Coon Creek Watershed District Watershed Restoration and Protection Strategy Report (WRAPS)

Mississippi River-Twin Cities Major Watershed

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Coon Creek Watershed District
Anoka Conservation District
Wenck
Minnesota Pollution Control Agency
Clean Water Land & Legacy Amendment

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Key Terms

Assessment Unit Identifier (AUID): The unique water body identifier for each river reach comprised of the USGS eight-digit HUC plus a three-character code unique within each HUC.

Aquatic consumption impairment – Lakes and streams are considered impaired based on fish tissue samples which are analyzed to determine the current levels of a chemical in the aquatic community. These impairments are based on the pollutant type (mercury, PCBs, etc.) which can be toxic to human health if ingested beyond the recommended levels. Guidelines for safe human consumption are issued by the Minnesota Department of Health for how often certain fish can be safely eaten.

Aquatic life impairment: The presence and vitality of aquatic life is indicative of the overall water quality of a stream. A stream is considered impaired for impacts to aquatic life if the fish Index of Biotic Integrity (IBI), macroinvertebrate IBI, dissolved oxygen, turbidity, or certain chemical standards are not met.

Aquatic recreation impairment: Streams are considered impaired for impacts to aquatic recreation if fecal bacteria standards are not met. Lakes are considered impaired for impacts to aquatic recreation if total phosphorus, chlorophyll-*a*, or Secchi disc depth standards are not met.

Hydrologic Unit Code (HUC): A Hydrologic Unit Code (HUC) is assigned by the USGS for each watershed. HUCs are organized in a nested hierarchy by size. For example, the Minnesota River Basin is assigned a HUC-4 of 0702 and the Pomme de Terre River Watershed is assigned a HUC-8 of 07020002.

Impairment: Water bodies are listed as impaired if water quality standards are not met for designated uses including: aquatic life, aquatic recreation, and aquatic consumption.

Index of Biotic integrity (IBI): A method for describing water quality using characteristics of aquatic communities, such as the types of fish and invertebrates found in the waterbody. It is expressed as a numerical value between 0 (lowest quality) to 100 (highest quality).

Protection: This term is used to characterize actions taken in watersheds of waters not known to be impaired to maintain conditions and beneficial uses of the waterbodies.

Restoration: This term is used to characterize actions taken in watersheds of impaired waters to improve conditions, eventually to meet water quality standards and achieve beneficial uses of the waterbodies.

Source (or Pollutant Source): This term is distinguished from 'stressor' to mean only those actions, places or entities that deliver/discharge pollutants (e.g., sediment, phosphorus, nitrogen, pathogens).

Stressor (or Biological Stressor): This is a broad term that includes both pollutant sources and non-pollutant sources or factors (e.g., altered hydrology, dams preventing fish passage) that adversely impact aquatic life.

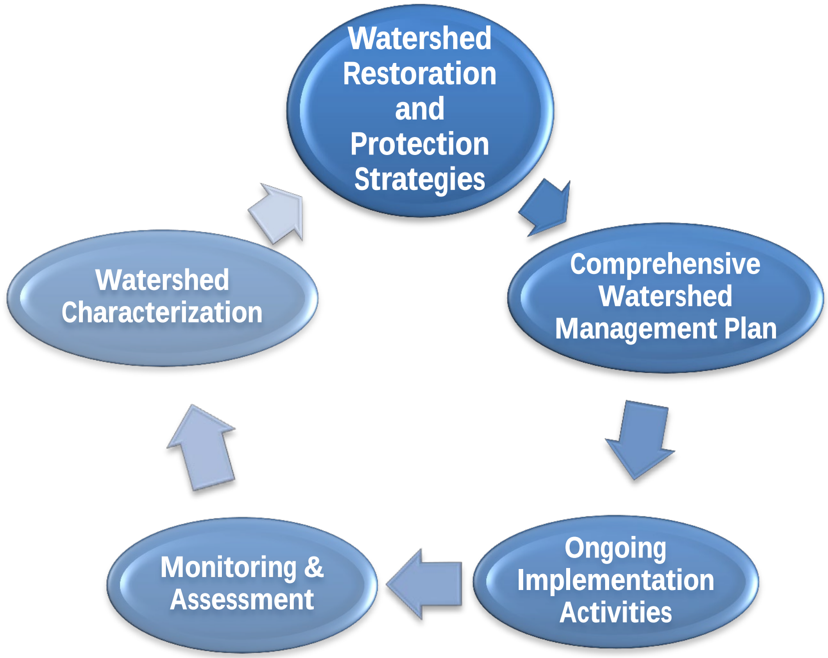
Total Maximum Daily Load (TMDL): A calculation of the maximum amount of a pollutant that may be introduced into a surface water and still ensure that applicable water quality standards for that water are met. A TMDL is the sum of the wasteload allocation for point sources, a load allocation for nonpoint sources and natural background, an allocation for future growth (i.e., reserve capacity), and a margin of safety as defined in the Code of Federal Regulations.

Executive Summary

Streams in the Coon Creek Watershed are polluted with bacteria, excess nutrients (including phosphorus), and sediment. Stream bank erosion and stormwater runoff are having a negative effect on the watershed's water quality. Urban development and agricultural activities in the watershed have resulted in runoff that carries excess phosphorus, sediment, and bacteria into bodies of water that degrades water quality and is harmful to aquatic life.

The intent of this Watershed Restoration and Protection Strategy report (WRAPS) was to develop a scientifically-based restoration and protection strategy for the Coon Creek Watershed. This WRAPS summarizes past efforts to monitor water quality, identifies impaired water bodies and those in need of protection, and identifies strategies for restoring and protecting water quality in the watershed. The strategies included in this report target point and non-point sources of pollution and include, riparian buffers, streambank stabilizations, stormwater retrofits, street sweeping, and education and outreach.

What is the WRAPS Report?



The State of Minnesota has adopted a "**watershed** approach" to address the state's 80 "major" watersheds (denoted by 8-digit hydrologic unit code or HUC). This watershed approach incorporates **water quality assessment, watershed analysis, civic engagement, planning**, **implementation**, and **measurement of results** into a 10-year cycle that addresses both restoration and protection.

As part of the watershed approach, waters not meeting state standards are still listed as impaired and Total Maximum Daily Load (TMDL) studies are performed, as they have been in the past, but in addition the watershed approach process facilitates a more cost-effective and comprehensive characterization of multiple water bodies and overall watershed health. A key aspect of this effort is to develop and utilize watershed-scale models and other tools to identify strategies and actions for point and nonpoint source pollution that will cumulatively achieve water quality targets. For nonpoint source pollution this report informs local planning efforts, but ultimately the local partners decide what work will be included in their local plans. This report also serves as a watershed plan addressing United States Environmental Protection Agency's (EPA's) nine minimum elements to qualify applicants for eligibility for Section 319 implementation funds.

Purpose

- Support local working groups and jointly develop scientifically-supported restoration and protection strategies to be used for subsequent implementation planning
- Summarize Watershed Approach work done to date including the following reports:
  - *2013-2023 Coon Creek Watershed District Comprehensive Plan*
  - *Coon Creek Watershed District Watershed Biotic Stressor Identification - 2014*
  - *Coon Creek Watershed District Total Maximum Daily Load Study - 2016*
  - *Mississippi River-Twin Cities Watershed Monitoring and Assessment Report - 2013*

Scope

- Impacts to aquatic recreation and aquatic life in streams
- Impacts to aquatic recreation in lakes
- Strategies for restoration and protection of water resources

Audience

- Local working groups (local governments, SWCDs, watershed management groups, etc.)
- State agencies (MPCA, DNR, BWSR, etc.)
- Local interest groups (citizen residents)

1. Watershed Background & Description

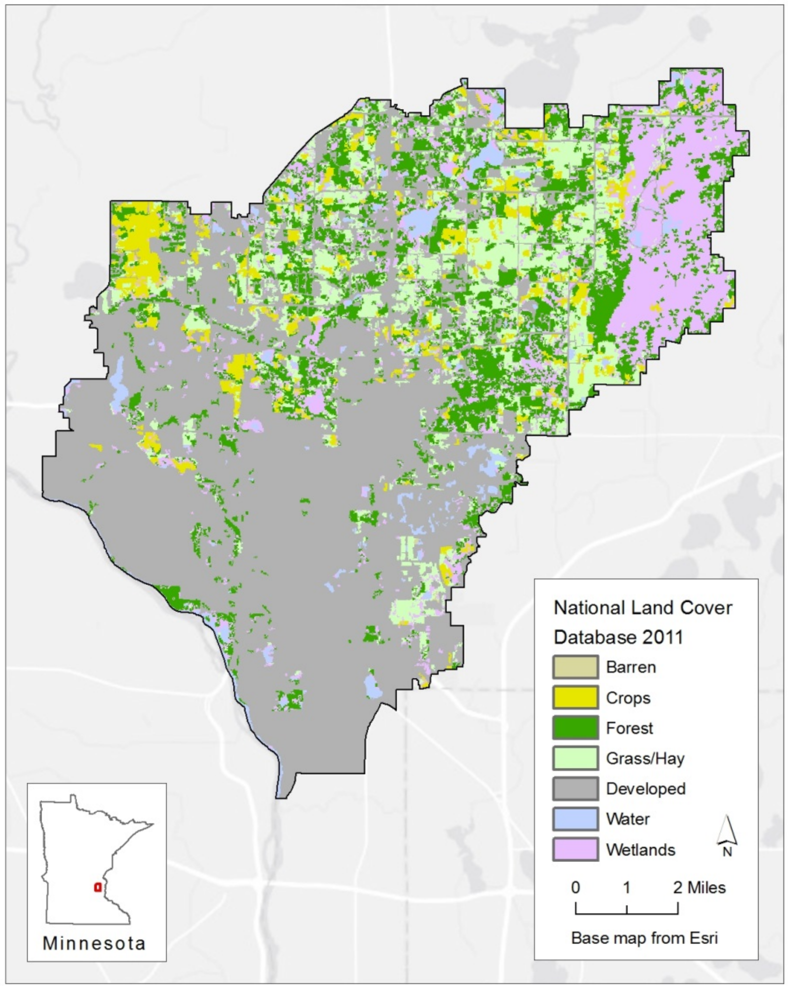


Figure 1. Land Cover in the Coon Creek Watershed District.

The Coon Creek Watershed (HUC 10 – 0701020602) is part of the larger 8-digit hydrologic unit known as the Upper Mississippi River – Twin Cities Watershed (HUC 8 – 07010206). Located in Anoka County, the Coon Creek Watershed is approximately 107 square miles, or 68,480 acres.

Land cover is predominately developed in the southern portion of the watershed, and characterized by rural, forested and wetland land cover in the north. The dominant land cover is developed (high, medium, or low density), which covers roughly 50% of the watershed. The remaining 50% is split between forested (15.5%), grassland (11.7%), and wetland areas (14.4%) (Figure 1).

The EPA identified ecoregions across Minnesota based on areas of relative homogeneity for land use, landforms, and natural vegetation. The Coon Creek Watershed is located within the North Central Hardwood Forest (NCHF) Ecoregion; an area defined by a transition between forested areas to the north and east and agricultural areas to the south and west. Terrain in the NCHF ecoregion varies from rolling hills to smaller plains. Upland areas are forested by hardwoods and conifers, while the plains include livestock pastures, hay fields, and row crops such as potatoes, beans, peas, and corn.

Water resources in the Coon Creek Watershed are overseen by the Coon Creek Watershed District (CCWD). The watershed district was established in 1959 pursuant to the Watershed Law (Minn. Stat. 103D). The District's statutory purpose is to develop and manage a uniform program for water and related land management within the drainage area of Coon Creek and amended areas. The mission of the district is to manage groundwater and surface water drainage systems to prevent property damage, maintain hydrologic balance, and protect water quality for the safety and enjoyment for citizens and the preservation and enhancement of wildlife and habitat.

For more information on the resources in the CCWD and adopted rules, policies, and permitting program, see the CCWD Watershed Management Plan on the CCWD website: http://www.cooncreekwd.org/.

Additional Coon Creek Watershed Resources

Coon Creek Watershed District

Coon Creek Watershed District Total Maximum Daily Load Study

Coon Creek Watershed District Stressor Identification Report

Mississippi River-Twin Cities Monitoring and Assessment Report

Mississippi River- Twin Cities Watershed

USDA Natural Resources Conservation Service (NRCS) Rapid Watershed Assessment for the Upper Mississippi River – Twin Cities Watershed

Minnesota Department of Natural Resources (DNR) Watershed Assessment Mapbook for the Upper Mississippi River – Twin Cities Watershed

2. Watershed Conditions

The Coon Creek Watershed drains generally in the southwest direction toward its eventual outlet into the Mississippi River. A large network of streams and ditches transport water through the watershed providing agricultural drainage as well as flood protection during storm events. Approximately 133 miles of public drainage ditch sprawl across the landscape (Figure 2).

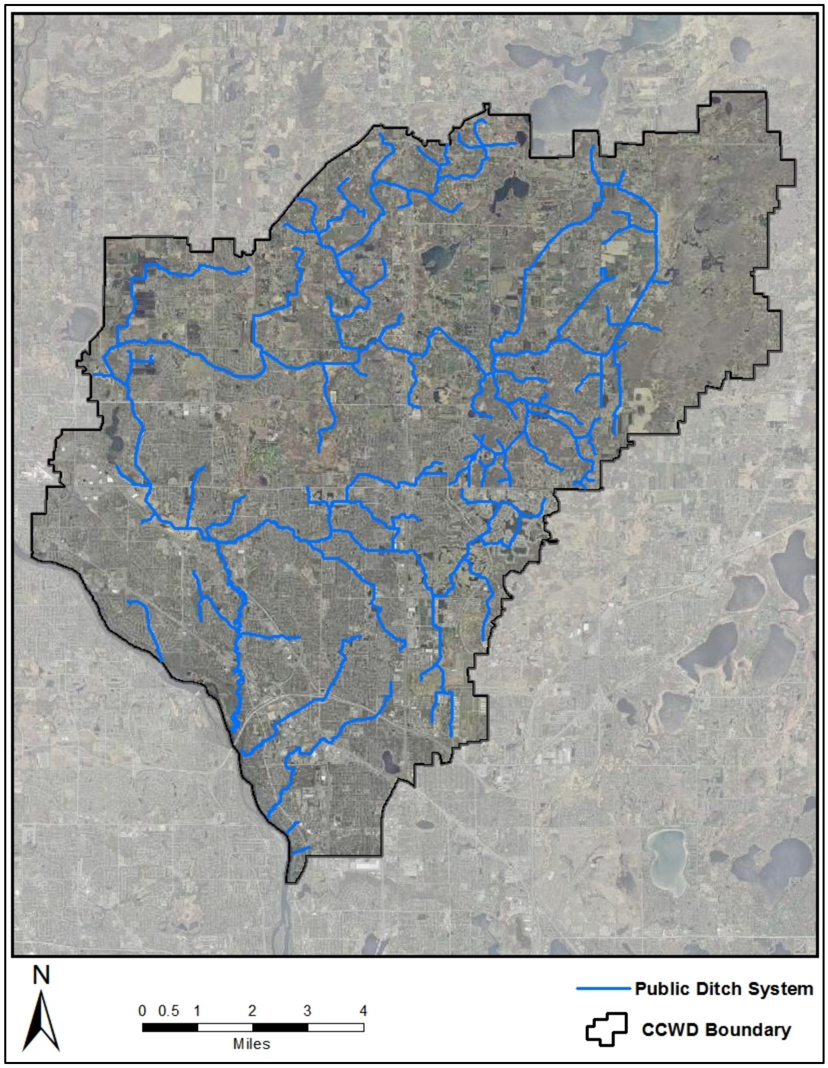


Figure 2. Coon Creek public ditch system.

Local land use patterns follow a similar pattern to land cover, transitioning from a more rural northern area to an urbanized southern portion. As the land use and land cover shift from north to south, so does water quality. For the impaired streams in this study, water quality degradation increases from upstream to downstream. This pattern is typical for many streams in the state; however, it is likely the increased impervious areas associated with densely populated areas of the watershed are exacerbating downstream degradation. Stormwater runoff is a significant source of a variety of pollutants across the U.S. (EPA 1996; EPA 2006).

In-channel factors also contribute to increased water quality degradation in downstream reaches. Streambank erosion contributes excess sediment to the water column where it eventually settles out, filling in pools, riffles, and other in-channel habitat.

The potential for streambank erosion in the CCWD is high due to the abundance of channelized drainage ditches, which often result in increased peak flows and reduced base flows. Channelized drainage ditches are unstable during periods of high water level fluctuation. Quickly receding stream levels can leave saturated stream banks unsupported, resulting in mass wasting events.

Not all of the waterbodies in the Coon Creek Watershed were assessed primarily due to the predominance of channelization; however, in some instances, insufficient data and/or proximity to the Mississippi River, prevented assessment.

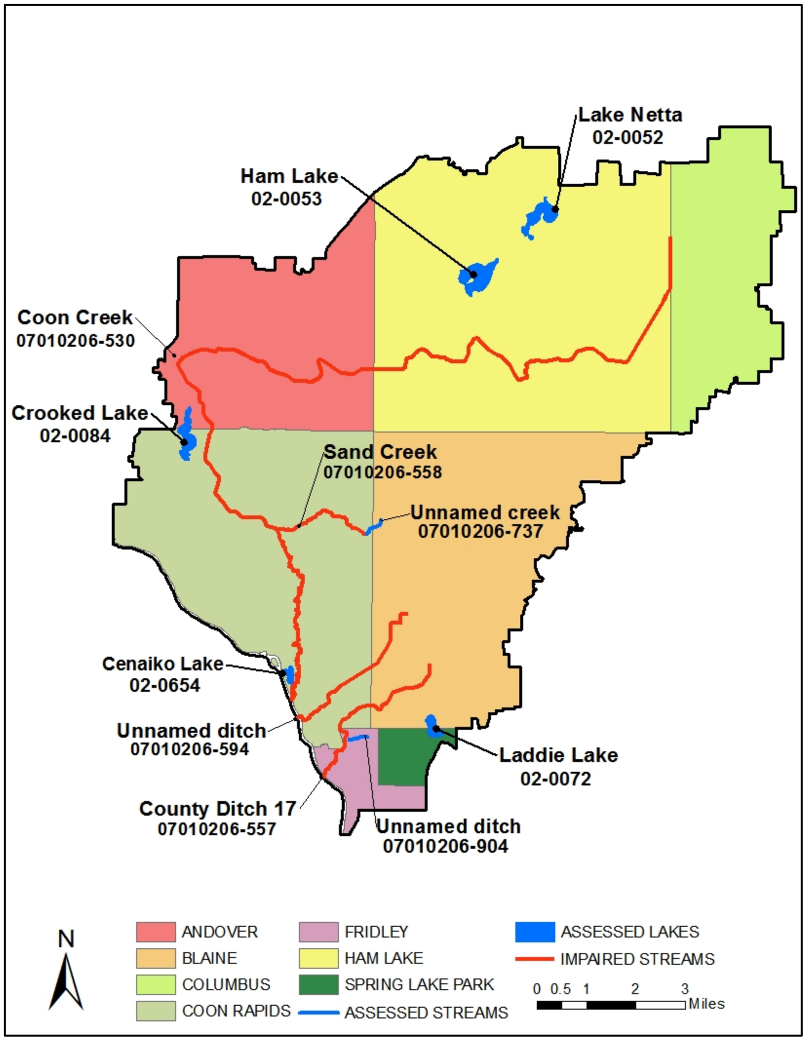


Figure 3. CCWD assessed/impaired waterbodies.

Five lakes and six stream segments in the watershed were assessed for support of aquatic life and/or aquatic recreation (Figure 3). All assessed lakes were determined to be supporting of aquatic recreation and therefore considered protection waters. Crooked Lake and Ham Lake are impaired by mercury; however, this report does not address toxic pollutants. For more information on mercury impairments see the Minnesota Statewide Mercury TMDL.

Coon Creek, Sand Creek, Unnamed Ditch (Pleasure Creek), and County Ditch 17 (Springbrook Creek) have been placed on the State of Minnesota's 303(d) list of impaired waters for aquatic life impairments due to biological indicators and aquatic recreation impairments due to *Escherichia coli* (*E. coli)* and have received TMDL allocations which are summarized in Section 2.4 of this report. Impaired stream reaches within the CCWD account for roughly 35% of the public ditch system. The subwatersheds of each impaired reach are illustrated in Figure 4 below. The condition of these streams and pollutant sources are detailed in the following sections.

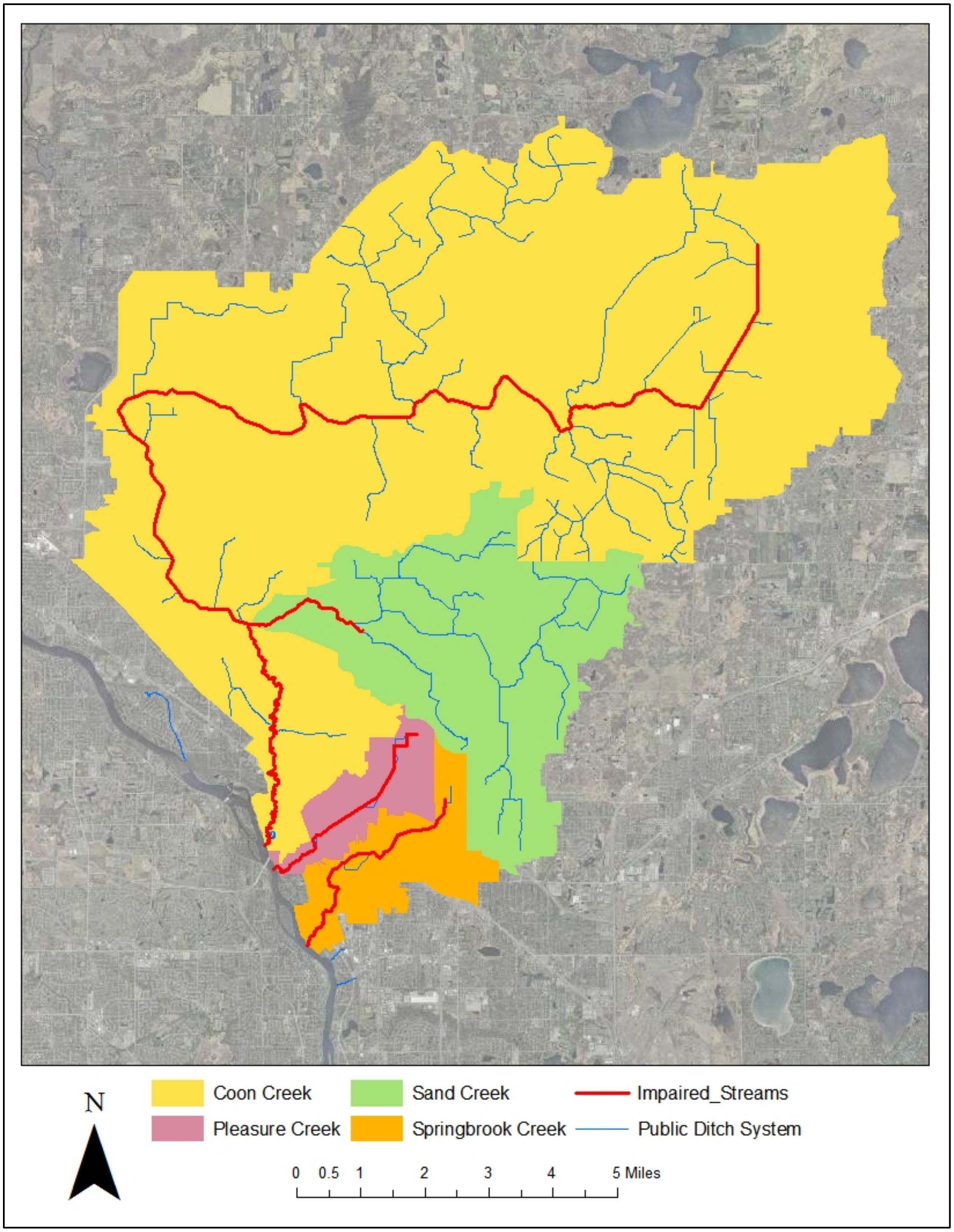


Figure 4. Subwatersheds of impaired reaches in the CCWD.

2.1 Condition Status

This section summarizes impairment assessments for lakes and streams in the Coon Creek Watershed.

Condition assessments are based on a waterbody's ability to support its beneficial uses as identified in the Clean Water Act of 1972 (i.e., aquatic recreation, aquatic life, aquatic consumption, navigation, etc.). All lakes and streams in the Coon Creek Watershed are classified as Class 2B waters which have specific beneficial uses as found in Minnesota Rules. Minn. R. 7050.0222 states, *"The quality of Class 2B surface waters shall be such as to permit the propagation and maintenance of a healthy community of cool or warm water sport or commercial fish and associated aquatic life, and their habitats. These waters shall be suitable for aquatic recreation of all kinds, including bathing, for which the waters may be usable."*

To determine if a waterbody is in support of aquatic life and recreation as required by Minn. R. 7050.0222, the Minnesota Pollution Control Agency (MPCA) conducts periodic water quality and biological sampling for comparison to standards. Condition assessments were conducted in the CCWD in 2000, 2005, and 2010. These assessments help separate waterbodies in need of restoration efforts (impaired waters) from those in need of protection efforts (fully supporting waters). Further information on protection consideration can be found in Section 2.5.

Lakes

Five lakes in the Coon Creek Watershed were assessed for support of aquatic recreation and Crooked Lake was assessed for aquatic life based on chloride. All five lakes are classified as Class 2B waters for which aquatic life and aquatic recreation are the protected beneficial uses. The eutrophication standards are based on the ecoregion and lake depth. Minn. R. 7050.0222 outlines the water quality criteria by ecoregion. This rule establishes the eutrophication criteria for deep and shallow lakes (shallow lakes are lakes with a maximum depth of 15 feet or a littoral area of 80% or more). Class 2B lakes are assessed based on ecoregion specific numeric water quality standards for total phosphorus (TP), chlorophyll-*a* (chl-*a*), and Secchi transparency depth. To be listed as impaired, a lake must not meet water quality standards for TP and either chl-*a* or secchi depth. All of the lakes assessed in the CCWD were found to be fully supporting aquatic recreation, and Crooked Lake did not violate the aquatic life standard for chloride (Table 1).

Table 1. Assessment status of lakes in the Coon Creek Watershed.

HUC-10 Subwatershed	Lake ID	Lake Name	Aquatic Recreation	Aquatic Life (Chloride)
Coon Creek 0701020602	02-0654	Cenaiko Lake	Sup	NA
	02-0052	Lake Netta	Sup	NA
	02-0053	Ham Lake*	Sup	NA
	02-0084	Crooked Lake*	Sup	Sup
	02-0072	Laddie Lake	Sup	NA

Sup = fully supporting aquatic recreation, NA = not assessed
*Impaired water for aquatic consumption based on elevated mercury concentrations.

Streams

Water quality of streams is assessed based on aquatic life and aquatic recreation uses. Aquatic life impairments include fish index of biotic integrity (Fish IBI), macroinvertebrate index of biotic integrity (Invert IBI), dissolved oxygen (DO), turbidity/total suspended solids (TSS), pH, and chloride. To determine aquatic life support for streams, indices of biotic integrity (IBI) are used in combination with DO and turbidity measurements. When a fish or macroinvertebrate community scores below their respective IBI, a determination of non-support is made. The same determination is made if DO concentrations or water clarity (turbidity) are too low to support aquatic life. For further information regarding the development of stream IBIs, refer to the MPCA Guidance Manual for Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment: 305(b) Report and 303(d) List.

Support of aquatic recreation beneficial use for streams is based on concentrations of *E. coli* bacteria present. *E. coli* is a type of bacteria used to indicate the potential presence of waterborne pathogens that can be harmful to human health. *E. coli* concentrations taken from assessed streams are compared to state standards to determine if the stream supports aquatic recreation activities. Four reaches were found to be impaired for aquatic recreation use based on *E. coli* (Table 2).

Three streams were found to be supporting of aquatic life based on chloride and three streams had insufficient data to make an assessment, but were determined to be high risk (at least one sample ≥207 mg/L within the last 10 years) in the TCMA Chloride Management Plan (2016).

Stream reaches in the Coon Creek Watershed have not yet been assessed with the recently approved river eutrophication and TSS standards. The standards were not approved at the time of the assessment.

Currently, the MPCA is deferring impairments occurring on channelized reaches until aquatic life use standards have been adopted as part of the Tiered Aquatic Life Use (TALU) framework. Adoption of TALU standards in Minnesota may impact aquatic life impairments in the Coon Creek Watershed.

Table 2. Assessment status of stream reaches in the Coon Creek Watershed District.

HUC-10 Subwatershed	AUID (Last 3 digits)	Stream	Reach Description	Aquatic Life							Aq Rec
				Fish Index of Biotic Integrity	Macroinvertebrate Index of Biotic Integrity	Dissolved Oxygen	Turbidity/TSS	Chloride	pH	NH_3	Bacteria
Coon Creek 0701020602	530	Coon Creek	Unnamed Cr to Mississippi R	Def*	Imp	Sup	Sup	Sup	Sup	Sup	Imp
	558	Sand Creek	Unnamed Cr to Coon Creek	Def*	Imp	IF	Sup	Sup	Sup	NA	Imp**
	737	Unnamed Cr	Unnamed Cr to Sand Creek	NA	NA	IF	Sup	Sup	Sup	NA	NA
	594	Unnamed ditch	Headwaters to Mississippi R	NA	Imp	IF	Sup	IF	Sup	NA	Imp
	557	County Ditch 17	Headwaters to Mississippi R	NA	Imp	IF	Sup	IF	Sup	NA	Imp
	904	Unnamed ditch	Unnamed Cr to CD 17	IF	IF	NA	NA	IF	Sup	NA	NA
	748	Unnamed ditch	Unnamed ditch to Unnamed cr	NA	NA	IF	Sup	Sup	Sup	NA	NA
	749	Unnamed ditch	Headwaters to Sand Cr	NA	NA	IF	Sup	Sup	Sup	NA	NA
	765	Unnamed ditch	Unnamed ditch to Unnamed ditch	NA	NA	IF	Sup	Sup	Sup	NA	NA

Sup = found to meet the water quality standard, Imp = does not meet the water quality standard and therefore is impaired, IF = the data collected was insufficient to make a finding, Def = deferred, NA = not assessed.

*aquatic life assessments (Fish IBI) have been deferred until the adoption of Tiered Aquatic Life Uses (TALU) due to the AUID being predominantly (>50 percent) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

** Expected to be listed on the 2016 303(d) Impaired Waters List

2.2 Water Quality Trends

Lake and stream water quality data have been collected by various groups throughout the Coon Creek Watershed including, the Anoka Conservation District (ACD), MPCA, Metropolitan Council and involved citizens. A substantial water quality data set has been compiled as a result of the collaboration between the aforementioned groups. Long-term statistical trend analysis requires a long, mostly continuous, monitoring record. It should be noted that date ranges provided in Table 3 are not completely continuous, although enough data was available to analyze long term trends. Trend analysis was done utilizing the Mann-Kendall test, a statistical method used to assess if there is a gradual upward or downward trend for a pollutant of interest over time.

Lake Trends

Trend analyses were conducted for total phosphorus, chlorophyll-*a*, and secchi depth for lakes in Table 1. These three parameters are typically referred to as the Carlson Trophic State Index (TSI) and provide a measure of lake eutrophication.

All lakes showed a stable trend (not variable), no trend (variable but not increasing or decreasing) or improving trend in water quality. None of assessed lakes showed a decline in water quality. Crooked Lake showed the most significant improvement in water quality with all parameter trends having a confidence factor of 99.9%. A confidence factor of 95% is the minimum accepted, meaning there is at least a 95% chance that the data are showing a true trend and at most a 5% chance that the trend is a random result. Using the 95% confidence level, seven significant lake water quality trends were observed in the CCWD (see Table 3).

Table 3. Lake water quality trends in the Coon Creek Watershed.

	Date Range	Mann-Kendall Statistic	Confidence Factor	Trend
Crooked Lake (02-0084)				
Total Phosphorus	1979-2014	-111	99.9%	Decreasing
Chlorophyll-*a*	1983-2014	-134	>99.9%	Decreasing
Secchi Depth	1975-2014	546	>99.9%	Increasing
Ham Lake (02-0053)				
Total Phosphorus	1984-2014	9	66.6%	No Trend
Chlorophyll-*a*	1984-2014	-52	98.3%	Decreasing
Secchi Depth	1975-2014	91	99.2%	Increasing
Laddie Lake (02-0072)				
Total Phosphorus	1980-2011	9	66.6%	No Trend
Chlorophyll-*a*	1980-2011	-5	58.5%	No Trend
Secchi Depth	1974-2011	12	67.2%	No Trend
Lake Netta (02-0052)				
Total Phosphorus	1997-2013	-32	98.4%	Decreasing
Chlorophyll-*a*	1997-2013	-12	77.0%	Stable
Secchi Depth	1974-2013	53	96.6%	Increasing
Cenaiko Lake (02-0654)				
Total Phosphorus	1997-2012	16	74.7%	No Trend
Chlorophyll-*a*	1997-2012	2	51.8%	No Trend
Secchi Depth	1997-2012	-12	68.7%	Stable

Stream Trends

Stream water quality data sets were not as extensive as lake water quality data sets and only had 5-10 years of data. In some instances, only two years of data were available therefore no long-term analyses were conducted. For streams with sufficient data, trend analysis was conducted using the Mann-Kendall test. Although the trends should not be considered long-term, they do provide some insight in recent water quality conditions. Trend analyses were conducted for TSS and total phosphorus. Each of these parameters has contributed to aquatic life and/or aquatic recreation impairments in the CCWD as detailed in the CCWD Biotic Stressor Identification Report and TMDL Report.

Most parameters saw no significant change or had no discernible trend; however, Coon Creek had a decreasing trend for TSS with a confidence factor of 94.6% (Table 4).

Table 4. Stream water quality trends of the Coon Creek Watershed.

	Date Range	Mann-Kendall Statistic (S)	Confidence Factor (CF)	Trend
Coon Creek (S003-993)				
Total Suspended Solids	2005-2014	-19	94.6%	Prob. Decreasing
Total Phosphorus	2005-2014	1	50.0%	No Trend
Sand Creek (S004-619)				
Total Suspended Solids	2007-2014	7	76.4%	No Trend
Total Phosphorus	2007-2014	-4	64.0%	Stable

2.3 Stressors and Sources

In order to develop appropriate strategies for restoring or protecting waterbodies, the stressors and/or sources impacting or threatening them must first be identified and evaluated. Biological stressor identification (SID) is done for streams with fish or macroinvertebrate biota impairments. Biological SID includes an evaluation of pollutants and non-pollutant-related factors as potential stressors (e.g. altered hydrology, fish passage, and habitat). The biological SID process characterizes potential relationships between candidate stressors and biological assemblages, and then identifies the most likely stressors based of strength of evidence tables. Pollutant source assessments are done where a biological stressor ID process identifies a pollutant as a stressor as well as for the typical pollutant impairment listings. More detail on the stressors and pollutant sources can be found in the following sections.

Stressors of Biologically-Impaired Stream Reaches

There are four stream reaches in the Coon Creek Watershed impaired for aquatic life use due to biological indicators. In order to identify the most probable stressors causing these impairments, a biotic SID study was conducted. The CCWD Biotic SID Report provides more detailed information along with a weight of evidence analysis which links stressors to the aquatic life impairments. Potential candidate causes that were ruled out based on review of the available data included: nitrates, pH; temperature, and un-ionized ammonia. Based on the available data, it was inconclusive if chlorides were a candidate cause for biological impairment.

The following stressors are potential candidate causes that were examined in greater detail: TP, excess sediment (TSS), altered hydrology, altered habitat, and dissolved oxygen. Table 5 summarizes the relative degree of these identified stressors in streams with aquatic life impairments within the CCWD.

The most common stressors are stream eutrophication and excess sediment as evidenced by TP and TSS concentrations above state standards, especially during storm events. Likely causes of high TP and TSS concentrations are streambank erosion, overland runoff from both agriculture and urban land uses, and natural decomposition of organic soils. Altered habitat and altered hydrology were also common across the CCWD and designated as non-pollutant related factors.

The CCWD contains a mix of natural, modified, and constructed drainage ditches that work collectively to convey stormwater through the landscape. Channel modifications (i.e., channelization, dredging, stream, or stream armoring) have occurred on approximately 94% of the public ditch system leaving only eight miles in a "natural" state. Undoubtedly, these channel modifications have negatively impacted habitat. Because these waterways also serve as stormwater conveyances, these channels are only likely to provide the dual functions of drainage and habitat if major modifications are made, such as use of a two-stage ditch design. Lower Coon Creek attained the highest habitat rating of all impaired reaches. This was not unexpected due to the fact that Lower Coon Creek has not undergone channel modifications and remains a natural stream reach. Despite the lack of habitat alteration in this reach, fish and macroinvertebrate scores were still below biotic integrity standards, suggesting that degraded water quality is influencing biological assemblages despite the presence of adequate habitat.

Significant land use change has resulted in altered hydrology which also negatively affects biological assemblages. Impervious surfaces directly associated with urbanized landscapes quickly deliver water to stormwater conveyance systems which leads to sudden increases in peak flows and shorter times of concentrations (i.e. the amount of time it takes a drop of water to move from the most remote area of a watershed to its outlet). In urbanized or paved areas, this time is much shorter than rural impervious areas.

Table 5. Primary stressors to aquatic life in biologically-impaired reaches in the Coon Creek Watershed

HUC-10 Subwater-shed	AUID (Last 3 digits)	Stream	Reach Description	Biological Impairment	Primary Stressor					
					Dissolved Oxygen	Excess Sediment	Phosphorus	Altered Habitat	Altered Hydrology	Chloride
Coon Creek 0701020602	530	Coon Creek	Unnamed Cr. to Mississippi R.	Macroinvertebrates	™	˜	˜	›	›	
				Fish *(deferred)*	™	˜	˜	›	›	
	594	Unnamed ditch *Pleasure Creek*	Headwaters to Mississippi R.	Macroinvertebrates		˜	˜	›		**/**
	558	Sand Creek	Unnamed Cr. to Coon Cr.	Macroinvertebrates		˜	˜	›	›	
				Fish *(deferred)*		˜	˜	›	›	
	557	County Ditch 17 *Springbrook Creek*	Headwaters to Mississippi R.	Macroinvertebrates			˜	›	›	**/**

Key: ˜ = High › = Moderate ™ = Low **/** = Inconclusive

Pollutant sources

Pollutant sources vary by subwatershed depending on permitted point sources, surrounding land uses, and nonpoint sources throughout the watershed. The primary pollutant sources in the impaired stream subwatersheds were identified and discussed in the Coon Creek TMDL Report are outlined in Table 6 and Table 7.

Point Sources

Point sources are defined as facilities that discharge stormwater or wastewater to a lake or stream and have a National Pollutant Discharge Elimination (NPDES)/State Disposal System (SDS) Permit. In the CCWD, point sources of pollution include municipal, construction, and industrial stormwater discharges. All regulated MS4 stormwater permittees discharging to impaired streams in the CCWD are listed in Table 6. There are no permitted municipal or industrial wastewater facilities in the CCWD.

Table 6. Permitted MS4s and NPDES Sources in the Coon Creek Watershed.

HUC-10 Subwatershed	Point Source			Notes	TMDL			
	Name	Permit #	Type		Coon Creek	Sand Creek	Pleasure Creek	Springbrook Creek
Coon Creek 0701020602	MnDOT Metro District	MS400170	Municipal Stormwater	Individual WLA	~	~	~	~
	Anoka County	MS400066			~	~	~	~
	Coon Creek WD	MS400172		Categorical WLA	~	~	~	~
	Andover City	MS400073			~			
	Blaine City	MS400075			~	~	~	~
	Coon Rapids City	MS400011			~	~	~	~
	Ham Lake City	MS400092			~	~		
	Spring Lake Park City	MS400050						~
	Fridley City	MS400019						~
	Flamingo Terrace Mobile Home Park	MN0051144	State Disposal System (SDS)	No reductions needed				

Nonpoint Sources

Nonpoint pollution sources, unlike wastewater discharges, are more diffuse. Nonpoint source pollution arises when runoff moves across the landscape accumulating natural and anthropogenic pollutants before finally depositing them into lakes and streams. Common nonpoint pollutant sources in the CCWD are:

- **Agricultural runoff** – sediment, animal waste, and fertilizers are common pollutants found in agricultural runoff. These pollutants can contain high concentrations of total suspended solids, phosphorus, and bacteria.
- **Failing septic systems** – septic systems that are failing or non-compliant and near a lake or stream can contribute excess phosphorus and bacteria to surface and shallow groundwater resources.

- **Wildlife** – dense or localized populations of wildlife, such as ducks, geese, or deer, can contribute phosphorus and bacteria to streams and stormwater ponds. This is common during winter where waterfowl overwinter on open water streams in urban areas.
- **Stormwater runoff** – stormwater runoff from rural residential areas, agricultural land, and forested areas typically flows overland without entering a regulated conveyance thus is defined as non-regulated stormwater. Runoff from rural residential areas, agricultural land, and forested areas is likely to contain both TSS and TP.
- **In channel/streambank erosion** – streambank erosion has the potential to contribute large amounts of sediment into surface waters, especially in the form of mass bank failures (sloughing).
- **Peatlands/wetlands** – organic soils, typical of most Peatlands/wetlands found in the CCWD, can contain significant amounts of phosphorus that are released to surface waters upon decomposition.

Table 7. Potential nonpoint Sources in the Coon Creek Watershed. Relative magnitudes of contributing sources are indicated based on the results of the TMDL.

			Pollutant Sources*								
HUC-10	Stream/Reach (AUID)	Pollutant	Agricultural runoff	WWTP Discharges	Poor pet waste management	Failing septic systems/SSTS	Combined Sewer Overflows	Wildlife	Stormwater runoff	In channel/Streambank erosion	Peatlands/Wetlands
Coon Creek 0701020602	Coon Creek (530)	TSS	˜						˜	˜	
		TP	›			™			˜	˜	?
		Bacteria	˜		›	™		™			?
	Unnamed ditch *Pleasure Creek* (594)	TSS							˜	›	
		TP							˜	›	?
		Bacteria			˜			™			?
	Sand Creek (558)	TSS							˜	›	
		TP							˜	›	?
		Bacteria	™		˜			™			?
	County Ditch 17 *Springbrook Creek* (557)	TP							˜	›	?
		Bacteria	™		˜			™			?

Key: ˜ = High › = Moderate ™ = Low ? = potential source/relative magnitude unknown

*Symbols differentiate the relative ranking of implementation targeting for the more significant sources within each subwatershed.

2.4 TMDL Summary

TMDL allocations and percent reductions from existing pollutant loads for each stream are summarized in Table 8. For information on priority areas of the watershed, refer to Section 3 of this report.

The Coon Creek Watershed is part of the Upper Mississippi River Basin (UMRB) and drains to the Mississippi River. Portions of the Mississippi River are impaired for aquatic recreation due to elevated *E. coli* concentrations. Coon Creek, Sand Creek, Unnamed ditch (*Pleasure Creek*), and County Ditch 17 (*Springbrook Creek)* were assigned allowable bacteria loads in the TMDL study. Those bacteria allocations provided in this report will reduce the amount of bacteria entering the Mississippi River.

Table 8. Allocation summary for all stream TMDLs in the Coon Creek Watershed.

HUC-10	Stream/Reach (AUID)	Pollutant	Flow Zone	Allowed Load	*E. coli* Allocations (billions organisms/day) Sediment Allocations (tons/year) Total Phosphorus Allocations (lbs/day)						Percent Reduction Needed[2]
					Wasteload Allocation			Load Allocation		MOS	
					Permitted Stormwater[1]	MnDOT	Anoka County	Total Load	Unallocated Load	Margin of Safety	
Coon Creek 0701020602	Coon Creek (530)	TSS	Very High	19.87	8.94	0.19	0.26	8.48	0.00	1.99	49%
			High	9.80	4.41	0.10	0.13	4.18	0.00	0.98	49%
			Mid	6.10	2.75	0.06	0.08	2.60	0.00	0.61	8%
			Low	4.08	0.96	0.02	0.03	0.91	1.95	0.21	0%
			Very Low	2.63	0.49	0.01	0.01	0.46	1.55	0.11	0%
		TP	Very High	133.4	60.05	1.31	1.75	56.98	0.00	13.34	61%
			High	65.36	29.41	0.64	0.86	27.91	0.00	6.54	47%
			Mid	40.74	18.33	0.40	0.53	17.40	0.00	4.07	19%
			Low	27.29	11.28	0.25	0.33	10.70	2.23	2.51	0%
			Very Low	17.58	5.58	0.12	0.16	5.30	5.17	1.24	0%
		E. coli	Very High	755.8	340.1	7.41	9.90	322.7	0.00	75.58	39%
			High	372.1	167.4	3.65	4.87	158.8	0.00	37.21	9%
			Mid	230.4	103.6	2.26	3.02	98.37	0.00	23.04	49%
			Low	153.6	69.14	1.51	2.01	65.59	0.00	15.36	34%
			Very Low	99.3	44.67	0.97	1.30	42.38	0.00	9.93	–
	Sand Creek (558)	TSS	Very High	9.07	6.94	0.20	0.20	0.83	0.00	0.91	10%
			High	5.19	2.29	0.06	0.07	0.27	2.20	0.30	0%
			Mid	3.28	0.34	0.01	0.01	0.04	2.84	0.04	0%

HUC-10	Stream/Reach (AUID)	Pollutant	Flow Zone	Allowed Load	*E. coli* Allocations (billions organisms/day) Sediment Allocations (tons/year) Total Phosphorus Allocations (lbs/day)						Percent Reduction Needed[2]
					Wasteload Allocation			Load Allocation		MOS	
					Permitted Stormwater[1]	MnDOT	Anoka County	Total Load	Unallocated Load	Margin of Safety	
Coon Creek 0701020602	Sand Creek (558)		Low	1.99	0.54	0.01	0.02	0.06	1.29	0.07	0%
			Very Low	0.59	0.14	0.004	0.004	0.02	0.41	0.02	0%
		TP	Very High	60.53	46.29	1.31	1.36	5.52	0.00	6.05	33%
			High	34.64	22.57	0.64	0.66	2.69	5.12	2.95	0%
			Mid	21.86	12.70	0.36	0.37	1.52	5.25	1.66	0%
			Low	13.30	7.30	0.21	0.21	0.87	3.75	0.96	0%
			Very Low	3.96	1.99	0.06	0.06	0.24	1.36	0.26	0%
		E. coli	Very High	345.1	128.9	3.65	3.78	15.39	176.4	16.87	0%
			High	197.6	151.1	4.28	4.43	18.04	0.00	19.76	77%
			Mid	124.9	95.5	2.70	2.80	11.40	–	12.49	–
			Low	75.90	58.0	1.64	1.70	6.93	0.00	7.59	61%
			Very Low	22.11	16.9	0.48	0.50	2.02	0.00	2.21	89%
	Unnamed ditch *Pleasure Creek* (594)	TSS	Very High	1.23	0.92	0.15	0.02	0.01	0.00	0.12	56%
			High	0.82	0.36	0.06	0.01	0.004	0.34	0.05	0%
			Mid	0.62	0.47	0.08	0.01	0.01	0.00	0.06	25%
			Low	0.49	0.14	0.02	0.003	0.002	0.31	0.02	0%
			Very Low	0.33	0.16	0.03	0.004	0.002	0.12	0.02	0%
		TP	Very High	8.23	6.18	1.02	0.14	0.07	0.00	0.82	9%
			High	5.47	2.40	0.39	0.05	0.03	2.28	0.32	0%
			Mid	4.10	2.71	0.45	0.06	0.03	0.49	0.36	0%
			Low	3.26	1.81	0.30	0.04	0.02	0.85	0.24	0%
			Very Low	2.21	1.16	0.19	0.03	0.01	0.67	0.15	0%
		E. coli	Very High	47.0	35.29	5.80	0.80	0.40	0.00	4.70	48%
			High	31.28	23.49	3.86	0.53	0.27	0.00	3.13	53%
			Mid	23.46	17.62	2.90	0.40	0.20	0.00	2.35	54%
			Low	18.64	14.0	2.30	0.32	0.16	0.00	1.86	52%
			Very Low	12.62	9.48	1.56	0.21	0.11	0.00	1.26	53%
	County Ditch 17 *Springbrook Creek* (557)[3]	TP	Very High	12.58	10.17	0.74	0.34	0.08	–	1.26	–
			High	8.38	6.77	0.49	0.23	0.05	0.00	0.84	6%
			Mid	6.28	5.07	0.37	0.17	0.04	0.00	0.63	35%
			Low	4.99	4.03	0.29	0.13	0.03	0.00	0.50	23%
			Very Low	3.38	2.44	0.18	0.08	0.02	0.36	0.30	0%

HUC-10	Stream/Reach (AUID)	Pollutant	Flow Zone	Allowed Load	*E. coli* Allocations (billions organisms/day) Sediment Allocations (tons/year) Total Phosphorus Allocations (lbs/day)						Percent Reduction Needed[2]
					Wasteload Allocation			Load Allocation		MOS	
					Permitted Stormwater[1]	MnDOT	Anoka County	Total Load	Unallocated Load	Margin of Safety	
Coon Creek 0701020602	County Ditch 17 *Springbrook Creek* (557)[3]	*E. coli*	Very High	71.92	58.12	4.22	1.94	0.44	0.00	7.19	58%
			High	47.86	38.37	2.81	1.29	0.30	0.00	4.79	55%
			Mid	35.89	29.00	2.11	0.97	0.22	0.00	3.59	65%
			Low	28.51	23.04	1.67	0.77	0.18	0.00	2.85	15%
			Very Low	19.40	15.68	1.14	0.52	0.12	0.00	1.94	26%

[1]Regulated stormwater includes municipal, construction and industrial sources.
[2]Total percent reduction (all sources) from existing conditions needed to meet TMDL allocations
[3]Sprinbrook Creek loading values are based on estimated flows.

2.5 Protection Considerations

The CCWD contains a variety of high value resources including the Carlos Avery Wildlife Management Area, Bunker Hills Regional Park, Pioneer Park, Coon Rapids Dam Regional Park, and natural areas such as Springbrook and Erlandson Nature Centers. The CCWD also contains many non-forested wetlands and shallow water lakes, such as Bunker Lake, Laddie Lake, and McKay Lake. These two habitat types were identified by the DNR as key habitats for Species in Greatest Conservation Need in the Anoka Sand Plain (DNR, 2015). Bunker Lake, Laddie Lake, and Mckay Lake were all recognized as shallow water lakes by the DNR. All resources mentioned above support a variety of plant and animal species including several which are listed as State endangered, threatened, or special concern species (see DNR Rare Species Guide).

All waters currently supporting aquatic life and recreation, including the five lakes in Table 1, in the watershed are also considered waters to protect. Working to protect surface and groundwater resources currently supporting beneficial uses through the implementation of best management practices is vital to the overall health of the CCWD and State of Minnesota.

Significant threats to water resources include:

- Declines in surficial groundwater threaten shallow water ecosystems such as wetlands, lakes, and streams. These ecosystems are vitally important to the watershed, the biological communities that rely on their existence, and for recreation.
- Climate change (or climate instability) poses a complex challenge to current water resource management practices. Recent climatological events such as drought, intense localized precipitation, and flooding have all been observed across the watershed. These changes can increase water quality degradation, flooding, and drought duration.

- Aquatic invasive species continue to threaten both the biodiversity and overall ecological health of high value resources within the watershed. The number of infested waterbodies continues to climb across the state of Minnesota.
- Conversion of agricultural and vacant lands to more urbanized use (i.e., single family residential, multi-family residential, etc.) is anticipated to continue in the CCWD for the foreseeable future. Land use conversions such as these will increase the amount of impervious area, reduce infiltration, and potentially exacerbate threats previously mentioned such as declines in surficial groundwater.
- Water quality degradation resulting from sediment, phosphorus, and bacteria introduction to surface waters of the CCWD. With increasing urbanization, these threats will increase in the future along with other potential contaminants such as chlorides, heavy metals, etc.
- Groundwater contamination poses a serious threat to the surficial aquifers of the CCWD. These groundwater aquifers are susceptible to pollution as a result of their shallow depth and sandy soils that allow water to move quickly through them.

3. Prioritizing and Implementing Restoration and Protection

The Clean Water Legacy Act (CWLA) requires that WRAPS reports summarize priority areas for targeting actions to improve water quality, identify point sources and identify nonpoint sources of pollution with sufficient specificity to prioritize and geographically locate watershed restoration and protection actions. In addition, the CWLA requires including an implementation table of strategies and actions that are capable of cumulatively achieving needed pollution load reductions for point and nonpoint sources.

This section of the report provides the results of such prioritization and strategy development. Because much of the nonpoint source strategies outlined in this section rely on voluntary implementation by landowners, land users and residents of the watershed it is imperative to create social capital (trust, networks and positive relationships) with those who will be needed to voluntarily implement best management practices. Thus, effective ongoing civic engagement is fully a part of the overall plan for moving forward.

The successful implementation of restoration and protection strategies provided in this WRAPS report will require a combined effort between the CCWD and local partners within the watershed. All entities will need to be involved in the decision making process, as it will increase transparency and likelihood of implementation success. Continued collaboration will also ensure that identified priorities and strategies are incorporated into local water plans, the CCWD Watershed Management Plan, grant applications, and future budgeting processes.

The restoration and protection strategies presented in this WRAPS should not be considered all-inclusive or complete. Furthermore, many strategies are predicated on needed funding being secured. More information on potential funding sources can be found in Section 3.3. As such, the proposed actions outlined are subject to adaptive management—an iterative approach of implementation, evaluation and course correction. Adaptive management will allow refinement of strategies put forth in this document and/or addition of strategies as technologies advance. Restoration and protection strategies in the WRAPS report are intended to be tailored to meet the needs of future subwatershed management plans.

3.1 Targeting of Geographic Areas

Understanding the range of conditions present and where they occur on the landscape are both critical pieces of information for implementation planning. Gaining insight into the resource condition facilitates a more efficient implementation strategy by allowing the local water resource professionals the opportunity to place BMPs in optimal areas. There are a number of tools, assessments and resources available to evaluate resource condition. Each of these tools and techniques were developed with different protection initiatives. For example, some tools may identify protection and restoration areas based solely on erosion potential while another may utilize only biological data such as fish and macroinvertebrate data. Each of these distinct approaches contains important information but are best used in conjunction with multiple assessment methods and field verification. To identify priority/critical areas best suited for restoration and protection in the CCWD, a variety of tools were used. Brief summaries of the tools used are provided below along with graphical illustrations of the priority/critical areas. These figures should serve as a starting point to targeting specific areas for restoration and protection efforts. The following discussion begins at the state and basin scale and moves to smaller more focused areas based on the specific tools used for this project.

State and Mississippi Basin Scale

The Minnesota Nutrient Reduction Strategy was developed in response to concern about excessive nutrient levels that pose a substantial threat to Minnesota's lakes and rivers, as well as downstream waters including the Great Lakes, Lake Winnipeg, the Mississippi River, and the Gulf of Mexico. In recent decades, nutrient issues downstream of Minnesota have reached critical levels, including the effect of nutrients in the Gulf of Mexico which resulted in a dead zone, eutrophication issues in Lake Winnipeg, and algal blooms in the Great Lakes. Several state-level initiatives and actions highlighted the need for a statewide strategy that ties separate but related activities together to further progress in making nutrient reductions. Minnesota conducted both nitrogen and phosphorus assessments to identify nutrient source contributions. The main nutrient sources to the Mississippi River are phosphorus from agricultural cropland runoff, wastewater, and streambank erosion, and nitrogen from agricultural tile drainage and water leaving cropland via groundwater. The national goal for phosphorus and nitrogen loading to the Gulf of Mexico is a 45% reduction relative to baseline average conditions from 1980-1996. Minnesota's goal for nitrogen reduction in the Mississippi River, using the national baseline, is 45% by 2040 and a milestone target of 20% reduction of nitrogen by 2025. It is important to note that there has been little progress toward nitrogen reduction in the Mississippi River Basin since the national baseline period. The Minnesota goal for phosphorus reduction is 45% by 2025. Unlike the lack of a positive trend in nitrogen loading reduction, there has been a substantial loading reduction of phosphorus in the Mississippi since the turn of the century due to reductions in agricultural and even greater reductions in point source, phosphorus. The Minnesota Nutrient Reduction Strategy notes that a 33% reduction in phosphorus loading to the Mississippi River Basin has been credited so that overall the remaining reduction needed to reach the Minnesota reduction goal for loading to the Mississippi leaving Minnesota is 12%, which may be less than the reduction needed for local lakes and streams.

The Nitrogen in Minnesota Surface Waters Strategy was developed in response to a concern of the toxic effects of nitrate on aquatic life, the increasing nitrogen loads in the Mississippi River and nitrogen's role in causing a large oxygen-depleted (hypoxic) zone in the Gulf of Mexico, and for human health concerns related to elevated nitrogen levels in drinking water supplies. The 10 mg/l nitrate-N drinking water standard established for surface and groundwater drinking water sources is exceeded in numerous wells and streams. The purpose of this study was to characterize nitrogen loading to Minnesota's surface waters, and assess conditions, trends, sources, pathways, and potential BMPs to achieve nitrogen reductions in our waters. The Nitrogen study contains a spreadsheet tool called the NBMP tool (NBMP is described in more detail in the Nitrogen Study Report).

Coon Creek Watershed Scale

Light Detection and Ranging

Light Detection and Ranging (LiDAR) is a remote sensing technology with the ability to detect subtle topographic changes on the earth's surface. Digital elevation maps generated with LiDAR information have numerous applications including erosion analysis, water storage and flow analysis, and flood control mapping. LiDAR information is also a particularly useful dataset to delineate small subwatershed and minor subwatershed areas. LiDAR was used to subdivide the CCWD into smaller, more feasible management units. A total of 20 subwatershed management units and 381 minor subwatersheds were identified (Figure 5). City stormwater data was also used to supplement LiDAR data to better refine delineated drainage areas. Subwatershed management units were delineated by public ditch number. For example, the drainage areas of Public Ditch 54 and Public Ditch 44 were recognized as two separate management units even though both are part of Coon Creek. Minor subwatersheds were delineated within each of these subwatershed management units.

Watershed Health Assessment Framework

The DNR developed the Watershed Health Assessment Framework (WHAF), which provides a comprehensive overview of watershed health across Minnesota. The WHAF framework focuses on five main components: hydrology, geomorphology, biology, connectivity, and water quality. Multiple watershed health index scores were calculated for a variety of attributes within each of the main components. Watershed health index scores are available for all 80 major watersheds (HUC-8) in Minnesota. More recently, the DNR has applied this tool to the HUC-12 scale providing increased detail for smaller drainage areas such as the Coon Creek Watershed, relative to the HUC-8 scale (Figure 6).

Ecological Ranking Tool (Environmental Benefit Index – EBI)

The Environmental Benefits Index (EBI) dataset was developed by the Minnesota Board of Water and Soil Resources (BWSR) and the University of Minnesota. The EBI is a statewide tool developed to assist local resource managers in the targeting of conservation practices on the landscape.

The EBI is a 30-meter resolution raster dataset that includes a single score between 0-300 indicating the relative conservation value of each grid cell (a higher score represents higher conservation value). The EBI score is derived from three separate data layers that include soil erosion risk, water quality risk, and habitat quality. Each of these source layers are provided with a score from 0-100.

The soil erosion risk data layer estimates potential soil erosion based on the USDA Soil Survey Geographic Database (SSURGO) and elements of the Universal Soil Loss Equation, including precipitation, erodibility, and a slope-length gradient factor (Figure 7).

The water quality risk data layer estimates water quality degradation resulting from overland runoff (Figure 8). This was done by using a stream power index model with a 30-meter digital elevation model (DEM) for half the score (50 of 100), and a distance decay function for the second half of the score. The distance decay function factors in proximity to surface water and places more weight on grid cells that are closer to surface waters.

The last data layer, habitat quality, estimates both terrestrial and aquatic habitat for each 30 meter grid cell (Figure 9). This data layer was developed by integrating information from a wide variety of sources including the Minnesota Statewide Conservation and Preservation Plan, Minnesota GAP analysis, Sites of Biodiversity Significance, and others. A higher score indicates higher quality habitat.

These three data layers are summed to provide the final EBI data layer (Figure 10). For more information on scoring methodology and datasets used, refer to: http://www.bwsr.state.mn.us/ecological_ranking/

Watershed Condition Classification

The CCWD conducted a Watershed Condition Classification (WCC) modeled after methodology developed by the U.S. Forest Service. WCC is the process of describing watershed condition in terms of discrete categories (or attributes) that reflect the level of watershed health or integrity (US Forest Service, 2011). In this assessment process, three classes were used to rank subwatershed condition:

1. Class 1 – Synonymous with "GOOD" condition. Watersheds exhibit high geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. The drainage network is generally stable. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are predominantly functional in terms of supporting beneficial uses.

2. Class 2 – Synonymous with "FAIR" condition. Watersheds exhibit moderate geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. Portions of the watershed may exhibit an unstable drainage network. Physical, chemical, and biologic conditions suggest that soil, aquatic, and riparian systems are at risk in being able to support beneficial uses.

3. Class 3 – Synonymous with "Poor" condition. Watersheds exhibit low geomorphic, hydrologic, and biotic integrity relative to their natural potential condition. A majority of the drainage network may be unstable. Physical, chemical, and biologic conditions suggest that soil, riparian, and aquatic systems do not support beneficial uses.

The CCWD classification recognized the importance of previous work including both the DNR Watershed Health Framework and BWSR's Ecological Ranking Tool and therefore included many of the same metrics (e.g., water quality risk, soil erosion, habitat quality, fish and macroinvertebrate IBIs, water quality data, impervious cover, etc.). However, the WCC process also incorporated more localized data such as CCWD ditch inspection information (sinuosity, substrate, and vegetation), soil infiltration rates, wetlands, and invasive species. All attributes were calculated for each of the 381 minor subwatersheds ultimately increasing the opportunity for fine scale targeting of BMPs (Figure 11). Scores for minor subwatersheds were also averaged for each subwatershed to allow ranking on a subwatershed scale for broader scale targeting similar to WHAF methodology (Figure 12). Refer to Appendix A for more information on the attributes evaluated, scoring methodology and datasets utilized by the CCWD.

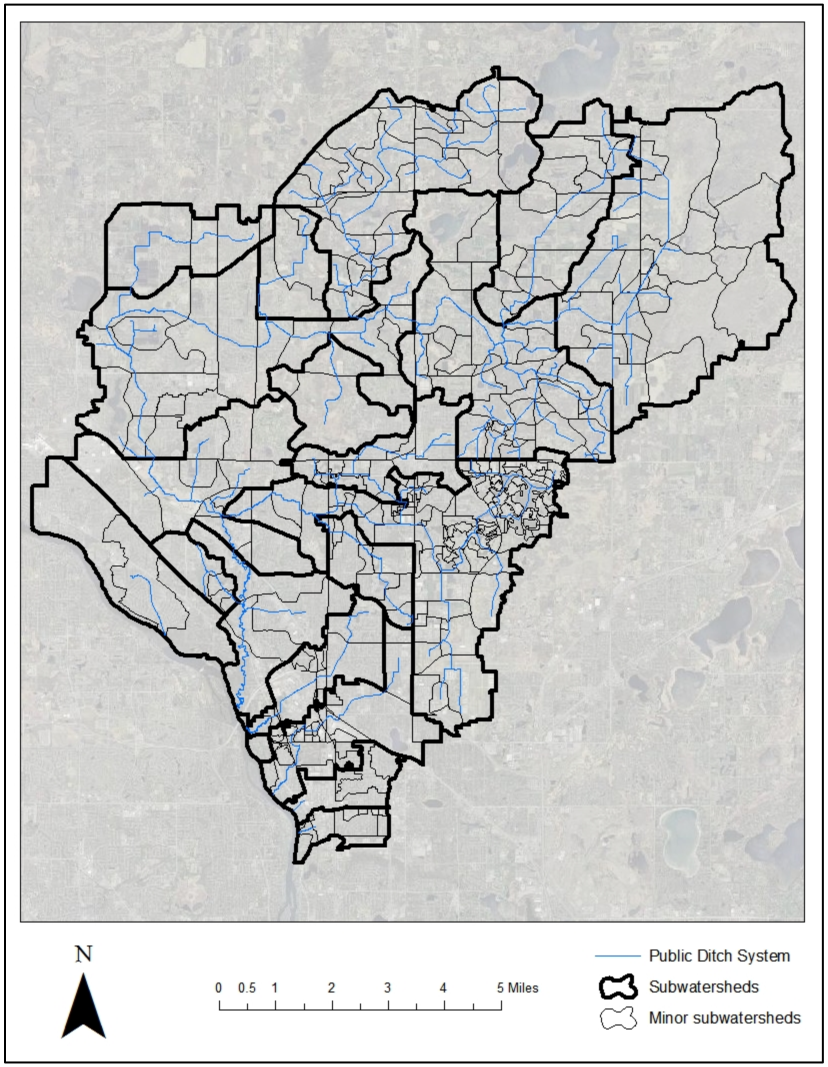


Figure 5. Subwatersheds and minor-subwatersheds delineated with LiDAR information.

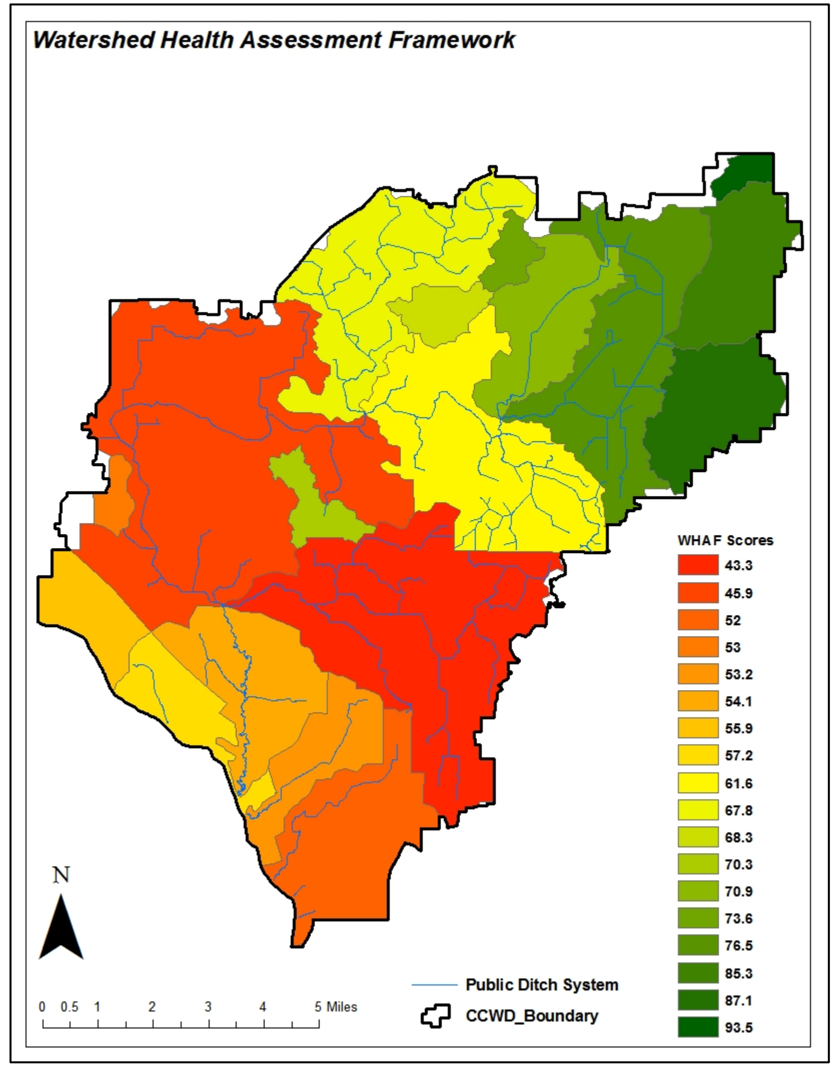


Figure 6. DNR Watershed Health Assessment Framework (WHAF). Higher values (green) indicate healthy catchments and should be considered for protection efforts.

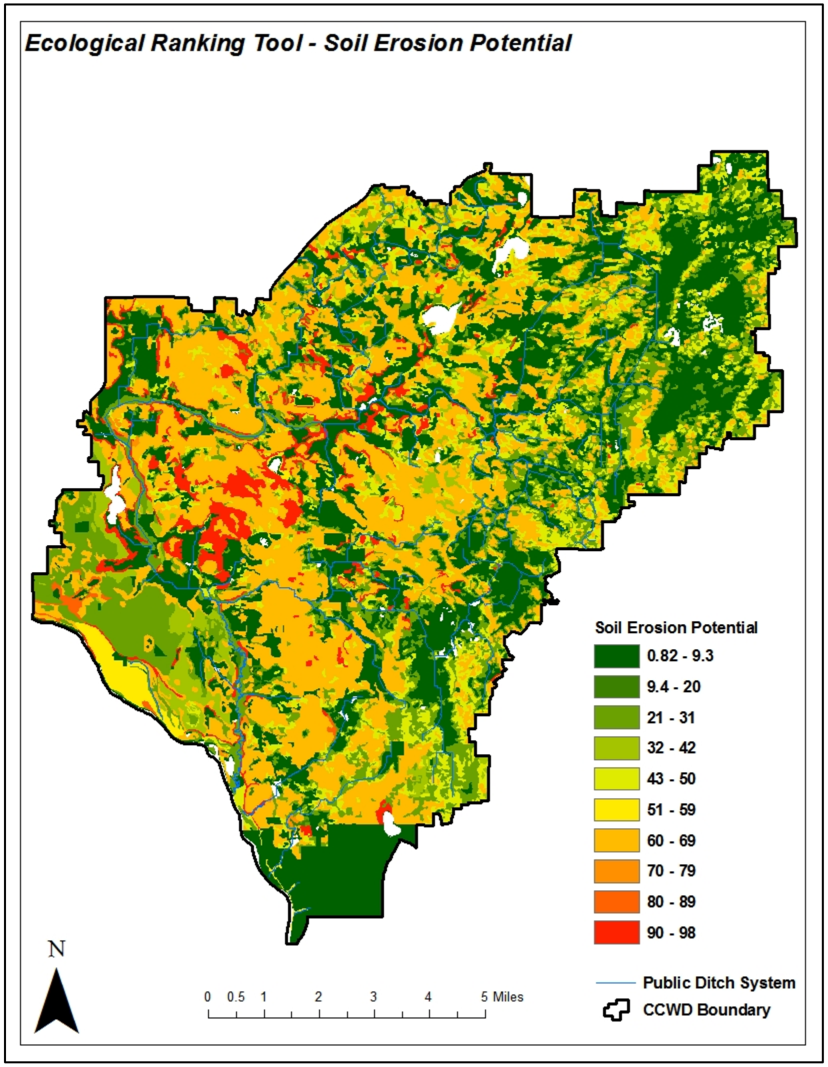


Figure 7. BWSR Soil Erosion Potential. Higher values (red) indicate areas of increased soil erosion potential and should be prioritized for protection efforts.

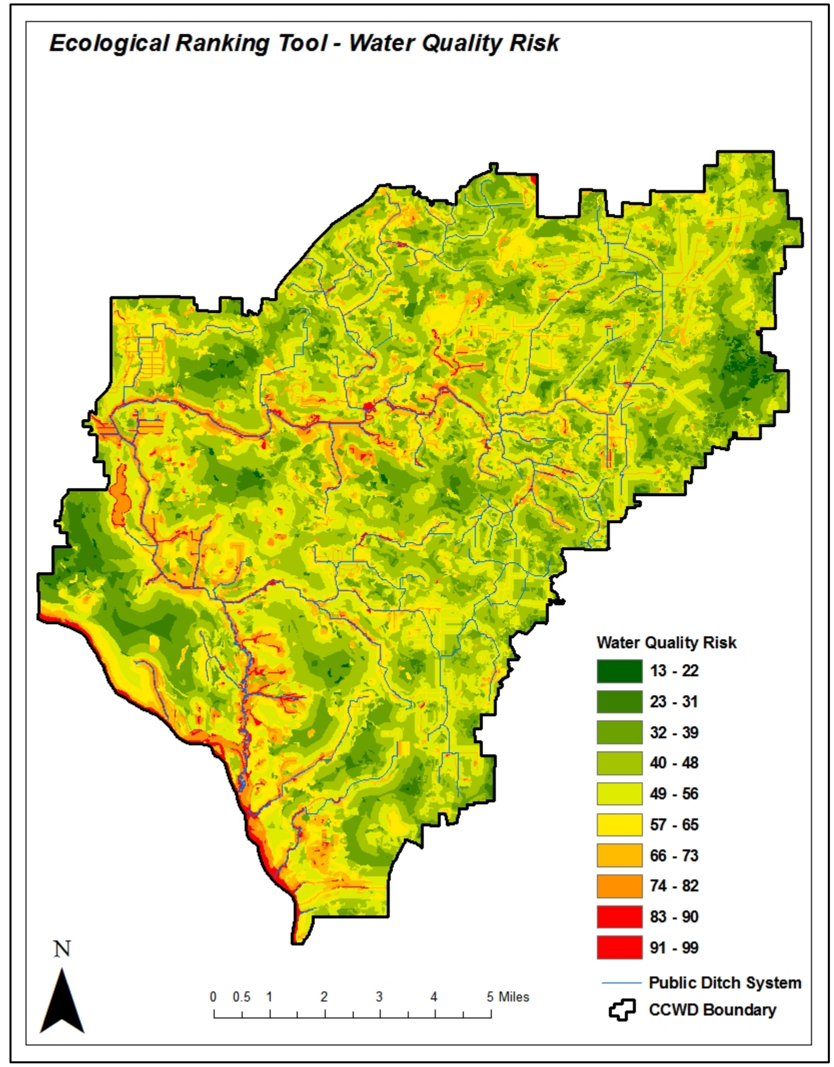


Figure 8. BWSR Water Quality Risk. Higher values (red) indicate areas of increased water quality risk and should be prioritized for protection efforts.

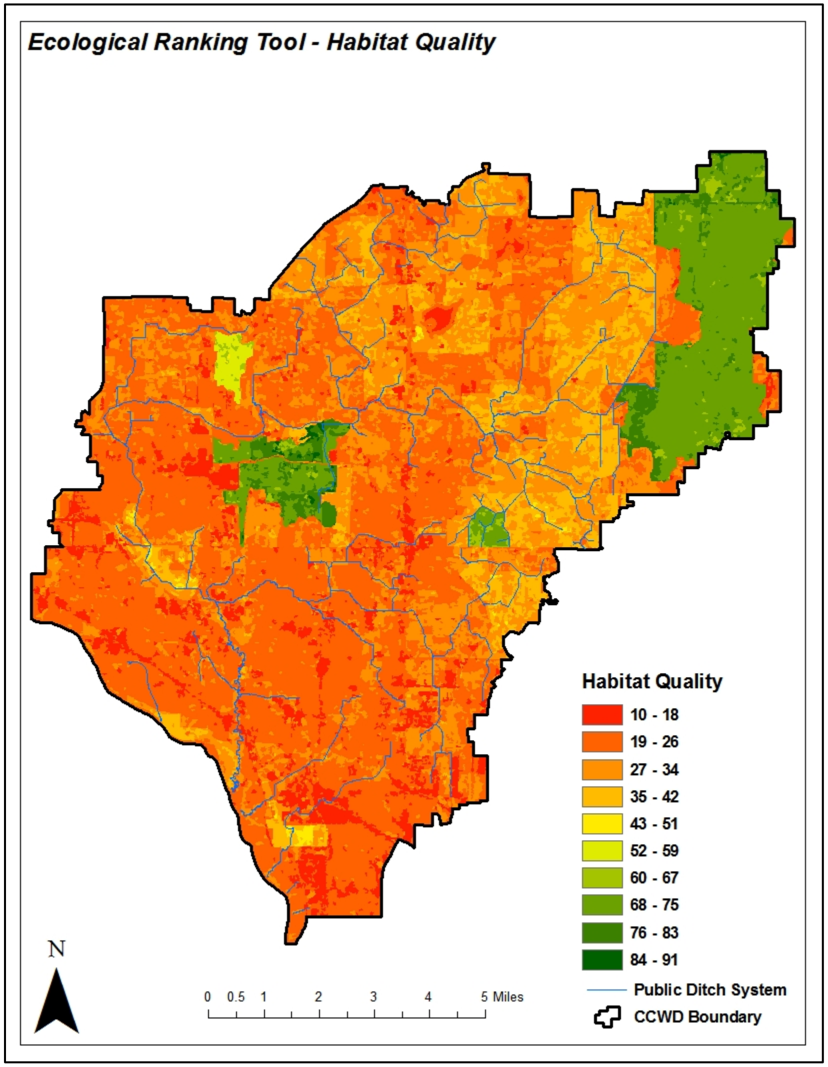


Figure 9. BWSR Habitat Quality. Higher values (green) indicate areas of high value habitat and should be considered for protection efforts.

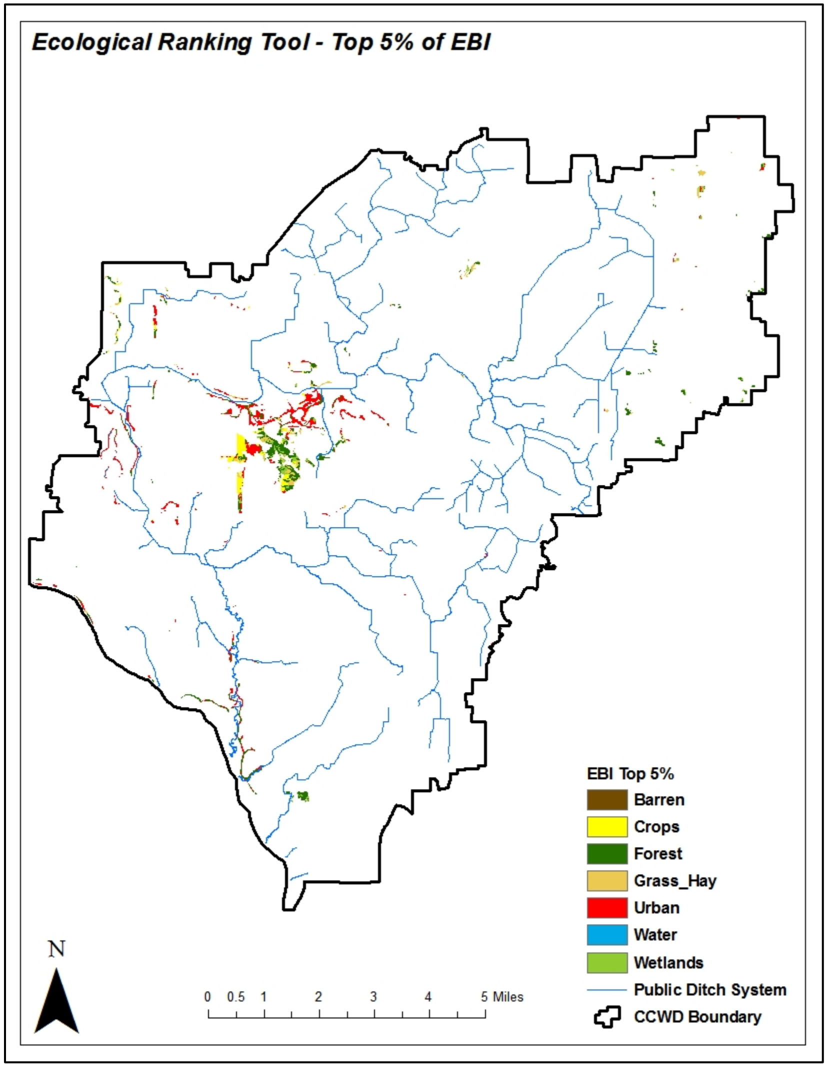


Figure 10. BWSR Environmental Benefits Index top 5% priority areas to be considered for protection and restoration efforts.

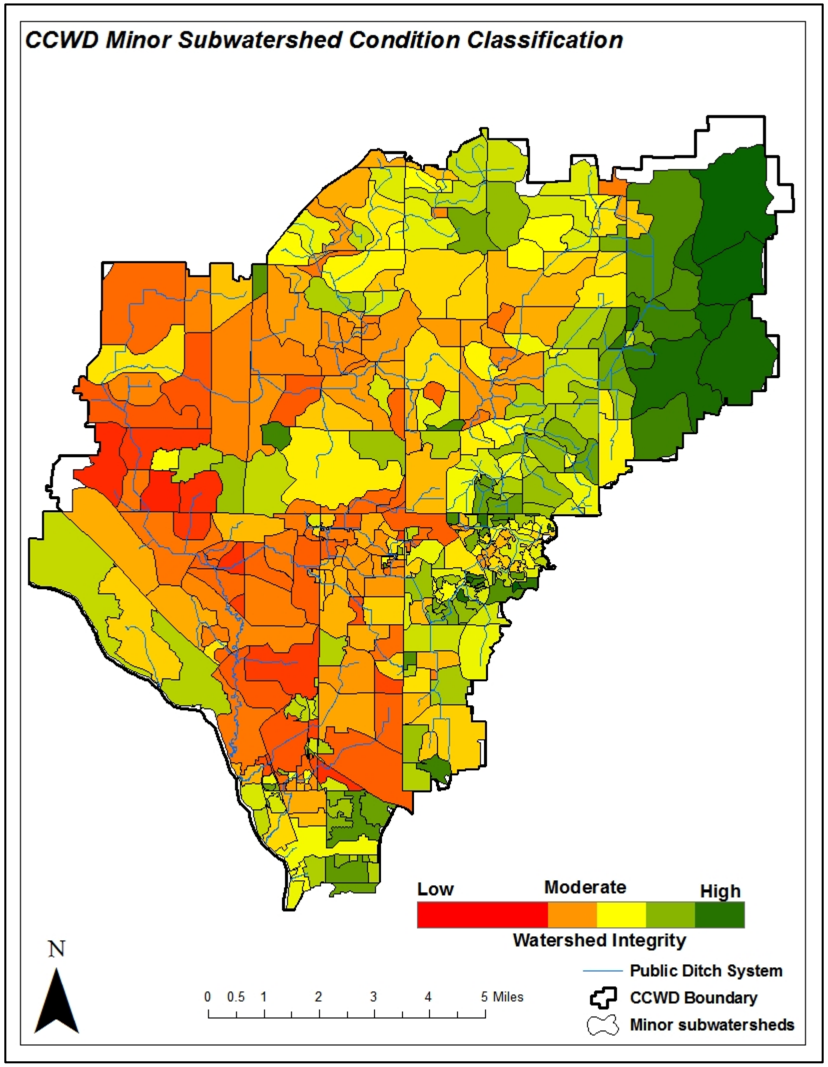


Figure 11. Minor subwatershed condition classification. Green shaded areas indicate better watershed health and may be prioritized for protection.

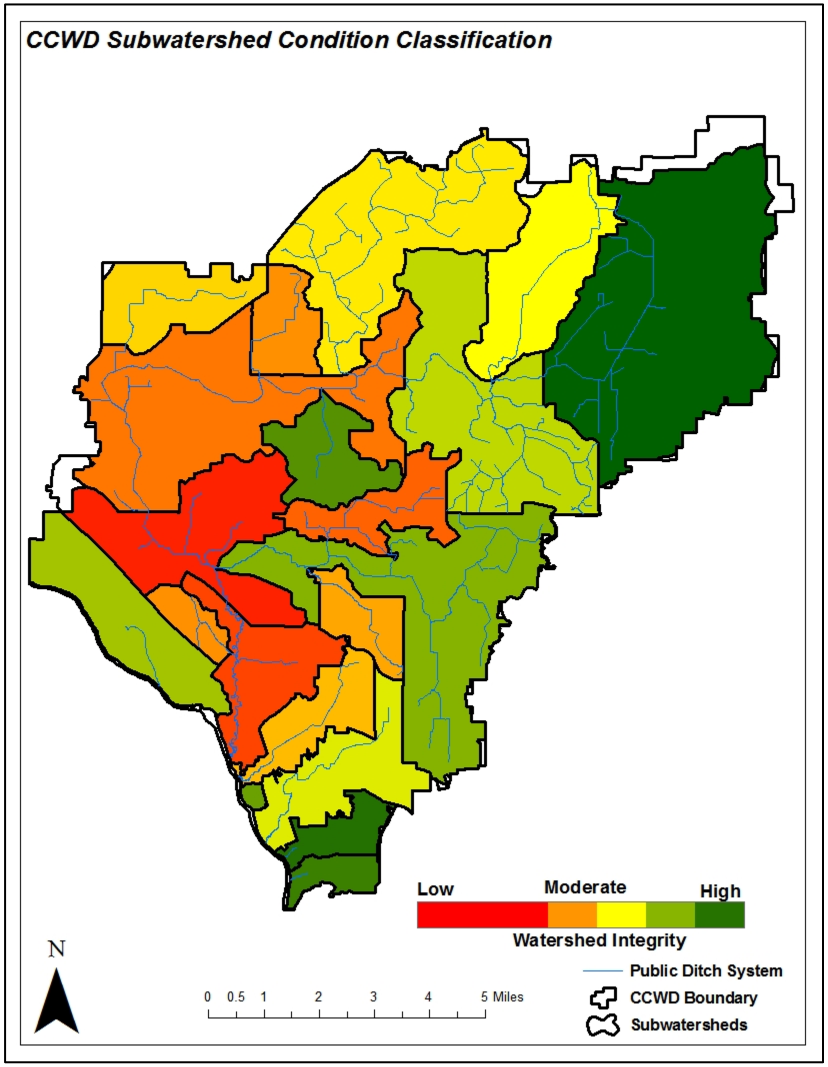
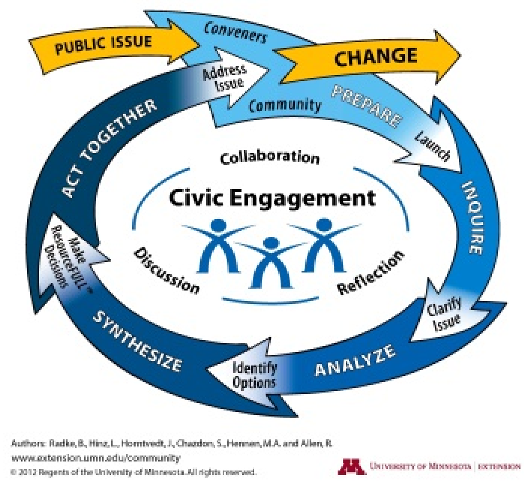


Figure 12. Subwatershed condition classification. Green shaded areas indicate better watershed health and may be prioritized for protection.

3.2 Civic Engagement

A key prerequisite for successful strategy development and on-the-ground implementation is meaningful civic engagement. This is distinguished from the broader term 'public participation' in that civic engagement encompasses a higher, more interactive level of involvement. Specifically, the University of Minnesota Extension's definition of civic engagement is "Making 'resourceFULL' decisions and taking collective action on public issues through processes that involve public discussion, reflection, and collaboration." A resourceFULL decision is one based on diverse sources of information and supported with buy-in, resources (including human), and competence. Further information on civic engagement is available at: http://www1.extension.umn.edu/community/civic-engagement/.



Accomplishments

- Technical Advisory Committee (TAC) – a group of project stakeholders developed to provide input of key project decisions such as overall approach, biotic stressor identification, TMDL development, and WRAPS report planning. A list of TAC members is listed below:

  - Anoka County Highway Department
  - Anoka Soil and Water Conservation District
  - Board of Water and Soil Resources
  - City of Andover
  - City of Blaine
  - City of Coon Rapids
  - City of Ham Lake
  - City of Fridley
  - City of Spring Lake Park
  - Metropolitan Council Environmental Services
  - Minnesota Department of Natural Resources
  - Minnesota Pollution Control Agency

- Citizen Advisory Committee (CAC) – a diverse group of participants made up of interested citizens, landowners, lake association members, CCWD Board members, and the local SWCD Board Supervisor. The CAC meets monthly to discuss activities and issues within the watershed. The CAC's input provides a public perspective on the direction and activities of the CCWD and are presented to the CCWD Board of Managers to aide in the decision making process. Since the inception

Image 1. Citizen Advisory Committee meeting.

of the WRAPS process, approximately 20 CAC meetings have been held. Not all of these meetings were specific to the WRAPS project; however, regular updates on this project were provided.

- Lake Associations – the CCWD works closely with the Crooked Lake Area Association and the Ham Lake Lake Association on issues such as water quality, shoreline protection, and aquatic invasive species. Both of these associations are strong advocates for each of their respective lakes as well as the District efforts in development of this WRAPS.

- CCWD Website – CCWD maintains an interactive website where public citizens can access a variety of information related to District projects and activities. From this website, citizens can access a project description, project timeline, and all documents created as part of this WRAPS project.

- City Newsletters – member cities were provided articles specific to the CCWD WRAPS for incorporation into quarterly newsletters.

- Board of Managers – meetings are held the second and fourth Mondays of every month, all of which are open to the public. Meeting agendas are posted to the CCWD website prior to each meeting. These meetings provide citizens with the opportunity to comment on all aspects of the CCWD WRAPS project and corresponding TMDLs.

- Volunteers – CCWD developed relationships with a variety of volunteer organizations to improve water resources in CCWD while fostering the civic engagement process. Partners include Lamplighters 4H Club, Mom's Club of Coon Rapids, Blaine-Ham Lake Rotary Club, Girl Scout Troop 11240, Northwest Passage Charter School, Cub Scout Pack 413, and Christ Lutheran Church.

- Grant Programs – CCWD has budgeted monies to help engage, educate, and inform the public through Demonstration Grants and Water Education Grants. Demonstration grants are awarded to in-ground practices that show innovative methods for dealing with stormwater. Water Education grants provide funding for projects that provide information, and/or opportunities for people to engage in activities regarding water resources, like water quality or water conservation.

Future Plans

The engagement of local, state, and federal agencies as well as local citizens is an important component of any long term planning process. Continuing to build momentum with the groups previously mentioned will be critical to the implementation activities outlined in Section 3.3.

Public Notice for Comments

An opportunity for public comment on the draft WRAPS report was provided via a public notice in the State Register from December 28, 2015, through January 28, 2016.

3.3 Restoration & Protection Strategies

The Subwatershed Condition Classification map (Figure 12) served as a general strategy map for restoration and protection planning by first identifying subwatersheds better suited for restoration (red shaded areas) and those better targeted for protection (green shaded areas). Restoration and protection activities were then identified through the results of numerous efforts including: water quality monitoring and biotic stressor identification work (Section 2.3), analysis of necessary pollutant reduction to meet state water quality standards (Section 2.4), and mapping done as part of geographic targeting analysis (Section 3.1). Table 9-13 list the strategies for restoration and protection by identifying BMPs that are generally appropriate for each subwatershed and/or impairment. The strategies listed in the following tables are not entirely prescriptive as new technologies will undoubtedly emerge; therefore adaptive management remains a critical component of on-going implementation planning.

The following tables are designed to help identify general recommended strategies for restoration and protection within a particular subwatershed. These recommendations should be further refined to optimize spatial targeting of BMPs and achieve maximum pollutant reductions. For example, streambank stabilization is an identified restoration strategy in the Coon Creek Subwatershed. Additional work is needed to identify optimal location for streambank stabilization projects. To accommodate this need, subwatershed plans will be developed for each subwatershed. Eventually, refined restoration and protection strategies may be reflected in local water plans, CCWD's Watershed Management Plan, and applications for federal and state clean water funds aimed towards such activities.

The CCWD is a permitted MS4 and a watershed district. Because the CCWD operates and maintains public ditches they must maintain and comply with the requirements of the MS4 General Permit (See Section 2.3). Since they are also a watershed district, they are the local unit of government that manages water resources within the Coon Creek Watershed jurisdiction. Watershed districts within the Twin Cities Metropolitan Area must follow the guidance of both the Watershed Act (Minn. Stat. 103D) and the Metropolitan Surface Water Management Act (Minn. Stat. 103B). Minn. Stat. 103B and 103D require watershed districts to prepare watershed management plans and follow the plan requirements of Minn. R. 8410. Because of their role as a watershed district, CCWD will be taking primary responsibility for the majority of the implementation strategies listed in Tables 9-13.

It is important to note that loading reduced from some implementation actions listed in Tables 9-13 is creditable to the load allocation and some to the wasteload allocation. Examples of non-WLA-creditable projects include strategies aimed at reducing in-lake loading (e.g. alum, aquatic plant management). For clarification on a particular project proposers should contact the MPCA Stormwater Program.

Funding Opportunities

There are a variety of funding sources to help cover some of the cost to implement practices that reduce pollutants from entering our surface waters and groundwater. There are several programs listed below that contain web links to the programs and contacts for each entity. The contacts for each grant program can assist in the determination of eligibility for each program as well as funding requirements and amounts available.

On November 4, 2008, Minnesota voters approved the Clean Water, Land & Legacy Amendment to the constitution to:

- *protect drinking water sources;*
- *protect, enhance, and restore wetlands, prairies, forests, and fish, game, and wildlife habitat;*
- *preserve arts and cultural heritage;*
- *support parks and trails;*
- *and protect, enhance, and restore lakes, rivers, streams, and groundwater.*

The Clean Water, Land, and Legacy Fund has several grant and loan programs that could potentially be used for implementation of the BMPs and education and outreach activities. The various programs and sponsoring agencies related to clean water funding and others are:

- Agriculture BMP Loan Program (Minnesota Department of Agriculture)
- Clean Water Fund Grants (BWSR)
- Clean Water Partnership (MPCA)
- Environment and Natural Resources Trust Fund (Legislative-Citizen Commission on Minnesota Resources)
- Environmental Assistance Grants Program (MPCA)
- Phosphorus Reduction Grant Program (Minnesota Public Facilities Authority)
- Section 319 Grant Program (MPCA)
- Small Community Wastewater Treatment Construction Loans & Grants (Minnesota Public Facilities Authority)
- Source Water Protection Grant Program (Minnesota Department of Health)
- Surface Water Assessment Grants (MPCA)
- TMDL Grant Program (Minnesota Public Facilities Authority)
- Wastewater and storm water financial assistance (MPCA)
- Conservation Partners Legacy Grant Program (MN DNR)
- Environmental Quality Incentives Program (NRCS)
- Conservation Reserve Program (USDA)

There are several grant and loan programs through the federal government that could be used for education and outreach as well as purchasing equipment and implementation of the BMPs. A list of federal grant programs can be found at: http://www.epa.gov/grants.

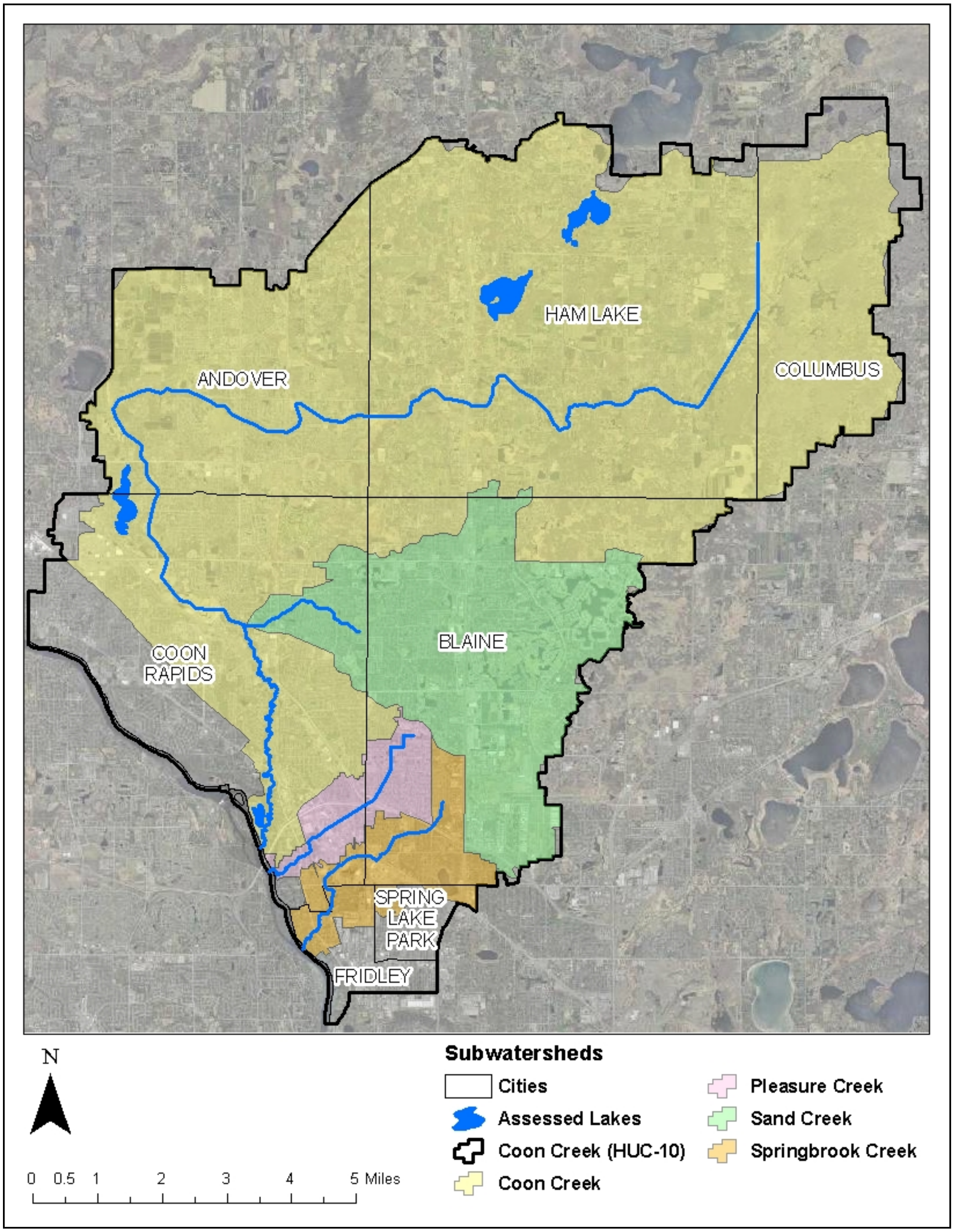


Figure 13. Subwatershed reference map.

Table 9. Strategies and actions proposed for the entire Coon Creek Watershed District.

HUC-10 Subwatershed	Waterbody and Location: Waterbody (ID)	Waterbody and Location: Location and Upstream Influence Counties	Parameter (incl. non-pollutant stressors)	Water Quality: Current Conditions	Water Quality: Goals / Targets and Estimated % Reduction	Strategies (see key below)	Strategy types and estimated scale of adoption needed to meet final water quality target	Interim 10-yr Milestones	Governmental Units with Primary Responsibility*: Watershed District	SWCD	MPCA	Cities	MN DNR	Anoka County	MnDOT	Lake Associations	Estimated Year to Achieve Water Quality Target
Coon Creek (0701020602)	Watershed Wide	Anoka	Nitrogen (TN) or Nitrate	--	45% Load Reduction/Nutrient Reduction Strategy	Improve Stormwater Management	Provide educational materials to residents regarding appropriate lawn care, fertilizer use, and agricultural runoff management	Ongoing (with additional emphasis in next 3 years)	A		P	A		A		A	2040 per Nutrient Reduction Strategy
			Social Infrastructure (to address all pollutants/ stressors)	--	-	Improve Education and Outreach	K-12 Watershed Education	Ongoing	P	A	A						Ongoing
							General public outreach and education		P	S	A	S	A				
						Improve coordination/collaboration	Involve citizen networks in water resource related projects		P	S	A	P	A				
							Coordinate planning/improvement projects with stakeholders		P			P		S			
						Implement/Review Policies and Rules	Ongoing review of policy and procedures to meet WLA goals		P	S	A	P		P	P		
			Chloride	Varies	<230 mg/L	Chloride Management	Promote and adopt strategies included in the TCMA Chloride Management Plan: https://www.pca.state.mn.us/water/road-salt-and-water-quality		S		A	P		P	P		
			Parameters cited in permit	--	-	Improve Stormwater management	See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		P	P		P	P		
						Construction and Industrial Stormwater permittees -- compliance with general permits			A		P	A					

*(P)-primary responsibility, (S)-secondary responsibility, (A)-assistance role

Table 10. Strategies and actions proposed for the Coon Creek subwatershed.

HUC-10 Subwatershed	Waterbody and Location: Waterbody (ID)	Waterbody and Location: Location and Upstream Influence Counties	Parameter (incl. non-pollutant stressors)	Water Quality: Current Conditions	Water Quality: TMDL Goals / Targets and Estimated % Reduction	Strategies (see key below)	Strategy types and estimated scale of adoption needed to meet final water quality target	Interim 10-yr Milestones	Watershed District	SWCD	MPCA	Cities	MN DNR	Anoka County	MnDOT	Other	Estimated Year to Achieve Water Quality Target
Coon Creek (0701020602)	Coon Creek (530)	Anoka	TSS (Fish/Macroinvertebrate IBI)	Varies, Existing TSS loads range from 1-39 tons/day	90% of TSS April-Oct ≤30mg/L; Estimated reductions range from 0-49% dependent on flow	Protect/stabilize banks/bluffs	Identify/prioritize sites of streambank erosion; address highest ranking sites first	YR 2: Identify/ranking completed YR 10: 5-7 streambank stabilizations completed	P	A		A					2045
						Improve riparian vegetation	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	S	P		A					
						Improve urban stormwater management	Meet TMDL WLAs: See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
						Stormwater Asset Inventory	Conduct an inventory/general condition assessment of all stormwater assets in the Coon Creek Subwatershed	Inventory/assessment completed	P			A					
			TP (Fish/Macroinvertebrate IBI)	Varies, Existing TP loads range from 12-340 lbs/day	TP Jun-Sep ≤100 µg/L; Estimated reductions range from 0-61% dependent on flow	Protect/stabilize banks/bluffs	Identify/prioritize sites of streambank erosion; address highest ranking sites first	YR 2: Identify/ranking completed YR 10: 5-7 streambank stabilizations completed	P	A		A					2045
						Improve fertilizer and manure application management	Provide resources/education for soil nutrient management	Work with landowners to understand current fertilizer/ manure management practices	S	P							
						Ordinance/Enforcement	Initiate enforcement action on improper organics disposal (illicit discharges)	Full compliance	P		A	S					
						Address Failing Septic Systems	ID and upgrade 100% ITPHS systems	ID process/upgrades complete	S		S	P		P			
							ID and upgrade 100% non-compliant SSTS near surface water resources	ID process complete	S		S	P		P			
						Improve urban stormwater management	Meet TMDL WLAs See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
						Stormwater Asset Inventory	Conduct an inventory/general condition assessment of all stormwater assets in the Coon Creek Subwatershed	Inventory/assessment completed	P			A					

HUC-10 Subwatershed	Waterbody and Location: Waterbody (ID)	Waterbody and Location: Location and Upstream Influence Counties	Parameter (incl. non-pollutant stressors)	Water Quality: Current Conditions	Water Quality: TMDL Goals / Targets and Estimated % Reduction	Strategies (see key below)	Strategy types and estimated scale of adoption needed to meet final water quality target	Interim 10-yr Milestones	Watershed District	SWCD	MPCA	Cities	MN DNR	Anoka County	MnDOT	Other	Estimated Year to Achieve Water Quality Target
Coon Creek (0701020602)	Coon Creek (530)	Anoka	TP (Fish/Macroinvertebrate IBI)	Varies, Existing TP loads range from 12-340 lbs/day	TP Jun-Sep ≤100 µg/L; Estimated reductions range from 0-61% dependent on flow	Improve riparian vegetation	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	S	P		A					2045
			E. coli	Varies, Existing *E. coli* loads range from 232-1250 billion orgs/day	Apr-Oct *E. coli* ≤126 cfu/100mL; Estimated reductions range from 9-49%	Address Failing Septic Systems	ID and upgrade all ITPHS systems	ID process/upgrades complete	S		S	P		P			2045
							ID and upgrade all non-compliant SSTS near surface water resources	ID process complete	S		S	P		P			
						Improve upland/field surface runoff controls	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	P	S		A					
						Pet waste management	Provide outreach and education materials to residents regarding appropriate pet waste management	Increased public awareness	P	A	A	P					
							Ordinance enforcement	Ongoing	P			P					
						Improve urban stormwater management	Meet TMDL WLAs See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
						New/Emerging Technologies	Follow new and emerging technologies (i.e., biochar, etc.)	Install 2 projects/devices aimed to reduce *E. coli*	P			P					
			Altered Habitat (Fish/Macroinvertebrate IBI)	--	--	Improve riparian vegetation	Examine riparian restoration potential	YR 10: Complete two riparian restoration projects	P	S	A	P					2045
						Channel Improvements/ Restoration	Conduct feasibility study on implementation of two stage ditch segments	Feasibility study completed	P	A	A	A					
			Altered Hydrology (Fish/Macroinvertebrate IBI)	--	--	Improve urban stormwater management	Reduce post-construction stormwater volume for redevelopment projects	Compliance with MS4 permit conditions	P		A	P		P	P		2045
						Reduce rural runoff by increasing infiltration	Decrease surface contributions to peak flows; identify areas suitable for regional ponding	YR 5: Identify priority areas TR 10: Install 1 “regional” BMP to reduce volume	P	S		S					

Coon Creek (0701020602)	Crooked (02-0084) Ham (02-0053) Cenaiko (02-0654) Netta (02-0052)	Anoka	TP	Meeting Standards	Maintain or improve water quality	Aquatic invasive plant management	Assess lakes for new AIS infestations	Annual assessments conducted	P	P		A	S			S	Ongoing
							Develop a plan to improve native plant communities and manage AIS Decrease occurrence rates of Curly leaf Pondweed and Eurasian Watermilfoil	Yr 5: Develop Plan Yr 6: Manage populations below nuisance levels	P	S		A	A			A	
							Conduct annual aquatic plant community assessments	Annual assessments conducted	P	P						P	
						Lakeshore management	Educate lake shore owners on responsible lakeshore management techniques	Information provided to 100% of lakeshore owners	P	S		S					
						Fish Assessments	Conduct population assessments	Complete in next 5 years					P				

*(P)-primary responsibility, (S)-secondary responsibility, (A)-assistance role

Table 11. Strategies and actions proposed for the Sand Creek Subwatershed.

HUC-10 Subwatershed	Waterbody and Location: Waterbody (ID)	Waterbody and Location: Location and Upstream Influence Counties	Parameter (incl. non-pollutant stressors)	Water Quality: Current Conditions	Water Quality: TMDL Goals / Targets and Estimated % Reduction	Strategies (see key below)	Strategy types and estimated scale of adoption needed to meet final water quality target	Interim 10-yr Milestones	Governmental Units with Primary Responsibility: Watershed District	SWCD	MPCA	Cities	MN DNR	Anoka County	MnDOT	Other	Estimated Year to Achieve Water Quality Target
Coon Creek (0701020602)	Sand Creek (558)	Anoka	TSS (Fish/Macroinvertebrate IBI)	Varies, Existing TSS loads range from <1-10 tons/day	90% of TSS April-Oct ≤30mg/L; Estimated reductions range from 0-10% dependent on flow	Protect/stabilize banks/bluffs	Identify/prioritize sites of streambank erosion; address highest ranking sites first	YR 2: Identify/ranking completed YR 10: 2-3 streambank stabilizations completed	P	A		A					2045
						Improve riparian vegetation	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	S	P		A					
						Improve urban stormwater management	Meet TMDL WLAs: See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
						Stormwater Asset Inventory	Conduct an inventory/general condition assessment of all stormwater assets in the Coon Creek Subwatershed	Inventory/assessment completed	P			A					
			TP (Fish/Macroinvertebrate IBI)	Varies, Existing TP loads range from 3-90 lbs/day	TP Jun-Sep ≤100 µg/L; Estimated reductions range from 0-33% dependent on flow	Protect/stabilize banks/bluffs	Identify/prioritize sites of streambank erosion; address highest ranking sites first	YR 2: Identify/ranking completed YR 10: 2-3 streambank stabilizations completed	P	A		A					2045
						Improve fertilizer and manure application management	Provide resources/education for soil nutrient management	Work with landowners to understand current fertilizer/ manure management practices	S	P							
						Ordinance/Enforcement	Initiate enforcement action on improper organics disposal (illicit discharges)	Full compliance	P		A	S					
						Improve urban stormwater management	Meet TMDL WLAs: See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
						Stormwater Asset Inventory	Conduct an inventory/general condition assessment of all stormwater assets in the Coon Creek Subwatershed	Inventory/assessment completed	P			A					
						Improve riparian vegetation	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	S	P		A					

Coon Creek (0701020602)	Sand Creek (558)	Anoka	*E. coli*	Varies, Existing *E. coli* loads range from 193-847 billion orgs/day	Apr-Oct *E. coli* ≤126 cfu/100mL; Estimated reductions range from 0-89%%	Improve riparian vegetation	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	S	P		A					2045
						Pet waste management	Provide outreach and education materials to residents regarding appropriate pet waste management	Increased public awareness	P	A	A	P					
							Ordinance enforcement	Ongoing	P			P					
						Improve urban stormwater management	Meet TMDL WLAs See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
			Altered Habitat (Fish/Macroinvertebrate IBI)	--	--	Improve riparian vegetation	Examine habitat restoration potential	YR 5: Identify priority areas	P	S	A	P					2045
			Altered Hydrology (Fish/Macroinvertebrate IBI)	--	--	Improve urban stormwater management	Reduce post-construction stormwater volume for redevelopment projects	Compliance with MS4 permit conditions	P		A	P		P	P		2045
						Reduce rural runoff by increasing infiltration	Decrease surface contributions to peak flows; identify areas suitable for regional ponding	YR 5: Identify priority areas TR 10: Install 1 "regional" BMP to reduce volume	P	S		S					

*(P)-primary responsibility, (S)-secondary responsibility, (A)-assistance role

Table 12. Strategies and actions proposed for the Pleasure Creek Subwatershed.

HUC-10 Subwatershed	Waterbody and Location: Waterbody (ID)	Waterbody and Location: Location and Upstream Influence Counties	Parameter (incl. non-pollutant stressors)	Water Quality: Current Conditions	Water Quality: TMDL Goals / Targets and Estimated % Reduction	Strategies (see key below)	Strategy types and estimated scale of adoption needed to meet final water quality target	Interim 10-yr Milestones	Governmental Units with Primary Responsibility: Watershed District	SWCD	MPCA	Cities	MN DNR	Anoka County	MnDOT	Other	Estimated Year to Achieve Water Quality Target
Coon Creek (0701020602)	Pleasure Creek (595)	Anoka	TSS (Macro-invertebrate IBI)	Varies, Existing TSS loads range from <1-3 tons/day	90% of TSS April-Oct ≤30mg/L; Estimated reductions range from 0-56% dependent on flow	Protect/stabilize banks/bluffs	Identify/prioritize sites of streambank erosion; address highest ranking sites first	YR 2: Identify/ranking completed YR 10: 1-2 streambank stabilizations completed	P	A		A					2045
						Improve riparian vegetation	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	S	P		A					
						Improve urban stormwater management	Meet TMDL WLAs: See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
						Stormwater Asset Inventory	Conduct an inventory/general condition assessment of all stormwater assets in the Coon Creek Subwatershed	Inventory/assessment completed	P			A					
			TP (Macro-invertebrate IBI)	Varies, Existing TP loads range from 2-9 lbs/day	TP Jun-Sep ≤100 µg/L; Estimated reductions range from 0-9% dependent on flow	Protect/stabilize banks/bluffs	Identify/prioritize sites of streambank erosion; address highest ranking sites first	YR 2: Identify/ranking completed YR 10: 1-2 streambank stabilizations completed	P	A		A					2045
						Ordinance/Enforcement	Initiate enforcement action on improper organics disposal	Increase in compliance	P		A	S					
						Improve urban stormwater management	Meet TMDL WLAs See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
						Stormwater Asset Inventory	Conduct an inventory/general condition assessment of all stormwater assets in the Coon Creek Subwatershed	Inventory/assessment completed	P			A					
						Improve riparian vegetation	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	S	P		A					
Coon Creek (0701020602)	Pleasure Creek (595)	Anoka	*E. coli*	Varies, Existing *E. coli* loads range from 27-90 billion orgs/day	Apr-Oct *E. coli* ≤126 cfu/100mL; Estimated reductions range from 48-54%	Improve riparian vegetation	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	P	S		A					2045

HUC-10 Subwatershed	Waterbody and Location		Parameter (incl. non-pollutant stressors)	Water Quality		Strategies (see key below)	Strategy types and estimated scale of adoption needed to meet final water quality target	Interim 10-yr Milestones	Governmental Units with Primary Responsibility								Estimated Year to Achieve Water Quality Target
	Waterbody (ID)	Location and Upstream Influence Counties		Current Conditions	TMDL Goals / Targets and Estimated % Reduction				Watershed District	SWCD	MPCA	Cities	MN DNR	Anoka County	MnDOT	Other	
						Pet waste management	Provide outreach and education materials to residents regarding appropriate pet waste management	Increased public awareness	P	A	A	P					
							Ordinance enforcement	Ongoing	P			P					
						Improve urban stormwater management	Meet TMDL WLAs See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
			Altered Habitat (Macro-invertebrate IBI)	--	--	Improve riparian vegetation	Examine habitat restoration potential	YR 5: Identify priority areas	P	S	A	P					2045
						Channel Improvements/ restoration	Restore over-widened reaches	Feasibility study completed	P	S	A						

*(P)-primary responsibility, (S)-secondary responsibility, (A)-assistance role

Table 13. Strategies and actions for the Springbrook Creek Subwatershed.

HUC-10 Subwatershed	Waterbody and Location: Waterbody (ID)	Waterbody and Location: Location and Upstream Influence Counties	Parameter (incl. non-pollutant stressors)	Water Quality: Current Conditions	Water Quality: TMDL Goals / Targets and Estimated % Reduction	Strategies (see key below)	Strategy types and estimated scale of adoption needed to meet final water quality target	Interim 10-yr Milestones	Governmental Units with Primary Responsibility: Watershed District	SWCD	MPCA	Cities	MN DNR	Anoka County	MnDOT	Other	Estimated Year to Achieve Water Quality Target
Coon Creek (0701020602)	Springbrook Creek (557)	Anoka	TP (Macro-invertebrate IBI)	Varies, Existing TP loads range from 3-10 lbs/day	TP Jun-Sep ≤100 µg/L; Estimated reductions range from 0-35% dependent on flow	Protect/stabilize banks/bluffs	Identify/prioritize sites of streambank erosion; address highest ranking sites first	YR 2: Identify/ranking completed YR 10: 1 streambank stabilizations completed	P	A		A					2045
						Ordinance/Enforcement	Initiate enforcement action on improper organics disposal	Increase in compliance	P		A	S					
						Improve urban stormwater management	Meet TMDL WLAs: See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
						Stormwater Asset Inventory	Conduct an inventory/general condition assessment of all stormwater assets in the Coon Creek Subwatershed	Inventory/assessment completed	P			A					
						Improve riparian vegetation	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	S	P		A					
			E. coli	Varies, Existing *E. coli* loads range from 26-172 billion orgs/day	Apr-Oct *E. coli* ≤126 cfu/100mL; Estimated reductions range from 15-65%	Improve riparian vegetation	Identify areas in need of riparian buffers; install/enhance 15-25 foot buffers where practicable	YR 2: Identify high priority areas YR 10: 20% buffers completed	P	S		A					2045
						Pet waste management	Provide outreach and education materials to residents regarding appropriate pet waste management	Increased public awareness	P	A	A	P					
							Ordinance enforcement	Ongoing	P			P					
						Improve urban stormwater management	Meet TMDL WLAs See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs	Compliance with MS4 permit conditions	P		A	P		P	P		
						Improve riparian vegetation	Examine habitat restoration potential	YR 10: Identify priority areas	P	S	A	P					
			Altered Habitat (Macro-invertebrate IBI)	--	--	Channel Improvements/ restoration	Restore over-widened reaches where feasible	Feasibility study completed	P	S	A						2045
Coon Creek (0701020602)	Springbrook Creek (557)	Anoka	Altered Hydrology (Macro-invertebrate IBI)	--	--	Improve urban stormwater management	Reduce post-construction stormwater volume for redevelopment projects	Compliance with MS4 permit conditions	P		A	P		P	P		2045

Coon Creek (0701020602)	Laddie Lake (02-0072)	Anoka	TP	Meeting Standards	Maintain or improve water quality	Aquatic invasive plant management	Assess lakes for new AIS infestations	Annual assessments conducted	P	P		A	S			S	Ongoing
							Develop a plan to improve native plant communities and manage AIS Decrease occurrence rates of Curly leaf Pondweed and Eurasian Watermilfoil	Yr 5: Develop Plan Yr 6: Manage populations below nuisance levels	P	S		A	A			A	
							Conduct annual aquatic plant community assessments	Annual assessments conducted	P	P						P	
						Lakeshore management	Educate lake shore owners on responsible lakeshore management techniques	Information provided to 100% of lakeshore owners	P	S		S					
						Fish Assessments	Conduct population assessments	Complete in next 5 years					P				

Restoration
Protection
Strategies to address downstream impairments
Multiple waterbodies

Table 14. Key for Strategies Column

Parameter (incl. non-pollutant stressors)	Strategy Key: Description	Strategy Key: Examples of Potential BMPs/actions
General/All Conventional Pollutants	Improve Education and Outreach	K-12 Watershed Education
		General public outreach and education
		Involve citizen networks in water resource related projects
	Improve coordination/collaboration	Coordinate planning/improvement projects with stakeholders
	Implement/Review Policies and Rules	Ongoing review of policy and procedures to meet WLA goals
Nitrogen (TN) or Nitrate	Improve Stormwater Management: Includes implementation of projects to improve stormwater runoff quality through the implementation of watershed best management practices (BMPs)	Provide educational materials to residents regarding appropriate lawn care, fertilizer use, and agricultural runoff management
Total Suspended Solids (TSS)	Protect/stabilize banks/bluffs: Reduce collapse of bluffs and erosion of streambank by reducing peak river flows and using vegetation to stabilize these areas.	Strategies for altered hydrology (reducing peak flow)
		Streambank stabilization
		Riparian buffer restoration/plantings
	Improve upland/field surface runoff controls: Soil and water conservation practices that reduce soil erosion and field runoff, or otherwise minimize sediment from leaving farmland	Cover crops
		Water and sediment basins
		Grassed waterways
		Strategies to reduce peak flows
		Conservation tillage
	Improve urban stormwater management: BMPs suitable to urban environments that reduce stormwater discharge/pollutant loadings	See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs
Phosphorus (TP)	Protect/stabilize banks/bluffs: Reduce collapse of bluffs and erosion of streambank by reducing peak river flows and using vegetation to stabilize these areas.	Strategies to reduce TSS from banks/bluffs (see above)
	Improve riparian vegetation: Soil and water conservation practices that reduce soil erosion and field runoff, or otherwise minimize sediment from leaving farmland	Strategies to reduce sediment from fields (see above)
	Improve fertilizer and manure application management: Applying phosphorus fertilizer and manure onto soils where it is most needed using techniques which limit exposure of phosphorus to rainfall and runoff.	Landowner education on proper fertilizer application
		Manure application meeting all 7020 rule setback requirements
	Address failing septic systems: Fixing septic systems so that on-site sewage is not released to surface waters. Includes straight pipes.	Eliminating straight pipes, surface seepages

Parameter (incl. non-pollutant stressors)	Strategy Key	
	Description	Examples of Potential BMPs/actions
Phosphorus (TP)	Reduce in-water loading: Minimizing the internal release of phosphorus within lakes	Curly-leaf pondweed management
		Eurasian Watermilfoil management
	Ordinance/Enforcement	Ordinance education campaign
		Initiate enforcement action
	Improve urban stormwater management	See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs
E. coli	New/Emerging technologies	Evaluate applicability of new and emerging technologies fitted to reduce *E. coli*.
	Reduce urban bacteria: Limiting exposure of pet waste to rainfall	Pet waste management
		Filter strips and buffers
		See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs
	Address failing septic systems: Fixing septic systems so that on-site sewage is not released to surface waters. Includes straight pipes.	Replace failing septic (SSTS) systems
		Maintain septic (SSTS) systems
Altered hydrology; peak flow and/or low base flow (Fish/Macroinvertebrate IBI)	Increase living cover: Planting crops and vegetation that maximize vegetative cover and evapotranspiration especially during the high flow spring months.	Grassed waterways
		Cover crops
		Conservation cover (easements & buffers of native grass & trees, pollinator habitat)
	Improve drainage management: Manage stormwater at constructed collection points and releasing stored waters after peak flow periods.	Treatment wetlands
		Restored wetlands
	Reduce rural runoff by increasing infiltration: Decrease surface runoff contributions to peak flow through soil and water conservation practices.	Conservation tillage (no-till)
		Water and sediment basins
	Improve urban stormwater management	See MPCA Stormwater Manual: http://stormwater.pca.state.mn.us/index.php/Information_on_pollutant_removal_by_BMPs
Poor Habitat (Fish/Macroinvertebrate IBI)	Improve riparian vegetation: Planting and improving perennial vegetation in riparian areas to stabilize soil, filter pollutants and increase biodiversity	Vegetated buffer on protected of waterways
		15'-20' ditch buffers
		Lake shoreland buffers
		Increase cover: in/near water bodies
		Improve/increase natural habitat in riparian, control invasive species
		Streambank and shoreline protection/stabilization
		Wetland restoration/protection
	Restore/enhance channel: Various restoration efforts largely aimed at providing substrate and natural stream morphology.	Restore riffle substrate
		Two-stage ditch implementation when feasible
		Restore natural meander and complexity when feasible
Chloride	Road salt management	Strategies currently under development within draft Twin Cities Metro Area Chloride Management Plan: https://www.pca.state.mn.us/water/road-salt-and-water-quality

4. Monitoring Plan

The CCWD will serve as the lead in both monitoring and tracking of the effectiveness of activities implemented to reduce TSS, TP, and *E. coli* loading in the watershed. Future monitoring of water quality in lakes and streams within the Coon Creek Watershed is necessary to enable assessment of whether progress is being made towards achievement of TMDL goals. Monitoring is also important to improve upon the current understanding of pollutant loading dynamics. Continuing to improve the understanding of linkages between load sources, stream impacts, and biological response will reduce uncertainties associated with model predictions, and allow refinement of load allocations to various sources. This type of effectiveness monitoring is critical in the adaptive management approach adopted in this study. An important aspect of effectiveness monitoring is progress toward a given benchmark. Accordingly, as a very general guideline, it is the intent of the CCWD and project stakeholders to achieve pollutant reductions equivalent to approximately 1% per year of the starting (i.e., long-term) pollutant concentration. For example, for a stream with a long term TSS concentration of 50 mg/L, by year 10 it would be 50 – (10 * 0.5) = 45 mg/L. It must be noted this is a general guideline. Factors that may result in slower progress include: limits in funding or landowner acceptance, challenging fixes (e.g., invasive species), and unstable climatic factors. Conversely, there may be faster progress for some impaired waters, especially where high impact fixes are identified.

Stream Monitoring

Historically, the CCWD has partnered with the ACD to conduct a wide variety of stream monitoring activities stream hydrology, stream water quality, flow, and bacteria levels. Continued monitoring is critical to successful evaluation of this restoration and protection strategy. Stream monitoring occurs annually at approximately 16 locations throughout the CCWD with approximately eight samples taken at each site from snowmelt through September. Sampling is equally distributed across both base and storm flows. Sampling parameters include but are not limited to pH, dissolved oxygen, turbidity, conductivity, temperature, salinity, total phosphorus, chloride, sulfate, total hardness, total suspended solids, and bacteria (*E. coli*).

Continuous stream hydrology is also recorded at eight locations throughout CCWD including all impaired reaches. This monitoring utilizes automatic data loggers to record stream elevations that are converted to flow/discharges. At a minimum, it is recommended that stream hydrology/flow monitoring occur at the outfalls of impaired stream reaches.

As BMP practices are implemented throughout the watershed, the CCWD will utilize continuous water quality samplers when feasible to track progress towards the TMDL. Data collected will build upon the current dataset and track changes based on implementation progress.

Lake Monitoring

Crooked Lake, Ham Lake, Laddie Lake, Lake Netta and Cenaiko Lake have been periodically monitored by staff and volunteers over many years. Parameters sampled include dissolved oxygen, pH, turbidity, conductivity, temperature, salinity, total phosphorus, chloride, transparency, and chlorophyll-*a*. In lake water quality monitoring results suggest that water quality is good on all lakes monitored within CCWD.

Each of these lakes will continue to be monitored by the CCWD on a rotating cycle with each lake undergoing monitoring two out of every three years. In-lake monitoring will continue as implementation activities are installed across the watershed.

Biological Monitoring

Continuing to monitor water quality and biological communities will help determine whether or not stream habitat restoration measures are required to bring the watershed into compliance. At a minimum, fish and macroinvertebrate sampling should be conducted by the MPCA, DNR, or other agencies every 10 years during the summer season at established locations until compliance is observed for at least two consecutive assessments. Sampling on a five year interval would be preferable and will be considered by the CCWD. It will also be important to continue to conduct streambank assessments before and after any major stabilization BMP is implemented to track if in-stream erosion is improving, or if more work is needed.

BMP Monitoring

Tracking the implementation of BMPs while continuing to monitor the biological and water quality conditions in the watershed will help local stakeholders and public agencies understand the effectiveness of the implementation strategies outlined in Tables 9-13.

5. References and Further Information

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Appendix A: Watershed Condition Classification Scoring Detail

The WCC implemented by the CCWD identified 10 indicators composed of 21 individual attributes pertinent to watershed health. Each of the 10 indicators and corresponding attributes are quantifiable and therefore allows the CCWD to track changes in watershed condition in future years. The WCC assessment consisted of the following 10 indicators:

1. Aquatic Habitat
2. Water Quality
3. Water Quantity
4. Aquatic Biota
5. Riparian/Wetland Vegetation
6. Roads and Trails
7. Soils
8. Forest Health
9. Habitat Quality
10. Terrestrial Invasive Species

These indicators were grouped according to four main ecological process categories: (1) aquatic physical, (2) aquatic biological, (3) terrestrial physical and (4) terrestrial biological (Figure 14). These categories represent the aquatic, riparian, and terrestrial processes that can affect the condition of a given watershed and associated water resources.

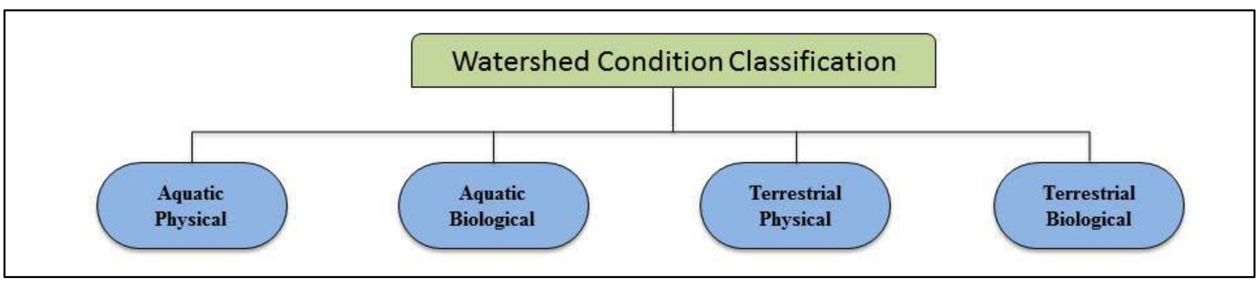

Figure 14. Four main ecological processes.

Each of the 10 indicators listed above were scored by averaging the individual scores for set of attributes within each indicator (Figure 15). For example, the “Aquatic Physical” process category contains an indicator for “Water quantity” condition. In this assessment “Water quantity” condition was determined by averaging scores from two attributes: (1) infiltration rate and (2) ditch density. Each indicator score was averaged again to determine the ecological process score.

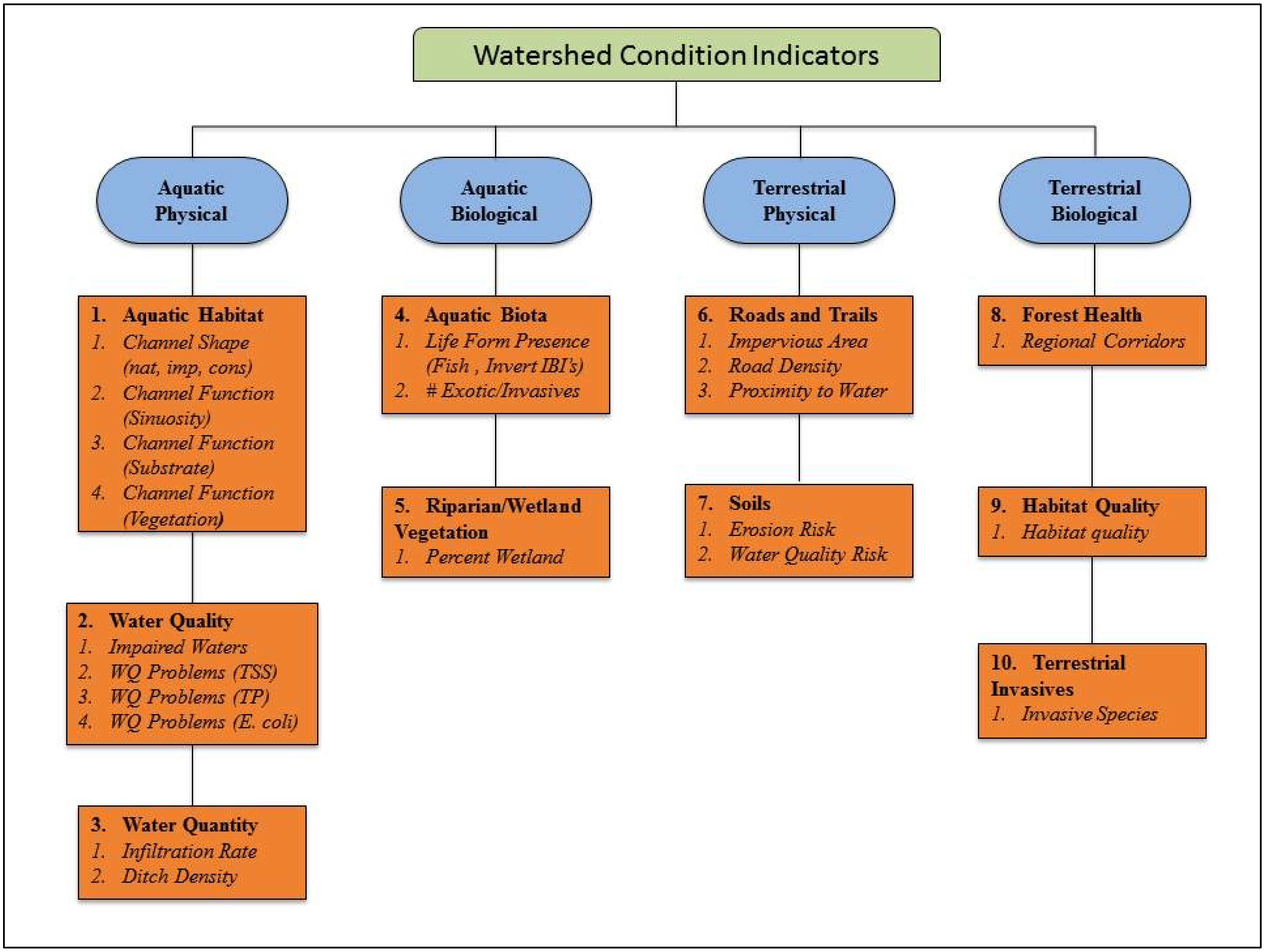

Figure 15 Conceptual model of Watershed Condition Classification assessment.

After all four ecological process scores were determined; a weighted average was taken to determine the overall condition score using the following weighted scheme; aquatic physical (30%), aquatic biological (30%), terrestrial physical (30%) and terrestrial biological (10%). Use of a weighted average approach operates on the assumption that not all ecological process contribute equally to the overall watershed health

Table 15. WCC scoring methodology.

Ecological Process Category	Condition Indicator	Attribute	Dataset	Scoring Method
Aquatic Physical	Aquatic Habitat	Channel Shape	CCWD Ditch system shapefiles	1 – Predominantly "natural" channel 2 – Predominantly "improved" channel 3 – Predominantly "constructed" channel
Aquatic Physical	Aquatic Habitat	Channel Function (sinuosity)	CCWD ditch inspection data	1 – Sinuosity ratio greater than 1.5, 2 – Sinuosity ratio between 1.2 and 1.5, 3 – Sinuosity ratio less than 1.2
Aquatic Physical	Aquatic Habitat	Channel Function (substrate)	CCWD ditch inspection data	1 – Predominately gravel/cobble substrate, 2 – Predominately sand substrate , 3 – Predominately silt/muck substrate
Aquatic Physical	Aquatic Habitat	Channel Function (bank vegetation)	CCWD ditch inspection data	1 – Little vegetation present, 2 – Medium vegetation present, 3 – Channel choked with vegetation
Aquatic Physical	Water Quality	Impaired waters	MPCA Impaired Waters Shapefiles	Percentage of public ditch length in subwatershed classified as impaired. Separated using "natural breaks" for relative comparison. 1 – 0-5% of public ditch length in subwatershed is impaired, 2 – 5-80% of public ditch length in subwatershed is impaired 3 – 80-100% of public ditch length in subwatershed is impaired
Aquatic Physical	Water Quality	WQ Problems	CCWD TSS monitoring samples	1 – 0-10% of samples above 30 mg/L standard, 2 – 10-20% of samples above 30 mg/L standard, 3 – 20-30% of samples above 30 mg/L standard
Aquatic Physical	Water Quality	WQ Problems	TP monitoring samples	1 – 0-10% of samples above 100 ug/L standard, 2 – 10-20% of samples above 100 ug/L standard, 3 – 20-30% of samples above 100 ug/L standard
Aquatic Physical	Water Quality	WQ Problems	CCWD *E. coli* monitoring samples	1 – average of all samples less than 126 cfu/100ml standard 2 – average of all samples less than 2 times the 126 cfu/100ml standard 3 – average of all samples greater than 2 times 126 cfu/100ml standard
Aquatic Physical	Water Quantity	Infiltration Rate	USGS soils classification shapefiles	Percentage of subwatershed with infiltration rates greater than 6 inches/hour. Separated using "natural breaks" for relative comparison. 1 – 0-15% of soils with infiltration rates >6 in/hr, 2 – 15-42% of soils with infiltration rates >6 in/hr 3 – 42-93% of soils with infiltration rates >6 in/hr

Ecological Process Category	Condition Indicator	Attribute	Dataset	Scoring Method
Aquatic Physical	Water Quantity	Ditch Density	CCWD ditch inspection data	Scored on feet of ditch per acre. Separated using “natural breaks” for relative comparison. 1 – 0-25 feet of ditch per acre, 2 – 25-73 feet of ditch per acre, 3 – 73-317 feet of ditch per acre
Aquatic Biological	Aquatic Biota	Life Form Presence	MPCA Fish/Invert IBI Scores	1 – IBI score above upper confidence interval, 2 – IBI score within confidence interval, 3 – IBI score below confidence interval
Aquatic Biological	Aquatic Biota	# Exotic/Invasives	MPCA Fish/Invert sampling data	Percentage of aquatic habitat infested with AIS 1 – less than 25% of aquatic habitat infested with AIS, 2 – 25-50% of aquatic habitat infested with AIS, 3 – 50-100% of aquatic habitat infested with AIS
Aquatic Biological	Riparian/Wetland	Percent Wetland	National Wetland Inventory shapefiles	Percentage of subwatershed containing wetland. Separated using “natural breaks” for relative comparison. 1 – 47-100% of subwatershed covered by wetland, 2 – 16-47% of subwatershed covered by wetland, 3 – 0-16% of subwatershed covered by wetland
Terrestrial Physical	Roads and Trails	Impervious Area	Met Council 2011 Land Cover dataset	Percentage of subwatershed covered by impervious surface. Separated using “natural breaks” for relative comparison. 1 – 0-12% of subwatershed considered impervious, 2 – 12-44% of subwatershed considered impervious, 3 – 44-100% of subwatershed considered impervious
Terrestrial Physical	Roads and Trails	Road Density	CCWD core geodatabase “Roads” shapefile	Miles of road per acre. Separated using “natural breaks” for relative comparison. 1 – 0-0.015 road miles per acre, 2 – 0.015-0.034 road miles per acre, 3 – 0.034-0.12 road miles per acre
Terrestrial Physical	Roads and Trails	Proximity to Water	Met Council 2011 Land Cover dataset CCWD ditch system shapefiles	Scored on the number of impervious acres within 300 feet of an open channel (public or private ditch). 1 – Less than 7 acres of impervious area within 300ft of an open channel, 2 – 7-30 acres of impervious area within 300ft of an open channel, 3 – Greater than 30 acres of impervious area within 300ft of an open channel.
Terrestrial Physical	Soils	Erosion Risk	BWSR Soil Erosion Risk shapefiles	Erosion risk was scored by BWSR’s Ecological Ranking Project on a scale from 0-100, with 100 indicating highest erosion risk. 1 – Soil erodibility score of 0-21, 2 – Soil erodibility score of 21-40, 3 – Soil erodibility score of 40-100

Ecological Process Category	Condition Indicator	Attribute	Dataset	Scoring Method
Terrestrial Physical	Soils	Water Quality Risk	BWSR Water Quality Risk shapefiles	Water quality risk was scored by BWSR's Ecological Ranking Project on a scale from 0-100, with 100 indicating highest risk for water quality degradation. 1 – Water quality risk score of 0-47, 2 – Water quality risk score of 47-54, 3 – Water quality risk score of 54-100
Terrestrial Biological	Forest Health	Ecological Corridors	MN DNR Ecological Corridors shapefiles	Percentage of subwatershed covered by ecological corridors as determined by DNR. 1 – 75-100% of subwatershed to be in an ecological corridor, 2 – 27-100% of subwatershed to be in an ecological corridor, 3 – 0-27% of subwatershed to be in an ecological corridor
Terrestrial Biological	Habitat Quality	Habitat Quality	BWSR Habitat Quality shapefiles	Habitat quality was scored by BWSR's Ecological Ranking Project on a scale from 0-100, with 100 representing the highest quality habitat. 1 – Habitat quality score of 52-100, 2 – Habitat quality score of 32-52, 3 – Habitat quality score of 0-32
Terrestrial Biological	Terrestrial Invasives	Invasive Species	CCWD Invasive Species shapefile	Percentage of subwatershed infested with Purple Loosestrife, Reed Canary Grass, Common Reed Grass, and Common Buckthorn. 1 – 0-10% of subwatershed infested, 2 – 10-25% of subwatershed infested, 3 – 25-100% of subwatershed infested