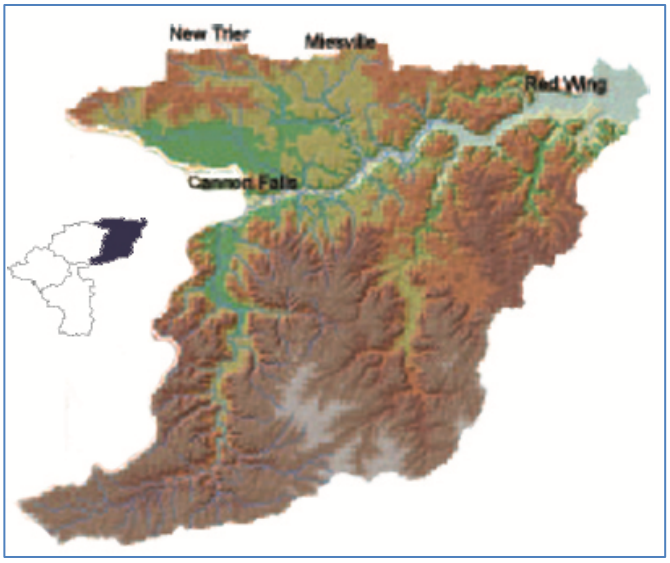
Outline



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Introduction

As discussed in Chapter 1, watershed management and monitoring strategies in this document are broken up by watershed lobe. The Lower Cannon Lobe includes portions of two counties: Dakota, and Goodhue. It begins at the outlet of the Byllesby Reservoir and ends at the Cannon River's confluence with the Mississippi River near Red Wing. This chapter contains a brief overview of the Lower Cannon River Lobe's physical landscape and land use, a summary of monitoring data collected on the lobe's lakes and streams, priority management zones and concepts with suggestions actions and/or projects to be implemented, and finally a monitoring strategy to guide future work to assess the health of the lakes and streams and track progress in making improvements.

Overview of Physical Landscape and Land Use

Most of the Lower Cannon lobe is a blufflands region. It has a well-developed natural drainage system, with few lakes or wetlands except at the mouth of the Cannon. Bedrock is near the surface. Just north of Red Wing, the Cannon emerges from its constraining bluffs and enters a delta. It joins the Vermillion River slough before discharging into the Mississippi.

Major tributaries are the Little Cannon River and Belle Creek on the south side, and Pine Creek and Trout Brook on the north side. Except for Belle Creek, these streams support trout. The Little Cannon River which drains 89 square miles has the highest gradient and steepest topography of any tributary of the Straight or Cannon. It experiences greater amounts of erosion and stream meandering.

Blufflands and forested land are distinctive landscape features in this lobe. There is a rich river bottom forest from Welch to the mouth at the Mississippi. Along the river bottomlands, the plant species of two centuries ago are still present today—American elm, green ash and soft maple as well as cottonwood, box elder, black walnut, red oak and basswood (Minnesota Department of Natural Resources, 1979).

Summary of Water Quality Data

Lower Cannon Turbidity Total Maximum Daily Load (TMDL)

The Lower Cannon River Turbidity TMDL was completed in 2007 and the implementation plan in 2009. Both are included in the Watershed Library on the CRWP website at http://www.crwp.net/lower-cannon-river/. The focus of this study and implementation plan was turbidity reductions in two impaired reaches of the Cannon River: from Pine Creek to Belle Creek, and the Rice Lake Bottoms/Vermillion Slough to the Mississippi River.

The TMDL study sets some significant load reductions for sediment in the Lower Cannon River watershed. The water quality goal is Total Suspended Solids (TSS) values of 44 mg/L or less. The reduction scenarios in the TMDL are based on a load duration curve from low flow to high flow. The most dramatic reductions are required during high flow conditions: 82% at the confluence reach and 49% at the Pine to Belle reach. Mid range flows require a 39% reduction at the confluence reach and an 8% reduction at the Pine to Belle reach. Under low flow conditions no reductions are needed. The implementation plan identifies the need for more specific data with regard to the nonpoint sources of sediment. A project is planned to begin in 2011 – 2015 that will look at trying to hone in on some of the sediment sources in the Little Cannon River and Belle Creek watersheds.

Additional monitoring data for the Lower Cannon Lobe and the Cannon River watershed as a whole is included in Appendix E. Analysis of whether the streams are improving can be found in Appendix A, Appendix C, and Appendix E.

Management Strategy: Priority Management Zones (PMZs) and Concepts (PMCs)

The Priority Management Zones and Priority Management Concepts below are meant to be for the next three to five years. Chapter 6 provides an explanation of PMZs and PMCs and a description of the process that was used to select the priority management zones and concepts for each lobe. The table summarizing information from the "list of assets" for each lake and stream in the lobe is included as Appendix I. The "list of assets" for the Lower Cannon River Lobe can be found in the Watershed Library on the Cannon River Watershed Partnership's website (www.crwp.net). The PMZs and PMCs selected by local water resource professionals and citizens leaders are listed below *(not in order of priority)*:

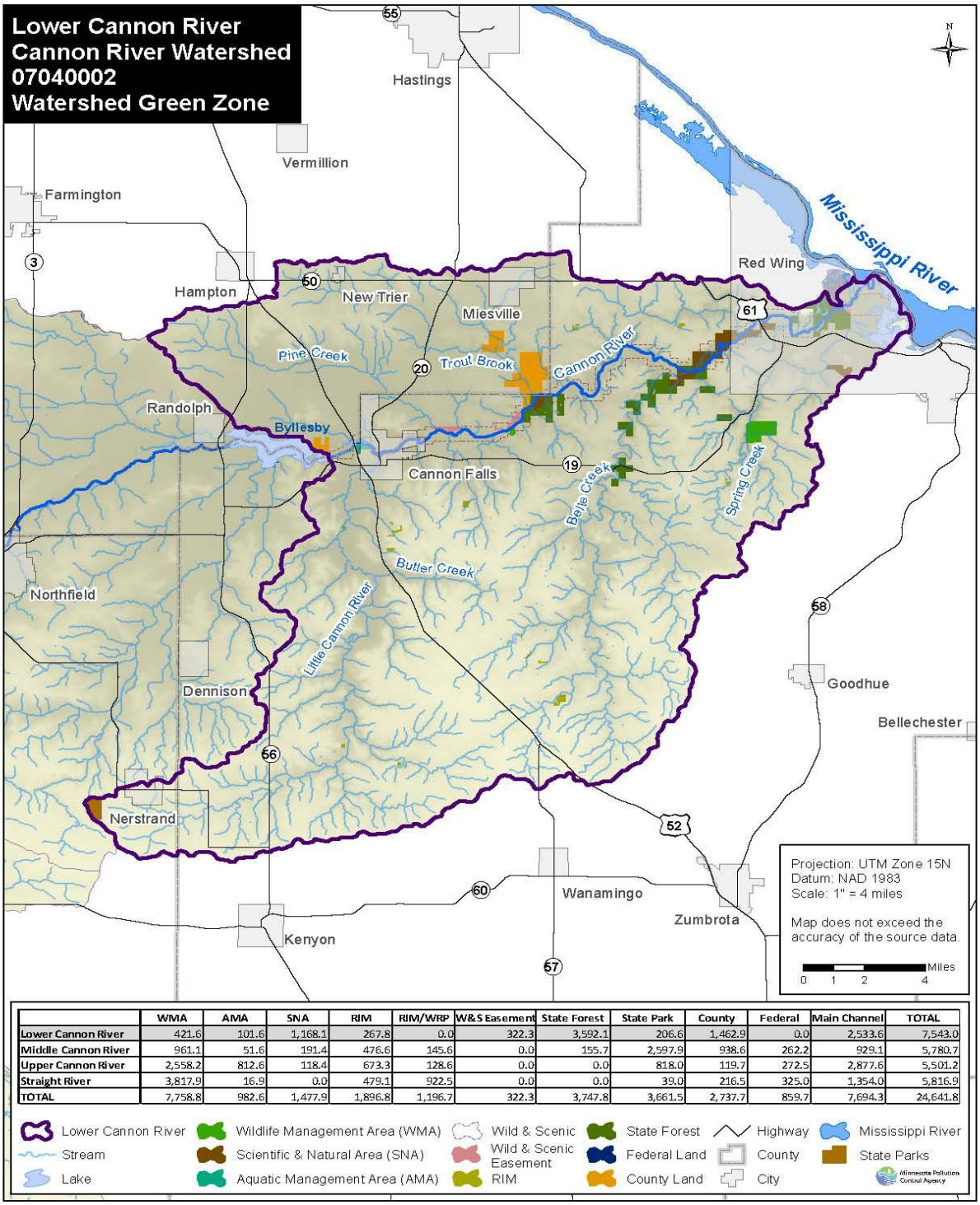
1. Lower Cannon River Green Corridor: Increase land protected along the Cannon River
2. Trout Brook, Belle Creek and Little Cannon River: Erosion control with a focus on Highly Erodible Land (HEL)
3. Trout Brook: Nitrate management in karst areas
4. Little Cannon River and Belle Creek: Sediment load reduction with a focus on the stream channel and gullies
5. Little Cannon River: *E.coli* bacteria loading reduction

Lower Cannon River Green Corridor: Increase land protected along the Cannon River

The riparian zone along a river serves many important functions. It provides habitat for wildlife, reduces sediment, bacteria, and phosphorus entering the river, provides flood storage, and creates a beautiful recreational experience.

Some of the Lower Cannon River's riparian zone has already been permanently preserved through land acquisition or easements by the DNR and other conservation groups, or as parkland. Currently 2,533 acres

along the Cannon River are protected. Figure 14 shows land protected in the Lower Cannon River Green Corridor.



	WMA	AMA	SNA	RIM	RIM/WRP	W&S Easement	State Forest	State Park	County	Federal	Main Channel	TOTAL
Lower Cannon River	421.6	101.6	1,168.1	267.8	0.0	322.3	3,592.1	206.6	1,462.9	0.0	2,533.6	7,543.0
Middle Cannon River	961.1	51.6	191.4	476.6	145.6	0.0	155.7	2,597.9	938.6	262.2	929.1	5,780.7
Upper Cannon River	2,558.2	812.6	118.4	673.3	128.6	0.0	0.0	818.0	119.7	272.5	2,877.6	5,501.2
Straight River	3,817.9	16.9	0.0	479.1	922.5	0.0	0.0	39.0	216.5	325.0	1,354.0	5,816.9
TOTAL	7,758.8	982.6	1,477.9	1,896.8	1,196.7	322.3	3,747.8	3,661.5	2,737.7	859.7	7,694.3	24,641.8

Figure 14. Lower Cannon River Green Corridor

The Cannon River from the outlet of the Byllesby Reservoir to the Mississippi at Red Wing is designated as a Minnesota Wild and Scenic River. Within the Wild and Scenic River designation there are three classifications: wild, scenic, and recreational. The Lower Cannon River is classified as scenic.

> Scenic rivers are those rivers that exist in a free-flowing state and with adjacent lands that are largely undeveloped (i.e., adjacent lands still present an overall natural character, but in places may have been developed for agricultural, residential, or other land uses). (Minnesota Department of Natural Resources, 2011)

The Wild and Scenic designation calls attention to the Cannon River's outstanding natural, scenic, and recreational value and also provides some limited protection, mostly in the form of zoning rules regulating setbacks, subdividing, etc., for the river. Additionally, the MN DNR can acquire land and scenic easements along wild and scenic rivers. Along the Lower Cannon River the DNR currently holds scenic easements on thirteen parcels protecting 341 acres. The Wild & Scenic designation will make it easier to protect and improve a "green corridor" along the river.

Actions

1. Identify priority parcels for inclusion in the Cannon River Green Corridor using aerial photos, fieldwork, already completed planning processes or assessments such as county biological surveys, ecological assessments, natural resource inventories, or floodplain maps.
2. Conduct outreach to landowners of unprotected land along the Cannon River about protecting their land as part of the Cannon River Green Corridor.
3. Promote the Cannon River Green Corridor concept and the Cannon River's Wild and Scenic designation to the general public and outdoor enthusiasts.
4. On lands already protected, restore or enhance habitat and natural communities.

Trout Brook, Belle Creek and Little Cannon River: Erosion control with a focus on Highly Erodible Land (HEL)

Approximately 64% of the land in the Lower Cannon River Lobe is classified as Highly Erodible Land (HEL) as depicted in Figure 15. The HEL land is shaded in pink. Highly Erodible Land (HEL) is determined by using the equation as established in the 1985 Farm Bill:

$$R \bullet K \bullet LS/T = HEL\ value$$ where:

R = rainfall and runoff,

K = the degree to which the soil resists water erosion,

LS = the effects of slope length (*L*) and steepness (*S*), and

T = tolerable soil loss.

An HEL value of 8 or above classifies the land as highly erodible (personal communication, Laurie Svien, NRCS, Rochester, MN September 15, 2009). As its name implies, this land is most likely to erode and send sediment into the streams and rivers. Controlling erosion on these lands is key.

Actions

1. As noted in previous sections use GIS to identify potential areas of HEL where BMPs would be most effective at reducing erosion.
2. Promote cover-crops and perennial cover on HEL.
3. Continue promotion of at least 50 foot buffers along public waters and enforce the shoreland rule to ensure these buffers are in place.
4. Provide manure management assistance for those spreading manure on HEL.
5. Restore and protect perennial vegetation on HEL

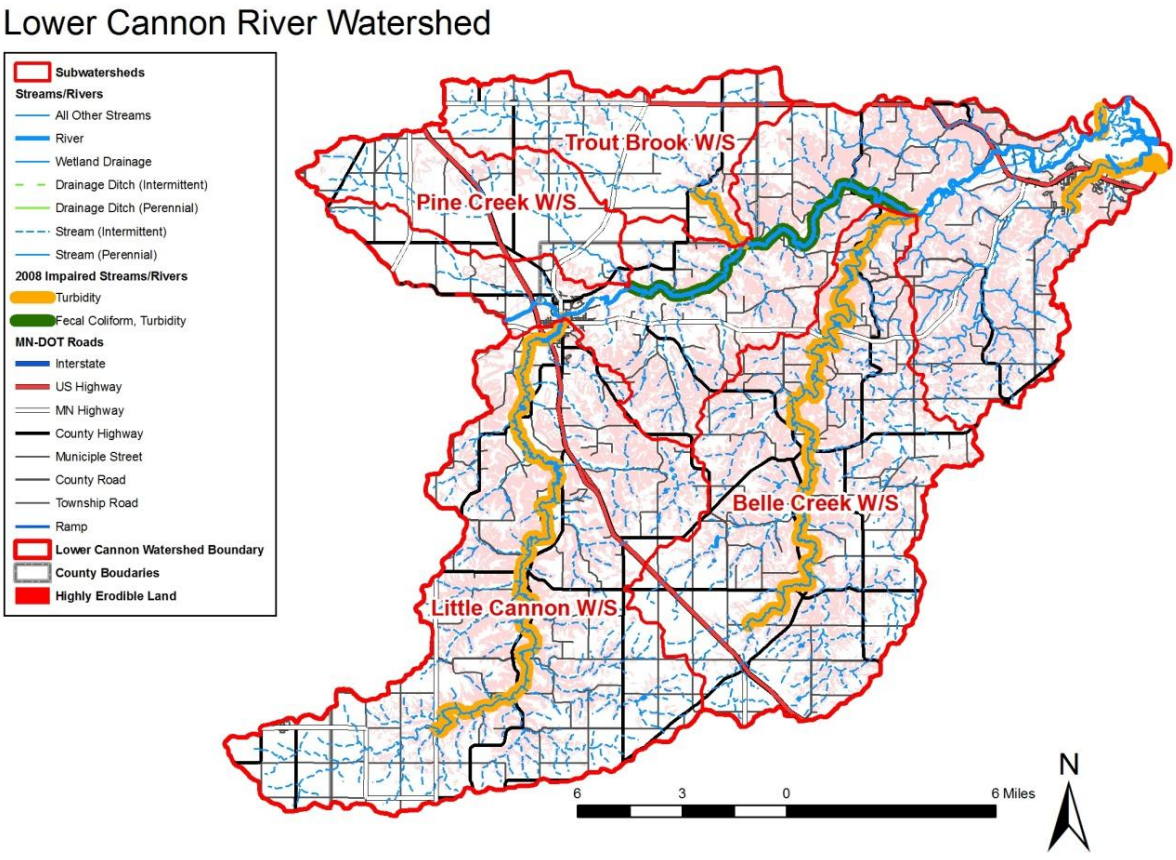


Figure 15. Lower Cannon River watershed – HEL land is noted in pink

Trout Brook: Nitrate management in karst areas

The Trout Brook watershed is dominated by agricultural land uses, primarily corn and soybean farming. This watershed is on the western edge of the karst landscape. Since 2001, the North Cannon Watershed Management Organization has sponsored periodic water quality monitoring within this watershed. Results of this monitoring effort have revealed several interesting findings, including unusually high nitrate concentrations. Based on these results and according to the Minnesota Pollution Control Agency, Trout Brook has the most chronically high nitrate results of any monitored stream in southeast Minnesota (J. Watkins, personal communication, January 26, 2011).

The most recent results from 2010 indicate that mean nitrate concentrations remain well above state water quality standards within Trout Brook, at all monitoring sites. In fact, 2010 mean nitrate concentrations even exceeded historical mean nitrate results for these monitoring locations (Figure 16). Additional research is needed in this watershed to help identify nitrate sources and develop management strategies to reduce nitrate concentrations in this stream.

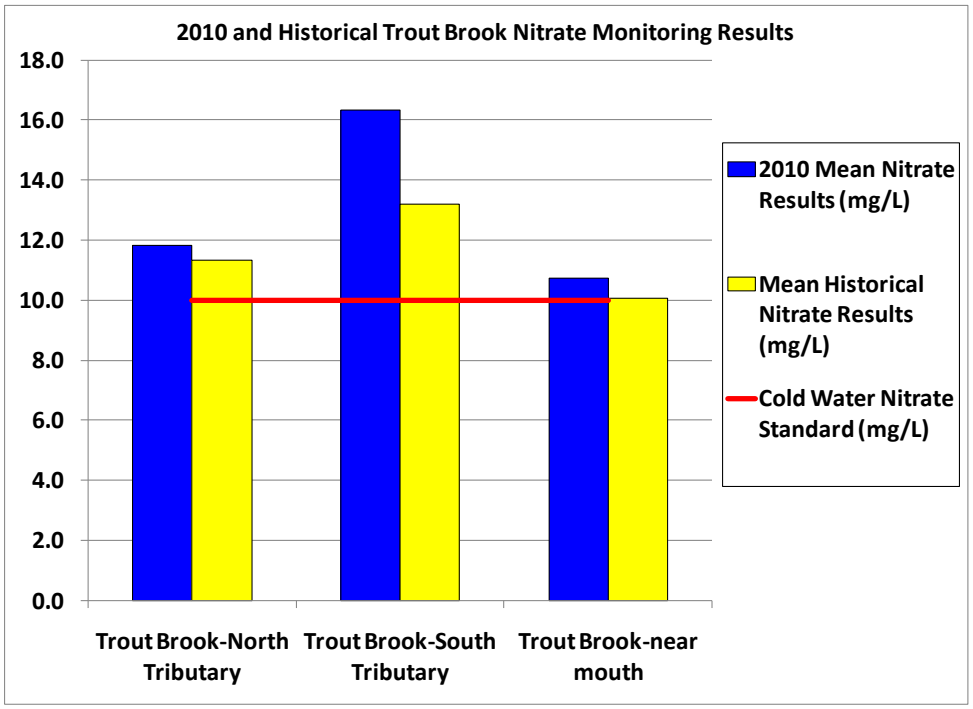


Figure 16. Trout Brook Nitrate Monitoring Data

Actions

The karst landscape in this watershed increases the interaction of groundwater and surface water and the potential for nitrate contamination of groundwater. Action items should focus on reducing nitrates that leave the land and reach drinking water supplies. The focus should be on reducing nitrate loading from commercial fertilizer and manure applications.

1. Provide a nutrient management staff person at the SWCD or Extension office who can serve as a resource to help producers with nutrient management plans.

2. Encourage producers to sign up for nutrient management trials and other demonstration projects to help them reduce commercial nitrogen fertilizer use as much as possible.
3. Encourage grid soil sampling, nitrate testing of corn stalks, manure testing, and other diagnostic practices so producers have the best possible understanding of the nitrogen and other nutrient needs of their crops.
4. Host *Value of Manure* workshops so producers gain a better understanding of what manure is worth and how best to use it so they reduce over application.
5. Work with cooperatives and agricultural retail stores to ensure they understand the issues of nitrate contamination of surface and ground water and are doing what they can to advise producers to make choices that will be good for production and protective of water quality.

Little Cannon River and Belle Creek: Sediment load reduction with a focus on the stream channel and gullies

The Little Cannon River is primarily in Goodhue County, with a small portion in Rice County. It is the largest subwatershed in the Lower Cannon River watershed. The city of Nerstrand (population ~ 236) is in the headwaters area, the town of Sogn (population ~ 20) is in the center and the city of Cannon Falls (population ~ 3876) is at the mouth of the river where it empties into the Cannon River at river mile 25. Other than these three areas the remainder of the watershed is made up of primarily agricultural, pasture land, and forest. The watershed drains approximately 96 square miles and has steep slopes. Reaches in the upper portion are designated as Class 2A Trout Stream.

The entire Belle Creek drainage lies in Goodhue County and includes no incorporated cities – only small communities such as Vasa, Belle Creek and White Rock. The watershed includes ~ 850 acres (1.7%) of public land (State of MN and MN DNR) in the bottom third of the watershed. It enters the Cannon River at river mile 11 about a mile downstream from the village of Welch. This watershed drains about 75 square miles and has one of the steepest gradients of all of the Cannon River tributaries at about 14 feet per mile. It is a 4th order stream and is primarily agricultural in the headwaters and forest from the mid reach down to the mouth. As with the Little Cannon River, steep topography makes erosion a primary issue in the Belle Creek watershed.

Belle Creek has the only Watershed District in the Cannon River watershed. The Belle Creek Watershed District was formed in 1968 to address flooding and sedimentation. Seven structures were installed to control flooding and provide stabilization from 1976-1983. The last plan for the district was written in 1991. The plan is being revised in 2011 by the Goodhue SWCD.

Actions

1. Riparian Channel Assessment and Inventory to identify sediment source spots.
   This project has been selected for 319 funding for 2011 and will be worked on by the University of Minnesota and Cannon River Watershed Partnership.
2. Use GIS and ground truthing to identify gullies and ravines.
3. Use GIS, SWAT modeling, and ground truthing to identify locations for rate and volume control BMPs.

4. Form groups of landowners, called Watershed Councils, in some of the key subwatersheds to help carry out land use changes and actions identified in items 1-3. (This is an action item in the 319 project).
5. Develop list and begin to carry out stream stabilization projects.

Little Cannon River: E.coli bacteria loading reduction

E.coli bacteria is also a pollutant of concern based on monitoring carried out in 2008 and 2009 by the Goodhue SWCD. Two unnamed tributary subwatersheds in the upper portion of the watershed, southeast area, had the highest E. coli levels as noted in Figure 17.

Actions

1. Continue feedlot fixes, vegetative buffers, and septic work in the watershed.

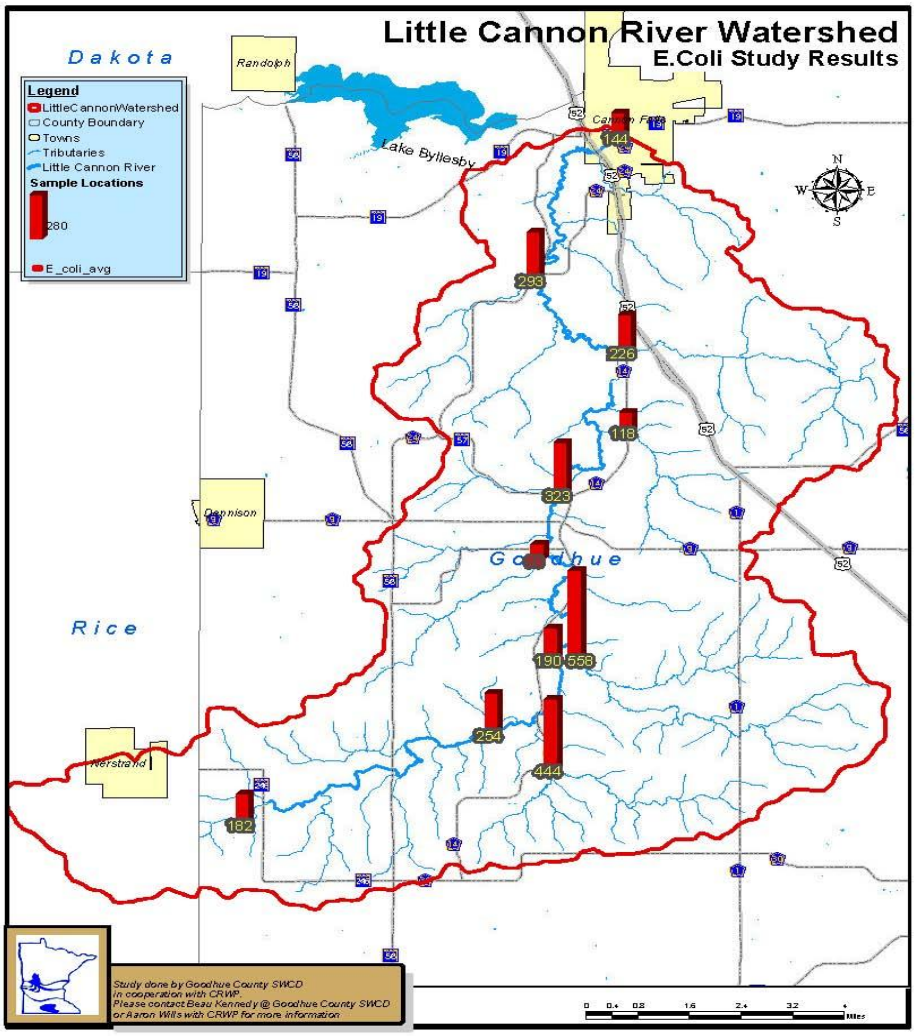


Figure 17. Little Cannon River watershed e. coli study results 2008-2009

Monitoring Strategy

Short-term (0-3 years) and long-term (5-10 years) monitoring strategies were determined utilizing past, current, and future water quality monitoring data. These short and long-term monitoring strategies are discussed in further detail below.

Short-term (0-3 years)

1.) Review all water quality and physical data collected

Based on the 2010 draft Impaired Waters list, there were ten impaired stream reaches in this lobe (Cannon River (3), Pine Creek, Trout Brook, Butler Creek, Little Cannon River, Spring Creek, and Belle Creek). Stream impairments in the lower lobe of the watershed are related to excessive nutrients, mercury, and sediment loading. In addition, there are numerous bacteria impairments on multiple streams. After reviewing the water quality and physical data collected in this region, additional information is needed on the tributary streams. Specifically, information related to stream flow, discharge rating curves, continuous stage data, and other stream metrics (*i.e.,* physical and biological). This information is essential for determining pollutant load for future TMDL projects, identifying pollutant sources, and establishing priority management zones for future restoration activities. Current and past projects were conducted on a rotational or limited schedule due to budget, equipment, and staff limitations making it more difficult to define the pollutant sources, stream health, current biotic communities, and to develop future restoration strategies. Recent projects (*e.g.,* Little Cannon Clean Water Legacy Grant, NCRWMO monitoring, MN Department of Agriculture Pesticide monitoring, MN DNR fish assemblage study, Little Cannon SWAT modeling, and Surface Water Assessment Grants projects) have allowed for some surface water assessment, limited watershed modeling efforts, identification of some priority management areas, fish population distribution and density, and possible areas where restoration activities or BMP strategies could be implemented. Utilizing "what we know" from these project is essential to achieve water quality goals for the region.

2.) Establishment of three year-round water quality monitoring stations

The second short-term monitoring benchmark is to establish three permanent (year-round or seasonal) water quality monitoring stations in this lobe of the watershed. Currently, there are three permanent monitoring locations in this lobe of the watershed maintained by the USGS and MPCA (Cannon River at Welch, Little Cannon River at Sogn, and Little Cannon River at County Road 24, respectively). Therefore, these additional monitoring stations will be placed on other large tributaries with impairment listings. The preliminary selected streams are Belle Creek, Pine Creek, and Trout Brook. The two of these three streams are designated trout streams. It is also important to note that part of the Little Cannon River supports a trout population; however, the population is relatively insignificant. These additional monitoring locations will provide flow, stage, and nutrient information necessary to identify areas within the lobe where future flooding, sediment, and nutrient impairment mitigation activities should occur. These stations will also help to determine the effectiveness of BMPs that are currently being implemented in the Trout Brook and Pine Creek sub-watersheds by Dakota County Soil and Water Conservation District (SWCD).

3. Conduct BMP effectiveness monitoring within this lobe

The third short-term monitoring benchmark is to conduct BMP effectiveness monitoring in portions of this watershed where past or current BMP projects are being conducted. Brad Becker from Dakota SWCD (personal communication, January, 2011) indicated that current and future projects will primarily be focused on sediment reductions in the eastern portions of the watershed utilizing control basins and grassed waterways. On the western side of the watershed, sediment reductions will be accomplished utilizing buffer strips and retention ponds. In addition to these on-going projects, he indicated that the New Trier region (containing the Trout Brook stream) of the lower lobe of the Cannon River watershed would be the future focus of BMP projects in the next five years. However, the SWCD has limited funding to monitor the water

quality conditions of the streams now and in the near future. Based on this information, short-term monitoring benchmarks will focus on collecting preliminary flow and nutrient data within this region before and after BMP implementation. This is an ideal monitoring scenario because it allows you to establish a baseline of water quality information and gain an understanding of BMP effectiveness within this area of the watershed.

4.) Assess all surface water resources for their impairment status

In comparison to the other three lobes of the watershed, the Lower Cannon lobe has had numerous large tributary streams evaluated and assessed. However, numerous smaller tributaries or intermittent streams, (*i.e.*, western branch of Trout Brook, headwaters of Pine Creek, headwaters of Little Cannon River, and headwaters of Belle Creek) ditch systems, and wetland outlets that have not been evaluated and could represent a significant source of pollutants leading to many of current surface water impairment listings. Identifying and evaluating the condition of these previously mentioned surface waters would be beneficial for future restoration, protection, and educational outreach activities.

5.) Incorporate knowledge gained from the SWAT model

The fifth short-term monitoring benchmark is to incorporate the knowledge gained from a Soil and Water Assessment (SWAT) model that was recently completed by the MPCA in the Little Cannon River sub-watershed. This hydrology model is comprised of the following components: weather, surface runoff, return flow, percolation, evapotranspiration, transmission losses, pond and reservoir storage, crop growth and irrigation, groundwater flow, reach routing, nutrient and pesticide loading, and water transfer. The objective of such a model is to predict the long-term impacts in large basins of management and also timing of agricultural practices within a year (i.e., crop rotations, planting and harvest dates, irrigation, fertilizer, and pesticide application rates and timing). It can be used to simulate at the basin scale, the water and nutrient cycles in landscapes whose dominant land use is agriculture. It can also help in assessing the environmental efficiency of BMP's and alternative management policies. The application of this model could be used within other sub-watershed basins of the Lower Cannon and the entire Cannon River Watershed. Information gathered from this model could potential point us in the direction of where and what BMPs and restoration activities will give us the greatest environmental return.

6.) Conduct effectiveness monitoring for Lower Mississippi Rive Basin Regional Fecal Coliform TMDL

The initial TMDL report was approved by EPA in November 2002. A revised TMDL report was approved by EPA in April 2006 and an implementation plan was completed in September 2007. In the Lower Cannon River Lobe the Cannon River was included in the TMDL. Implementation projects to address the TMDL have been ongoing since 2003. Millions of dollars have been invested in feedlot fixes, upgrading septic systems, constructing new wastewater treatment systems in small communities with inadequate sewer systems, and other projects. It is important to determine if fecal coliform levels have decreased as a result of these efforts.

In 2007 MPCA conducted regional monitoring to begin evaluating the effectiveness of implementation activities and progress towards meeting the TMDL. To assess trends, five years of data is desirable. A good start for conducting effectiveness monitoring would be collecting three years of data making sure to include the sites that were monitored in 2007.

Long-term (5-10 years)

1.) Develop, identify and establish a subsurface tile outlet and point source drainage inventory

First of the long-term monitoring benchmarks will be to identify, develop, and establish a subsurface tile outlet and point source drainage inventory. This will work will entail locating all existing or newly-installed drainage tile systems and point source outlets within the lower lobe of the Cannon River watershed. The first critical component of this long-term benchmark would be to conduct field surveys on the numerous streams and ditches. It is especially important for streams in this area that contain trout (*i.e.,* Trout Brook, Pine Creek and Little Cannon River) because they are very sensitive to changes in the water quality. Developing this inventory will take years and will require landowners to "buy-in" to the project by allow access onto their property. The inventorying process would identify subsurface drainage systems and straight pipe outlet points. Once these points have been referenced using GPS and the data will be collected pertaining to: pipe diameter, type of pipe, type of material drained, installation date, and current land-use. This information will be compiled into a database were maps can be utilized by land managers throughout the various counties. This information could prove to be very beneficial for flood modeling and mitigation, bacteria reduction, nutrient management initiatives, nutrient pollutant reductions, and implementation of BMPs across the lower lobe. In addition to the benefits that this information can provide, it can lead to protect of streams reaches that have sensitive biotic communities living within them (i.e., brown trout). An example of such a place in the Lower Cannon is Trout Brook, located south of New Trier, MN. This creek contains brown trout populations that are very sensitive to fluctuations in water temperature, dissolved oxygen, as well as water quality conditions. Therefore, it is very important to inventory and identify all possible pollutant sources that may be contributing to the condition of the stream as a way to protect this unique fish community. Currently, subsurface drainage information is not being inventoried by any local or county government unit making it particularly difficult to come by. This information in the future will be essential in determining point and non-point sources that may be contributing to flooding and surface water impairment issues.

2. Establishment of 5-6 long-term biological and geomorphic monitoring stations

These stations will collect biological and physical metrics used to establish long-term stream health trends. These locations will be determined in the future and will be dependent on funding availability, location, and utilization of trained citizen volunteers interested in this subject matter. After the MPCA concludes their 2011 intensive watershed monitoring project in the Cannon River watershed, information will be available to determine which locations would be the best suited for long-term stream health observation. By collecting this information, stream health trends, stream channel morphology, channel evolution, and long-term trends can be monitored and developed. Thus, allowing us to determine if the stream condition/health are improving or degrading over time.

3. Develop and implement field stream assessments within the lobe

Last long-term monitoring benchmark for the Lower Cannon lobe is to develop a field stream assessment toolbox. This field stream assessment toolbox is comprised of six distinct components which are: BEHI, NBS, stream discharge measurements, stream dimension surveys, stream habitat assessments, and invertebrate surveys. These components mentioned, would provide an abundance of information relating to stream condition, channel evolution, and overall stream health. The information gathered would assist to identify priority areas where restoration activities need to be focused to address impairment issues. In addition, it enables the researcher to monitor the stream's condition and evolution over-time in a subjective manner. CRWP is unaware of any type of stream assessment work being conducted or scheduled for the future in the Lower Cannon lobe.

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