Chippewa River Watershed Monitoring and Assessment Report

Minnesota Pollution Control Agency

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Executive Summary

The Chippewa River Watershed (07020005) is located in west-central Minnesota. The watershed falls in three different Ecoregions. The North Central Hardwood Forest Ecoregion covers the eastern two-thirds of the watershed, the Northern Glaciated Plains Ecoregion covers the west-central part of the watershed, and the Western Corn Belt Plains Ecoregion covers the southern part of the watershed. Much of the landscape of this watershed was modified by the early settlers in the area. Draining wetlands and modifying stream channels were used to gain land for agriculture. Now approximately 79 percent of the watershed is used for agricultural production.

In 2009, the Minnesota Pollution Control Agency (MPCA) undertook an intensive watershed monitoring effort of the Chippewa River Watershed surface waters. Ninety-six sites were sampled for biology at the outlet points of variable sized sub-watersheds within the Chippewa watershed. These locations include the Chippewa River, just above the water diversion channel, outlets of the major tributaries and outlets of headwater tributaries. The Chippewa River Watershed Project also completed water chemistry sampling at the outlet points of seventeen major subwatersheds and lake water quality sampling focusing on basins greater than 100 acres in size. In 2010, a holistic approach was started to assess all of the watershed's surface water bodies for aquatic life, recreation and consumption use support. Where sufficient data was available, 112 stream reaches and 84 lakes were assessed in this effort. (Not all lake and stream AUIDs were able to be assessed due to insufficient data, modified channel condition or their status as limited resources waters).

Four stream AUIDs are fully supporting of aquatic life and zero are fully supporting of aquatic recreation. Twenty-one stream reaches are non-supporting of aquatic life and eight of aquatic recreation throughout the watershed. Sixty-five biological sites were on channelized streams reaches that were not assessed. They have good percent, fair percent, and poor percent qualitative scores (Appendix 5.1) and others did not have enough information to assess. Aquatic consumption impairments span the length of the Chippewa River.

Twenty-nine of the watershed's assessed lakes are fully supporting of aquatic recreation. Thirty-four lakes are non-supporting of aquatic recreation. Twenty-one have insufficient information to assess.

Land use modification and hydrologic alteration including groundwater withdrawal may be contributing factors to the observed pervasive poor water quality conditions. Additional monitoring to determine stressors followed by the development and implementation of restoration and protection strategies, are needed to improve conditions and attain water quality standards.

Introduction

Water is one of Minnesota's most abundant and precious resources. The Minnesota Pollution Control Agency (MPCA) is charged under both federal and state law with the responsibility of protecting the water quality of Minnesota's water resources. The MPCA's water management efforts are tied to the 1972 Federal Clean Water Act (CWA) requiring states to adopt water quality standards to protect their water resources and the designated uses of those waters, such as for drinking water, recreation, fish consumption, and aquatic life. States are required to provide a summary of the status of the state's surface waters and to develop a list of water bodies that do not meet established standards. Such waters are referred to as "impaired waters" and the state must take appropriate actions to restore these waters, including the development of Total Maximum Daily Loads (TMDLs). A TMDL is a comprehensive study identifying all pollution sources causing or contributing to impairment and the reductions needed to restore a water body so that it can support its designated use.

The MPCA currently conducts a variety of surface water monitoring activities that support our overall mission of helping Minnesotans protect the environment. To be successful in preventing and addressing problems, decision makers need good information about the status of the resources, potential and actual threats, options for addressing the threats, and data on how effective management actions have been. The MPCA's monitoring efforts are focused on providing that critical information. Overall, the MPCA is striving to provide information to assess-and ultimately to restore or protect-the integrity of Minnesota's waters.

The passage of Minnesota's Clean Water Legacy Act (CWLA) provided a policy framework and initial resources to state and local governments to accelerate efforts to monitor, assess, restore, and protect surface waters. Funding from the Clean Water Fund allows this work to continue. In response, the MPCA has developed a watershed monitoring strategy which will promote an effective and efficient integration of water monitoring programs to provide a more comprehensive assessment of water quality and expedite the restoration and protection process. This has permitted the MPCA to establish a strategy and goal to assess the condition of Minnesota's surface waters via a 10-year cycle, provided an opportunity to more fully integrate MPCA water resource management efforts in cooperation with local government and stakeholders, and allowed for coordinated development and implementation of water quality restoration and improvement projects.

The rationale behind the watershed approach is to intensively monitor the streams and lakes within a major watershed to determine the overall health of water resources, identify impaired waters, and identify waters in need of additional protection efforts. This monitoring strategy was implemented in the Chippewa River Watershed in the summer of 2009. This report provides a summary of all water quality assessment results at a watershed scale and incorporates all data available for the assessment process including watershed monitoring, volunteer monitoring, and monitoring conducted by local government units. Consequently, there is an opportunity to begin to address most, if not all, the impairments through a coordinated TMDL process at a watershed scale, rather than the reach by reach and parameter by parameter approach historically employed. A watershed approach will more effectively address multiple impairments resulting from the cumulative effects of point and non-point sources of pollution and further the CWA goal of protecting, restoring, and preserving the quality of Minnesota's water resources.

I. The watershed monitoring approach

The watershed monitoring approach is a 10-year rotation for assessing waters of the state on the level of Minnesota's 81 major watersheds (Figure 1). The primary feature of the watershed approach is that it provides a unifying focus on the water resources within a watershed as the starting point for water quality assessment, planning, and results measures. The major benefit of this approach is the integration of monitoring resources to provide a more complete and systematic assessment of water quality at a geographic scale useful for the development and implementation of effective TMDLs and protection strategies. The following paragraphs provide details on each of the four principal monitoring components of the watershed approach. For additional information see: Watershed Approach to Condition Monitoring and Assessment (MPCA 2008) (http://www.pca.state.mn.us/publications/wq-s1-27.pdf).

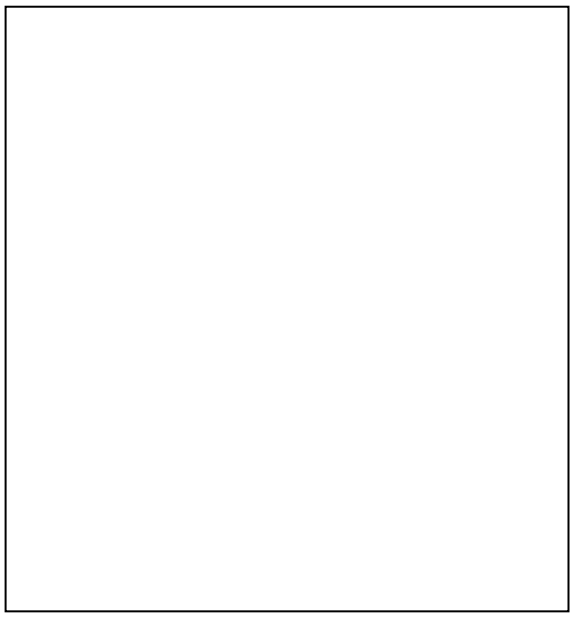

Figure 1. Major watersheds within Minnesota (8-Digit HUC).

Load monitoring network

The first component of this effort is the Major Watershed Load Monitoring Program (MWLMP), which involves permanent flow and water chemistry monitoring stations on Minnesota's major rivers, including the Red, Minnesota, Mississippi, and Rainy, and the outlets of major tributaries of each of the state's major watersheds. MWLMP and program cooperators monitor water quality at many of these outlets and at various locations along Minnesota's major rivers. Initiated in 2007, and funded with appropriations from Minnesota's Clean Water Fund, the MWLMP's multi-agency monitoring approach combines site specific stream flow data from United States Geological Survey (USGS) and Minnesota Department of Natural Resources (MDNR) flow gauging stations. This partnership effort, along with water quality data collected by the Metropolitan Council Environmental Services (MCES), and local monitoring organizations, is a cornerstone of the watershed approach.

Water quality samples are collected year round at all MWLMP monitoring sites. Approximately 30-35 mid-stream grab samples are collected per site per year. Sample collection intensity is greatest during periods of moderate and high flow due to the importance these samples carry in pollutant load calculations. Sampling also occurs during low flow periods, but at a lesser frequency. Water quality and discharge data are combined in the "Flux32 Pollutant Load Model" to create concentration/flow regression equations to estimate pollutant concentrations and loads on days when samples are not collected. Primary outputs from Flux32 include pollutant loads and flow weighted mean concentrations (FWMC). A pollutant load is defined as the amount (mass) of a pollutant passing a stream location over a given unit of time. The flow weighted mean concentration is used to estimate the overall quality of water passing this point, computed by dividing the pollutant load by the total flow volume that passed the stream location over the same given unit of time. Annual pollutant loads are calculated for total suspended solids (TSS), total phosphorus (TP), dissolved orthophosphate (DOP), and nitrate plus nitrite-nitrogen (nitrate-N). Primary outputs from Flux32 include pollutant loads (Table 1) and FWMC (Figures 1-4). When fully implemented, the MWLMP will monitor and compute pollutant loads at 81 stream sites across the State.

The program is designed to measure and compare regional differences and long-term trends in water quality. This will be particularly helpful in putting the intensive watershed monitoring data (see below) into a longer-term context, given that the intensive monitoring will occur once every 10 years. The load monitoring network will also provide critical information for identifying baseline or acceptable loads for maintaining and protecting water resources. In the case of impaired waters, the data collected through

these efforts will be used to aid in the development of "Total Maximum Daily Load" (TMDL) studies, implementation of plans, assist watershed modeling efforts, and provide information to watershed research projects.

Intensive watershed monitoring

Stream monitoring

The intensive watershed monitoring strategy utilizes a nested watershed design allowing the aggregation of watersheds from a coarse to a fine scale. The foundation of this comprehensive approach is the 81 major watersheds within Minnesota. Streams are broken into segments by hydrologic unit codes (HUC) to define separate waterbodies within a watershed. Sampling occurs in each major watershed once every 10 years. In this approach, intermediate-sized (approx. HUC-11) and "minor" (14-digit HUC) watersheds are sampled along with the major watershed outlet to provide a complete assessment of water quality (Figure 2). River/stream sites are selected near the outlet at all watershed scales. This approach provides holistic assessment coverage of rivers and streams without monitoring every single stream reach.

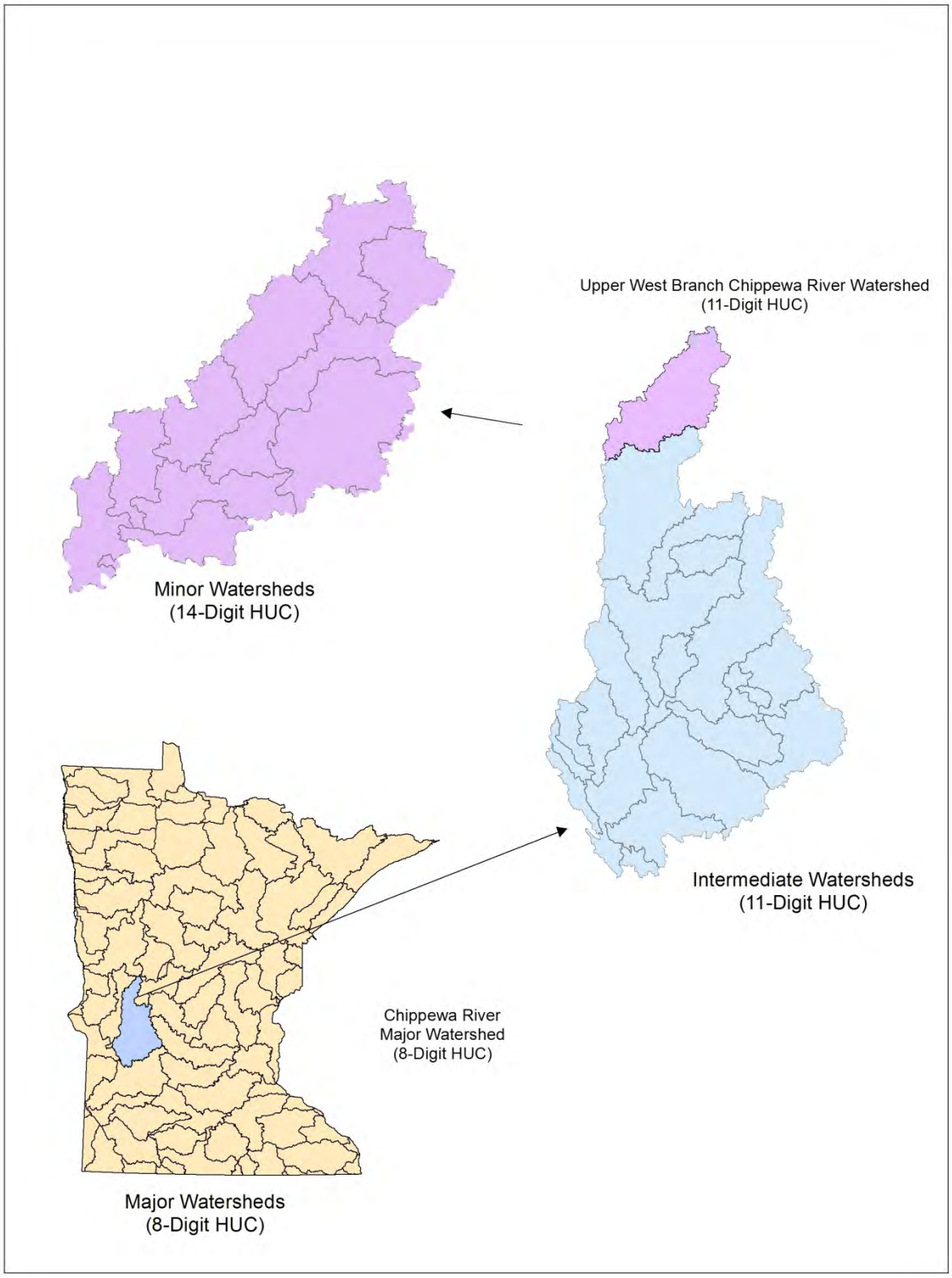

Figure 2. The intensive watershed monitoring design

The outlet of the major watershed (HUC-8) is sampled for biology, water chemistry, and fish contaminants to allow for the assessment of aquatic life, aquatic recreation and aquatic consumption use-support. Each intermediate watershed (HUC-11) outlet is sampled for biology and water chemistry for the assessment of aquatic life and aquatic recreation use-support. Watersheds at this scale generally consist of major tributary streams with drainage areas ranging from 75 to 150 square miles. Lastly, most minor watersheds (HUC-14) (typically 10-20 square miles) are sampled for biology to assess for aquatic life use-support. Chemistry monitoring is performed by MPCA staff and by local partners funded by Surface Water Assessment Grants (SWAGs) while biological monitoring is performed by MPCA staff.

The second step of the intensive watershed monitoring effort consists of follow-up monitoring at all intermediate watersheds determined to have impaired waters. This follow-up monitoring is designed to collect the information needed to initiate the stressor identification process in order to identify the source(s) and cause(s) of impairment required for TMDL development and implementation.

Lake monitoring

The MPCA conducts and supports lake monitoring for a variety of objectives. Lake condition monitoring activities are focused on assessing the recreational use-support of lakes and identifying trends over time. The MPCA also assesses lakes for aquatic consumption use-support, based on fish-tissue and water column concentrations of toxic pollutants. Lake monitoring was brought into the watershed monitoring framework in 2009.

Even when pooling MPCA and local resources, the MPCA is not able to monitor all lakes in Minnesota. The primary focus of MPCA monitoring is lakes $\geq$500 acres in size ("large lakes"). These resources typically have public access points, they generally provide the greatest aquatic recreational opportunity to Minnesota's citizens, and these lakes collectively represent 72 percent of the total lake area (greater than 10 acres) within Minnesota. Though the primary focus is on monitoring and assessing larger lakes, the MPCA is also committed to directly monitoring, or supporting the monitoring of some lakes between 100-499 acres ("small lakes") for assessment purposes.

Citizen and local monitoring

Citizen monitoring is an important components of the watershed monitoring approach. The MPCA coordinates two programs aimed at encouraging citizen surface water monitoring: the Citizen Lake Monitoring Program (CLMP) and the Citizen Stream Monitoring Program (CSMP). Like the permanent load monitoring network that will be established at watershed outlets, sustained citizen monitoring can provide the long-term picture needed to help evaluate current status and trends. The advance identification of lake and stream sites that will be sampled by agency staff provides an opportunity to actively recruit volunteers to monitor those sites too, so that water quality data are available for the years before and after the intensive monitoring effort. This citizen-collected data helps agency staff interpret the results from the intensive monitoring effort, which only occurs once every 10 years. It also allows interested parties to track any water quality changes that occur in the years between the intensive monitoring events. Coordinating with volunteers to focus monitoring efforts where it will be most effective for Clean Water Legacy planning and tracking purposes will help local citizens/governments see how their efforts are being used to inform water quality management decisions and affect change.

The MPCA also passes through funding via Surface Water Assessment Grants (SWAGs) to local groups such as counties, soil and water conservation districts (SWCDs), watershed districts, nonprofits, and educational institutions to monitor lake and stream water quality. These local partners greatly expand our overall capacity to conduct sampling. Many SWAG grantees invite citizen participation in their monitoring projects.

The annual SWAG Request for Proposal (RFP) indentified the major watersheds that are scheduled for upcoming intensive monitoring activities. HUC-11 outlet stream chemistry sites and lakes less than 500 acres that need monitoring are identified on the RFP and local entities are invited to request funds to complete the sampling. SWAG grantees conduct detailed sampling efforts following the same established monitoring protocols and quality assurance procedures used by the MPCA. All of the lake and stream monitoring data from SWAG projects are combined with the MPCA's monitoring data to assess the condition of Minnesota lakes and streams.

II. Assessment methodology

The Clean Water Act requires states to report on the condition of the waters of the state every two years. This biennial report to Congress contains an updated list of surface waters that are determined to be supporting or non-supporting of their designated uses. The assessment and listing process involves dozens of MPCA staff, other state agencies and local partners. The goal of this effort is to use the best data and best science available to assess the condition of Minnesota's water resources. For a thorough review of the assessment methodology see: *Guidance Manual for Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment 305(b) Report and 303(d) List* (MPCA 2012). http://www.pca.state.mn.us/index.php/view-document.html?gid=8601.

Water quality standards

Water quality standards are the fundamental benchmarks by which the quality of surface waters are measured and used to determine impairment. Use attainment status is a term describing the degree to which environmental indicators are either above or below criteria specified by Minnesota Water Quality Standards (Minn. R. ch. 7050 2008) (https://www.revisor.leg.state.mn.us/rules/?id=7050). These standards can be numeric or narrative in nature and define the concentrations or conditions of surface waters that allow them to meet their designated beneficial uses, such as for fishing (aquatic life), swimming (aquatic recreation) or human consumption (aquatic consumption). All surface waters in Minnesota, including lakes, rivers, streams and wetlands are protected for aquatic life and recreation where these uses are attainable. Protection of aquatic life means the maintenance of healthy, diverse and successfully reproducing populations of aquatic organisms, including fish and invertebrates. Protection of recreation means the maintenance of conditions suitable for swimming and other forms of water recreation. Protection of consumption means protecting citizens who eat fish inhabiting Minnesota waters or receive their drinking water from waterbodies protected for this use.

Numeric water quality standards represent concentrations of specific pollutants in water that protect a specific designated use. Ideally, if the standard is not exceeded, the use will be protected. However, nature is very complex and variable therefore, the MPCA uses a variety of tools to fully assess designated uses. Assessment methodologies often differ by parameter and designated use. Furthermore, pollutant concentrations may be expressed in different ways such as chronic value, maximum value, final acute value, magnitude, duration and frequency.

Narrative standards are statements of conditions in and on the water, such as biological condition, that protect their designated uses. Interpretations of narrative criteria for aquatic life support in streams are based on multi-metric biological indices including the Fish Index of Biological Integrity (F-IBI), which evaluates the health of the fish community, and the Macroinvertebrate Index of Biological Integrity (M-IBI), which evaluates the health of the aquatic invertebrate community. Biological monitoring is a direct means to assess aquatic life use support, as the aquatic community tends to integrate the effects of pollutants and stressors over time.

Assessment units

Assessments of use support in Minnesota are made for individual waterbodies. The waterbody unit used for river systems, lakes and wetlands is called the "assessment unit". A stream or river assessment unit usually extends from one significant tributary stream to another or from the headwaters to the first tributary. A reach may be further divided into two or more assessment reaches when there is a change in use classification (as defined in Minnesota R. ch. 7050) or when there is a significant morphological feature, such as a dam or lake, within the reach. Therefore, a stream or river is often segmented into multiple assessment units that are variable in length. The MPCA is using the 1:24,000 scale, high resolution National Hydrologic Dataset (NHD) to define and index stream, lake and wetland assessment units. Each river or stream reach is identified by a unique waterbody identifier (known as its AUID), comprised of the United States Geological Survey (USGS) eight digit hydrologic unit code plus a three character code that is unique within each HUC. Lake and wetland identifiers are assigned by the MDNR. The Protected Waters Inventory provides the identification numbers for lake, reservoirs, and wetlands. These identification numbers serve as the AUID and are composed of an eight digit number indicating county, lake, and bay for each basin.

It is for these specific stream reaches or lakes that the data are evaluated for potential use impairment. Therefore, any assessment of use support would be limited to the individual assessment unit. The major exception to this is the listing of rivers for contaminants in fish tissue (aquatic consumption). Over the course of time it takes fish, particularly game fish, to grow to "catchable" size and accumulate unacceptable levels of pollutants, there is a good chance they have traveled a considerable distance. The impaired reach is defined by the location of significant barriers to fish movement such as dams upstream and downstream of the sampled reach, and thus often includes several assessment units.

Determining use attainment status

Conceptually, the process for determining use attainment status of a waterbody is similar for each designated use-comparison of monitoring data to established water quality standards. However, the complexity of that process and the amount of information required to make accurate assessments varies between uses. In part, the level of complexity in the assessment process depends on the strength of the dose-response relationship; i.e., if chemical B exceeds water quality criterion X, how often is beneficial use Y truly not being attained. For beneficial uses related to human health, such as drinking water, the relationship is well understood and thus the assessment process is a relatively simple interpretation of numeric standards. In contrast, assessing whether a waterbody supports a healthy aquatic community is not as straightforward and often requires multiple lines of evidence to make use attainment decisions with a high degree of certainty. Incorporating a multiple lines of evidence approach into MPCA's assessment process has been evolving over the past few years. The current process used to assess the aquatic life use of rivers and streams is outlined below and in Figure 3.

The first step in the aquatic life assessment process is a comparison of the monitoring data to standards. This is largely an automated process performed by logic programmed into a database application and the results are referred to as 'Pre-Assessments'. Pre-assessments are then reviewed by either a biologist or water quality professional, depending on whether the parameter is biological or chemical in nature. These reviews are conducted at the workstation of each reviewer (i.e., desktop review) using computer applications to analyze the data for potential temporal or spatial trends, as well as to gain a better understanding of any attenuating circumstances that should be considered (e.g., flow, time/date of data collection, habitat).

The next step in the process is a Comprehensive Watershed Assessment meeting where reviewers convene to discuss the results of their desktop assessments for each individual waterbody. Implementing a comprehensive approach to water quality assessment requires a means of organizing

and evaluating information to formulate a conclusion utilizing multiple lines of evidence. Occasionally, the evidence stemming from individual parameters are not in agreement and would result in discrepant assessments if the parameters were evaluated independently. However, the overall assessment considers each piece of evidence to make a use attainment determination based on the preponderance of information available. See the *Guidance Manual for Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment 305(b) Report and 303(d) List* (MPCA 2012) http://www.pca.state.mn.us/index.php/view-document.html?gid=8601 for guidelines and factors to consider when making such determinations.

Any new impairment determination (i.e., waterbody not attaining its beneficial use) is reviewed using GIS to determine if greater than 50 percent of the assessment unit is channelized. Currently, the MPCA is deferring any new impairments on channelized reaches until new aquatic life use standards have been developed as part of the tiered aquatic life use framework. For additional information see: Tiered Aquatic Life Use (TALU) Framework (http://www.pca.state.mn.us/index.php/water/water-monitoring-and-reporting/water-quality-and-pollutants/the-tiered-aquatic-life-use-talu-framework.html). Since large portions of a watershed may be channelized, reaches with biological data are evaluated on a "good-fair-poor" system to help evaluate their condition. (see section VI below for more discussion)

The last step in the assessment process is the Professional Judgement Group or PJG meeting. At this meeting, results are shared and discussed with entities outside of the MPCA that may have been involved in data collection or that might have a vested interest in the outcomes of the assessment process. Information obtained during this meeting may be used to revise previous use attainment decisions. The result of this meeting is a compilation of the assessed waters which will be included in the watershed assessment report. Waterbodies that do not meet standards and therefore do not attain one or more of their designated uses, are considered impaired waters and are placed on the draft 303(d) Impaired Waters List.

Data management

It is MPCA policy to use all credible and relevant monitoring data to assess surface waters. The MPCA relies on data it collects along with data from other sources, such as sister agencies, local government and volunteers. The data must meet rigorous quality-assurance protocols before being used. The MPCA stores surface monitoring data in U.S. Environmetnal Protection Agency (EPA) STORET system and all monitoring data required or paid for by MPCA is entered into EQuIS, MPCA's front end data portal to STORET. Projects funded by MPCA include Clean Water Partnership (CWP) projects, SWAG projects and TMDL projects. Many local projects not funded by MPCA choose to submit their data to the MPCA in STORET-ready format so that it may be utilized in the assessment process. Prior to each biennial assessment cycle, the MPCA publishes a "Call for Data" in the State Register and contacts partner organizations directly to request their monitoring data.

Period of record

The MPCA uses data collected over the most recent 10-year period for all water quality assessments. Generally, the most recent data from the 10-year assessment period is reviewed first when assessing toxic pollutants, eutrophication and fish contaminants. Also, the more recent data for all pollutant categories may be given more weight during the comprehensive watershed assessment or professional judgment group meetings. The goal is to use data from the 10-year period that best represents the current water quality conditions. Using data over a 10-year period provides a reasonable assurance that data will have been collected over a range of weather and flow conditions and that all seasons will be adequately represented; however, data for the entire period is not required to make an assessment.

Figure 3. Flowchart of aquatic life use assessment process

III. Watershed Overview

The Chippewa River Watershed is located in the west-central portion of Minnesota. The 2083.6 square mile watershed is agriculturally dominated. The area is primarily agricultural with 79 percent of the land used for cropland and pasture. The majority of the cropland is planted with corn and soybeans. The watershed is located in the North Central Hardwood Forest Ecoregion, Northern Glaciated Plains Ecoregion, and the Western Corn Belt Plains Ecoregion (Figure 4). The Chippewa River and its tributaries flow through eight counties where it combines with the Minnesota River in the town of Montevideo; however, there is a water diversion channel near the town of Watson where water is diverted west to the Minnesota River to lessen the flooding in Montevideo. Montevideo, Benson, Starbuck and Glenwood are the largest towns in the watershed, but the watershed is mostly rural, with developed areas making up only five percent of the land use (Figure 5).

The Chippewa River Watershed is a south flowing watershed. The watershed is narrow at the north end and widens east-west as it flows south. The East and West Branch Chippewa Rivers combine near the city of Benson to become the Chippewa River. The Little Chippewa, Dry Weather Creek, South Mud Creek, and Shakopee Creek are the largest of the tributaries to the Chippewa River. The watershed is comprised of twenty-one HUC-11 units.

Stream and lake monitoring as part of the intensive watershed monitoring project began in 2009 in the Chippewa River Watershed. While the majority of data used for assessment was collected from 2009 to 2010, available data from the last 10 years was used for assessment. Ninety-six sites were sampled throughout the watershed for biology, seventeen sites were sampled for intensive water chemistry, and one site was sampled for fish contaminants (all locations are available in Appendix 3).

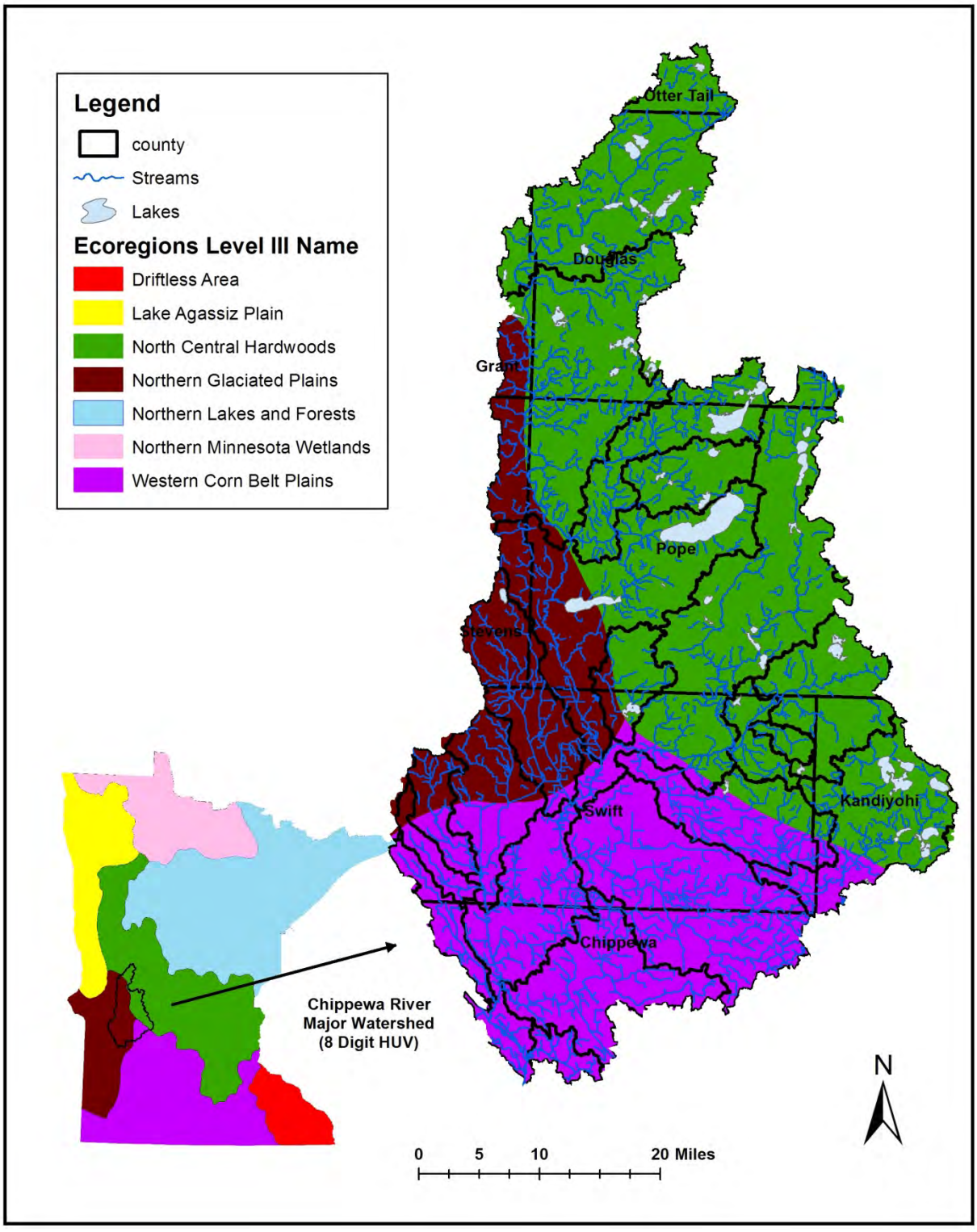

Figure 4. The Chippewa River Watershed West Central Minnesota

Land use summary

The Chippewa River transitions from hardwood forests to prairie as it flow south. Many of the Chippewa River's tributaries emerge from wetlands and lakes in the northern third of the watershed. The river's riparian zones have remained intact on many stretches of the Chippewa River, but channelization has occurred on a large scale in the watershed, including the Chippewa River itself.

Prior to western settlement, tall grasslands and prairie potholes extended over much of the watershed. The Chippewa River has some very high bluffs caused by the draining of glacial Lake Agassiz. The draining of the lake by the glacial River Warren, scoured out large valleys in the entire Minnesota River Basin including the Chippewa River.

The draining of wetlands and the straightening of the Chippewa River and its tributaries has allowed nearly all remaining arable land to be employed in agricultural production. Today land cover in the watershed is distributed as follows: 68.3 percent cropland, 11.1 percent rangeland, 4.5 percent forest/shrub, five percent developed, 5.9 percent open water, 5.2 percent wetland and 0.1 percent barren/mining (Figure 5).

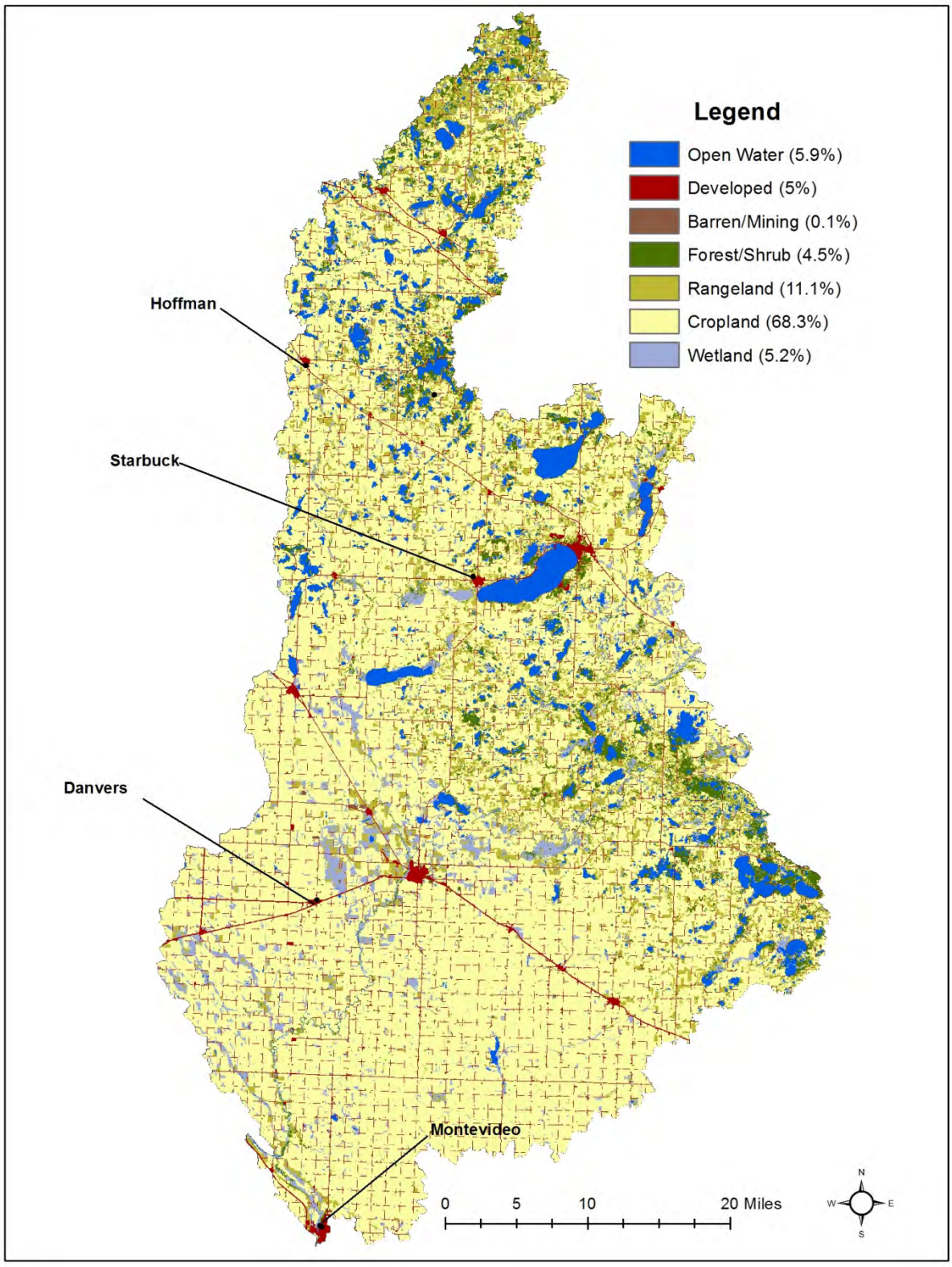

Figure 5. Land use in the Chippewa River Watershed

Climate and precipitation

Precipitation is the source of almost all water inputs to a watershed. Precipitation in the watershed ranges from 25 to 29 inches each year. Evaporation estimates are between 36 to 37 inches annually (Minnesota State Climatologists Office, 1999). The October 2008-September 2009 water year precipitation summary shows conditions were near normal to slightly drier than normal (Figure 6).

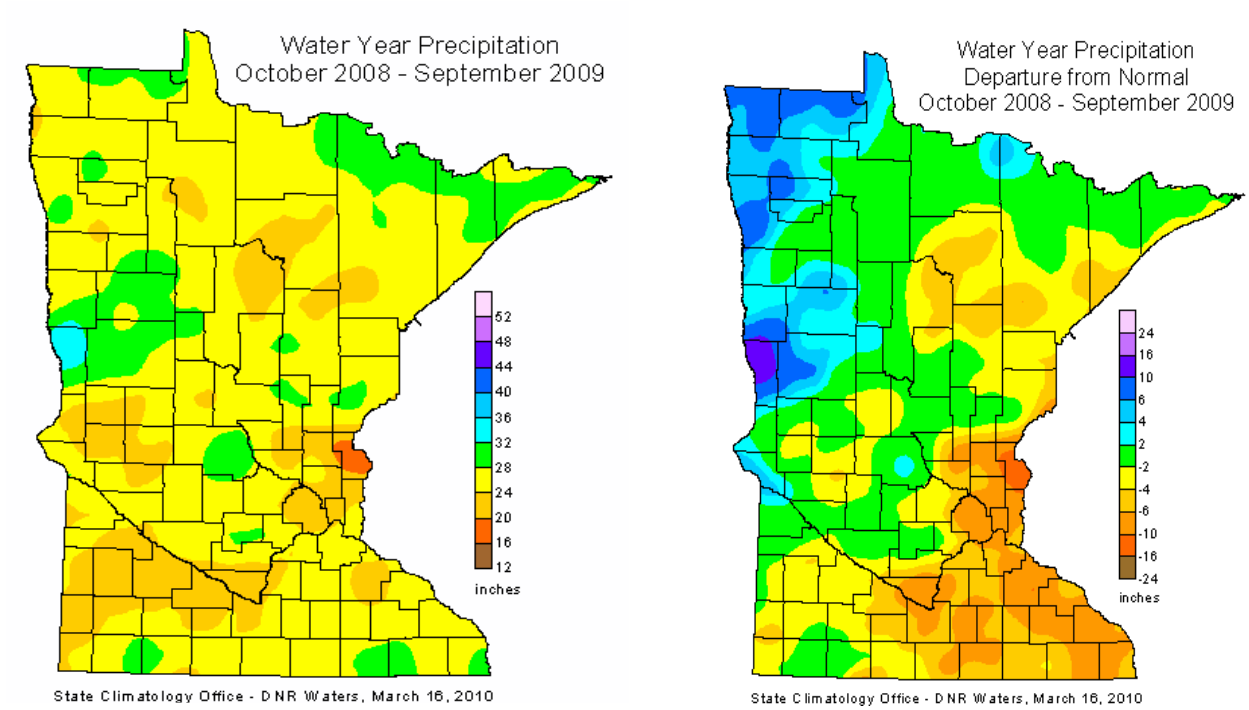

Figure 6. State-wide precipitation levels during the 2009 water year

IV. Watershed-wide data collection methodology

Load monitoring

The Chippewa River is monitored on State Highway 40 near Milan, Minnesota, approximately 21 river miles above the confluence with the Minnesota River. Many years of water quality data from throughout Minnesota combined with the previous analysis of Minnesota's ecoregion patterns, resulted in the development of three "River Nutrient Regions" (RNR), each with unique nutrient standards (MPCA, 2008). Of the state's three RNRs (North, Central, South), the Chippewa River's monitoring station is located within the South RNR.

Funded with appropriations from Minnesota's Clean Water Legacy Fund, the Watershed Pollutant Load Monitoring Network (WPLMN) is a long-term program designed to measure and compare regional differences and long-term trends in water quality among Minnesota's major rivers including the Red, Rainy, St. Croix, Mississippi, and Minnesota, and the outlets of the major tributaries (8 digit HUC scale) draining to these rivers. Since the program's inception in 2007, the WPLMN has adopted a multi-agency monitoring design that combines site specific stream flow data from United States Geological Survey (USGS) and Minnesota Department of Natural Resources (MDNR) flow gaging stations with water quality data collected by the Metropolitan Council Environmental Services (MCES), local monitoring organizations, and Minnesota Pollution Control Agency (MPCA) WPLMN staff to compute annual pollutant loads at 79 river monitoring sites across Minnesota. Data will also be used to assist with: Total

Maximum Daily Load (TMDL) studies and implementation plans; watershed modeling efforts; and watershed research projects.

Intensive water quality sampling occurs throughout the year at all WPLMN sites. Between 27 and 35 mid-stream grab samples were collected per year at the Chippewa River on State Highway 40 near Milan, Minnesota focusing the sampling frequency greatest during periods of moderate to high flow. Because correlations between concentration and flow exist for many of the monitored analytes, and because these relationships can shift between storms or with season, computation of accurate load estimates requires frequent sampling of all major run-off events. Low flow periods are also sampled and are well represented, but sampling frequency tends to be less as concentrations are generally more stable when compared to periods of elevated flow. Despite discharge related differences in sample collection frequency, this staggered approach to sampling generally results in samples being well distributed over the entire range of flows.

Annual water quality and daily average discharge data are coupled in the "Flux32," pollutant load model, originally developed by Dr. Bill Walker and recently upgraded by the U.S. Army Corp of Engineers and the MPCA. Flux32 allows the user to create seasonal or discharge constrained concentration/flow regression equations to estimate pollutant concentrations and loads on days when samples were not collected. Primary output include annual and daily pollutant loads and flow weighted mean concentrations (pollutant load/total flow volume). Loads and flow weighted mean oncentrations are calculated for total suspended solids (TSS), total phosphorus (TP), dissolved orthophosphate (DOP), and nitrate plus nitrite nitrogen (nitrate-N).

Stream water sampling

Seventeen water chemistry stations were sampled from May thru September in 2009, and again June thru August of 2010, to provide sufficient water chemistry data to assess all components of the Aquatic Life and Recreation Use Standards in the 11 HUC subwatersheds (green circles in Figure 7). A Surface Water Assessment Grant (SWAG) was awarded to the Chippewa River Watershed Project to complete the monitoring. Following the IWM design, sampling locations were established near the outlets of the intermediate HUC-11 watersheds. The Chippewa River Watershed project has actively sampled the watershed and as such has compiled an extensive data set; the additional data collected for this project filled in existing data gaps needed for a complete watershed assessment. See Appendix 1 for definitions of stream chemistry analytes monitored in this study.

Stream biological sampling

The biological monitoring component of the intensive watershed monitoring in the Chippewa River Watershed was completed during the summer of 2009. A total of 80 sites were established across the watershed and sampled. These sites were located near the outlet of most minor HUC-11 and HUC-14 watersheds, following the sampling design. While data from the last 10 years contributed to the watershed assessments, the majority of data utilized for the 2010 assessment was collected in 2009. A total of 134 AUIDs were sampled for biology and/or water chemistry in the Chippewa River Watershed. Waterbody assessments to determine aquatic life use support were conducted for 27 AUIDs. Waterbody assessments were not conducted for 89 AUID's because criteria for channelized AUIDs do not allow for their assessment. Nonetheless, the biological information that was not used in the assessment process will be crucial to the stressor identification process and will also be used as a basis for long term trend results in subsequent reporting cycles. Therefore, they were qualitatively evaluated as good-fair-poor in later sections of this report. To measure the health of the biological communities at each biological monitoring station an Index of Biological Integrity (IBI) was used, specifically the Fish Index of Biological Integrity (F-IBI) and the Macroinvertebrate Index of Biological Integrity (M-IBI). A fish and macroinvertebrate classification framework was developed to account for natural variation in community structure. For both the F-IBI and the M-IBI, Minnesota's streams and rivers were divided into

seven distinct classes, with each class having its own unique IBI. The classification factors used to produce the seven classes were drainage area, gradient, water temperature and geographic region of the state. Fish and macroinvertebrate communities occurring at sites within each class are more similar to each other than those occurring in other classes. These classification factors are unaffected by human disturbance to ensure that the framework reflects natural variability and that the resulting IBIs reflect human-induced impacts to the waterbody. IBI development was stratified by class, with a unique suite of metrics, scoring functions, impairment thresholds, and confidence intervals identified for each. IBI scores higher than the impairment threshold indicate that the stream reach supports its aquatic life use; contrarily scores below the impairment threshold indicate that the stream reach does not support its aquatic life use. Confidence limits around the impairment threshold help to ascertain where additional information may be considered to help inform the impairment decision. When IBI scores fall within the confidence interval, interpretation and assessment of waterbody condition involves consideration of potential stressors, and draws upon additional water chemistry, physical habitat, and land use information. For individual biological monitoring station IBI scores, thresholds and confidence intervals for all biological monitoring sites within the watershed refer to Appendix 6.1.

Fish contaminants

Mercury and polychlorinated biphenyls (PCBs) were analyzed in fish tissue samples collected from the Chippewa River and 20 lakes in the watershed. Fish from the Chippewa River were collected in 2009 by the MPCA biomonitoring staff and in 1998 by MDNR Fisheries staff. The MDNR Fisheries staff also collected fish from the lakes.

Captured fish were wrapped in aluminum foil and frozen until they were thawed, scaled (or skinned), filleted, and ground to a homogenized tissue sample. Homogenized fillets were placed in 125 mL glass jars with Teflon™ lids and frozen until thawed for lab analysis. The Minnesota Department of Agriculture Laboratory performed all mercury and PCBs analyses of fish tissue.

The MPCA has included waters impaired for mercury in fish on the 303d Impaired Waters List since 1998. Impairment assessment for PCBs in fish tissue is based on the fish consumption advisories prepared by the Minnesota Department of Health (MDH). If the consumption advice is to restrict consumption of a particular fish species to less than a meal per week because of PCBs, the MPCA considers the lake or river impaired. The threshold concentration for impairment (consumption advice of one meal per month) is 0.22 mg/Kg for PCBs.

Prior to 2006, mercury fish tissue concentrations were assessed for water quality impairment based on the MDH's fish consumption advisory. Since 2006, a waterbody has been classified as impaired for mercury in fish tissue if 10 percent of the fish samples (measured as the 90^{th} percentile) exceeded 0.2 mg/Kg of mercury, which is one of Minnesota's water quality standards for mercury. At least five fish samples are required per species to make this assessment and only the last 10 years of data are used for statistical analysis. MPCA's Impaired Waters Inventory includes waterways that were assessed as impaired prior to 2006, as well as more recently.

In the 1970s and 1980s, PCBs were the primary contaminant of concern in fish tissue. PCBs in fish have not been monitored as intensively as mercury in the last three decades. High concentrations of PCBs were only a concern downstream of large urban areas in large rivers, such as the Mississippi River, and in Lake Superior. Consequently, it was not necessary to continue widespread frequent monitoring of smaller river systems, as is done with mercury. Limited monitoring of PCBs has continued in watershed monitoring. The two largest fish of the fish species collected at the watershed outlet point were analyzed for PCBs.

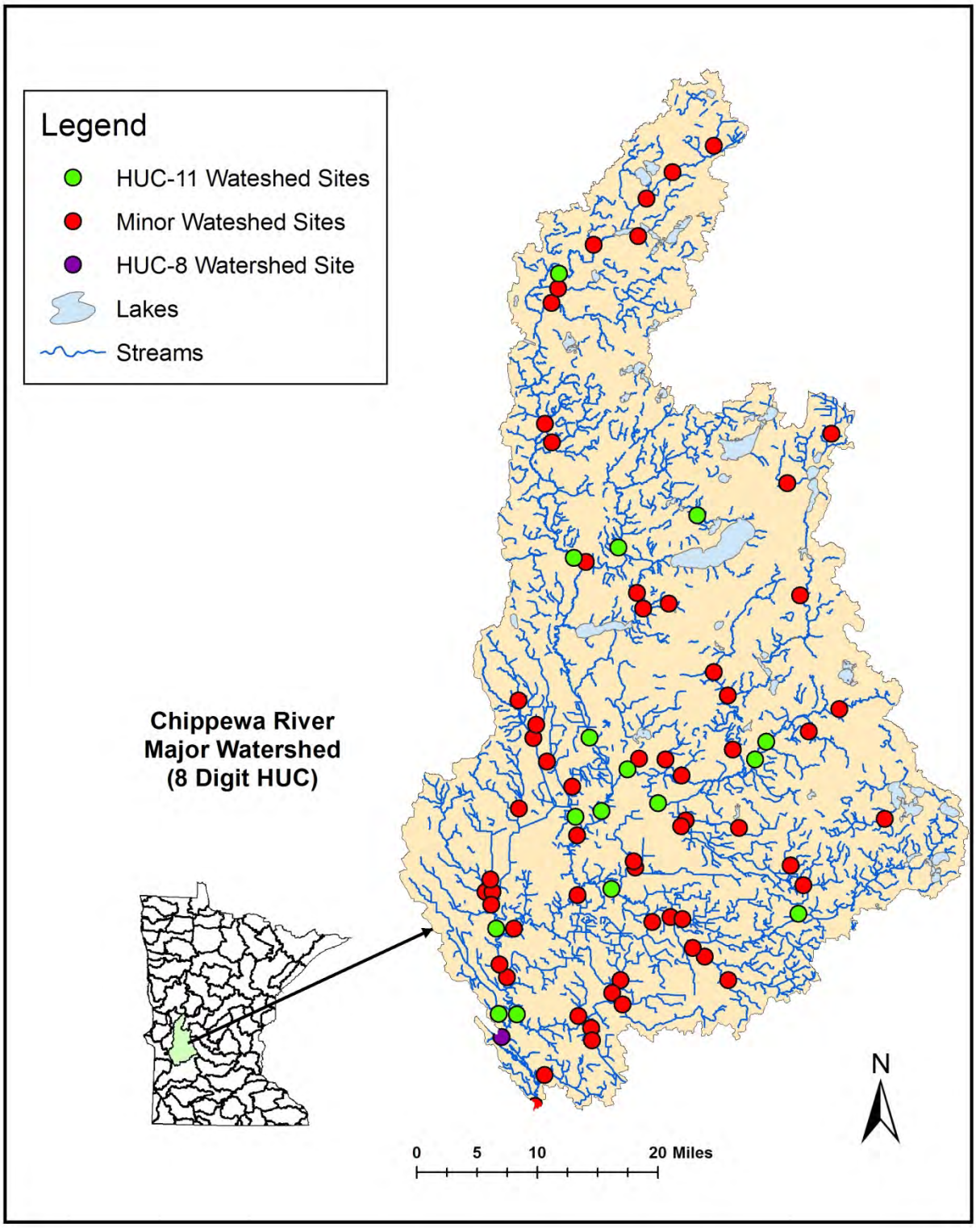

Figure 7. Intensive watershed monitoring stations in the Chippewa River Watershed

Lake water sampling

Lakes were not targeted during the Intensive Watershed Monitoring efforts that took place in 2009. However, extensive monitoring of lakes has occurred in the Chippewa River watershed in the past. Lake water chemistry and Secchi data used in this report was taken from the MPCA's EQUIS database. This data was collected by both MPCA staff and local partners including: MPCA and Citzens Lake Monitoring Program (CLMP) volunteers.

Volunteers enrolled in the MPCA's CLMP have completed a majority of the lake monitoring within the watershed. Sampling methods are similar among monitoring groups and are described in the document entitled "MPCA Standard Operating Procedure for Lake Water Quality" found at: http://www.pca.state.mn.us/publications/wq-s1-16.pdf. The lake water quality assessment standard requires eight observations/samples within a 10-year period for Phosphorus, chlorophyll-a and secchi depth.

V. Individual watershed results

HUC-11 watershed units

Assessment results are presented for each HUC-11 watershed unit within the Chippewa River Watershed, enabling the assessment of all surface waters at one time and the ability to develop comprehensive TMDL studies on a watershed wide basis, rather than the reach by reach and parameter by parameter approach that has been historically employed. This scale provides a robust assessment of water quality condition in the 11-digit watershed unit and is a practical size for the development and implementation of effective TMDLs and protection strategies. The primary objective of this monitoring strategy is to portray all the impairments within a watershed resulting from the complex and multi-step assessment and listing process. The graphics presented for each of the HUC-11 watershed units contain the assessment results from the most recent 2010 assessment cycle, as well as any impairment listings carried forward from previous assessment cycles. Discussion of assessment results will focus primarily on the 2009 intensive watershed monitoring effort but will also consider all available data from the last 10 years. Given all of the potential sources of data and differing assessment methodologies for assessing indicators and designated uses, it is not feasible to provide results or summary tables for every monitoring station by parameter. However, in the proceeding pages an individual account of each HUC-11 subwatershed is provided. Within each account, readers are given a brief description of the subwatershed, a stream assessment table where an overall assessment result is provided for each AUID by each assessable parameter and designated use (i.e. aquatic life and aquatic recreation), a non assessed channelized AUID table describing the quality of these AUIDs, a stream habitat results table, a outlet water chemistry results table, a table describing lake water chemistry, and a narrative summary relating the unique components of the assessment and highlighting interesting.

Stream assessment

This table provides a summary of all assessable AUIDs by parameter within the watershed (where sufficient information was available to make an assessment). The tables denote the use support status of each individual water chemistry and biological parameter, as well as an overall use support assessment for aquatic life and aquatic recreation for each assessable AUID. The assessment for aquatic life is derived from analyzing biological data, DO, turbidity, chloride, pH and NH3 to determine use status, while the assessment for aquatic recreation in streams is solely based on E. coli concentrations.

Immediately following the AUID specific use support results, the location of any assessed biological monitoring sites are listed. Water chemistry station locations are not provided because information collected at specific locations within each AUID are combined for the purposes of conducting waterbody assessments. Some AUIDs within the subwatershed do not have sufficient information for assessment

and are not included in this table. Following the stream assessment table is a table describing a narrative biological condition of stations that could not be assessed due to their occurrence on channelized AUIDs, and is not an assessment for aquatic life for these systems. For more information regarding chemistry parameters monitored in these studies refer to Appendix 1. A complete listing of all AUIDs within the watershed may be found in Appendix 4.

Channelized stream assessment

Ratings of "Good" for channelized streams are based on Minnesota's general use threshold for aquatic life. Stations with IBIs that score above this general use threshold would be given a rating of "Good". The "Fair" rating is calculated as a 15 point drop from the general use threshold. Stations with IBI scores below the general use threshold, but above the "Fair" threshold would be given a rating of "Fair". Stations scoring below the Fair threshold would be considered "Poor". For more information regarding channelized stream parameters refer to Appendix 5.1.

Stream habitat results

These tables convey the results of the Minnesota Stream Habitat Assessment (MSHA) surveys that are conducted during each fish sampling visit. The MSHA provides information on available fish habitat, land use and buffers along the immediate site reach, providing clues for impacts such as siltation or eutrophication which may lead to unhealthy fish and macroinvertebrate communities. The MSHA score is comprised of numerous scoring categories including land use, riparian zone, instream zone (substrate, embeddedness, cover types and amounts) and channel morphology (depth variability, sinuosity, stability, channel development, velocity), which are summed for a total possible score of 100 points. Total scores for each category and a summation of the total MSHA score are included with a narrative rating of good, fair or poor, indicating the overall condition of the station. Where multiple visits occur at the same station, the scores from each visit have been averaged. The final row in each table displays average MSHA scores for each scoring category for that particular subwatershed.

Outlet water chemistry results

These summary tables display the water chemistry results for the intensive watershed station representing the outlet of the HUC-11 watershed. This data along with other data collected within the 10 year assessment window can provide valuable insight on water quality characteristics and potential parameters of concern within the watershed, and includes those parameters most closely related to the standards or expectations used for determining the assessments (i.e. supporting aquatic life and aquatic recreational use). While not all of the water chemistry parameters of interest have developed water quality standards, McCollor and Heiskary (1993) developed ecoregion expectations for a number of water quality parameters in streams that provide a good basis for evaluating water quality data and estimating attainable water quality for an ecoregion. For comparative purposes, water chemistry results or the Chippewa River Watershed are compared to expectations developed by McCollor and Heiskary 1993) that were based on the 75th percentile of a long term dataset of least impacted streams.

Lake water chemistry

These summary tables display lake water chemistry results for all lakes where assessment quality data is present. Basic morphometry data, trophic status, trophic status indicators, trend data (based on volunteer monitoring statistics) and the assessment status is provided where available.

Upper West Branch Chippewa River Watershed unit HUC 07020005010

The Upper West Branch Chippewa River Watershed unit encompasses parts of Ottertail, Douglas, and Grant Counties and has a drainage area of 95.9 square miles, and is the most northern watershed in the Chippewa basin. The entire watershed falls in the North Central Hardwoods Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 8), but this HUC-11 is one of the most lake rich watersheds in the basin. The Upper West Branch Chippewa River HUC-11 flows southwest. The outlet of this watershed unit is represented by site 09MN005 on the Chippewa River.

Table 1. Aquatic life and recreation assessments on stream reaches n the Upper West Branch Chippewa River Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-503, Chippewa River, *Stowe Lk to Little Chippewa R*	71	2B	09MN005	Upstream of CR 25, 7.5 mi. W of Brandon	MTS	EXP	IF	EXS	MTS	MTS	MTS	- -	EX	NS	NS
07020005-536, Unnamed creek, *Unnamed lk through Devils Lk to Little Chippewa Lk*	3	2B	- -	- -	- -	- -	- -	NA	- -	- -	- -	- -	- -	IF	NA
07020005-541, Unnamed creek, *Fanny Lk to Chippewa R*	2	2B	09MN071	Upstream of CR 55, 2 mi. S of Evansville	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-581, Hoplin Creek, *Little Chippewa Lk to Stowe Lk*	1	2B	09MN017	Downstream of CR 16, 2 mi. N of Brandon	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-665, Unnamed creek, *Headwaters to CD 60*	5	2B	09MN067	Downstream of Ost Rd NW, 7 mi. SW of Parkers Prairie	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-666, Unnamed creek, *Unnamed lk (21-0295-00) to Chippewa R*	3	2B	09MN030	Downstream of CR 25, 8.5 mi SW of Brandon	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).
Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support
Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.
*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.
†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 2. Biological sampling of channelized stream reaches for Upper West Branch Chippewa River Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-541, Unnamed creek, *Fanny Lk to Chippewa R*	09MN071	Upstream of CR 55, 2 mi. S of Evansville	poor	poor
07020005-581, Hoplin Creek, *Little Chippewa Lk to Stowe Lk*	09MN017	Downstream of CR 16, 2 mi. N of Brandon	good	good
07020005-665, Unnamed creek, *Headwaters to CD 60*	09MN067	Downstream of Ost Rd NW, 7 mi. SW of Parkers Prairie	good	--
07020005-666, Unnamed creek, *Unnamed lk (21-0295-00) to Chippewa R*	09MN030	Downstream of CR 25, 8.5 mi SW of Brandon	poor	--
07020005-539, County Ditch 60 (Chippewa River), *T130 R39W S14, east line to Upper Hunt Lk*	09MN016	Upstream of CR 5, 5 mi. NE of Evansville	good	fair
07020005-539, County Ditch 60 (Chippewa River), *T130 R39W S14, east line to Upper Hunt Lk*	09MN051	Upstream of CR 60 NW, 0.5 mi. E of Millerville	good	good

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 3. Minnesota Stream Habitat Assessment (MSHA) results for the Upper West Branch Chippewa River HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
2	09MN005	Chippewa River	0	11	4	21.7	13.5	78.2	good
1	09MN016	County Ditch 60	0	8	12	7	13	40	poor
1	09MN017	Hoplin Creek	0	10.5	9	12	11	42.5	poor
1	09MN030	Trib. to Chippewa River	0	14	19.2	14	28	75.2	good
1	09MN051	County Ditch 60	0	11.5	16	5	13	45.5	fair
1	09MN067	Unnamed ditch	0	13	10.6	11	25	59.6	fair
1	09MN071	Unnamed creek	0	10.5	9	14	13	46.5	fair
Average Habitat Results: *Upper West Branch Chippewa River Watershed Unit*			0	11.2	14.9	11.3	20.9	58.2	fair

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 4. Outlet water chemistry results **for Upper West Branch Chippewa River Watershed

Station Location:	Chippewa River upstream of CR 25, 7.5 miles W of Brandon							
Storet ID:	S005-630							
Station #:	09MN005							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	15	15.0	490.0	153.3	79.4	1260	0
Ammonia-nitrogen	mg/l	10	0.02	10.00	0.99	0.08		
Inorganic nitrogen (nitrate and nitrite)	mg/l	0						
Kjeldahl nitrogen	mg/l	10	1.10	10.00	2.20	1.30		
Phosphorus	ug/l	10	10	232	102	111		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	10	51	20	18		
Total volatile solids	mg/l	10	2	14	5	5		
Hardness, carbonate	mg/l	9	9	257	210	226		
Chloride	mg/l	10	10	26	18	19	230	0
Sulfate	mg/l	10	10	34	28	30		
Specific conductance	uS/cm	19	19	531	450	469		
pH	--	17	7.58	8.4	8.02	8.07	6.5-9	0
Dissolved oxygen (DO)	mg/l	19	5.10	19.00	7.58	7.04	5	0
Temperature, water	deg C	19	14.8	25.7	20.3	19.6		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	19	14	72	38	33		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Upper West Branch Chippewa River HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

Table 5. Lake Morphometric and assessment data for Upper West Branch Chippewa River Watershed

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
21-0125-00	Private	DOUGLAS	7020005010	NCHF	41.7	16.8	1.8	1405.2	56	IF
21-0136-00	Indian	DOUGLAS	7020005010	NCHF	33.6	10.7	3.2	514.1	60	IF
21-0145-00	Chippewa	DOUGLAS	7020005010	NCHF	712.7	29.3	6.0	4971.1	43	FS
21-0212-00	Little Chippewa	DOUGLAS	7020005010	NCHF	114.1	7.6	3.9	8961.9	100	FS
21-0213-00	Devils	DOUGLAS	7020005010	NCHF	90.2	7.6	3.3	5196.2	100	IF
21-0216-00	Whiskey	DOUGLAS	7020005010	NCHF	61.5	14.0	5.6	696.3	47	FS
21-0242-00	Aaron	DOUGLAS	7020005010	NCHF	259.0	4.9	2.7	1692.8	77	FS
21-0245-00	Moses	DOUGLAS	7020005010	NCHF	346.4	9.8	5.2	2174.8	49	FS
21-0264-00	Stowe	DOUGLAS	7020005010	NCHF	215.7	4.3	2.3	29792.4	100	IF
21-0323-00	Jennie	DOUGLAS	7020005010	NGP	127.9	2.1	0.6	712.0	100	NS
21-0336-00	Fanny	DOUGLAS	7020005010	NCHF	14.2	1.1	0.8	2778.2	100	IF
21-0343-00	Long	DOUGLAS	7020005010	NCHF	83.0	5.5	*1.8	36941.2	100	NS
26-0020-00	Thompson	GRANT	7020005010	NGP	60.3	6.7	4.1	394.6	47	NS
56-0079-00	Block	OTTER TAIL	7020005010	NCHF	121.8	7.0	3.9	861.1	50	NS

* Estimated mean depth

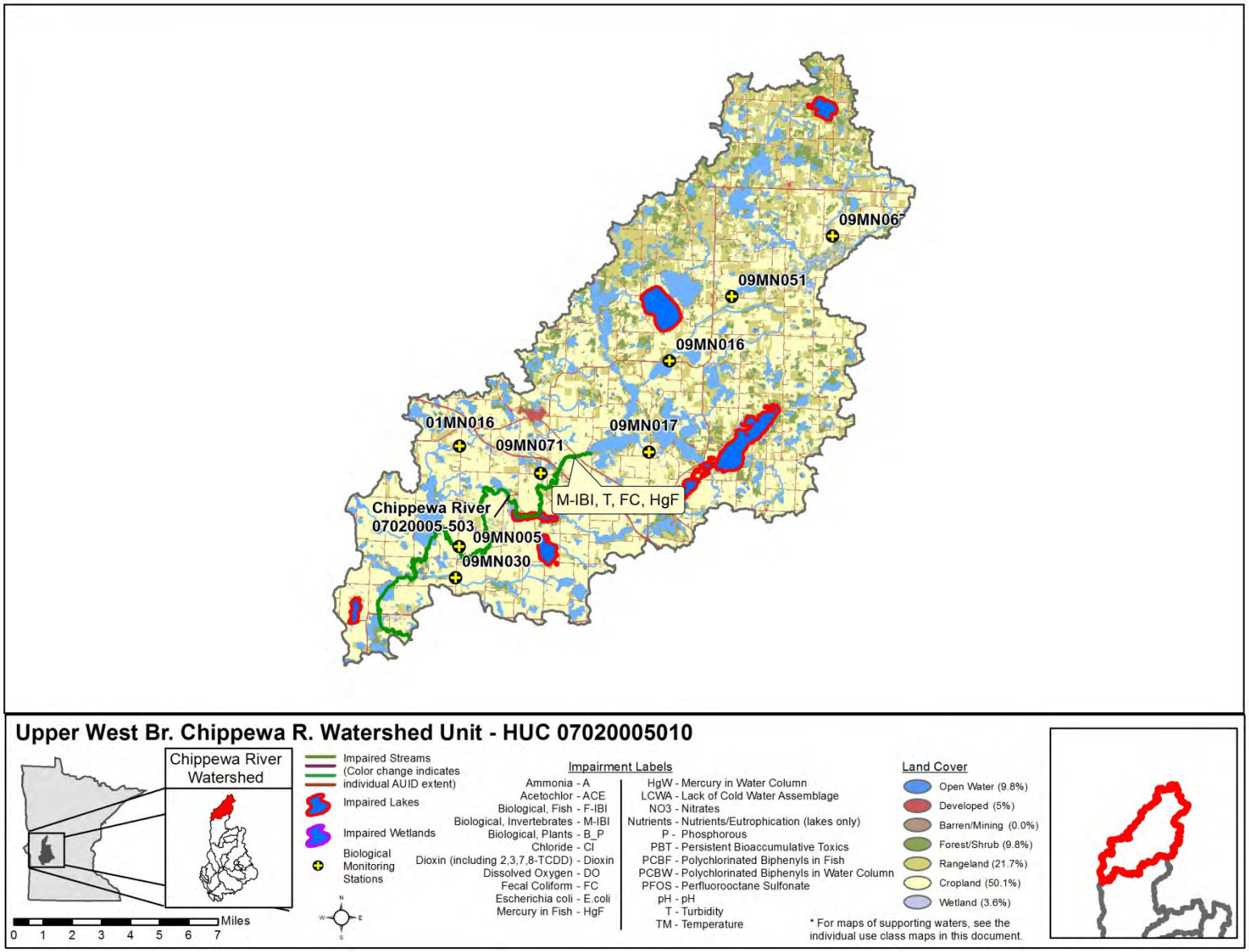

Figure8. Land use and currently listed impaired streams by parameter, in the Upper West Branch Chippewa River Watershed unit

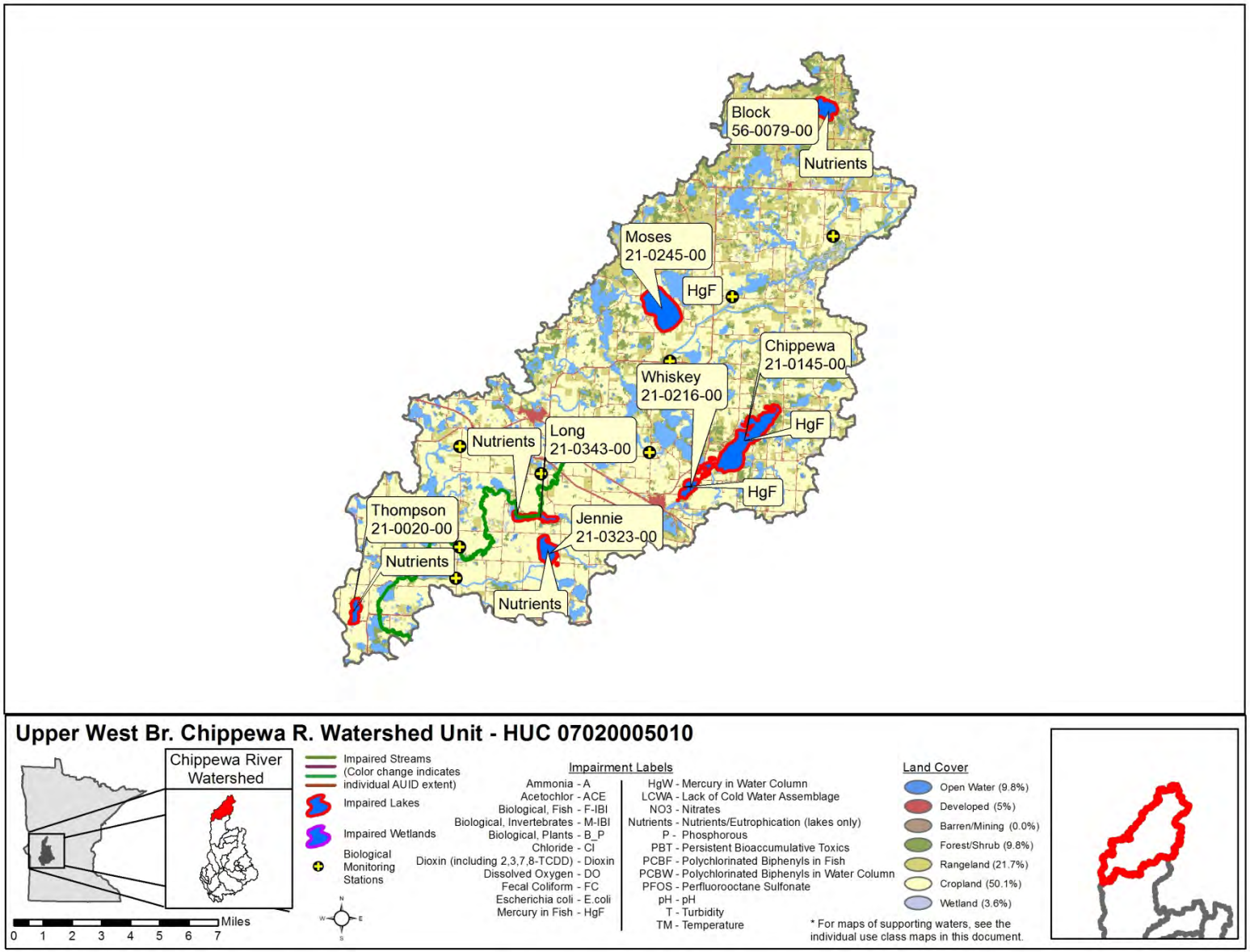

Figure 9. Land use and currently listed impaired lakes by parameter, in the Upper West Branch Chippewa River Watershed unit

Summary

Stream biological assessment results

The headwaters of the Chippewa River are predominately channelized. Only one of five AUIDs was assessed for biology because of channelization. It is listed for aquatic life because of a low macroinvertebrate score. The biological condition of the channelized reaches scored fairly well, but two sites near the downstream end of the watershed had low biological scores. This could be due to the lack of habitat from the abundance of channelized streams. Dissolved Oxygen (DO) was not found to be impaired, but there was a high reading of 19 mg/l which during the night may drop to below the five mg/l contributing to low fish and invertebrate IBI scores. There is also a previous listing for turbidity which may also be a contributing factor to low IBI scores.

Stream water chemistry/bacteria assessment results

Stream water quality data was available on one reach of the Chippewa River downstream of Stowe Lake. This AUID is approximately 70 miles long and extends into the Middle West Branch Chippewa River watershed unit. The Chippewa River exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The same reach is considered impaired for aquatic life use based on excess turbidity. Methodology for streams was not appropriate for assessment upstream of Stowe Lake because of close proximity and water chemistry influences from upstream lakes. DO ranged up to 19 mg/l indicating that it could be low in the early morning. A recording DO sondes should be placed at this site during August to ensure DO is not impaired.

Lake water chemistry assessment results

Fourteen of the 70 lakes greater than four hectares (10 acres) were reviewed for aquatic recreation use in the watershed (Appendix 8). Lakes in this watershed are a mixture of deep and shallow basins, most of which consist of the head waters forming the Chippewa River. Most lakes in the northern portion of the watershed- Chippewa, Little Chippewa, Whisky, Aaron, and Moses are fully supporting for aquatic recreation use. Block Lake is an exception, located at the northern most point in the watershed, and is listed as impaired for aquatic recreation use (excess nutrients). In addition three other lakes, Jennie, Long, and Thompson were also found to be impaired for aquatic recreation use (excess nutrients). A transition in land use is evident with the northern portion of the watershed comprised of a mixture of forest, rangeland, and cropland. The southern portion of the watershed is dominated by cropland. Five other lakes, Unnamed (21-0125), Indian, Devils, Stowe, and Fanny had some water quality information available but the data sets were not strong enough for an assessment decision to be made.

Middle West Branch Chippewa River Watershed unit HUC 07020005020

The Middle West Branch Chippewa River Watershed unit encompasses parts of Grant, Douglas, Stevens, and Pope Counties and has a drainage area of 240.4 square miles. The western edge of the HUC-11 is in the Northern Glaciated Plains Ecoregion whiles the majority of the watershed falls in the North Central Hardwoods Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 10), but this watershed has the most open water of any HUC-11 in the Chippewa basin. The Middle West Branch Chippewa River HUC-11 flows from the north to south to the town of Cyrus where it turns southeast and exits the HUC-11. The outlet of this watershed unit is represented by site 09MN013 on the Chippewa River.

Table 6. Aquatic life and recreation assessments on stream reach in the Middle West Branch Chippewa River Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-503, Chippewa River, *Stowe Lk to Little Chippewa R*	71	2B	09MN013 09MN070	Downstream of 210th St, 3 mi. SE of Cyrus Downstream of Pope Douglas Rd SW, 4 mi. SW of Kensington	MTS	EXP	IF	EXS	MTS	MTS	MTS	- -	EX	NS	NS
07020005-543, Unnamed creek, *Unnamed lk (21-0288-00) to Chippewa R*	8	2B	09MN031	Upstream of 115th St, 8.5 mi. SE of Hoffman	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-633, Unnamed creek, *Holleque Lk to Lk Venus*	1	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	NA	NA
07020005-634, Unnamed creek, *Quam Lk to Lk Venus*	1	2B		- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	NA	NA
07020005-638, Unnamed creek, *Unnamed lk to Unnamed lk*	4	2B	09MN018	Downstream of CR 8, 10.5 mi. SW of Brandon	EXS	EXP	- -	- -	- -	- -	- -	- -	- -	NS	NA

07020005-901, Unnamed creek (Freeborn Lake Inlet), *Headwaters to Freeborn Lk*	0	2B	--	--	--	--	--	EXP	--	--	--	--	--	NS	NA
07020005-903, Unnamed creek, *Little Freeborn Lk to Freeborn Lk*	0	2B	--	--	--	--	--	EXP	--	--	--	--	--	NA	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. R. 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 7. Biological sampling of channelized stream reaches for Middle West Branch Chippewa River Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-503, Chippewa River, *Stowe Lk to Little Chippewa R*	09MN070	Downstream of Pope Douglas Rd SW, 4 mi. SW of Kensington	fair	fair

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 8. Minnesota Stream Habitat Assessment (MSHA) results for the Middle West Branch Chippewa River HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
2	09MN013	Chippewa River	1.25	9.5	20.5	15	34.5	80.7	poor
1	09MN018	Unnamed creek	3.5	12.5	19.9	10	16	61.9	fair
1	09MN031	Trib. to Chippewa River	0	12.5	4	10	11	37.5	poor
1	09MN070	Chippewa River	0	5	20.2	7	25	57.2	fair
Average Habitat Results: *Middle West Branch Chippewa River Watershed Unit*			1.2	9.8	17	11.4	24.2	63.6	fair

Qualitative habitat ratings

Good: MSHA score above the median of the least-disturbed sites (MSHA>66)

Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)

Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 9. Outlet water chemistry resultsfor Middle West Branch Chippewa River Watershed**

Station Location:	Chippewa River downstream of 210th St., 3 miles SE of Cyrus							
Storet ID:	S000-963							
Station #:	09MN013							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	15	0.0	440.0	167.1	142.1	1260	0
Ammonia-nitrogen	mg/l	10	0.00	0.12	0.05	0.05		
Inorganic nitrogen (nitrate and nitrite)	mg/l	10	0.00	0.46	0.16	0.16		
Kjeldahl nitrogen	mg/l	10	0.90	2.30	1.46	1.31		
Phosphorus	ug/l	10	33	293	153	132		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	5	138	55	42		
Total volatile solids	mg/l	10	0	27	11	8		
Hardness, carbonate	mg/l	9	305	396	333	323		
Chloride	mg/l	10	13	17	16	16	230	0
Sulfate	mg/l	10	45	720	142	76		
Specific conductance	uS/cm	34	487	764	580	580		
pH	--	30	7.5	8.48	8.07	8.12	6.5-9	0
Dissolved oxygen (DO)	mg/l	35	5.58	9.80	7.00	6.80	5	0
Temperature, water	deg C	35	15.6	27.0	21.7	21.7		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	42	8	60	17	13		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Middle West Branch Chippewa River HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

Table 10. Lake morphometric and assessment data for Middle West Branch Chippewa River Watershed

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
21-0156-01	LITTLE OSCAR (MAIN)	DOUGLAS	7020005020	NGP	68.0	6.1	1.3	599.3	100	FS
21-0162-00	Freeborn	DOUGLAS	7020005020	NGP	101.2	5.5	3.3	697.8	71	FS
21-0189-00	Gilbert	DOUGLAS	7020005020	NCHF	107.2	5.5	*1.8	726.1	100	NS
21-0257-02	South Oscar	DOUGLAS	7020005020	NGP	292.6	5.8	2.1	2292.4	100	FS
21-0291-00	Red Rock	DOUGLAS	7020005020	NGP	316.1	6.7	3.5	2331.8	56	NS
21-0305-00	Venus	DOUGLAS	7020005020	NGP	78.1	5.2	*1.7	13871.2	100	IF
26-0046-00	Lower Elk	GRANT	7020005020	NGP	46.5	4.0	2.6	604.4	100	IF
61-0183-00	Pike	POPE	7020005020	NGP	108.1	1.5	*1.0	1233.9	100	IF
61-0204-00	Wicklund	POPE	7020005020	NGP	59.9	1.5	*1.0	2514.3	100	NS
61-0211-00	Irgens	POPE	7020005020	NCHF	80.1	1.7	*1.0	5308.9	100	NS

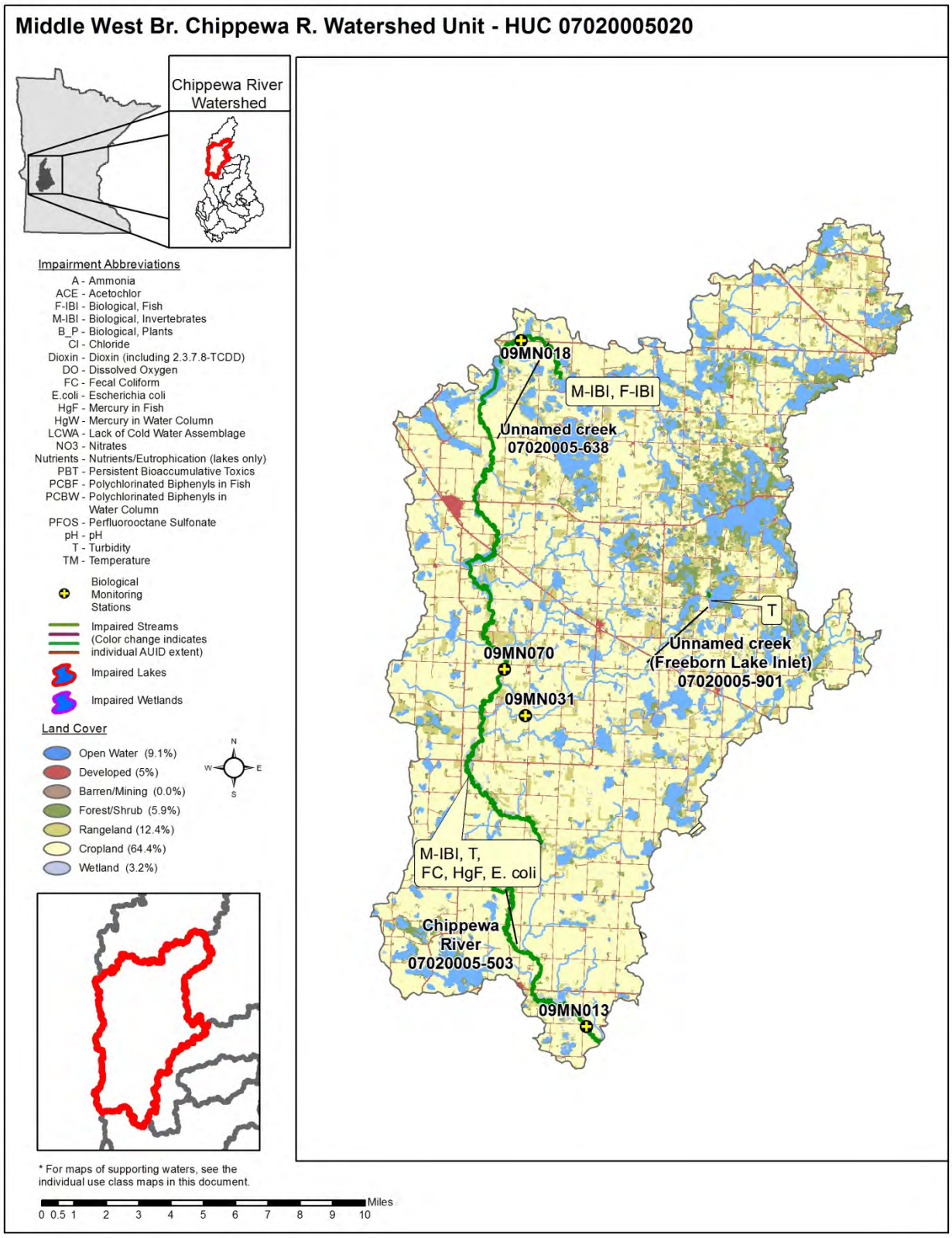

Figure 10. Land use and currently listed impaired streams by parameter, in the Middle West Branch Chippewa River Watershed unit

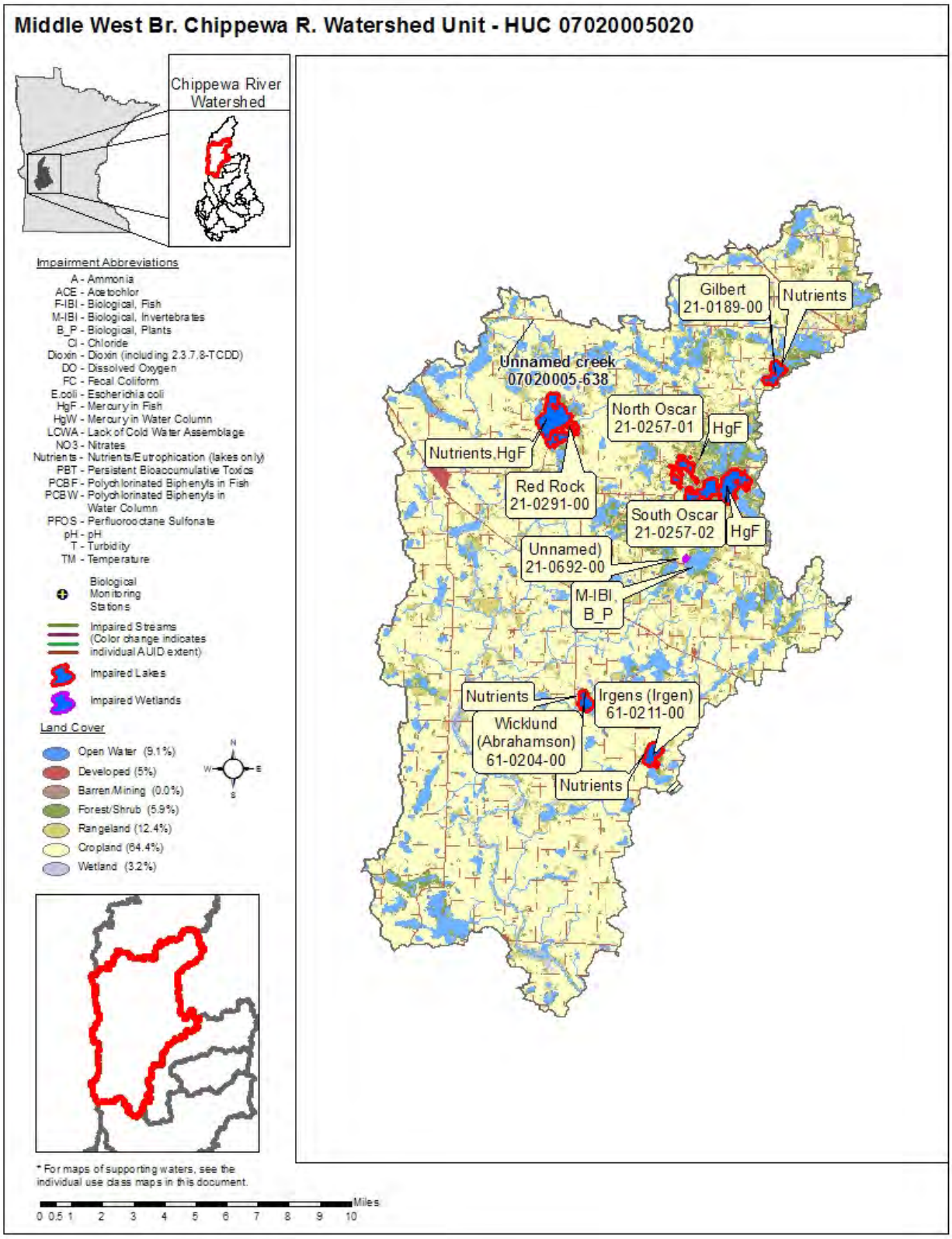

Figure 11. Land use and currently listed impaired lakes by parameter in the Middle West Branch Chippewa River Watershed unit

Summary

Stream biological assessment results

Both of the assessable AUIDs for biology in this watershed are not supporting for aquatic life. The channelized reach has a fair score for both fish and invertebrates. The entire main stem of the West Branch Chippewa is impaired for both fish and invertebrates. This is a continuation of the upstream HUC-11. The habitat may be a reason for the poor biological condition, with all of the habitat scores being fair to poor.

Stream water chemistry/bacteria assessment results

The Chippewa River AUID continues from the Upper West Branch Chippewa River Watershed unit through the Middle West Branch Chippewa River Watershed unit. Stream water chemistry data was collected at one site near the outlet of the Middle West Branch River Watershed unit. The reach remains impaired for aquatic recreation use due to elevated bacteria levels. The Chippewa River is also impaired for aquatic life based on excess turbidity.

Lake water chemistry assessment results

Ten of the 92 lakes greater than four hectares (10 acres) were reviewed for aquatic recreation use in the watershed (Appendix 8). Little Oscar, South Oscar, and Freeborn Lakes were all fully supporting for aquatic recreation use. These three lakes are all located on the eastern boundary of the watershed. The immediate lake watersheds are relatively small and are composed of a mixture of forest/shrub land and rangeland. Four lakes, Gilbert, Red Rock, Wicklund, and Irgens were found to be impaired for aquatic recreation use (excess nutrients). All of the impaired lakes except Gilbert have a large watershed area, which is likely a source of excess nutrient loading. Three other lakes, Venus, Lower Elk, and Pike had some water quality information available, but the data sets were not strong enough for an assessment decision to be made.

Little Chippewa River Watershed unit HUC 07020005030

The Little Chippewa River Watershed unit encompasses parts of Douglas and Pope Counties and has a drainage area of 89.5 square miles. The entire watershed is in the North Central Hardwoods Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 12). The Little Chippewa River HUC-11 flows southwest to near Erickson Lake where it turns south and just after County Road 28 flows east into the Outlet Creek HUC-11. This is not the natural outlet for the watershed before the area was channelized the Little Chippewa flowed west after County Road 28 to the Chippewa River. The outlet of this watershed unit is represented by site 09MN004 on the Little Chippewa River.

Table 11. Aquatic life and recreation assessment on stream reaches in the Little Chippewa River Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-531, Little Chippewa River, *Headwaters to Unnamed cr*	15	2B	07MN037	Upstream of 110th St, 5 mi. E of Farwell	--	--	--	--	--	--	--	--	--	NA	NA
07020005-713, Little Chippewa River, *Unnamed cr to CD 2*	14	2B	09MN004	Downstream of CR 28, 4.5 mi. W of Starbuck	EXS	EXP	IF	EXS	MTS	MTS	MTS	--	EX	NS	NS
07020005-714, Little Chippewa River, *Unnamed wetland (61-0527-00) to Chippewa R*	4	2B	03MN004	Upstream of C.R. 1, 7 mi. W. of Starbuck	EXS	EXS	--	MTS	--	--	--	--	--	NS	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 12. Biological sampling of channelized stream reaches for Little Chippewa River Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-531, Little Chippewa River, *Headwaters to Unnamed cr*	07MN037	Upstream of 110th St, 5 mi. E of Farwell	fair	fair

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 13. Minnesota Stream Habitat Assessment (MSHA) results for the Little Chippewa River 11-HUC

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
2	03MN004	Little Chippewa River	0	11.5	18.6	16.5	31	77.6	good
1	07MN037	Unnamed ditch	0	11.5	10.3	11	22	54.8	fair
1	09MN004	Little Chippewa River	0	5	12.5	11	23	51.5	fair
Average Habitat Results: *Little Chippewa River Watershed unit*			0	9.875	15	13.75	26.75	65.375	fair

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 14. Outlet water chemistry resultsfor Little Chippewa River Watershed**

Station Location:	**Little Chippewa River** downstream of CR 28, 4.5 miles W of Starbuck
Storet ID:	S004-705
Station #:	09MN004

Parameter	Units	# of Samples	Minimum	Maximum	Mean	Median	WQ Standard	# WQ Exceedances
Escherichia coli	MPN/100ml	20	0.0	1600.0	605.7	648.8	1260	1
Ammonia-nitrogen	mg/l	10	0.00	0.09	0.04	0.04		
Inorganic nitrogen (nitrate and nitrite)	mg/l	22	0.00	2.70	0.66	0.31		
Kjeldahl nitrogen	mg/l	10	0.50	1.85	1.11	1.10		
Phosphorus	ug/l	22	45	400	135	100		
Orthophosphate	ug/l	16	4	179	72	58		
Total suspended solids	mg/l	22	6	76	23	20		
Total volatile solids	mg/l	14	1	14	5	4		
Hardness, carbonate	mg/l	9	358	622	470	481		
Chloride	mg/l	10	9	17	13	14	230	0
Sulfate	mg/l	10	92	339	190	160		

Specific conductance	uS/cm	36	579	1147	763	705		
pH	--	32	6.75	8.33	7.97	8.08	6.5-9	0
Dissolved oxygen (DO)	mg/l	46	6.15	21.00	8.74	7.89	5	0
Temperature, water	deg C	45	0.4	25.4	17.6	18.7		
Turbidity	NTU	14	5.4	60.0	17.3	12.0	25 NTU	2
Transparency, tube 60	cm	46	0	70	31	30		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Little Chippewa River HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

Table 15. Lake morphometric and assessment data for Little Chippewa River Watershed

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
21-0079-00	Maple	DOUGLAS	7020005030	NCHF	350.9	23.8	6.8	5913.9	48	FS
21-0090-00	Turtle	DOUGLAS	7020005030	NCHF	108.9	5.8	2.0	6335.0	83	FS
61-0078-00	Reno	POPE	7020005030	NCHF	1545.1	7.0	3.4	3648.4	35	NS
61-0164-00	Jorgenson	POPE	7020005030	NCHF	48.2	4.9	*1.0	429.9	100	NS
61-0199-00	McIver	POPE	7020005030	NGP	63.1	4.9	*1.0	948.9	100	NS

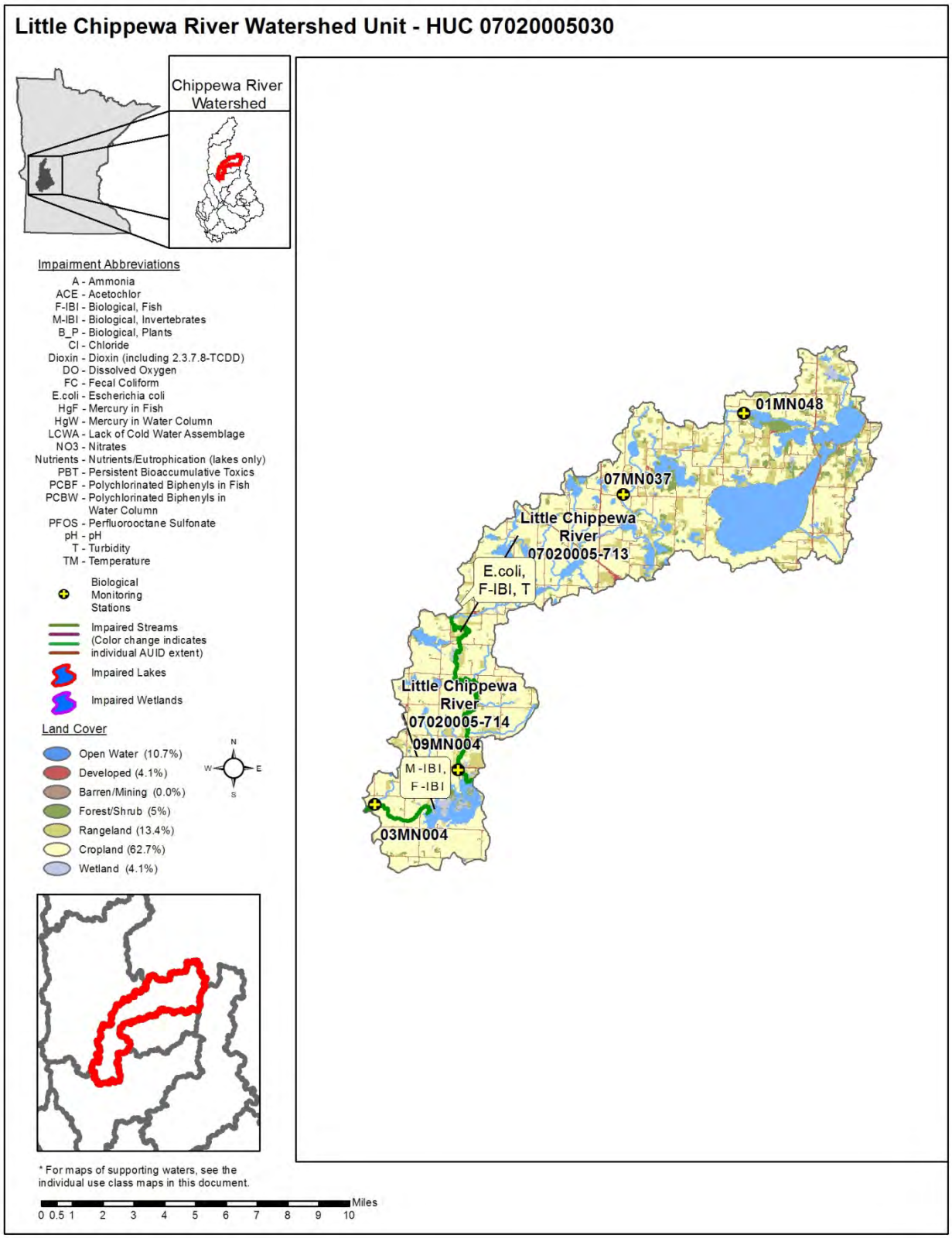

Figure 12. Land use and currently listed impaired streams by parameter, in the Little Chippewa River Watershed unit

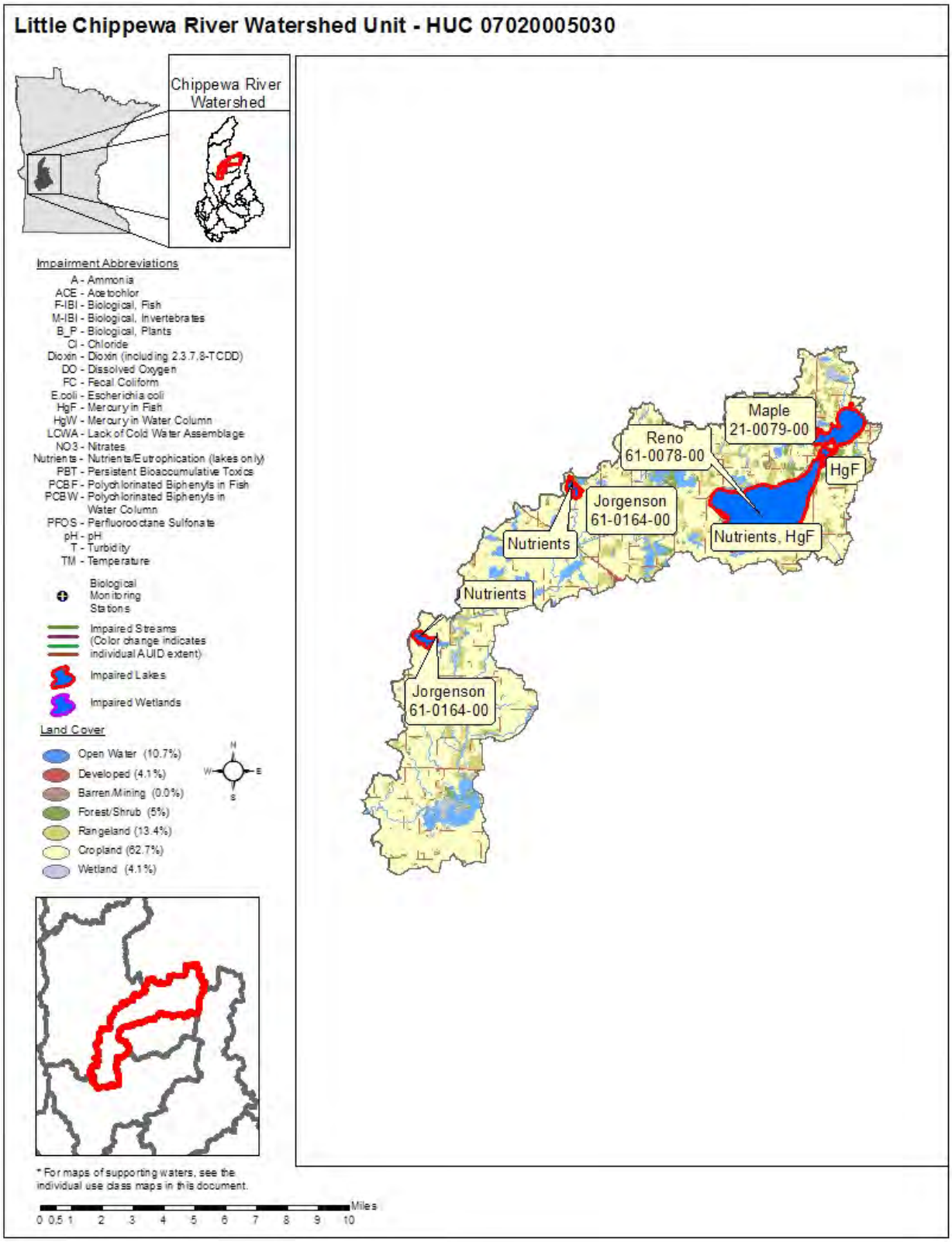

Figure 13. Land use and currently listed impaired lakes by parameter in the Little Chippewa River Watershed unit

Summary

Stream biological assessment results

Both assessed AUIDs in this watershed are not supporting of aquatic life. Both of the sites are at the downstream end of the watershed. The biological condition of the channelized reach is fair. The habitat for the three biological sites is fair to good and does not seem to be the issue in this watershed. One possible cause of the impairments in the lower downstream section of the watershed may be the impaired lakes in the upper part of the watershed.

Stream water chemistry assessment results

Stream water quality data was available on one reach of the Little Chippewa River and was found to be impaired. The impaired reach begins at the confluence of an unnamed stream flowing from the outlet of Erickson Lake and ends at White Bear Lake. The Little Chippewa River exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The same reach is considered impaired for aquatic life use based on excess turbidity. Dissolved Oxygen (DO) in the daytime ranged up to 21 mg/l indicating that it could be low in the early morning. A recording DO sondes should be placed at this site during August to ensure DO is not impaired.

Lake water chemistry assessment results

Five of the twenty lakes greater than four hectares (10 acres) were reviewed for aquatic recreation use in the watershed (Appendix 8). Turtle and Maple Lakes were both fully supporting of aquatic recreation use. These two lakes are all located in the headwaters of the watershed and drain into Reno Lake. Three lakes, Reno, Jorgenson, and McIver were found to be impaired for aquatic recreation use (excess nutrients). Both Jorgenson and McIver are shallow lakes with relatively small watersheds. Reductions in overland run-off and management of internal loading of phosphorus in shallow lakes will need to be addressed to see water quality improvements in these basins.

Trappers Run Creek Watershed unit HUC 07020005040

Trappers Run Creek Watershed unit is completely in Pope County and has a drainage area of 47.7 square miles. The watershed is in the North Central Hardwoods Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 14). Trappers Run Creek flows southeast from near the city of Lowry to Pelican Lake then into Lake Minnewaska in Long Beach. The outlet of this watershed unit is represented by site 09MN007 on Trappers Run Creek.

Table 16. Aquatic life and recreation assessments on stream reach in the Trappers Run Creek Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators: Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides	Bacteria	Aquatic Life	Aquatic Rec.
07020005-628, Trapper Run Creek, *Strandness Lk to Pelican Lk*	5	2B	09MN007	Upstream of 270th Ave, 3 mi. W of Long Beach	EXS	EXP	--	MTS	--	--	--	--	EX	NS	NS
07020005-630, Trapper Run Creek, *Pelican Lk to Shallow Pond*	0	2B	--	--	--	--	--	MTS	--	--	--	--	--	NA	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 17. Minnesota Stream Habitat Assessment (MSHA) results for the Trappers Run Creek HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	09MN007	Trapper Run Creek	2.5	14.5	12.9	7	21	57.9	fair
Average Habitat Results: *Trappers Run Creek Watershed Unit*			2.5	14.5	12.9	7	21	57.9	fair

Qualitative habitat ratings

Good: MSHA score above the median of the least-disturbed sites (MSHA>66)

Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)

Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 18. Outlet water chemistry resultsfor Trappers Run Creek Watershed**

Station Location:	Trappers Run Creek upstream of 270th Ave., 3 miles W of Long Beach							
Storet ID:	S005-631							
Station #:	09MN007							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	15	0.0	770.1	255.5	218.7	1260	0
Ammonia-nitrogen	mg/l	10	0.02	0.10	0.06	0.05		
Inorganic nitrogen (nitrate and nitrite)	mg/l	0						
Kjeldahl nitrogen	mg/l	10	1.10	4.20	1.64	1.38		
Phosphorus	ug/l	10	65	148	93	92		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	3	11	7	6		
Total volatile solids	mg/l	10	2	3	2	2		
Hardness, carbonate	mg/l	9	259	406	340	345		
Chloride	mg/l	10	19	27	24	25	230	0
Sulfate	mg/l	10	92	161	124	122		
Specific conductance	uS/cm	19	550	803	660	651		
pH	--	17	7.24	8.15	7.84	7.86	6.5-9	0
Dissolved oxygen (DO)	mg/l	19	3.63	9.98	6.89	7.18	5	5
Temperature, water	deg C	19	15.7	26.4	20.1	19.8		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	19	26	73	56	60		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Trappers Run Creek HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

Table 19. Lake morphometric and assessment data for Trappers Run Creek Watershed

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
61-0111-00	Pelican	POPE	7020005040	NCHF	208.8	10.4	2.7	10685.4	80	NS
61-0122-00	Ann	POPE	7020005040	NCHF	150.5	4.3	3.2	2130.6	100	NS
61-0123-00	John	POPE	7020005040	NCHF	48.2	2.1	1.2	2548.2	100	NS
61-0128-00	Strandness	POPE	7020005040	NCHF	36.0	1.5	*1.0	7338.8	100	NS
61-0156-00	Wallin	POPE	7020005040	NCHF	60.3	1.5	*1.0	812.4	100	IF
61-0162-00	Malmedal	POPE	7020005040	NCHF	74.5	2.4	1.7	2707.7	100	NS

* Estimated mean depth

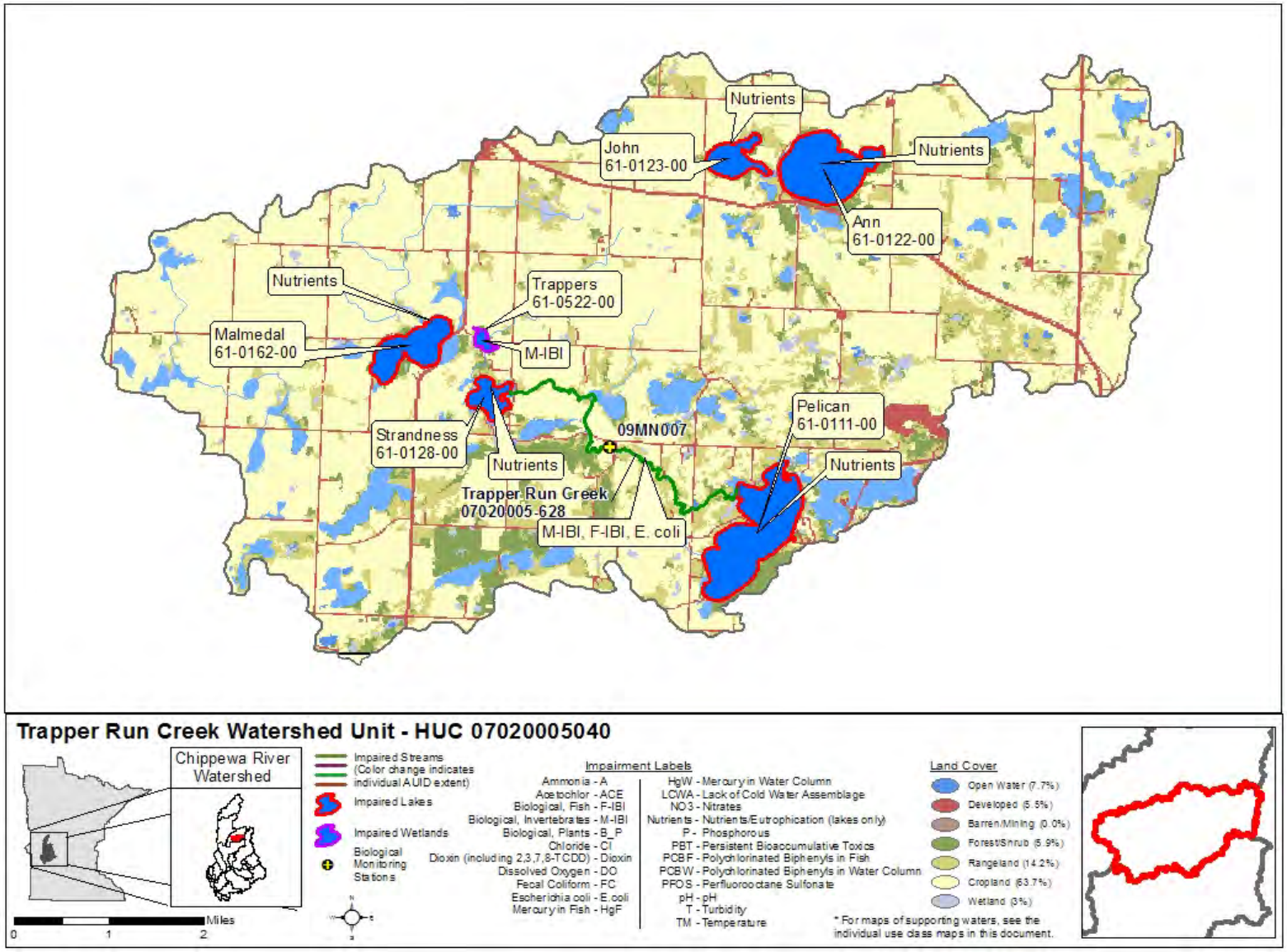

Figure 14. Land use and currently listed impaired waters by parameter in the Trappers Run Creek Watershed unit

Summary

Stream biological assessment results

There is one biological station in this watershed and it is not supporting of aquatic life. This biological station has fair habitat. The AUID is impaired for both fish and invertebrates and flows between two lakes that are impaired for nutrients, which could be a reason for the biological impairment.

Stream water chemistry assessment results

Limited stream water quality data was available within the Trapper Run Creek Watershed unit. One reach, Strandness Lake to Pelican Lake, had turbidity data which does not appear to indicate a stressor to aquatic life.

Lake water chemistry assessment results

Six of the 14 lakes greater than four hectares (10 acres) were reviewed for aquatic recreation use in the watershed (Appendix 8). Five lakes, Pelican, Ann, John, Strandness, and Malmedal were found to be impaired for aquatic recreation use (excess nutrients). Wallin also appeared to exceed water quality standards for aquatic recreation use. However, due to its shallow depth, which skewed Secchi transparency, and variable Chl-a values that were near the standard the lake was found to have insufficient data for assessment. All of these lakes are relatively shallow and have large littoral areas. Attention will need to be paid to internal loading in addition to reductions in nutrient run-off in the watershed.

Lower West Branch Chippewa River Watershed unit HUC 07020005050

The Lower West Branch Chippewa River Watershed unit encompasses parts of Pope, Stevens, and Swift Counties and has a drainage area of 193.1 square miles. The western half of the watershed is in the Northern Glaciated Plains Ecoregion, the eastern half is in the North Central Hardwoods Ecoregion, and the very southern tip is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with open water being the second most abundant (Figure 15). This includes Lake Minnewaska which is the largest lake in the watershed and is the thirteenth largest in Minnesota. The Lower West Branch Chippewa HUC-11 is made up of two main parts, the Chippewa River and Outlet Creek. The Chippewa River flows north to south from just south of Cyrus to just north of Benson. The Outlet Creek flows southwest out of Lake Minnewaska and combines with County Ditch 2, which drains the Little Chippewa HUC-11 due to stream modification. Outlet creek continues southwest to Lake Emily then west to the Chippewa River. The outlet of this watershed unit is represented by site 03MN010 on the Chippewa River.

Table 20. Aquatic life and recreation assessments on stream reach in the Lower West Branch Chippewa River Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-504, Chippewa River, *Little Chippewa R to Unnamed cr*	8	2B	- -	- -	- -	- -	IF	EXS	- -	- -	- -	- -	- -	NS	NA
07020005-505, Chippewa River, *Unnamed cr to E Br Chippewa R*	22	2B	03MN009 03MN010	Upstream of Twp.Rd 20, 4 mi. S.E. of Hancock Upstream of CR 22, 1 mi. NE of Clontarf	EXS	EXP	IF	EXS	MTS	MTS	MTS	IF	EX	NS	NS
07020005-521, Unnamed creek, *Lk Emily to Chippewa R*	2	2B	- -	- -	- -	- -	IF	EXS	- -	- -	- -	- -	IF	NA	IF
07020005-523, Outlet Creek, *Lk Minnewaska to Lk Emily*	13	2B	09MN065 09MN077	Upstream of CR 14, 7.5 mi. SW of Starbuck Upstream of 320th Ave, 5 mi. SW of Starbuck	EXP	EXP	IF	IF	- -	- -	- -	- -	NS	NS	NS
07020005-528, Signalness Creek, *Headwaters to Outlet Cr*	4	2B	90MN008	Upstream of CR 41, 4.5 mi S of Starbuck	MTS	EXP	- -	- -	- -	- -	- -	- -	- -	FS	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).
Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support
Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.
*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.
†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 21. Biological sampling of channelized stream reaches for Lower West Branch Chippewa River Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-505, Chippewa River, *Unnamed cr to E Br Chippewa R*	03MN010	Upstream of CR 22, 1 mi. NE of Clontarf	good	good
07020005-523, Outlet Creek, *Lk Minnewaska to Lk Emily*	09MN077	Upstream of 320th Ave, 5 mi. SW of Starbuck	good	--

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 22. Minnesota Stream Habitat Assessment (MSHA) results for the Lower West Branch Chippewa River HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	03MN009	Chippewa River	0	9.5	14	10	25	58.5	fair
3	03MN010	Chippewa River	0.5	9	15.3	6.7	9	40.5	poor
1	09MN065	Outlet Creek	0	9	15.55	13	25	62.55	fair
1	09MN077	Outlet Creek	0	10.5	16.3	12	25	63.8	fair
2	90MN008	Signalness Creek	4	14.25	11.525	13	26	68.775	good
Average Habitat Results: *Lower West Branch Chippewa River Watershed Unit*			1.2	10.6	14.4	10.1	19.25	55.5	fair

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 23. Outlet water chemistry resultsfor Lower West Branch Chippewa River Watershed**

Station Location:	Chippewa River upstream of CR 22, 1 mile E of Clantarf							
Storet ID:	S002-193							
Station #:	03MN010							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	26	12.0	1413.6	265.4	174.1	1260	1
Ammonia-nitrogen	mg/l	10	0.00	0.07	0.03	0.03		
Inorganic nitrogen (nitrate and nitrite)	mg/l	46	0.00	3.05	0.53	0.41		
Kjeldahl nitrogen	mg/l	10	0.70	1.80	1.19	1.10		
Phosphorus	ug/l	46	38	368	139	132		
Orthophosphate	ug/l	39	0	203	44	32		
Total suspended solids	mg/l	46	10	116	47	51		
Total volatile solids	mg/l	19	2	20	9	7		
Hardness, carbonate	mg/l	10	281	357	337	343		
Chloride	mg/l	10	16	164	33	19	230	0
Sulfate	mg/l	10	54	126	92	96		
Specific conductance	uS/cm	37	536	717	616	612		
pH	--	32	7.57	8.74	8.16	8.2	6.5-9.0	0
Dissolved oxygen (DO)	mg/l	45	6.19	12.65	7.73	7.38	5	0
Temperature, water	deg C	45	2.4	28.6	19.6	21.2		
Turbidity	NTU	38	7.3	81.0	36.0	40.0	25 NTU	23
Transparency, tube 60	cm	47	8	60	23	14		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Lower West Branch Chippewa River HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

Table 24. Lake morphometric and assessment data for Lower West Branch Chippewa River Watershed

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
61-0130-00	Minnewaska	POPE	7020005050	NCHF	3144.4	9.8	4.6	22666.2	30	FS
61-0149-00	Signalness	POPE	7020005050	NCHF	16.6	4.3	2.4	143.3	100	FS
61-0180-00	Emily	POPE	7020005050	NGP	875.7	1.4	0.6	63711.8	100	NS
61-0194-00	Danielson Slough	POPE	7020005050	NGP	57.5	1.5	*1	2439.8	100	NS
75-0024-00	Long	STEVENS	7020005050	NGP	238.0	2.9	1.5	1408.7	100	NS

* Estimated mean depth

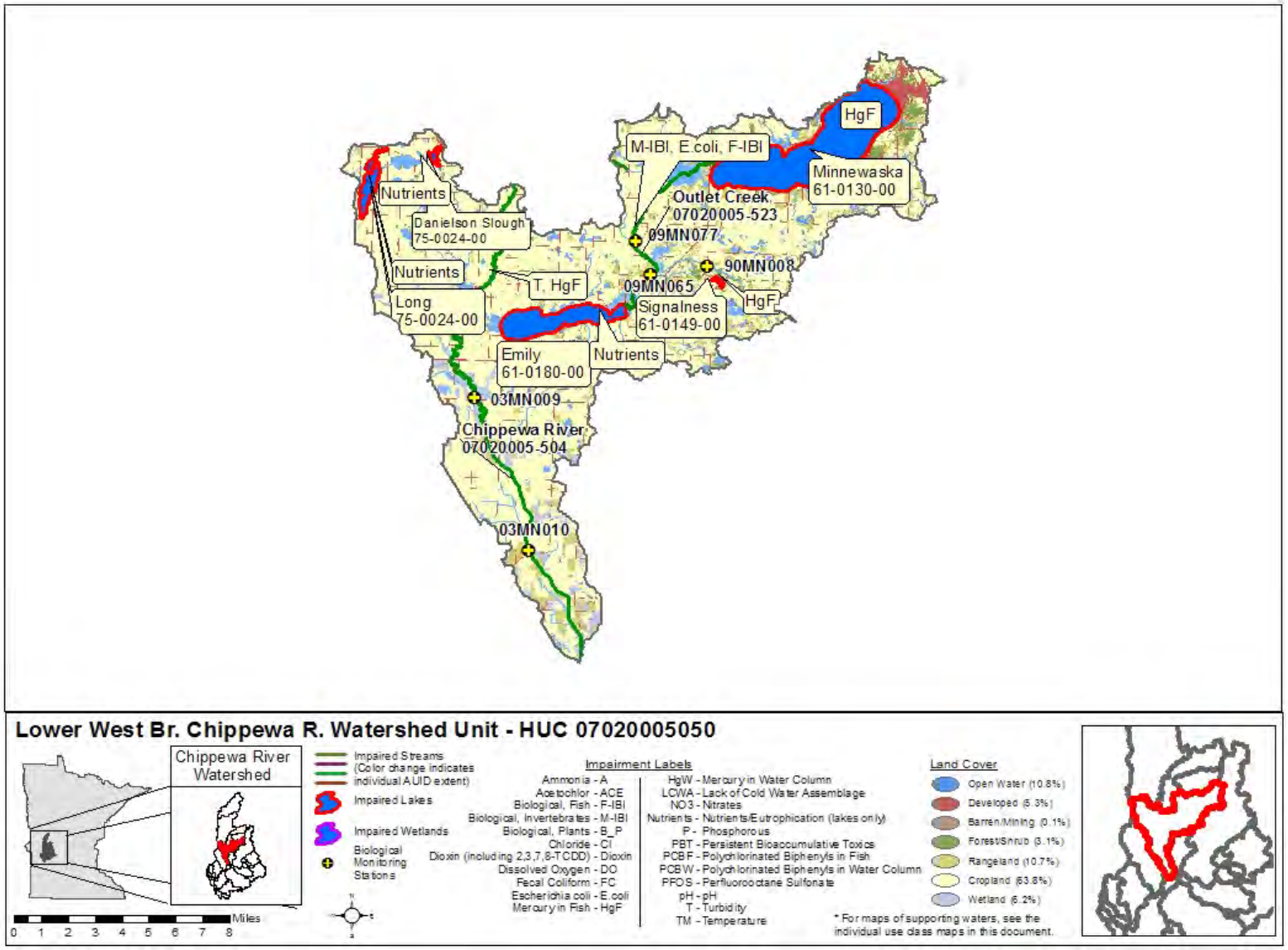

Figure 15. Land use and currently listed impaired waters by parameter in the Lower West Branch Chippewa River Watershed unit

Summary

Stream biological assessment results

Two of the three assessed AUIDs in this watershed are not supporting of aquatic life and one AUID is supporting of aquatic life. The main stem of the West Branch Chippewa River is not supporting of aquatic life, similar to the two upstream HUC-11 watersheds. The main tributary, Outlet Creek, is also impaired. Signalness Creek which is a tributary to Outlet Creek is fully supporting of aquatic life. The Outlet Creek and the West Branch Chippewa both have channelized reaches that have good biological scores. Habitat in this watershed is fair. Outlet Creek flows from Lake Minnewaska into Lake Emily, and both lakes are not supporting of aquatic recreation. The impaired lakes could affect the biology for the steam between them.

Stream water chemistry assessment results

Stream water quality data was available on three stream reaches in the Lower West Branch Chippewa River watershed unit. Lake Minnewaska to Lake Emily exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The Little Chippewa River to Unnamed Creek, which flows from the outlet of Lake Emily, was found to be impaired for aquatic life use based on excess turbidity. The reach directly downstream, Unnamed Creek to the East Branch of the Chippewa River exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The same reach is considered impaired for aquatic life use based on excess turbidity.

Lake water chemistry assessment results

Five of the 14 lakes greater than four hectares (10 acres) were reviewed for aquatic recreation use in the watershed (Appendix 8). Minnewaska and Signalness were both fully supporting of aquatic recreation. Minnewaska is a large, 3,144 ha, lake with only 30 percent littoral area. Efforts to keep phosphorus out of the lake with best management practices should be used to preserve the high water quality in this lake. Three lakes, Emily, Long, and Danielson Slough were found to be impaired for aquatic recreation use (excess nutrients). Lake Emily has a very large watershed and is shallow, allowing for internal loading. In addition reductions in nutrient run-off with in the watershed will need to be addressed. Reducing phosphorus run-off and careful management of land use will be important in remediation of Long Lake and Danielson Slough.

East Branch Chippewa River Watershed unit HUC 07020005060

The East Branch Chippewa River Watershed unit encompasses parts of Pope and Swift Counties and has a drainage area of 262.4 square miles. The majority of the watershed is in the North Central Hardwoods Ecoregion and the southwest tip is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 16). The East Branch Chippewa River HUC-11 flows south from near the Forada State Wildlife Management Area to Terrace then turns southwest to Swift Falls. From Swift Falls the East Branch Chippewa River flows south to Camp Kerk State Wildlife Management Area then flow west to the Chippewa River. The outlet of this watershed unit is represented by site 09MN011 on the Chippewa River, but the outlet of the East Branch Chippewa River is represented by site 07MN041. The HUC-11 boundaries extended the East Branch Chippewa River to past the confluence with the West Branch Chippewa River. Two intensive water chemistry sites are in this HUC-11, one on the main stem Chippewa River and the other on the main stem East Branch Chippewa.

Table 25. Aquatic life and recreation assessments on stream reach in the East Branch Chippewa River Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID ***Reach Name***, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-514, Chippewa River, *East Branch, Mud Cr to Chippewa R*	17	2B	07MN041 09MN036	Upstream of CR 78, 3 mi. N of Benson Upstream of CR 29, 3 mi. E of Benson	EXP	EXP	IF	EXS	MTS	MTS	MTS	MTS	EX	NS	NS
07020005-515, Chippewa River, East Branch, Headwaters *(Amelia Lk 61-0064-00) to Mud Cr*	47	2B	03MN012 09MN055 09MN056 09MN059 10EM122 90MN010	Swift Falls Co. Park Upstream of 235th St, 5.5 mi. SE of Glenwood Upstream of CR 28, 13 mi. NE of Benson Downstream of 320th St, 3 mi. N of Swift Adjacent to CSAH 26, 1 mi. W of Swift Falls Swift County Park, in Swift Falls	MTS	MTS	EXP	MTS	--	MTS	--	--	NS	FS	NS
07020005-580, County Ditch 15, *Unnamed cr to E Br Chippewa R*	3	2B	07MN036	Downstream of CR 10, 5 mi. W of Gilchrist	--	--	--	MTS	--	--	--	--	--	IF	NA
07020005-619, Unnamed creek, *Headwaters to E Br Chippewa R*	2	2B	03MN011	Upstream of 40th St., 5 mi. N.E. of Benson	--	--	--	--	--	--	--	--	--	NA	NA
07020005-623, Unnamed creek, *Headwaters to Lk Ben*	5	2B	03MN005	Upstream of CR 21, 5.5 mi. South of Glenwood	EXS	--	--	--	--	--	--	--	--	NS	NA

07020005-625, Unnamed creek, *Lk Ben to Lk Hanson*	4	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-627, Unnamed creek, *Lk Hanson to CD 15*	2	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-649, County Ditch 8, *Headwaters to E Br Chippewa R*	6	2B	07MN040	Upstream of 45th St, 6 mi. NE of Benson	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-670, Unnamed creek, *Headwaters to Ellen Lk*	5	2B	09MN034	Upstream of Pennie Rd SE, 3 mi. N of Villard	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-672, Unnamed creek, *Ellen Lk to Leven Lk*	1	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	NA	NA
07020005-673, Unnamed creek, *Villard Lk to Amelia Lk*	0	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	NA	NA
07020005-693, County Ditch 12, CD 28 to Villard Lk	3	2B	09MN035	Downstream of CR 30, 4 mi. W of Villard	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-921, Unnamed creek (Gilchrist Lake Inlet), *Unnamed lk (61-0079-00) to Gilchrist Lk*	0	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	NA	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 26. Biological sampling of channelized stream reaches for East Branch Chippewa River Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-619, Unnamed creek, *Headwaters to E Br Chippewa R*	03MN011	Upstream of 40th St., 5 mi. N.E. of Benson	fair	--
07020005-580, County Ditch 15, *Unnamed cr to E Br Chippewa R*	07MN036	Downstream of CR 10, 5 mi. W of Gilchrist	fair	fair
07020005-649, County Ditch 8, *Headwaters to E Br Chippewa R*	07MN040	Upstream of 45th St, 6 mi. NE of Benson	good	fair
07020005-514, Chippewa River, *East Branch, Mud Cr to Chippewa R*	07MN041	Upstream of CR 78, 3 mi. N of Benson	good	fair
07020005-506, Chippewa River, *E Br Chippewa R to Shakopee Cr*	09MN011	Upstream of CR 75, 1 mi. SW of Benson	good	Fair
07020005-670, Unnamed creek, *Headwaters to Ellen Lk*	09MN034	Upstream of Pennie Rd SE, 3 mi. N of Villard	fair	poor
07020005-693, County Ditch 12, CD 28 to Villard Lk	09MN035	Downstream of CR 30, 4 mi. W of Villard	good	poor
07020005-515, Chippewa River, East Branch, Headwaters *(Amelia Lk 61-0064-00) to Mud Cr*	09MN055	Upstream of 235th St, 5.5 mi. SE of Glenwood	fair	good

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 27. Minnesota Stream Habitat Assessment (MSHA) results for the East Branch Chippewa River HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	03MN005	Trib. to Ben Lake	0	8	13.4	11	19.5	52	fair
1	03MN011	Trib. to Chippewa River, East Branch	1.5	13.5	7	15	15	52	fair
1	03MN012	Chippewa River, East Branch	0	13.5	22.5	15	34.5	85.5	good
2	07MN036	County Ditch 15	1.3	8.8	18.1	12	20.5	60.6	fair
2	07MN040	County Ditch 8	0.9	9.3	5.1	9	10.5	34.8	poor
2	07MN041	Chippewa River, East Branch	0	9	17.2	4.5	13	43.7	poor
1	09MN011	Chippewa River	0	8	15	9	7	39	poor
1	09MN034	Trib. to Leven Lake	0	9	4	6	4	23	poor
1	09MN035	Trib. to Villard Lake	0	7	8	5	5	25	poor
2	09MN036	Chippewa River, East Branch	0	6.5	7.5	4	8	26	poor
1	09MN055	Chippewa River, East Branch	0	6	17.95	12	22	57.95	fair
2	09MN056	Chippewa River, East Branch	0	14.5	21.5	14.5	36	86.5	good
1	09MN059	Chippewa River, East Branch	0	10	20	13	29	72	good
Average Habitat Results: *East Branch Chippewa River Watershed unit*			0.3	9.5	13.7	9.7	17.3	50.5	fair

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 28. Outlet water chemistry resultsfor Chippewa River East Branch Watershed**

Station Location:	Chippewa River East Branch upstream of CR 78, 1.5 miles N of Benson
Storet ID:	S005-364
Station #:	07MN041

Parameter	Units	# of Samples	Minimum	Maximum	Mean	Median	WQ Standard	# WQ Exceedances
Escherichia coli	MPN/100ml	26	27.0	1119.9	255.7	182.3	1260	0
Ammonia-nitrogen	mg/l	10	0.00	0.07	0.03	0.03		
Inorganic nitrogen (nitrate and nitrite)	mg/l	49	0.00	4.40	0.97	0.62		
Kjeldahl nitrogen	mg/l	10	0.60	1.20	0.77	0.70		
Phosphorus	ug/l	49	46	790	118	90		
Orthophosphate	ug/l	42	6	200	50	40		
Total suspended solids	mg/l	49	5	201	28	21		

Total volatile solids	mg/l	20	0	38	6	5		
Hardness, carbonate	mg/l	10	277	330	300	296		
Chloride	mg/l	10	11	13	12	12	230	0
Sulfate	mg/l	10	32	54	39	36		
Specific conductance	uS/cm	39	496	764	578	564		
pH	--	37	7.33	8.56	8.16	8.25	6.5-9	0
Dissolved oxygen (DO)	mg/l	48	5.20	12.10	7.66	7.65	5	0
Temperature, water	deg C	49	0.9	30.2	19.8	21.6		
Turbidity	NTU	41	6.6	240.0	23.1	14.0	25 NTU	7
Transparency, tube 60	cm	54	2	51	26	24		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Chippewa River East Branch HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

Table 29. Outlet water chemistry resultsfor Chippewa River East Branch Watershed**

Station Location:	Chippewa River upstream of CR 75, 1 mile SW of Benson							
Storet ID:	S000-383							
Station #:	09MN011							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	15	31.0	1413.6	276.4	180.0	1260	1
Ammonia-nitrogen	mg/l	10	0.00	0.10	0.03	0.02	0.04	2
Inorganic nitrogen (nitrate and nitrite)	mg/l	10	0.00	0.52	0.31	0.31		
Kjeldahl nitrogen	mg/l	10	0.70	1.60	1.08	1.05		
Phosphorus	ug/l	9	56	167	108	101		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	11	82	35	23		
Total volatile solids	mg/l	10	2	17	7	5		
Hardness, carbonate	mg/l	10	283	353	329	331		
Chloride	mg/l	10	16	157	34	21	230	0
Sulfate	mg/l	10	48	102	75	76		
Specific conductance	uS/cm	36	536	928	617	607		
pH	--	31	7.33	8.69	8.25	8.28	6.5-9	0
Dissolved oxygen (DO)	mg/l	37	6.29	11.07	8.07	7.39	5	0

Temperature, water	deg C	37	16.4	28.7	22.6	22.4		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	37	0	49	19	15		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Chippewa River East Branch HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

Table 30. Lake morphometric and assessment data for East Branch Chippewa River Watershed

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
61-0037-00	Linka	POPE	7020005060	NCHF	72.4	15.2	6.9	537.0	78	FS
61-0041-00	Scandinavian	POPE	7020005060	NCHF	165.5	14.9	4.5	1351.7	60	FS
61-0048-00	Round	POPE	7020005060	NCHF	153.4	4.9	*1	2457.5	100	FS
61-0051-00	Swenoda	POPE	7020005060	NCHF	157.0	1.8	*1	828.9	100	NS
61-0060-00	Marlu	POPE	7020005060	NCHF	164.7	4.9	*1	15291.4	100	FS
61-0062-00	State	POPE	7020005060	NCHF	140.8	1.1	*1	828.4	100	FS
61-0064-00	Amelia	POPE	7020005060	NCHF	383.6	21.0	7.0	12444.7	41	FS
61-0066-00	Leven	POPE	7020005060	NCHF	119.8	10.1	4.0	3715.0	57	NS
61-0067-00	Villard	POPE	7020005060	NCHF	226.2	4.6	3.1	9731.4	91	FS
61-0072-00	Gilchrist	POPE	7020005060	NCHF	133.5	8.5	3.3	29624.1	63	NS
61-0080-00	Hanson	POPE	7020005060	NCHF	243.2	1.8	*1	12755.2	100	NS
61-0086-00	Rasmuson	POPE	7020005060	NGP	52.6	4.9	*1	426.8	100	NS
61-0092-00	Hoff	POPE	7020005060	NCHF	47.8	11.6	1.9	111.4	64	FS
61-0095-00	Steenerson	POPE	7020005060	NCHF	80.9	4.9	1.0	359.8	100	NS
61-0097-00	Benson	POPE	7020005060	NCHF	162.3	4.1	0.6	5349.0	100	FS
61-0099-00	Mary	POPE	7020005060	NCHF	40.5	4.9	*1	550.0	100	NS
61-0101-01	Nelson (Main Lake)	POPE	7020005060	NCHF	110.1	2.7	*1	1485.2	100	FS
61-0106-00	Edwards	POPE	7020005060	NCHF	66.8	2.6	*1	1746.9	100	NS
61-0139-00	Benson	POPE	7020005060	NCHF	29.9	3.2	*1	339.0	100	IF
76-0088-00	Moore	SWIFT	7020005060	NGP	91.9	2.1	*1	1070.4	100	IF

* Estimated mean depth

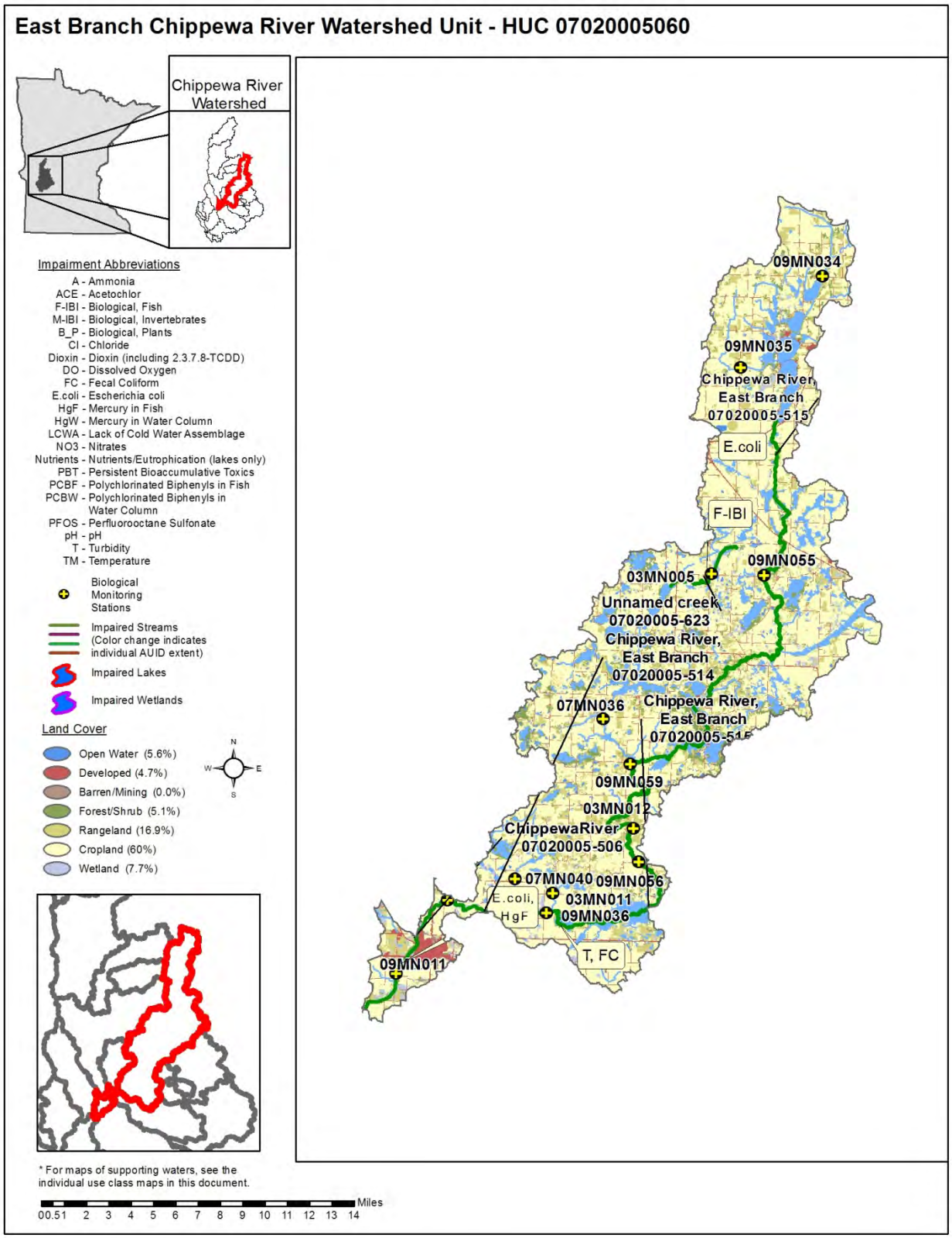

Figure 16. Land use and currently listed impaired streams by parameter in the East Branch Chippewa River Watershed unit

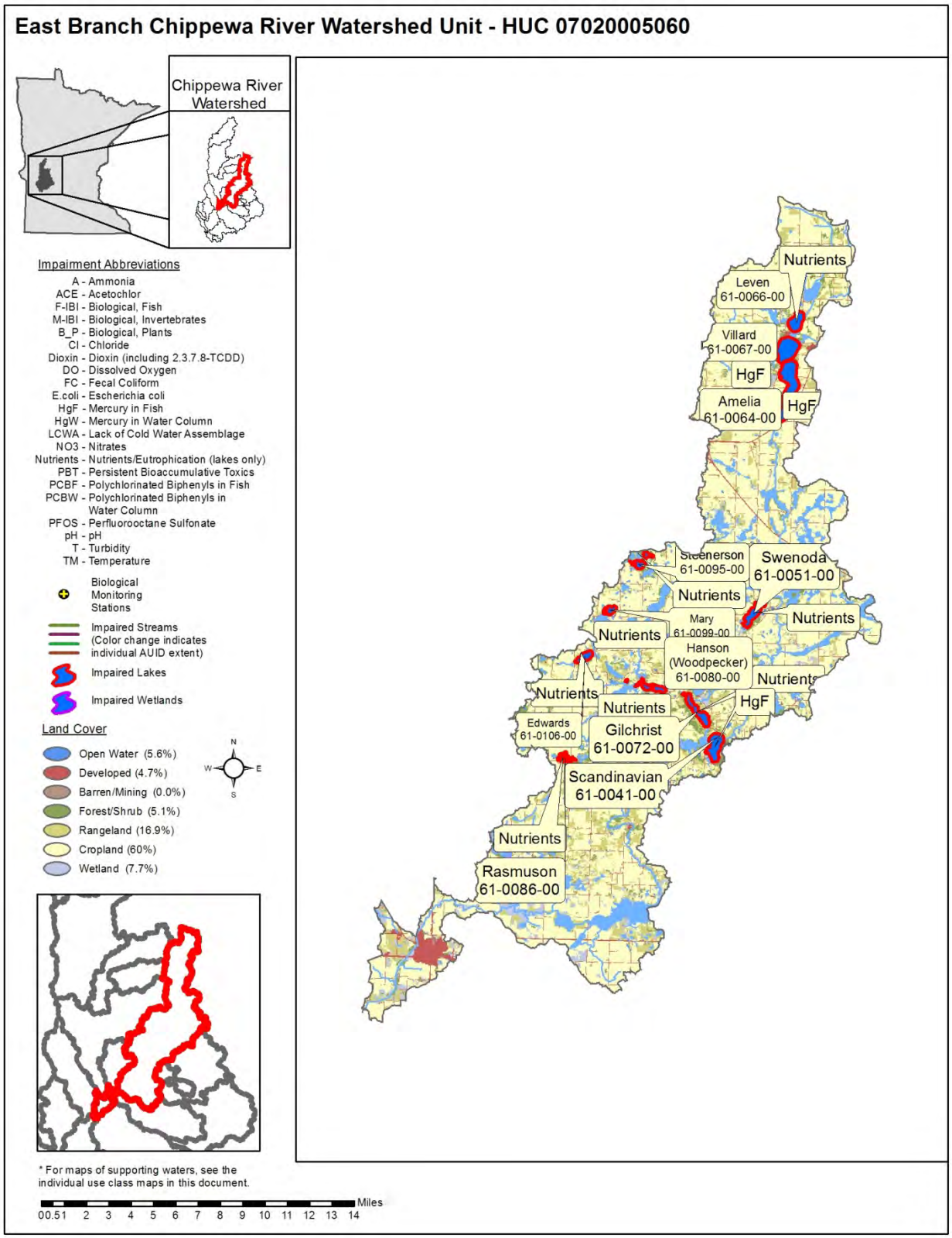

Figure 17. Land use and currently listed impaired lakes by parameter in the East Branch Chippewa River Watershed unit

Summary

Stream biological assessment results

There are two assessed AUIDs for biology in this watershed. The upstream AUID on the East Branch Chippewa River fully supports aquatic life while the downstream section is not supporting of aquatic life. This watershed has a significant amount of channelization in it. The combination of many impaired lakes, fair to poor habitat scores, and the abundance of channelization may contribute to the low IBI scores in the most downstream AUID in the watershed.

Stream water chemistry assessment results

Stream water quality data was available on three stream reaches on the East Branch Chippewa River. The head waters of the East Branch Chippewa River and the Lake Amelia to Mud Creek segment exceeded the standard for bacteria and are considered impaired for aquatic recreation use. Mud Creek to the Chippewa River exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The same reach is considered impaired for aquatic life use based on excess turbidity. The Chippewa River from the confluence of the East Branch of the Chippewa River to Shakopee Creek exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The same reach is considered impaired for aquatic life use based on excess turbidity.

Lake water chemistry assessment results

Twenty of the 43 lakes greater than four hectares (10 acres) were reviewed for aquatic recreation use in the watershed (Appendix 8). Lakes in the northern portion of the watershed make up the head waters of the East Branch of the Chippewa River. Lakes in the headwaters portion of the watershed, except for Leven, tend to have good water quality. Ten lakes, Linka, Scandinavian, Round, Marlu, State, Amelia, Villard, Hoff, Benson (61-0097), and Nelson were all fully supporting of aquatic recreation. Efforts to keep phosphorus out of these lakes will be necessary to preserve good water quality. Eight lakes, Swenoda, Leven, Gilchirst, Hanson, Rasmuson, Steenerson, Mary, and Edwards were found to be impaired for aquatic recreation use (excess nutrients). Gilchirst and Hanson likely act as reservoirs for nutrients from large contributing areas upstream in the watershed. Reductions in overland run-off and management of internal loading of phosphorus in shallow lakes will need to be addressed to see water quality improvements in these basins. Two lakes, Benson (61-0139) and Moore had some water quality information available, but the data sets were not strong enough for an assessment decision to be made.

North Mud Creek Watershed unit HUC 07020005070

The North Mud Creek Watershed unit encompasses parts of Kandiyohi, Pope, Stearns, and Swift Counties and has a drainage area of 90.8 square miles. The entire watershed is in the North Central Hardwoods Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 18). The North Mud Creek HUC-11 flows west from the Stearns/Pope County line to the Swift/Pope County line just south of Lake Simon. North Mud Creek has the only coldwater AUID being assessed for biology in the entire Chippewa River HUC-8. The outlet of this watershed unit is represented by site 09UM014 on Mud Creek. The site is not within the boundaries of the North Mud Creek Watershed because of wetlands, so the site was added approximately 2 miles downstream of the outlet. There are no major tributaries to Mud Creek between the outlet and the site that represents the outlet.

Table 31. Aquatic life and recreation assessment on stream reaches in the North Mud Creek Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID ***Reach Name***, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-551, Mud Creek, *T123 R36W S28, east line to T123 R36W S29, west line*	3	2A	90MN009	Upstream of Twp Rd T143, 6 mi. SW of Brooten	NA	EXP	- -	MTS	- -	- -	- -	- -	- -	NS	NA
07020005-552, Mud Creek, *Unnamed cr to Unnamed cr*	3	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-563, Mud Creek, *Unnamed lk (61-0012-00) to T123 R36W S27, west line*	1	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-564, Mud Creek, *T123 R36W S30, east line to Unnamed cr*	2	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-583, Unnamed creek, *Headwaters to Mud Cr*	3	2B	03MN008	West of Hwy. 104, 10 mi. S. of Sedan	EXP	MTS	- -	- -	- -	- -	- -	- -	- -	FS	NA
07020005-690, County Ditch 15, *Unnamed cr to Unnamed cr*	4	2B	09MN057	Downstream of 165th Ave NE, 5 mi. NW of Sunburg	EXS	EXP	- -	MTS	- -	- -	- -	- -	- -	NS	NA
07020005-691, County Ditch 15, *Headwaters to Unnamed cr*	4	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).
Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support
Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle = new impairment; =full support of designated use.
*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.
†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 32. Minnesota Stream Habitat Assessment (MSHA) results for the North Mud Creek HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	03MN008	Trib. to Mud Lake	3	12	14.8	14	19	63	fair
2	09MN057	County Ditch 15	3.8	12	19.9	12.5	28.5	76.7	good
4	90MN009	Mud Creek	5	7	19.8	9.8	26.3	67.8	good
Average Habitat Results: *North Mud Creek Watershed Unit*			4.4	9.1	19.1	11.1	25.9	69.6	good

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 33. Outlet water chemistry resultsfor North Mud Creek Watershed**

Station Location:	Mud Creek downstream of CR 33, 10 miles NE of Degraff
Storet ID:	S003-372
Station #:	09MN014

Parameter	Units	# of Samples	Minimum	Maximum	Mean	Median	WQ Standard	# WQ Exceedances
Escherichia coli	MPN/100ml	15	38.0	1986.3	477.4	387.3	1260	1
Ammonia-nitrogen	mg/l	10	0.07	0.15	0.11	0.12		
Inorganic nitrogen (nitrate and nitrite)	mg/l	0						
Kjeldahl nitrogen	mg/l	10	0.50	1.00	0.79	0.75		
Phosphorus	ug/l	9	70	124	86	81		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	4	21	12	11		
Total volatile solids	mg/l	10	1	4	3	3		
Hardness, carbonate	mg/l	10	301	371	337	331		
Chloride	mg/l	10	2	61	10	4	230	0
Sulfate	mg/l	10	11	28	18	17		

Specific conductance	uS/cm	31	507	688	590	579		
pH	--	27	7.18	8.49	8.06	8.1	6.5-9	0
Dissolved oxygen (DO)	mg/l	32	4.61	9.36	6.95	6.79	5	0
Temperature, water	deg C	32	16.8	27.9	20.8	20.4		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	44	0	80	44	45		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

Table 34. Lake morphometric and assessment data for North Mud Creek Watershed

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
34-0336-00	East Sunburg	KANDIYOHI	7020005070	NCHF	45.5	4.0	*1	678.3	100	IF
34-0347-00	Hefta	KANDIYOHI	7020005070	NCHF	46.5	3.0	*1	2183.5	100	IF
34-0359-00	Sunburg	KANDIYOHI	7020005070	NCHF	168.3	2.6	*1	1794.7	100	IF
61-0006-00	Johanna	POPE	7020005070	NCHF	487.2	3.0	*1	2960.7	100	NS
61-0010-00	Johnson	POPE	7020005070	NCHF	43.7	4.9	*1	231.4	100	FS
61-0013-00	Unnamed	POPE	7020005070	NCHF	45.3	4.9	*1	988.9	100	FS
61-0034-00	Simon	POPE	7020005070	NCHF	230.3	2.7	*1	1369.4	100	NS
61-0043-00	Goose	POPE	7020005070	NCHF	123.0	3.4	1.8	393.2	100	IF
76-0032-00	West Sunberg	SWIFT	7020005070	NCHF	80.9	2.6	*1	641.2	100	IF
76-0033-00	Monson	SWIFT	7020005070	NCHF	57.9	4.9	2.0	387.2	90	NS

* Estimated mean depth

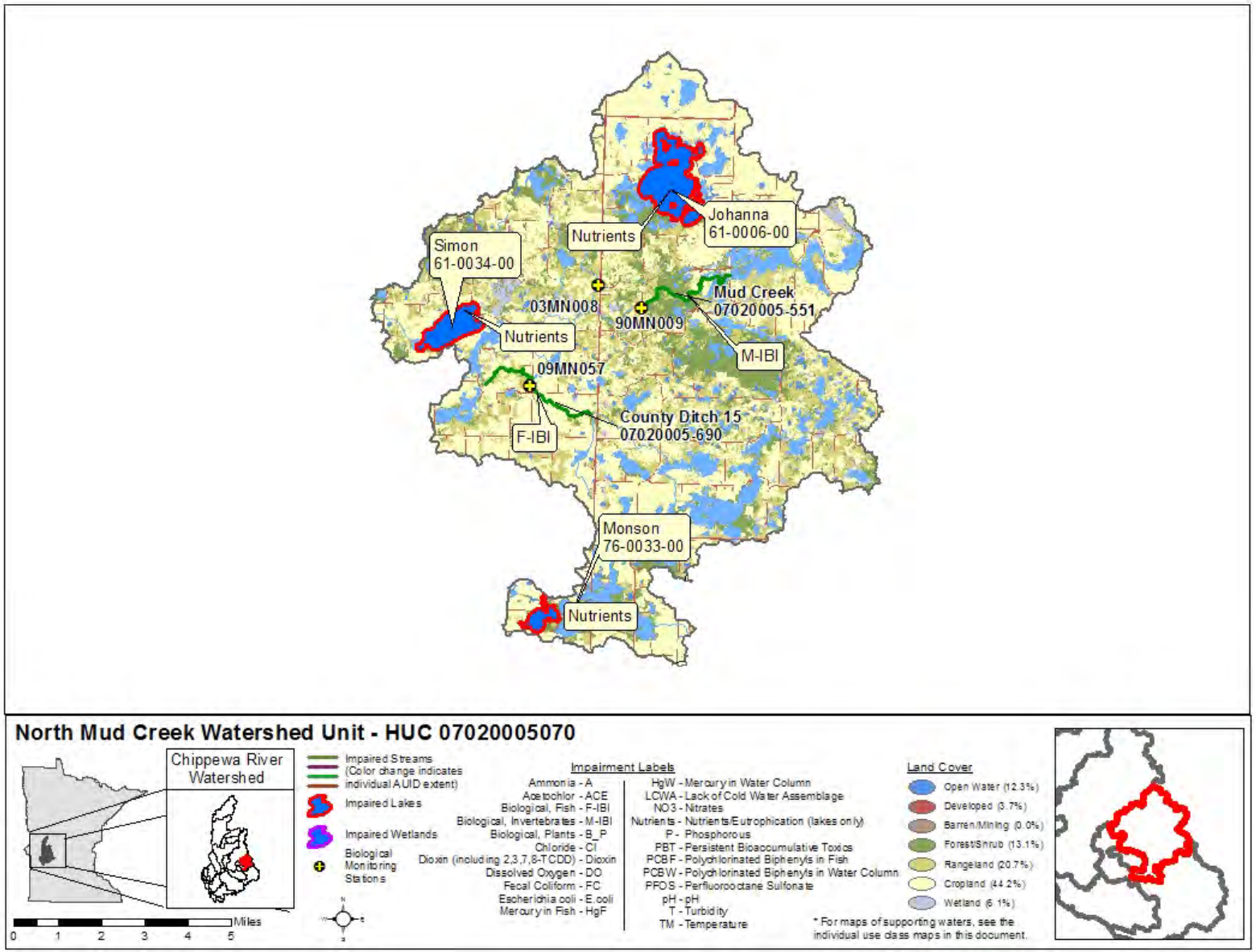

Figure 18 Land use and currently listed impaired waters by parameter, in the North Mud Creek Watershed unit

Summary

Stream biological assessment results

Three AUIDs in this watershed were assessed for biology. Two of them were not supporting aquatic life and one was fully supporting. The habitat for this watershed is good. There are three lakes with nutrient impairments which could contribute to the biological impairments. The impairment on the upstream section of Mud Creek is a coldwater stream where invertebrates are found to be impaired, but fish were not assessed. Due to the isolation of this coldwater stream from other populations of coldwater species, it is believed that the native coldwater fish community in the upper portions of Mud Creek are susceptible to local extinction events caused by natural disturbances such as drought and beaver impoundments (i.e., increasing the water temperature). Therefore, even though groundwater inputs into this stream may be sufficient for supporting a coldwater fishery, other natural factors may be precluding the establishment and/or maintenance of a coldwater fish community in Mud Creek, which is why this AUID was not assessed with the Fish IBI. Migration of coldwater invertebrate species, particularly insects, is not restricted to coldwater pathways and thus may repopulate after such extinctions.

Stream water chemistry assessment results

Stream water quality data was available on three stream reaches on the East Branch of the Chippewa River. The head waters of the East Branch of the Chippewa River and Lake Amelia to Mud Creek exceeded the standard for bacteria and are considered impaired for aquatic recreation use. Mud Creek to the Chippewa River exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The same reach is considered impaired for aquatic life based on excess turbidity. The Chippewa River from the confluence of the East Branch of the Chippewa River to Shakopee Creek exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The same reach is considered impaired for aquatic life based on excess turbidity.

Lake water chemistry results

Twenty of the 43 lakes greater than four hectares (10 acres) were reviewed for aquatic recreation use in the watershed (Appendix 8). Lakes in the northern portion of the watershed make up the head waters of the East Branch of the Chippewa River, which travels the length of the watershed. Lakes in the headwaters portion of the watershed, except for Leven, tend to have good water quality. Ten lakes, Linka, Scandinavian, Round, Marlu, State, Amelia, Villard, Hoff, Benson (61-0097), and Nelson were all fully supporting for aquatic recreation use. Efforts to keep phosphorus out of these lakes will be necessary to preserve good water quality. Eight lakes, Swenoda, Leven, Gilchirst, Hanson, Rasmuson, Steenerson, Mary, and Edwards were found to be impaired for aquatic recreation use due to excess nutrients. Gilchirst and Hanson likely act as reservoirs for nutrients from large contributing areas upstream in the watershed. Reductions in overland run-off and management of internal loading of phosphorus in shallow lakes will need to be addressed to see water quality improvements in these basins. Two lakes, Benson (61-0139) and Moore had some water quality information available but the data sets were not strong enough for an assessment decision to be made.

Spring Creek Watershed unit HUC 07020005080

The Spring Creek Watershed unit encompasses parts of Swift and Kandiyohi Counties and has a drainage area of 10.2 square miles. The entire watershed is in the North Central Hardwoods Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 19). Spring Creek flows northwest from the Swift/Kandiyohi border, just west of Sunburg, to Mud Creek near the Camp Kerk State Wildlife Management Area. The only biological sampling site in this watershed was dry so it was not sampled.

Table 35. Aquatic life and recreation assessment on stream reaches in the Spring Creek Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators: Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides	Bacteria	Aquatic Life	Aquatic Rec.
07020005-621, Spring Creek, *Headwaters to Mud Cr*	5	2B	--	--	--	--	--	MTS	--	--	--	--	--	IF	NA
07020005-699, Unnamed creek, *Headwaters to Spring Cr*	1	2B	--	--	--	--	--	MTS	--	--	--	--	--	IF	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

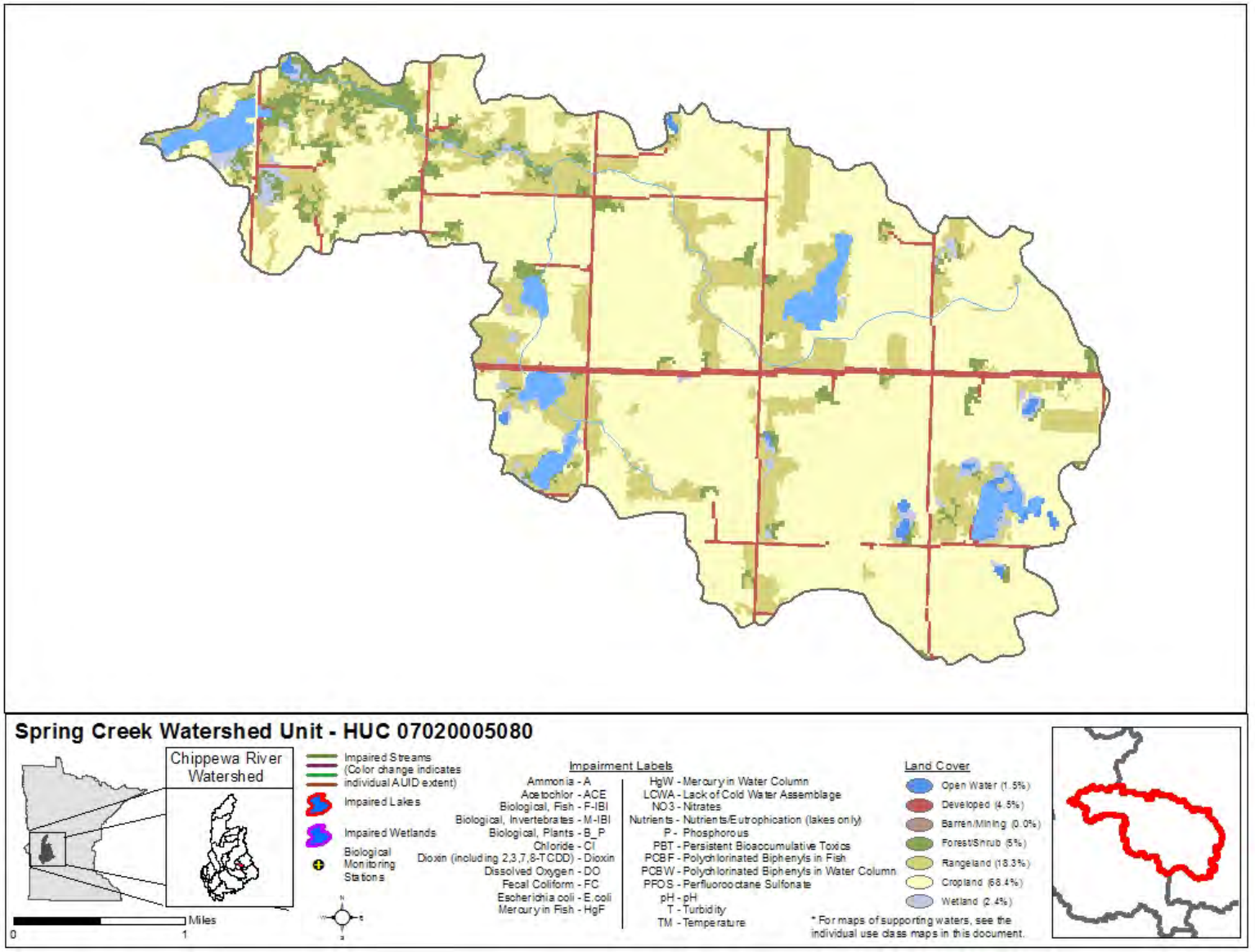

Figure 19. Land use and currently listed impaired waters by parameter, in the Spring Creek Watershed unit

Summary

Stream biological assessment results

No biological monitoring occurred in this watershed.

Stream water chemistry assessment results

Limited water quality data was available within the Spring Creek watershed unit. Turbidity data looked to meet the standard; however, data was insufficient to list as full support.

Lake water chemistry assessment results

No lakes were assessed for water quality in this watershed unit.

Frank Lake Watershed unit HUC 07020005090

The Frank Lake Watershed unit encompasses parts of Pope and Swift Counties and has a drainage area of 27.3 square miles. The entire watershed is in the North Central Hardwoods Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 20). Mud Creek in the Frank Lake HUC-11 flows southwest from the Pope/Swift County line to the East Branch Chippewa River southwest of Camp Kerk Sate Wildlife Management Area. The outlet of this watershed unit is represented by site 03MN013 on the Mud Creek.

Table 36. Aquatic life and recreation assessment on stream reaches in the Frank Lake Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators: Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides	Bacteria	Aquatic Life	Aquatic Rec.
07020005-554, Mud Creek, *CD 15 to E Br Chippewa R*	11	2B	03MN013 09MN014	Upstream of CR 87, 10 mi. N.E. of Benson Downstream of CR 33, 10 mi. NE of Degraff	EXP	EXP	EXS	MTS	--	MTS	--	--	EX	NS	NS

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. R. 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 37. Minnesota Stream Habitat Assessment (MSHA) results for the Frank LakeHUC-11**

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
2	03MN013	Mud Creek	1.25	9.75	10.1	11	19	52.35	fair
1	09MN014	Mud Creek	0	9	3.3	13	16	41.3	poor
Average Habitat Results: *Frank Lake Watershed Unit*			0.8	9.5	7.8	11.7	18	48.7	fair

Qualitative habitat ratings

Good: MSHA score above the median of the least-disturbed sites (MSHA>66)

Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)

Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 38. Outlet water chemistry resultsfor Frank Lake Watershed**

Station Location:	Mud Creek upstream of 120th Ave. NE, 7.5 miles W of Sunburg							
Storet ID:	S005-633							
Station #:	03MN013							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	15	68.0	920.8	329.6	280.0	1260	0
Ammonia-nitrogen	mg/l	10	0.02	0.09	0.05	0.05		
Inorganic nitrogen (nitrate and nitrite)	mg/l	0						
Kjeldahl nitrogen	mg/l	10	0.60	1.02	0.77	0.80		
Phosphorus	ug/l	9	58	151	93	88		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	7	35	17	16		
Total volatile solids	mg/l	10	2	8	4	4		
Hardness, carbonate	mg/l	10	307	380	343	342		
Chloride	mg/l	10	3	67	11	4	230	0
Sulfate	mg/l	10	14	36	24	23		
Specific conductance	uS/cm	30	519	967	617	597		
pH	--	28	7.18	8.35	8.03	8.095	6.5-9	0
Dissolved oxygen (DO)	mg/l	32	4.75	9.78	6.86	6.80	5	1
Temperature, water	deg C	31	15.7	28.3	20.9	20.5		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	33	15	66	33	30		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Frank Lake HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

Table 39. Lake morphometric and assessment data for Frank Lake Watershed**

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
76-0072-00	Camp	SWIFT	7020005090	NCHF	87.4	7.9	3.8	971.9	48	FS

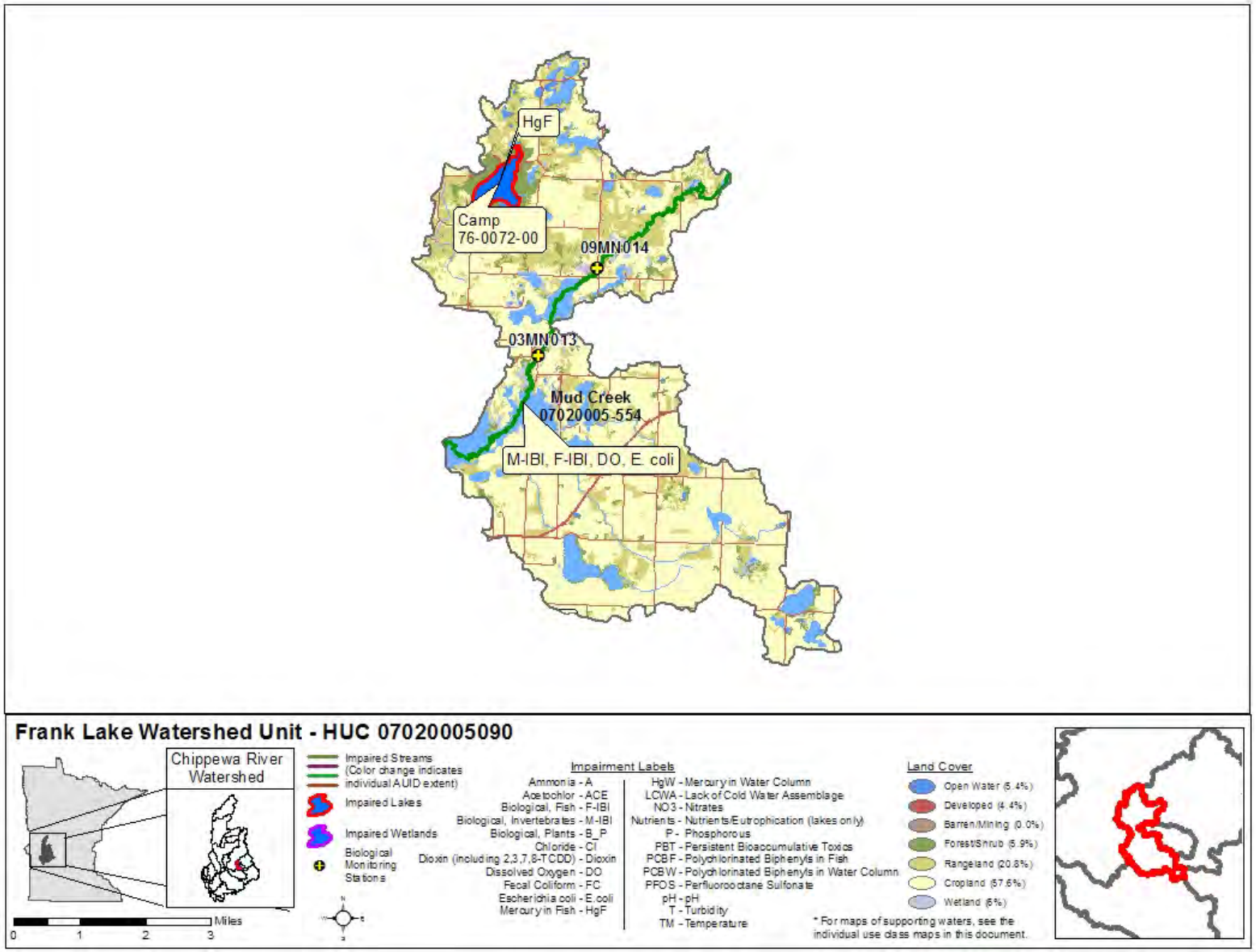

Figure 20. Land use and currently listed impaired waters by parameter, in the Frank Lake Watershed unit

Summary

Stream Biological Assessment Results

One AUID was sampled twice for biology. The AUID was found not supporting of aquatic life. Habitat was fair to poor in the watershed and the upstream AUID impaired for aquatic life use. Upstream impairments may be playing a role in the stare of the biology of this watershed.

Stream Water Chemistry Assessment Results

Stream water quality data was available on one reach of Mud Creek from County Ditch 15 to the East Branch of the Chippewa River. Dissolved oxygen exceeded the standard and the reach will be listed as impaired due to low DO levels. Turbidity does not look to be a biological stressor along this reach.

Lake Water Chemistry Assessment Results

One of the six lakes greater than four hectares (10 acres) was reviewed for aquatic recreation use in the watershed (Appendix 8). Camp Lake was found to be fully supporting of aquatic recreation. Land use in Camp Lake Watershed is mostly forest and should be protected in order to prevent increased run-off that may cause nutrient levels in the lake to rise.

South Mud Creek Watershed unit HUC 07020005100

The South Mud Creek Watershed unit encompasses parts of Swift and Kandiyohi Counties and has a drainage area of 88 square miles. The northeast half of the watershed is in the North Central Hardwoods Ecoregion and the other half is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 21). The South Mud Creek HUC-11 flows northwest from the Swift/Kandiyohi county line, near Kerkhoven, to the East Branch Chippewa River near Benson. The outlet of this watershed unit is represented by site 07MN045 on Mud Creek.

Table 40. Aquatic life and recreation assessment on stream reaches in the South Mud Creek Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID ***Reach Name***, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-516, Mud Creek, *Headwaters to T120 R38W S1, north line*	13	2B	09MN046	Downstream of CR 89, 3 mi. NE of Kerkhoven	- -	- -	- -	MTS	- -	- -	- -	- -	IF	IF	NA
07020005-518, Mud Creek, *T121 R39W S2, south line to E Br Chippewa R*	3	2B	- -	- -	- -	- -	EXP	MTS	- -	MTS	- -	- -	EX	IF	NS
07020005-655, County Ditch 63, Unnamed cr to Unnamed ditch	2	2B	07MN050	Upstream of 90th Ave, 2 mi. NE of De Graff	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-656, County Ditch 63, *Unnamed ditch to Mud Cr*	3	2B	09MN050	Upstream of 65th Ave SE, 6 mi. E of Benson	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-657, County Ditch 63, *Unnamed ditch to Unnamed cr*	4	2B	09MN048	Downstream of CR 16, 4 mi. N of Murdock	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-700, Unnamed creek, *Unnamed cr to Mud Cr*	1	2B	09MN049	Downstream of 60th St SE, 3 mi. N of Kerkhoven	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-711, Unnamed creek, *Unnamed cr to Unnamed cr*	2	2B	10EM186	Downstream of CSAH 5 (150th St SE), 4 mi. N of Kerkhoven	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).
Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support
Key for Cell Shading: =previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.
*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.
†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 41. Biological sampling of channelized stream reaches for South Mud Creek Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-517, Mud Creek, *T121 R37W S31, south line to T121 R39W S11, north line*	07MN039	Downstream of CR 12, 1 mi. NE of Murdock	fair	fair
07020005-517, Mud Creek, *T121 R37W S31, south line to T121 R39W S11, north line*	07MN045	Upstream of CR 18, 2.5 mi E of Benson	fair	poor
07020005-655, County Ditch 63, Unnamed cr to Unnamed ditch	07MN050	Upstream of 90th Ave, 2 mi. NE of De Graff	fair	fair
07020005-516, Mud Creek, *Headwaters to T120 R38W S1, north line*	09MN046	Downstream of CR 89, 3 mi. NE of Kerkhoven	fair	poor
07020005-657, County Ditch 63, *Unnamed ditch to Unnamed cr*	09MN048	Downstream of CR 16, 4 mi. N of Murdock	good	fair
07020005-700, Unnamed creek, *Unnamed cr to Mud Cr*	09MN049	Downstream of 60th St SE, 3 mi. N of Kerkhoven	fair	--
07020005-656, County Ditch 63, *Unnamed ditch to Mud Cr*	09MN050	Upstream of 65th Ave SE, 6 mi. E of Benson	fair	fair
07020005-517, Mud Creek, *T121 R37W S31, south line to T121 R39W S11, north line*	09MN054	Upstream of CR 16, 6.5 mi. SE of Benson	fair	Poor
07020005-711, Unnamed creek, *Unnamed cr to Unnamed cr*	10EM186	Downstream of CSAH 5 (150th St SE), 4 mi. N of Kerkhoven	good	poor

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 42. Minnesota Stream Habitat Assessment (MSHA) results for the South Mud Creek HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
2	07MN039	Mud Creek	0	9	10.5	13.5	12	45	fair
3	07MN045	Mud Creek	0	9	16	5	7	37	poor
1	07MN050	County Ditch 63	0	12	14	12	15	53	fair
1	09MN046	Mud Creek	0	8.5	4	5	4	21.5	poor
1	09MN048	County Ditch 63	0	13	18.1	14	24	69.1	good
1	09MN049	Trib. to Mud Creek	1.25	10.5	17.9	13	26	68.65	good
1	09MN050	Hollerberg Floodway	0	11	13.8	14	30	68.8	good
1	09MN054	Mud Creek	0	9	18.05	11	16	54.05	fair
1	10EM186	Unnamed ditch	0	13	12.4	16	17	58.4	fair
Average Habitat Results: *South Mud Creek River Watershed unit*			0.1	10.4	13.9	11.3	14.8	50.6	fair

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 43. Outlet watershed chemistry resultsfor South Mud Creek Watershed**

Station Location:	Mud Creek upstream of CR 18, 3 miles E of Benson							
Storet ID:	S002-195							
Station #:	07MN045							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	15	50.4	1553.1	196.0	95.9	1260	1
Ammonia-nitrogen	mg/l	10	0.02	0.15	0.05	0.03		
Inorganic nitrogen (nitrate and nitrite)	mg/l	0						
Kjeldahl nitrogen	mg/l	10	0.20	1.05	0.67	0.60		
Phosphorus	ug/l	10	61	187	108	97		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	3	15	8	7		
Total volatile solids	mg/l	10	1	6	2	2		
Hardness, carbonate	mg/l	10	366	431	397	399		
Chloride	mg/l	10	2	21	14	14	230	0
Sulfate	mg/l	10	73	120	93	91		
Specific conductance	uS/cm	35	665	998	809	775		
pH	--	32	7.63	8.61	8.17	8.21	6.5-9	0
Dissolved oxygen (DO)	mg/l	35	2.44	17.79	9.20	9.47	5	4
Temperature, water	deg C	35	17.5	28.0	21.2	21.0		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	17	42	60	58	60		
Transparency, tube 100	cm	18	63	100	94	100		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the South Mud Creek HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

Table 44. Lake morphometric and assessment data for South Mud Creek Watershed

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
76-0057-00	Hollerberg	SWIFT	7020005100	WCBP	105.2	1.5	*1	1097.9	100	NS

* Estimated mean depth

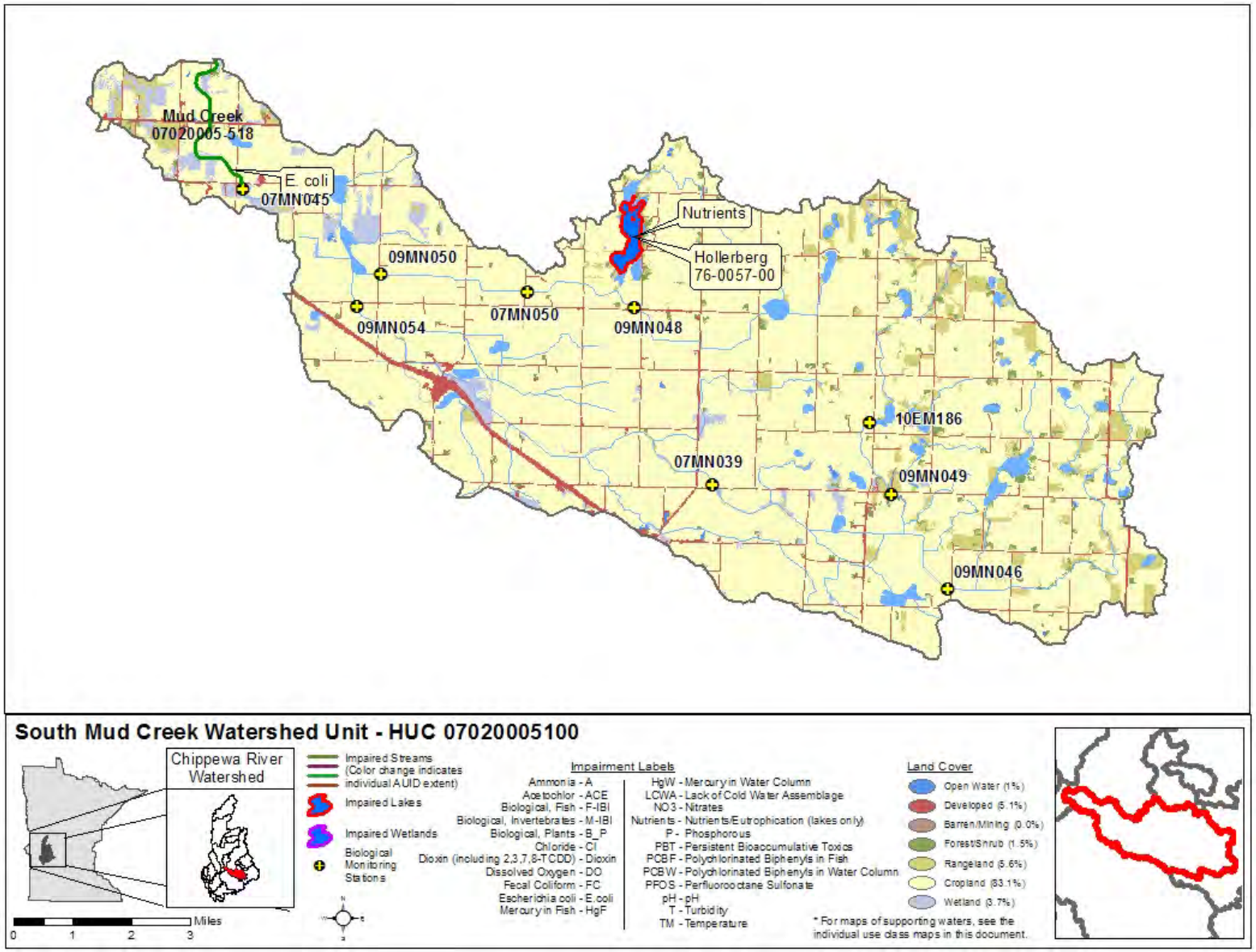

Figure 21. Land use and currently listed impaired waters by parameter, in the South Mud Creek Watershed unit

Summary

Stream Biological Assessment Results

No AUIDs were assessed for biology in this watershed since all biological sites are on channelized reaches or limited resource waters. These reaches had fair biological scores and fair habitat scores.

Stream Water Chemistry Assessment Results

Limited stream water quality data was available within the South Mud Creek Watershed unit. Dissolved Oxygen (DO) ranged up to 17.79 mg/l indicating that it could be low in the early morning. A recording DO sondes should be placed at this site during August to ensure low DO is not impairing the stream.

Lake Water Chemistry Assessment Results

One of the two lakes greater than four hectares (10 acres) was reviewed for aquatic recreation use in the watershed (Appendix 8). Hollerberg Lake was found to be impaired for aquatic recreation due to excess nutrients. Reductions in overland run-off and management of internal loading of phosphorus will need to be addressed to see water quality improvements in this lake.

Lake Hassel Watershed unit HUC 07020005110

The Lake Hassel Watershed unit encompasses parts of Pope and Swift Counties and has a drainage area of 39.9 square miles. The majority of the watershed is in the North Central Hardwoods Ecoregion, while the western edge is in the Northern Glaciated Plains Ecoregion and the southern tip is in the Western Corn Belt Plains Ecoregions. The predominant land use is cropland with rangeland being the second most abundant (Figure 22). Lake Hassel HUC-11 flows from the north to south from County Road 2, in Pope County, through Lake Hassel to the East Branch Chippewa River North of Benson. The outlet of this watershed unit is represented by site 09MN026 on Unnamed Creek, but no intensive water chemistry monitoring was done because this HUC-11 was less than 40 square miles.

Table 45. Aquatic life and recreation assessment on stream reaches in the Lake Hassel Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators: Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides	Bacteria	Aquatic Life	Aquatic Rec.
07020005-712, Unnamed creek, *Unnamed cr to E Br Chippewa R*	1	2B	09MN026	Downstream of 45th St. NE, 4.5 mi. NE of Benson	EXP	MTS	--	--	--	--	--	--	--	IF	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: =previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 46. Minnesota Stream Habitat Assessment (MSHA) results for the Lake Hassel HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	09MN026	Unnamed creek	2.5	10.5	14	12	26	65	fair
Average Habitat Results: *Lake Hassel Watershed Unit*			2.5	10.5	14	12	26	65	fair

Qualitative habitat ratings

Good: MSHA score above the median of the least-disturbed sites (MSHA>66)

Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)

Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 47. Lake morphometric and assessment data for Lake Hassel Watershed

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
61-0274-00	Unnamed	POPE	7020005110	NGP	7.3	2.0	*1	246.8	100	IF
76-0086-00	Hassel	SWIFT	7020005110	NGP	285.7	1.5	0.6	8996.4	100	NS

* Estimated mean depth

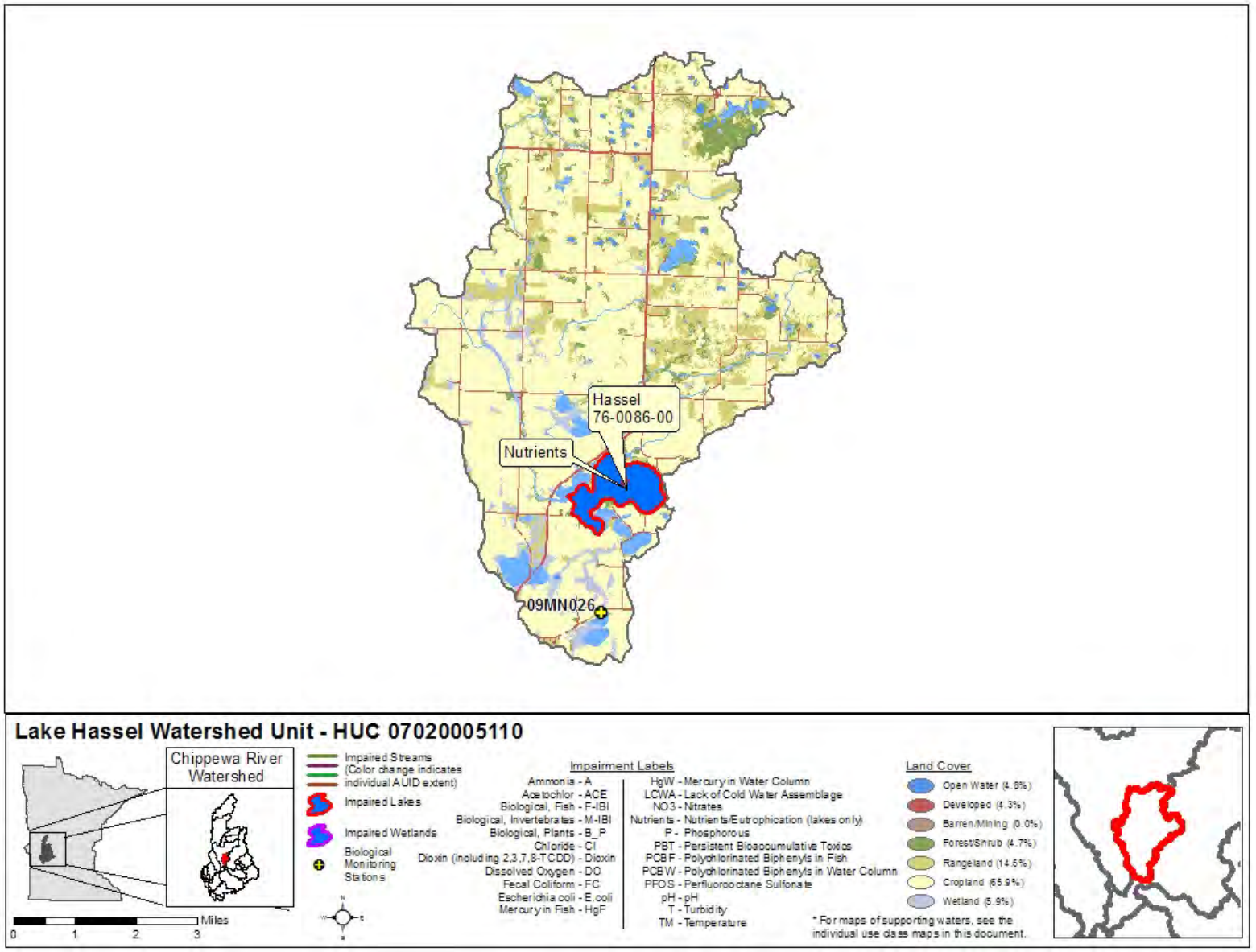

Figure 22. Land use and currently listed impaired waters by parameter, in the Lake Hassel Watershed unit

Summary

Stream Biological Assessment Results

There is one biological station in this watershed. The site was not supporting aquatic life, but the AUID was over 90 percent channelized and was not listed for biology. Upstream of the biological site is Lake Hassel which is impaired due to excess nutrients, which could be a factor for the low fish IBI score.

Stream Water Chemistry Assessment Results

No Stream reaches were assessed for water quality in this watershed unit.

Lake Water Chemistry Assessment Results

Two of the six lakes greater than four hectares (10 acres) were reviewed for aquatic recreation use in the watershed (Appendix 8). Hassel Lake was found to be impaired for aquatic recreation use due to excess nutrients. Hassel Lake has a very large watershed and is shallow allowing for internal loading to negatively impact water quality. In addition reductions in nutrient run-off with in the watershed will need to be addressed. An unnamed (61-0274) lake had some water quality information available but the data set was not strong enough for an assessment decision to be made.

Moore Township Branch Chippewa Watershed unit HUC 07020005120

The Moore Township Branch Chippewa River Watershed unit encompasses parts of Stevens, Pope, and Swift Counties and has a drainage area of 91.4 square miles. The majority of the watershed is in the Northern Glaciated Plains Ecoregion and the very southern tip is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 23). The Moore Township Branch Chippewa River HUC-11 flows south from near Hancock to the Chippewa River between Danvers and Benson. The outlet of this watershed unit is represented by site 09MN012 on the County Ditch 3.

Table 48. Aquatic life and recreation assessments n stream reaches in the Moore Township Branch Chippewa River Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-579, County Ditch 3, *CD 7 to Chippewa R*	2	2B	09MN012	Downstream of CR 75, 4 mi. SW of Benson	- -	- -	IF	MTS	- -	- -	- -	- -	EX	IF	NS
07020005-585, Judicial Ditch 9, *Unnamed cr to CD 3*	4	2B	03MN078	Downstream of CR 22, 3 mi W of Clontarf	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-586, County Ditch 3, *JD 9 to JD 8*	3	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-659, County Ditch 7, *Unnamed ditch to CD 3*	1	2B	07MN051	Upstream of 10th St, 4 mi. W of Benson	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-694, Unnamed creek, *Headwaters to JD 9*	9	2B	09MN061	Upstream of 330th St, 4.5 mi. S of Hancock	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-695, Judicial Ditch 9, *Unnamed cr to Unnamed cr*	2	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-703, Unnamed ditch, *Unnamed ditch to CD 3*	1	2B	09MN073	Downstream of CR 15, 3 mi. SW of Clontarf	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-704, County Ditch 7, *Lynch Lk to Unnamed ditch*	3	2B	09MN072	Upstream of CR 20, 3 mi. W of Benson	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).
Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support
Key for Cell Shading: =previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.
*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.
†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 49. Biological sampling of channelized stream reaches for Moore Township Branch Chippewa Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-585, Judicial Ditch 9, *Unnamed cr to CD 3*	03MN078	Downstream of CR 22, 3 mi W of Clontarf	poor	fair
07020005-659, County Ditch 7, *Unnamed ditch to CD 3*	07MN051	Upstream of 10th St, 4 mi. W of Benson	poor	poor
07020005-579, County Ditch 3, *CD 7 to Chippewa R*	09MN012	Downstream of CR 75, 4 mi. SW of Benson	good	fair
07020005-694, Unnamed creek, *Headwaters to JD 9*	09MN061	Upstream of 330th St, 4.5 mi. S of Hancock	fair	poor
07020005-704, County Ditch 7, *Lynch Lk to Unnamed ditch*	09MN072	Upstream of CR 20, 3 mi. W of Benson	poor	good
07020005-703, Unnamed ditch, *Unnamed ditch to CD 3*	09MN073	Downstream of CR 15, 3 mi. SW of Clontarf	fair	poor
07020005-595, Unnamed ditch, *T123 R41W S11, north line to JD 9*	09MN075	Downstream of 70th St NW, 4 mi. W of Clontarf	poor	poor

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 50. Minnesota Stream Habitat Assessment (MSHA) results for the Moore Township Branch Chippewa HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
2	03MN078	Judicial Ditch 9	0	5.8	16	6.5	9.5	38.3	poor
1	07MN051	County Ditch 3	2.5	11	19.8	13	12	58.3	fair
1	09MN012	County Ditch 3	0	11	14	13	4	42	poor
1	09MN061	Trib. to Judicial Ditch 9	0	7	5	14	7	33	poor
1	09MN072	County Ditch 7	0	9	9	10	16	44	poor
1	09MN073	Trib. to County Ditch 9	3	11	9	5	8	36	poor
1	09MN075	Trib. to County Ditch 9	0	8	4	12	4	28	poor
Average Habitat Results: *Moore Twp. Branch Chippewa Watershed Unit*			0.7	8.6	11.6	10	8.8	39.7	poor

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 51. Outlet water chemistry results **for Moore Township Branch Chippewa Watershed

Station Location:	County Ditch 3 downstream of 20th St. SW, 4 miles SW of Benson
Storet ID:	S003-507
Station #:	09MN012

Parameter	Units	# of Samples	Minimum	Maximum	Mean	Median	WQ Standard	# WQ Exceedances
Escherichia coli	MPN/100ml	15	42.0	547.5	213.5	160.0	1260	0
Ammonia-nitrogen	mg/l	10	0.02	0.21	0.07	0.04		
Inorganic nitrogen (nitrate and nitrite)	mg/l	0						
Kjeldahl nitrogen	mg/l	10	0.40	0.82	0.69	0.75		
Phosphorus	ug/l	9	39	111	62	58		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	1	8	4	4		
Total volatile solids	mg/l	10	1	3	2	2		
Hardness, carbonate	mg/l	10	511	602	549	550		
Chloride	mg/l	10	18	26	21	21	230	0
Sulfate	mg/l	10	243	345	275	270		
Specific conductance	uS/cm	34	815	1069	962	964		
pH	--	28	7.32	8.55	8.08	8.115	6.5-9	0

Dissolved oxygen (DO)	mg/l	34	6.96	15.20	9.66	9.23	5	0
Temperature, water	deg C	34	12.7	27.1	19.8	20.2		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	16	50	60	59	60		
Transparency, tube 100	cm	20	88	100	97	100		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Moore Township Branch Chippewa HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

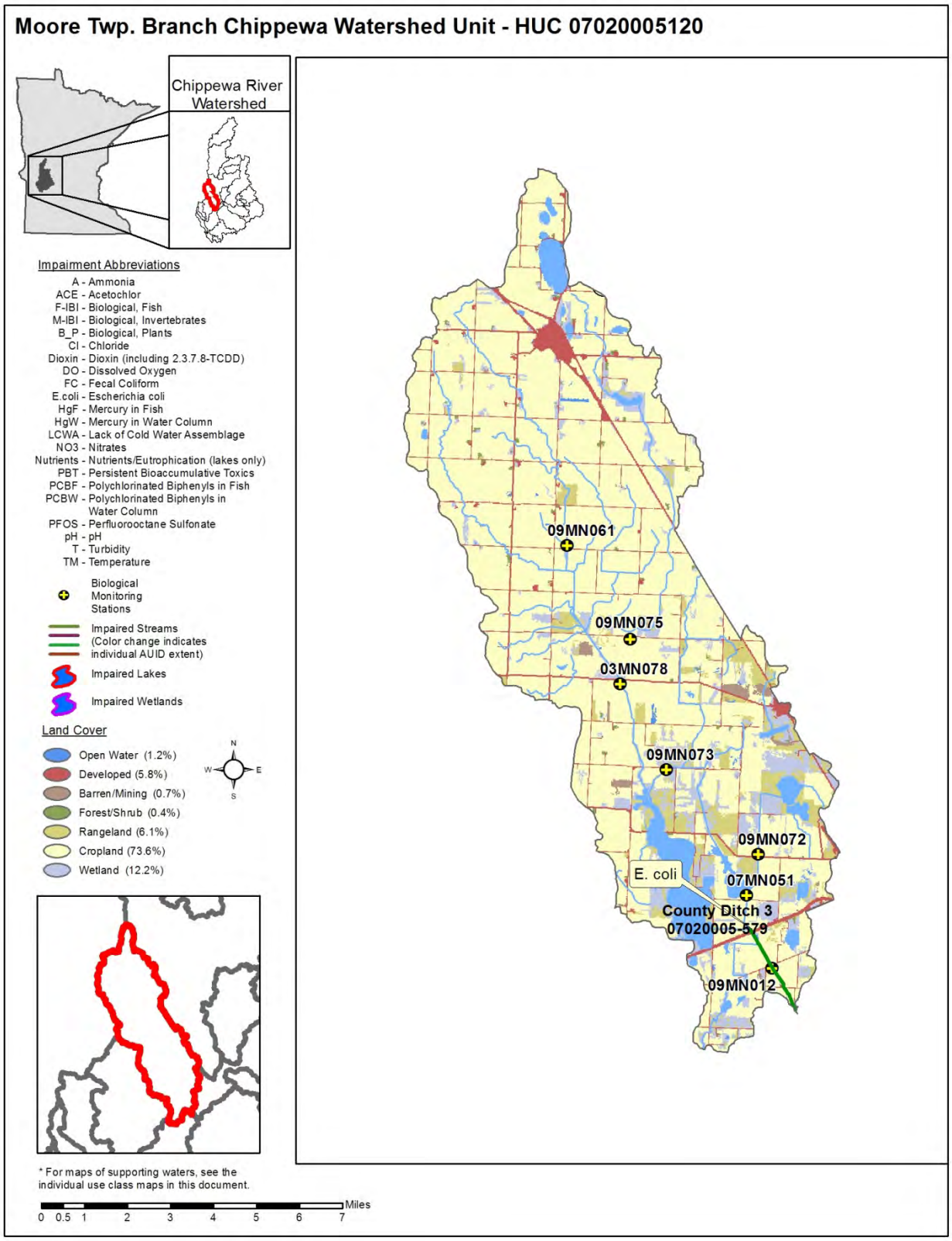

Figure 23. Land use and currently listed impaired waters by parameter, in the Moore Township Branch Chippewa Watershed unit

Summary

Stream biological assessment results

No AUIDs were assessed for biology in this watershed since all biological sites are on channelized reaches or limited resource waters. These reaches had fair to poor biological scores and poor habitat scores.

Stream water chemistry assessment results

Limited stream water quality data was available within the Moore Township Branch Chippewa River Watershed unit. Turbidity data looked to meet the standard; however, data was insufficient to list the reach as fully supporting aquatic life. Dissolved oxygen ranged up to 15.2 mg/l indicating that it could be low in the early morning. A recording DO sondes should be placed at this site during August to ensure low DO is not a cause of impairment.

Lake water chemistry assessment results

No lakes were assessed for water quality in this watershed unit.

Chippewa River Watershed unit HUC 07020005130

The Chippewa River Watershed unit encompasses parts of Swift and Chippewa Counties and has a drainage area of 110.8 square miles. The entire watershed is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with urban development being the second most abundant (Figure 24). The Chippewa River HUC-11 flows south from near Danvers to the confluence with the Minnesota River in Montevideo. There is also a diversion channel northeast of Watson that flow west to the Minnesota River. There are two dams on the main stem Chippewa River and one on the diversion channel in this HUC-11. The outlet of this watershed unit is represented by site 09MN019 on the Chippewa River. The fish contaminants data and additional intensive water chemistry was also collected in this watershed unit at site 09MN001 upstream of the diversion channel.

Table 52. Aquatic life and recreation assessment on stream reaches in the Chippewa River Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID ***Reach Name***, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-501, Chippewa River, *Watson Sag to Minnesota R*	13	2B	09MN019	Upstream Hwy 59, in Montevideo	- -	- -	IF	EXS	MTS	MTS	MTS	- -	EX	NS	NS
07020005-502, Chippewa River, *Dry Weather Cr to Watson Sag*	3	2B	09MN001	Upstream of dam on CR 13, 0.5 mi. N of Watson	EXS	EXP	- -	- -	- -	- -	- -	- -	- -	NS	NA
07020005-506, Chippewa River, *E Br Chippewa R to Shakopee Cr*	12	2B	09MN021	Upstream of CR 14, 4 mi. SW of Benson	- -	- -	IF	EXS	MTS	MTS	MTS	- -	EX	IF	NS
07020005-507, Chippewa River, *Shakopee Cr to Cottonwood Cr*	15	2B	09MN063 09MN068	Downstream of CR 17, in Hagen Downstream of CR 6, 5.5 mi. NE of Big Bend	MTS	EXP	IF	EXS	- -	- -	- -	- -	- -	NS	NA
07020005-508, Chippewa River, *Cottonwood Cr to Dry Weather Cr*	9	2B	09MN064 90MN012	Upstream of CR 40, 2 mi SW of Big Bend Downstream of CR 12,4.5 mi S of Big Bend City	EXP	EXP	IF	EXS	MTS	MTS	MTS	MTS	EX	NS	NS
07020005-576, Unnamed creek, *Unnamed cr to Chippewa R*	7	2B	09MN023	Downstream of 50th St NW, 3 mi. S of Big Bend City	EXP	MTS	- -	MTS	- -	- -	- -	- -	- -	IF	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).
Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support
Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.
*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.
†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 53. Biological sampling of channelized stream reaches for Chippewa River Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-501, Chippewa River, *Watson Sag to Minnesota R*	09MN019	Upstream Hwy 59, in Montevideo	good	good
07020005-506, Chippewa River, *E Br Chippewa R to Shakopee Cr*	09MN021	Upstream of CR 14, 4 mi. SW of Benson	good	good

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 54. Minnesota Stream Habitat Assessment (MSHA) results for the Chippewa River HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
2	09MN001	Chippewa River	0	9.5	11	8	17	45.5	fair
1	09MN019	Chippewa River	2	8	3	2	1	16	poor
1	09MN021	Chippewa River	0	7.5	18	2	6	33.5	poor
1	09MN023	Unnamed creek	2.5	11	14	12	22	61.5	fair
2	09MN063	Chippewa River	0	7	19.2	12.5	29.5	68.2	good
1	09MN064	Chippewa River	0	7.5	19.1	13	31	70.6	good
1	09MN068	Chippewa River	0	12	21	8	18	59	fair
Average Habitat Results: *Chippewa River Watershed unit*			0.5	8.8	15	8.7	19	52	fair

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 55. Outlet water chemistry resultsfor Chippewa River Watershed**

Station Location:	Chippewa River upstream of dam on CR 13, 0.5 miles N of Watson							
Storet ID:	S000-494							
Station #:	09MN001							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	15	35.0	980.4	214.9	120.0	1260	0
Ammonia-nitrogen	mg/l	10	0.00	0.07	0.02	0.01		
Inorganic nitrogen (nitrate and nitrite)	mg/l	10	0.00	0.58	0.28	0.29		
Kjeldahl nitrogen	mg/l	10	0.60	1.27	1.00	1.00		
Phosphorus	ug/l	9	77	160	122	125		
Orthophosphate	ug/l	1	26	26	26	26		
Total suspended solids	mg/l	10	18	56	38	39		
Total volatile solids	mg/l	10	3	11	7	6		
Hardness, carbonate	mg/l	10	327	416	384	398		
Chloride	mg/l	10	19	167	35	21	230	0
Sulfate	mg/l	10	90	930	218	142		
Specific conductance	uS/cm	36	596	1018	778	754		
pH	--	31	7.47	8.62	8.27	8.28	6.5-9	0
Dissolved oxygen (DO)	mg/l	37	6.10	10.69	7.53	7.25	5	0
Temperature, water	deg C	65	9.5	27.3	22.3	22.8		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	66	11	38	21	21		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Chippewa River HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

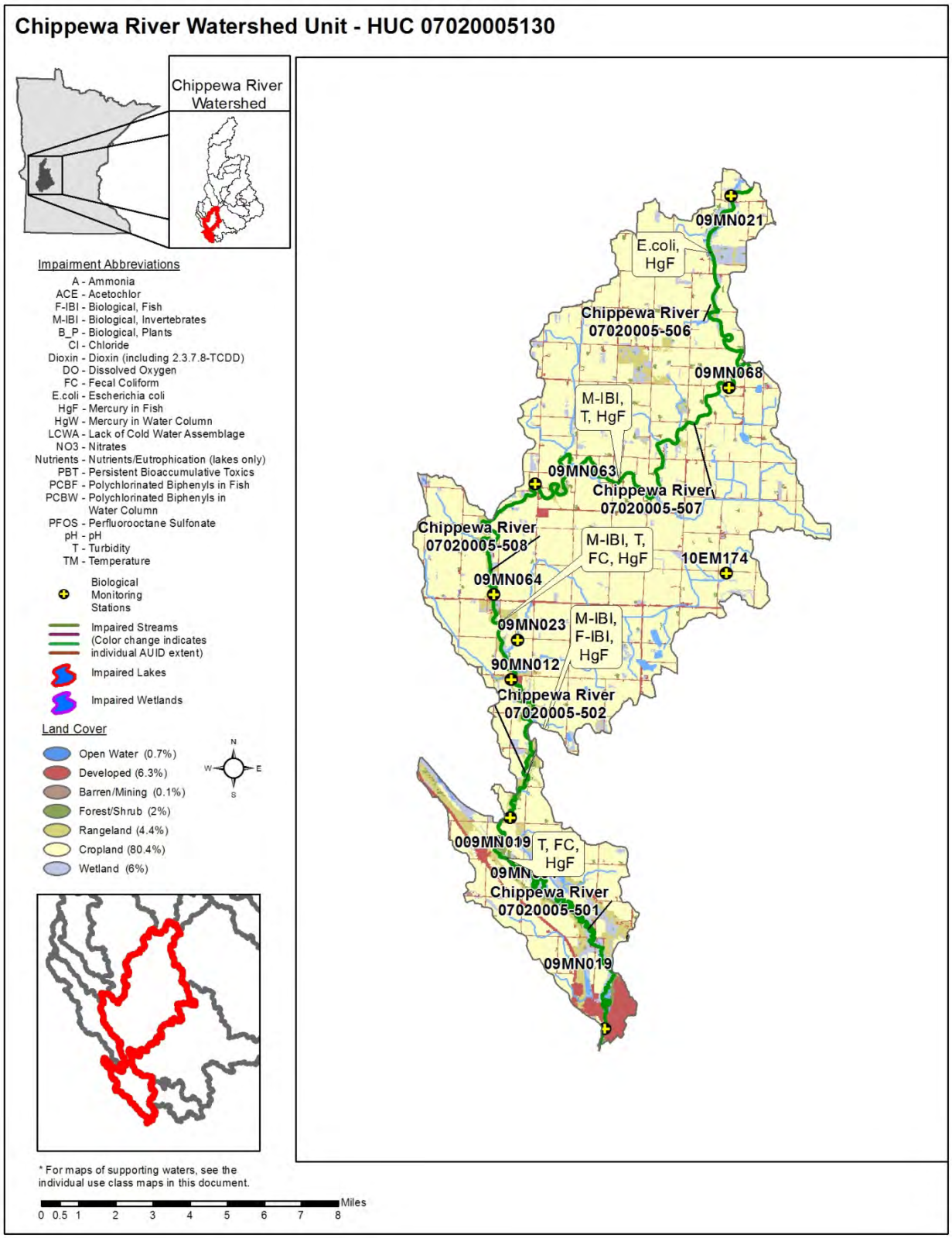

Figure 24. Land use and currently listed impaired waters by parameter, in the Chippewa River Watershed unit

Summary

Stream biological assessment results

Three biological stations were assessed in this watershed. All three are not supporting aquatic life. All of the sites are on the main stem Chippewa River and all upstream AUIDs are also not supporting aquatic life. There were two biological stations on channelized reaches of the Chippewa River which had good biological scores. The habitat in this watershed is fair.

Stream water chemistry assessment results

Water quality data for assessment was available on three stream reaches in the Chippewa River Watershed unit. The East Branch of the Chippewa River to Shakopee Creek exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The same reach shows excess turbidity as a stressor for biology. The Chippewa River from Shakopee Creek to Cottonwood Creek exceeded standards for turbidity and is considered impaired for aquatic life. Further downstream the Chippewa River from Cottonwood Creek to Dry Weather Creek exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The same reach is considered impaired for aquatic life use based on excess turbidity.

Lake water chemistry assessment results

No lakes were assessed for water quality in this watershed unit.

Upper Shakopee Creek Watershed unit HUC 07020005140

The Upper Shakopee Creek Watershed unit encompasses parts of Kandiyohi, Swift, and Chippewa Counties and has a drainage area of 125.4 square miles. The watershed is in the North Central Hardwoods Ecoregion and Western Corn Belt Plains Ecoregion. The predominant land use is cropland with rangeland being the second most abundant (Figure 25). The Upper Shakopee Creek HUC-11 flows southwest from the lakes in Sibley State Park to just southeast of Kerkhoven. The outlet of this watershed unit is represented by site 09MN010 on the Shakopee Creek; the site is located in HUC 07020005150 because that was the best location to collect the best representation of water chemistry for the Upper Shakopee Creek Watershed unit.

Table 56. Aquatic life and recreation assessment on stream reaches in the Upper Shakopee Creek Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID ***Reach Name***, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-512, Shakopee Creek, *Headwaters to T121 R36W S36, south line*	11	2B	03MN006	Upstream of C.R. 40, 4.5 mi. West of New London	MTS	EXP	EXP	MTS	- -	- -	- -	- -	IF	FS	IF
07020005-555, Shakopee Creek, *T120 R36W S1, north line to Swan Lk*	2	2C	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	- -	IF	NA
07020005-557, Shakopee Creek, *Swan Lk to Shakopee Lk*	20	2C	07MN038 07MN084	Upstream of Kandi-Swift Rd, 3.5 mi. NW of Pennock Downstream of Kandi-Swift Rd, 3.5 mi. NW of Pennock	- -	- -	EXS	EXS	- -	MTS	- -	- -	EX	IF	NS
07020005-560, County Ditch 61, *Headwaters to T120 R37W S16, south line*	2	2B	09MN079	Upstream of CSAH 35, 0.5 mi. N of Kerkhoven	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-566, Unnamed ditch (Judicial Ditch 29), *Headwaters to CD 29*	2	2B	- -	- -	- -	- -	IF	MTS	- -	- -	- -	- -	EX	IF	NS
07020005-567, County Ditch 29, *Headwaters to Unnamed ditch*	3	2B	- -	- -	- -	- -	IF	MTS	- -	- -	- -	- -	EX	IF	NS
07020005-570, County Ditch 27, *Unnamed ditch to Unnamed ditch*	3	2B	09MN043	Upstream of CR 1, 14 mi. NW of Willmar	- -	- -	IF	EXP	- -	- -	- -	- -	EX	IF	NS

07020005-904, Unnamed creek, *Henschien Lk to Lk Andrew*	0	2B	- -	- -	- -	- -	- -	MTS	- -	- -	- -	- -	IF	NA	NA
07020005-917, Unnamed creek (Huse Creek), *Headwaters to Norway Lk*	1	2B	- -	- -	- -	- -	IF	MTS	- -	- -	- -	- -	EX	IF	NS

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 57. Biological sampling of channelized stream reaches for Upper Shakopee Creek Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-557, Shakopee Creek, *Swan Lk to Shakopee Lk*	07MN038	Upstream of Kandi-Swift Rd, 3.5 mi. NW of Pennock	good	poor
07020005-557, Shakopee Creek, *Swan Lk to Shakopee Lk*	07MN084	Downstream of Kandi-Swift Rd, 3.5 mi. NW of Pennock	good	fair
07020005-570, County Ditch 27, *Unnamed ditch to Unnamed ditch*	09MN043	Upstream of CR 1, 14 mi. NW of Willmar	poor	poor
07020005-513, County Ditch 61, T120 R37W S21, north line to Shakopee Cr	09MN078	Downstream of CSAH 6, 0.5 mi. NE of Kerkhoven	poor	poor
07020005-560, County Ditch 61, *Headwaters to T120 R37W S16, south line*	09MN079	Upstream of CSAH 35, 0.5 mi. N of Kerkhoven	--	poor

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 58. Minnesota Stream Habitat Assessment (MSHA) results for the Upper Shakopee Creek HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	03MN006	Shakopee Creek	2.5	10.5	20	13	32	78	good
1	07MN038	Shakopee Creek	0	10	8	7	14	39	poor
1	07MN084	Shakopee Creek	0	9	16	6	20	51	fair
1	09MN043	County Ditch 27	0	14	17.8	13	23	67.8	good
1	09MN078	County Ditch 61	0	9	3	12	7	31	poor
1	09MN079	County Ditch 61	0	7.5	3	5	10	25.5	poor
Average Habitat Results: *Upper Shakopee Creek Watershed unit*			0.4	10	11.3	9.3	17.7	48.7	fair

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 59. Outlet water chemistry resultsfor Upper Shakopee Creek Watershed**

Station Location:	Shakopee Creek upstream of HWY 12, 1 mile SE of Kerkhoven
Storet ID:	S002-550
Station #:	09MN010

Parameter	Units	# of Samples	Minimum	Maximum	Mean	Median	WQ Standard	# WQ Exceedances
Escherichia coli	MPN/100ml	15	0.0	1732.9	251.9	90.8	1260	1
Ammonia-nitrogen	mg/l	10	0.02	0.18	0.05	0.04		
Inorganic nitrogen (nitrate and nitrite)	mg/l	0						
Kjeldahl nitrogen	mg/l	10	0.70	1.74	1.15	1.20		
Phosphorus	ug/l	9	76	241	143	124		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	2	23	7	6		
Total volatile solids	mg/l	10	1	6	3	2		
Hardness, carbonate	mg/l	9	309	394	352	370		
Chloride	mg/l	10	18	30	24	23	230	0
Sulfate	mg/l	10	38	83	59	59		
Specific conductance	uS/cm	20	437	804	623	592		
pH	--	17	7.27	8.71	8.17	8.22	6.5-9	0
Dissolved oxygen (DO)	mg/l	20	4.86	15.43	8.27	7.31	5	1

Temperature, water	deg C	20	17.7	27.5	21.4	21.3		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	47	7	60	48	56		
Transparency, tube 100	cm	4	70	100	93	100		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Upper Shakopee Creek HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

Table 60. Lake morphometric and assessment data for Upper Shakopee Creek Watershed

Lake ID	Lake Name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
34-0204-00	Florida Slough	KANDIYOHI	7020005140	NCHF	312.4	1.8	*1	17792.9	100	FS
34-0206-00	Andrew	KANDIYOHI	7020005140	NCHF	316.1	7.9	5.0	12314.4	36	FS
34-0208-00	Middle	KANDIYOHI	7020005140	NCHF	152.2	3.4	*1	432.8	100	NS
34-0217-00	Florida	KANDIYOHI	7020005140	NCHF	324.2	12.2	5.7	922.8	40	FS
34-0224-00	Games	KANDIYOHI	7020005140	NCHF	225.4	12.8	4.2	10949.5	47	FS
34-0249-00	Mary	KANDIYOHI	7020005140	WCBP	44.1	2.9	*1	381.2	100	IF
34-0251-00	Norway	KANDIYOHI	7020005140	NCHF	1010.1	10.1	1.8	10073.8	92	NS
34-0292-00	Church	KANDIYOHI	7020005140	WCBP	20.2	2.7	*1	177.1	100	IF
34-0321-00	Swenson	KANDIYOHI	7020005140	WCBP	41.3	4.3	2.8	1020.3	100	IF
34-0327-00	Unnamed	KANDIYOHI	7020005140	WCBP	12.5	1.7	1.1	174.7	100	IF

* Estimated mean depth

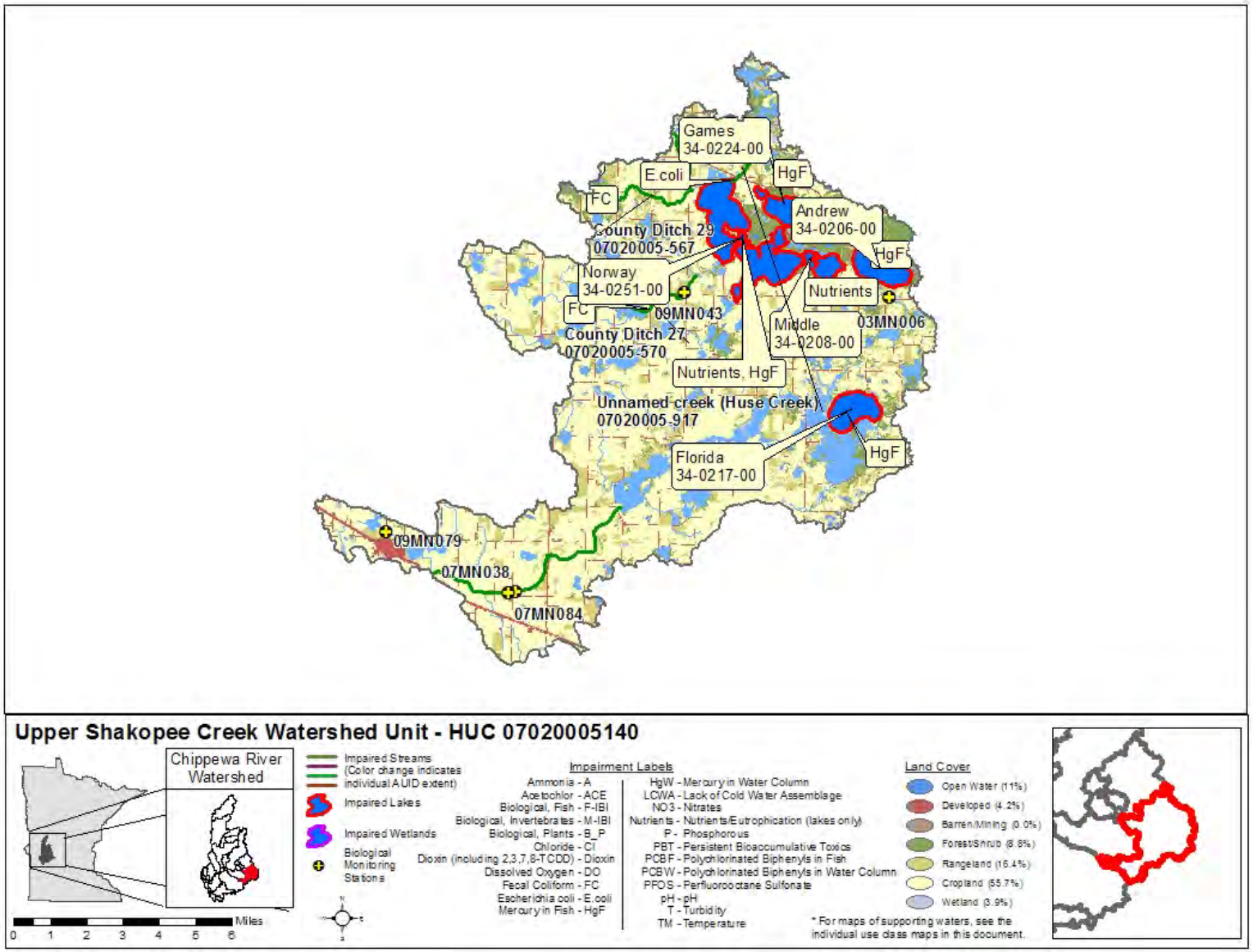

Figure 25. Land use and currently listed impaired waters by parameter, in the Upper Shakopee Creek Watershed unit

Summary

Stream biological assessment results

One AUID was assessed for biology and it was fully supporting aquatic life, but it is located in the headwaters of the watershed. The channelized reaches best describe the majority of the watershed and they have fair to poor biological scores. The habitat scores are fair. There are many lakes at the headwaters of this watershed that are impaired which could contribute to the poor biological scores of the downstream AUIDs.

Stream water chemistry assessment results

Stream water quality data for assessment was available on five stream reaches in the Upper Shakopee Creek Watershed unit. All assessed reaches exceed the standard for bacteria and are considered impaired for aquatic recreation use. The impaired reached are: Unnamed Creek (Huse Creek) from the headwaters to Norway Lake, Unnamed Ditch (Judicial Ditch #29) from the headwaters to Judicial Ditch #29, County Ditch #29, County Ditch #27, and Shakopee Lake form Swan Lake to Shakopee Lake. Dissolved Oxygen (DO) and turbidity also appear to be biological stressors in the Shakopee Lake to Swan Lake reach but were not listed as impairment causes. DO range up to 15.43 mg/l indicating that it could be low in the early morning. A recording DO sondes should be placed at this site during August to ensure low DO is not a cause of impairment.

Lake water chemistry assessment results

Ten of the 23 lakes greater than four hectares (10 acres) were reviewed for aquatic recreation use in the watershed (Appendix 8). Four lakes, Florida Slough, Andrew, Florida, and Games were all fully supporting for aquatic recreation use. The Shakopee Creek originates at the outlet of Andrew Lake and flows through Florida Lake and Florida Slough all of which have good water quality. Middle and Norway were found to be impaired for aquatic recreation use (excess nutrients). This is unexpected because these two lakes flow into Games Lake which has good water quality. If forest land in the watershed of the lakes is converted to crop or developed increased run-off may cause nutrient levels in the lakes to rise. Forested areas near these lakes should be protected in order to buffer run-off that could potentially enter the lake.

Shakopee Creek Watershed unit HUC 07020005150

The Shakopee Creek Watershed unit encompasses parts of Swift and Chippewa Counties and has a drainage area of 194.4 square miles. The watershed is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with developed being the second most abundant (Figure 26). The Shakopee Creek HUC-11 flows northwest from near Kerkhoven to the Chippewa River near County Road 6. The outlet of this watershed unit is represented by site 03MN015 on Shakopee Creek.

Table 61. Aquatic life and recreation assessment on stream reaches in the Shakopee Creek Watershed unit. Reaches are organized up stream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID ***Reach Name***, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-548, Unnamed ditch, *Unnamed cr to Unnamed ditch*	3	2B	01MN035	Downstream CR 2, In Louriston twp	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-549, Unnamed ditch, *Unnamed ditch to Unnamed cr*	2	2B	09MN039	Upstream of CR 30, 1 mi. NE of Louriston	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-550, Unnamed ditch, *Unnamed cr to Shakopee Cr*	3	2B	09MN040	Downstream of 80th Ave NE, 2.5 mi. NW of Louriston	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-557, Shakopee Creek, *Swan Lk to Shakopee Lk*	20	2C	09MN010 09MN069	Upstream of Hwy 12, 1 mi. SE of Kerkhoven Downstream of CR 4, 4 mi. NW of Louriston	- -	- -	IF	IF	- -	MTS	- -	- -	EXS	IF	NS
07020005-559, Shakopee Creek, *Shakopee Lk to Chippewa R*	13	2C	03MN015 09MN042	Upstream of 20th Ave., 7.5 mi. S. of Benson Downstream of CR 83, 7 mi. SW of Murdock	- -	- -	IF	EXS	MTS	MTS	MTS	MTS	EXS	NS	NS
07020005-574, Unnamed creek, *Unnamed cr to Unnamed ditch*	2	2B	- -	- -	- -	- -	- -	IF	- -	- -	- -	- -	- -	NS	NA
07020005-575, Unnamed creek, *Unnamed ditch to Shakopee Cr*	3	2B	09MN076	Downstream of 60th Ave SE, 7 mi. SW of Murdock	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA
07020005-599, Unnamed ditch, *T120 R39W S5, east line to JD 5*	0	2B	07MN043	Downstream of 70th St, 4 mi. S of Benson	- -	- -	- -	- -	- -	- -	- -	- -	- -	NA	NA

07020005-701, Unnamed creek, *Unnamed cr to Shakopee Cr*	2	2B	09MN041	Upstream of CR 27, 11.5 mi. S of Benson	--	--	--	--	--	--	--	--	--	NA	NA
07020005-702, Judicial Ditch 5, *Unnamed ditch to Unnamed ditch*	4	2B	09MN047	Upstream of CR 10, 6.5 mi. S of Benson	--	--	--	--	--	--	--	--	--	NA	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).
Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support
Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.
*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.
†Reach was assessed based on use class included in table and existing use class as defined in Minn. R. 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 62. Biological sampling of channelized stream reaches for Shakopee Creek Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-548, Unnamed ditch, *Unnamed cr to Unnamed ditch*	01MN035	Downstream CR 2, In Louriston twp	poor	poor
07020005-559, Shakopee Creek, *Shakopee Lk to Chippewa R*	03MN015	Upstream of 20th Ave., 7.5 mi. S. of Benson	poor	poor
07020005-599, Unnamed ditch, *T120 R39W S5, east line to JD 5*	07MN043	Downstream of 70th St, 4 mi. S of Benson	good	poor
07020005-557, Shakopee Creek, *Swan Lk to Shakopee Lk*	09MN010	Upstream of Hwy 12, 1 mi. SE of Kerkhoven	fair	poor
07020005-549, Unnamed ditch, *Unnamed ditch to Unnamed cr*	09MN039	Upstream of CR 30, 1 mi. NE of Louriston	poor	poor
07020005-550, Unnamed ditch, *Unnamed cr to Shakopee Cr*	09MN040	Downstream of 80th Ave NE, 2.5 mi. NW of Louriston	fair	fair
07020005-701, Unnamed creek, *Unnamed cr to Shakopee Cr*	09MN041	Upstream of CR 27, 11.5 mi. S of Benson	poor	--
07020005-559, Shakopee Creek, *Shakopee Lk to Chippewa R*	09MN042	Downstream of CR 83, 7 mi. SW of Murdock	poor	poor

07020005-702, Judicial Ditch 5, *Unnamed ditch to Unnamed ditch*	09MN047	Upstream of CR 10, 6.5 mi. S of Benson	fair	poor
07020005-557, Shakopee Creek, *Swan Lk to Shakopee Lk*	09MN069	Downstream of CR 4, 4 mi. NW of Louriston	fair	poor
07020005-575, Unnamed creek, *Unnamed ditch to Shakopee Cr*	09MN076	Downstream of 60th Ave SE, 7 mi. SW of Murdock	good	--

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 63. Minnesota Stream Habitat Assessment (MSHA) results for the Shakopee Creek HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	01MN035	Unnamed ditch	0	7	7	13	5	32	poor
3	03MN015	Shakopee Creek	0.5	9	9	3	7.8	29.2	poor
2	07MN043	Unnamed ditch	0	10.25	11.9	9.5	21	52.65	fair
1	09MN010	Shakopee Creek	0	10	19.1	10	18	57.1	fair
1	09MN039	Unnamed ditch	0	8	10	12	4	34	poor
1	09MN040	Unnamed ditch	0	8	13.5	12	24	57.5	fair
1	09MN041	Trib. to Shakopee Creek	0	8.5	5	7	8	28.5	poor
1	09MN042	Shakopee Creek	0	6	9	7	1	23	poor
1	09MN047	Judicial Ditch 5	0	10	16	10	13	49	fair
1	09MN069	Shakopee Creek	0	8	9	10	14	41	poor
1	09MN076	Trib. to Shakopee	1	10	13.3	13	18	55.3	fair
Average Habitat Results: *Shakopee Creek Watershed unit*			0.2	8.8	10.9	8.7	12.2	40.7	poor

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 64. Outlet water chemistry resultsfor Shakopee Creek Watershed**

Station Location:	Shakopee Creek upstream of 20th Ave. SW, 8 miles S of Benson							
Storet ID:	S002-201							
Station #:	03MN015							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	25	24.3	1119.9	315.9	228.2	1260	0
Ammonia-nitrogen	mg/l	10	0.00	0.43	0.13	0.07		
Inorganic nitrogen (nitrate and nitrite)	mg/l	48	0.00	13.30	3.16	2.31		
Kjeldahl nitrogen	mg/l	10	1.30	3.40	2.31	2.30		
Phosphorus	ug/l	47	72	500	219	194		
Orthophosphate	ug/l	35	4	362	64	42		
Total suspended solids	mg/l	48	13	167	63	55		
Total volatile solids	mg/l	19	6	39	16	12		
Hardness, carbonate	mg/l	10	327	475	383	383		
Chloride	mg/l	10	20	200	44	28	230	0
Sulfate	mg/l	10	80	160	115	115		
Specific conductance	uS/cm	32	642	1075	786	759		
pH	--	30	6.47	9.54	8.30	8.36	6.5-9	2
Dissolved oxygen (DO)	mg/l	40	5.79	12.77	8.36	7.98	5	0
Temperature, water	deg C	41	1.3	27.7	19.1	20.4		
Turbidity	NTU	39	6.8	130.0	40.8	36.0	25 NTU	25
Transparency, tube 60	cm	43	4	33	14	12		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Shakopee Creek HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

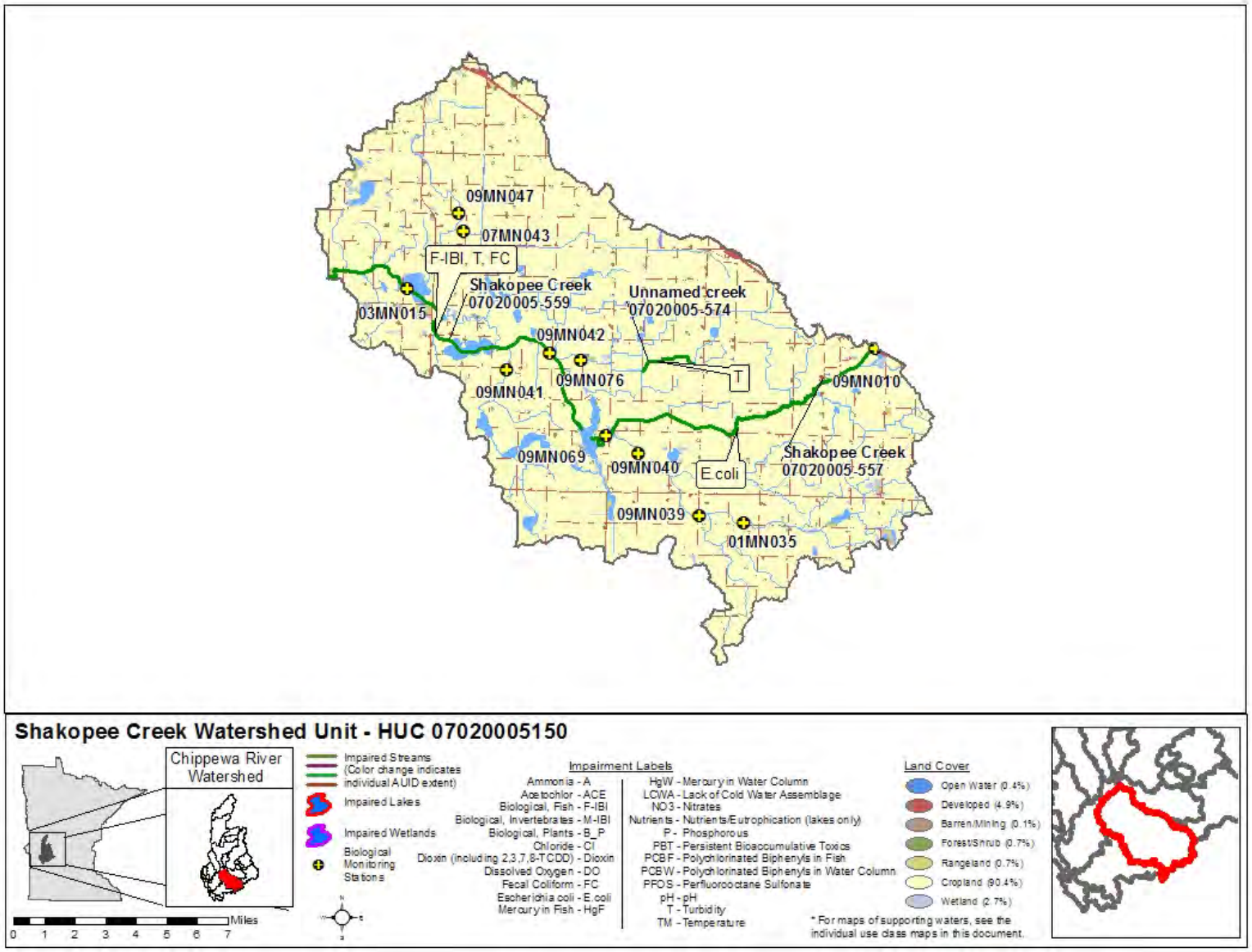

Figure 26. Land use and currently listed impaired waters by parameter, in the Shakopee Creek Watershed unit

Summary

Stream biological assessment results

No AUIDs were assessed for biology in this watershed since all biological sites are on channelized reaches. These reaches have good to poor biological scores with most being poor. These also have poor habitat scores with poor substrate and channel morphology. The Upper Shakopee Creek Watershed unit has impaired waters which also may influence this watershed.

Stream water chemistry assessment results

Water quality data for assessment was available on three stream reaches in the Shakopee Creek watershed unit. The Shakopee Creek reach form Swan Lake to Shakopee Lake, continues form the Upper Shakopee Creek Watershed unit. This reach exceeded the standard for bacteria and is considered impaired for aquatic recreation use. A tributary to Shakopee Creek, Unnamed Creek, is considered impaired for aquatic life based on excess turbidity. Shakopee Creek from Shakopee Lake to the Chippewa River exceeded the standard for bacteria and is considered impaired for aquatic recreation use. The same reach is considered impaired for aquatic life based on excess turbidity.

Lake water chemistry assessment results

No lakes were assessed for water quality in this watershed unit.

Holloway Creek Watershed unit HUC 07020005160

The Holloway Creek Watershed unit is in Swift County and has a drainage area of 32 square miles. The northern half of the watershed is in the Northern Glaciated Plains Ecoregion and the southern half is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with wetland being the second most abundant (Figure 27). Holloway Creek HUC-11 flows south from north of Holloway to County Road 6. The outlet of this watershed unit is represented by site 09MN027 on the Cottonwood Creek. This watershed was not sampled for intensive water chemistry because it is less than 40 square miles.

Table 65. Aquatic life and recreation assessment on stream reaches in the Holloway Creek Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-510, Cottonwood Creek, *Unnamed cr to T120 R41W S20, east line*	5	2C	09MN027	North of CR 6, 7.5 mi. SE of Holloway	- -	- -	- -	IF	- -	- -	- -	- -	- -	IF	NA
07020005-577, Unnamed creek (Cottonwood Creek), *Unnamed cr to Unnamed cr*	4	2C	- -	- -	- -	- -	- -	EXP	- -	- -	- -	- -	- -	IF	NA
07020005-578, Unnamed creek, Headwaters to Unnamed cr (Cottonwood Cr)	2	2B	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	IF	NA	IF
07020005-616, Unnamed creek (Cottonwood Creek), *Unnamed cr to Unnamed cr*	3	2C	- -	- -	- -	- -	- -	EXS	- -	- -	- -	- -	- -	IF	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream

†Reach was assessed based on use class included in table and existing use class as defined in Minn. R. 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 66. Biological sampling of channelized stream reaches for Holloway Creek Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-510, Cottonwood Creek, *Unnamed cr to T120 R41W S20, east line*	poor	North of CR 6, 7.5 mi. SE of Holloway	poor	poor

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 67. Minnesota Stream Habitat Assessment (MSHA) results for the Holloway Creek HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	09MN027	Cottonwood Creek	0	11	10.7	10	20	51.7	fair
Average Habitat Results: *Judicial Ditch #8 Watershed Unit*			0	11	10.7	10	20	51.7	fair

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

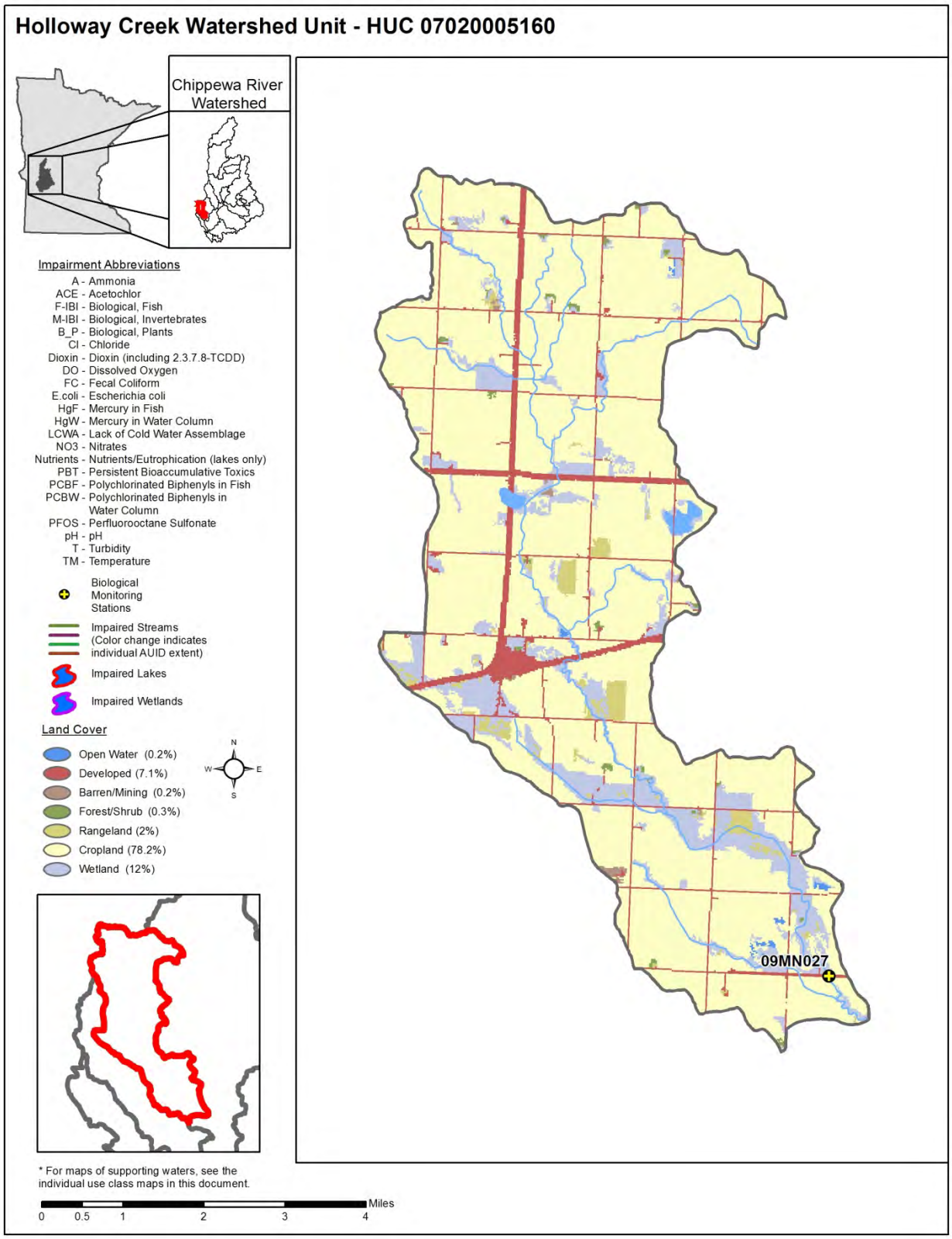

Figure 27. Land use and currently listed impaired waters by parameter, in the Holloway Creek Watershed unit

Summary

Stream biological assessment results

No AUIDs were assessed for biology in this watershed since the one biological site is on channelized a reach. The reach has a poor biological score and fair habitat score. The amount of upstream channelization and lack of habitat could be a factor in the low biological scores.

Stream water chemistry assessment results

Limited water quality data was available within the Halloway Creek Watershed unit. DO data appeared to exceed standards in the lower reaches of Cottonwood Creek, however, because of channelization the data was insufficient to list as non-supporting for aquatic life.

Lake water chemistry assessment results

No lakes were assessed for water quality in this watershed unit.

Moyer-Edison Creek Watershed unit HUC 07020005170

Moyer-Edison Creek Watershed unit is in Swift County and has a drainage area of 18.5 square miles. The northern tip of the watershed is in the Northern Glaciated Plains Ecoregion and the southern half is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with wetland being the second most abundant (Figure 28). The Moyer-Edison Creek HUC-11 flows south from west of Holloway to County Road 6. The outlet of this watershed unit is represented by site 09MN028 on the tributary to Cottonwood Creek. This watershed was not sampled because of low flow. It was not sampled for intensive water chemistry, because it is less than 40 square miles.

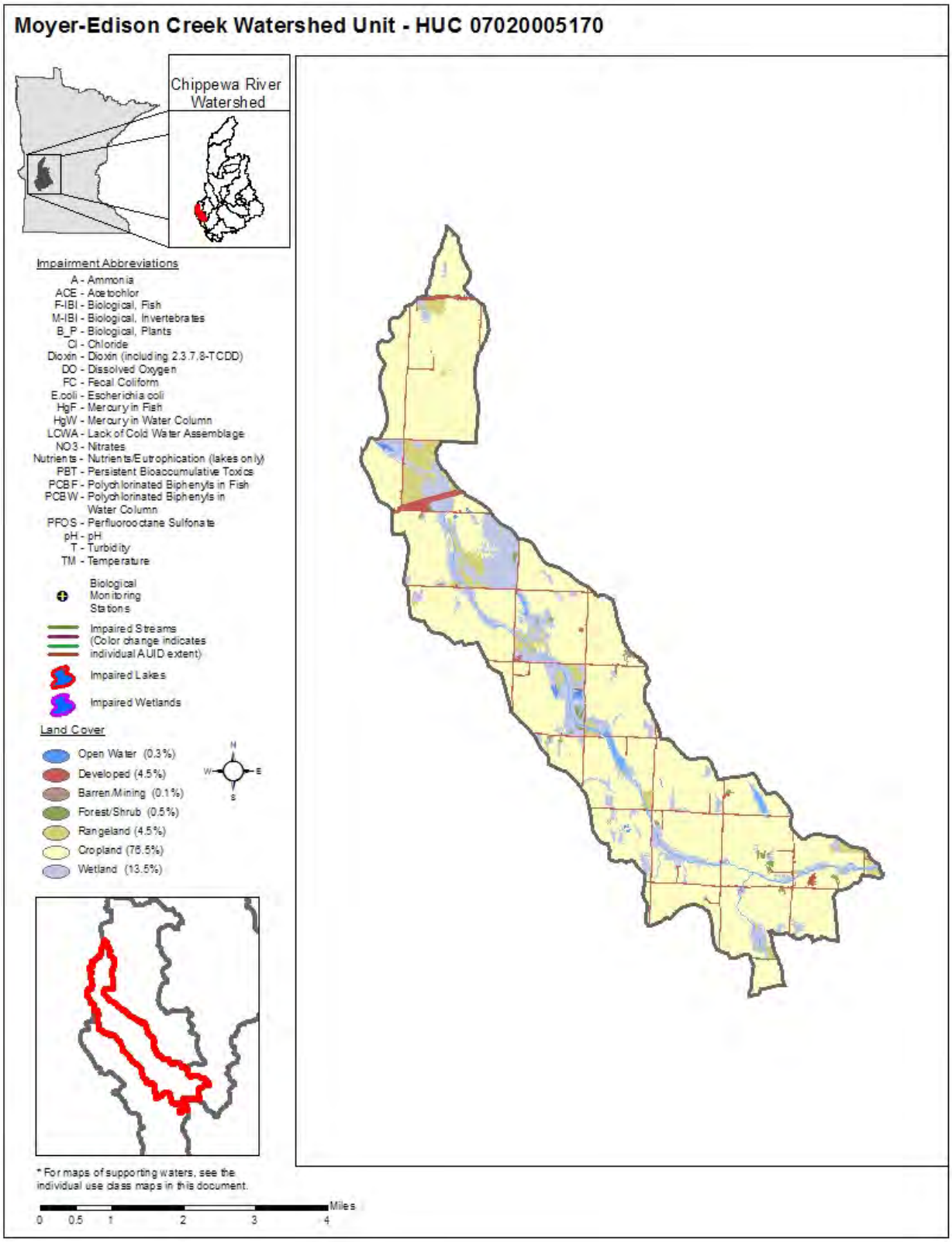

Figure 28. Land use and currently listed impaired waters by parameter, in the Moyer Edison Creek Watershed unit

Summary

Stream biological assessment results

No biological monitoring occurred in this watershed.

Stream water chemistry assessment results

No water chemistry data was assessed for water quality in this watershed unit

Lake water chemistry assessment results

No lakes were assessed for water quality in this watershed unit

Judicial Ditch #8 Watershed unit HUC 07020005180

The Judicial Ditch #8 Watershed unit encompasses parts of Swift and Chippewa Counties and has a drainage area of 72.2 square miles. The northern half of the watershed is in the Northern Glaciated Plains Ecoregion and the southern half is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with urban development being the second most abundant (Figure 29). Judicial Ditch #8 HUC-11 flows south from northwest of Danvers State Wildlife Management Area to the Chippewa River near Big Bend. The outlet of this watershed unit is represented by site 09MN008 on Cottonwood Creek. The lower section of Cottonwood Creek is listed as cold water by the Minnesota DNR. Coldwater IBI scores were not used in this section because the MDNR and MPCA agreed that it is not a coldwater reach.

Table 68. Aquatic life and recreation assessments on stream reaches in the Judicial Ditch #8 Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID ***Reach Name***, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators:								Bacteria	Aquatic Life	Aquatic Rec.
					Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides			
07020005-511, Cottonwood Creek, *T120 R41W S21, west line to Chippewa R*	5	2A†	09MN008 90MN011	Upstream of 120th St SW, 0.5 mi. NW of Big Bend Downstream of CR 65, 3 mi NW of Big Bend City	EXP	EXP	IF	MTS	--	MTS	--	--	EX	NS	NS
07020005-546, Judicial Ditch 8, *Unnamed cr to Unnamed ditch*	7	2B	01MN003 03MN014 07MN042	Downstream CR 60, 2.5mi SW of Danvers 9 mi. E. of Appleton on C.R. 65 Upstream of 40th St, 1.5 mi. SW of Danver	--	--	IF	MTS	--	--	--	--	--	NS	NA
07020005-547, Judicial Ditch 8, *Unnamed ditch to Cottonwood Cr*	1	2A†	--	--	--	--	--	IF	--	--	--	--	--	IF	NA
07020005-643, Unnamed ditch, *Unnamed cr to JD 8*	5	2B	07MN052	Upstream of 80th St, 5 mi. SE of Holloway	--	--	--	--	--	--	--	--	--	NA	NA
07020005-705, Unnamed ditch, *Unnamed ditch to JD 8*	2	2B	09MN044	Downstream of 20th St NW, 2.5 mi. NW of Danvers	--	--	--	MTS	--	--	--	--	--	IF	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 69. Biological sampling of channelized stream reaches for Judicial Ditch *8 Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-546, Judicial Ditch 8, *Unnamed cr to Unnamed ditch*	01MN003	Downstream CR 60, 2.5mi SW of Danvers	poor	good
07020005-546, Judicial Ditch 8, *Unnamed cr to Unnamed ditch*	03MN014	9 mi. E. of Appleton on C.R. 65	poor	fair
07020005-546, Judicial Ditch 8, *Unnamed cr to Unnamed ditch*	07MN042	Upstream of 40th St, 1.5 mi. SW of Danver	poor	fair
07020005-643, Unnamed ditch, *Unnamed cr to JD 8*	07MN052	Upstream of 80th St, 5 mi. SE of Holloway	fair	poor
07020005-705, Unnamed ditch, *Unnamed ditch to JD 8*	09MN044	Downstream of 20th St NW, 2.5 mi. NW of Danvers	fair	fair
07020005-511, Cottonwood Creek, *T120 R41W S21, west line to Chippewa R*	90MN011	Downstream of CR 65, 3 mi NW of Big Bend City	poor	good

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 70. Minnesota Stream Habitat Assessment (MSHA) results for the Judicial Ditch #8 HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	01MN003	Judicial Ditch 8	0	5.5	10	9	10	34.5	poor
3	03MN014	Judicial Ditch 8	0	8	13.7	9.3	16.3	47.3	fair
1	07MN042	Judicial Ditch 8	0	7.5	9	8	15	39.5	poor
3	07MN052	Trib. to Cottonwood Creek	0	9.8	15.5	9	16	50.4	fair
1	09MN008	Cottonwood Creek	0	13	19.05	17	30	79.05	good
1	09MN044	Trib. to Judicial Ditch 8	0	8.5	16.8	11	17	53.3	fair
2	90MN011	Cottonwood Creek	4.1	11	15	7.5	13	50.6	fair
Average Habitat Results: *Judicial Ditch #8 Watershed unit*			0.7	9.2	14.4	9.6	16.3	50	fair

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 71. Outlet water chemistry resultsfor Judicial Ditch #8 Watershed**

Station Location:	Cottonwood Creek upstream of 120th St. SW, 0.5 miles NW of Big Bend City							
Storet ID:	S002-202							
Station #:	09MN008							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	15	170.0	1553.1	558.0	461.0	1260	1
Ammonia-nitrogen	mg/l	10	0.02	0.14	0.04	0.02		
Inorganic nitrogen (nitrate and nitrite)	mg/l	0						
Kjeldahl nitrogen	mg/l	10	0.40	0.70	0.52	0.50		
Phosphorus	ug/l	9	44	91	63	61		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	2	6	4	4		
Total volatile solids	mg/l	10	1	2	2	2		
Hardness, carbonate	mg/l	10	543	584	563	563		
Chloride	mg/l	10	17	290	45	18	230	1
Sulfate	mg/l	10	260	3490	614	295		
Specific conductance	uS/cm	33	886	1054	996	1004		
pH	--	31	7.41	8.37	7.95	8.01	6.5-9	0
Dissolved oxygen (DO)	mg/l	34	5.81	11.12	7.68	7.55	5	0
Temperature, water	deg C	34	11.2	24.0	18.0	17.9		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	34	0	90	27	0		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Judicial Ditch #8 HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

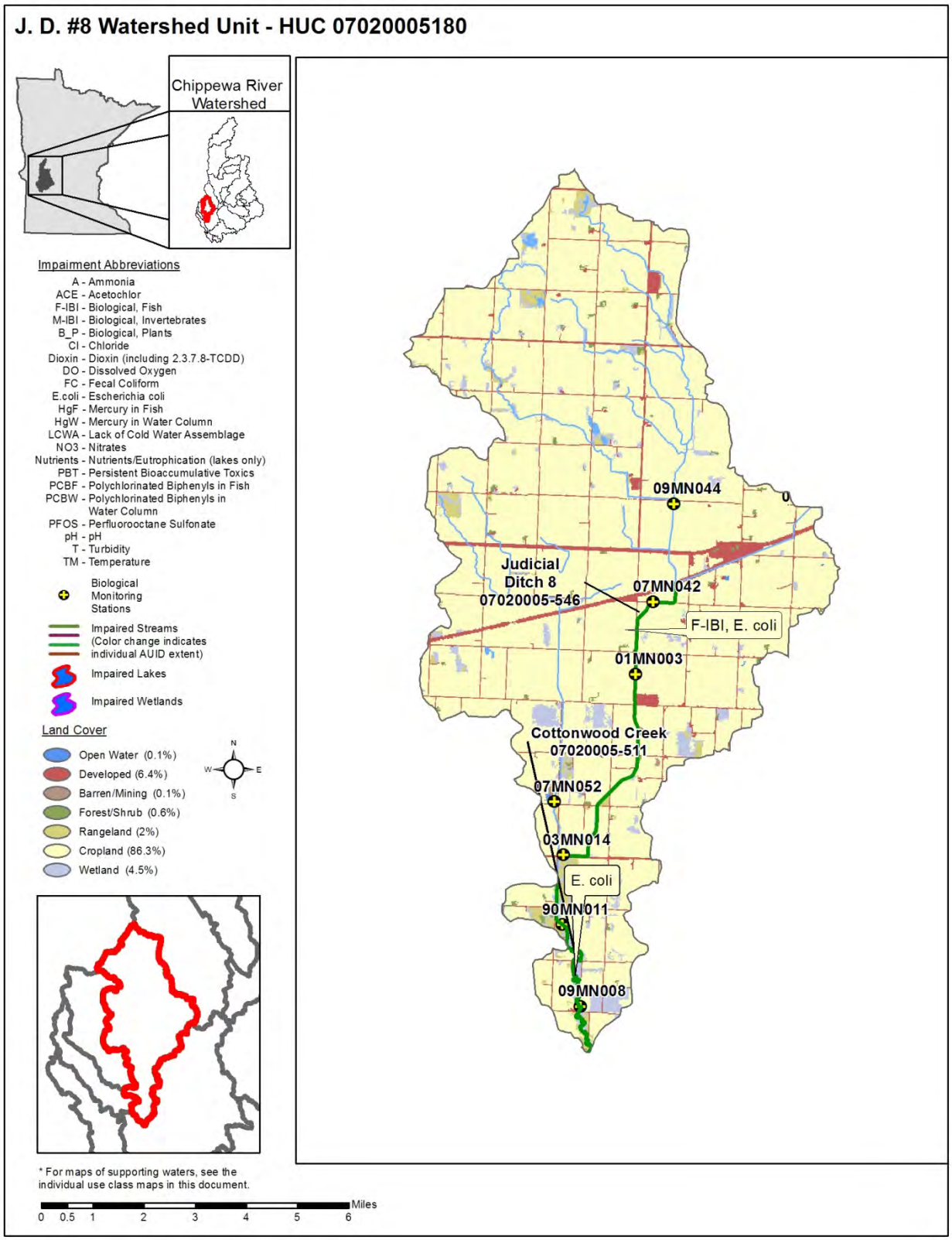

Figure 29. Land use and currently listed impaired waters by parameter, in the Judicial Ditch #8 Watershed unit

Summary

Stream biological assessment results

Two AUIDs were assessed for biology in this watershed. Both AUIDs are not supporting aquatic life. One of the AUIDs was previously listed and is still impaired for this reason. The channelized reaches had fair (generally the invertebrates) to poor (generally the fish) biological scores and the habitat score for the watershed is fair. Fair to poor habitat and the abundance of channelized streams may contribute to the low biological scores.

Stream water chemistry assessment results

Limited stream water quality data was available within the Judicial Ditch #8 Watershed unit.

Lake water chemistry assessment results

No lakes were assessed for water quality in this watershed unit.

Dry Weather Creek Watershed unit HUC 07020005190

The Dry Weather Creek Watershed unit encompasses parts of Swift and Chippewa Counties and has a drainage area of 106.3 square miles. The entire watershed is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with urban development being the second most abundant (Figure 30).The Dry Weather Creek HUC-11 flows west from County Road 6 to the Chippewa River, four miles northeast of Watson. The outlet of this watershed unit is represented by site 09MN009 on Dry Weather Creek.

Table 72. Aquatic life and recreation assessment on stream reaches in the Dry Weather Creek Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators: Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides	Bacteria	Aquatic Life	Aquatic Rec.
07020005-509, Dry Weather Creek, *Headwaters to Chippewa R*	17	2C	09MN009 09MN038 97MN005	Upstream of 85th Ave NW, 4 mi. NE of Watson Downstream of CR 13 , 9 mi. NE of Montevideo near Watson, MN	EXP	EXP	IF	EXP	MTS	MTS	MTS	IF	EXS	IF	NS
07020005-615, Unnamed creek, *Unnamed cr to Dry Weather Cr*	1	2B	91MN013	Downstream of 20th St NW, 7 mi NE of Montevideo	--	--	--	--	--	--	--	--	--	NA	NA
07020005-660, Unnamed creek, *Unnamed cr to Dry Weather Cr*	5	2B	09MN037	Downstream of 10th St NW, 9 mi. NE of Montevideo	--	--	--	MTS	--	--	--	--	--	IF	NA
07020005-661, Unnamed creek, *Unnamed cr to Unnamed cr*	1	2B	07MN049	Downstream of CR 12, 1 mi. NW of Havelock	--	--	--	EXP	--	--	--	--	--	IF	NA
07020005-662, Unnamed creek, *Unnamed cr to Unnamed cr*	2	2B	07MN048	Upstream of CR 6, 1 mi. S of Aggie	--	--	--	--	--	--	--	--	--	NA	NA
07020005-663, Unnamed creek, *Unnamed cr to Unnamed cr*	1	2B	09MN052	Downstream of CR 12, 2 mi. S of Aggie	--	--	--	--	--	--	--	--	--	NA	NA
07020005-709, Unnamed creek, *Headwaters to Unnamed cr*	13	2B	--	--	--	--	--	EXS	--	--	--	--	--	IF	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 73. Biological sampling of channelized stream reaches for Dry Weather Creek Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-662, Unnamed creek, *Unnamed cr to Unnamed cr*	07MN048	Upstream of CR 6, 1 mi. S of Aggie	poor	poor
07020005-661, Unnamed creek, *Unnamed cr to Unnamed cr*	07MN049	Downstream of CR 12, 1 mi. NW of Havelock	good	poor
07020005-660, Unnamed creek, *Unnamed cr to Dry Weather Cr*	09MN037	Downstream of 10th St NW, 9 mi. NE of Montevideo	poor	poor
07020005-509, Dry Weather Creek, *Headwaters to Chippewa R*	09MN038	Downstream of CR 13 , 9 mi. NE of Montevideo	poor	poor
07020005-663, Unnamed creek, *Unnamed cr to Unnamed cr*	09MN052	Downstream of CR 12, 2 mi. S of Aggie	poor	--
07020005-615, Unnamed creek, *Unnamed cr to Dry Weather Cr*	91MN013	Downstream of 20th St NW, 7 mi NE of Montevideo	good	--

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 74. Minnesota Stream Habitat Assessment (MSHA) results for the Dry Weather Creek HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
2	07MN048	Trib. to Dry Weather Creek	0	8.8	5.5	11.5	11.5	37.3	poor
3	07MN049	Trib. to Dry Weather Creek	0	9.2	8	7	9.3	33.5	poor
1	09MN009	Dry Weather Creek	0	14.5	20.8	17	36	88.3	good
1	09MN037	Trib. to Dry Weather Creek	0	9	11	13	16	49	fair
1	09MN038	Dry Weather Creek	0	8.5	5	5	10	28.5	poor
1	09MN052	Unnamed creek	0	7	5	12	7	31	poor
2	91MN013	Trib. to Dry Weather Creek	0	9.5	14.1	4	12	39.6	poor
Average Habitat Results: *Dry Weather Creek Watershed unit*			0	9.4	9.5	9	13.1	41	poor

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 75. Outlet water chemistry resultsfor Dry Weather Creek Watershed**

Station Location:	Dry Weather Creek upstream of 85th Ave. NW, 4 miles NE of Watson							
Storet ID:	S002-204							
Station #:	09MN009							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	27	16.0	1046.2	230.9	155.3	1260	0
Ammonia-nitrogen	mg/l	10	0.00	0.25	0.07	0.03		
Inorganic nitrogen (nitrate and nitrite)	mg/l	53	0.00	9.26	4.72	5.00		
Kjeldahl nitrogen	mg/l	10	0.40	1.10	0.77	0.80		
Phosphorus	ug/l	52	30	1040	184	131		
Orthophosphate	ug/l	43	0	414	113	76		
Total suspended solids	mg/l	53	2	263	30	12		
Total volatile solids	mg/l	20	0	39	6	3		
Hardness, carbonate	mg/l	10	727	966	845	856		
Chloride	mg/l	10	17	25	20	21	230	0
Sulfate	mg/l	10	500	970	666	656		
Specific conductance	uS/cm	32	1373	2054	1635	1594		
pH	--	27	7.3	8.72	7.97	7.99	6.5-9	0
Dissolved oxygen (DO)	mg/l	41	5.20	19.20	8.89	7.86	5	0
Temperature, water	deg C	42	1.4	26.4	17.0	19.1		
Turbidity	NTU	43	2.4	210.0	26.4	8.3	25 NTU	5
Transparency, tube 60	cm	23	6	60	58	60		
Transparency, tube 100	cm	15	31	100	68	69		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Dry Weather Creek HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

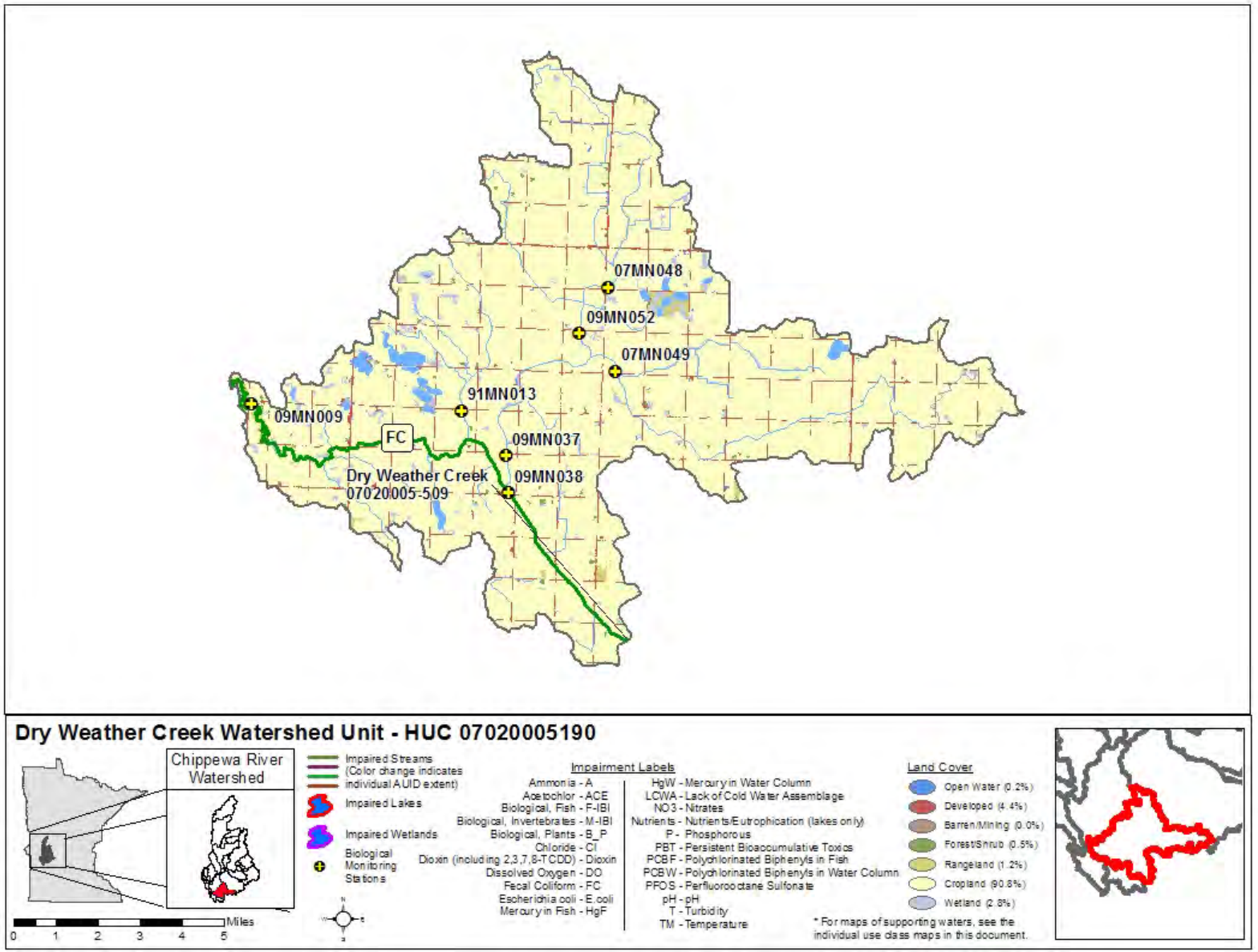

Figure 30. Land use and currently listed impaired waters by parameter, in the Dry Weather Creek Watershed unit

Summary

Stream biological assessment results

No AUIDs were assessed for biology in this watershed since all biological sites are on channelized reaches. These reaches have poor biological scores and poor habitat scores. The abundance of channelized streams and poor habitat may contribute to the low biological scores.

Stream water chemistry assessment results

Water quality data was available on one reach of the Dry Weather Creek from the Headwaters to the Chippewa River. The Dry Weather Creek exceeded the standard for bacteria and is considered impaired for aquatic recreation use. Dissolved Oxygen (DO) ranged up to 19.2 mg/l indicating that it could be low in the early morning. A recording DO sondes should be placed at this site during August to ensure DO is not a cause of impairment.

Lake water chemistry assessment results

No lakes were assessed for water quality in this watershed unit.

Judicial Ditch #7 Watershed unit HUC 07020005200

The Judicial Ditch #7 Watershed unit encompasses parts of Swift and Chippewa Counties and has a drainage area of 29.1 square miles. The entire watershed is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with wetland being the second most abundant (Figure 31). Judicial Ditch #7 HUC-11 flows southeast from four miles west of Hagen to the Chippewa River two miles north of Watson. The outlet of this watershed unit is represented by site 09MN002 on Unnamed Creek.

Table 76. Aquatic life and recreation assessments on stream reaches in the Judicial Ditch #7 Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators: Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides	Bacteria	Aquatic Life	Aquatic Rec.
07020005-584, Unnamed creek, *Unnamed cr to Chippewa R*	3	2B	03MN056 09MN002	Downstream of CR 9, 7 mi. NW of Montevideo Downstream of CR 9, 2 mi. N of Watson	MTS	EXS	EXS	MTS	--	MTS	--	--	EX	NS	NS
07020005-708, Unnamed creek, *Headwaters to Unnamed cr*	13	2B	--	--	--	--	--	MTS	--	--	--	--	--	IF	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. Rule 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 77. Minnesota Stream Habitat Assessment (MSHA) results for the Judicial Ditch #7 HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	03MN056	Trib. to Chippewa River	3	14	15	14	29	75	good
1	09MN002	Unnamed creek	0	9	10	12	20	51	fair
Average Habitat Results: *Judicial Ditch#7 Watershed Unit*			1.5	11.5	12.5	13	24.5	63	fair

Qualitative habitat ratings

Good: MSHA score above the median of the least-disturbed sites (MSHA>66)

Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)

Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

Table 78. Outlet water chemistry resultsfor Judicial Ditch #7 Watershed**

Station Location:	Unnamed Creek downstream of CR 9, 2 miles N of Watson							
Storet ID:	S005-629							
Station #:	09MN002							
Parameter	**Units**	**# of Samples**	**Minimum**	**Maximum**	**Mean**	**Median**	**WQ Standard**	**# WQ Exceedances**
Escherichia coli	MPN/100ml	15	0.0	727.0	232.4	155.3	1260	0
Ammonia-nitrogen	mg/l	10	0.02	0.05	0.03	0.02		
Inorganic nitrogen (nitrate and nitrite)	mg/l	0						
Kjeldahl nitrogen	mg/l	10	0.60	1.30	0.85	0.81		
Phosphorus	ug/l	9	70	545	273	259		
Orthophosphate	ug/l	0						
Total suspended solids	mg/l	10	2	10	5	5		
Total volatile solids	mg/l	10	1	4	2	2		
Hardness, carbonate	mg/l	10	463	640	572	583		
Chloride	mg/l	10	12	188	32	14	230	0
Sulfate	mg/l	10	130	1600	359	232		
Specific conductance	uS/cm	30	782	1112	947	946		
pH	--	28	6.68	8.38	7.71	7.725	6.5-9	0
Dissolved oxygen (DO)	mg/l	32	2.97	15.46	6.39	5.98	5	12
Temperature, water	deg C	32	13.8	25.4	20.0	19.9		
Turbidity	NTU	0					25 NTU	
Transparency, tube 60	cm	33	0	96	23	0		

[1]Geometric mean of all samples is provided for *E. coli*.
[2]Total suspended solids and transparency tube standards are surrogate standards derived from the turbidity standard of 25
[3]Represents exceedances of individual maximum standard for *E. coli* (1260/100ml) or fecal coliform.
[4]Based on 1970-1992 summer data; see *Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions* (McCollor and Heiskary 1993).

****Data found in the table above was compiled using the results from data collected at the outlet monitoring station in the Judicial Ditch #7 HUC, a component of the IWM work conducted in 2009 and 2010. This site specific data does not necessarily reflect all data that was used to assess the AUID.**

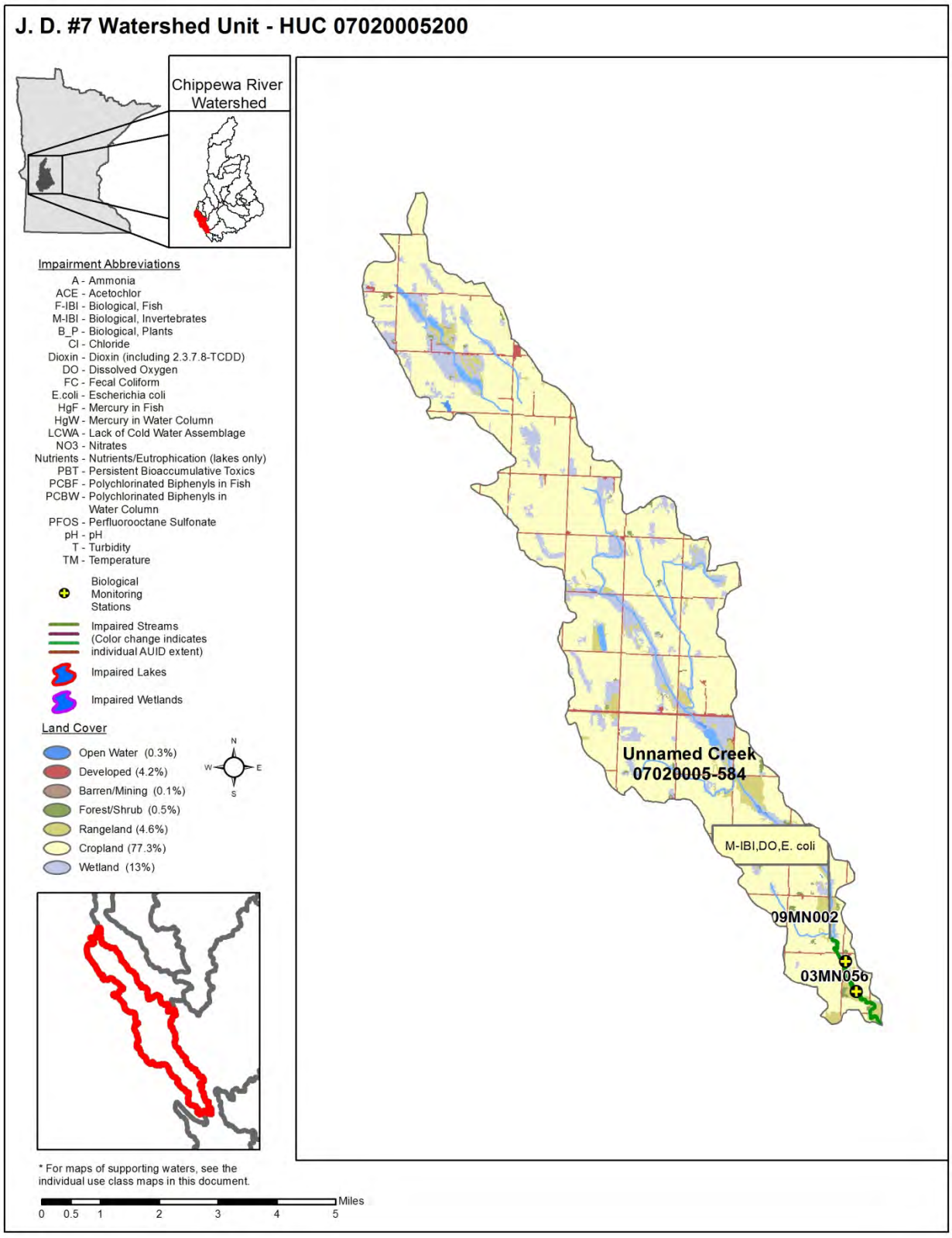

Figure 31. Land use and currently listed impaired waters by parameter, in the Judicial Ditch #7 Watershed unit

Summary

Stream biological assessment results

One AUID was assessed in this watershed. There were two biological stations on the AUID and it is not supporting aquatic life. Habitat for the stations is good to fair but there is a dissolved oxygen problem which may contributes to the low biological scores.

Stream water chemistry assessment results

Water quality data was available on one reach of a tributary (Unnamed Creek) to the Chippewa River. DO exceed the standard and the reach will be listed as impaired due to low DO. Turbidity does not look to be a biological stressor along this reach.

Lake water chemistry assessment results

No lakes were assessed for water quality in this watershed unit.

Spring Creek Watershed unit HUC 07020005210

Spring Creek Watershed unit is encompassed by Chippewa County and has a drainage area of 16.4 square miles. The entire watershed is in the Western Corn Belt Plains Ecoregion. The predominant land use is cropland with urban development being the second most abundant (Figure 32). Spring Creek HUC-11 flows northwest from five miles east of Montevideo to the Chippewa River in Montevideo. The outlet of this watershed unit is represented by site 09MN020 on Spring Creek. No intensive water chemistry monitoring was done at this site because of the small drainage area.

Table 79. Aquatic life and recreation assessment on stream reaches in the Spring Creek Watershed unit. Reaches are organized upstream to downstream in the table. Colored vertical lines to the left of the AUID information box indicate groupings of Unnamed AUIDs occurring along the same watercourse.

AUID *Reach Name*, *Reach Description*	Reach Length (miles)	Use Class	Biological Station ID	Location of Biological Station	Aquatic Life Indicators: Fish IBI	Invert IBI	Dissolved Oxygen	Turbidity	Chloride	pH	NH_3	Pesticides	Bacteria	Aquatic Life	Aquatic Rec.
07020005-592, Spring Creek (County Ditch 10A), *Unnamed cr to CD 67*	3	2C	01MN011	Upstream 50th Ave., 1 mi. NE of Montevideo	--	--	--	--	--	--	--	--	--	NA	NA
07020005-593, Spring Creek (County Ditch 10A), *T118 R40W S32, south line to T118 R40W S32, south line*	1	2C	09MN020	Upstream of MN-29, 0.5 mi. N of Montevideo	--	--	--	--	--	--	--	--	--	NA	NA
07020005-594, Spring Creek (County Ditch 10A), *T117 R40W S5, north line to Minnesota R*	1	2C	--	--	--	--	--	MTS	--	--	--	--	--	IF	NA

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. R 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Table 80. Biological sampling of channelized stream reaches for Spring Creek Watershed

AUID	Biological Station ID	Biological Station Location	F-IBI Quality	M-IBI Quality
07020005-592, Spring Creek (County Ditch 10A), *Unnamed cr to CD 67*	01MN011	Upstream 50th Ave., 1 mi. NE of Montevideo	fair	fair
07020005-593, Spring Creek (County Ditch 10A), *T118 R40W S32, south line to T118 R40W S32, south line*	09MN020	Upstream of MN-29, 0.5 mi. N of Montevideo	fair	good

See Appendix 5.1 for clarification on the good/fair/poor thresholds and Appendix 5.2 and 5.3 for IBI results. Parentheses behind ratings indicate the quantity of site visits, which may or may not occur in the same year (10 percent of monitoring stations are repeated for quality control purposes).

Table 81. Minnesota Stream Habitat Assessment (MSHA) results for the Spring Creek HUC-11

Visits	Site ID	Stream Name	Land Use (0-5)	Riparian (0-15)	Substrate (0-27)	Fish Cover (0-17)	Channel Morphology (0-36)	MSHA Score (0-100)	MSHA Rating
1	01MN011	Spring Creek	0	10	15	13	20	58	fair
1	09MN020	Spring Creek (County Ditch 10A)	0	9.5	17.1	7	23	56.6	fair
Average Habitat Results: *Spring Creek Watershed unit*			0	9.8	16.1	10	21.5	57.3	fair

Qualitative habitat ratings
Good: MSHA score above the median of the least-disturbed sites (MSHA>66)
Fair: MSHA score between the median of the least-disturbed sites and the median of the most-disturbed sites (45 < MSHA < 66)
Poor: MSHA score below the median of the most-disturbed sites (MSHA<45)

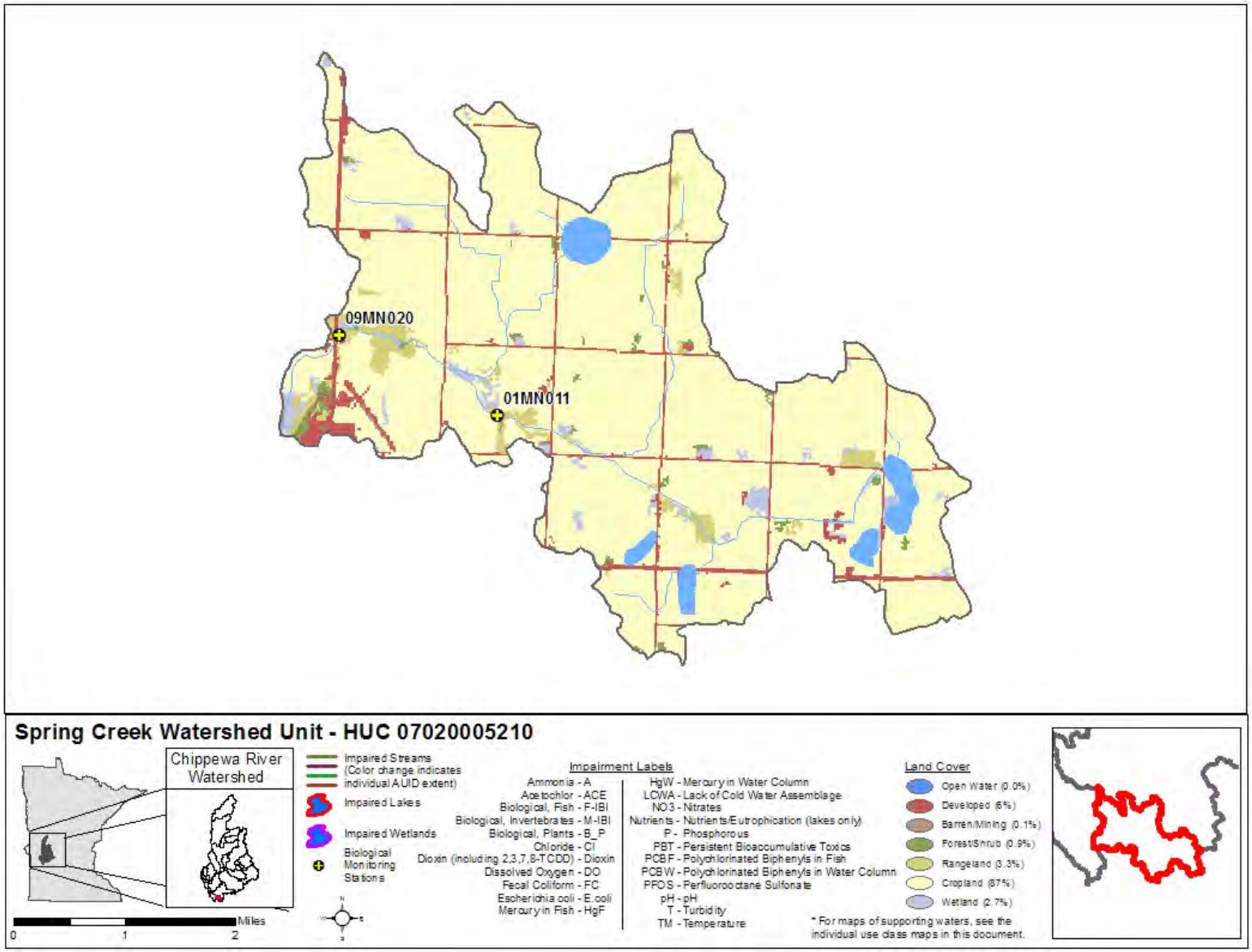

Figure 32. Land use and currently listed impaired waters by parameter, in the Spring Creek Watershed

Summary

Stream biological assessment results

No AUIDs were assessed for biology in this watershed since both biological sites are on channelized reaches. These reaches had fair to good biological scores and fair habitat scores.

Stream water chemistry assessment results

Limited stream water quality data was available within the Spring Creek Watershed unit.

Lake water chemistry assessment results

No lakes were assessed for water quality in this watershed unit

VI. Watershed-Wide Results and Discussions

Assessment results and data summaries are included below for the entire HUC-8 watershed unit of the Chippewa River, grouped by sampling type. Summaries are provided for aquatic life and recreation uses in streams and lakes throughout the watershed, for aquatic consumption results at select river and lake locations along the watershed, and for load monitoring data results near the mouth of the river. Following the results are a series of graphics that provide an overall summary of assessment results by designated use, impaired waters, and fully supporting waters within the entire Chippewa River Watershed. No long term trend information is available for the Chippewa River Watershed.

Pollutant load monitoring

Annual flow weighed mean pollutant concentrations (FWMCs) were calculated and compared for years 2007-2009 (Figures 33-36) and compared to the RNR standards (only Total Phosphorus (TP) and Total suspended solids (TSS) draft standards are available for the South RNR). It should be noted that while a FWMC exceeding given water quality standard is generally a good indicator that the water body is out of compliance with the RNR standard, the rule does not always hold true. Waters of the state are listed as impaired based on the percentage of individual samples exceeding the numeric standard, generally 10 percent and greater, over the most recent 10- year period and not based on comparisons with FWMCs (MPCA, 2012). A river with a FWMC above a water quality standard, for example, would not be listed as impaired if less than 10 percent of the individual samples collected over the assessment period were above the standard.

Pollutant sources affecting rivers are often diverse and can be quite variable from one watershed to the next depending on land use, climate, soils, slopes, and other watershed factors. However, as a general rule, elevated levels of (TSS) and nitrate plus nitrite-nitrogen (nitrate-N) are generally regarded as “non-point” source derived pollutants originating from many small diffuse sources such as urban or agricultural run-off. Excess (TP) and dissolved orthophosphate (DOP) can be attributed to both “non-point” as well as “point” or end of pipe sources such as industrial or waste water treatment plants. Major “non-point” sources of phosphorus include dissolved phosphorus from fertilizers and phosphorus adsorbed to and transported with sediment during run-off.

Within a given watershed, pollutant sources and source contributions can also be quite variable from one run-off event to the next depending on factors such as crop development, canopy development, soil saturation level, and precipitation type and intensity. Surface erosion and in-stream sediment concentrations, for example, will typically be much higher following high intensity rain events prior to canopy development rather than after low intensity post-canopy events where less surface run-off and more infiltration occur. Precipitation type and intensity influence the major course of storm run-off, routing water through several potential pathways including overland, shallow and deep groundwater, and/or tile flow. Run-off pathways, along with other factors determine the type and levels of pollutants transported in run-off to receiving waters and help explain between-storm and temporal differences in FWMCs and loads. During years when high intensity rain events provide the greatest proportion of total

annual run-off, concentrations of TSS and TP tend to be higher and DOP and nitrate-N concentrations tend to be lower. In contrast, during years with high snow melt run-off and less intense rainfall events, TSS levels tend to be lower while TP, DOP, and nitrate-N levels tend to be elevated. In many cases, it is a combination of climatic factors from which the pollutant loads are derived.

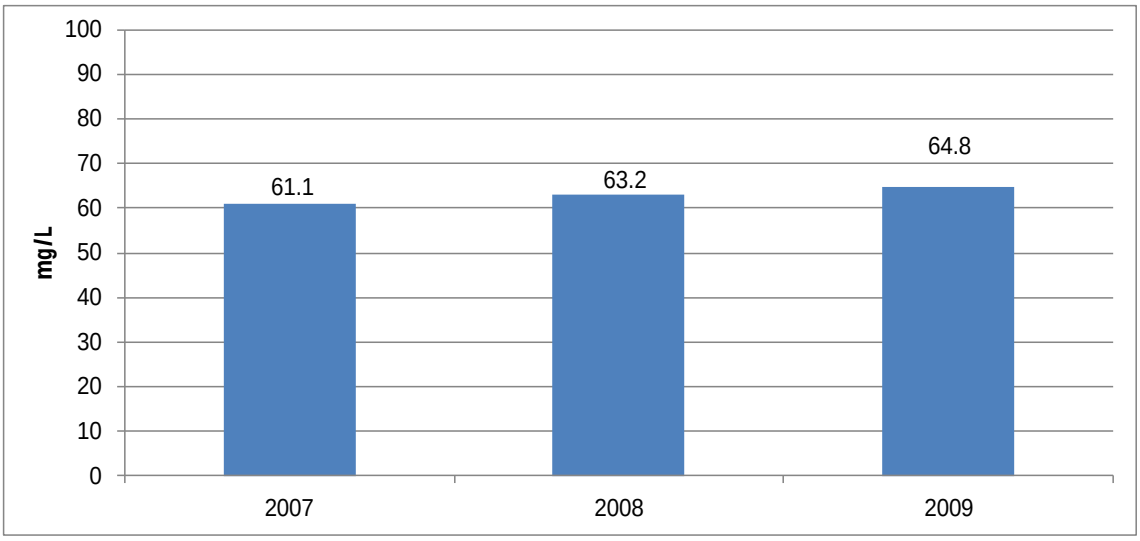

Figure 33. Total Suspended Solids (TSS) Flow Weighted Mean Concentrations in the Chippewa River.

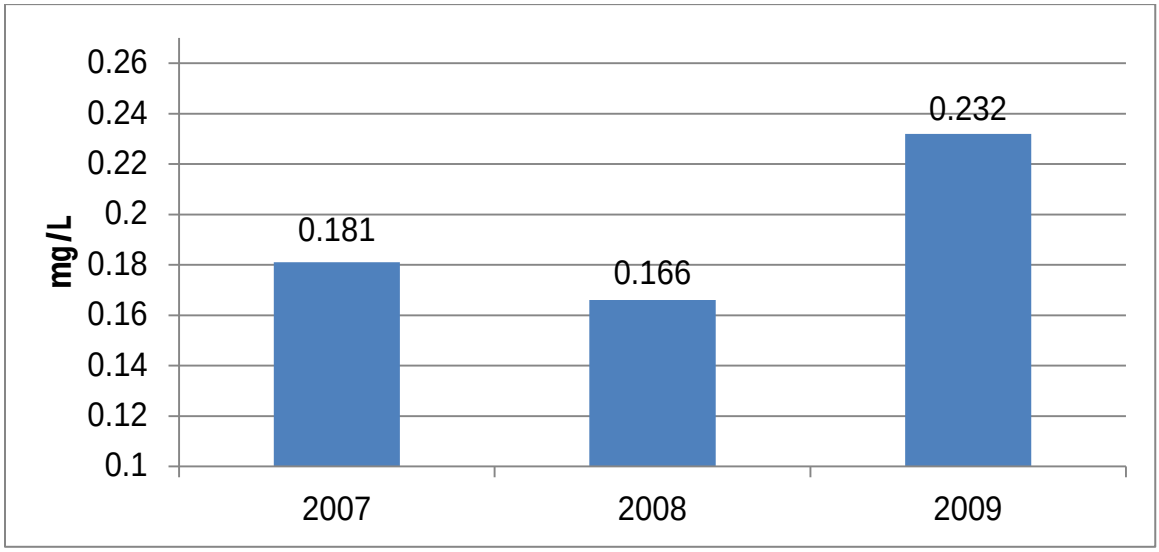

Figure 34. Total Phosphorus (TP) Flow Weighted Mean Concentrations and for the Chippewa River.

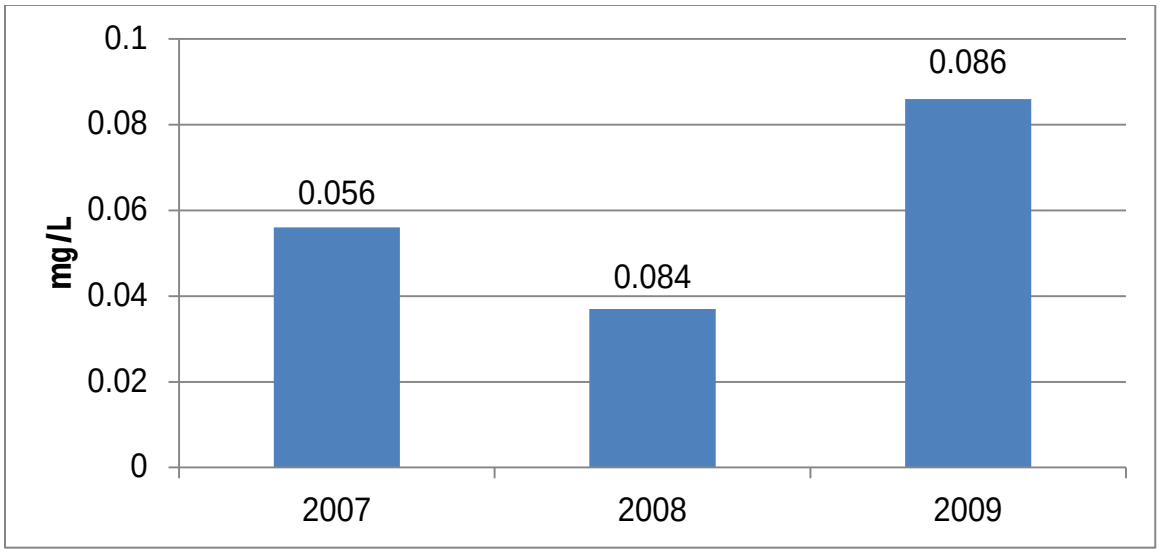

Figure 35. Dissolved Orthophosphate (DOP) Flow Weighted Mean Concentrations for the Chippewa River

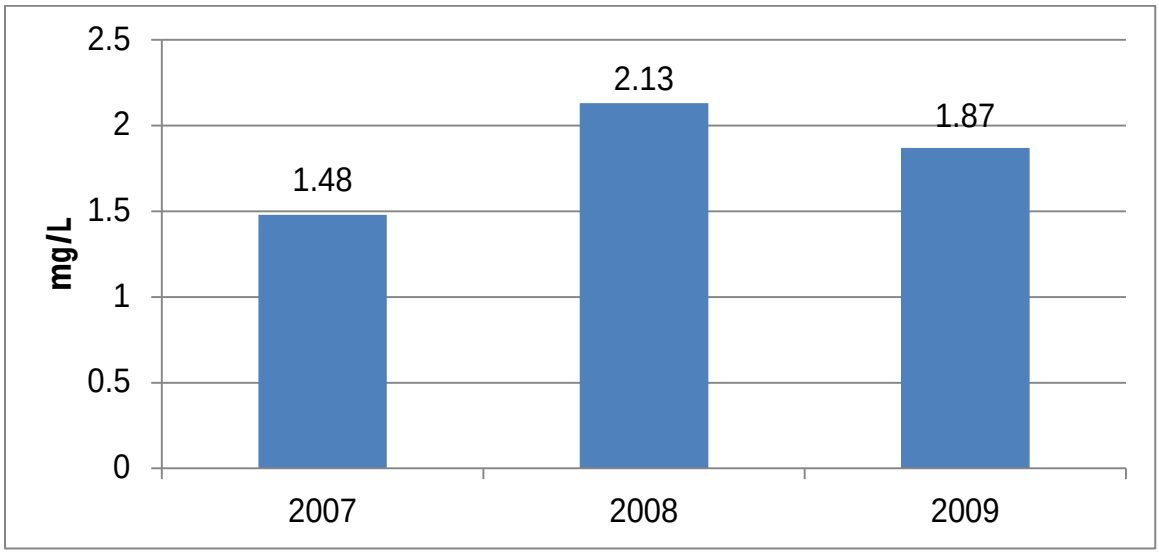

Figure 36. Nitrate + Nitrite Nitrogen (Nitrate-N) Flow Weighted Mean Concentrations for the Chippewa River.

Table 82. Annual pollutant loads by parameter calculated for the Chippewa River

	2007	2008	2009
Parameter	**Mass (kg)**	**Mass (kg)**	**Mass (kg)**
Total Suspended Solids	20,545,596	17,862,002	33,276,684
Total Phosphorus	60,763	46,936	119,252
Ortho Phosphorus	18,904	10,488	44,407
Nitrate + Nitrite Nitrogen	498,568	602,040	959,910

Total Suspended Solids (TSS)

Water clarity refers to the transparency of water. Turbidity is a measure of the lack of transparency or "cloudiness" of water due to the presence of suspended and colloidal materials such as clay, silt, finely divided organic and inorganic matter, and plankton or other microscopic organisms. By definition, turbidity is caused primarily by suspension of particles that are smaller than one micron in diameter in the water column.

Analysis has shown a strong correlation to exist between the measures of TSS and turbidity. The greater the level of TSS, the murkier the water appears and the higher the measured turbidity. High turbidity results in reduced light penetration that harms beneficial aquatic species and favors undesirable algae species (MPCA and MSUM, 2009). An overabundance of algae can lead to increases in turbidity, further compounding the problem. Periods of high turbidity often occur when heavy rains fall on unprotected soils. Upon impact, raindrops dislodge soil particles and overland flow transports fine particles of silt and clay into rivers and streams (MPCA and MSUM, 2009). Scouring of streambanks due to increased flows also increased turbidity.

Currently, the state of Minnesota's TSS standards is moving from the "development phase" into the "approval phase" and must be considered to be draft standards until approved. Within the South RNR, the river would be considered impaired when greater than 10 percent of the individual samples exceed the TSS draft standard of 65 mg/L. (MPCA, 2011). From 2007–2009, 28 percent, 40 percent, and 28 percent of the samples exceeded the 65 mg/L draft standard, respectively. Interestingly, the computed FWMCs did not exceed the 65 mg/L draft standard as shown in Figure 32, which suggests periods of elevated flow carried less sediment per unit volume. In 2007, samples were only collected from March–October with the eight TSS exceedences occurring in response to several different rainfall events. The annual peak flow during 2008 was the least of the three monitoring years (only 1,580 cfs versus 2,660 cfs in 2007 and 7,630 cfs in 2009). However, 2008 showed the most exceedences of the draft standard. There was one rain event in early June where TSS exceeded the draft standard and following this event TSS exceedences occurred in the nine consecutive samples. In 2009, the highest TSS concentration (680 mg/L) was collected on March 23, 2009, which was during snow melt. Four of the six TSS exceedences in 2009 occurred during this major snow melt event. Table 4 displays the total annual loads which indicate TSS loads to be lowest in 2008 even though most of the TSS draft standard exceedences were seen in that year. Often, there is a strong correlation between pollutant loads and annual run-off volume; the differences may be due strictly to differences in annual run-off volume (Figure 33).

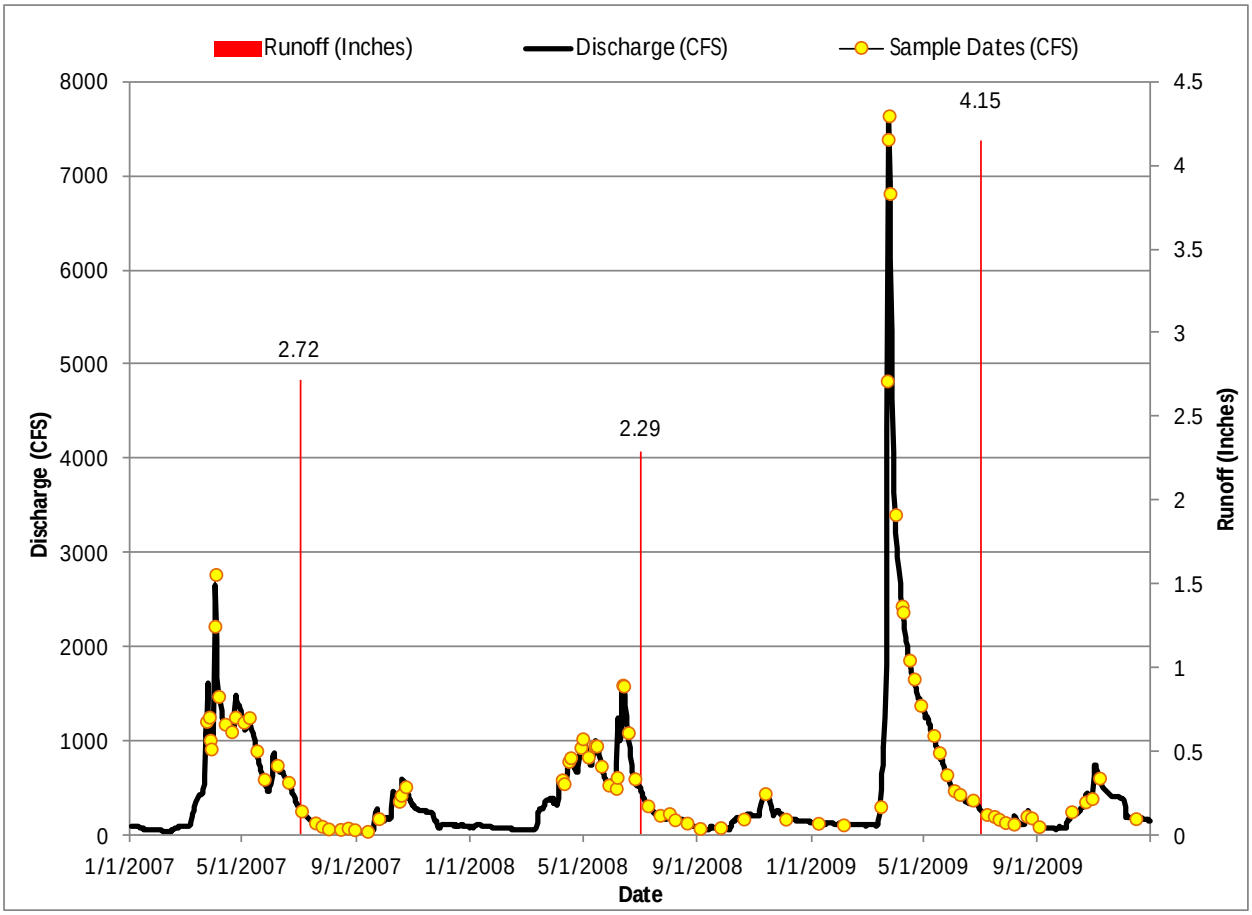

Figure 37. 2007-2009 Hydrograph, Sampling Regime and Annual Run-off for the Chippewa River near Milan, Minnesota

Total Phosphorus

Nitrogen, phosphorus, and potassium are essential macronutrients and are required for growth by all animals and plants. Lack of sufficient nutrient levels in surface water often restricts the growth of aquatic plant species (University of Missouri Extension, 1999). In freshwaters such as lakes and streams, phosphorus is typically the nutrient limiting growth; increasing the amount of phosphorus entering a stream or lake will increase the growth of aquatic plants and other organisms. Although phosphorus is a necessary nutrient, excessive levels over stimulate aquatic growth in lakes and streams resulting in reduced water quality. The progressive deterioration of water quality from overstimulation of nutrients is called eutrophication where, as nutrient concentrations increase, the surface water quality is degraded (University of Missouri Extension, 1999). Elevated levels of phosphorus in rivers and streams can result in: increased algae growth, reduced water clarity, reduced oxygen in the water, fish kills, altered fisheries, and toxins from cyanobacteria (blue green algae) which can affect human and animal health (University of Missouri Extension, 1999). In non-point source dominated watersheds, total phosphorus (TP) concentrations are strongly correlated with stream flow. During years of above average precipitation, TP loads are generally highest.

TP standards for Minnesota's rivers are also in the final approval phase and must be considered draft standards until approved. Within the South RNR, the TP draft standard is 0.150 mg/L as a summer average. Summer average violations of one or more "response" variables (pH, biological oxygen demand, dissolved oxygen flux, chlorophyll-a) must also occur along with the numeric TP violation for the water to be listed. In comparison of the data collected from June through September from 2007 to 2009, TP exceedences occurred 53 percent, 87 percent and 18 percent, respectively. Although there were exceedences to the draft standard, only 2007 and 2008, had summer means greater than the draft standard (0.150 mg/L and 0.201 mg/L, respectively). Figure 34 illustrates FWMCs greater than the draft

standard, albeit this includes all data throughout the year (not just summer values). Table 4 shows annual loads which exhibit similar traits as the FWMCs. The higher FWMC and loads in 2009 likely are due to the high TP value that was seen during snowmelt (1.05 mg/L on March 24, 2009).

Dissolved Orthophosphate

Dissolved Orthophosphate (DOP) is a water soluble form of phosphorus that is readily available for plant uptake (MPCA and MSUM, 2009). While orthophosphates occur naturally in the environment, river and stream concentrations may become elevated with additional inputs from waste-water treatment plants, noncompliant septic systems, and fertilizers in urban and agricultural run-off. The DOP: TP ratios of FWMCs from the three years were 31 percent, 22 percent, and 37 percent, respectively. Figure 35 and Table 37 shows similar trends between years as seen in TP and TSS. This is not uncommon due to the relationship between DOP, TP and TSS.

Nitrate plus Nitrite - Nitrogen

Nitrate and nitrite-nitrogen are inorganic forms of nitrogen present within the environment that are formed through the oxidation of ammonia-nitrogen by nitrifying bacteria (nitrification). Ammonia-nitrogen is found in fertilizers, septic systems, and animal waste. Once converted from ammonia-nitrogen to nitrate and nitrite-nitrogen, they too, like phosphorus, can stimulate excessive levels of some algae species in streams (MPCA, 2008). Because nitrate and nitrite-nitrogen are water soluble, transport to surface waters is enhanced through agricultural drainage. The ability of nitrite-nitrogen to be readily converted to nitrate-nitrogen is the basis for the combined laboratory analysis of nitrate plus nitrite-nitrogen, with nitrite-nitrogen typically making up a small proportion of the combined total concentration. These and other forms of nitrogen exist naturally in aquatic environments; however concentrations can vary drastically depending on season, biological activity, and anthropogenic inputs. Environmentally, studies have shown that the elevated nitrate-nitrogen levels in the Minnesota River basin contribute to hypoxia (low levels of dissolved oxygen) in the Gulf of Mexico. This occurs by nitrate-nitrogen stimulating the growth of algae which, through death and biological decomposition, consume large amounts of dissolved oxygen and thereby threaten aquatic life (MPCA and MSUM, 2009).

Nitrate-nitrogen can also be a common toxicant to aquatic organisms in Minnesota's surface waters, with invertebrates appearing to be the most sensitive to nitrate toxicity. Draft nitrate-N standards have been proposed for the protection of aquatic life in lakes and streams. The draft acute value (maximum standard) for all Class 2 surface waters is 41 mg/L nitrate-N for a one-day duration, and the draft chronic value for Class 2B (warm water) surface waters is 4.9 mg/L nitrate-N for a four-day duration. In addition, a draft chronic value of 3.1 mg/L nitrate-N (four-day duration) was determined for protection of Class 2A (cold water) surface waters (MPCA, 2010).

Figure 36 shows the nitrate-N FWMCs over the three-year period for the Chippewa River monitoring site. The FWMC for all three years were below the draft acute and chronic nitrate-N standards. In 2007 and 2009, there was only one excedence of the draft chronic standard. In 2008, there were three exceedences of the chronic standard which occurred during a large storm event in June. Table 37 displays the annual loads which increased over the three year period. This may be related to the increase of run-off volume and the magnitude of the exceedences from 2007 to 2009.

Stream water quality

Thirty-three of the 96 sampled stream AUIDs were assessed for aquatic life and recreation (Table 83). Of the assessed streams, four streams were considered to be fully supporting of aquatic life and zero of aquatic recreation. Four AUIDs were not assessed due to their classification as limited resource waters. 57 AUIDS were not assessed for aquatic biology because greater than 50 percent of the AUID is channelized or the biological station fell on a channelized stream reach on the AUID. Twenty-seven samples at biological stations fell in good range for fish and 13 for invertebrates. Twenty-six samples at

biological stations fell in the fair range for fish and 26 for the invertebrates. Thirty-one samples at biological stations fell in poor range for fish and 39 for invertebrates.

Throughout the watersheds 32 AUIDs are non-supporting of aquatic life and/or recreation. Of those AUIDs, 23 are non-supporting of aquatic life and 22 are non-supporting of aquatic recreation. High bacteria concentrations and turbidity are a common concern across the watershed affecting 21 and 10 AUIDs respectively

Table 83. Assessment summary for stream water chemistry in the Chippewa River Watershed

			Supporting		Non-support		
Waterbody	Area (acres)	# Assessed AUIDs	# Aquatic Life	# Aquatic Recreation	# Aquatic Life	# Aquatic Recreation	Insufficient Data
Chippewa River HUC 8	1,333,517	33	4	0	23	22	47
Upper West Br. Chippewa River	119,616	0	0	0	0	0	2
Middle West Br. Chippewa River	153,856	3	0	0	3	1	0
Little Chippewa River	57,280	2	0	0	2	1	0
Trapper Run Creek	30,528	1	0	0	1	1	1
Lower West Br. Chippewa River	123,584	4	1	0	3	2	1
East Branch Chippewa River	167,936	3	1	0	2	2	3
North Mud Creek	58,112	3	1	0	2	0	4
Spring Creek	6,528	0	0	0	0	0	2
Frank Lake	17,472	1	0	0	1	1	1
South Mud Creek	56,256	0	0	0	0	1	3
Lake Hassel	25,536	0	0	0	0	0	1
Moore Twp. Branch Chippewa	58,816	0	0	0	0	1	6
Chippewa River	70,912	4	0	0	4	3	2
Upper Shakopee Creek	80,256	5	1	0	0	4	6
Shakopee Creek	124,416	3	0	0	2	2	1
Holloway Creek	20,480	0	0	0	0	0	4
Moyer-Edison Creek	11,840	0	0	0	0	0	0
J. D. #8	46,208	2	0	0	2	1	3
Dry Weather Creek	68,032	1	0	0	0	1	4
J. D. #7	18,624	1	0	0	1	1	2
Spring Creek	10,496	0	0	0	0	0	1

Lake water quality

In general the lake water quality in the Chippewa River Watershed in modest to poor; 53 percent of assessed lakes are designated as non-support for aquatic recreation use. Bringing the watershed's lakes into compliance with water quality standards is an immense task when considering the scale and complexity of the problem.

Table 84. Assessment summary for lake water chemistry in the Chippewa River Watershed

Waterbody	Area (acres)	Total Lakes	Full Support	Non-support	Insufficient Data
Chippewa River HUC 8	1,333,517	83	29	33	21
Upper West Branch Chippewa River	119,616	13	5	3	5
Middle West Branch Chippewa River	153,856	10	3	4	3
Little Chippewa River	57,280	5	2	3	--
Trappers Run Creek	30,528	6	--	5	1
Lower West Branch Chippewa River	123,584	5	2	3	--
East Branch Chippewa River	167,936	20	10	8	2
North Mud Creek	58,112	10	2	3	5
Frank Lake	17,472	1	1	--	--
South Mud Creek	56,256	1	--	1	--
Lake Hassel	25,536	2	--	1	1
Upper Shakopee Creek	80,256	10	4	2	4

Chippewa watershed fish contaminants

Results

A summary of descriptive statistics for mercury and PCBs (Table 85) indicates the 90th percentiles of mercury concentration exceeded the threshold of 0.2 mg/Kg in carp, northern pike, and walleye from the Chippewa River. PCBs tested in the two largest carp from 2009 were not detected (reporting limit = 0.025 mg/Kg). PCBs had also not been detected in any of the fish species collected in 1998. Impairments caused by fish contaminants are usually applied to all river AUIDs where fish could potentially swim from the collection site. The Chippewa River has eight AUIDs with no dams impeding fish movement among the AUIDs; therefore, all of them are in the Impaired Waters Inventory because of mercury in fish tissue (http://www.pca.state.mn.us/enzq94b).

Seventeen of the 20 lakes tested for fish contaminants and are listed in the Impaired Waters Inventory (IWI) because of mercury in fish tissue (identified by a red asterisk in Table 1). Oscar Lake is listed on the IWI as two AUIDs—North Oscar (21025701) and South Oscar (21025702)—because of separate but connected basins. Minnesota Department of Naturally Resources usually treats all basins as a single lake if fish can move between the basins. All connected lake AUIDs are used for the impairment listing.

All lakes tested for PCBs were mostly below or near the reporting limit; therefore, neither the Chippewa River nor the lakes are listed as impaired for PCBs in fish tissue.

Overall, mercury clearly remains a major concern for fish consumption in the Chippewa River Watershed, whereas PCBs are not. Consequently, mercury will continue to be periodically tested in fish from most of the lakes.

Table 85. Descriptive statistics of mercury and PCB concentrations in fish species in Chippewa River Watershed

						Length (in)			Mercury (mg/Kg)						PCBs (mg/Kg)			
Waterway	AUID	Species	Year	Total Fish	Sam-ples	Mean	Min	Max	N	Mean	90th pctl	Median	Min	Max	N	Mean	Min	Max
CHIPPEWA RIVER *	7020005	Common Carp	1998	19	7	21.0	10.4	25.9	7	0.111	0.256	0.097	0.045	0.290	4	< 0.01	< 0.01	< 0.01
			2009	4	4	19.6	17.6	21.4	4	0.095	0.152	0.083	0.061	0.152	2	<0.025	<0.025	<0.025
		Channel catfish	1998	1	1	13.7	13.7	13.7	1	0.052					1	< 0.01		
		Northern pike	1998	13	13	17.9	14.0	22.5	13	0.152	0.252	0.130	0.035	0.260	2	< 0.01	< 0.01	< 0.01
		Walleye	1998	8	8	17.0	14.7	20.8	8	0.143	0.255	0.135	0.086	0.300	2	< 0.01	< 0.01	< 0.01
MAPLE *	21007900	Bluegill sunfish	1995	10	1	5.7	5.7	5.7	1	0.093								
			2009	5	1	7.1	7.1	7.1	1	0.117								
		Black crappie	2009	4	1	10.2	10.2	10.2	1	0.092								
		Largemouth bass	2009	5	5	13.5	10.8	16.2	5	0.364	0.565	0.328	0.246	0.565				
		Northern pike	1995	15	4	21.9	16.8	27.8	4	0.343	0.540	0.320	0.190	0.540	1	< 0.01		
			2000	24	24	19.0	13.8	27.6	24	0.238	0.380	0.235	0.120	0.470				
			2009	7	7	20.0	18.2	22.8	7	0.333	0.406	0.328	0.252	0.412				
		Walleye	2009	6	6	16.1	13.6	24.1	6	0.315	0.577	0.260	0.207	0.604				
		White sucker	1995	7	1	18.2	18.2	18.2	1	0.074								
		Yellow perch	2000	10	10	6.9	5.5	7.6	10	0.073	0.135	0.060	0.040	0.140				
BIG CHIPPEWA *	21014500	Bluegill sunfish	2009	7	2	7.6	7.2	8.0	2	0.094	0.110	0.094	0.078	0.110				
		Black crappie	1993	10	1	9.3	9.3	9.3	1	0.140								
			2009	10	2	10.7	10.2	11.2	2	0.138	0.146	0.138	0.130	0.146				

		Common Carp	1993	21	4	24.2	17.5	31.8	4	0.082	0.110	0.084	0.048	0.110	1	0.015		
		Largemouth bass	2009	8	8	14.8	13.8	15.6	8	0.572	0.662	0.587	0.485	0.687				
		Northern pike	2009	8	8	20.7	15.7	27.3	8	0.401	0.562	0.402	0.263	0.607				
		Walleye	1993	20	4	18.8	12.2	25.9	4	0.375	0.500	0.385	0.230	0.500	1	< 0.01		
			2009	5	5	17.0	13.3	24.3	5	0.505	0.696	0.516	0.377	0.696				
WHISKEY *	21021600	Bluegill sunfish	1998	10	1	6.9	6.9	6.9	1	0.066								
		Walleye	1998	8	8	19.1	16.4	25.7	8	0.435	0.619	0.395	0.320	0.670				
MOSES *	21024500	Bluegill sunfish	2010	10	2	7.4	7.0	7.8	2	0.099	0.107	0.099	0.090	0.107				
		Black bullhead	2010	5	1	9.0	9.0	9.0	1	0.042								
		Black crappie	2010	10	2	9.4	8.3	10.5	2	0.180	0.265	0.180	0.095	0.265				
		Largemouth bass	2010	8	8	11.4	10.6	13.3	8	0.384	0.433	0.394	0.318	0.439				
		Northern pike	2010	8	8	17.4	14.4	20.2	8	0.251	0.344	0.227	0.191	0.358				
		Walleye	2010	8	8	16.8	14.3	22.0	8	0.342	0.578	0.303	0.221	0.642				
OSCAR *	21025700	Bluegill sunfish	2010	5	1	7.0	7.0	7.0	1	0.041								
		Black crappie	2010	10	2	9.3	8.7	9.8	2	0.057	0.084	0.057	0.030	0.084				
		Northern pike	2010	6	6	23.6	20.8	27.6	6	0.142	0.244	0.107	0.084	0.247				
		Walleye	2010	7	7	15.5	12.6	19.4	7	0.088	0.123	0.078	0.056	0.124				
		White sucker	2010	3	1	12.5	12.5	12.5	1	0.010								
RED ROCK *	21029100	Bluegill sunfish	2010	10	2	7.1	6.8	7.3	2	0.055	0.059	0.055	0.051	0.059				
		Black crappie	2010	10	2	8.0	6.7	9.2	2	0.055	0.058	0.055	0.051	0.058				
		Common Carp	2010	5	1	19.4	19.4	19.4	1	0.026								

		Northern pike	2010	8	8	20.6	13.6	25.9	8	0.137	0.259	0.119	0.054	0.293				
		Walleye	2010	8	8	19.4	13.2	26.8	8	0.263	0.505	0.186	0.096	0.529				
		White sucker	2010	3	1	16.6	16.6	16.6	1	0.098								
		Yellow perch	2010	10	2	8.4	7.4	9.4	2	0.048	0.053	0.048	0.043	0.053				
ANDREW *	34020600	Bluegill sunfish	2010	5	1	6.4	6.4	6.4	1	0.019								
		Black bullhead	2010	5	1	12.0	12.0	12.0	1	0.082								
		Black crappie	1993	10	1	7.6	7.6	7.6	1	0.061								
		Freshwater Drum	1993	7	2	16.4	14.6	18.2	2	0.171	0.300	0.171	0.041	0.300	1	< 0.01		
		Northern pike	1993	6	4	23.5	17.1	30.0	4	0.218	0.280	0.215	0.160	0.280	1	< 0.01		
			2010	7	7	20.2	17.3	22.9	7	0.130	0.165	0.124	0.088	0.166				
		Walleye	1993	14	3	17.6	14.4	20.4	3	0.273	0.330	0.280	0.210	0.330	1	< 0.01		
FLORIDA *	34021700	Bluegill sunfish	2010	8	2	7.2	6.8	7.6	2	0.021	0.022	0.021	0.020	0.022				
		Common Carp	1993	5	2	25.1	21.9	28.3	2	0.072	0.080	0.072	0.063	0.080	2	0.024		
			2010	2	1	12.0	12.0	12.0	1	0.012								
		Freshwater Drum	2010	2	1	17.2	17.2	17.2	1	0.083								
		Northern pike	1993	5	3	24.3	18.6	30.6	3	0.196	0.370	0.140	0.078	0.370	1	0.016		
			2010	8	8	22.1	18.1	25.7	8	0.147	0.319	0.114	0.083	0.379				
		Walleye	1993	20	4	19.7	13.4	25.3	4	0.330	0.690	0.255	0.120	0.690	1	0.024		
		Yellow perch	1993	6	1	7.5	7.5	7.5	1	0.084								
GAMES *	34022400	Bluegill sunfish	2010	5	1	5.9	5.9	5.9	1	0.029								
		Freshwater Drum	2010	5	1	14.7	14.7	14.7	1	0.030								

		Northern pike	2010	7	7	20.8	15.8	24.5	7	0.159	0.203	0.158	0.083	0.205				
NORWAY *	34025100	Bluegill sunfish	1993	9	1	6.6	6.6	6.6	1	0.053								
			2010	5	1	7.2	7.2	7.2	1	0.052								
		Common Carp	1993	8	2	24.4	21.7	27.1	2	0.035	0.041	0.035	0.028	0.041	1	0.015		
		Freshwater Drum	2010	3	1	14.7	14.7	14.7	1	0.049								
		Northern pike	1993	13	4	25.1	19.9	30.3	4	0.148	0.190	0.145	0.110	0.190	1	< 0.01		
			2010	7	7	22.6	14.3	31.9	7	0.192	0.413	0.107	0.071	0.436				
		Walleye	1993	24	5	17.3	11.6	23.2	5	0.176	0.240	0.210	0.100	0.240	1	< 0.01		
JOHANNA	61000600	Northern pike	2010	8	8	19.8	13.7	22.9	8	0.083	0.161	0.059	0.037	0.165				
		Walleye	2010	7	7	17.4	13.2	22.3	7	0.051	0.126	0.044	0.019	0.142				
		White sucker	2010	3	1	16.9	16.9	16.9	1	0.056								
SCANDINAVIAN *	61004100	Bluegill sunfish	1996	10	1	5.7	5.7	5.7	1	0.078								
		Northern pike	1996	21	4	21.8	18.2	25.7	4	0.330	0.370	0.330	0.290	0.370				
			2001	23	23	19.4	17.4	23.2	23	0.317	0.406	0.326	0.180	0.458				
			2006	22	22	21.2	17.3	24.8	22	0.370	0.629	0.337	0.140	0.752				
		Walleye	1996	16	5	18.3	13.1	24.4	5	0.526	0.860	0.440	0.280	0.860	1	< 0.01		
		White sucker	1996	5	1	17.2	17.2	17.2	1	0.030								
		Yellow perch	2001	11	2	5.8	5.2	6.3	2	0.083	0.088	0.083	0.077	0.088				
			2006	9	4	5.9	5.5	6.1	4	0.093	0.126	0.091	0.063	0.126				
AMELIA *	61006400	Bluegill sunfish	2008	10	1	7.0	7.0	7.0	1	0.100								
		Northern pike	2008	5	5	21.4	20.1	24.0	5	0.389	0.422	0.379	0.370	0.422				

VILLARD *	61006700	Bluegill sunfish	2008	10	1	7.2	7.2	7.2	1	0.153								
		Black crappie	2008	10	1	8.8	8.8	8.8	1	0.263								
		Northern pike	2008	5	5	19.9	17.1	23.1	5	0.320	0.382	0.353	0.241	0.382				
		Walleye	2008	5	5	18.3	12.7	22.2	5	0.392	0.558	0.348	0.276	0.558				
RENO *	61007800	Bluegill sunfish	2010	9	2	8.2	7.8	8.5	2	0.071	0.077	0.071	0.064	0.077				
		Black crappie	2010	10	2	10.7	10.4	10.9	2	0.114	0.124	0.114	0.103	0.124				
		Northern pike	2010	6	6	20.5	15.1	22.8	6	0.194	0.349	0.182	0.078	0.367				
		Walleye	2010	7	7	17.8	15.1	21.8	7	0.380	0.538	0.369	0.241	0.565				
		White sucker	2010	5	1	18.4	18.4	18.4	1	0.075								
PELICAN	61011100	Bluegill sunfish	1994	8	1	6.2	6.2	6.2	1	0.082								
		Northern pike	1994	15	4	22.5	17.0	29.4	4	0.144	0.200	0.143	0.089	0.200	1	< 0.01		
		White sucker	1994	2	1	18.2	18.2	18.2	1	0.042								
MINNEWASKA *	61013000	Bluegill sunfish	1984	10	1	8.3	8.3	8.3	1	0.140								
		Black crappie	1971	6	6	11.7	9.3	13.6	6	0.218	0.267	0.230	0.160	0.270				
			2002	10	1	9.7	9.7	9.7	1	0.089								
		Common Carp	1970	1	1	18.7	18.7	18.7	1	0.020								
		Northern pike	1984	4	1	23.5	23.5	23.5	1	0.190								
			1986	5	1	22.1	22.1	22.1	1	0.280					1	< 0.05		
		Walleye	1970	17	17	20.0	16.2	25.8	17	0.561	0.856	0.670	0.170	0.910				
			1971	20	20	14.3	9.8	20.8	20	0.284	0.355	0.210	0.150	1.100				
			1984	5	1	17.4	17.4	17.4	1	0.260								

			1986	5	1	17.6	17.6	17.6	1	0.520					1	< 0.05		
			1992	24	4	19.9	12.7	27.4	4	0.368	0.730	0.295	0.150	0.730	1	0.016		
		White sucker	1970	1	1	19.2	19.2	19.2	1	0.060								
			1992	7	1	17.7	17.7	17.7	1	0.039					1	0.011		
		Yellow perch	1971	2	2	9.4	8.1	10.7	2	0.215	0.290	0.215	0.140	0.290				
			1992	6	1	8.3	8.3	8.3	1	0.130								
SIGNALNESS *	61014900	Bluegill sunfish	1992	10	1	7.6	7.6	7.6	1	0.043								
		Northern pike	1992	15	2	19.6	17.6	21.6	2	0.220	0.300	0.220	0.140	0.300	1	< 0.01		
		White sucker	1992	1	1	19.2	19.2	19.2	1	0.170					1	0.019		
EMILY	61018000	Black crappie	2010	10	2	10.2	8.2	12.2	2	0.011	0.011	0.011	0.010	0.011				
		Northern pike	2010	8	8	24.4	19.5	32.4	8	0.100	0.140	0.101	0.064	0.144				
		Walleye	2010	8	8	18.3	16.7	20.9	8	0.054	0.061	0.053	0.046	0.062				
		White sucker	2010	5	1	17.2	17.2	17.2	1	0.067								
CAMP *	76007200	Bluegill sunfish	2010	4	1	5.6	5.6	5.6	1	0.045								
		Brown bullhead	2010	5	1	14.5	14.5	14.5	1	0.081								
		Northern pike	2010	7	7	24.0	21.9	28.8	7	0.291	0.391	0.284	0.188	0.401				

* Impaired for mercury in fish tissue

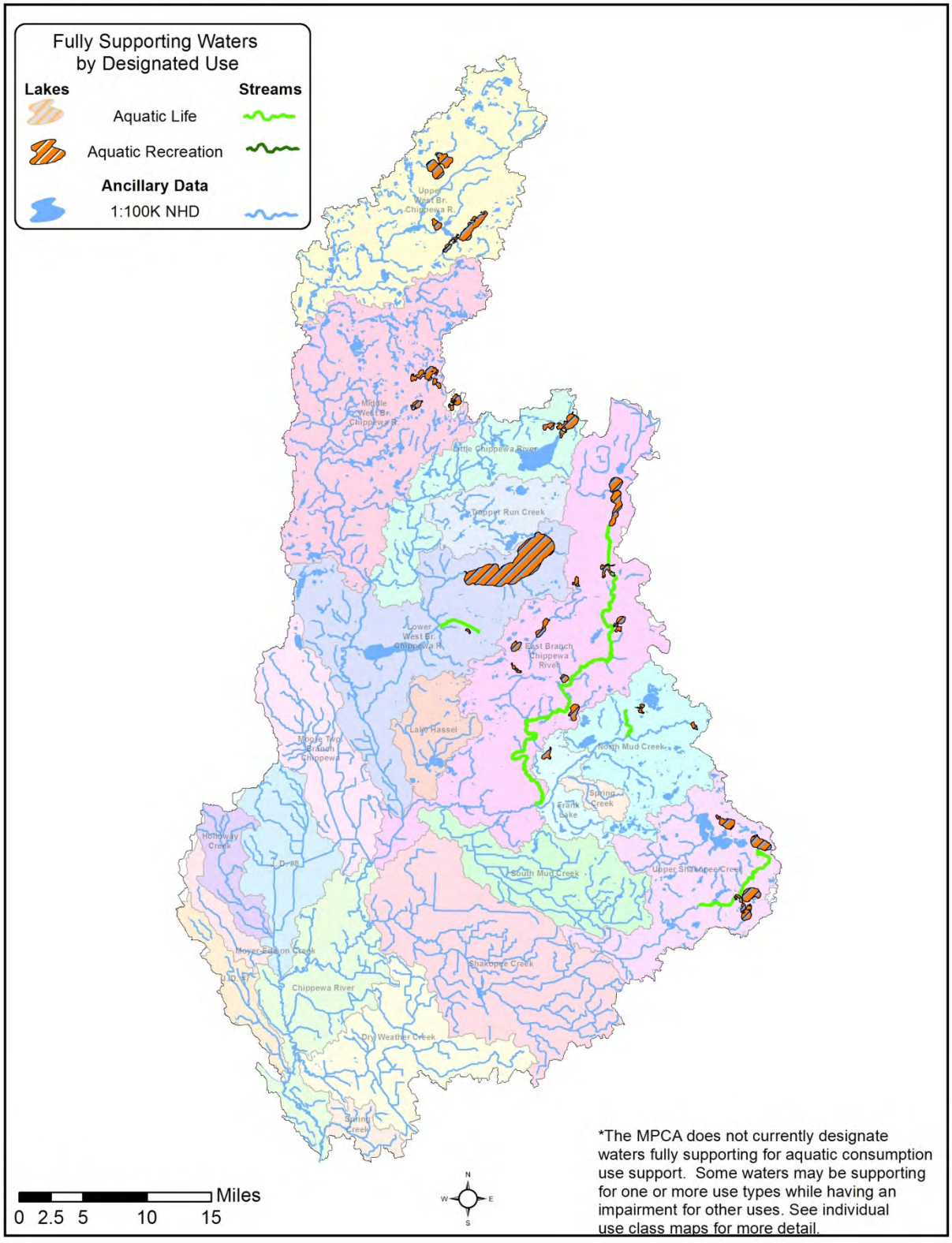

Figure 37. Fully supporting waters by designated use in the Chippewa River Watershed

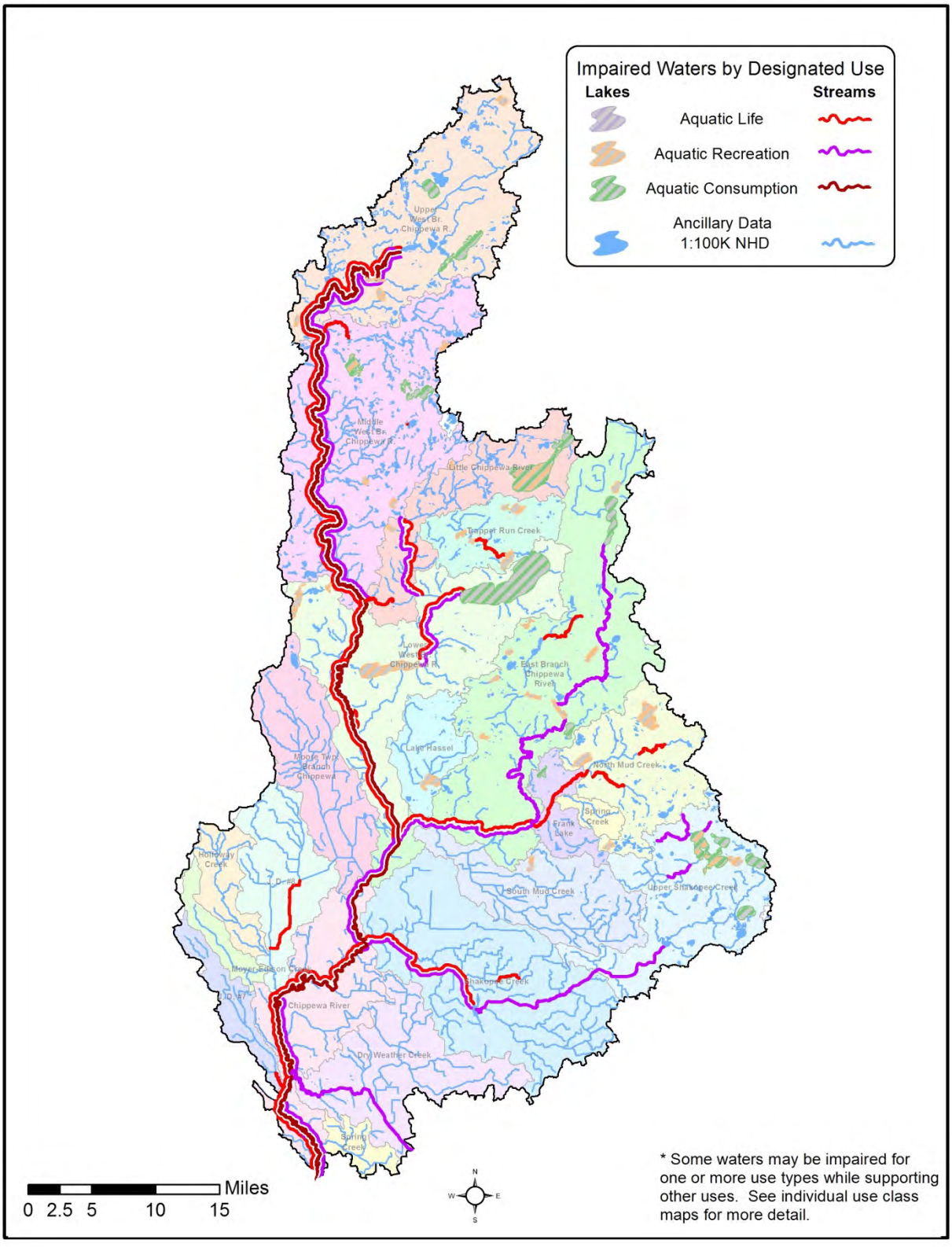

Figure 38. Impaired waters by designated use in the Chippewa River Watershed

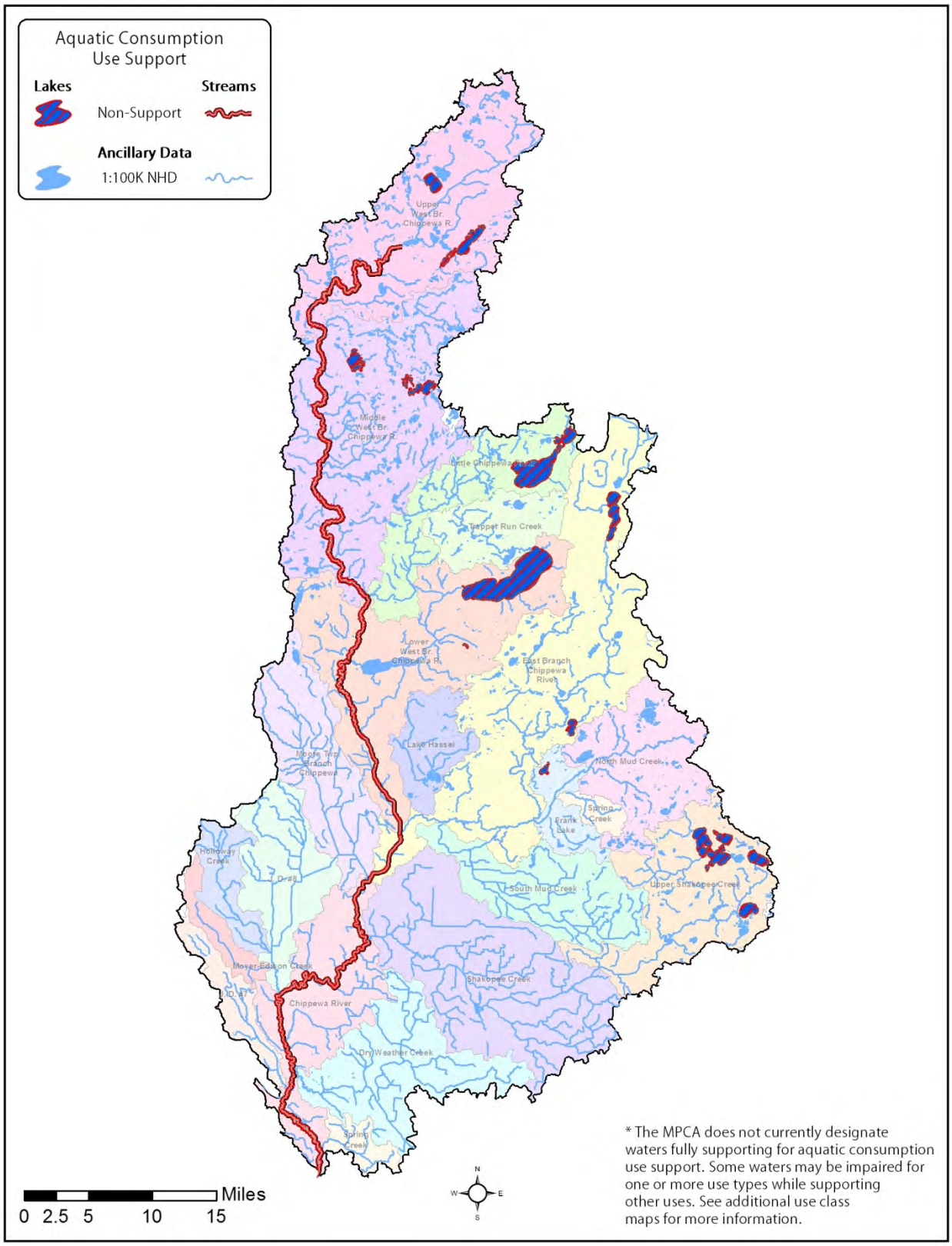

Figure 39. Aquatic consumption use support in the Chippewa River Watershed

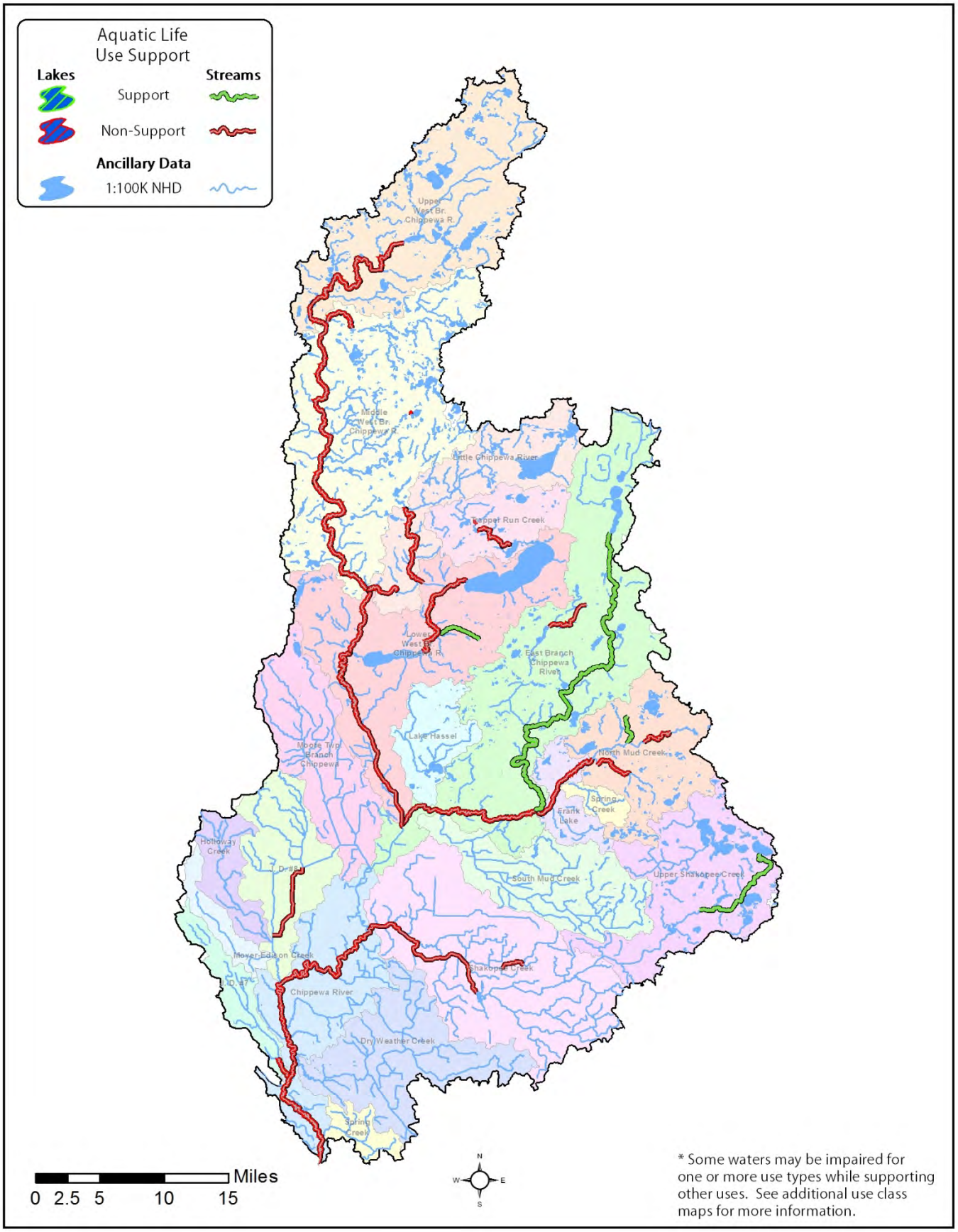

Figure 40. Aquatic life use support in the Chippewa River Watershed

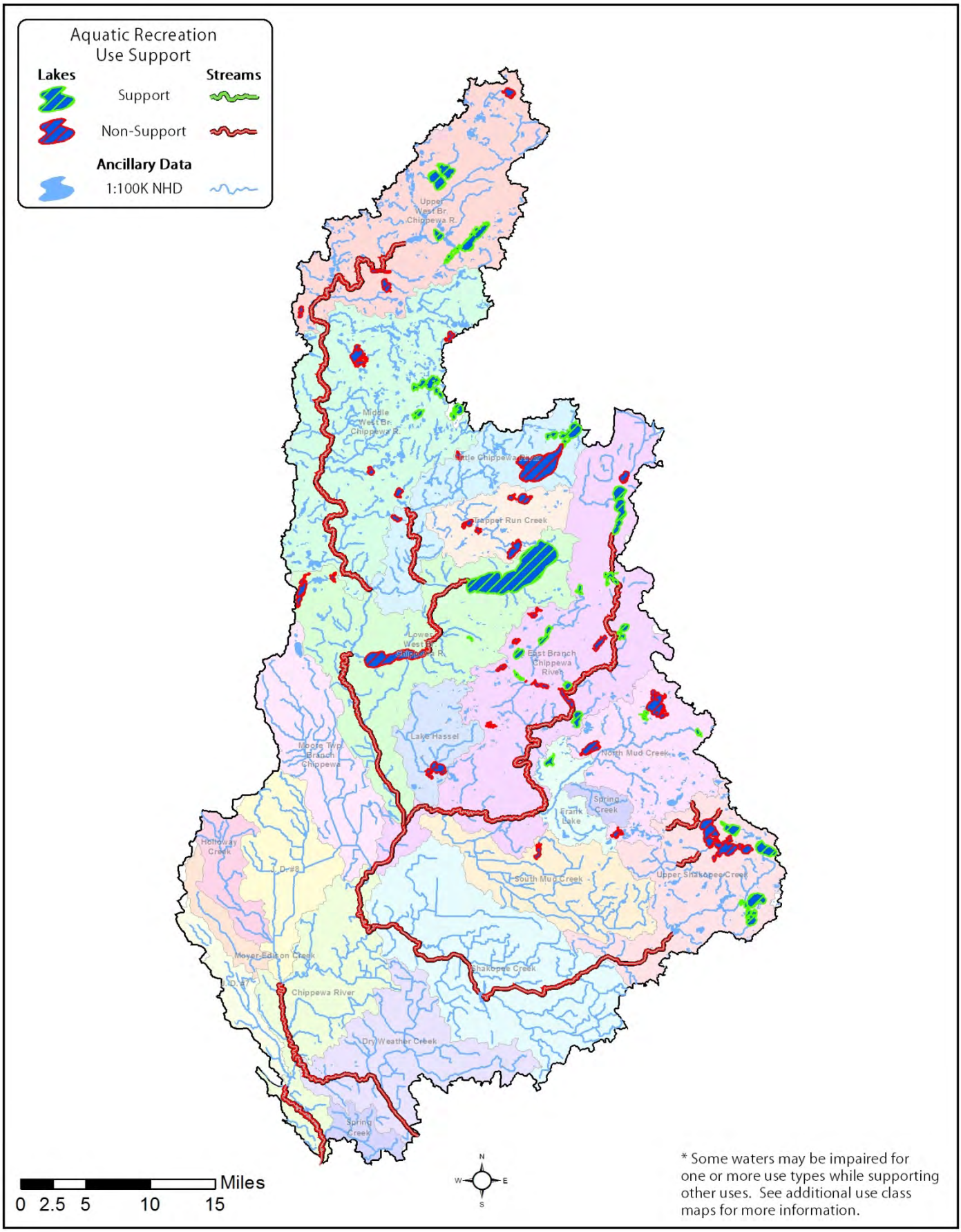

Figure 41. Aquatic recreation use support in the Chippewa River Watershed

VII. Summaries and recommendations

While improvements have been made to the water quality of the Chippewa River Watershed over the last 30 years with regards to point source discharges, and on nonpoint issues through the Chippewa River Watershed Project (http://www.chippewariver.com/), many of its waterbodies struggle to attain water quality standards. In order to see measureable improvements in water quality, additional measures must be taken to address both point and non-point source pollution across the watershed.

Additional monitoring should include investigating the extent of existing and new impairments and the effects of BMP implementation. This also should include sonde placement in the seven HUC-11s that had very high dissolved oxygen readings in the afternoon which could be indicative of low dissolved oxygen overnight. Studies to identify the potential of dam retrofitting or removal to improve stream connectivity, and to examine the effects of groundwater withdrawal in the watershed in areas where there is a strong interaction between surficial and groundwater would be beneficial. Continued lake monitoring should target the lakes where insufficient or no assessment level data is present. More targeted stream chemistry monitoring is needed in areas where sufficient data for assessment is lacking and to determine the extent and type of stressors of known impairments.

Measures should be taken to work with landowners in the watershed to target BMPs and improve riparian corridors where they will most benefit water quality improvements. Protection strategies should be developed to protect remaining forested areas and natural landscapes.

The natural and social complexity of the Chippewa River Watershed explains the wide spectrum of water quality observed within its lakes. Understanding the dynamics of how water travels through the Chippewa River Watershed is difficult because individual bodies of water cycle pollutants differently. Geology, land use, lake morphology, and watershed size must all be considered in order to fully understand water quality for individual water bodies.

The northern portion of the watershed is lake rich with relatively homogeneous geology consisting of rolling till prairie. The driving factors of lake water quality appear to be the contributing watershed size and land use. Lakes with small contributing watersheds and higher percentages of forest and rangeland have better water quality. However, many lakes are hydraulically connected to each other resulting in large watersheds which can increase nutrient loading to downstream lakes. The southern portion of the watershed has very few lakes; much of this area has been drained and is dominated by agriculture.

Bringing the watershed's lakes into compliance with water quality standards is an immense task when considering the scale and complexity of the problem. However, steps can be taken to protect lakes with good water quality and to improve lakes with poor water quality. Land use is one area that needs to be addressed. Reductions in overland run-off and good land management practices can substantially reduce loading of phosphorus in lakes resulting in water quality improvements.

VIII. Literature cited

MPCA (2008). Regionalization of Minnesota's Rivers for Application of River Nutrient Criteria. http://www.pca.state.mn.us/index.php/view-document.html?gid=6072

MPCA (2010). Aquatic Life Water Quality Standards Technical Support Document for Nitrate. http://www.pca.state.mn.us/index.php/view-document.html?gid=14949

MPCA (2011). Aquatic Life Water Quality Standards Draft Technical Support Document for Total Suspended Solids (Turbidity). http://www.pca.state.mn.us/index.php/view-document.html?gid=14922

MPCA (2012). Guidance Manual for Assessing the Quality of Minnesota Surface Water for the Determination of Impairment: 305(b) Report and 303(d) List. http://www.pca.state.mn.us/index.php/view-document.html?gid=16988

Minnesota Pollution Control Agency and Minnesota State University of Mankato (2009). State of the Minnesota River, Summary of Surface Water Quality Monitoring 2000-2008. http://mrbdc.mnsu.edu/sites/mrbdc.mnsu.edu/files/public/reports/basin/state_08/2008_fullreport1109.pdf?field_pubtitle_value=State+of+the+Minnesota+River&field_pubauthor_value=&body_value=&taxonomy_vocabulary_1_tid%255B%255D=1258&=Apply

Minnesota Pollution Control Agency (MPCA). 2007a. Guidance Manual for Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment 305(b) Report and 303(d) List. Environmental Outcomes Division, Minnesota Pollution Control Agency, St. Paul, Minnesota.

Minnesota Pollution Control Agency (MPCA). 2007b. Minnesota Statewide Mercury Total Maximum Daily Load. Minnesota Pollution Control Agency, St. Paul, Minnesota.

Minnesota Pollution Control Agency (MPCA). 2008a. Watershed Approach to Condition Monitoring and Assessment. Appendix 7 *in* Biennial Report of the Clean Water Council. Minnesota Pollution Control Agency, St. Paul, Minnesota.

Minnesota Pollution Control Agency (MPCA). 2010. Guidance Manual for Assessing the Quality of Minnesota Surface Water for the Determination of Impairment: 305(b) Report and 303(d) List. Environmental Outcomes Division, Minnesota Pollution Control Agency, St. Paul, Minnesota.

Minnesota Pollution Control Agency (MPCA). 2010. Minnesota Milestone River Monitoring Report. http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/streams-and-rivers/minnesota-milestone-river-monitoring-program.html

McCollor, S., and S. Heiskary. 1993. Selected Water Quality Characteristics of Minimally Impacted Streams from Minnesota's Seven Ecoregions. Addendum to Fandrei, G., S. Heiskary, and S. McCollor. 1988. Descriptive Characteristics of the Seven Ecoregions in Minnesota. Division of Water Quality, Program Development Section, Minnesota Pollution Control Agency, St. Paul, Minnesota. 140 p.

National Resource Conservation Service (NRCS). 2007. Rapid Watershed Assessment: Chippewa (MN) 070020005. NRCS. USDA. http://www.mn.nrcs.usda.gov/technical/rwa/Assessments/reports/chippewa.pdf

Niemela, S.L., and Feist, M. D. 2000. Index of Biotic Integrity Guidance for Coolwater Rivers and Streams of the St. Croix River Basin. Minnesota Pollution Control Agency, St. Paul, Minnesota. 47 p.

Omernik, J.M. and A.L. Gallant. 1988. Ecoregions of the Upper Midwest States. EPA/600/3-88/037. Corvallis, OR: United States Environmental Protection Agency. 56 p.

State Climatology Office- DNR Division of Ecological and Water Resources. 2010. http://www.climate.umn.edu/doc/hydro_yr_pre_maps.htm

University of Missouri Extension (1999). Agricultural Phosphorus and Water Quality. Pub. G9181. http://extension.missouri.edu/explorepdf/agguides/soils/g09181.pdf

Appendix 1. Water chemistry definitions

Dissolved oxygen (DO)-Oxygen dissolved in water required by aquatic life for metabolism. Dissolved oxygen enters into water from the atmosphere by diffusion and from algae and aquatic plants when they photosynthesize. Dissolved oxygen is removed from the water when organisms metabolize or breathe. Low DO often occurs when organic matter or nutrient inputs are high, and light inputs are low.

Escherichia coli (E. coli)-A type of fecal coli form bacteria that come from human and animal waste. E. coli levels aid in the determination of whether or not fresh water is safe for recreation. Disease-causing bacteria, viruses and protozoans may be present in water that has elevated levels of E. coli.

Nitrate plus Nitrite–Nitrogen-Nitrate and nitrite-nitrogen are inorganic forms of nitrogen present within the environment that are formed through the oxidation of ammonia-nitrogen by nitrifying bacteria (nitrification). Ammonia-nitrogen is found in fertilizers, septic systems and animal waste. Once converted from ammonia-nitrogen to nitrate and nitrite-nitrogen, these species can stimulate excessive levels of algae in streams. Because nitrate and nitrite-nitrogen are water soluble, transport to surface waters is enhanced through agricultural drainage. The ability of nitrite-nitrogen to be readily converted to nitrate-nitrogen is the basis for the combined laboratory analysis of nitrate plus nitrite-nitrogen (nitrate-N), with nitrite-nitrogen typically making up a small proportion of the combined total concentration. These and other forms of nitrogen exist naturally in aquatic environments; however concentrations can vary drastically depending on season, biological activity, and anthropogenic inputs.

Orthophosphate-Orthophosphate (OP) is a water soluble form of phosphorus that is readily available to algae (bio-available). While orthophosphates occur naturally in the environment, river and stream concentrations may become elevated with additional inputs from waste water treatment plants, noncompliant septic systems and fertilizers in urban and agricultural run-off.

pH-A measure of the level of acidity in water. Rainfall is naturally acidic, but fossil fuel combustion has made rain more acid. The acidity of rainfall is often reduced by other elements in the soil. As such, water running into streams is often neutralized to a level acceptable for most aquatic life. Only when neutralizing elements in soils are depleted, or if rain enters streams directly, does stream acidity increase.

Specific Conductance-The amount of ionic material dissolved in water. Specific conductance is influenced by the conductivity of rainwater, evaporation and by road salt and fertilizer application.

Temperature-Water temperature in streams varies over the course of the day similar to diurnal air temperature variation. Daily maximum temperature is typically several hours after noon, and the minimum is near sunrise. Water temperature also varies by season as doe's air temperature.

Total Kjehldahl nitrogen (TKN)-The combination of organically bound nitrogen and ammonia in wastewater. TKN is usually much higher in untreated waste samples then in effluent samples.

Total Phosphorus (TP)-Nitrogen (N), phosphorus (P) and potassium (K) are essential macronutrients and are required for growth by all animals and plants. Increasing the amount of phosphorus entering the system therefore increases the growth of aquatic plants and other organisms. Excessive levels of Phosphorous over stimulate aquatic growth and resulting in the progressive deterioration of water quality from overstimulation of nutrients, called Eutrophication. Elevated levels of phosphorus can result in: increased algae growth, reduced water clarity, reduced oxygen in the water, fish kills, altered fisheries and toxins from cyanobacteria (blue green algae) which can affect human and animal health.

Total Suspended Solids (TSS)-TSS and turbidity are highly correlated. Turbidity is a measure of the lack of transparency or "cloudiness" of water due to the presence of suspended and colloidal materials such as clay, silt, finely divided organic and inorganic matter and plankton or other microscopic organisms. The greater the level of TSS, the murkier the water appears and the higher the measured turbidity.

Higher turbidity results in less light penetration which may harm beneficial aquatic species and may favor undesirable algae species. An overabundance of algae can lead to increases in turbidity, further compounding the problem.

Total Suspended Volatile Solids (TSVS)-Volatile solids are solids lost during ignition (heating to 500 degrees C.) They provide an approximation of the amount of organic matter that was present in the water sample. ''Fixed solids'' is the term applied to the residue of total, suspended, or dissolved solids after heating to dryness for a specified time at a specified temperature. The weight loss on ignition is called ''volatile solids.''

Unionized Ammonia (NH3)-Ammonia is present in aquatic systems mainly as the dissociated ion $NH4^{+}$, which is rapidly taken up by phytoplankton and other aquatic plants for growth. Ammonia is an excretory product of aquatic animals. As it comes in contact with water, ammonia dissociates into $NH4^{+}$ ions and ^{-}OH ions (ammonium hydroxide). If pH levels increase, the ammonium hydroxide becomes toxic to both plants and animals

Appendix 2. Intensive chemistry monitoring stations in the Chippewa River Watershed

FieldNum	STORET ID	Waterbody Name	Location	HUC-11
09MN001	S000-494	Chippewa River	Upstream of dam on CR 13, .5 mi. N of Watson	07020005-502
09MN002	S005-629	Unnamed Creek	Downstream of CR 9, 2 mi. N of Watson	07020005-584
09MN007	S005-631	Trapper Run Creek	Upstream of 270th Ave., 3 mi. W of Long Beach	07020005-628
03MN013	S005-633	Mud Creek	Upstream of 120th Ave NE, 7.5 mi. W of Sunburg	07020005-554
07MN041	S005-364	Chippewa River, East Branch	Upstream of CR 78, 1.5 mi. N of Benson	07020005-514
09MN005	S005-630	Chippewa River	Upstream of CR 25, 7.5 mi. W of Brandon	07020005-503
09MN004	S004-705	Little Chippewa River	Downstream of CR 28, 4.5 mi. W of Starbuck	07020005-713
09MN011	S000-383	Chippewa River	Upstream of CR 75, 1 mi. SW of Benson	07020005-506
03MN015	S002-201	Shakopee Creek	Upstream of 20th Ave. SW, 8 mi S of Benson	07020005-559
09MN014	S003-372	Mud Creek	Downstream of CR 33, 10 mi. NE of Degraff	07020005-554
09MN008	S002-202	Cottonwood Creek	Upstream of 120th St SW, .5 mi. NW of Big Bend City	07020005-511
09MN010	S002-550	Shakopee Creek	Upstream of Hwy 12, 1 mi. SE of Kerkhoven	07020005-557
09MN013	S000-963	Chippewa River	Downstream of 210th St, 3 mi. SE of Cyrus	07020005-503
07MN045	S002-195	Mud Creek	Upstream of CR 18, 3 mi. E of Benson	07020005-517
09MN012	S003-507	County Ditch 3	Downstream of 20th St SW, 4 mi. SW of Benson	07020005-579
03MN010	S002-193	Chippewa River	Upstream of CR 22, 1 mi. E of Clantarf	07020005 -505
09MN009	S002-204	Dry Weather Creek	Upstream of 85th Ave NW, 4 mi. NE of Watson	07020005-509

Appendix 3. Biological monitoring stations in the Chippewa Watershed

Field Number	Waterbody Name	Location	Drain Mi²
01MN003	Judicial Ditch 8	Downstream CR 60, 2.5mi SW of Danvers	38.09
01MN011	Spring Creek	Sparta twp, NE of Montevideo	10.25
01MN035	Unnamed ditch	Louriston twp, downstream CR 2	13.92
03MN004	Little Chippewa River	7 mi. W. of Starbuck, upstream of C.R. 1	12.57
03MN005	Trib. to Ben Lake	5.5 mi. South of Glenwood, upstream of CR 21	10.27
03MN006	Shakopee Creek	4.5 mi. West of New London, upstream of C.R. 40	48.35
03MN008	Trib. to Mud Lake	About 10 mi. S. of Sedan on Hwy. 104	1.60
03MN009	Chippewa River	4 mi. S.E. of Hancock, upstream of C.R. (?)	713.62
03MN010	Chippewa River	1 mi. NE of Clontarf on CR 22 (upstream of bridge)	741.63
03MN011	Trib. to Chippewa River, East Branch	About 5 mi. N.E. of Benson, upstream of 40th St (within WMA)	7.38
03MN012	Chippewa River, East Branch	Swift Falls Co. Park	204.56
03MN013	Mud Creek	10 mi. N.E. of Benson on C.R. 87 (Camp Kerk WMA)	113.99
03MN014	Judicial Ditch 8	9 mi. E. of Appleton on C.R. 65	46.37
03MN015	Shakopee Creek	7.5 mi. S. of Benson [upstream of 20th(?) Ave.]	304.57
03MN056	Trib. to Chippewa River	7 mi. NW of Montevideo, 2 mi. N of CR 13 on CR 9	30.00
03MN078	Judicial Ditch 9	Downstream of CR 22, 3 mi W of Clontarf	52.53
07MN036	County Ditch 15	Downstream of CR 10, 5 mi. W of Gilchrist	58.97
07MN037	Unnamed ditch	Upstream of 110th St, 5 mi. E of Farwell	38.40
07MN038	Shakopee Creek	Upstream of Kandi-Swift Rd, 3.5 mi. NW of Pennock	112.84
07MN039	Mud Creek	Downstream of CR 12, 1 mi. NE of Murdock	33.37
07MN040	County Ditch 8	Upstream of 45th St, 6 mi. NE of Benson	6.26
07MN041	Chippewa River, East Branch	Upstream of CR 78, 3 mi. N of Benson	512.37
07MN042	Judicial Ditch 8	Upstream of 40th St, 1.5 mi. SW of Danver	36.10
07MN043	Unnamed ditch	Downstream of 70th St, 4 mi. S of Benson	27.15
07MN045	Mud Creek	Upstream of CR 18, 2.5 mi E of Benson	83.81
07MN048	Trib. to Dry Weather Creek	Upstream of CR 6, 1 mi. S of Aggie	15.83
07MN049	Trib. to Dry Weather Creek	Downstream of CR 12, 1 mi. NW of Havelock	27.83
07MN050	County Ditch 63	Upstream of 90th Ave, 2 mi. NE of De Graff	15.78
07MN051	County Ditch 3	Upstream of 10th St, 4 mi. W of Benson	78.28
07MN052	Trib. to Cottonwood Creek	Upstream of 80th St, 5 mi. SE of Holloway	17.26
07MN084	Shakopee Creek	Downstream of Kandi-Swift Rd, 3.5 mi. NW of Pennock	113.09
09MN001	Chippewa River	Upstream of dam on CR 13, 0.5 mi. N of Watson	2043.68
09MN002	Unnamed creek	Downstream of CR 9, 2 mi. N of Watson	29.36
09MN004	Little Chippewa River	Downstream of CR 28, 4.5 mi. W of Starbuck	97.69
09MN005	Chippewa River	Upstream of CR 25, 7.5 mi. W of Brandon	148.94
09MN007	Trapper Run Creek	Upstream of 270th Ave, 3 mi. W of Long Beach	32.14
09MN008	Cottonwood Creek	Upstream of 120th St SW, 0.5 mi. NW of Big Bend	123.07
09MN009	Dry Weather Creek	Upstream of 85th Ave NW, 4 mi. NE of Watson	104.21

09MN010	Shakopee Creek	Upstream of Hwy 12, 1 mi. SE of Kerkhoven	125.33
09MN011	Chippewa River	Upstream of CR 75, 1 mi. SW of Benson	1276.30
09MN012	County Ditch 3	Downstream of CR 75, 4 mi. SW of Benson	91.57
09MN013	Chippewa River	Downstream of 210th St, 3 mi. SE of Cyrus	401.30
09MN014	Mud Creek	Downstream of CR 33, 10 mi. NE of Degraff	94.75
09MN016	County Ditch 60	Upstream of CR 5, 5 mi. NE of Evansville	47.93
09MN017	Hoplin Creek	Downstream of CR 16, 2 mi. N of Brandon	35.73
09MN018	Unnamed creek	Downstream of CR 8, 10.5 mi. SW of Brandon	58.27
09MN019	Chippewa River	Upstream Hwy 59, in Montevideo	2078.31
09MN020	Spring Creek (County Ditch 10A)	Upstream of MN-29, 0.5 mi. N of Montevideo	16.69
09MN021	Chippewa River	Upstream of CR 14, 4 mi. SW of Benson	1373.28
09MN023	Unnamed creek	Downstream of 50th St NW, 3 mi. S of Big Bend City	19.69
09MN026	Unnamed creek	Downstream of 45th St. NE, 4.5 mi. NE of Benson	38.57
09MN027	Cottonwood Creek	North of CR 6, 7.5 mi. SE of Holloway	30.74
09MN030	Trib. to Chippewa River	Downstream of CR 25, 8.5 mi SW of Brandon	9.78
09MN031	Trib. to Chippewa River	Upstream of 115th St, 8.5 mi. SE of Hoffman	21.59
09MN034	Trib. to Leven Lake	Upstream of Pennie Rd SE, 3 mi. N of Villard	8.45
09MN035	Trib. to Villard Lake	Downstream of CR 30, 4 mi. W of Villard	10.04
09MN036	Chippewa River, East Branch	Upstream of CR 29, 3 mi. E of Benson	363.83
09MN037	Trib. to Dry Weather Creek	Downstream of 10th St NW, 9 mi. NE of Montevideo	61.62
09MN038	Dry Weather Creek	Downstream of CR 13 , 9 mi. NE of Montevideo	11.96
09MN039	Unnamed ditch	Upstream of CR 30, 1 mi. NE of Louriston	22.51
09MN040	Unnamed ditch	Downstream of 80th Ave NE, 2.5 mi. NW of Louriston	40.49
09MN041	Trib. to Shakopee Creek	Upstream of CR 27, 11.5 mi. S of Benson	13.50
09MN042	Shakopee Creek	Downstream of CR 83, 7 mi. SW of Murdock	227.99
09MN043	County Ditch 27	Upstream of CR 1, 14 mi. NW of Wilmar	12.83
09MN044	Trib. to Judicial Ditch 8	Downstream of 20th St NW, 2.5 mi. NW of Danvers	24.70
09MN046	Mud Creek	Downstream of CR 89, 3 mi. NE of Kerkhoven	12.71
09MN047	Judicial Ditch 5	Upstream of CR 10, 6.5 mi. S of Benson	15.27
09MN048	County Ditch 63	Downstream of CR 16, 4 mi. N of Murdock	8.07
09MN049	Trib. to Mud Creek	Downstream of 60th St SE, 3 mi. N of Kerkhoven	10.36
09MN050	Hollerberg Floodway	Upstream of 65th Ave SE, 6 mi. E of Benson	18.11
09MN051	County Ditch 60	Upstream of CR 60 NW, 0.5 mi. E of Millerville	39.92
09MN052	Unnamed creek	Downstream of CR 12, 2 mi. S of Aggie	24.93
09MN054	Mud Creek	Upstream of CR 16, 6.5 mi. SE of Benson	58.24
09MN055	Chippewa River, East Branch	Upstream of 235th St, 5.5 mi. SE of Glenwood	64.31
09MN056	Chippewa River, East Branch	Upstream of CR 28, 13 mi. NE of Benson	206.68
09MN057	County Ditch 15	Downstream of 165th Ave NE, 5 mi. NW of Sunburg	37.21
09MN059	Chippewa River, East Branch	Downstream of 320th St, 3 mi. N of Swift	193.88
09MN061	Trib. to Judicial Ditch 9	Upstream of 330th St, 4.5 mi. S of Hancock	10.39
09MN063	Chippewa River	Downstream of CR 17, in Hagen	1741.09

09MN064	Chippewa River	Upstream of CR 40, 2 mi SW of Big Bend	1872.18
09MN065	Outlet Creek	Upstream of CR 14, 7.5 mi. SW of Starbuck	216.18
09MN067	Unnamed ditch	Downstream of Ost Rd NW, 7 mi. SW of Parkers Prairie	9.30
09MN068	Chippewa River	Downstream of CR 6, 5.5 mi. NE of Big Bend	1706.00
09MN069	Shakopee Creek	Downstream of CR 4, 4 mi. NW of Louriston	193.63
09MN070	Chippewa River	Downstream of Pope Douglas Rd SW, 4 mi. SW of Kensington	300.24
09MN071	Unnamed creek	Upstream of CR 55, 2 mi. S of Evansville	15.18
09MN072	County Ditch 7	Upstream of CR 20, 3 mi. W of Benson	6.73
09MN073	Trib. to County Ditch 9	Downstream of CR 15, 3 mi. SW of Clontarf	7.55
09MN075	Trib. to County Ditch 9	Downstream of 70th St NW, 4 mi. W of Clontarf	17.11
09MN076	Trib. to Shakopee	Downstream of 60th Ave SE, 7 mi. SW of Murdock	14.56
09MN077	Outlet Creek	Upstream of 320th Ave, 5 mi. SW of Starbuck	201.49
09MN078	County Ditch 61	Downstream of CSAH 6, 0.5 mi. NE of Kerkhoven	3.05
09MN079	County Ditch 61	Upstream of CSAH 35, 0.5 mi. N of Kerkhoven	2.56
90MN008	Signalness Creek	Upstream of CR 41, near Glacial Lake State Park, 4.5 mi S of Starbuck	8.15
90MN009	Mud Creek	Upstream of Twp Rd T143, 6 mi SW of Brooten	27.52
90MN010	Chippewa River, East Branch	Swift County Park, in Swift Falls	204.57
90MN011	Cottonwood Creek	Downstream of CR 65, 3 mi NW of Big Bend City	100.37
91MN013	Trib. to Dry Weather Creek	Downstream of 20th St NW, 7 mi NE of Montevideo	10.64
01MN003	Judicial Ditch 8	Downstream CR 60, 2.5mi SW of Danvers	38.09

Appendix 4. AUID table of results (by parameter and beneficial use)

National Hydrography Dataset (NHD) Assessment Unit ID	Stream Segment Name	Segment Description	Reach Length (Miles)	Use Class	Aquatic Life	Aquatic Recreation		Fish IBI	Invert IBI	Chloride	Bacteria	Dissolved Oxygen	pH	Turbidity	Unionized Ammonia
07020070200050 10															
07020005-536	Unnamed creek	Unnamed lk through Devils Lk to Little Chippewa Lk	2.8	2B	IF	NA								NA	
07020005-539	County Ditch 60 (Chippewa River)	T130 R39W S14, east line to Upper Hunt Lk	5.3	7								IF			
07020005-541	Unnamed creek	Fanny Lk to Chippewa R	1.9	2B	NA	NA									
07020005-581	Hoplin Creek	Little Chippewa Lk to Stowe Lk	1.5	2B	IF	NA								MTS	
07020005-665	Unnamed creek	Headwaters to CD 60	4.7	2B	NA	NA									
07020005-666	Unnamed creek	Unnamed lk (21-0295-00) to Chippewa R	3.5	2B	NA	NA									
07020005020															
07020005-503	Chippewa River	Stowe Lk to Little Chippewa R	70.7	2B	NS	NS		MTS	EXP	MTS	EXS	IF	MTS	EXS	MTS
07020005-543	Unnamed creek	Unnamed lk (21-0288-00) to Chippewa R	7.6	2B	NA	NA									
07020005-633	Unnamed creek	Holleque Lk to Lk Venus	1.2	2B	NA	NA								MTS	
07020005-634	Unnamed creek	Quam Lk to Lk Venus	0.8	2B	NA	NA								MTS	
07020005-638	Unnamed creek	Unnamed lk to Unnamed lk	4.3	2B	NS	NA		EXS	EXP						
07020005-901	Unnamed creek (Freeborn Lake Inlet)	Headwaters to Freeborn Lk	0.1	2B	NS	NA								EXP	
07020005-903	Unnamed creek	Little Freeborn Lk to Freeborn Lk	0.1	2B	NA	NA								EXP	
07020005030															
07020005-531	Little Chippewa River	Headwaters to Unnamed cr	15.1	2B	NA	NA									
07020005-713	Little Chippewa River	Unnamed cr to CD 2	14.4	2B	NS	NS		EXS	EXP	MTS	EXS	IF	MTS	EXS	MTS
07020005-714	Little Chippewa River	Unnamed wetland (61-0527-00) to Chippewa R	4.1	2B	NS	NA		EXS	EXS					MTS	
07007020005040															
07020005-628	Trapper Run Creek	Strandness Lk to Pelican Lk	4.9	2B	NS	NS		EXS	EXP		EX			MTS	

07020005-630	Trapper Run Creek	Pelican Lk to Shallow Pond	0.3	2B	NA	NA							MTS	
07020005050															
07020005-504	Chippewa River	Little Chippewa R to Unnamed cr	8.4	2B	NS	NA						IF		EXS	
07020005-505	Chippewa River	Unnamed cr to E Br Chippewa R	22.5	2B	NS	NS		EXS	EXP	MTS	EX	IF	MTS	EXS	MT
07020005-521	Unnamed creek	Lk Emily to Chippewa R	1.9	2B	NA	IF					IF	IF		EXS	
07020005-523	Outlet Creek	Lk Minnewaska to Lk Emily	12.8	2B	NS	NS		EXP	EXP		EX	IF		IF	
07020005-528	Signalness Creek	Headwaters to Outlet Cr	4.1	2B	FS	NA		MTS	EXP						
07020005060															
07020005-514	Chippewa River, East Branch	Mud Cr to Chippewa R	17.2	2B	NS	NS		EXP	EXP	MTS	EX	IF	MTS	EXS	MT
07020005-515	Chippewa River, East Branch	Headwaters (Amelia Lk 61-0064-00) to Mud Cr	47.0	2B	FS	NS		MTS	MTS		IF	EXP	MTS	MTS	
07020005-580	County Ditch 15	Unnamed cr to E Br Chippewa R	3.2	2B	IF	NA								MTS	
07020005-619	Unnamed creek	Headwaters to E Br Chippewa R	2.1	2B	NA	NA									
07020005-623	Unnamed creek	Headwaters to Lk Ben	4.6	2B	NS	NA		EXS							
07020005-625	Unnamed creek	Lk Ben to Lk Hanson	4.0	2B	IF	NA								MTS	
07020005-627	Unnamed creek	Lk Hanson to CD 15	2.2	2B	IF	NA								MTS	
07020005-649	County Ditch 8	Headwaters to E Br Chippewa R	5.7	2B	NA	NA									
07020005-670	Unnamed creek	Headwaters to Ellen Lk	5.2	2B	NA	NA									
07020005-672	Unnamed creek	Ellen Lk to Leven Lk	0.9	2B	NA	NA								MTS	
07020005-673	Unnamed creek	Villard Lk to Amelia Lk	0.1	2B	NA	NA								MTS	
07020005-693	County Ditch 12	CD 28 to Villard Lk	2.6	2B	NA	NA									
07020005-921	Unnamed creek (Gilchrist Lake Inlet)	Unnamed lk (61-0079-00) to Gilchrist Lk	0.5	2B	NA	NA								MTS	
07020005070															
07020005-551	Mud Creek	T123 R36W S28, east line to T123 R36W S29, west line	3.4	2A	NS	NA		NA	EXP					MTS	
07020005-552	Mud Creek	Unnamed cr to Unnamed cr	3.2	2B	IF	NA								MTS	
07020005-563	Mud Creek	Unnamed lk (61-0012-00) to T123 R36W S27, west line	1.4	2B	IF	NA								MTS	
07020005-564	Mud Creek	T123 R36W S30, east line to Unnamed cr	2.0	2B	IF	NA								MTS	
07020005-583	Unnamed creek	Headwaters to Mud Cr	2.8	2B	FS	NA		EXP	MTS						
07020005-690	County Ditch 15	Unnamed cr to Unnamed cr	4.2	2B	NS	NA		EXS	EXP					MTS	
07020005-691	County Ditch 15	Headwaters to Unnamed cr	4.2	2B	IF	NA								MTS	

07020005080															
07020005-621	Spring Creek	Headwaters to Mud Cr	5.1	2B	IF	NA							MTS	
07020005-699	Unnamed creek	Headwaters to Spring Cr	1.0	2B	IF	NA							MTS	
07020005090															
07020005-554	Mud Creek	CD 15 to E Br Chippewa R	11.0	2B	NS	NS	EXP	EXP		EXS	EXS	MTS	MTS	
07020005100															
07020005-516	Mud Creek	Headwaters to T120 R38W S1, north line	13.0	2B	IF	NA							MTS	
07020005-517	Mud Creek	T121 R37W S31, south line to T121 R39W S11, north line	12.1	7										
07020005-518	Mud Creek	T121 R39W S2, south line to E Br Chippewa R	3.2	2B	IF	NS				EXS	EXP	MTS	MTS	
07020005-655	County Ditch 63	Unnamed cr to Unnamed ditch	2.2	2B	NA	NA								
07020005-656	County Ditch 63	Unnamed ditch to Mud Cr	2.6	2B	NA	NA								
07020005-657	County Ditch 63	Unnamed ditch to Unnamed cr	3.9	2B	NA	NA								
07020005-700	Unnamed creek	Unnamed cr to Mud Cr	0.9	2B	NA	NA								
07020005-711	Unnamed creek	Unnamed cr to Unnamed cr	2.0	2B	NA	NA								
07020005110															
07020005-712	Unnamed creek	Unnamed cr to E Br Chippewa R	1.3	2B	IF	NA	EXP	MTS						
07020005120															
07020005-579	County Ditch 3	CD 7 to Chippewa R	2.3	2B	IF	NS				EXS	IF		MTS	
07020005-585	Judicial Ditch 9	Unnamed cr to CD 3	4.3	2B	IF	NA							MTS	
07020005-586	County Ditch 3	JD 9 to JD 8	3.3	2B	IF	NA							MTS	
07020005-595	Unnamed ditch	T123 R41W S11, north line to JD 9	9.0	7										
07020005-659	County Ditch 7	Unnamed ditch to CD 3	0.9	2B	NA	NA								
07020005-694	Unnamed creek	Headwaters to JD 9	8.8	2B	IF	NA							MTS	
07020005-695	Judicial Ditch 9	Unnamed cr to Unnamed cr	1.7	2B	IF	NA							MTS	
07020005-703	Unnamed ditch	Unnamed ditch to CD 3	1.1	2B	NA	NA								
07020005-704	County Ditch 7	Lynch Lk to Unnamed ditch	3.0	2B	NA	NA								
07020005130															
07020005-501	Chippewa River	Watson Sag to Minnesota R	13.0	2B	NS	NS			MTS	EXS	IF	MTS	EXS	MTS
07020005-502	Chippewa River	Dry Weather Cr to Watson Sag	3.0	2B	NS	NA	EXS	EXP						
07020005-506	Chippewa River	E Br Chippewa R to Shakopee Cr	12.0	2B	IF	NS			MTS	EXS	IF	MTS	EXS	MTS

07020005-507	Chippewa River	Shakopee Cr to Cottonwood Cr	15.0	2B	NS	NA		MTS	EXP			IF		EXS	
07020005-508	Chippewa River	Cottonwood Cr to Dry Weather Cr	9.2	2B	NS	NS		EXP	EXP	MTS	EXS	IF	MTS	EXS	MTS
07020005-576	Unnamed creek	Unnamed cr to Chippewa R	7.0	2B	IF	NA		EXP	MTS					MTS	
07020005140															
07020005-512	Shakopee Creek	Headwaters to T121 R36W S36, south line	10.9	2B	FS	IF		MTS	EXP		IF	EXP		MTS	
07020005-513	County Ditch 61	T120 R37W S21, north line to Shakopee Cr	1.7	7											
07020005-555	Shakopee Creek	T120 R36W S1, north line to Swan Lk	2.3	2C	IF	NA								MTS	
07020005-560	County Ditch 61	Headwaters to T120 R37W S16, south line	2.0	2B	NA	NA									
07020005-566	Unnamed ditch (Judicial Ditch 29)	Headwaters to CD 29	1.9	2B	IF	NS					EXS	IF		MTS	
07020005-567	County Ditch 29	Headwaters to Unnamed ditch	3.3	2B	IF	NS					EXS	IF		MTS	
07020005-570	County Ditch 27	Unnamed ditch to Unnamed ditch	2.6	2B	IF	NS					EXS	IF		EXP	
07020005-904	Unnamed creek	Henschien Lk to Lk Andrew	0.2	2B	NA	NA					IF			MTS	
07020005-917	Unnamed creek (Huse Creek)	Headwaters to Norway Lk	1.1	2B	IF	NS					EXS	IF		MTS	
07020005150															
07020005-548	Unnamed ditch	Unnamed cr to Unnamed ditch	3.5	2B	NA	NA									
07020005-549	Unnamed ditch	Unnamed ditch to Unnamed cr	2.2	2B	NA	NA									
07020005-550	Unnamed ditch	Unnamed cr to Shakopee Cr	2.7	2B	NA	NA									
07020005-557	Shakopee Creek	Swan Lk to Shakopee Lk	20.3	2C	IF	NS					EXS	EXS	MTS	IF	
07020005-559	Shakopee Creek	Shakopee Lk to Chippewa R	13.1	2C	NS	NS				MTS	EXS	IF	MTS	EXS	MTS
07020005-574	Unnamed creek	Unnamed cr to Unnamed ditch	2.2	2B	NS	NA								IF	
07020005-575	Unnamed creek	Unnamed ditch to Shakopee Cr	3.2	2B	NA	NA									
07020005-599	Unnamed ditch	T120 R39W S5, east line to JD 5	0.4	2B	NA	NA									
07020005-701	Unnamed creek	Unnamed cr to Shakopee Cr	2.2	2B	NA	NA									
07020005-702	Judicial Ditch 5	Unnamed ditch to Unnamed ditch	3.8	2B	NA	NA									
07020005160															
07020005-510	Cottonwood Creek	Unnamed cr to T120 R41W S20, east line	5.2	2C	IF	NA								IF	
07020005-577	Unnamed creek (Cottonwood Creek)	Unnamed cr to Unnamed cr	4.1	2C	IF	NA								EXP	
07020005-578	Unnamed creek	Headwaters to Unnamed cr (Cottonwood Cr)	2.1	2B	NA	IF					IF				
07020005-616	Unnamed creek (Cottonwood Creek)	Unnamed cr to Unnamed cr	3.0	2C	IF	NA								EXS	

07020005180															
07020005-511	Cottonwood Creek	T120 R41W S21, west line to Chippewa R	5.3	2B*	NS	NS		EXP	EXP		EXS	IF	MTS	MTS	
07020005-546	Judicial Ditch 8	Unnamed cr to Unnamed ditch	6.9	2B	NS	NA		--				IF		MTS	
07020005-547	Judicial Ditch 8	Unnamed ditch to Cottonwood Cr	0.5	2B*	IF	NA								IF	
07020005-643	Unnamed ditch	Unnamed cr to JD 8	4.9	2B	NA	NA									
07020005-705	Unnamed ditch	Unnamed ditch to JD 8	1.7	2B	IF	NA								MTS	
07020005190															
07020005-509	Dry Weather Creek	Headwaters to Chippewa R	17.4	2C	IF	NS		EXP	EXP	MTS	EXS	IF	MTS	EXP	MTS
07020005-615	Unnamed creek	Unnamed cr to Dry Weather Cr	1.5	2B	NA	NA									
07020005-660	Unnamed creek	Unnamed cr to Dry Weather Cr	5.2	2B	IF	NA								MTS	
07020005-661	Unnamed creek	Unnamed cr to Unnamed cr	1.0	2B	IF	NA								EXP	
07020005-662	Unnamed creek	Unnamed cr to Unnamed cr	1.5	2B	NA	NA									
07020005-663	Unnamed creek	Unnamed cr to Unnamed cr	1.5	2B	NA	NA									
07020005-709	Unnamed creek	Headwaters to Unnamed cr	13.2	2B	IF	NA								EXS	
07020005-710	Unnamed creek	Unnamed cr to Unnamed cr	6.8	2B	NA	NA									
07020005200															
07020005-584	Unnamed creek	Unnamed cr to Chippewa R	3.0	2B	NS	NS		MTS	EXS		EXS	EXS	MTS	MTS	
07020005-708	Unnamed creek	Headwaters to Unnamed cr	12.7	2B	IF	NA								MTS	
07020005210															
07020005-592	Spring Creek (County Ditch 10A)	Unnamed cr to CD 67	3.1	2C	NA	NA									
07020005-593	Spring Creek (County Ditch 10A)	T118 R40W S32, south line to T118 R40W S32, south line	1.3	2C	NA	NA									
07020005-594	Spring Creek (County Ditch 10A)	T117 R40W S5, north line to Minnesota R	1.2	2C	IF	NA								MTS	

Abbreviations for Indicator Evaluations: **--** = No Data, **NA** = Not Assessed, **IF** = Insufficient Information, **MTS** = Meets criteria; **EXP** = Exceeds criteria, potential impairment; **EXS** = Exceeds criteria, potential severe impairment; **EX** = Exceeds criteria (Bacteria).

Abbreviations for Use Support Determinations: **NA** = Not Assessed, **IF** = Insufficient Information, **NS** = Non-Support, **FS** = Full Support

Key for Cell Shading: = previous impairment or deferred impairment prior to 2012 reporting cycle; = new impairment; = full support of designated use.

*Aquatic Life assessment and/or impairments have been deferred until the adoption of Tiered Aquatic Life Uses due to the AUID being predominantly (>50%) channelized or having biological data limited to a station occurring on a channelized portion of the stream.

†Reach was assessed based on use class included in table and existing use class as defined in Minn. R. 7050 is different. The MPCA is currently in the process of changing the existing use class for this AUID in rule based on an analysis of the biological community and temperature data.

Appendix 5.1 Good/fair/poor thresholds for biological stations on non-assessed channelized AUIDs

Ratings of **Good** for channelized streams are based on Minnesota's general use threshold for aquatic life (Stations with IBIs that score above this general use threshold would be given a rating of **Good**. The **Fair** rating is calculated as a 15 point drop from the general use threshold. Stations with IBI scores below the general use threshold, but above the **Fair** threshold would be given a rating of **Fair**. Stations scoring below the **Fair** threshold would be considered **Poor**.

Class #	Class Name	Good	Fair	Poor
Fish				
1	Southern Rivers	>38	38-24	<24
2	Southern Streams	>44	44-30	<30
3	Southern Headwaters	>50	50-36	<36
4	Northern Rivers	>34	34-20	<20
5	Northern Streams	>49	49-35	<35
6	Northern Headwaters	>39	39-25	<25
7	Low Gradient Streams	>39	39-25	<25
Invertebrates				
1	Northern Forest Rivers	>51	52-36	<36
2	Prairie Forest Rivers	>31	31-16	<16
3	Northern Forest Streams RR	>50	50-35	<35
4	Northern Forest Streams GP	>52	52-37	<37
5	Southern Streams RR	>36	36-21	<21
6	Southern Forest Streams GP	>47	47-32	<32
7	Prairie Streams GP	>38	38-23	<23

Appendix 5.2 Channelized stream AUID IBI score fish

National Hydrography Dataset (NHD)Assessment Segment AUID	Biological Station ID	Stream Segment Name	Drainage Area Mi^2	Fish Class	Good	Fair	Poor	FIBI	Visit Date
HUC 11: 07020005010 (Upper West Branch Chippewa River)									
07020005-539	09MN016	County Ditch 60	47.9	2	100 - 45	44 - 30	29 - 0	60	23-Jun-09
07020005-581	09MN017	Hoplin Creek	35.7	2	100 - 45	44 - 30	29 - 0	50	06-Jul-09
07020005-666	09MN030	Trib. to Chippewa River	9.8	3	100 - 51	50 - 36	35 - 0	33	06-Jul-09
07020005-539	09MN051	County Ditch 60	39.9	2	100 - 45	44 - 30	29 - 0	62	17-Jun-09
07020005-665	09MN067	Unnamed ditch	9.3	3	100 - 51	50 - 36	35 - 0	52	23-Jun-09
07020005-541	09MN071	Unnamed creek	15.2	3	100 - 51	50 - 36	35 - 0	34	06-Jul-09
HUC 11: 07020005020 (Middle West Branch Chippewa River)									
07020005-503	09MN070	Chippewa River	300.2	1	100 - 39	38 - 24	23 - 0	25	25-Jun-09
HUC 11: 07020005030 (Little Chippewa River)									
07020005-531	07MN037	Unnamed ditch	38.4	2	100 - 45	44 - 30	29 - 0	44	21-Jun-07
HUC 11: 07020005050 (Lower West Branch Chippewa River)									
07020005-505	03MN010	Chippewa River	741.6	1	100 - 39	38 - 24	23 - 0	63	18-Jul-07
07020005-505	03MN010	Chippewa River	741.6	1	100 - 39	38 - 24	23 - 0	50	20-Aug-03
07020005-505	03MN010	Chippewa River	741.6	1	100 - 39	38 - 24	23 - 0	54	20-Jul-09
07020005-523	09MN077	Outlet Creek	201.5	2	100 - 45	44 - 30	29 - 0	49	17-Jun-09
HUC 11: 07020005060 (East Branch Chippewa River)									
07020005-619	03MN011	Trib. to Chippewa River, East Branch	7.4	7	100 - 40	39 - 25	24 - 0	28	23-Jun-03
07020005-580	07MN036	County Ditch 15	59.0	2	100 - 45	44 - 30	29 - 0	47	23-Jul-07
07020005-580	07MN036	County Ditch 15	59.0	2	100 - 45	44 - 30	29 - 0	37	25-Jun-09

07020005-649	07MN040	County Ditch 8	6.3	3	100 - 51	50 - 36	35 - 0	73	10-Jul-07
07020005-649	07MN040	County Ditch 8	6.3	3	100 - 51	50 - 36	35 - 0	56	10-Jun-09
07020005-514	07MN041	Chippewa River, East Branch	512.4	1	100 - 39	38 - 24	23 - 0	64	18-Jul-07
07020005-514	07MN041	Chippewa River, East Branch	512.4	1	100 - 39	38 - 24	23 - 0	23	09-Jun-09
07020005-506	09MN011	Chippewa River	1276.3	1	100 - 39	38 - 24	23 - 0	43	23-Jun-09
07020005-670	09MN034	Trib. to Leven Lake	8.4	3	100 - 51	50 - 36	35 - 0	33	01-Jul-09
07020005-693	09MN035	Trib. to Villard Lake	10.0	3	100 - 51	50 - 36	35 - 0	73	25-Jun-09
07020005-515	09MN055	Chippewa River, East Branch	64.3	2	100 - 45	44 - 30	29 - 0	44	10-Jun-09
HUC 11: 07020005100 (South Mud Creek)									
07020005-517	07MN039	Mud Creek	33.4	2	100 - 45	44 - 30	29 - 0	54	10-Jul-07
07020005-517	07MN039	Mud Creek	33.4	2	100 - 45	44 - 30	29 - 0	30	24-Jun-09
07020005-517	07MN045	Mud Creek	83.8	2	100 - 51	50 - 36	35 - 0	41	19-Jul-07
07020005-517	07MN045	Mud Creek	83.8	2	100 - 51	50 - 36	35 - 0	39	16-Jun-09
07020005-655	07MN050	County Ditch 63	15.8	3	100 - 51	50 - 36	35 - 0	58	10-Jul-07
07020005-516	09MN046	Mud Creek	12.7	3	100 - 51	50 - 36	35 - 0	39	29-Jun-09
07020005-657	09MN048	County Ditch 63	8.1	3	100 - 51	50 - 36	35 - 0	46	29-Jun-09
07020005-700	09MN049	Trib. to Mud Creek	10.4	3	100 - 45	44 - 30	29 - 0	37	18-Jun-09
07020005-656	09MN050	Hollerberg Floodway	18.1	3	100 - 51	50 - 36	35 - 0	62	11-Jun-09
07020005-517	09MN054	Mud Creek	58.2	2	100 - 45	44 - 30	29 - 0	21	16-Jun-09
HUC 11: 07020005120 (Moore Twp. Branch Chippewa)									
07020005-585	03MN078	Judicial Ditch 9	52.53	2	100 - 45	44 - 30	29 - 0	0	23-Jun-09
07020005-585	03MN078	Judicial Ditch 9	52.53	2	100 - 45	44 - 30	29 - 0	22	05-Aug-03
07020005-659	07MN051	County Ditch 3	78.28	2	100 - 45	44 - 30	29 - 0	29	18-Jul-07

07020005-579	09MN012	County Ditch 3	91.57	2	100 - 45	44 - 30	29 - 0	46	21-Jul-09
07020005-694	09MN061	Trib. to Judicial Ditch 9	10.39	3	100 - 51	50 - 36	35 - 0	39	01-Jul-09
07020005-704	09MN072	County Ditch 7	6.73	7	100 - 40	39 - 25	24 - 0	18	23-Jun-09
07020005-703	09MN073	Trib. to County Ditch 9	7.55	7	100 - 40	39 - 25	24 - 0	28	10-Jun-09
07020005-595	09MN075	Trib. to County Ditch 9	17.11	7	100 - 40	39 - 25	24 - 0	23	01-Jul-09
HUC 11: 07020005130 (Chippewa River)									
07020005-501	09MN019	Chippewa River	2078.3	1	100 - 39	38 - 24	23 - 0	59	23-Jul-09
07020005-506	09MN021	Chippewa River	1373.3	1	100 - 39	38 - 24	23 - 0	52	21-Jul-09
HUC 11: 07020005140 (Upper Shakopee Creek)									
07020005-557	07MN038	Shakopee Creek	112.8	2	100 - 45	44 - 30	29 - 0	48	23-Jul-07
07020005-557	07MN084	Shakopee Creek	113.1	2	100 - 45	44 - 30	29 - 0	64	27-Aug-07
07020005-570	09MN043	County Ditch 27	12.8	3	100 - 51	50 - 36	35 - 0	0	29-Jun-09
07020005-513	09MN078	County Ditch 61	3.0	7	100 - 40	39 - 25	24 - 0	0	24-Jun-09
HUC 11: 07020005150 (Shakopee Creek)									
07020005-548	01MN035	Unnamed ditch	13.9	7	100 - 40	39 - 25	24 - 0	13	28-Jun-01
07020005-559	03MN015	Shakopee Creek	304.6	1	100 - 39	38 - 24	23 - 0	21	20-Aug-03
07020005-559	03MN015	Shakopee Creek	304.6	1	100 - 39	38 - 24	23 - 0	0	23-Jun-03
07020005-559	03MN015	Shakopee Creek	304.6	1	100 - 39	38 - 24	23 - 0	3	18-Jun-09
07020005-599	07MN043	Unnamed ditch	27.2	3	100 - 51	50 - 36	35 - 0	54	11-Jul-07
07020005-599	07MN043	Unnamed ditch	27.2	3	100 - 51	50 - 36	35 - 0	45	17-Jun-09
07020005-557	09MN010	Shakopee Creek	125.3	2	100 - 45	44 - 30	29 - 0	31	22-Jun-09
07020005-549	09MN039	Unnamed ditch	22.5	7	100 - 40	39 - 25	24 - 0	10	30-Jun-09
07020005-550	09MN040	Unnamed ditch	40.5	2	100 - 45	44 - 30	29 - 0	31	11-Jun-09
07020005-701	09MN041	Trib. to Shakopee Creek	13.5	7	100 - 40	39 - 25	24 - 0	0	18-Jun-09

07020005-559	09MN042	Shakopee Creek	228.0	2	100 - 45	44 - 30	29 - 0	26	16-Jun-09
07020005-702	09MN047	Judicial Ditch 5	15.3	3	100 - 51	50 - 36	35 - 0	50	17-Jun-09
07020005-557	09MN069	Shakopee Creek	193.6	2	100 - 45	44 - 30	29 - 0	33	16-Jun-09
07020005-575	09MN076	Trib. to Shakopee	14.6	3	100 - 40	39 - 25	24 - 0	58	18-Jun-09
HUC 11: 07020005180 (Judicial Ditch #8)									
07020005-546	01MN003	Judicial Ditch 8	38.1	2	100 - 45	44 - 30	29 - 0	29	16-Jul-01
07020005-546	03MN014	Judicial Ditch 8	46.4	2	100 - 45	44 - 30	29 - 0	32	23-Jul-03
07020005-546	03MN014	Judicial Ditch 8	46.4	2	100 - 45	44 - 30	29 - 0	29	23-Jun-03
07020005-546	03MN014	Judicial Ditch 8	46.4	2	100 - 45	44 - 30	29 - 0	25	30-Jun-09
07020005-546	07MN042	Judicial Ditch 8	36.1	2	100 - 45	44 - 30	29 - 0	0	10-Jul-07
07020005-643	07MN052	Trib. to Cottonwood Creek	17.3	3	100 - 51	50 - 36	35 - 0	17	27-Jun-07
07020005-643	07MN052	Trib. to Cottonwood Creek	17.3	3	100 - 51	50 - 36	35 - 0	52	08-Jul-09
07020005-643	07MN052	Trib. to Cottonwood Creek	17.3	3	100 - 51	50 - 36	35 - 0	49	17-Jun-09
07020005-510	09MN027	Cottonwood Creek	30.7	2	100 - 45	44 - 30	29 - 0	9	17-Jun-09
07020005-705	09MN044	Trib. to Judicial Ditch 8	24.7	3	100 - 51	50 - 36	35 - 0	40	18-Jun-09
07020005-511	90MN011	Cottonwood Creek	100.4	2	100 - 45	44 - 30	29 - 0	26	28-Aug-01
07020005-511	90MN011	Cottonwood Creek	100.4	2	100 - 45	44 - 30	29 - 0	16	11-Jun-09
HUC 11: 07020005190 (Dry Weather Creek)									
07020005-662	07MN048	Trib. to Dry Weather Creek	15.8	7	100 - 40	39 - 25	24 - 0	0	11-Jul-07
07020005-662	07MN048	Trib. to Dry Weather Creek	15.8	7	100 - 40	39 - 25	24 - 0	15	16-Jun-09
07020005-661	07MN049	Trib. to Dry Weather Creek	27.8	3	100 - 51	50 - 36	35 - 0	69	11-Jul-07
07020005-661	07MN049	Trib. to Dry Weather Creek	27.8	3	100 - 51	50 - 36	35 - 0	48	08-Jul-09
07020005-661	07MN049	Trib. to Dry Weather Creek	27.8	3	100 - 51	50 - 36	35 - 0	44	16-Jun-09

07020005-660	09MN037	Trib. to Dry Weather Creek	61.6	2	100 - 45	44 - 30	29 - 0	15	17-Jun-09
07020005-509	09MN038	Dry Weather Creek	12.0	7	100 - 40	39 - 25	24 - 0	0	17-Jun-09
07020005-663	09MN052	Unnamed creek	24.9	7	100 - 40	39 - 25	24 - 0	21	16-Jun-09
07020005-615	91MN013	Trib. to Dry Weather Creek	10.6	3	100 - 51	50 - 36	35 - 0	53	08-Jul-09
07020005-615	91MN013	Trib. to Dry Weather Creek	10.6	3	100 - 51	50 - 36	35 - 0	50	17-Jun-09
HUC 11: 07020005210 (Spring Creek)									
07020005-592	01MN011	Spring Creek	10.3	3	100 - 51	50 - 36	35 - 0	39	27-Jun-01
07020005-593	09MN020	Spring Creek (County Ditch 10A)	16.7	3	100 - 51	50 - 36	35 - 0	42	30-Jun-09

Appendix 5.3 Channelized stream AUID IBI score invertebrate

National Hydrography Dataset (NHD)Assessment Segment AUID	Biological Station ID	Stream Segment Name	Drainage Area Mi^2	Invert Class	Good	Fair	Poor	MIBI	Visit Date
HUC 11: 07020005010 (Upper West Branch Chippewa River)									
07020005-539	09MN016	County Ditch 60	47.9	6	100 – 48	47- 32	31 - 0	37	17-Aug-09
07020005-539	09MN016	County Ditch 60	47.9	6	100 – 48	47- 32	31 - 0	38	17-Aug-09
07020005-581	09MN017	Hoplin Creek	35.7	7	100 – 39	38- 23	22 - 0	49	18-Aug-09
07020005-539	09MN051	County Ditch 60	39.9	5	100 – 37	36- 21	20 - 0	38	17-Aug-09
07020005-541	09MN071	Unnamed creek	15.2	7	100 – 39	38- 23	22 - 0	15	18-Aug-09
HUC 11: 07020005020 (Middle West Branch Chippewa River)									
07020005-503	09MN070	Chippewa River	300.2	5	100 – 37	36- 21	20 - 0	30	18-Aug-09
HUC 11: 07020005030 (Little Chippewa River)									
07020005-531	07MN037	Unnamed ditch	38.4	7	100 – 39	38- 23	22 - 0	37	14-Aug-07
HUC 11: 07020005050 (Lower West Branch Chippewa River)									
07020005-505	03MN010	Chippewa River	741.6	2	100 – 32	31- 16	15 - 0	27	19-Aug-03

07020005-505	03MN010	Chippewa River	741.6	2	100 – 32	31- 16	15 - 0	40	16-Aug-07
HUC 11: 07020005060 (East Branch Chippewa River)									
07020005-580	07MN036	County Ditch 15	59.0	5	100 – 37	36- 21	20 - 0	31	12-Aug-09
07020005-649	07MN040	County Ditch 8	6.3	7	100 – 39	38- 23	22 - 0	18	14-Aug-07
07020005-649	07MN040	County Ditch 8	6.3	7	100 – 39	38- 23	22 - 0	32	11-Aug-09
07020005-514	07MN041	Chippewa River, East Branch	512.4	2	100 – 32	31- 16	15 - 0	33	21-Aug-07
07020005-514	07MN041	Chippewa River, East Branch	512.4	2	100 – 32	31- 16	15 - 0	28	11-Aug-09
07020005-506	09MN011	Chippewa River	1276.3	2	100 – 32	31- 16	15 - 0	27	11-Aug-09
07020005-670	09MN034	Trib. to Leven Lake	8.4	7	100 – 39	38- 23	22 - 0	7	20-Aug-09
07020005-670	09MN034	Trib. to Leven Lake	8.4	7	100 – 39	38- 23	22 - 0	14	20-Aug-09
07020005-693	09MN035	Trib. to Villard Lake	10.0	7	100 – 39	38- 23	22 - 0	22	20-Aug-09
07020005-515	09MN055	Chippewa River, East Branch	64.3	7	100 – 39	38- 23	22 - 0	50	12-Aug-09
HUC 11: 07020005100 (South Mud Creek)									
07020005-517	07MN039	Mud Creek	33.4	7	100 – 39	38- 23	22 - 0	41	14-Aug-07
07020005-517	07MN039	Mud Creek	33.4	7	100 – 39	38- 23	22 - 0	21	12-Aug-09
07020005-517	07MN045	Mud Creek	83.8	5	100 – 37	36- 21	20 - 0	17	14-Aug-07
07020005-517	07MN045	Mud Creek	83.8	5	100 – 37	36- 21	20 - 0	16	11-Aug-09
07020005-517	07MN045	Mud Creek	83.8	5	100 – 37	36- 21	20 - 0	19	11-Aug-09
07020005-655	07MN050	County Ditch 63	15.8	7	100 – 39	38- 23	22 - 0	31	16-Aug-07
07020005-516	09MN046	Mud Creek	12.7	7	100 – 39	38- 23	22 - 0	9	13-Aug-09
07020005-657	09MN048	County Ditch 63	8.1	7	100 – 39	38- 23	22 - 0	37	12-Aug-09
07020005-657	09MN048	County Ditch 63	8.1	7	100 – 39	38- 23	22 - 0	27	12-Aug-09

07020005-656	09MN050	Hollerberg Floodway	18.1	7	100 – 39	38- 23	22 - 0	25	11-Aug-09
07020005-517	09MN054	Mud Creek	58.2	7	100 – 39	38- 23	22 - 0	11	12-Aug-09
HUC 11: 07020005120 (Moore Twp. Branch Chippewa)									
07020005-585	03MN078	Judicial Ditch 9	52.5	7	100 – 39	38- 23	22 - 0	31	10-Aug-09
07020005-585	03MN078	Judicial Ditch 9	52.5	7	100 – 39	38- 23	22 - 0	32	19-Aug-03
07020005-659	07MN051	County Ditch 3	78.3	7	100 – 39	38- 23	22 - 0	17	22-Aug-07
07020005-659	07MN051	County Ditch 3	78.3	7	100 – 39	38- 23	22 - 0	7	22-Aug-07
07020005-579	09MN012	County Ditch 3	91.6	7	100 – 39	38- 23	22 - 0	32	11-Aug-09
07020005-694	09MN061	Trib. to Judicial Ditch 9	10.4	7	100 – 39	38- 23	22 - 0	12	10-Aug-09
07020005-704	09MN072	County Ditch 7	6.7	7	100 – 39	38- 23	22 - 0	40	10-Aug-09
07020005-703	09MN073	Trib. to County Ditch 9	7.6	7	100 – 39	38- 23	22 - 0	16	10-Aug-09
07020005-595	09MN075	Trib. to County Ditch 9	17.1	7	100 – 39	38- 23	22 - 0	10	10-Aug-09
HUC 11: 07020005130 (Chippewa River)									
07020005-501	09MN019	Chippewa River	2078.3	2	100 – 32	31- 16	15 - 0	40	04-Aug-09
07020005-506	09MN021	Chippewa River	1373.3	2	100 – 32	31- 16	15 - 0	33	11-Aug-09
HUC 11: 07020005140 (Upper Shakopee Creek)									
07020005-557	07MN038	Shakopee Creek	112.8	7	100 – 39	38- 23	22 - 0	20	14-Aug-07
07020005-557	07MN084	Shakopee Creek	113.1	5	100 – 37	36- 21	20 - 0	34	14-Aug-07
07020005-570	09MN043	County Ditch 27	12.8	7	100 – 39	38- 23	22 - 0	19	13-Aug-09
07020005-513	09MN078	County Ditch 61	3.0	7	100 – 39	38- 23	22 - 0	1	13-Aug-09
07020005-560	09MN079	County Ditch 61	2.6	7	100 – 39	38- 23	22 - 0	7	13-Aug-09
HUC 11: 07020005150 (Shakopee Creek)									
07020005-548	01MN035	Unnamed ditch	13.9	7	100 – 39	38- 23	22 - 0	4	14-Sep-01
07020005-559	03MN015	Shakopee Creek	304.6	7	100 – 39	38- 23	22 - 0	21	19-Aug-03

07020005-559	03MN015	Shakopee Creek	304.6	7	100 – 39	38- 23	22 - 0	1	11-Aug-09
07020005-599	07MN043	Unnamed ditch	27.2	5	100 – 37	36- 21	20 - 0	23	16-Aug-07
07020005-599	07MN043	Unnamed ditch	27.2	5	100 – 37	36- 21	20 - 0	16	13-Aug-09
07020005-557	09MN010	Shakopee Creek	125.3	7	100 – 39	38- 23	22 - 0	10	03-Aug-09
07020005-549	09MN039	Unnamed ditch	22.5	7	100 – 39	38- 23	22 - 0	18	13-Aug-09
07020005-550	09MN040	Unnamed ditch	40.5	7	100 – 39	38- 23	22 - 0	27	13-Aug-09
07020005-559	09MN042	Shakopee Creek	228.0	7	100 – 39	38- 23	22 - 0	9	13-Aug-09
07020005-559	09MN042	Shakopee Creek	228.0	7	100 – 39	38- 23	22 - 0	13	13-Aug-09
07020005-702	09MN047	Judicial Ditch 5	15.3	7	100 – 39	38- 23	22 - 0	17	13-Aug-09
07020005-557	09MN069	Shakopee Creek	193.6	7	100 – 39	38- 23	22 - 0	17	13-Aug-09
HUC 11: 07020005180 (Judicial Ditch #8)									
07020005-546	01MN003	Judicial Ditch 8	38.1	7	100 – 39	38- 23	22 - 0	47	14-Sep-01
07020005-546	03MN014	Judicial Ditch 8	46.4	7	100 – 39	38- 23	22 - 0	51	19-Aug-03
07020005-546	03MN014	Judicial Ditch 8	46.4	7	100 – 39	38- 23	22 - 0	35	09-Sep-03
07020005-546	03MN014	Judicial Ditch 8	46.4	7	100 – 39	38- 23	22 - 0	28	06-Aug-09
07020005-546	07MN042	Judicial Ditch 8	36.1	7	100 – 39	38- 23	22 - 0	24	22-Aug-07
07020005-643	07MN052	Trib. to Cottonwood Creek	17.3	7	100 – 39	38- 23	22 - 0	21	22-Aug-07
07020005-643	07MN052	Trib. to Cottonwood Creek	17.3	7	100 – 39	38- 23	22 - 0	21	22-Aug-07
07020005-643	07MN052	Trib. to Cottonwood Creek	17.3	7	100 – 39	38- 23	22 - 0	24	06-Aug-09
07020005-510	09MN027	Cottonwood Creek	30.7	7	100 – 39	38- 23	22 - 0	12	06-Aug-09
07020005-705	09MN044	Trib. to Judicial Ditch 8	24.7	7	100 – 39	38- 23	22 - 0	25	10-Aug-09
07020005-511	90MN011	Cottonwood Creek	100.4	7	100 – 39	38- 23	22 - 0	41	13-Sep-01
07020005-511	90MN011	Cottonwood Creek	100.4	7	100 – 39	38- 23	22 - 0	37	06-Aug-09

HUC 11: 07020005190 (Dry Weather Creek)									
07020005-662	07MN048	Trib. to Dry Weather Creek	15.8	7	100 – 39	38- 23	22 - 0	7	15-Aug-07
07020005-661	07MN049	Trib. to Dry Weather Creek	27.8	7	100 – 39	38- 23	22 - 0	9	15-Aug-07
07020005-661	07MN049	Trib. to Dry Weather Creek	27.8	7	100 – 39	38- 23	22 - 0	8	19-Aug-09
07020005-660	09MN037	Trib. to Dry Weather Creek	61.6	7	100 – 39	38- 23	22 - 0	12	14-Aug-09
07020005-509	09MN038	Dry Weather Creek	12.0	7	100 – 39	38- 23	22 - 0	4	14-Aug-09
HUC 11: 07020005210 (Spring Creek)									
07020005-592	01MN011	Spring Creek	10.3	5	100 – 37	36- 21	20 - 0	24	13-Sep-01
	09MN020	Spring Creek (County Ditch 10A)	16.7	7	100 – 39	38- 23	22 - 0	58	05-Aug-09

Appendix 6.1 Minnesota statewide IBI thresholds and confidence limits

Class #	Class Name	Use Class	Threshold	Confidence Limit	Upper	Lower
Fish						
1	Southern Rivers	2B	39	±11	50	28
2	Southern Streams	2B	45	±9	54	36
3	Southern Headwaters	2B	51	±7	58	44
4	Northern Rivers	2B	35	±9	44	26
5	Northern Streams	2B	50	±9	59	41
6	Northern Headwaters	2B	40	±16	56	24
7	Low Gradient	2B	40	±10	50	30
10	Southern Coldwater	2A	45	±13	58	32
Invertebrates						
1	Northern Forest Rivers	2B	51.3	±10.8	62.1	40.5
2	Prairie Forest Rivers	2B	30.7	±10.8	41.5	19.9
3	Northern Forest Streams RR	2B	50.3	±12.6	62.9	37.7
4	Northern Forest Streams GP	2B	52.4	±13.6	66	38.8
5	Southern Streams RR	2B	35.9	±12.6	48.5	23.3
6	Southern Forest Streams GP	2B	46.8	±13.6	60.4	33.2
7	Prairie Streams GP	2B	38.3	±13.6	51.9	24.7
8	Northern Coldwater	2A	26	±12.4	38.4	13.6
9	Southern Coldwater	2A	46.1	±13.8	59.9	32.3

Appendix 6.2 Biological monitoring results - Fish IBI

National Hydrograph Dataset (NDH) AUID	Biological Station ID	Stream Segment Name	Drainage Area (mi2)	Fish Class	Threshold	Fish IBI	Visit Date
HUC 11: 07020005010 (Upper West Branch Chippewa River)							
07020005-503	09MN005	Chippewa River	178.9	2	45	75	12-Aug-09
HUC 11: 07020005020 (Middle West Branch Chippewa River)							
07020005-638	09MN018	Unnamed creek	58.3	2	45	16	17-Jun-09
07020005-543	09MN031	Trib. to Chippewa River	21.6	3	51	32	07-Jul-09
HUC 11: 07020005030 (Little Chippewa River)							
07020005-714	03MN004	Little Chippewa River	12.6	3	51	41	24-Jun-09
07020005-714	03MN004	Little Chippewa River	12.6	3	51	27	23-Jul-03
07020005-713	09MN004	Little Chippewa River	97.7	2	45	33	21-Jul-09
HUC 11: 07020005040 (Trapper Run Creek)							
07020005-628	09MN007	Trapper Run Creek	32.1	2	45	27	24-Jun-09
HUC 11: 07020005050 (Lower West Branch Chippewa River)							
07020005-505	03MN009	Chippewa River	713.6	1	39	24	20-Aug-03
07020005-523	09MN065	Outlet Creek	216.2	2	45	42	10-Jun-09
07020005-528	90MN008	Signalness Creek	8.2	3	51	63	07-Jul-09
07020005-528	90MN008	Signalness Creek	8.2	3	51	52	25-Jun-09
07020005-528	90MN008	Signalness Creek	8.2	3	51	61	27-Aug-01
HUC 11: 07020005060 (East Branch Chippewa River)							
07020005-623	03MN005	Trib. to Ben Lake	10.3	3	51	33	23-Jul-03
07020005-515	03MN012	Chippewa River, East Branch	204.6	2	45	66	23-Jul-03
07020005-514	09MN036	Chippewa River, East Branch	363.8	1	39	49	11-Aug-09
07020005-514	09MN036	Chippewa River, East Branch	363.8	1	39	54	09-Jun-09
07020005-515	09MN056	Chippewa River, East Branch	206.7	2	45	69	11-Aug-09
07020005-515	09MN056	Chippewa River, East Branch	206.7	2	45	68	09-Jun-09
07020005-515	09MN059	Chippewa River, East Branch	193.9	2	45	60	08-Jun-09
HUC 11: 07020005070 (North Mud Creek)							
07020005-583	03MN008	Trib. to Mud Lake	1.6	3	51	51	22-Jul-03
07020005-690	09MN057	County Ditch 15	37.2	2	45	33	07-Jul-09
07020005-690	09MN057	County Ditch 15	37.2	2	45	35	25-Jun-09
07020005-551	90MN009	Mud Creek	27.5	10	45	38	08-Jul-09
07020005-551	90MN009	Mud Creek	27.5	10	45	25	24-Jun-09
07020005-551	90MN009	Mud Creek	27.5	10	45	32	08-Jul-09
07020005-551	90MN009	Mud Creek	27.5	10	45	31	27-Aug-01
HUC 11: 07020005090 (Frank Lake)							
07020005-554	03MN013	Mud Creek	114.0	2	45	35	15-Jun-09

07020005-554	03MN013	Mud Creek	114.0	2	45	37	24-Jul-03
07020005-554	09MN014	Mud Creek	94.7	2	45	58	15-Jun-09
HUC 11: 07020005110 (Lake Hassel)							
07020005-712	09MN026	Unnamed creek	38.6	2	45	38	10-Jun-09
HUC 11: 07020005130 (Chippewa River)							
07020005-502	09MN001	Chippewa River	2043.7	1	39	29	02-Sep-09
07020005-502	09MN001	Chippewa River	2043.7	1	39	14	13-Jul-09
07020005-576	09MN023	Unnamed creek	19.7	3	51	45	17-Jun-09
07020005-507	09MN063	Chippewa River	1741.1	1	39	48	13-Jul-09
07020005-507	09MN063	Chippewa River	1741.1	1	39	50	10-Aug-09
07020005-508	09MN064	Chippewa River	1872.2	1	39	49	22-Jul-09
07020005-507	09MN068	Chippewa River	1706.0	1	39	53	21-Jul-09
HUC 11: 07020005140 (Upper Shakopee Creek)							
07020005-512	03MN006	Shakopee Creek	48.4	2	45	54	04-Aug-03
HUC 11: 07020005180 (Judicial Ditch #8)							
07020005-511	09MN008	Cottonwood Creek	123.1	2	45	37	11-Jun-09
HUC 11: 07020005190 (Dry Weather Creek)							
07020005-509	09MN009	Dry Weather Creek	104.2	2	45	46	23-Jun-09
HUC 11: 07020005200 (Judicial Ditch #7)							
07020005-584	03MN056	Trib. to Chippewa River	30.0	3	51	60	25-Jun-03
07020005-584	09MN002	Unnamed creek	29.4	3	51	62	30-Jun-09

Appendix 6.3 Biological monitoring results–macroinvertebrate IBI

National Hydrograph Dataset(NDH) AUID	Biological Station ID	Stream Segment Name	Drainage Area (mi2)	Invert Class	Threshold	Invert IBI	Visit Date
HUC 11: 07020005010 (Upper West Branch Chippewa River)							
07020005-503	09MN005	Chippewa River	148.9	5	35.9	33.35	18-Aug-09
HUC 11: 07020005020 (Middle West Branch Chippewa River)							
07020005-503	09MN013	Chippewa River	401.3	5	35.9	38.51	12-Aug-09
07020005-638	09MN018	Unnamed creek	58.3	7	35.9	36.93	18-Aug-09
HUC 11: 07020005030 (Little Chippewa River)							
07020005-714	03MN004	Little Chippewa River	12.6	5	35.9	20.17	19-Aug-03
07020005-713	09MN004	Little Chippewa River	97.7	7	35.9	46.23	12-Aug-09
HUC 11: 07020005040 (Trapper Run Creek)							
07020005-628	09MN007	Trapper Run Creek	32.1	7	35.9	37.34	20-Aug-09
HUC 11: 07020005050 (Lower West Branch Chippewa River)							
07020005-505	03MN009	Chippewa River	713.6	2	30.7	35.41	19-Aug-03

07020005-523	09MN065	Outlet Creek	216.2	7	35.9	33.45	12-Aug-09
07020005-528	90MN008	Signalness Creek	8.2	5	35.9	26.41	12-Aug-09
07020005-528	90MN008	Signalness Creek	8.2	5	35.9	34.78	13-Sep-01
HUC 11: 07020005060 (East Branch Chippewa River)							
07020005-515	03MN012	Chippewa River, East Branch	204.6	5	35.9	48.69	20-Aug-03
07020005-514	09MN036	Chippewa River, East Branch	363.8	7	35.9	41.72	11-Aug-09
07020005-515	09MN056	Chippewa River, East Branch	206.7	5	35.9	44.44	12-Aug-09
07020005-515	09MN056	Chippewa River, East Branch	206.7	5	35.9	46.66	12-Aug-09
07020005-515	09MN059	Chippewa River, East Branch	193.9	7	35.9	48.77	12-Aug-09
HUC 11: 07020005070 (North Mud Creek)							
07020005-583	03MN008	Trib. to Mud Lake	1.6	5	35.9	54.13	25-Aug-03
07020005-690	09MN057	County Ditch 15	37.2	5	35.9	41.96	12-Aug-09
07020005-551	90MN009	Mud Creek	27.5	9	46.1	58.32	13-Sep-01
07020005-551	90MN009	Mud Creek	27.5	9	46.1	36.60	12-Aug-09
HUC 11: 07020005090 (Frank Lake)							
07020005-554	03MN013	Mud Creek	114.0	7	35.9	53.35	20-Aug-03
07020005-554	03MN013	Mud Creek	114.0	7	35.9	33.60	12-Aug-09
07020005-554	09MN014	Mud Creek	94.7	7	35.9	35.27	12-Aug-09
HUC 11: 07020005110 (Lake Hassel)							
07020005-712	09MN026	Unnamed creek	38.6	7	35.9	49.66	11-Aug-09
HUC 11: 07020005130 (Chippewa River)							
07020005-502	09MN001	Chippewa River	2043.7	2	30.7	33.58	05-Aug-09
07020005-576	09MN023	Unnamed creek	19.7	7	35.9	51.73	07-Aug-09
07020005-507	09MN063	Chippewa River	1741.1	2	30.7	34.41	06-Aug-09
07020005-508	09MN064	Chippewa River	1872.2	2	30.7	35.78	06-Aug-09
07020005-507	09MN068	Chippewa River	1706.0	2	30.7	39.49	11-Aug-09
HUC 11: 07020005140 (Upper Shakopee Creek)							
07020005-512	03MN006	Shakopee Creek	48.4	5	35.9	34.75	25-Aug-03
HUC 11: 07020005180 (Judicial Ditch #8)							
07020005-511	09MN008	Cottonwood Creek	123.1	7	35.9	56.76	06-Aug-09
HUC 11: 07020005190 (Dry Weather Creek)							
07020005-509	09MN009	Dry Weather Creek	104.2	5	35.9	37.59	05-Aug-09
HUC 11: 07020005200 (Judicial Ditch #7)							
07020005-584	03MN056	Trib. to Chippewa River	30.0	7	35.9	19.49	20-Aug-03
07020005-584	09MN002	Unnamed creek	29.4	7	35.9	22.98	05-Aug-09

Appendix 7 Minnesota ecoregion-based lake eutrophication standards

Ecoregion	TP µg/L	Chl-a µg/L	Secchi meters
NLF – Lake Trout (Class 2A)	< 12	< 3	> 4.8
NLF – Stream trout (Class 2A)	< 20	< 6	> 2.5
NLF – Aquatic Rec. Use (Class 2B)	< 30	< 9	> 2.0
NCHF – Stream trout (Class 2A)	< 20	< 6	> 2.5
NCHF – Aquatic Rec. Use (Class 2B)	< 40	< 14	> 1.4
NCHF – Aquatic Rec. Use (Class 2B) Shallow lakes	< 60	< 20	> 1.0
WCBP & NGP – Aquatic Rec. Use (Class 2B)	< 65	< 22	> 0.9
WCBP & NGP – Aquatic Rec. Use (Class 2B) Shallow lakes	< 90	< 30	> 0.7

Appendix 8 Lake morphometric and assessment data

Lake ID	Lake name	County	HUC-11	Ecoregion	Lake Area (ha)	Max Depth (m)	Mean Depth (m)	Watershed Area (ha)	% Littoral	Aquatic Recreation Use Support
21-0079-00	Maple	DOUGLAS	7020005030	NCHF	350.9	23.8	6.8	5913.9	48	FS
21-0090-00	Turtle	DOUGLAS	7020005030	NCHF	108.9	5.8	2.0	6335.0	83	FS
21-0125-00	Private	DOUGLAS	7020005010	NCHF	41.7	16.8	1.8	1405.2	56	IF
21-0136-00	Indian	DOUGLAS	7020005010	NCHF	33.6	10.7	3.2	514.1	60	IF
21-0145-00	Chippewa	DOUGLAS	7020005010	NCHF	712.7	29.3	6.0	4971.1	43	FS
21-0156-01	LITTLE OSCAR (MAIN)	DOUGLAS	7020005020	NGP	68.0	6.1	1.3	599.3	100	FS
21-0162-00	Freeborn	DOUGLAS	7020005020	NGP	101.2	5.5	3.3	697.8	71	FS
21-0189-00	Gilbert	DOUGLAS	7020005020	NCHF	107.2	5.5	1.8*	726.1	100	NS
21-0212-00	Little Chippewa	DOUGLAS	7020005010	NCHF	114.1	7.6	3.9	8961.9	100	FS
21-0213-00	Devils	DOUGLAS	7020005010	NCHF	90.2	7.6	3.3	5196.2	100	IF
21-0216-00	Whiskey	DOUGLAS	7020005010	NCHF	61.5	14.0	5.6	696.3	47	FS
21-0242-00	Aaron	DOUGLAS	7020005010	NCHF	259.0	4.9	2.7	1692.8	77	FS
21-0245-00	Moses	DOUGLAS	7020005010	NCHF	346.4	9.8	5.2	2174.8	49	FS

21-0257-02	South Oscar	DOUGLAS	7020005020	NGP	292.6	5.8	2.1	2292.4	100	FS
21-0264-00	Stowe	DOUGLAS	7020005010	NCHF	215.7	4.3	2.3	29792.4	100	IF
21-0291-00	Red Rock	DOUGLAS	7020005020	NGP	316.1	6.7	3.5	2331.8	56	NS
21-0305-00	Venus	DOUGLAS	7020005020	NGP	78.1	5.2	1.7*	13871.2	100	IF
21-0323-00	Jennie	DOUGLAS	7020005010	NGP	127.9	2.1	0.6	712.0	100	NS
21-0336-00	Fanny	DOUGLAS	7020005010	NCHF	14.2	1.1	0.8	2778.2	100	IF
21-0343-00	Long	DOUGLAS	7020005010	NCHF	83.0	5.5	1.8*	36941.2	100	NS
26-0020-00	Thompson	GRANT	7020005010	NGP	60.3	6.7	4.1	394.6	47	NS
26-0046-00	Lower Elk	GRANT	7020005020	NGP	46.5	4.0	2.6	604.4	100	IF
34-0204-00	Florida Slough	KANDIYOHI	7020005140	NCHF	312.4	1.8	1.0*	17792.9	100	FS
34-0206-00	Andrew	KANDIYOHI	7020005140	NCHF	316.1	7.9	5.0	12314.4	36	FS
34-0208-00	Middle	KANDIYOHI	7020005140	NCHF	152.2	3.4	1.0*	432.8	100	NS
34-0217-00	Florida	KANDIYOHI	7020005140	NCHF	324.2	12.2	5.7	922.8	40	FS
34-0224-00	Games	KANDIYOHI	7020005140	NCHF	225.4	12.8	4.2	10949.5	47	FS
34-0249-00	Mary	KANDIYOHI	7020005140	WCBP	44.1	2.9	1.0*	381.2	100	IF
34-0251-00	Norway	KANDIYOHI	7020005140	NCHF	1010.1	10.1	1.8	10073.8	92	NS
34-0292-00	Church	KANDIYOHI	7020005140	WCBP	20.2	2.7	1.0*	177.1	100	IF
34-0321-00	Swenson	KANDIYOHI	7020005140	WCBP	41.3	4.3	2.8	1020.3	100	IF
34-0327-00	Unnamed	KANDIYOHI	7020005140	WCBP	12.5	1.7	1.1	174.7	100	IF
34-0336-00	East Sunburg	KANDIYOHI	7020005070	NCHF	45.5	4.0	1.0*	678.3	100	IF
34-0347-00	Hefta	KANDIYOHI	7020005070	NCHF	46.5	3.0	1.0*	2183.5	100	IF
34-0359-00	Sunburg	KANDIYOHI	7020005070	NCHF	168.3	2.6	1.0*	1794.7	100	IF
56-0079-00	Block	OTTER TAIL	7020005010	NCHF	121.8	7.0	3.9	861.1	50	NS
61-0006-00	Johanna	POPE	7020005070	NCHF	487.2	3.0	1.0*	2960.7	100	NS
61-0010-00	Johnson	POPE	7020005070	NCHF	43.7	4.9	1.0*	231.4	100	FS
61-0013-00	Unnamed	POPE	7020005070	NCHF	45.3	4.9	1.0*	988.9	100	FS
61-0034-00	Simon	POPE	7020005070	NCHF	230.3	2.7	1.0*	1369.4	100	NS
61-0037-00	Linka	POPE	7020005060	NCHF	72.4	15.2	6.9	537.0	78	FS
61-0041-00	Scandinavian	POPE	7020005060	NCHF	165.5	14.9	4.5	1351.7	60	FS
61-0043-00	Goose	POPE	7020005070	NCHF	123.0	3.4	1.8	393.2	100	IF

61-0048-00	Round	POPE	7020005060	NCHF	153.4	4.9	1.0*	2457.5	100	FS
61-0051-00	Swenoda	POPE	7020005060	NCHF	157.0	1.8	1.0*	828.9	100	NS
61-0060-00	Marlu	POPE	7020005060	NCHF	164.7	4.9	1.0*	15291.4	100	FS
61-0062-00	State	POPE	7020005060	NCHF	140.8	1.1	1.0*	828.4	100	FS
61-0064-00	Amelia	POPE	7020005060	NCHF	383.6	21.0	7.0	12444.7	41	FS
61-0066-00	Leven	POPE	7020005060	NCHF	119.8	10.1	4.0	3715.0	57	NS
61-0067-00	Villard	POPE	7020005060	NCHF	226.2	4.6	3.1	9731.4	91	FS
61-0072-00	Gilchrist	POPE	7020005060	NCHF	133.5	8.5	3.3	29624.1	63	NS
61-0078-00	Reno	POPE	7020005030	NCHF	1545.1	7.0	3.4	3648.4	35	NS
61-0080-00	Hanson	POPE	7020005060	NCHF	243.2	1.8	1.0*	12755.2	100	NS
61-0086-00	Rasmuson	POPE	7020005060	NGP	52.6	4.9	1.0*	426.8	100	NS
61-0092-00	Hoff	POPE	7020005060	NCHF	47.8	11.6	1.9	111.4	64	FS
61-0095-00	Steenerson	POPE	7020005060	NCHF	80.9	4.9	1.0*	359.8	100	NS
61-0097-00	Benson	POPE	7020005060	NCHF	162.3	4.1	0.6	5349.0	100	FS
61-0099-00	Mary	POPE	7020005060	NCHF	40.5	4.9	1.0*	550.0	100	NS
61-0101-01	Nelson (Main Lake)	POPE	7020005060	NCHF	110.1	2.7	1.0*	1485.2	100	FS
61-0106-00	Edwards	POPE	7020005060	NCHF	66.8	2.6	1.0*	1746.9	100	NS
61-0111-00	Pelican	POPE	7020005040	NCHF	208.8	10.4	2.7	10685.4	80	NS
61-0122-00	Ann	POPE	7020005040	NCHF	150.5	4.3	3.2	2130.6	100	NS
61-0123-00	John	POPE	7020005040	NCHF	48.2	2.1	1.2	2548.2	100	NS
61-0128-00	Strandness	POPE	7020005040	NCHF	36.0	1.5	1.0*	7338.8	100	NS
61-0130-00	Minnewaska	POPE	7020005050	NCHF	3144.4	9.8	4.6	22666.2	30	FS
61-0139-00	Benson	POPE	7020005060	NCHF	29.9	3.2	1.0*	339.0	100	IF
61-0149-00	Signalness	POPE	7020005050	NCHF	16.6	4.3	2.4	143.3	100	FS
61-0156-00	Wallin	POPE	7020005040	NCHF	60.3	1.5	1.0*	812.4	100	IF
61-0162-00	Malmedal	POPE	7020005040	NCHF	74.5	2.4	1.7	2707.7	100	NS
61-0164-00	Jorgenson	POPE	7020005030	NCHF	48.2	4.9	1.0*	429.9	100	NS
61-0180-00	Emily	POPE	7020005050	NGP	875.7	1.4	0.6	63711.8	100	NS
61-0183-00	Pike	POPE	7020005020	NGP	108.1	1.5	1.0*	1233.9	100	IF
61-0194-00	Danielson	POPE	7020005050	NGP	57.5	1.5	1.0*	2439.8	100	NS

	Slough									
61-0199-00	McIver	POPE	7020005030	NGP	63.1	4.9	1.0*	948.9	100	NS
61-0204-00	Wicklund	POPE	7020005020	NGP	59.9	1.5	1.0*	2514.3	100	NS
61-0211-00	Irgens	POPE	7020005020	NCHF	80.1	1.7	1.0*	5308.9	100	NS
61-0274-00	Unnamed	POPE	7020005110	NGP	7.3	2.0*	1.0*	246.8	100	IF
75-0024-00	Long	STEVENS	7020005050	NGP	238.0	2.9	1.5	1408.7	100	NS
76-0032-00	West Sunberg	SWIFT	7020005070	NCHF	80.9	2.6	1.0*	641.2	100	IF
76-0033-00	Monson	SWIFT	7020005070	NCHF	57.9	4.9	2.0	387.2	90	NS
76-0057-00	Hollerberg	SWIFT	7020005100	WCBP	105.2	1.5	1.0*	1097.9	100	NS
76-0072-00	Camp	SWIFT	7020005090	NCHF	87.4	7.9	3.8	971.9	48	FS
76-0086-00	Hassel	SWIFT	7020005110	NGP	285.7	1.5	0.6	8996.4	100	NS
76-0088-00	Moore	SWIFT	7020005060	NGP	91.9	2.1	1.0*	1070.4	100	IF

* Estimated mean depth

Appendix 9 MINLEAP modeling results

Lake ID	Lake Name	Obs TP	MINLEAP TP	Obs Chl-a	MINLEAP Chl-a	Obs Secchi	MINLEAP Secchi	Average TP Inflow	TP Load	Background TP	P Retention	Outflow	Residence Time	Areal Load
		ug/L	ug/L	ug/L	ug/L	m	m	ug/L	kg/yr	ug/L	%	hm3/yr	years	m/yr
21-0079-00	Maple	18	40	5	14	2.9	1.6	159	1243	24.0	75	7.83	3.0	2.23
21-0090-00	Turtle	41	85	18	43	1.5	0.8	151	1252	35.2	44	8.28	0.3	7.60
21-0136-00	Indian	24	51	10	21	2.6	1.3	160	109	-	68	0.68	1.6	2.01
21-0145-00	Chippewa	17	31	5	10	3.6	2.0	173	1170	23.6	0.82	6.75	6.3	0.95
21-0156-00	Little Oscar	47	171	20	120	1.5	0.5	2155	470	-	92	0.22	4.1	0.32
21-0162-00	Freeborn	30	95	11	51	1.8	0.8	2431	554	-	96	0.23	14.6	0.23
21-0189-00	Gilbert	72	50	36	20	0.6	1.3	174	172	-	71	0.99	2.0	0.92
21-0212-00	Little Chippewa	32	77	8	38	2.7	0.9	150	1758	-	49	11.70	0.4	10.26
21-0216-00	Whiskey	37	37	11	13	2.4	1.7	164	153	23.5	77	0.93	3.7	1.50
21-0242-00	Aaron	25	42	8	16	2.3	1.5	175	403	-	76	2.30	3.0	0.89
21-0245-00	Moses	17	31	8	10	4.7	2.0	176	522	-	82	2.97	6.1	0.86

21-0257-02	South Oscar	28	127	9	78	2.5	0.6	2275	1807	-	94	0.79	7.7	0.27
21-0264-00	Stowe	56	98	36	53	1.4	0.7	149	5797	-	34	38.82	0.1	17.97
21-0291-00	Red Rock	141	95	38	51	1.7	0.8	2343	1844	31.9	96	0.79	14.1	0.25
21-0323-00	Jennie	163	206	77	158	0.4	0.4	2828	572	48.8	93	0.20	3.8	0.16
21-0343-00	Long	99	119	44	71	0.6	0.6	148	7132	35.5	20	48.06	0.0	57.90
26-0020-00	Thompson	141	83	53	42	1.5	0.9	2504	314	29.1	97	0.13	19.6	0.21
26-0046-00	Lower Elk	101	143	48	93	1.3	0.5	1902	467	-	92	0.25	5.0	0.52
34-0204-00	Florida Slough	79	98	25	53	0.8	0.7	151	3517	42.3	35	23.26	0.1	7.45
34-0206-00	Andrew	21	59	6	25	2.7	1.2	153	2464	25.2	62	16.13	1.0	5.11
34-0208-00	Middle	65	51	38	21	0.5	1.3	207	129	-	75	0.62	2.4	0.41
34-0217-00	Florida	20	24	6	7	2.7	2.5	207	275	-	89	1.33	13.9	0.41
34-0224-00	Games	27	66	9	30	2.5	1.0	152	2174	26.6	56	14.33	0.7	6.37
34-0251-00	Norway	67	56	26	23	1.0	1.2	166	2241	34.5	66	13.50	1.3	1.34
34-0321-00	Swenson	108	153	76	103	0.5	0.5	569	768	-	73	1.35	0.8	3.29
34-0327-00	Unnamed	569	174	461	124	0.2	0.5	568	134	-	69	0.24	0.6	1.81
34-0336-00	East Sunburg	267	74	148	36	1.3	0.9	160	144	-	54	0.90	0.5	1.96
34-0359-00	Sunburg	133	69	68	32	1.1	1.0	165	396	-	58	2.40	0.7	1.43
56-0079-00	Block	81	37	33	13	1.9	1.7	173	202	-	79	1.17	4.1	0.96
61-0006-00	Johanna	76	61	45	26	1.5	1.1	177	716	38.5	66	4.04	1.2	0.83
61-0010-00	Johnson	38	59	21	25	1.9	1.2	181	58	-	68	0.32	1.4	0.72
61-0013-00	Unnamed	15	81	4	41	1.3	0.9	156	204	-	48	1.30	0.3	2.90
61-0034-00	Simon	124	60	72	26	0.3	1.1	178	332	45.0	66	1.87	1.2	0.81
61-0037-00	Linka	26	29	6	9	3.8	2.1	172	125	-	83	0.73	6.8	1.01
61-0041-00	Scandinavian	26	37	7	13	2.7	1.7	170	310	-	79	1.82	4.1	1.10
61-0043-00	Goose	59	41	56	15	0.8	1.6	201	113	-	79	0.56	4.0	0.46
61-0048-00	Round	26	76	10	37	1.9	0.9	159	519	-	52	3.26	0.5	2.13
61-0051-00	Swenoda	91	59	57	25	0.6	1.2	181	207	-	68	1.14	1.4	0.73
61-0060-00	Marlu	45	106	23	60	1.6	0.7	150	2991	-	29	19.94	0.1	12.09
61-0062-00	State	22	60	4	26	1.4	1.1	178	202	-	66	1.13	1.2	0.80

61-0064-00	Amelia	21	49	8	19	3.9	1.3	154	2510	-	68	16.33	1.6	4.25
61-0066-00	Leven	53	59	25	25	1.5	1.2	154	751	-	62	4.88	1.0	4.06
61-0067-00	Villard	44	70	19	33	1.8	1.0	152	1940	-	54	12.74	0.5	5.64
61-0072-00	Gilchirst	66	100	41	55	1.3	0.7	149	5740	-	33	38.56	0.1	28.78
61-0078-00	Reno	48	29	15	9	2.4	2.1	217	1165	-	87	5.36	9.8	0.35
61-0080-00	Hanson	111	97	41	52	0.7	0.8	152	2527	-	36	16.68	0.1	6.86
61-0086-00	Rasmuson	149	187	85	137	0.7	0.4	2242	336	-	92	0.15	3.5	0.28
61-0092-00	Hoff	23	37	7	13	2.8	1.7	219	36	-	83	0.16	5.6	0.34
61-0095-00	Steenerson	320	57	62	24	1.4	1.2	187	94	-	70	0.50	1.6	0.62
61-0097-00	Benson	36	99	14	54	1.9	0.7	154	1078	-	36	7.02	0.1	4.33
61-0099-00	Mary	110	73	82	35	0.6	1.0	161	118	-	55	0.73	0.5	1.83
61-0101-01	Nelson	44	73	20	35	1.2	1.0	161	319	45.8	55	1.97	0.6	1.80
61-0106-00	Edwards	220	84	106	43	1.0	0.8	155	356	-	46	2.30	0.3	3.43
61-0111-00	Pelican	55	76	21	37	1.4	0.9	152	2118	-	50	13.97	0.4	6.69
61-0122-00	Ann	317	50	74	20	1.6	1.3	161	455	-	69	2.83	1.7	1.87
61-0123-00	John	141	93	81	50	0.6	0.8	151	505	-	38	3.33	0.2	6.94
61-0128-00	Strandness	110	117	37	69	0.8	0.6	149	1423	-	21	9.56	0.0	26.54
61-0130-00	Minnewaska	27	35	8	12	2.8	1.8	173	5304	-	80	30.72	4.7	0.98
61-0149-00	Singalness	22	48	4	19	3.2	1.4	169	33	-	72	0.19	2.1	1.13
61-0156-00	Wallin	117	73	22	35	0.9	1.0	161	174	-	55	1.08	0.6	1.80
61-0162-00	Malmedal	145	80	80	39	0.5	0.9	153	543	-	48	3.55	0.4	4.80
61-0164-00	Jorgenson	210	66	124	30	0.5	1.0	168	97	-	60	0.58	0.8	1.20
61-0180-00	Emily	112	557	46	674	0.4	0.2	1560	48047	-	64	30.80	0.2	3.52
61-0183-00	Pike	99	217	49	171	0.7	0.4	1965	958	-	89	0.49	2.2	0.45
61-0194-00	Danielson Slough	147	377	70	382	0.7	0.2	1604	1847	-	76	1.15	0.5	2.02
61-0199-00	McIver	177	245	104	203	0.6	0.3	1832	731	-	87	0.40	1.6	0.63
61-0204-00	Wicklund	178	374	41	377	0.8	0.2	1606	1904	-	77	1.19	0.5	1.98
61-0211-00	Irgens	203	101	91	55	0.5	0.7	151	1045	-	33	6.93	0.1	8.67

75-0024-00	Long	150	133	32	83	0.9	0.6	2693	1128	40.6	95	0.42	8.5	0.18
76-0033-00	Monson	84	48	40	19	1.3	1.4	175	92	32.1	73	0.53	2.2	0.91
76-0057-00	Hollerberg	79	165	34	114	0.8	0.5	567	845	42.9	71	1.49	0.7	1.42
76-0072-00	Camp	35	43	18	16	1.7	1.5	164	213	25.5	74	1.30	2.5	1.49
76-0086-00	Hassel	200	413	73	436	0.2	0.2	1645	6833	52.8	75	4.15	0.4	1.45