Fairbault. The Straight River (Straight River Lobe) passes through flat to rolling fields, collecting water from many small streams before it meets the Cannon just below the reservoir dam. The stretch of the Cannon River between Fairbault and the Byllesby Reservoir (Middle Cannon Lobe) continues through relatively gentle topography, but receives water from some larger tributary networks, including Wolf Creek, Heath Creek, Chub Creek, and Prairie Creek. Below the dam at Byllesby Reservoir (Lower Cannon Lobe), the River enters the steeper and more dissected topography of the blufflands, where spring fed coldwater streams feed into the river before it meets the Mississippi.

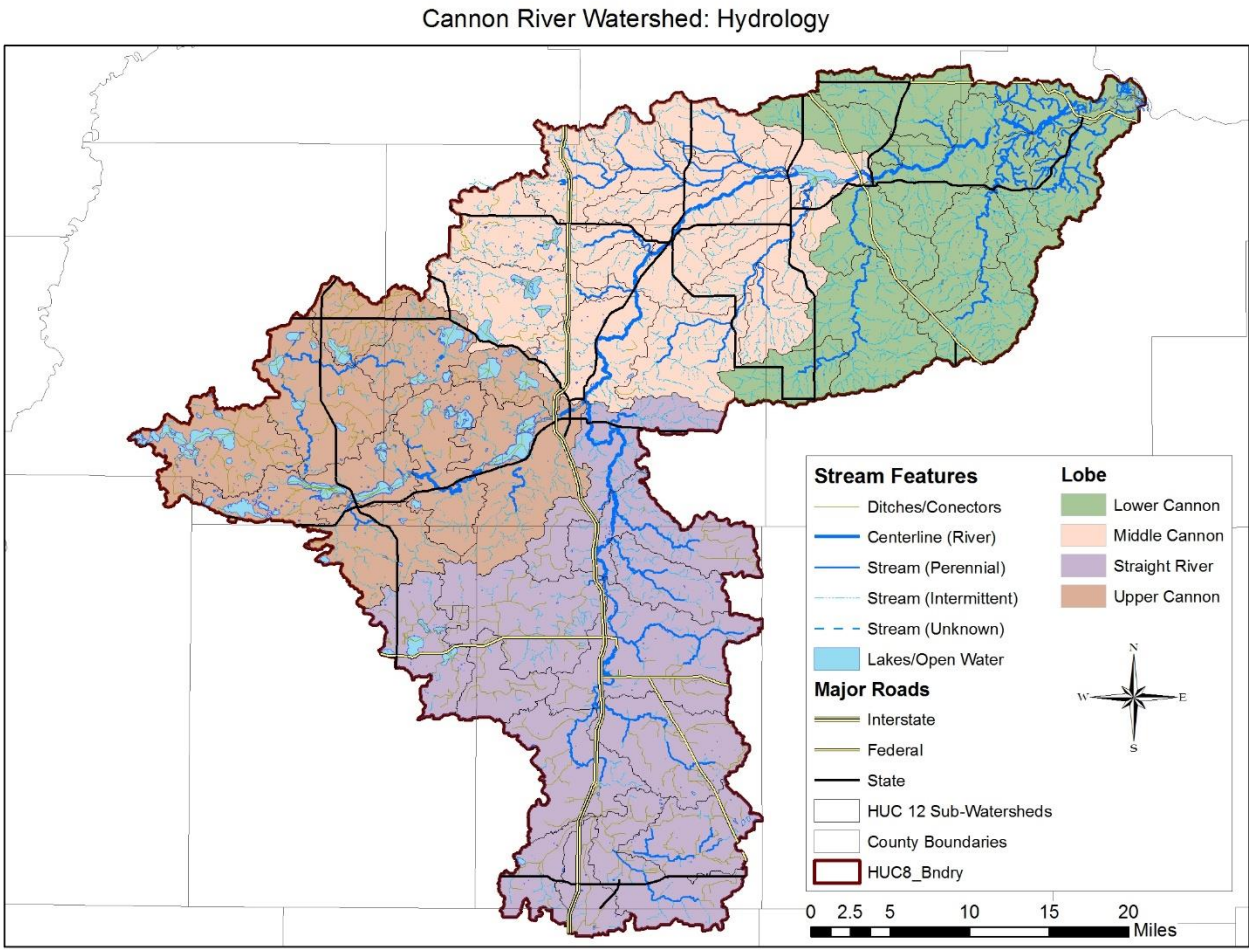


Figure 5. Stream network and major lobes of the Cannon River Watershed.

The Active River Area conservation framework provides a conceptual and spatially explicit basis for the assessment, protection, management, and restoration of freshwater and riparian

ecosystems (Figure 6). The active river area framework is based upon dominant processes and disturbance regimes to identify areas within which important physical and ecological processes of the river or stream occur (*Active River Area (ARA) Three-Stream Class (3SC) Toolbox Documentation*, 2011, Analie Barnett, TNC Eastern Division). It defines wet flat zones, base riparian areas, and material contribution zones for streams from small first order perennial to large rivers. It provides a method of identifying the historically active floodplain, where meander belts, closed oxbows, and other floodplain features are likely to be found. It also identifies flat areas where water is likely to accumulate, presenting opportunities for wetland restoration or other practices to increase storage and mitigate flooding.

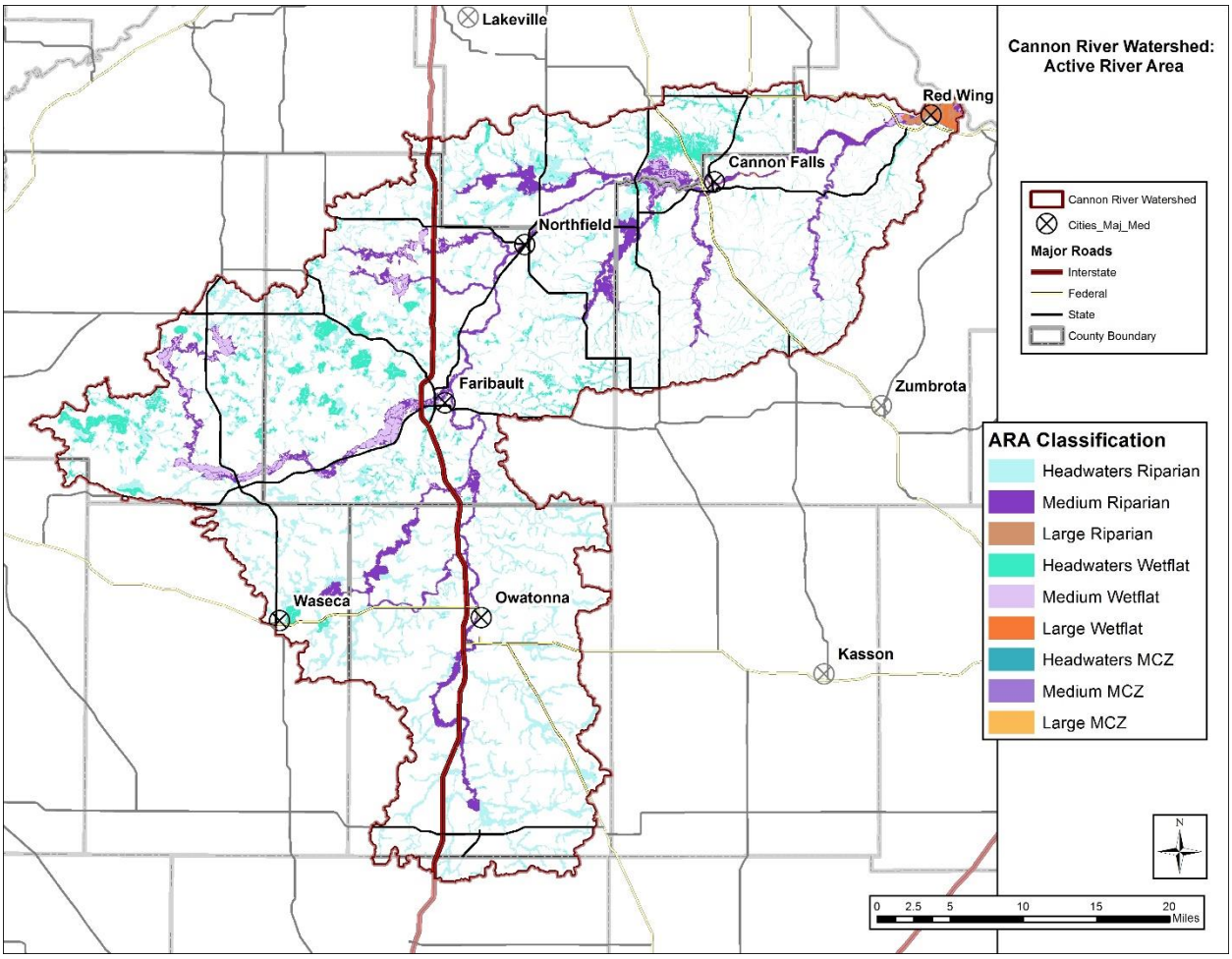


Figure 6. Active River Area analysis showing areas of historical river interaction, which includes the historic floodplain and meander belt.

Geology and Soils

The geology of the Cannon River Watershed varies from the rolling landscape of the headwaters to steep valleys where it meets the Mississippi. Overall the geology of the region is characterized by loess deposits which are a 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 (Cannon WRAPS 2016).

The CRW has three major geological areas (Figure 7):

- *Central Iowa and Minnesota Till Prairies.* Predominantly found in the Straight River, Upper Cannon and western half of the Middle Cannon lobes. Soils in are generally very deep, loamy, and range from well drained to very poorly drained. Predominantly derived from glacial till as part of the Des Moines Lobe of the Wisconsin ice sheet that once covered the region.

- *Eastern Iowa and Minnesota Till Prairies.* A mix of glacial till and outwash deposits with clay, silt, sand, and gravel filling the major river valleys characterizes the eastern half of the Middle Cannon lobe around Northfield and Cannon Falls. Karst features exist in this area with shallow depth of soils and glacial material covering limestone. Soils range from well drained to very poorly drained.

- *Northern Mississippi Valley Loess Hills.* The southern two thirds of the Lower Cannon lobe are considered part of the "Driftless Area" because the area underwent limited landscape formation by glacial ice. The resulting landscape is mostly gently sloping to rolling summits that create scenic landscapes of deep valleys, abundant rock outcrops, high bluffs, caves, crevices, and sinkholes (Cannon WRAPS 2016). Limestone and sandstone outcrops are observed along some streams and rivers in the area. Loess deposits cover bedrock in many areas. Some karst areas exist where carbonate rocks are near the surface. Soils are generally moderately deep to very deep, loamy, and well drained to moderately well drained.

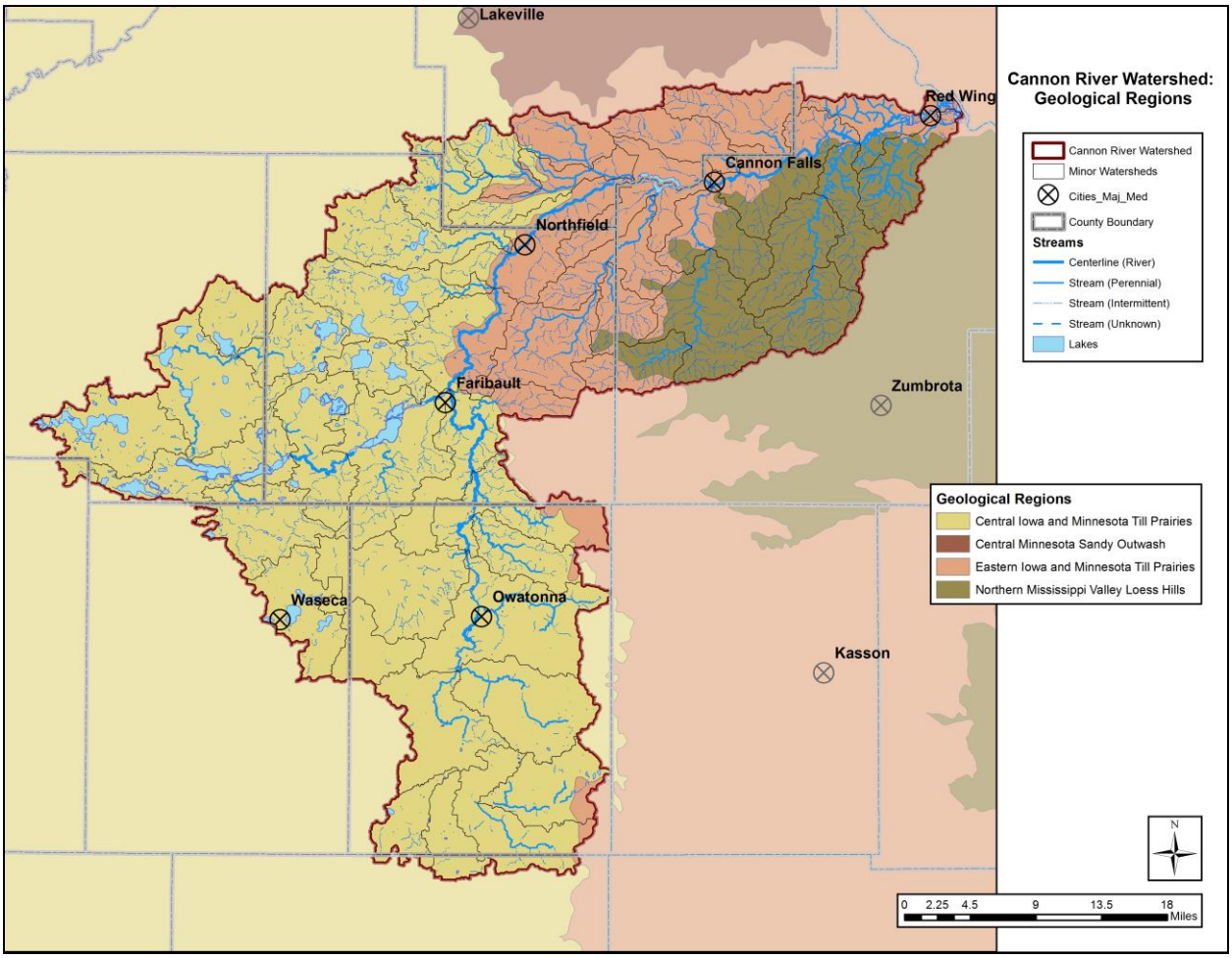


Figure 7. Major land resource areas in the Cannon River Watershed.

Key Geological Feature: Parts of the CRW contain karst features (Figure 8). Karst describes a landscape underlain by limestone that is being slowly dissolved by infiltrating rainwater, producing ridges, towers, fissures, sinkholes, and other characteristic landforms. This landscape can be challenging to protect because there are often hidden, rapid pathways from pollution release points to drinking water wells or surface water. In these areas, contaminants can enter the ground and move miles per day through cracks and crevices. The MPCA karst web page (https://www.pca.state.mn.us/water/karst-minnesota) discusses the process leading to the formation of Minnesota's karst, karst landforms and environmental problems that occur in karst landscapes.

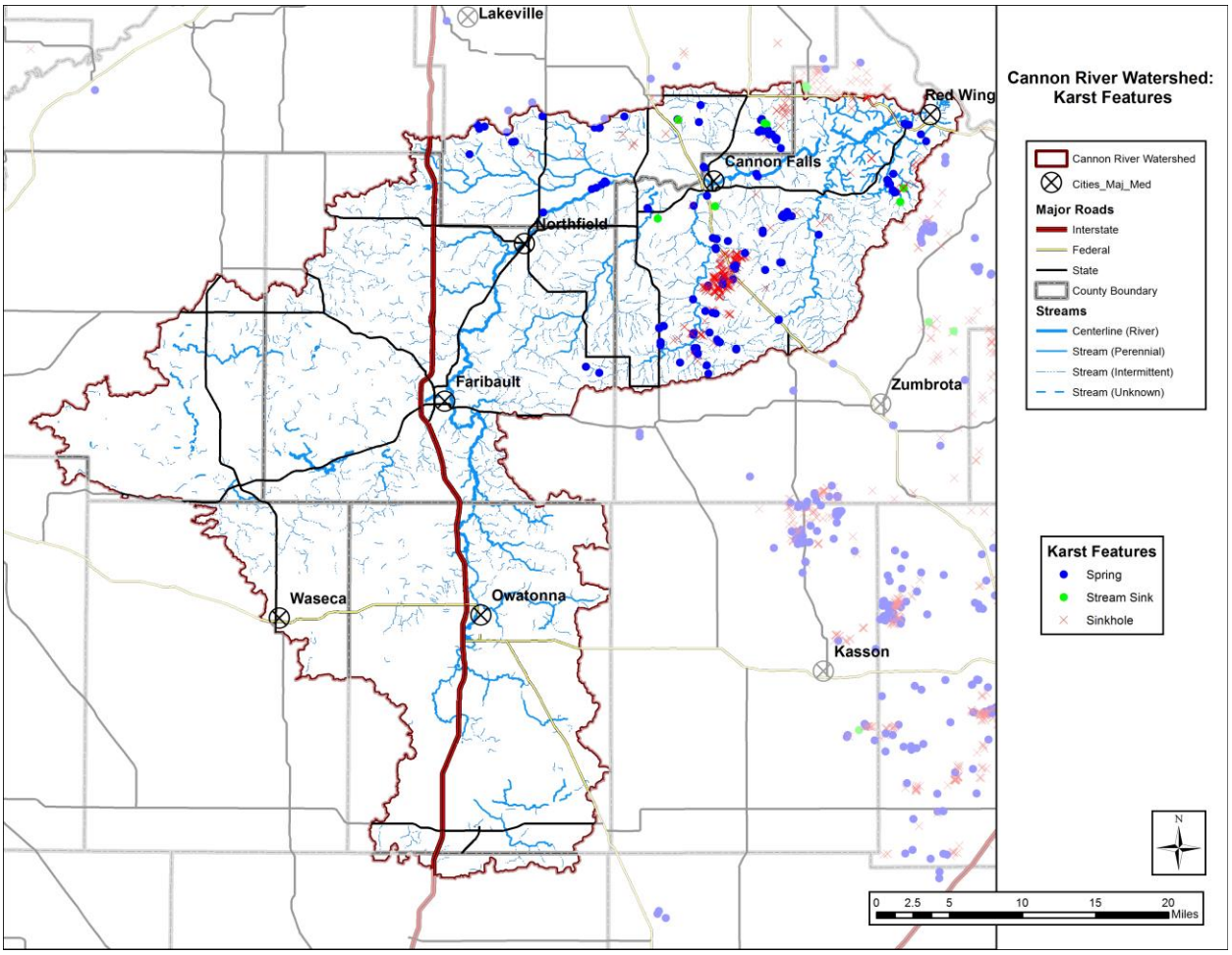


Figure 8. Known karst features in the Cannon River Watershed.

Vegetation

Land Cover Change

Prairie communities dominated much of the Cannon River Watershed prior to European arrival (Figure 9). Wet Prairies occupied moister areas near streams or wetlands. Where trees were present, they were often scattered in Oak Openings and Barrens communities. The largest exception to this trend is the Big Woods area that occupied much of the Upper Cannon Lobe. Here hardwood stands of maple, basswood, oak, and hickory, along with associated minor species and

shrubs, were the dominant vegetation. River bottom and Big Woods forest communities were also found in the lowest end of the watershed near the outlet to the Mississippi.

Today, the watershed is dominated by agriculture (Figure 10). The cities of Red Wing, Cannon Falls, Northfield, Fairbault, Owatonna, and Waseca, represent most of the developed land, though some suburban development is occurring in areas north and east of Northfield and Fairbault. Although greatly reduced, areas of natural land cover can be found around some of the lakes in the Upper Cannon Lobe, and along the steeply dissected valley slopes of the Lower Cannon Lobe. Additionally, portions of riparian forest vegetation remain along the main stem of the Cannon River between Fairbault, Northfield, and Cannon Falls and a block of the Big Woods ecosystem is preserved as Nerstrand Big Woods State Park.

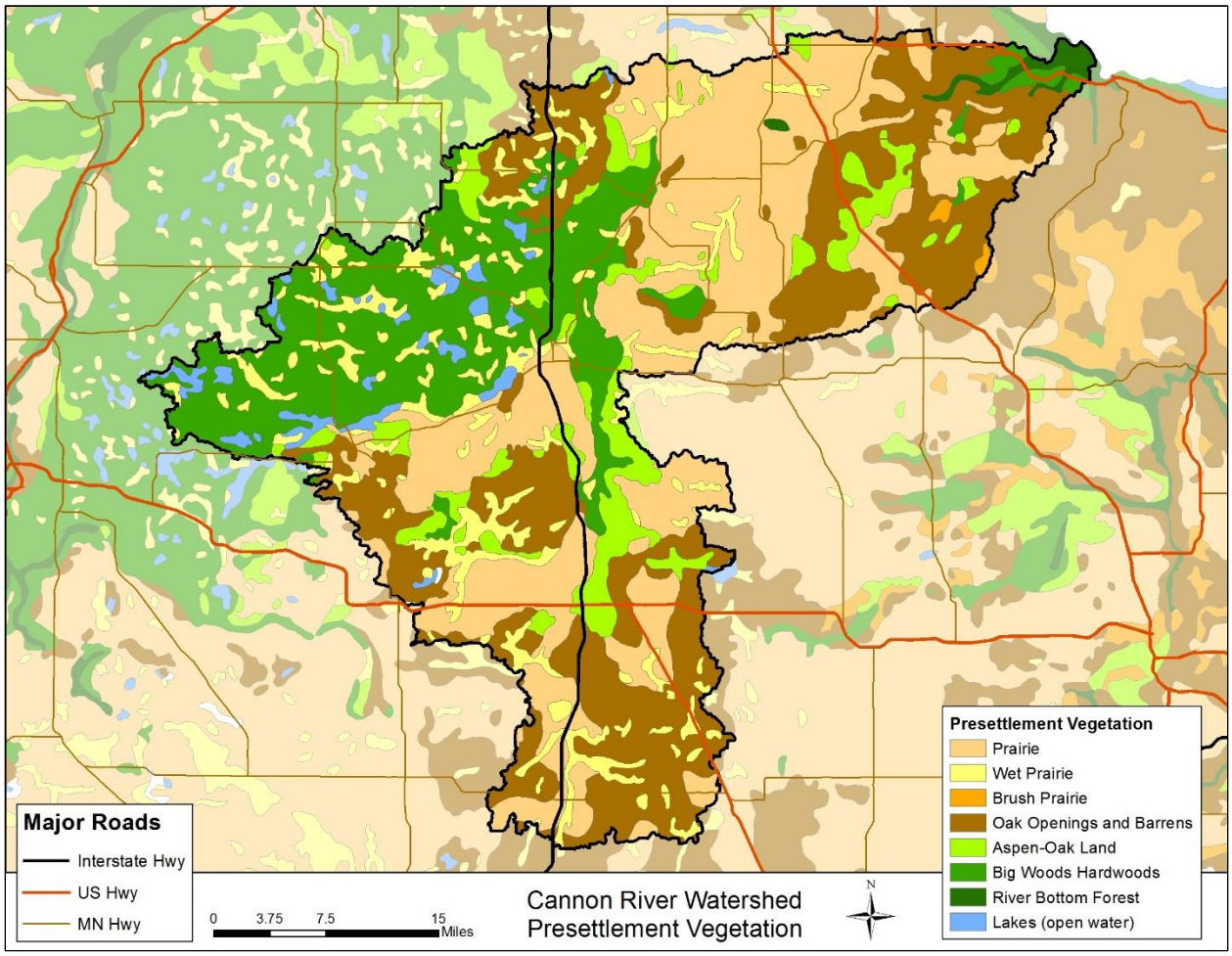


Figure 9. Pre-settlement land cover in the Cannon River Watershed based on Marschner's interpretation of the Public Land Survey.

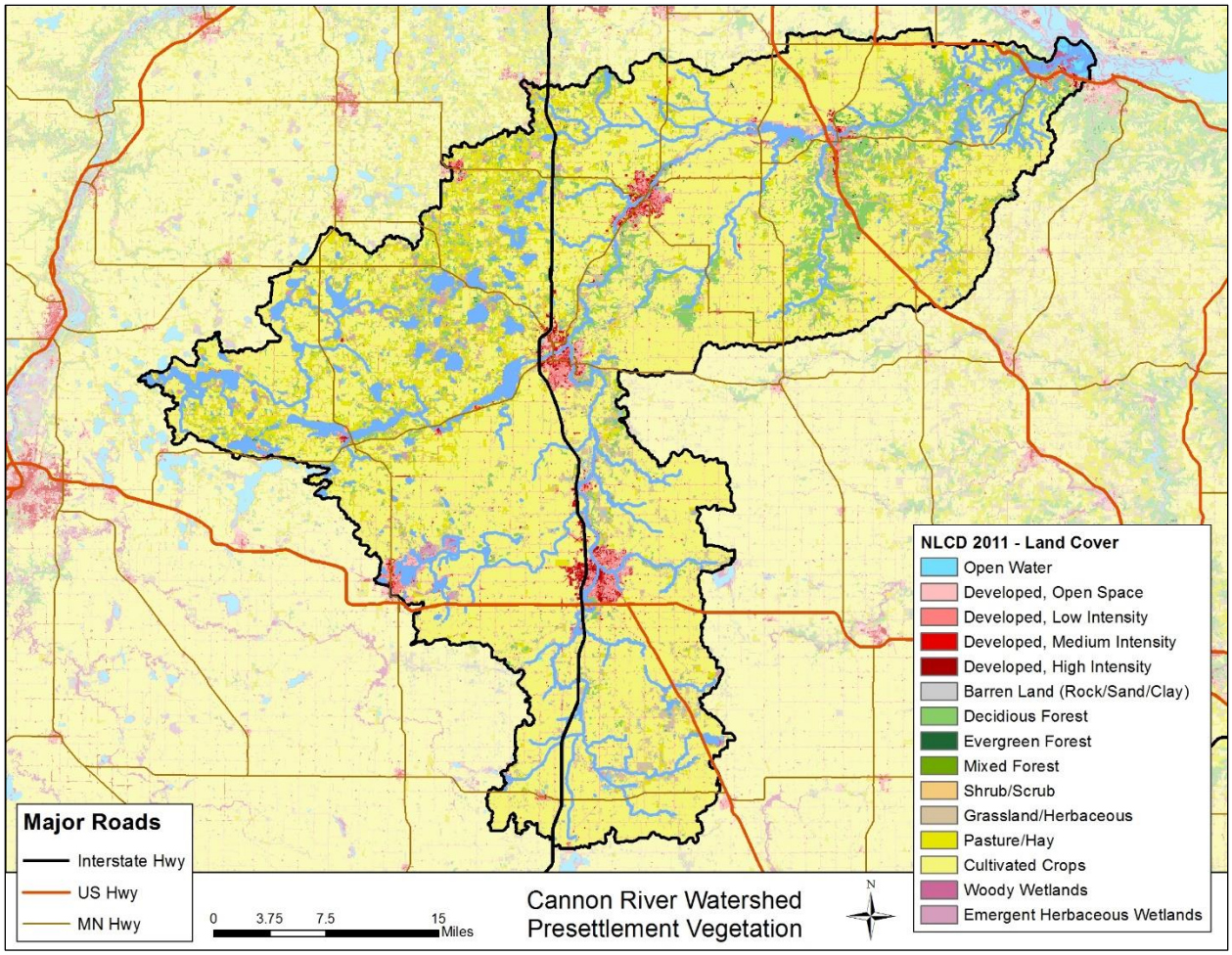


Figure 10. Current land cover in the Cannon River Watershed based on the National Land Cover Database.

Even in areas that retain natural land cover, the disturbance regime has changed significantly. Cessation of fire, extensive logging, and conversion to agriculture during the settlement era (mid-1800's) led to dramatic changes in the local ecosystems. The primary disturbance regime in many of these natural communities such as prairies, savannahs, and oak woodlands was fire. With modern fire suppression these communities are under pressure from native and non-native invasive woody vegetation that would have been controlled by fire. Additionally, forest structure has become much more homogenous, with many of the stands in the same growth stage. The shift away from fire dependent species like oaks and structural homogeneity will likely make forests more vulnerable to the suite of emerging stressors including climate change, invasive species, pests and pathogens.

Native Plant Communities

Ecologists in Minnesota have developed a system to classify land into Native Plant Communities (NPCs) based on native vegetation, landforms, and other local conditions such as amount of rainfall and soil richness. This system is used in combination with the Ecological Classification System (see above) to more precisely describe patterns on the landscape.

The Native Plant Community system describes an area's specific land types or ecosystems. A single community might cover a large area, or exist in scattered pockets. Sometimes very different native plant communities exist near each other. For example, notice the differences

between the types of trees growing along a river from those growing several hundred feet uphill. Native plant communities are also a useful tool for telling the story of the land's history. Forests are constantly changing under the influence of time and other factors. The trees and other plants that emerge 20 years after a fire will differ from those growing in the same area a hundred years later. You can also notice variations as you move from north to south or east to west within a region

The Minnesota Biological Survey has mapped and identified NPCs in several sites throughout the Cannon River watershed (Figure 11). A list of the NPC ecological systems identified in the watershed is presented in Table 3 and more detailed descriptions can be found in the Field Guide to the Native Plan Communities of Minnesota: The Eastern Broadleaf Forest Province produced by the Minnesota DNR and available at: http://www.dnr.state.mn.us/npc/index.html.

These Native Plant Communities can significantly reduce sediment and nutrient loads entering regional water resources. According to work done by Kevin Benck and Reed Fry at St. Mary's University of Minnesota, total nitrogen and total phosphorus (lbs/yr) would increase by 31% and 41% respectively if woody natural areas were converted to row crops in the Cannon River Watershed (see *Examining the Relationship between Land Cover and Water Quality Protection: The Blufflands Region of the Cannon and Zumbro River Watersheds*, 2017, Saint Mary's University of Minnesota - GeoSpatial Services, 700 Terrace Heights, Box #7, Winona, MN 55987).

Table 3. Native Plant Community Systems in the Cannon River Watershed.

System Name	Acres
Mesic Hardwood	15,354
Floodplain Forest	4,960
Marsh	4,246
Fire Dependent Woodland	1,862
Upland Prairie	1,349
Wet Meadow/Carr	1,152
Open Rich Peatland	91
Forested Rich Peatland	34
Lakeshore	27
Wetland Prairie	16
Wet Forest	10
River Shore	7
Cliff/Talus	5
N/A	30

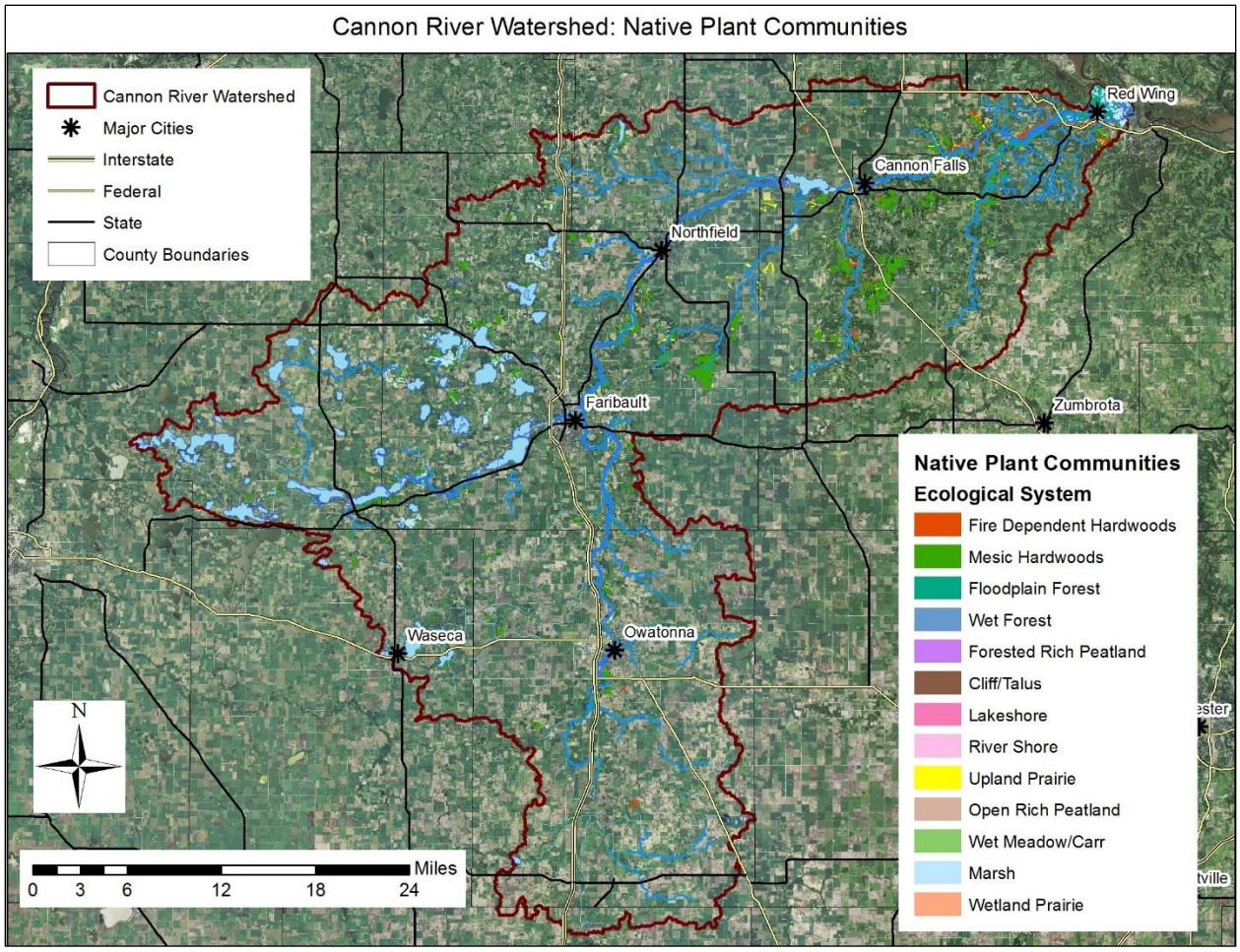


Figure 11. Native Plant Communities in the Cannon River Watershed

Invasive Species


Riparian area dominated by garlic mustard.

Non-native invasive species are becoming an increasing challenge for natural area management in the Cannon River Watershed and throughout Minnesota. Many areas has shifted from a healthy natural community to degraded systems dominated by invasive species. This is perhaps most noticeable in oak savannas with an overstory of mature bur oak and understory dominated by European buckthorn and honeysuckle. Widespread fire suppression has further complicated this issue in many of these fire-dependent communities. Forest pests also have a significant impact on the forest composition of the region. American elm was one of the most significant species in many of the watershed's forest ecosystems but an introduced disease (Dutch elm) has decimated this species. Invasive plants of note in the

watershed include garlic mustard, reed canary grass, wild parsnip, Canada thistle, exotic honeysuckle, and buckthorn. Several invasive insect pests also pose a risk to the area such as emerald ash borer. Monitoring and early detection will be of vital importance in slowing the spread and impact of these non-native species on the landscape. It is important for management of both private and public lands to address the control of these problem species that do not recognize property boundaries.

Rare Natural Features

The mix of headwater lakes, Big Woods remnants, karst geology, and steep valleys of the Driftless Area provide conditions for a diverse array of plant communities and habitats. The Cannon River watershed contains over 57,000 acres of land that the Minnesota Biological Survey (MBS) has delineated as potential sites of biodiversity significance (Table 4, Figure 12). Field assessments of those sites ranked roughly 14,000 acres as Outstanding and 16,000 acres as High. These rankings are based on presence of rare species populations, size and condition of native plant communities, and the landscape context of the site. Additional information about the process, as well as descriptions of the four biodiversity significance ranks can be found at: http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html

Table 4. Minnesota Biological Survey delineated areas of biodiversity significance in the Cannon River Watershed.

MBS Biodiversity Significance Rank	Acres
Outstanding	13,911
High	16,080
Moderate	13,426
Below	13,833
Total	57,249

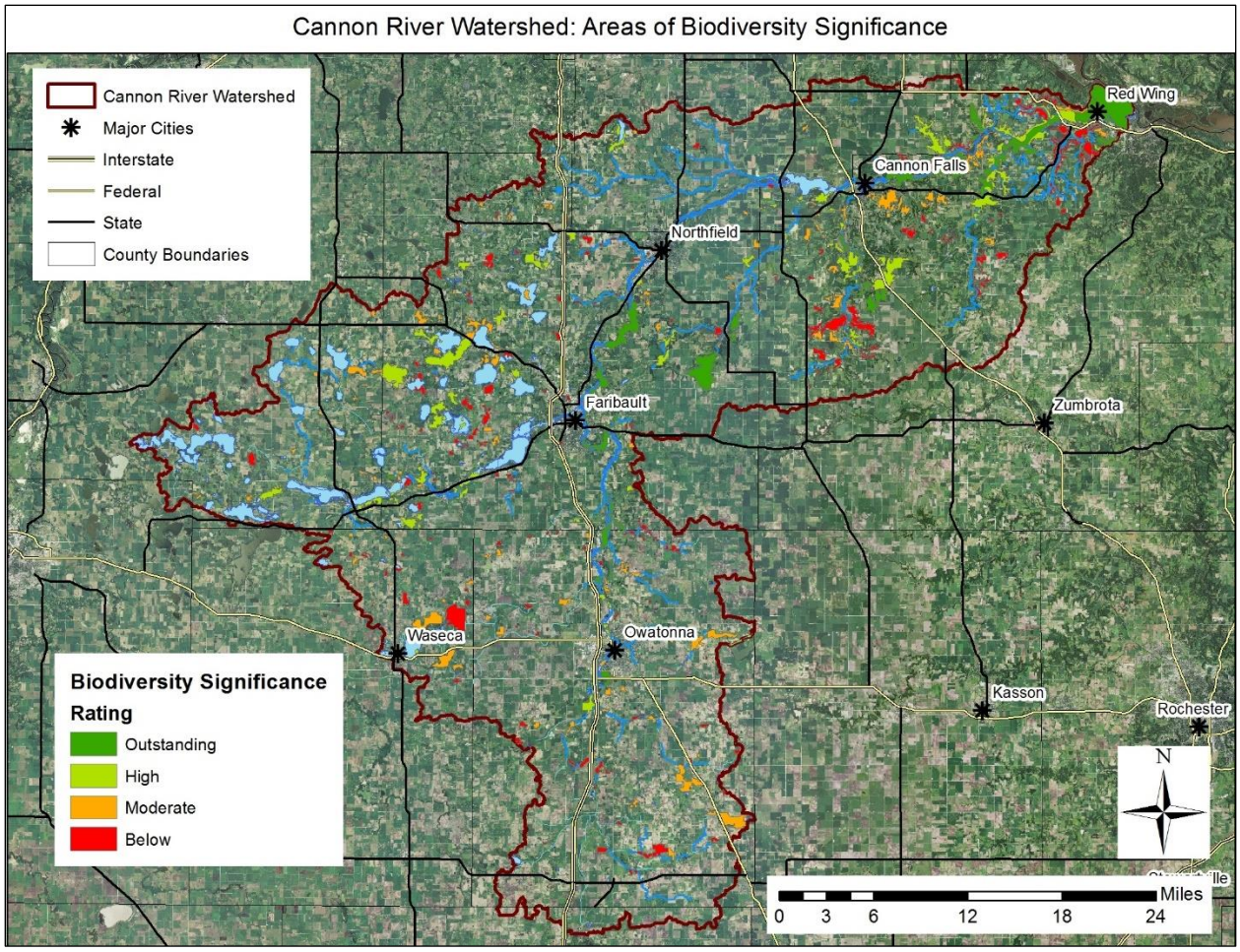


Figure 12. Sites of biodiversity significance in the Cannon River Watershed, as mapped by the Minnesota Biological Survey.

Wildlife

Interaction with wildlife through hunting, fishing, and wildlife watching is important to many Minnesota residents and visitors and a number of popular game and non-game wildlife species can be found in the Cannon River Watershed. The specific make-up of wildlife varies from place to place throughout the watershed but includes common species such as white-tailed deer and turkey and rare species such as Acadian flycatchers. The Cannon River, its tributaries, and the assortment of lakes found throughout the watershed support a variety of warm-water (walleye, northern pike, bass, catfish, sunfish, and crappies) and cold-water (brook and brown trout) species.

The 2015-2025 Minnesota DNR Wildlife Action Plan focuses a habitat approach that prioritizes conservation for Species of Greatest Conservation Need (SGCN) and other wildlife within a mapped Wildlife Action Network (Table 5, Figure 13). Over 145,000 acres were identified in this process. These areas

represent quality habitats for terrestrial and aquatic Species of Greatest Conservation Need (SGCN). Large core areas and connections that facilitate species movement will support the biological diversity already present in the network. Targeting conservation within the network will increase the effectiveness and efficiency of actions to reduce the primary causes of population declines. The lower portion of the Cannon River watershed was identified in the Wildlife Action Plan as a priority Conservation Focus Area. This area was identified for its importance to rare species and overall biodiversity. Specific species of conservation focus in this area include Acadian flycatcher, cerulean warbler, prothonotary warbler, wood thrush, mudpuppy, smooth softshell, wood turtle, six-lined racerunner, timber rattlesnake, Arogos skipper, Leonard's skipper, and regal fritillary.

Table 5. Wildlife Action Network Scores for the Cannon River Watershed.

Wildlife Action Network Score	Acres
High	3,639
Medium-High	18,322
Medium	40,243
Low-Medium	76,246
Low	6,710

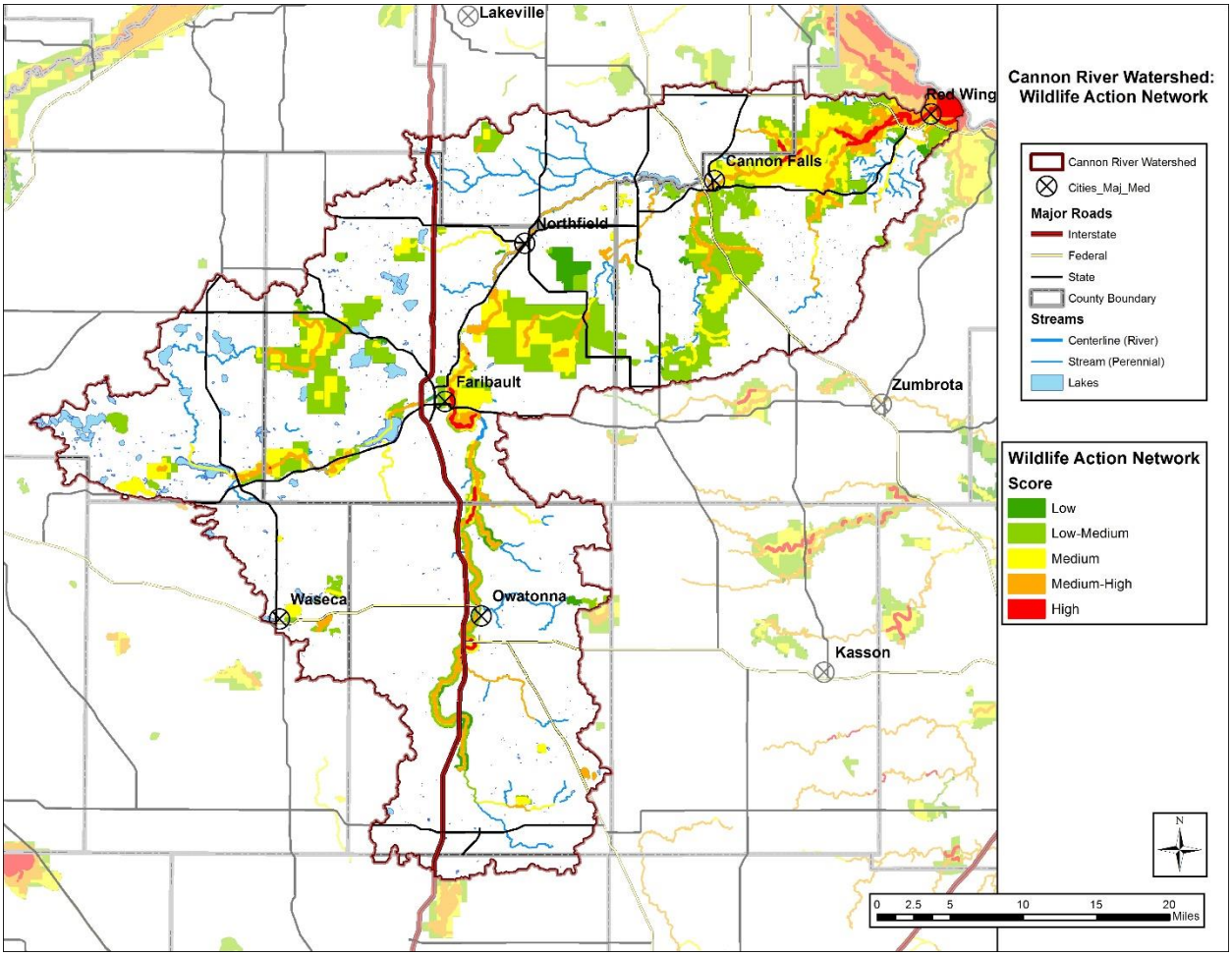


Figure 13. Wildlife Action Network in the Cannon River Watershed.

Land Use History and Cultural Resources

The Cannon River and its watershed have a long history of human activity dating back thousands of years. The river was used extensively as a travel corridor long before the appearance of Europeans on the American continent and several sites of archeological importance have been discovered in the watershed. Prior to European settlement, Native American settlements existed predominantly in the river valleys where they farmed the rich alluvial soil of the terraces, gathered fruits, nuts, and other forest products from the forested blufflands. They would also use the Cannon River to access the upland prairies that they frequently burned to maintain open characteristics so they could hunt bison, elk and deer.

Initial European contact was with explorers and fur traders. The mouth of the Cannon River was a major cultural center and Native Americans frequently hid their canoes near the river's mouth. When French fur traders arrived in the area and saw the number of stored canoes they called the river “La Riviere aux Canots” meaning "the river of canoes." This name eventually morphed into the Cannon River.

In 1851, treaties opened up most of Southern Minnesota to European American settlement. The earliest settlers in the region originally exploited the abundant timber resources followed quickly by pioneer farmers lured to the area by the region’s the fertile soils. Wheat production in the area quickly lead to the region’s timber mills being converted to gristmills. These early grist millers developed a series of innovations that changed milling throughout the world and remnants of the earliest mill companies live on through the Northfield Malt-O-Meal mill and in textile milling at the Faribault Woolen Mill.

During the settlement years, trees were seemingly so plentiful in the Big Woods and Lower Cannon regions that much usable timber was simply burned where it was felled to clear land for farming. The extensive forests also provided farmers and homesteaders with wood for heating, fence posts, and lumber. Many of today’s farmhouses, barns, and outbuildings are framed or sheathed with rough sawn lumber from trees that were harvested and milled within a short wagon ride of where they now stand. The disappearance of these forests and intensive farming methods used by early settlers were very damaging to the region’s precious topsoil, and lead to significant erosion. Conservation actions taken in the twentieth century have helped to reduce these negative impacts.

Archeological resources can be found throughout the area due to its long history as a travel corridor and cultural center, however, they are more likely to be found along the river valleys and tops of ridges with good vantage points from which ancient hunters would spot and wait for prey.

Current Land Use and Socio-economic Context

In the western portion of the watershed, cultivated crops dominate the landscape (**Error! R eference source not found.**). The most common are corn, soybeans, and forage for livestock. Rangeland is also common in this area. Towards the east of the watershed, rangeland and forests increase. Outdoor recreation is popular in forested areas and on streams. Hiking, canoeing, kayaking, biking, cross-country skiing, and snowshoeing are all popular, as well as hunting and fishing. Many private lands are also kept for outdoor recreation and hunting, with occasional timber harvesting. The Minnesota DNR added the Cannon River to its Wild & Scenic Rivers Program in 1980 in recognition of the natural beauty and recreational opportunities in the area. The designated stretch extends from Faribault to its confluence with the Mississippi River. Other popular outdoor recreation areas include the Cannon Valley Trail and Nerstrand Big Woods State Park.

The Cannon River watershed falls primarily within Dakota, Goodhue, Le Sueur, Rice, Steele, and Waseca counties. These semi-rural counties had a combined population of 592,292 residents at the 2010 US Census. This population total is somewhat misleading because Dakota County alone accounts for 398,552 of these residents and many of them live in northern Dakota County, which is part of the Minneapolis-St. Paul metropolitan area but outside the watershed. The largest communities in the watershed include Faribault (23,352), Northfield (20,007), Owatonna (25,599), and Red Wing (16,459). Today, roughly 97% of the Cannon River watershed is privately owned with public ownership spread between county, state, federal and non-profit ownership (Figure 14).

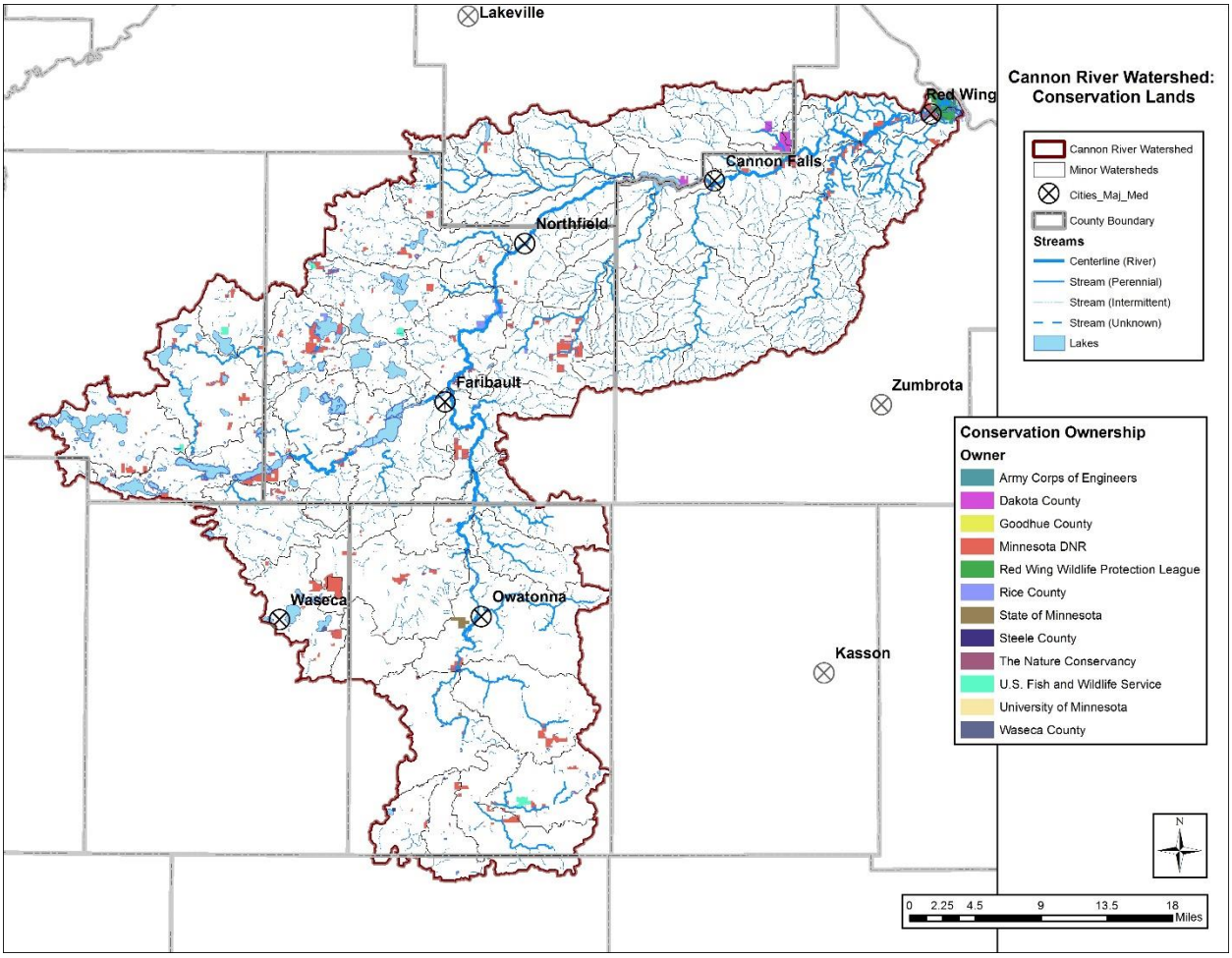


Figure 14. Public land in the Cannon River Watershed. Although not visible at this scale, all organizations listed in the legend have land in the watershed.

Section 6: Implementation Resources

The following is a list of potential resources to pursue in the project and funding development stage. This inventory of administrative, technical, financial, and political resources should be maintained and grown to foster increased success in the implementation of the Plan.

Administrative Resources

- Cannon River Watershed Partnership
- Southeast Landscape Committee
- Landowners
- County Soil and Water Conservation Districts
- County Boards
- County Planning and Zoning
- MN DNR Forestry, Fish and Wildlife, Ecological and Water Resources, Parks and Trails
- Board of Water and Soil Resources
- MN Pollution Control Agency
- Township Officials
- Basin Alliance for the Lower Mississippi in Minnesota (BALMM)

Technical Resources

- GIS mapping – plan maps, other sources
- State agency personnel - DNR Division of Forestry, Division of Fish and Wildlife, etc.
- County staff – planning & zoning staff, county water planners, SWCD technicians, etc.
- Consulting foresters and Loggers.

Financial Resources

- MFRC seed money
- Clean Water Land & Legacy Amendment funds
- Costs Share programs
- State agency programs
- County Water Plans projects and programs
- Foundations and organizations
- Landowners - private investments
- Federal and State agency budgets - staff assistance

Political Resources

- Private landowners
- Townships
- Soil and Water Conservation Districts - supervisors and staff
- County boards and staff and county water plan committees
- MFRC

Funding Strategies and Opportunities through Collaboration

We anticipate this, like many other landscape-scale forest stewardship initiatives, will be funded through a variety of synergistic funding efforts. Historically, partners that get involved in a landscape-scale project area do so because it meets some of their own resource or public relations goals and they work together to support efforts throughout the project area. Landscape-scale, multi-partner, coordinated efforts often carry increased weight with foundations, trusts, and government agencies when it comes to applying for grants. Federal and state funding agencies as well as private foundations tend to look favorably on multi-partner project applications. There is a considerable amount of money available through grants and other programs that landscape stewardship approaches can facilitate.

Landscape stewardship projects also seek to encourage and promote greater levels of private investments to leverage public investments. Many private woodland owners make significant investments in their own lands. These investments may not end up on the balance sheets of service provider agencies, but they are no less important in the health and integrity of the natural landscape of the region.

Individual Financial Assistance Programs Available to Landowners

Farm Service Agency Programs:
Conservation Reserve Program (CRP): CRP offers annual payments to landowners who set aside cropland or pasture adjacent to water, for the purpose of reducing erosion, increasing wildlife habitat, improving water quality, and increasing forestland. Cost-share for tree planting, grass cover, small wetland restoration, or prairie and oak savanna restoration may also be available.

NRCS Programs:
Environmental Quality Incentives Program (EQIP): EQIP provides financial and technical assistance to landowners for management practices. All properly implemented forest management practices are eligible, including timber stand improvement (TSI), site preparations, culverts, stream crossings, water bars, planting, prescribed burns, hazard reduction, fire breaks, silvopasture, fence, grade stabilization, plan preparation and more. Contracts last from one to 10 years.

Conservation Stewardship Program (CSP): CSP encourages agricultural and forestry producers to maintain existing conservation activities and adopt additional ones in their operations. Annual payments per acre for five years are available for installing new activities and maintaining existing ones.

State Programs:
Reinvest in Minnesota (RIM) Reserve Program: RIM is run by the Board of Water and Soil Resources (BWSR). The program compensates landowners willing to give the state a conservation easement to permanently protect, restore, and manage critical natural resources, in the interest of improving water quality. The RIM program is the primary land acquisition program for state-held conservation easements and restoration of wetlands and native grasslands. It is coordinated statewide by BWSR and administered and implemented locally by county Soil & Water Conservation Districts (SWCDs). There are currently 230 RIM tracts in the Cannon River watershed totaling over 6,350 acres.

Erosion Control and Water Management Program: More commonly known as the State Cost Share Program, this program provides funds to SWCDs to share the cost of conservation practices for erosion control, sedimentation control, or water quality improvements with the land occupier.

The primary purpose of activities is to assist with structural or vegetative practices to correct existing problems.

Grant Programs for Local Governmental Units or Non-Governmental Organizations

Clean Water Fund: Clean water fund grants are funded through Minnesota's 2008 Legacy Amendment. It provides funding for local governments or local government joint powers boards for projects that restore, enhance, and protect water quality. A non-state match of at least 25% of funds is required.

Lessard-Sams Outdoor Heritage Council (LSOHC): The LSOHC is charged with making annual funding recommendations to the Minnesota Legislature on appropriations from the Outdoor Heritage Fund. Through these recommendations, funds raised through Minnesota's Legacy Amendment are provided to support programs to restore, protect, and enhance wetlands, prairies, forests, and habitat for fish, game, and wildlife.

Legislative-Citizen Commission on Minnesota Resources (LCCMR): In 1988, Minnesota voters approved a constitutional amendment establishing the Environment and Natural Resources Trust Fund - a constitutionally dedicated fund that originates from a combination of Minnesota State Lottery proceeds and investment income. Applications for this funding are due every May. The purpose of this fund is to provide a long-term, consistent, and stable source of funding for activities that protect, conserve, preserve, and enhance Minnesota's "air, water, land, fish, wildlife, and other natural resources" for the benefit of current citizens and future generations.

Section 319 Nonpoint Source Management Program: The 1987 amendments to the federal Clean Water Act established the Section 319 Nonpoint Source Management Program. This Environmental Protection Agency administered program addresses the need for greater federal leadership to help focus state and local nonpoint source efforts. Under Section 319, states, territories and tribes receive grant money that supports a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects and monitoring to assess the success of specific non-point source implementation projects.

Landscape Stewardship Plan Conclusion

This Landscape Stewardship Plan for the Cannon River Watershed presents a blueprint for protecting the biodiversity and natural resources of the watershed, while also helping to improve water quality by maintaining and enhancing the natural integrity of the watershed. These goals will not be achieved by any single stakeholder or department, nor can they be met with a single strategy. Widespread adjustments to intense land uses that reduce the impacts of agriculture on water will be needed, but so will increased protection of natural areas at key places in the watershed. An expanded footprint of public conservation land will be needed to achieve that level of protection, but it will not be sufficient alone. Private landowners and communities will need to remain engaged in managing, and, just as important, valuing the wild places of the region.

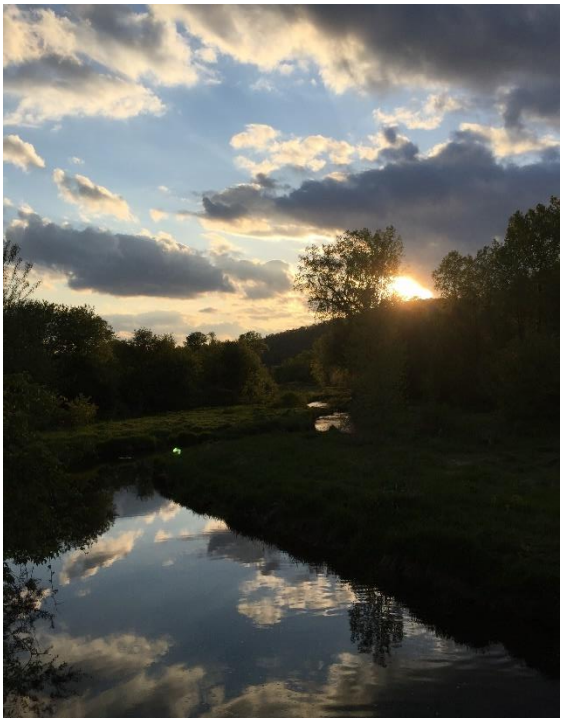
To help engage the variety of partners and stakeholders that will be required to achieve the goals of this plan, several supplemental materials have also been prepared. They include a brochure to distribute widely as an introduction to this effort to a general audience, as well as a multi-page summary document to help familiarize both the general public and important partners to its goals and strategies. Additionally, a reflection document that describes the process and lessons learned has been developed as a resource for future landscape stewardship planning efforts in other watersheds.

While many actions described in this plan will need to be carried out across the watershed, a major watershed such as the Cannon River is too large an area to effectively address in a single effort. To maximize the effectiveness of our efforts, we will need to prioritize. This plan has identified several areas within the watershed where protection strategies are most important and will benefit multiple conservation interests. The following section contains more detailed protection plans for these four priority areas.

Section 7: Conservation Opportunity Area Plans

Conservation Opportunity Area Overview

As discussed in the plan above, GIS analysis of potential protection targets in the Cannon River Watershed identified four priority areas, called Conservation Opportunity Areas (COAs). These COAs represent areas where the local watershed (HUC12 level) is relatively intact when compared to the rest of the region (Figure 15). Water quality in these areas is either above average for the larger watershed, or near thresholds for water quality standards. They also contain important terrestrial features that warrant protection, such as areas of biodiversity significance, publicly owned conservation lands, and higher than average proportions of perennial vegetative cover in the most important areas for water quality protection.



Because these COAs were identified through an additive process, where desirable landscape features were added up within each sub-watershed, they primarily represent places with significant overlap of different stakeholder's priorities. They are places of importance to multiple state agencies and environmental interests. That indicates they are logical focal points for collaboration and coordination of protection efforts between the multiple conservation professionals who work in the region. Effort and investment from one agency (e.g. DNR Wildlife) will also benefit the efforts of water quality professionals by enhancing the integrity of natural communities to better slow run-off and increase infiltration. It will also benefit public and private forestland owners in the area if it reduces the regional presence of invasive species, cutting down on potential seed sources and making further infestations less likely.

Ultimately, COAs represent regions where conservation actions are likely to provide the greatest number of benefits, and where coordination and communication between conservation professionals will be most beneficial.

The stewardship plans for each COA focus on specific resources and needs, as well as strategies that are appropriate to the different social resources and ownership patterns within each COA. The four COAs are:

- Big Woods COA: Covers 51,053 acres in the headwaters of Prairie Creek and the Crystal Lake section of the Cannon River north and east of Faribault and south of Northfield. The Big Woods COA includes several key natural areas such as Nerstrand Big Wood State Park, Cannon River Trout Lily State Scientific and Natural Area, Rice County's Cannon River Wilderness, and The Nature Conservancy's Trout Lily Preserve.

- Headwater Lakes COA: This is the largest COA in the Cannon River Watershed at 98,306 acres. It covers the Cannon River's headwaters northwest of Faribault, east of Lonsdale,

and west of Northfield. This area features rolling topography that is pocketed with numerous small lakes, wetlands, and patches of forest.

- Little Cannon COA: This COA lies south of Cannon Falls encompassing 51,163 acres in the Little Cannon watershed. The COA is entirely privately owned and contains several high quality natural areas. The lack of public-land in this COA puts and even higher onus on the need to support private landowner stewardship for the maintenance of these natural areas and associated water quality.

- Lower Cannon COA: This COA encompasses the bottom 76,673 acres of the watershed between Cannon Falls and the Cannon River's confluence with the Mississippi River near Red Wing. In addition to the Cannon River main stem, the COA includes all or portions of the Lower Belle Creek, Pine Creek, Spring Creek, and Trout Brook watersheds which support cold-water fisheries. Key natural areas in the Lower Cannon COA include Cannon River Turtle Preserve SNA, Spring Creek Prairie SNA, portions of the Richard J. Dorer Memorial Hardwood State Forest, and Dakota County's Miesville Ravine Regional Park.

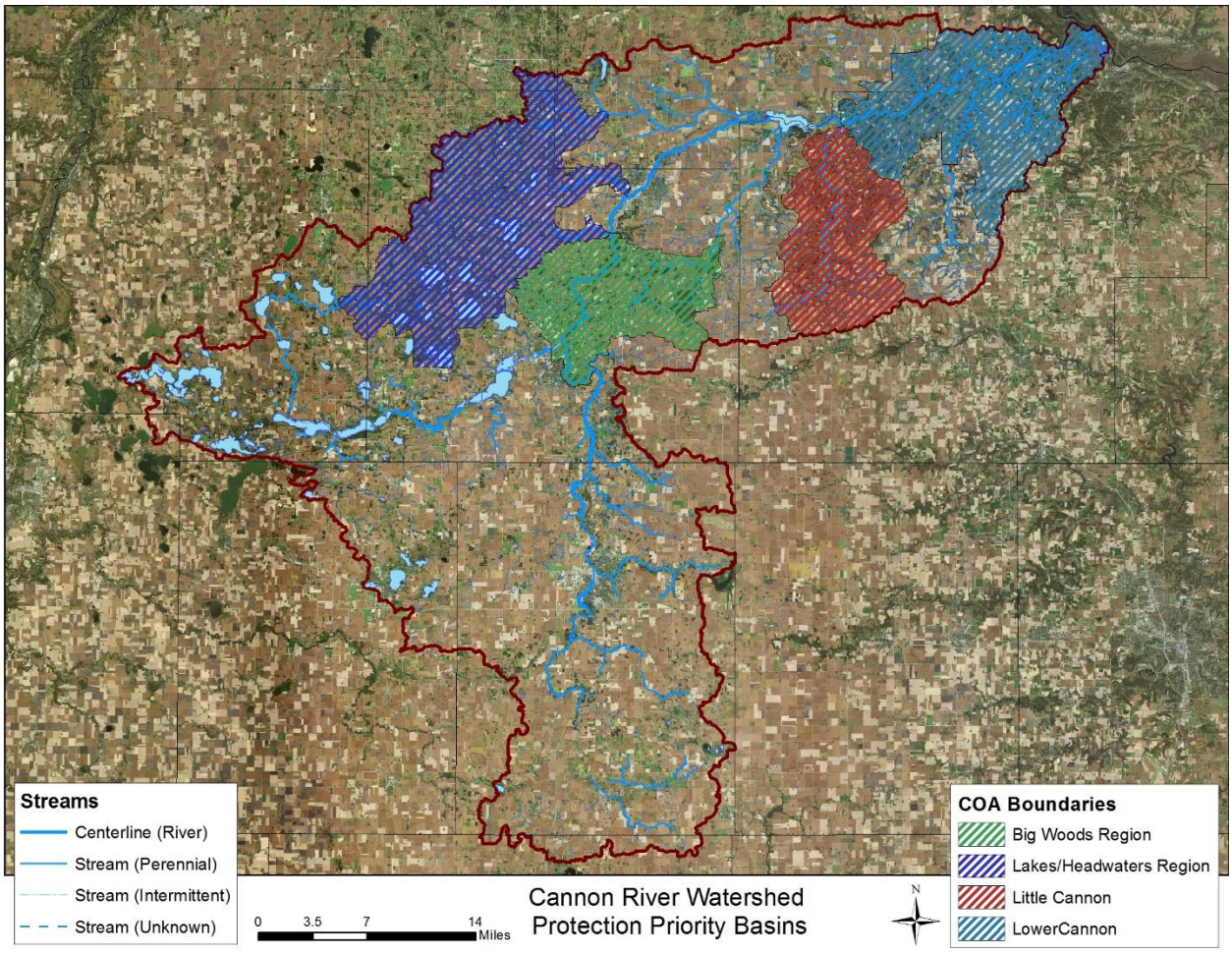


Figure 15. Conservation Opportunity Areas within the Cannon River Watershed.

Big Woods Conservation Opportunity Area

Overview

The Big Woods COA lies north and east of Faribault and south of Northfield encompassing over 51,000 acres primarily in the headwaters of Prairie Creek and the Crystal Lake section of the Cannon River (Figure 16). Key natural areas in the Big Woods COA include Nerstrand Big Wood State Park, Cannon River Trout Lily State Scientific and Natural Area, Rice County's Cannon River Wilderness, and The Nature Conservancy's Trout Lily Preserve. Additionally, a number of privately owned parcels in the vicinity of Big Woods State Park have been protected through the Forest Legacy conservation easement program, making this area a good example of combined public and private landscape protection.

According to data from the Public Land Survey, this region north and west of Nerstrand Big Woods State Park was dominated by an impressive mesic hardwood forest of maple and basswood. Much of this area has been converted to agriculture however; the remnants of the big woods ecosystem represent a conservation opportunity within the matrix of agriculture to build from.

The remaining areas of the big woods ecosystem represent a hotspot for biodiversity as identified in the Wildlife Action Network and State Wildlife Action Plan. The area along the Cannon River and the State Park at the headwaters of Prairie Creek offer a large block of forested conditions that are no longer common in the area and home to numerous native plant community types. The mesic hardwoods and floodplain forests are host to a number of spring ephemeral wildflowers that often grow and bloom before the canopy trees leaf out. This includes species such as false rue anemone, wild ginger, spring beauty, cut-leaved toothwort, Dutchman's breeches, sharp-lobed hepatica, bloodroot and violets, as well as the only federally endangered plant in Minnesota: the dwarf trout lily. This three-inch tall spring ephemeral's entire wild population is restricted to a mere 600 acres in Rice, Goodhue, and Steele counties. The maple-basswood forests of the Big Woods COA offer ideal habitat for dwarf trout lilies, which prefer the moist woods of river bottoms and ravines along the Cannon River and its tributaries. This delicate plant typically grows on the fragile banks of streams so managing upstream hydrology of these streams is important in addition to protecting the forested communities so their habitat is not subject to extensive erosion or inundation.

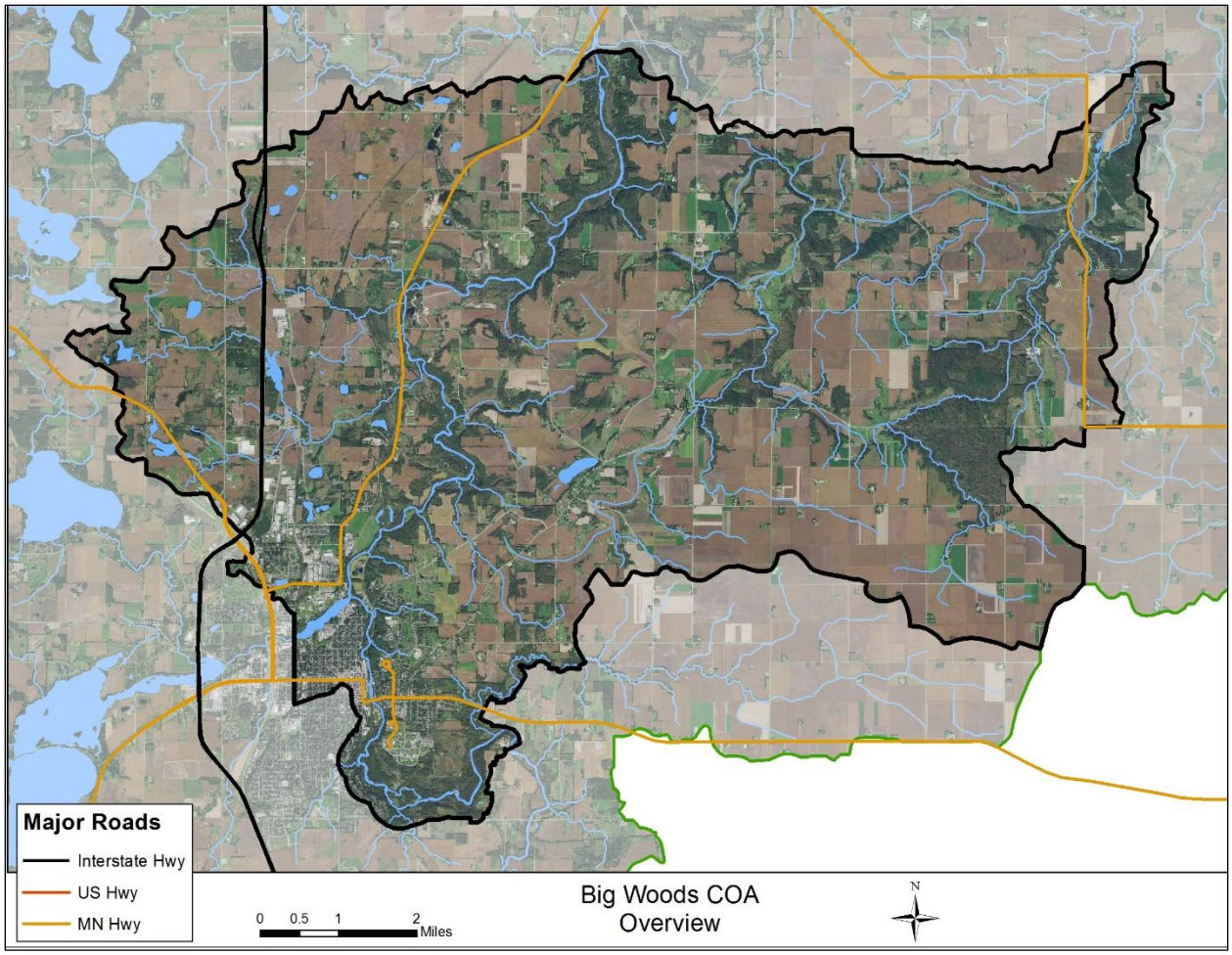


Figure 16. Big Woods COA in the Cannon River Watershed.

Natural Resource Assessment

Hydrology

The dominant hydrological features of the Big Woods COA are the headwaters of Prairie Creek, the confluence of the Cannon and Straight Rivers, and the Crystal Lake section of the Cannon River. Numerous unnamed perennial or intermittent streams originating in the agricultural uplands feed these major hydrological features (Figure 17). Extensive agricultural tile lines and a reduction in perennial cover have changed the hydrology in the COA to move water faster through the system.

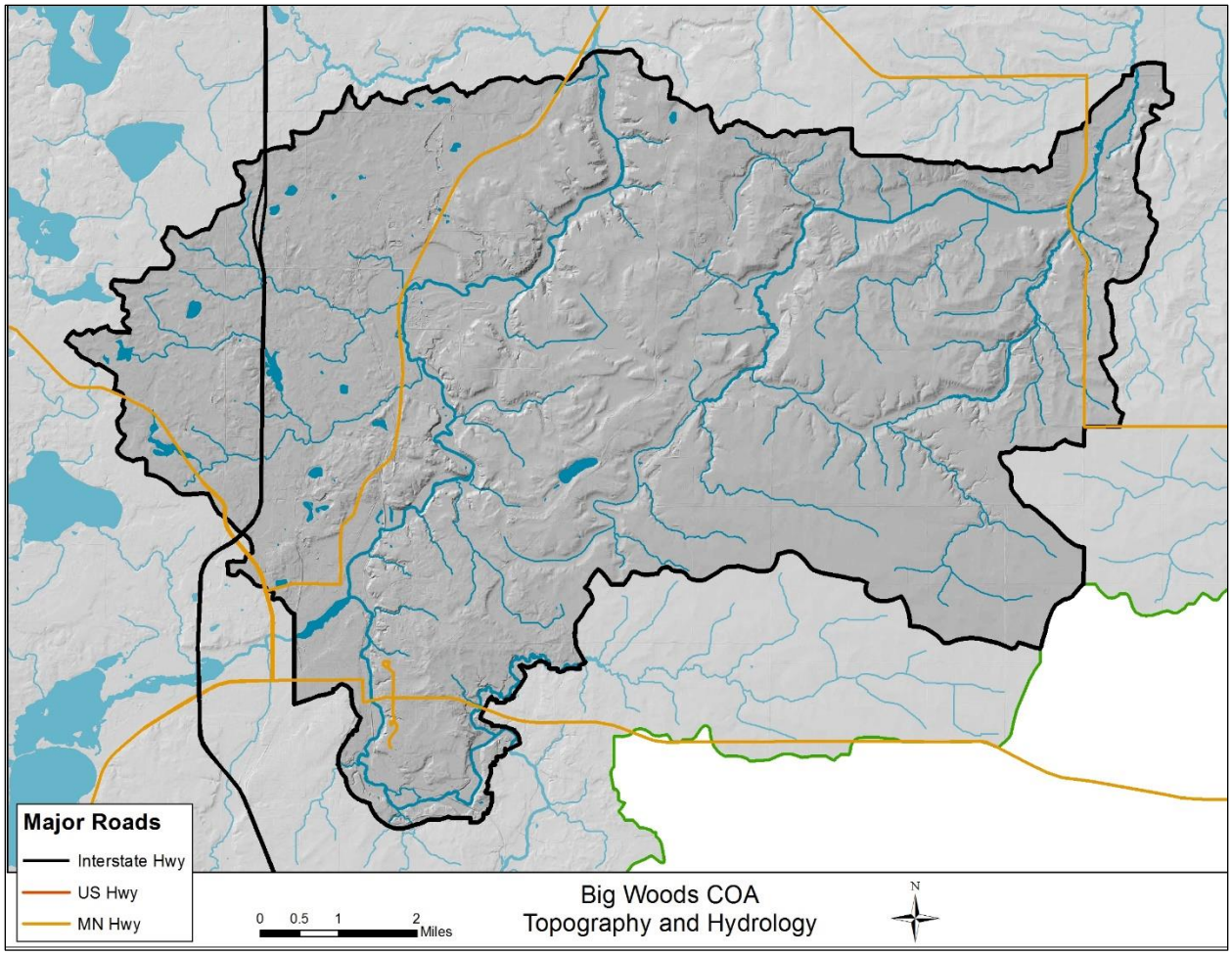


Figure 17. Hydrology of the Big Woods COA.

Plant Communities

Big Woods COA contains over 4,000 acres of Native Plant Communities (NPC) in nine different systems (Figure 18) and 25 different types and subtypes as identified by the Minnesota Biological Survey (MBS) (Table 6). Mesic hardwoods make up 73% of the identified NPC acres with floodplain forest (14%) and wet meadow (8%) systems also making a significant portion of the total acreage. Full descriptions of native plant community types and their associated ecological systems can be found in *Field Guide to the Native Plant Communities of Minnesota: the Eastern Broadleaf Forest Province*, produced and distributed by the MN DNR.

Approximately 36 percent of the NPCs in the Big Woods COA are on publicly owned land with the majority of privately owned NPCs on parcels near the blocks of public land. Private parcels containing NPCs, especially those bordering publicly managed areas, represent an important priority for increased protection and private conservation efforts.

Table 6. Native Plant Communities of the Big Woods COA.

System	NPC Code	Native Plant Community	Acreage	% of NPC Acreage
Cliff & Talus	CTs53a	Wet Sandstone Cliff (Southern)	1	0%
Fire Dependent Forest or Woodland	FDs37	Southern Dry-Mesic Oak (Maple) Woodland	35	1%
	FDs38a	Oak - Shagbark Hickory Woodland	63	1%
Floodplain Forest	FFs59	Southern Terrace Forest	92	2%
	FFs59a	Silver Maple - Green Ash - Cottonwood Terrace Forest	182	4%
	FFs59c	Elm - Ash - Basswood Terrace Forest	287	7%
	FFs68a	Silver Maple - (Virginia Creeper) Floodplain Forest	22	1%
Mesic Hardwood Forest	MHs37	Southern Dry-Mesic Oak Forest	44	1%
	MHs38	Southern Mesic Oak-Basswood Forest	273	6%
	MHs38c	Red Oak-Sugar Maple-Basswood-(Bitternut Hickory) Forest	571	13%
	MHs39a	Sugar Maple - Basswood - (Bitternut Hickory) Forest	1,350	31%
	MHs39c	Sugar Maple Forest (Big Woods)	866	20%
	MHs49	Southern Wet-Mesic Hardwood Forest	8	0%
	MHs49a	Elm - Basswood - Black Ash - (Hackberry) Forest	33	1%
Marsh	MRn93	Northern Bulrush-Spikerush Marsh	3	0%
Open Rich Peatland	OPp93c	Calcareous Fen (Southeastern)	10	0%
Upland Prairie	UPs13a	Dry Barrens Prairie (Southern)	2	0%
	UPs13c	Dry Bedrock Bluff Prairie (Southern)	12	0%
	UPs14a2	Dry Barrens Oak Savanna (Southern): Oak Subtype	33	1%
	UPs14c	Dry Hill Oak Savanna (Southern)	72	2%
Wet Forest	WFs57a	Black Ash - (Red Maple) Seepage Swamp	4	0%
Wet Meadow or Carr	WMn82a	Willow - Dogwood Shrub Swamp	66	2%
	WMn82b	Sedge Meadow	157	4%
	WMn82b2	Sedge Meadow: Tussock Sedge Subtype	64	1%
	WMs83a1	Seepage Meadow/Carr Tussock: Sedge Subtype	38	1%

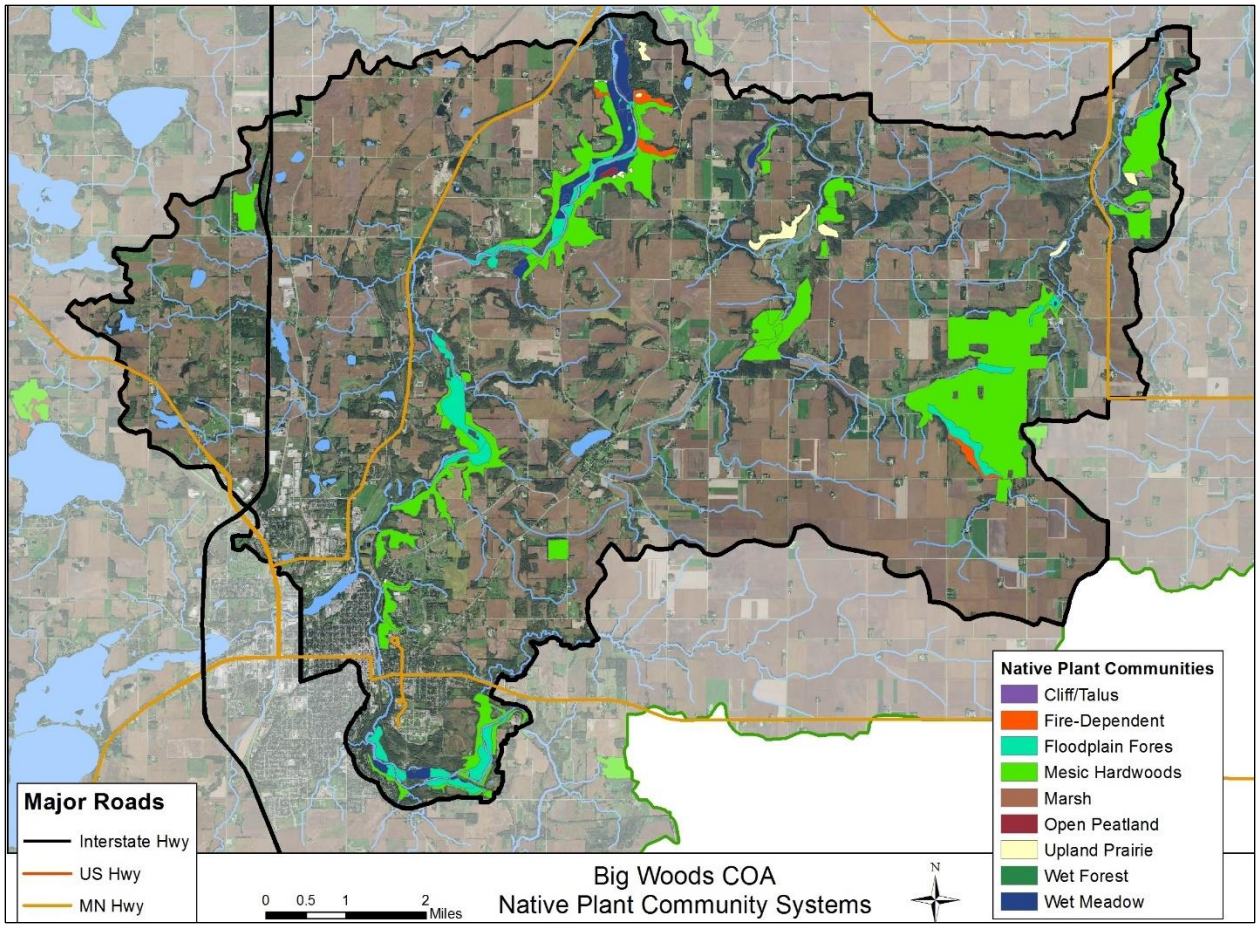


Figure 18. Native plant communities in the Big Woods COA.

Biodiversity and Rare Species

The Natural Heritage Information System (NHIS) has recorded 241 different occurrences of rare plants, animals, or communities in Big Woods COA (Table 7). Rare species are those listed as either endangered, threatened, or of special concern. Endangered species are those facing extinction throughout all or a significant portion of its range within Minnesota. Threatened species are likely to become endangered in the foreseeable future. Species of Special Concern, though not endangered or threatened, are extremely uncommon in Minnesota.

Forty-one rare terrestrial communities are listed in Big Woods COA. Rare terrestrial communities are collections of plant species growing together, whose presence on the landscape is rare or severely diminished. These communities are monitored, but not given designations as endangered, threatened, or of special concern.

Table 7. Number of rare species and community occurrences in the Big Woods COA.

Organism Type	Observations
Animal Assemblage	1
Fungus	2
Vascular Plant	200
Invertebrate Animal	17
Vertebrate Animal	21
Terrestrial Community	41

The Minnesota Biological Survey has delineated over 5,200 acres of the Big Woods COA based on their significance to biodiversity in the state (Figure 19). Of that area over 4,200 acres were given the highest level of 'Outstanding'. The outstanding areas are concentrated along the Cannon and Straight Rivers and Nerstrand Big Woods State Park.

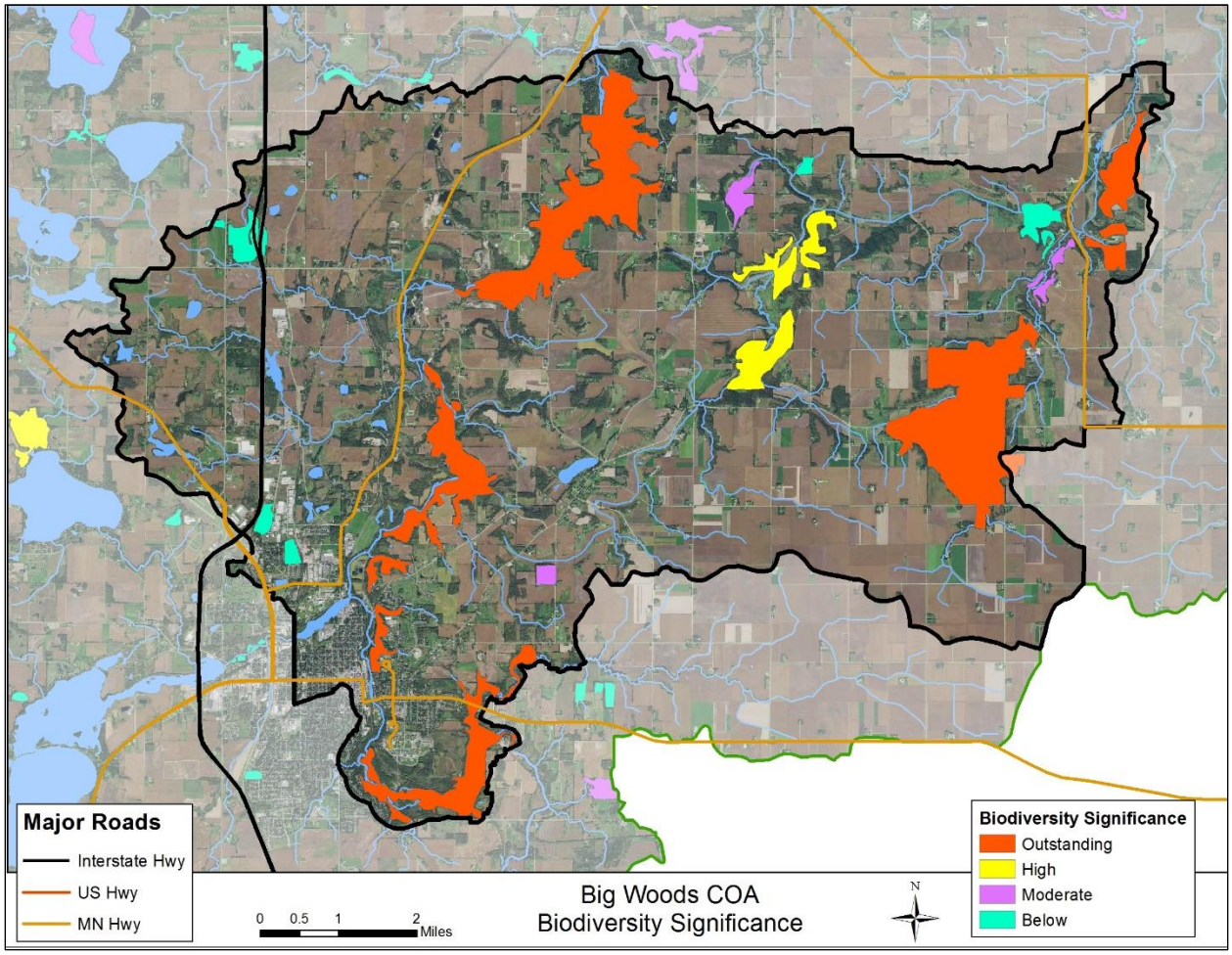


Figure 19. Sites of biodiversity significance in the Big Woods COA.

Recreation

There are a number of important outdoor recreation areas in the Big Woods COA that contribute to the well-being of residents and support the local economy. Nerstrand Big Woods State Park offers individual and group campsites, picnic areas, a playground, and an extensive network of hiking, cross-country skiing, and snowmobiling trails. The state park also offers a special permit deer hunt in the fall. Hunting is a popular outdoor recreational activity throughout the area on public and private land. Additionally, the Cannon and Straight Rivers are designated state water trails that are very popular canoe and kayak routes in the summer. Both rivers offer fishing opportunities. Many people are also introduced to the outdoors at the River Bend Nature Center at the southern edge of the COA.

Environmental Threats

Development pressures:
The City of Faribault is located in the southwestern corner of the Big Woods COA and is expected to grow in population in the coming years. This economic and population growth can lead to increased parcellization, fragmentation, and conversion of rural lands. This disrupts wildlife movement and migration, reduces available habitat, and increased water quality concerns from the added impervious surface area. The demand for dispersed rural residences places less-disturbed parts of the landscape under pressure for development. This is compounded by the likelihood of population growth in the region.

Industrial silica sand mining:
Southeast Minnesota has significant deposits of industrial silica sand bedrock at or near the surface. The increased demand for this material in the hydrological fracturing (fracking) process for oil and gas development has created an ongoing policy debate about appropriate use and regulations of this resource. There currently are not any mines operating in the Cannon River Watershed but a significant portion of the Big Woods COA has quartz-rich sandstone within 50 ft. of the land surface. Potential impacts of mining include removal of vegetation and underlying substrates, habitat destruction, chemical contamination of karst hydrology, and water contamination from high volume dispersals from water processing facilities and dewatering pits.

Mismanagement of forest resources:
The forests of Southeast Minnesota support a number of high value timber species, and many sites exist containing high quality timber stock. This represents an important resource for the region, but is also a target for exploitative harvesting practices. Timber harvests that remove all of the most valuable trees in a stand, and leave behind a patchy, irregular forest of poor quality trees do serious harm to the health and productive potential of that site, and severely limit management options in the future. The high value of the timber resource enables sustainable timber management to produce valuable economic products while also providing the habitat and ecosystem services of a healthy forest. Unsustainable harvesting practices can seriously impair a stand's ability to do so in the future.

Nutrient, sediment, and contaminants from upstream agricultural areas:
A significant portion of the Big Woods COA, and areas upstream, are heavily farmed, often with practices that have the potential to impair water quality. This has large impacts on downstream reaches. Best management practices are available to farmers to protect their soil from erosion, and help prevent excess nutrients and sediment from washing into the streams. Riparian buffer strips help slow run-off and increase infiltration, allowing nutrients to be filtered and removed by soil processes. Increased adoption of agricultural BMPs to protect water quality in upstream areas will help protect the water quality of downstream reaches in the COA.

Land Ownership

Nearly 3,300 acres of the Big Woods COA are in public ownership (Table 8, Figure 20). The DNR Division of Parks and Recreation's ownership in Nerstrand Big Woods State Park is the largest public land holding followed closely by Rice County's Cannon River Wilderness Area.

Despite the relatively large area of public land for the region, private lands still make up over 93% of the COA. Since private lands make up such a large portion of the COA it is clear that private landowners will play a crucial role in conservation. Much of the forested area occurs in places with dispersed residential development, and finding programs that will appeal to these landowners will be necessary to encourage the necessary private conservation.

Private conservation programs have demonstrated some success in the area. The DNR Forest Stewardship Program is an excellent first step in landowner involvement and concern for the ecological health of the landscape and 673 acres have a registered stewardship plan in the Big Woods COA. This voluntary program provides technical advice and long-range forest management planning to interested landowners. Plans are designed by professional foresters to meet the landowner's goals while maintaining the sustainability of the land.

The Reinvest in Minnesota (RIM) program has easements in the COA covering 235 acres. This program purchases conservation easements on privately owned lands to retire environmentally sensitive lands from agricultural production. Conservation practices are established by planting native vegetation, and restoring wetlands with the goal of protecting and improving water quality, reducing soil erosion, and enhancing fish and wildlife habitat. Additionally, the Big Woods area in Rice County has been designated as an active Forest Legacy Area by the State of Minnesota. The Minnesota Forest Legacy Program protects environmentally important private forests threatened by conversion to non-forest uses. Landowners apply to participate in the program. If they are accepted, federal funds and local matching funds are used to purchase development rights and conservation easements to keep these forests intact and continuing to provide forest benefits. The landowner retains ownership and can continue activities such as timber management, recreation, hunting, and hiking as long as they do not conflict with the terms of the easement. All easements are perpetual, and any new owner is bound by the terms of the easement.

Table 8. Land ownership in the Big Woods COA.

Ownership	Acres	Percent of Public	Percent of COA
Private	47,754		93.5%
Division of Parks and Recreation	1,069	32.4%	2.1%
County	981	29.8%	1.9%
Division of Forestry	586	17.8%	1.1%
The Nature Conservancy	267	8.1%	0.5%
Division of Fish and Wildlife	216	6.5%	0.4%
Division of Ecological Services	179	5.4%	0.4%

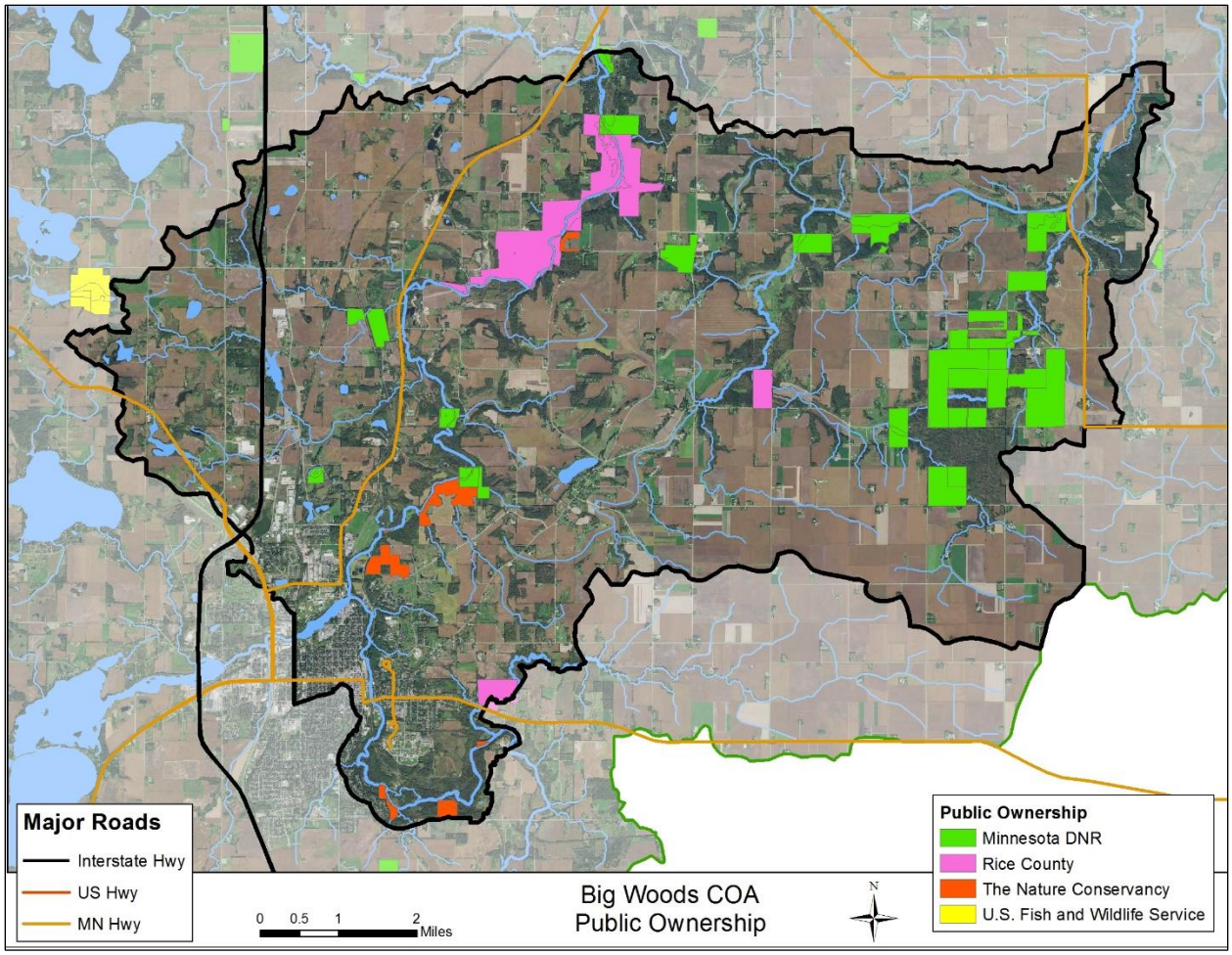


Figure 20. Public land in the Big Woods COA.

Land Cover and Use

Nearly half of the Big Woods COA was covered by a hardwood forest at the time of European settlement (Table 9, Figure 21). The core of this forest existed on the western portion of the COA with the area now protected as Nerstrand Big Woods State Park representing an island of this forest type surrounded by prairie.

Today the land use patterns in the Big Woods COA follow the general pattern for the broader watershed. The predominantly flat, upland areas are mostly cropland or pasture. The hillsides are dominated by forests, and the valley floors and floodplain areas contain a mix of cropland, pasture, forests, and wetlands (Figure 22). Major cover types are cultivated crops (52.1%) and deciduous forest (16.8%). Pasture/hay (7.7%), developed open space (6.8%) and grassland/herbaceous (6.6%) cover are also significant.

Table 9. Presettlement land cover in the Big Woods COA

Land Type	Acres	Percent
Aspen-Oak Land	5,554	11%
Big Woods - Hardwoods (oak, maple, basswood, hickory)	22,161	43%
Oak openings and barrens	3,309	6%
Prairie	16,673	33%
Wet Prairie	3,356	7%

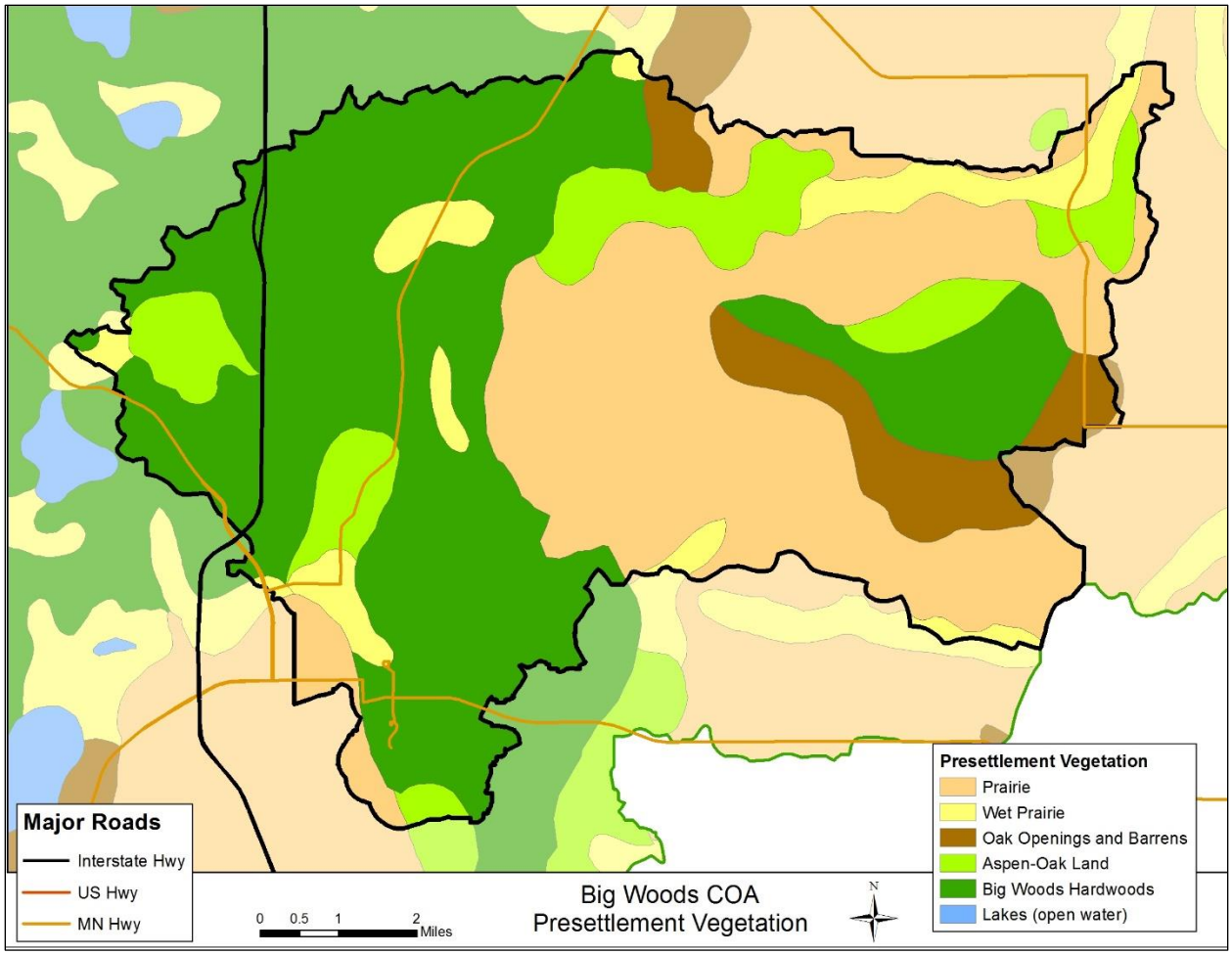


Figure 21. Presettlement land cover in the Big Woods COA based on the work of Francis J. Marschner.

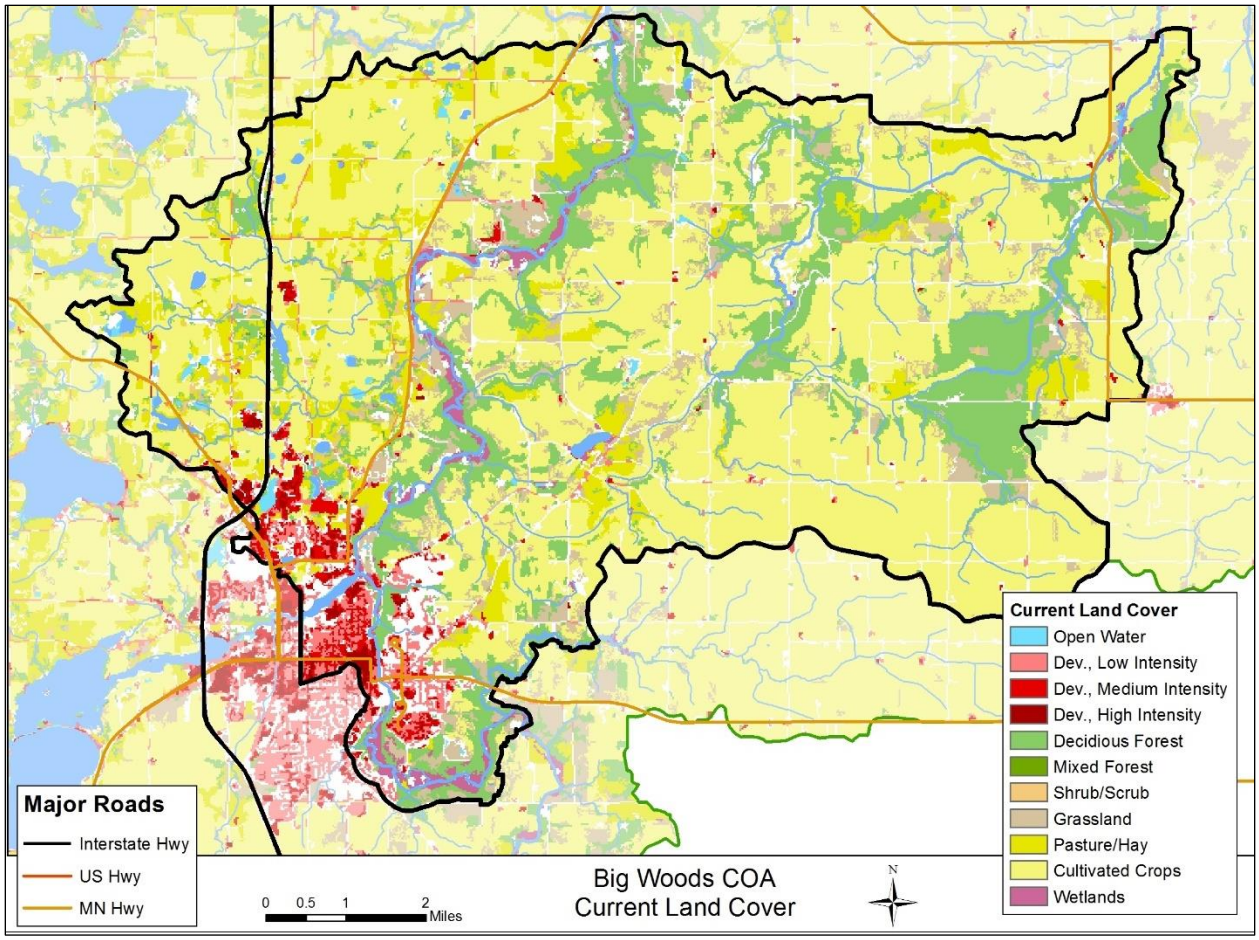


Figure 22. Current land cover in the Big Woods COA based on the 2011 National Land Cover Database.

Desired Future Conditions

- Native plant community remnants have expanded, especially remaining examples of the Big Woods ecosystem.
- 100% of riparian areas are covered by native vegetation, returning a host of ecological services for water quality, habitat quality, and connectivity.
- Dwarf trout lily populations are increasing.
- Biotic integrity of all streams within the COA is restored, resulting in healthy aquatic species and de-listing of impaired waters.
- Human activity in riparian areas follows best management practices to protect water quality and sensitive shorelines.
- Agricultural practices within the COA follow best management practices to protect soil from erosion, and streams from sedimentation and nutrient loading.
- A natural fire regime is restored through prescribed burning on all appropriate native plant communities.
- Large blocks of native habitat exist across ownership lines.
- Habitat corridors link patches of biodiversity habitat, supporting migration and travel, especially in riparian areas.
- Rare plants and animal habitat are protected from degradation
- Invasive species are monitored and controlled

Key Stewardship Parcels

Acquisition efforts can only go so far and stewardship efforts on private parcels will be crucial to protecting the natural resources of the area. Conservation efforts in the Big Woods COA will be most effective in places where they protect existing native plant communities, and enhance habitat on public lands by increasing their size and/or connectivity. Working with larger parcels is preferable, because more stewardship options are available on larger tracts, and stewardship planning will impact a greater area. To make the most efficient use of conservation resources, it is useful to target parcels where those resources will have the most impact. A GIS analysis by The Nature Conservancy identified 106 key stewardship parcels in the Big Woods COA that met the following conditions (Figure 23):

- Larger than 40 acres in size, AND
- That contain at least one native plant community mapped by the MBS
- And are with a quarter mile of publicly owned conservation lands. Intersect areas of medium rank or higher in the Wildlife Action Network

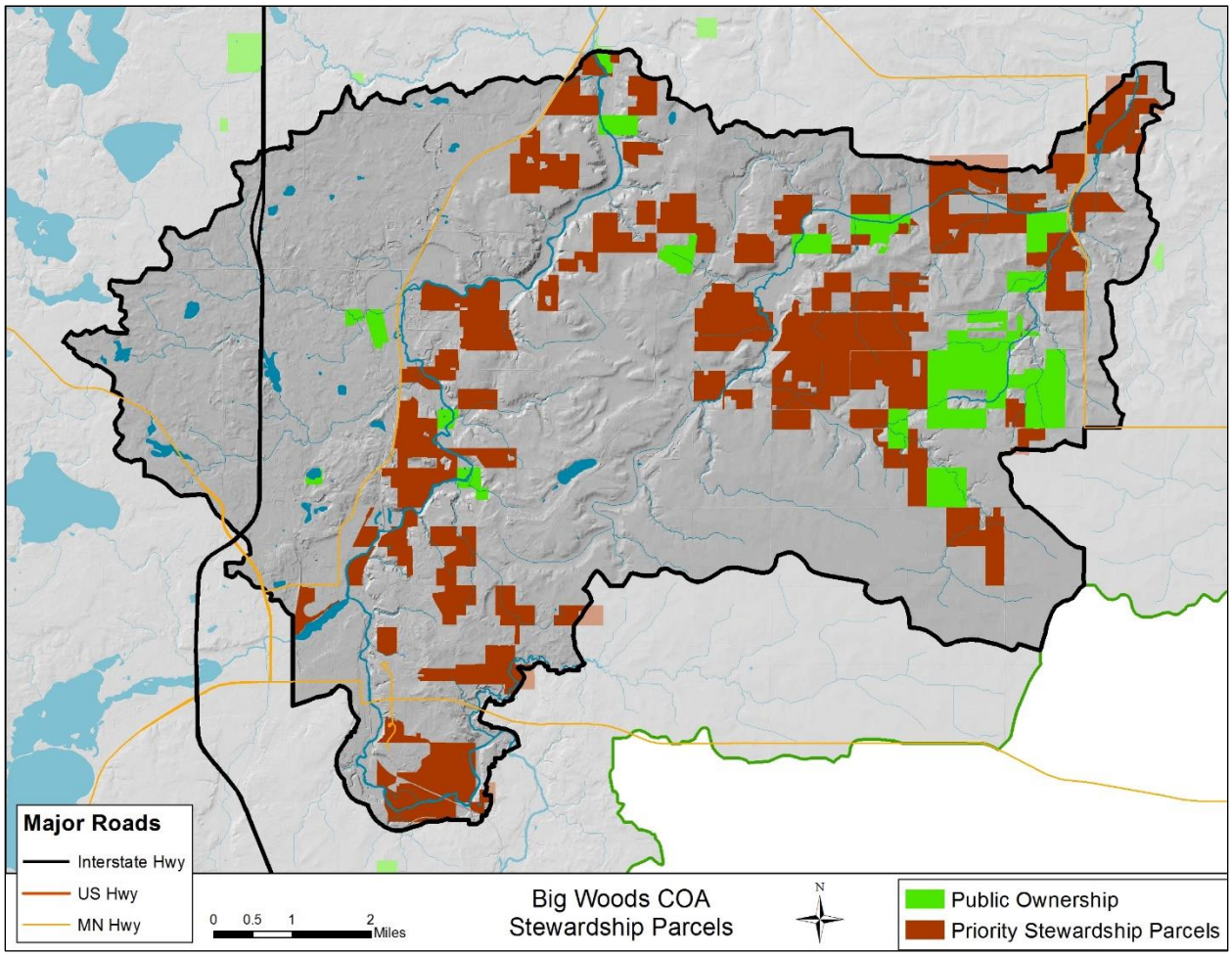


Figure 23. Priority stewardship parcels in the Big Woods COA.

Stewardship Activities

There is a variety of tools and strategies available for enacting stewardship activities on the landscape (see Section 1). Different strategies and actions will be appropriate for different types of parcels, natural resources, and landowners. This section provides a summary of strategies appropriate for the natural resources present in this COA.

Core Forest Areas

Large, continuous stretches of forest communities represent core forest habitat in the Big Woods COA. In addition to providing quality habitat to a number of species, including dwarf trout lily, these areas represent favorite places for recreation and scenery, making them important for the tourism industry in the region. They also provide a great benefit to water quality, as forests help prevent erosion, slow and filter water run-off, and shade streams in riparian areas.

Stewardship Activities:

On all lands:

- Control invasive species
- Burn where appropriate
- Manage according to sustainable silvicultural and ecological principles
- Where possible, increase size and connectivity of forest habitat through reforestation / afforestation of connecting patches

On Private lands:

- Prepare comprehensive forest stewardship plans
- Assist landowner in researching and applying for relevant cost-share programs available (e.g. EQIP, CSP)

Prairies, Savannas, and Fire-Associated Native Plant Communities

The suppression of fire and mass conversion to agriculture that came with Euro-American settlement drastically reduced the amount of native prairie and savannas in both Minnesota, and the US as a whole. These communities offer important habitat for a number of animals, and many flowering plants and grasses.

Stewardship Activities:

On all lands:

- Restore a natural fire regime through prescribed burns
- Remove brush as needed
- Control invasive species
- Expand grassland habitat as buffer areas around other NPCs.

Wet meadow/carr communities

The Prairie Creek Watershed contains many scattered examples of seepage meadows, or carrs, where groundwater seeping back to the surface on the edge of aquifers or near riparian creates wetlands frequently dominated by sedges and/or shrubs. These small, distinct communities add

diversity to the landscape, but can be greatly affected by changes in surface or groundwater hydrology. They are also vulnerable to conversion to agriculture when drained.

Stewardship Activities:

On public lands:

- Identify, map, and maintain small patches of carr communities.
- Control invasive species near these communities.

On private lands:

- Attempt to document and protect these wetlands to discourage drainage and conversion where those risks are present.
- Encourage landscape scale BMPs to maintain groundwater and surface hydrology.

Riparian Area Restoration

Riparian areas are those nearest, and most connected to streams and rivers. They have an important impact on water quality either, positively by slowing and filtering run-off, or negatively, by contributing to sediment and nutrient loads brought to streams through erosion and run-off. Implementing best management practices and other conservation actions in these areas can have significant water quality and wildlife benefits.

Stewardship Activities:

On public lands:

- Reconnect waterways with their floodplains.
- Maintain and/or establish appropriate plant communities for the hydrology of the site.

On private lands:

- Support SWCDs in implementing and enforcing the state buffer law and other best management practices. Help interested landowners apply for the various cost-share or easement programs available for water quality protection (e.g. CRP, RIM).
- Work with landowners to reconnect streams to their floodplains.
- Maintain and restore natural vegetation along stream and riverbanks.

Key Stewardship Parcels

These parcels were identified based on their geographical size and proximity to areas of biodiversity significance (see above). They are areas where conservation effort can be most beneficial to the overall health of the landscape.

Stewardship Activities:

- Work to engage the owners of these parcels in a targeted manner.
- Target strategic parcels for potential acquisition or conservation easements.
- Tailor outreach and assistance to each landowner individually based on characteristics of their parcel and its geographical and ecological characteristics
- Prioritize stewardship efforts affecting these parcels

Headwater Lakes Conservation Opportunity Area

Overview

The Headwater Lakes COA lies northwest of Faribault, east of Lonsdale, and west of Northfield encompassing nearly 100,000 acres in the Cannon River headwaters. Significant portions of the Devil Creek, Dutch Creek, Heath Creek, Roberds Lake, and Wolf Creek watersheds fall within the Headwater Lakes COA.

The rolling topography of the Headwaters Lakes COA is pocketed with numerous small lakes, wetlands, and forest (Figure 24). Today much of this region has been converted to agriculture, but according to data from the Public Land Survey, over half of this area was dominated by an impressive mesic hardwood forest of maple and basswood. Although greatly reduced, the remnants of the big woods ecosystem represent a conservation opportunity from which to build within the agriculture matrix. So far, over 3,000 acres of these forests and wetlands have been protected as Wildlife Management Areas and other public land designations.

The wetlands and remaining areas of the big woods ecosystem represent hotspots for biodiversity as identified in the Wildlife Action Network and State Wildlife Action Plan. The southern portion of the COA between Shields and Cedar Lakes in particular contains a relatively large block of forest and wetland conditions that offers good wildlife habitat that is no longer common in the area. The wetlands are particularly important to waterfowl and other water birds while the mesic hardwoods forests are host to a number of spring ephemeral wildflowers that often grow and bloom before the canopy trees leaf out. This includes species such as false rue anemone, wild ginger, spring beauty, cut-leaved toothwort, Dutchman's breeches, sharp-lobed hepatica, bloodroot and violets. The Minnesota Biological Survey has designated substantial portions of the COA as having moderate or high significance to biodiversity, and an opportunity exists for successful private land conservation efforts. With the prevalence of publicly owned land in the COA, the priority for private parcels should be placed on those in close proximity to protected land, in order to enhance to size and connectivity of those habitats.

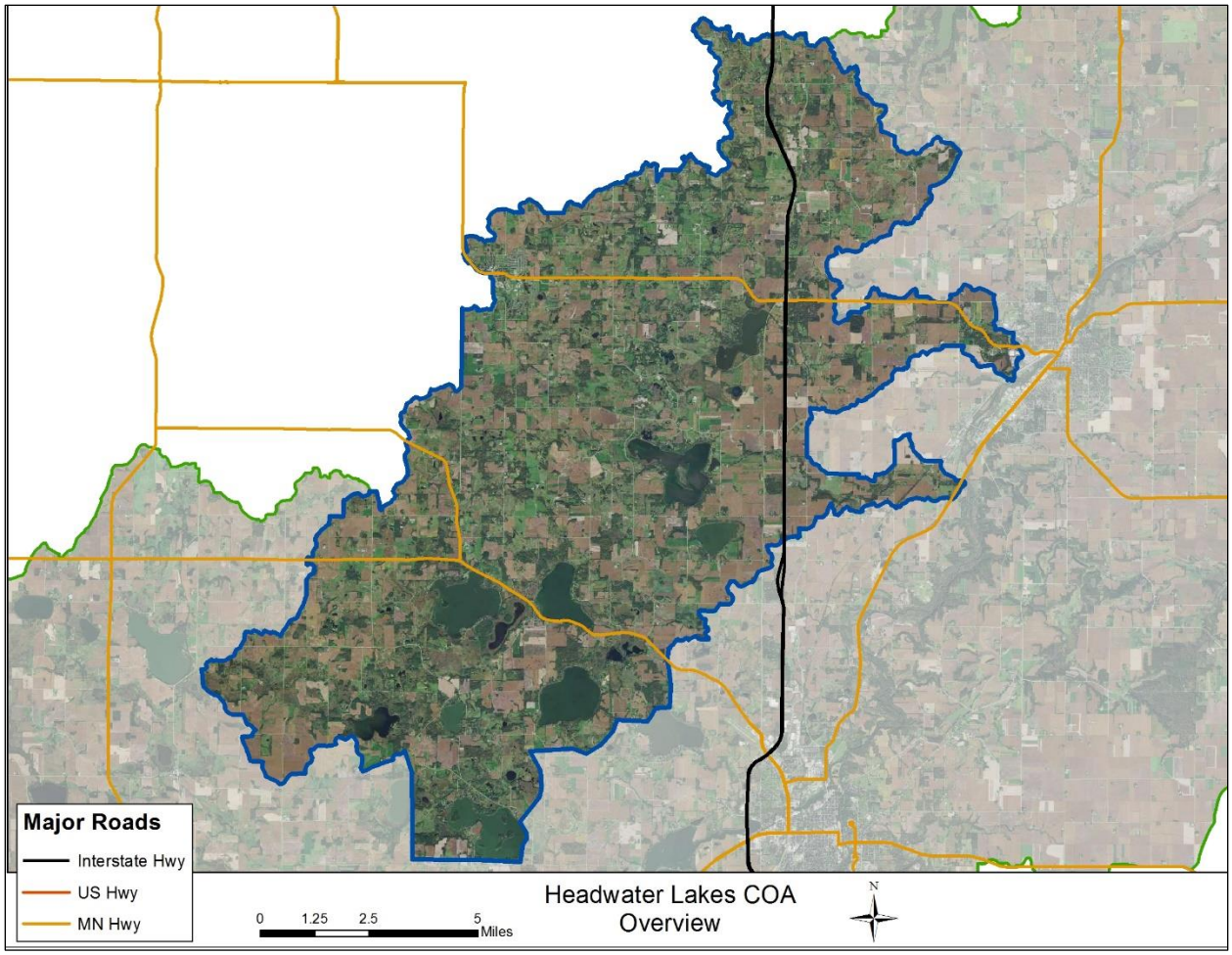


Figure 24. Headwater Lakes COA.

Natural Resource Assessment

Hydrology

The dominant hydrological features of the Headwater Lakes COA are the numerous lakes, wetlands and headwater streams in this rolling topography. Numerous unnamed perennial or intermittent streams originating in the agricultural uplands feed these hydrological features (Figure 25). Water in the northern portion of the COA travels east to the main stem of the Cannon River, while the southern lakes and wetlands eventually coalesce into the beginning of the Cannon River and head west before the Cannon eventually flows to the northeast. Extensive agricultural tile lines and a reduction in perennial cover have changed the hydrology in the COA to move water faster through the system.

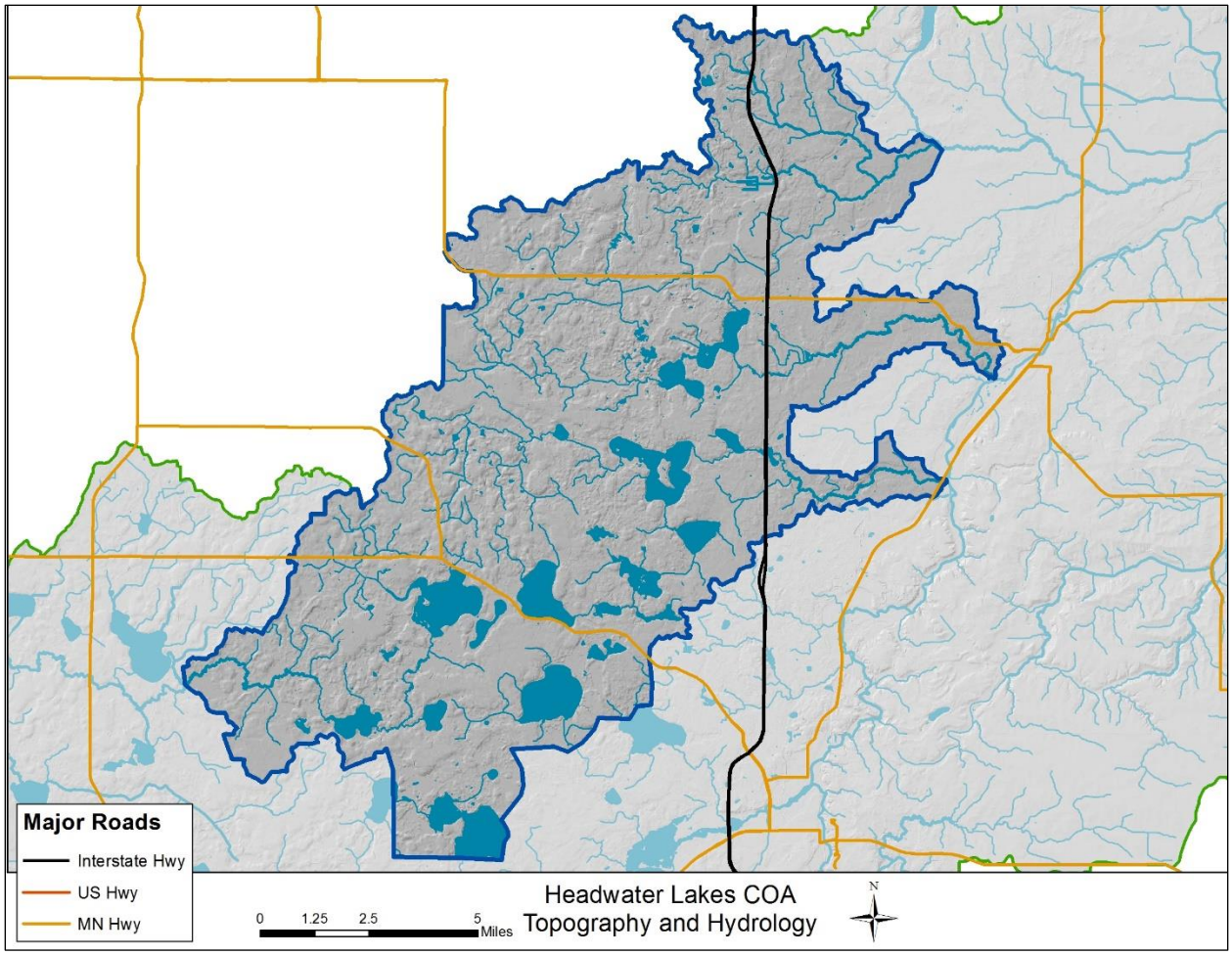


Figure 25. Hydrology of the Headwater Lake COA.

Plant Communities

Headwater Lakes COA contains almost 4,500 acres of Native Plant Communities (NPC) in six different systems and 16 different types and subtypes as identified by the Minnesota Biological Survey (MBS) (Table 10). Marsh (50%) and mesic hardwoods (39.5%) make up the majority of the identified NPC acres (Figure 26). Full descriptions of native plant community types and their associated ecological systems can be found in *Field Guide to the Native Plant Communities of Minnesota: the Eastern Broadleaf Forest Province*, produced and distributed by the MN DNR.

Approximately 20 percent of the NPCs in the Headwater Lakes COA are on publicly owned land with the many of the privately owned NPCs on parcels near the blocks of public land. Private parcels containing NPCs, especially those bordering publicly managed areas, represent an important priority for increased protection and private conservation efforts.

Table 10. Native Plant Communities of the Headwater Lakes COA.

System	NPC Code	Native Plant Community	Acreage	% of NPC Acreage
Floodplain Forest	FFs59a	Silver Maple - Green Ash - Cottonwood Terrace Forest	8	0.2%
Forested Rich Peatland	FPs63a	Tamarack Swamp (Southern)	34	0.8%
Lakeshore	LKi32	Inland Lake Sand/Gravel/Cobble Shore	8	0.2%
	LKi32b	Gravel/Cobble Beach (Inland Lake)	18	0.4%
Mesic Hardwood Forest	MHs37	Southern Dry-Mesic Oak Forest	109	2.4%
	MHs37b	Red Oak - White Oak - (Sugar Maple) Forest	11	0.2%
	MHs38	Southern Mesic Oak-Basswood Forest	21	0.5%
	MHs38c	Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest	258	5.7%
	MHs39	Southern Mesic Maple-Basswood Forest	945	21.1%
	MHs39c	Sugar Maple Forest (Big Woods)	346	7.7%
	MHs49a	Elm - Basswood - Black Ash - (Hackberry) Forest	81	1.8%
Marsh	MRn83	Northern Mixed Cattail Marsh	1653	36.8%
	MRn83a	Cattail - Sedge Marsh (Northern)	378	8.4%
	MRn93	Northern Bulrush-Spikerush Marsh	211	4.7%
Wet Meadow	WMn82a	Willow - Dogwood Shrub Swamp	342	7.6%
	WMn82b1	Sedge Meadow: Bluejoint Subtype	64	1.4%

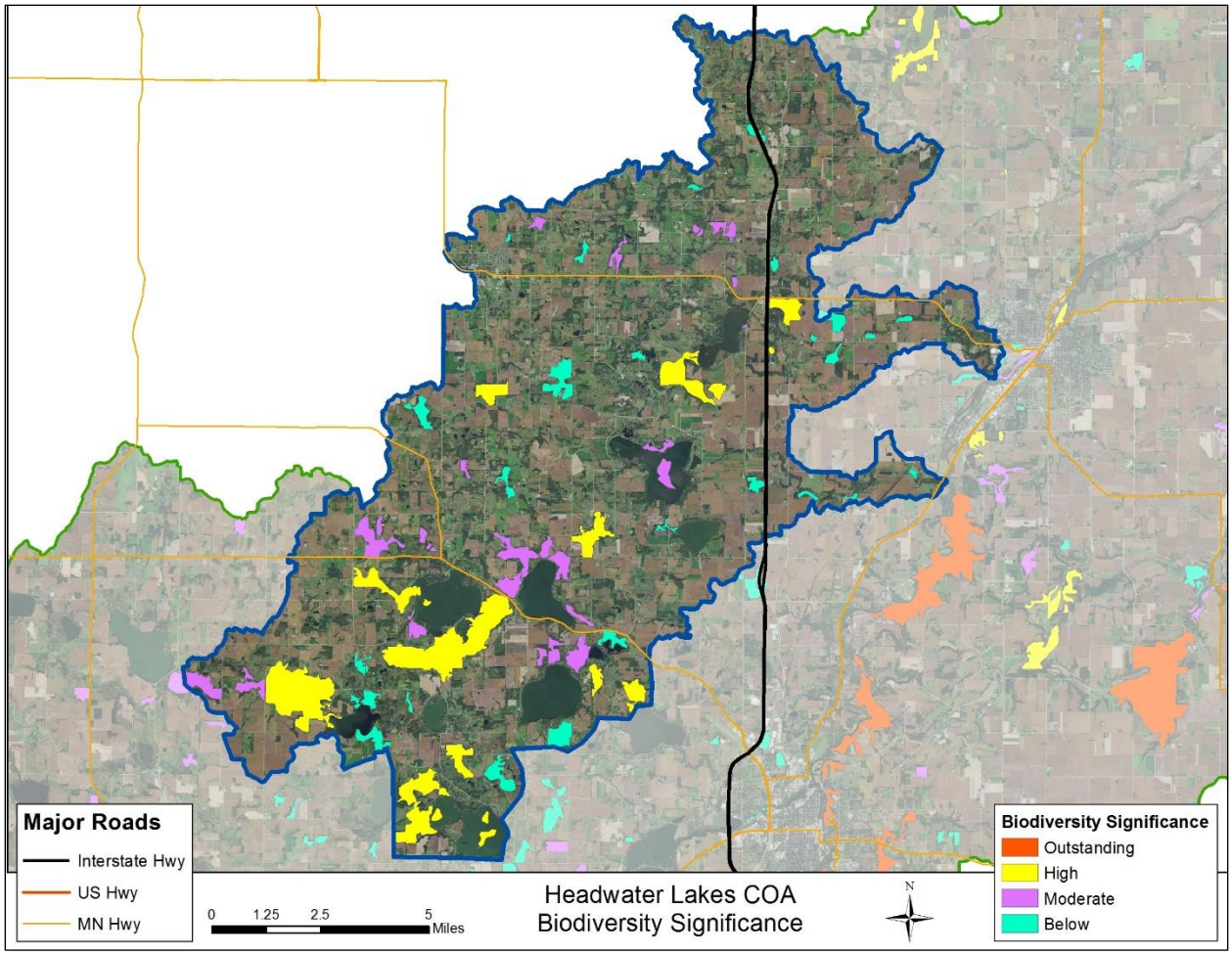


Figure 26. Native plant communities in the Headwater Lakes COA.

Biodiversity and Rare Species

The Natural Heritage Information System (NHIS) has recorded 13 different occurrences of rare plants, animals, or communities in Headwater Lakes COA (Table 11). Rare species are those listed as either endangered, threatened, or of special concern. Endangered species are those facing extinction throughout all or a significant portion of its range within Minnesota. Threatened species are likely to become endangered in the foreseeable future. Species of Special Concern, though not endangered or threatened, are extremely uncommon in Minnesota.

Forty-four rare terrestrial communities are listed in Headwater Lakes COA. Rare terrestrial communities are collections of plant species growing together, whose presence on the landscape is rare or severely diminished. These communities are monitored, but not given designations as endangered, threatened, or of special concern.

Table 11. Number of rare species and community occurrences in the Headwater Lakes COA.

Organism Type	Observations
Animal Assemblage	2
Vascular Plant	3
Invertebrate Animal	1
Vertebrate Animal	7
Terrestrial Community	44

The Minnesota Biological Survey has delineated over 8,150 acres of the Headwater Lakes COA based on their significance to biodiversity in the state (Figure 27). Of that area, 4,600 acres were designated as having 'High' biodiversity significance. No acres were given the highest level of 'Outstanding' biodiversity significance.

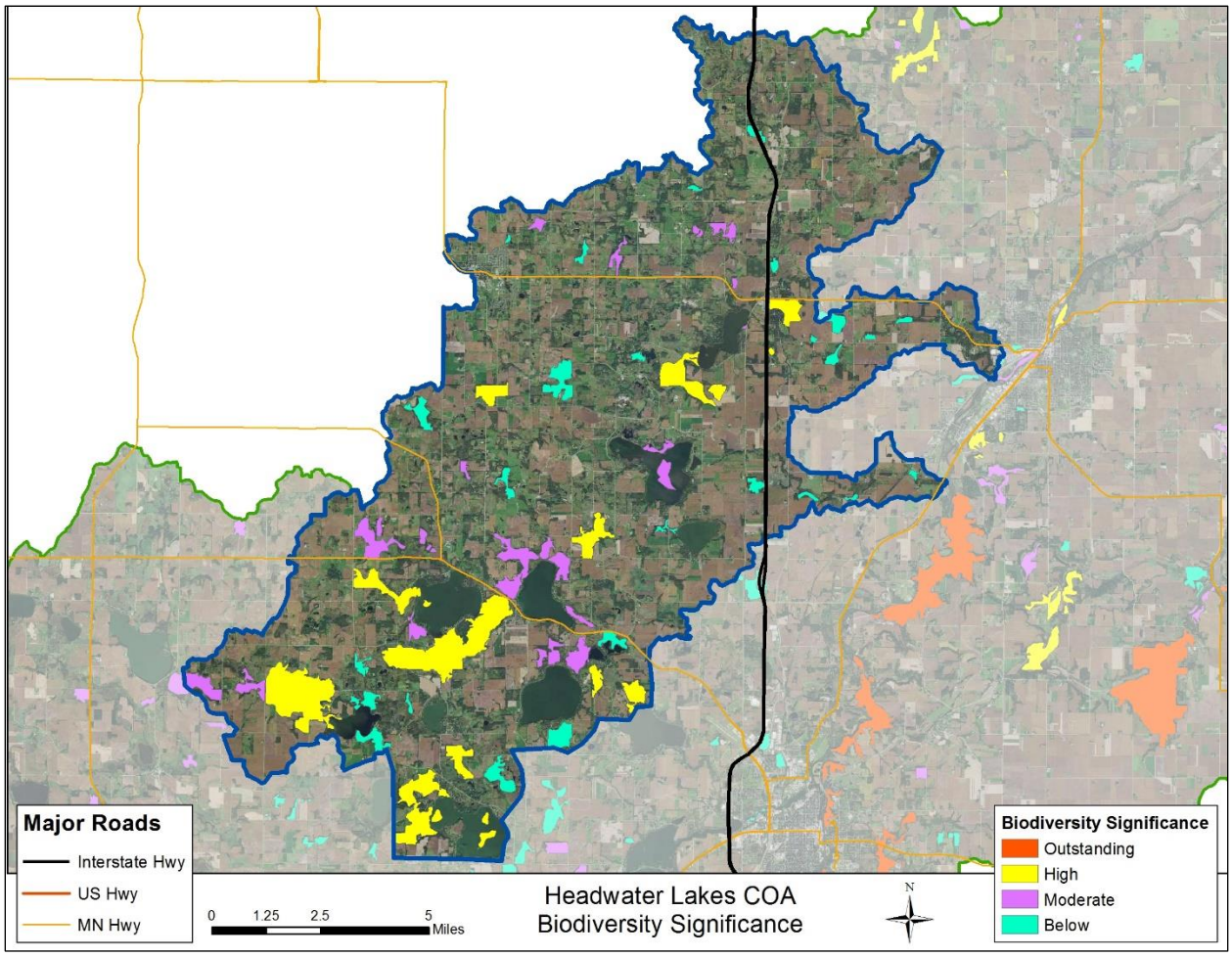


Figure 27. Sites of biodiversity significance in the Headwater Lakes COA.

Recreation

Outdoor recreation areas in the Headwater Lakes COA contribute to the well-being of residents and support the local economy. The region's lakes are popular fishing and recreating destinations. Hunting is a popular outdoor recreational activity throughout the area on public and private land. A network of snowmobile trails also winds through the COA.

Environmental Threats

Development pressures:
There are no significant population centers in the Headwaters COA but the lakes are popular recreation destinations and there is significant development pressure along their shorelines. Additionally, this area is relatively close to the expanding Minneapolis-Saint Paul metropolitan area and there will likely be increasing parcellization, fragmentation, and conversion of rural lands in the COA. This disrupts wildlife movement and migration, reduces available habitat, and increased water quality concerns from the added impervious surface area. The demand for

dispersed rural residences places less-disturbed parts of the landscape under pressure for development.

Mismanagement of forest resources:
The forests of Southeast Minnesota support a number of high value timber species, and many sites exist containing high quality timber stock. This represents an important resource for the region, but is also a target for exploitative harvesting practices. Timber harvests that remove all of the most valuable trees in a stand, and leave behind a patchy, irregular forest of poor quality trees do serious harm to the health and productive potential of that site, and severely limit management options in the future. The high value of the timber resource enables sustainable timber management to produce valuable economic products while also providing the habitat and ecosystem services of a healthy forest. Unsustainable harvesting practices can seriously impair a stand's ability to do so in the future.

Nutrient, sediment, and contaminants from upstream agricultural areas:
A significant portion of the Headwater Lakes COA are heavily farmed, often with practices that have the potential to impair water quality. This has large impacts on downstream reaches. Best management practices are available to farmers to protect their soil from erosion, and help prevent excess nutrients and sediment from washing into the streams. Riparian buffer strips help slow run-off and increase infiltration, allowing nutrients to be filtered and removed by soil processes. Increased adoption of agricultural BMPs to protect water quality in upstream areas will help protect the water quality of downstream reaches in the COA.

Land Ownership

Over 3,000 acres of the Headwaters COA are in public ownership (Table 12, Figure 28). The DNR Division of Fish and Wildlife manages the largest amount of this public land in their Wildlife Management Area system.

The vast majority of the COA, however is in private ownership. Since private lands make up such a large portion of the COA it is clear that private landowners will play a crucial role in conservation. Much of the forested area occurs in areas with dispersed residential development, and finding programs that will appeal to these landowners will be necessary to encouraging the necessary private conservation.

Table 12. Estimated land ownership in the Headwater Lakes COA.

Ownership	Acres	Percent of Public	Percent of COA
Private	95,245		96.9%
Division of Fish and Wildlife	2,379	77.7%	2.4%
U.S. Fish and Wildlife Service	262	8.6%	0.3%
Division of Forestry	258	8.4%	0.3%
Rice County	120	3.9%	0.1%
Division of Ecological Services	41	1.4%	0.0%

To date, private conservation programs have demonstrated a fair amount of success in the COA. The DNR Forest Stewardship Program is an excellent first step in landowner involvement and concern for the ecological health of the landscape and 1,381 acres have a registered stewardship plan in the Headwater Lakes COA. This voluntary program provides technical advice and long-range forest management planning to interested landowners. Plans are designed by professional foresters to meet the landowner's goals while maintaining the sustainability of the land.

The Reinvest in Minnesota (RIM) program has easements in the COA covering 1,023 acres. This program purchases conservation easements on privately owned lands to retire environmentally sensitive lands from agricultural production. Conservation practices are established by planting native vegetation, and restoring wetlands with the goal of protecting and improving water quality, reducing soil erosion, and enhancing fish and wildlife habitat. Additionally, this portion of Rice County has been designated as an active Forest Legacy Area by the State of Minnesota to protect the remaining examples of the big woods ecosystem. The Minnesota Forest Legacy Program protects environmentally important private forests threatened by conversion to non-forest uses. Landowners apply to participate in the program. If they are accepted, federal funds and local matching funds are used to purchase development rights and conservation easements to keep these forests intact and continuing to provide forest benefits. The landowner retains ownership and can continue activities such as timber management, recreation, hunting, and hiking as long as they do not conflict with the terms of the easement. All easements are perpetual, and any new owner is bound by the terms of the easement.

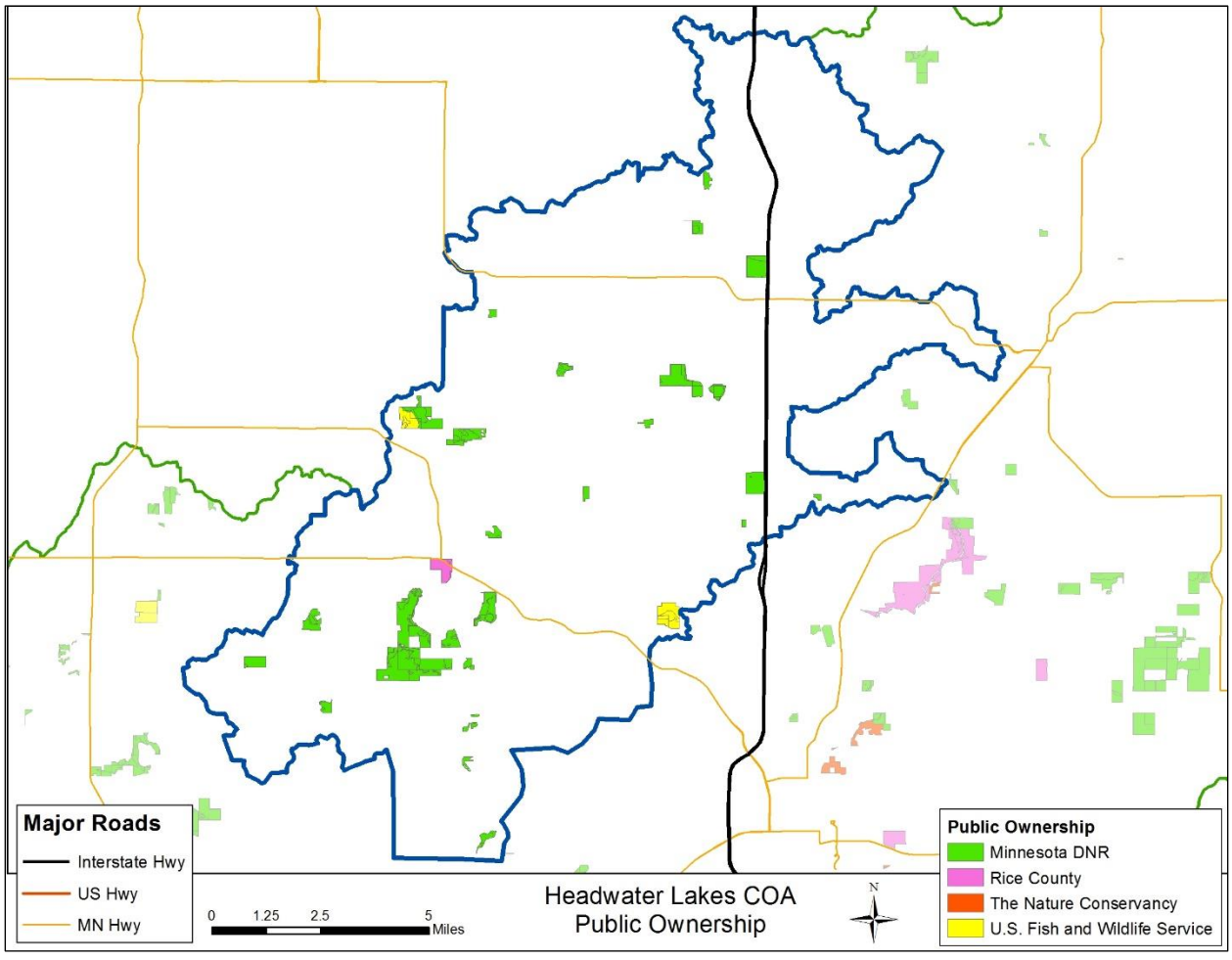


Figure 28. Public land in the Headwater Lake COA.

Land Cover and Use

Over half of the Headwater Lakes COA was covered by a hardwood forest at the time of European settlement (Table 13, Figure 29). Today, the rolling topography of the COA is largely agriculture, pocketed with numerous small lakes, wetlands, and patches of forest. In general, the area surrounding lakes and wetlands tends to be forested with the surrounding uplands supporting agriculture (Figure 30). Major cover types are cultivated crops (35.0%) and pasture/hay (27.8%). Deciduous forest (11.9%), open water (7.3%) and emergent herbaceous wetlands (5.7%) cover are also significant.

Table 13. Presettlement land cover in the Headwater Lakes COA.

Land Type	Acres	Percent
Aspen-Oak Land	5,843	6%
Big Woods - Hardwoods (oak, maple, basswood, hickory)	50,544	51%
Lakes (open water)	6,580	7%
Oak openings and barrens	19,043	19%
Wet Prairie	16,297	17%

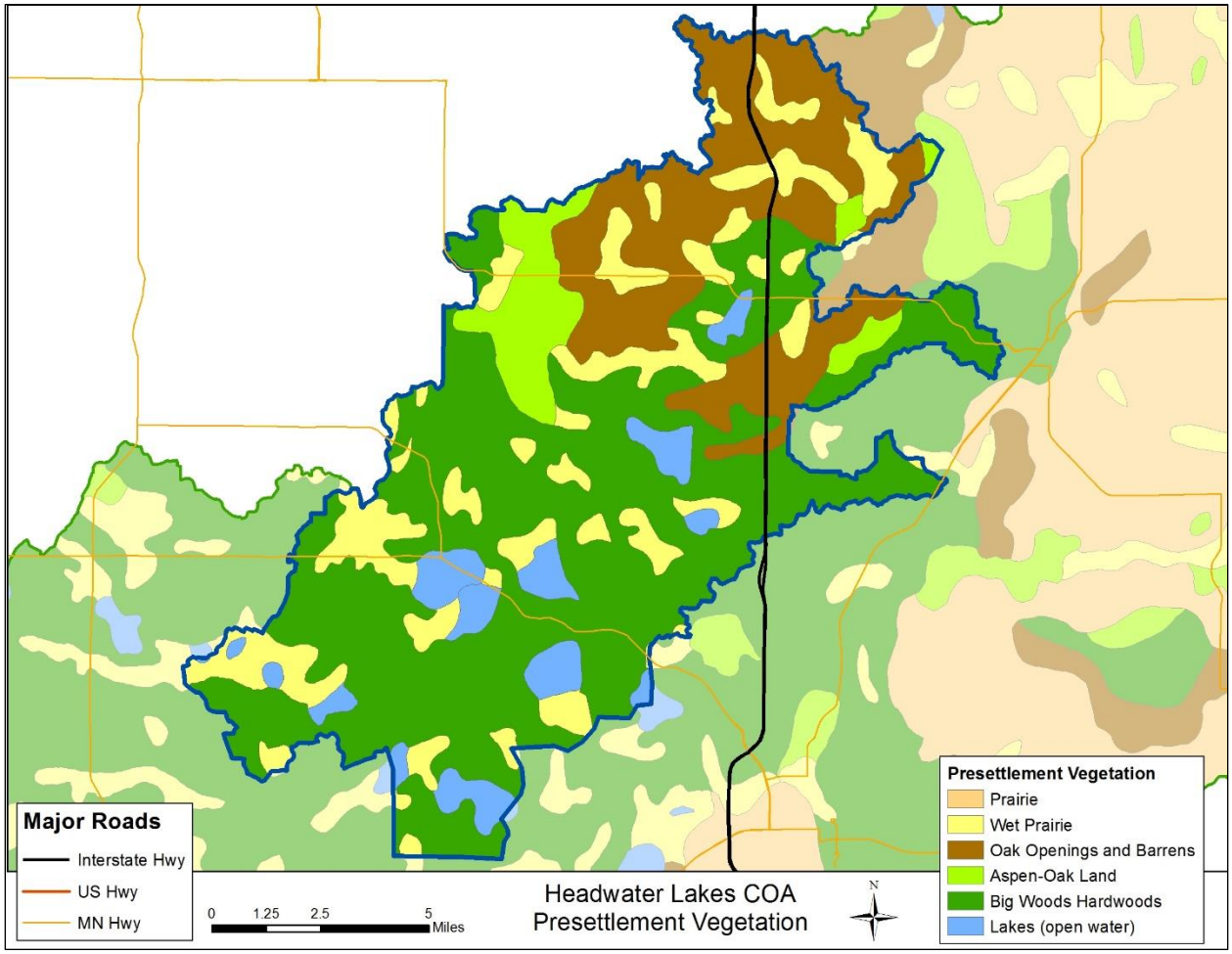


Figure 29. Presettlement land cover in the Headwater Lakes COA based on the work of Francis J. Marschner.

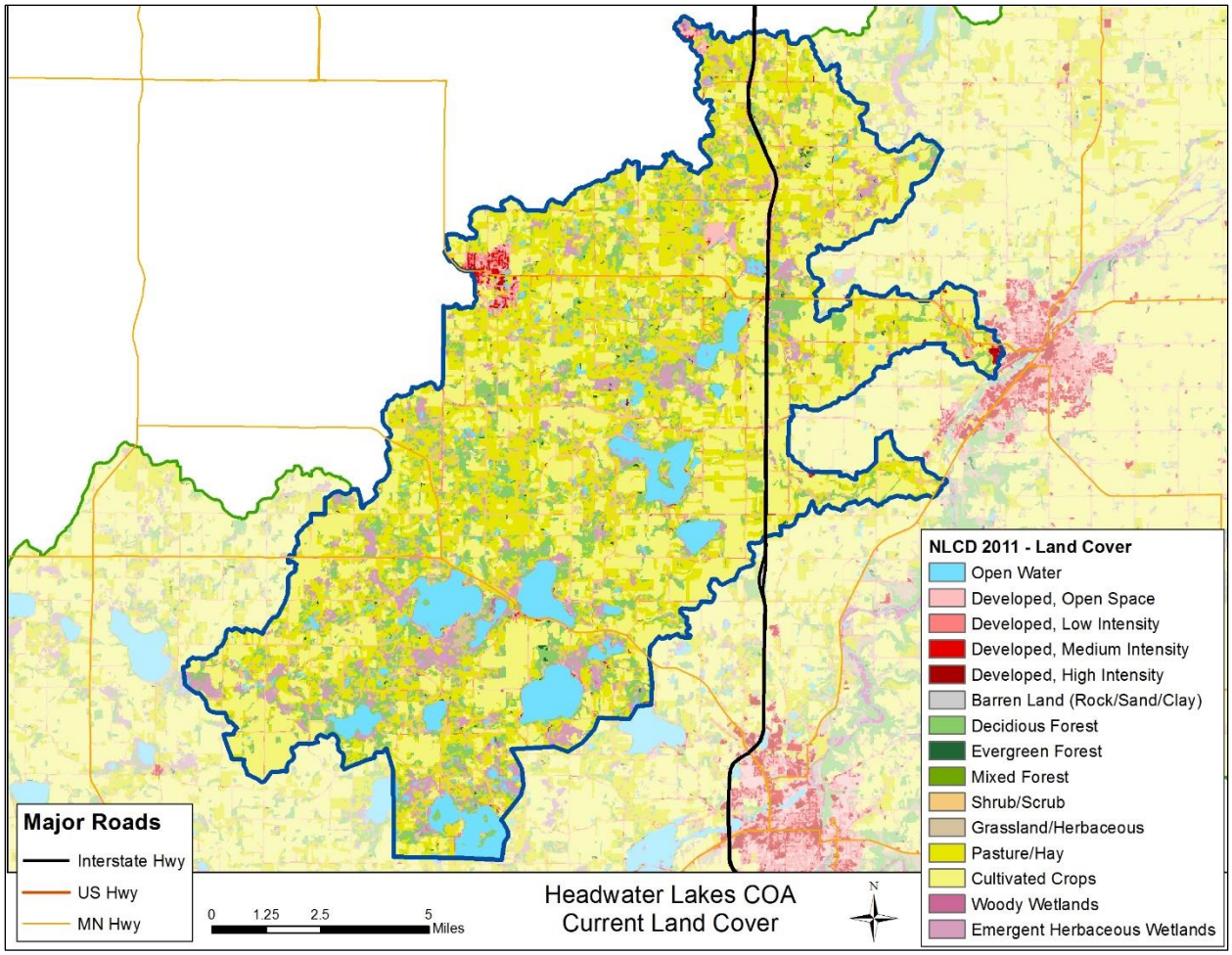


Figure 30. Current land cover in the Headwater Lakes COA based on the 2011 National Land Cover Database.

Desired Future Conditions

- Human activity in riparian and lakeshore areas follows best management practices to protect water quality and sensitive shorelines.
- Biotic integrity of all streams and lakes within the COA is restored, resulting in healthy aquatic species and de-listing of impaired waters.
- 100% of riparian areas are covered by native vegetation, returning a host of ecological services for water quality, habitat quality, and connectivity.
- Agricultural practices within the COA follow best management practices to protect soil from erosion, and streams from sedimentation and nutrient loading.
- A natural fire regime is restored through prescribed burning on all appropriate native plant communities.
- Large blocks of native habitat exist across ownership lines.
- Habitat corridors link patches of biodiversity habitat, supporting migration and travel, especially in riparian areas.
- Native plant community remnants have expanded
- Rare plants and animal habitat are protected from degradation
- Invasive species are monitored and controlled

Key Stewardship Parcels

With nearly 97% of the Headwater Lakes COA in private ownership, stewardship efforts on private parcels will be crucial to protecting the natural resources of the area. Residential development along the lakes and in many of the stream valleys has led to smaller average parcel sizes in forested areas. Conservation efforts in the COA will be most effective in places where they protect existing native plant communities, and enhance habitat on public lands by increasing their size and/or connectivity. Working with larger parcels is preferable, because more stewardship options are available on larger tracts, and stewardship planning will impact a greater area. To make the most efficient use of conservation resources, it is useful to target parcels where those resources will have the most impact. A GIS analysis by The Nature Conservancy identified 233 key stewardship parcels in the Headwater Lakes COA that met the following conditions (Figure 31):

- Larger than 40 acres in size, AND
- Intersect areas of low-medium rank or higher in the Wildlife Action Network or Moderate or higher Biodiversity Significance according to the Minnesota Biological Survey.

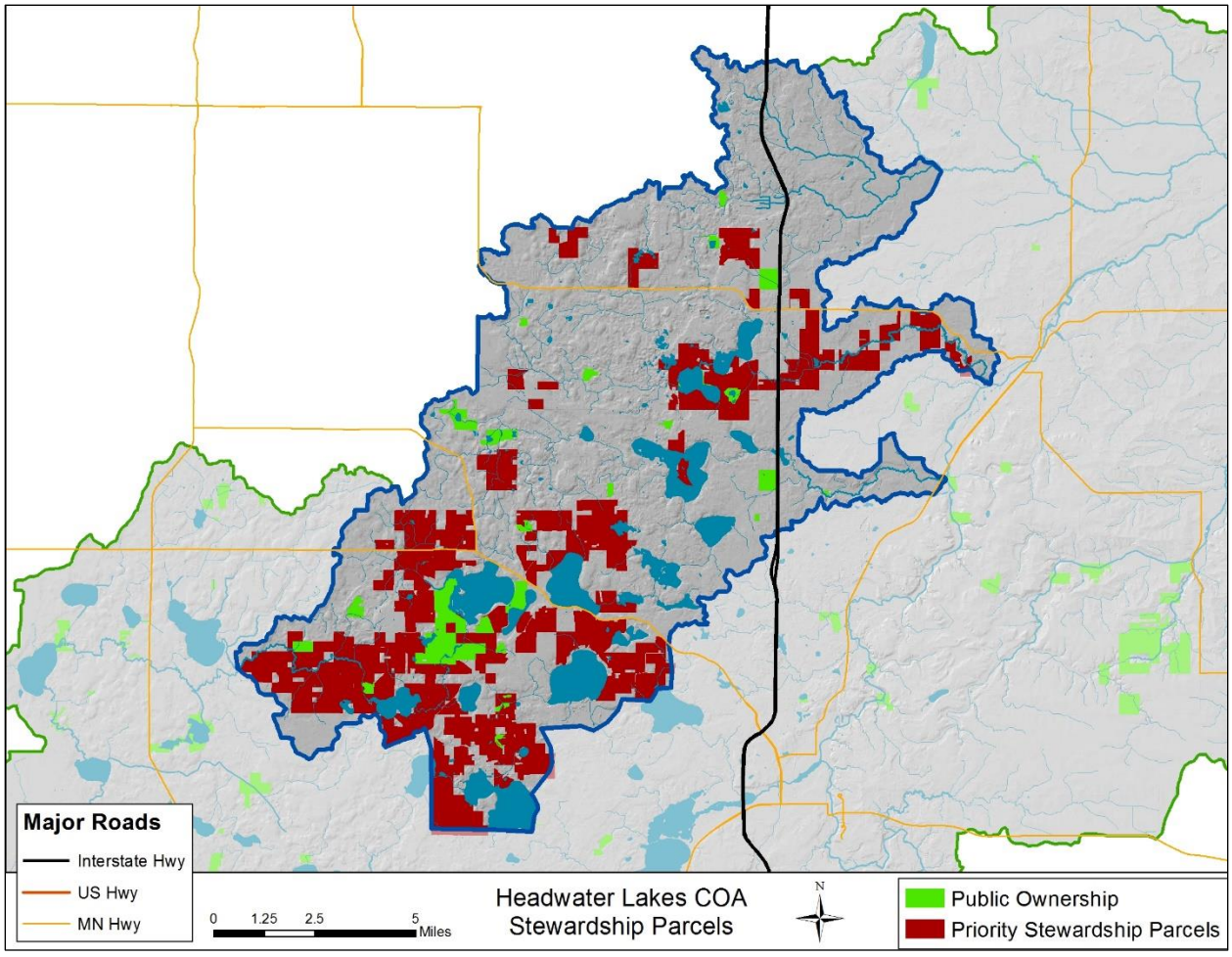


Figure 31. Priority stewardship parcels in the Headwater Lakes COA.

Stewardship Activities

There is a variety of tools and strategies available for enacting stewardship activities on the landscape (see Section 1). Different strategies and actions will be appropriate for different types of parcels, natural resources, and landowners. This section provides a summary of strategies appropriate for the natural resources present in this COA.

Wetland, Riparian, and Lakeshore Best Management Practices

A large portion of the Headwater Lakes COA is in close proximity to open water, wetland, or streams and rivers. These areas have a large important impact on water quality by slowing and filtering run-off. Development in these areas can reduce the effectiveness of these areas at protecting water quality. Additionally, croplands in these areas that involve tilling soil and applying nutrients can pose a risk to water quality.

Stewardship Activities:

On public lands:

- Maintain and/or establish appropriate plant communities for the hydrology of the site.
- Reconnect waterways with their floodplains.
- Where possible, restore wetlands to increase storage and improve hydrology.

On private lands:

- Support SWCDs in implementing and enforcing the state buffer law and other best management practices. Help interested landowners apply for the various cost-share or easement programs available for water quality protection (e.g. CRP, RIM).
- Work with landowners to reconnect streams to their floodplains.
- Seek opportunities to decommission drainage ditches, or implement design practices such as two-stage ditches that improve nutrient removal and increase flood storage high in the watershed.
- Seek opportunities to restore wetlands on marginal cropland to increase floodwater storage and ground water infiltration.
- Work with landowners around developed lakes, through lake associations or similar landowner groups where possible, to maintain and restore natural vegetation along shorelines.

Core Forest Areas

Large, continuous stretches of forest communities represent core forest habitat. In addition to providing quality habitat to a number of species, these areas represent favorite places for recreation and scenery, making them important for the tourism industry in the region. They also provide a great benefit to water quality, as forests help prevent erosion, slow and filter water run-off, and shade streams in riparian areas.

Stewardship Activities:

On all lands:

- Control invasive species
- Burn where appropriate
- Manage according to sustainable silvicultural and ecological principles

- Where possible, increase size and connectivity of forest habitat through reforestation / afforestation of connecting patches

On Private lands:

- Prepare comprehensive forest stewardship plans
- Assist landowner in researching and applying for relevant cost-share programs available (e.g. EQIP, CSP)

Prairies, Savannas, and Fire-Associated Native Plant Communities

The suppression of fire and mass conversion to agriculture that came with Euro-American settlement drastically reduced the amount of native prairie and savannas in both Minnesota, and the US as a whole. These communities offer important habitat for a number of animals, and many flowering plants and grasses.

Stewardship Activities:

On all lands:

- Restore a natural fire regime through prescribed burns
- Remove brush as needed
- Control invasive species
- Expand grassland habitat as buffer areas around other NPCs.

Key Stewardship Parcels

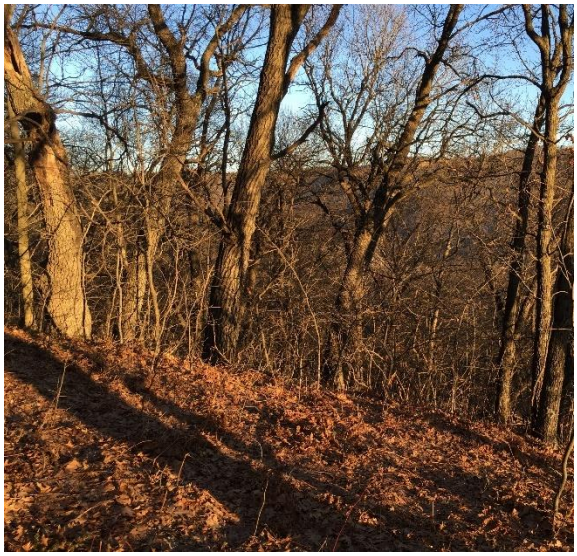
These parcels were identified based on their geographical size and areas of biodiversity significance (see above). They are areas where conservation effort can be most beneficial to the overall health of the landscape.

Stewardship Activities:

- Work to engage the owners of these parcels in a targeted manner.
- Tailor outreach and assistance to each landowner individually based on characteristics of their parcel and its geographical and ecological characteristics
- Prioritize stewardship efforts affecting these parcels

Little Cannon Conservation Opportunity Area

Overview



The Little Cannon COA lies south of Cannon Falls encompassing over 51,000 acres in the Little Cannon River watershed (Figure 32). The Little Cannon COA contains some high quality natural areas but unlike the COAs to the west and east, this area has no public land. According to data from the Public Land Survey, oak forests and savannas dominated this area. Significant forested tracks remain in the watershed; however, much of the region has been converted to agriculture. The remaining forested areas represent a hotspot for biodiversity as identified in the Wildlife Action Network and State Wildlife Action Plan. The area along the Little Cannon River and Butler Creek offers a large block of forested conditions that is home to numerous native plant community types.

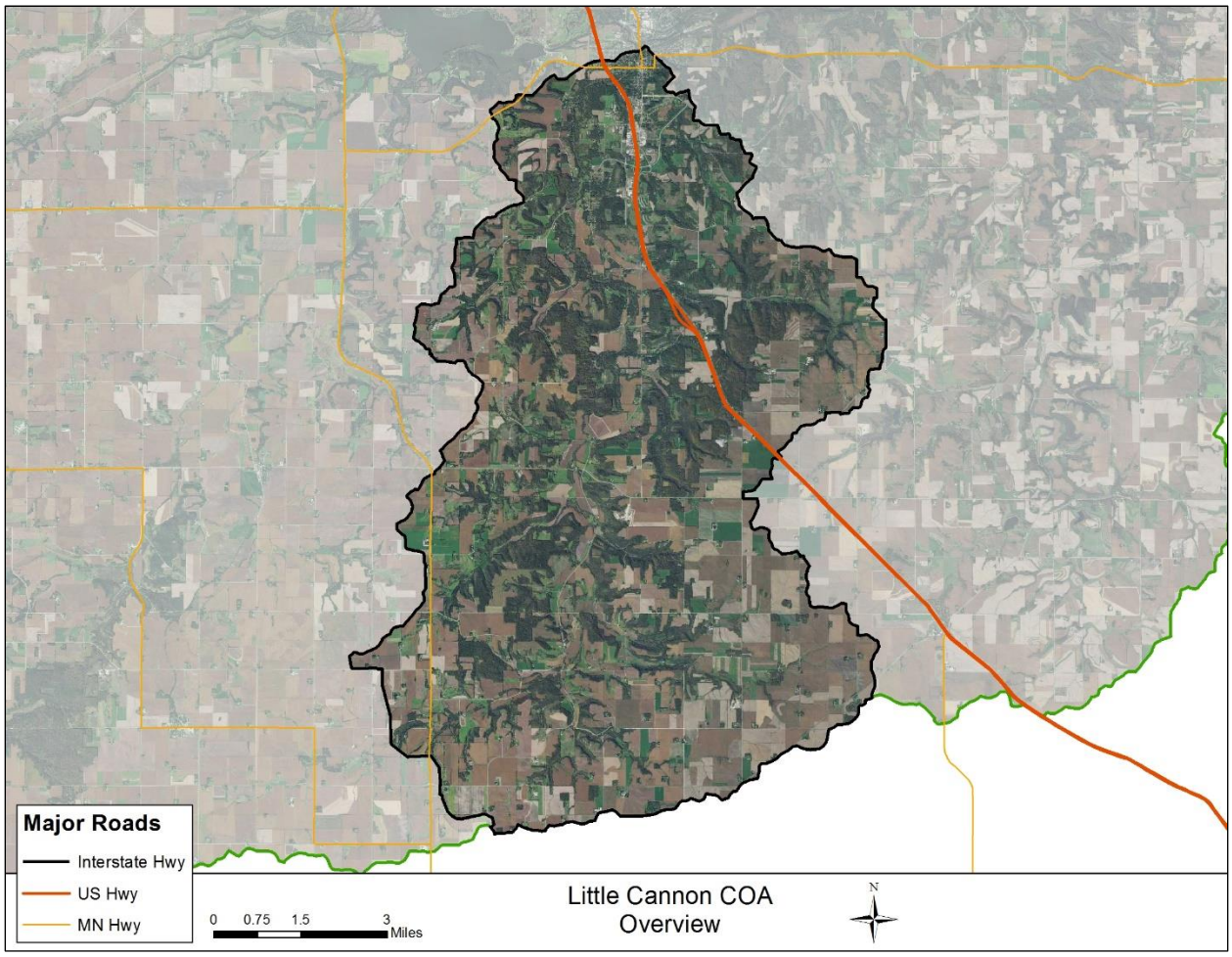


Figure 32. Little Cannon COA.

Hydrology

The dominant hydrological features of the Little Cannon COA is the Little Cannon River and its tributaries. The river valley for the main stem of the Little Cannon cuts through the center of the COA, and the entire area lies in its watershed (Figure 33). Numerous unnamed perennial or intermittent streams originating in the agricultural uplands feed the Little Cannon, which is a designated trout stream. Extensive agricultural tile lines and a reduction in perennial cover have changed the hydrology in the COA to move water faster through the system.

There are almost 300 karst features in the area including abundant sinkholes and springs that feed several of the COA's streams. These geological features can complicate the understanding of local hydrology and be challenging to protect because there are often hidden, rapid pathways from pollution release points to drinking water wells or surface water.

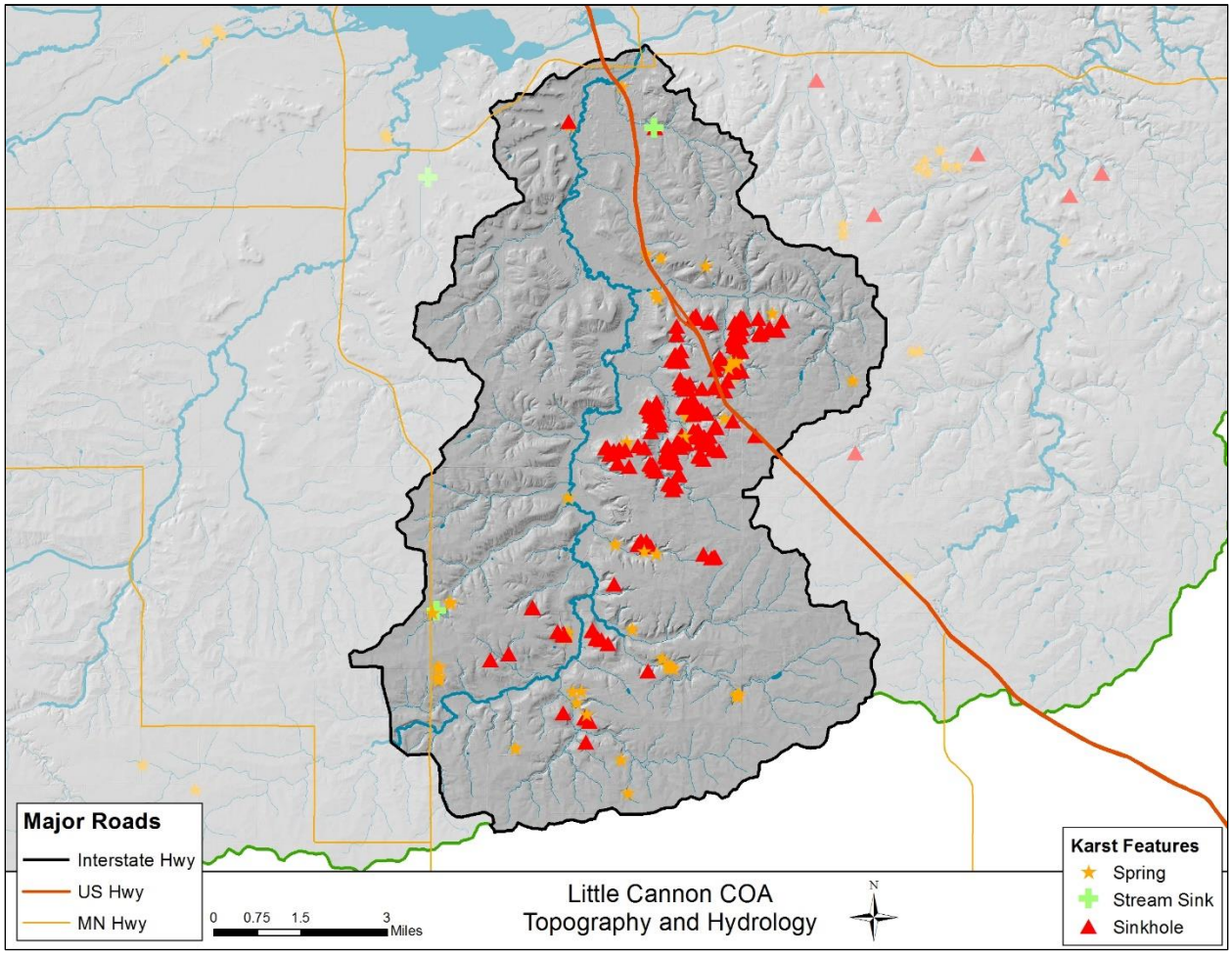


Figure 33. Hydrology and karst features of the Little Cannon COA.

Plant Communities

The Little Cannon COA contains over 3,600 acres of Native Plant Communities (NPC) in six different systems and 13 different types and subtypes as identified by the Minnesota Biological Survey (MBS) (Table 14; Figure 34). Mesic hardwoods make up 78.5% of the identified NPC acres with floodplain forest (11.2%) and fire dependent forests and woodlands (6.5%) also making a significant portion of the total acreage. Full descriptions of native plant community types and their associated ecological systems can be found in *Field Guide to the Native Plant Communities of Minnesota: the Eastern Broadleaf Forest Province*, produced and distributed by the MN DNR.

As the COA is entirely privately owned, engaging with landowners to manage and conserve these communities will be crucial to protect them.

Table 14. Native Plant Communities of the Little Cannon COA.

System	NPC Code	Native Plant Community	Acreage	% of NPC Acreage
Cliff/Talus	CTs12a	Dry Sandstone Cliff (Southern)	3	0.1%
Fire Dependent Forest or Woodland	FDs38a	Oak - Shagbark Hickory Woodland	238	6.5%
Floodplain Forest	FFs59c	Elm - Ash - Basswood Terrace Forest	408	11.2%
Mesic Hardwood Forest	MHs37	Southern Dry-Mesic Oak Forest	57	1.6%
	MHs37a	Red Oak - White Oak Forest	66	1.8%
	MHs37b	Red Oak - White Oak - (Sugar Maple) Forest	160	4.4%
	MHs38c	Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest	223	6.1%
	MHs39	Southern Mesic Maple-Basswood Forest	241	6.6%
	MHs39a	Sugar Maple - Basswood - (Bitternut Hickory) Forest	1,275	35.0%
	MHs39b	Sugar Maple - Basswood - Red Oak - (Blue Beech) Forest	813	22.3%
	MHs49b	Elm - Basswood - Black Ash - (Blue Beech) Forest	22	0.6%
Open Rich Peatland	OPp93c	Calcareous Fen (Southeastern)	6	0.2%
Upland Prairie	UPs13c	Dry Bedrock Bluff Prairie (Southern)	128	3.5%

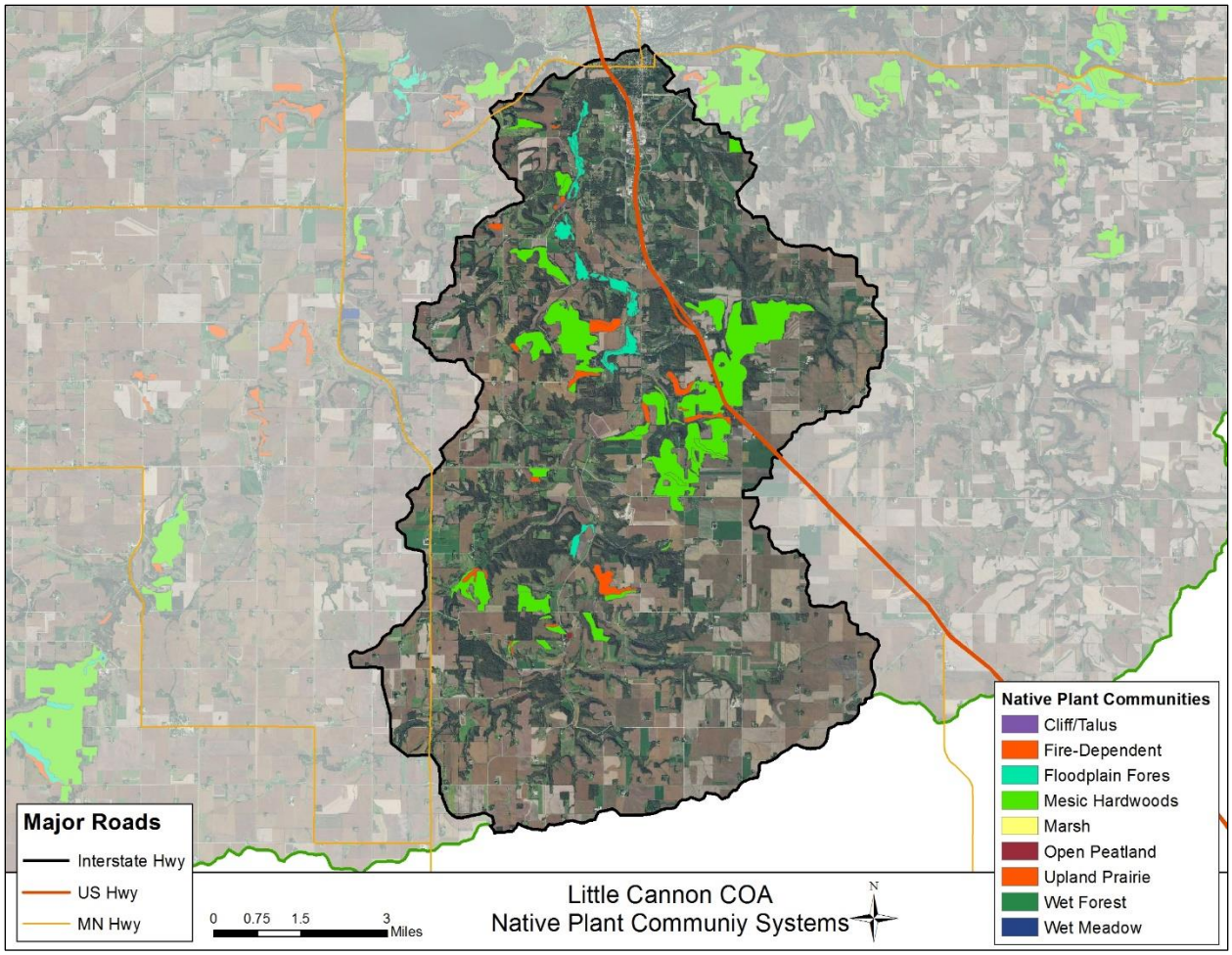


Figure 34. Native plant communities of the Little Cannon COA.

Biodiversity and Rare Species

The Natural Heritage Information System (NHIS) has recorded 61 different occurrences of rare plants, animals, or communities in Little Cannon COA (Table 15). Rare species are those listed as either endangered, threatened, or of special concern. Endangered species are those facing extinction throughout all or a significant portion of its range within Minnesota. Threatened species are likely to become endangered in the foreseeable future. Species of Special Concern, though not endangered or threatened, are extremely uncommon in Minnesota.

Thirty-three rare terrestrial communities are listed in Little Cannon COA. Rare terrestrial communities are collections of plant species growing together, whose presence on the landscape is rare or severely diminished. These communities are monitored, but not given designations as endangered, threatened, or of special concern.

Table 15. Number of rare species and community occurrences in the Little Cannon COA.

Organism Type	Observations
Vascular Plant	36
Vertebrate Animal	25
Terrestrial Community	33

The Minnesota Biological Survey has delineated nearly 9,000 acres of the Little Cannon COA based on their significance to biodiversity in the state (Figure 35). Areas that warranted assessment included the forested bluffsides and other natural areas. Of the assessed area, 52 percent was designated as having 'High' or 'Outstanding' biodiversity significance.

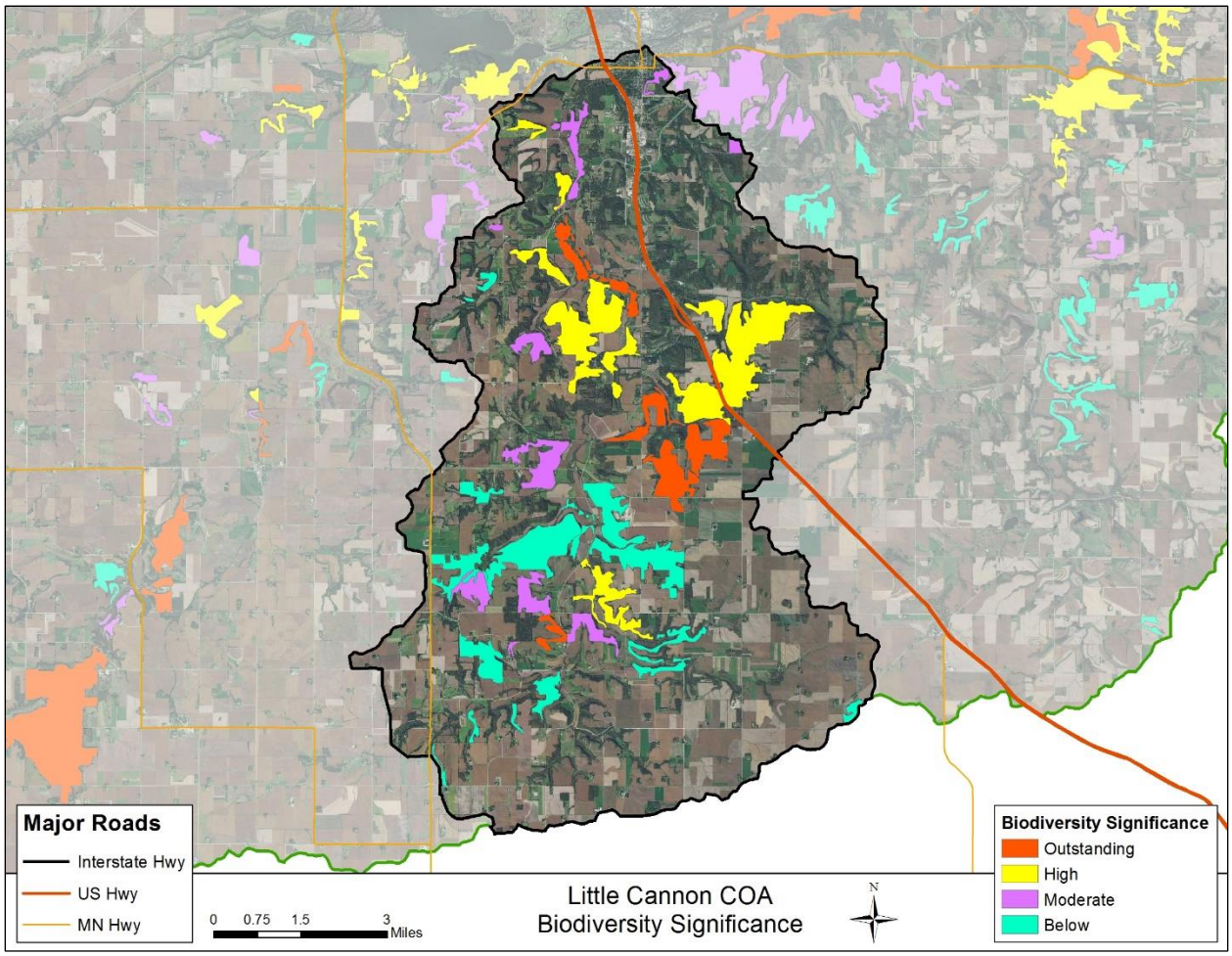


Figure 35. Sites of biodiversity significance in the Little Cannon COA.

Recreation

The Little Cannon COA is entirely privately owned, and therefore, public access for outdoor activities is much more limited than in other COAs. Trout fishing is popular where access is allowed. Several of the State and County Highways winding through the COA are popular biking and sightseeing routes. Hunting is a popular outdoor recreational activity throughout the area. A network of snowmobile trails also winds through the COA.

Environmental Threats

Mismanagement of forest resources:
The forests of Southeast Minnesota support a number of high value timber species, and many sites exist containing high quality timber stock. This represents an important resource for the region, but is also a target for exploitative harvesting practices. Timber harvests that remove all of the most valuable trees in a stand, and leave behind a patchy, irregular forest of poor quality trees do serious harm to the health and productive potential of that site, and severely limit

management options in the future. The high value of the timber resource enables sustainable timber management to produce valuable economic products while also providing the habitat and ecosystem services of a healthy forest. Unsustainable harvesting practices can seriously impair a stand's ability to do so in the future.

Nutrient, sediment, and contaminants from upstream agricultural areas:
A significant portion of the Little Cannon COA, and areas upstream, are heavily farmed, often with practices that have the potential to impair water quality. This has large impacts on downstream reaches. Best management practices are available to farmers to protect their soil from erosion, and help prevent excess nutrients and sediment from washing into the streams. Riparian buffer strips help slow run-off and increase infiltration, allowing nutrients to be filtered and removed by soil processes. Increased adoption of agricultural BMPs to protect water quality in upstream areas will help protect the water quality of downstream reaches in the COA.

Development pressures:
There are no significant population centers in the Little Cannon COA but it is part of the U.S. Highway 52 corridor connecting Minneapolis-Saint Paul to Rochester. Both metropolitan areas are expected to see significant population and economic expansion in the coming years. This economic and population growth can lead to increased parcellization, fragmentation, and conversion of rural lands. This disrupts wildlife movement and migration, reduces available habitat, and increased water quality concerns from the added impervious surface area. The demand for dispersed rural residences places less-disturbed parts of the landscape under pressure for development.

Industrial silica sand mining:
Southeast Minnesota has significant deposits of industrial silica sand bedrock at or near the surface. The increased demand for this material in the hydrological fracturing (fracking) process for oil and gas development has created an ongoing policy debate about appropriate use and regulations of this resource. There currently are not any mines operating in the Cannon River Watershed but a significant portion of the Little Cannon COA has quartz-rich sandstone within 50 ft. of the land surface. Potential impacts of mining include removal of vegetation and underlying substrates, habitat destruction, chemical contamination of karst hydrology, and water contamination from high volume dispersals from water processing facilities and dewatering pits.

Land Ownership

Unlike other COAs, the Little Cannon is entirely privately owned. As such, it is clear that private landowners will play a crucial role in conservation. In other COAs, efforts will be targeted to enhance habitat on public lands by increasing their size and/or connectivity; however in the Little Cannon, efforts will likely focus primarily on private land stewardship and easement acquisition due to the current lack of public land. Finding programs that will appeal to these landowners will be necessary to encouraging the necessary private conservation.

To date, private conservation programs have demonstrated some success in the COA. The DNR Forest Stewardship Program is an excellent first step in landowner involvement and concern for the ecological health of the landscape and 655 acres have a registered stewardship plan in the Little Cannon COA. This voluntary program provides technical advice and long-range forest management planning to interested landowners. Plans are designed by professional foresters to meet the landowner's goals while maintaining the sustainability of the land.

The Reinvest in Minnesota (RIM) program has easements in the COA covering 212 acres. This program purchases conservation easements on privately owned lands to retire environmentally

sensitive lands from agricultural production. Conservation practices are established by planting native vegetation, and restoring wetlands with the goal of protecting and improving water quality, reducing soil erosion, and enhancing fish and wildlife habitat.

Land Cover and Use

Nearly 75 percent of the Little Cannon COA was covered by oak ecosystems at the time of European settlement (Table 16, Figure 36). The core of this oak forest existed in the Little Cannon valley with prairie on the edges and a transitional ecosystem in between. Today the land use patterns in the Little Cannon COA follow the general pattern for the broader watershed. The predominantly flat, upland areas are mostly cropland or pasture. The hillsides are dominated by forests, and the valley floors and floodplain areas contain a mix of cropland, pasture, forests, and wetlands (Figure 37). Major cover types are cultivated crops (47.4%) and deciduous forest (25.3%). Grassland/herbaceous (11.0%) and pasture/hay (8.3%) cover is also significant.

Table 16. Presettlement land cover in the Little Cannon COA

Land Type	Acres	Percent
Aspen-Oak Land	10,783	21%
Oak openings and barrens	27,279	53%
Prairie	13,102	26%

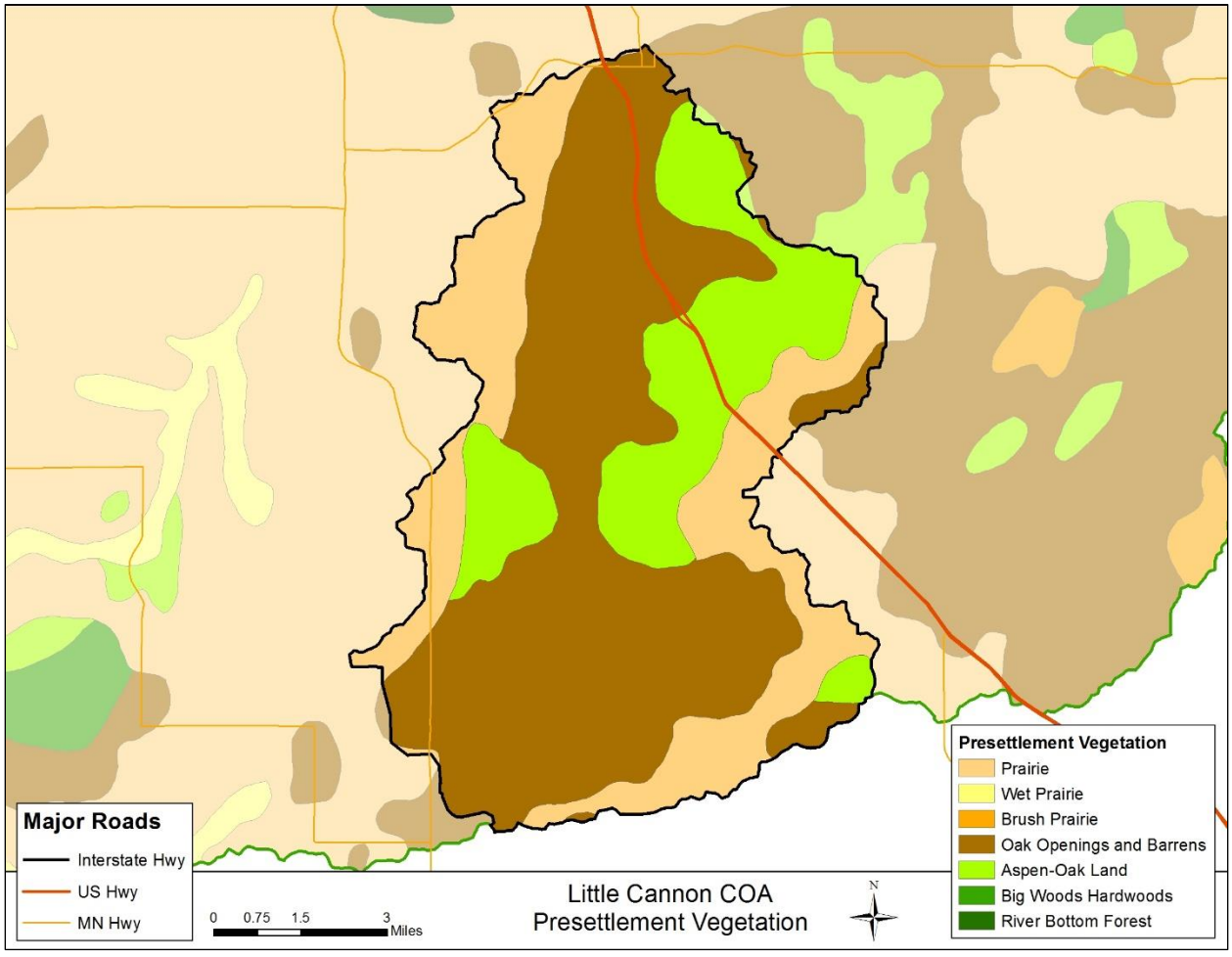


Figure 36. Presettlement land cover in the Little Cannon COA based on the work of Francis J. Marschner.

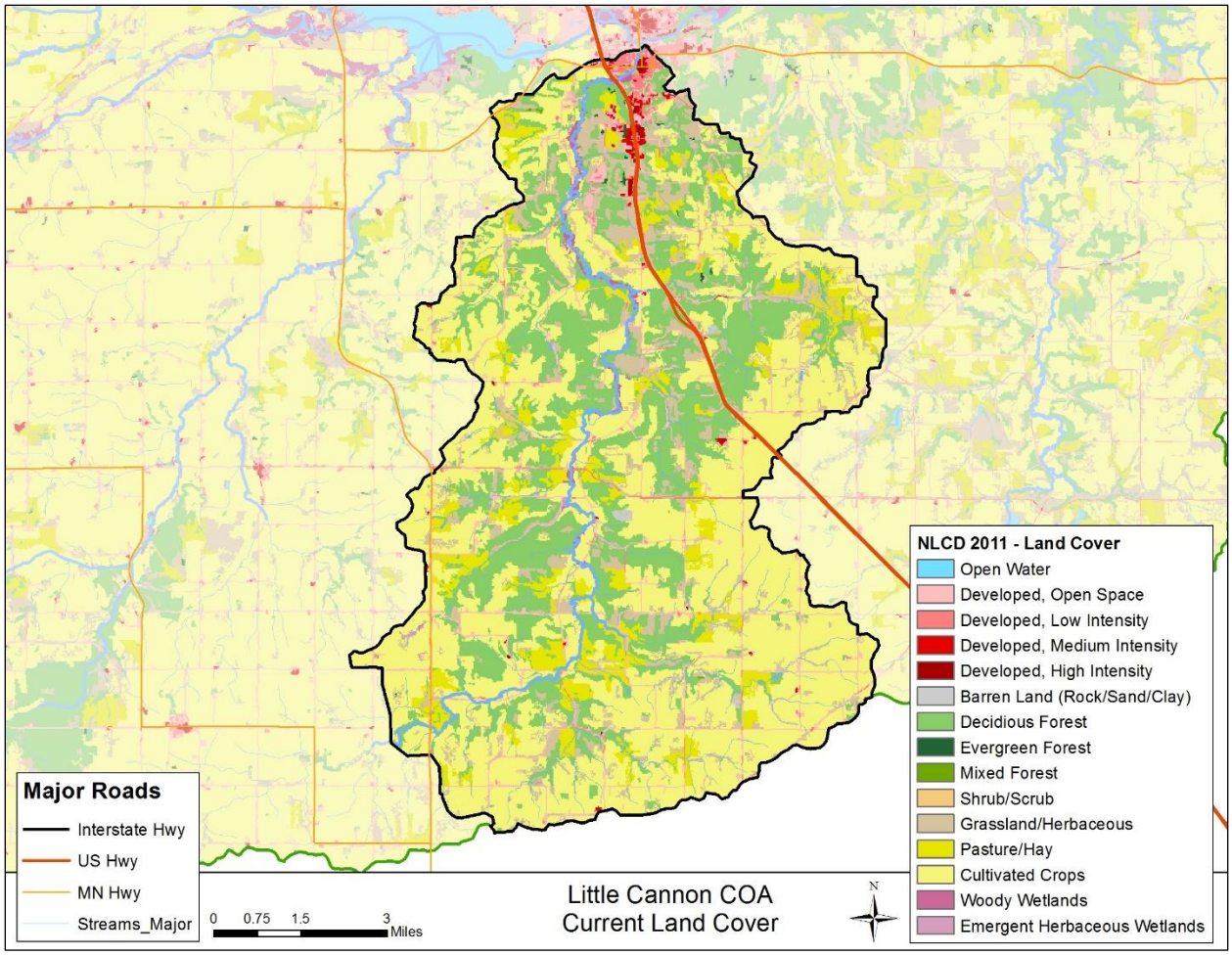


Figure 37. Current land cover in the Little Cannon COA based on the 2011 National Land Cover Database.

Desired Future Conditions

- 100% of riparian areas are covered by native vegetation, returning a host of ecological services for water quality, habitat quality, and connectivity.
- Biotic integrity of all streams within the COA is restored, resulting in healthy aquatic species and de-listing of impaired waters.
- Human activity in riparian areas follows best management practices to protect water quality and sensitive shorelines.
- Agricultural practices within the COA follow best management practices to protect soil from erosion, and streams from sedimentation and nutrient loading.
- A natural fire regime is restored through prescribed burning on all appropriate native plant communities.
- Large blocks of native habitat exist across ownership lines.
- Habitat corridors link patches of biodiversity habitat, supporting migration and travel, especially in riparian areas.
- Native plant community remnants have expanded
- Rare plants and animal habitat are protected from degradation
- Invasive species are monitored and controlled

Key Stewardship Parcels

With the entire Little Cannon COA in private ownership, stewardship efforts on private parcels will be crucial to protecting the natural resources of the area. Conservation efforts will be most effective in places where they protect existing native plant communities, and increase natural community size and/or connectivity. Working with larger parcels is preferable, because more stewardship options are available on larger tracts, and stewardship planning will impact a greater area. To make the most efficient use of conservation resources, it is useful to target parcels where those resources will have the most impact. A GIS analysis by The Nature Conservancy identified 121 key stewardship parcels in the Headwater Lakes COA that met the following conditions (Figure 38):

- Larger than 40 acres in size; AND
- Contain an area ranked as medium priority in the Wildlife Action Network or as moderate or above significance for biodiversity according to the Minnesota Biological Survey.

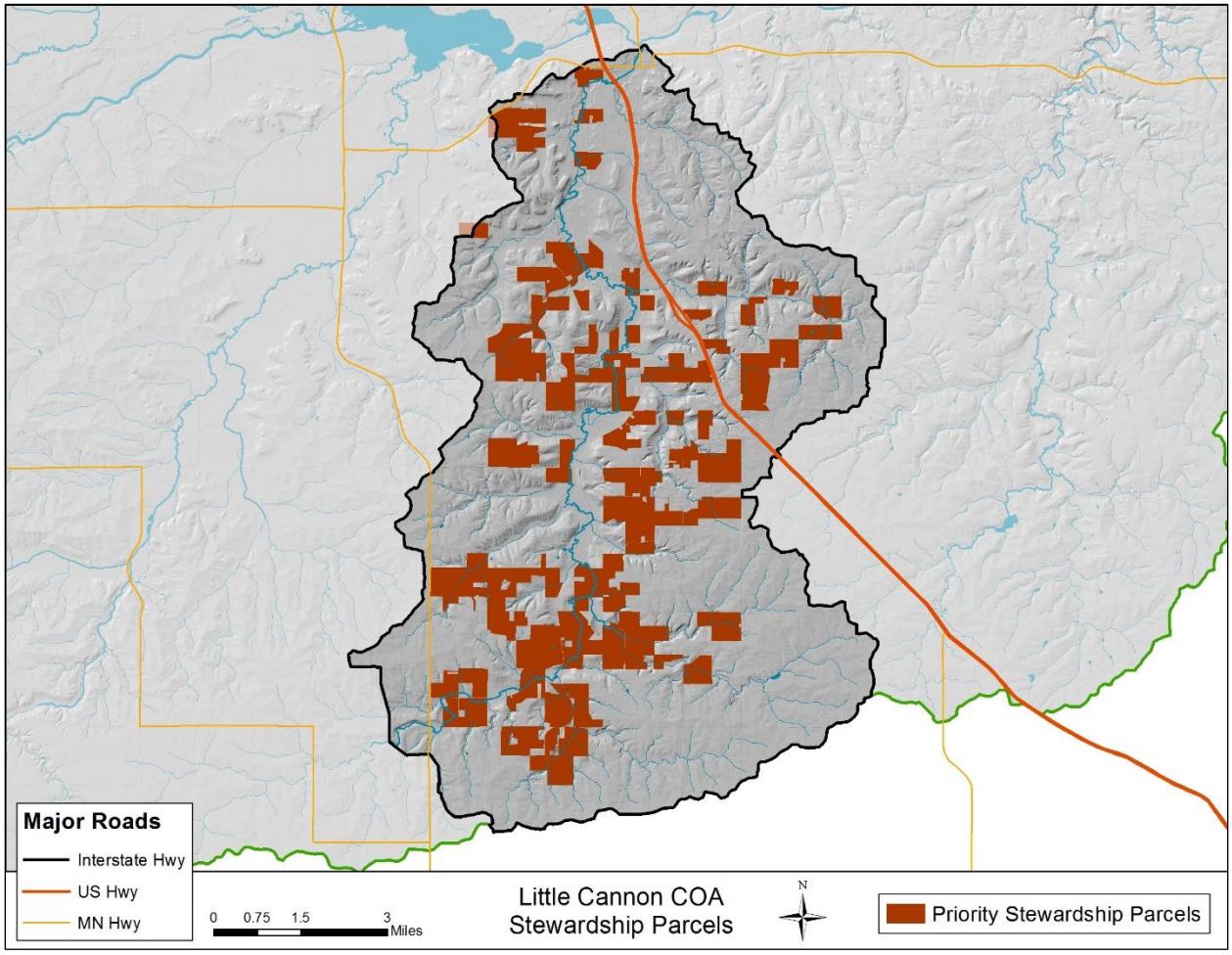


Figure 38. Priority stewardship parcels in the Little Cannon COA.

Stewardship Activities

There is a variety of tools and strategies available for enacting stewardship activities on the landscape (see Section 1). Different strategies and actions will be appropriate for different types of parcels, natural resources, and landowners. This section provides a summary of strategies appropriate for the natural resources present in this COA.

Core Forest Areas

Large, continuous stretches of forest communities represent core forest habitat. In addition to providing quality habitat to a number of species, these areas represent favorite places for recreation and scenery, making them important for the tourism industry in the region. They also provide a great benefit to water quality, as forests help prevent erosion, slow and filter water run-off, and shade streams in riparian areas.

Stewardship Activities:

On all lands:

- Control invasive species
- Burn where appropriate
- Manage according to sustainable silvicultural and ecological principles
- Where possible, increase size and connectivity of forest habitat through reforestation / afforestation of connecting patches

On Private lands:

- Prepare comprehensive forest stewardship plans
- Assist landowner in researching and applying for relevant cost-share programs available (e.g. EQIP, CSP)

Karst Features

Karst features are locations where cracks or fissures in the bedrock create sinkholes and other direct connections between surface water and ground water aquifers. Springs and seeps are places where groundwater reemerges onto the land or streams. Pollution in these areas can quickly enter groundwater reservoirs and also affect surface water quality. They are crucial areas to protect in order to preserve the water quality of the COA.

Stewardship Activities:

- Protect sinkholes and springs with buffers of native vegetation
- Limit pesticide applications in the vicinity of sinkholes

Prairies, Savannas, and Fire-Associated Native Plant Communities

The suppression of fire and mass conversion to agriculture that came with Euro-American settlement drastically reduced the amount of native prairie and savannas in both Minnesota, and the US as a whole. These communities offer important habitat for a number of animals, and many flowering plants and grasses.

Stewardship Activities:

On all lands:

- Restore a natural fire regime through prescribed burns
- Remove brush as needed
- Control invasive species
- Expand grassland habitat as buffer areas around other NPCs.

Riparian Best Management Practices

Riparian areas are those nearest, and most connected to streams and rivers. They have an important impact on water quality either, positively by slowing and filtering run-off, or negatively, by contributing to sediment and nutrient loads brought to streams through erosion and run-off. Implementing best management practices and other conservation actions in these areas can have significant water quality and wildlife benefits.

Stewardship Activities:

On public lands:

- Reconnect waterways with their floodplains.
- Utilize the delineation of critical cropland areas from Benck and Fry (Examining the Relationship between Land Cover and Water Quality Protection: The Blufflands Region of the Cannon and Zumbro River Watersheds, 2017, Saint Mary's University of Minnesota - GeoSpatial Services, 700 Terrace Heights, Box #7, Winona, MN 55987)
- Maintain and/or establish appropriate plant communities for the hydrology of the site.

On private lands:

- Support SWCDs in implementing and enforcing the state buffer law and other best management practices. Help interested landowners apply for the various cost-share or easement programs available for water quality protection (e.g. CRP, RIM).
- Work with landowners to reconnect streams to their floodplains.
- Maintain and restore natural vegetation along stream and riverbanks.

Key Stewardship Parcels

These parcels were identified based on their geographical size and proximity to areas of biodiversity significance (see above). They are areas where conservation effort can be most beneficial to the overall health of the landscape.

Stewardship Activities:

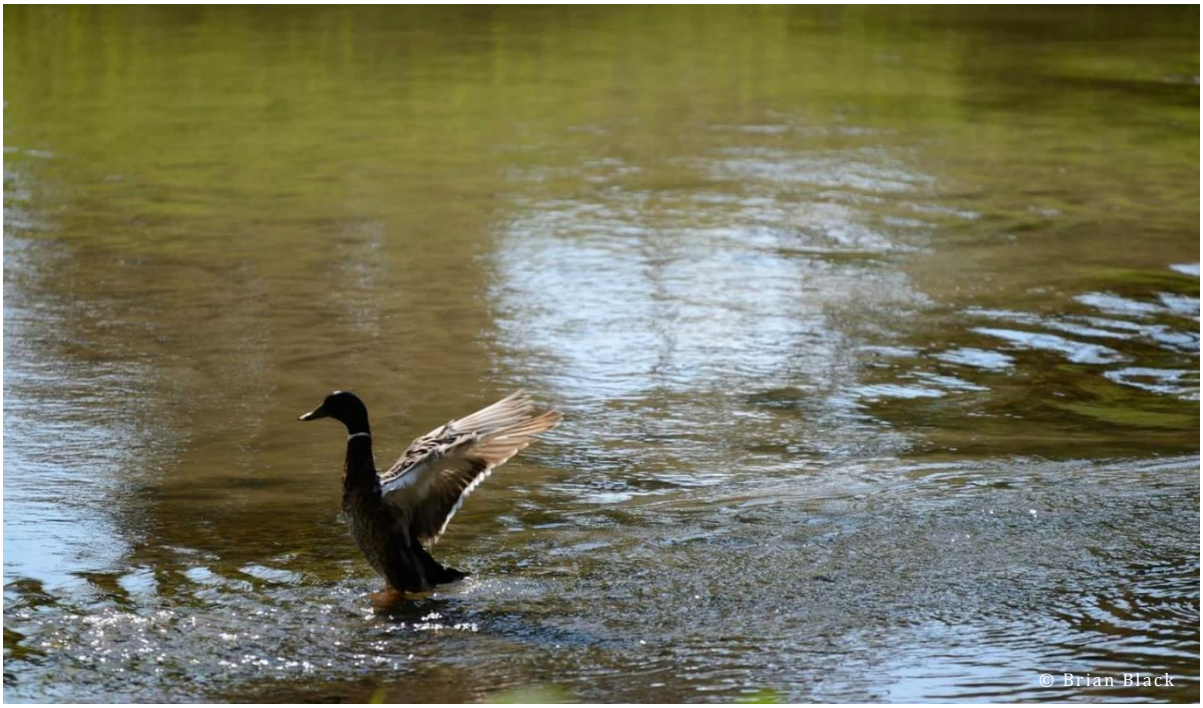
- Work to engage the owners of these parcels in a targeted manner.
- Tailor outreach and assistance to each landowner individually based on characteristics of their parcel and its geographical and ecological characteristics
- Prioritize stewardship efforts affecting these parcels

Lower Cannon Conservation Opportunity Area

Overview

The Lower Cannon COA encompasses nearly 76,700 acres in the bottom of the watershed between Cannon Falls and Red Wing (Figure 39). In addition to the Cannon main stem, the COA includes all or portions of the Lower Belle Creek, Pine Creek, Spring Creek, and Trout Brook watersheds. Key natural areas in the Lower Cannon COA include Cannon River Turtle Preserve State Scientific and Natural Area, Spring Creek Prairie State Scientific and Natural Area, portions of the Richard J. Dorer Memorial Hardwood State Forest, and Dakota County's Miesville Ravine Regional Park.

According to data from the Public Land Survey, this area contained a mix of hardwood forests, oak woodlands, savannas, and prairies. Much of this region has been converted to agriculture, however; the remnants of these historic ecosystems represent a conservation opportunity within the matrix of agriculture to build from. The remaining natural areas represent a hotspot for biodiversity as identified in the Wildlife Action Network and State Wildlife Action Plan. The habitat along the Cannon River from just above the confluence with Belle Creek, downstream to the Mississippi has some particularly high conservation value. In addition, several areas in this COA offer a large block of forested conditions that is no longer common in the area and home to numerous native plant community types. The mesic hardwoods and floodplain forests are host to a number of spring ephemeral wildflowers that often grow and bloom before the canopy trees leaf out. This includes species such as false rue anemone, wild ginger, spring beauty, cut-leaved toothwort, Dutchman's breeches, sharp-lobed hepatica, bloodroot and violets. Additionally, the wetland complex that formed at the mouth of the Cannon and associated floodplain forests within the valley of the Mississippi River provides habitat for an incredible diversity of birds that migrate along the Mississippi flyway every year. The region's oak forests and prairies are also important to regional wildlife.



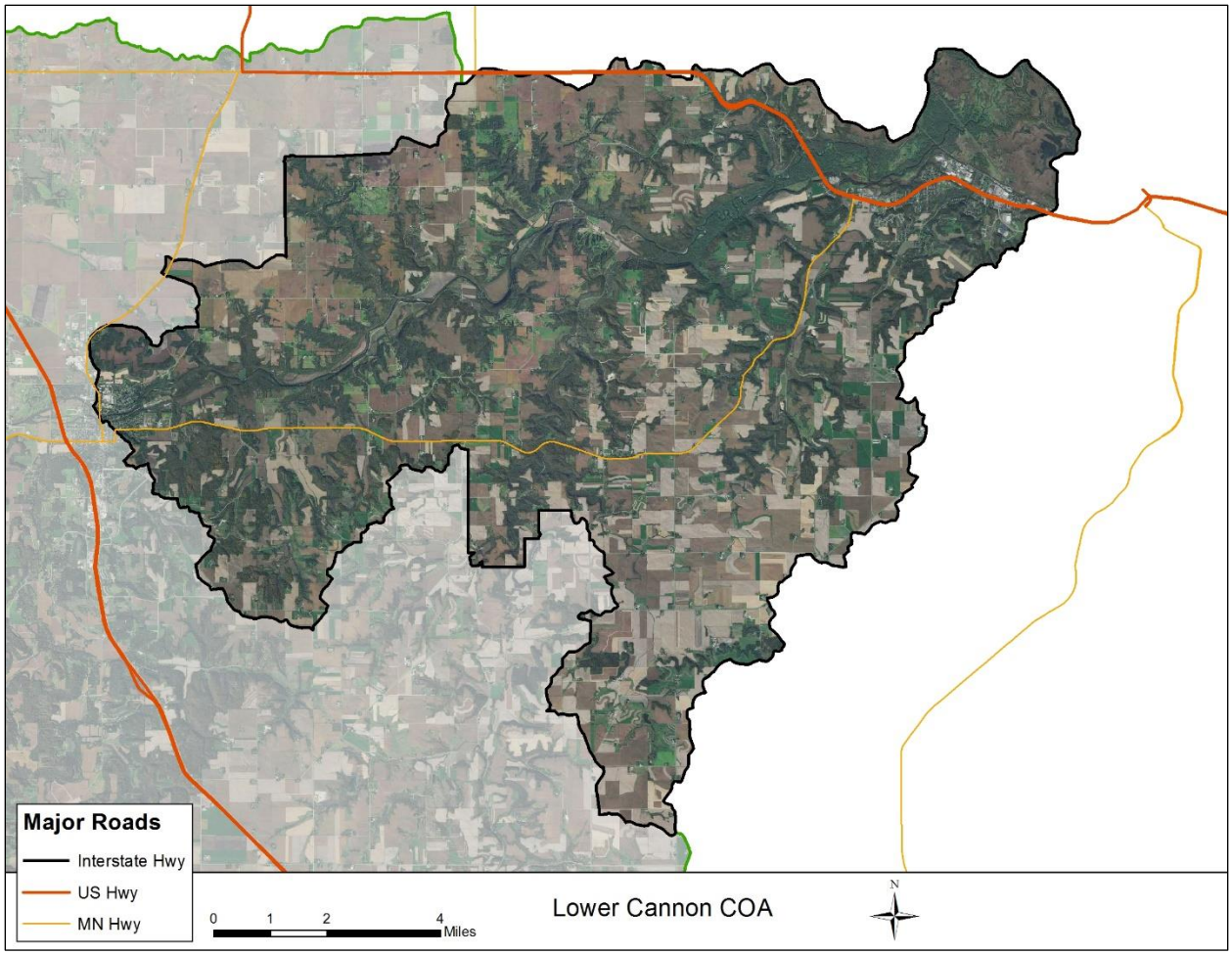


Figure 39. Lower Cannon COA.

Natural Resource Assessment

Hydrology

The dominant hydrological feature of the Lower Cannon COA is the Cannon River and its tributaries. The river valley for the main stem of the Cannon cuts through the center of the COA from the confluence with the Little Cannon in Cannon Falls to the mouth at the Mississippi in Red Wing. In addition to the Cannon main stem, the COA includes all or portions of the Lower Belle Creek, Pine Creek, Spring Creek, and Trout Brook watersheds (Figure 40). Numerous unnamed perennial or intermittent streams originating in the agricultural uplands feed these larger streams. There are also several popular trout streams fed by springs and seeps.

There are almost 112 karst features in the area including sinkholes and springs that feed several of the streams. These geological features are primarily in the Trout Brook and Spring Creek areas and can complicate the understanding of the local hydrology and be challenging to protect because there are often hidden, rapid pathways from pollution release points to drinking water wells or surface water.

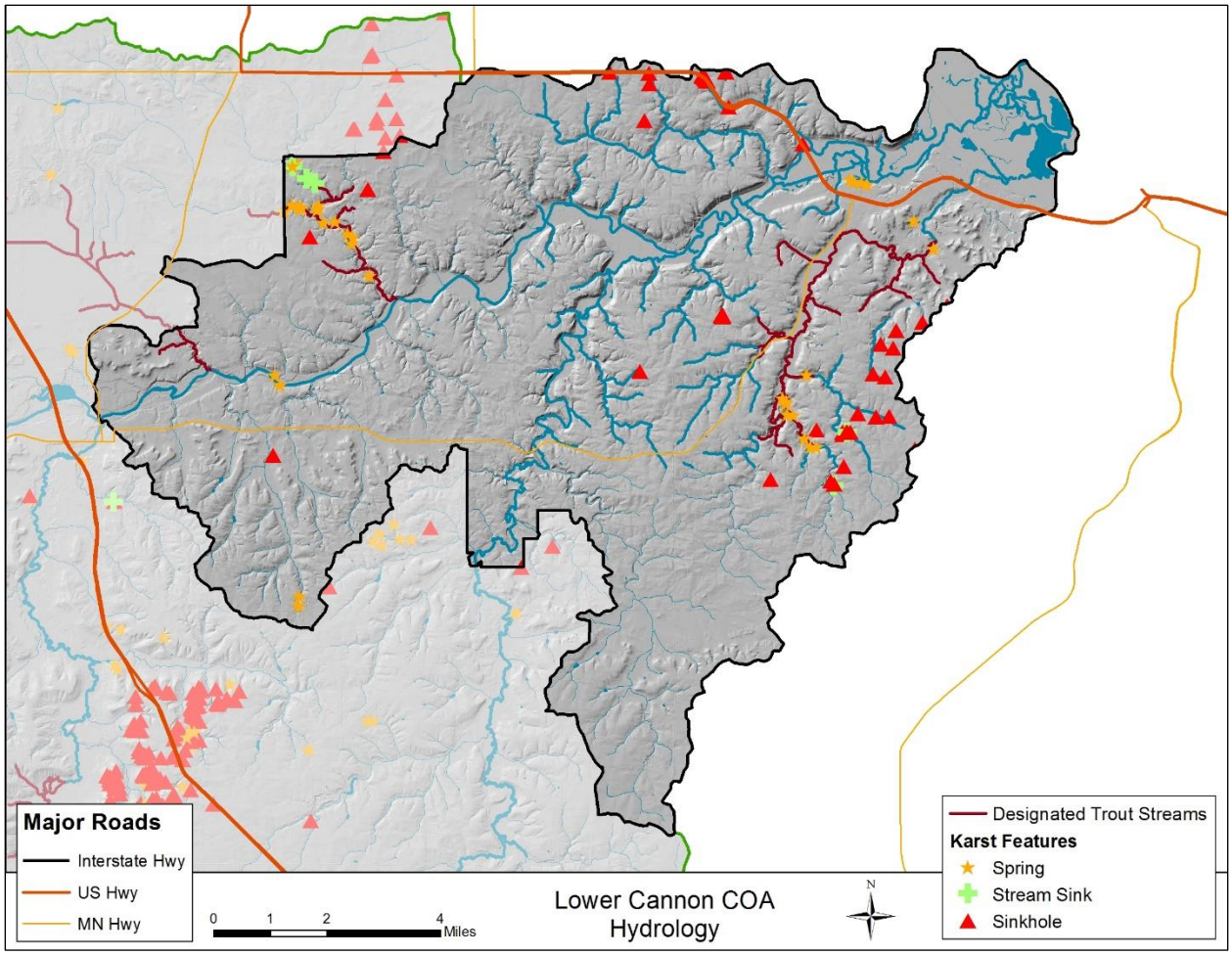


Figure 40. Hydrology and karst features of the Lower Cannon COA.

Plant Communities

Lower Cannon COA contains nearly 9,700 acres of Native Plant Communities (NPC) in eight different systems and 26 different types and subtypes as identified by the Minnesota Biological Survey (MBS) (Table 17). Mesic hardwoods make up 40% of the identified NPC acres with floodplain forest (30%), fire dependent forest or woodland (13%), and marsh (12%) systems also making a significant portion of the total acreage (Figure 41). Some of these native plant communities are rare and sensitive community types unique to Southeastern Minnesota. Full descriptions of native plant community types and their associated ecological systems can be found in *Field Guide to the Native Plant Communities of Minnesota: the Eastern Broadleaf Forest Province*, produced and distributed by the MN DNR.

Approximately 41 percent of the NPCs in the Lower Cannon COA are on publicly owned land with the majority of privately owned NPCs on parcels near the blocks of public land. Private parcels containing NPCs, especially those bordering publicly managed areas, represent an important priority for increased protection and private conservation efforts.

Table 17. Native Plant Communities of the Lower Cannon COA

System	NPC Code	Native Plant Community	Acreage	% of NPC Acreage
Fire Dependent Forest or Woodland	FDs27b	White Pine - Oak Woodland (Sand)	18.1	0.2%
	FDs27c	Black Oak - White Oak Woodland (Sand)	118.6	1.2%
	FDs38a	Oak - Shagbark Hickory Woodland	1,138.7	11.7%
Floodplain Forest	FFs59a	Silver Maple - Green Ash - Cottonwood Terrace Forest	1,728.4	17.8%
	FFs59c	Elm - Ash - Basswood Terrace Forest	290.3	3.0%
	FFs68a	Silver Maple - (Virginia Creeper) Floodplain Forest	868.1	9.0%
Mesic Hardwood Forest	MHs37	Southern Dry-Mesic Oak Forest	1,074.9	11.1%
	MHs37a	Red Oak - White Oak Forest	697.5	7.2%
	MHs37b	Red Oak - White Oak - (Sugar Maple) Forest	849.8	8.8%
	MHs38a	White Pine - Oak - Sugar Maple Forest	29.4	0.3%
	MHs38c	Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest	333.4	3.4%
	MHs39	Southern Mesic Maple-Basswood Forest	214.1	2.2%
	MHs39a	Sugar Maple - Basswood - (Bitternut Hickory) Forest	392.4	4.0%
	MHs39b	Sugar Maple - Basswood - Red Oak - (Blue Beech) Forest	233.9	2.4%
	MHs49	Southern Wet-Mesic Hardwood Forest	3.5	0.0%
	MHs49b	Elm - Basswood - Black Ash - (Blue Beech) Forest	57.2	0.6%
Marsh	MRn93	Northern Bulrush-Spikerush Marsh	676.6	7.0%
	MRn93b	Spikerush - Bur Reed Marsh (Northern)	438.3	4.5%
Open Rich Peatland	OPp93c	Calcareous Fen (Southeastern)	32.8	0.3%
River Shore	RVx32b2	Sand Beach/Sandbar (River): Permanent Stream Subtype	6.5	0.1%
Upland Prairie	UPs13a	Dry Barrens Prairie (Southern)	3.2	0.0%
	UPs13b	Dry Sand - Gravel Prairie (Southern)	43.9	0.5%
	UPs13c	Dry Bedrock Bluff Prairie (Southern)	417.8	4.3%
	UPs14c	Dry Hill Oak Savanna (Southern)	10.9	0.1%
Wet Meadow or Carr	WMn82b	Sedge Meadow	2.6	0.0%
	WMs83a	Seepage Meadow/Carr	18.0	0.2%

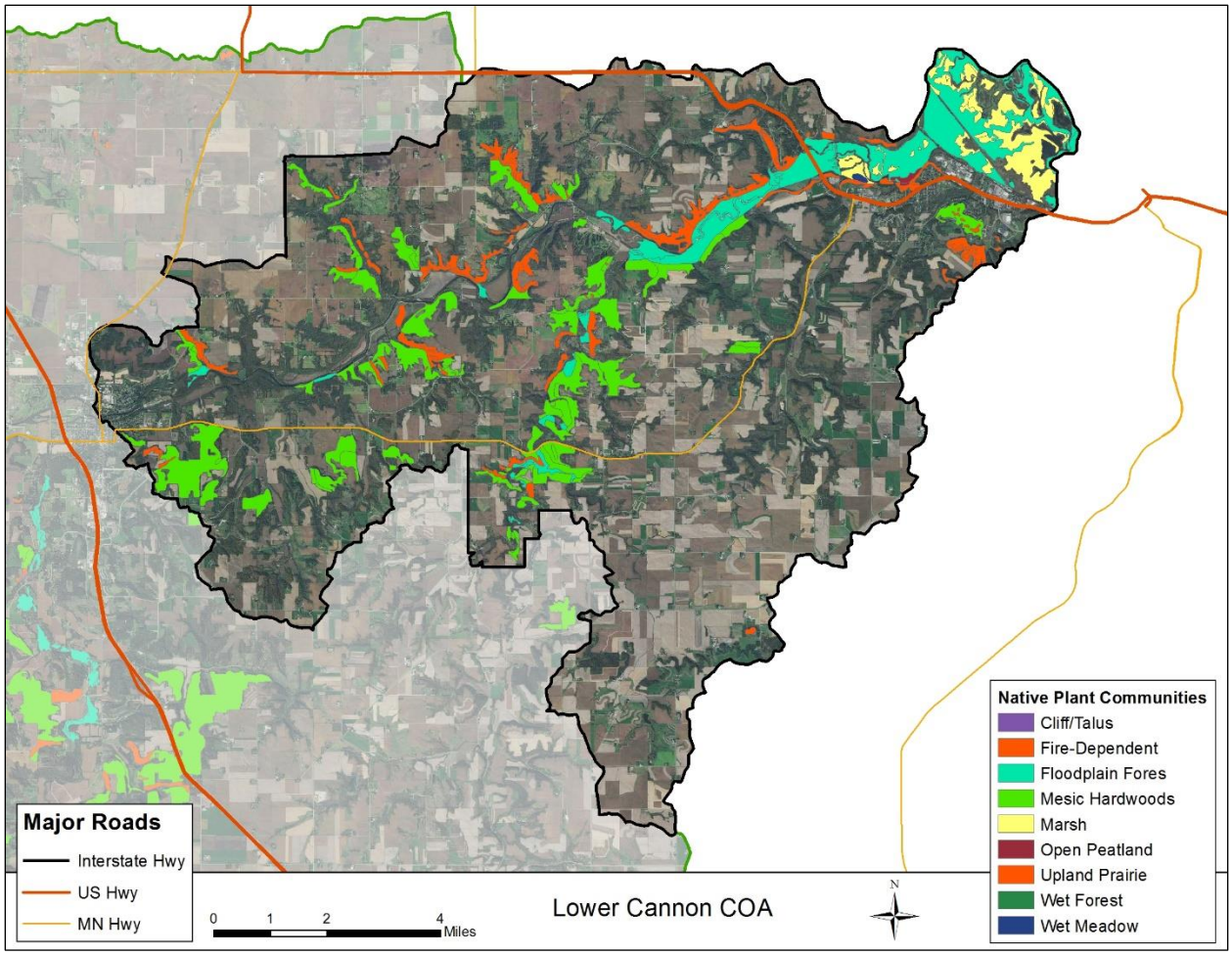


Figure 41. Native plant communities of the Lower Cannon COA.

Biodiversity and Rare Species

The Natural Heritage Information System (NHIS) has recorded 141 different occurrences of rare plants, animals, or communities in Lower Cannon COA (Table 18). Rare species are those listed as either endangered, threatened, or of special concern. Endangered species are those facing extinction throughout all or a significant portion of its range within Minnesota. Threatened species are likely to become endangered in the foreseeable future. Species of Special Concern, though not endangered or threatened, are extremely uncommon in Minnesota.

Eighty-five rare terrestrial communities are listed in Lower Cannon COA. Rare terrestrial communities are collections of plant species growing together, whose presence on the landscape is rare or severely diminished. These communities are monitored, but not given designations as endangered, threatened, or of special concern.

Table 18. Number of rare species and community occurrences in the Lower Cannon COA.

Organism Type	Observations
Animal Assemblage	1
Vascular Plant	63
Invertebrate Animal	12
Vertebrate Animal	65
Terrestrial Community	85

The Minnesota Biological Survey has delineated over 17,600 acres of the Lower Cannon COA based on their significance to biodiversity in the state (Figure 42). Of that area, nearly 7,500 acres were given the highest level of 'Outstanding'. The 'Outstanding' areas are predominately found along the main stem of the Cannon River, lower Belle Creek, and the Mississippi River Valley.

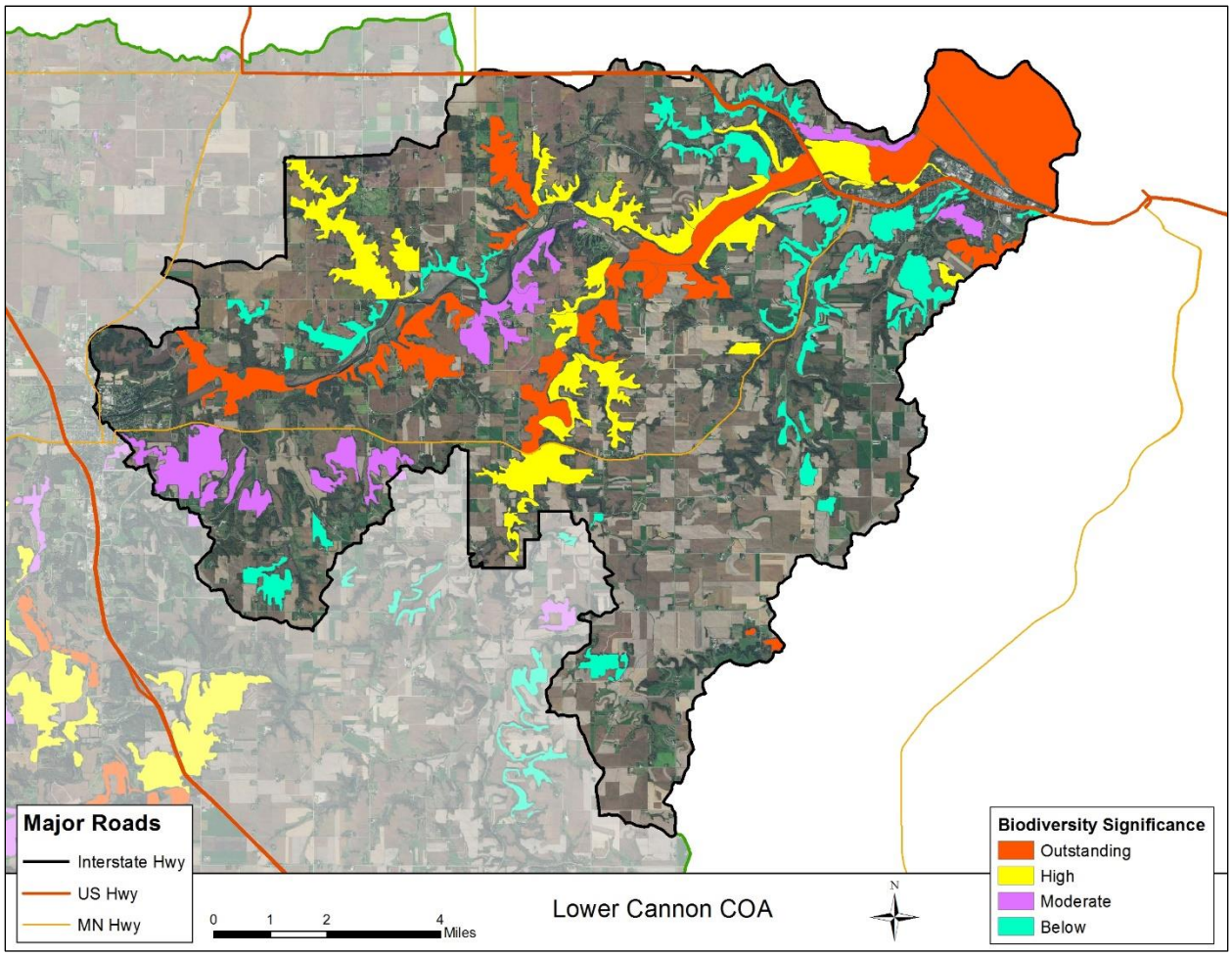


Figure 42. Sites of biodiversity significance in the Lower Cannon COA.

Recreation

There are a number of important outdoor recreation areas in the Lower Cannon COA that contribute to the well-being of residents and support the local economy. Miesville Ravine Park Reserve offers picnic and hiking areas at the confluence of Trout Brook and the Cannon River. Hunting is a popular outdoor recreational activity throughout the area on public and private land. Additionally, the Cannon River is a designated state water trail that is a very popular canoe, kayak, and inner-tube route in the summer. This stretch of river was added to the Minnesota DNR Wild & Scenic Rivers Program in 1980 in recognition of the natural beauty and recreational opportunities in the area. Fishing opportunities abound for both cool and cold water fish species. The Cannon Valley Trail parallels this stretch of the Cannon River, offering glimpses and panoramas of the valley. It is open year round for bicycling, in-line skating, skateboarding, similar wheeled recreational devices, hiking, walking and cross country skiing. A network of snowmobile trails also winds through the COA.

Environmental Threats

Development pressures:
The City of Red Wing is located at the eastern edge of the Lower Cannon COA and is expected to grow in population in the coming years. Additionally, this area is relatively close to the expanding Minneapolis-Saint Paul metropolitan area and there will likely be increasing parcellization, fragmentation, and conversion of rural lands in the COA. This disrupts wildlife movement and migration, reduces available habitat, and increased water quality concerns from the added impervious surface area. The demand for dispersed rural residences places less-disturbed parts of the landscape under pressure for development. This is compounded by the likelihood of population growth in the region.

Mismanagement of forest resources:
The forests of Southeast Minnesota support a number of high value timber species, and many sites exist containing high quality timber stock. This represents an important resource for the region, but is also a target for exploitative harvesting practices. Timber harvests that remove all of the most valuable trees in a stand, and leave behind a patchy, irregular forest of poor quality trees do serious harm to the health and productive potential of that site, and severely limit management options in the future. The high value of the timber resource enables sustainable timber management to produce valuable economic products while also providing the habitat and ecosystem services of a healthy forest. Unsustainable harvesting practices can seriously impair a stand's ability to do so in the future.

Nutrient, sediment, and contaminants from upstream agricultural areas:
A significant portion of the Lower Cannon COA, and areas upstream, are heavily farmed, often with practices that have the potential to impair water quality. This has large impacts on downstream reaches. Best management practices are available to farmers to protect their soil from erosion, and help prevent excess nutrients and sediment from washing into the streams. Riparian buffer strips help slow run-off and increase infiltration, allowing nutrients to be filtered and removed by soil processes. Increased adoption of agricultural BMPs to protect water quality in upstream areas will help protect the water quality of downstream reaches in the COA.

Industrial silica sand mining:
Southeast Minnesota has significant deposits of industrial silica sand bedrock at or near the surface. The increased demand for this material in the hydrological fracturing (fracking) process for oil and gas development has created an ongoing policy debate about appropriate use and regulations of this resource. There currently are not any mines operating in the Cannon River Watershed but a significant portion of the Lower Cannon COA has quartz-rich sandstone within 50 ft. of the land surface. Potential impacts of mining include removal of vegetation and underlying substrates, habitat destruction, chemical contamination of karst hydrology, and water contamination from high volume dispersals from water processing facilities and dewatering pits.

Land Ownership

Nearly 6,750 acres of the Lower Cannon COA are in public ownership (Table 19, Figure 43). The DNR Division of Forestry's Richard J. Dorer Memorial Hardwood State Forest and the Red Wing Wildlife Protection League are the largest public land holdings in the Lower Cannon COA. The majority of the COA, however is in private ownership. Since private lands make up such a large portion of the COA it is clear that private landowners will play a crucial role in conservation. Much of the forested area occurs in areas with dispersed residential development, and finding programs that will appeal to these landowners will be necessary to encouraging the necessary private conservation.

To date, private conservation programs have demonstrated some success in the COA. The DNR Forest Stewardship Program is an excellent first step in landowner involvement and concern for the ecological health of the landscape and 220 acres have a registered stewardship plan in the Lower Cannon COA. This voluntary program provides technical advice and long-range forest management planning to interested landowners. Plans are designed by professional foresters to meet the landowner's goals while maintaining the sustainability of the land.

The Reinvest in Minnesota (RIM) program has easements in the COA covering 141 acres. This program purchases conservation easements on privately owned lands to retire environmentally sensitive lands from agricultural production. Conservation practices are established by planting native vegetation, and restoring wetlands with the goal of protecting and improving water quality, reducing soil erosion, and enhancing fish and wildlife habitat.

This portion of the Cannon River is also designated as a Wild and Scenic River. This designation includes authorization for the State of Minnesota to purchase conservation easements to protect the wild and scenic nature of the river. Properties with stream frontage, or that are visible from the river could potentially qualify for this program.

Table 19. Estimated land ownership in the Lower Cannon COA.

Ownership	Acres	Percent of Public	Percent of COA
Private	69,926.7	--	91.2%
Division of Forestry	2,064.1	30.6%	2.7%
Red Wing Wildlife Protection League	2,055.2	30.5%	2.7%
Dakota County	1,162.9	17.2%	1.5%
Division of Ecological Services	989.2	14.7%	1.3%
Division of Trails and Waterways	273.1	4.0%	0.4%
Goodhue County	135.5	2.0%	0.2%
Division of Fish and Wildlife	51.5	0.8%	0.1%
Army Corps of Engineers	16.2	0.2%	0.0%

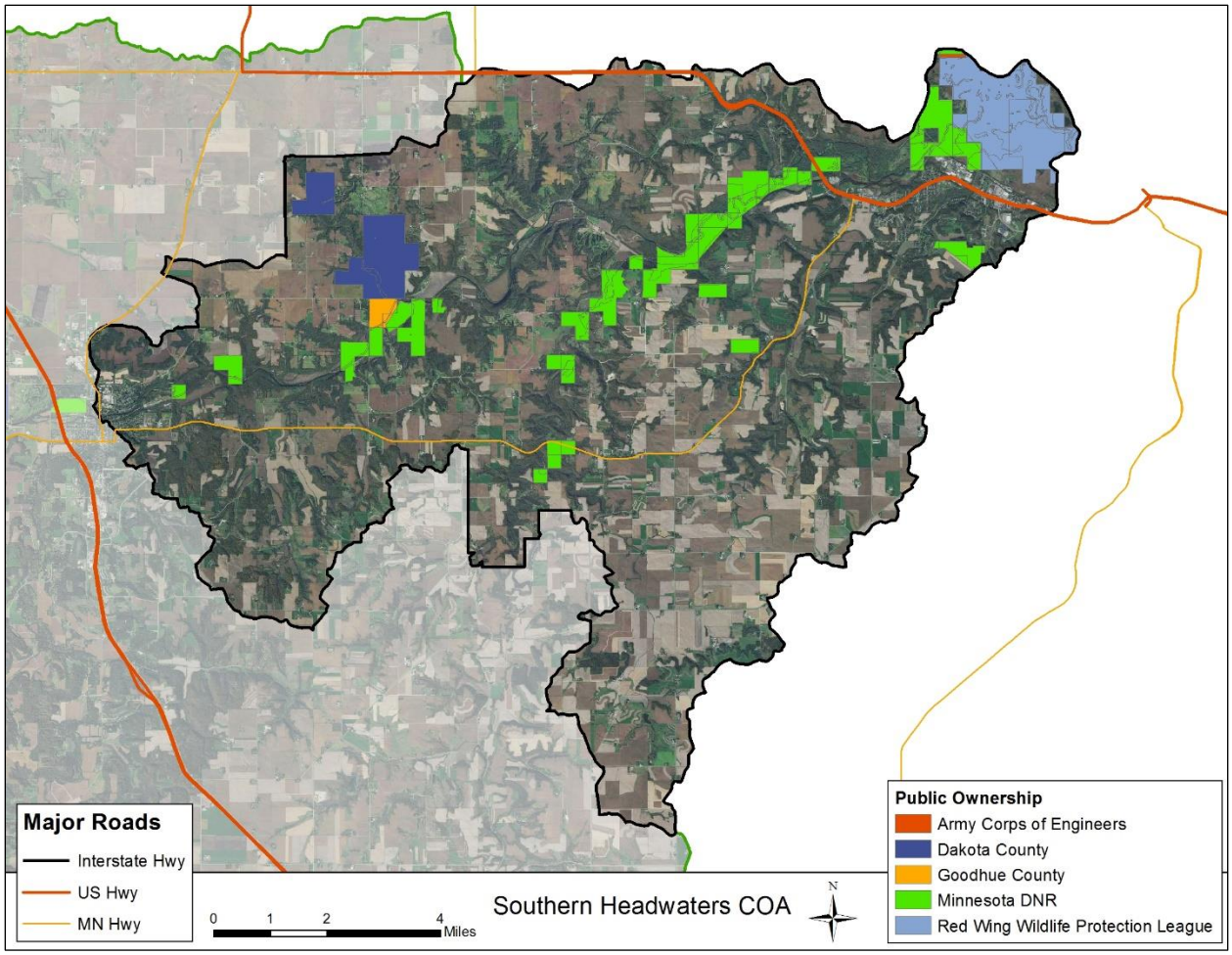


Figure 43. Public land in the Lower Cannon COA.

Land Cover and Use

About 20 percent of the Lower Cannon COA was covered by prairie at the time of European settlement and the rest existed in some type of forest ranging from oak savanna type openings to dense mesic hardwood forests (Table 20, Figure 44). Today the land use patterns in the Lower Cannon COA follow the general pattern for the broader watershed. The predominantly flat, upland areas are mostly cropland or pasture. The hillsides are dominated by forests, and the valley floors and floodplain areas contain a mix of cropland, pasture, forests, and wetlands (Figure 45). Major cover types are cultivated crops (43.3%) and deciduous forest (25.0%). Grassland / herbaceous (11.6%) and pasture / hay (7.1%) and cover is also significant.

Table 20. Presettlement land cover in the Lower Cannon COA

Land Type	Acres	Percent
Aspen-Oak Land	3,670	4.8%
Big Woods - Hardwoods (oak, maple, basswood, hickory)	6,746	8.8%
Brush Prairie	13	0.0%
Oak openings and barrens	42,971	56.0%
Prairie	15,772	20.6%
River Bottom Forest	7,501	9.8%

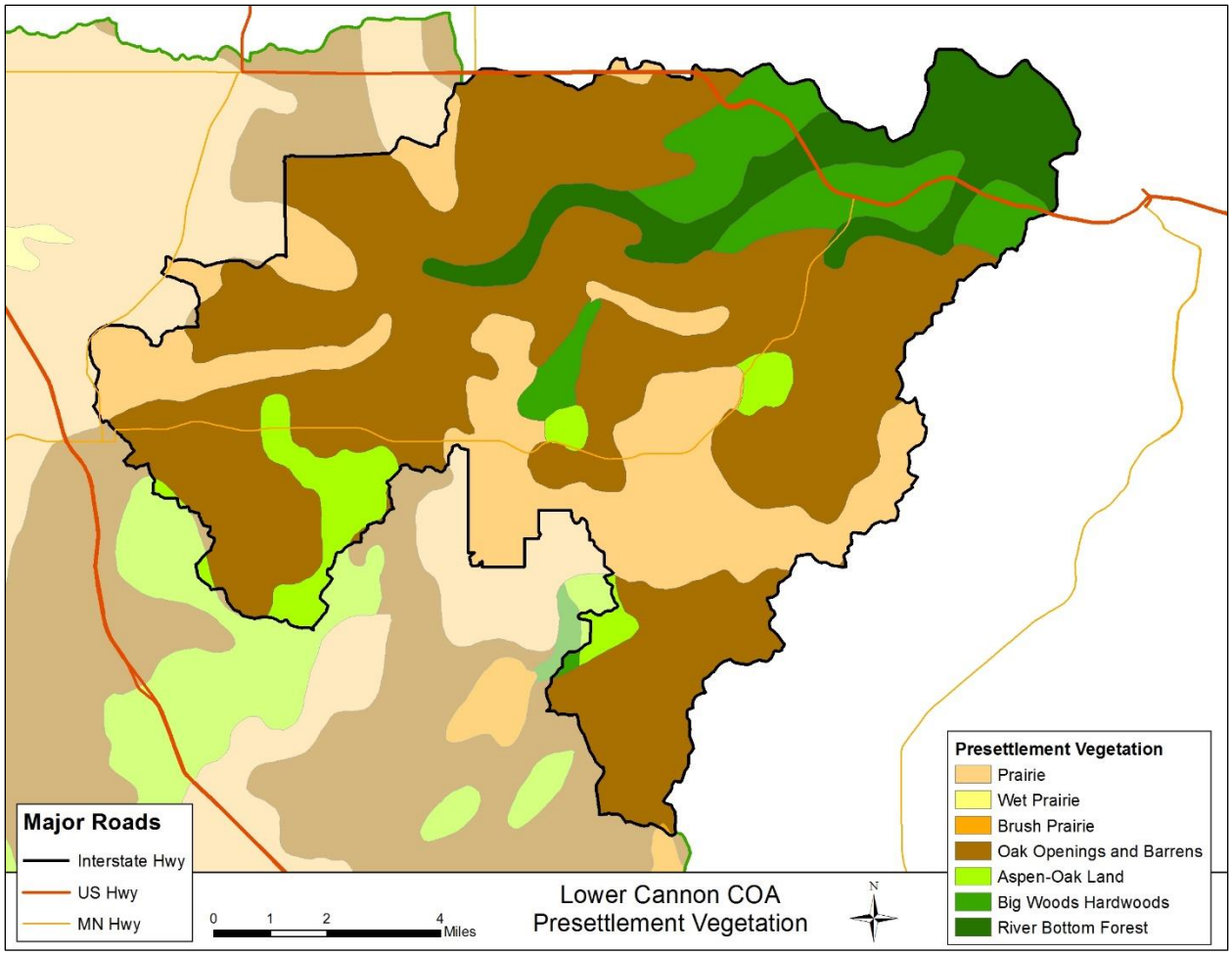


Figure 44. Presettlement land cover in the Lower Cannon COA based on the work of Francis J. Marschner.

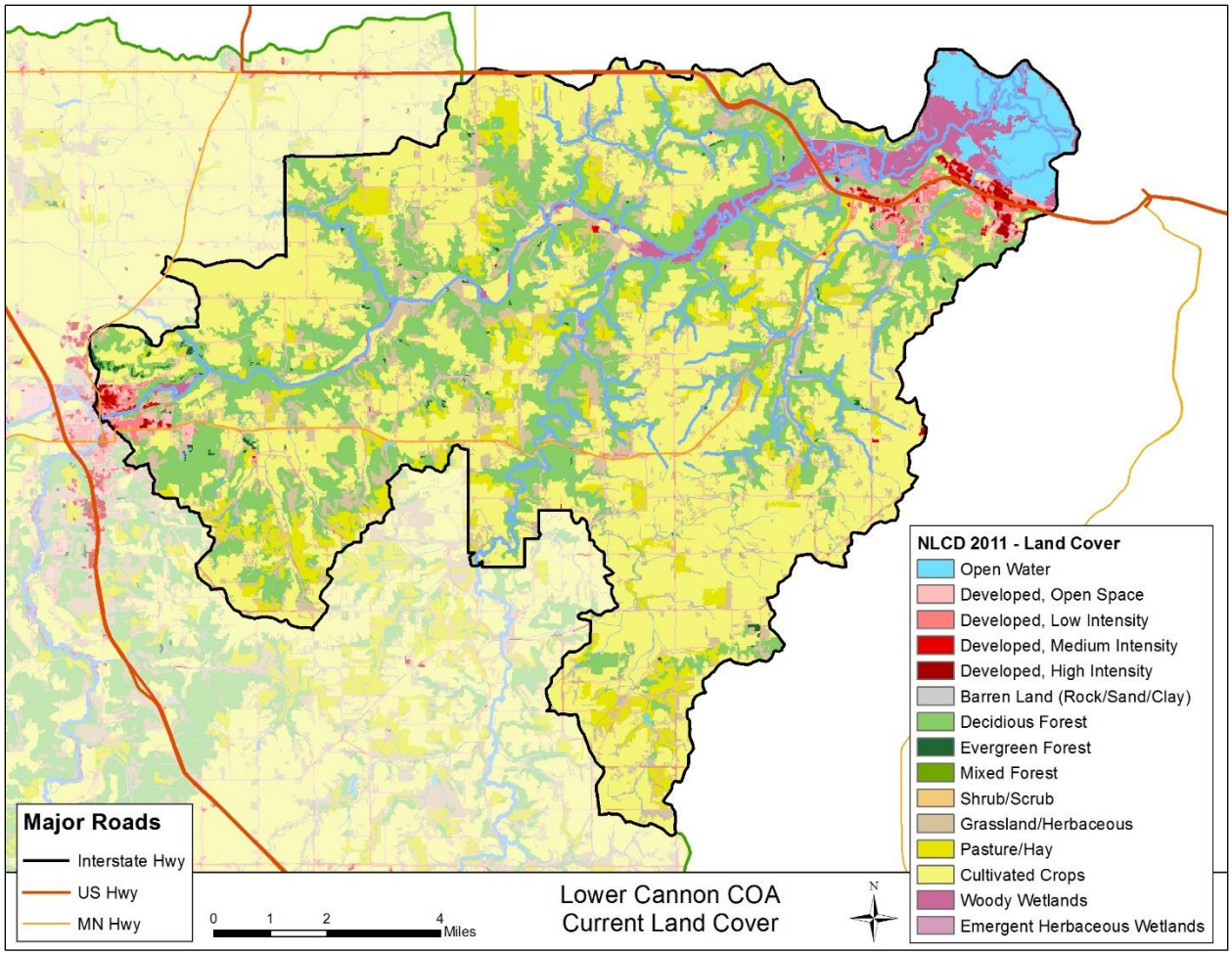


Figure 45. Current land cover in the Lower Cannon COA based on the 2011 National Land Cover Database.

Desired Future Conditions

- 100% of riparian areas are covered by native vegetation, returning a host of ecological services for water quality, habitat quality, and connectivity.
- Biotic integrity of all streams within the COA is restored, resulting in healthy aquatic species and de-listing of impaired waters.
- Human activity in riparian areas follows best management practices to protect water quality and sensitive shorelines.
- Agricultural practices within the COA follow best management practices to protect soil from erosion, and streams from sedimentation and nutrient loading.
- A natural fire regime is restored through prescribed burning on all appropriate native plant communities.
- Large blocks of native habitat exist across ownership lines.
- Habitat corridors link patches of biodiversity habitat, supporting migration and travel, especially in riparian areas.
- Native plant community remnants have expanded
- Rare plants and animal habitat are protected from degradation
- Invasive species are monitored and controlled

Key Stewardship Parcels

Acquisition efforts can only go so far and stewardship efforts on private parcels will be crucial to protecting the natural resources of the area. Conservation efforts in the Lower Cannon COA will be most effective in places where they protect existing native plant communities, and enhance habitat on public lands by increasing their size and/or connectivity. Working with larger parcels is preferable, because more stewardship options are available on larger tracts, and stewardship planning will affect a greater area. To make the most efficient use of conservation resources, it is useful to target parcels where those resources will have the most impact. A GIS analysis by The Nature Conservancy identified 213 key stewardship parcels in the Lower Cannon COA that met the following conditions (Figure 46):

- Larger than 40 acres in size; AND
- Contain an area ranked as medium priority in the Wildlife Action Network or as moderate or above significance for biodiversity according to the Minnesota Biological Survey; AND
- Within a mile of publicly owned conservation lands.

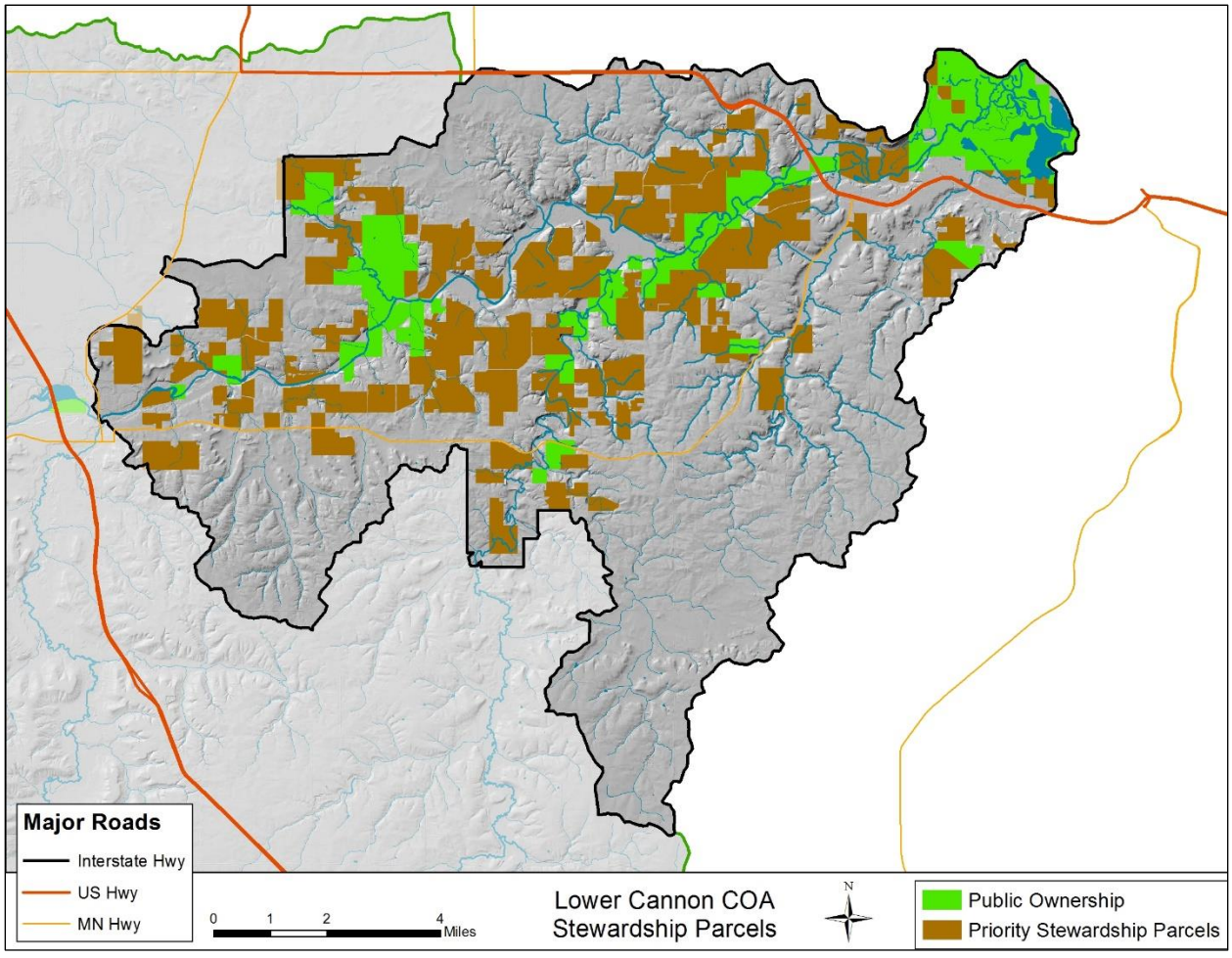


Figure 46. Priority stewardship parcels in the Lower Cannon COA.

Stewardship Activities

There is a variety of tools and strategies available for enacting stewardship activities on the landscape (see Section 1). Different strategies and actions will be appropriate for different types of parcels, natural resources, and landowners. This section provides a summary of strategies appropriate for the natural resources present in this COA.

Core Forest Areas

Large, continuous stretches of forest communities represent core forest habitat. In addition to providing quality habitat to a number of species, these areas represent favorite places for recreation and scenery, making them important for the tourism industry in the region. They also provide a great benefit to water quality, as forests help prevent erosion, slow and filter water run-off, and shade streams in riparian areas.

Stewardship Activities:

On all lands:

- Manage according to sustainable silvicultural and ecological principles
- Control invasive species
- Burn where appropriate
- Target strategic parcels for potential acquisition or conservation easements.
- Where possible, increase size and connectivity of forest habitat through reforestation / afforestation of connecting patches

On Private lands:

- Prepare comprehensive forest stewardship plans
- Assist landowner in researching and applying for relevant cost-share programs available (e.g. EQIP, CSP)

Prairies, Savannas, and Fire-Associated Native Plant Communities

The suppression of fire and mass conversion to agriculture that came with Euro-American settlement drastically reduced the amount of native prairie and savannas in both Minnesota, and the US as a whole. These communities offer important habitat for a number of animals, and many flowering plants and grasses.

Stewardship Activities:

On all lands:

- Restore a natural fire regime through prescribed burns
- Remove brush as needed
- Control invasive species
- Expand grassland habitat as buffer areas around other NPCs.

Riparian Area Restoration and Maintenance

Riparian areas are those nearest, and most connected to streams and rivers. They have an important impact on water quality either, positively by slowing and filtering run-off, or negatively, by contributing to sediment and nutrient loads brought to streams through erosion

and run-off. Implementing best management practices and other conservation actions in these areas can have significant water quality and wildlife benefits.

Stewardship Activities:

On public lands:

- Reconnect waterways with their floodplains.
- Utilize the delineation of critical cropland areas from Benck and Fry (Examining the Relationship between Land Cover and Water Quality Protection: The Blufflands Region of the Cannon and Zumbro River Watersheds, 2017, Saint Mary's University of Minnesota - GeoSpatial Services, 700 Terrace Heights, Box #7, Winona, MN 55987)
- Maintain and/or establish appropriate plant communities for the hydrology of the site.

On private lands:

- Support SWCDs in implementing and enforcing the state buffer law and other best management practices. Help interested landowners apply for the various cost-share or easement programs available for water quality protection (e.g. CRP, RIM).
- Work with landowners to reconnect streams to their floodplains.
- Maintain and restore natural vegetation along stream and riverbanks.

Key Stewardship Parcels

These parcels were identified based on their geographical size, areas of biodiversity significance, and proximity to public land (see above). They are areas where conservation effort can be most beneficial to the overall health of the landscape.

Stewardship Activities:

- Work to engage the owners of these parcels in a targeted manner.
- Target strategic parcels for potential acquisition or conservation easements.
- Tailor outreach and assistance to each landowner individually based on characteristics of their parcel and its geographical and ecological characteristics
- Prioritize stewardship efforts affecting these parcels.

Overview
Cannon River Watershed Landscape Stewardship Plan

Including Dakota, Goodhue, Le Sueur, Rice, Steele, and Waseca counties

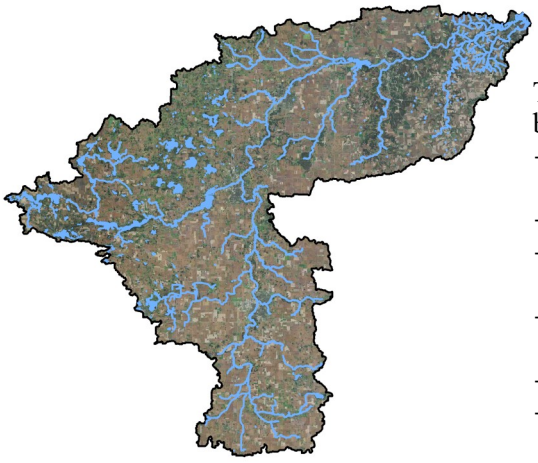
This overview offers a quick look at the Cannon River Watershed Landscape Stewardship Plan.

The purpose of the plan is to provide a vision and framework that allows landowners, resource managers, local officials, and other stakeholders to work together to voluntarily implement landscape stewardship practices that sustain the region's water quality, natural areas, and biodiversity.

A vision for healthy waters, ecosystems, and human experiences in the Cannon River watershed.

Healthy Lands, Healthy Waters

The *Cannon River Landscape Stewardship Plan* focuses on protecting water quality by maintaining and enhancing the health of land in the watershed. It is based on the premise that the quality of a water body reflects the integrity of its watershed. Stewardship efforts that maintain forests, wetlands, and other natural communities benefit the biodiversity and ecological health of the region. They also weaken floods, improve infiltration, and remove nutrients from runoff as it makes its way to our streams. Implementing best management practices and expanding perennial cover in agricultural and residential areas will benefit both the natural habitat of the landscape and the water quality in the watershed. This plan proposes a vision, desired future conditions, and strategies that utilize a landscape approach to natural resource stewardship.



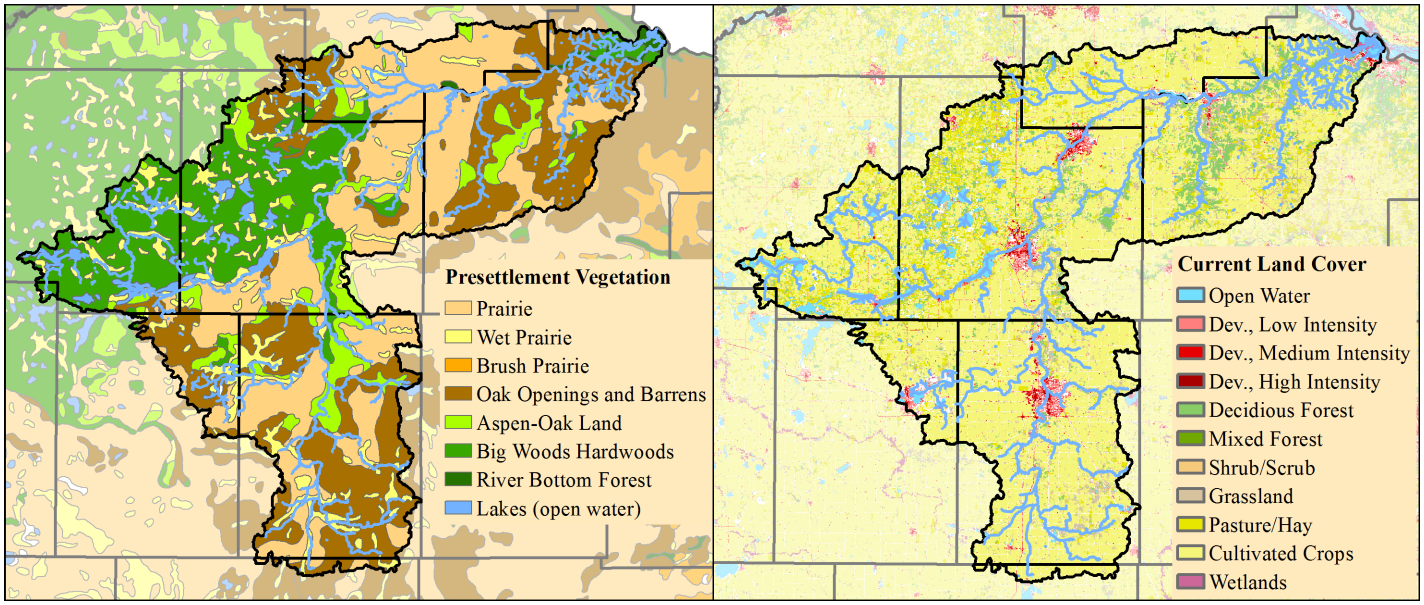
Who the plan is for

The landscape stewardship plan can be used in:

- Water and Natural Resource Planning
- Community Land Use Planning
- Conservation Project Prioritization and Funding
- Connecting with Policy and Decision Makers
- Guiding Private Land Stewardship
- Other Projects In and Around the Watershed

Landscape Context

The Cannon River drains over 940,500 acres through a series of lakes, wetlands, underground karst features, and approximately 800 miles of streams and rivers. The watershed ranges from deep fertile glacial tills in the upper portion to steep "Driftless Area" bluffs in the lower reaches.



Historically this watershed had vast prairies, oak forests and savannas, and the southeastern edge of the 'Big Woods' ecosystem. Today, only 18% remains as forest, wetland, or grassland and many of these areas have been degraded in some fashion. Despite these changes, the watershed retains relatively high water quality and areas of outstanding biodiversity significance that warrant special protection, maintenance, and restoration to sustain their function on the landscape. This plan highlights some of these areas and outlines strategies for their stewardship.

There are several public parks and wildlife management areas within the watershed which conserve native plant communities and protect water resources. These areas also offer opportunities for hiking, biking, canoeing, camping, hunting, and fishing. The vast majority of this watershed, however, is privately owned and stewardship of these lands will be key to maintaining regional biodiversity, water quality, and all of the outdoor recreational opportunities this region offers.

While there are many ways to divide a region into landscapes, using watersheds as the organizing feature emphasizes the link between natural resource management and water. It also parallels other state planning trends, such as the move to a *One Watershed, One Plan* system to replace local water plans. Planning natural community stewardship by watersheds increases the value of Landscape Stewardship Plans as resources for other water planning exercises.

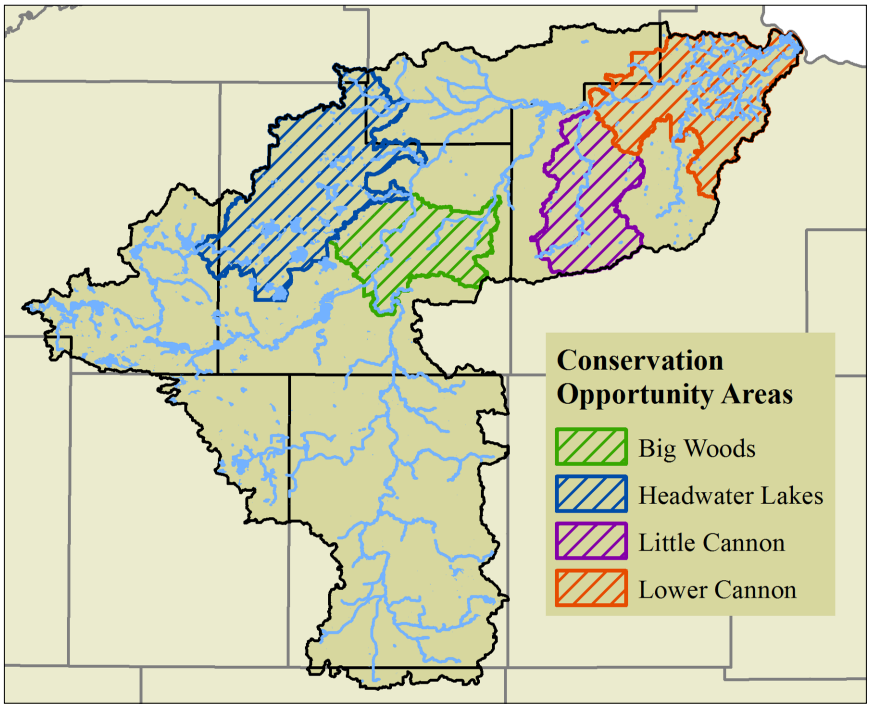
Vision for the Cannon River Watershed

The *Cannon River Watershed Landscape Stewardship Plan* supports the regional vision laid out by the Basin Alliance for the Lower Mississippi in Minnesota (BALMM) as the overarching landscape guidance for the watershed. The plan further focuses the BALMM guidance on the Cannon River Watershed with a series of Desired Future Conditions (DFCs) and implementation strategies. Many of the plan's DFCs closely align with those of other regional plans and highlight the confluence of objectives between stakeholders in the watershed.

Desired Future Conditions

- High quality streams and healthy groundwater resources
- Stabilized and increasing populations of rare and threatened species
- Streams with rehabilitated banks and native floodplain vegetation
- Large habitat buffers and corridors around and between core biodiversity areas
- Fire is used as a management tool in appropriate ecosystems
- Consistent funding for cost share assistance associated with landowner activities such as invasive species control and native plant community restoration
- A more robust hardwood timber market supporting sustainable private timber management
- Improved landowner education
- Active comprehensive conservation planning on priority sites
- Regional land use plans recognize and protect rare features

Most of the world's dwarf trout lilies are found in the Cannon River Watershed.



Conservation Opportunity Areas

The plan identifies four Conservation Opportunity Areas (COAs) to help direct conservation efforts within the watershed in strategic and cost effective ways.

- Big Woods COA (51,053 ac.): Contains some of the best remaining examples of the big woods ecosystem and dwarf trout lily habitat.
- Headwater Lakes COA (98,306 ac.): Features rolling topography that is pocketed with numerous small lakes, wetlands, and forest patches.
- Little Cannon COA (51,163 ac.): An entirely privately owned COA that contains several high quality natural areas.
- Lower Cannon COA (76,673 ac.): Contains forested valleys, rock outcrops, and a river-mouth wetland complex that have outstanding biodiversity significance.

Achieving the Landscape Vision

The *Cannon River Watershed Landscape Stewardship Plan* contains a series of strategies and an action plan for moving the landscape toward the overarching vision and desired future conditions. The strategies are organized into actions that focus on Public Land, Private Land, and Education/Outreach. Progress in all three of these categories will be needed for this voluntary plan to be successful.

Annual targets proposed in the Landscape Stewardship Plan include: 600 acres of prescribed fire, 50,000 tree seedlings sold to private landowners, 900 acres enrolled in programs that promote restoration and maintenance of native habitats, ten new forest stewardship plans, two miles of streambank stabilization, and three outreach events. See the plan for a full list of implantation strategies and associated targets.

These targets are benchmarked off information on what is currently happening in the landscape, and what may be possible under realistic growth scenarios at five and ten year intervals. These general targets help set measureable goals for the landscape with the caveat that individuals and organizations will set their own targets that, when combined, will move the entire watershed toward the overall landscape targets.

More information on how you can contribute to achieving this vision for the Cannon River Watershed can be found in the Landscape Stewardship Plan at:

https://mn.gov/frc/southeast-committee.html

The Minnesota Environment and Natural Resources Trust Fund and the U.S. Forest Service provided funding for this project.
Developed by The Nature Conservancy and the Forest Stewards Guild with input and review from several local stakeholders.

Landscape Stewardship Planning

This overview offers a quick look at Landscape Stewardship Planning. Particularly as it relates to watershed management in a stream, as opposed to a lake or wetland basin dominated landscape.

What is Landscape Stewardship?

According to the Landscape Stewardship Guide produced by the U.S. Department of Agriculture:

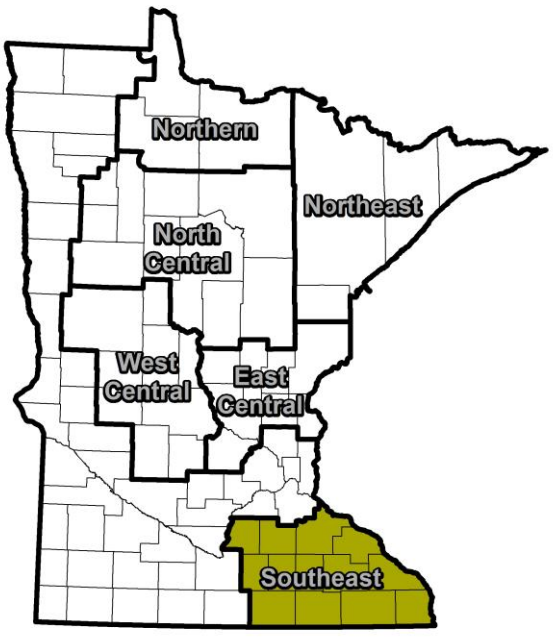
Landscape stewardship involves bringing together the stakeholders in a community of place or community of interest to address resource-based issues of mutual concern. Different stakeholders typically have different views of an issue. For example, a public agency may be interested in improving forest health to conserve an endangered species, a woodland owner may be interested in improved fishing or hunting opportunities, and a member of the public may be interested in access to trails.

The landscape stewardship approach is predicated on the likelihood that these different "stakes" will be satisfied by common solutions. This approach follows five general principles in developing and applying these solutions:

- *Invest in priority areas – be strategic*
- *Build a collaborative network – create ownership in the process and leverage resources*
- *Appeal to self interest – understand stakeholder motivations and needs*
- *Manage for results – align actions with objectives and evaluate outcomes*
- *Encourage flexibility at all levels – be adaptive; every situation is unique*

Landscape Approach in Minnesota

Minnesota has a long history of taking this "landscape" approach to natural resource planning. These efforts build off the foundation laid by the Minnesota Forest Resource's Council's Landscape Program. This program fulfills the MFRC's charge to "encourage cooperation and collaboration between public and private sectors in the management of the state's forest resources." This grass-roots effort builds relationships, strengthens partnerships, and identifies collaborative forest management projects that address local needs and represent concrete steps in determining and reaching citizen-identified short-term and long-term goals for broad landscape regions (see image to the right).



Committee members represent forest industry, natural resource agencies, individual landowners, non-profit organizations, educational institutions and concerned citizens. These committees develop regional landscape plans on a roughly 10-year interval.

Landscape Stewardhsip Plans

Stakeholders in Minnesota have used the guidance from the USDA Landscape Stewardship Guide to develop slightly smaller scape Landscape Stewardship Plans (LSP), These LSPs fit generally under the larger MFRC Landscape Plans.

While there are many ways to divide a region into landscapes, using watersheds as the organizing feature emphasizes the link between natural resource management and water. It also parallels other planning trends in Minnesota, such as the move to One Watershed One Plan (1W1P) plans to replace local water plans. Planning natural community stewardship by watersheds increases the value of Landscape Stewardship Plans as resources for other water planning exercises. To date, Landscape Stewardship Plans have been developed for five watersheds in the state: Root, Kettle, Mississippi River—Winona, Cannon, and Zumbro.

Landscape Stewardship Plans are based on the recognition that many, if not all, of our conservation and environmental challenges are interrelated. Yet, practicality requires a division of activities and expertise in addressing them. As a result, private landowners, city planners, and experts in hydrology, forests, game and non-game wildlife management all work to achieve diverse, but interrelated, goals from their own specialized angle. For example, additional perennial cover in an upland agricultural area can improve soil health while also reducing erosion on the forested hillside below it, and improved conditions in both areas will benefit the hydrology, water quality, and associated biodiversity in the stream below them. Recognizing how these efforts can reinforce each other, and identifying areas where coordination will add the most benefit, will allow greater synthesis of all our efforts, making all our goals for the landscape easier to achieve. To do so, the LSP embraces an "all lands" approach that identifies shared objectives across public and private natural areas as well as urban and agricultural areas.

Healthy Lands, Healthy Waters

In general, these plans focus on protecting water quality by maintaining and enhancing the health of land in the watershed. It is based on the premise that the quality of a water body reflects the integrity of its watershed. Stewardship efforts that maintain forests, wetlands, and other natural communities benefit the biodiversity and ecological health of the region. They also weaken floods, improve infiltration, and remove nutrients from runoff as it makes its way to our streams. Implementing best management practices and expanding perennial cover in agricultural and residential areas will benefit both the natural habitat of the landscape and the water quality in the watershed. This plan proposes a vision, desired future conditions, and strategies that utilize a landscape approach to natural resources stewardship.

Plan Audience

There are many potential uses for LSPs but in general they are intended to benefit:

- Local Water Resource Management Plans and Implementation, including the One Watershed One, Plan (1W1P) program.
- Forest Stewardship Plans and Implementation
- Fish & Wildlife Management Plans
- Community Land Use Planning and Implementation
- Collaborative Project and Funding Development
- Connections to Forest and Water Resource Policy Decision Makers

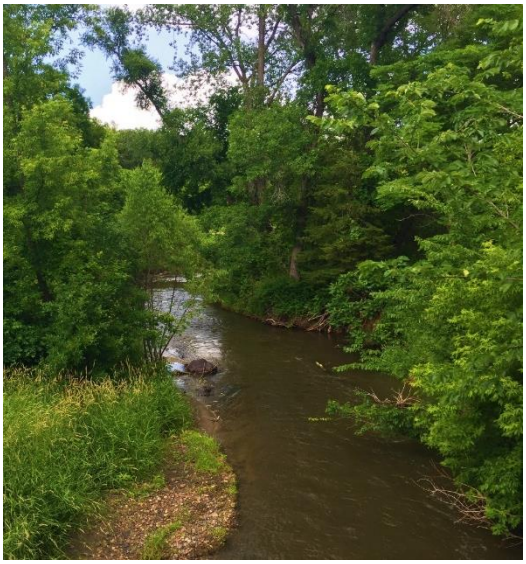
Why a Landscape Stewardship Plan?

A common refrain early in the LSP process is "Why a Landscape Stewardship Plan when there are so many other plans and planning efforts?" This is a valid question but these plans are unique because they focuses on achieving and maintaining healthy water and biodiversity through land stewardship. Additionally, these plans serve as a synthesis of other efforts in the region helping to point out overlaps in goals, objectives and strategies. They can even be valuable as parallel efforts. For

example, while the Cannon River LSP was being developed, the Minnesota Pollution Control (MPCA) was concurrently developing a Watershed Restoration and Protection Strategies (WRAPS) plan for the Cannon River Watershed. The focus of the two planning processes were not identical, however they shared several key goals and they helped inform each other in several ways. The WRAPS process provided strong input from multiple partners that was helpful in developing the Cannon LSP, and the LSP was referenced in the WRAPS as a useful tool in developing and coordinating water protection strategies for the in the Cannon River Watershed.

These plans are not intended to replace other plans and planning efforts in the region but instead it serves as a reference for future and concurrent planning efforts, and to set a framework for coordinated implementation of the multiple conservation efforts those plans represent.

Stream Based Systems



The five watersheds in Minnesota to have LSPs developed (Root, Kettle, Mississippi River—Winona, Cannon, and Zumbro) differ in many ways but they are all primarily stream dominated. Landscape stewardship planning is even more important in these stream-based systems due to the complexity of managing their hydrology. Several factors effect this, but in most cases, the condition of a watershed is reflected in the condition of its water.

The connection between land use and water quality becomes more complicated in a stream based system where land uses far away may be impacting the water quality downstream or, as in the case of southeastern Minnesota, the region is underlain by karst features. These karst landscapes feature hidden, rapid pathways through which water, and associated pollutants, can travel to drinking water wells or surface water.

As the authors of the Cannon and Zumbro LSPs dealt with the challengs of prioritizing natural community stewardship for water quality protection in such a spatially complex system, a few insights became helpful:

- **Interpreting water quality data is more complex than in lake-dominated watersheds**. While water quality data remain crucial to protection planning their interpretation becomes complicated in a system where stream segments are influenced by conditions potentially far upstream. These data are most useful in smaller tributary catchments where the landscape effect is more traceable.
- **Focus on beneficial landscape features.** Because water quality data can be complicated in interconnected stream networks, it is easier, and likely more useful, to focus analysis on identifying places where concentrations of desirable

lanscape conditions occur. This is especially true in watersheds, such as those of Southeast Minnesota, where the most degraded portions are commonly found in the headwaters of the streams. While the effects of altered hydrology and nutrient runoff at the top of the watershed will remain present downstream, protecting places where natural processes are preventing further water quality impacts is still crucial to improving our water resources in the most efficient manner posisble.

- **Identify catchments where action can make a measurable difference.** The ability to make a measurable difference in water quality is often a requiremnet of funding oportunities, and is important for justifying the effort involved. This often results in shifting focus towards smaller catchments where the landscape improvements won't be offset as easily by degradation upstream.
- **Recognize that sometime success means no change in quality.** While funding agencies are often concerned with "measurable improvements", it is also important to note that a typical goal of protection is to prevent degradation. By definition, this means that success is defined by preventing a negative change in water quality, not creating a positive one. It is important to communicate that maintaining an acceptaible status quo can also be a "win" for water quality.
- **Potential risks deserve more attention in watershed modeling.** The WRAPS for nearly all of Southeast Minnesota's watersheds have included HSPF modelling to identify potential impacts of different restoration strategies. However, none of the HSPF models were run to assess potential impacts from increased conversion of native cover, or other likely changes in the landscape that could impact water quality. By only modelling restoration strategies, these results falsely assume that general landcover patterns will remain static. This creates bias in the document towards expensive restoration projects while ignoring the need to preserve beneficial landscape features that are at risk. The analysis performed by St. Mary's Geospatial Services department during development of the Cannon and Zumbro LSPs attempted to fill some of this information gap, however it lacked the sophisticated modelling capabillities that HSPF provides.
- **Protection and restoration efforts will need to reinforce eachother to meet goals.** Natural communities are currently providing critical water quality services in Southeast Minnesota. Improving them, and adding more, will increase those benefits. However, their effectiveness is also somewhat dependent on improvement of agricultural practices, especially relating to soil health and drainage management. The "flashier" hydrology that has resulted from increased soil drainage and decreased soil organic matter content in agricultural areas is causing water flow to be faster and more channelized. This allows water to flow more quickly through natural communities, and lessen their ability to treat it. The closer the hydrology of these watersheds can be brought to their natural patterns, the more effictive native vegetation will be at slowing water, increasing infiltration, and taking up nutrients.

Process Review

Now that five Landscape Stewardship Plans have been developed in Minnesota, we felt it worthwhile to reflect on what is working, not working, and directions to go from here. The authors of this summary are most familiar with the process for developing the Cannon and Zumbro plans and most of these thoughts are related to the development of these plans, although we think many themes will be widely applicable. The authors find the LSP and planning process to be a valuable asset to land and water management in the region. The following list is meant to inform future LSP development not dissuade one from undertaking the effort.

- **Leadership**: Although this is a collaboratively developed planning effort, there needs to be particular organizations that take the lead in seeking funding to develop these plans and see them through to completion. Minnesota is lucky to have several such organizations.

- **Stakeholders**: These plans have a wide range of potential stakeholders but there will often be a handful that are essential to a viable planning process. These key stakeholder are also often the individuals whose time is stretched thinnest. If a convincing hook is not utilized early they may only loosely participate and are unlikely to feel much ownership in the resulting LSP and its implementation. Knowing who your key stakeholders are ahead of time and their strengths and weaknesses will be crucial to involve them in the process. Some you will want to bring in early, others will be best contacted once something has been developed. A somewhat narrow steering committee seems to be effective but bringing in a broader group for input and review will likely help the product but also their engagement in the implementation of the plan.

- **Meetings**: Schedules can be difficult to coordinate but in-person meetings are important for this collaborative process. The development of this plan is as much about relationship building as the final document. Contact between stakeholders leads to an increased likelihood of cross-boundary projects being undertaken. Excessive meetings, on the other

hand, can lead to frustration by those who commit time to attend. It will depend on the project and audience but a mix of in-person meetings of a larger group coupled with a few informal one-on-one meetings with partners focused on specific subjects is the best way to maximize stakeholder engagement.

- **Document**: There are many ways to develop one of these documents. Determining what should be included and what should be referenced is an important question that each planning team will need to decide. Plan length will largely be determined based on whether Conservation Opportunity Areas (COAs) are included and how many map images are included. Maps often give useful contextual information to plan users but efforts should be made to determine their potential usefulness. One option utilized in the Cannon and Zumbro LSPs was to place the landscape context information further back in the document.

- **Implementation**: Implementation of these plans is difficult to enforce due to the voluntary nature of these plans. One key is to have the individual or organization leading the development to be committed to the outcome and implementation of the plan. Having leadership in the early stages of implementation will be key to long-range implementation.

The Minnesota Environment and Natural Resources Trust Fund and the U.S. Forest Service provided funding for this project. Developed by The Nature Conservancy (David Schmidt) and the Forest Stewards Guild (Michael Lynch) with informal input from various stakeholders.

Healthy Lands, Healthy Waters

The Zumbro River Landscape Stewardship Plan focuses on protecting water quality by maintaining and enhancing the health of the lands in its watershed. It is based on the premise that the quality of a water body reflects the integrity of its watershed. Stewardship efforts that maintain forests, wetlands, and other natural communities will not only benefit the biodiversity and ecological health of the region, but also weaken floods, improve infiltration, and remove nutrients from runoff as it makes its way to our streams. Implementing best management practices and expanding perennial cover in agricultural and residential areas will benefit both the natural habitat of the landscape and the water quality in the watershed. This plan proposes a vision, desired future conditions, and strategies that utilize a landscape approach to natural resource stewardship.

The landscape stewardship plan can be used in:

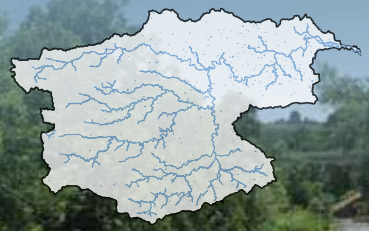
- Water and Natural Resource Planning
- Community Land Use Planning
- Conservation Project Prioritization and Funding
- Connecting with Policy and Decision Makers
- Guiding Private Land Stewardship
- Other Projects in and Around the Watershed

The Nature Conservancy

Weaver Dunes Preserve
60042 County Rd 84,
Kellogg, MN 55945

Zumbro River Watershed

LANDSCAPE STEWARDSHIP PLAN



A vision for healthy waters, ecosystems, and human experiences in the Zumbro River watershed.

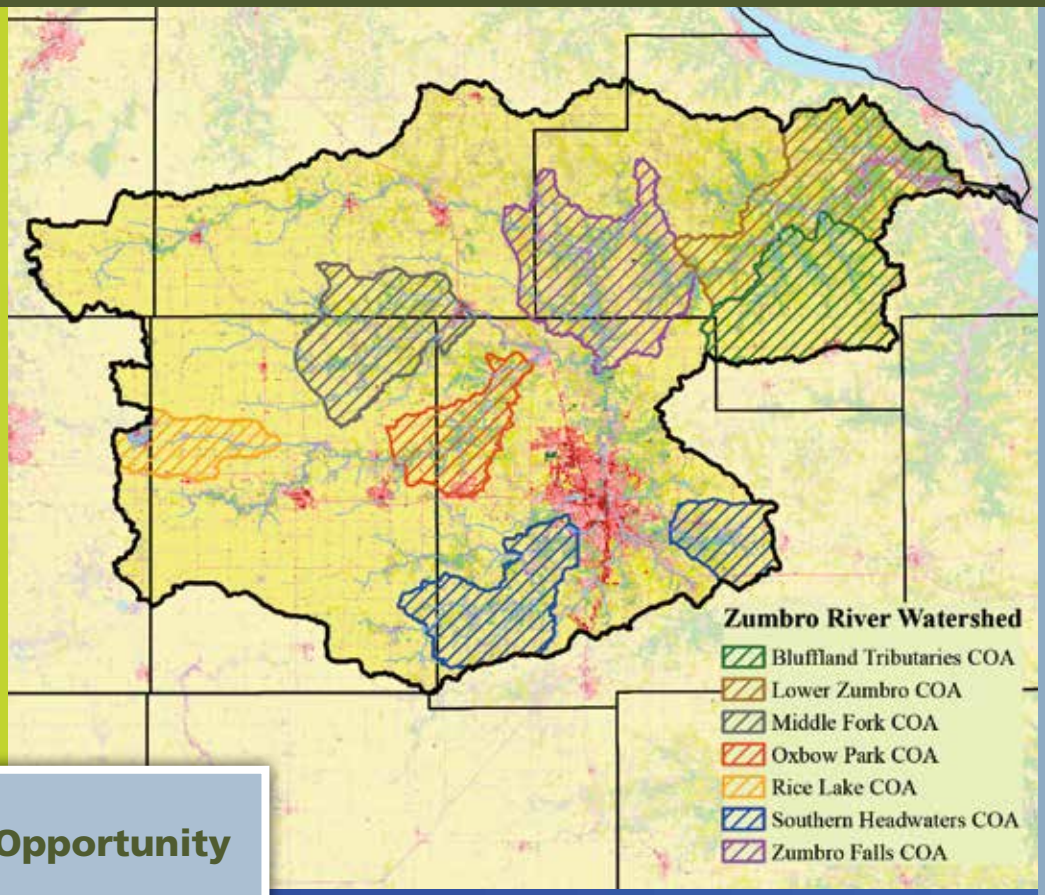
Watershed stewardship takes a collaborative effort by public and private partners. Learn how you can play a part in the stewardship of this watershed's ecological services.

The Nature Conservancy

Minnesota Forest Resources Council

Zumbro River Watershed

- 909,366 acres
- Dodge, Goodhue, Olmsted, Rice, Steele, and Wabasha counties
- Deep fertile glacial-tills in the upper portion and steep bluffs in the lower reaches
- 23% forest, wetland, or grassland (green and tan), 12% pasture (dark yellow), 56% row-crop agriculture (yellow) and 9% residential/ urban development (red)
- Many remaining areas of outstanding biodiversity significance and high importance to regional water quality
- 125 miles of Designated Trout Streams



Conservation Opportunity Areas (COAs)

The plan identifies seven focal areas to help direct conservation efforts within the watershed in strategic and cost effective ways.

More information on how you can contribute to achieving this vision can be found in the Landscape Stewardship Plan at:

https://mn.gov/frc/southeast-committee.html

Vision for the Watershed:

- High quality streams and healthy groundwater resources
- Stabilized and increasing populations of rare and threatened species
- Adequately buffered karst features including springs, fens, sinkholes, and the Decorah Edge
- Streams with rehabilitated banks and native floodplain vegetation
- Large habitat buffers and corridors around and between core biodiversity areas
- Fire is used as a management tool in appropriate ecosystems
- Consistent funding for cost share assistance associated with various landowner activities such as invasive species control and native plant community restoration
- A more robust hardwood timber market supporting sustainable private timber management
- Improved landowner education
- Active comprehensive conservation planning on priority sites
- Regional land use plans recognize and protect rare features

Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund and the U.S. Forest Service.
Developed by The Nature Conservancy and the Forest Stewards Guild.

Zumbro River Watershed Landscape Stewardship Plan

June 25, 2017

A vision for healthy waters, ecosystems, and human experiences in the Zumbro River watershed.

The Nature Conservancy

Minnesota Forest Resources Council

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The Zumbro River Watershed Landscape Stewardship Plan can be found online at:
https://mn.gov/frc/southeast-committee.html

Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR). The Trust Fund is a permanent fund constitutionally established by the citizens of Minnesota to assist in the *protection, conservation, preservation, and enhancement of the state's air, water, land, fish, wildlife, and other natural resources.* Currently 40% of net Minnesota State Lottery proceeds are dedicated to growing the Trust Fund and ensuring future benefits for Minnesota's environment and natural resources.

The Northeastern Area State and Private Forestry division of the U.S. Forest Service also provided funding for this project.

Table of Contents

Plan Overview

Healthy Lands, Healthy Waters

This plan focuses on protecting water quality by maintaining and enhancing the health of land in the watershed. It is based on the premise that the quality of a water body reflects the integrity of its watershed. Stewardship efforts that maintain forests, wetlands, and other natural communities benefit the biodiversity and ecological health of the region. They also weaken floods, improve infiltration, and remove nutrients from runoff as it makes its way to our streams. Implementing best management practices and expanding perennial cover in agricultural and residential areas will benefit both the natural habitat of the landscape and the water quality in the watershed. This plan proposes a vision, desired future conditions, and strategies that utilize a landscape approach to natural resource stewardship.

Landscape Approach to Natural Resources Stewardship

This Landscape Stewardship Plan (LSP) is based on the recognition that many, if not all, of our conservation and environmental challenges are interrelated. Yet, practicality requires a division of activities and expertise in addressing them. As a result, private landowners, city planners, and experts in hydrology, forests, game and non-game wildlife management all work to achieve diverse, but interrelated, goals from their own specialized angle. For example, additional perennial cover in an upland agricultural area can improve soil health while also reducing erosion on the forested hillside below it, and improved conditions in both areas will benefit the hydrology, water quality, and associated biodiversity in the stream below them. Recognizing how these efforts can reinforce each other, and identifying areas where coordination will add the most benefit, will allow greater synthesis of all our efforts, making all our goals for the landscape easier to achieve. To do so, the LSP embraces an "all lands" approach that identifies shared objectives across public and private natural areas as well as urban and agricultural areas.

While there are many ways to divide a region into landscapes, using watersheds as the organizing feature emphasizes the link between natural resource management and water. It also parallels other state planning trends, such as the move to One Watershed One Plan (1W1P) plans to replace local water plans. Planning natural community stewardship by watersheds increases the value of Landscape Stewardship Plans as resources for other water planning exercises.

Project Area Background

This landscape stewardship plan covers the 1,428 square mile Zumbro River Watershed in Southeast Minnesota (Figure 1). The watershed, which includes portions of Dodge, Goodhue,

Olmsted, Rice, Steele, and Wabasha counties, drains roughly West-to-East through three main forks (South Fork, Middle Fork, and North Fork) which join north of Rochester to form the main stem. Rochester is by far the largest city in the watershed. It drains a diverse landscape ranging from deep fertile glacial tills in the upper reaches to sandy soils and steep bluffs in the lower portion of the watershed as it nears the Mississippi River at Kellogg. Much of the watershed is underlain by karst, with exposed bedrock and complex groundwater systems predominant in the eastern half of the region. Landforms common to this area are steep bluffs overlooking deep river valleys, sinkholes, caverns, and cold-water spring-fed streams. Landscape features such as lake and outwash plains, moraines, and drumlin fields that were created by glaciers and associated meltwater drainage characterize the western part of the watershed.

This southeastern Minnesota watershed has seen significant change in the last 150 years. Today, only 23% remains as forest, wetland, or grassland and many of these areas have been degraded in some fashion. Despite these changes, the watershed retains relatively high water quality and areas of outstanding biodiversity significance that warrant special protection, maintenance, and restoration to sustain their function on the landscape.

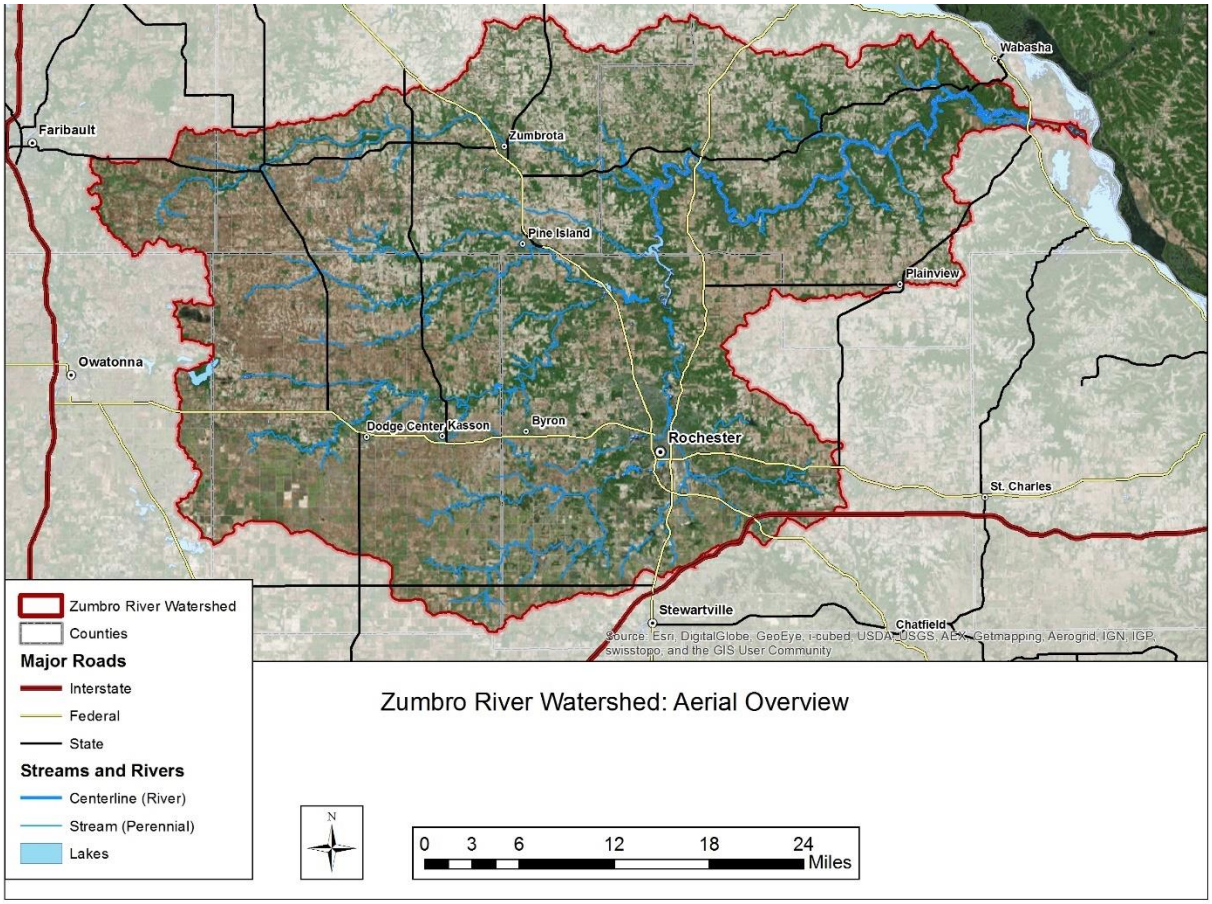


Figure 1. Aerial view of the Zumbro River Watershed.

Organization of Plan

The Zumbro River Watershed Landscape Stewardship Plan is organized into seven sections. Individuals unfamiliar with the landscape are encouraged to review Section 5 for context on the state of the watershed prior to Section 1.

- Section 1. Landscape Vision and Strategies
- Section 2. Implementing the Plan
- Section 3. Action Plan Template
- Section 4. Monitoring and Evaluation
- Section 5. Landscape Context
- Section 6: Implementation Resources
- Section 7: Conservation Opportunity Area Plans

Plan Audience

This landscape stewardship plan is intended to benefit:

- Local Water Resource Management Plans and Implementation, including a potential Zumbro River One Watershed One Plan (1W1P).
- Forest Stewardship Plans and Implementation
- Fish & Wildlife Management Plans
- Community Land Use Planning and Implementation
- Collaborative Project and Funding Development
- Connections to Forest and Water Resource Policy Decision Makers

These are just a few of the plan's applications and uses. This plan is not intended to incorporate other planning efforts; it is meant to supplement and inform those efforts in a manner that promotes increased and improved collaboration among current and future partners and stakeholders to achieve plan's vision for the watershed.

Process

The Nature Conservancy of Minnesota and the Forest Stewards Guild led the development of the Zumbro River Watershed Landscape Stewardship Plan with input and review from several local stakeholders throughout the process (Table 1). These partners represented a variety of specialties and interests, from both the county and state level.

Table 1. Zumbro River Watershed Landscape Stewardship Advisory Committee.

Name	Organization	Email
Terry Lee	Olmsted County	lee.terry@co.olmsted.mn.us
Skip Langer	Olmsted SWCD	langer.skip@co.olmsted.mn.us
John Harford	Olmsted County	harford.john@co.olmsted.mn.us
Gretchen Miller	MN DNR Wildlife	gretchen.miller@state.mn.us
Mark Miller	MN DNR Forestry	mark.dnr.miller@state.mn.us
Justin Watkins	MN Pollution Control Agency	justin.watkins@state.mn.us
Jeff Weiss	MN DNR Water Resources	jeffrey.weiss@state.mn.us

Additionally, this plan was developed concurrently with the Minnesota Pollution Control Agency's Watershed Restoration and Protection Strategies (WRAPS) process (see below). Plan developers participated in the WRAPS process, and the stakeholder feedback from that advisory group was also considered in the development of this plan.

Why a Landscape Stewardship Plan

There are a variety of plans and planning efforts in the Zumbro River. This plan is unique because it focuses on achieving and maintaining healthy water and biodiversity through land stewardship. While this plan was being written, the Minnesota Pollution Control (MPCA) was concurrently developing a Watershed Restoration and Protection Strategies (WRAPS) plan for the Zumbro River Watershed. The focus of the two planning processes were not identical, however they shared several key goals and they helped inform each other in several ways.

With the diverse array of stakeholders in the Zumbro River Watershed, a wide variety of plans and planning efforts also cover the region (see Section 2). This plan is not intended to replace those. Instead, it serves as a reference for future and concurrent planning efforts, and to set a framework for coordinated implementation of the multiple conservation efforts those plans represent. For example, the Landscape Stewardship Plan (LSP) was developed at the same time as the Minnesota Pollution Control Agency (MPCA) was developing their Watershed Restoration and Protection Strategies (WRAPS). The two efforts were similar in many ways: both were organized on the watershed boundary, both involved input from multiple stakeholders, and both contained goals for water quality. The WRAPS, however, gives stronger consideration than the LSP to the restoration needs of the watershed, with a strong focus on nutrient load reductions in heavily farmed portions of the watershed. The LSP meanwhile focuses on providing a framework for protecting landscape features like native plant communities that help maintain healthy water.

The WRAPS process provided strong input from multiple partners that was helpful in developing this LSP, and the LSP has been referenced in the WRAPS as a useful tool in developing and coordinating water protection strategies for the in the Zumbro River Watershed.

Section 1. Landscape Vision and Strategies

Landscape Vision

The Basin Alliance for the Lower Mississippi in Minnesota (BALMM) is a locally led alliance of land and water resource agencies that coordinates efforts to protect and improve water quality in the Lower Mississippi River Basin. As a key watershed in this region, the Zumbro River Watershed Landscape Stewardship Plan adopts the BALMM Vision as the overarching landscape guidance for the watershed.

The BALMM envisions the following to sustain water health and support rural communities:

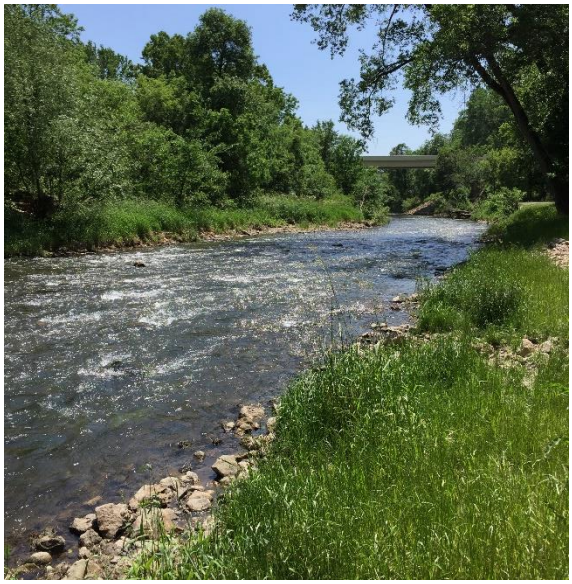
- Water resources with safe drinking water from its aquifers and surface water supporting thriving aquatic ecosystems.
- Land uses supporting healthy, resilient, and diverse terrestrial ecosystems and abundant outdoor recreational opportunities.
- Productive and sustainable agricultural resources including ruminant livestock, local food production, managed woodlands, and biomass production.

Desired Future Conditions

The following Desired Future Conditions (DFCs) focus the overarching BALMM landscape vision on the Zumbro River Watershed. Many of these DFCs closely align with those of other regional plans and highlight the confluence of objectives between stakeholders in the watershed. Like the rest of the plan, these DFCs are subject to revision and refinement by partner organizations but serve as an overall unifying vision. They include:

- High quality streams and healthy groundwater resources
- Stabilized and increasing populations of rare and threatened species
- Streams with rehabilitated banks and native floodplain vegetation
- Adequately buffered karst features including springs, fens, sinkholes and the Decorah Edge
- Large habitat buffers and corridors around and between core biodiversity areas
- Fire is used as a management tool in appropriate ecosystems
- Consistent funding for cost share assistance associated with landowner activities such as invasive species control and native plant community restoration
- A more robust timber market supporting sustainable private timber management
- Improved landowner education
- Active comprehensive conservation planning on priority sites
- Regional land use plans recognize and protect rare features

Achieving the Landscape Vision



This plan was not created to be the guiding document of any organization and its implementation is based on the coordination of voluntary efforts by a wide range of stakeholders that are trying to accomplish their own organizational or individual goals. Therefore, this plan focuses on a list of strategies that can be used by implementing organizations instead of developing goals and objectives that do not have a specific entity accountable for their achievement. The strategies outlined below can be used by individuals and organizations to move the landscape towards the overall vision and desired future conditions. This plan recognizes that not all strategies will work for all organizations but that organizations need to work together in a coordinated effort to accomplish the overall watershed vision. We have organized strategies for achieving the landscape vision around three primary areas of focus: Public Land, Private Land, and Education/Outreach. There is considerable opportunity for overlap between these categories and many activities will take advantage of strategies in multiple categories.

Category	Summary	Principle Actors
Public Land	Strategies under this heading are primarily focused on the region's state and conservancy owned and managed lands. These areas are generally the most protected from conversion threats but often still face the risk of habitat degradation. When well maintained, these areas often provide a tremendous effect on regional biodiversity and water quality. Strategies under this heading include actions that can be done to restore these protected lands or expand these public spaces by acquiring private lands and adding them to the regional public land management portfolio. Permeant conservation easements also fall in this category.	Minnesota DNR Divisions, The Nature Conservancy, MN Land Trust, Trust for Public Land,
Private Land	The majority of land in the Zumbro River Watershed is in private ownership and only in rare situations are these lands candidates for public land acquisition. Private landowners will manage the rest of this land, and their actions will be key to increasing and maintaining regional water quality. This section outlines steps that can be taken to support these landowners in successful stewardship of their lands.	DNR Forestry, Soil and Water Conservation Districts, Board of Soil and Water Resources, Natural Resources Conservation Service, Farm Service Agency
Education & Outreach	Strategies under this heading focus on efforts to increase both the knowledge base and stewardship ethic of landowners, citizens, and whole communities in the region. It recognizes that the foundation of all	Zumbro Watershed Partnership, UMN Extension

	conservation efforts is the value placed on natural resources by the community.	

Public Land Strategies

- Hold, manage, and restore currently protected blocks of native habitats. Utilize management tools that, to the extent possible, approximate natural disturbance regimes and strengthen these natural communities. Use public and conservation lands as an anchor point to initiate functional landscape management across ownerships. Utilize sound management on public lands to demonstrate ecological management principles and catalyze improved management on private lands. In addition to standard land management practices, this plan encourages public land managers to expand the following land management tools:
    - Utilize prescribed fire as a key tool in the management and restoration of protected lands. This form of management should imitate pre-suppression era fire-disturbance patterns and increase the presence, and competitiveness, of fire dependent communities.
    - Increase forest cover and forest health through sustainable forest management practices and site and climate appropriate plantings.
    - Integrate climate change projections into management planning. Demonstrate forest management for forest resiliency with a changing climate.
    - Control invasive species through management, monitoring, and outreach.

- Support and pursue opportunities for increased protection through conservation easements and public acquisition in strategically important areas. Focus future acquisitions within the targeted Conservation Opportunity Areas (COAs) but continue to look for key opportunities throughout the watershed. Focus acquisition efforts on:
    - The rarest or highest quality natural areas and opportunities to develop natural community buffers around these sites.
    - Protection of karst features and other key water resource areas. Couple these efforts with the installation of native plant community buffers to reduce pollutant run-off entering groundwater.
    - Sites that increase connectivity between natural areas, such as habitat corridors and riparian areas.
    - Sites that expand upon currently protected areas to fully include functioning habitat complexes.

- Agencies and nongovernment conservation organizations engage in productive coordination and collaboration to accomplish the goals and visions outlined in this plan.
    - Seek funding for enhancement projects that will be economical to maintain after completion (e.g. bluff prairie enhancement, forest understory improvement).
    - Seek funding for projects that can be carried out across public land boundaries with cooperation of neighboring landowners.

Private Land Strategies

- Increase the extent of perennial vegetation focusing on critical areas, while improving the condition and function of existing perennial vegetation for the benefit of water quality, quantity, and wildlife habitat.

- Identify opportunities to work with landowners to increase habitat corridors and connectivity. Focus efforts on landowners around publicly owned natural areas to ensure greater connectivity of native plant communities into a larger matrix of well-managed private forest and grasslands.
    - Contact landowners near important natural areas to assess interest in conservation easements and agricultural set-aside programs such as the Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP), and Reinvest in Minnesota (RIM).

- Encourage landowner participation in programs that promote the restoration and maintenance of native habitats.
    - Increase CRP acreage availability and landowner enrollment. Work with local seed suppliers to produce and distribute native perennial grass and forb seed that can be utilized on CRP and other conservation planting acres.
    - Increase awareness and funding for cost share programs focused on the management of natural communities on private land. Particular focus is needed on cost share opportunities for invasive species management.
    - Support and promote annual tree sale. Encourage landowners to plant seedlings from appropriate seed zones.

- Ensure professional assistance is readily available to landowners for resource management. This results in management that optimizes resources, meets landowner objectives, and maintains ecological and habitat benefits.
    - Coordinate technical assistance from multiple agencies and stakeholders.
    - Promote consulting businesses who have local forestry and natural community knowledge that can develop forest management plans for landowners.

- Work with area producers to expand the use of low-intensity conservation grazing. Encourage the addition of lightly grazed perennial cover on the upslope woodlands to reduce the rate at which overland flow reaches wooded ravines.
    - Promote farmer-to-farmer networks for knowledge sharing related to grazing management and practices.
    - Seek opportunities to improve market options for grass fed or pasture raised beef.

- Identify areas and funding for engineering projects that will improve the region's water quality and groundwater recharge.
    - Wetland restoration
    - Water and sediment basins at the wooded bluff edge to reduce ravine head cutting
    - Farm pond improvements
    - Stream bank restoration
    - Grassed waterways
    - Floodplain reconnection and restoration

- Encourage producers to implement best management practices to improve soil health and reduce runoff.

- Collaboration between partners on funding applications.

Education and Outreach Strategies

- Use outreach and education to foster a 'land ethic' about the value of natural resources in the watershed among land managers, landowners, community and citizen groups, and local communities.

- Integrate information on social benefits of sustainable forestry, prairies, buffers, and pastures in outreach documents.

- Educate landowners on, and encourage proper management of, their native plant communities as well as Best Management Practices (BMPs) agricultural and residential areas.

- Inform local officials and elected representatives of the benefits of perennial vegetation for water quality, flood retention, and local quality of life.

- Increase understanding for the role fire once played, and can continue to play, as a land management tool.

- Early identification and management techniques for forest health issues and invasive species.

- Work with local forest products businesses to identify new technologies for under-utilized species and potential markets

- Increase awareness about cost-share, incentive, and tax break programs that provide economically viable options to promote sustainable forest and natural community management by private landowners in priority areas for water quality or habitat enhancement.

- Recognize outdoor recreation and tourism as economic priorities in the landscape.

- Hold annual stakeholder meetings to coordinate completed, ongoing, and planned activities.

- Encourage community and citizen group participation in resource management, monitoring, and restoration.

Section 2. Implementing the Plan

Effective implementation of this plan will take a combination of efforts by an assortment of organizations and individuals at a diversity of spatial and temporal scales. This section outlines the process used to select focal areas for the implementation of this plan called Conservation Opportunity Areas (COAs). It also highlights the wealth of government agencies, non-profit organizations, conservation groups, and stakeholders working in the watershed and their assorted plans. These partners and related conservation plans will be key to implementing the strategies outlined in Section 1. Additional information on implementation resources and funding opportunities can be found in Section 6.

Scaling Project Implementation

The potential strategies and techniques for protecting and managing natural communities and associated waterways are broad and varied. Options on private lands range from providing information and advice to interested landowners all the way to full fee title acquisition and management by a state or non-governmental conservation organization. The "Private Land Stewardship Implementation Tool Box" illustrates how many of these options fall along a spectrum from least to most costly and least to most permanent and beneficial.

Private Land Stewardship Implementation Tool Box

Range of Options

#1	#2	#3	#4	#5	#6	#7	#8
Technical Advice and Assistance	**Stewardship Plans**	**Cost Share Programs**	**Property Tax Programs**	**Construction Projects**	**Conservation Easements**	**Land Trades and Exchanges**	**Fee Title Acquisition**
– Information – Site Visits – Tree Sales – Equipment	– Forest – Agricultural – Grazing	– Federal – State – Local	– Credit – Deferral	– Wetland Restorations – Stream Bank Restoration – Floodplain Reconnection	– Donated – Purchased	– Public – Industrial	– Federal – State – Local

Costs and Benefits

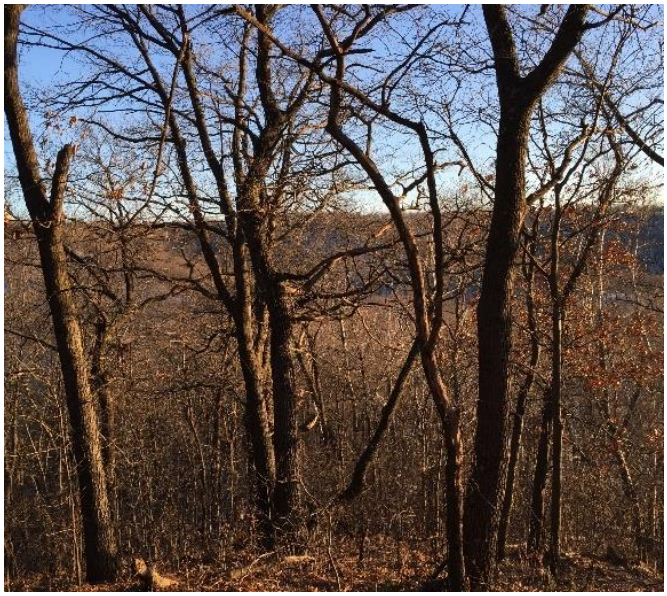
Generally…
- Lower cost
- Less permanent
- Fewer social benefits

Generally…
- Higher cost
- More permanent
- Greater social benefits

Adapted from the "PFM Implementation Tool Box: Foundation to Service Delivery to Private Woodland Owners" originally developed by Dan Steward, Minnesota Board of Water and Soil Resources

As the diagram suggests, services provided to landowners on the left tend to be less costly, but are also less permanent and less explicitly connected with societal benefits. In contrast, techniques listed further to the right side of the spectrum, while more costly, generally tend to be more permanent and produce more easily recognized benefits to society. While less permanent, the options on the left can be implemented at broader scales across the landscape, while the expense of the more permanent solutions requires them to be much more targeted. An efficient strategy recognizes that different options will be appropriate on different scales and in different places, depending on the human, economic, and natural communities involved. This is especially true in a landscape like the Zumbro River, where the majority of the land is privately owned.

Conservation Opportunity Areas



To help direct conservation efforts within the watershed in strategic and cost effective ways, several Conservation Opportunity Areas (COAs) have been identified to focus efforts on to have the greatest impact protecting habitat and water quality. In general, these areas have not been seriously degraded or developed, and support quality natural communities and habitat, but lack a significant amount of long-term protection or management planning. Landforms most closely connected to the rivers and streams are particularly important to protect and improve, as these areas will play a larger role in maintaining water quality in the watershed. Identification of these areas relied on a combination of data analysis and the firsthand knowledge of local natural resource professionals and stakeholders.

Overview- What to look for in a COA

Across a landscape, the quality of local areas in terms of habitat and ecosystem function is likely to be spread across a general continuum ranging from high-functioning intact ecosystems to heavily altered and degraded ones. In the most seriously degraded systems, their condition is practically irreversible, and mitigation of broader landscape impacts (e.g. pollution, energy use, water consumption) should be the focus of environmental policies. There will also be highly degraded areas for which restoration to functioning native plant community states could be possible, but would take unreasonably large investments. In the Zumbro River watershed, many areas of agricultural row crops fall into this category. When these lands exist in places of remarkable importance in the landscape, restoration efforts may be appropriate. Over a large scale, however, restoration is not practical, and efforts should focus on sustainable practices to maintain soil fertility and prevent pollution and erosion.

On the other end of the spectrum, high functioning ecosystems exist which have avoided serious degradation or alteration from human activities, and which are most commonly publicly managed and protected from future development or degradation. The historical reasons for their preservation can vary. In the Zumbro River watershed, such areas are often found on steep forested hillsides along the region's rivers and lakes which would have been impractical to plow, and where fire would not have been a crucial part of the disturbance regime prior to suppression.

After several waves of renewed national and state interest in conservation over the past century, many of these areas have been protected in some manner. Their impressive natural condition has made them preferred targets of conservation and enhancement activities, which has increased their overall quality relative to nearby areas. Continued protection and proper management is important to preserve these special areas. However, the added benefit to the overall ecology of the landscape of additional funding or enhancement efforts is likely to be less than work done in areas with more room for improvement.

Between these two extremes will be the areas for which routine conservation efforts will have the greatest impact on the landscape scale. Examples could include existing high quality habitat that is not sufficiently protected from development, areas where natural conditions have recovered from historical damage but important plant or animal populations have not yet returned, or areas that have not been degraded, but require additional management to maintain high levels of ecosystem function.

Prioritization Methodology

GIS analysis was used to determine priority areas for conservation focus within the Zumbro River Watershed. Several spatial data layers were used to quantify the water and habitat quality, and conservation assets, priorities, and threats that exist within each of the 39 HUC-12 sub-watersheds in the CRW. An analysis of development and agricultural conversion risk was also used to quantify which HUC-12s were most likely to experience habitat loss or water quality degradation.

Habitat and Water Quality:

These layers were selected to rate HUC12 sub-watersheds based on the presence and abundance of features likely to be a focus of multi-benefit protection efforts.

Data Set	**Scoring Method**
MBS Biodiversity Significance Rankings	A raster was created scoring cells of "Outstanding" biodiversity significance 4 points, "High" 3 points, "moderate" 2 points, and "Below" 1 point. All "No Data" areas were 0 points. The zonal mean for each HUC12 sub-watershed was calculated, and scores were standardized to 10 points by dividing each sub-watershed by the max score and multiplying by 10.
Public Ownership (GAP Stewardship 2008)	Total area of public and conservation land in each sub-watershed was calculated. Scores were standardized to 10 points as follows: Less than 500 acres = 2 points; 500-1,000 acres = 4 points, 1,000-1,500 acres = 7 points, more than 1,500 acres = 10 points. [selection of these thresholds was based on visual histogram analysis]
Stream Quality Thresholds	Monitoring stations reporting values within the Minnesota Pollution Control Agency's confidence interval of relevant water quality thresholds were given the following points: Above threshold, but within CI: 10 Points Below threshold, and within ½ of the CI: 4 points More than ½ the CI below threshold, within one CI: 2 points

EBI Habitat Quality Index	The zonal mean of each sub-watershed was calculated for the EBI Habitat Quality layer. Sub-watersheds were then classified into quintiles, with the top quintile receiving 10 points, the 2nd highest 8 points, the third highest 6, etc.
Perennial Cover in Critical Areas (EBI Water Quality; NLCD 2011)	Overlapped National Land Cover Database (NLCD) 2011 land cover data and the EBI Water Quality layer to pick out areas scoring over 60 in the EBI data for their impact on water quality that were mapped as having perennial landcover in the NLCD data. The total area in each HUC12 was calculated and standardized to 10 points.

The **Biodiversity Significance Rankings** from the Minnesota Biological Survey (MBS) provide categorical assessments of a sites importance in sustaining the natural biodiversity of Minnesota. A site's biodiversity significance rank is based on the presence of rare species populations, the size and condition of native plant communities within the site, and the landscape context of the site. Sites are ranked as either "Outstanding," "High," "Moderate," or "Below." (http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html)

The **GAP Stewardship 2008** data layer is a map of land ownership in Minnesota. Attributes are available for both ownership and administrator. It was used to determine what percentage of each minor watershed is under private ownership, not counting non-governmental conservation organizations. (http://www.mngeo.state.mn.us/chouse/land_own_general.html)

Minnesota Pollution Control Agency's (MPCA) **Index of Biological Integrity** assesses biological communities, specifically invertebrate or fish communities, to measure the health of those communities as they reflect the integrity of the stream ecosystem. Populations are sampled at monitoring stations along streams, and the community health is scored based on the relative tolerances of the organisms found. Different stream types have thresholds for acceptable quality, along with confidence intervals surrounding those thresholds. (https://www.pca.state.mn.us/water/index-biological-integrity)

The **EBI Habitat Quality Index** is one of three component parts of the Environmental Benefits Index (EBI) compiled by the MN Board of Water and Soil Resources (BWSR) and the University of Minnesota. It is developed using data from several datasets mapping habitat for biodiversity, game species, birds, and species of greatest conservation need. (http://www.bwsr.state.mn.us/ecological_ranking/)

The **EBI Water Quality Risk Index** is one of three component parts of the Environmental Benefits Index (EBI) compiled by the MN Board of Water and Soil Resources (BWSR) and the University of Minnesota. It uses an area's Stream Power Index (SPI) and its proximity to water to assess the likelihood of it contributing runoff from overland flow. (http://www.bwsr.state.mn.us/ecological_ranking/)

The **National Land Cover Database** was created through a cooperative project conducted by a partnership of federal agencies called the Multi-Resolution Land Characteristics (MRLC) Consortium. NLCD 2011 is the most up-to-date iteration of the National Land Cover Database and provides 30-meter resolution land cover for the entire country. (www.mrlc.gov)

Conversion Risk:

The **Agricultural Conversion Risk Layer** and **Development Risk Layer** were developed by Kristin Blann, Freshwater Ecologist for The Nature Conservancy. The Agricultural Conversion layer uses soil type, slope class, cover type, and distance from other agricultural land to determine the likelihood of a parcel or field being converted from perennial cover to row crops. The development risk layer predicts likelihood of conversion from perennial cover for development based on township growth projections and proximity to major roads. Both layers are raster data on a 1 to 100 scale. The zonal mean for each sub-watershed was standardized to a 10-point scale.

Watershed Health Assessment Framework (WHAF):

A subset of the layers available from the WHAF was also included in the analysis (all scores standardized to 10 points for each HUC12 for each of the main categories below):

The Watershed Health Assessment Framework was developed by the Minnesota DNR as a set of statewide metrics that measure various components of watershed health. HUC-12 sub-watersheds are ranked on 100-point scales on a number of criteria. A subset of those criteria was included in this analysis. The criteria used were separated by WHAF component, and the component scores for each sub-watershed were divided by 10, resulting in a 10-point scale.

Component	Scoring Method
Hydrology	○ Perennial cover index (2011) ○ Impervious cover index (2011) ○ Storage, straightened-meandering stream ratio index
Biology	○ Aquatic invertebrate IBI ○ Fish IBI ○ Mussel score
Connectivity	○ Riparian connectivity ○ Aquatic connectivity
Water Quality Metric	○ Non-point sources: phosphorous risk ○ Wastewater treatment plants ○ Superfund sites ○ Septic systems ○ Potential contaminants ○ Animal units

Analysis and Results

Final scores for each sub-watershed were calculated by taking the sum of the average component score within each scoring category (Protection Value, Conversion Risk, and WHAF Metrics). Since each component within the categories had a max score of 10, this resulted in combined scores for each HUC12 having a max of 30. Each sub-watershed was then ranked by percentile. Figure 2 shows the combined scores for each sub-watershed.

Based on those combined rankings, COAs were designated to capture contiguous, high scoring sub-watersheds that contained recognizable ecological complexes. COA boundaries were primarily based on sub-watersheds, with the edges expanded in places to fully capture ecologically significant natural communities (as mapped by either the Minnesota Biological

Survey's Biodiversity Significance layer or DNR Wildlife's Wildlife Action Network) that straddle a watershed divide. The final COA shapes are shown in Figure 3.

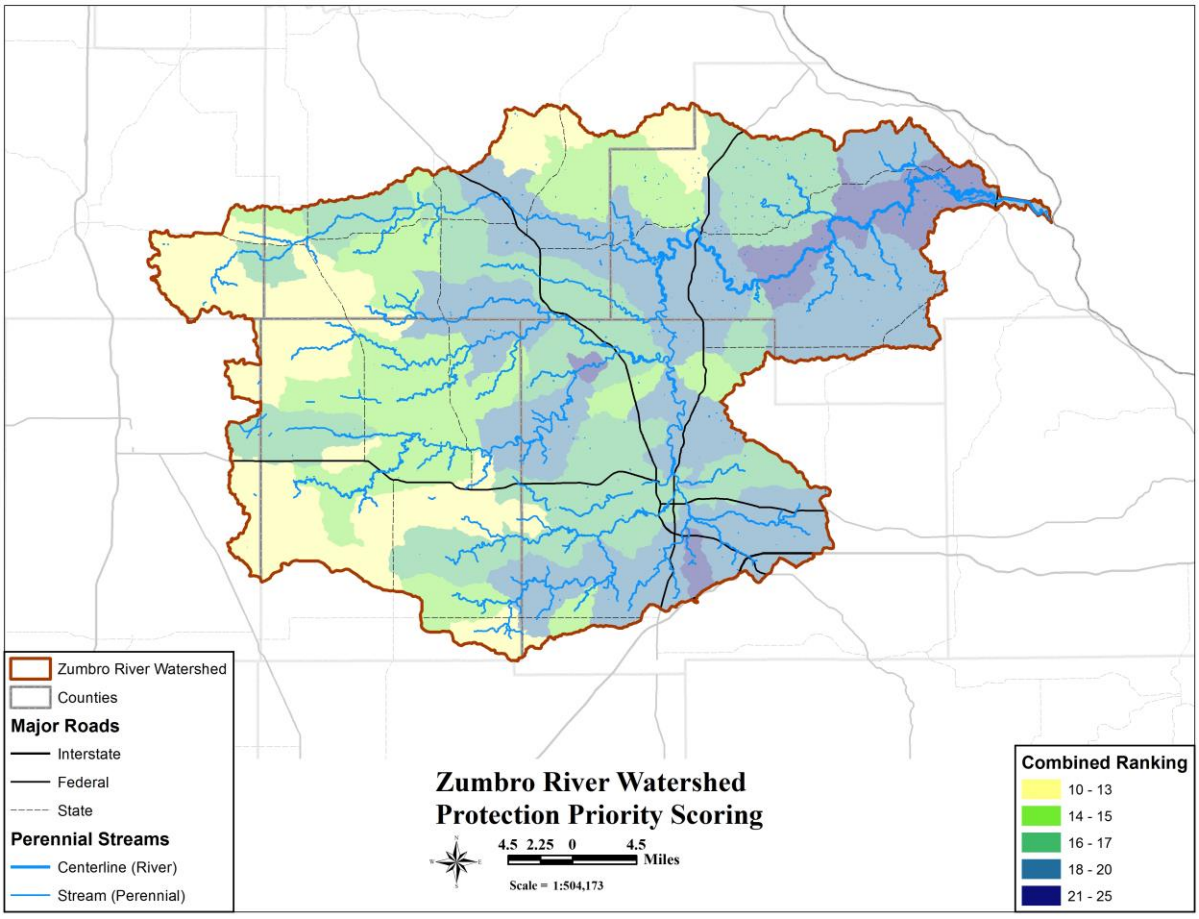


Figure 2. Combined priority ranking scores for the Zumbro River Watershed.

Selected Conservation Opportunity Areas

Seven COAs were selected in the Zumbro River Watershed based on the assessment information (Figure 3).

- The Zumbro Falls COA includes Lake Zumbro and the area around the small towns of Hammond, Mazeppa, and Zumbro Falls. This COA encompasses nearly 61,500 acres in the watersheds of Dry Run Creek, Lake Zumbro, Mazeppa Creek, North Fork of the Zumbro River, and the main stem of the Zumbro River after it merges with the North Fork. Topography in this area leads to a diversity of riparian areas and forested ecosystems that represent hotspots for biodiversity and water quality protection.

- The Lower Zumbro COA This nearly 60,000 acre COA includes forested bluffs, floodplain forests, and cold-water streams that have been identified as particularly important for regional biodiversity. The COA lies in the lowest reach of the watershed between Millville and Kellogg. In addition to the Zumbro main stem, the COA includes all or portions of the Trout Brook, Silver Spring Creek, Spring Creek, and the lowest reaches of West Albany Creek. Key public natural areas include several tracts of the Richard J. Dorer Memorial

Hardwood State Forest, most notably the Zumbro Bottoms unit. Public lands and acquisition strategies will have a larger role in this COA than the rest of the watershed.

- The Bluffland Tributaries COA contains a series of cold-water trout streams and forested bluffs that provide important habitat to a wide variety of plants and animals. Notable streams in this 49,640-acre COA are West Indian Creek, Long Creek, and Middle Creek. MN DNR's Blufflands/ Rochester Plateau Subsection Forest Resource Management Plan includes a High Biodiversity Site Plan for the West Indian Creek Watershed due to its importance to the biodiversity of the state.

- The Southern Headwaters COA consists of two separate units around the City of Rochester. These two areas are important areas for protecting the drinking water of Rochester and feature rare calcareous fens. The eastern unit occupies the US Highway 14 corridor east of Rochester near Chester Woods. The western unit extends southwest from Rochester along the South Fork of the Zumbro towards the town of Rock Dell. These two units encompass nearly 55,000 acres in the watersheds of Goose Creek, Bear Creek and the South Fork of the Zumbro. Much of this region has been converted to agriculture or residential development however; the remnants of the region's natural communities represent a conservation opportunity to build from.

- The Oxbow Park COA occupies nearly 26,000 acres along the South Branch of the Middle Fork of the Zumbro River with its most notable feature being Oxbow Park, a forested area outside Rochester that has been identified as having outstanding biodiversity significance. This stretch of river is also regarded as one of the best smallmouth bass fisheries in the state.

- The Rice Lake COA occupies 19,462 acres in a nearly entirely agricultural part of the Zumbro River watershed. The key feature of this COA is Rice Lake State Park at the headwaters of the South Branch of the Middle Fork of the Zumbro River. Rice Lake is one of the few natural lakes in the Zumbro River Watershed, conservation efforts in this area will focus on this lake, and agricultural best management practices in the surrounding landscape. This COAs position as a headwaters area for the Middle Fork makes it an especially important place to focus on water quality and hydrology.

- The Middle Fork COA (43,261 acres) contains a variety of biologically rich valleys that are almost entirely privately owned. The low proportion of public-land in this COA highlights the need to support private landowner stewardship in the maintenance of these natural areas and associated water quality.

These COAs represent places of emphasis for the conservation actions outlined in Section 1 of the plan. Individual stewardship plans for three of these areas (Zumbro Falls, Lower Zumbro-Bluffland Tributaries, and Southern Headwaters) are found in Section 7. These plans focus on specific resources and needs, as well as strategies that are appropriate to the different social resources and ownership patterns within each COA.

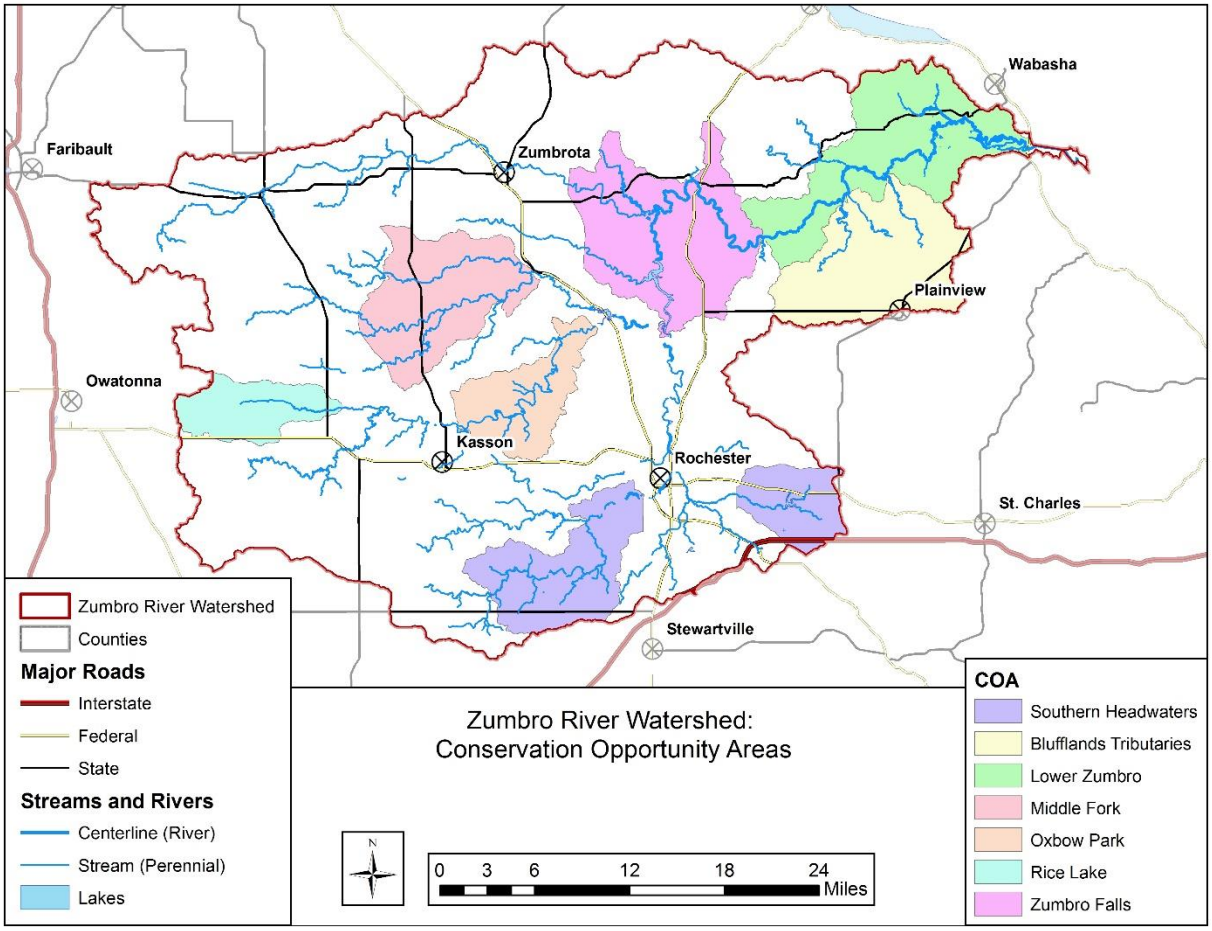


Figure 3. Conservation Opportunity Areas within the Zumbro River Watershed.

Partners and Partnerships

With the wealth of government agencies, non-profit organizations, conservation groups, and stakeholders working in the watershed, coordinating efforts can make efficient use of time and resources. Thus increasing the impact each group makes on the ecological health of the watershed. These coordination efforts are important across the entire watershed and within the focal COAs. Experience has taught us that focusing coordination for healthy lands and waters within, and between, these COAs often has higher viability and can be a crucial step in achieving buy-in for coordination efforts across the landscape.

Achieving the goals of this plan will require a wide variety of groups and agencies to provide seamless service to private landowners interested in managing their land, while also performing public land management in a manner and sequence that makes the biggest impact. All agencies involved should complement each other's efforts towards the common goal of implementing sustainable natural resource management.

Conservation and stewardship of natural communities, ecosystem health, and water quality require sustainable behaviors and attitudes from numerous private individuals and public agencies that affect economic, cultural, and recreational resources of the community. As such, it is an inherently collaborative effort. The potential partners for conservation in the Zumbro River watershed include a number of state and federal agencies, as well as non-governmental conservation groups. The adjacent list includes many, but not necessarily all, such partners:

State Agencies:
- Board of Water and Soil Resources
- DNR Ecological & Water Resources
- DNR Fish and Wildlife
- DNR Forestry
- DNR Parks and Trails
- MN Dept. of Agriculture
- MN Forest Resources Council
- MN Pollution Control Agency
- University of Minnesota

Local Government:
- County and City
- SE MN Water Resource Board
- Soil and Water Conservation Districts

Federal Agencies:
- Natural Resources Conservation Service
- U.S. Fish and Wildlife Service
- U.S. Forest Service

Non-governmental Organizations:
- Basin Alliance for the Lower Mississippi in Minnesota
- Zumbro Watershed Partnership
- Land Management Consultants
- Minnesota Land Trust
- Pheasants Forever
- The Nature Conservancy
- Trout Unlimited
- Trust for Public Land

Related Conservation Plans

Minnesota has a long history of taking this "landscape" approach to natural resource planning and this plan builds off efforts by the Minnesota Forest Resource's Council's Landscape Program and previous watershed based landscape stewardship plans developed for the Kettle, Root, Cannon, and Mississippi River – Winona watersheds. While there are many ways to divide a region into landscapes, using watersheds as the organizing feature emphasizes the link between natural resource management and water. It also parallels other state planning trends, such as the move to One Watershed One Plan (1W1P) plans to replace local water plans. Planning natural community stewardship by watersheds increases the value of Landscape Stewardship Plans as resources for other water planning exercises.

The list below highlights several conservation or development plans covering portions of the watershed whose goals or actions may overlap and influence conservation efforts outlined in this Landscape Stewardship Plan:

- MPCA Zumbro River Watershed Restoration and Protections Strategies (WRAPS)
- Potential One Watershed, One Plan efforts in the Zumbro Watershed
- Dodge, Goodhue, Olmsted, Rice, Steele, and Wabasha Counties' Comprehensive Plans and Water Management Plans
- City of Rochester Water and Development Plans
- MFRC Southeast Landscape Plan
- MN DNR Blufflands/Rochester Plateau Subsection Forest Resource Management Plan (SFRMP) and Extension
- MN DNR State Wildlife Action Plan, 2015-2025
- MN DNR Minnesota Scientific and Natural Areas (SNA) Program Strategic Land Protection Plan
- MN DNR Aquatic Management Area Acquisition Plan
- MN DNR Division of Fisheries Strategic Plan for Coldwater Resources Management in Southeast Minnesota
- Basin Alliance for the Lower Mississippi in Minnesota 2001 Basin Plan Scoping Document

Watershed Restoration and Protection Strategies (WRAPS)

This plan is intended to support the parallel efforts to develop a 2017 Zumbro River WRAPS Plan. The WRAPS plan was being developed concurrently with the development of the Landscape Stewardship Plan and should be referenced along with this plan for projects in the watershed. The WRAPS process occurs on a 10-year cycle for each HUC8 watershed in the state with the Zumbro River effort scheduled to conclude in 2017. Periods of elevated water quality monitoring lead to analysis of collected data to determine the stressors and impairments of watershed streams. That information is then incorporated into a table and document outlining the water quality issues facing the watershed and necessary strategies to both restore impaired areas and protect healthy areas. Data collected during this WRAPS process were used in the development of this plan, and it is intended that the objectives and strategies it lists will inform the protection strategies outlined in the WRAPS process.

One Watershed One Plan

Stakeholders began developing a One Watershed One Plan (1W1P) for the neighboring Cannon River Watershed while the Zumbro River Landscape Stewardship Plan was being developed. There is no definitive timeline for undertaking a similar effort in the Zumbro River; however, it will likely happen in the coming years. The vision of the 1W1P program is to align local water planning on major watershed boundaries with state strategies towards prioritized, targeted and measurable implementation plans. The Cannon was one of the first watersheds in the state to go through this Minnesota Board of Water and Soil Resources (BWSR) coordinated process. This watershed focused approach to local government water management implementation plans helped lead the Landscape Stewardship Plan to base its boundaries on the watershed and it is intended that any future 1W1P efforts in the Zumbro can inform, and be informed by, efforts outlined in the Landscape Stewardship Plan.

Zumbro Watershed Partnership

The Zumbro Watershed Partnership (ZWP) is a member-based, nonprofit organization dedicated to creating a watershed where everyone can swim and fish in the rivers and drink clean water from the wells. The organization focuses on educating the public about how they can take care of water resources by making better choices at home and work. Demonstrating how to slow the flow of water and prevent pollution. Implementing on-the-ground projects to protect our water, stimulating data sharing and project coordination in the watershed, and inspiring residents to clean and protect area lakes and rivers. A 25-member Board of Directors governs the Zumbro Watershed Partnership. Twelve members are public officials (six county commissioners and six Soil and Water Conservation District Supervisors from the six counties of the watershed) and thirteen are citizen members.

ZWP will be a valuable partner in efforts moving forward, for both their outreach and educational capacity and their ability to convene important stakeholders in the watershed. Additionally they have a diversity of plans, reports, and publications that will be useful in any future efforts in the watershed.

Minnesota Forest Resources Council Southeast Landscape Plan

The MFRC Landscape Program fulfills the MFRC's charge to "encourage cooperation and collaboration between public and private sectors in the management of the state's forest resources." This grass-roots effort builds relationships, strengthens partnerships, and identifies collaborative forest management projects that address local needs and represent concrete steps in determining and reaching citizen-identified short-term and long-term goals for broad landscape regions. Committee members represent forest industry, natural resource agencies, individual landowners, non-profit organizations, educational institutions and concerned citizens. The Southeast Landscape Committee completed a revised landscape plan, Southeast Landscape Plan: A Regional Plan to Guide Sustainable Forest Management, in November 2014.

Future Plan and Policy Integration

Land and water resources can be directly impacted by management plans and policies that govern land use, economic development, transportation, utilities, water resources, forest resources and other natural resources. To better influence future policy and minimize issues, partners and key stakeholders must be aware of existing and proposed plans and policies and how they may impact natural resources stewardship planning efforts. They must also be engaged early in policy discussions to integrate sustainable resource management into the planning process. Landscape stewardship can provide reliable and relevant information for local officials to help define the context and value of natural resources in a community.

Section 3. Action Plan Template

The purpose of this section is to outline steps that would be required to accomplish the vision outlined in Section 1 of the plan. This section delineates a generalized action plan for those items that call for measurable on-the-ground actions to be taken in the watershed with targets for the levels of action to be taken after five and ten years. These targets are based off information on what is currently happening in the landscape, and what may be possible under a realistic growth scenario. Targets are listed either as 5- or 10-year totals or as annual averages for the first five years and second five years. These general targets set measureable goals for the landscape with the caveat that individuals and organizations will set their own targets that, when combined, will move the entire landscape towards these targets. No one entity will be responsible for attaining all of these targets. With any effort, there is year-to-year variability and annual values are expected to fluctuate.

Other strategies are not as conducive to measureable targets but are no less important to achieving the landscape vision. Many of these will be implemented through structures of collaboration and data management that are not listed in this table. Additionally, several strategies refer to social or legislative changes for which measurable actions are not immediately apparent, but which the plan nevertheless wishes to endorse as positive directions for the future health of native communities and water quality in the region.

Strategy to Achieve the Landscape Vision	5-Year Target	10-Year Target
Utilize prescribed fire as a tool in management and restoration.	600 acres of natural areas burned annually	600 acres of natural areas burned annually
Increase forest cover through site and climate appropriate plantings.	1,000 new acres of forestland	2,000 new acres of forestland
	70,000 seedlings sold by SWCDs annually	70,000 seedlings sold by SWCDs annually
Control invasive species through management, monitoring, and outreach.	2,000 acres treated	5,000 acres treated
Pursue opportunities for increased protection through conservation easements and public acquisition in strategically important areas.	600 acres acquired	1,500 acres acquired
Protection of karst features and other key water resource areas. Focus these efforts through installation of native plant community buffers to reduce pollutant run-off entering groundwater.	80% of karst features protected with appropriate buffers	100% of karst features protected with appropriate buffers

Identify opportunities to work with landowners to increase habitat corridors and connectivity. Focus efforts on landowners around publicly owned natural areas to ensure greater connectivity of native plant communities into a larger matrix of well-managed private forest and grasslands.	100 landowners contacted	200 landowners contacted
Encourage landowner participation in programs that promote the restoration and maintenance of native habitats. Increase CRP acreage availability and landowner enrollment.	3,000 acres added to conservation programs	9,000 acres added to conservation programs
Promote consulting businesses who have local forestry and natural community knowledge that can develop forest management plans for landowners	75 new stewardship plans	150 new stewardship plans
Work with area producers to expand the use of rotational or conservation grazing. Encourage the addition of sustainably grazed perennial cover on the upslope woodlands to reduce the rate at which overland flow reaches wooded ravines.	500 new acres of conservation grazing	3,000 new acres of conservation grazing
Identify areas and funding for engineering projects such as wetland restorations and farm pond improvements that will improve the region's water quality and groundwater recharge.	30 new projects implemented	60 new projects implemented
Identify areas and funding for engineering projects such as water and sediment basins at the wooded bluff edge to reduce ravine head cutting.	10 new projects implemented	20 new projects implemented
Identify areas and funding for engineering projects such as stream bank restoration.	10 new miles of streambank stabilization	20 new miles of streambank stabilization
Encourage producers to implement best management practices to improve soil health and reduce runoff	BMPs implemented on 5,000 new acres in COAs through programs like EQIP	BMPs implemented on 10,000 new acres in COAs through programs like EQIP
Use outreach and education to foster a 'land ethic' among land managers, landowners, community and citizen groups, and local communities	3 outreach events per year	3 outreach events per year

Agency and Organization Recommendations

Outreach and Community Engagement Organizations

Examples: Zumbro Watershed Partnership, SWCDs, U of M Extension

1. Host General and Targeted Outreach Events. The majority of landowners and the public value healthy natural communities, but may not be informed about the full benefits they provide to society, or the ways they can help protect and enhance them. Educating landowners on sustainable forest management, invasive species control methods, and best management practices for forestry and agriculture can help them take measures to protect and enhance the ecological health of their property. Informing the broader public on the value of natural communities, and ways to prevent the spread of invasive species can also be helpful.

2. Natural Area Management Techniques. Develop online content and host events showcasing natural area management techniques. Often landowners would like to undertake land stewardship projects but often lack the confidence to do them or awareness of the best techniques. Information on vegetation selection, planting techniques, and ways to limit herbivore damage are topics to consider.

3. Connections with Elected Officials. Encourage the connection of elected officials with their constituent groups through education programs. Promote and support sustainable resource education programs that connect informed citizens with elected officials.

Technical and Financial Assistance Organizations

Examples: SWCDs, Private Consultants, DNR Forestry, NRCS, FSA, BWSR

1. One-on-one Technical Assistance. The adoption of sustainable natural area practices and best management practices are improved when landowners are provided with technical assistance needed to properly implement them. This can be done directly by professionals within agencies, such as DNR Forestry and SWCDs, or through local consultants and contractors with the necessary skills.

2. Financial Assistance. Incentive programs provide technical and financial assistance that is designed to help achieve goals and policies established by Federal, State, and local agencies. Incentive programs have long been the foundation for promoting land stewardship among landowners. Examples include the EQIP program from NRCS and CRP from FSA. BWSR also provides financial assistance programs through local SWCDs. These and other financial assistance programs should be maintained or expanded.

3. Increase Awareness of Technical Assistance Options. Many landowners may not be aware of the numerous programs and resources to help them with their land stewardship. Increased advertising and awareness should increase the utilization of the great services offered by consultants, agencies, and non-profit organizations.

Natural Resource Agencies

Examples: DNR Fish and Wildlife, DNR Forestry, US Fish and Wildlife Service, County Land Departments

1. Commitment to Sustainable Natural Resources Management. Many private landowners will look to public lands as a model for land management, and when done well, management on these lands often provides a tremendous effect on regional biodiversity and water quality. Natural Resource Agencies should be aware of this and undertake efforts to expand prescribed burning, invasive species control, sustainable silviculture, and other activates that will benefit local biodiversity and water quality as well as serving as a model for private landowners.

2. Service to Landowners. Continue to improve the delivery of technical and financial assistance on forest and prairie management to private landowners. Continue to promote native plant communities using the Ecological Classification System (ECS) as a guide to developing land management strategies when working with landowners and local officials. Refer to this Landscape Plan and its COA Plans.

3. Important and Critical Areas. Continue to identify and protect important or critical ecological areas in the landscape, particularly focused within the COAs, though conservation easements or strategic acquisition. Put an emphasis on NPCs, identified biodiversity sites, and impacts on water quality in these areas.

4. Public Investments. Local, State, and Federal investments are made in all communities on a regular basis. Public investments are made to construct public facilities and support public lands, but their location and operation across the watershed can significantly impact, positively or negatively, private land use decisions. Roads, bridges, and waterways support public good but also encourage and support private investment. Partners and stakeholders concerned about conserving natural communities should consider strategies that help shape relevant decision-making processes related to public investments.

5. Data Gathering. Support the collection, organization and evaluation of data collected relating to natural resources at the local level on private lands. Encourage the coordination and sharing of data with other resource agencies and local officials.

6. Fund Restoration Projects. Natural resource management is a long-term commitment and requires long term funding to reach the desired future conditions. Contribute staff time or direct funding to support projects.

Board of Water and Soil Resources

1. Support healthy watershed protection easements in Southeast Minnesota. Healthy Watershed RIM easement programs are being piloted in other areas of Minnesota. Similar programs targeting managed grassland and forestland on key landforms in the Southeast would be a powerful tool to help protect both water quality and existing native plant communities. One possible example would be a CREP style arrangement providing CRP payments for 10 years and placing a permanent RIM easement on highly erodible or moderately steep cropland converted to grassland that slopes towards hillside forest communities.

Clean Water Fund Advisory Council

1. Healthy Forests for Healthy Waters. Continue to support programs that target natural community protection for water quality benefits. The Healthy Forests for Healthy Waters (HFHW) program managed by DNR Forestry's CFM program provides a good example. These programs enable stewardship specifically targeted for multiple benefits on the landscape.

Conservation and Non-governmental Organizations

Examples: The Nature Conservancy, Minnesota Land Trust, Pheasants Forever, Trust for Public Land

1. Commitment to Sustainable Natural Resources Management. Many private landowners will look to public lands as a model for land management, and when done well, management on these lands often provides a tremendous effect on regional biodiversity and water quality. Conservation Organizations should be aware of this and undertake efforts to expand prescribed burning, invasive species control, sustainable silviculture, and other activates that will benefit local biodiversity and water quality as well as serving as a model for private landowners.

2. Important and Critical Areas. Continue to identify and protect important or critical ecological areas in the landscape, particularly focused within the COAs, though conservation easements or strategic acquisition. Put an emphasis on NPCs, identified biodiversity sites, and impacts on water quality in these areas.

3. Reference Document. Conservation groups and NGOs are encouraged to use this Plan as a reference document when developing their plans and strategies.

4. Collaboration. Encourage the partnering of conservation and non-governmental organizations to address major resource management issues.

5. Fund Restoration Projects. Natural resource management is a long-term commitment and requires long term funding to reach the desired future conditions. Contribute staff time or direct funding to support projects.

6. Connections. Connect members and citizens with resources on sustainable natural resource management topics.

Local Officials

1. Reference Document. Local officials are strongly encouraged to use this Plan as a reference document when developing their resource management plans including county water plans, local land use plans, and state resource plans. They are further encouraged to adopt this landscape stewardship plan as an appendix to their plans to provide more detailed guidance on sustainable natural resource management and support more proactive and collaborative funding development.

2. Consider Forests, Prairies and Riparian Areas in Local Land Use Decisions. Local officials are encouraged to consider the values and benefits that natural areas can bring to their communities. Healthy and sustainable forests and prairies promote a high quality of life for citizens and can support increased economic opportunities as well. Forests, prairies, and streams should be included in the land use decision making process.

3. Resource-Based Planning. Local officials are encouraged to incorporate a more comprehensive consideration of natural resources into their land use planning process.

4. Alternative Development Options. There are alternative ways that land can be developed to provide for both economic growth and the protection of natural resources. Local officials are encouraged to use forestry as a way to improve their communities and their future development. Zoning should take into account impacts on natural areas and water quality.

DNR Forestry Cooperative Forest Management Program

1. Local CFM Foresters. Maintain support and funding for local CFM foresters. Continue to provide cost share services to private landowners for appropriate forestry activities. Direct local CFM foresters to engage in direct outreach with key landowners in COAs identified in this plan.

2. Target Cost Share Funding. Place priority on funding cost share programs targeted to strategic locations within watersheds, including the COAs identified in this plan. Emphasize funding for activities that will maximize the multiple benefits of forests.

Minnesota Forest Resources Council

1. Convening Body. Serve as a convening body for data and accomplishment sharing though the Southeast Landscape Committee. Support the increased sharing of ideas and experiences between the individuals and organizations involved with implementing the plan. Provide updates on sustainable natural resource management activities taking place with other watersheds.

2. Staff Support to the SE Committee. Provide additional staff support to the efforts of the Southeast Committee that can help in the ongoing implementation of this plan and coordination of its recommended activities.

3. PFM Funding. Find ways to increase funding support for the private forest management program administered by the DNR to serve more landowners.

Forestry and Natural Area Consultants

1. Reference Document. Private land consultants are encouraged to use this plan as a reference document when developing Forest Stewardship Plans and other landowner materials. Reference the connection between the actions landowners take on their land and the larger landscape in written and verbal communication with clients.

2. Engage with Public Land Managers. Stay connected with public land managers and see if there are cross-boundary projects that can benefit public and private landowners while moving towards the overall landscape vision.

Private Landowners

1. Become Informed. The organizations mentioned in this document have numerous programs and resources to help landowners become more informed about sustainable forestry and the benefits of forests and natural areas to our communities. All landowners are encouraged to become more knowledgeable about natural resources. Learning about best management practices (BMPs) is one easy way to get started. Recognize that forestry and natural area management is a long-term endeavor and that changes on the land will generally take several years to become realized.

2. Seek Technical Assistance. While there are numerous sources of information available, landowners are encouraged to seek technical assistance to help manage their forestlands. Often a landowner may need assistance from many technical service providers.

3. Get Involved. All citizens and landowners are encouraged to get involved in their communities and help promote sustainable forestry and natural area management. Voicing your concerns and sharing your ideas will help generate many new opportunities to improve forests, waters, and the quality of life in the region.

Section 4. Monitoring and Evaluation

The purpose of this section is to provide an initial outline for monitoring and evaluating the implementation of this Plan over the next ten to twenty years. The Southeast Landscape Committee will work with partner agencies and conservation organizations to develop this monitoring program. They will periodically review progress made towards the implementation of this plan based on information provided by partners in the watershed and report their findings to the Minnesota Forest Resources Council.

Overview

A critical portion of any management plan is the effort to monitor what has been accomplished as well as evaluate the effectiveness of the project's approach to natural area stewardship over time. The effects of plan implementation on ecological, economic, and social goals should all be tracked in an iterative process of assessing/identifying problems and recommending a series of solutions. Monitoring effects and adapting recommendations accordingly allows a plan to remain relevant in responding to the changes in landscape condition, scientific knowledge, and social needs over time.

The monitoring framework of this plan is based on the Desired Future Conditions and Strategies outlined in Section 1. Short-term efforts will focus on the strategies, and these will provide the basis for monitoring success in implementing the plan. Long-term monitoring will focus on how effective implemented plan projects are at bringing the condition of the watershed close to meeting the overall Desired Future Conditions.

Short-Term: Monitor Performance and Evaluate Process

Annual monitoring should focus on rates of implementation for recommended programs and actions. Different measurements and criteria will be appropriate for different activities. For some activities, especially those focused on creating data management networks or building community engagement, narrative descriptions will be the best reporting method. Management or restoration activities are best measured by acres affected or landowners assisted. The Southeast Landscape Committee will coordinate the tracking of annual results for each strategy. A sample of a few metrics is included in the table below.

Strategy to Achieve the Landscape Vision	Metric
Utilize prescribed fire as a tool in management and restoration.	Acres burned
Increase forest cover and forest health through sustainable forest management practices and site and climate appropriate plantings.	Trees planted
Control invasive species through management, monitoring, and outreach.	Acres treated

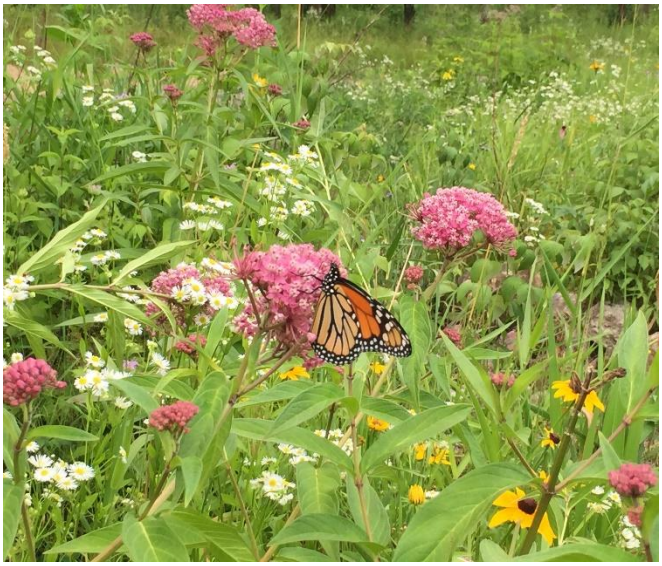
Pursue opportunities for increased protection through conservation easements and public acquisition in strategically important areas.	Acres acquired, Easements added
Protection of karst features and other key water resource areas. Focus these efforts through installation of native plant community buffers to reduce pollutant run-off entering groundwater.	Percent of karst features with adequate vegetation buffers
Identify opportunities to work with landowners to increase habitat corridors and connectivity. Focus efforts on landowners around publicly owned natural areas to ensure greater connectivity of native plant communities into a larger matrix of well-managed private forest and grasslands.	Landowners contacted
Encourage landowner participation in programs that promote the restoration and maintenance of native habitats. Increase CRP acreage availability and landowner enrollment.	Acres added to conservation programs
Promote local consulting businesses who meet CEU requirements and have local forest resource knowledge to develop forest management plans for local landowners	Number of new stewardship plans
Work with area producers to expand the use of low-intensity conservation grazing. Encourage the addition of lightly grazed perennial cover on the upslope woodlands to reduce the rate at which overland flow reaches wooded ravines.	Acres of conservation grazing
Identify areas and funding for engineering projects such as wetland restorations, sediment basins, farm pond improvements, stream bank restorations, grassed waterways, and floodplain reconnections that will improve the region's water quality and groundwater recharge.	Number of new projects implemented and miles of streambank stabilized
Encourage producers to implement best management practices to improve soil health and reduce runoff	Acres added to EQIP BMPs
Use outreach and education to foster a 'land ethic' among land managers, landowners, community and citizen groups, and local communities	Number of outreach events and number of attendees

Long-Term: Assess Results and Evaluate Effectiveness

As the strategies outlined in this plan are being implemented, periodic assessment of the progress toward the long-term vision for the watershed is also necessary. At least twice during the intended 10-year life of this plan, the Southeast Landscape Committee should convene regional stakeholders to discuss the state of the watershed relative to those desired future conditions, and determine what progress has been made, and what improvements could be made to the plan strategies or their implementation. Below are a few initial assessment questions. The committee will want to add to and refine these questions as well as evaluate whether the data necessary to assess watershed conditions are being collected; and if not, what additional data are needed? All of this information will be useful in determining what can be done to improve this plan, and conservation efforts overall within the watershed.

Desired Future Condition	Assessment Questions:
High quality streams and healthy groundwater resources	Is surface water quality improving or degrading? Is groundwater quality improving or degrading?
Populations of rare and threatened species are stabilized and increasing	What is the status of species and communities of concern within the watershed?
Streams that have rehabilitated banks and native floodplain vegetation	What is the status of floodplain forests? Have 50-foot stream buffers been applied to all streams in the watershed?
Adequately buffered karst features including springs, fens, sinkholes and the Decorah Edge	Are policies in place to protect these important areas to biodiversity and water quality? What is the overall state of buffering and protection?
Large habitat buffers and corridors around and between core biodiversity areas	How has connectivity of natural communities improved across the watershed
Fire is used as a management tool in appropriate ecosystems	To what degree is fire being utilized in the watershed?
Consistent funding for cost share assistance associated with various landowner activities such as invasive species control and native plant community restoration	Are landowners receiving the financial support they need to implement conservation activities?
A more robust hardwood timber market supporting sustainable private timber management	Have markets in the area improved? Are landowners able to sell the wood they have grown? What new industries have become established?
Improved landowner education	How has landowner engagement changed or improved? Do landowners have access to necessary information, and do they know where to get it? How are we tracking landowner involvement and reaching out to those with interest in conservation?
Active comprehensive conservation planning on priority sites	How has collaboration improved between agencies and stakeholders within the watershed? How has communication and collaboration helped make conservation efforts more effective? How has the identification of priority areas improved conservation planning?
Regional land use plans recognize and protect rare features	Are rare features being protected in the watershed? How has the approach to protecting these rare features changed?

Section 5. Landscape Context



This southeastern Minnesota watershed has seen significant change in the last 150 years. Today, sixty-five percent of the watershed has been converted to row-crop agriculture or residential/urban development and many of the remaining forests, wetlands, and prairies have been degraded in some fashion. Yet, the watershed retains relatively high water quality and areas of outstanding biodiversity significance that warrant special protection, maintenance, and restoration to sustain their function on the landscape.

This section provides an overview of the ecological, geological, and social aspects of the watershed. The information included here is intended to be a contextual starting point for interpreting the landscape but plan users are encouraged to also refer to other regional plans and reports for a more detailed exploration of this material.

Ecological Setting

The Ecological Classification System (ECS) developed by the Minnesota DNR provides a system for classifying plant communities in the state, as well as broad geographic ranges for those communities. It recognizes ecological regions at three nested scales: Provinces, Sections, and Subsections. The Zumbro River Watershed lies entirely with in the Eastern Broadleaf Forest Province and contains portions of the Minnesota and NE Iowa Morainal (MIM) and the Paleozoic Plateau sections (Figure 4). All of the MIM area in the watershed is considered part of the Oak Savanna subsection while the Paleozoic Plateau contains both the Rochester Plateau and the Blufflands subsections.

Oak Savanna (MIM): (Adapted from: http://www.dnr.state.mn.us/ecs/222Me/index.html)

The Oak Savanna subsection lies on a rolling loess plain over bedrock or till. The hydrology is relatively mature, with the few lakes in the subsection occupying end moraines that extend from the Big Woods subsection to the north, but are generally smaller. Fire has been the dominant disturbance, with landforms that disrupted prairie fires from the South, West, and East, but not enough to allow the development of mature forest. As a result, prior to Euro-American settlement, bur oak savanna was the primary vegetation, with areas of tallgrass prairie and maple-basswood forest also common. Today most of the area is farmed, though urban development is accelerating along the northern boundary.

Rochester Plateau: (Adapted from: http://www.dnr.state.mn.us/ecs/222Lf/index.html)

The Rochester Plateau subsection is a level to gently rolling plateau of bedrock overlain by loess in the east and pre-Wisconsin age glacial till in the central and west. Tallgrass prairie and bur oak savanna were the major pre-settlement vegetative communities. Presently the majority of the unit is heavily farmed. Before its suppression, fire was an important component of the disturbance regime. Tornados and ice storms also had local impacts on forested communities.

The Blufflands: (Adapted from: http://www.dnr.state.mn.us/ecs/222Lc/index.html)

The Blufflands subsection is a transition area between the Rochester Plateau and the Mississippi River. The loess-covered Plateau is deeply dissected by dendritic stream networks that cut down through bedrock on their way to the Mississippi River, forming bluffs and deep stream valleys. Pre-settlement vegetation varied by landform. On ridge-tops and dry upper slopes, burr oak savanna and tallgrass prairie were major vegetation types. Moister slopes supported Red oak-white oak-shagbark hickory-basswood forests, and red oak-basswood-black walnut forests occupied protected valleys. Presently, roughly 30% of the Blufflands is cropped, 20% is in pasture, and 50% is woodland.

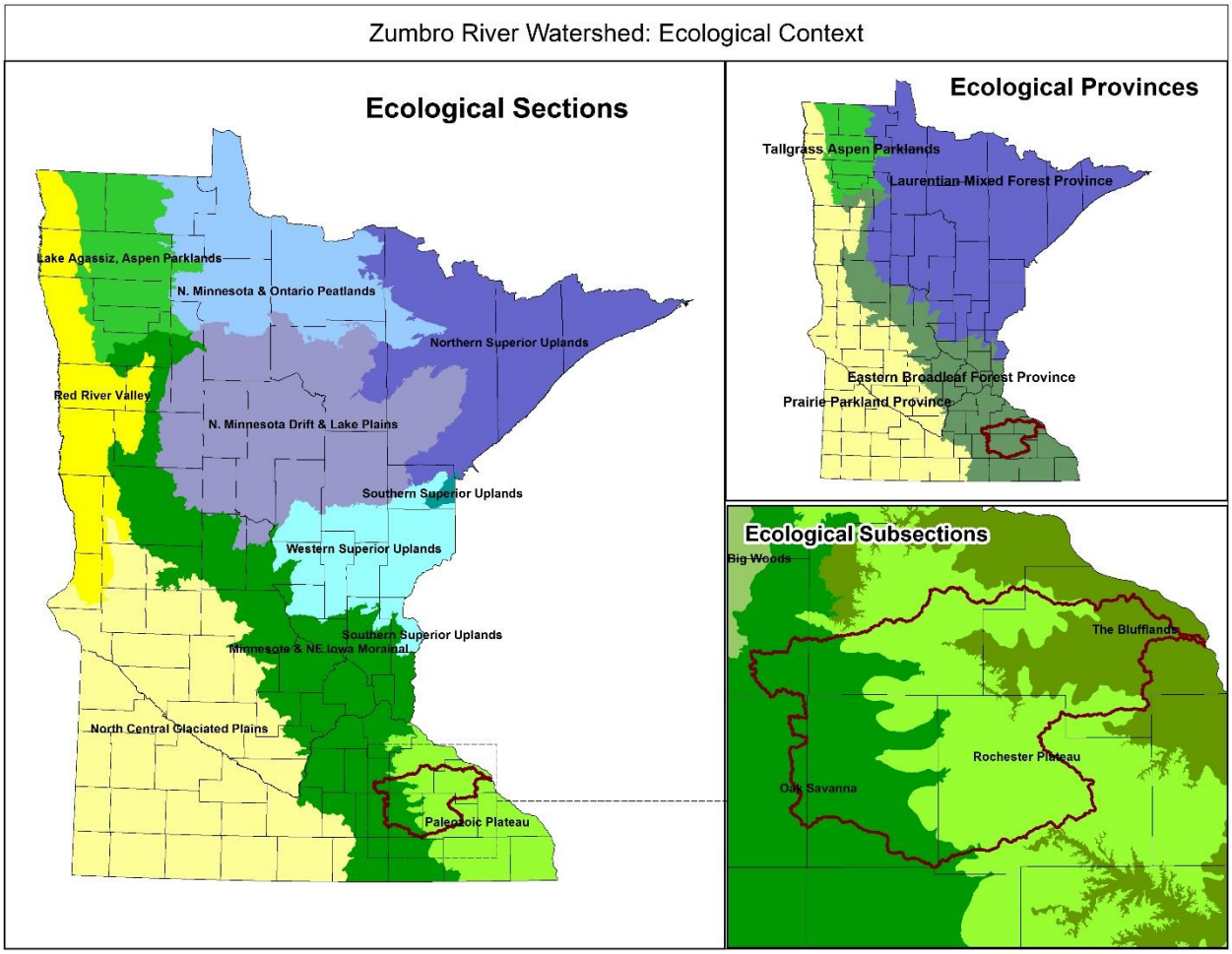


Figure 4. The Zumbro River Watershed lies in two sections of the Eastern Broadleaf Forest Province: the Minnesota and NE Iowa Morainal (MIM) and Paleozoic Plateau. All of the MIM in the watershed is part of the Oak Savanna subsection while the Paleozoic Plateau contains both the Rochester Plateau and the Blufflands subsections.

Hydrology

The Zumbro River Watershed is large and diverse, with hydrological characteristics that vary across the watershed (Figure 5 and Figure 6). In describing the watershed, it is helpful to break it into sections, or lobes, with roughly similar characteristics. The watershed has five primary lobes: South Fork, Middle Fork, North Fork, Lake Zumbro, and Lower Zumbro.

- The South Fork of the Zumbro River flows east and then north through Rochester to the point at which it meets the Middle Fork near Lake Zumbro. This lobe is dominated by the city of Rochester and accounts for approximately one quarter of the Zumbro River watershed (232,574 acres; 26% of total drainage). Cascade Creek, Salem Creek and Bear Creek are significant tributaries in this lobe.

- The Middle Fork of the Zumbro River encompasses much of the western part of the basin. Three branches of this fork converge in Oronoco at the former Lake Shady and join the South Fork near the south end of Lake Zumbro. The Middle Fork is the largest general lobe of the watershed (277,816 acres; 31% of total drainage) and contains several cities, including Pine Island, Oronoco, Dodge Center and Mantorville.

- The North Fork of the Zumbro River is the smallest of the three forks (153,149 acres; 17% of total drainage). This fork merges with Mazeppa Creek just before it joins the main stem of the river downstream of Lake Zumbro. The North Fork flows through the cities of Kenyon, Wanamingo, Zumbrota and Mazeppa.

- The Lake Zumbro Immediate Watershed includes the smallest area of land (34,881 acres; 4% of total drainage) that drains directly to the lake and its tailwater. This land is situated downstream of the confluence of South and Middle Forks and upstream of the confluence of the North Fork. Pine Island Creek flows directly into Lake Zumbro from the west and is the only large, named stream in this lobe.

- The Lower Zumbro River starts at the confluence of the three forks of the Zumbro River, and ends where the river joins the Mississippi. It includes 211,903 acres (23% of total drainage), but does not contain any large cities. In this lobe the River descends through the steeper and more dissected topography of the blufflands, where spring fed coldwater streams such as Cold Spring Brook and West Indian Creek feed into the river before it meets the Mississippi.

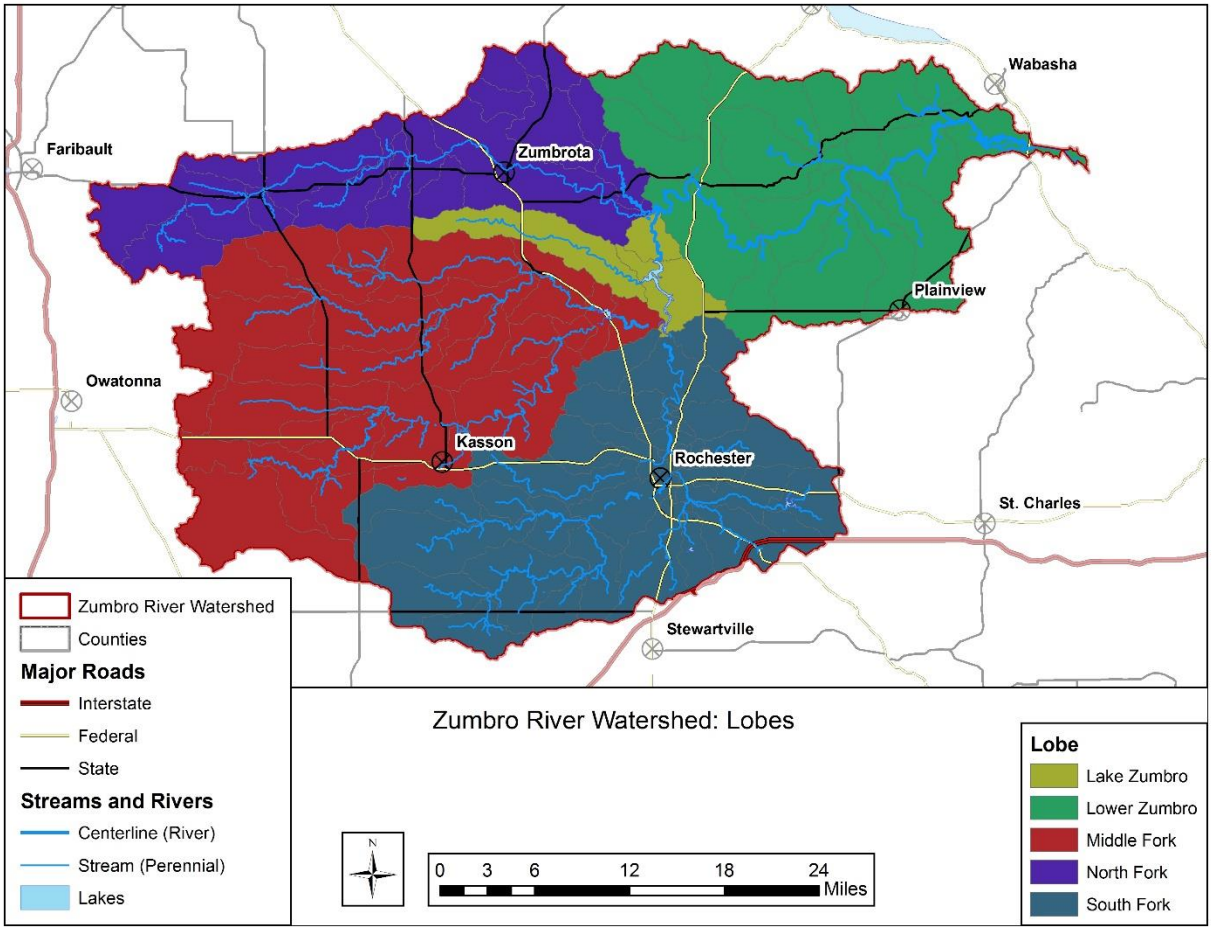


Figure 5. Stream network and lobes of the Zumbro River Watershed.

The Active River Area conservation framework provides a conceptual and spatially explicit basis for the assessment, protection, management, and restoration of freshwater and riparian ecosystems (Figure 6). The active river area framework is based upon dominant processes and disturbance regimes to identify areas within which important physical and ecological processes of the river or stream occur (*Active River Area (ARA) Three-Stream Class (3SC) Toolbox Documentation*, 2011, Analie Barnett, TNC Eastern Division). It defines wet flat zones, base riparian areas, and material contribution zones for streams from small first order perennial to large rivers. It provides a method of identifying the historically active floodplain, where meander belts, closed oxbows, and other floodplain features are likely to be found. It also identifies flat areas where water is likely to accumulate, presenting opportunities for wetland restoration or other practices to increase storage and mitigate flooding.

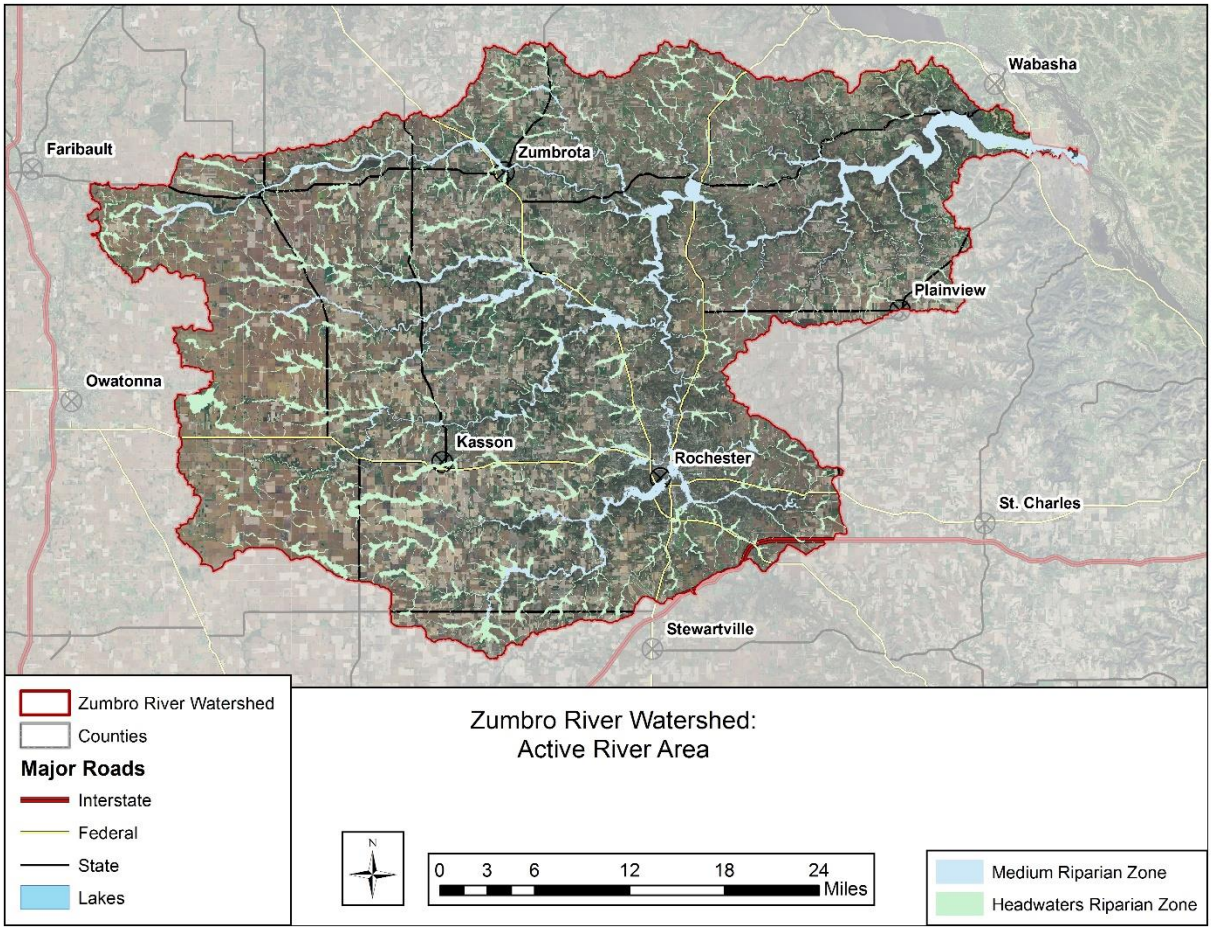


Figure 6. Active River Area analysis showing areas of historical river interaction which includes the historic floodplain and meander belt.

Geology and Soils

The geology of the Zumbro River Watershed varies from the largely flat landscape of the headwaters to the steep valleys where it meets the Mississippi. Major landforms in the western part of the watershed include lake plains, outwash plains, end and ground moraines, and drumlin fields, all remnant landscapes of past glacial activities and the melt water drainage associated with it. The eastern half of the watershed is included in what is called the —driftless area. This portion of the watershed contains much older glacial deposits, and well-weathered and eroded landscapes featuring many areas of exposed karst bedrock. Landforms common to this area are steep bluffs overlooking deep river valleys, sinkholes, caverns and cold-water spring-fed streams. Soils of the region include Alfisol, Entisol, Histosol or Mollisol orders, which lead to variation in the overlying vegetation.

The Zumbro River Watershed exists primarily in two major geological areas (Figure 7):

- *Eastern Iowa and Minnesota Till Prairies.* A mix of glacial till and outwash deposits with clay, silt, sand, and gravel characterizes this geological area in the western half of the watershed around Dodge Center, Byron, and Kenyon. Karst features exist in this area with shallow depth of soils and glacial material covering limestone. Soils range from well drained to very poorly drained.

- *Northern Mississippi Valley Loess Hills.* The eastern half of the watershed is considered part of the "Driftless Area" because the area underwent limited landscape formation by glacial ice. The resulting landscape is mostly gently sloping to rolling summits that create scenic landscapes of deep valleys, abundant rock outcrops, high bluffs, caves, crevices, and sinkholes. Limestone and sandstone outcrops are observed along some streams and rivers in the area. Loess deposits cover bedrock in many areas. Some karst areas exist where carbonate rocks are near the surface. Soils are generally moderately deep to very deep, loamy, and well drained to moderately well drained.

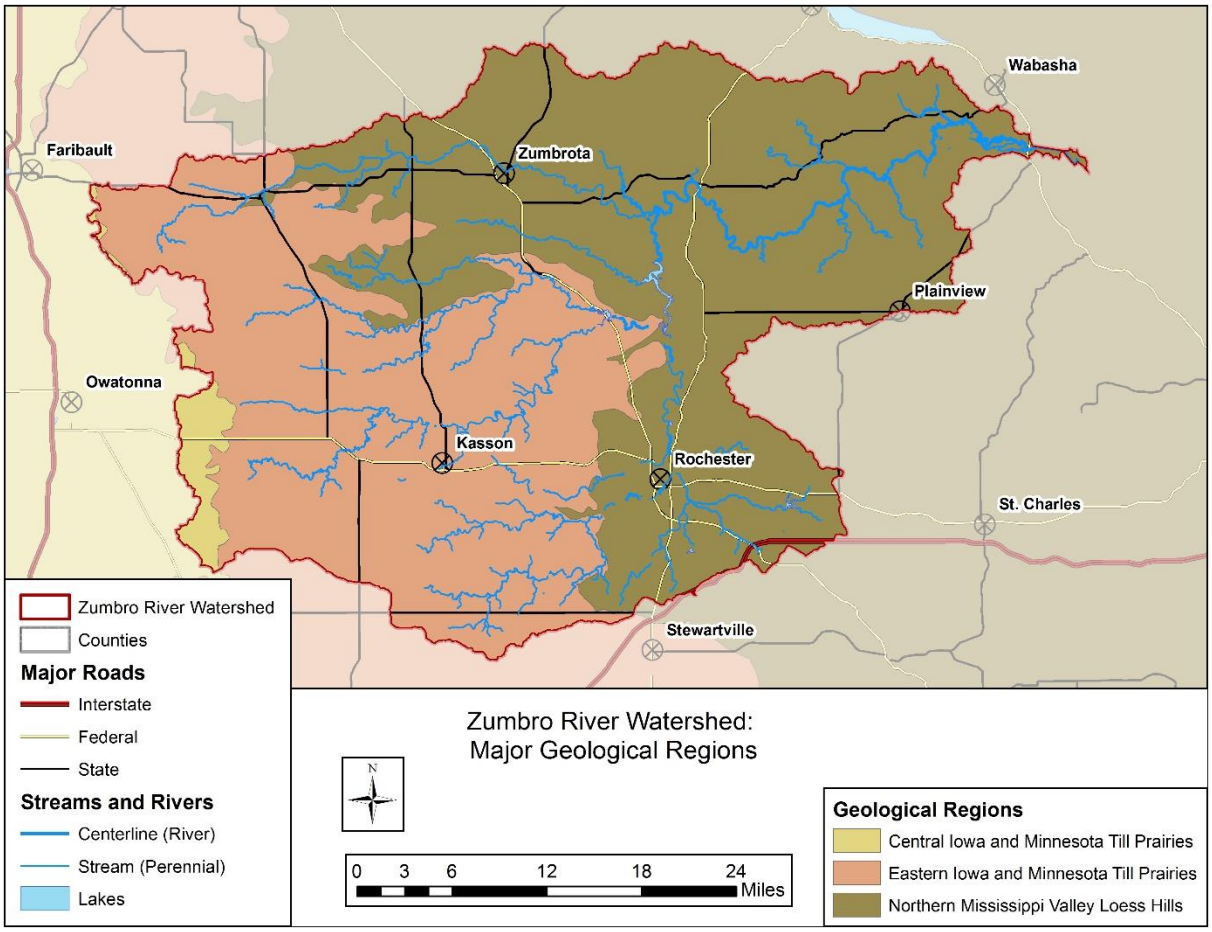


Figure 7. Major land resource areas in the Zumbro River Watershed.

Key Geological Feature: Parts of the CRW contain karst features (Figure 8). Karst describes a landscape underlain by limestone that is being slowly dissolved by infiltrating rainwater, producing ridges, towers, fissures, sinkholes, caves, and other characteristic landforms. This landscape can be challenging to protect because there are often hidden, rapid pathways from pollution release points to drinking water wells or surface water. In these areas, contaminants can enter the ground and move miles per day through cracks and crevices. The MPCA karst web page (https://www.pca.state.mn.us/water/karst-minnesota) discusses the process leading to the formation of Minnesota's karst, karst landforms and environmental problems that occur in karst landscapes.

One key aspect of conservation concern in the karst landscape in Southeastern Minnesota is the Decorah Edge. It is formed where groundwater that has been slowly flowing atop the impermeable Decorah shale reaches a sidehill where it spills over this impermeable surface and then reenters the groundwater below. This "edge" sustains a biologically diverse ecosystem and naturally filters the groundwater that supplies drinking water for the region's cities and farms. These flowing waters are most evident during wet periods when seeps and springs discharge along hillsides. They can also be seen in excavations and in basements of homes located on the hillsides. Agriculture dominates much of the upland area that drains to the Decorah Edge. While the groundwater above the Decorah shale is often polluted with fertilizers, pesticides, manure and sewage, water immediately below the Decorah Edge generally has few of these pollutants. The Decorah Edge works as a natural filter removing pollutants from water as it flows through the soils, vegetation, and wetlands that overlie the shale bed. This filtration is a valuable economic asset for the region. Replacing this natural drinking water filtration in the Rochester area may cost as much as $5 million per year. In addition to removing pollutants from groundwater, filtration processes at the Decorah Edge also purify seep and spring water discharges that form the headwaters of the Cannon, Root, Whitewater, and Zumbro Rivers. In the urbanizing areas around Rochester, the Decorah Edge is under increasing development pressure. Disturbance of groundwater flows and removal of vegetation associated with development may jeopardize the ability of this important natural resource to both supply groundwater and to purify it.

In southeastern Minnesota, the Decorah Edge extends from Rice County through Goodhue, Dodge, Olmsted, Winona, Fillmore, and Houston Counties. It continues winding through northeastern Iowa through its namesake city and ends in Dubuque. Its total length is close to 200 miles and if stretched straight it would extend nearly 1,000 miles. There are also discontinuous areas of Decorah Edge found in the Twin Cities and in Southwestern Wisconsin.

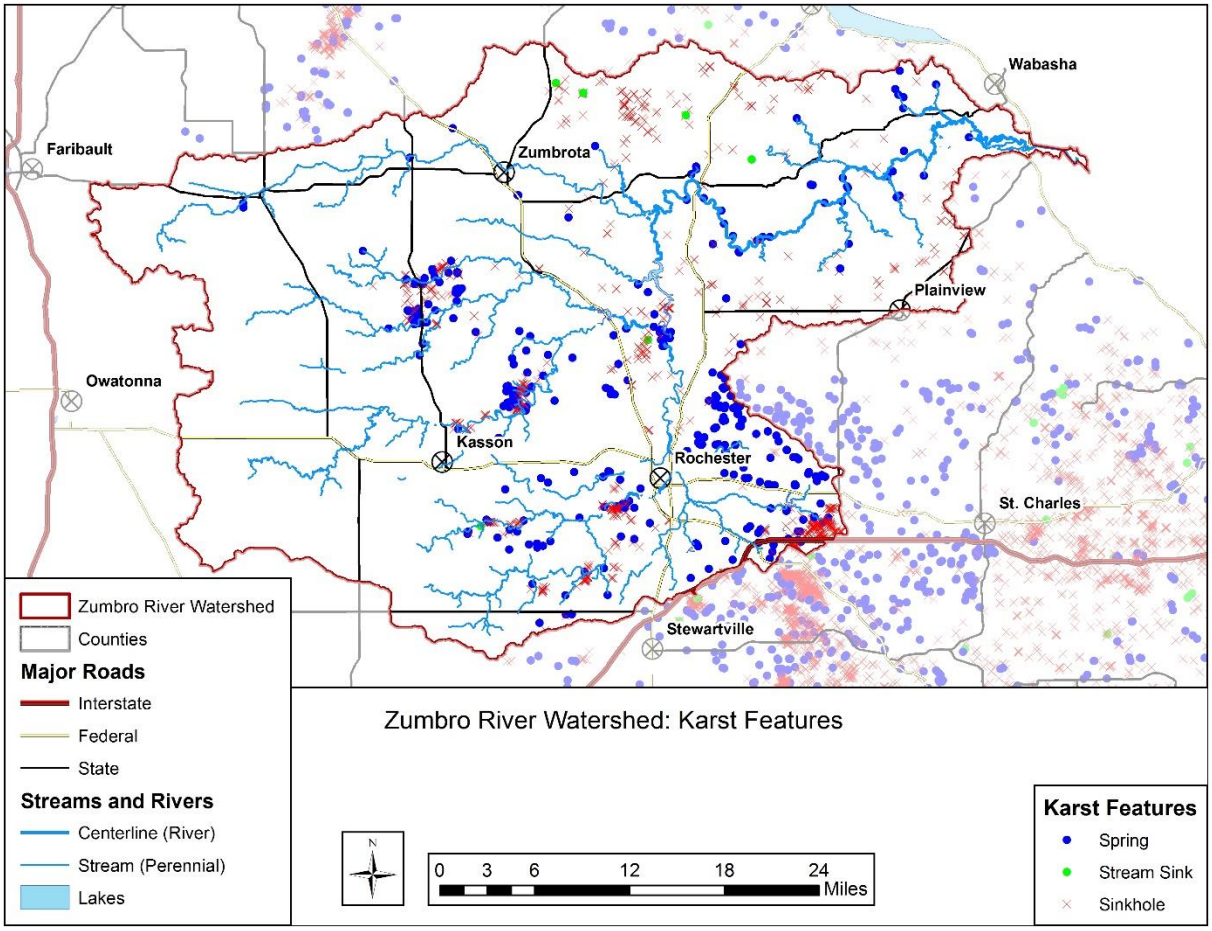


Figure 8. Known karst features in the Zumbro River Watershed.

Vegetation

Land Cover Change

Prairie and oak savanna communities dominated much of the Zumbro River Watershed prior to European arrival (Table 2, Figure 9). Fire was the primary ecosystem level disturbance and the presence of trees on the landscape depended on fire frequency and intensity. The most fire prone areas remained treeless while areas that were protected by landscape position often included scattered oak openings and barrens communities. True forested communities were most common in the center of the watershed between Pine Island, Mantorville, and Oronoco. These forested communities were typically found in relatively close proximity to a river, stream, or steep slope. Here hardwood stands of oak, maple, basswood, and hickory, along with associated minor species and shrubs were the dominant vegetation. River bottom and Big Woods forest communities were also found in the lowest end of the watershed near the outlet to the Mississippi River.

Today, the vast majority of the watershed is in agricultural production (Table 3, Figure 10). The City of Rochester and the surrounding communities represent most of the developed land and indications are that will continue. Although greatly reduced, areas of natural land cover can be found along the river and steeply dissected valley slopes.

Table 2. Estimated presettlement vegetation in the Zumbro River Watershed.

Marschner Presettlement Vegetation	Acres	Percent
Prairie	416,143	46 %
Oak openings and barrens	284,987	31 %
Brush Prairie	89,965	10 %
Aspen-Oak Land	49,688	5 %
Big Woods - Hardwoods (oak, maple, basswood, hickory)	31,682	3 %
River Bottom Forest	22,830	3 %
Wet Prairie	12,715	1 %
Lakes (open water)	1,355	0 %

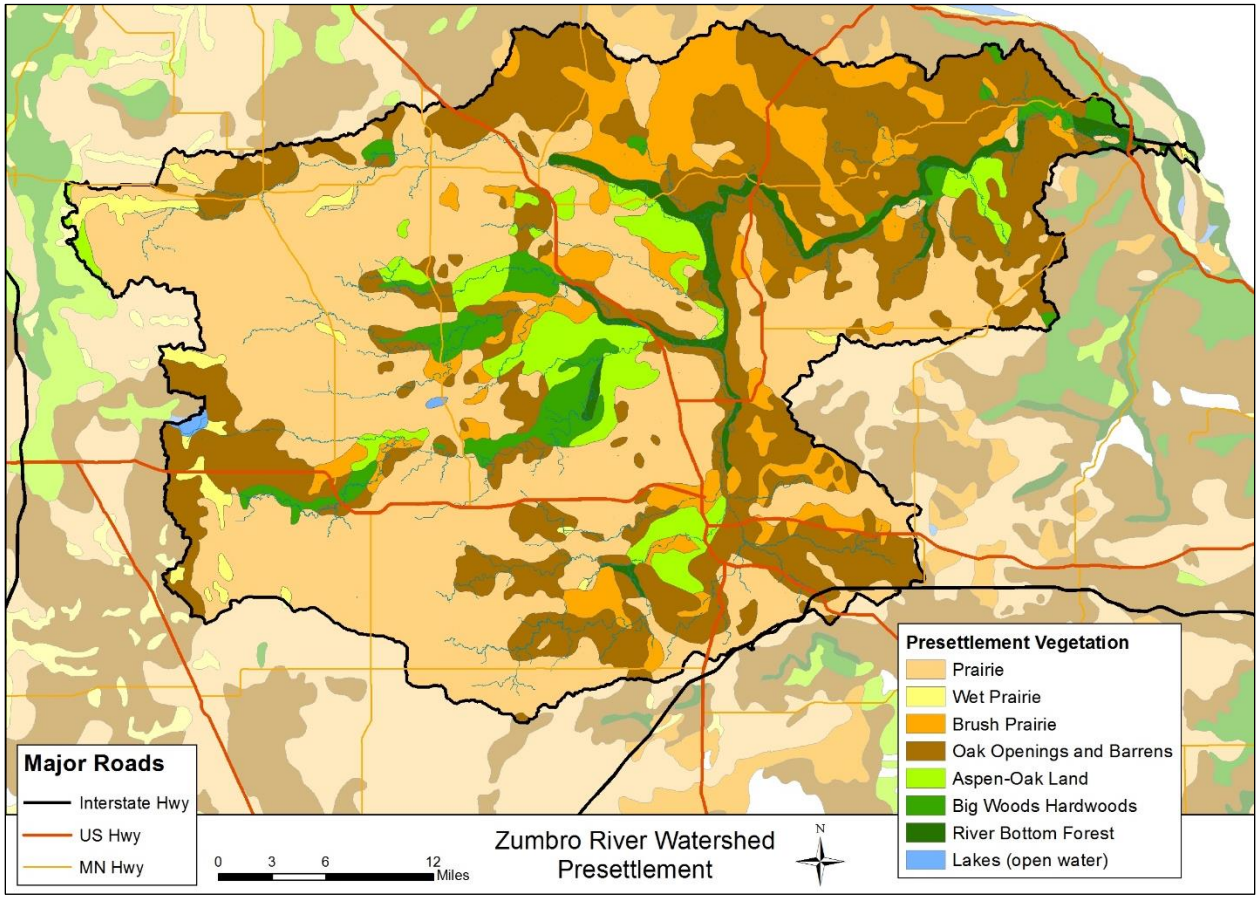


Figure 9. Pre-settlement land cover in the Zumbro River Watershed based on Marschner's interpretation of the Public Land Survey.

Table 3. Current land cover in the Zumbro River Watershed.

Land Cover Class	Acres	Percent of Watershed	Land Cover Class	Acres	Percent of Watershed
Cultivated Crops	509,121	56.0%	Open Water	4,204	0.5%
Herbaceous	107,049	11.8%	Emergent Herb. Wetlands	3,255	0.4%
Hay/Pasture	104,984	11.5%	Developed, High Intensity	2,543	0.3%
Deciduous Forest	87,036	9.6%	Evergreen Forest	977	0.1%
Developed, Open Space	47,923	5.3%	Barren Land	687	0.1%
Developed, Low Intensity	22,459	2.5%	Shrub/Scrub	167	0.0%
Woody Wetlands	10,380	1.1%	Mixed Forest	44	0.0%
Developed, Med. Intensity	8,530	0.9%			

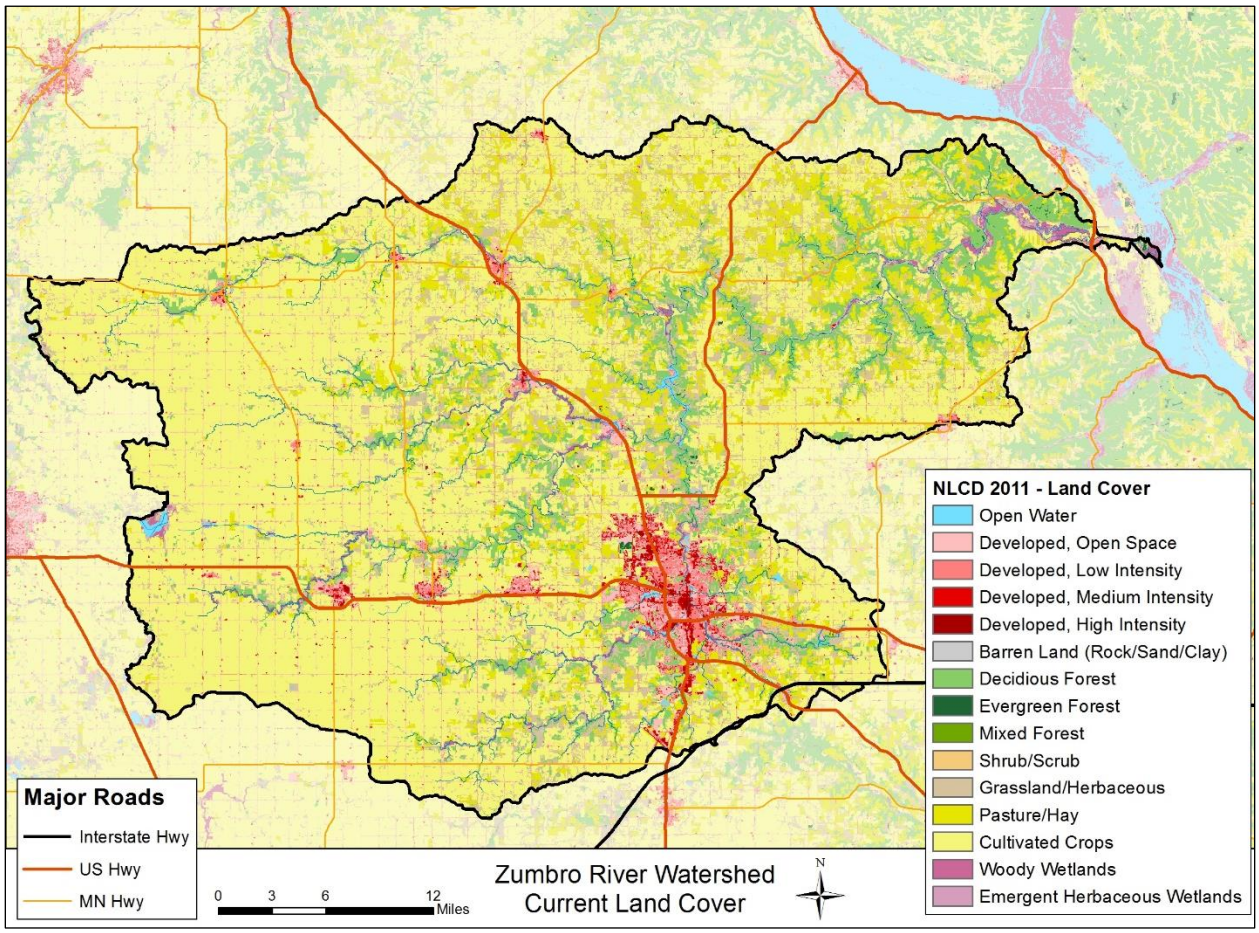


Figure 10. Current land cover in the Zumbro River Watershed based on the National Land Cover Database

Even in areas that retain natural land cover, the disturbance regime has changed significantly. Cessation of fire, extensive logging, and conversion to agriculture during the settlement era (mid-1800's) led to dramatic changes in the local ecosystems. The primary disturbance regime in many of these natural communities such as prairies, savannahs, and oak woodlands was fire. With modern fire suppression, these communities are under pressure from native and non-native invasive woody vegetation that would have been controlled by fire. Additionally, forest structure has become much more homogenous, with many of the stands in the same growth stage. The shift away from fire dependent species like oaks and structural homogeneity will likely make forests more vulnerable to the suite of emerging stressors including climate change, invasive species, pests and pathogens.

Native Plant Communities

Ecologists in Minnesota have developed a system to classify land into Native Plant Communities (NPCs) based on native vegetation, landforms, and other local conditions such as amount of rainfall and soil richness. This system is used in combination with the ECS to more precisely describe patterns on the landscape.

The Native Plant Community system describes an area's specific land types or ecosystems. A single community might cover a large area, or exist in scattered pockets. Sometimes very different native plant communities exist near each other. For example, notice the differences between the types of trees growing along a river from those growing several hundred feet uphill. Native plant communities are also a useful tool for telling the story of the land's history. Forests are constantly changing under the influence of time and other factors. The trees and other plants that emerge 20 years after a fire will differ from those growing in the same area a hundred years later. You can also notice variations as you move from north to south or east to west within a region.

The Minnesota Biological Survey has mapped and identified NPCs in several sites throughout the Zumbro River watershed (Figure 11). A list of the general NPC ecological systems identified in the watershed is presented in Table 4 and more detailed descriptions can be found in the Field Guide to the Native Plan Communities of Minnesota: The Eastern Broadleaf Forest Province produced by the Minnesota DNR and available at: http://www.dnr.state.mn.us/npc/index.html.

These Native Plant Communities can significantly reduce sediment and nutrient loads entering regional water resources. According to work done by Kevin Benck and Reed Fry at St. Mary's University of Minnesota, total nitrogen and total phosphorus (lbs/yr) would increase by 31% and 41% respectively if woody natural areas were converted to row crops in the Cannon River Watershed (see *Examining the Relationship between Land Cover and Water Quality Protection: The Blufflands Region of the Cannon and Zumbro River Watersheds*, 2017, Saint Mary's University of Minnesota - GeoSpatial Services, 700 Terrace Heights, Box #7, Winona, MN 55987).

Table 4. Native Plant Community Systems in the Zumbro River Watershed.

System Name	Area (ac)
Mesic Hardwood	10,882
Floodplain Forest	3,843
Fire Dependent Woodland	1,098
Upland Prairie	740
Wet Meadow/Carr	573
Marsh	175
Cliff/Talus	149
Wetland Prairie	92
Open Rich Peatland	23
Wet Forest	12
N/A	707

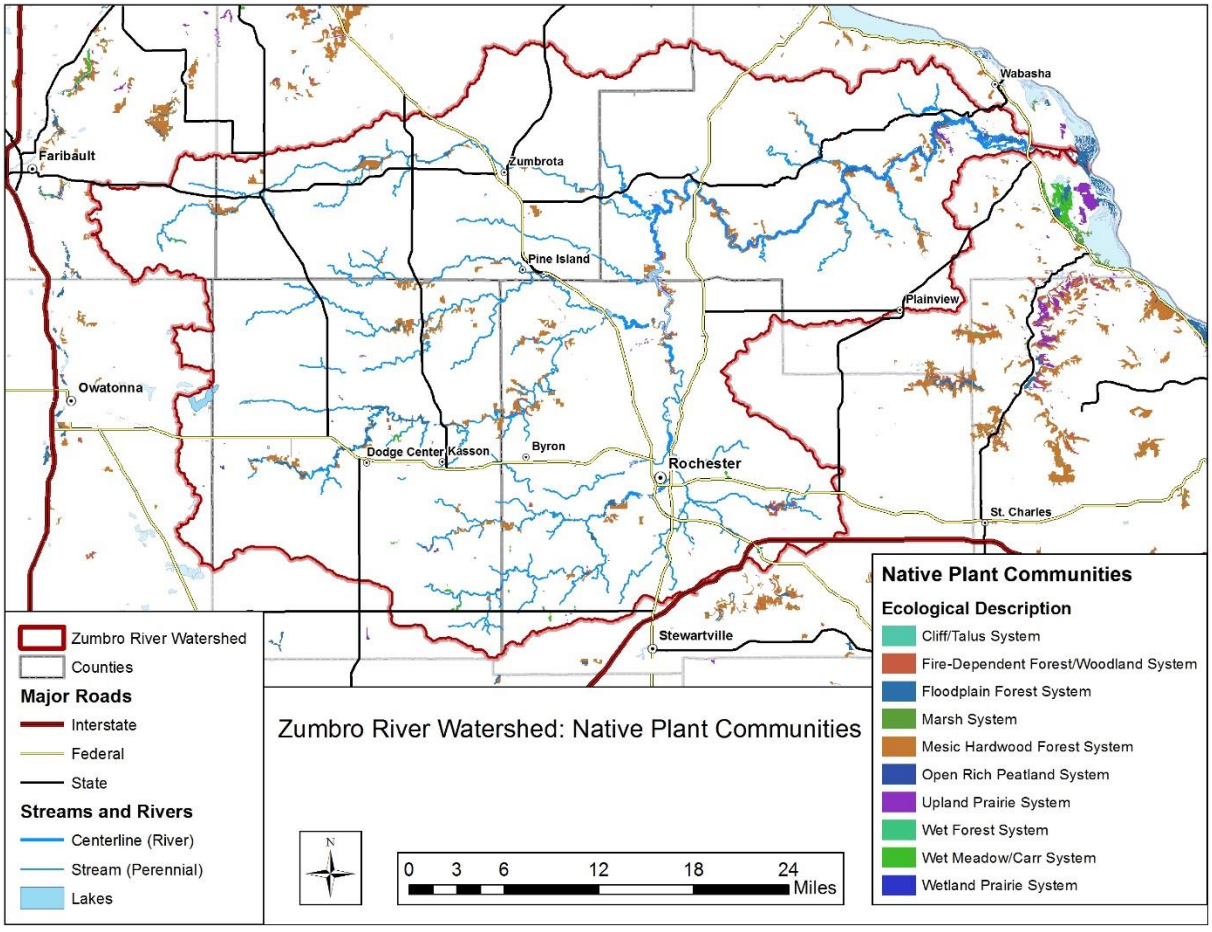


Figure 11. Native Plant Communities in the Zumbro River Watershed

Invasive Species

Riparian area dominated by garlic mustard.

Non-native invasive species are becoming an increasing challenge for natural area management in the Zumbro River Watershed and throughout Minnesota. Many areas has shifted from a healthy natural community to degraded systems dominated by invasive species. This is perhaps most noticeable in oak savannas with an overstory of mature bur oak and understory dominated by European buckthorn and honeysuckle. Widespread fire suppression has further complicated this issue in many of these fire-dependent communities. Forest pests also have a significant impact on the forest composition of the region. American elm was one of the most significant species in many of the watershed's forest ecosystems but an introduced disease (Dutch elm) has decimated this species. Invasive plants of note in the watershed include garlic mustard, reed canary grass, wild parsnip, thistle, exotic honeysuckle, and buckthorn. Several invasive insect pests also pose a risk to the area such as emerald ash borer. Monitoring and early detection will be of vital importance in slowing the spread and impact of these non-native species on the landscape. It is important for management of both private and public lands to address the control of these problem species that do not recognize property boundaries.

Rare Natural Features

The mix of oak savanna and big woods remnants, karst geology, and steep valleys of the Driftless Area provide conditions for a diverse array of plant communities and habitats. The Zumbro River watershed contains nearly 50,000 acres of land that the Minnesota Biological Survey (MBS) has delineated as potential sites of biodiversity significance (Table 5, Figure 12). Field assessments of those sites ranked 4,806 acres as Outstanding and an additional 9,413 acres as High. These rankings are based on presence of rare species populations, size and condition of native plant communities, and the landscape context of the site. Additional information about the process, as well as descriptions of the four biodiversity significance ranks can be found at: http://www.dnr.state.mn.us/eco/mcbs/biodiversity_guidelines.html

Table 5. Minnesota Biological Survey delineated areas of biodiversity significance in the Zumbro River Watershed.

MBS Biodiversity Significance Rank	Acres
Outstanding	4,806
High	9,413
Moderate	23,132
Below	12,454
Total	49,805

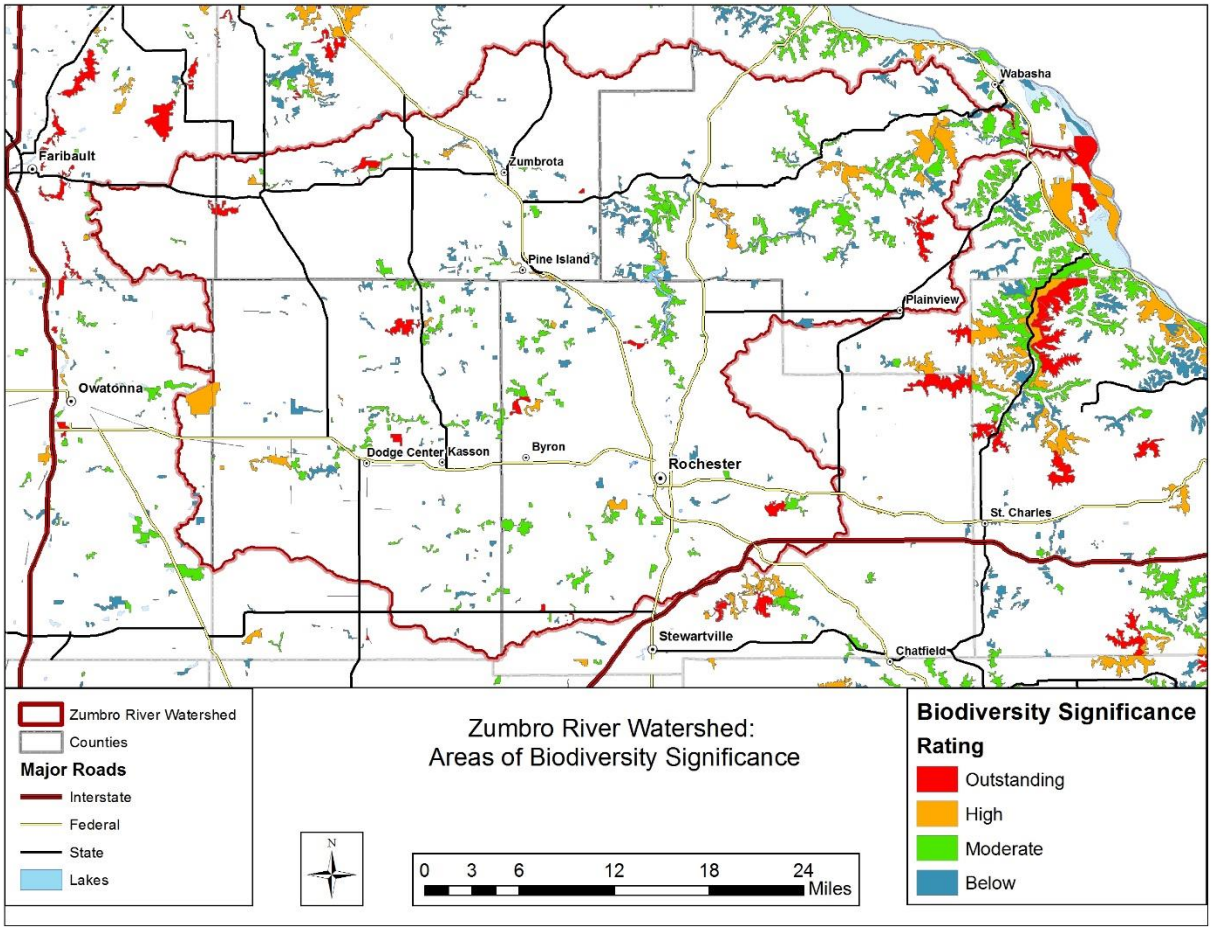


Figure 12. Sites of biodiversity significance in the Zumbro Watershed, as mapped by the Minnesota Biological Survey.

Wildlife

Interaction with wildlife through hunting, fishing, and wildlife watching is important to many Minnesota residents and visitors and a number of popular game and non-game wildlife species can be found in the Zumbro River Watershed. The specific make-up of wildlife varies from place to place throughout the watershed but includes common species such as white-tailed deer and turkey and rare species such as Acadian flycatchers. Additionally the Zumbro River, tributaries, and the handful of lakes and impoundments in the watershed support a variety of warm-water (walleye, northern pike, bass, catfish, sunfish, and crappies) and cold-water (brook and brown trout) species.

The recent revision to the State Wildlife Action Plan (2015-2025 Wildlife Action Plan) did not specifically identify any areas in the Zumbro River Watershed as priority Conservation Focus Area but the areas is generally regarded as important to rare species and overall biodiversity. Over 81,000 acres were

identified in the Wildlife Action Network (Table 6, Figure 13). These areas represent quality habitats for terrestrial and aquatic Species of Greatest Conservation Need (SGCN). Large core areas and connections that facilitate species movement will support the biological diversity already present in the network. Targeting conservation within the network will increase the effectiveness and efficiency of actions to reduce the primary causes of population declines.

Table 6. Wildlife Action Network Scores for the Zumbro River Watershed.

Wildlife Action Network Score	Acres
High	1,875
Medium-High	13,110
Medium	16,562
Low-Medium	38,908
Low	10,794

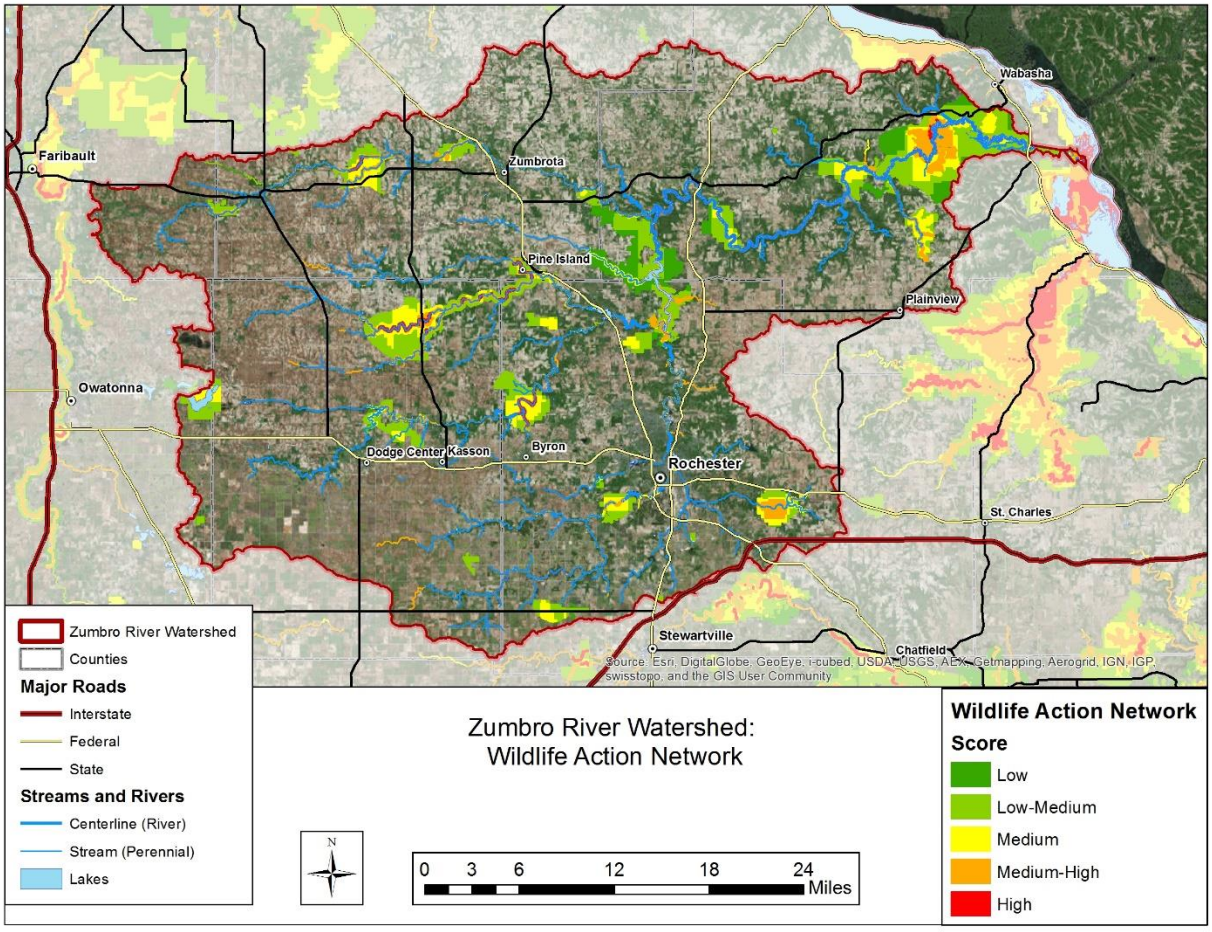


Figure 13. Wildlife Action Network in the Zumbro River Watershed.

Land Use History and Cultural Resources

The Zumbro River and its watershed has a long history of human activity dating back thousands of years. Like rivers everywhere, the Zumbro River, was used as a travel corridor prior to the modern road network and several sites of archeological importance have been discovered in the watershed. Prior to European settlement, Native American settlements existed predominantly in the river valleys where they farmed the rich alluvial soil of the terraces, gathered fruits, nuts, and other forest products from the forested blufflands. They would also use the Zumbro River and its numerous tributaries to access the upland prairies which they frequently burned to maintain open characteristics so they could hunt bison, elk and deer.

Unlike other rivers in the area such as the Cannon, which had significant cultural centers at their mouth (Red Wing), the Zumbro was noted by early explores and fur traders as having an expansive delta that stretched for miles. According to some of the oldest European accounts, the Zumbro River joined the Whitewater River before entering the Mississippi. The mouths of these two rivers are now miles apart.

When these early Europeans arrived, the area was inhabited by the Mdewakanton Dakota who referred to the river as 'Wazi Oju' which means 'pines planted'. The French however focused on the snags, caused by widespread bank erosion that hindered their canoes and called it 'Riviere d'Embarrass' meaning river of difficulties. History is unclear on how English-speaking immigrants transformed Embarrass into Zumbro.

In 1851, treaties opened up most of Southern Minnesota to European American settlement. The earliest settlers in the region originally exploited the abundant timber resources followed quickly by pioneer farmers lured to the area by the regions the fertile soils. The region's forests provided farmers and homesteaders with wood for heating, fence posts, and lumber. Many of today's farmhouses, barns, and outbuildings are framed or sheathed with rough sawn lumber from trees that were harvested and milled within a short wagon ride of where they now stand. The disappearance of these forests and intensive farming methods used by early settlers were very damaging to the region's precious topsoil leading to significant erosion. Conservation actions taken in the twentieth century have helped to reduce these negative impacts.

Archeological resources can be found throughout the area, however, they are more likely to be found along the river valleys and tops of ridges with good vantage points from which ancient hunters would spot and wait for prey. These prominent lookouts were also occasionally used as burial mound sites.

Current Land Use and Socio-economic Context

Today, cultivated crops dominate much of the landscape (Figure 10). The most common are corn, forage for livestock, and soybeans. Rangeland is also common this area, particularly on steep slopes that are difficult to operate row crop machinery or areas with shallow soils. As one moves eastward through the watershed rangeland and forests tend to increase, particularly near rivers, streams, or areas with deeply incised topography. Outdoor recreation is popular in forested areas and on streams. Hiking, canoeing, kayaking, biking, cross-country skiing, and snowshoeing are all popular, as well as hunting and fishing. Many private lands are also kept for outdoor recreation and hunting, with occasional timber harvesting occurring as well.

The Zumbro River watershed falls primarily within Dodge, Goodhue, Olmsted, and Wabasha counties with a small part extending into the eastern potions of Rice and Steele counties. The four primary counties had a combined estimated population of 239,197 residents in 2015. Overall,

these are semi-rural counties, however, Olmstead County contains the growing city of Rochester and accounts for 151,436 of these residents; 112,225 of which live in Rochester which is by far the largest community in the watershed. Today, over 98% of the land in the Zumbro River watershed is privately owned with public ownership spread between county, state, federal and non-profit ownership (Figure 14).

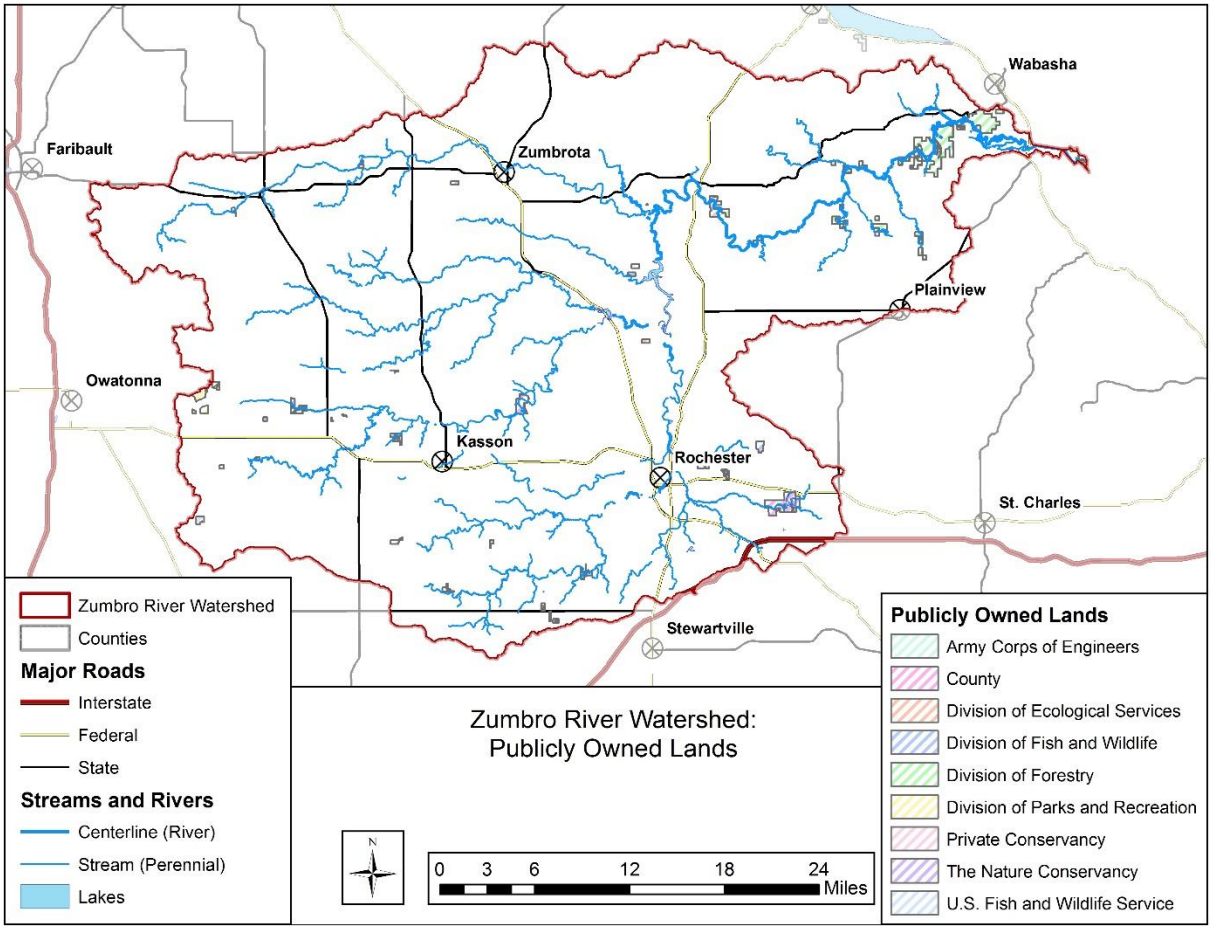


Figure 14. Public land in the Zumbro River Watershed. Although not visible at this scale, all organizations listed in the legend have land in the watershed.

Section 6: Implementation Resources

The following is a list of potential resources to pursue in the project and funding development stage. This inventory of administrative, technical, financial, and political resources should be maintained and grown to foster increased success in the implementation of the Plan.

Administrative Resources

- Zumbro Watershed Partnership
- Southeast Landscape Committee
- Landowners
- County Soil and Water Conservation Districts
- County Boards
- County Planning and Zoning
- MN DNR Forestry, Fish and Wildlife, Ecological and Water Resources, Parks and Trails
- Board of Water and Soil Resources
- MN Pollution Control Agency
- Township Officials
- Basin Alliance for the Lower Mississippi in Minnesota (BALMM)

Technical Resources

- GIS mapping – plan maps, other sources
- State agency personnel - DNR Division of Forestry, Division of Fish and Wildlife, etc.
- County staff – planning & zoning staff, county water planners, SWCD technicians, etc.
- Consulting foresters and Loggers.

Financial Resources

- MFRC seed money
- Clean Water Land & Legacy Amendment funds
- Costs Share programs
- State agency programs
- County Water Plans projects and programs
- Foundations and organizations
- Landowners - private investments
- Federal and State agency budgets - staff assistance

Political Resources

- Private landowners
- Townships
- Soil and Water Conservation Districts - supervisors and staff
- County boards and staff and county water plan committees
- MFRC

Funding Strategies and Opportunities through Collaboration

We anticipate this, like many other landscape-scale forest stewardship initiatives, will be funded through a variety of synergistic funding efforts. Historically, partners that get involved in a landscape-scale project area do so because it meets some of their own resource or public relations goals and they work together to support efforts throughout the project area. Landscape-scale, multi-partner, coordinated efforts often carry increased weight with foundations, trusts, and government agencies when it comes to applying for grants. Federal and state funding agencies as well as private foundations tend to look favorably on multi-partner project applications. There is a considerable amount of money available through grants and other programs that landscape stewardship approaches can facilitate.

Landscape stewardship projects also seek to encourage and promote greater levels of private investments to leverage public investments. Many private woodland owners make significant investments in their own lands. These investments may not end up on the balance sheets of service provider agencies, but they are no less important in the health and integrity of the natural landscape of the region.

Individual Financial Assistance Programs Available to Landowners

Farm Service Agency Programs:
Conservation Reserve Program (CRP): CRP offers annual payments to landowners who set aside cropland or pasture adjacent to water, for the purpose of reducing erosion, increasing wildlife habitat, improving water quality, and increasing forestland. Cost-share for tree planting, grass cover, small wetland restoration, or prairie and oak savanna restoration may also be available.

NRCS Programs:
Environmental Quality Incentives Program (EQIP): EQIP provides financial and technical assistance to landowners for management practices. All properly implemented forest management practices are eligible, including timber stand improvement (TSI), site preparations, culverts, stream crossings, water bars, planting, prescribed burns, hazard reduction, fire breaks, silvopasture, fence, grade stabilization, plan preparation and more. Contracts last from one to 10 years.

Conservation Stewardship Program (CSP): CSP encourages agricultural and forestry producers to maintain existing conservation activities and adopt additional ones in their operations. Annual payments per acre for five years are available for installing new activities and maintaining existing ones.

State Programs:
Reinvest in Minnesota (RIM) Reserve Program: RIM is run by the Board of Water and Soil Resources (BWSR). The program compensates landowners willing to give the state a conservation easement to permanently protect, restore, and manage critical natural resources, in the interest of improving water quality. The RIM program is the primary land acquisition program for state-held conservation easements and restoration of wetlands and native grasslands. It is coordinated statewide by BWSR and administered and implemented locally by county Soil & Water Conservation Districts (SWCDs). There are currently 117 RIM tracts in the Zumbro River watershed totaling over 3,218 acres.

Erosion Control and Water Management Program: More commonly known as the State Cost Share Program, this program provides funds to SWCDs to share the cost of conservation practices for erosion control, sedimentation control, or water quality improvements with the land occupier.

The primary purpose of activities is to assist with structural or vegetative practices to correct existing problems.

Grant Programs for Local Governmental Units or Non-Governmental Organizations

Clean Water Fund: Clean water fund grants are funded through Minnesota's 2008 Legacy Amendment. It provides funding for local governments or local government joint powers boards for projects that restore, enhance, and protect water quality. A non-state match of at least 25% of funds is required.

Lessard-Sams Outdoor Heritage Council (LSOHC): The LSOHC is charged with making annual funding recommendations to the Minnesota Legislature on appropriations from the Outdoor Heritage Fund. Through these recommendations, funds raised through Minnesota's Legacy Amendment are provided to support programs to restore, protect, and enhance wetlands, prairies, forests, and habitat for fish, game, and wildlife.

Legislative-Citizen Commission on Minnesota Resources (LCCMR): In 1988, Minnesota voters approved a constitutional amendment establishing the Environment and Natural Resources Trust Fund - a constitutionally dedicated fund that originates from a combination of Minnesota State Lottery proceeds and investment income. Applications for this funding are due every May. The purpose of this fund is to provide a long-term, consistent, and stable source of funding for activities that protect, conserve, preserve, and enhance Minnesota's "air, water, land, fish, wildlife, and other natural resources" for the benefit of current citizens and future generations.

Section 319 Nonpoint Source Management Program: The 1987 amendments to the federal Clean Water Act established the Section 319 Nonpoint Source Management Program. This Environmental Protection Agency administered program addresses the need for greater federal leadership to help focus state and local nonpoint source efforts. Under Section 319, states, territories and tribes receive grant money that supports a wide variety of activities including technical assistance, financial assistance, education, training, technology transfer, demonstration projects and monitoring to assess the success of specific non-point source implementation projects.

Landscape Stewardship Plan Conclusion

This Landscape Stewardship Plan for the Zumbro River Watershed presents a blueprint for protecting the biodiversity and natural resources of the watershed, while also helping to improve water quality by maintaining and enhancing the natural integrity of the watershed. These goals will not be achieved by any single stakeholder or department, nor can they be met with a single strategy. Widespread adjustments to intense land uses that reduce the impacts of agriculture on water will be needed, but so will increased protection of natural areas at key places in the watershed. An expanded footprint of public conservation land will be needed to achieve that level of protection, but it will not be sufficient alone. Private landowners and communities will need to remain engaged in managing, and, just as important, valuing the wild places of the region.

To help engage the variety of partners and stakeholders that will be required to achieve the goals of this plan, several supplemental materials have also been prepared. They include a brochure to distribute widely as an introduction to this effort to a general audience, as well as a multi-page summary document to help familiarize both the general public and important partners to its goals and strategies. Additionally, a reflection document that describes the process and lessons learned has been developed as a resource for future landscape stewardship planning efforts in other watersheds.

While many actions described in this plan will need to be carried out across the watershed, a major watershed such as the Zumbro River is too large an area to effectively address in a single effort. To maximize the effectiveness of our efforts, we will need to prioritize. This plan has identified several areas within the watershed where protection strategies are most important and will benefit multiple conservation interests. The following section contains more detailed protection plans for three of these priority areas.

Section 7: Conservation Opportunity Area Plans

Conservation Opportunity Area Overview

As discussed in the plan above, GIS analysis of potential protection targets in the Zumbro River Watershed identified seven priority areas, called Conservation Opportunity Areas (COAs). These COAs represent areas where the local watershed (HUC12 level) is relatively intact when compared to the rest of the region. Water quality in these areas is either above average for the larger watershed, or near thresholds for water quality standards. They also contain important terrestrial features that warrant protection, such as areas of biodiversity significance, publicly owned conservation lands, and higher than average proportions of perennial vegetative cover in the most important areas for water quality protection.

Because these COAs were identified through an additive process, where desirable landscape features were added up within each sub-watershed, they primarily represent places with significant overlap of different stakeholder's priorities. They are places of importance to multiple state agencies and environmental interests. That indicates they are logical focal points for collaboration and coordination of protection efforts between the multiple conservation professionals who work in the region. Effort and investment from one agency (e.g. DNR Wildlife) will also benefit the efforts of water quality professionals by enhancing the integrity of natural communities to better slow run-off and increase infiltration. It will also benefit public and private forestland owners in the area if it reduces the regional presence of invasive species, cutting down on potential seed sources and making further infestations less likely.

Ultimately, COAs represent regions where conservation actions are likely to provide the greatest number of benefits, and where coordination and communication between conservation professionals will be most beneficial.

This section provides three COA summaries: Lower Zumbro – Bluffland Tributaries, Southern Headwaters, and Zumbro Falls. The stewardship plans for each of these COAs focus on specific resources and needs, as well as strategies that are appropriate to the different social resources and ownership patterns within each COA. Highlighting these three COAs should not diminish the importance of the other three. The seven COAs identified in the Zumbro watershed are:

- Zumbro Falls COA: Includes Lake Zumbro and the area around the small towns of Hammond, Mazeppa, and Zumbro Falls. This COA encompasses nearly 61,500 acres in the watersheds of Dry Run Creek, Lake Zumbro, Mazeppa Creek, North Fork of the Zumbro River, and the main stem of the Zumbro River after it merges with the North Fork. Topography in this area leads to a diversity of riparian areas and forested ecosystems that represent hotspots for biodiversity and water quality protection.

- Lower Zumbro COA: This nearly 60,000 acre COA includes forested bluffs, floodplain forests, and cold-water streams that have been identified as particularly important for regional biodiversity. The COA lies in the lowest reach of the watershed between Millville and Kellogg. In addition to the Zumbro main stem, the COA includes all or portions of the Trout Brook, Silver Spring Creek, Spring Creek, and the lowest reaches of West Albany Creek. Key public natural areas include several tracts of the Richard J. Dorer Memorial Hardwood State Forest, most notably the Zumbro Bottoms unit. Public lands and acquisition strategies will have a larger role in this COA than the rest of the watershed.

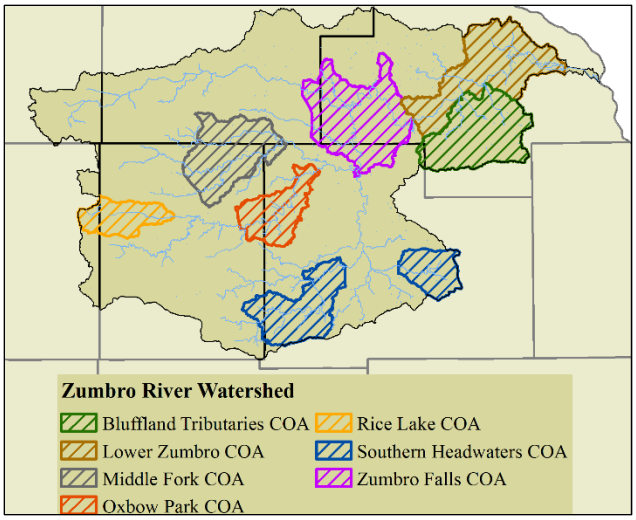
- Bluffland Tributaries COA: Contains a series of cold-water trout streams and forested bluffs that provide important habitat to a wide variety of plants and animals. Notable streams in this 49,640-acre COA are West Indian Creek, Long Creek, and Middle Creek. MN DNR's Blufflands/ Rochester Plateau Subsection Forest Resource Management Plan includes a High Biodiversity Site Plan for the West Indian Creek Watershed due to its importance to the biodiversity of the state.

- Southern Headwaters COA: Consists of two separate units around the City of Rochester. These two areas are important areas for protecting the drinking water of Rochester and feature rare calcareous fens. The eastern unit occupies the US Highway 14 corridor east of Rochester near Chester Woods. The western unit extends southwest from Rochester along the South Fork of the Zumbro towards the town of Rock Dell. These two units encompass nearly 55,000 acres in the watersheds of Goose Creek, Bear Creek and the South Fork of the Zumbro. Much of this region has been converted to agriculture or residential development however; the remnants of the region's natural communities represent a conservation opportunity to build from.

- Oxbow Park COA: Occupies nearly 26,000 acres along the South Branch of the Middle Fork of the Zumbro River with its most notable feature being Oxbow Park, a forested area outside Rochester that has been identified as having outstanding biodiversity significance and a highly regarded smallmouth bass fishery.

- Rice Lake COA: Occupies 19,462 acres in a nearly entirely agricultural part of the Zumbro River watershed. The key feature of this COA is Rice Lake State Park at the headwaters of the South Branch of the Middle Fork of the Zumbro River. Rice Lake is one of the few natural lakes in the Zumbro River Watershed, conservation efforts in this area will focus on this lake, and agricultural best management practices in the surrounding landscape. This COAs position as a headwaters area for the Middle Fork makes it an especially important place to focus on water quality and hydrology.

- Middle Fork COA: This 43,261 acre COA contains a variety of biologically rich valleys that are almost entirely privately owned. The low proportion of public-land in this COA highlights the need to support private landowner stewardship in the maintenance of these natural areas and associated water quality.



Lower Zumbro and Bluffland Tributaries Conservation Opportunity Areas

Overview

The Lower Zumbro and Bluffland Tributaries COAs encompass over 107,500 acres in the lowest reaches of the watershed between Millville and Kellogg (Figure 15). In addition to the Zumbro main stem, the COAs include all or portions of the Trout Brook, West Indian Creek, Middle Creek, Long Creek, Silver Spring Creek, Spring Creek, and the lowest reaches of West Albany Creek. Key public natural areas include several tracts of the Richard J. Dorer Memorial Hardwood State Forest, most notably the Zumbro Bottoms unit. Multiple easement programs also have a presence in the COA. Several parcels have been protected through the Forest Service's Forest Legacy program and trout stream easements held by Minnesota DNR Division of Fisheries cover portions of the area's coldwater streams.

According to data from the Public Land Survey, this area contained a mix of prairies, oak savannas and woodlands, mesic hardwood forests, and river bottom forests. Like the surrounding landscape, much of this region has been converted to agriculture, particularly in the southern portion of the COA. There are however, several areas in the COA that offer large blocks of forested conditions that are no longer common in the area and home to numerous native plant community types. These areas represent hotspots for biodiversity as identified in the State Wildlife Action Plan and Wildlife Action Network that offer a conservation opportunity to build from.

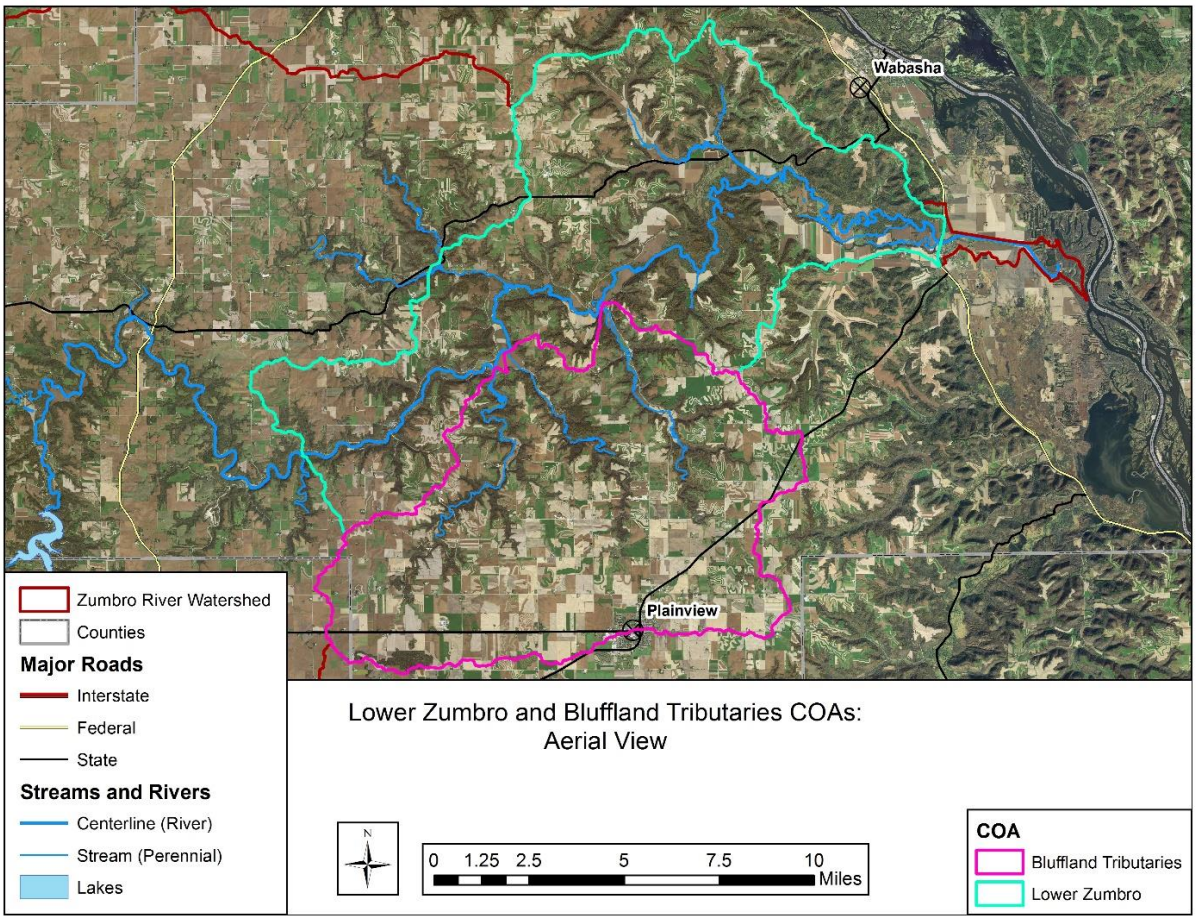


Figure 15. Lower Zumbro and Bluffland Tributaries COAs in the Zumbro River Watershed.

Natural Resource Assessment

Hydrology

The dominant hydrological feature of the Lower Zumbro and Bluffland Tributaries COAs is the lower Zumbro River in addition to all or portions of the Trout Brook, West Indian Creek, Middle Creek, Long Creek, Silver Spring Creek, Spring Creek, and lowest reach of West Albany Creek watersheds. All of these watersheds feature deep valleys with rather significant relief changes from the surrounding uplands (Figure 16). Extensive agricultural tile lines and a reduction in perennial cover have changed the hydrology in the COA to move water faster through the system.

Karst features are not as abundant in this COA as other parts of Southeastern Minnesota, yet there are 72-recorded features in the area including sinkholes and springs that feed several of the streams (Figure 17). These geological features can complicate the understanding of the local hydrology and be challenging to protect because there are often hidden, rapid pathways from pollution release points to drinking water wells or surface water.

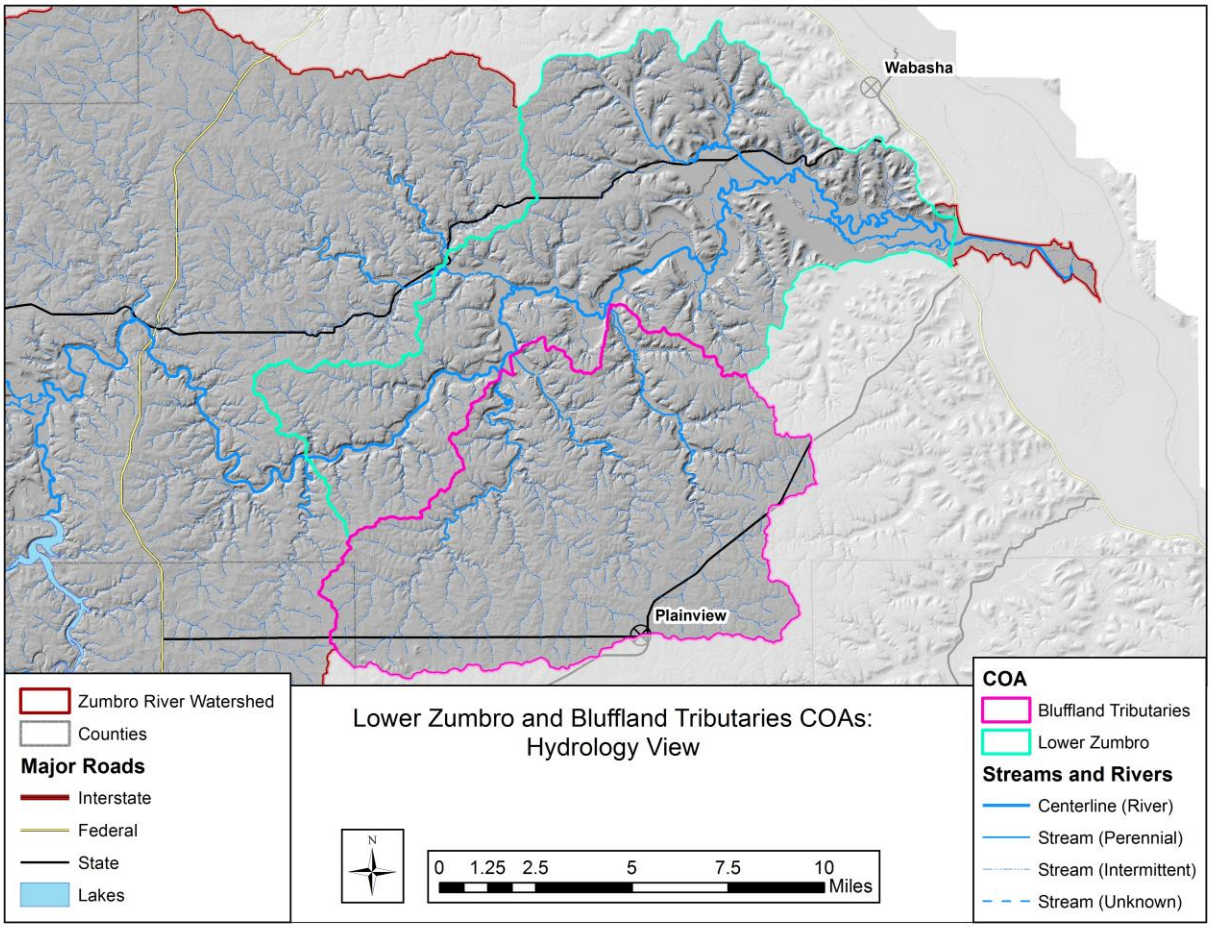


Figure 16. Hydrology of the Lower Zumbro and Bluffland Tributaries COAs.

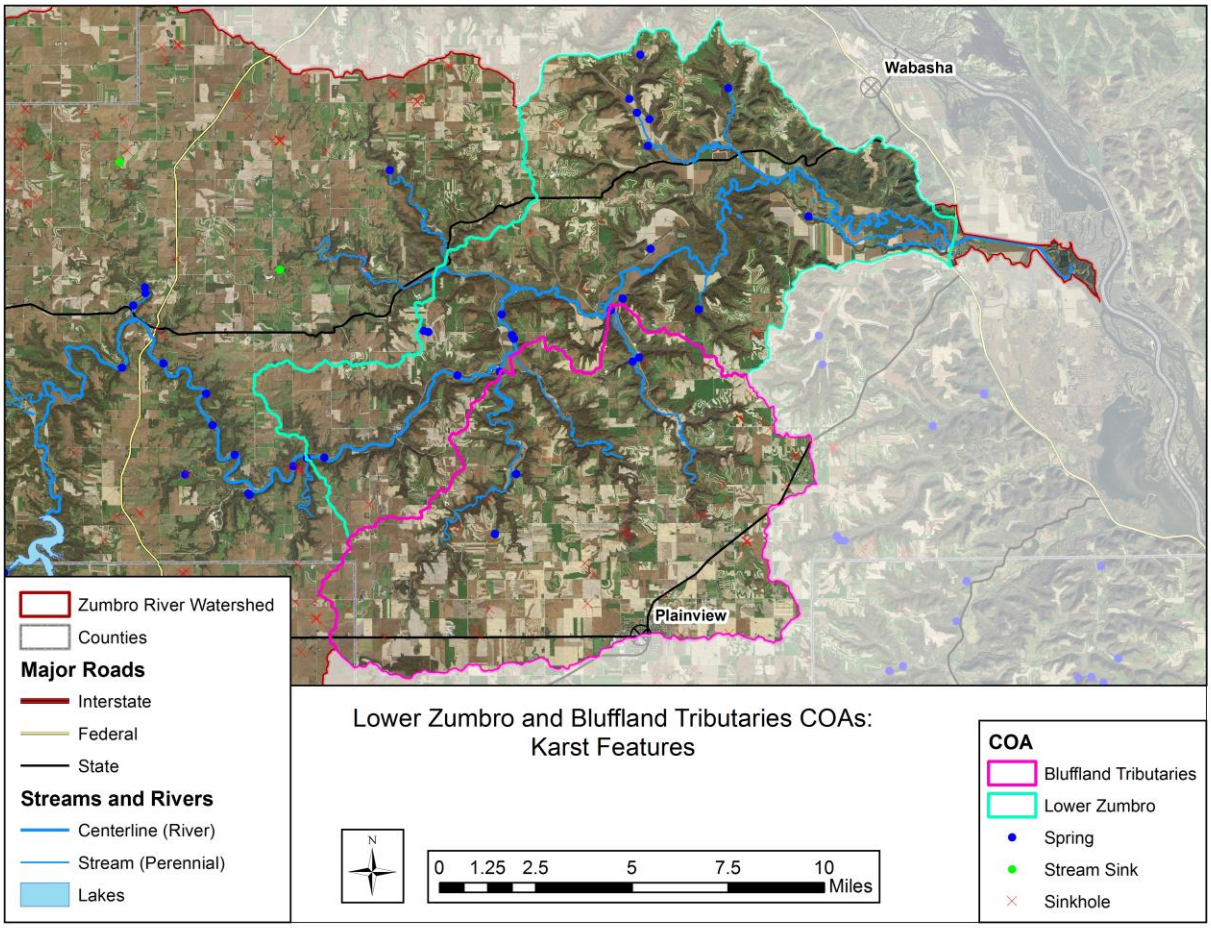


Figure 17. Karst features in the Lower Zumbro and Bluffland Tributaries COAs.

Plant Communities

The Lower Zumbro and Bluffland Tributaries COAs contains over 3,405 acres of Native Plant Communities (NPC) in six different systems and 23 different types and subtypes as identified by the Minnesota Biological Survey (MBS) (Table 7). Mesic hardwoods make up 48% of the identified NPC acres with floodplain forest (33%), fire dependent forest or woodland (9%), and upland prairie (9%) systems also making a significant portion of the total acreage. Some of these native plant communities are rare and sensitive community types unique to Southeastern Minnesota. Full descriptions of native plant community types and their associated ecological systems can be found in *Field Guide to the Native Plant Communities of Minnesota: the Eastern Broadleaf Forest Province* produced and distributed by the MN DNR.

Approximately 37 percent of the NPCs in the Lower Zumbro and Bluffland Tributaries COAs are on publicly owned land with many of the privately owned NPCs on parcels near blocks of public land (Figure 18). Private parcels containing NPCs, especially those bordering publicly managed areas, represent an important priority for increased protection and private conservation efforts.

Table 7. Native Plant Communities of the Lower Zumbro and Bluffland Tributaries COAs.

System	NPC Code	Native Plant Community	Acreage	% of NPC Acreage
Cliff and Talus	CTs12	Southern Dry Cliff	22	0.6%
	CTs12b	Dry Limestone - Dolomite Cliff (Southern)	4	0.1%
	CTs33a	Mesic Sandstone Cliff (Southern)	1	0.0%
	CTs46a2	Algific Talus: Dolomite Subtype	2	0.1%
Fire Dependent Forest or Woodland	FDs27b	White Pine - Oak Woodland (Sand)	45	1.3%
	FDs38a	Oak - Shagbark Hickory Woodland	250	7.4%
Floodplain Forest	FFs59a	Silver Maple - Green Ash - Cottonwood Terrace Forest	563	16.5%
	FFs59c	Elm - Ash - Basswood Terrace Forest	553	16.2%
Mesic Hardwood Forest	MHs37	Southern Dry-Mesic Oak Forest	98	2.9%
	MHs37a	Red Oak - White Oak Forest	490	14.4%
	MHs37b	Red Oak - White Oak - (Sugar Maple) Forest	274	8.0%
	MHs38a	White Pine - Oak - Sugar Maple Forest	56	1.7%
	MHs38c	Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest	102	3.0%
	MHs39	Southern Mesic Maple-Basswood Forest	70	2.1%
	MHs39a	Sugar Maple - Basswood - (Bitternut Hickory) Forest	174	5.1%
	MHs39b	Sugar Maple - Basswood - Red Oak - (Blue Beech) Forest	316	9.3%
	MHs49	Southern Wet-Mesic Hardwood Forest	18	0.5%
	MHs49b	Elm - Basswood - Black Ash - (Blue Beech) Forest	46	1.4%
Upland Prairie	UPs13b	Dry Sand - Gravel Prairie (Southern)	39	1.2%
	UPs13c	Dry Bedrock Bluff Prairie (Southern)	101	3.0%
	UPs14b	Dry Sand - Gravel Oak Savanna (Southern)	171	5.0%
	UPs23a	Mesic Prairie (Southern)	6	0.2%
Wet Forest	WFs57b	Black Ash - Sugar Maple - Basswood - (Blue Beech) Seepage Swamp	3	0.1%

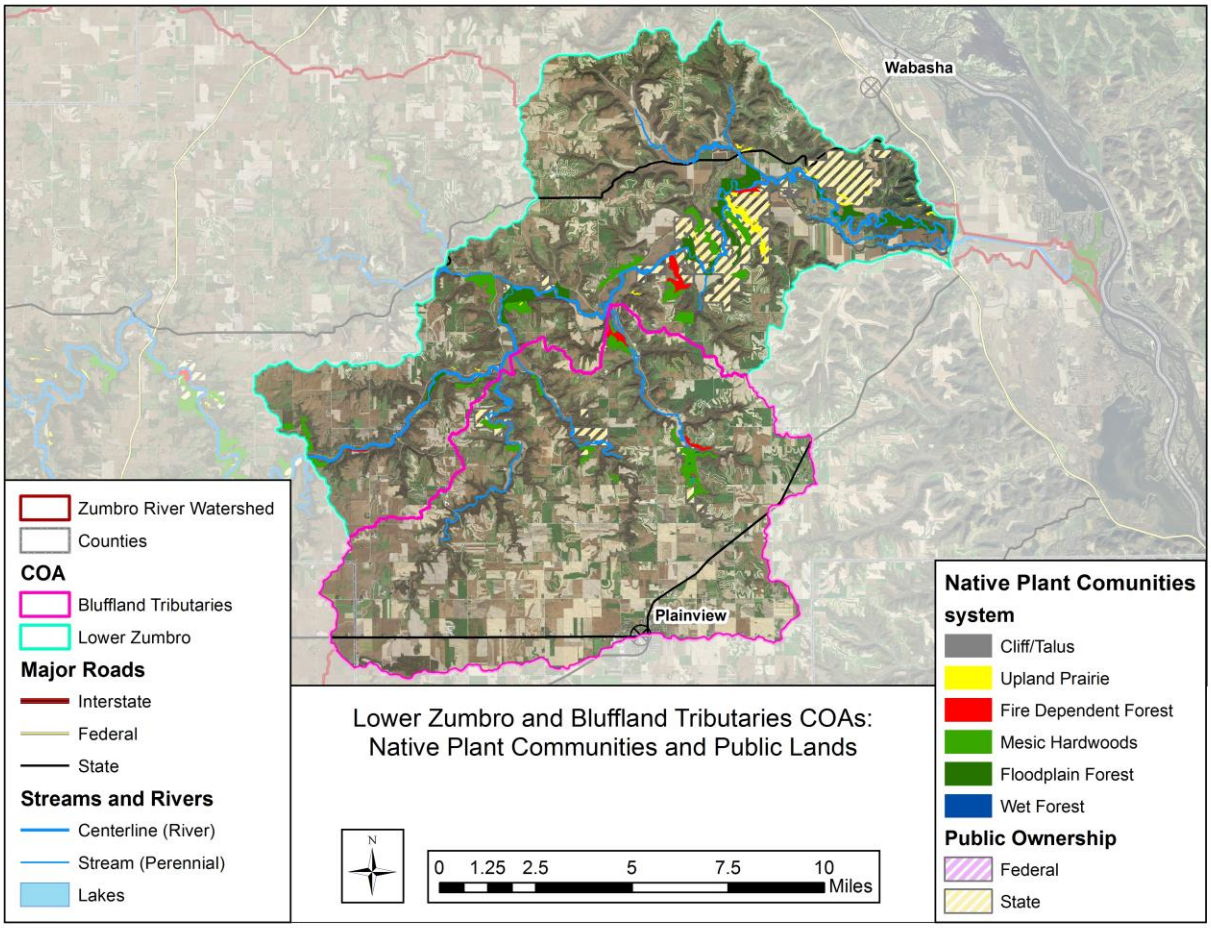


Figure 18. Native Plant Communities on and off public lands in the Lower Zumbro and Bluffland Tributaries COAs.

Biodiversity and Rare Species

The Natural Heritage Information System (NHIS) has recorded 67 different occurrences of rare plants, animals, or communities in Lower Zumbro and another 57 in the Bluffland Tributaries (Table 8). Rare species are those listed as either endangered, threatened, or of special concern. Endangered species are those facing extinction throughout all or a significant portion of its range within Minnesota. Threatened species are likely to become endangered in the foreseeable future. Species of Special Concern, though not endangered or threatened, are extremely uncommon in Minnesota. Additionally, 36 rare terrestrial communities listed in the Lower Zumbro and 22 listed in the Bluffland Tributaries COA. Rare terrestrial communities are collections of plant species growing together, whose presence on the landscape is rare or severely diminished. These communities are monitored, but not given designations as endangered, threatened, or of special concern.

Table 8. Number of rare species and community occurrences in the Lower Zumbro and Bluffland Tributaries COAs.

Organism Type	Lower Zumbro COA Observations	Blufflands Tributaries COA Observations
Animal Assemblage	2	1
Fungus	0	0
Vascular Plant	28	48
Invertebrate Animal	3	0
Vertebrate Animal	34	8
Terrestrial Community	36	22

Over 15,900 acres of the Lower Zumbro and Bluffland Tributaries COAs have been assessed by the Minnesota Biological Survey for significance to biodiversity in the state (Figure 19). Of that area, nearly 5,700 acres were assigned one of the two highest levels of 'Outstanding' of 'High' biodiversity significance. The 'High' biodiversity areas were scattered throughout the Lower Zumbro river valley however the only area designated as 'Outstanding' is along West Indian Creek.

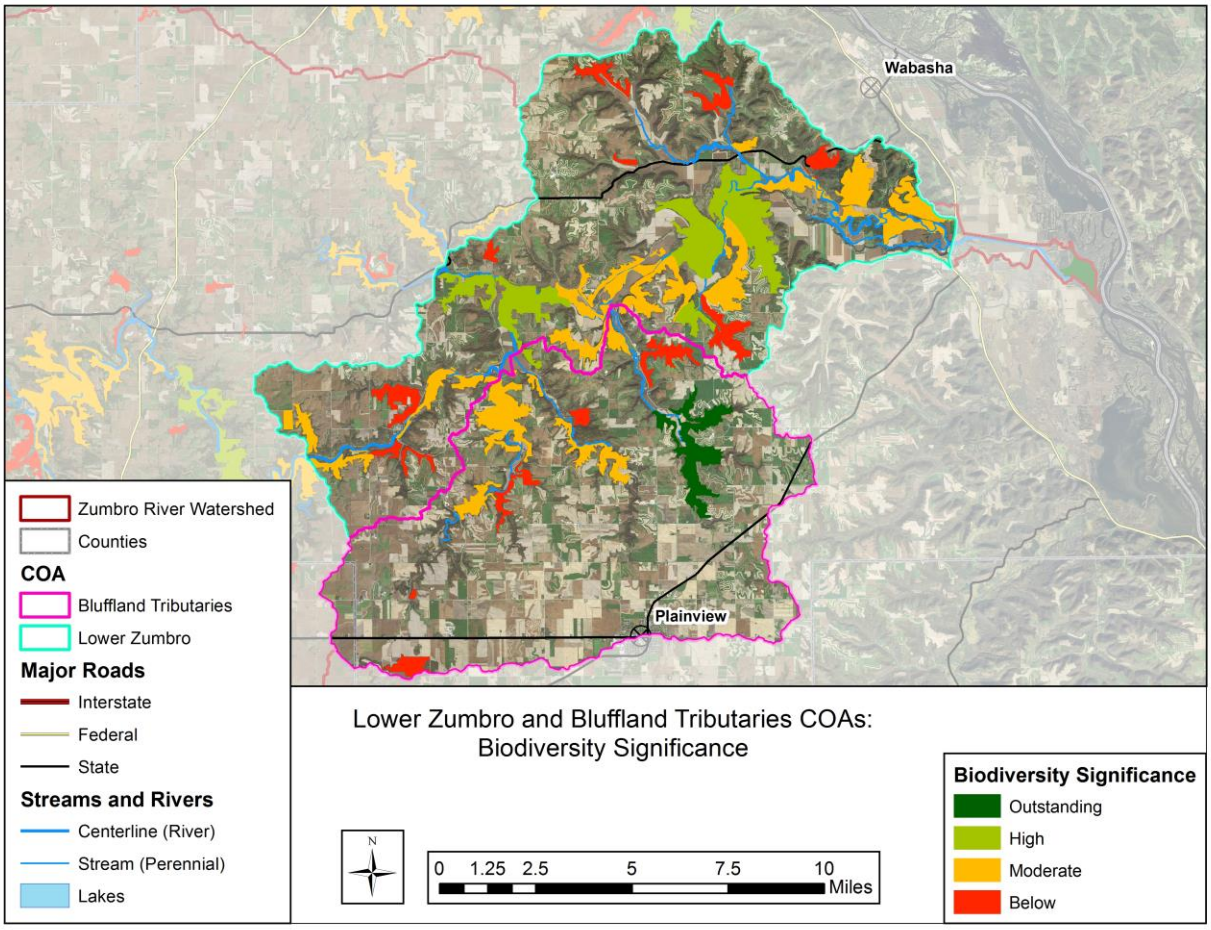


Figure 19. Areas identified by the Minnesota Biological Survey as having biodiversity significance.

Recreation

The Lower Zumbro and Bluffland Tributaries COAs offers opportunities to bike, watch birds, fish, hike, hunt, snowmobile, or ride dirt bike. These outdoor recreation activities contribute to the well-being of residents and support the local economy. A key hub for outdoor recreation in the area is the Zumbro Bottoms which offers 44 miles of horseback riding trails and three equestrian campgrounds. These campgrounds have 72 campsites specifically designed for horses with a hand-pumped well, picket lines, tie rails, and manure disposal areas. This special equestrian area is unique in the state and very popular with horse owners. Hunting is a popular outdoor recreational activity throughout the area on public and private land. Additionally, the Zumbro River is a designated state water trail that is a very popular canoe, kayak, and inner-tube route in the summer. Fishing opportunities abound for both cool and cold-water fish species. A network of snowmobile trails also winds through the COA.

Environmental Threats

Mismanagement of forest resources:
The forests of Southeast Minnesota support a number of high value timber species, and many sites exist containing high quality timber stock. This represents an important resource for the region, but is also a target for exploitative harvesting practices. Timber harvests that remove all of the most valuable trees in a stand, and leave behind a patchy, irregular forest of poor quality trees do serious harm to the health and productive potential of that site, and severely limit management options in the future. The high value of the timber resource enables sustainable timber management to produce valuable economic products while also providing the habitat and ecosystem services of a healthy forest. Unsustainable harvesting practices can seriously impair a stand's ability to do so in the future.

Nutrient, sediment, and contaminants from upstream agricultural areas:
A portion of the COA and areas upstream, are heavily farmed, often with practices that have the potential to impair water quality. This has large impacts on downstream reaches. Best management practices are available to farmers to protect their soil from erosion, and help prevent excess nutrients and sediment from washing into the streams. Riparian buffer strips help slow run-off and increase infiltration, allowing nutrients to be filtered and removed by soil processes. Increased adoption of agricultural BMPs to protect water quality in upstream areas will help protect the water quality of downstream reaches in the COA.

Development pressures:
Although the Lower Zumbro and Bluffland Tributaries COAs are currently relatively rural, the area is within 45 minutes of the City of Rochester which is in the early stages of a multi-billion dollar economic development project called the "Destination Medical Center" (DMC). The DMC is projected to create between 26,800 to 32,200 new jobs directly. This economic and population growth can lead to increased parcellization, fragmentation, and conversion of rural lands. This disrupts wildlife movement and migration, reduces available habitat, and increased water quality concerns from the added impervious surface area. The demand for dispersed rural residences places less-disturbed parts the landscape under pressure for development. This is compounded by the likelihood of population growth in the region.

Industrial silica sand mining:
Southeast Minnesota has significant deposits of industrial silica sand bedrock at or near the surface. The increased demand for this material in the hydrological fracturing (fracking) process for oil and gas development has created an ongoing policy debate about appropriate use and

regulations of this resource. There currently are not any mines operating in the Zumbro River Watershed but a significant portion of the Lower Zumbro and Bluffland Tributaries COAs have quartz-rich sandstone within 50 ft. of the land surface. Potential impacts of mining include removal of vegetation and underlying substrates, habitat destruction, chemical contamination of karst hydrology, and water contamination from high volume dispersals from water processing facilities and dewatering pits.

Land Ownership

Nearly 5,900 acres of the Lower Zumbro and Bluffland Tributaries COAs are in public ownership (Table 9, Figure 20). All of this public land is managed by the Minnesota DNR Division of Forestry as part of the Richard J. Dorer Memorial Hardwood State Forest. Despite the relatively large area of public land for the region, private lands still make up nearly 95% of the COA. Since private lands make up such a large portion of the COA it is clear that private landowners will play a crucial role in conservation. Much of the forested area occurs in areas with dispersed residential development, and finding programs that will appeal to these landowners will be necessary to encouraging the necessary private conservation.

To date, private conservation programs have demonstrated some success in the COA. The DNR Forest Stewardship Program is an excellent first step in landowner involvement and concern for the ecological health of the landscape and 2,040 acres have a registered stewardship plan in the Zumbro COA. This voluntary program provides technical advice and long-range forest management planning to interested landowners. Plans are designed by professional foresters to meet the landowner's goals while maintaining the sustainability of the land.

The Reinvest in Minnesota (RIM) program has easements in the COA covering 616 acres. This program purchases conservation easements on privately owned lands to retire environmentally sensitive lands from agricultural production. Conservation practices are established by planting native vegetation, and restoring wetlands with the goal of protecting and improving water quality, reducing soil erosion, and enhancing fish and wildlife habitat.

Table 9. Estimated land ownership in the Lower Zumbro and Bluffland Tributaries COAs.

Ownership	Acres	Percent of Public	Percent of COA
Private	101,707	--	94.5%
MN DNR Division of Forestry	5,867	100%	5.5%

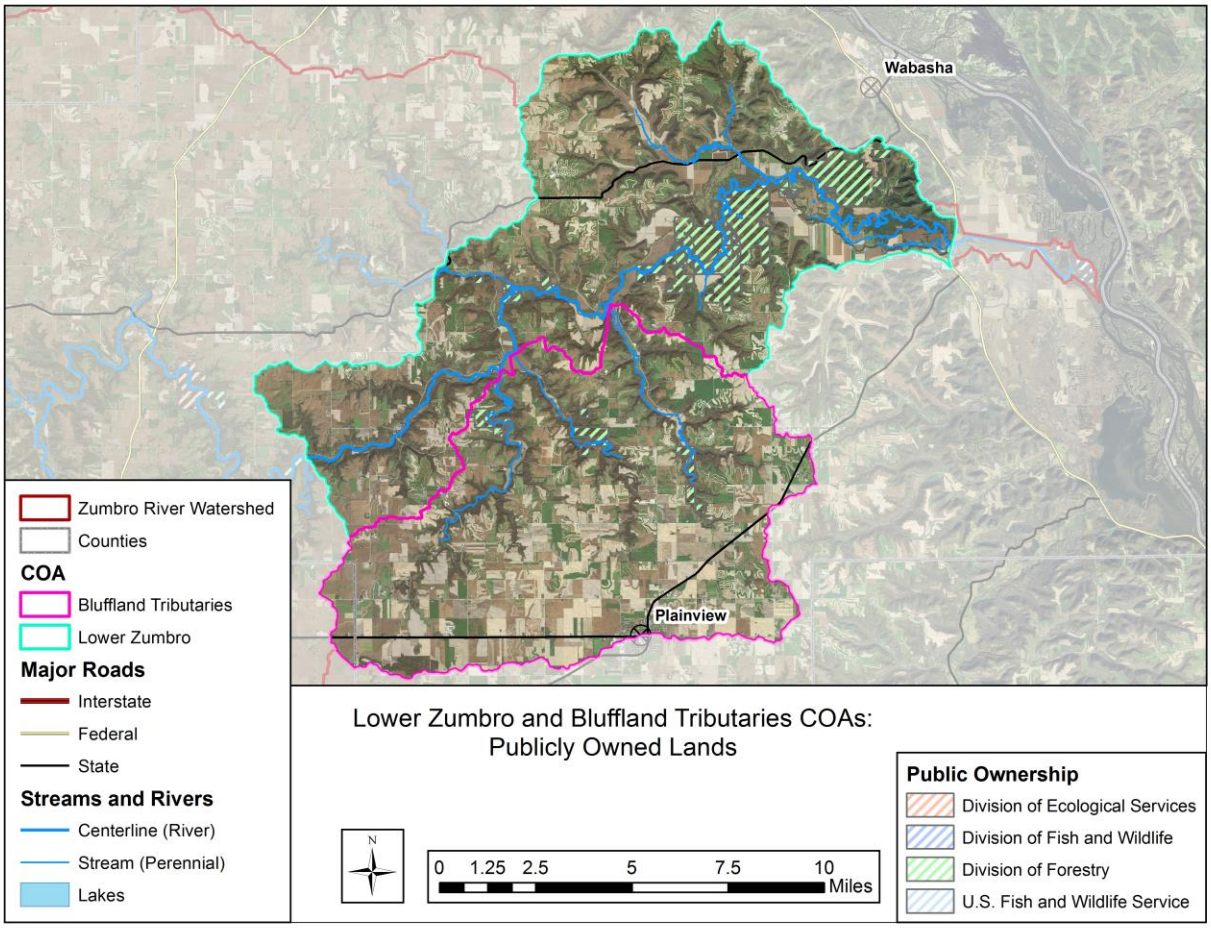


Figure 20. Public land in the Lower Zumbro and Bluffland Tributary COAs.

Land Cover and Use

About 24 percent of the Lower Zumbro and Bluffland Tributaries COAs was covered by prairie at the time of European settlement and the rest existed in some type of forest ranging from oak savanna openings to dense mesic hardwood forests (Table 10, Figure 21). Today the land use patterns in the COAs follows the general pattern for the broader watershed. The predominantly flat, upland areas are mostly cropland or pasture. The hillsides are dominated by forests, and the valley floors and floodplain areas contain a mix of cropland, pasture, forests, and wetlands (Figure 22). Major cover types are cultivated crops (35.6%), deciduous forest (23.3%), pasture/hay (19.0%), and grassland/herbaceous (13.8%) cover is also significant (Table 11).

Table 10. Presettlement land cover in the Lower Zumbro and Bluffland Tributaries COAs.

Land Type	Acres	Percent
Aspen-Oak Land	4,600	4%
Big Woods - Hardwoods (oak, maple, basswood, hickory)	5,644	5%
Brush Prairie	5,825	5%
Oak openings and barrens	58,441	54%
Prairie	25,825	24%
River Bottom Forest	7,239	7%

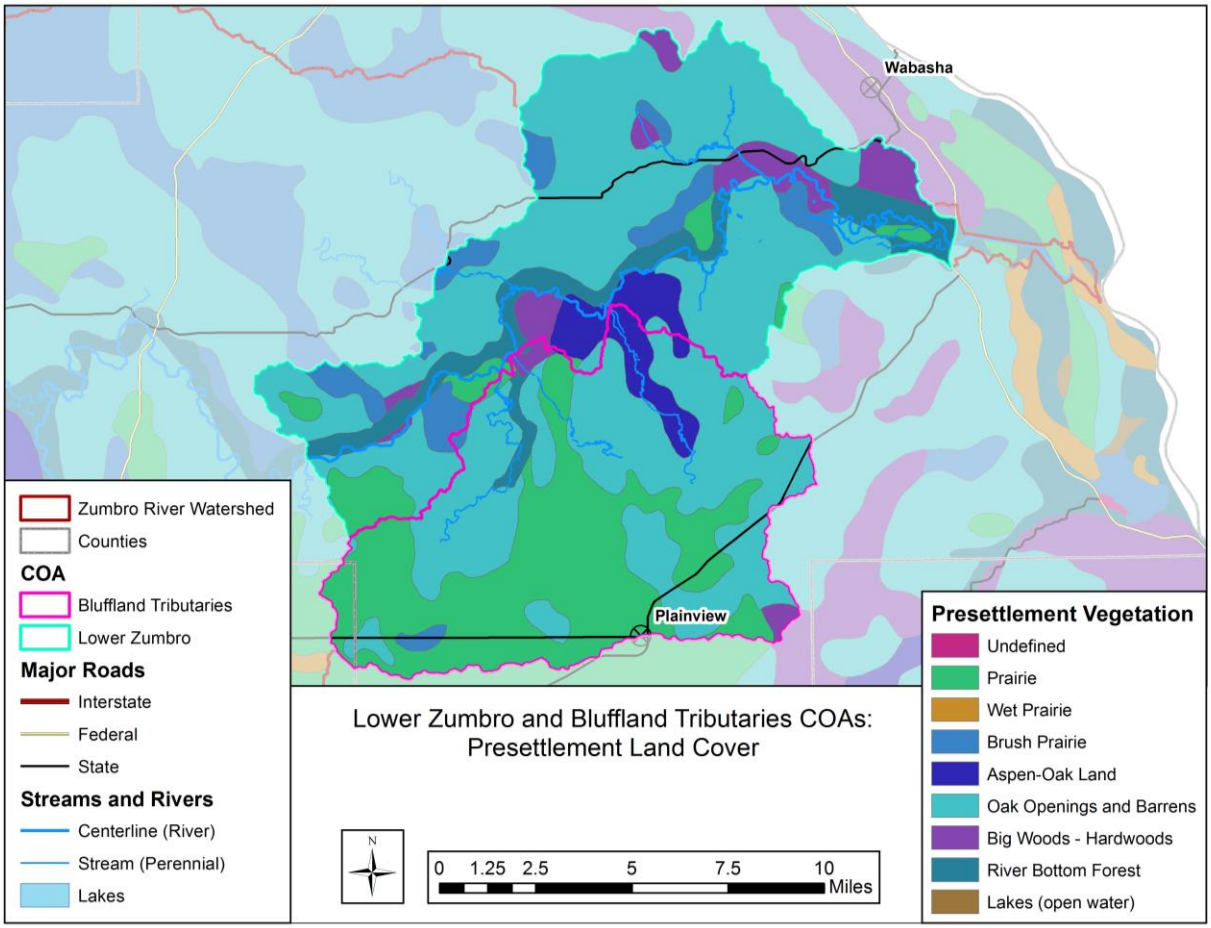


Figure 21. Presettlement land cover in the Lower Zumbro and Bluffland Tributaries COAs based on the work of Francis J. Marschner.

Table 11. Current land cover in the Lower Zumbro and Bluffland Tributaries COAs.

Land Cover Class	Acres	Percent of COAs
Cultivated Crops	38,329	35.6%
Deciduous Forest	25,096	23.3%
Hay/Pasture	20,418	19.0%
Herbaceous	14,816	13.8%
Developed, Open Space	3,216	3.0%
Woody Wetlands	2,524	2.3%
Emergent Herbaceous Wetlands	1,129	1.0%
Developed, Low Intensity	834	0.8%
Open Water	669	0.6%
Developed, Medium Intensity	202	0.2%
Evergreen Forest	178	0.2%
Barren Land	50	0.0%
Mixed Forest	41	0.0%
Developed, High Intensity	38	0.0%
Shrub/Scrub	36	0.0%

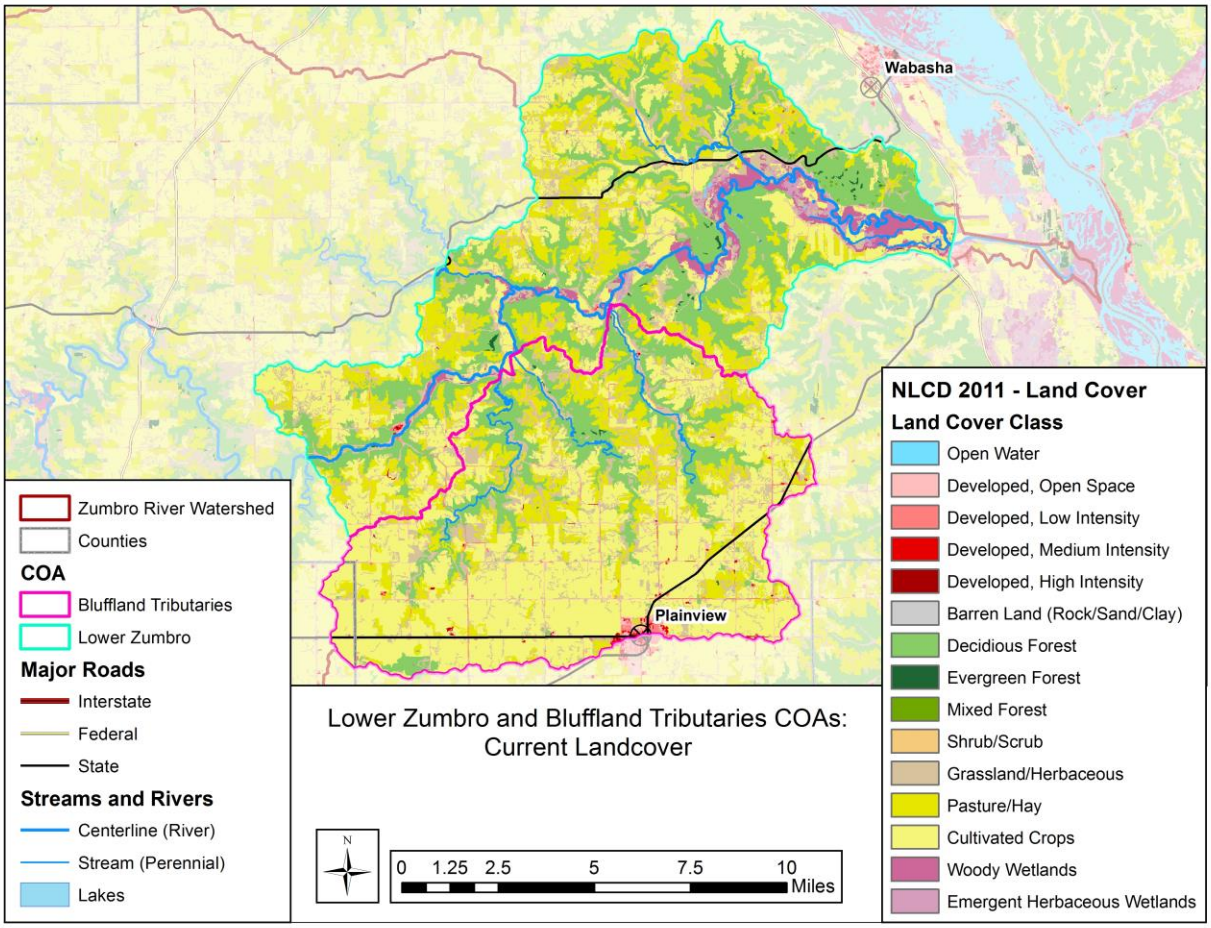


Figure 22. Current land cover in the Lower Zumbro and Bluffland Tributaries COAs based on the 2011 National Land Cover Database.

Desired Future Conditions

- 100% of riparian areas are covered by native vegetation, returning a host of ecological services for water quality, habitat quality, and connectivity.
- Biotic integrity of all streams within the COA is restored, resulting in healthy aquatic species and de-listing of impaired waters.
- Human activity in riparian areas follows best management practices to protect water quality and sensitive shorelines.
- Agricultural practices within the COA follow best management practices to protect soil from erosion, and streams from sedimentation and nutrient loading.
- A natural fire regime is restored through prescribed burning on all appropriate native plant communities.
- Large blocks of native habitat exist across ownership lines.
- Habitat corridors link patches of biodiversity habitat, supporting migration and travel, especially in riparian areas.
- Native plant community remnants have expanded
- Rare plants and animal habitat are protected from degradation
- Invasive species are monitored and controlled

Key Stewardship Parcels

Acquisition efforts can only go so far and stewardship efforts on private parcels will be crucial to protecting the natural resources of the area. Conservation efforts in the Lower Zumbro and Bluffland Tributaries COAs will be most effective in places where they protect existing native plant communities, and enhance habitat on public lands by increasing their size and/or connectivity. Working with larger parcels is preferable, because more stewardship options are available on larger tracts, and stewardship planning will impact a greater area. To make the most efficient use of conservation resources, it is useful to target parcels where those resources will have the most impact. A GIS analysis identified key stewardship parcels in the COA that met the following conditions:

- Parcels larger than 40 acres in size
- Include an area of moderate, high, or outstanding biodiversity significance as delineated by the MBS

There were 134 such parcels within Lower Zumbro and Bluffland Tributaries COAs, covering over 14,800 acres, with 90 unique owners listed (Figure 23). Average size among priority parcels was 110 acres.

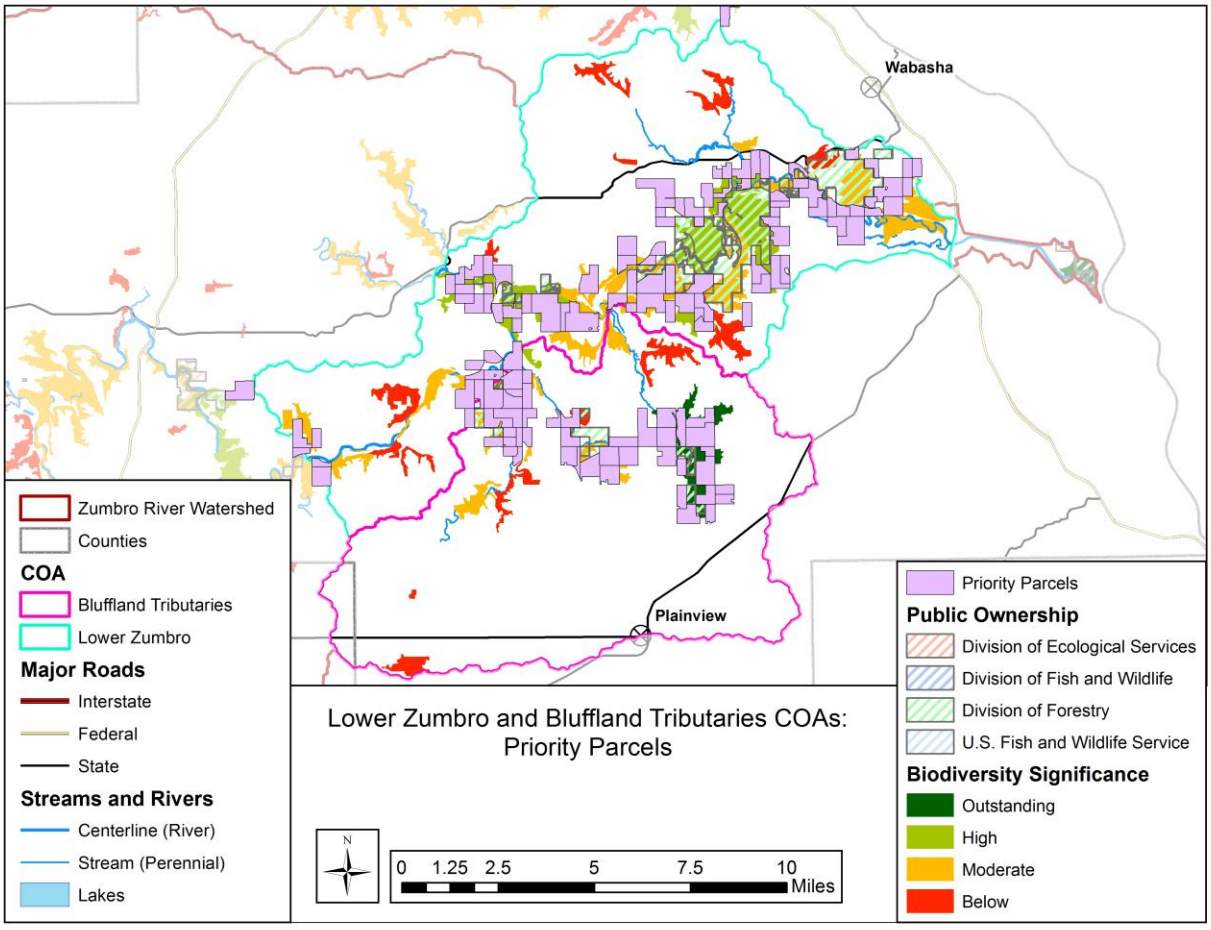


Figure 23. Priority parcels in the Lower Zumbro and Bluffland Tributaries COAs.

Stewardship Activities

There is a variety of tools and strategies available for enacting stewardship activities on the landscape (see Section 1). Different strategies and actions will be appropriate for different types of parcels, natural resources, and landowners. This section provides a summary of strategies appropriate for the natural resources present in this COA.

Core Forest Areas

Large, continuous stretches of forest communities represent core forest habitat. In addition to providing quality habitat to a number of species, these areas represent favorite places for recreation and scenery, making them important for the tourism industry in the region. They also provide a great benefit to water quality, as forests help prevent erosion, slow and filter water run-off, and shade streams in riparian areas.

Stewardship Activities:

On all lands:

- Control invasive species
- Burn where appropriate
- Manage according to sustainable silvicultural and ecological principles
- Where possible, increase size and connectivity of forest habitat through reforestation / afforestation of connecting patches

On Private lands:

- Prepare comprehensive forest stewardship plans
- Assist landowner in researching and applying for relevant cost-share programs available (e.g. EQIP, CSP)

Karst Features

Karst features are locations where cracks or fissures in the bedrock create sinkholes and other direct connections between surface water and ground water aquifers. Springs and seeps are places where groundwater reemerges onto the land or streams. Pollution in these areas can quickly enter groundwater reservoirs and also affect surface water quality. They are crucial areas to protect in order to preserve the water quality of the COA.

Stewardship Activities:

- Protect sinkholes and springs with buffers of native vegetation
- Limit pesticide applications in the vicinity of sinkholes

Prairies, Savannas, and Fire-Associated Native Plant Communities

The suppression of fire and mass conversion to agriculture that came with Euro-American settlement drastically reduced the amount of native prairie and savannas in both Minnesota, and the US as a whole. These communities offer important habitat for a number of animals, and many flowering plants and grasses.

Stewardship Activities:

On all lands:

- Restore a natural fire regime through prescribed burns
- Remove brush as needed
- Control invasive species
- Expand grassland habitat as buffer areas around other NPCs.

Riparian Area Maintenance and Restoration

Riparian areas are those nearest, and most connected to streams and rivers. They have an important impact on water quality either, positively by slowing and filtering run-off, or negatively, by contributing to sediment and nutrient loads brought to streams through erosion and run-off. Implementing best management practices and other conservation actions in these areas can have significant water quality and wildlife benefits.

Stewardship Activities:

On public lands:

- Reconnect waterways with their floodplains.
- Utilize the delineation of critical cropland areas from Benck and Fry (Examining the Relationship between Land Cover and Water Quality Protection: The Blufflands Region of the Cannon and Zumbro River Watersheds, 2017, Saint Mary's University of Minnesota - GeoSpatial Services, 700 Terrace Heights, Box #7, Winona, MN 55987)
- Maintain and/or establish appropriate plant communities for the hydrology of the site.

On private lands:

- Support SWCDs in implementing and enforcing the state buffer law and other best management practices. Help interested landowners apply for the various cost-share or easement programs available for water quality protection (e.g. CRP, RIM).
- Work with landowners to reconnect streams to their floodplains.
- Maintain and restore natural vegetation along stream and riverbanks.

Key Stewardship Parcels

These parcels were identified based on their geographical size, areas of biodiversity significance, and proximity to public land (see above). They are areas where conservation effort can be most beneficial to the overall health of the landscape.

Stewardship Activities:

- Work to engage the owners of these parcels in a targeted manner.
- Tailor outreach and assistance to each landowner individually based on characteristics of their parcel and its geographical and ecological characteristics
- Prioritize stewardship efforts affecting these parcels.

Southern Headwaters Conservation Opportunity Area

Overview

The Southern Headwaters COA is composed of two areas near Rochester (Figure 24). The eastern unit occupies the US Highway 14 corridor east of Rochester near Chester Woods. The western unit extends southwest from Rochester along the South Fork of the Zumbro towards the town of Rock Dell. These two units encompass nearly 55,000 acres in the watersheds of Goose Creek, Bear Creek and the South Fork of the Zumbro. Key natural areas in the Southern Headwaters COA include Chester Woods County Park, Keller WMA, Marian Marshall WMA, Nelson Fen WMA, and Suess WMA. According to data from the Public Land Survey, 92% of this area was covered by either open prairie or oak savanna type habitat. Much of this region has been converted to agriculture however; the remnants of the region's natural communities represent a conservation opportunity to build from.

A primary focus in this COA is to protect the water quality of the Zumbro River and local groundwater supply, especially as it pertains to the drinking water of Rochester. Riparian areas, calcareous fens, and forested ecosystems in this COA represent hotspots for biodiversity as identified in the Wildlife Action Network and represent opportunities to protect regional drinking water. The Minnesota Biological Survey has designated substantial portions of the COA as having biodiversity significance, and an opportunity exists for successful private land conservation efforts. Acquisition efforts should focus on landscape features that impact local groundwater quality. Efforts should also be made to avoid commercial and residential development along the Decorah Edge.

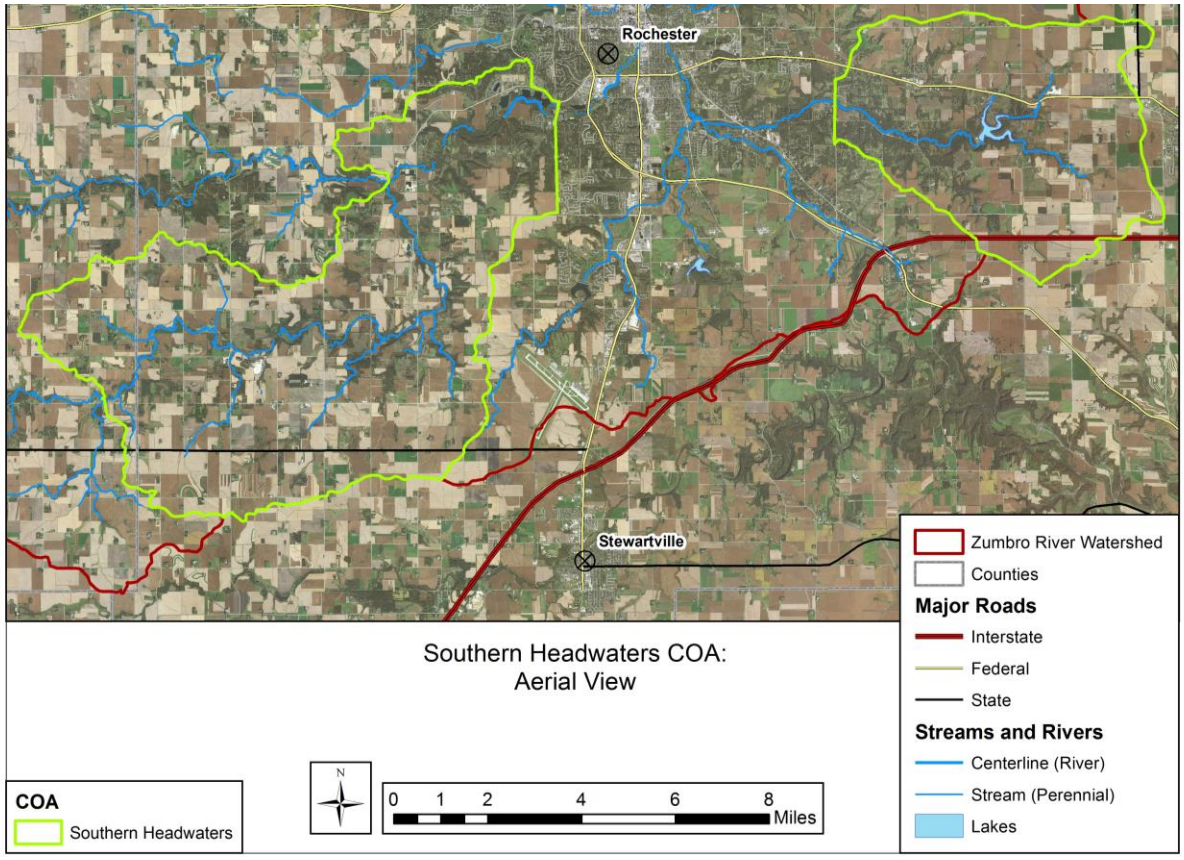


Figure 24. Southern Headwaters COA in the Zumbro River Watershed.

Hydrology

The dominant hydrological features of the Southern Headwaters COA are the South Fork of the Zumbro River and two significant tributaries: Bear and Goose Creek. Numerous unnamed perennial or intermittent streams originating in the agricultural uplands feed these major hydrological features (Figure 25). Extensive agricultural tile lines and a reduction in perennial cover have changed the hydrology in the COA to move water faster through the system. Additionally, this COA contains a series of karst features (Figure 26) that can complicate the understanding of the local hydrology and be challenging to protect because there are often hidden, rapid pathways from pollution release points to drinking water wells or surface water.

A landscape feature knows as the Decorah Edge plays a significant role in the hydrology of this COA and the surrounding area. The Decorah Edge is formed where groundwater that has been slowly flowing atop the impermeable Decorah shale reaches a sidehill where it spills over this impermeable surface and then reenters the groundwater below. This "edge" sustains a biologically diverse ecosystem and naturally filters the groundwater that supplies drinking water for the region's cities and farms. These flowing waters are most evident during wet periods when seeps and springs discharge along hillsides. They can also be seen in excavations and in basements of homes located on the hillsides. This feature works as a natural filter removing pollutants from water as it flows through the soils, vegetation, and wetlands that overlie the shale bed. This filtration is a valuable economic asset for the region. In addition to removing pollutants from groundwater, filtration processes at the Decorah Edge also purify seep and spring water discharges that form the surrounding waterways.

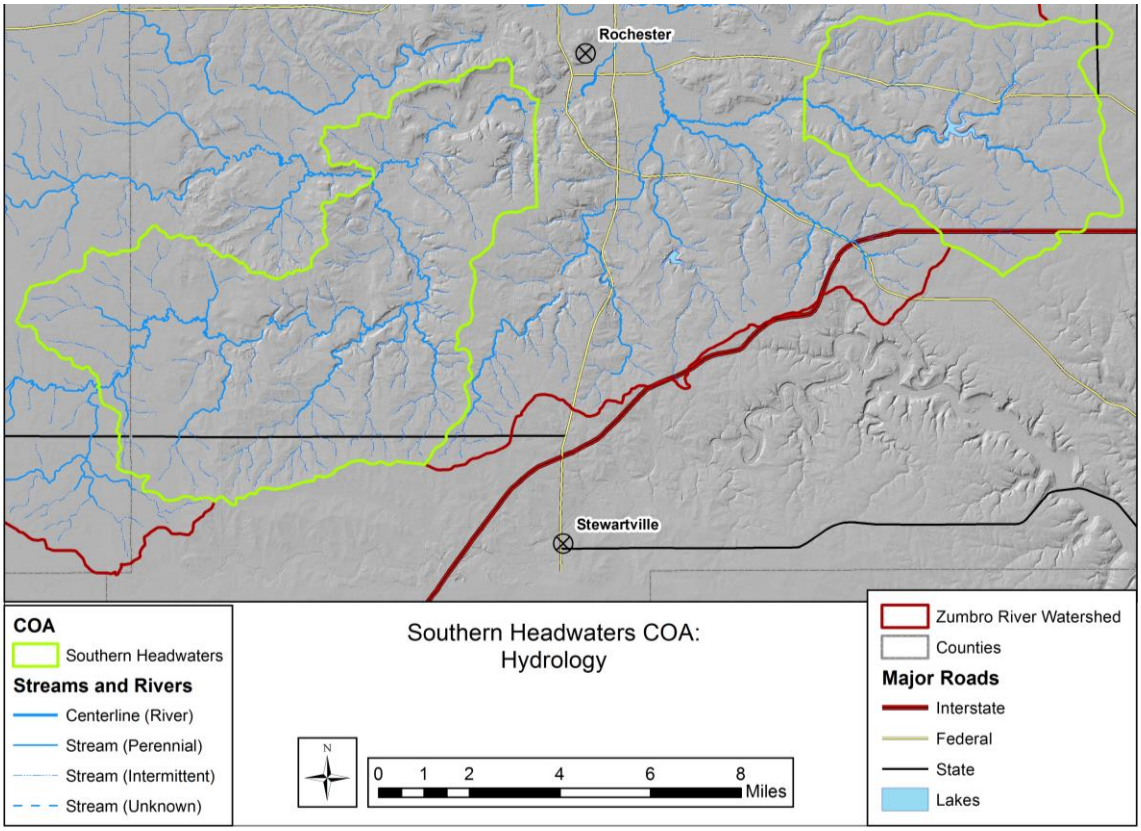


Figure 25. Hydrology of the Southern Headwaters COA.

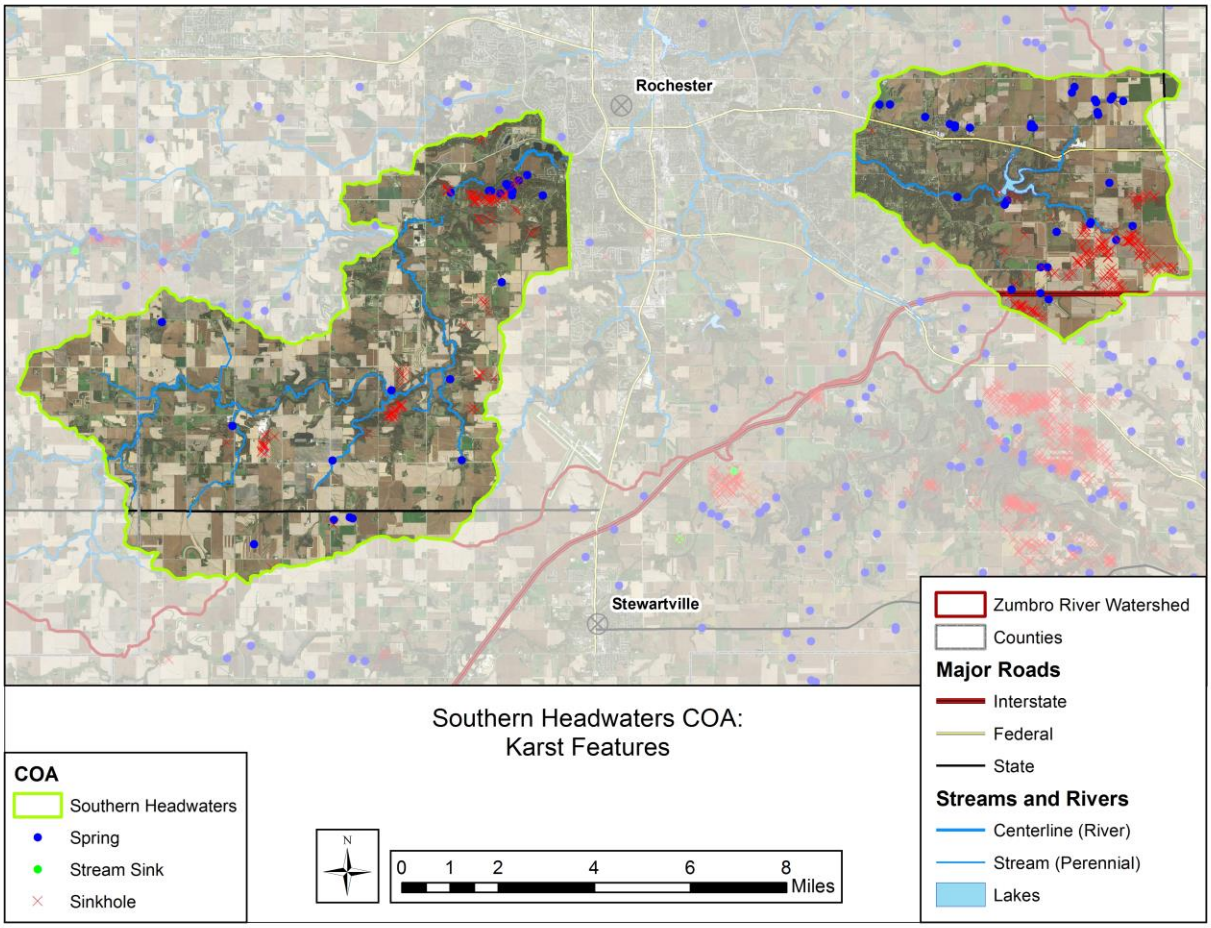


Figure 26. Karst features in the Southern Headwaters COA.

Plant Communities

The Southern Headwaters COA contains almost 1,150 acres of Native Plant Communities (NPC) in six different systems and 18 different types and subtypes as identified by the Minnesota Biological Survey (MBS) (Table 12). Floodplain forest make up 35% of the identified NPC acres with mesic hardwoods (31%) and fire dependent forest or woodland (18%) systems also making a significant portion of the total acreage. Full descriptions of native plant community types and their associated ecological systems can be found in *Field Guide to the Native Plant Communities of Minnesota: the Eastern Broadleaf Forest Province* produced and distributed by the MN DNR.

Approximately 68 percent of the NPCs in the Southern Headwaters COA are on publicly owned land, with many of the privately owned NPCs on parcels near the blocks of public land (Figure 27). Private parcels containing NPCs, especially those bordering publicly managed areas, represent an important priority for increased protection and private conservation efforts.

Table 12. Native Plant Communities of the Southern Headwaters COA.

System	NPC Code	Native Plant Community	Acreage	% of NPC Acreage
Fire Dependent Forest or Woodland	FDs27b	White Pine - Oak Woodland (Sand)	23.1	2.0%
	FDs27c	Black Oak - White Oak Woodland (Sand)	148.3	13.0%
	FDs38a	Oak - Shagbark Hickory Woodland	30.8	2.7%
Floodplain Forest	FFs59	Southern Terrace Forest	51.1	4.5%
	FFs59c	Elm - Ash - Basswood Terrace Forest	346.6	30.4%
Mesic Hardwood Forest	MHs37	Southern Dry-Mesic Oak Forest	107.6	9.4%
	MHs37a	Red Oak - White Oak Forest	117.1	10.3%
	MHs37b	Red Oak - White Oak - (Sugar Maple) Forest	23.3	2.0%
	MHs39a	Sugar Maple - Basswood - (Bitternut Hickory) Forest	10.3	0.9%
	MHs39b	Sugar Maple - Basswood - Red Oak - (Blue Beech) Forest	79.5	7.0%
	MHs49	Southern Wet-Mesic Hardwood Forest	20.2	1.8%
Open Rich Peatland	OPp93c	Calcareous Fen (Southeastern)	18.1	1.6%
Upland Prairie	UPs13a	Dry Barrens Prairie (Southern)	29.8	2.6%
	UPs13b	Dry Sand - Gravel Prairie (Southern)	4.6	0.4%
	UPs13c	Dry Bedrock Bluff Prairie (Southern)	22.2	1.9%
	UPs14a2	Dry Barrens Oak Savanna (Southern): Oak Subtype	6.3	0.6%
Wet Meadow or Carr	WMn82b	Sedge Meadow	31.2	2.7%
	WMs83a1	Seepage Meadow/Carr Tussock: Sedge Subtype	71.6	6.3%

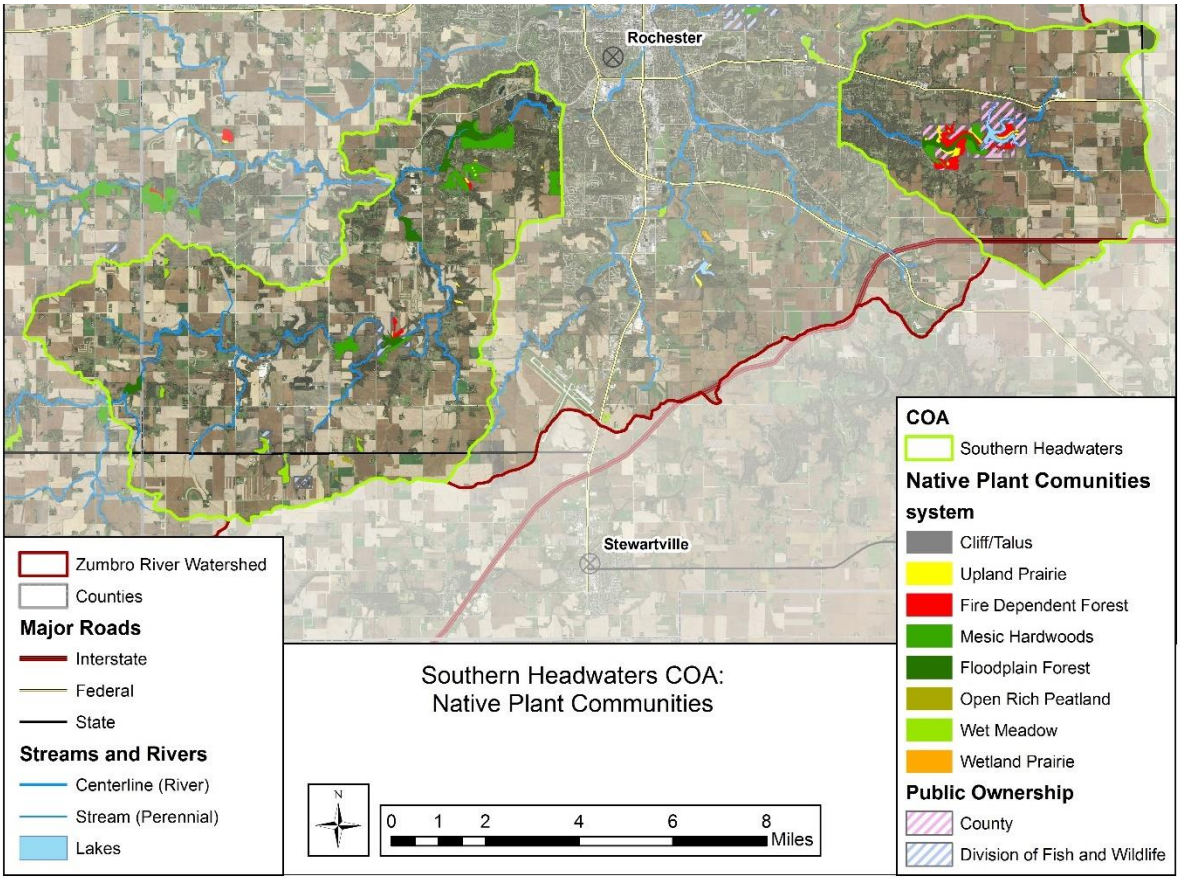


Figure 27. Native Plant Communities on and off public lands in the Southern Headwaters COA.

Biodiversity and Rare Species

The Natural Heritage Information System (NHIS) has recorded 69 different occurrences of rare plants, animals, or communities in the western unit of the Southern Headwaters COA and another 19 in the eastern unit (Table 13). Rare species are those listed as either endangered, threatened, or of special concern. Endangered species are those facing extinction throughout all or a significant portion of its range within Minnesota. Threatened species are likely to become endangered in the near future. Species of Special Concern, though not endangered or threatened, are extremely uncommon in Minnesota. Eight rare terrestrial communities are listed in each unit of the Southern Headwaters COA. Rare terrestrial communities are collections of plant species growing together, whose presence on the landscape is rare or severely diminished. These communities are monitored, but not given designations as endangered, threatened, or of special concern.

Table 13. Number of rare species and community occurrences in the Southern Headwaters COA.

Organism Type	Eastern Unit Observations	Western Unit Observations
Vascular Plant	12	19
Invertebrate Animal		7
Vertebrate Animal	7	43
Terrestrial Community	8	8

Over 3,200 acres of the Southern Headwaters COA have been assessed by the Minnesota Biological Survey for its significance to biodiversity in the state (Figure 28). Of that area, nearly 650 acres were given the highest level of 'Outstanding'. The outstanding areas are concentrated around Chester Woods in the eastern unit and the calcareous fens in the western unit.

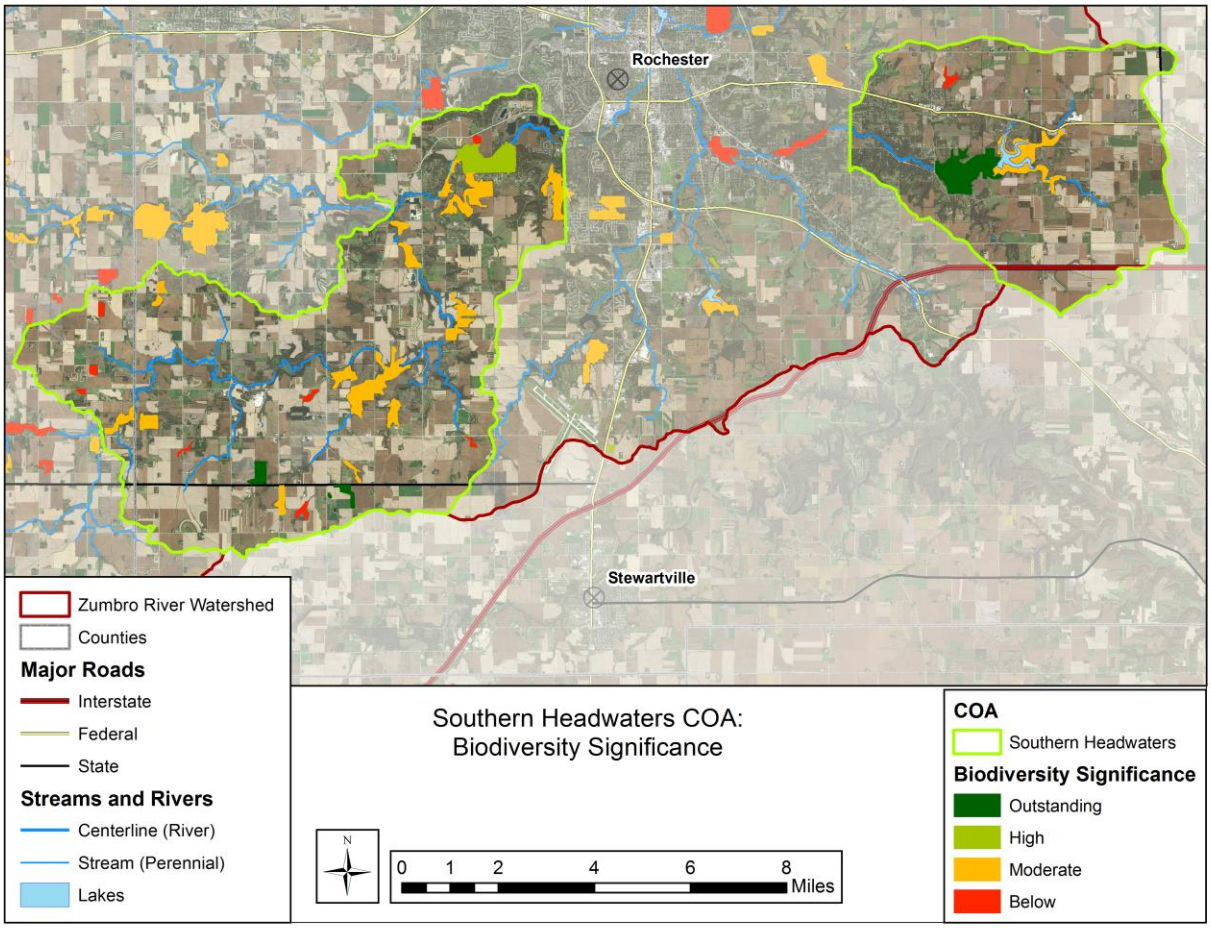


Figure 28. Areas identified by the Minnesota Biological Survey as having biodiversity significance in the Southern Headwaters COA.

Recreation

There are a number of important outdoor recreation areas in the Southern Headwaters COA that contribute to the well-being of residents and support the local economy. Chester Woods County Park offers a 52-unit campground and approximately 12 miles of primitive trails winding through a variety of natural habitats. In addition, a mile long hard surfaced trail links the campground, boat launch, fishing pier, and picnic areas. The western unit has several Wildlife Management Areas (WMA) that are popular locations for hunting, hiking and birdwatching. Hunting is a popular outdoor recreational activity throughout the area on public and private land. Additionally, the Zumbro River is a designated state water trail that is a popular canoe and kayak route in the summer. Both units offer fishing opportunities.

Environmental Threats

Development pressures:
The City of Rochester is located on the edge of both units of this COA and is in the early stages of a multi-billion dollar economic development project called the "Destination Medical Center" (DMC). The DMC is projected to create between 26,800 to 32,200 new jobs directly. This economic and population growth can lead to increased parcellization, fragmentation, and conversion of rural lands. This disrupts wildlife movement and migration, reduces available

habitat, and increased water quality concerns from the added impervious surface area. The demand for dispersed rural residences places less-disturbed parts of the landscape under pressure for development. This is compounded by the likelihood of population growth in the region.

Development in the Decorah Edge:
In the urbanizing areas around Rochester, the Decorah Edge is under increasing development pressure. Disturbance of groundwater flows and removal of vegetation associated with development may jeopardize the ability of this important natural resource to both supply groundwater and to purify it.

Industrial silica sand mining:
Southeast Minnesota has significant deposits of industrial silica sand bedrock at or near the surface. The increased demand for this material in the hydrological fracturing (fracking) process for oil and gas development has created an ongoing policy debate about appropriate use and regulations of this resource. There currently are not any mines operating in the Zumbro River Watershed but a significant portion of the Southern Headwaters COA has quartz-rich sandstone within 50 ft. of the land surface. Potential impacts of mining include removal of vegetation and underlying substrates, habitat destruction, chemical contamination of karst hydrology, and water contamination from high volume dispersals from water processing facilities and dewatering pits.

Mismanagement of forest resources:
The forests of Southeast Minnesota support a number of high value timber species, and many sites exist containing high quality timber stock. This represents an important resource for the region, but is also a target for exploitative harvesting practices. Timber harvests that remove all of the most valuable trees in a stand, and leave behind a patchy, irregular forest of poor quality trees do serious harm to the health and productive potential of that site, and severely limit management options in the future. The high value of the timber resource enables sustainable timber management to produce valuable economic products while also providing the habitat and ecosystem services of a healthy forest. Unsustainable harvesting practices can seriously impair a stand's ability to do so in the future.

Nutrient, sediment, and contaminants from upstream agricultural areas:
A significant portion of the Southern Headwaters COA, and areas upstream, are heavily farmed, often with practices that have the potential to impair water quality. This has large impacts on downstream reaches. Best management practices are available to farmers to protect their soil from erosion, and help prevent excess nutrients and sediment from washing into the streams. Riparian buffer strips help slow run-off and increase infiltration, allowing nutrients to be filtered and removed by soil processes. Increased adoption of agricultural BMPs to protect water quality in upstream areas will help protect the water quality of downstream reaches in the COA.

Land Ownership

Over 1,700 acres of the Southern Headwaters COA are in public ownership (Table 14, Figure 29). Much of this public land exists in one parcel, Olmstead County's Chester Woods (1,300 acres). The remaining 97% of the COA is in private ownership. Since private lands make up such a large portion of the COA it is clear that private landowners will play a crucial role in conservation in this COA. Much of the forested area occurs in areas with dispersed residential development, and finding programs that will appeal to these landowners will be necessary to encouraging the necessary private conservation.

To date, private conservation programs have demonstrated some success in the COA. The DNR Forest Stewardship Program is an excellent first step in landowner involvement and concern for the ecological health of the landscape and 432 acres have a registered stewardship plan in the Southern Headwaters COA. This voluntary program provides technical advice and long-range forest management planning to interested landowners. Plans are designed by professional foresters to meet the landowner's goals while maintaining the sustainability of the land.

The Reinvest in Minnesota (RIM) program has easements in the COA covering 195 acres. This program purchases conservation easements on privately owned lands to retire environmentally sensitive lands from agricultural production. Conservation practices are established by planting native vegetation, and restoring wetlands with the goal of protecting and improving water quality, reducing soil erosion, and enhancing fish and wildlife habitat.

Table 14. Land ownership in the Southern Headwaters COA.

Ownership	Acres	Percent of Public	Percent of COA
Private	1,300	--	96.9%
Olmstead County	52,811	76.3%	2.4%
Division of Fish and Wildlife	404	23.7%	0.7%

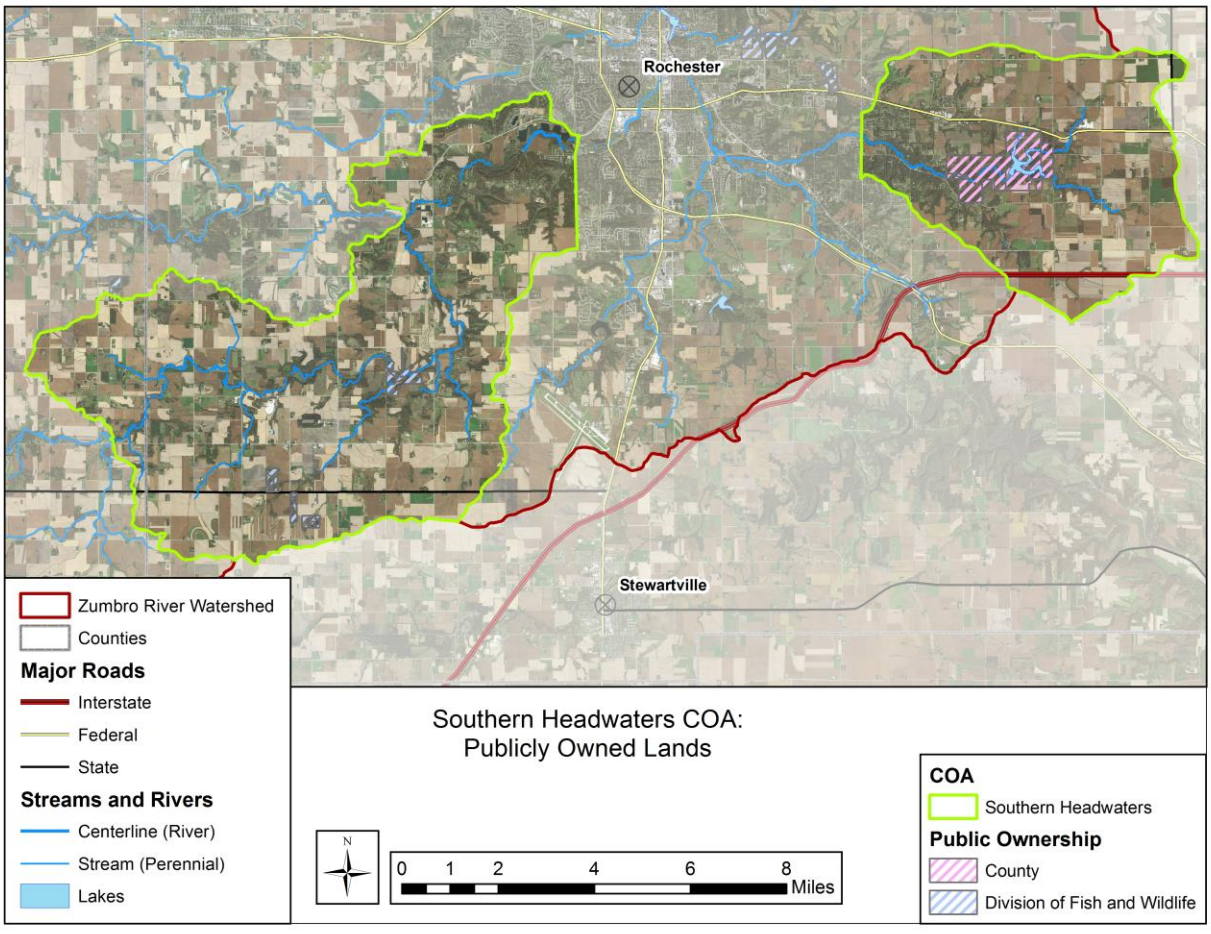


Figure 29. Public land in the Southern Headwaters COA.

Land Cover and Use

Ninety-two percent of the Southern Headwaters COA was covered in prairie or semi-open oak savanna habitat at the time of European settlement (Table 15, Figure 30). Exceptions included floodplain forest along the Zumbro River and a more closed canopy forest on the outskirts of present day Rochester.

Today the land use patterns in the Southern Headwaters COA follow the general pattern for the broader watershed. The predominantly flat, upland areas are mostly cropland or pasture. The hillsides are dominated by forests, and the valley floors and floodplain areas contain a mix of cropland, pasture, forests, and wetlands (Figure 31). Residential and commercial development is scattered throughout this COA due to its proximity to Rochester. Major cover types are cultivated crops (49.4%) and grassland/herbaceous (20.7%). Pasture/hay (11.5%) and deciduous forest (11.4%) cover are also significant in this landscape (Table 16).

Table 15. Presettlement land cover in the Southern Headwaters COA

Land Type	Acres	Percent
Oak openings and barrens	26,822	49%
Aspen-Oak Land	4,086	7%
Brush Prairie	7,190	13%
River Bottom Forest	490	1%
Prairie	15,928	29%

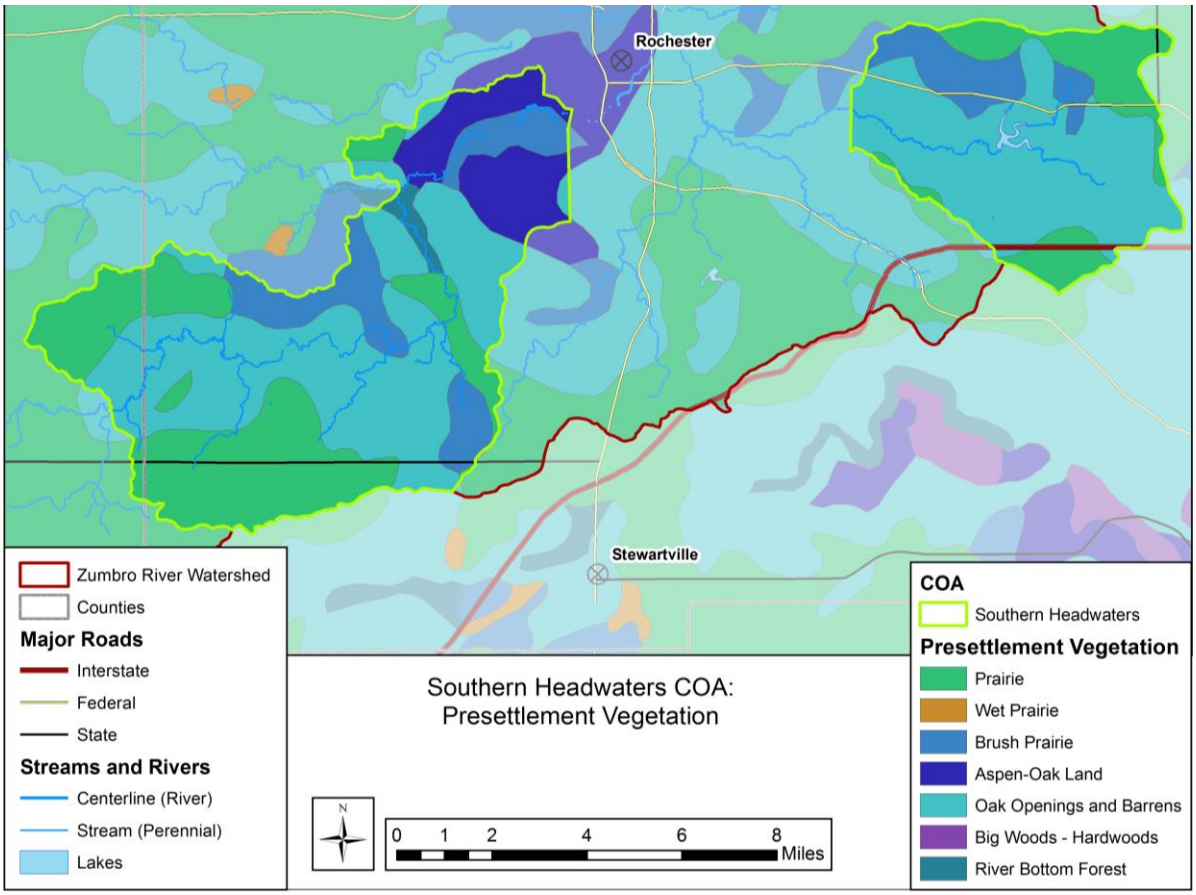


Figure 30. Presettlement land cover in the Southern Headwaters COA based on the work of Francis J. Marschner.

Table 16. Current land cover in the Southern Headwater COA.

Land Cover Class	Acres	Percent of COAs
Cultivated Crops	26,918	49.4%
Herbaceous	9,504	17.4%
Hay/Pasture	6,264	11.5%
Deciduous Forest	6,232	11.4%
Developed, Open Space	2,818	5.2%
Developed, Low Intensity	1,098	2.0%
Woody Wetlands	932	1.7%
Open Water	247	0.5%
Developed, Medium Intensity	171	0.3%
Emergent Herbaceous Wetlands	163	0.3%
Barren Land	76	0.1%
Evergreen Forest	60	0.1%
Developed, High Intensity	28	0.1%
Shrub/Scrub	8	0.0%

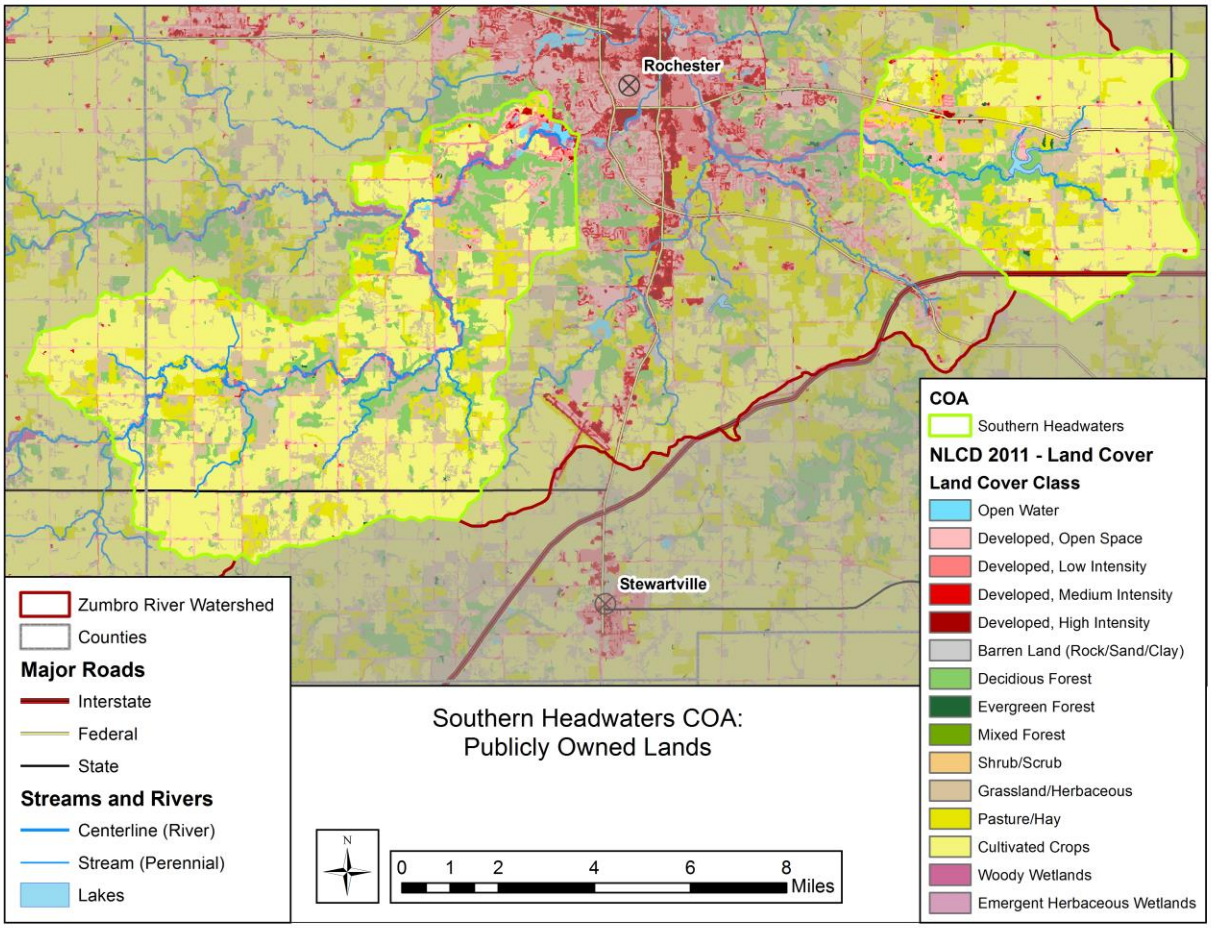


Figure 31. Current land cover in the Southern Headwaters COA based on the 2011 National Land Cover Database.

Desired Future Conditions

- Key areas associated with producing high quality drinking water such as fens and the Decorah Edge are protected with native vegetation. These areas continue to provide high quality plant and wildlife habitat as well as protecting area groundwater quality.
- Residential and commercial development take into account underlying hydrology and avoid areas such as the Decorah Edge.
- The watershed's hydrology is restored by increasing storage through wetland restoration and watershed wide improvements to soil health and reduced drainage, as well as installation of small retention ponds.
- 100% of riparian areas are covered by native vegetation, returning a host of ecological services for water quality, habitat quality, and connectivity.
- Biotic integrity of all streams within the COA is restored, resulting in healthy aquatic species and de-listing of impaired waters.
- Human activity in riparian areas follows best management practices to protect water quality and sensitive shorelines.
- Agricultural practices within the COA follow best management practices to protect soil from erosion, and streams from sedimentation and nutrient loading.
- A natural fire regime is restored through prescribed burning on all appropriate native plant communities.
- Large blocks of native habitat exist across ownership lines.
- Habitat corridors link patches of biodiversity habitat, supporting migration and travel, especially in riparian areas.
- Native plant community remnants have expanded
- Rare plants and animal habitat are protected from degradation
- Invasive species are monitored and controlled

Key Stewardship Parcels

Acquisition efforts can only go so far and stewardship efforts on private parcels will be crucial to protecting the natural resources of the area. Conservation efforts in the Southern Headwaters COA will be most effective in places where they protect existing native plant communities, and enhance habitat on public lands by increasing their size and/or connectivity. Working with larger parcels is preferable, because more stewardship options are available on larger tracts, and stewardship planning will impact a greater area. To make the most efficient use of conservation resources, it is useful to target parcels where those resources will have the most impact. A GIS analysis identified key stewardship parcels in the COA that met the following conditions:

- Parcels larger than 40 acres in size
- Include an area of moderate, high, or outstanding biodiversity significance as delineated by the MBS

There were 57 such parcels within Southern Headwaters COA, covering nearly 6,000 acres, with 49 unique owners listed (Figure 32). Average size among priority parcels was 105 acres. In addition to these larger parcels, efforts should be particularly focused on and around area fens.

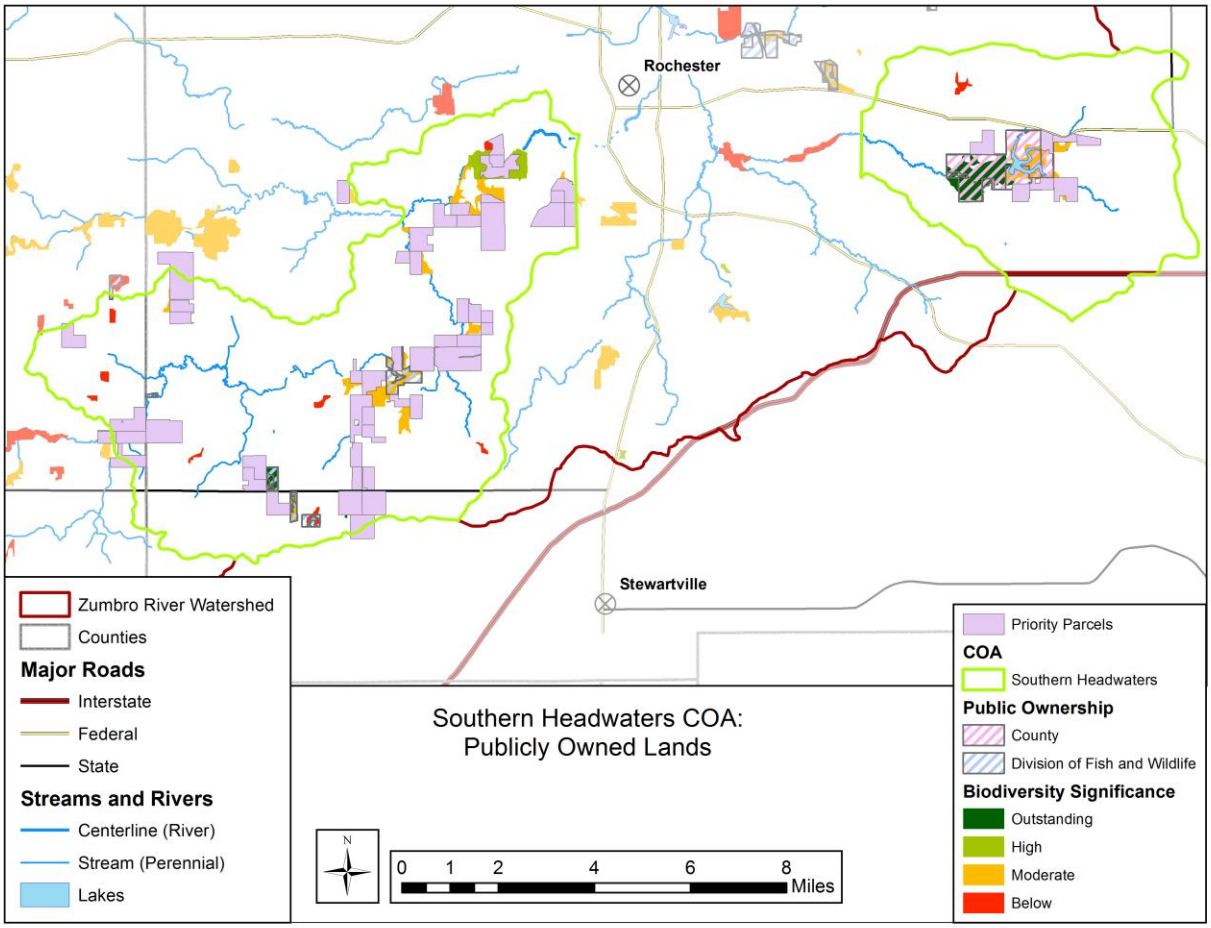


Figure 32. Priority parcels in the Southern Headwaters COA.

Stewardship Activities

There is a variety of tools and strategies available for enacting stewardship activities on the landscape (see Section 1). Different strategies and actions will be appropriate for different types of parcels, natural resources, and landowners. This section provides a summary of strategies appropriate for the natural resources present in this COA.

Protection of Calcareous Fens

Calcareous fens are rare and distinctive wetlands 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. This calcium-rich environment supports a rare plant community. These fens typically occur on slight slopes where upwelling water eventually drains away and where surface water inputs are minimal. These fens are highly susceptible to disturbance.

Stewardship Activities:

On all lands:

- Control invasive species, particularly reed canary grass in and around these communities
- Reduce shrubs that can compete with the rare native vegetation.

- Reduce or eliminate human and livestock activity in fens. The soft, saturated character of the peat makes almost any level of activity within them, by humans or domestic livestock, highly disruptive.
- Where possible, increase size and connectivity of natural habitat around fens.

Protection of the Decorah Edge

Development in and around the Decorah Edge may jeopardize its ability to both supply groundwater and to purify it. Additionally, buildings in this area often suffer from excess water issues.

On all lands:

- Limit development in and around the Decorah Edge.
- Maintain native vegetation in this area
- Map the extent of this feature
- Work with regional planning and zoning to control development in and around this feature.
- Pursue strategic conservation easements.
- Where possible, increase size and connectivity of natural habitat around the Decorah Edge.

Core Forest Areas

Large, continuous stretches of forest communities represent core forest habitat. In addition to providing quality habitat to a number of species, these areas represent favorite places for recreation and scenery, making them important for the tourism industry in the region. They also provide a great benefit to water quality, as forests help prevent erosion, slow and filter water run-off, and shade streams in riparian areas.

Stewardship Activities:

On all lands:

- Control invasive species
- Burn where appropriate
- Manage according to sustainable silvicultural and ecological principles
- Where possible, increase size and connectivity of forest habitat through reforestation / afforestation of connecting patches

On Private lands:

- Prepare comprehensive forest stewardship plans
- Assist landowner in researching and applying for relevant cost-share programs available (e.g. EQIP, CSP)

Prairies, Savannas, and Fire-Associated Native Plant Communities

The suppression of fire and mass conversion to agriculture that came with Euro-American settlement drastically reduced the amount of native prairie and savannas in both Minnesota, and the US as a whole. These communities offer important habitat for a number of animals, and many flowering plants and grasses.

Stewardship Activities:

On all lands:

- Restore a natural fire regime through prescribed burns
- Remove brush as needed
- Control invasive species
- Expand grassland habitat as buffer areas around other NPCs.

Riparian Best Management Practices

Riparian areas are those nearest, and most connected to streams and rivers. They have an important impact on water quality either, positively by slowing and filtering run-off, or negatively, by contributing to sediment and nutrient loads brought to streams through erosion and run-off. Implementing best management practices and other conservation actions in these areas can have significant water quality and wildlife benefits.

Stewardship Activities:

On public lands:

- Reconnect waterways with their floodplains.
- Maintain and/or establish appropriate plant communities for the hydrology of the site.

On private lands:

- Support SWCDs in implementing and enforcing the state buffer law and other best management practices. Help interested landowners apply for the various cost-share or easement programs available for water quality protection (e.g. CRP, RIM).
- Work with landowners to reconnect streams to their floodplains.
- Maintain and restore natural vegetation along stream and riverbanks.
- Find opportunities to restore wetland storage areas in riparian zones to help improve stream hydrology.

Key Stewardship Parcels

These parcels were identified based on their geographical size, areas of biodiversity significance, and proximity to public land (see above). They are areas where conservation effort can be most beneficial to the overall health of the landscape.

Stewardship Activities:

- Work to engage the owners of these parcels in a targeted manner.
- Tailor outreach and assistance to each landowner individually based on characteristics of their parcel and its geographical and ecological characteristics
- Prioritize stewardship efforts affecting these parcels.

Zumbro Falls Conservation Opportunity Area

Overview

The Zumbro Falls COA includes Lake Zumbro and the area around the small towns of Hammond, Mazeppa, and Zumbro Falls (Figure 33). This COA encompasses nearly 61,500 acres in the watersheds of Dry Run Creek, Lake Zumbro, Mazeppa Creek, North Fork of the Zumbro River, and the main stem of the Zumbro River after it merges with the North Fork. Key public natural areas in the Zumbro Falls COA include the Isaac Walton League WMA, Zumbro Falls Woods WMA, and a few parcels of the Richard J. Dorer Memorial Hardwood Forest.

According to data from the Public Land Survey, 73% of this area was covered by either open prairie or oak savanna type habitat. Much of this region has been converted to agriculture however; the remnants of the region's natural communities represent a conservation opportunity to build from.

A primary focus in this COA is to protect the areas of biodiversity significance that exist in the river valley. Riparian areas and forested ecosystems represent hotspots for biodiversity in this COA as identified in the Wildlife Action Network. The Minnesota Biological Survey has designated substantial portions of the COA as having biodiversity significance, and an opportunity exists for successful private land conservation efforts. With the low percentage of publicly owned land in the COA, priority should be placed on private land stewardship efforts. Parcel acquisition should focus on sites of high or outstanding biodiversity significance and those in close proximity to protected land, in order to enhance to size and connectivity of those habitats.

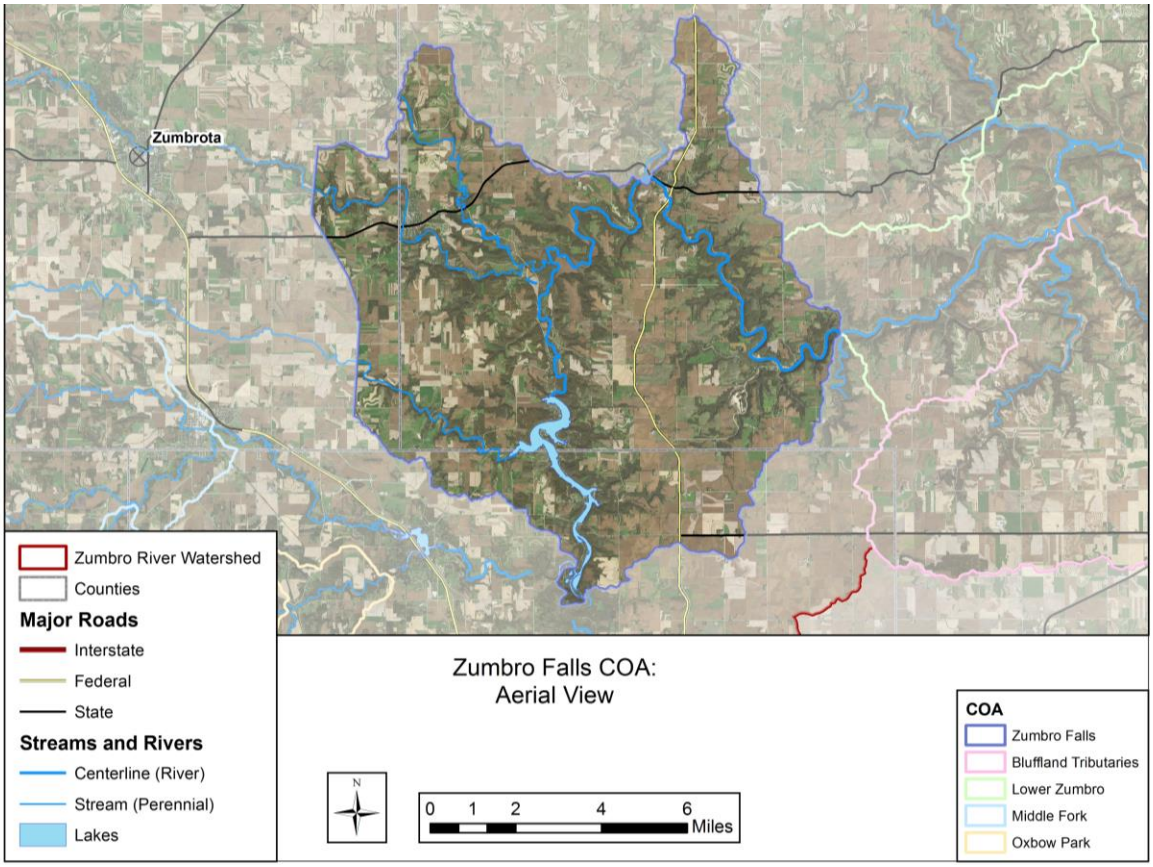


Figure 33. Zumbro Falls COA in the Zumbro River Watershed.

Hydrology

The dominant hydrological features of the Zumbro Falls COA are Lake Zumbro and the confluences of the Zumbro River with Dry Run Creek, Mazeppa Creek, and the North Fork (Figure 34). Numerous unnamed perennial or intermittent streams originating in the agricultural uplands feed these major hydrological features. This COA has a number or karst features which often have hidden pathways that can rapidly take pollution from a release point to drinking water wells or surface water (Figure 35). Extensive agricultural tile lines and a reduction in perennial cover have changed the hydrology in the COA to move water faster through the system.

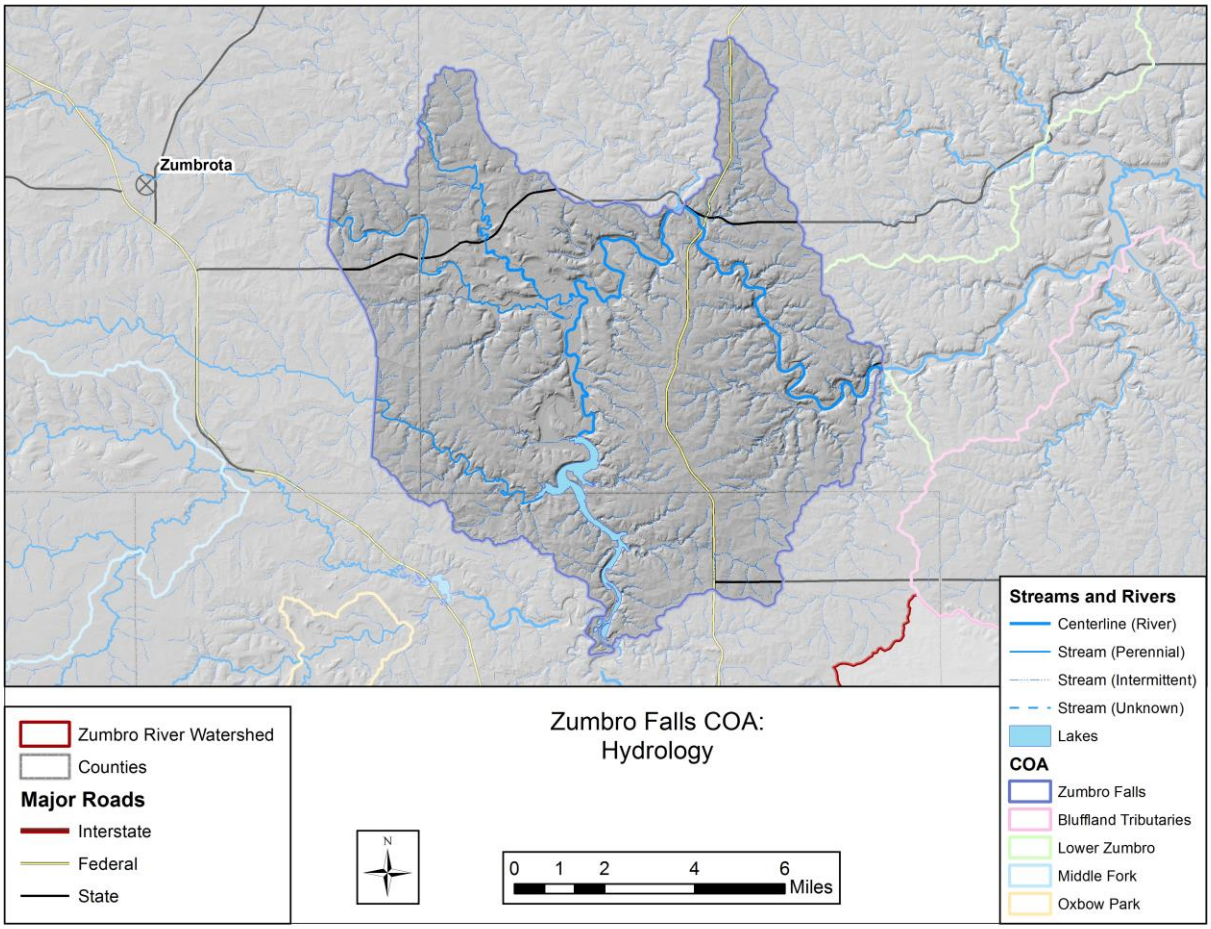


Figure 34. Hydrology of the Zumbro Falls COA.

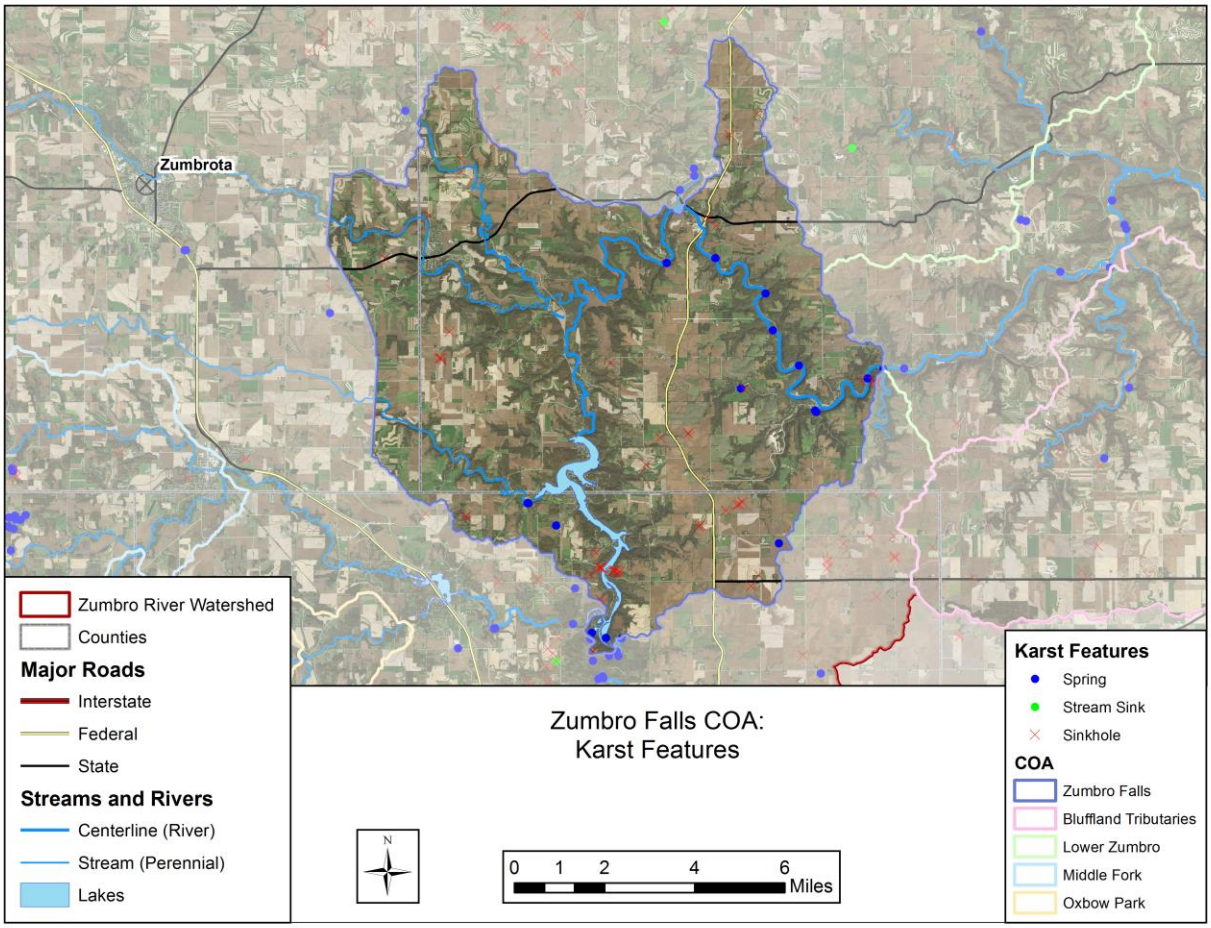


Figure 35. Karst features in the Zumbro Falls COA.

Plant Communities

Zumbro Falls COA contains almost 1,700 acres of Native Plant Communities (NPC) in five different systems and 18 different types and subtypes as identified by the Minnesota Biological Survey (MBS) (Table 17). Mesic hardwood forests make up 86% of the identified NPC acres with upland prairie (7%) and fire dependent forest or woodland (6%) systems also making up a portion of the total acreage. Full descriptions of native plant community types and their associated ecological systems can be found in *Field Guide to the Native Plant Communities of Minnesota: the Eastern Broadleaf Forest Province*, produced and distributed by the MN DNR.

Approximately 16 percent of the NPCs in the Zumbro Falls COA are on publicly owned land. Some of the privately owned NPCs are on parcels near blocks of public land, and nearly all are in relatively close proximity to the river valley (Figure 36). Private parcels containing NPCs, especially those bordering publicly managed areas, represent an important priority for increased protection and private conservation efforts.

Table 17. Native Plant Communities of the Zumbro Falls COA.

System	NPC Code	Native Plant Community	Acreage	% of NPC Acreage
Cliff and Talus	CTs12	Southern Dry Cliff	1.8	0%
Fire Dependent Forest or Woodland	FDs27b	White Pine - Oak Woodland (Sand)	20.0	1%
	FDs38a	Oak - Shagbark Hickory Woodland	80.9	5%
Floodplain Forest	FFs59a	Silver Maple - Green Ash - Cottonwood Terrace Forest	7.9	0%
	FFs59c	Elm - Ash - Basswood Terrace Forest	10.7	1%
Mesic Hardwood Forest	MHs37	Southern Dry-Mesic Oak Forest	114.2	7%
	MHs37a	Red Oak - White Oak Forest	556.1	33%
	MHs37b	Red Oak - White Oak - (Sugar Maple) Forest	211.1	13%
	MHs38	Southern Mesic Oak-Basswood Forest	52.9	3%
	MHs38c	Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest	52.6	3%
	MHs39	Southern Mesic Maple-Basswood Forest	32.2	2%
	MHs39a	Sugar Maple - Basswood - (Bitternut Hickory) Forest	64.3	4%
	MHs39b	Sugar Maple - Basswood - Red Oak - (Blue Beech) Forest	321.9	19%
	MHs49	Southern Wet-Mesic Hardwood Forest	34.4	2%
Upland Prairie	UPs13b	Dry Sand - Gravel Prairie (Southern)	15.8	1%
	UPs13c	Dry Bedrock Bluff Prairie (Southern)	91.9	5%
	UPs14b	Dry Sand - Gravel Oak Savanna (Southern)	6.2	0%
	UPs23a	Mesic Prairie (Southern)	9.0	1%

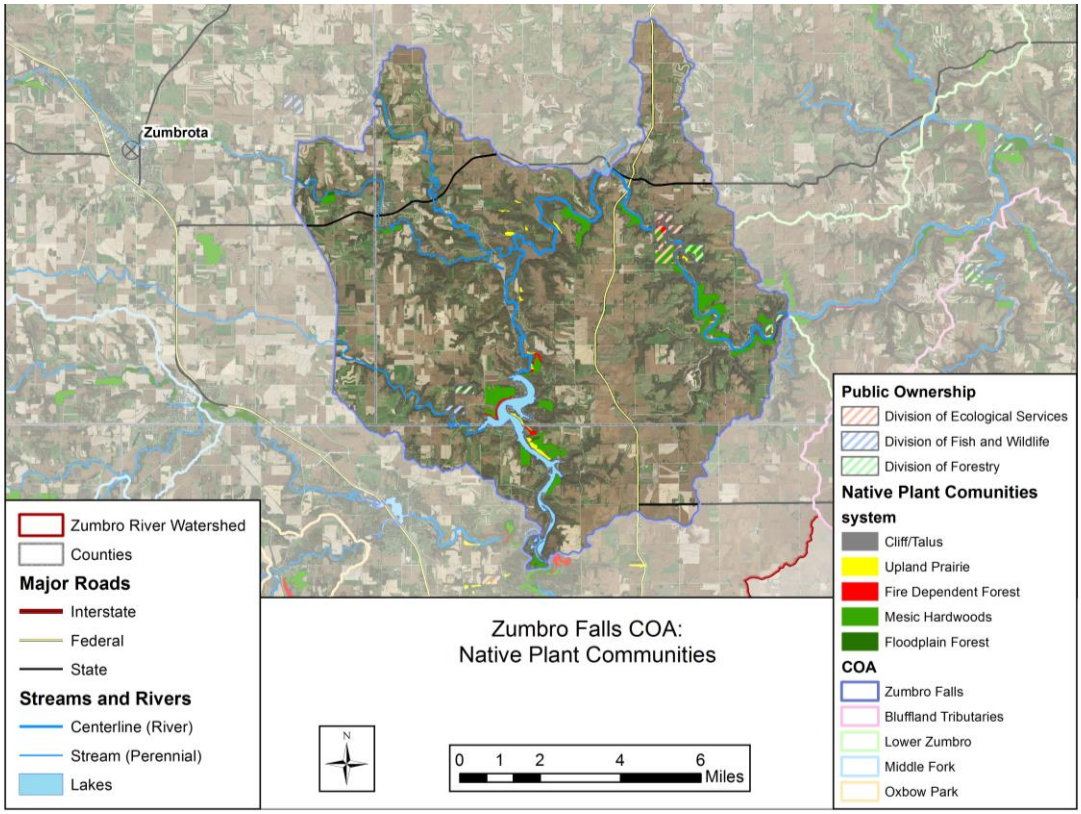


Figure 36. Native Plant Communities on and off public lands in the Zumbro Falls COA.

Biodiversity and Rare Species

The Natural Heritage Information System (NHIS) has recorded 59 different occurrences of rare plants, animals, or communities in the Zumbro Falls COA (Table 18). Rare species are those listed as either endangered, threatened, or of special concern. Endangered species are those facing extinction throughout all or a significant portion of its range within Minnesota. Threatened species are likely to become endangered in the near future. Species of Special Concern, though not endangered or threatened, are extremely uncommon in Minnesota.

Twenty-three rare terrestrial communities have been identified in the Zumbro Falls COA. Rare terrestrial communities are collections of plant species growing together, whose presence on the landscape is rare or severely diminished. These communities are monitored, but not given designations as endangered, threatened, or of special concern.

Table 18. Number of rare species and community occurrences in the Zumbro Falls COA.

Organism Type	Observations
Animal Assemblage	3
Fungus	1
Vascular Plant	25
Invertebrate Animal	7
Vertebrate Animal	23
Terrestrial Community	23

Nearly 7,200 acres of the Zumbro Falls COA have been assessed by the Minnesota Biological Survey for its significance to biodiversity in the state (Figure 37). Only one percent of that area was given the highest level of 'Outstanding' but over 1,200 acres were designated as having 'High' biodiversity significance. These areas of 'high' biodiversity significance are near Lake Zumbro and in the river valley between Zumbro Falls and Hammond.

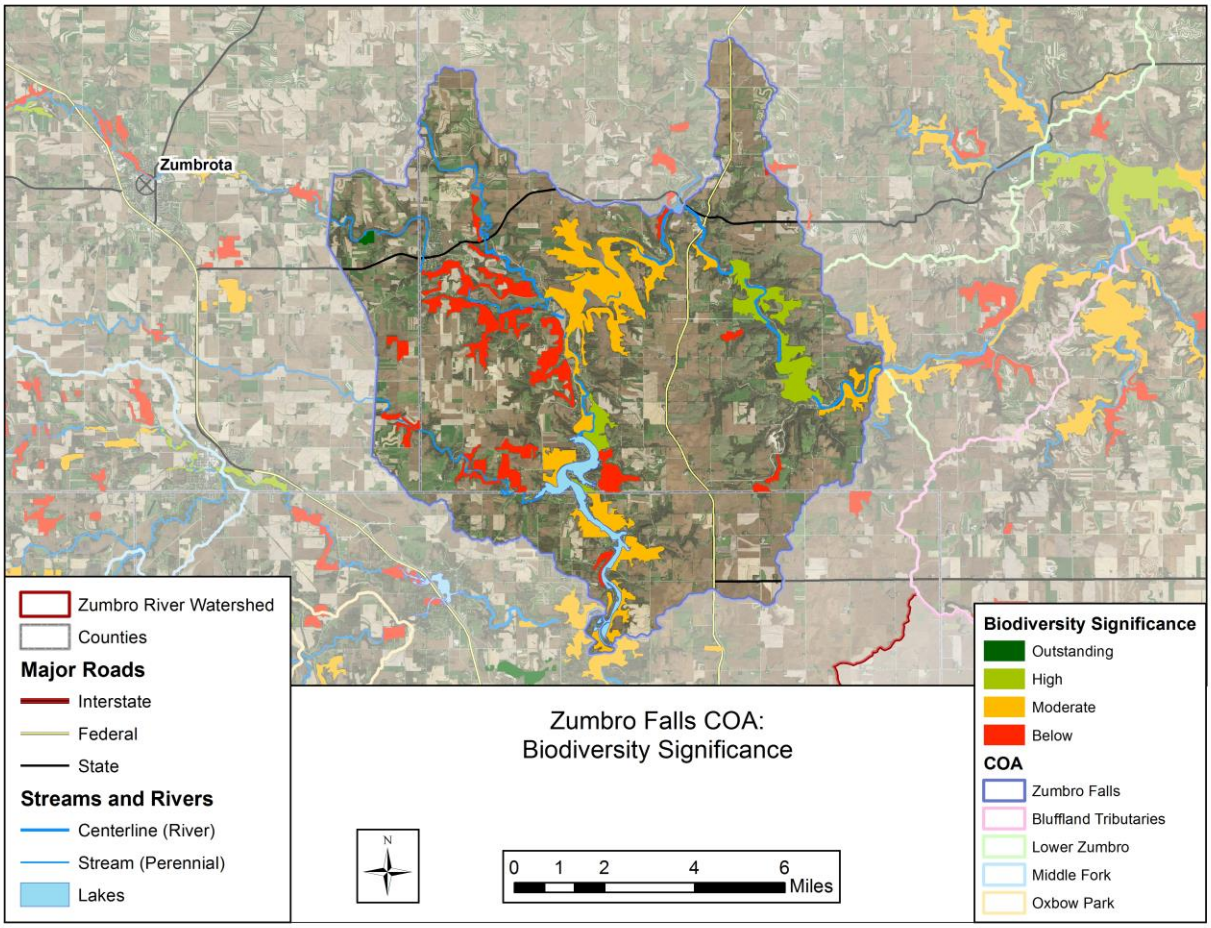


Figure 37. Areas identified by the Minnesota Biological Survey as having biodiversity significance in the Zumbro Falls COA.

Recreation

Outdoor recreation areas in the Zumbro Falls COA contribute to the well-being of residents and support the local economy. There is a relatively small amount of public land in the COA but the existing Wildlife Management Areas (WMA) are popular locations for hunting, hiking and birdwatching. Hunting is a popular outdoor recreational activity throughout the area on public and private land. The Zumbro River is a designated state water trail that is a popular canoe and kayak routes in the summer. Lake Zumbro is also a popular recreation destination. Fishing opportunities exist throughout the COA.

Environmental Threats

Development pressures:
Although the Zumbro Falls COA is currently relatively rural, it is within 30 minutes of the City of Rochester, which is in the early stages of a multi-billion dollar economic development project called the "Destination Medical Center" (DMC). The DMC is projected to create between 26,800 to 32,200 new jobs directly. This economic and population growth can lead to increased parcellization, fragmentation, and conversion of rural lands. This disrupts wildlife movement and migration, reduces available habitat, and increased water quality concerns from the added impervious surface area. The demand for dispersed rural residences places less-disturbed parts

the landscape under pressure for development. This is compounded by the likelihood of population growth in the region.

Industrial silica sand mining:
Southeast Minnesota has significant deposits of industrial silica sand bedrock at or near the surface. The increased demand for this material in the hydrological fracturing (fracking) process for oil and gas development has created an ongoing policy debate about appropriate use and regulations of this resource. There currently are not any mines operating in the Zumbro River Watershed but a significant portion of the Zumbro Falls COA has quartz-rich sandstone within 50 ft. of the land surface. Potential impacts of mining include removal of vegetation and underlying substrates, habitat destruction, chemical contamination of karst hydrology, and water contamination from high volume dispersals from water processing facilities and dewatering pits.

Mismanagement of forest resources:
The forests of Southeast Minnesota support a number of high value timber species, and many sites exist containing high quality timber stock. This represents an important resource for the region, but is also a target for exploitative harvesting practices. Timber harvests that remove all of the most valuable trees in a stand, and leave behind a patchy, irregular forest of poor quality trees do serious harm to the health and productive potential of that site, and severely limit management options in the future. The high value of the timber resource enables sustainable timber management to produce valuable economic products while also providing the habitat and ecosystem services of a healthy forest. Unsustainable harvesting practices can seriously impair a stand's ability to do so in the future.

Nutrient, sediment, and contaminants from upstream agricultural areas:
A significant portion of the Zumbro Falls COA, and areas upstream, are heavily farmed, often with practices that have the potential to impair water quality. This has large impacts on downstream reaches. Best management practices are available to farmers to protect their soil from erosion, and help prevent excess nutrients and sediment from washing into the streams. Riparian buffer strips help slow run-off and increase infiltration, allowing nutrients to be filtered and removed by soil processes. Increased adoption of agricultural BMPs to protect water quality in upstream areas will help protect the water quality of downstream reaches in the COA.

Land Ownership

Only 1.4% (887 acres) of the Zumbro Falls COA is publicly owned (Table 19, Figure 38). Over half of this public land is in one property, the Zumbro Falls Woods SNA. This Scientific and Natural Area includes steep bluffs, loess-covered uplands, narrow river valleys and broad floodplains on both sides of the Zumbro River. The remaining 98.6% of the COA is in private ownership. Since private lands make up such a large portion of the COA it is clear that private landowners will play a crucial role in conservation in this COA. Much of the forested area occurs in areas with dispersed residential development, and finding programs that will appeal to these landowners will be necessary to encouraging the necessary private conservation.

To date, private conservation programs have demonstrated some success in the COA. The DNR Forest Stewardship Program is an excellent first step in landowner involvement and concern for the ecological health of the landscape and 1,620 acres have a registered stewardship plan in the Zumbro Falls COA. This voluntary program provides technical advice and long-range forest management planning to interested landowners. Plans are designed by professional foresters to meet the landowner's goals while maintaining the sustainability of the land.

The Reinvest in Minnesota (RIM) program has easements in the COA covering 287 acres. This program purchases conservation easements on privately owned lands to retire environmentally sensitive lands from agricultural production. Conservation practices are established by planting native vegetation, and restoring wetlands with the goal of protecting and improving water quality, reducing soil erosion, and enhancing fish and wildlife habitat.

Table 19. Land ownership in the Zumbro Falls COA.

Ownership	Acres	Percent of Public	Percent of COA
Private	60,577		98.6%
Zumbro Falls Woods SNA	451	50.9%	0.7%
R J D Memorial Hardwood Forest	274	30.9%	0.4%
County Miscellaneous	80	9.0%	0.1%
Isaac Walton League WMA	78	8.8%	0.1%
Mazeppa WMA	4	0.4%	0.0%

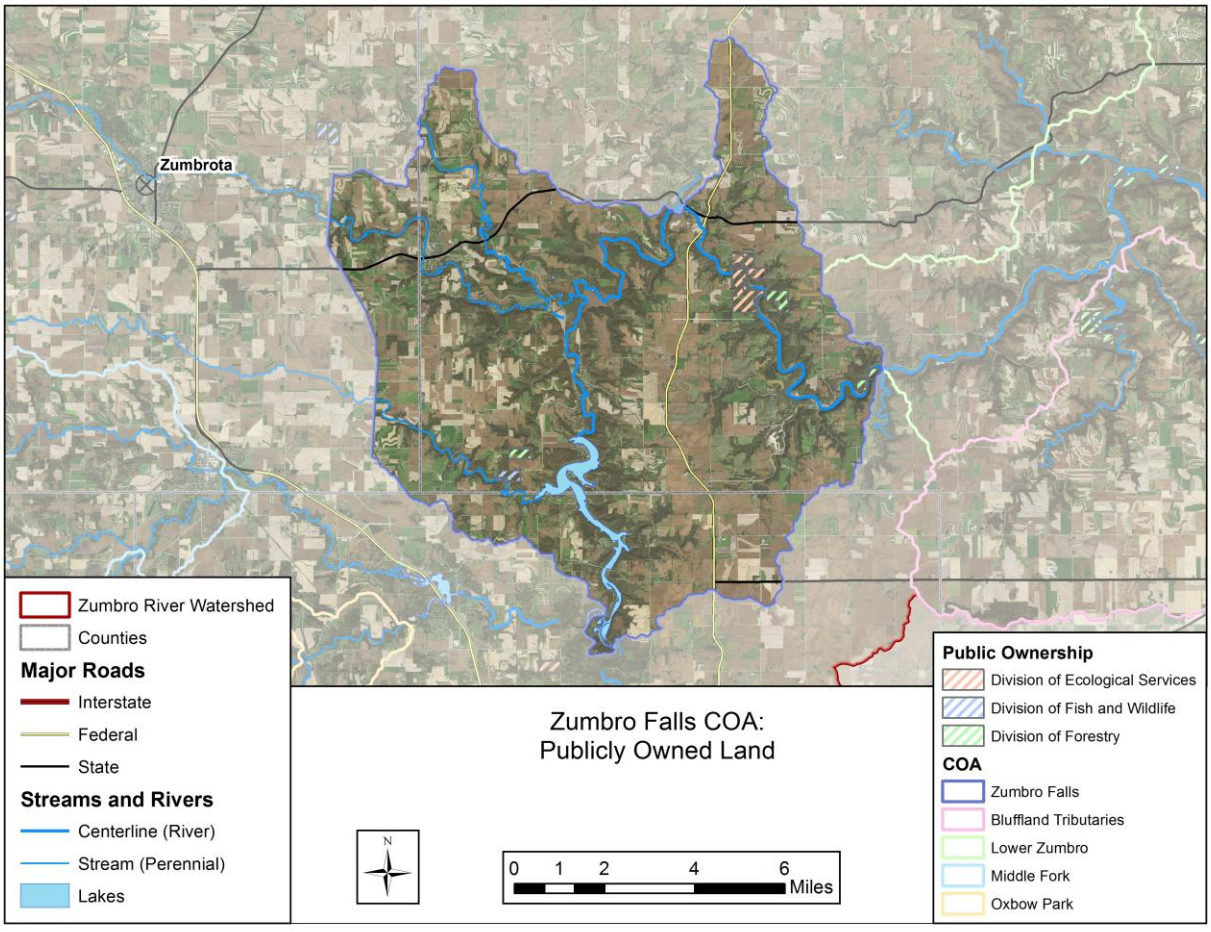


Figure 38. Public land in the Zumbro Falls COA.

Land Cover and Use

Seventy-three percent of the Zumbro Falls COA was covered in prairie or semi-open oak savanna habitat at the time of European settlement (Table 20, Figure 39). The rest of the landscape was classified as either oak dominated upland forest or floodplain forests along the river.

Today the land use patterns in the Zumbro Falls COA follow the general pattern for the broader watershed. The predominantly flat, upland areas are mostly cropland or pasture. The hillsides are dominated by forests, and the valley floors and floodplain areas contain a mix of cropland, pasture, forests, and wetlands (Figure 40). Some areas have also seen residential and commercial development. Major cover types are cultivated crops (31.8%), deciduous forest (20.7%), pasture/hay (19.9%) and grassland/herbaceous (18.9%) (Table 21).

Table 20. Presettlement land cover in the Zumbro Falls COA.

Land Type	Acres	Percent
Aspen-Oak Land	8,335	13.6%
Big Woods - Hardwoods (oak, maple, basswood, hickory)	59	0.1%
Brush Prairie	9,038	14.7%
Oak openings and barrens	22,141	36.0%
Prairie	13,586	22.1%
River Bottom Forest	8,305	13.5%

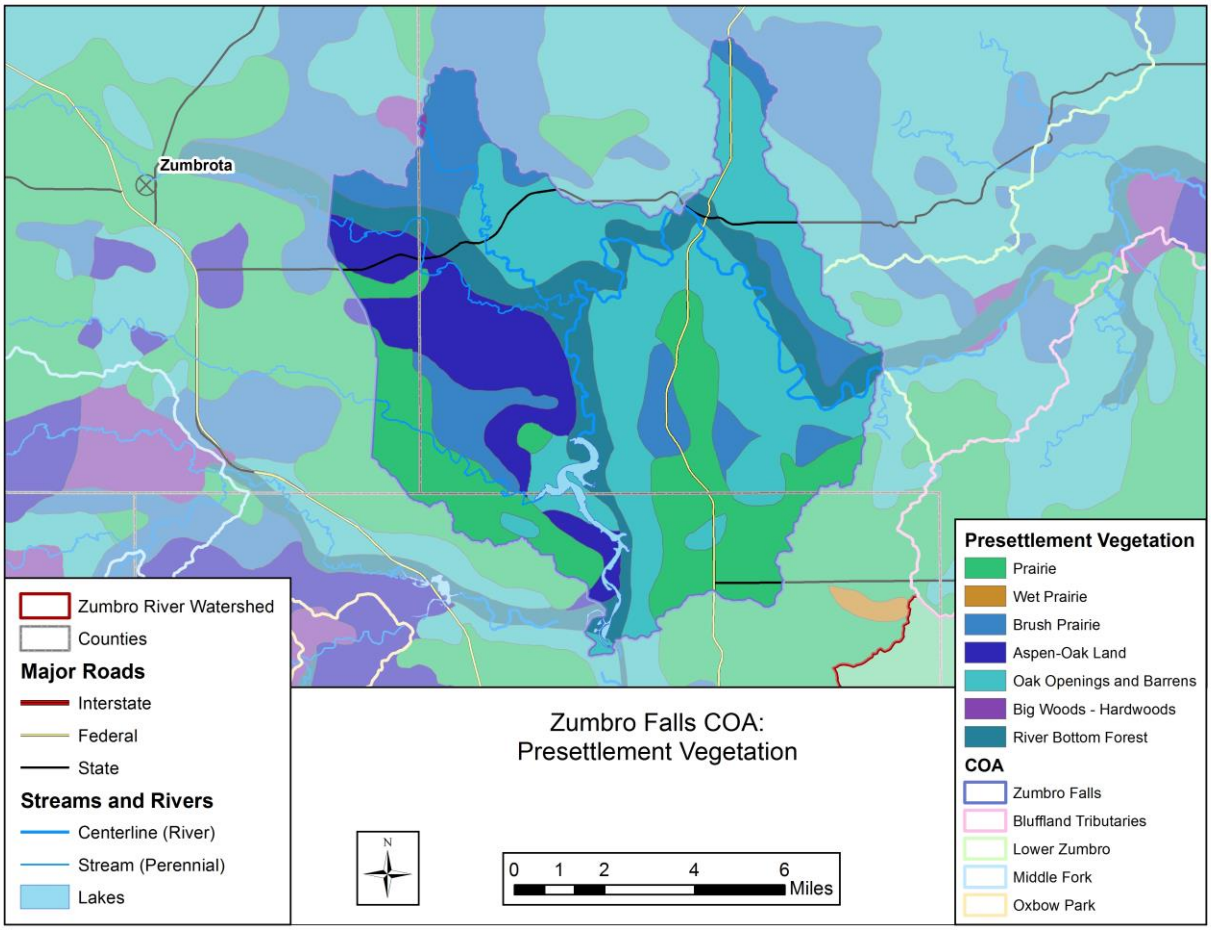


Figure 39. Presettlement land cover based on the work of Francis J. Marschner.

Table 21. Current land cover in the Zumbro Falls COA.

Land Cover Class	Acres	Percent of COAs
Cultivated Crops	19,533	31.8%
Deciduous Forest	12,732	20.7%
Hay/Pasture	12,238	19.9%
Herbaceous	11,622	18.9%
Developed, Open Space	2,631	4.3%
Open Water	1,128	1.8%
Developed, Low Intensity	719	1.2%
Woody Wetlands	433	0.7%
Emergent Herbaceous Wetlands	183	0.3%
Evergreen Forest	125	0.2%
Developed, Medium Intensity	57	0.1%
Barren Land	47	0.1%
Developed, High Intensity	12	0.0%
Shrub/Scrub	11	0.0%

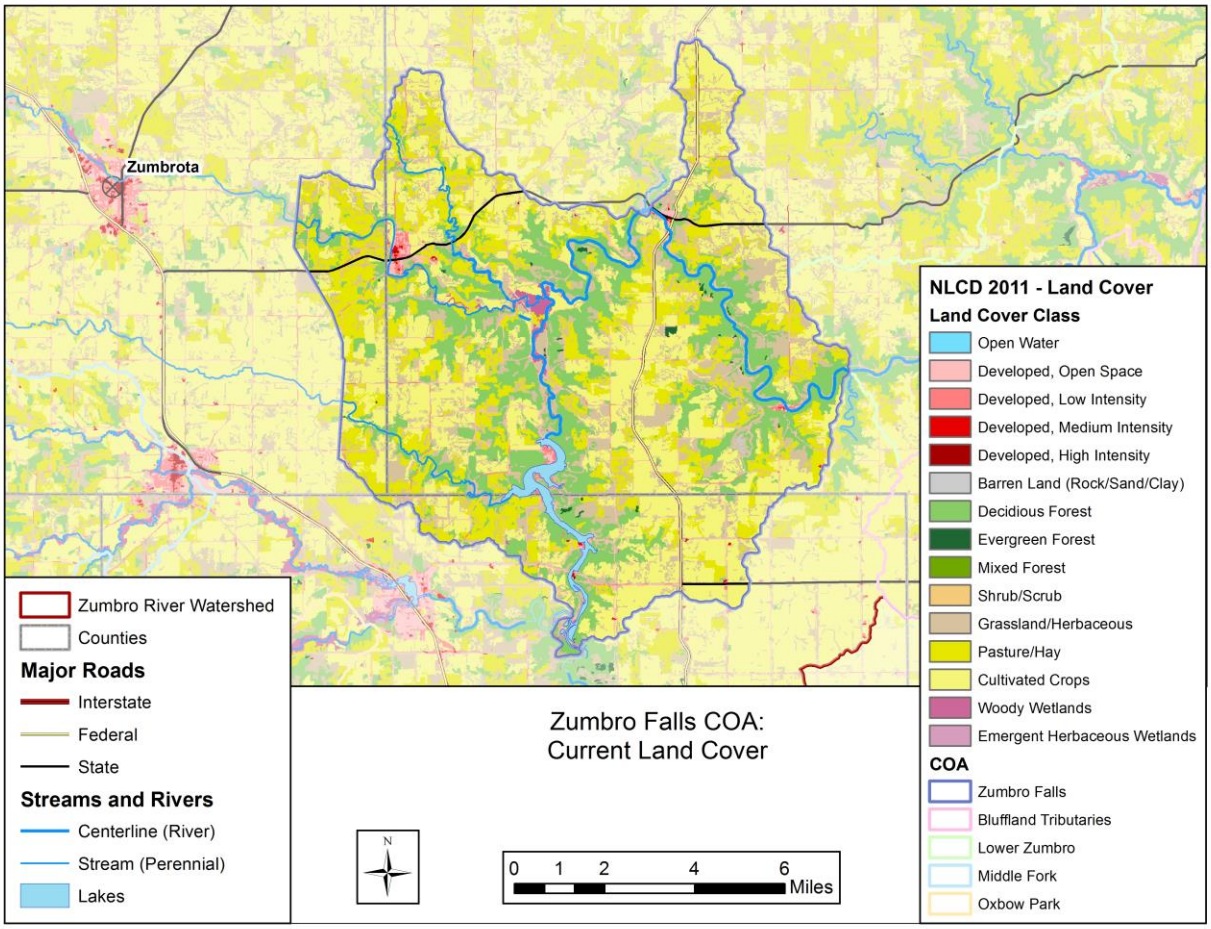


Figure 40. Current land cover based on the 2011 National Land Cover Database.

Desired Future Conditions

- 100% of riparian areas are covered by native vegetation, returning a host of ecological services for water quality, habitat quality, and connectivity.
- Biotic integrity of all streams within the COA is restored, resulting in healthy aquatic species and de-listing of impaired waters.
- Human activity in riparian areas follows best management practices to protect water quality and sensitive shorelines.
- Agricultural practices within the COA follow best management practices to protect soil from erosion, and streams from sedimentation and nutrient loading.
- A natural fire regime is restored through prescribed burning on all appropriate native plant communities.
- Large blocks of native habitat exist across ownership lines.
- Habitat corridors link patches of biodiversity habitat, supporting migration and travel, especially in riparian areas.
- Native plant community remnants have expanded
- Rare plants and animal habitat are protected from degradation
- Invasive species are monitored and controlled

Key Stewardship Parcels

Acquisition efforts can only go so far and stewardship efforts on private parcels will be crucial to protecting the natural resources of the area. Conservation efforts in the Zumbro Falls COA will be most effective in places where they protect existing native plant communities, and enhance habitat on public lands by increasing their size and/or connectivity. Working with larger parcels is preferable, because more stewardship options are available on larger tracts, and stewardship planning will impact a greater area. To make the most efficient use of conservation resources, it is useful to target parcels where those resources will have the most impact. A GIS analysis identified key stewardship parcels in the COA that met the following conditions:

- Parcels larger than 40 acres in size
- Include an area of moderate, high, or outstanding biodiversity significance as delineated by the MBS

There were 106 such parcels within Zumbro Falls COA, covering nearly 10,000 acres, with 78 unique owners listed (Figure 41). Average size among priority parcels was 94 acres.

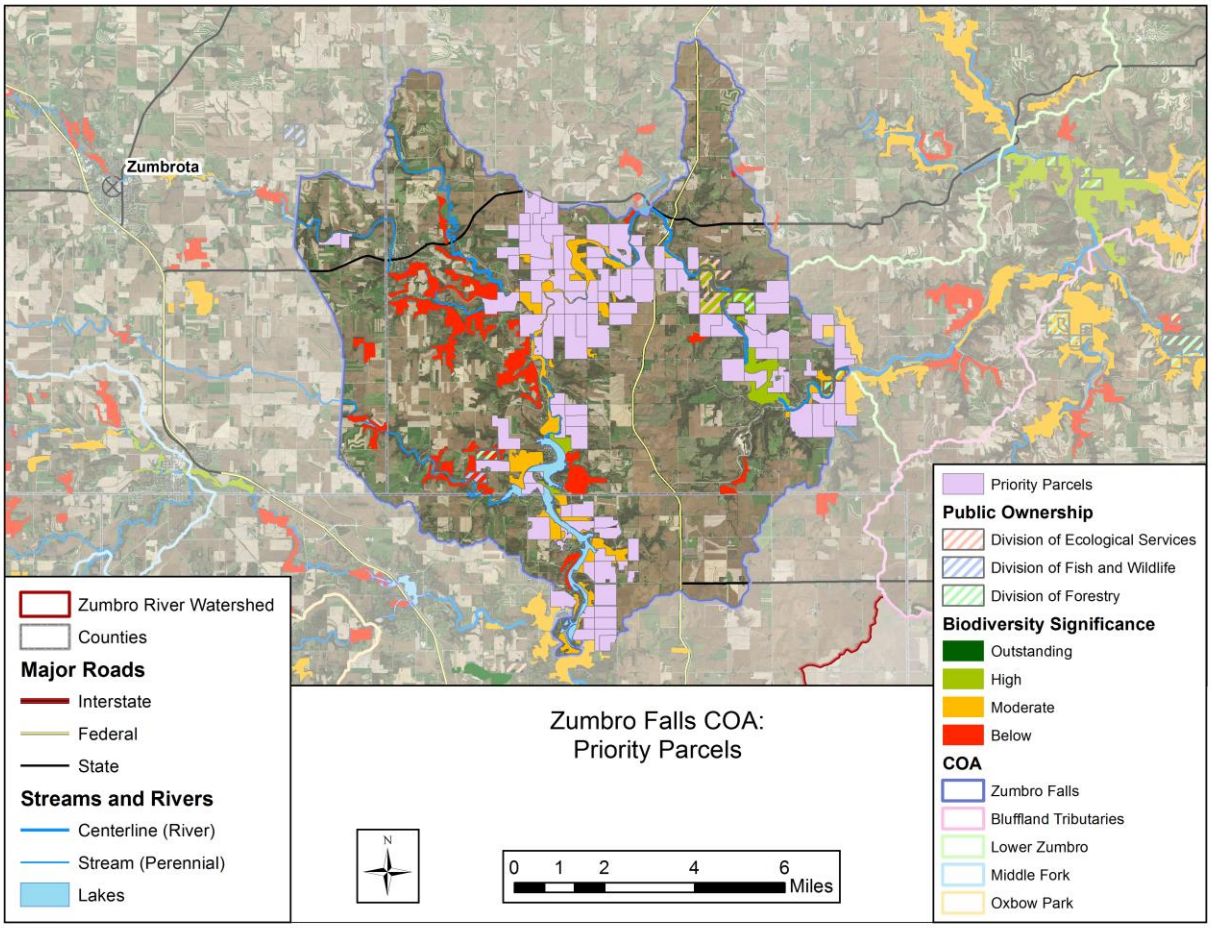


Figure 41. Priority parcels in the Zumbro Falls COA.

Stewardship Activities

There is a variety of tools and strategies available for enacting stewardship activities on the landscape (see Section 1). Different strategies and actions will be appropriate for different types of parcels, natural resources, and landowners. This section provides a summary of strategies appropriate for the natural resources present in this COA.

Lakeshore and Riparian Best Management Practices

Riparian areas are those nearest, and most connected to streams and rivers. They have an important impact on water quality either, positively by slowing and filtering run-off, or negatively, by contributing to sediment and nutrient loads brought to streams through erosion and run-off. Implementing best management practices and other conservation actions in these areas can have significant water quality and wildlife benefits.

Stewardship Activities:

On public lands:

- Reconnect waterways with their floodplains.
- Utilize the delineation of critical cropland areas from Benck and Fry (Examining the Relationship between Land Cover and Water Quality Protection: The Blufflands Region

of the Cannon and Zumbro River Watersheds, 2017, Saint Mary's University of Minnesota - GeoSpatial Services, 700 Terrace Heights, Box #7, Winona, MN 55987)
- Maintain and/or establish appropriate plant communities for the hydrology of the site.

On private lands:

- Work with landowners around Lake Zumbro, through lake associations or similar landowner groups where possible, to maintain and restore natural vegetation along shorelines.
- Support SWCDs in implementing and enforcing the state buffer law and other best management practices. Help interested landowners apply for the various cost-share or easement programs available for water quality protection (e.g. CRP, RIM).
- Work with landowners to reconnect streams to their floodplains.
- Maintain and restore natural vegetation along stream and riverbanks.

Core Forest Areas

Large, continuous stretches of forest communities represent core forest habitat. In addition to providing quality habitat to a number of species, these areas represent favorite places for recreation and scenery, making them important for the tourism industry in the region. They also provide a great benefit to water quality, as forests help prevent erosion, slow and filter water run-off, and shade streams in riparian areas.

Stewardship Activities:

On all lands:

- Control invasive species
- Burn where appropriate
- Manage according to sustainable silvicultural and ecological principles
- Where possible, increase size and connectivity of forest habitat through reforestation / afforestation of connecting patches

On Private lands:

- Prepare comprehensive forest stewardship plans
- Assist landowner in researching and applying for relevant cost-share programs available (e.g. EQIP, CSP)

Prairies, Savannas, and Fire-Associated Native Plant Communities

The suppression of fire and mass conversion to agriculture that came with Euro-American settlement drastically reduced the amount of native prairie and savannas in both Minnesota, and the US as a whole. These communities offer important habitat for a number of animals, and many flowering plants and grasses.

Stewardship Activities:

On all lands:

- Restore a natural fire regime through prescribed burns
- Remove brush as needed
- Control invasive species

- Expand grassland habitat as buffer areas around other NPCs.

Key Stewardship Parcels

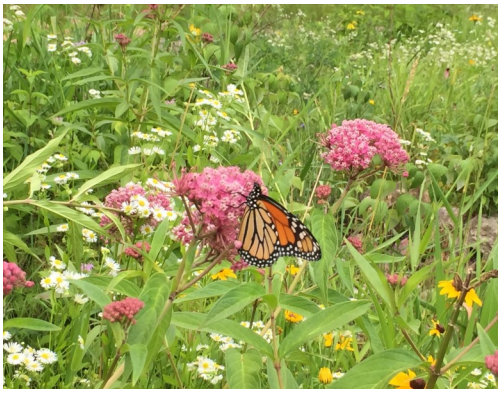
These parcels were identified based on their geographical size, areas of biodiversity significance, and proximity to public land (see above). They are areas where conservation effort can be most beneficial to the overall health of the landscape.

Stewardship Activities:

- Work to engage the owners of these parcels in a targeted manner.
- Tailor outreach and assistance to each landowner individually based on characteristics of their parcel and its geographical and ecological characteristics
- Prioritize stewardship efforts affecting these parcels.

Overview
Zumbro River Watershed Landscape Stewardship Plan

Including Dodge, Goodhue, Olmsted, Rice, Steele, and Wabasha counties

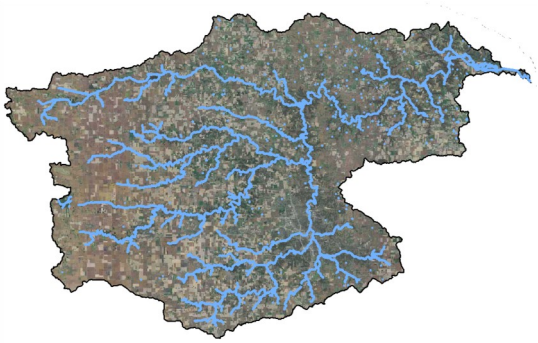


This overview offers a quick look at the Zumbro River Watershed Landscape Stewardship Plan.

The purpose of the plan is to provide a vision and framework that allows landowners, resource managers, local officials, and other stakeholders to work together to voluntarily implement landscape stewardship practices that sustain the region's water quality, natural areas, and biodiversity.

A vision for healthy waters, ecosystems, and human experiences in the Zumbro River watershed.

Healthy Lands, Healthy Waters



The *Zumbro River Landscape Stewardship Plan* focuses on protecting water quality by maintaining and enhancing the health of land in the watershed. It is based on the premise that the quality of a water body reflects the integrity of its watershed. Stewardship efforts that maintain forests, wetlands, and other natural communities will not only benefit the biodiversity and ecological health of the region, but also weaken floods, improve infiltration, and remove nutrients from runoff as it makes its way to our streams. Implementing best management practices and expanding perennial cover in agricultural and residential areas will benefit both the natural habitat of the landscape and the water quality in the watershed. This plan proposes a vision, desired future conditions, and strategies that utilize a landscape approach to natural resource stewardship.

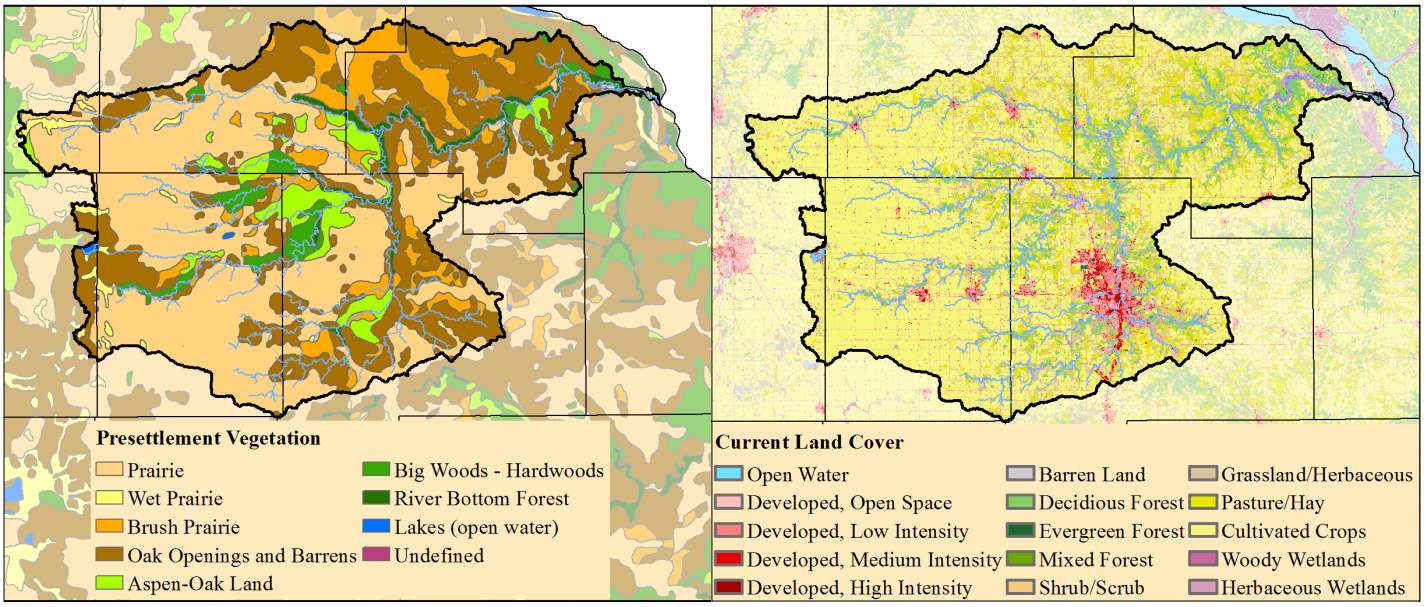
Who the plan is for

The landscape stewardship plan can be used in:

- Water and Natural Resource Planning
- Community Land Use Planning
- Conservation Project Prioritization and Funding
- Connecting with Policy and Decision Makers
- Guiding Private Land Stewardship
- Other Projects In and Around the Watershed

Landscape Context

The Zumbro River drains over 909,000 acres through a series of wetlands, underground karst features, and nearly 700 miles of streams and rivers. The watershed ranges from deep fertile glacial tills in the upper portion to steep "Driftless Area" bluffs in the lower reaches.



Historically this watershed had vast prairies, savannas, and oak forests, with stands of mesic hardwood forest in areas that were protected from fire. Today, only 23% remains as forest, wetland, or grassland and many of these areas have been degraded in some fashion. Despite these changes, the watershed retains relatively high water quality and areas of outstanding biodiversity significance that warrant special protection, maintenance, and restoration to sustain their function on the landscape. This plan highlights some of these areas and outlines strategies for their stewardship.

There are several public parks and wildlife management areas within the watershed which conserve native plant communities and protect water resources. These areas also offer opportunities for hiking, biking, canoeing, camping, hunting, and fishing. The vast majority of the watershed, however, is privately owned and stewardship of these lands will be key to maintaining regional biodiversity, water quality, and all of the outdoor recreational opportunities this region offers.

While there are many ways to divide a region into landscapes, using watersheds as the organizing feature emphasizes the link between natural resource management and water. It also parallels other state planning trends, such as the move to a *One Watershed, One Plan* system to replace local water plans. Planning natural community stewardship by watersheds increases the value of Landscape Stewardship Plans as resources for other water planning exercises.

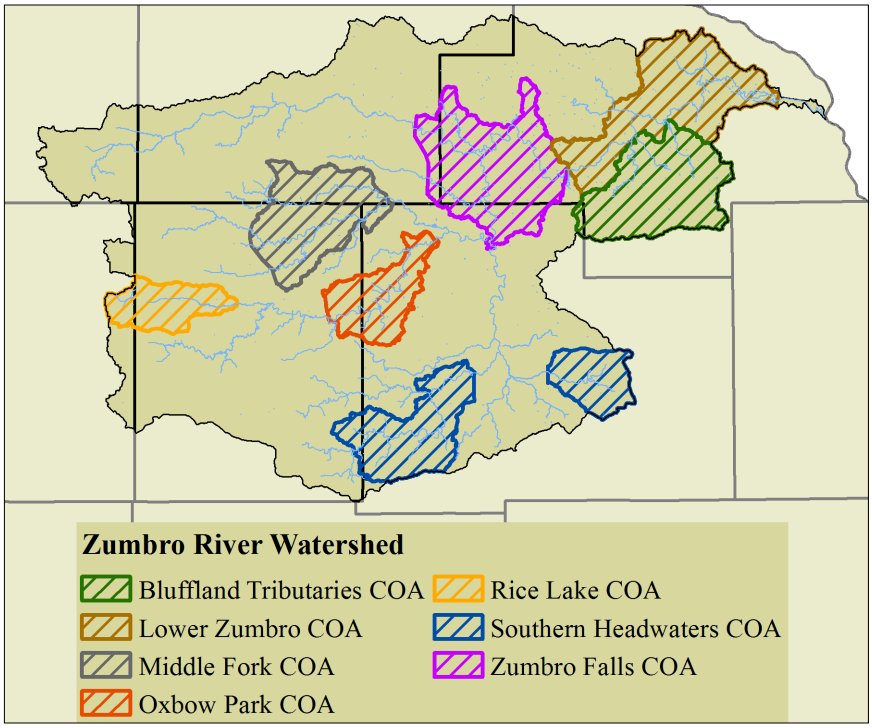
Vision for the Zumbro River Watershed

The *Zumbro River Watershed Landscape Stewardship Plan* supports the regional vision laid out by the Basin Alliance for the Lower Mississippi in Minnesota (BALMM) as the overarching landscape guidance for the watershed. The plan further focuses the BALMM guidance on the Zumbro River Watershed with a series of Desired Future Conditions (DFCs) and implementation strategies. Many of the plan's DFCs closely align with those of other regional plans and highlight the confluence of objectives between stakeholders in the watershed.

Desired Future Conditions

- High quality streams and healthy groundwater resources
- Stabilized and increasing populations of rare and threatened species
- Adequately buffered karst features including springs, fens, sinkholes, and the Decorah Edge
- Streams with rehabilitated banks and native floodplain vegetation
- Large habitat buffers and corridors around and between core biodiversity areas
- Fire is used as a management tool in appropriate ecosystems
- Consistent funding for cost share assistance associated with landowner activities such as invasive species control and native plant community restoration
- A more robust hardwood timber market supporting sustainable private timber management
- Improved landowner education
- Active comprehensive conservation planning on priority sites
- Regional land use plans recognize and protect rare features

The watershed contains over 125 miles of designated trout streams. Many of which support native brook trout.



Conservation Opportunity Areas

The plan identifies four Conservation Opportunity Areas (COAs) to help direct conservation efforts within the watershed in strategic and cost effective ways.

- Bluffland Tributaries (49,640 ac.): Contains a series of cold-water trout streams and forested bluffs that have outstanding biodiversity significance.
- Lower Zumbro (57,934 ac.): Includes forested bluffs, floodplain forests, and cold-water streams.
- Middle Fork (43,261 ac.): Almost entirely privately owned COA that contains a variety of biologically rich valleys.
- Oxbow Park (25,927 ac.): Contains an area of outstanding biodiversity significance along the South Branch of the Middle Fork.
- Rice Lake (19,462 ac.): Rice Lake is one of the few natural lakes in the watershed and serves as an important biodiversity site in a largely agricultural landscape.
- Southern Headwaters (54,515 ac.): Consists of two units near Rochester that are important recharge areas for the City's drinking water and contain rare calcareous fens.
- Zumbro Falls (61,464 ac.): Topography in this area leads to a diversity of riparian areas and forested ecosystems that represent hotspots for biodiversity.

Achieving the Landscape Vision

The *Zumbro River Watershed Landscape Stewardship Plan* contains a series of strategies and an action plan for moving the landscape toward the overarching vision and desired future conditions. The strategies are organized into actions that focus on Public Land, Private Land, and Education/Outreach. Progress in all three of these categories will be needed for this voluntary plan to be successful.

Annual targets proposed in the Landscape Stewardship Plan include: 600 acres of prescribed fire, 70,000 tree seedlings sold to private landowners, 900 acres enrolled in programs that promote restoration and maintenance of native habitats, 15 new forest stewardship plans, two miles of streambank stabilization, and three outreach events. See the plan for a full list of implantation strategies and associated targets.

These targets are benchmarked off information on what is currently happening in the landscape, and what may be possible under realistic growth scenarios at five and ten year intervals. These general targets help set measureable goals for the landscape with the caveat that individuals and organizations will set their own targets that, when combined, will move the entire watershed toward the overall landscape targets.

More information on how you can contribute to achieving this vision for the Zumbro River Watershed can be found in the Landscape Stewardship Plan at:

https://mn.gov/frc/southeast-committee.html

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