WATERSHED MANAGEMENT ORGANIZATION

2 watershed MANAGEMENT PLAN

for the lower mississippi river watershed management organization

August 2011
Amendment Adopted August 2015

WSB

3rd GENERATION LOWER MISSISSIPPI RIVER WATERSHED MANAGEMENT PLAN

PREPARED FOR THE LOWER MISSISSIPPI RIVER WATERSHED MANAGEMENT ORGANIZATION

August 2011
Amendment Adopted August 2015

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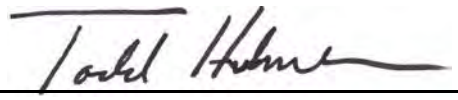
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.



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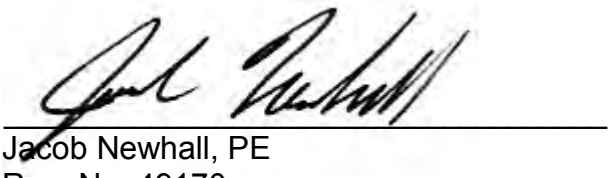

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1.0 Executive Summary

The Lower Mississippi River Watershed Management Organization (LMRWMO) Watershed Management Plan sets the vision and guidelines for managing surface water within its boundaries. This executive summary summarizes the history, purpose, issues, goals, policies, and implementation tasks of the Watershed Management Organization (WMO).

A major plan amendment was completed in 2014 to reflect the addition of the western portion of Mendota Heights into the LMRWMO. The additional land, including all water resources, is now part of the LMRWMO's jurisdiction.

1.1 Location and History

The Lower Mississippi River Watershed Management Organization is located in the southeast part of the Twin Cities metropolitan area, in northern Dakota County and southern Ramsey County. It abuts the south and west sides of the Mississippi River, from the Mississippi River's confluence with the Minnesota River to Rosemount. The location of the WMO is shown in **Figure 1**. Adjoining watershed management entities include Lower Minnesota River Watershed District, Eagan-Inver Grove Heights WMO, and the Vermillion River Watershed Joint Powers Organization. The WMO covers 35,548 acres (55.8 square miles) and is composed of seven cities partially or wholly within the organization's boundaries. The member cities include:

Dakota County	Ramsey County
City of Inver Grove Heights	City of St. Paul
City of Lilydale	
City of Mendota Heights	
City of South St. Paul	
City of Sunfish Lake	
City of West St. Paul	

A joint powers agreement was executed on October 25, 1985, which established and empowered the Lower Mississippi River Watershed Management Organization. The WMO was formed in response to the requirements of the Metropolitan Surface Water Management Act ("Chapter 509," now recodified to Minnesota Statutes 103B). The Act required, among other things, the preparation of watershed management plans in the Minneapolis-St. Paul Metropolitan area.

The WMO has provided a valuable forum for the member cities to evaluate and resolve drainage issues within the watershed. The WMO and its member cities successfully addressed the majority of the intercommunity water management issues that were identified in the past WMO plans. The cooperation of the member cities and the implementation of the WMO's joint powers agreement (JPA) were key factors in resolving the identified problems. The WMO provided the forum for the cities to systemically prioritize and address these and other intercommunity drainage issues. Refer to **Table 6-6** for a list of the completed projects and planning activities.

1.2 Watershed Management Purposes

The WMO developed the following vision statement on December 23, 2009:

> *"Water resources and related ecosystems are managed to sustain their long-term health and integrity through member city collaboration and partnerships with other water management organizations with member city citizen support and participation."*

The general purposes for the 3rd Generation Plan include the following purposes consistent with the Metropolitan Surface Water Management Act and Minnesota Statutes 103B.201.

- Protect, preserve, and use natural surface and groundwater storage and retention systems.
- Minimize public capital expenditures needed to correct flooding and water quality problems.
- Identify and plan for means to effectively protect and improve surface and groundwater quality.
- Establish more uniform local policies and official controls for surface and groundwater management.
- Prevent erosion of soil into surface water systems.
- Promote groundwater recharge.
- Protect and enhance fish and wildlife habitat and water recreational facilities.
- Secure other benefits associated with the proper management of surface and groundwater.

In addition, the WMO has developed the following purposes:

- Assist member cities in achieving current and future water quality and water quantity regulations collaboratively, equitably, and cost-effectively for all members within the watershed.
- Identify and effectively communicate member concerns to other government jurisdictions to better align their policies and activities with those of the WMO and its members.
- Educate citizens about the use, protection, and management of water resources and engage them in WMO water management programs and decision making.
- Consider potential impacts of WMO decisions on natural resources and habitat.
- Govern the WMO with a citizen led Board and keep regulation at the local level – the WMO will not administer a permit program.
- Assist member communities with *intercommunity* runoff and water resource

management issues. The WMO, at the discretion of the Board, may also work with individual member cities to address water resource issues within individual city boundaries. This may include but is not limited to monitoring of water bodies or outlets to the Mississippi River.

- Assess performance of the WMO and the member cities toward achieving the goals stated in this plan.

- Provide member cities with useful information about the WMO, its activities, and water resource management.

In an effort to achieve the purposes of the WMO; goals, strategies, and policies have been developed for water quantity, water quality, recreation, fish and wildlife habitat, wetlands, groundwater protection, erosion and sedimentation, education, and WMO administration. These goals, strategies, and policies are provided in **Section 5**.

1.3 WMO Management Structure, Powers, Duties and Agreements

The WMO Board of Managers (Board) consists of seven managers appointed by their respective municipalities. Each city appoints one manager and one alternate to serve at the pleasure of the city. Each manager has one vote, however in certain cases, the JPA provides for a weighted vote system. Regular meetings are held every month on the third Thursday at various member city facilities. The public is invited to attend the WMO Board meetings.

Each year, the Board authorizes and obtains an audit of the WMO's financial records. The Board also reviews and approves an annual budget.

The JPA between the member cities of the WMO went into effect on October 25, 1985. The authority of the WMO is established by Minnesota Statutes 103B and by the JPA. The JPA was revised and restated in 2001. The joint powers agreement was formally amended in 2014 in response to the expansion of the WMO to include increased area from Mendota Heights. The current JPA is included in **Appendix B**. The powers and duties of the WMO, as stated in the JPA, include, but are not limited to:

1. Prepare and adopt a watershed management plan meeting the requirements of Minnesota Rules Chapter 8410.

2. Review and approve local water management plans as defined in Minnesota Rules Chapter 8410.

3. Review local land use and development at the request of a municipality, in the absence of an approved local water management plan, or for projects requiring a variance from the adopted local water management plan or implementation program.

4. Conduct surveys (or use other information) and develop projects to accomplish the WMO's purposes.

5. Establish and maintain devices for acquiring and recording hydrological and water quality data.

6. Enter upon lands to make surveys and investigations to accomplish the WMO's purposes.

7. Acquire, operate, construct and maintain the drainage system improvements delineated in the capital improvement programs adopted by the WMO Board.

8. Accumulate reserve funds and invest funds not currently needed for WMO operations.

9. Collect money from the WMO members and from any other WMO-approved source.

10. Obtain an annual audit of the books and accounts of the WMO.

11. Make contracts, employ consultants, incur expenses and make expenditures.

12. Enter into contracts or cooperate with governmental agencies, private/public organizations, or individuals to accomplish the WMO's purposes.

13. Contract for or purchase insurance.

14. Adopt an annual general administrative budget.

15. Apportion/allocate costs of capital improvements (including engineering, legal and administrative costs) listed in the WMO watershed management plan, based on "allowable flow" or other cost sharing allocations determined by the WMO Board of Managers.

1.4 Plan Organization

The Lower Mississippi River WMO *Watershed Management Plan* sets the course for the WMO in managing stormwater runoff and the quality of the WMO water resources. The plan outlines the regulations involved, assesses specific and watershed-wide issues, sets goals and policies for the WMO and its resources and lists implementation tasks to achieve the goals. The plan also discusses the financial considerations of implementing the plan and other funding sources that may be available to the WMO and/or its member cities. The WMO plan is organized into the following sections:

Section 1.0 Executive Summary – states the authority and composition of the Lower Mississippi River Watershed Management Organization, the purpose of the Surface Water Management Act and the components of this watershed management plan.

Section 2.0 Land and Water Resource Inventory – presents information about the WMO's climate, precipitation, topography, soils, geology, groundwater, land use, public utilities, surface waters, natural communities and rare species, and pollutant sources. This is the basic information that describes the surface and subsurface conditions of the WMO.

Section 3.0 Agency Coordination – lists many of the agencies that have rules and regulations related to water resources within the WMO.

Section 4.0 Problems and Approaches for Addressing Problems – outlines existing and potential water resource management issues within the WMO and identifies the approaches for improvement for each issue. Approaches for improvement are included in the WMO implementation program.

Section 5.0 Goals, Strategies, and Policies – outlines the purposes of the WMO and the vision for its water resources. This section sets goals for water quantity, water quality, recreation, fish and wildlife habitat, wetlands, groundwater protection, erosion and sedimentation, education, and administration. The goals are followed by strategies and policies that provide methods for achieving goals and serve as decision making guidelines.

Section 6.0 Implementation Program – presents the programs, studies, and capital improvements proposed to address the existing and potential water resource management issues within the WMO. The cost of each implementation element, possible funding mechanism, and the anticipated year for completion is also outlined.

Section 7.0 Impact on Local Government - discusses the conformance of local governmental water resource management plans to this watershed management plan.

Section 8.0 Amendment Procedures - discusses the procedure to be followed should it be necessary to amend this plan. This procedure would be invoked only for major changes that would directly affect water resource management within the member cities.

Section 9.0 References - contains a list of all documents incorporated into this plan by reference or other documents which are referred to in this plan as containing information helpful in the management of WMO water resources.

Section 10.0 Glossary of Acronyms - contains a list and description of acronyms used in this plan.

2.0 Land and Water Resource Inventory

The Lower Mississippi River Watershed Management Organization is surrounded by valuable water and land resources. Protecting and enhancing these important resources is a high priority for the WMO and the surrounding area. Refer to **Figure 1** for a location map of the WMO. Information has been collected regarding land and water resources for the WMO from a variety of sources. This section of the plan provides a general description and summary of the climate, surficial topography, soils, geology, surface and ground water resource data, land use and public utilities, public waters and wetlands, public areas for water-based recreation, fish and wildlife habitat, unique features and scenic areas, pollutant sources, and water resource problem areas. More information can be obtained from Dakota County and Ramsey County websites.

2.1 Climate and Precipitation Data

The Twin Cities metropolitan area climate is a humid continental climate, with moderate precipitation, wide daily temperature variations, warm humid summers and cold winters. The growing season varies from 142 days to 202 days, averaging 166 days. Freezing temperatures may occur until the middle of May and after the middle of September.

The nearest "first order" weather recording station is the Minneapolis/St. Paul Metropolitan Airport Station of the U.S. National Oceanic and Atmospheric Administration. The data from this installation is of highest value and accuracy. The National Weather Service forecast office for the metropolitan area, located in Chanhassen, also records weather data. Several Minnesota State Climatological network stations also exist and provide more detailed local weather data, kept by the Minnesota State Climatologist.

The highest temperature on record at the airport station to date was 108ºF, set in 1936, and the lowest temperature was -34ºF, set in 1936. The extreme conditions tell little except that temperatures range from uncomfortably hot to bitterly cold. The average annual temperature at the airport station is 44.9ºF. Average total annual precipitation at the airport is 29.0 inches (1961-2009 average). **Table 2-1** gives a precipitation summary for the airport station. Generally, the summer precipitation far exceeds that of the winter, the summer rainfall usually being sufficient for proper plant growth. From May to September, the growing months, the average rainfall is 18.0 inches, or about 62 percent of the normal annual precipitation.

Table 2-1. Precipitation Summary – Minneapolis/St. Paul Airport Station

Averages: 1961-2009 Extremes: 1891-2009

Total Precipitation, Inches					Snow, inches		Average # Days with Precip		
Month	Mean	High—Yr	Low—Yr	1-Day Max	Mean	High—Yr	0.1"	0.5"	1"
January	0.95	3.63 1967	0.05 1898	1.21 24/1967	12.4	46.4 1982	3.7	0.8	0.5
February	0.81	3.25 1922	0.03 1894	1.90 24/1930	8.7	26.5 1962	3.1	1.1	0.7
March	1.88	4.75 1965	0.09 1910	1.62 1/1965	11.2	46.1 1965	4.9	1.2	0.4
April	2.50	7.00 2001	0.16 1987	2.22 27/1975	2.8	21.8 1983	6.1	1.9	0.5
May	3.40	10.92 1942	0.21 1934	3.59 29/1942	0.1	2.4 1954	7.6	2.6	1
June	4.10	9.82 1990	0.22 1988	2.91 7/1984	0	0.0 1949	7.5	3	1.2
July	3.65	17.90 1987	0.11 1936	9.15 23/1987	0	0.0 1948	6	2.7	1.1
August	3.95	9.32 2007	0.20 1925	7.28 30/1977	0	0.0 1948	6.8	3	1.8
September	2.87	7.77 1903	0.41 1940	4.96 12/1903	0	0.4 1985	6.1	2.2	1.1
October	2.33	6.42 1911	0.01 1952	2.75 19/1934	0.6	8.2 1991	4.7	1.6	0.7
November	1.56	5.29 1991	0.02 1939	2.52 11/1940	7.4	46.9 1991	3.8	1.1	0.4
December	1.03	4.27 1982	0.00 1943	1.50 14/1891	10.6	33.5 1969	3.2	0.6	0.2
Annual	29.03	41.53 2002	11.54 1910	9.15 7/23/87	53.8	101.5 1983	63.5	21.8	9.6

The annual snowfall averages about 54 inches, equivalent to about 5.4 inches of water. The heaviest monthly snowfall recorded to date at the Minneapolis/St. Paul International Airport was 46.4 inches of snow for the month of January 1982. The area averages 40 to 45 days per year when the snow depth is six inches or greater and about 20 days per year when the snow depth is more than 12 inches. Runoff from snowmelt can occur anytime during the winter, but the most severe snowmelt runoff conditions usually occur in March and early April.

Average weather imposes little strain on the typical drainage system. Extremes of precipitation and snowmelt are important for drainage design. The National Weather Service has data on extreme precipitation events that can be used to aid in the design of drainage systems. Extremes of snowmelt most often affect major rivers, the design of stormwater storage areas, and landlocked basins, while extremes of precipitation most often

affect the design of conveyance facilities. Refer to **Figure 2** for the 1% chance of rainfall event (100-year storm) across Minnesota and **Figure 3** for the annual normal precipitation across Minnesota.

There are recent concerns that the increase in urban development and resulting "heat island" effect is contributing to more frequent, high intensity storm events. These storm events can produce large amounts of runoff which may exceed storm sewer designs and result in flooding. Substantial increases of storm events above the 95th percentile since 1950 have been observed, however, only a few regions have enough data to assess such trends. As the average temperature has risen slightly, precipitation has also increased[1]. Some Climatologists predict there will be more of an increase in extreme events than mean precipitation[2]. The National Oceanic and Atmospheric Administration (NOAA) Atlas 14 was completed in 2013. This document was developed to take the place of TP-40 for predicting the frequency and intensity of rainfall events. Atlas-14 provides valuable, updated precipitation information to account for the changing climate and rainfall intensities in planning and engineering efforts. By incorporating Atlas-14 rainfall data, LGUs can more accurately design, develop, and redevelop property to be able to react to the current trends of high-intensity/high-volume rainfall events.

Atlas 14 information can be found at http://www.dnr.state.mn.us/climate/noaa_atlas_14.html and additional climatological information can be obtained from the State Climatologist website at http://www.climate.umn.edu/.

2.2 Topographic Data

The WMO topography is characterized by rolling to hilly terrain interspersed with poorly drained depressions that form many ponds and lakes. The Mississippi River bluffs and the ravines that cut through them form the main areas of steep slope. Steep slopes are also found around the ponds and depressions in the southern two-thirds of the watershed. Flat and relatively flat areas can be found along the Mississippi River flood plain and above the bluffs in south and central South St. Paul.

---

[1] Solomon, S., D. Qin, M. Manning, R.B. Alley, T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, J.M. Gregory, G.C. Hegerl, M. Heimann, B. Hewitson, B.J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T.F. Stocker, P. Whetton, R.A. Wood and D. Wratt, 2007: Technical Summary. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

[2] Hegerl, G.C., F. W. Zwiers, P. Braconnot, N.P. Gillett, Y. Luo, J.A. Marengo Orsini, N. Nicholls, J.E. Penner and P.A. Stott, 2007: Understanding and Attributing Climate Change. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

The bluffs, ravines, and other steep slopes are usually wooded or overgrown with underbrush. These steep-sloped areas are not suitable for development. However, they are important because of the wildlife they support and their natural beauty. Erosion can be a problem in areas of steep slope.

Dakota County has two-foot and Ramsey County has one-foot contour interval topographic mapping available. There are also 10-foot contour interval topographic maps available from the U.S. Geological Survey. Refer to **Figure 4** for a contour map showing 10-foot contours across the WMO.

2.3 Soils Data

Soil composition, slope and land management practices determine the effect of soils on stream and lake water quality. Soil composition and slope are important factors affecting the rate and amount of storm water runoff. The shape and stability of aggregates of soil particles—expressed as soil structure—influence the permeability, infiltration rate, and erodibility of soils. Slope is important in determining storm water runoff rates and hence susceptibility to erosion.

Infiltration capacities of soils affect the amount of direct runoff resulting from rainfall. The higher the infiltration rate for a given soil is, the lower the runoff potential. Conversely, soils with low infiltration rates produce high runoff volumes and high peak discharge rates. The hydrologic soil classification map in **Figure 5** shows the estimated distribution of soils as determined by the Natural Resource Conservation Service (NRCS). The five soil classifications are defined as follows:

Group A - These soils have high infiltration rates even when thoroughly wetted. These soils consist chiefly of deep, well drained to excessively drained sands and gravel. Group A soils have a high rate of water transmission, therefore resulting in a low runoff potential.

Group B - These soils have moderate infiltration rates. Group B soils consist of deep moderately well to well drained soils with moderately fine to moderately coarse textures.

Group C - These soils have slow infiltration rates. These soils typically consist of clayey gravel or clayey sand.

Group D - These soils have very slow infiltration. Group D soils are typically clay soils with high swelling potential, soils with high permanent water table, soils with a clay layer at or near the surface, or shallow soils over nearly impervious material.

Urban - These soils have been greatly affected by development and are frequently compacted, cut, and filled, resulting in variable runoff rates and a poor environment for plant growth.

The hydrologic grouping symbols (A-D) are combined with land use and used to estimate the amount of runoff that will occur over a given area for a particular rainfall amount. As land is developed for urban use, much of the soil is covered with impervious surfaces, and soils in the remaining areas are significantly disturbed and altered. Development often

results in consolidation of the soil and tends to reduce infiltration capacity of otherwise permeable soils, resulting in significantly greater amounts of runoff.

With the exception of the Mississippi River floodplain, the soils in the WMO generally consist of well-drained soils formed in loamy and sandy glacial till and outwash. The subsoils in the watershed are generally sand. The following is a percentage breakdown of each soil group in the WMO:

Group A – 7.0% **Group B –** 55.5%

Group C – 0.0% **Group D –** 2.1%

Urban – 35.3%

The Dakota County and Ramsey County soil surveys contain maps showing generalized and detailed soils information. The following generalized soil and land descriptions are taken from the county soil maps.

Most of the soil along the Mississippi River is "alluvium," which is either a silty, sandy, or loamy soil on nearly level floodplains or fill material on wet substratum. The mapping unit indicates soils that are nearly level to very gently sloping, generally poorly-drained and located in floodplain areas. In Ramsey County, this soil type is generally covered with fill material 2 feet thick or more. However, this soil is still considered poorly drained because of the underlying poorly drained soil and nearly level land surface.

The "urban land" designation in the City of St. Paul includes the Chetek and Mahtomedi soil groups. The soils have been disturbed and reworked by urbanization. This land can be level or very steep. The soils, generally associated with uplands, tend to be excessively drained with a moderately coarse texture.

The most prevalent general soil type in the WMO is "loamy and sandy soil," which is a combination of the Kingsley-Mahtomedi soil groups. This loamy and sandy soil is well drained and moderately coarse textured. It is found on gently sloping to very steep land, much of it urban, and is also found on uplands.

The "silty, loamy, and sandy soil" unit is the Waukegan/Wadena/Hawick group. It is a silty, loamy and sandy soil, well drained to excessively drained, found on level to very steep land on outwash plains and terraces.

Much of the watershed is urbanized, which changes the character of soil — typically resulting in decreased infiltration rates for sandy areas. Grading, plantings, and tended lawns tend to dominate the landscape in urbanized areas and may become more important factors in runoff generation than the original soil type. The topography of the watershed, characterized by numerous small depressions and steep slopes, causes the watershed to be well drained and the surficial soils to have less impact on runoff generation than would be true for flat or gently rolling terrain.

More information about soils can be obtained from the Dakota County and Ramsey County soil surveys.

2.4 Geology and Groundwater Resources

2.4.1 Geology

The geology of the WMO consists of Quaternary deposits directly overlying Cambrian or Ordovician bedrock formations. This sequence is depicted in the generalized regional stratigraphic column shown in **Appendix C**. The stratigraphic column shows the vertical relationship of the units, their approximate thickness and their water-bearing capabilities.

The subcropping bedrock units in the WMO are the Decorah shale, the Platteville and Glenwood shale, the St. Peter sandstone, the Prairie du Chien dolomite, the Jordan sandstone, and the St. Lawrence shale. Subcropping bedrock is the first bedrock encountered below the overlying soils. The youngest subcropping bedrock units, such as the Decorah shale, occur in the northern part of the WMO, while the older subcropping bedrock units, such as the Jordan Sandstone, occur in the southern part of the WMO. All of these bedrock units are sedimentary rocks deposited by shallow seas during late Cambrian and Ordovician times, approximately 500 million years ago. The bedrock formations form part of a gently sloping bowl-like structure centered under the Minneapolis-St. Paul metropolitan area, known as the Twin Cities basin. The Dakota County and Ramsey County geologic atlases contain more information about the subcropping bedrock units. Refer to **Figure 6** for a map showing the depth to bedrock throughout the watershed.

Glacial deposits of varying thickness cover most of the bedrock in the watershed area. The thickest deposit lies over the extensive buried bedrock valley located in southern Inver Grove Heights. The bedrock valley was carved during the Pleistocene era by advancing and retreating glaciers and by erosion from streams inhabiting the valley during inter-glacial periods. Later, this valley was buried under thick deposits of stream and glacial sand and gravel. The deposits that buried the bedrock valley are approximately 400 feet thick, even 500 feet thick or more in places, while the glacial deposits in the northern and eastern parts of the WMO are less than 50 feet thick, with exposed bedrock along the cliffs of the Mississippi River banks.

2.4.2 Groundwater Resources

Two types of aquifers are present in the Lower Mississippi River WMO: surficial and bedrock aquifers. The following paragraphs provide general information about the aquifers in the WMO. For more information, refer to the Dakota County and Ramsey County geologic atlases, the *Dakota County Groundwater Protection Plan*, and the *Ramsey County Ground Water Quality Protection Plan.* **Figure 7** shows the type and location of the DNR permitted groundwater appropriations sites within the WMO. Updated information on groundwater appropriations is available at http://www.dnr.state.mn.us/waters/watermgmt_section/appropriations/wateruse.html.

Surficial Aquifers

Surficial aquifers are water-bearing layers of sediment, usually sand and gravel, which lie close to the ground surface. Many domestic and some irrigation wells in the watershed draw water from these aquifers. Since the surficial aquifers are more susceptible to pollution, they are not used for municipal or public supply wells. In some locations in the WMO, the aquifer could provide sufficient water yield for some non-potable industrial uses.

Recharge to the surficial aquifers is primarily through the downward percolation of local precipitation. Some surficial aquifers may also be recharged during periods of high water levels. Surficial aquifers may discharge to local lakes, streams or to the underlying bedrock.

A large number of ponds and lakes are scattered throughout the southern part of the watershed and recharge the groundwater. Many of these water bodies are landlocked and their only outlet is to the groundwater. Some of the landlocked water bodies are probably perched above the regional level of the shallow groundwater in the watershed.

Refer to **Figure 8** for an approximation of the depth to groundwater throughout the watershed. The depth to groundwater was interpolated using known land elevation data and known groundwater elevation information. A groundwater elevation raster (digital image) was created using known lake, wetland, and soil boring information. The depth to groundwater was then calculated by subtracting the groundwater elevations from ground elevations throughout the WMO. Groundwater elevations were then verified using well data from the County Well Index and water table elevation contours from the Ramsey and Dakota County Geologic Atlases. For exact groundwater information it is suggested that soil borings be performed at the desired location.

Bedrock Aquifers

Five major bedrock aquifers are available for water supply in the WMO. The major bedrock aquifers are, in order of use and development: (1) Prairie du Chien-Jordan, (2) Mount Simon-Hinckley, (3) Franconia-Ironton-Galesville, (4) St. Peter, and (5) Platteville. The aquifer used most often for water supply in the area is the Prairie du Chien-Jordan aquifer. The Prairie du Chien-Jordan aquifer is high yielding, more easily tapped than deeper aquifers, has very good water quality and is continuous throughout most of the area.

The groundwater level in the Prairie du Chien-Jordan aquifer varies from less than 700 feet to more than 800 feet above mean sea level as shown in the county geologic atlases. The aquifer is recharged in areas where thin permeable drift overlies the limestone layers. Some recharge of this aquifer occurs locally from percolation through the overlying glacial deposits or St. Peter sandstone. However, hydrogeologic considerations suggest this recharge would be a minimal contribution to the aquifer flow. Regional recharge of the Prairie du Chien-Jordan aquifer occurs to the south, in Freeborn and Mower Counties. Groundwater movement in the aquifer is generally from south to north, toward the Minnesota and Mississippi Rivers. The drift-filled bedrock valley in the southern portion of the area cuts deeply into the Prairie du Chien-Jordan aquifer, creating a direct connection between the aquifer and the surficial groundwater in the glacial drift. Hence, any contamination percolating through the glacial drift in the bedrock valley may enter the bedrock aquifer system.

The aquifer with the highest water quality and highest possible yields is the Mt. Simon-Hinckley aquifer, but it is more expensive to use than the Prairie du Chien-Jordan because of its greater depth and there are limitations to its use. Minnesota statutes limit appropriations from the Mt. Simon-Hinckley aquifer to potable water uses, where there are no feasible or practical alternatives, and where a water conservation plan is incorporated with the appropriations permit. The water level of the Mt. Simon-Hinckley has been nearly constant, having a head of about 700 feet above mean sea level (artesian conditions are most likely present in areas where ground elevations are close to or less than 700 feet). Recharge of the Mt. Simon-Hinckley takes place far north of the watershed, where the

bedrock is closer to the surface, and occurs by percolation through the overlying drift and bedrock. Groundwater movement in the aquifer is generally to the southeast. The local direction of groundwater flow in the Twin Cities area tends to be toward the western suburbs, due to pumping of the aquifer.

The City of Inver Grove Heights obtains its municipal water from the Prairie du Chien - Jordan and the Mount Simon Hinckley aquifers, and the City of South St. Paul obtains its water from the Prairie du Chien-Jordan aquifer.

2.5 Land Use and Public Utilities

Figure 9 shows existing land use in the WMO. The land use map shows most of the land use in the watershed is residential, with concentrated areas of commercial development along Robert Street, Highway 110, and Concord Avenue, business and industrial areas along the river, and large amounts of undeveloped land in Inver Grove Heights. **Figure 10** shows the anticipated future land use in the WMO. The land use maps show that most of the land use changes are projected to occur in the southern half of the WMO, in the form of new development. Smaller land use changes, mostly in the form of redevelopment, are anticipated in the remainder of the watershed.

The Cities of Lilydale, Mendota Heights, St. Paul, South St. Paul, Sunfish Lake and West St. Paul are entirely within the Metropolitan Urban Service Area (MUSA). The MUSA is the area delineated by the Metropolitan Council in their *Regional Blueprint*, where urbanization is expected to occur and where metropolitan service systems (particularly sewer and major highways/interchanges) will be provided to accommodate growth. About 44% of the land in the City of Inver Grove Heights lies within the 2010 MUSA boundary. Refer to **Figure 9** for the 2010 MUSA boundary and **Figure 10** for the projected 2030 MUSA boundary in the WMO.

The Cities of St. Paul, Lilydale (supplied by Mendota Heights), Mendota Heights, and West St. Paul obtain their municipal water through the St. Paul Regional Water Utility, which obtains most of its water from the Mississippi River. The Cities of South St. Paul and Inver Grove Heights obtain their municipal water supplies from groundwater aquifers. Areas of large lot development (outside the MUSA) within the City of Inver Grove Heights and a few areas within the City of Mendota Heights and the City of Lilydale are served by private individual wells. Although the City of Sunfish Lake is located within the MUSA, private individual wells and on-site septic systems serve the residents of Sunfish Lake. The City of Sunfish Lake has no plans to provide either public water or sanitary sewer services in the future.

2.6 Surface Water Resource Information

2.6.1 Public Waters (Lakes, Wetlands, Streams, Ditches) and Wetlands

Figure 11 shows the DNR-protected waters located in Lower Mississippi River WMO. As seen in the figure, none of the DNR-protected waters are streams, and there are no public ditches in the WMO. **Figure 12** shows the wetlands identified in the National Wetlands Inventory (NWI) and other water bodies. There may be additional wetlands (especially those smaller than 0.5 acre) in the WMO that are not included in the inventory.

The City of Inver Grove Heights' *Natural Resource Inventory and Management Plan for the Northwest Expansion Area* (2004), *Stormwater Manual for the Northwest Area* (2006), and

the *Draft Southwest Area Wetland Inventory and Assessment (2002)* contain an inventory and detailed information about the wetlands located in the City. The City of Inver Grove Heights' 1990 wetland inventory, completed by the Dakota Soil and Water Conservation District, identifies over 350 wetlands 0.5 acres and larger. The City of Mendota Heights' *Local Surface Water Management Plan* (2006) contains an inventory and detailed information about all wetlands in the City. The City of St. Paul completed a *Wetland Management Plan* (2008) to address the wetlands throughout the City.

The following paragraphs present information for some of the water bodies within the WMO. Increased water quality monitoring information is needed to more accurately classify many of the water bodies and to establish water quality trends. Refer to **Appendix D** for the MPCA's inventory of public waters located in the WMO. The table also classifies some of the water body types according to the MPCA's classification system.

Mississippi River

The Mississippi River borders the majority of the Lower Mississippi River WMO and is a significant resource for the area. As the water source for the City of St. Paul, a national "Heritage River", and a national park this area, the water quality of the Mississippi River is of local, regional, state, and national concern. The Mississippi River is the largest river system in the United States and provides essential benefits including but not limited to transportation, recreation, and ecology. The Lower Mississippi River WMO Board recognizes the importance of improving the quality of the stormwater runoff reaching the Mississippi River from the WMO.

There are three reaches of the Mississippi River that border the Lower Mississippi River WMO, each of which is listed as impaired by the MPCA. The first reach (AUID – 07010206-505), from the Minnesota River to the Metro Waste Water Treatment Plant (River Mile 844 to 835), is impaired due to Fecal Coliform (1996), Polychlorinated Biphenyls (PCB) in fish tissue (1998), Perfluorooctane Sulfonate (PFOS) in fish tissue (2008), Turbidity (1998), and Mercury in fish tissue and water column (1998). The second reach (AUID – 07010206-504), from the Metro Waste Water Treatment Plant to Rock Island Railroad Bridge (River Mile 835 to 830), is impaired due to PCB in fish tissue (1998), PFOS in fish tissue (2008), Turbidity (1998), and Mercury in fish tissue and water column (1998). The third reach (AUID – 07010206-502), from the Rock Island Railroad Bridge to Lock & Dam #2 (River Mile 830 to 815.2), is impaired due to PCB in fish tissue (1998), PFOS in fish tissue (2008), Turbidity (1998), and Mercury in fish tissue and water column (1998). The year in parenthesis is the year the reach was placed on the impaired waters inventory. Refer to the MPCA's website for information on individual Total Maximum Daily Loads (TMDL) start and completion dates.

Sunfish Lake (ID #19-0050-00)

Sunfish Lake, a 51-acre lake located in the City of Sunfish Lake, supports some fishing and swimming, but there is no public access or adjoining public parks. The City has no plans to provide public access or acquire adjacent land for parks. Sunfish Lake has a high overflow outlet, constructed in about 1997**,** that carries water to Friendly Marsh and Interstate Valley Creek. The outlet is located above the Ordinary High Water (OHW) elevation, so there is typically no discharge from the lake. Sunfish Lake was listed by the MPCA as impaired due to nutrients/eutrophication biological indicators in 2010. Sunfish Lake was monitored through the Citizen Assisted Lake Monitoring Program (CAMP) from 2006-2011 and as part of the WRAPS project in 2012.

Water quality data (including Phosphorus, Chlorophyll, Secchi Disk, Temperature, Total Kjeldahl Nitrogen, Pheophytin-a) is available from 1973, 1984, 1985, 1986, 1991, 1994, 1995, 1997, 2006, 2007, and 2008. Not all parameters are available for each year. Sunfish Lake is currently included in the Watershed Restoration and Protection Strategy (WRAPS) project.

Hornbean Lake (ID #19-0047-00)

Hornbean Lake is a 20-acre lake that straddles the Sunfish Lake/Inver Grove Heights border, just north of I-494. It is surrounded by land that is either currently low density residential or will be low density residential in the future. The lake receives runoff from I-494, in addition to the residential land uses. There is no public access or adjoining public parks and neither City has plans to provide future public access or acquire adjacent land for parks. Phosphorus, Chlorophyll, and Secchi disk data are available from water quality sampling conducted from 1999 to 2008. Hornbean Lake was monitored by the CAMP from 2006-2010 and 2012-2013.

Horseshoe Lake (ID #19-0051-00)

Horseshoe Lake is a 15-acre lake that lies in the southeast corner of the City of Sunfish Lake, adjacent to I-494 and Robert Trail. The Horseshoe Lake outlet is located at the southeast corner of the lake; water discharges under 60th Street and flows to small ponds in Inver Grove Heights. The lake is surrounded by land that is either currently low density residential or will be low density residential in the future. There is no public access or adjoining public parks and neither Sunfish Lake nor Inver Grove Heights plans to provide future public access or acquire adjacent land for parks. Phosphorus, Chlorophyll, Secchi disk, Temperature, Total Kjeldahl Nitrogen, and Pheophytin-a data are available from water quality sampling conducted in 2006, 2007, and 2008. Horseshoe Lake was monitored by CAMP from 2006-2013. The relatively good water quality of Horseshoe Lake indicates the lake is not a major contributor of nutrients to the downstream system.

Seidl's Pond (ID #19-0095-00)

Seidl's Pond is a 4-acre pond located in both South St. Paul and Inver Grove Heights. The lake is surrounded by parkland in both cities, which is heavily wooded with steep topography. Seidl's Pond has no surface water outlet (it is "landlocked"). Phosphorus, Chlorophyll, Secchi disk, Temperature, Total Kjeldahl Nitrogen, and Pheophytin-a data is available from 1993-2008. Seidl's Pond was monitored by CAMP from 1995-2013. Not all parameters are available for each year.

Pickerel Lake (ID #19-0079-00)

Pickerel Lake, a 78-acre lake located in Lilydale and St. Paul, is in the Lilydale-Harriet Island Regional Park complex. In addition to the park, land use in the watershed is mostly low density residential. Ivy Falls Creek (and its watershed) discharges into Pickerel Lake. Pickerel Lake also receives drainage from the wetland south of the lake, in the Central Highway 13 watershed. Pickerel Lake discharges to the Mississippi River. When river levels are high enough, the Mississippi River backs up into Pickerel Lake, which can greatly affect the water quality of the lake. Pickerel Lake was listed as impaired due to mercury by the MPCA in 2010 and is part of the state-wide TMDL for mercury.

There is a public access on the lake. Improvements including fish stocking, a nature/interpretive center, a parking area, and other public improvements are proposed for completion in 2011. There is minimal water quality data available for Pickerel Lake; however, the MPCA used volunteers to assess water quality in Pickerel Lake in 2010 and 2011 and by the WMO in 2012 as part of the WRAPS project.

Simley Lake (ID #19-0037-00)

Simley Lake is an 11-acre lake located in Inver Grove Heights. There is a small city park, comprised of the island in the middle of the lake. Access to the park is limited to a pedestrian trail to the island. There is no public access on the lake. Land use in the watershed includes a high school, commercial, and residential land uses. Most of the watershed is developed. Phosphorus, Chlorophyll, Secchi disk, Temperature, Total Kjeldahl Nitrogen, and Pheophytin-a data is available from 1995-2002. Simley Lake was monitored by the LMRWMO in 2012 and 2013. Not all parameters are available for each year.

Dickman Lake/Loch Gregor (ID #19-0046-00)

Dickman Lake/Loch Gregor is a 20-acre lake located in northwestern Inver Grove Heights. The lake's tributary area is primarily from Inver Grove Heights but also includes a small portion of the City of Sunfish Lake, between I-494 and Robert Trail. There is no outlet from Dickman Lake/Loch Gregor. Existing land use in the watershed includes low density residential, park land, and undeveloped land. Future land use in the watershed will convert the undeveloped land to low density residential land use. There are no parks or public access on the lake. Water quality data (Phosphorus, Chlorophyll, Secchi disk, Temperature, Total Kjeldahl Nitrogen, Pheophytin-a, pH, Dissolved Oxygen, Total Suspended Solids, Turbidity) is available for this lake from 1996 and 1997, which indicates the lake is hypereutrophic. The WMO also monitored the Lake in 2010 and 2011.

Thompson Lake (ID #19-0048-00)

Thompson Lake is a 7-acre lake located in the City of West St. Paul. Thompson Lake is the centerpiece for the popular Thompson County Park. The area has numerous trails, a fishing pier, a community center, and a picnic shelter. Monitoring performed by the City of West St. Paul and Dakota County has determined that lake sediments contain concentrations of polycyclic aromatic hydrocarbons (PAHs) at levels that prevent reuse of the sediment on residential or industrial properties. A feasibility study to address the high concentrations of PAHs and investigate the upstream source has been completed. The County and City are working to secure funding to remove the sediment with high PAH concentrations. Thompson Lake was monitored by Dakota County in 2011 and by the LMRWMO in 2012 (as part of the WRAPS project). Thompson Lake is listed on the MPCA's 2014 impaired waters list for Nutrient/Eutrophication Biological Indicators and Chloride.

Rogers Lake (ID #19-0080-00)

Rogers Lake, a 107-acre lake located in Mendota Heights, formerly supported a public swimming beach and is popular among local residents for panfish fishing. Although there is no public access on this lake, there is a City park on the lake with picnic grounds, trails, and play areas that also provides opportunities for non-motorized boating. Land uses in the watershed are highway, low density residential and park land. Outflows from the lake reach Friendly Marsh and Interstate Valley Creek. Phosphorus, Chlorophyll, Secchi disk, Temperature, and Total Kjeldahl Nitrogen data is available for this lake from 2009. Rogers

Lake was monitored by CAMP in 2007, 2009-2011, and 2013. Rogers Lake was also monitored by the WMO as part of the WRAPS project in 2012.

Marcott Lakes (IDs #19-0042-00, #19-0041-00, #19-0040-00, #19-0039-00)

There are no public access points or adjoining park land for any of the Marcott chain of lakes in Inver Grove Heights. Land use in the watershed is currently a mixture of low density residential, highway, and undeveloped land. The undeveloped land is proposed to be low density or rural density residential in the future. Water quality data is available for Marcott (Rosenberger) Lake (DNR #19-0041), a 22-acre lake at the north end of the chain. Based on data from 1995, 1996, 1997, 1998, 2000, 2001 and 2002, the lake water quality is very good. Highway runoff and slope failures have threatened the water quality of Rosenberger Lake in the past. Secchi disk transparency data is available for 27-acre Marcott Lake II (Ohman's Lake, DNR #19-0042) for 1988 and 1989 and water quality data (Phosphorus, Chlorophyll, Secchi disk, Temperature, Total Kjeldahl Nitrogen, Pheophytin-a, pH, Dissolved Oxygen, Total Suspended Solids, Turbidity) is available from 1997. The LMRWMO monitored 19-0039, 19-0041, and 19-0042 in 2012 and 2013.

Schmitt Lake (ID #19-0052-00)

Schmitt Lake is a 57-acre lake located in northern Inver Grove Heights, near the intersection of I-494 and Robert Trail South. There is no public access on the lake. Fishing for northern pike and bluegills is popular at Schmitt Lake. Existing land use in the watershed includes commercial, low and high density residential, and undeveloped land. The WMO monitored Schmitt Lake in 2010 and 2011. Phosphorus, Chlorophyll, and Secchi disk data is available from 2010.

Golf Course Pond (ID #19-0049-00)

This 14-acre pond is located in Inver Grove Heights. Southview Country Club is adjacent to the pond. Other land uses in the watershed include mostly low density residential, with a small amount of medium density residential. There is no public access on the pond. The only water quality data available are Secchi disk transparencies for 1988, which show the pond to be hypereutrophic.

Augusta Lake (ID #19-0081-00)

Augusta Lake is a 33-acre lake located in Mendota Heights, southeast of the intersection of Highways 55 and 110. The land use near the lake is mostly institutional (there is a cemetery on the east side) and single-family housing to the west. The MPCA collected Secchi disk transparency data for Augusta Lake from 1998-2011. Augusta Lake was also monitored through the Gun Club Lake WMO from 2007-2009. Augusta Lake was added to the MPCA's impaired listed in 2010 due to Nutrients.

Lemay Lake (ID #19-0082-00)

Lemay Lake is a 36-acre lake located in Mendota Heights. Land use near Lemay Lake is mostly undeveloped on the east and southeast sides and single-family residential on the west side. The MPCA has collected water quality data for Lemay Lake through 2011.

Other Water Bodies: McGroarty Pond (ID #19-0035-00), Gun Club Pond (#19-0245-00), City Hall Pond (#19-0267-00)

These water bodies, located in Inver Grove Heights, are managed by the DNR's Fishing in the Neighborhood (FiN) Program. For more information on these water bodies and other water bodies managed by the Fishing in the Neighborhood Program refer to the DNR's website www.dnr.state.mn.us.

2.6.2 Water Resources Monitoring Information

Water quality monitoring data is available for: Sunfish Lake, Horseshoe Lake, Hornbean Lake, Seidl's Pond, Dickman Lake, Golf Course Pond, Pickerel Lake, Simley Lake, Marcott Lakes, Augusta Lake, Lemay Lake, Schmitt Lake, Thompson Lake, and Rogers Lake. See **Figure 13** for monitoring locations throughout the WMO. Most of the data was obtained from MPCA's EQUIS Database, including Metropolitan Council's Citizen Assisted Monitoring Program (CAMP) monitoring results. The monitoring at Seidl's Pond, Simley Lake, and Marcott (Rosenberger) Lake was completed under the Metropolitan Council's CAMP. Refer to **Appendix E** for a summary of monitoring information for water bodies in the WMO. More detailed monitoring information can be found online at http://www.dnr.state.mn.us/lakefind/index.html or at the Environmental Data Access system on the MPCA website; http://www.pca.state.mn.us.

2.6.3 2014 List of Impaired Waters (Section 303d)

The MPCA prepares a list of streams and lakes that are not meeting their intended beneficial uses (impaired waters, or 303(d) list). For water bodies on the impaired waters list, the state will be establishing a total maximum daily load (TMDL). To establish a TMDL, a study must be completed that identifies the relative contribution of all point and nonpoint sources of each pollutant that contributes to the impairment of the water body, and develops an implementation plan that reduces pollutant loads so the water body meets designated uses. As of 2014, the Minnesota Pollution Control Agency lists the following water bodies within the WMO as being impaired and the nature of the impairment is shown in parenthesis (the 2014 list is a draft and is currently being reviewed by the EPA):

- Sunfish Lake *(Nutrients/Eutrophication Biological Indicators)*
- Pickerel Lake *(Mercury)*
- *Augusta Lake (Nutrients/Eutrophication Biological Indicators)*
- *Thompson Lake (Nutrients/Eutrophication Biological Indicators, Chloride)*
- *Interstate Valley Creek (E. coli)*
- Mississippi River from the Minnesota River to the Metro Waste Water Treatment Plant, River Mile 844 to 835 *(Fecal Coliform, PCB, PFOS, Turbidity, Mercury)*
- Mississippi River from the Metro Waste Water Treatment Plant to Rock Island Railroad Bridge, River Mile 835 to 830 *(PCB, PFOS, Turbidity, Mercury)*
- Mississippi River from the Rock Island Railroad Bridge to Lock & Dam #2, River Mile 830 to 815.2 *(PCB, PFOS, Turbidity, Mercury)*

Figure 13 shows the impaired waters and the location of monitoring sites listed on the MPCA website.

The MPCA has not monitored for all water quality parameters or all water bodies, so there may be other water bodies considered impaired once an increased monitoring effort has been completed and they are assessed.

2.6.4 Stormwater System, Hydrologic Data, and Flooding Information

Figure 14 shows the major subwatersheds in WMO and labels the subwatersheds based on outlet status to the Mississippi River and whether or not the subwatershed is within more than one member city. The watersheds are grouped as follows:

Group A – Watershed to Mississippi River outlet that encompasses more than one city. An example is the Simon's Ravine subwatershed in South St. Paul and West St. Paul.

Group B – Watershed to Mississippi River outlet that includes only one city. An example is the South St. Paul 2 subwatershed in South St. Paul.

Group C – Watershed that currently has no outlet to the Mississippi River (landlocked), and no outlet is planned for the next 10 to 20 years. An example is the Barnes Avenue subwatershed in Inver Grove Heights.

Table 2-2 lists the subwatersheds and their areas.

Table 2-2. Major Subwatersheds in Lower Mississippi River WMO

Subwatershed Name	Area, in Acres
"A" Subwatersheds – Intercommunity subwatersheds with existing outlet to the Mississippi River	
Interstate Valley Creek	4,318
Highway 13	809
Ivy Falls Creek	707
Riverview	3,490
Simons Ravine	1,425
Wentworth Street	636
South Grove	1,015
Highway 110-494	3,075
Old Village	511
MB	202
Mendota	88
"B" Subwatersheds – Non-intercommunity subwatersheds with existing outlet to the Mississippi River	
South St. Paul 1	150
South St. Paul 2	277
South St. Paul 3	1265
Skyline Village	427
Arbor Pointe	1020
Mississippi River	900
Eagan	30
Simley Lake	566

Subwatershed Name	Area, in Acres
Rosemount	430
Gun Club Lake	1014
IP	477
"C" Subwatersheds – Non-intercommunity subwatersheds with no outlet to the Mississippi River planned for 10-20 years (landlocked)	
Babcock Trail	1,174
Valley Park	427
Inver Grove Trail	426
Barnes Avenue	440
South Marcott Lakes	698
Northwest	2,498
Rich Valley	1,692
Argenta Trail	227
Albavar Path	149
Jefferson Trail	106
110th Street	2,496
Pine Bend	795

Hydrologic modeling results for each member city are contained in their water management plans: Inver Grove Heights (2008), Lilydale (2013), Mendota Heights (2006), Saint Paul (2006), South St. Paul (2012), Sunfish Lake (2009), and West Saint Paul (2006). More detailed information on the drainage within each member city can be found in these plans and can be obtained by contacting the city of interest.

Hydrologic modeling results are also available for the following intercommunity studies and projects: Highway 110-494 watershed, Simon's Ravine, Ivy Falls Creek, East Lexington Avenue, Mayfield Heights Road, and Akron Avenue. These modeling results are stored electronically and are revised/updated on an as-needed basis. This hydrologic information is available from the WMO's engineer.

Flooding information can be found in the member cities' local water management plans, along with detailed information about stormwater ponds. Additional flood information is available from the Flood Insurance Studies (FIS) for some of the WMO communities. Refer to **Figure 15** for the 100-year and 500-year FEMA floodplain locations.

2.7 Public Areas for Water Based Recreation and Access

There are numerous water bodies (see **section 2.6.1**) and parks within or near the WMO which offer recreational activities such as walking, biking, fishing, and boating. A number of recreational resources and opportunities are outlined below:

Parks: Year-round, people utilize the amenities of popular area parks. Thompson County Park, Pickerel Lake Regional Park, Seidl's Lake Park, Kaposia Park, and many others throughout the watershed are visited frequently.

Fishing/Boating: Fishing and boating are popular activities throughout the watershed. Many fishing piers are located on ponds, lakes, and along the Mississippi River. Canoeing and kayaking is also a popular form of recreation and exercise at many water bodies across the watershed. There are no public facilities on any of the basins in the WMO for launching boats, so access is limited for those who do not live adjacent to a water body.

Trail Systems: Walking, biking, and jogging are common activities on the numerous trail systems located at area parks, along the river, and throughout the watershed.

Additional information regarding recreational opportunities within the WMO is available at the member cities' web sites.

2.8 Fish and Wildlife Habitat

The WMO contains habitat for a variety of small mammals, fish, reptiles, birds, amphibians, and insects. Maintenance of habitat for wildlife species is important in maintaining ecological stability of the WMO's natural areas. Information from the DNR indicates there is a variety of unique plant and animal life within the WMO, much of which is located in or around the area water bodies.

There are many different species of fish located in the Mississippi River and area lakes. Fish sampling information can be obtained to determine the species of fish in a given river or lake. This information can be found at www.dnr.state.mn.us/lakefind/index.html. The Mississippi River is an especially popular fishery. The DNR reports there may be over 125 species present in Pool 2 (from Ford Dam in St. Paul to the Hastings Dam) and attracts many anglers fishing for walleye, sauger, catfish, and white bass.

2.9 Unique Features

2.9.1 Scenic Areas

Scenic areas include State designated Scientific and Natural Areas, designated Scenic Areas, and Historic Areas. The WMO contains many lakes and wetlands that are the centerpiece for many scenic areas and parks. It is bordered by the Mississippi River on the entire north and east boundaries. The Katherine Ordway Natural History Study Area is adjacent to the Mississippi River, in southeast Inver Grove Heights. Other important park areas include Thompson County Park in West St. Paul and Dodge Nature Center in Mendota Heights.

2.9.2 Natural Communities and Rare Species

The Minnesota DNR Natural Heritage Information System from 2011 was queried for the WMO. The Minnesota DNR conducts the Minnesota County Biological Survey (MCBS), which identifies natural communities and rare species. The Natural Heritage Information System shows the presence of rare species in WMO along the Mississippi River in Lilydale, South St. Paul, St. Paul, and Inver Grove Heights. The survey also shows the presence of rare species in the Cities of West St. Paul and Inver Grove Heights separate from the Mississippi River corridor. In addition, there are 16 native plant communities including mesic prairies, dry sand prairies, and black ash seepage swamps within the WMO boundary. These surveys are evidence of the ecological importance of the Mississippi River

corridor and critical habitats within the member cities. **Figure 16** shows the location of MCBS Native Plant Communities and Scientific and Natural Areas.

The presettlement vegetation in the WMO consisted of river bottom forest along the Mississippi River, and as a mixture of oak openings and barrens, upland deciduous forest, and brush prairie. **Figure 17** shows the presettlement vegetation.

2.9.3 Mississippi National River and Recreational Area (MNRRA) and Mississippi River Corridor Critical Area (MRCCA)

The Minnesota State Legislature enacted the Critical Areas Act in 1973 and an executive order (79-19) was signed in 1976 declaring the Mississippi River corridor a Critical Area. The executive order states the following purposes for the Critical Area designation:

1. To protect and preserve a unique and valuable state and regional resource for the benefit of the health, safety and welfare of the citizens for the state, region, and nation;
2. To prevent and mitigate irreversible damage to this state, regional and national resource;
3. To preserve and enhance its natural, aesthetic, cultural, and historical value for the public use;
4. To protect and preserve the river as an essential element in the national, state and regional transportation, sewer and water and recreational systems; and
5. To protect and preserve the biological and ecological functions of the corridor.

The MRCCA includes 72 miles of the river, extending from the Cities of Dayton and Ramsey to just south of the City of Hastings. The boundary of the MRCCA can generally be described as from the river bluff down to the river, with the corridor width varying. The Cities of Inver Grove Heights, Lilydale, Mendota Heights, St. Paul, and South St. Paul are affected by the state Critical Areas Act and the federally designated MNRRA. **Figure 18** shows the MRCCA boundary in relation to the WMO.

In 1976, four corridor districts were established, corresponding to the following different types of land use along the Mississippi River: rural open space district, urban developed district, urban open space district, and urban diversified district. Each district has its own set of guidelines. The Critical Area Act requires that each city having jurisdiction over land within the Critical Area develop a Critical Area Plan. Executive Order 79-19 includes the rules and guidelines that each city must incorporate in its Critical Area Plan.

In 1988, the U.S. Congress designated the Mississippi River corridor as the MNRRA, a unit of the national park system. The boundaries of the MNRRA corridor are the same as the Critical Area corridor. MNRRA was established to:

1. Protect, preserve, and enhance the significant values of the Mississippi River corridor through the Twin Cities metropolitan area;
2. Encourage coordination of federal, state, and local programs; and
3. Provide a management framework to assist the state of Minnesota and local governments in the development and implementation of integrated resource management programs and ensure orderly public and private development in the area.

The Mississippi River Coordinating Commission and the National Park Service adopted the MNRRA *Comprehensive Management Plan* in 1995. This plan adopts and incorporates by reference the state Critical Area Program, Shoreland Management Program, and other applicable state and regional land use management programs. The MNRRA comprehensive plan also identifies voluntary policies that are additional to the Critical Area requirements, for the purpose of protecting and enhancing river resources. The earlier Critical Area requirements are referred to as Tier 1 criteria, whereas the additional voluntary guidelines in the MNRRA comprehensive plan are referred to as Tier 2 criteria. Although city conformance with Tier 2 criteria is not mandatory, conformance to Tier 2 criteria is necessary to receive federal grants for land acquisition and development. All of the member cities within the MNRRA corridor have comprehensive plans that conform to Tier 1 criteria, but there are varying levels of conformance with Tier 2 criteria.

In 2009 the Minnesota State Legislature directed the DNR to conduct new rulemaking for the MRCCA. The boundary of the existing corridor is not anticipated to change, however the boundaries and requirements within the corridor are expected to change. The adoption of updated rules will be mandatory by the local government units (LGUs) located within corridor boundaries. New rules for the MRCCA are in the process of being drafted and are expected to be completed shortly after the adoption of this plan.

2.10 Pollutant Sources

The MPCA identified the following types and number of environmentally contaminated sites within the WMO:

1. MPCA's List of Permitted Solid Waste Facilities (SWPERM) – 16 sites
2. MPCA's 1980 Metropolitan Area Waste Disposal Site Inventory (MDI), unpermitted dumpsites – 25 sites
3. MPCA's Voluntary Investigation and Cleanup (VIC) Unit List – 95 sites
4. MPCA's Sites Delisted from Permanent List of Priorities (DPLP) – 3 sites
5. U.S. EPA's No Further Remedial Action Planned (NFRAP) Sites, removed from CERCLIS by U.S. EPA – 8 sites
6. MPCA's Closed Landfill Sites Undergoing Cleanup – 1 site

The MPCA also identified approximately 250 reported underground storage tank leaks within the WMO.

Refer to **Figure 19** for approximate location of possible pollutant sources throughout the WMO. More information can be obtained by contacting the MPCA or going to www.mpca.state.mn.us and searching "What's in my neighborhood". The MPCA should be contacted for site-specific details.

Dakota County initiated the Site Assessment and Site Response Program to inventory, identify, evaluate and restore contaminated sites. This program complements existing State and Federal programs.

The highways in the WMO (i.e. I-35E, I-494, Highway 52, and Highway 55) present potential environmental hazards. For example, a spill on Interstate 494 could result in pollution of Schmitt Lake since the lake is located immediately adjacent to the roadway. The MPCA's spill reports show that spills have occurred in the past on Interstate 494 and Highways 52 and 55 within the WMO.

Other potential pollutant sources include industrial, office, commercial, residential and other highly impervious land uses. Stormwater runoff from these land uses could carry pollutants into the stormwater system (nonpoint source pollution), especially if there are direct inlets into the storm sewer system that do not drain first into a stormwater pond. Facilities within these land use types may be covered by a NPDES General Industrial Stormwater Permit, which requires preparation of stormwater pollution prevention plans (SWPPP) to prevent nonpoint source pollution. In addition, each member city is part of the MPCA's MS4 (Municipal Separate Storm Sewer System) program. Each member city is required to have a city wide SWPPP as part of the MS4 program requirements. Refer to the MPCA's website for the most up to date information regarding these programs.

2.11 Water Resource Problem Areas

A number of water resource problem areas, issues or concerns were identified within the WMO. The problem areas were identified through information obtained from the Technical Advisory Committee (TAC) and the Citizen Advisory Committee (CAC). Each site was analyzed and potential solutions to address the problems were developed, as detailed in **Section 4**. Refer to **Figure 20** for the location of site-specific problem areas. The following is a list and brief description of some of the water resource problem areas in the WMO.

1) Stream bank erosion along the Mississippi River – Improvements are needed to stabilize erosion-prone areas and reduce sediment loading to the river.

2) Pickerel Lake Regional Park for BMPs and Improvements – Improvements are needed to enhance water quality and provide access to high quality recreational areas.

3) PAHs present in Thompson Lake Sediments – Increased modeling and source determination needs to be completed to address PAHs.

4) Impaired Waters – The MPCA has identified Sunfish Lake, Pickerel Lake, Augusta Lake, Thompson Lake, Interstate Valley Creek, and three reaches of the Mississippi River as being impaired.

5) Debris and Floatables at Simley Lake – Source of pollution and maintenance responsibilities need to be addressed.

6) Flooding and Erosion at Marie Ave/Dodd Rd. – Improvements need to be constructed to address erosion and reduce flood potential.

7) Erosion at Golf Course Pond – Continued monitoring of the erosion problem is needed along with potential constructed improvements.

8) Water Quality in Hornbean Lake – Implementation of BMPs in the Hornbean Lake watershed is needed to minimize the impacts of upstream development.

9) Erosion of Ravines and Bluffs Tributary to Ivy Falls Creek and Pickerel Lake.

10) Seidl's Lake Erosion and Water Quality Issues

There are most likely additional problem areas located throughout the WMO that have yet to be identified due to a lack of monitoring. These problem areas will be identified and addressed as additional monitoring occurs.

The *Lower Mississippi River WMO Watershed Restoration and Protection Strategy (WRAPS) and Total Maximum Daily Load (TMDL) Report* (WRAPS report) was completed and published in September 2014. For more information on the WRAPS, please see the WRAPS website at: http://www.dakotaswcd.org/watersheds/lowermisswmo/wrapp.html

3.0 Agency Cooperation

There are a number of local, state, and federal agencies that have rules and regulations related to water resource management. The WMO recognizes the roles of these other agencies and will cooperate, coordinate, and when possible partner with these agencies.

This Plan is in conformance with but does not restate all other agency rules that are applicable to water resource management. The following agencies deal with or regulate water resources throughout the WMO:

- Minnesota Department of Health www.health.state.mn.us
- Minnesota Pollution Control Agency www.pca.state.mn.us
- Board of Water and Soil Resources www.bwsr.state.mn.us and the Wetland Conservation Act www.bwsr.state.mn.us/wetlands/wca/index.html
- Minnesota Department of Natural Resources www.dnr.state.mn.us
- US Army Corps of Engineers www.mvp.usace.army.mi
- Minnesota Department of Agriculture www.mda.state.mn.us
- US Fish and Wildlife Service www.fws.gov
- Dakota County www.co.dakota.mn.us
- Dakota County Soil and Water Conservation District www.dakotacountyswcd.org
- Ramsey County www.co.ramsey.mn.us
- Ramsey County Soil and Water Conservation District www.co.ramsey.mn.us/cd/index.htm
- Minnesota Environmental Quality Board www.eqb.state.mn.us
- Metropolitan Council www.metrocouncil.org
- National Park Service www.nps.gov

While these other agencies' rules, policies, and guidelines are not all restated in this Plan, they are applicable to projects, programs, and planning within the WMO. The MPCA Minnesota Stormwater Manual, which is a document intended to be frequently updated, is also incorporated by reference into this Plan and can be found at www.pca.state.mn.us/water/stormwater/stormwater-manual.html.

4.0 Problems and Approaches for Addressing Problems

This section contains an assessment of existing and potential water resource-related problems within the WMO. These problems have been identified from analysis of the land and water resource data collected during the preparation of this Plan, through information provided by the WMO, information from the member cities, information obtained at the public open house, and contributions from the TAC and CAC. A description of existing and potential problems within the WMO has been listed along with potential corrective actions. The WMO implementation plan containing future planning and projects is presented in **Tables 6-1, 6-2, 6-3, 6-4**, and **6-5.** Projects and studies completed by the WMO and member cities that resolved problems and issues identified in previous plans can be found in **Table 6-6**.

Refer to **Figure 20** for the location of site-specific problem areas.

4.1 Water Quality Problems and Issues

Problem 4.1.A: The following water bodies located in the WMO have been listed as impaired by the Minnesota Pollution Control Agency:

- Sunfish Lake *(Nutrients/Eutrophication Biological Indicators)*
- Pickerel Lake *(Mercury)*
- *Augusta Lake (Nutrients/Eutrophication Biological Indicators)*
- *Thompson Lake (Nutrients/Eutrophication Biological Indicators, Chloride)*
- Interstate Valley Creek (*E. coli*)
- Mississippi River from the Minnesota River to the Metro Waste Water Treatment Plant, River Mile 844 to 835 *(Fecal Coliform, PCB, PFOS, Turbidity, Mercury)*
- Mississippi River from the Metro Waste Water Treatment Plant to Rock Island Railroad Bridge, River Mile 835 to 830 *(PCB, PFOS, Turbidity, Mercury)*
- Mississippi River from the Rock Island Railroad Bridge to Lock & Dam #2, River Mile 830 to 815.2 *(PCB, PFOS, Turbidity, Mercury)*

Approach for Addressing Problem 4.1.A: The WMO and affected member cities shall work with the MPCA and other relevant agencies to address impairments, develop TMDLs, and implement TMDL and Watershed Restoration and Protection Strategy (WRAPS) plans. The WMO and its member cities shall also be prepared to incorporate the provisions of the South Metro Mississippi TSS TMDL and the Upper Mississippi River Bacteria TMDL once they are completed. The WMO will be affected by both of these implementation plans that are anticipated to be completed during the ten year life-cycle of this plan.

The mercury TMDL is a statewide study that was completed by the MPCA in 2007. Over 90% of the mercury deposition in the state originates beyond the boundaries of the State of Minnesota. The federal government will be responsible for meeting its reduction goal, while

the State of Minnesota needs a 93% reduction from 1990 levels by 2025 to meet its share. The MPCA will work with an Implementation Oversight Group and Minnesota entities that release mercury into the environment.

Monitoring has not been completed for all water quality parameters or all water bodies within the WMO. As a result, other water bodies may be added to the impaired waters list once an increased monitoring effort has been completed.

Problem 4.1.B: Increased water quality monitoring is needed to better classify DNR protected water bodies in the WMO and to help establish water quality trends.

Approach for Addressing Problem 4.1.B: The WMO will work with member cities to develop a monitoring program to collect water quality data for water bodies throughout the WMO. Monitoring will be determined annually and by the WMO budget. The data collected, combined with historic data will be used to classify water bodies, establish water quality trends, and determine areas where improvements are necessary to preserve and enhance resources. The WMO may conduct monitoring, require the local governments to conduct monitoring, or seek other means to complete these monitoring activities.

The WMO may also work with the MPCA to monitor water bodies as part of the MPCA's Watershed Approach Program.

Problem 4.1.C: There is not enough data to understand the quality of water reaching the Mississippi River through stormwater outfalls and streams.

Approach for Addressing Problem 4.1.C: The WMO will work with member cities to develop a monitoring program to monitor select outfalls to the Mississippi River. Monitoring will be determined annually and by the WMO budget. This monitoring effort will help identify point source locations for pollutant loadings to the river and will help establish high priority areas for water quality improvements and BMP implementation. This will also help identify the most cost-effective locations to construct water quality capital improvements.

Problem 4.1.D: The efficiency and effectiveness of many stormwater BMPs in the watershed is unknown.

Approach for Addressing Problem 4.1.D: MPCA's Minimal Impact Design Standards (MIDS) Project, once complete, should be utilized to help determine the effectiveness of BMPs within the WMO. Refer to http://www.pca.state.mn.us for more information and updates on the MIDS Project.

The WMO may also monitor certain BMPs throughout the WMO to determine their effectiveness. This may be accomplished through the use of grant funding or volunteers.

Problem 4.1.E: There are increased algae blooms due to excessive nutrients in many lakes, rivers, and ponds.

Approach for Addressing Problem 4.1.E: Stormwater BMPs shall be implemented by member cities to reduce both point source and non point source pollutants and reduce the impact of development on the water quality of water bodies in the WMO. Retrofits of existing BMPs shall also be performed where feasible and applicable during redevelopment.

Increased education and public awareness of housekeeping BMPs will be a focus of the WMO and member cities to improve the quality of surface waters in the WMO.

Problem 4.1.F: Water quality in Hornbean Lake may be negatively impacted by future development in Inver Grove Heights and Sunfish Lake.

Approach for Addressing Problem 4.1.F: BMPs shall be implemented by Inver Grove Heights and Sunfish Lake as development occurs to reduce negative impacts on Hornbean Lake and other resources downstream of the development.

Problem 4.1.G: Presence of polycyclic aromatic hydrocarbons (PAHs) in Thompson Lake.

Approach for Addressing Problem 4.1.G: A feasibility study was completed in 2014 to evaluate stormwater and sediment improvements. A stormwater basin at the north end of Thompson Lake is anticipated to be constructed consistent with the WRAPS Study and feasibility study for Thompson Lake.

Problem 4.1.H: Accumulation of debris and floatables at Simley Lake.

Approach for Addressing Problem 4.1.H: The WMO will investigate the source of the pollution and will establish maintenance responsibilities of Simley Lake in effort to address the problem.

Problem 4.1.I: The ability of member cities to efficiently address requirements of new NPDES and MS4 Permits.

Approach for Addressing Problem 4.1.I: Develop education and public outreach programs that address member city NDPES and MS4 Permit requirements. Investigate the cost and efficiency of assisting member cities with MS4 Permit renewals.

Problem 4.1.J: Multiple water resource issues have been outlined in the "Lower Mississippi River WMO Watershed Restoration and Protection Strategy (WRAPS) Report" completed in 2014. Thompson, Pickerel, Sunfish, Augusta, and Rogers Lakes are included in the WRAPS study.

Approach for Addressing Problem 4.1.J: It is a high priority of the WMO to address the issues outlined in the WRAPS Report which can be found at the following link: http://www.pca.state.mn.us/index.php/view-document.html?gid=21144.

4.2 Flooding and Stormwater Rate Control Concerns

Problem 4.2.A: Increased impervious areas that result from development or redevelopment and other land use practices cause increased rates and volumes of stormwater runoff which may result in downstream flooding, erosion, sedimentation, and water quality problems.

Approach for Addressing Problem 4.2.A: Strengthen the WMO's current Low Impact Development (LID) encouragement policy and rate control and volume control goals while taking into consideration development and redevelopment conditions. Focus on performance standards rather than prescriptive standards for water quality improvements.

The WMO shall also utilize the MPCA's MIDS Project, once it has been completed, to help determine appropriate and effective BMPs for certain development and redevelopment conditions.

Problem 4.2.B: The WMO has a number of landlocked basins that need to be evaluated on whether they will require an outlet or remain landlocked.

Approach for Addressing Problem 4.2.B: WMO and member cities will evaluate landlocked basins of interest. If there are no flooding concerns, no outlet will be necessary. If the area does flood or could cause flood problems in the future, the WMO and member cities will investigate the option of providing an outlet for the area which will protect adjacent land uses and not adversely impact downstream resources.

Problem 4.2.C: Establishing appropriate minimum building elevations to prevent the flooding of structures located adjacent to flood-prone areas and landlocked basins.

Approach for Addressing Problem 4.2.C: Member cities shall establish minimum building elevations above the critical 100-year flood elevation. The cities need to consider the effects of larger storms and plugged outlet conditions when they set these elevations. In situations such as landlocked basins or ponds with large tributary watersheds, additional freeboard above the 100-year flood elevation may be required. The cities also need to provide emergency overflows for ponds and inundation areas to address plugged outlet conditions and the effects of larger floods.

Problem 4.2.D: Flooding and erosion at Marie Avenue/Dodd Road.

Approach for Addressing Problem 4.2.D: Feasibility study has been completed for this problem area. Improvements need to be constructed to address the flooding and erosion problems.

Problem 4.2.E: Rate control and streambank erosion in the Interstate Valley Creek Watershed north of Marie Avenue.

Approach for Addressing Problem 4.2.E: Feasibility study and project shall be completed to address rate control issues and provide streambank stabilization north of Marie Avenue in the Interstate Valley Creek Watershed.

Problem 4.2.F: Drainage issues in Lilydale east of the intersection of Lexington Avenue (County Road 43) and Sibley Memorial Highway (Trunk Highway 13) have resulted in major water problems at the Lexington-Riverside Condominiums (1101 Sibley Memorial Highway), ongoing sedimentation and erosion problems within the highway right-of-way and on Lexington-Riverside property, and gullying and erosion problems along the Mississippi River bluffs. Runoff coming down the hill from Mendota Heights is a contributing factor to these drainage and flooding issues.

Approach for Addressing Problem 4.2.F: A feasibility study to investigate this problem was completed in 2010. Recommended improvements include plugging the west culvert under Trunk Highway 13 and diverting water eastward through a ditch and culvert on the south side of Trunk Highway 13, construction of a new outlet from the Lexington-Riverside Pond, construction of a new storm sewer system to convey flows from the pond to the existing storm sewer, and addressing hillside erosion on the Overlook Condominiums

Property. The Cities of Lilydale and Mendota Heights, along with MnDOT, Dakota County, and the Lexington-Riverside Condo Association are anticipated to participate in the cost share for this project. More information can be found in the *Lexington Avenue-Trunk Highway 13 Drainage and Erosion Feasibility Study* which can be found on the WMO's website.

Problem 4.2.G: Seidl's Pond, a landlocked basin in South St. Paul, experiences high water levels and periodic flooding.

Approach for Addressing Problem 4.2.G: A feasibility study to address this problem was completed in 2004. Construction of an outlet and a lift station is necessary to reduce drainage and flood potential of the area. More information can be found in the feasibility study which can be obtained by contacting the WMO.

Problem 4.2.H: The storm sewer system on Dawn Way in Inver Grove Heights is susceptible to surcharge as a result of insufficient capacity to convey storm water runoff from the upstream drainage area. The upstream drainage area consists of the South St. Paul Airport and portions of Inver Grove Heights.

Approach for Addressing Problem 4.2.H: Hydrologic analysis and cost split analysis have been completed for potential Dawn Way storm sewer system improvements. The Cities of Inver Grove Heights and South St. Paul will construct the necessary improvements to address the existing drainage problems and provide additional capacity to the Dawn Way storm sewer system.

4.3 Impacts of Water Resource Management on Recreation

Problem 4.3.A: The WMO has limited public access to high quality lakes and park areas for recreational activities.

Approach for Addressing Problem 4.3.A: The WMO and member cities will investigate opportunities to implement access points and construct improvements to improve access to high quality water resources in the area. An example of this is the improvements currently underway at Pickerel Lake Regional Park to increase access and provide an enhanced recreation area.

4.4 Impacts of Wetland Loss on Fish and Wildlife Resources

Problem 4.4.A: Due to densely developed areas in the WMO, some member cities may have less opportunity than others to take advantage of wetland banking and restoring fish and wildlife resources.

Approach for Addressing Problem 4.4.A: The WMO will evaluate and pursue locations to conduct wetland restoration opportunities. These locations may serve as a wetland bank for member communities within the WMO and thus increase fish and wildlife resources within the WMO.

4.5 Impacts of Erosion and Sedimentation on Water Resources

Soil erosion can be a significant sediment source to water resources throughout the WMO, resulting in decreased water depth and degraded water quality. Erosion also impacts stormwater rates and volumes. As soil erodes, vegetation is removed from the ground

surface, which results in increased rates of stormwater runoff. Erosion also results in channelization of stormwater flow, increasing the rate of stormwater runoff.

Problem 4.5.A: There are many areas along the Mississippi River, within the boundary of the WMO, that are experiencing stream bank erosion. This erosion results in a large sediment load to the river.

Approach for Addressing Problem 4.5.A: The WMO will work with the U.S. Army Corps of Engineers to identify the exact location and extent of the erosion problems. The WMO will reference the DNR's *River Restoration Guidelines*, once completed, when developing improvement options. Improvements will then need to be constructed to stabilize erosion-prone areas and reduce sedimentation of the river.

Problem 4.5.B: The need for consistency in erosion control inspection and design requirements.

Approach for Addressing Problem 4.5.B: Conduct and/or facilitate joint certification training for member city staff on designing and inspecting erosion control plans and erosion control measures.

Problem 4.5.C: Significant erosion and sedimentation along the Mississippi River near Cherokee Heights Park in St. Paul.

Approach for Addressing Problem 4.5.C: The City of St. Paul is currently completing a feasibility study to evaluate improvement options to address the erosion issues. The feasibility study is anticipated to be completed in 2014. It is estimated that improvements will be constructed in 2016. The City and WMO plan to investigate grant opportunities to help fund the improvements. Cost share will also be determined.

Problem 4.5.D: Sedimentation of stormwater ponds reduces storage volume capacity, decreases stormwater treatment ability, and can result in flooding.

Approach for Addressing Problem 4.5.D: WMO and member cities shall develop a maintenance program for pond maintenance and maintenance of all BMPs to avoid these potential issues. Determination of excess sources of sediment or other loadings will be a component of this maintenance program.

Problem 4.5.E: Golf Course Pond, in northern Inver Grove Heights, has severe erosion around the entire shore of the pond, but the erosion may be the result of a high water table, and not the result of wave action or runoff.

Approach for Addressing Problem 4.5.E: The WMO and City of Inver Grove Heights will need to monitor the problem and determine if action is required.

Problem 4.5.F: There are shoreland vegetation and erosion problems on various water bodies in the WMO.

Approach for Addressing Problem 4.5.F: Evaluate DNR protected water bodies with potential or known problems within the WMO and pursue shoreland restoration projects where needed.

4.6 Impact of Land Use Practices and Development on Water Resources

Problem 4.6.A: There is a need for groundwater management and protection in the WMO.

Approach for Addressing Problem 4.6.A: The WMO and member cities shall encourage infiltration in suitable areas to provide groundwater recharge and stormwater volume control. Infiltration shall not be allowed in areas with potential contamination, drinking water supply management areas, and wellhead protection areas. Infiltration will not be encouraged where soils are not suitable for infiltration or where there is less than three feet of separation between the bottom of the infiltration system and the groundwater or bedrock.

4.7 Public Education

Problem 4.7.A: The public needs more education on issues facing the water resources in their community and how they impact water quality.

The current WMO education program consists of the annual WMO newsletter, which the member cities distribute, and the annual activity report, which is submitted to BWSR and is available to residents upon request.

The cities use a variety of methods to educate their residents about stormwater management issues. Some of these methods include: storm drain stenciling, door hangers, newsletters, and newspapers and other media to distribute water resource and stormwater management information. Member cities are also involved in Dakota County's Wetland Health Evaluation Program (WHEP) which uses volunteers to assess the biological health of wetlands.

Approach for Addressing Problem 4.7.A: Expand the WMO's education and public involvement efforts to provide more assistance to the member cities. The WMO shall implement a marketing strategy throughout the WMO that helps change social behavior in regards to stormwater and water quality. The WMO will also investigate the creation of a committee to focus on education and public outreach. Refer to **Section 5.8** for details regarding the new components of the WMO education program.

4.8 Administrative Issues

Problem 4.8.A: Some grants and funding is only available to watersheds or similar organizations.

Approach for Addressing Problem 4.8.A: Assist member cities in pursuing/securing grants to assist in implementation of their Local Water Resource Management Plans.

Problem 4.8.B: Implementation of the evaluation criteria contained in the BWSR performance standards.

Approach for Addressing Problem 4.8.B: Redirect administrative resources to address BWSR performance standards such as data practices policy, project and program expenditures, Board training, operational guidelines, water quality and watershed yield trends, and public information and education outcomes.

Problem 4.8.C: Need to improve collaboration of WMO/WD and County ideas and programs to maximize efficiency throughout the WMO.

Approach for Addressing Problem 4.8.C: Explore opportunities to partner with other WMO/WD programs and County programs.

Problem 4.8.D: The WMO is required to have a Board that contains all citizen members.

Approach for Addressing Problem 4.8.D: The WMO will pursue the transition of its Board to an all citizen member Board.

Problem 4.8.E: Expansion of Technical Advisory Committee (TAC) membership and participation.

Approach for Addressing Problem 4.8.E: Revise JPA to broaden membership of formal TAC beyond county and SWCD staff to include member city staff and others.

Problem 4.8.F: There are concerns that the current electronic and GIS boundary of the WMO does not reflect the existing Joint Powers Agreement watershed boundary.

Approach for Addressing Problem 4.8.F: The WMO will compare legal documents from the Joint Powers Agreement and the existing GIS watershed boundary to verify the appropriate limits of the WMO.

Problem 4.8.G: Lack of citizen involvement and participation in dealing with processes, education, and issues throughout the WMO.

Approach for Addressing Problem 4.8.G: The Board will investigate implementation of a permanent CAC. The CAC would be utilized as an advisory group to the Board and would provide watershed-wide input on items such as water resource problems and strategies to improve education.

4.9 Adequacy of Existing Programs

Problem 4.9.A: The water body classification system (Categories I-V) used by the WMO since their Second Generation Plan (2001) does not align with the MPCA's water body classification system and water quality monitoring protocol.

Refer to **Appendix F** for a description of the former classification categories along with the water bodies that were classified by the WMO and the member cities.

Approach for Addressing Problem 4.9.A: The WMO will use a similar water body classification system to that of the MPCA. Refer to **Table 5-1** located in **Section 5.3.2.I** for the table that will be used to help classify water bodies as deep lakes, shallow lakes, wetlands, and ponds. The pond column has been added to the MPCA's table by the WMO to provide a classification for water bodies that may be considered ponds.

The classification system determines whether a water body should be managed as a deep lake, shallow lake, wetland, or pond. For water bodies classified as wetlands, member cities must use a wetland management classification system that takes into account the susceptibility of the wetlands to degradation by stormwater. The WMO requires the member cities use a wetland classification system that ranks the wetlands and sets wetland management standards based on the rank and desired level of protection. **Table 5-2** in **Section 5.3.2.I** shows the WMO's water quality goals based on classification.

Problem 4.9.B: The WMO does not currently have a uniform water quality cost allocation formula for inter community projects.

The WMO does have "allowable flow" which is the flowrate that an upstream community can discharge to a downstream community without incurring financial obligation for the stormwater management system in the downstream community. The allowable flow is intended to represent the flows from the tributary watershed under natural/pre-development conditions. Discharges from the upstream community in excess of the allowable flow obligate the upstream community to share in the cost of the stormwater management system, in accordance with the formulas in the joint powers agreement. The September 1985 Joint Powers Agreement sets forth the method for calculating allowable flow. **Appendix B** includes a copy of the joint powers agreement and memoranda regarding allowable flow.

Approach for Addressing Problem 4.9.B: The WMO will attempt to develop a water quality cost allocation formula. The WMO will also review the current allowable flow methodology and verify that no revisions are necessary.

Problem 4.9.C: Maintenance of Stormwater System - The stormwater system within the WMO includes pipes, constructed ponds, lakes, wetlands, ditches, swales and other drainageways. Proper maintenance of the stormwater system will ensure that the system provides the necessary flood control and water quality treatment. Many units of government are responsible for maintaining the stormwater systems within the WMO and need to perform this maintenance on a regular basis. For example:

- MnDOT is responsible for maintaining the storm sewers, ponds, culverts, etc. located along I-494, I-35E, Highway 55, Highway 52, Highway 156, Highway 110, and Highway 3.

- Dakota County is responsible for maintaining only the "mainline" culvert crossings in their county roads; member cities are currently responsible for maintaining storm sewer catch basins and leads in the county roads (e.g. County Road 73-"Babcock Trail", County Road 75-"Cahill Avenue", and County Road 26-"70th Street").

- Ramsey County is responsible for maintaining storm sewer catch basins and leads in the county roads (e.g. County Road 63-"Delaware Avenue").

- Member cities are responsible for maintaining their stormwater system in accordance with the requirements of the MPCA SWPPP Program.

- Owners of private stormwater facilities are responsible for maintaining their facilities in proper condition, consistent with the original performance design standards.

For stormwater systems constructed using WMO cost share monies, member cities may request reimbursement from the WMO for maintenance activities, according to the WMO cost share formula since the new JPA has other cost share methods.

Approach for Addressing Problem 4.9.C: Maintenance responsibilities shall be carried out by the appropriate organizations listed above. Member cities are to fulfill their requirements and notify the WMO or other regulatory agencies should they know of maintenance deficiencies.

4.10 Availability and Adequacy of Existing Information to Manage Water Resources

Problem 4.10.A: Several intercommunity drainage issues had persisted unresolved for decades prior to the establishment of the WMO. The WMO and its member cities successfully addressed the majority of the intercommunity water management issues identified in past plans. The cooperation of the member cities and the implementation of the WMO's Joint Powers Agreement (JPA) were key factors in resolving many of the identified problems.

Approach for Addressing Problem 4.10.A: The WMO will continue to update the implementation plan and prioritize and address water resource issues as they arise.

5.0 Goals, Strategies, and Policies

The WMO has developed a number of purposes for the management of the watershed and its water resources. These purposes have been developed to be consistent with the vision of the WMO, as well as, to meet the requirements of the Metropolitan Surface Water Management Act. In addition, many goals, strategies, and policies have been outlined to help achieve the purposes of the 3rd Generation Watershed Management Plan.

5.1 Watershed Management Purposes

5.1.1 Lower Mississippi River WMO Purposes (3rd Generation)

The WMO developed the following vision statement on December 23, 2009:

> *"Water resources and related ecosystems are managed to sustain their long-term health and integrity through member city collaboration and partnerships with other water management organizations with member city citizen support and participation."*

The general purposes for the 3rd Generation Plan include the following purposes consistent with the Metropolitan Surface Water Management Act and Minnesota Statutes 103B.201.

- Protect, preserve, and use natural surface and groundwater storage and retention systems.
- Minimize public capital expenditures needed to correct flooding and water quality problems.
- Identify and plan for means to effectively protect and improve surface water and groundwater quality.
- Establish more uniform local policies and official controls for surface and groundwater management.
- Prevent erosion of soil into surface water systems.
- Promote groundwater recharge.
- Protect and enhance fish and wildlife habitat and water recreational facilities.
- Secure other benefits associated with the proper management of surface water and groundwater.

In addition, the WMO has developed the following purposes:

- Assist member cities in achieving current and future water quality and water quantity regulations collaboratively, equitably, and cost-effectively for all members within the watershed.
- Identify and effectively communicate member concerns to other government jurisdictions to better align their policies and activities with those of the WMO and its members.

- Educate citizens about the use, protection, and management of water resources and engage them in WMO water management programs and decision making.

- Consider potential impacts of WMO decisions on natural resources and habitat.

- Govern the WMO with a citizen-led Board and keep regulation at the local level – the WMO will not administer a permit program.

- Assist member communities with *intercommunity* runoff and water resource management issues. The WMO, at the discretion of the Board, may also work with individual member cities to address water resource issues within individual city boundaries. This may include, but is not limited to, monitoring of water bodies or outlets to the Mississippi River.

- Assess performance of the WMO and the member cities toward achieving the goals stated in this plan.

- Provide member cities with useful information about the WMO, its activities, and water resource management.

To achieve the purposes of the WMO, the following goals, strategies, and policies have been developed for water quantity, water quality, recreation, fish and wildlife habitat, wetlands, groundwater protection, erosion and sedimentation, education, and administration.

WMO Goals: Desired outcomes to help achieve the vision of the WMO and the purposes of this plan.

WMO Strategies: Activities the WMO will undertake to help achieve their goals.

WMO Policies: Standards that have been developed that require specific action of the member cities to help achieve the goals of the WMO.

These goals, strategies, and policies have been developed to complement member city, county, regional, and state goals and policies. Pursuant to State Statute, member cities shall update their local plans (if necessary) within two years of WMO adoption of this plan.

An implementation plan has been developed that outlines the estimated completion dates and timelines of the WMO's measurable outcomes and activities. The implementation plan is located in **Section 6**.

5.2 Water Quantity

The WMO recognizes the importance of minimizing effects of development and redevelopment to reduce existing and avoid future water resource problems. The following goals and policies have been developed to address volume control, rate control, flooding, and other water quantity related issues.

5.2.1 WMO Goals

A. Reduce stormwater runoff volumes by increasing infiltration and ground water recharge.

B. Reduce existing flood occurrences and minimize future flood potential throughout the WMO.

5.2.2 WMO Strategies

A. The WMO will establish stormwater volume reduction requirements taking into consideration variable development and redevelopment conditions. This may include establishing LID policies to provide increased volume control for development and redevelopment projects. (Goal 5.2.1 A, Goal 5.2.1 B)

B. The WMO will continue to use the previously established intercommunity "design flows" (stormwater flow rates that the stormwater management system is expected to convey with fully developed conditions in the watershed) as the design parameters for downstream improvements. The WMO will also continue to use the previously established "allowable flows" (stormwater flow rate that an upstream community can discharge to a downstream community without incurring financial obligation for the stormwater system in the downstream community) as the basis for determining the financial obligation of member cities for intercommunity flooding and erosion control projects. Refer to **Appendix B** for the joint powers agreement and memoranda regarding established intercommunity design flow (allowable flow). (General Water Quantity)

C. The WMO will coordinate intercommunity stormwater runoff design and planning with the member communities by:

- Reviewing the member cities' local watershed management plans for consistency with WMO goals and consistency with intercommunity planning.

- Calculating the cost apportionment between cities for water resources projects with intercommunity participation. (General Water Quantity)

D. The WMO will consider practicable solutions when involved with intercommunity water resources planning activities.

- All drainage studies or feasibility studies (whether by the WMO or a city) for projects in a subwatershed with intercommunity drainage, shall consider the impact of the project and the total intercommunity project cost.

- Any projects with intercommunity drainage issues shall not be implemented without prior completion of a feasibility study outlining improvement options and adoption of a preferred option by the WMO, except in emergencies. (General Water Quantity)

5.2.3 WMO Policies

A. Member cities are to reduce the amount of impervious surfaces through the use of Low Impact Development (LID) techniques to the greatest extent reasonable for new development and redevelopment projects, taking into consideration land use, zoning, topography, previous site uses, and site constraints. LID techniques may include, but are not limited to, those presented on the MPCA-Low Impact Development website, http://www.pca.state.mn.us/water/stormwater/stormwater-lid.html. (Goal 5.2.1 A, Goal 5.2.1 B)

B. Member cities will not be allowed to use infiltration as a stormwater BMP in areas where there are known contaminants or in drinking water supply management areas/wellhead protection areas. In addition, infiltration will not be encouraged where the soils are not suitable for infiltration or in areas where there is less than three feet of separation between the bottom of the infiltration system and the groundwater or bedrock. In-situ field tests shall be required to verify the infiltration rates of on-site soils prior to the construction of infiltration BMPs. (Goal 5.2.1 A, Goal 5.6.1 A)

C. Member cities are to provide pretreatment of stormwater prior to discharge to any new infiltration system to protect the functionality of the system. Pretreatment shall collect sediment, skim floatables, and be easily accessed for inspection and maintenance. (Goal 5.2.1 A, Goal 5.6.1 A)

D. The level of protection along all trunk conveyors, streams, and channels and around all wetlands, ponds, detention basins, and lakes shall be based on the critical duration 100-year event, which shall be defined as the 100-year, 24-hour rainfall or the 100-year, 10-day runoff event; whichever is greater. (Goal 5.2.1 B)

E. Design of new trunk stormwater systems should provide discharge capacity for the critical-duration runoff event that is not less than a 10-year frequency event. For open channel conveyance construction, the design criteria shall be for the critical 100-year event. Variances to this standard may apply in areas where in-place storm sewers are designed for a 5-year frequency event. (Goal 5.2.1 B)

F. Design of new non-trunk stormwater systems should provide discharge capacity for the critical-duration runoff event that is not less than a 5-year frequency event, preferably a 10-year frequency event (level of service). Where the planned level of service would cause hardship in operation of a downstream system, the owner may design for a lesser level of service if the following circumstances are present:

- The proposed new or replacement system will not have a longer life than that of the existing downstream system.
- It is not practical to incorporate temporary measures into the new system to mitigate the effects of the new system on the downstream system. (Goal 5.2.1 B)

G. Member cities are to ensure that proposed development, redevelopment, and/or infrastructure projects will not exceed the capacity of the existing downstream stormwater drainage system. (Goal 5.2.1 B)

H. Member cities are to incorporate emergency overflow structures (e.g. swales, spillways), where feasible, into pond outlet structure designs to prevent undesired flooding resulting from storms larger than the 100-year (one percent) event or plugged outlet conditions. (Goal 5.2.1 B)

I. Member cities are to maintain ordinances or policies that allow the cities to secure easements over floodplains, detention areas, wetlands, ditches, and all other parts of the stormwater system as areas develop or redevelop. (Goal 5.2.1 B)

J. Member cities are to incorporate multi-stage outlets into their pond designs to control flows from smaller, less frequent storms and help maintain base flows in downstream open channels, where practicable. (Goal 5.2.1 B)

K. Member cities are to maintain ordinances or policies that set minimum building elevations at least one foot above the critical 100-year flood elevation for structures adjacent to inundation areas. The cities should consider the effects of events larger than the 100-year flood when setting minimum building elevations. Higher minimum building elevations should be considered for structures adjacent to ponding areas with large tributary watersheds and for structures adjacent to landlocked basins. (Goal 5.2.1 B)

L. The WMO establishes the following policies regarding landlocked basins:

- The flood levels established in local (city) watershed management plans shall take into consideration the effects of water level fluctuations on trees, vegetation, erosion and property values. Steeply sloped shorelines that are subject to slope failure and shoreline damage should not be in contact with flood water for extended periods of time. (Goal 5.2.1 B)

- Only the existing tributary area may discharge to a landlocked basin, unless provision has been made for an outlet from the basin, or hydrologic analysis has been completed showing additional discharge to basin is acceptable. The form of outlet may range from temporary pumps to gravity storm sewers. The outlet is to be in place before increased water levels are likely to affect vegetation, slope stability and adjacent properties. (Goal 5.2.1 B)

- If outlets from landlocked basins are needed, member cities are encouraged, where practicable, to keep outflow rates low enough to allow for as much infiltration as possible. Drawdown time to within one foot of the normal water level should not exceed 48 hours to reduce damage to upland vegetation. (Goal 5.2.1 B)

- When member cities establish high water elevations and whether outlets are needed for landlocked basins, member cities are encouraged, where practicable, to account for long duration events, such as multiple-year wet cycles and high runoff volume events (e.g. snowmelt events that last for many weeks). (Goal 5.2.1 B)

- Member cities need to consider both the water quality and flooding impacts of proposed outlets from landlocked basins on downstream water resources. (Goal 5.2.1 B)

M. Member cities are to require developers to provide Runoff Control Plans prepared by a licensed professional engineer for projects that disturb one or more acres of land. The Runoff Control Plan shall incorporate best management practices (BMPs) and shall conform to approved local water management plans.

Runoff Control Plans shall include the following:

a. Property lines and delineation of lands under ownership of the project proposer.

b. Delineation of the subwatersheds contributing runoff from off-site, and proposed and existing subwatersheds on-site.

c. Location, alignment and elevation of proposed and existing stormwater facilities.

d. Delineation of existing on-site wetlands, shoreland and/or floodplain areas. Removal or disturbance of streambank and shoreland vegetation should be avoided. The plan shall address how unavoidable disturbances to this vegetation will be mitigated.

e. Existing and proposed normal, 5-year (or 10-year) and 100-year water elevations on-site.

f. Existing and proposed site contour elevations related to the North American Vertical Datum (NAVD) of 1988.

g. Construction plans and specifications of all proposed stormwater management facilities.

h. Stormwater runoff volume and rate analyses for existing and proposed conditions.

i. All hydrologic and hydraulic computations completed to design the proposed stormwater quantity and quality management facilities.

j. Provision of outlots or easements for maintenance access to detention basins, constructed wetlands and other stormwater management facilities.

k. Maintenance agreement between developer and city which addresses sweeping, pond inspection, sediment removal and disposal, etc.

l. Documentation indicating conformance with the city's existing local water management plan.

m. Inlets to detention basins, wetlands, etc. shown at or below the normal water level.

n. Identification of receiving water body.

Runoff Control Plans shall meet the following criteria:

- The peak rate of stormwater runoff from the developed subwatershed of the site shall not exceed the existing peak rate of runoff for the 5-year (or 10-year) and the 100-year return frequency critical duration storm events (encouraged to maintain the runoff rate for the 2-year storm event as well). For the purposes of this criteria, "subwatershed" may be the project site, or may be an area of greater size for which an approved local water management plan meets this criteria (e.g. regional detention basins).

- A hydrograph method based on sound hydrologic theory shall be used to analyze stormwater runoff for the design or analysis of flows in conveyors, streams, and channels and flows to ponds and wetlands.

- Reservoir routing procedures and critical duration 100-year runoff events shall be used for design of detention basins and outlets. (Goal 5.2.1 B)

5.3 Water Quality

There are many water bodies throughout the WMO that are valuable resources to the people of the area. The following goals and policies have been developed to maintain or improve water quality in surface waters throughout the WMO.

5.3.1 WMO Goals

A. Evaluate and track water quality trends within the WMO.

B. Improve intergovernmental coordination regarding water quality management within the WMO.

C. Improve water quality within the WMO.

5.3.2 WMO Strategies

A. The WMO will assist member cities in creating an equitable and cost-effective method to address the requirements of the South Metro Mississippi TMDL study and implementation plan and other TMDLs as they are completed. (Goal 5.3.1 B)

B. The WMO will continue to focus on the water quality of intercommunity water bodies. The WMO, at the discretion of the Board, may also work with individual member cities to address water quality issues within individual city boundaries. (Goal 5.3.1 C)

C. The WMO will investigate the possibility of coordinating joint member contracts for maintenance to achieve economies of scale. Post construction stormwater management and good housekeeping practices for MS4 stormwater facilities shall comply with MPCA/MS4 requirements. (Goal 5.3.1 B)

D. The WMO will monitor DNR protected water bodies. Prioritization of water bodies for monitoring will be determined annually and by the WMO budget. Monitoring data from CAMP (Citizen Assisted Monitoring Program), WHEP (Wetland Health Evaluation Program), and CSMP (Citizen Stream Monitoring Program) should be taken into consideration so monitoring information is not being duplicated. (Goal 5.3.1 A)

E. The WMO will monitor select storm sewers and streams that outlet to the Mississippi River. Prioritization of storm sewers and streams will be determined annually and by the WMO budget. Monitoring parameters should be consistent with downstream impairments and may be modified at the discretion of the Board. Possible parameters include: Total Phosphorus, PCBs (Polychlorinated biphenyls), PFOS (Perfluorooctane sulfonate), Fecal Coliform, Turbidity, and Dissolved Oxygen. (Goal 5.3.1 A)

F. The WMO shall attempt to develop a water quality cost allocation formula for intercommunity projects by the year 2015. In the interim, the WMO will address each project individually. (Goal 5.3.1 B)

G. The WMO requires MnDOT, Ramsey County, Dakota County, and other governmental agencies to meet the water quality treatment requirements outlined in this plan for runoff leaving their right-of-way, facilities, or easements. Regular maintenance of their stormwater facilities shall also be performed. (Goal 5.3.1 B)

H. The WMO will recruit volunteers, through the use of its CAC, and encourage member cities to recruit volunteers to participate in the WMO's monitoring activities. Where necessary, volunteers would be provided training on MPCA-accepted protocol to ensure that the data is acceptable for the MCPA EQUIS Database. (Goal 5.3.1 A)

I. The WMO will use a similar water body classification system to that of the MPCA. **Table 5-1** will be used to help classify water bodies as deep lakes, shallow lakes, wetlands, and ponds. The pond column has been added to the MPCA's table by the WMO to provide a classification for water bodies that may be considered ponds.

The classification system determines whether a water body should be managed as a deep lake, shallow lake, wetland, or pond. For water bodies classified as wetlands, member cities must use a wetland management classification system that takes into account the susceptibility of the wetlands to degradation by stormwater. The WMO requires the member cities use a wetland classification system that ranks the wetlands and sets wetland management standards based on the rank and desired level of protection. (Goal 5.3.1 A, Goal 5.3.1 C)

Table 5-1: Factors Used to Classify Deep Lakes, Shallow Lakes, Wetlands, and Ponds

Factor	Deep Lakes	Shallow Lakes	Wetlands	Ponds
Public Waters Inventory Code	Typically coded as "L or LP" in PWI	May be coded as either "L, LP or LW" in PWI	Typically coded as "LW" in PWI	May be coded as either "L, LP or LW" in PWI
Depth, max.	Typically > 15 feet	Typically < 15 feet	Typically <7 feet	Typically <10 feet
Littoral area	Typically < 80%	Typically >80%	Typically 100%	Typically 100%
Area (min.)	> 10 acres (Bulletin 25)	> 10 acres (Bulletin 25)	No minimum	No minimum
Thermal stratification (summer)	Stratification common but dependent upon depth	Typically do not stratify	Typically do not stratify	Typically do not stratify

Factor	Deep Lakes	Shallow Lakes	Wetlands	Ponds
Fetch	Significant fetch depending on size & shape	Fetch is variable depending on size & shape	Rarely has a significant fetch	Rarely has a significant fetch
Substrate	Consolidated sand/silt/gravel	Consolidated to mucky	Mucky to unconsolidated	Variable
Shoreline features	Generally wave formed, often sand, gravel or rock	Generally wave formed, often sand, gravel or rock	Generally dominated by emergents	Generally dominated by emergents
Emergent vegetation & relative amount of open water	Shoreline may have ring of emergents; vast majority of basin open water	Emergents common, may cover much of fringe of lake; basin often has high percentage of open water	Emergents often dominate much of basin; often minimal open water	Emergents common, may cover much of fringe of pond; basin often has high percentage of open water
Submergent vegetation	Common in littoral fringe, extent dependant on transparency	Abundant in clear lakes; however may be lacking in algal-dominated turbid lakes	Common unless dominated by an emergent like cattail	Common unless dominated by an emergent like cattail
Dissolved Oxygen	Aerobic epilimnion; hypolimnion often anoxic by midsummer	Aerobic epilimnion but wide diurnal flux possible	Diurnal flux & anaerobic conditions common	Variable
Fishery	Typically managed for a sport/game fishery. May be stocked. DNR fishery assessments typically available	May or may not be managed for a sport fishery. If so, fishery assessment should be available. Winter aeration often used to minimize winterkill potential	Typically not managed for a sport fishery. Little or no DNR fishery information. Seldom aerated. May be managed to remove fish & promote waterfowl	Not managed for a sport fishery
Uses	Wide range of uses including boating, swimming, skiing, fishing; boat ramps & beaches common	Boating, fishing, waterfowl production, hunting, aesthetics; limited swimming; may have boat ramp, beaches uncommon	Waterfowl & wildlife production, hunting, aesthetics. Unimproved boat ramp if any. No beaches	Typically manmade basins. Important for flood protection and runoff pollutant removal

Note: This table was developed by the MPCA and is located in the *Guidance Manual for Assessing the Quality of Minnesota Surface Waters.* The "Ponds" column was added by the WMO for the purposes of this Plan. It is important to note that the MPCA does not have a pond classification.

Table 5-2 shows the WMO's water quality goals based on classification.

Table 5-2: Water Quality Goals for Classified Water Bodies in the WMO

Classification	TP (ppb)	Chi-a (ppb)	Secchi (meters)
Deep Lakes	≤ 40	≤ 14	≥ 1.4
Shallow Lakes	≤ 60	≤ 20	≥ 1.0
Wetlands	NA	NA	NA
Ponds	NA	NA	NA

Note: The water quality goals shown in this table are consistent with the goals shown in the MPCA's *Guidance Manual for Assessing the Quality of Minnesota Surface Waters.*

5.3.3 WMO Policies

A. Member cities shall require a 50% total phosphorus removal from runoff leaving new development and redevelopment projects that exceed one acre of land disturbance (for this policy, mill and overlay and pavement rehabilitation projects are not considered land disturbance). For areas that discharge directly to the Mississippi River or to an impaired water body for which a TMDL has been completed, the findings of the TMDL may replace this requirement (whether more or less stringent). The required reduction of total phosphorus may be accomplished through the use of regional or on-site stormwater BMPs such as: ponds, NURP (National Urban Runoff Program) basins, infiltration basins, biofiltration, vegetated swales, mechanical devices, porous pavements, or any other techniques effective at phosphorus reduction. (Goal 5.3.1 C)

B. Linear construction projects should meet policy 5.3.3A where possible and feasible. Linear projects will be required to meet NPDES Construction Permit requirements. (Goal 5.3.1 C)

C. For stormwater discharge points/outfalls that did not exist prior to the adoption of this plan: member cities are to provide pretreatment of stormwater prior to its discharge to wetlands and other water resources. Pretreatment shall collect sediment, skim floatables, and be easily accessed for inspection and maintenance. (General Water Quality)

D. For replacement discharge points/outfalls or existing stormwater discharge points/outfalls: the WMO encourages member cities to provide pretreatment of stormwater prior to its discharge to wetlands and water resources. (General Water Quality)

5.4 Recreation, Fish and Wildlife Habitat

The WMO has many natural areas that are popular recreation sites and provide excellent fish and wildlife habitat. The following goals and policies have been developed to enhance water based recreational opportunities and protect and improve fish and wildlife habitat. In addition, many of the other goals, strategies, and policies outlined throughout **Section 5** will result in improved recreational opportunities and fish and wildlife habitat.

5.4.1 WMO Goals

A. Protect and enhance fish and wildlife habitat and recreation opportunities, and maintain shoreland integrity.

5.4.2 WMO Strategies

A. The WMO will promote and encourage protection of non-disturbed natural shoreland areas and restoration of disturbed shorelines and streambanks to their natural state through participation in Blue Thumb or other educational programs. (Goal 5.4.1 A)

B. The WMO supports water quality improvements in order to maintain or improve water quality and the habitat consistent with intended use and classifications of lakes, streams, wetlands, and ponds. (Goal 5.4.1 A, Goal 5.5.1 A)

C. The WMO will encourage the appropriate development of access to water bodies for recreation and education. (Goal 5.4.1 A)

5.4.3 WMO Policies

A. The WMO requires member cities to consider landscape designs for projects located in close proximity to natural areas or greenways to:

1) increase beneficial habitat, wildlife and recreational uses; promote infiltration and vegetative water use; and

2) decrease detrimental wildlife uses (such as beaver dams, goose overabundance) that damage water control facilities, shoreline vegetation, water quality or recreational facilities. (Goal 5.4.1 A, Goal 5.5.1 A)

B. The WMO requires member cities to prioritize shoreland areas for restoration. Shoreland areas include streambanks and lakeshore areas. The cities will be required to address this issue in their local watershed management plans. (Goal 5.4.1 A)

C. Member cities are required to maintain a shoreland ordinance that is, at a minimum, in conformance with the requirements of the Minnesota DNR. (Goal 5.4.1 A)

D. The WMO requires member cities within the Mississippi River Critical Corridor Area/Mississippi National River Recreation Area (MRCCA/MNRRA) to conform to the current rules for areas within the MRCCA/MNRRA. (Goal 5.4.1 A)

5.5 Wetlands

There are many wetlands located throughout the WMO that provide wildlife habitat and offer a natural method of conveying and storing stormwater. The following goals and policies have been developed to manage existing wetlands and restore drained wetlands where possible.

5.5.1 WMO Goals

A. Enhance or protect wetlands from the adverse impacts of development and redevelopment.

5.5.2 WMO Strategies

A. The WMO will continue to support member city management efforts to improve wildlife habitat, aesthetic enjoyment, and other public uses of wetlands adjacent to parks. (Goal 5.5.1 A, Goal 5.4.1 A)

B. The WMO will continue in the support of wetlands for inclusion in Wetland Health Evaluation Program (WHEP).(Goal 5.5.1 A)

5.5.3 WMO Policies

A. Member cities are the local governmental units (LGUs) responsible for administering the Wetland Conservation Act (WCA). MnDOT is the LGU for the WCA on its rights-of-way. (Goal 5.5.1 A)

B. An average 15 foot buffer of natural vegetation above the 100-year High Water Level (if established) or wetted boundary is required by the WMO around lakes, streams, and wetlands, upon new or redevelopment projects that exceed one acre in land disturbance (for this policy, mill and overlay and pavement rehabilitation projects are not considered land disturbance). (Goal 5.5.1 A, Goal 5.4.1 A)

C. Member cities are to inventory, classify and determine the functions and values of wetlands, either through a comprehensive wetland management plan or for development or redevelopment projects that exceed one acre. For cities facing significant development or redevelopment, the WMO recommends that they complete comprehensive wetland management plans. The cities could complete the plans in phases, focusing on the areas where the information is most needed, such as areas within the 2030 MUSA. They should do this either as part of their local watershed planning process or as an implementation task identified in the local plan. Member cities shall submit their comprehensive wetland management plans to the WMO for review and comment. (Goal 5.5.1 A, Goal 5.4.1 A)

D. The WMO requires that member cities use a wetland classification system that ranks the wetlands and sets wetland management standards based on the rank and desired level of protection (e.g. highest to lowest protection). The wetland management standards should include buffer strip width, structural setback distance from buffer strip, amount of pretreatment required for phosphorus removal, storm bounce restrictions, and susceptibility of the wetlands to degradation by stormwater inputs. (Goal 5.5.1 A)

5.6 Groundwater Protection

The WMO recognizes the importance of groundwater on its drinking water sources and the overall hydrology of the area. The following goals and policies have been developed to protect groundwater quality and supply throughout the WMO.

5.6.1 WMO Goals

A. Protect groundwater resources within the WMO.

5.6.2 WMO Strategies

A. The WMO will work to improve the quality and availability of groundwater data. In addition, the WMO will coordinate with other agencies to identify sources or potential sources of groundwater pollution. (Goal 5.6.1 A)

B. The WMO will advocate for larger scale State monitoring and evaluation of LID (Low Impact Development) techniques on groundwater. (Goal 5.6.1 A)

C. The WMO will support the policies in the Dakota County and Ramsey County groundwater plans. (Goal 5.6.1 A)

5.6.3 WMO Policies

A. Member cities are to encourage groundwater recharge and are required to protect recharge areas from potential sources of contamination. The cities should also provide increased green space, native vegetation, and pond "dead" storage, wherever possible and appropriate, to allow for the infiltration of stormwater runoff and promote groundwater recharge. (Goal 5.6.1 A, Goal 5.2.1 A)

B. Member cities responsible for wellhead protection plans should follow the requirements outlined in those plans for managing groundwater within wellhead protection areas. (Goal 5.6.1 A)

C. The WMO encourages its member cities to use stormwater BMPs (such as grassed waterways, biofiltration, porous pavements, etc.) to maximize infiltration, where feasible and not detrimental to groundwater supplies. (Goal 5.6.1 A, Goal 5.2.1 A)

D. Each WMO member city is to maintain updated records of all known on-site septic systems, and prohibit installation of new individual sewer systems or alteration, repair or extension of existing systems when connection can be made to the city sanitary sewer system. The cities are to notify property owners with on-site septic systems that they are required to connect to the cities' sanitary sewer, if available. The cities are to also develop management programs and ordinances for subsurface sewage treatment systems (SSTS) that are consistent with MPCA standards and Minnesota Rules 7080 to 7083. (Goal 5.6.1 A)

E. Member cities should work with their counties in effort to promote awareness of groundwater resource issues through public education and information programs. (Goal 5.6.1 A, Goal 5.8.1 B)

F. Member cities are to support the policies in the Dakota County and Ramsey County groundwater plans.

5.7 Erosion and Sedimentation

Erosion and sedimentation causes surface water quality degradation, habitat damage, and other water resource issues. The following goals and policies have been developed to prevent and minimize sedimentation from areas prone to erosion.

5.7.1 WMO Goals

A. Minimize erosion, sedimentation, stream degradation, and related issues within the watershed.

5.7.2 WMO Strategies

A. The WMO shall address intercommunity erosion and sediment control issues. (Goal 5.7.1 A)

B. The WMO will facilitate joint certification training for member city staff on designing and inspecting erosion control plans and inspecting erosion control measures. (Goal 5.7.1 A, Goal 5.8.1 A)

C. The WMO will coordinate/conduct non-certification training for "other" city staff (streets, parks, building inspections) to address items in MS4 permit (e.g. mowing and erosion control). (Goal 5.7.1 A, Goal 5.8.1 A)

5.7.3 WMO Policies

A. Member cities must adopt, administer, implement and enforce ordinances addressing erosion and sediment control, including the permitting and inspection of such controls. The ordinance must be in conformance with the NPDES standards, at a minimum. The WMO suggests that the cities use the MPCA's model ordinance, which covers overall stormwater management. (Goal 5.7.1 A)

B. Member cities are to require erosion control plans for land development and construction work that will disturb one or more acres of land. Local watershed management plans and city ordinances are to include the requirements and procedures for reviewing, approving and enforcing the erosion control plans. Erosion Control Plans shall be prepared by a qualified individual, and shall conform to the MPCA's NPDES General Permit to Discharge Stormwater from Construction Sites. The erosion control plan shall also conform to all future NPDES stormwater regulations that apply to erosion control. (Goal 5.7.1 A)

C. Acceptable erosion in drainage ways is limited to that which causes no net degradation of the watercourse or destruction of properties adjacent to the watercourse.

- Measures to alter the natural course and meandering of streams will be discouraged, except when foreseeable erosion threatens to damage structures, utilities or natural amenities, or impair the drainage system.

- Land use adjacent to watercourses shall be regulated to allow for the reasonably expected natural behavior of streams. (Goal 5.7.1 A)

D. Design of stream bank stabilization and streambed control measures should consider unique or special site conditions, energy dissipation potential, adverse effects, preservation of natural processes and habitat, and aesthetics, in addition to standard engineering and economic criteria. (Goal 5.7.1 A)

5.8 Public Participation and Education

The WMO desires to foster responsible water quality management practices by educating residents, business owners, member city staff, elected officials, and developers about proper water resource management. It is important for these audiences to recognize their role in responsible water resource management in their homes, businesses, and practices, to help preserve and improve the resources present within the WMO. The following goals and policies have been developed to increased public participation and provide improved awareness on water resource issues throughout the WMO.

5.8.1 WMO Goals

A. Expand the WMO's education and public involvement efforts to provide more assistance to the member cities.

B. Increase public awareness of human impacts on water quality and habitat and explore ways to increase active citizen involvement.

5.8.2 WMO Strategies

A. The WMO will develop and use email lists to communicate WMO activities, information, and announcements. (Goal 5.8.1 A, Goal 5.8.1 B)

B. The WMO will develop appropriate, targeted educational content regarding water resource issues to be used by member cities for distribution to and use by various citizen groups such as: homeowners and renters; youth groups; and community groups such as Rotary, Lions, Kiwanis, ROMA (Responsible Owners and Managers Organization), WSCO (West Side Citizens Organization), All Around the Neighborhood, Chamber of Commerce, etc. The WMO will also utilize water resource materials to educate the public at community events and festivals throughout the WMO. (Goal 5.8.1 A, Goal 5.8.1 B)

C. The WMO will maintain the WMO website to communicate watershed news, events, and other water resource information. WMO website address shall be included on all distributed material and will be updated regularly to serve as an additional source for watershed information(Goal 5.8.1 A, Goal 5.8.1 B)

D. The WMO shall seek citizen involvement to assist in the monitoring of water bodies or outlets (storm sewer or streams) to the Mississippi River. CAMP, WHEP, and CSMP are three programs that currently monitor water bodies in the WMO. The WMO shall solicit citizens (starting with the 3rd Generation Plan CAC) to either join these programs or start a new program for monitoring its water bodies. (Goal 5.8.1 B, Goal 5.3.1 A)

E. The WMO will continue to participate in the Blue Thumb Program or other similar programs. (Goal 5.8.1 B)

F. The WMO will continue to support Clean Water Minnesota Media Campaign or develop "catchy" educational information, possibly through the use of an ad agency, focusing on water quality within the community. The ad agency may provide varying

media techniques depending on the audience being targeted. Educational components shall be updated to avoid redundancy. (Goal 5.8.1 A, Goal 5.8.1 B)

5.8.3 WMO Policies

A. Member cities' City Engineers and Public Works Officials are encouraged to attend Board Meetings to provide technical advice and information to the Board. (General Public Participation and Education)

B. Member cities are to make information available to active community groups such as Rotary, Lions, Kiwanis, ROMA (Responsible Owners and Managers Organization), WSCO (West Side Citizens Organization), All Around the Neighborhood, and Chamber of Commerce to educate and increase awareness of water resource issues throughout the WMO. (Goal 5.8.1 A, Goal 5.8.1 B)

5.9 Administration

The WMO's administration can have a significant impact on the success of the 3rd Generation Watershed Management Plan. The following goals and policies are aimed at operational activities associated with water resource management within the WMO.

5.9.1 WMO Goals

A. Meet the requirements set forth in the Metropolitan Surface Water Management Act regarding the management of a watershed management organization.

B. Increase efficiency of programs throughout the WMO and provide increased economic opportunities for the WMO and its member cities.

5.9.2 WMO Strategies

A. The WMO will explore opportunities to partner with other WMO/WD programs and County programs. The updates of neighboring WMO/WD plans may be an opportunity to explore these partnerships. (Goal 5.9.1 A, Goal 5.9.1 B)

B. The WMO will continue to publish an annual newsletter summarizing its activities for public distribution. (Goal 5.8.1 A, Goal 5.8.1 B)

C. The WMO will assist member cities (including being the applicant) in pursuing/securing grants for projects contained within an individual city and those that cross city boundaries. (Goal 5.9.1 A, Goal 5.9.1 B)

D. The WMO will adhere to BWSR administrative performance standards (e.g. data practices policy, project and program expenditures, Board training, operational guidelines, water quality and watershed yield trends, and public information and education outcomes). (Goal 5.9.1 A)

E. The WMO will utilize ad hoc subcommittees for special projects. (Goal 5.9.1 A, Goal 5.8.1 B)

F. The WMO will initiate the development of an eight to twelve member permanent CAC to serve as an ongoing advisory group. Citizens will be solicited as needed until the desired number is met. (Goal 5.9.1 A, Goal 5.8.1 B)

G. The WMO will continue to transition to an all citizen Board. (Goal 5.9.1 A, Goal 5.8.1 B)

H. The WMO will fund updating and maintenance of its web site (for posting data, the watershed management plan, etc.) through the WMO dues. (Goal 5.9.1 A)

I. The WMO will revise its joint powers agreement to reflect the 3rd Generation Watershed Management Plan. (Goal 5.9.1 A, Goal 5.3.1 C)

J. The WMO's cost allocation for intercommunity flooding and erosion control studies and construction projects will continue to be based on allowable flow. (Goal 5.9.1 A)

K. The WMO will provide technical review of projects, if requested, as a service to the member cities. Costs to complete these reviews may be charged back to member cities. (Goal 5.9.1 A)

L. The WMO will finance the implementation program elements through either the WMO dues (the annual contributions of its member cities) or some form of cost sharing in accordance with the joint powers agreement. The WMO and cities will also seek grants and other funding opportunities to help offset the costs of the implementation tasks. (Goal 5.9.1 A, Goal 5.9.1 B)

M. The operation and maintenance costs associated with a WMO improvement project will be apportioned according to the WMO joint powers agreement, as revised. (Goal 5.9.1 A)

N. Although the WMO will not be administering a permit program, the WMO will:

- Review projects for consistency with the WMO plan, as requested by member cities or other governmental agencies.
- Review and approve any proposed changes to the intercommunity stormwater system that are inconsistent with an approved local watershed management plan
- Review and approve any changes to the approved local plan that would cause the local plan to be inconsistent with the WMO plan.
- Review member city local plan updates for consistency with WMO Plan.
- Review annual progress reports from the member cities and provide areas that need to be addressed to keep in compliance with the WMO plan. The WMO may request specific projects be included in the annual progress report to review for conformance with the approved local plan.
- Reserve its authority under State Statute 103B to intervene in the permit process if a member city is determined to be out of compliance with its

approved local watershed management plan and the WMO rules. It is the LMRWMO's preferred position to work cooperatively with the member cities and avoid unnecessary duplication of permitting.

- Review member city comprehensive plan changes when revisions to their comprehensive plans affect water resource management. Stormwater management elements of the city comprehensive plans are to conform to the WMO plan. (Goal 5.9.1 A)

5.9.3 WMO Policies

A. Member cities are to adopt new ordinances or revise existing ordinances that meet the WMO policies listed in this plan. (Goal 5.9.1 A)

B. Member cities are to report their annual progress to the WMO. This may consist of each member city submitting an implementation plan progress update from their local water management plan. (Goal 5.9.1 A)

6.0 Implementation Program

Table 6-1, 6-2, and 6-3 contain a comprehensive list of the projects, programs, and studies that comprise the WMO implementation program. The WMO developed these activities through reviewing existing information (**Section 2**) and agency coordination (**Section 3**), identifying potential and existing problems (**Section 4**), developing goals, strategies, and policies (**Section 5**), and then assessing the need for programs, studies or projects. Each table shows estimated cost, proposed year of implementation, and proposed financing method for each element of the implementation program. The implementation program identifies special projects and ongoing implementation components through 2020. The proposed dates listed to complete the projects, programs, and studies are estimates and highly dependent upon available funding. The implementation plan will be reviewed annually and updated as necessary based on past progress, new issues arising, and available funding.

Many of the activities listed in **Table 6-1, 6-2, and 6-3** are to be incorporated into each city's local watershed management plan and Capital Improvement Program. Capital improvements identified in the approved City local plans will be the responsibility of the local government units. The programs and studies identified in this section of the plan may be entirely or partially completed by the WMO, the local government unit, or joint effort between multiple entities.

Table 6-4 provides a cost summary of the implementation program. **Table 6-5** provides the estimated annual plan implementation cost for each member city. **Table 6-6** lists the projects and planning activities completed by the WMO.

TABLE 6-1

CAPITAL IMPROVEMENT PROJECTS

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
1	Local government to construct BMPs to reduce negative impacts of development upstream of Hornbean Lake.	$120,000	Inver Grove Heights, Sunfish Lake or Developer (Cost share to be determined by WMO)				$120,000							4.1 F, To be constructed in coordination with new development.
2	Local government to construct improvements to reduce flooding/erosion at Marie Ave/Dodd Rd (feasibility study has been completed).	$80,000	Mendota Heights or Developer		$80,000									4.2 D
3	Local government to construct improvements to provide rate control and stream bank stabilzation north of Marie Ave in Interstate Valley Creek Watershed	$75,000	Mendota Heights, Sunfish Lake, Lilydale, or developer							$75,000				4.2 E, Some stabilization projects have been constructed. Additional improvements to be constructed once funding becomes available.
4	Local government to construct improvements to stabilize erosion-prone areas along the Mississippi River.	$1,500,000	LGU, ACOE, or Grant funding (WMO to facilitate where necessary and determine cost share)										$1,500,000	4.5 A, Improvements to be constructed once analysis has been completed.

TABLE 6-1

CAPITAL IMPROVEMENT PROJECTS

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
5	Local government to construct Lexington Avenue-Trunk Highway 13 Drainage and Erosion Improvements.	$360,000	Lilydale, Dakota County, MnDOT, and Lexington-Riverside Condo Association					$360,000						4.2 F, Feasibility study was completed in 2010. Study identified a cost share of $320,000 for Lilydale and $40,000 for Mendota Heights. Funding from other entities has not yet been determined.
6	Local government to construct Seidls Pond/Lake lift station.	$411,000	South St. Paul, Inver Grove Heights, West St. Paul, (Possible cost share to be determined by WMO)						$411,000					4.2 G, Feasibility study was completed in 2004.
7	Local government to construct Dawn Way Storm Sewer Improvement Project	$550,000	Inver Grove Heights, South St. Paul (Cost Share as determined previously by WMO)									$550,000		4.2 H, Allowable flow cost apportionment was completed in 2008.

TABLE 6-1

CAPITAL IMPROVEMENT PROJECTS

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
8	Stormwater BMPs or education to improve stormwater management upstream of Rogers Lake	$500,000	Mendota Heights, Developer, Grant Funding										$500,000	Part of the WRAPS Study (2014) - Anticipated to be completed in conjunction with development/ redevelopment. Refer to the WRAPS Study for project and cost info.
9	Ravine/bluff stabilization in Ivy Creek, Lilydale Park, and/or near Pickerel Lake	$1,000,000	Grant Funding									$1,000,000		Part of the WRAPS Study (2014) - Anticipated to be completed between 2016 and 2020. Refer to the WRAPS Study for project and cost info.
10	Phosphorus treatment in Sunfish Lake	$110,000	Sunfish Lake or Grant Funding							$110,000				Part of the WRAPS Study (2014) - Anticipated to be completed between 2015 and 2020. Refer to the WRAPS Study for project and cost info.

TABLE 6-1

CAPITAL IMPROVEMENT PROJECTS

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
11	Thompson Lake Stormwater/Sediment Improvement Project	$265,000	West St. Paul or Grant Funding						$265,000					Part of the WRAPS Study (2014) - In addition, feasibility study was completed in 2014. Refer to WRAPS Study or feasibility study for project and cost info.
12	Phosphorus treatment in Augusta Lake	$100,000	Mendota Heights or Grant Funding						$100,000					Part of the WRAPS Study (2014) - Anticipated to be completed between 2015 and 2020. Refer to the WRAPS Study for project and cost info.
13	Cherokee Heights culvert analysis and erosion control improvement project	$2,000,000	St. Paul, West St. Paul, Mendota Heights, (Cost share to be determined by WMO) and/or Grant Funding						$2,000,000					Feasibility study/cost estimate anticipated to be completed in 2014. Construction anticipated in 2016.
		$7,071,000	**TOTAL**	**$0**	**$80,000**	**$0**	**$120,000**	**$360,000**	**$2,776,000**	**$185,000**	**$0**	**$1,550,000**	**$2,000,000**	

1) Cost estimates provided are for planning purposes only and are subject to change upon final design and/or updated information. Costs reflect 2011 value and do not account for inflation.

TABLE 6-2

WATERSHED MANAGEMENT PROGRAMS

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
1	Address BWSR performance standards.	$2,500	WMO Dues	$250	$250	$250	$250	$250	$250	$250	$250	$250	$250	4.8 B, 5.9.2 D
2	Transition to an all citizen Board.	TBD	WMO Dues											4.8 D, 5.9.2 G
3	Revise JPA to reflect the 3rd Generation Plan.	$5,000	WMO Dues	$5,000										5.9.2 I
3.a.	Revise JPA to broaden membership of formal Technical Advisory Committee (TAC).	See Program 3	WMO Dues											4.8 E, 5.9.2 I
3.b.	Revise JPA to include a water quality cost allocation formula.	See Program 3	WMO Dues											4.9 B, 5.3.2 F, 5.9.2 I
4	Implement permanent Citizen Advisory Committee (CAC).	$5,000	WMO Dues	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	4.8 G, 5.9.2 F
5	Maintain WMO website to communicate water resource related information.	$14,000	WMO Dues	$1,400	$1,400	$1,400	$1,400	$1,400	$1,400	$1,400	$1,400	$1,400	$1,400	5.8.2 C, 5.9.2 H
6	WMO administration.	$120,000	WMO Dues	$12,000	$12,000	$12,000	$12,000	$12,000	$12,000	$12,000	$12,000	$12,000	$12,000	
7	WMO annual insurance premiums.	$25,000	WMO Dues	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	
8	WMO attorney and audit expenses.	$45,000	WMO Dues	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	$4,500	
9	Publish annual WMO newsletter for public distribution.	$10,000	WMO Dues	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	5.9.2 B
10	Review annual evaluation reports from member cities.	$5,000	WMO Dues	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	5.9.2 N, 5.9.3 B
11	Review member city local plan updates for consistency with WMO Plan.	$13,000	WMO Dues		$3,500	$3,500	$2,000	$2,000	$2,000					5.2.2 C, 5.9.2 N
12	Develop water resource educational content.	$15,000	WMO Dues	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	5.8.2 B,F,G, 5.8.3 B

Programs Required by State Agencies or Joint Powers Agreement
Programs Identified as Additional Priorities by the WMO

TABLE 6-2

WATERSHED MANAGEMENT PROGRAMS

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
12.a.	Educate homeowners and renters on how their behaviors affect water resources and the cost of degrading water resources on community finances.	See Program 12	WMO Dues											5.8.2 B
12.b.	Provide educational content regarding water resource issues for member cities to distribute to active community groups throughout the WMO such as Rotary, Lions, Kiwanis, ROMA (Responsible Owners and Managers Org.), WSCO (West Side Citizens Organization), All Around the Neighborhood, and Chamber of Commerce.	See Program 12	WMO Dues											5.8.2 B, 5.8.3 B
12.c.	Initiate the development of multilingual educational content.	See Program 12	WMO Dues											5.8.2 B
12.d.	Develop water resource educational materials that are targeted at actively engaging youth throughout the WMO for classes, displays, service projects, and possibly a community education class.	See Program 12	WMO Dues											5.8.2 B

Programs Required by State Agencies or Joint Powers Agreement
Programs Identified as Additional Priorities by the WMO

TABLE 6-2

WATERSHED MANAGEMENT PROGRAMS

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
12.e.	Provide educational material for distribution to the member cities. Material will be aimed at fostering responsible water resource management practices and may include: fliers for city mailings or utility bills, press release for local newspapers, cartoon posters for local schools, and a regularly updated social networking site. Material topics may include: Shoreland restoration, BMP techniques, proper lawn and garden care, controlling invasive species, proper waste disposal, surface water quality, and current activities of the WMO.	See Program 12	WMO Dues											5.8.2 B
12.f.	Continue to support Clean Water Minnesota Media Campaign or develop "catchy" educational information.	See Program 12	WMO Dues											5.8.2 B, 5.8.2 F
12.g.	Utilize water resource materials to educate the public at community events and festivals throughout the WMO.	See Program 12	WMO Dues											5.8.2 B
12.h.	Develop and use email lists to communicate WMO activities, information, and announcements.	See Program 12	WMO Dues											5.8.2 A

Programs Required by State Agencies or Joint Powers Agreement
Programs Identified as Additional Priorities by the WMO

TABLE 6-2

WATERSHED MANAGEMENT PROGRAMS

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
13	Coordinate/conduct non-certification training for member city staff to address items in MS4 permit.	$4,000	WMO Dues		$2,000					$2,000				5.7.2 C
14	Participate in Blue Thumb Program	$20,000	WMO Dues	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	5.8.2 E
15	Assist member cities in addressing the South Metro Mississippi TMDL and other TMDLs as they are completed.	$31,500	WMO Dues		$3,500	$3,500	$3,500	$3,500	$3,500	$3,500	$3,500	$3,500	$3,500	4.1 A, 5.3.2 A, 5.8.2 D
16	Develop annual water quality monitoring program for water bodies and outfalls to the Mississippi River.	$4,500	WMO Dues	$4,500										4.1 B, 5.3.2 D, 5.8.2 D
17	Implement water quality monitoring program to assess water bodies and outfalls to the Mississippi River	$135,000	WMO Dues		$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	$15,000	4.1 C, 5.3.2 E
18	Develop outreach program to assist member cities with MS4 permit renewal.	$5,000	WMO Dues		$5,000									4.1 I
19	Pursue locations to conduct wetland restoration for a wetland bank program.	$12,000	WMO Dues				$12,000							4.4 A
20	Conduct or facilitate joint certification training for member city staff on designing and inspecting erosion control plans and inspecting erosion control measures.	$10,000	WMO Dues			$5,000					$5,000			4.5 B, 5.7.2 B

Programs Required by State Agencies or Joint Powers Agreement
Programs Identified as Additional Priorities by the WMO

TABLE 6-2

WATERSHED MANAGEMENT PROGRAMS

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
21	Develop a pond and BMP maintenance program.	$30,000	WMO Dues		$30,000									4.5 D
22	Assist member cities in pursuing grants available to watersheds.	$30,000	WMO Dues	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	4.8 A, 5.9.2 C, 5.9.2 L
23	Monitoring of Pickerel Lake and/or inflows to Pickerel Lake	$6,000	WMO Dues/ Grant Funding					$1,000	$1,000	$1,000	$1,000	$1,000	$1,000	Part of the WRAPS Study (2014) - Anticipated to be completed between 2015 and 2020. Refer to the WRAPS Study for more project and cost info.
STORM WATER MANAGEMENT PROGRAMS		**$547,500**	**TOTAL**	**$38,650**	**$88,150**	**$56,150**	**$61,650**	**$50,650**	**$50,650**	**$50,650**	**$53,650**	**$48,650**	**$48,650**	

1) Cost estimates provided are for planning purposes only and are subject to change upon final design and/or updated information. Costs reflect 2011 value and do not account for inflation.

Programs Required by State Agencies or Joint Powers Agreement
Programs Identified as Additional Priorities by the WMO

TABLE 6-3

WATERSHED MANAGEMENT STUDIES

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
1	Utilize MIDS, once complete, to determine effectiveness of existing BMPs throughout the WMO.	$25,000	WMO Dues					$25,000						4.1 D
2	Complete feasibility study to address PAHs in Thompson Lake.	$16,500	Dakota County, West St. Paul, Grant Funding		$16,500									4.1 G
3	Complete feasibility study to investigate debris and floatables in Simley Lake.	$4,000	WMO Dues		$4,000									4.1 H
4	Evaluate landlocked basins with flood concerns or future flood potential or on an as needed basis.	$6,500	WMO Dues				$6,500							4.2 B
5	Complete feasibility study to provide rate control and streambank stabilization north of Marie Ave in Interstate Valley Creek Watershed.	$17,500	WMO Dues			$17,500								4.2 E, Some stabilization improvements have been completed (2007, 2008). Additional projects are needed.
6	Investigate opportunities to implement access points to improve access to water resources (e.g. fishing pier, observation platform).	$3,500	WMO Dues					$3,500						4.3 A
7	Evaluate DNR protected water bodies with known or potential problems and pursue shoreland restoration where needed.	$120,000	WMO Dues					$20,000	$20,000	$20,000	$20,000	$20,000	$20,000	4.5 F

TABLE 6-3

WATERSHED MANAGEMENT STUDIES

No.	Project Description	Cost Estimate[1]	Potential Funding Sources	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Plan References/ Comments
8	Work with ACOE to identify location/extent of erosion problems on Mississippi River.	$10,000	LGU, ACOE, or Grant funding (WMO to facilitate where necessary and determine cost share)					$10,000						4.5 A
9	Monitor shoreland erosion around Golf Course pond and determine if remedial action is necessary.	$1,200	WMO Dues		$1,200									4.5 E
10	Verify the existing electronic and GIS boundary of the WMO matches the legal description from the JPA.	$1,800	WMO Dues	$1,800										4.8 F
11	Establish stormwater volume reduction requirements.	$8,000	WMO Dues			$8,000								5.2.2 A
12	Set aside funding for 4th Generation Watershed Management Plan.	$50,000	WMO Dues	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	$5,000	
13	Cherokee Heights culvert analysis and erosion control feasibility study	$75,000					$75,000							4.5 C
14	Feasibility Studies to evaluate ravine/bluff stabilization in Ivy Creek, Lilydale Park, and/or near Pickerel Lake	$50,000	Member Cities, WMO Dues								$50,000			Part of the WRAPS Study (2014) - Anticipated to be completed between 2014 and 2020. Refer to the WRAPS Study for project and cost info.
		$389,000	**TOTAL**	**$6,800**	**$26,700**	**$30,500**	**$86,500**	**$63,500**	**$25,000**	**$25,000**	**$75,000**	**$25,000**	**$25,000**	

1) Cost estimates provided are for planning purposes only and are subject to change upon final design and/or updated information. Costs reflect 2011 value and do not account for inflation.

TABLE 6-4												
SUMMARY												
Improvements, Programs, and Studies	**Totals[1]**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**Comments**
Totals for Capital Improvements:	**$7,071,000**	$0	$80,000	$0	$120,000	$360,000	$2,776,000	$185,000	$0	$1,550,000	$2,000,000	
Totals for Management Programs:	**$547,500**	$38,650	$88,150	$56,150	$61,650	$50,650	$50,650	$50,650	$53,650	$48,650	$48,650	
Totals for Management Studies:	**$389,000**	$6,800	$26,700	$30,500	$86,500	$63,500	$25,000	$25,000	$75,000	$25,000	$25,000	
Grand Totals:	**$8,007,500**	$45,450	$194,850	$86,650	$268,150	$474,150	$2,851,650	$260,650	$128,650	$1,623,650	$2,073,650	

1) Cost estimates provided are for planning purposes only and are subject to change upon final design and/or updated information. Costs reflect 2011 value and do not account for inflation.

TABLE 6-5

SUMMARY OF PLAN IMPLEMENTATION COSTS[1] FOR EACH MEMBER CITY

Member Cities	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	TOTAL
Inver Grove Heights	$20,502	$51,809	$39,088	$66,830	$51,493	$34,126	$34,126	$58,034	$33,224	$33,224	$422,456
Lilydale	$673	$1,700	$1,282	$2,193	$1,689	$1,120	$1,120	$1,904	$1,090	$1,090	$13,861
Mendota Heights	$6,308	$15,941	$12,027	$20,563	$15,844	$10,500	$10,500	$17,857	$10,223	$10,223	$129,986
South St. Paul	$6,204	$15,677	$11,828	$20,222	$15,581	$10,326	$10,326	$17,561	$10,053	$10,053	$127,831
St. Paul	$1,191	$3,009	$2,270	$3,882	$2,991	$1,982	$1,982	$3,371	$1,930	$1,930	$24,538
West St. Paul	$6,204	$15,677	$11,828	$20,222	$15,581	$10,326	$10,326	$17,561	$10,053	$10,053	$127,831
Sunfish Lake	$4,368	$11,037	$8,327	$14,237	$10,970	$7,270	$7,270	$12,363	$7,078	$7,078	$89,998
TOTAL	$45,450	$114,850	$86,650	$148,149	$114,149	$75,650	$75,650	$128,651	$73,651	$73,651	$936,501

1) Cost estimates provided are for planning purposes only and are subject to change upon final design and/or updated information. Costs reflect 2011 value and do not account for inflation.

Note This table does not include Capital Improvements shown in Table 6-1

TABLE 6-6

COMPLETED PLANNING AND PROJECTS

No.	Planning/Project	Description	Issue	Status
1	Project	Flooding on Akron Avenue between Mendota Road and Highway 110. Watershed includes Inver Grove Heights and West St. Paul.	Flooding	Drainage system improvements were completed in 1991.
2	Project	Flooding from East Lexington Avenue to Mayfield Heights Road near Highway 13. Watershed includes Mendota Heights and Lilydale.	Flooding	Drainage system improvements were completed in 1994 and 1996.
3	Planning	Watershed draining east along Highways 110 and 494. Watershed includes West St. Paul, Sunfish Lake, Inver Grove Heights, and South St. Paul.	Planning	Study was completed in 1989.
4	Planning	Hornbean Lake, Horseshoe Lake, and Sunfish Lake along Highway 494 in Sunfish Lake and Inver Grove Heights.	Planning	Study was incorporated into Sunfish Lake Water Resource Management Plan, approved 1991.
5	Planning	Seidls Lake Water Quality Study	Water Quality	Study was completed in 1991.
6	Project	Flooding and erosion along Ivy Falls Creek in Mendota Heights and West St. Paul (West of Delaware Avenue).	Flooding and Erosion	Three projects completed: 1) Ruby Drive Outfall (1990), 2) Ivy Falls Creek Stabilization (1994), 3) Thompson Avenue Drainage Diversion.
7	Planning	Water Quality Study for Simley Lake.	Water Quality	Study was completed in 1993 for the City of Inver Grove Heights.
8	Planning	Water Quality Monitoring Report for Horseshoe Lake, Hornbean Lake, and Sunfish Lake.	Water Quality	Monitoring report was completed in 1994 for the City of Sunfish Lake.
9	Project	Flooding and erosion in Simon's Ravine between Wentworth Avenue and Butler Avenue, from Robert Street to Concord Street.	Flooding and Erosion	West St. Paul pond expansions and storm sewer improvements completed 1993. Additional ponding constructed 1995. South St. Paul storm sewer improvements completed to Kaposia Dam (19th Avenue) with projects in 1990, 1993, 1994, 1999, and 2009.
10	Planning	Revise Joint Powers Agreement.	Administrative	Agreement completed in 2001, signatures completed in 2002
11	Project	Erosion, flooding, and safety at Simon's Ravine and Kaposia Dam in South St. Paul between Butler Avenue and Bromley Street.	Flooding, erosion, safety	System from Kaposia Dam to Concord completed in 2002, system from Concord to Mississippi River completed in 2006.
12	Project	Potential flooding on Babcock Trail south of Southview Boulevard. Watershed includes South St. Paul, Inver Grove Heights, and West St. Paul.	Potential Flooding	Drainage system improvements were completed in conjunction with Co. Road 14 improvements (2002).
13	Planning	Water Quality Modeling Study for Ivy Falls Creek, Interstate Valley Creek, and Highway 13 Subwatersheds	Water Quality	Modeling study was completed in 2003.

TABLE 6-6

COMPLETED PLANNING AND PROJECTS

No.	Planning/Project	Description	Issue	Status
14	Planning	Water Quality Feasibility Study for Ivy Falls Creek, Interstate Valley Creek, and Highway 13 Subwatersheds	Water Quality	Feasibility study was completed in 2004.
15	Planning	Seidls Pond/Lake lift station. Watershed includes South St. Paul, Inver Grove Heights, and West St. Paul.	Flooding/Drainage	Feasibility study completed in 2004.
16	Project	Diversion of Thompson Avenue drainage into Ivy Falls Creek subwatershed.	Flooding	Project was completed in 2006.
17	Planning	Flooding and erosion at Marie Avenue and Dodd Road. Watershed includes Inver Grove Heights, Sunfish Lake, Mendota Heights, and West St. Paul.	Flooding and Erosion	Feasibility Study Completed (2006).
18	Project	Bank Stabilization on Marie Creek in Mendota Heights north of Marie Avenue.	Erosion	Project was completed (2007,2008).
19	Planning	Allowable Flow Cost Apportionment for Dawn Way Storm Sewer Improvement Project. Watershed includes Inver Grove Heights and South St. Paul	Drainage	Hydrologic analysis and cost split analysis was completed in 2008.
20	Planning/Project	Water quality improvements for Anderson Pond in South St. Paul and Southview Pond in West St. Paul.	Flooding and Erosion	Feasibility Study was completed in 2005. Construction of improvements was completed in 2008-2009.
21	Planning	Create internet website.	Administrative	Worked with Dakota County SWCD to complete website in 2009.
22	Planning	Lexington Avenue-Trunk Highway 13 Drainage and Erosion Feasibility Study.	Flooding and Erosion	Feasibility Study was completed in 2010.

7.0 Impact on Local Governments

The WMO's intention is to limit additional requirements imposed upon local units of government. Most of the WMO plan's implementation program elements will be implemented by the member cities and many of the implementation tasks will be funded by WMO cost sharing. Some of the implementation program elements reflect the goals, policies and requirements of state and regional units of government that local units of government would need to address regardless. **Table 7-1** shows member city conformance with many of the policies contained in the 3rd Generation Watershed Management Plan.

Table 7-1: Member City Conformance with 3rd Generation WMO Policies

Policy	Inver Grove Heights	Lilydale	Mendota Heights	St. Paul	South St. Paul	Sunfish Lake	West St. Paul
Minimum Building Elevations (5.2.3 K)	Y	Y	Y	Y	Y	Y	Y
Rate Control (5.2.3 M)	Y	Y	Y	Y	Y	Y	Y
Storm Sewer Design (5.2.3 D-F)	Y	Y	Y	Y	Y	Y	Y
Runoff Control Plans (5.2.3 M)	N	Y	N	N	Y	N	N
50% Phosphorus Removal Policy (5.3.3 A)	N*	N*	N*	N*	N*	N*	N*
Pretreatment Prior to Infiltration (5.2.3 C)	N	N	N	N	N	N	N
Stormwater Easements (5.2.3 I)	Y	Y	Y	Y	Y	Y	Y
Erosion and Sediment Control (5.7.3 A-B)	Y	Y	Y	Y	Y	Y	Y
Wetland Buffer (5.5.3 B)	N (except in NW area)	N	N	N	N	Y	N
Shoreland Ordinance (5.4.3 D)	Y	N	Y	Y	Y	Y	Y
Prioritize shoreland areas for restoration (5.4.3 C)	N	N	N	N	N	N	N
Inventory and classify wetlands (5.5.3 C)	Y	N	Y	Y	Y	Y	Y

*Member city policy requires similar phosphorus removal as WMO policy 5.3.3 A. Member city policy should be amended to provide consistent language unless member city desires a more stringent policy.

7.1 WMO Responsibilities

The Lower Mississippi River Watershed Management Organization is not a permitting agency. As a result, the WMO's major responsibilities are to 1) ensure that the policies and standards in the WMO plan are adopted and implemented by the member cities; 2) manage and assist member communities with intercommunity runoff, water quality, and water

management issues; and 3) assess the performance of the WMO and the member cities toward achieving the goals stated in the WMO plan.

Member cities are responsible for primary management of stormwater and water resources within their boundaries. Member cities will continue as the local government units (LGUs) responsible for administering the Wetland Conservation Act within their boundaries, and will continue to implement and enforce their existing ordinances related to water resource management. The cities, other government organizations, and private parties are responsible for maintaining their stormwater systems.

7.2 Local Planning

According to MN Rules 8410.0160, the cities are to adopt local watershed management plans within two years of the BWSR's approval of the last watershed management organization plan that affects the unit of government.

It is anticipated that all of the member cities will need to revise their local plans to bring them into conformance with WMO's revised plan and MN Rules 8410. The following local units of government will be required to revise or prepare local plans that conform to the WMO plan, MN Statutes 103B and to MN Rules 8410:

Dakota County:	Ramsey County:
Inver Grove Heights	St. Paul
Lilydale	
Mendota Heights	
South St. Paul	
Sunfish Lake	
West St. Paul	

Within 30 days of the WMO Board's adoption of the WMO plan, the WMO will notify each city of these requirements pertaining to local plan revision and adoption.

A local governmental unit can assume as much management control as it wishes through its approved local water management plan. The WMO assumes that the member cities will continue to be the permitting authority for all land alteration activities. To continue as the permitting authority, the local government must outline its permitting process in its local water management plan, including the preliminary and final platting process. The WMO will reserve its authority under State Statute 103B to intervene in the permit process if a member city is determined to be out of compliance with its approved local watershed management plan and the WMO rules. It is the LMRWMO's preferred position to work cooperatively with the member cities and avoid unnecessary duplication of permitting

The WMO will review proposed changes to an intercommunity stormwater system that are inconsistent with a city's approved plan, and/or changes to an approved city plan that would cause the plan to be inconsistent with the WMO plan.

7.2.1 Requirements for Local Watershed Management Plans

Local water management plans are required to conform to MS 103B.235, MN Rules 8410.0160, MN Rules 8410.0170 and the WMO plan. MN Rules 8410.0160 requires (in part) that:

"Each local plan must include sections containing a table of contents; executive summary; land and water resource inventory; establishment of goals and policies; relation of goals and policies to local, regional, state, and federal plans, goals, and programs; assessment of problems; corrective actions; financial considerations; implementation priorities; amendment procedures; implementation program; and an appendix. Each community should consider including its local plan as a chapter of its local comprehensive plan."

MN Rules 8410.0170 explains in more detail the general requirements given above.

The policies and goals established in each city's watershed management plan must be consistent with the WMO plan. The section of the local plan covering assessment of problems must include those problems identified in the WMO plan that affect the city. The approaches for improvement proposed must be limited to those actions that can be carried out at the local government level and must be consistent with the WMO plan. A city may use all or part of the WMO plan when developing its local plan.

Local watershed management plans must clearly identify when the management programs will go into effect. All local plan controls and programs must be developed and in effect within two years of adoption of the last WMO plan in the local governmental unit.

7.2.2 Lower Mississippi River WMO Review of Local Watershed Management Plans

Before a member city adopts its local watershed management plan, the plan must be submitted to all of the affected WMOs for review. The city must also submit its plan to the Metropolitan Council, and to any counties with adopted groundwater plans, for a 45-day review. Within 60 days of receipt of the local plan, the WMO will review the local plan for conformance with the WMO plan. As part of its review, the WMO will take into consideration any comments received from the Metropolitan Council and the counties. The WMO will approve or disapprove all or part of the local plan within the 60-day time frame, unless the city agrees to an extension. If the WMO does not complete its review, or fails to approve/disapprove the plan within the allotted time, and the city has not given an extension, the local plan will be considered approved (MN Rules 8410.0170, Subp. 12 and MN Statutes 103B.235, Subd. 3 and 3a).

Once the WMO approves the local plan, the local government must adopt and implement its plan within 120 days and amend its official controls within 180 days of plan approval. Each member city must notify the WMO (and the other affected WMOs) within 30 days of plan adoption and implementation, and adoption of necessary official controls.

Any amendments to the local plan must be submitted to the WMO for review and approval prior to their adoption by the member city. The WMO review process is the same as for the original local plan.

7.3 Review of WMO Plan

This watershed management plan was submitted to the member cities, the Board of Water and Soil Resources, the Minnesota Pollution Control Agency, the Minnesota Department of Natural Resources, the Minnesota Department of Agriculture, the Minnesota Department of Health, the Minnesota Department of Transportation, the Metropolitan Council, the counties, the Dakota Soil and Water Conservation District, the Ramsey Soil and Water Conservation District, the National Park Service, and Friends of the Mississippi River for formal review, in accordance with Minnesota statutes.

8.0 Plan Revision and Amendments

8.1 Plan Revision and Amendments

This plan remains in effect for ten (10) years from the year it was approved and adopted, unless it is superseded by adoption and approval of a succeeding plan. All amendments to this plan must follow the procedures set forth in this section, or as required by revised laws and rules. Plan amendments may be proposed by any person to the LMRWMO Board, but only the LMRWMO may initiate the amendment process. The LMRWMO may amend its plan in the interim (interim plan amendment) if either minor changes are required or if problems arise that are not addressed in the plan.

In accordance with Minnesota Statutes 103B.231, Subd. 3a, BWSR developed (and occasionally revises) a priority schedule for the revision of water management plans. BWSR uses the schedule to inform WMOs of when they will be required to revise their plans. Minnesota Statutes 103B.231, Subd. 3a also states that once a WMO is notified by BWSR that a plan revision is required, the WMO has 24 months from the date of notification to submit a revised plan for review. If BWSR does not notify the LMRWMO that a plan revision is required and the plan expires, Minnesota Statutes 103B.231, Subd. 3a states that the existing plan, authorities, and official controls of the LMRWMO remain in full force and effect until a revision is approved. The same statute also allows the LMRWMO to submit a draft plan revision for review prior to BWSR's scheduled date. If BWSR fails to begin review of the submitted plan within 45 days of plan submittal, the LMRWMO may adopt and implement the plan without formal BWSR approval.

8.2 General Amendment Procedure

Minnesota Rules 8410.0140, Subp. 2, requires that all plan amendments must adhere to the review process listed in MN Statutes 103B.231, Subd. 11, except when the proposed amendments constitute minor amendments and:

1. The LMRWMO held a public meeting to explain the amendments and published a legal notice of the meeting twice, at least seven days and fourteen days before the date of the meeting;

2. The LMRWMO sent copies of the amendments to the affected local units of government, the Metropolitan Council, and the state review agencies for review and comment; and

3. BWSR either agreed that the amendments are minor or failed to act within 45 days of receipt of the amendments.

The review process for minor plan amendments is more streamlined than the general plan amendment review process. The LMRWMO will also consider sending drafts of proposed amendments to all plan review authorities to receive input before establishing a hearing date or beginning the formal review process.

8.3 Minor Plan Amendments

MN Rules 8410.0140, Subp.3 considers amendments to the approved capital improvement program to be minor plan amendments if the following conditions are met:

1. The original plan set forth the capital improvements but not to the degree needed to meet the definition of "capital improvement program" as provided in Minnesota Statutes, section 103B.205, subdivision 3; and

2. The affected county or counties approve the capital improvement in its revised, more detailed form.

The following examples of other minor plan amendments are given in Minnesota Rules 8410.0020, Subp. 10:

> "...recodification of the plan, revision of a procedure meant to streamline administration of the plan, clarification of the intent of a policy, the inclusion of additional data not requiring interpretation, or any other action that will not adversely affect a local unit of government or diminish a water management organization's ability to achieve its plan's goals or implementation program."

Prior to sending a proposed minor plan amendment out for review, the LMRWMO Board will obtain BWSR's concurrence that the proposed amendment is a minor plan amendment.

8.4 Amendment Format

Upon completion of the plan amendment, the LMRWMO will submit the plan amendment to the appropriate review authorities in a format consistent with Minnesota Rules 8410.0140, Subp. 4. The rule requires that, unless the entire document is reprinted, all amendments adopted must be printed in the form of replacement pages for the plan, each page of which must:

1. Show deleted text as stricken and new text as underlined (for draft amendments under consideration):

2. Be renumbered as appropriate; and

3. Include the effective date of the amendment.

8.5 Distribution of Amendments

The LMRWMO will maintain a distribution list of everyone who receives a copy of the plan. Within 30 days of adopting an amendment, the LMRWMO will distribute copies of the amendment to everyone on the distribution list. The LMRWMO will also consider sending drafts of proposed amendments to all plan review authorities to receive input before establishing a hearing date or beginning the formal review process.

9.0 References

Portions of the *Lower Mississippi River Watershed Management Organization Watershed Management Plan, 2001 (Barr Engineering)* were unchanged and reused in this document. The following documents have been referenced within the text of the Plan and are available within the Appendices of the Plan, from LMRWMO Board, or from member city staff.

1. Minnesota Board of Water and Soil Resources. *Minnesota Rules Chapter 8410. Metropolitan Area Local Water Management*.

2. Barr Engineering. 2001. *Lower Mississippi River Watershed Management Organization Watershed Management Plan*.

3. Barr Engineering. 2009. *Gaps Analysis and Visioning Project for the Lower Mississippi River Watershed Management Organization*.

4. Barr Engineering. 2008. *Water Resource Management Plan for the City of Lilydale.*

5. Barr Engineering. 2008. *City of Inver Grove Heights 2nd Generation Water Resources Management Plan.*

6. Bonestroo. 2006. *Local Surface Water Management Plan for the City of Mendota Heights.*

7. Bonestroo. 2006. *Local Surface Water Management Plan for the City of West Saint Paul.*

8. Emmons and Olivier Resources. 2006. *City of Inver Grove Heights Stormwater Manual – Northwest Area.*

9. MPCA. 2009. *Manual for Assessing the Quality of Minnesota Surface Waters.*

10. WSB & Associates. 2006. *St. Paul Local Surface Water Management Plan.*

11. WSB & Associates. 2004. *Comprehensive Storm Water Management Plan for the City of South St. Paul.*

12. WSB & Associates. 2009. *Comprehensive Stormwater Management Plan for the City of Sunfish Lake.*

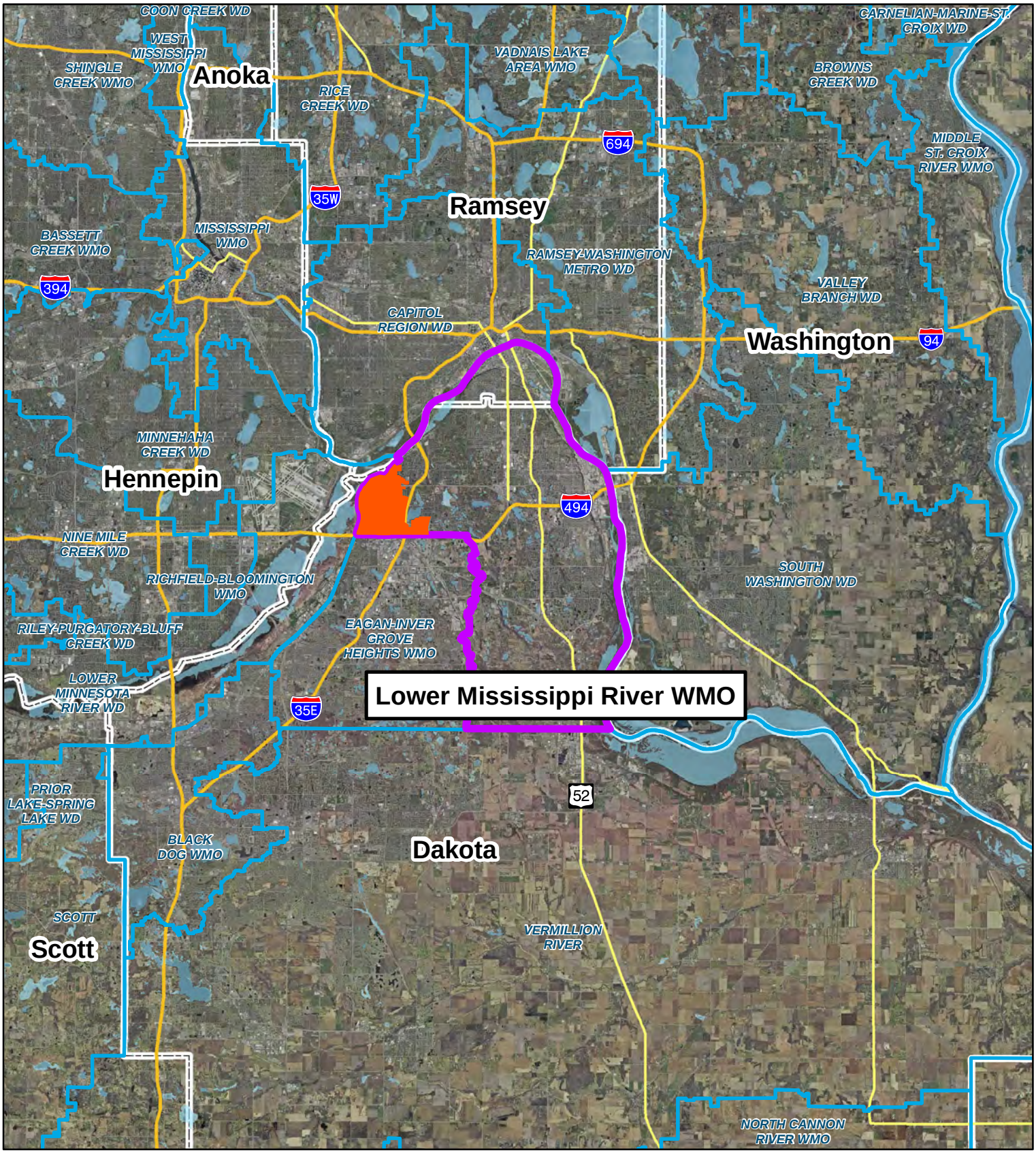
13. MPCA. 2014. *Lower Mississippi River WMO Watershed Restoration and Protection Strategy (WRAPS) Report.*

10.0 Glossary of Acronyms

BMP	Best Management Practice
BWSR	Board of Water and Soil Resources
CAC	Citizen Advisory Committee
CAMP	Citizen Assisted Monitoring Program – MCES
CIP	Capital Improvement Project
CSMP	Citizen Stream Monitoring Program - MPCA
DNR	Minnesota Department of Natural Resources
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GIS	Geographic Information System
HWL	High Water Level
IDDE	Illicit Discharge Detection and Elimination
JPA	Joint Powers Agreement
LGU	Local Governing Unit
LID	Low Impact Development
LMC	League of Minnesota Cities
LMRWMO	Lower Mississippi River Watershed Management Organization
MCES	Metropolitan Council Environmental Services
MDA	Minnesota Department of Agriculture
MDH	Minnesota Department of Health
MIDS	Minimal Impact Design Standards
MNDOT	Minnesota Department of Transportation
MNRAM	Minnesota Routine Assessment Method for Wetlands
MPCA	Minnesota Pollution Control Agency
MS4	Municipal Separate Storm Sewer System
MUSA	Metropolitan Urban Service Area
NEMO	Nonpoint Source Education for Municipal Officials
NPDES	National Pollutant Discharge Elimination System
NURP	National Urban Runoff Program
NRCS	Natural Resource Conservation Service
NWL	Normal Water Level
OHW	Ordinary High Water Elevation
PAHs	Polycyclic Aromatic Hydrocarbons
P8	Program for Predicting Pollutant Particle Passage through Pits, Puddles, and Ponds
SWCD	Soil and Water Conservation District
SWPPP	Storm Water Pollution Prevention Plan
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Load
TP	Total Phosphorus
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WCA	Wetland Conservation Act
WD	Watershed District
WHEP	Wetland Health Evaluation Program
WMO	Watershed Management Organization

APPENDIX A

FIGURES



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Legend

- Added Jurisdiction
- Lower Mississippi River WMO
- Watersheds
- Interstate Highways
- US Highways
- County Boundaries

Lower Mississippi River WMO
Watershed Management Plan

Location Map

Figure 1

Source: Minnesota Department of Natural Resources, 2003
Revised: November 2014

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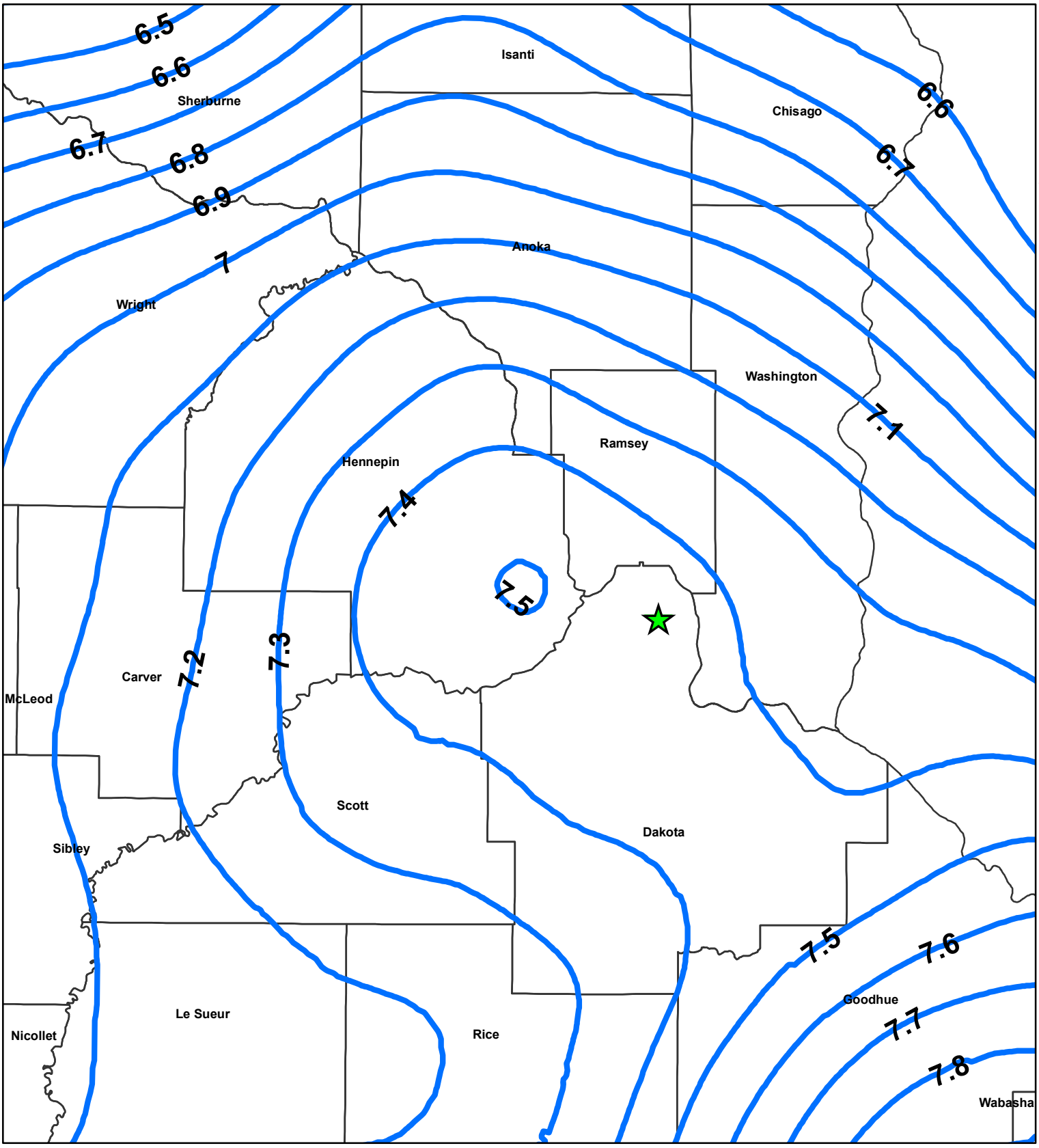
WSB & Associates, Inc.



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Lower Mississippi River WMO

Lower Mississippi River WMO
Watershed Management Plan

Source: National Oceanic and Atmospheric Administration, Atlas-14, Volume 8, 2013.
Revised: November 2014

N

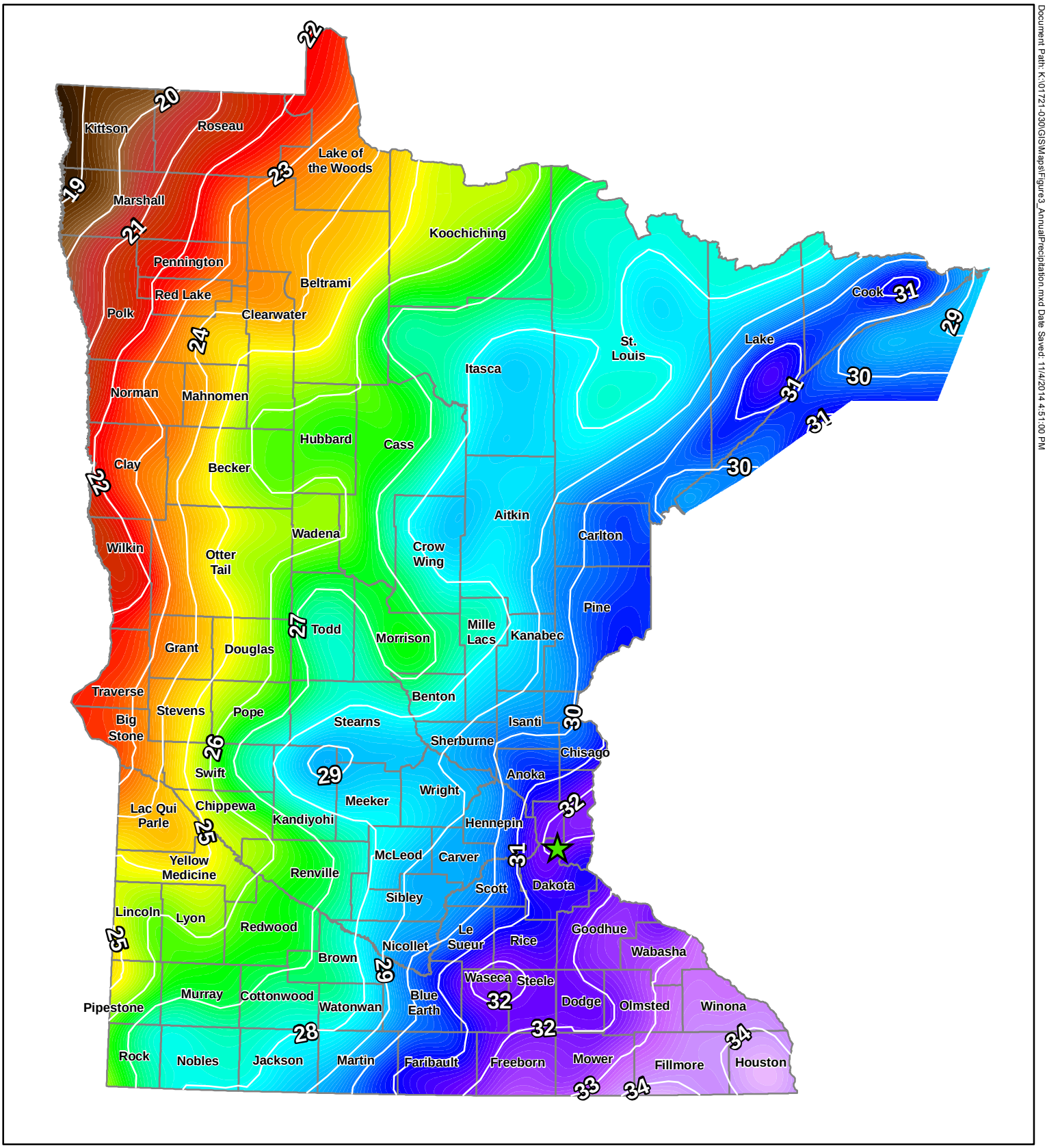
S

Atlas 14 1% Chance Rainfall Event in 24-hours

Values in Inches

Figure 2

WSB & Associates, Inc.



Lower Mississippi River WMO

Lower Mississippi River WMO Watershed Management Plan

Source: National Oceanic and Atmospheric Administration, Natural Resources Conservation Service, U.S. Department of Agriculture, 2003
Revised: November 2014

Annual Normal Precipitation

Values in Inches

Figure 3

0 50 100 Miles

N S

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Ramsey
Maplewood
Saint Paul
Lilydale
West Saint Paul
Mendota Heights
Sunfish Lake
South St. Paul
Newport
Dakota
Inver Grove Heights
Saint Paul Park
Eagan
Grey Cloud Island
Washington
Cottage Grove
Apple Valley
Rosemount
952
94
61
10
156
149
35E
13
110
494
55
3
52

Legend

- Lower Mississippi River WMO
- 10-Foot Contours
- Municipal Boundaries

Lower Mississippi River WMO Watershed Management Plan

Contours

Figure 4

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Feet

Source: MnGeo, 2011
Revised: November 2014

WSB & Associates, Inc.

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Ramsey
Saint Paul
Maplewood
Lilydale
West Saint Paul
Mendota Heights
South St. Paul
Sunfish Lake
Newport
Dakota
Washington
Saint Paul Park
Eagan
Inver Grove Heights
Grey Cloud Island
Cottage Grove
Rosemount

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MINNESOTA 156
MINNESOTA 149
35E
MINNESOTA 13
MINNESOTA 110
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MINNESOTA 55
MINNESOTA 3

Legend

- Municipal Boundaries
- Lower Mississippi River WMO
- A - These soils have high infiltration rates even when thoroughly wetted. These soils consist chiefly of deep, well drained to excessively drained sands and gravel. These soils have a high rate of water transmission, therefore resulting in a low runoff potential.
- B - These soils have moderate infiltration rates. These soils consist of deep moderately well to well drained soils with moderately fine to moderately coarse textures.
- C - These soils have slow infiltration rates. These soils typically consist of clayey gravel or clayey sand.
- D - These soils have very slow infiltration rates. These soils are are typically clay soils with high swelling potential at or near the surface or shallow soils over nearly impervious material.
- Urban - These soils have been greatly affected by development and are frequently compacted, cut, and filled, resulting in variable runoff rates and a poor environment for plant growth.

LMRWMO Soil Breakdown:

Group A – 7.0%
Group B – 55.5%
Group C – 1.3%
Group D – 2.1%
Urban – 34.1%

Note As a result of continued development, there are likely more Urban soils than are shown on this map.

Lower Mississippi River WMO
Watershed Management Plan

Hydrologic Soils Classification

Figure 5

Source: Natural Resources Conservation Service, 2008
Revised: November 2014

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WSB & Associates, Inc.

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Ramsey
Saint Paul
Lilydale
West Saint Paul
Mendota Heights
Sunfish Lake
South St. Paul
Newport
Dakota
Inver Grove Heights
Eagan
Apple Valley
Rosemount
Washington
Grey Cloud Isla
Cottage Gro
Saint Paul
Maplew

94 952 10 61 35E 13 149 156 110 494 52 55 3

Legend

- Municipal Boundaries
- Lower Mississippi River WMO

Depth to Bedrock (ft)

- 0 - 25
- 25 - 50
- 50 - 100
- 100 - 200
- Over 200

Lower Mississippi River WMO
Watershed Management Plan

Depth to Bedrock

Figure 6

Source: Minnesota Geologic Survey, 2006
Revised: November 2014

N S

0 5,000 Feet

WSB & Associates, Inc.

Ramsey
Saint Paul
Maplewoo
Lilydale
West Saint Paul
Mendota Heights
South St. Paul
Sunfish Lake
Newport
Dakota
Saint Paul Par
Inver Grove Heights
Eagan
Grey Cloud Island
Washington
Cottage Grove
Apple Valley
Rosemount

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MINNESOTA 149
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MINNESOTA 13
MINNESOTA 110
494
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MINNESOTA 55
MINNESOTA 3

Legend

CATEGORY

- Industrial Processing
- Non-Crop Irrigation
- Waterworks (Wells)
- Special Categories
- Temporary
- Lower Mississippi River WMO
- Municipal Boundaries

Lower Mississippi River WMO
Watershed Management Plan

Groundwater Appropriations

Figure 7

Source: Minnesota Department of Natural Resources, 2010, City of Inver Grove Heights, 2011, City of South St. Paul, 2011
Revised: November 2014

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WSB & Associates, Inc.

Ramsey
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Maplewoo
Lilydale
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Sunfish Lake
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Inver Grove Heights
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MINNESOTA 3

Note: The Depth to Groundwater shown on this map is an interpolation. A groundwater elevation raster was created using known lake, wetland, and soil boring information. The depth to groundwater was then calculated by subtracting the groundwater elevations from ground elevations throughout the WMO. Groundwater elevations were then verified using well information from the county well index and water table elevations from the Dakota and Ramsey County Geologic Atlases. For exact groundwater information it is suggested that soil borings be performed at the desired location.

Lower Mississippi River WMO
Open Water Surface

Depth to Groundwater (ft)

0 - 10
10 - 25
25 - 50
50 - 100
100+
Municipal Boundaries

Lower Mississippi River WMO Watershed Management Plan

Depth (ft) to Groundwater

Figure 8

N
S
0
5,000
Feet

Source: WSB & Associates, 2010
Revised: November 2014

WSB & Associates, Inc.

Ramsey
Saint Paul
Maplewood
Lilydale
West Saint Paul
Mendota Heights
South St. Paul
Sunfish Lake
Newport
Dakota
Washington
Saint Paul Park
Inver Grove Heights
Eagan
Grey Cloud Island
Cottage Grove
Rosemount

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MINNESOTA 156
MINNESOTA 149
MINNESOTA 13
35E
MINNESOTA 110
494
52
MINNESOTA 55
MINNESOTA 3

Legend

- 2010 MUSA Line
- Municipal Boundaries
- Lower Mississippi River WMO
- Agricultural (3.08%)
- Single Family Residential (33.37%)
- Multifamily Residential (2.07%)
- Commercial (4.04%)
- Industrial (6.14%)
- Institutional (4.29%)
- Mixed Use (0.43%)
- Open Space (10.45%)
- ROW (4.74%)
- Railway Corridor (0.37%)
- Airport (2.25%)
- Undeveloped (23.01%)
- Open Water (5.73%)

Lower Mississippi River WMO
Watershed Management Plan

Source: Metropolitan Council, 2010
City of Inver Grove Heights, 2010
Revised: November 2014

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5,000
Feet

WSB & Associates, Inc.

2010 Land Use

Figure 9

Ramsey
Saint Paul
Lilydale
West Saint Paul
Maplewoo
Mendota Heights
South St. Paul
Sunfish Lake
Newport
Dakota
Saint Paul Par
Inver Grove Heights
Eagan
Grey Cloud Island
Washington
Cottage Grove
Rosemount

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MINNESOTA 156
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MINNESOTA 13
MINNESOTA 110
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MINNESOTA 55
MINNESOTA 3

Legend

- 2030 MUSA Line
- Municipal Boundaries
- Lower Mississippi River WMO
- Single Family Residential (54.31%)
- Multifamily Residential (2.64%)
- Commercial (4.87%)
- Industrial (9.40%)
- Institutional (4.39%)
- Mixed Use (0.82%)
- Open Space (11.29%)
- ROW (5.17%)
- Railway Corridor (1.10%)
- Airport (2.26%)
- Undeveloped (0.07%)
- Open Water (3.67%)

**NOTE* The following Cities Land Use Plan is for 2030:*
Inver Grove Heights, Lilydale, Sunfish Lake, and West St. Paul

The following Cities Land Use Plan is for 2020:
Mendota Heights, South St. Paul, and St. Paul

Lower Mississippi River WMO
Watershed Management Plan

2020/2030 Land Use

Figure 10

Source: Metropolitan Council, 2010
City of Inver Grove Heights, 2010
Revised: November 2014

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5,000
Feet

WSB & Associates, Inc.

Ramsey
Saint Paul
Maplewood
Pickerel Lake
Lilydale
Mississippi River
Lily Lake
Thompson Lake
Mud Lake
West Saint Paul
Mendota Heights
Augusta Lake
Friendly Marsh
Lemay Lake
Rogers Lake
Sunfish Lake
Golf Course Pond
Seidls Pond
Schmitt Lake
Newport
Horseshoe Lake
Hornbean Lake
Dickman Lake
Bohner Pond
Dakota
Simley Lake
Inver Grove Heights
Saint Paul Park
Eagan
Marcott Lake
River Lake
Grey Cloud Island
Washington
Cottage Grove
Apple Valley
Rosemount

94 952 61 10 MINNESOTA 156 MINNESOTA 149 35E MINNESOTA 13 MINNESOTA 110 494 52 MINNESOTA 55 MINNESOTA 3

19-79 P 19-79 P 62-3 P 19-84 W 19-85 W 19-48 W 19-88 W 19-86 P 19-87 P 19-89 P 19-91 P 19-104 W 19-106 W 19-105 W 19-93 W 19-94 W 19-95 W 19-81 P 19-102 W 19-100 W 19-101 W 19-99 W 19-98 W 19-49 P 19-97 W 19-50 P 19-96 W 19-108 W 19-103 P 19-237 W 19-82 W 19-52 P 19-80 P 19-233 W 19-231 W 19-232 W 19-227 W 19-236 W 19-228 W 19-234 W 19-47 P 19-51 P 19-229 W 19-235 W 19-238 W 19-239 W 19-35 P 19-243 W 19-46 P 19-240 W 19-242 W 19-241 W 19-246 W 19-249 W 19-248 W 19-245 W 19-244 W 19-34 P 19-247 W 19-270 W 19-266 W 19-265 W 19-37 P 19-263 W 19-264 W 19-262 W 19-269 W 19-267 W 19-38 P 19-41 P 19-268 W 19-271 W 19-260 W 19-261 W 19-40 W 19-272 W 19-273 W 19-39 W 19-284 W 19-230 W 19-274 W 19-275 W 19-277 W 19-42 P 19-276 W 19-287 W 19-278 W 19-286 W 19-282 W 19-279 W 19-288 W 19-285 W 19-289 W 19-43 P 19-280 W 19-281 W 19-300 W 19-302 W 19-299 W 19-301 W 19-296 W 19-295 W 19-297 W 19-298 W 19-53 W 19-303 W 19-305 W 19-304 W 19-306 W 19-310 W 19-313 W

Legend

- Municipal Boundaries
- Lower Mississippi River WMO
- DNR Public Water Inventory (PWI)

Lower Mississippi River WMO
Watershed Management Plan

DNR Public Water Inventory (PWI) Map

Figure 11

Source: Minnesota Department of Natural Resources, 2008
Revised: November 2014

N S

0 5,000 Feet

WSB & Associates, Inc.

Ramsey
Saint Paul
Maplewood
Lilydale
West Saint Paul
Mendota Heights
South St. Paul
Sunfish Lake
Newport
Dakota
Saint Paul Park
Eagan
Inver Grove Heights
Grey Cloud Island
Washington
Cottage Grove
Apple Valley
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MINNESOTA 3

Legend

- Lower Mississippi River WMO
- Municipal Boundaries
- National Wetlands Inventory

Lower Mississippi River WMO
Watershed Management Plan

National Wetlands Inventory Map

Figure 12

Source: U.S. Fish and Wildlife Service, 2010
Revised: November 2014

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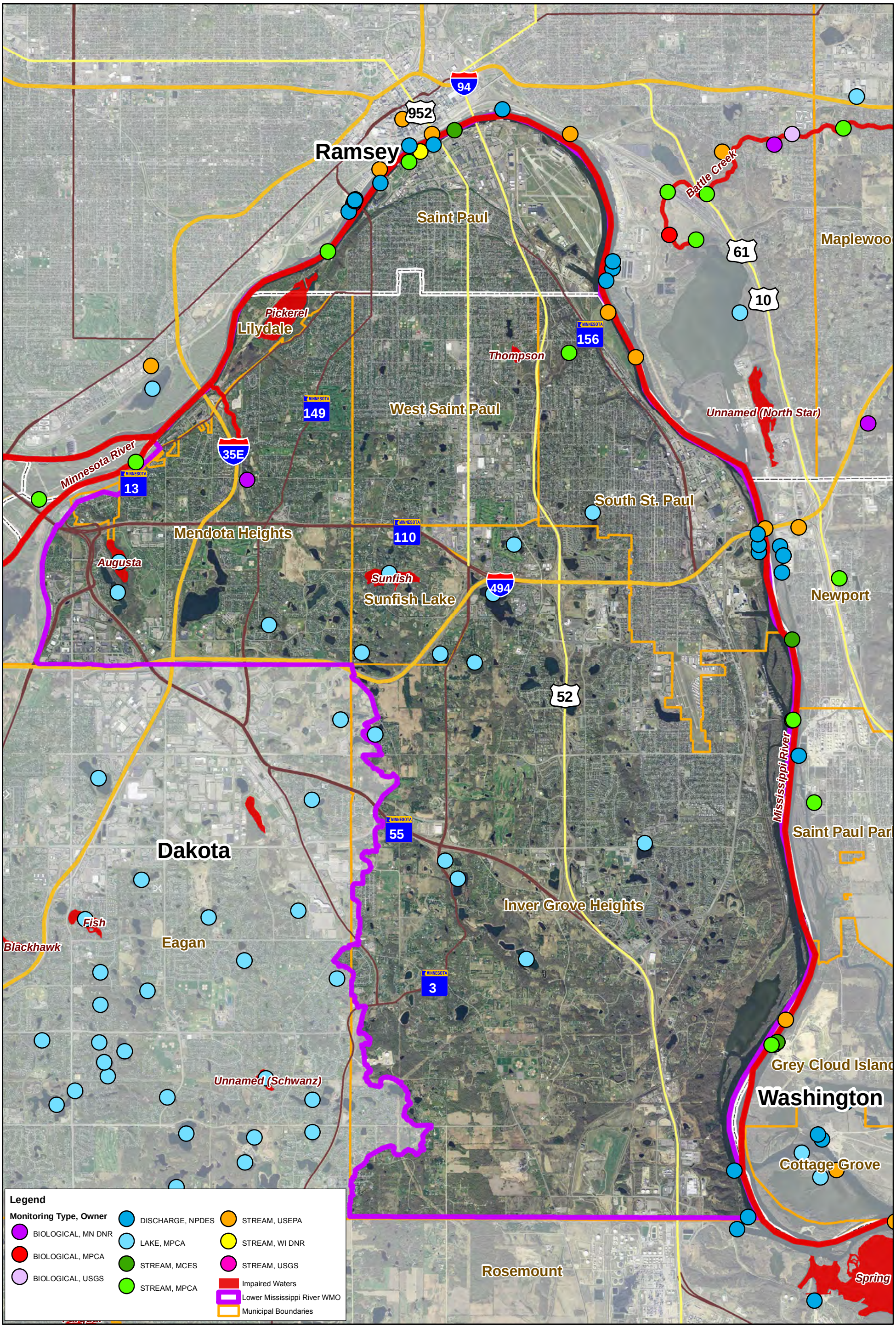
0 5,000 Feet

WSB & Associates, Inc.



Lower Mississippi River WMO
Watershed Management Plan

Water Quality Monitoring Locations

Figure 13

Source: Minnesota Pollution Control Agency, 2006
Revised: November 2014

N
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Feet

WSB & Associates, Inc.

Ramsey
Saint Paul
Riverview
Highway 13
Highway 13
Lilydale
Ivy Falls Creek
Highway 13
Simons Ravine
West Saint Paul
South St. Paul 1
Highway 135E
Wentworth Street
Mendota
Mendota Heights
MB
Interstate Valley Creek
South St. Paul
South St. Paul 3
Highway 110-494
Sunfish Lake
IP
Gun Club Lake
Old Village
Babcock Trail
Argenta Trail
South Grove
Valley Park
Northwest
Skyline Village
Dakota
Simley Lake
Eagan
Inver Grove Heights
Arbor Pointe
Jefferson Trail
South Marcott Lakes
Inver Grove Trail
Mississippi River
Barnes Avenue
Rich Valley
Pine Bend
Eagan
110th Street
Eagan
Albavar Path
Rosemount
Rosemount
Rosemount
Rosemount
Maplev
Newpor
Saint Pa
Grey Cloud Is
Cottage G
Eagan

Legend

- Lower Mississippi River WMO
- Municipal Boundaries

Subwatersheds

- Group A - Watershed to Mississippi River outlet that encompasses more than one city.
- Group B - Watershed to Mississippi River outlet that includes only one city.
- Group C - Watershed that currently has no outlet to the Mississippi River (landlocked), and no outlet is planned for the next 10 to 20 years.

Lower Mississippi River WMO
Watershed Management Plan

Subwatersheds

Figure 14

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Source: Member City Water Management Plans: Inver Grove Heights (2008), Lilydale (2008), Mendota Heights (2006), Saint Paul (2006), South St. Paul (2004), Sunfish Lake (2009), West Saint Paul (2006)
Revised: November 2014

WSB & Associates, Inc.

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Ramsey
Saint Paul
Maplewood
Lilydale
West Saint Paul
South St. Paul
Mendota Heights
Sunfish Lake
Newport
Dakota
Saint Paul Park
Eagan
Inver Grove Heights
Grey Cloud Island
Washington
Cottage Grove
Apple Valley
Rosemount

94
952
61
10
MINNESOTA 156
MINNESOTA 149
35E
MINNESOTA 13
MINNESOTA 110
494
52
MINNESOTA 55
MINNESOTA 3

Legend

- 100-Year Floodplain
- 500-Year Floodplain
- Lower Mississippi River WMO
- Municipal Boundaries

Lower Mississippi River WMO Watershed Management Plan

Floodplain Boundary Map

Figure 15

Source: Federal Emergency Management Agency, 2003
Revised: November 2014

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WSB & Associates, Inc.

Ramsey
Saint Paul
Lilydale
West Saint Paul
South St. Paul
Mendota Heights
Sunfish Lake
Newport
Dakota
Inver Grove Heights
Rosemount
Grey Cloud Isla
Washington
Cottage Grove
Saint Paul P
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MINNESOTA 156
MINNESOTA 110
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MINNESOTA 55
MINNESOTA 3

Legend

Scientific and Natural Areas
- Pig's Eye Island Heron Rookery SNA
- Pine Bend Bluffs SNA

Native Plant Communities
- Black Ash - (Red Maple) Seepage Swamp
- Black Ash - Yellow Birch - Red Maple - Basswood Swamp (Eastcentral)
- Bulrush Marsh (Northern)
- Calcareous Fen (Southeastern)
- Dry Sand - Gravel Prairie (Southern)
- Elm - Ash - Basswood Terrace Forest
- Northern Bulrush-Spikerush Marsh
- Oak - (Red Maple) Woodland
- Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest
- Red Oak - White Oak Forest
- Sand Beach/Sandbar (River)
- Sedge Meadow
- Silver Maple - (Virginia Creeper) Floodplain Forest
- Southern Mesic Maple-Basswood Forest
- Spikerush - Bur Reed Marsh (Northern)
- White Pine - Oak Woodland (Sand)
- Willow - Dogwood Shrub Swamp
- Willow Sandbar Shrubland (River)
- Lower Mississippi River WMO
- Municipal Boundaries

Source: Minnesota Department of Natural Resources, 2010
Revised: November 2014

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Feet

Lower Mississippi River WMO
Watershed Management Plan

Native Plant Communities and Scientific and Natural Areas

Figure 16

WSB & Associates, Inc.

Ramsey
Saint Paul
Maplewood
Lilydale
West Saint Paul
Mendota Heights
South St. Paul
Sunfish Lake
Newport
Dakota
Saint Paul Park
Inver Grove Heights
Eagan
Grey Cloud Island
Washington
Cottage Grove
Rosemount

94 952 61 10 35E 149 13 110 494 156 52 55 3

Legend

- Big Woods (Hardwoods)
- Brush Prairie
- Oak openings and barrens
- Prairie
- Wet Prairie
- River Bottom Forest
- Lower Mississippi River WMO
- Municipal Boundaries

Source: Minnesota Department of Natural Resources, 1994
Revised: November 2014

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Lower Mississippi River WMO
Watershed Management Plan

Presettlement Vegetation

Figure 17

WSB & Associates, Inc.

Ramsey
Saint Paul
Maplewoo
Lilydale
West Saint Paul
South St. Paul
Mendota Heights
Sunfish Lake
Newport
Dakota
Saint Paul P
Inver Grove Heights
Eagan
Grey Cloud Islan
Washington
Cottage Grove
Apple Valley
Rosemount

94
952
61
10
MINNESOTA 156
MINNESOTA 149
35E
MINNESOTA 13
MINNESOTA 110
494
52
MINNESOTA 55
MINNESOTA 3

Legend

- Municipal Boundaries
- Lower Mississippi River WMO
- Mississippi River Corridor Critical Area

Lower Mississippi River WMO
Watershed Management Plan

Mississippi River Corridor Critical Area

Figure 18

Source: Minnesota Department of Natural Resources, 2000
Revised: November 2014

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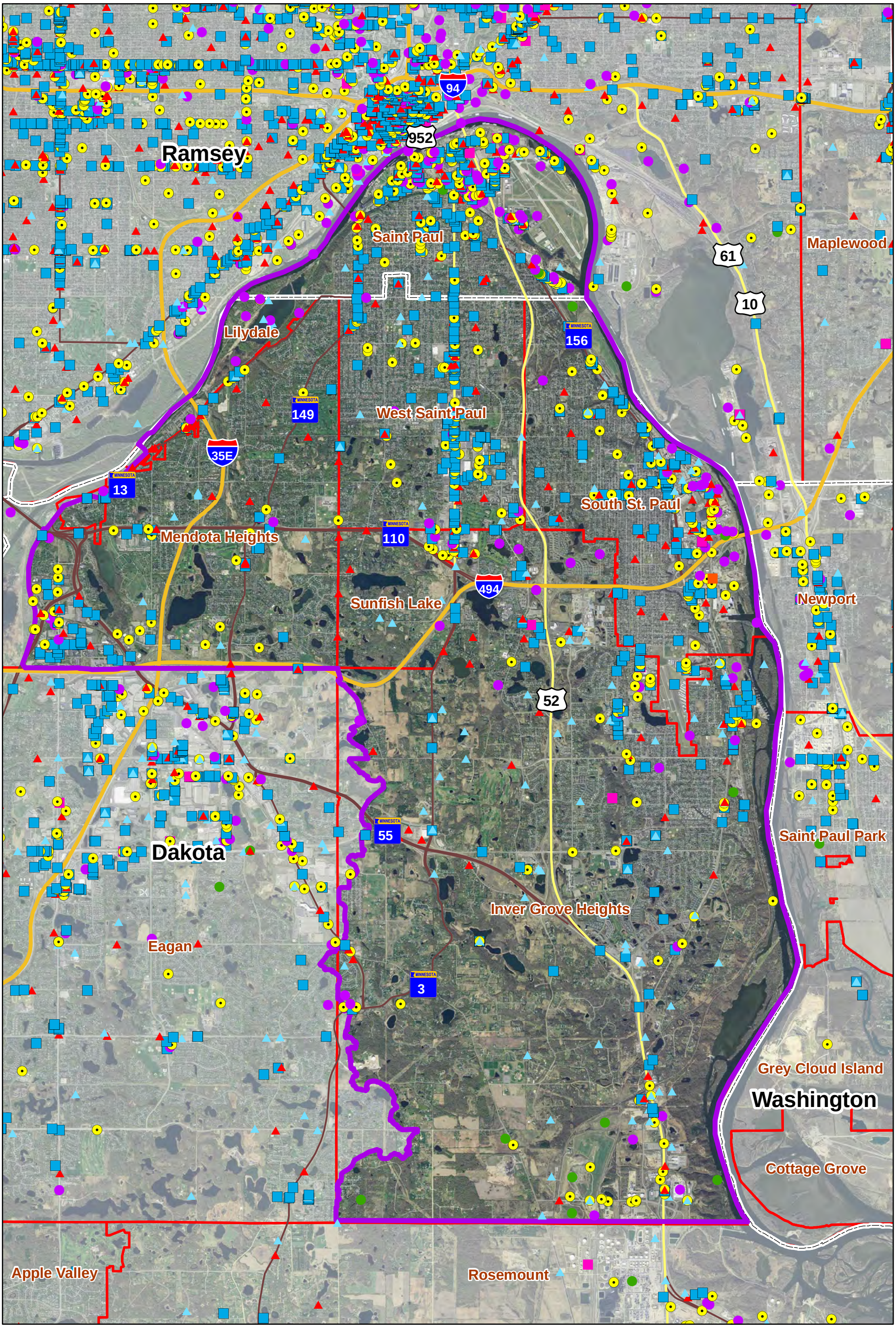
WSB & Associates, Inc.



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Legend

- Municipal Boundaries
- LowerMississippiWMO
- Air
- Investigation and Cleanup
- Water
- Feedlot
- Hazardous Waste
- Solid Waste
- Tanks and Leaks
- Multiple Activities

Lower Mississippi River WMO
Watershed Management Plan

Possible Pollutant Sources

Figure 19

Source: Minnesota Pollution Control Agency, 2009

Contact the MPCA or go to "What's In My Neighborhood" at www.pca.state.mn.us for more information.
Revised: November 2014

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WSB & Associates, Inc.

Ramsey
Saint Paul
Maple
Lilydale
West Saint Paul
Mendota Heights
South St. Paul
Sunfish Lake
Newpor
Dakota
Inver Grove Heights
Saint Paul
Eagan
Grey Cloud Is
Cottage Gro
Rosemount

Problem Areas

1. Streambank erosion along Mississippi River
2. Pickerel Lake/Regional Park for BMPs & Improvements
3. PAHs present in Thompson Lake
4. Impairment of Sunfish Lake, Augusta Lake, Thompson Lake Mississippi River, and Interstate Valley Creek
5. Debris and Floatables at Simley Lake
6. Flooding and Erosion at Marie Ave/Dodd Rd
7. Erosion at Golf Course Pond
8. Water Quality in Hornbean Lake
9. Cherokee Heights Erosion/Sedimentation
10. Seidl's Lake Erosion and Water Quality

Note Refer to Section 4 for more information on the problem areas listed above and others located throughout the Lower Mississippi River WMO.

Legend

- Lower Mississippi River WMO
- Municipal Boundaries

Lower Mississippi River WMO
Watershed Management Plan

Problem Areas and Land Use Conflicts with Water Resources

Figure 20

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Feet

Source: Technical Advisory Committee and Citizen Advisory Committee for 3rd Generation Plan, 2010
Revised: November 2014

WSB & Associates, Inc.

APPENDIX B

JOINT POWERS AGREEMENT

THIRD AMENDMENT TO
REVISED AND RESTATED JOINT POWERS AGREEMENT
ESTABLISHING A WATERSHED MANAGEMENT ORGANIZATION
FOR THE LOWER MISSISSIPPI RIVER WATERSHED

THE PARTIES TO THIS AGREEMENT are members of the Lower Mississippi River Watershed Management Organization and have land that drains surface water into the Mississippi River. This Agreement amends the Revised and Restated Joint Powers Agreement between the members. This Agreement is made pursuant to the authority conferred upon the parties by Minn. Stat. §§ 471.59 and 103B.201 - 103B.255.

1. EXISTING AGREEMENT. The existing Revised and Restated Joint Powers Agreement, as previously amended by a First and Second Amendment for the Lower Mississippi River Watershed Management Organization, shall remain in full force and effect, except as specifically amended by this Agreement.

2. AMENDMENT. Section 1 of the Revised and Restated Joint Powers Agreement is amended to read:

> **SECTION 1. NAME AND LEGAL BOUNDARY.** The parties hereby establish the Lower Mississippi River Watershed Management Organization, hereinafter referred to as the "WMO." The "Revised Legal Boundary Map of the Lower Mississippi River Watershed Management Organization" is attached hereto as Exhibit A.

IN WITNESS WHEREOF, the undersigned governmental units, by action of their governing bodies, have caused this Agreement to be executed in accordance with the authority of Minn. Stat. § 471.59.

[Remainder of Page Intentionally Left Blank.]

Approved by the City Council
July 28, 2014.

CITY OF INVER GROVE HEIGHTS

BY: George Tourville

Attest: Melissa R. Kennedy

177167v1

Approved by the City Council
August 11, 2014.

CITY OF LILYDALE

BY: Anita M. Pomputch

Attest: Mary Schultz

177167v1

Approved by the City Council
Aug. 5, 2014.

CITY OF MENDOTA HEIGHTS

BY: _____

Attest: _____

177167v1

Approved by the City Council
8-4, 2014.

CITY OF SOUTH ST. PAUL

BY: _____

Attest: _____

177167v1

Approved by the City Council

August 13, 2014

CITY OF SAINT PAUL

Kristin Beckmann

Mayor

Director, Office of Financial Services

Approved as to form:

Lisa A. Veith

Assistant City Attorney

Approved by the City Council
October 7, 2014.

CITY OF SUNFISH LAKE

BY: Molly Peck, Mayor

Attest: Katherine Iggo, City Clerk

177167v1

Approved by the City Council
July 28, 2014.

CITY OF WEST ST. PAUL

BY: _____
Its Mayor

BY: _____
Its City Manager

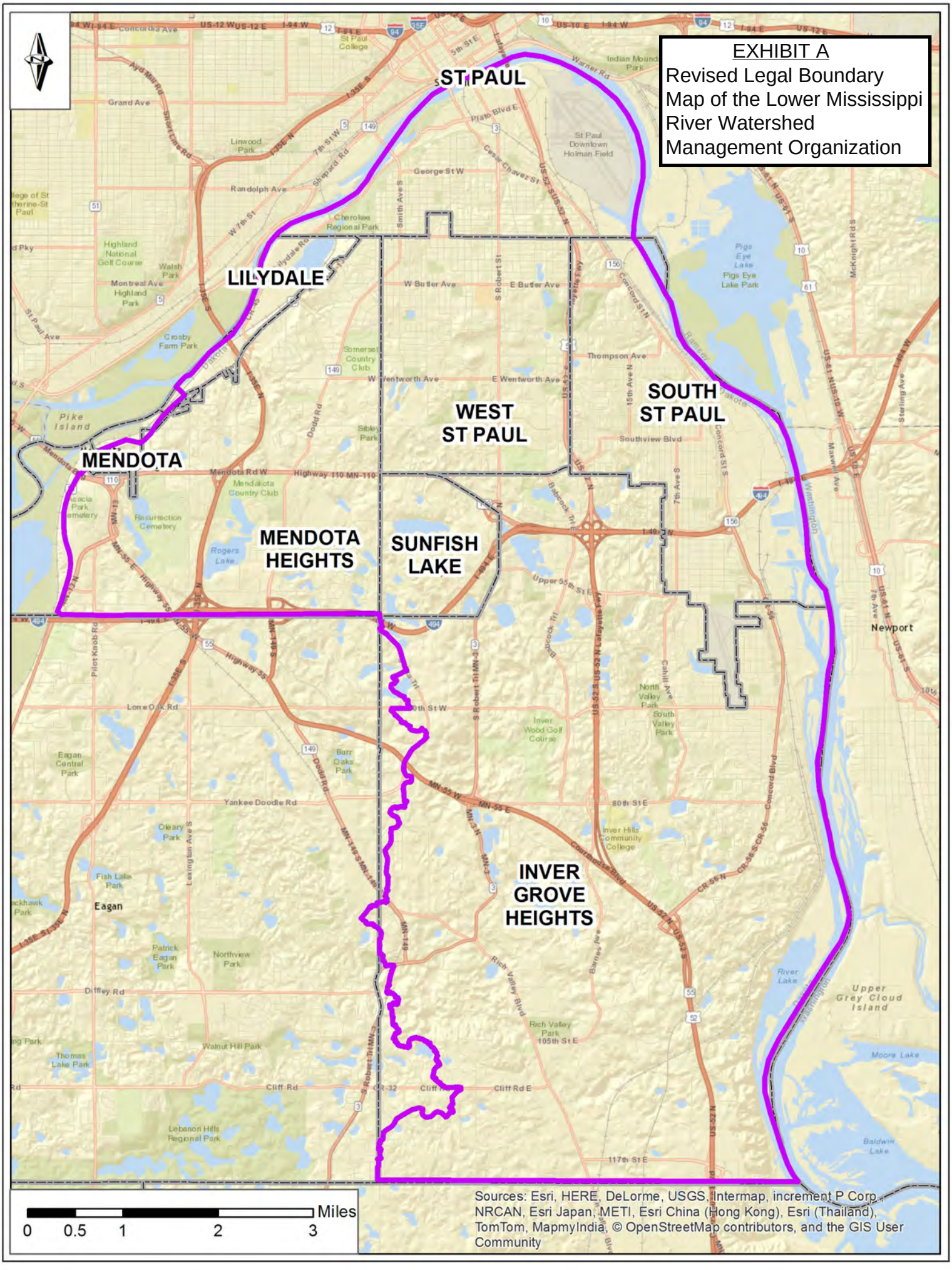
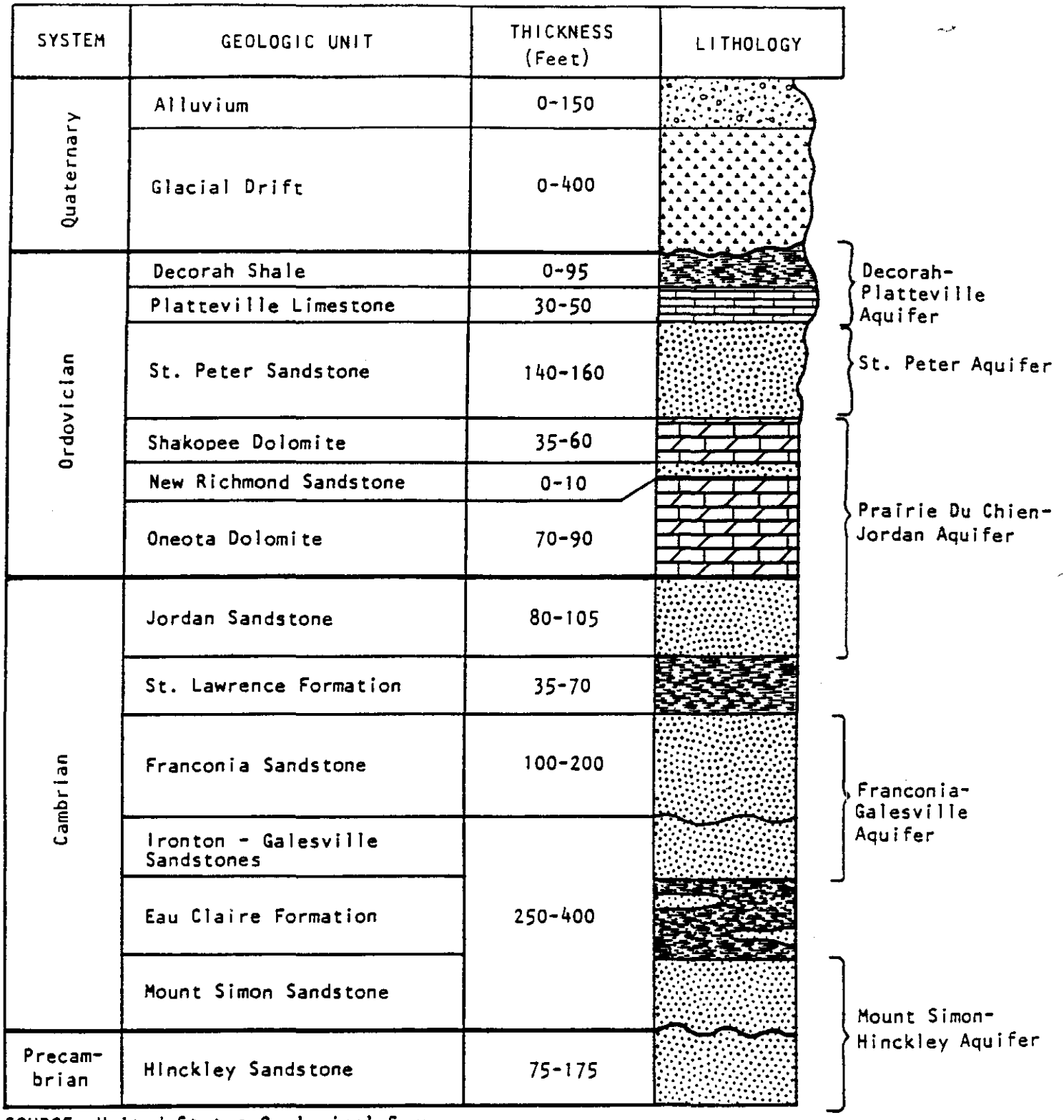


EXHIBIT A
Revised Legal Boundary
Map of the Lower Mississippi
River Watershed
Management Organization
ST PAUL
LILYDALE
MENDOTA
MENDOTA HEIGHTS
SUNFISH LAKE
WEST ST PAUL
SOUTH ST PAUL
INVER GROVE HEIGHTS
Eagan
Newport
Miles
0
0.5
1
2
3
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), TomTom, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

APPENDIX C

GEOLOGIC COLUMN



SOURCE: United States Geological Survey

Figure 2
GEOLOGIC COLUMN

APPENDIX D

WATERBODY CLASSIFICATION INVENTORY FROM THE MPCA (8/23/10)

ID_NoBay	Acres	PWI	Name	**Waterbody Type** (deep lake, shallow lake, wetland, pond)	Notes
19-0079	107	lake	**Pickerel**	shallow lake	11 ft max depth; 100% littoral
19-0080	107	lake	**Rogers**	shallow lake	8 ft max depth; 97% littoral; fish stocked
19-0052	61	lake	**Schmitt**		
19-0050	45	lake	**Sunfish**	deep lake	32 ft max depth (from lake depth map)
19-0081	33	lake	**Augusta**	deep lake	33 ft depth (from MPCA description)
19-0082	25	lake	**Lemay**	shallow lake	
19-0046	24	lake	**Dickman**		
19-0042	22	lake	**Marcott**	deep lake	33 ft max depth (from lake depth map)
19-0047	22	lake	**Hornbean**	shallow Lake	waterbody type P
19-0041	20	lake	**Marcott**	deep lake	27 ft max depth; 95% littoral
19-0103	18	lake			
19-0035	17	lake			
19-0049	15	lake	**Unnamed**		
19-0051	14	lake	**Horseshoe**	shallow lake	
19-0034	14	lake	**Unnamed**		
19-0241	13	wetland	**Unnamed**		
19-0039	12	wetland	**Marcott**		
19-0037	11	lake	**Unnamed (Simley)**	shallow lake	17 ft max depth; fish stocked; waterbody type P
19-0038	10	lake	**Unnamed**		
19-0043	9	lake			
19-0102	9	wetland			
19-0053	9	wetland	**Unnamed**		
19-0040	8	wetland	**Marcott**		
19-0296	8	wetland	**Unnamed**		
19-0272	8	wetland			
19-0233	8	wetland			
19-0245	7	wetland	**Unnamed (Gun Club)**		DNR says 4 acres
19-0240	7	wetland			
19-0048	7	wetland	**Thompson**	shallow lake	8 ft max depth
19-0093	6	wetland			
19-0227	6	wetland	**Unnamed**	shallow lake	waterbody type W
19-0084	6	wetland	**Lily**		
19-0295	6	wetland	**Unnamed**		
19-0234	6	wetland	**Unnamed**		
19-0263	5	wetland	**Unnamed**		
19-0228	5	wetland			
19-0281	5	wetland			
19-0243	5	wetland			
19-0096	5	wetland			
19-0232	5	wetland	**Unnamed**		

19-0303	4	wetland			
19-0091	4	lake	**Marthaler Pond**		6 ft max depth
19-0249	4	wetland			
19-0284	4	wetland			
19-0086	4	lake			
19-0267	4	wetland	**Unnamed (IGH City Hall Pond)**		DNR says 13.5 acres; 20% littoral; 17 ft max depth; fish stocked
19-0095	4	wetland	**Unnamed (Seidl)**	shallow lake	waterbody type W
19-0235	4	wetland			
19-0270	4	wetland			
19-0304	3	wetland			
19-0264	3	wetland			
19-0242	3	wetland			
19-0282	3	wetland			
19-0277	3	wetland			
19-0276	3	wetland			
19-0108	3	wetland			
19-0237	3	wetland			
19-0265	3	wetland			
19-0236	3	wetland			
19-0269	3	wetland			
19-0087	3	lake			
19-0297	3	wetland			
19-0229	3	wetland			
19-0310	3	wetland			
19-0260	3	wetland			
19-0279	3	wetland			
19-0231	3	wetland			
19-0305	3	wetland			
19-0244	2	wetland			
19-0306	2	wetland			
19-0238	2	wetland			
19-0101	2	wetland			
19-0088	2	wetland			
19-0287	2	wetland			
19-0268	2	wetland			
19-0089	2	lake			
19-0098	2	wetland			
19-0274	2	wetland			
19-0094	2	wetland			
19-0239	2	wetland			
19-0097	2	wetland			
19-0271	2	wetland			
19-0044	2	not protected			

19-0266	2	wetland			
19-0278	2	wetland			
19-0085	1	wetland	**Mud**		
19-0100	1	wetland			
19-0246	1	wetland			
19-0104	1	wetland			
19-0099	0	wetland			

notes are information from DNR lake finder unless otherwise noted
waterbodies are usually classified as lakes if they are greater than 10 acres

Table 12. Some of the factors used to separate lakes, shallow lakes, and wetlands are as follows:

Factor	Lakes	Shallow lakes	Wetlands
Protected Waters Inventory Code	Typically coded as “L or LP” in PWI	May be coded as either “L, LP or LW” in PWI	Typically coded as a “LW” in PWI
Depth, maximum	Typically >15 feet	Typically < 15 feet	Typically < 7 feet
Littoral area	Typically <80%	Typically >80%	Typically 100%
Area (minimum)	> 10 acres (Bulletin 25)	> 10 acres (Bulletin 25)	No minimum
Thermal stratification (summer)	Stratification common but dependant upon depth, size and fetch	Typically do not thermally stratify	Typically do not stratify.
Fetch	Significant fetch depending on size & shape	Fetch is variable depending on size & shape	Rarely has a significant fetch
Substrate	Consolidated sand/silt/gravel	Consolidated to mucky	Mucky to unconsolidated
Shoreline features	Generally wave formed, often sand, gravel or rock	Generally wave formed, often sand, gravel or rock	Generally dominated by emergents
Emergent vegetation & relative amount of open water	Shoreline may have ring of emergents; vast majority of basin open water.	Emergents common, may cover much of fringe of lake; basin often has high percentage of open water.	Emergents often dominate much of basin; often minimal open water.
Submergent vegetation	Common in littoral fringe, extent dependant on transparency	Abundant in clear lakes; however may be lacking in algal-dominated turbid lakes.	Common unless dominated by an emergent like cattail.

Dissolved Oxygen	Aerobic epilimnion; hypolimnion often anoxic by midsummer	Aerobic epilimnion but wide diurnal flux possible	Diurnal flux & anaerobic conditions common
Fishery	Typically managed for a sport/game fishery. May be stocked. MDNR fishery assessments typically available.	May or may not be managed for a sport fishery. If so, fishery assessment should be available. Winter aeration often used to minimize winterkill potential.	Typically not managed for a sport fishery. Little or no MDNR fishery information. Seldom aerated May be managed to remove fish & promote waterfowl.
Uses	Wide range of uses including boating, swimming, skiing, fishing; boat ramps & beaches common	Boating, fishing, waterfowl production, hunting, aesthetics; limited swimming; may have boat ramp, beaches uncommon	Waterfowl & wildlife production, hunting, aesthetics. Unimproved boat ramp if any. No beaches.

From: Janna Kieffer [mailto:JKieffer@barr.com]
Hello all,

At the 6/17 LMRWMO meeting, there was discussion regarding the MPCA's method for classifying lakes regard to the WMO's 3rd Generation Plan and future WQ monitoring activities. I have included an excer MPCA's Guidance Manual for the 2010 water quality assessment cycle that discusses their approach to wetlands vs lakes. The full document can be found at the following link: http://www.pca.state.mn.us/in types-and-programs/minnesota-s-impaired-waters-and-tmdls/assessment-and-listing/tmdl-water-quali

Excerpt from the MPCA *Guidance Manual for Assessing the Quality of Minnesota Surface Waters for Determination of Impairment: 305(b) Report and 303(d) List, 2010 Assessment Cycle,* Section X.B.2.b (Assessment for Lake Eutrophication):

"The standards also require determining whether the lake is a "deep", "shallow", or is more accurately classifi formal definition of "deep" versus "shallow" is drawn directly from chapter 7050 as follows:

"Lake" means an enclosed basin filled or partially filled with standing fresh water with a maximum depth greater than 15 feet. Lakes may have no inlet or outlet, an inlet or outlet, or both an inlet and outlet.

"Shallow lake" means an enclosed basin filled or partially filled with standing fresh water with a maximum depth of 15 feet or less or with 80 percent or more of the lake area shallow enough to support emergent and submerged rooted aquatic plants (the littoral zone). It is uncommon for shallow lakes to thermally stratify during the summer. The quality of shallow lakes will permit the propagation and maintenance of a healthy indigenous aquatic community and they will be suitable for boating and other forms of aquatic recreation for which they may be usable.

In some cases it may be difficult to differentiate shallow lakes from wetlands. For example, some lakes, while listed as "W" in the Protected Waters Inventory (PWI), may be characterized as lakes by local watershed management organizations (WMOs), actively managed as lakes by MDNR Fisheries (as evidenced through lake survey data and fish stocking documented on their web site), and/or there is a weight of evidence that suggests the public perceives the waterbody as a lake based on presence of public access, boating and fishing usage. A series of questions (factors) have been assembled in Table 12 that may help in resolving the appropriate classification of waterbodies for purposes of 303(d) assessment. When there is a question on whether the waterbody is best classified as a lake or as a wetland, for the purpose of 303(d) assessment, review of MDNR web-based information, consultation with local resource managers and a site visit to the lake(s) in question are recommended to help determine what the most appropriate characterization might be. Those determined to be wetlands will be assessed through the wetland assessment methodology. Once these decisions are made, the data can be applied to the proper standard."

s vs wetlands, with
rpt below from the
ward classification of
ıdex.php/water/water-
ty-assessment.html

ed as a wetland. A

APPENDIX E

WATER QUALITY MONITORING INFORMATION

Sunfish Lake [Sunfish Lake] (19-0050) *City of Sunfish Lake*

Sunfish Lake is located in the City of Sunfish Lake (Dakota County). The lake has a surface area of 49 acres and a maximum depth of 9.8 m (32 ft).

During each sampling event the lake was monitored for total phosphorus (TP), chlorophyll-a (CLA), and total kjeldahl nitrogen (TKN), and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability.

2009 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	24.6	12.0	36.0	B
CLA (µg/l)	13.3	1.6	43.0	B
Secchi (m)	2.6	1.1	5.5	B
TKN (mg/l)	0.78	0.58	1.00	
			Lake Grade	B

The lake received a lake grade of B for 2009, which is the best lake grade yet received in its limited monitoring history. Additional years of monitoring are suggested for continuing to build the water quality database so as to better understand the lake's water quality and determine potential water quality trends.

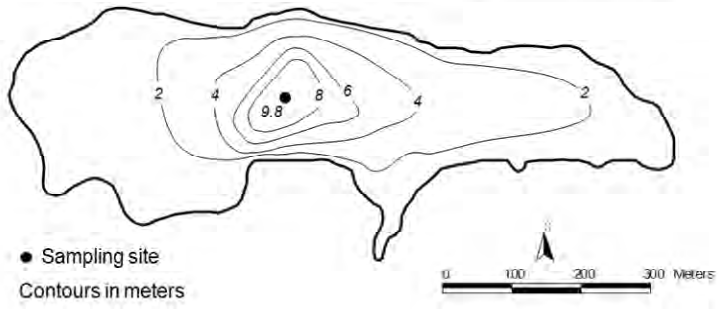
Throughout the monitoring period, the volunteer's opinions of the lake's physical condition and recreational suitability were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page.

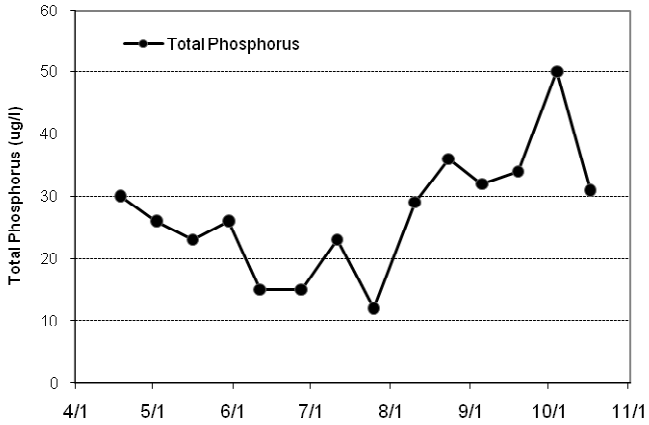
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Brian Johnson of the Metropolitan Council at (651) 602-8743 or brian.johnson@metc.state.mn.us.

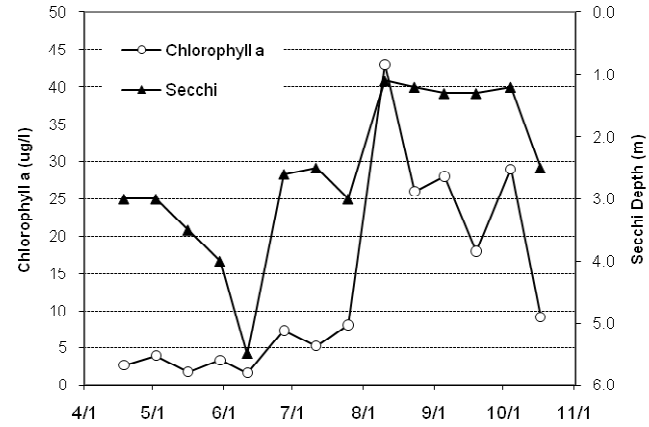
Sunfish Lake

Sunfish Lake, Dakota Co.

Lake ID: 190050-00
WMO: Lower Mississippi River
Volunteer: Dick Bancroft

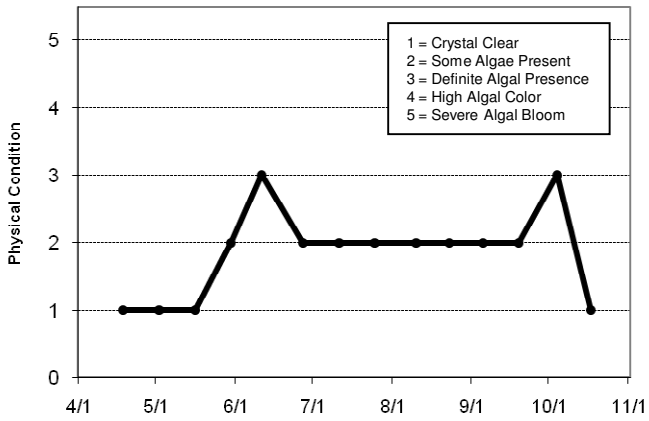






2009 Data

	Surf Tmp	Bot Tmp	Surf DO	Bot DO	CLA	Surf TP	Bot TP	Secchi		
DATE	(ºC)	(ºC)	(mg/L)	(mg/L)	(µg/L)	(µg/L)	(µg/L)	(m)	PC	RS
4/18	15.2				2.6	30		3.0	1	1
5/2	16.3				3.9	26		3.0	1	1
5/16	15.5				1.7	23		3.5	1	1
5/30	19.8				3.3	26		4.0	2	1
6/11	18.4				1.6	15		5.5	3	3
6/27	26.2				7.3	15		2.6	2	3
7/11	24.6				5.2	23		2.5	2	3
7/25	23.6				8.1	12		3.0	2	1
8/10	24.9				43	29		1.1	2	1
8/23	22.6				26	36		1.2	2	1
9/5	22.7				28	32		1.3	2	1
9/19	24.1				18	34		1.3	2	1
10/4	12.7				29	50		1.2	3	1
10/17	8.6				9.2	31		2.5	1	1

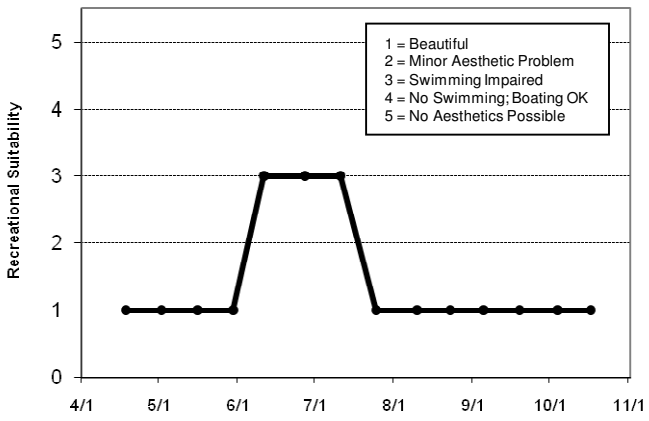


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth					C	C	C					C
Lake Grade												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Lake Grade												

Year	2004	2005	2006	2007	2008	2009
Total Phosphorus			C	C	C	B
Chlorophyll a			C	C	C	B
Secchi Depth			D	C	C	B
Lake Grade			**C**	**C**	**C**	**B**



Source: Metropolitan Council and STORET data

Minnesota Pollution Control Agency

Connection Failure

Physical Information

Name: Sunfish
DNR Lake ID number: 19-0050
County: DAKOTA
Location from nearest town: AT SUNFISH LAKE (TOWN)
Ecoregion: NCHF
Basin: UM
Hydrologic Unit Code: 7010206
Surface Area: 45.077 (acres)
Maximum depth: 32 (feet)
Water Body Type: P

Latitude/Longitude: 44.87611111/-93.09777778
UTMx/UTMy: 492282/4969189

Lake Water Quality Assessment

This summary is based on available summer (June through September) data in STORET (STOF the national water quality data repository developed by the United States Environmental Protec Agency. All water quality data collected by MPCA or received from external groups is placed in STORET.) collected between 1999 and 2008.

Data Quality: excellent
Aquatic Recreation Use Support: Non-supporting Lakes are worse than (exceed) the aquatic recrea support thresholds with sufficient data to make an assessment for aquatic recreation use (at least 10 T Chl-a, and 10 Secchi). These lakes appear on the 303(d) Impaired Waters List.

Lake Water Quality Data Summary

Total Phosphorus Mean: 48.84615385 ppb (parts per billion)
Total Phosphorus Standard Error: 4.588511509 ppb
Total Phosphorus # of Observations: 26

Chlorophyll-a Mean: 31.52093023 ppb
Chlorophyll-a Standard Error: 3.437155392 ppb
Chlorophyll-a # of Observations: 43

Secchi Disk Mean: 1.296153846 meters
Secchi Disk Standard Error: 0.153771136 meters
Secchi Disk # of Observations: 26
www.pca.state.mn.us/water/clmp.html

Alkalinity Mean: ppm (parts per million)
Color Mean: Platinum-cobalt Units
Carlson Trophic Status for Total Phosphorus: 60.22470275
Carlson Trophic Status for Chlorophyll-a: 64.45089393
Carlson Trophic Status for Secchi Disk: 56.26202728
Overall Trophic Status: E
(O=oligotrophic, M=mesotrophic, E=eutrophic, H=hypereutrophic)

See the Difference! **Oligotrophic** vs. **Hypereutrophic**

Watch how lakes change over the summer.

Compare this lake to reference lakes or all assessed lakes.

Transparency *Chlorophyll-a* *Total Phosphorus*

Horseshoe Lake [Sunfish Lake] (19-0051) *City of Sunfish Lake*

Horseshoe Lake is an approximate 16-acre lake located within the City of Sunfish Lake (Dakota County). There is very little morphological information available for the lake.

On each sampling day the lake was monitored for total phosphorus (TP), chlorophyll-a (CLA), total kjeldahl nitrogen (TKN), and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The resulting data and graphs appear on the next page.

2009 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	25.6	16.0	42.0	B
CLA (µg/l)	4.5	2.7	10.0	A
Secchi (m)	2.3	2.0	3.2	B*
TKN (mg/l)	0.69	0.55	0.88	
			Lake Grade	B

* see discussion below

The lake's 2009 lake water quality grade was a B, which was similar to last year's lake grade. However, the water clarity was better than the Secchi depth data would suggest since most of the measurements were made with the Secchi disk visible on the lake bottom. Therefore the Secchi depth mean and grade given above underestimate the actual water clarity. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

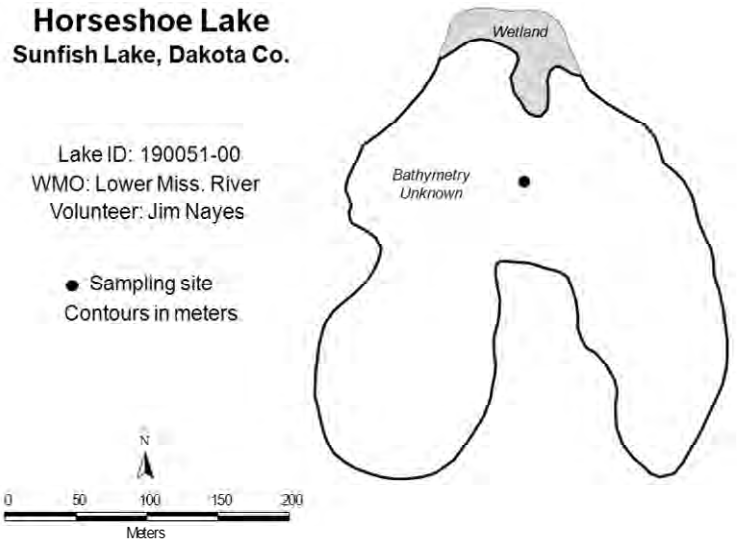
Throughout the monitoring period, the volunteer's opinions of the lake's physical condition and recreational suitability were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page.

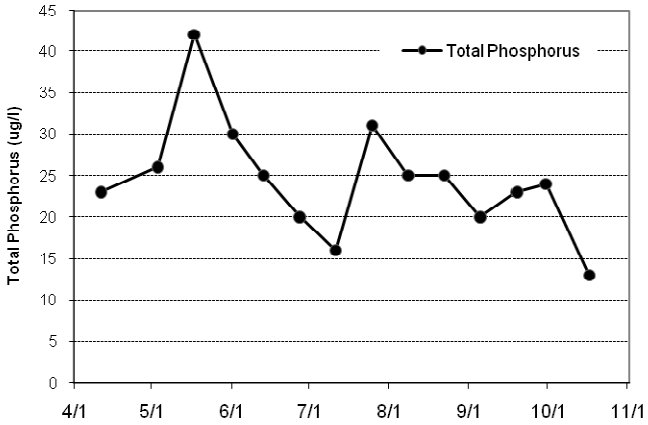
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Brian Johnson of the Metropolitan Council at (651) 602-8743 or brian.johnson@metc.state.mn.us.

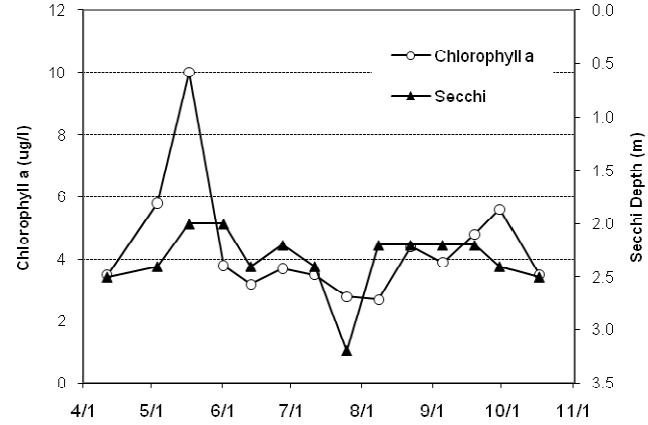
Horseshoe Lake
Sunfish Lake, Dakota Co.

Lake ID: 190051-00
WMO: Lower Miss. River
Volunteer: Jim Nayes

● Sampling site
Contours in meters

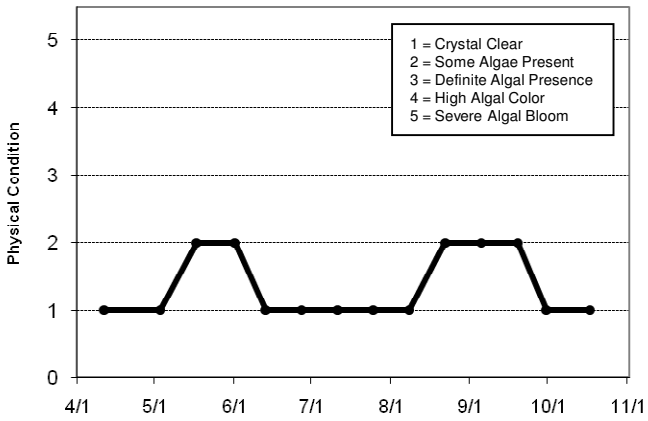






2009 Data

	Surf Tmp	Bot Tmp	Surf DO	Bot DO	CLA	Surf TP	Bot TP	Secchi		
DATE	(ºC)	(ºC)	(mg/L)	(mg/L)	(µg/L)	(µg/L)	(µg/L)	(m)	PC	RS
4/11	10.3				3.5	23		2.5	1	1
5/3	16.7				5.8	26		2.4	1	1
5/17	18.7				10	42		2.0	2	1
6/1	20.4				3.8	30		2.0	2	1
6/13	18.6				3.2	25		2.4	1	1
6/27	27.6				3.7	20		2.2	1	1
7/11	25.2				3.5	16		2.4	1	1
7/25	24.5				2.8	31		3.2	1	1
8/8	24				2.7	25		2.2	1	1
8/22	22				4.4	25		2.2	2	1
9/5	24.4				3.9	20		2.2	2	1
9/19	23.7				4.8	23		2.2	2	1
9/30	14.7				5.6	24		2.4	1	1
10/17	8.1				3.5	13		2.5	1	1

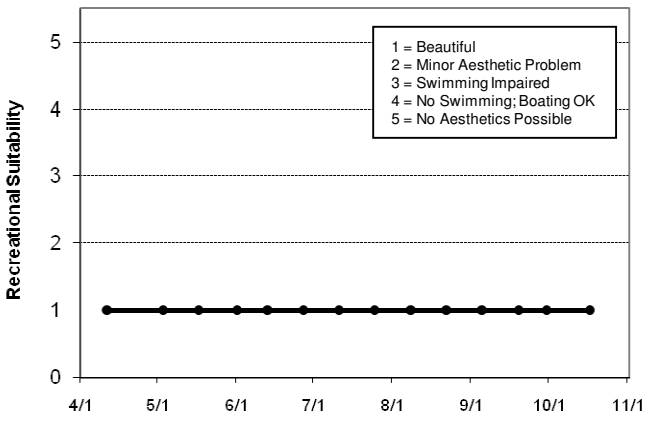


Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Lake Grade												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Lake Grade												

Year	2004	2005	2006	2007	2008	2009
Total Phosphorus			C	C	A	B
Chlorophyll a			A	A	A	A
Secchi Depth			C	C	C	B
Lake Grade			**B**	**B**	**B**	**B**



Source: Metropolitan Council and STORET data

Minnesota Pollution Control Agency

Connection Failure

Physical Information

Name: Horseshoe
DNR Lake ID number: 19-0051
County: DAKOTA
Location from nearest town: IN SUNFISH LAKE
Ecoregion: NCHF
Basin: LM
Hydrologic Unit Code: 7040001
Surface Area: 14.269 (acres)
Water Body Type:

Latitude/Longitude: 44.86357/-93.08663
UTMx/UTMy: /

Lake Water Quality Assessment

This summary is based on available summer (June through September) data in STORET (STOR the national water quality data repository developed by the United States Environmental Protec Agency. All water quality data collected by MPCA or received from external groups is placed in STORET.) collected between 1999 and 2008.

Data Quality: excellent
Aquatic Recreation Use Support: Fully Supporting Lakes are better than the aquatic recreation use thresholds with sufficient data to make an assessment. These lakes are considered to be assessed fo recreation and fully supporting by the MPCA.

Lake Water Quality Data Summary

Total Phosphorus Mean: 37.8 ppb (parts per billion)
Total Phosphorus Standard Error: 5.986651819 ppb
Total Phosphorus # of Observations: 20

Chlorophyll-a Mean: 4.060606061 ppb
Chlorophyll-a Standard Error: 1.133753315 ppb
Chlorophyll-a # of Observations: 33

Secchi Disk Mean: 1.805 meters
Secchi Disk Standard Error: 0.075210232 meters
Secchi Disk # of Observations: 20
www.pca.state.mn.us/water/clmp.html

Alkalinity Mean: ppm (parts per million)
Color Mean: Platinum-cobalt Units
Carlson Trophic Status for Total Phosphorus: 56.52789726
Carlson Trophic Status for Chlorophyll-a: 44.34706926
Carlson Trophic Status for Secchi Disk: 51.49002187
Overall Trophic Status: E
(O=oligotrophic, M=mesotrophic, E=eutrophic, H=hypereutrophic)

See the Difference! **Oligotrophic** vs. **Hypereutrophic**

Watch how lakes change over the summer.

Compare this lake to reference lakes or all assessed lakes.

Transparency *Chlorophyll-a* *Total Phosphorus*

Hornbean Lake (19-0047) *City of Sunfish Lake*

Hornbean Lake is located within the City of Sunfish Lake (Dakota County), and has an area of approximately 22-acres. There is very little morphological information available for the lake.

On each sampling day the lake was monitored for total phosphorus (TP), chlorophyll-a (CLA), total kjeldahl nitrogen (TKN), and Secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The resulting data are summarized in the tables and figures on the next page.

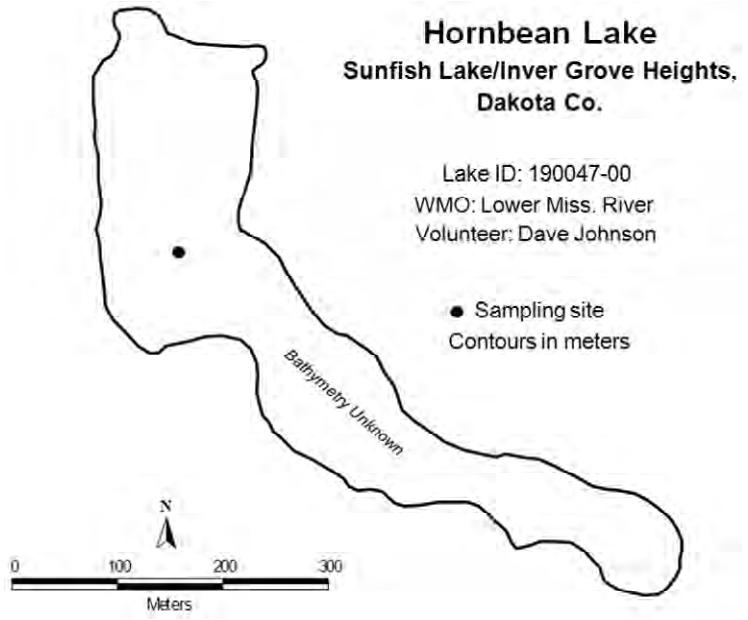
2009 summer (May-September) data summary

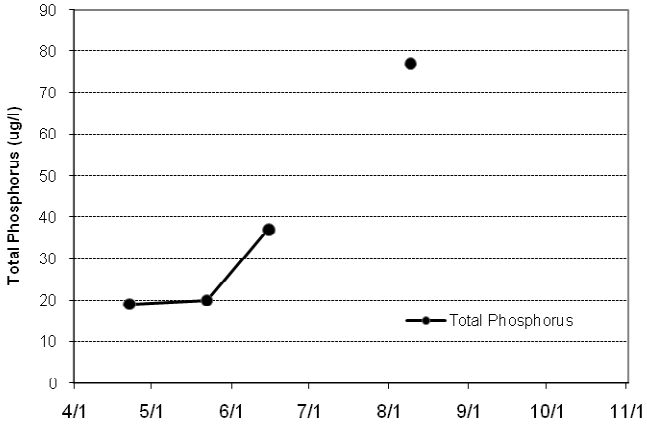
Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	44.7	20.0	77.0	N/A
CLA (µg/l)	20.2	4.5	36.0	N/A
Secchi (m)	1.7	0.8	2.7	N/A
TKN (mg/l)	1.49	0.96	1.80	
			Lake Grade	N/A

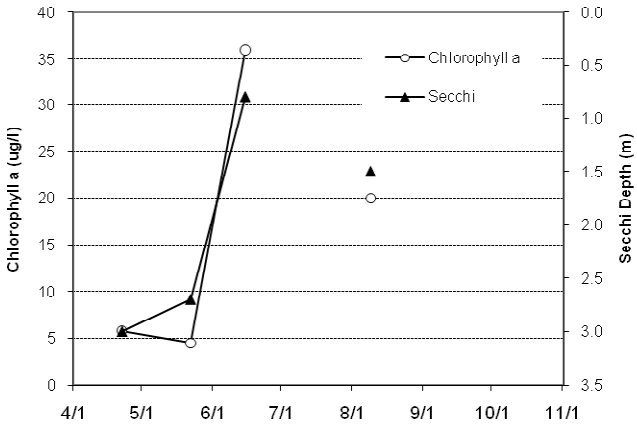
There was an insufficient quantity of data to calculate grades for the lake in 2009. At least 5 monitoring events during the summer-time period (May – September) are needed. To better understand the lake's water quality and where it may be heading, additional years of data collection are needed.

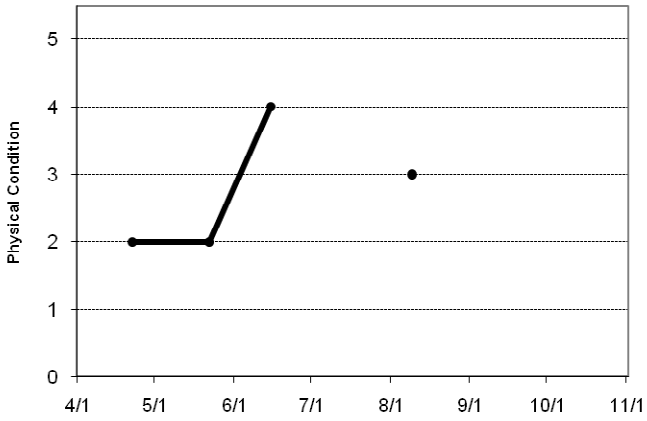
Throughout the monitoring period, the volunteer's opinions of the lake's physical condition and recreational suitability were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page.

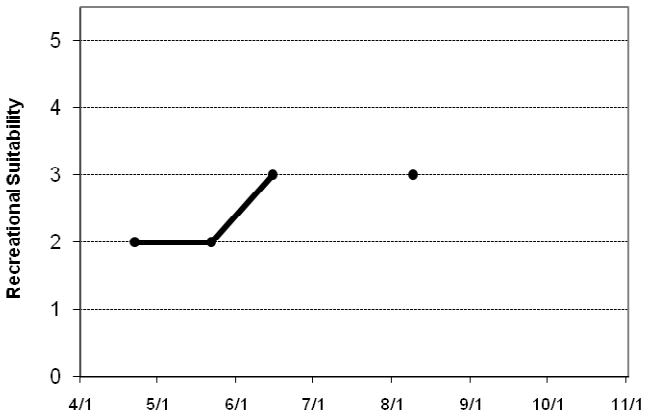
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Brian Johnson of the Metropolitan Council at (651) 602-8743 or brian.johnson@metc.state.mn.us.











2009 Data

DATE	Surf Tmp (ºC)	Bot Tmp (ºC)	Surf DO (mg/L)	Bot DO (mg/L)	CLA (µg/L)	Surf TP (µg/L)	Bot TP (µg/L)	Secchi (m)	PC	RS
4/22	13.2				5.8	19		3.0	2	2
5/22	21.3				4.5	20		2.7	2	2
6/15	24.8				36	37		0.8	4	3
8/9	25.1				20	77		1.5	3	3

Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Lake Grade												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Lake Grade												

Year	2004	2005	2006	2007	2008	2009
Total Phosphorus			C	C	C	
Chlorophyll a			B	C	A	
Secchi Depth			C	C	B	
Lake Grade			**C**	**C**	**B**	**NA**

Source: Metropolitan Council and STORET data

Minnesota Pollution Control Agency

Connection Failure

Physical Information

Name: Hornbean
DNR Lake ID number: 19-0047
County: DAKOTA
Location from nearest town:
Ecoregion: NCHF
Basin: UM
Hydrologic Unit Code: 7010206
Surface Area: 22.039 (acres)
Maximum depth: 0 (feet)
Water Body Type: P

Latitude/Longitude: 44.86377544/-93.10380495
UTMx/UTMy: /

Lake Water Quality Assessment

This summary is based on available summer (June through September) data in STORET (STOF the national water quality data repository developed by the United States Environmental Protec Agency. All water quality data collected by MPCA or received from external groups is placed in STORET.) collected between 1999 and 2008.

Data Quality: excellent
Aquatic Recreation Use Support:

Lake Water Quality Data Summary

Total Phosphorus Mean: 56.55555556 ppb (parts per billion)
Total Phosphorus Standard Error: 5.610577209 ppb
Total Phosphorus # of Observations: 18

Chlorophyll-a Mean: 22.40714286 ppb
Chlorophyll-a Standard Error: 5.016346107 ppb
Chlorophyll-a # of Observations: 28

Secchi Disk Mean: 1.494444444 meters
Secchi Disk Standard Error: 0.181761933 meters
Secchi Disk # of Observations: 18
www.pca.state.mn.us/water/clmp.html

Alkalinity Mean: ppm (parts per million)

Color Mean: Platinum-cobalt Units
Carlson Trophic Status for Total Phosphorus: 62.33792199
Carlson Trophic Status for Chlorophyll-a: 61.1030157
Carlson Trophic Status for Secchi Disk: 54.21071724
Overall Trophic Status: E
(O=oligotrophic, M=mesotrophic, E=eutrophic, H=hypereutrophic)

See the Difference! **Oligotrophic** vs. **Hypereutrophic**

Watch how lakes change over the summer.

Compare this lake to reference lakes or all assessed lakes.

Transparency *Chlorophyll-a* *Total Phosphorus*

Seidl's Lake (19-0095) Cities of ***Inver Grove Heights and South St. Paul***

Seidl's Lake is a 14-acre lake located in the City of Inver Grove Heights (Dakota County) which receives inflow from five inlets. The maximum depth of the lake is approximately 5.0 m (17 feet). There are little known morphological data available.

On each sampling day the lake was monitored for total phosphorus (TP), chlorophyll-a (CLA), total kjeldahl nitrogen (TKN), and secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The resulting data are summarized in tables and figures on the following page.

2009 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	50.0	48.0	52.0	N/A
CLA (µg/l)	17.0	17.0	17.0	N/A
Secchi (m)	1.0	1.0	1.0	N/A
TKN (mg/l)	1.65	1.60	1.70	
			Lake Grade	N/A

No lake grade or parameter grades were issued this year because of too few monitoring events. At least 5 monitoring events during the summer-time period are required to determine grades.

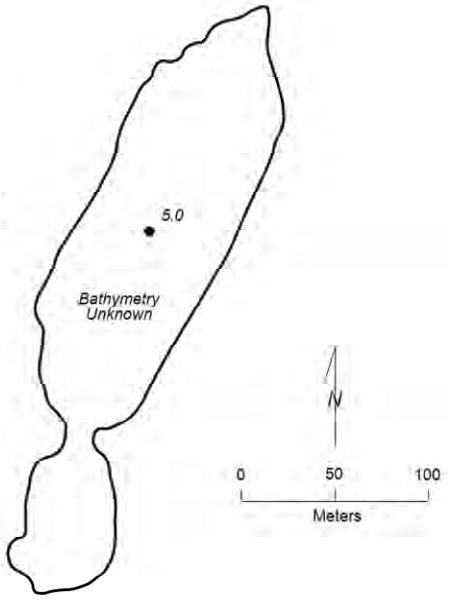
Throughout the monitoring period, the volunteer's opinions of the lake's physical condition and recreational suitability were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page.

If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Brian Johnson of the Metropolitan Council at (651) 602-8743 or brian.johnson@metc.state.mn.us.

Seidl Lake

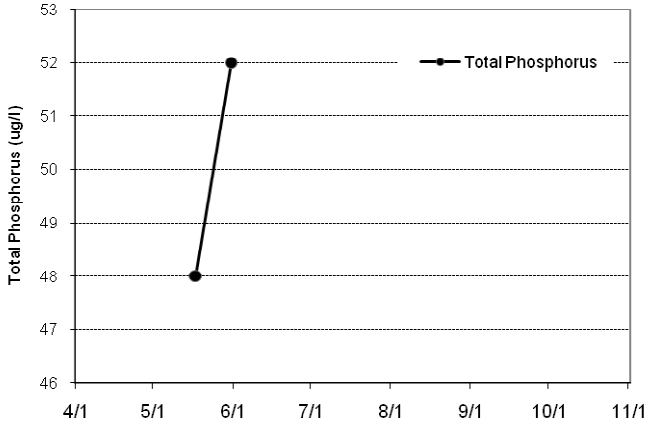
Inver Grove Heights, Dakota Co.

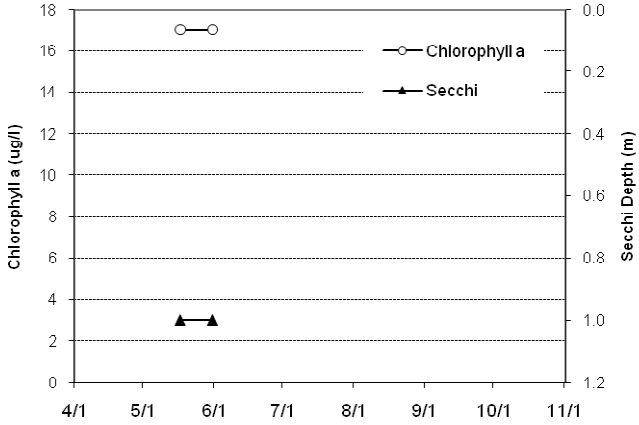
Lake ID: 190095-00
WMO: Lower Mississippi River
Volunteer: Randy Bjorklund



- Sampling site

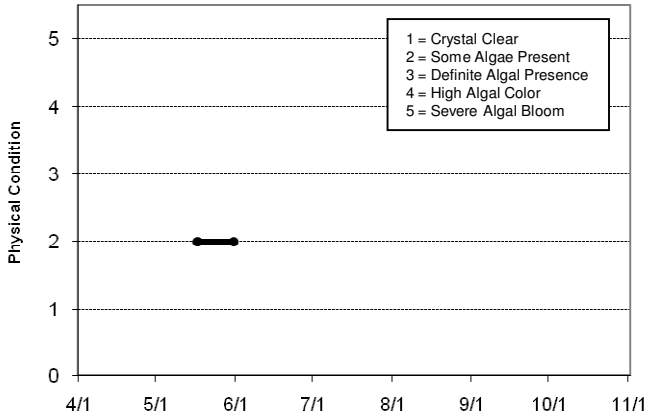
Contours in meters





2009 Data

	Surf Tmp	Bot Tmp	Surf DO	Bot DO	CLA	Surf TP	Bot TP	Secchi		
DATE	**(ºC)**	**(ºC)**	**(mg/L)**	**(mg/L)**	**(µg/L)**	**(µg/L)**	**(µg/L)**	**(m)**	**PC**	**RS**
5/17	21.5				17	48		1.0	2	4
5/31	22.9				17	52		1.0	2	4



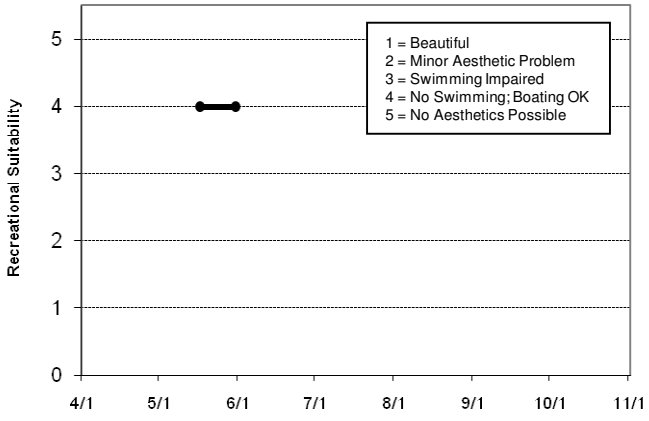
Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												C
Chlorophyll a												C
Secchi Depth												D
Lake Grade												**C**

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Phosphorus				C	C	C	C	D	C	C	D	C
Chlorophyll a				A	B	B	C	C	C	C	C	B
Secchi Depth		D	D	B	B	C	D	D	C	C	D	D
Lake Grade				**B**	**B**	**C**	**C**	**D**	**C**	**C**	**D**	**C**

Year	2004	2005	2006	2007	2008	2009
Total Phosphorus	D	C	D	D		
Chlorophyll a	B	C	C	C		
Secchi Depth	C	D	F	F		
Lake Grade	**C**	**C**	**D**	**D**		**NA**

Source: Metropolitan Council and STORET data



Minnesota Pollution Control Agency

Connection Failure

Physical Information

Name: Unnamed (Seidl)
DNR Lake ID number: 19-0095
County: DAKOTA
Location from nearest town: IN SOUTH ST. PAUL
Ecoregion: NCHF
Basin: UM
Hydrologic Unit Code: 7010206
Surface Area: 3.633 (acres)
Maximum depth: 0 (feet)
Water Body Type: W

Latitude/Longitude: 44.88555556/-93.05327778
UTMx/UTMy: 495793/4970235

Lake Water Quality Assessment

This summary is based on available summer (June through September) data in STORET (STOR the national water quality data repository developed by the United States Environmental Protec Agency. All water quality data collected by MPCA or received from external groups is placed in STORET.) collected between 1999 and 2008.

Data Quality: excellent
Aquatic Recreation Use Support:

Lake Water Quality Data Summary

Total Phosphorus Mean: 72.97727273 ppb (parts per billion)
Total Phosphorus Standard Error: 5.976414715 ppb
Total Phosphorus # of Observations: 66

Chlorophyll-a Mean: 28.14070796 ppb
Chlorophyll-a Standard Error: 1.890183837 ppb
Chlorophyll-a # of Observations: 113

Secchi Disk Mean: 0.998797468 meters
Secchi Disk Standard Error: 0.053705988 meters
Secchi Disk # of Observations: 79
www.pca.state.mn.us/water/clmp.html

Alkalinity Mean: ppm (parts per million)

Color Mean: Platinum-cobalt Units
Carlson Trophic Status for Total Phosphorus: 66.01393503
Carlson Trophic Status for Chlorophyll-a: 63.33810083
Carlson Trophic Status for Secchi Disk: 60.01733891
Overall Trophic Status: E
(O=oligotrophic, M=mesotrophic, E=eutrophic, H=hypereutrophic)

See the Difference! **Oligotrophic** vs. **Hypereutrophic**

Watch how lakes change over the summer.

Compare this lake to reference lakes or all assessed lakes.

Transparency *Chlorophyll-a* *Total Phosphorus*

Rogers Lake (19-0080) – *Lower Mississippi River Watershed Management Organization*

Rogers Lake lies within the City of Mendota Heights. The lake has a surface area of 94 acres and a maximum depth of 2.4 m (7.9 ft). The entire area of the lake is considered littoral zone which is the 0-15 feet depth zone of aquatic plant dominance. Furthermore, the lake does not maintain a thermocline, which is a density gradient caused by changing water temperatures throughout the water column.

On each sampling day the lake was monitored for total phosphorus (TP), chlorophyll-a (CLA), total kjeldahl nitrogen (TKN), and secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The resulting data are summarized in tables and figures on the following page.

2009 summer (May-September) data summary

Parameter	*Mean*	*Minimum*	*Maximum*	*Grade*
TP (µg/l)	39.9	28.0	68.0	C
CLA (µg/l)	8.5	4.2	12.0	A
Secchi (m)	1.3	1.0	1.5	C
TKN (mg/l)	1.32	0.86	1.90	
			Lake Grade	B

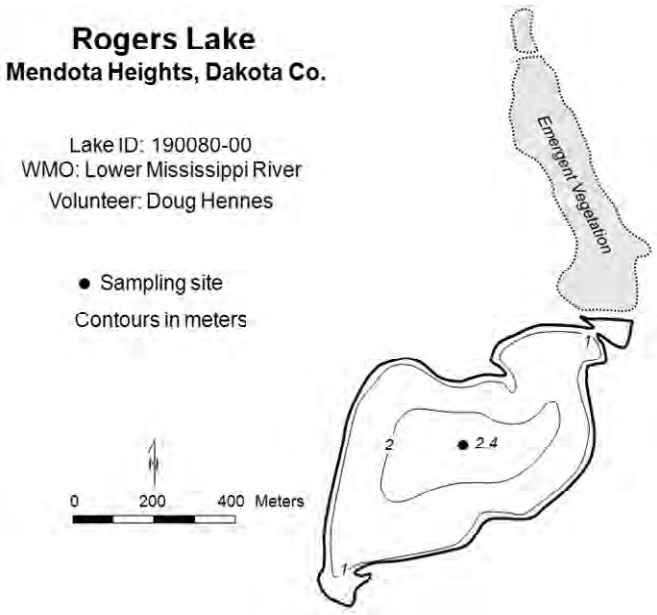
The lake received a lake grade of B for 2009. Additional years of monitoring are suggested for continuing to build the water quality database so as to better understand the lake's water quality and determine potential water quality trends.

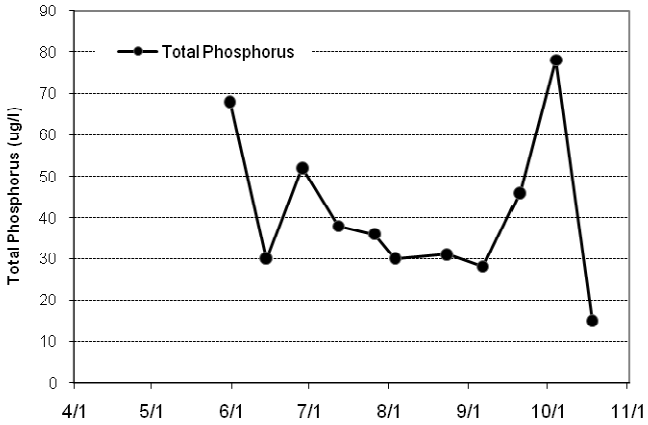
The water clarity grade of C does not correlate well with the chlorophyll-a grade of A. A possible explanation may be that the water clarity may be affected by higher levels of total suspended solids from surface runoff from the surrounding urbanized watershed. It is possible for higher suspend solids loadings to decrease water clarity which would decrease light penetration thereby inhibiting algal growth.

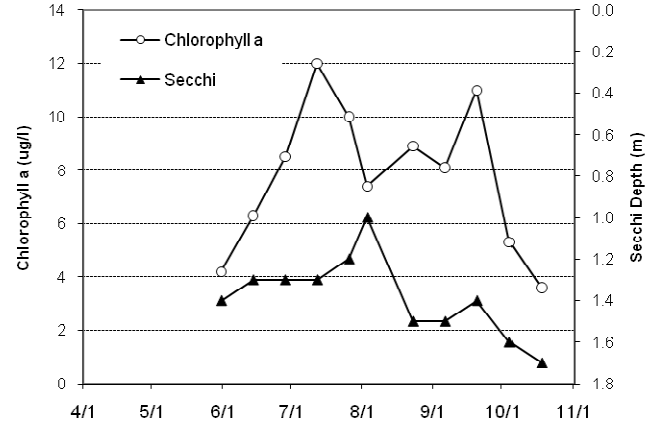
Throughout the monitoring period, the volunteer's opinions of the lake's physical condition and recreational suitability were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page.

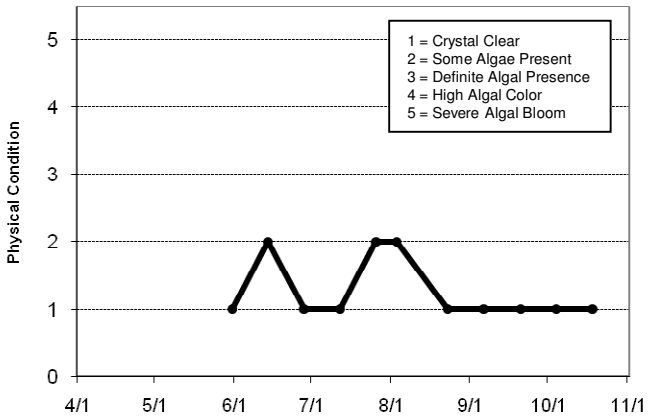
The Fisheries Section of the Minnesota Department of Natural Resources (MDNR) has conducted a fisheries survey on the lake. Information on the survey can be obtained through the MDNR Fisheries Section by calling (651) 259-5831 or by downloading the information off the Internet at http://www.dnr.state.mn.us/lakefind/.

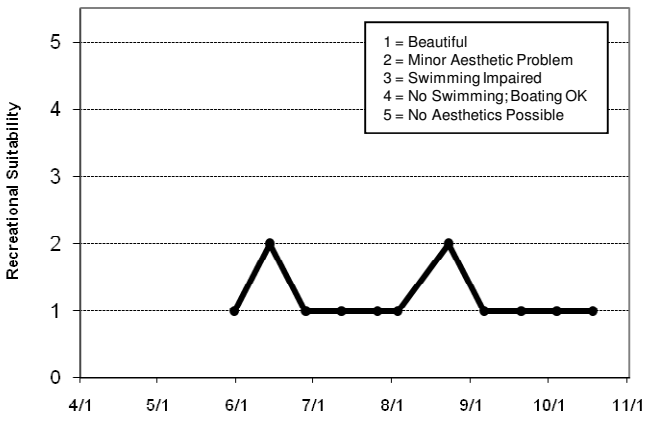
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Brian Johnson of the Metropolitan Council at (651) 602-8743 or brian.johnson@metc.state.mn.us.











2009 Data

	Surf Tmp	Bot Tmp	Surf DO	Bot DO	CLA	Surf TP	Bot TP	Secchi		
DATE	(ºC)	(ºC)	(mg/L)	(mg/L)	(µg/L)	(µg/L)	(µg/L)	(m)	PC	RS
5/31	18.9				4.2	68		1.4	1	1
6/14	23.9				6.3	30		1.3	2	2
6/28	24.6				8.5	52		1.3	1	1
7/12	26.8				12	38		1.3	1	1
7/26	24.5				10	36		1.2	2	1
8/3	24.3				7.4	30		1.0	2	1
8/23	23.5				8.9	31		1.5	1	2
9/6	24.2				8.1	28		1.5	1	1
9/20	23.9				11	46		1.4	1	1
10/4	12.1				5.3	78		1.6	1	1
10/18	9				3.6	15		1.7	1	1

Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Lake Grade												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total Phosphorus												
Chlorophyll a												
Secchi Depth												
Lake Grade												

Year	2004	2005	2006	2007	2008	2009
Total Phosphorus				C	B	C
Chlorophyll a				A	A	A
Secchi Depth				D	C	C
Lake Grade				**C**	**B**	**B**

Source: Metropolitan Council and STORET data

Minnesota Pollution Control Agency

Connection Failure

Physical Information

Name: Marcott
DNR Lake ID number: 19-0041
County: DAKOTA
Location from nearest town: IN INVER GROVE HEIGHTS
Ecoregion: NCHF
Basin: LM
Hydrologic Unit Code: 7040001
Surface Area: 19.865 (acres)
Maximum depth: 27 (feet)
Water Body Type: P

Latitude/Longitude: 44.82861111/-93.08272222
UTMx/UTMy: 493461/4963911

Lake Water Quality Assessment

This summary is based on available summer (June through September) data in STORET (STOR the national water quality data repository developed by the United States Environmental Protec Agency. All water quality data collected by MPCA or received from external groups is placed in STORET.) collected between 1999 and 2008.

Data Quality: excellent
Aquatic Recreation Use Support: Fully Supporting Lakes are better than the aquatic recreation use thresholds with sufficient data to make an assessment. These lakes are considered to be assessed fo recreation and fully supporting by the MPCA.

Lake Water Quality Data Summary

Total Phosphorus Mean: 23.875 ppb (parts per billion)
Total Phosphorus Standard Error: 1.743738799 ppb
Total Phosphorus # of Observations: 16

Chlorophyll-a Mean: 3.492 ppb
Chlorophyll-a Standard Error: 0.465650799 ppb
Chlorophyll-a # of Observations: 25

Secchi Disk Mean: 2.520625 meters
Secchi Disk Standard Error: 0.192051358 meters
Secchi Disk # of Observations: 16
www.pca.state.mn.us/water/clmp.html

Alkalinity Mean: ppm (parts per million)
Color Mean: Platinum-cobalt Units
Carlson Trophic Status for Total Phosphorus: 49.9022358
Carlson Trophic Status for Chlorophyll-a: 42.8671562
Carlson Trophic Status for Secchi Disk: 46.67785576
Overall Trophic Status: M
(O=oligotrophic, M=mesotrophic, E=eutrophic, H=hypereutrophic)

See the Difference! **Oligotrophic** vs. **Hypereutrophic**

Watch how lakes change over the summer.

Compare this lake to reference lakes or all assessed lakes.

Transparency *Chlorophyll-a* *Total Phosphorus*

Minnesota Pollution Control Agency

Photo not available

Lake Station Information

Station Name	UNNAMED (GOLF COURSE)
Alternate IDs:	19-0049
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0049
Hydrologic Unit Code (HUC):	07010206
Assessment Unit:	
Period of Record:	1988 through 1988

Connection Failure

Lat/Lon: 44.8806/-93.0705
Datum: NAD83
County: Dakota

Projects Associated with this Station

Project	Purpose
Citizen Lake Monitoring Program	Monitor lake eutrophication status. Project manager formerly Jennifer Klang and assis project manager Johanna Schussler. 2008 new project manager Johanna Schussler.

Station Data Collection Years

1988

Station Data

Sample Date:	Sample Type	Sample Depth	BOD mg/L	Chl-a µg/L	DO mg/L	TKN mg/L	NOx mg/L	pH	Pheo µg/L	TP mg/L	TSS mg/L	Temp Degrees C	Turb	FC #/100ml	F #/
10/04/1988	Routine Sample/Observation	0 m													
09/07/1988	Routine Sample/Observation	0 m													
08/31/1988	Routine Sample/Observation	0 m													
08/17/1988	Routine Sample/Observation	0 m													
07/27/1988	Routine Sample/Observation	0 m													

07/13/1988	Routine Sample/Observation	0 m
06/28/1988	Routine Sample/Observation	0 m
06/21/1988	Routine Sample/Observation	0 m
06/13/1988	Routine Sample/Observation	0 m

Station Dataset Download

Download Standard Parameter Data (Same format as above)

Download All Monitoring Data (Including all Parameters)

Additional Information and Links

Secchi Disk readings for 19-0049 Lake

- Full Secchi information from the MPCA site
- Lake Water Quality Information from the MPCA site

This page was last updated 19-Jul-10

If you have suggestions on how we can improve this site, or if you have questions or problems, please contact us.
If you have technical questions or problems with this site, contact webmaster@pca.state.mn.us
Minnesota Pollution Control Agency, 520 Lafayette Road, St. Paul, MN 55155-4194
Phone: 651-296-6300, 800-657-3864; 24-hour emergency number: 651-649-5451 or 800-422-0798; TTY: 651-282-5332, TTY 24-hour emergency number: 651 627-3529 dione

Minnesota Pollution Control Agency

Connection Failure

Physical Information

Name: Unnamed (Simley)
DNR Lake ID number: 19-0037
County: DAKOTA
Location from nearest town: 2 MI SW OF INVER GROVE
Ecoregion: NCHF
Basin: UM
Hydrologic Unit Code: 7010206
Surface Area: 10.638 (acres)
Maximum depth: 17 (feet)
Water Body Type: P

Latitude/Longitude: 44.83416667/-93.04188889
UTMx/UTMy: 496689/4964526

Lake Water Quality Assessment

This summary is based on available summer (June through September) data in STORET (STOF the national water quality data repository developed by the United States Environmental Protec Agency. All water quality data collected by MPCA or received from external groups is placed in STORET.) collected between 1999 and 2008.

Data Quality: excellent
Aquatic Recreation Use Support:

Lake Water Quality Data Summary

Total Phosphorus Mean: 45.11111111 ppb (parts per billion)
Total Phosphorus Standard Error: 2.773107185 ppb
Total Phosphorus # of Observations: 36

Chlorophyll-a Mean: 26.06326531 ppb
Chlorophyll-a Standard Error: 3.048191019 ppb
Chlorophyll-a # of Observations: 49

Secchi Disk Mean: 0.994444444 meters
Secchi Disk Standard Error: 0.075060234 meters
Secchi Disk # of Observations: 36
www.pca.state.mn.us/water/clmp.html

Alkalinity Mean: ppm (parts per million)

Color Mean: Platinum-cobalt Units
Carlson Trophic Status for Total Phosphorus: 59.07763416
Carlson Trophic Status for Chlorophyll-a: 62.58576853
Carlson Trophic Status for Secchi Disk: 60.08027876
Overall Trophic Status: E
(O=oligotrophic, M=mesotrophic, E=eutrophic, H=hypereutrophic)

See the Difference! **Oligotrophic** vs. **Hypereutrophic**

Watch how lakes change over the summer.

Compare this lake to reference lakes or all assessed lakes.

Transparency *Chlorophyll-a* *Total Phosphorus*

CITY OF SAINT PAUL
INTERDEPARTMENTAL MEMORANDUM

October 3, 1984

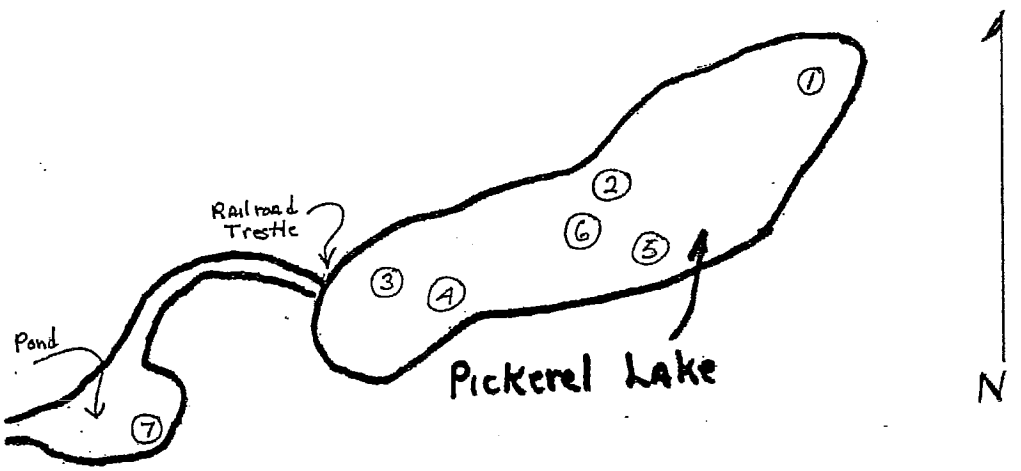
TO: Timothy M. Agness

FROM: William F. Gunther, Laboratory Director WFG
CITY OF ST. PAUL HEALTH DIVISION

SUBJECT: Test results from Pickerel Lake

The test results from the water samples taken from Pickerel Lake on Sept. 14, 1984 are as follows:

Location number	Fecal Coliform	Total Plate Count
1	43	220
2	93	750 est
3	9	160
4	< 3	430 est
5	< 3	320 est
6	3	170
7	240	1,080 est

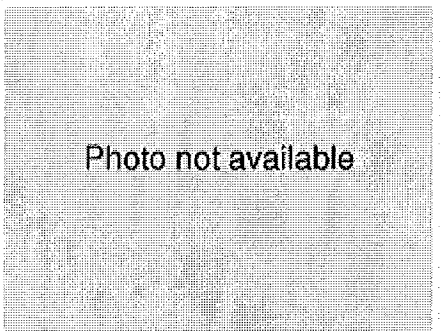


The standard for natural water for swimming is less than 200 fecal coliforms and less than a 1,000 on the total plate count. All of the samples passed bacteriologically accept the pond sample #7.

The samples indicate that the lake water quality is bacteriologically safe for swimming.

WFG:cw

Minnesota Pollution Control Agency



Connection Failure

Lake Station Information

Station Name	DICKMAN
Alternate IDs:	19-0046
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0046
Hydrologic Unit Code (HUC):	07010206
Assessment Unit:	
Period of Record:	1996 through 1997

Lat/Lon: 44.8622/-93.0791
Datum: NAD83
County: Dakota

Projects Associated with this Station

Project	Purpose
MPCA Lake Monitoring Program Project	This is an inclusive project created to migrate data to modernized STORET from t 21MINNL Agency Code in Legacy STORET where project information was not s the sample or result level. Specific purposes for Legacy STORET data collection i available in the station descriptions.
Atmospheric and Nonpoint Trends in MN Lakes LCMR study	Trends

Station Data Collection Years

1997 1996

Station Data

Sample Date:	Sample Type	Sample Depth	BOD mg/L	Chl-a µg/L	DO mg/L	TKN mg/L	NOx mg/L	pH	Pheo µg/L	TP mg/L	TSS mg/L	Temp Degrees C	Turb	FC #/100ml
08/15/1997	Routine Sample/Observation	0 m			6.8			7.57				22.3		
08/15/1997	Routine Sample/Observation	1.00 m			5.5							21.9		

08/15/1997	Routine Sample/Observation	2.00 m		5						21.8	
08/15/1997	Routine Sample/Observation		59.2		1.34		10.4	0.103	7.6		
05/13/1997	Routine Sample/Observation	0 m		9.9		9.25				13	
05/13/1997	Routine Sample/Observation	1.00 m		10						12.6	
05/13/1997	Routine Sample/Observation	2.00 m		9.4						12.4	
05/13/1997	Routine Sample/Observation		46.7		1.45	< 0.05	< 0.85	0.076	13		8.7

Station Dataset Download

Download Standard Parameter Data (Same format as above)

Download All Monitoring Data (Including all Parameters)

Additional Information and Links

Secchi Disk readings for 19-0046 Lake

- Full Secchi information from the MPCA site
- Lake Water Quality Information from the MPCA site

This page was last updated 07-Jul-10

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Minnesota Pollution Control Agency, 520 Lafayette Road, St. Paul, MN 55155-4194
Phone: 651-296-6300, 800-657-3864; 24-hour emergency number: 651-649-5451 or 800-422-0798; TTY: 651-282-5332, TTY 24-hour emergency number: 651 627-3529 dione

Minnesota Pollution Control Agency

Photo not available

Lake Station Information

Station Name	DICKMAN
Alternate IDs:	19-0046
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0046
Hydrologic Unit Code (HUC):	07010206
Assessment Unit:	
Period of Record:	1996 through 1997

Connection Failure

Lat/Lon: 44.8622/-93.0791
Datum: NAD83
County: Dakota

Projects Associated with this Station

Project	Purpose
MPCA Lake Monitoring Program Project	This is an inclusive project created to migrate data to modernized STORET from t 21MINNL Agency Code in Legacy STORET where project information was not s the sample or result level. Specific purposes for Legacy STORET data collection r available in the station descriptions.
Atmospheric and Nonpoint Trends in MN Lakes LCMR study	Trends

Station Data Collection Years

1997 1996

Station Data

Sample Date:	Sample Type	Sample Depth	BOD mg/L	Chl-a µg/L	DO mg/L	TKN mg/L	NOx mg/L	pH	Pheo µg/L	TP mg/L	TSS mg/L	Temp Degrees C	Turb	FC #/100ml	I #
09/19/1996	Routine Sample/Observation			86					28.44	0.136					

Station Dataset Download

Download Standard Parameter Data (Same format as above) 

Download All Monitoring Data (Including all Parameters) 

Additional Information and Links

Secchi Disk readings for 19-0046 Lake

- Full Secchi information from the MPCA site
- Lake Water Quality Information from the MPCA site

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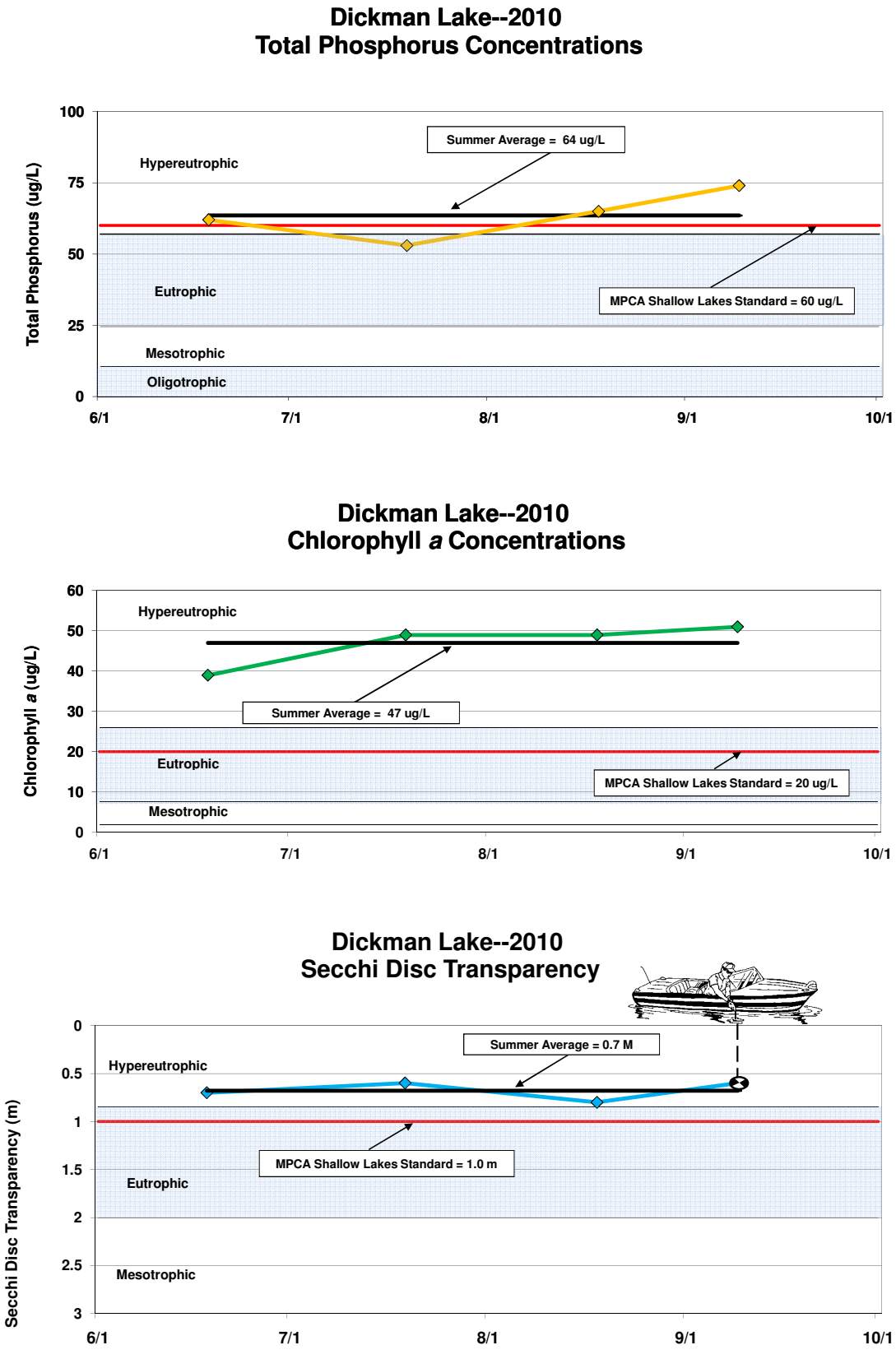
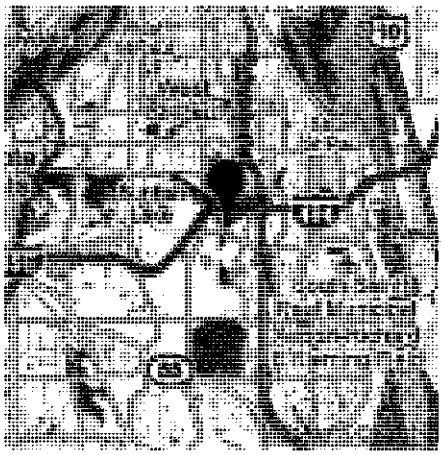


Figure 1.
Dickman Lake 2010 Monitoring Results

Table 1. 2010 Monitoring Data for Dickman Lake

Dickman Lake

Date	Max Depth (m)	Sample Depth (m)	Secchi Depth (m)	Chl. a (ug/L)	Turbidity (NTU's)	D. O. (mg/L)	Temp (°C)	Sp. Cond. (µmho/cm @ 25°C)	Total P (mg/L)	Chloride (mg/L)	pH (S.U.)	ORP (mv)
6/18/10	2.4	0-2	0.7	39.0	6.5	--	--	--	0.062	49	--	--
		0.0				10.8	23.4	299	--	--	8.8	186
		1.0				10.8	23.4	299	--	--	8.8	176
		2.0				5.1	20.3	302	--	--	7.6	185
		Aquatic plant grow near shore 0-3.5 feet of depth P. sp. (narrowleaf), Najas sp., Ceratophyllum demersum present										
7/19/10	2.4	0-2	0.6	49.0	10.3	--	--	--	0.053	47	--	--
		0.0				9.9	26.1	273	--	--	9.4	161
		1.0				9.1	25.8	272	--	--	9.3	154
		2.0				0.2	24.6	290	0.055	--	7.5	-45
8/18/10	2.4	0-2	0.8	49.0	5.4	--	--	--	0.065	46	--	--
		0.0				10.1	24.9	254	--	--	9.0	102
		1.0				9.3	24.6	254	--	--	8.8	103
		2.0				0.3	24.4	254	--	--	8.6	104
9/9/10	2.4	0-2	0.6	51.0	6.9	--	--	--	0.074	46	--	--
		0.0				10.3	18.1	256	--	--	9.2	119
		1.0				10.0	18.1	257	--	--	9.2	118
		2.0				10.1	18.1	257	--	--	9.2	115



Physical Information

Name: Schmitt
DNR Lake ID number: 19-0052
County: Dakota
Location from nearest town:
Ecoregion: North Central Hardwood Forests
Basin: Upper Mississippi
Hydrologic Unit Code: 7010206
Surface Area: 57 (acres)
Water Body Type:

Latitude/Longitude: 44.86999893/-93.07350159
UTMx/UTMy: /

Lake Water Quality Assessment

This summary is based on available summer (June through September) data in STORET (STORET is the national water quality data repository developed by the United States Environmental Protection Agency. All water quality data collected by MPCA or received from external groups is placed in STORET.) collected between 2001 and 2010.

Data Quality:
Aquatic Recreation Use Support: Insufficient Information

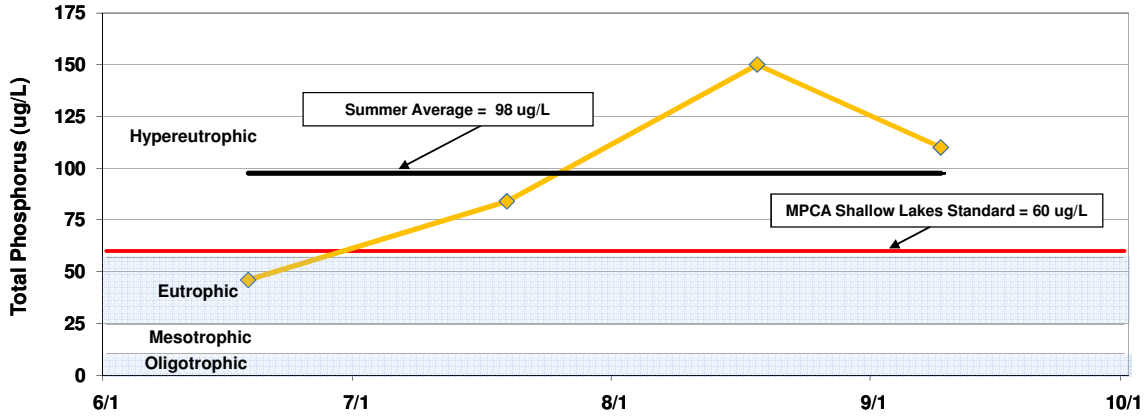
Lake Water Quality Data Summary

Chlorophyll-a Mean: 0.0 ppb
Chlorophyll-a Standard Error: 0.0 ppb
Chlorophyll-a # of Observations:

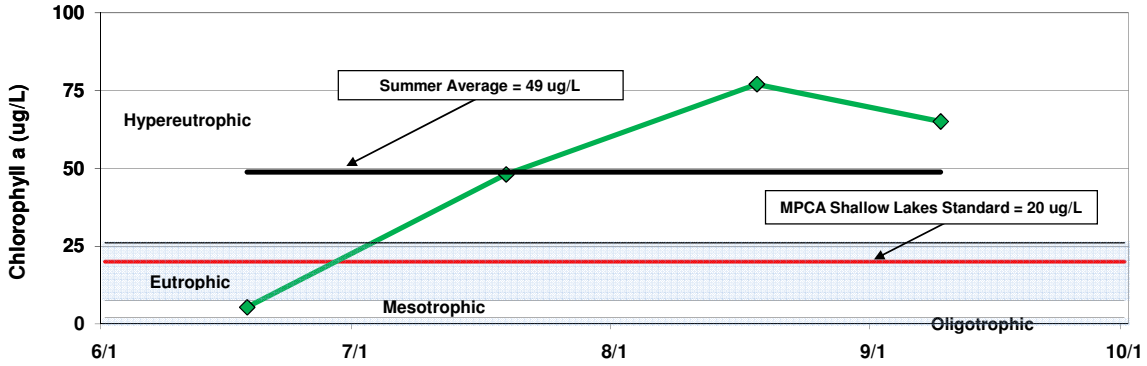
Secchi Disk Mean: 0.0 meters
Secchi Disk Standard Error: 0.0 meters
Secchi Disk # of Observations: 7
www.pca.state.mn.us/water/clmp.html

Alkalinity Mean: 0.0 ppm (parts per million)
Color Mean: 0.00 Platinum-cobalt Units
Carlson Trophic Status for Total Phosphorus: 0.0
Carlson Trophic Status for Chlorophyll-a: 0.0
Carlson Trophic Status for Secchi Disk: 118.6
Overall Trophic Status: Hypereutrophic
(O=oligotrophic, M=mesotrophic, E=eutrophic, H=hypereutrophic)

Schmitt Lake--2010
Total Phosphorus Concentrations



Schmitt Lake--2010
Chlorophyll *a* Concentrations



Schmitt Lake--2010
Secchi Disc Transparency

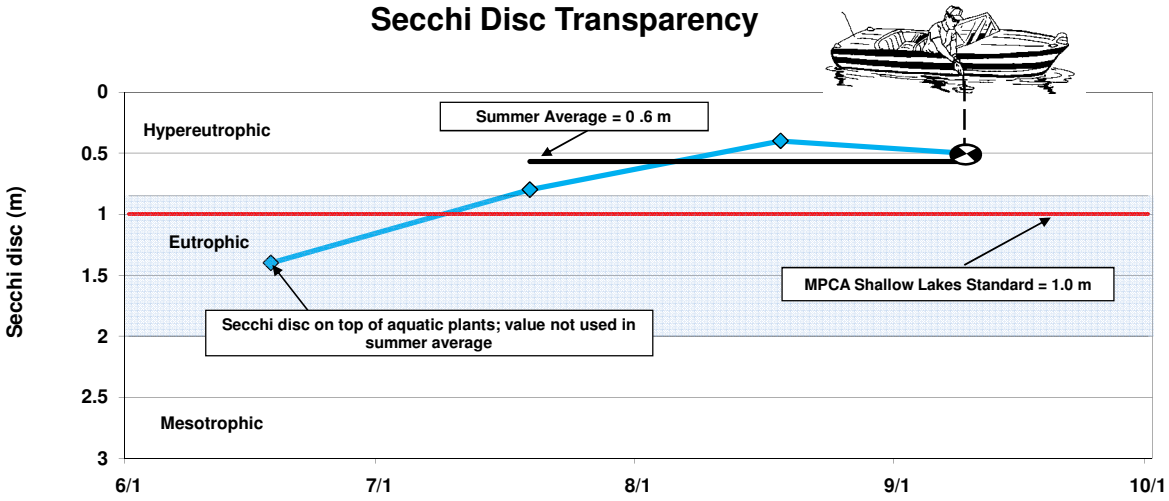


Figure 2.
Schmitt Lake 2010 Monitoring Results

P:\Mpls\23 MN\19\2319078\WorkFiles\WQ Monitoring\Dickman-Schmidt-2010 WQ Data\Schmidt Lake WQ-2010 Data

Table 2. 2010 Monitoring Data for Schmitt Lake

Schmitt Lake

Date	Max Depth (m)	Sample Depth (m)	Secchi Depth (m)	Chl. a (ug/L)	Turbidity (NTU's)	D. O. (mg/L)	Temp (°C)	Sp. Cond. (µmho/cm @ 25°C)	Total P (mg/L)	Chloride (mg/L)	pH (S.U.)	ORP (mv)
6/18/10	1.8	0-1.5	1.4	5.3	1.3	--	--	--	0.046	200	--	--
		0.0				13.1	23.4	770	--	--	9.9	208
		1.0				13.1	23.4	770	--	--	9.8	193
		1.5				8.5	21.8	801	--	--	9.3	99
			secchi disc on top of aquatic plants									
			P. crispus present, algal mats near shore, dense Elodea canadensis									
			Myriophyllum spicatum present (sample pressed and dried)									
7/19/10	1.5	0-1	0.8	48.0	8.1	--	--	--	0.084	150	--	--
		0.0				5.9	25.0	610	--	--	8.5	156
		1.0				3.2	24.9	615	--	--	8.2	160
8/18/10	1.5	0-1	0.4	77.0	16.8	--	--	--	0.150	130	--	--
		0.0				9.2	23.5	583	--	--	8.8	113
		1.0				4.4	22.7	596	--	--	8.0	124
9/9/10	1.5	0-1	0.5	65.0	13.9	--	--	--	0.110	120	--	--
		0.0				10.2	16.6	560	--	--	8.7	115
		1.0				10.2	16.6	560	--	--	8.7	115

LeMay Lake (19–0082) *City of Mendota Heights*

Volunteer: City of Mendota Heights staff

LeMay Lake is located in the City of Mendota Heights. It has a surface area of 34 acres and an average depth of 1.6 m (5.1 ft). The maximum depth is 4.0 m (13 ft). The entire lake is considered littoral zone, which is the shallow 0 – 15 feet depth zone that is typically dominated by aquatic plants. Since the lake is relatively shallow, it does not maintain a thermocline, which is a density gradient caused by changing water temperatures throughout the water column.

On each sampling day the lake was monitored for total phosphorus (TP), chlorophyll-a (CLA), total Kjeldahl nitrogen (TKN), and secchi transparency, as well as the lake's perceived physical condition and recreational suitability. The resulting data are summarized in tables and figures on the following pages.

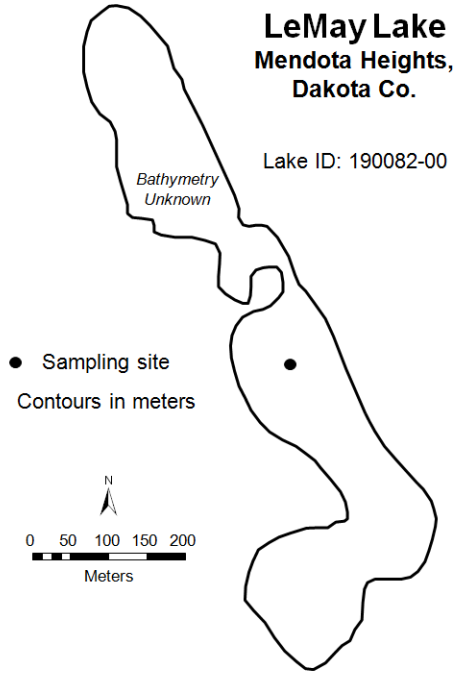
2012 summer (May - September) data summary

Parameter	Mean	Minimum	Maximum	Grade
TP (µg/l)	60	22	121	C
CLA (µg/l)	3.8	2.6	4.6	A
Secchi (m)				
TKN (mg/l)	1.14	0.82	1.60	
			Lake Grade	

Most of the Secchi depth measurements were not attainable because either the visibility of the disk was blocked by aquatic vegetation rather than by water clarity. There were insufficient quantity of Secchi depth data to calculate a Secchi grade, and therefore no lake grade was calculated. Additional years of monitoring are suggested for continuing to build the water quality database.

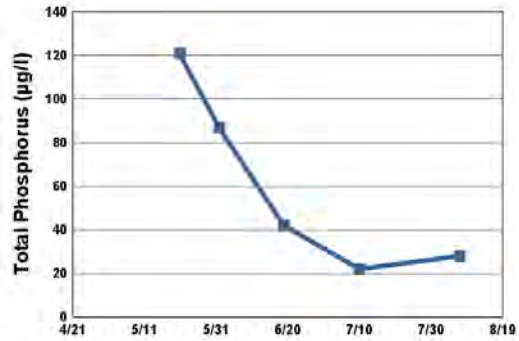
Throughout the monitoring period, the volunteer's opinions of the lake's physical condition and recreational suitability were ranked on a 1-to-5 scale. These user perception rankings are shown on the following page.

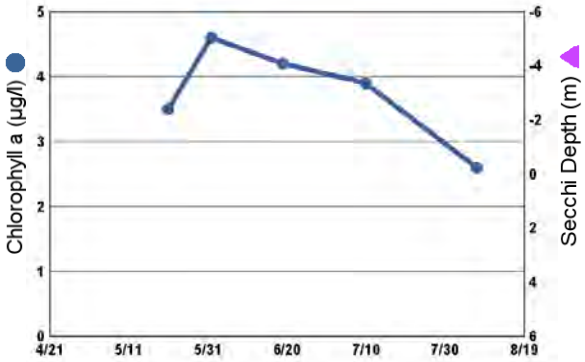
If you notice any errors in the lake's data or physical information, or are aware of any additional or missing information, please contact Brian Johnson of the Metropolitan Council at (651) 602-8743 or brian.johnson@metc.state.mn.us.



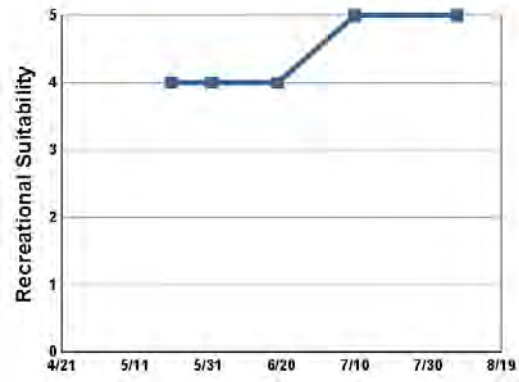
2012 Data

Date	SURF-TEMP (° C)	SURF DO (mg/L)	CLA (µg/L)	SURF TP (µg/L)	Secchi (m)	PC (1-5)	RS (1-5)
5/21	21.4		3.5	121		2	4
6/1	23.3		4.6	87		3	4
6/19	24.6		4.2	42		3	4
7/10			3.9	22		5	5
8/7	27.3		2.6	28		5	5





1 = Crystal Clear
2 = Some Algae Present
3 = Definite Algal Presence
4 = High Algal Color
5 = Severe Algal Bloom



1 = Beautiful
2 = Minor Aesthetic Problem
3 = Swimming Impaired
4 = No Swimming; Boating OK
5 = No Aesthetics Possible

Lake Water Quality Grades Based on Summertime Averages

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
TP												
CLA												
Secchi												
Lake Grade												

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
TP												
CLA												
Secchi							F					
Lake Grade												

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012
TP				C	B	C	B	C	C
CLA				B	A	A	A	A	A
Secchi				D	C	C	C	C	
Lake Grade				**C**	**B**	**B**	**B**	**B**	

Source: Metropolitan Council and STORET data

Environmental Data Access

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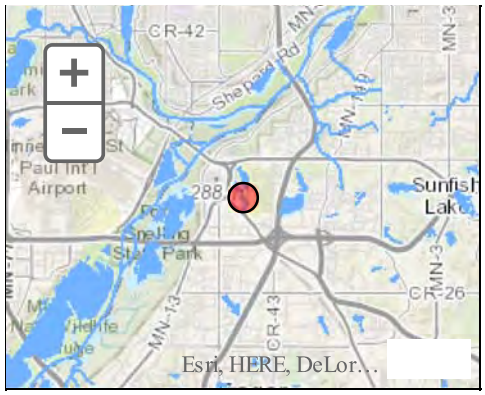

Lake Station Information

Station Name:	LEMAY
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0082-00-451
Hydrologic Unit Code (HUC):	07020012
Assessment Unit:	
Period of Record:	2007 through 2011
Lat/Lon	44.872986,-93.157333

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Year 2011 Data

Station Data

Sample Date	Type	Depth	BOD	Chl-a	Trans	DO	TKN	NO2NO3	pH	Pheo	TP	TSS	Turb	FC	Ecoli	Secchi
	Information															
10-26-11	Routine	0 m		2.7			1.4		< 1		0.036					2.8
10-17-11	Routine	0 m		3.4			0.59		< 1		0.021					2.2
09-06-11	Routine	0 m		5.8			0.98		1.2		0.041					1.3
08-09-11	Routine	0 m		7.5			0.78		1.9		0.022					1.4
08-03-11	Routine	0 m		5.6			1.1		2		0.019					1.8
07-12-11	Routine	0 m		3.3			1.1		< 1		0.023					1.8
06-17-11	Routine	0 m		3.1			1.1		< 1		0.034					1.8
06-09-11	Routine	0 m		3.1			0.92		1.6		0.075					1.9
05-23-11	Routine	0 m		5			1.1		1.4		0.034					2.3
05-10-11	Routine	0 m		3.6			0.71		< 1		0.021					2.8

Year 2010 Data

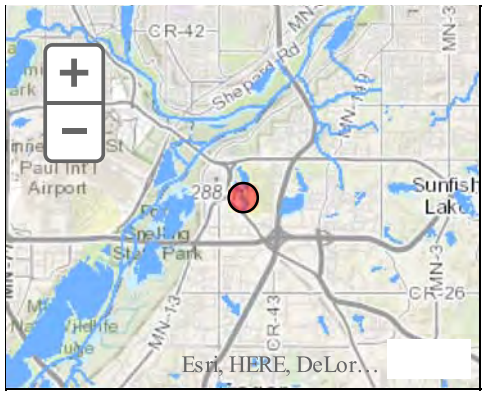
Year 2009 Data

Year 2008 Data

Year 2007 Data

Environmental Data Access

Print Report New Search



Lake Station Information

Station Name:	LEMAY
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0082-00-451
Hydrologic Unit Code (HUC):	07020012
Assessment Unit:	
Period of Record:	2007 through 2011
Lat/Lon	44.872986,-93.157333

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Year 2011 Data

Year 2010 Data

Station Data

Sample Date	Type	Depth	BOD	Chl-a	Trans	DO	TKN	NO2NO3	pH	Pheo	TP	TSS	Turb	FC	Ecoli	Secchi
	Information															
09-30-10	Routine	0 m		6.2			0.95		< 1		0.030					2
09-17-10	Routine	0 m		16			1.7		2		0.042					1.9
08-17-10	Routine	0 m		7.5			0.89		1.5		0.032					1.35
08-03-10	Routine	0 m		7.9			0.95		< 1		0.029					1.8
07-21-10	Routine	0 m		3.5			1		1.3		0.027					2
07-09-10	Routine	0 m		4.1			0.89		< 1		0.032					1.9
06-22-10	Routine	0 m		2.2			0.87		1.2		0.025					2
06-15-10	Routine	0 m		2.7			0.64		< 1		0.024					2
06-01-10	Routine	0 m		3.8			0.56		< 1		0.018					2.1
04-28-10	Routine	0 m		12			0.73		3.7		0.024					2.3
04-20-10	Routine	0 m					0.5				0.018					

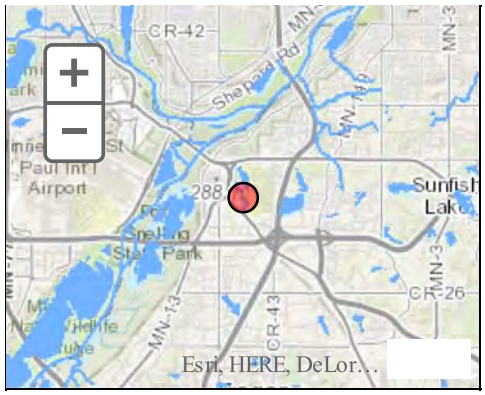
Year 2009 Data

Year 2008 Data

Year 2007 Data

Environmental Data Access

Print Report New Search



Lake Station Information

Station Name:	LEMAY
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0082-00-451
Hydrologic Unit Code (HUC):	07020012
Assessment Unit:	
Period of Record:	2007 through 2011
Lat/Lon	44.872986,-93.157333

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Year 2011 Data

Year 2010 Data

Year 2009 Data

Station Data

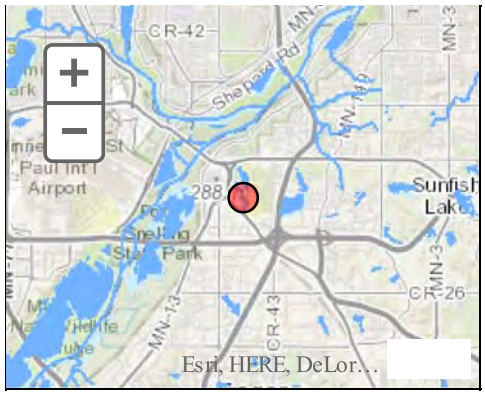
Sample Date	Type	Depth	BOD	Chl-a	Trans	DO	TKN	NO2NO3	pH	Pheo	TP	TSS	Turb	FC	Ecoli	Secchi
	Information															
10-05-09	Routine	0 m		6.3			0.9		1.1	0.028						2.1
09-21-09	Routine	0 m		19			1.2		2.7	0.049						1.0
09-08-09	Routine	0 m		13			1.3		3.5	0.065						1.1
08-26-09	Routine	0 m		10			1		3.3	0.045						0.8
07-15-09	Routine	0 m		5.9			1.9		1.6	0.066						1.0
06-30-09	Routine	0 m		6			1.3		< 1	0.048						1.6
06-15-09	Routine	0 m		3.5			1.4		1.1	0.055						2.9
06-10-09	Routine	0 m		4.9			1.4		2.4	0.043						1.9
05-28-09	Routine	0 m		4.5			1.5		1.6	0.034						1.1

Year 2008 Data

Year 2007 Data

Environmental Data Access

Print Report New Search



Lake Station Information

Station Name:	LEMAY
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0082-00-451
Hydrologic Unit Code (HUC):	07020012
Assessment Unit:	
Period of Record:	2007 through 2011
Lat/Lon	44.872986,-93.157333

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Year 2011 Data

Year 2010 Data

Year 2009 Data

Year 2008 Data

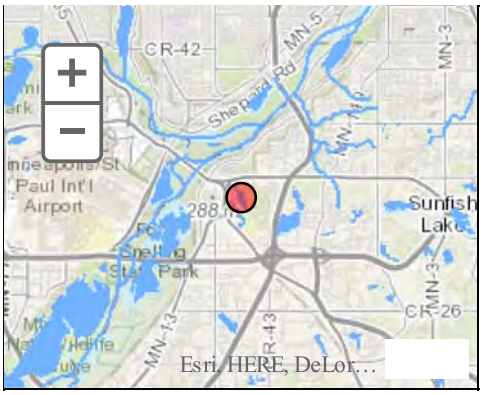
Station Data

Sample Date	Type	Depth	BOD	Chl-a	Trans	DO	TKN	NO2NO3	pH	Pheo	TP	TSS	Turb	FC	Ecoli	Secchi
	Information															
10-03-08	Routine	0 m		12			1.4		1.3		0.049					0.8
09-19-08	Routine	0 m		10			1.4		1.1		0.033					1.1
09-12-08	Routine	0 m		13			1.4		1.1		0.04					1.0
08-29-08	Routine	0 m		14			1.3		<		0.035					1.3
08-08-08	Routine	0 m		4			1.8		3.6		0.027					1.5
07-18-08	Routine	0 m		4.4			1.2		<		0.028					1.9
07-10-08	Routine	0 m		3.7			1.5		<		0.026					2.3
06-27-08	Routine	0 m		2.1			1.6		<		0.027					2.3
06-09-08	Routine	0 m		4.7			1.9		<		0.035					2.0
05-22-08	Routine	0 m		< 1			1.8		10		0.034					2.1
05-15-08	Routine	0 m		2.1			1.5		<		0.026					2.0

Year 2007 Data

Environmental Data Access

Print Report New Search



Lake Station Information

Station Name:	AUGUSTA
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0081-00-202
Hydrologic Unit Code (HUC):	07020012
Assessment Unit:	
Period of Record:	2007 through 2013
Lat/Lon	44.877789,-93.156888

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Year 2013 Data

Station Data

Sample Date	Type	Depth	BOD	Chl-a	Trans	DO	TKN	NO2NO3	pH	Pheo	TP	TSS	Turb	FC	Ecoli	Secchi
	Information															
06-14-13	Routine	0 m				12.39					0.183					0.4
06-14-13	Routine	1 m				12.37					0.194					
06-14-13	Routine	2 m				2.57					0.158					
06-14-13	Routine	3 m				1.33					0.08					
06-14-13	Routine	4 m				1					0.07					
06-14-13	Routine	5 m				0.56										
05-30-13	Routine	0 m		130		13.13					0.19					0.3
05-30-13	Routine	1 m				12.78					0.193					
05-30-13	Routine	2 m				12.64					0.236					
05-30-13	Routine	3 m				12.47					0.172					
05-30-13	Routine	4 m				5.78					0.106					
05-30-13	Routine	5 m				1.89										
05-16-13	Routine	0 m		100		15.85					0.171					0.4
05-16-13	Routine	1 m				15.07					0.17					
05-16-13	Routine	2 m				12.86					0.169					
05-16-13	Routine	3 m				12.42					0.16					
05-16-13	Routine	4 m				10.3					0.128					
05-16-13	Routine	5 m				5.28										
05-02-13	Routine	0 m		93		12.98					0.19					0.5
05-02-13	Routine	1 m				13.13					0.203					
05-02-13	Routine	2 m				13.03					0.187					
05-02-13	Routine	3 m				7.79					0.136					
05-02-13	Routine	4 m				5.22					0.134					
05-02-13	Routine	5 m				3.45										

Year 2009 Data

Year 2008 Data

Environmental Data Access

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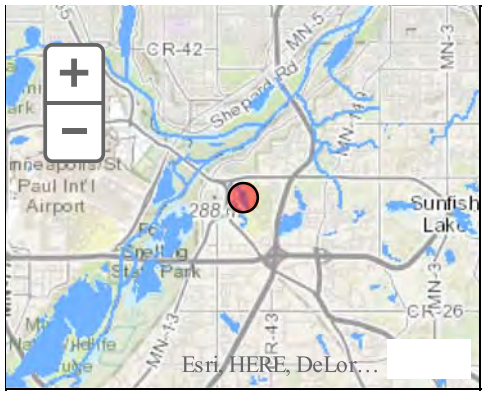

Lake Station Information

Station Name:	AUGUSTA
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0081-00-202
Hydrologic Unit Code (HUC):	07020012
Assessment Unit:	
Period of Record:	2007 through 2013
Lat/Lon	44.877789,-93.156888

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Year 2013 Data

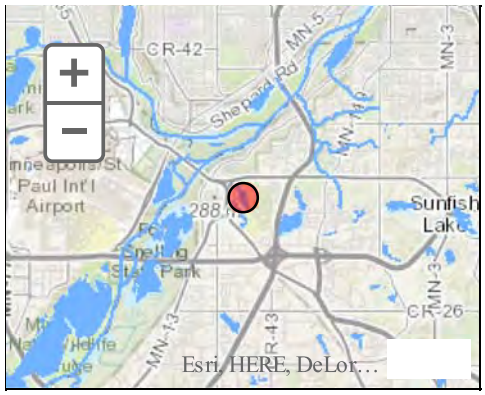
Year 2009 Data

Station Data

Sample Date	Type	Depth	BOD	Chl-a	Trans	DO	TKN	NO2NO3	pH	Pheo	TP	TSS	Turb	FC	Ecoli	Secchi
	Information															
06-23-09	Routine	0 m	65			12.70	2.6 <				0.13					0.3
06-23-09	Routine	1 m				13.50										
06-23-09	Routine	2 m				2.05										
06-23-09	Routine	3 m				0.60					0.093					
06-02-09	Routine	0 m	64			12.40	2.5 <				0.16					0.3
06-02-09	Routine	1 m				12.50										
06-02-09	Routine	2 m				12.60										
06-02-09	Routine	3 m				4.20										
06-02-09	Routine	4 m				0.40										
06-02-09	Routine	5 m				0.20					0.094					
06-02-09	Routine	6 m				0.20										
06-02-09	Routine	7 m				0.20										
06-02-09	Routine	8 m				0.14										
06-02-09	Routine	9 m				0.13										
06-02-09	Routine	10 m				0.13										
06-02-09	Routine	11 m				0.12										
05-18-09	Routine	0 m	25			11.46	2.5	0.12			0.14					0.6
05-18-09	Routine	1 m				11.49										
05-18-09	Routine	2 m				9.43										
05-18-09	Routine	3 m				8.01										
05-18-09	Routine	4 m				7.05										
05-18-09	Routine	5 m				4.66										
05-18-09	Routine	6 m				0.27										
05-18-09	Routine	6.5 m									0.14					
05-18-09	Routine	7 m				0.22										
05-18-09	Routine	8 m				0.02										

Environmental Data Access

Print Report New Search



Lake Station Information

Station Name:	AUGUSTA
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0081-00-202
Hydrologic Unit Code (HUC):	07020012
Assessment Unit:	
Period of Record:	2007 through 2013
Lat/Lon	44.877789,-93.156888

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Year 2013 Data

Year 2009 Data

Year 2008 Data

Station Data

Sample Date	Type	Depth	BOD	Chl-a	Trans	DO	TKN	NO2NO3	pH	Pheo	TP	TSS	Turb	FC	Ecoli	Secchi
	Information															
10-01-08	Routine	0 m				6.59	2.6 <				0.087					0.15
10-01-08	Routine	1 m				6.16										
10-01-08	Routine	2 m				6.41										
10-01-08	Routine	3 m				7.04										
10-01-08	Routine	4 m				6.18										
10-01-08	Routine	5 m				6.31										
10-01-08	Routine	6 m				6.29										
10-01-08	Routine	7 m				4.8										
10-01-08	Routine	8 m				0.7					0.520					
10-01-08	Routine	9 m				0.57										
09-17-08	Routine	0 m				12.1	2.9 <				0.380					0.38
09-17-08	Routine	1 m				12.4										
09-17-08	Routine	2 m				7.6										
09-17-08	Routine	3 m				6.5										
09-17-08	Routine	4 m				0.5										
09-17-08	Routine	5 m				0.3										
09-17-08	Routine	6 m				0.55										
09-17-08	Routine	7 m				0.55										
09-17-08	Routine	8 m				0.5										
09-17-08	Routine	9 m				0.4										
09-17-08	Routine	10 m				0.35										
08-20-08	Routine	0 m					3.2 <				0.120					0.15
08-20-08	Routine	.5 m				13.8										
08-20-08	Routine	1 m				14.2										
08-20-08	Routine	1.5 m				13.4										

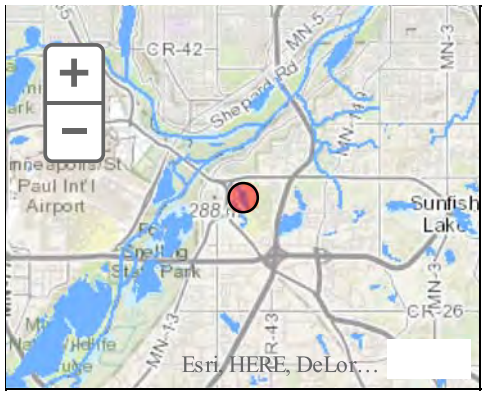
08-20-08	Routine 2 m	8.8			
08-20-08	Routine 2.5 m	3.1			
08-20-08	Routine 3 m	4.2			
08-20-08	Routine 4 m	2.2			
08-20-08	Routine 5 m	2.4			
08-20-08	Routine 6 m	2.7			
08-20-08	Routine 7 m	2.9		0.420	
08-07-08	Routine 0 m	10.35	2.9 <	0.110	0.15
08-07-08	Routine 1 m	8.5			
08-07-08	Routine 2 m	6.46			
08-07-08	Routine 3 m	0.16			
08-07-08	Routine 4 m	0.16			
08-07-08	Routine 5 m	0.14			
08-07-08	Routine 6 m	0.13			
08-07-08	Routine 7 m	0.17			
08-07-08	Routine 8 m	0.16			
08-07-08	Routine 9 m	0.16			
08-07-08	Routine 10 m	0.18		0.580	
07-22-08	Routine 0 m	13.9	3.2 <	0.140	0.15
07-22-08	Routine 1 m	12.3			
07-22-08	Routine 2 m	2.1			
07-22-08	Routine 3 m	0.23			
07-22-08	Routine 4 m	0.17			
07-22-08	Routine 5 m	0.15			
07-22-08	Routine 6 m	0.17			
07-22-08	Routine 7 m	0.17			
07-22-08	Routine 8 m	0.14			
07-22-08	Routine 9 m	0.13		0.610	
07-22-08	Routine 10 m	0.15			
07-22-08	Routine 11 m	0.13			
07-09-08	Routine 0 m	9.88	2.7 <	0.160	0.3
07-09-08	Routine 1 m	9.23			
07-09-08	Routine 2 m	5.15			
07-09-08	Routine 3 m	0.31			
07-09-08	Routine 4 m	0.2			
07-09-08	Routine 5 m	0.17			
07-09-08	Routine 6 m	0.17			
07-09-08	Routine 7 m			0.620	
06-24-08	Routine 0 m	12.8	3.4 <	0.180	0.15
06-24-08	Routine .5 m	12.9			
06-24-08	Routine 1 m	12.5			
06-24-08	Routine 1.5 m	11			
06-24-08	Routine 2 m	8.3			
06-24-08	Routine 2.5 m	1.5			
06-24-08	Routine 3 m	0.6			
06-24-08	Routine 4 m	0.7			
06-24-08	Routine 5 m	0.55			
06-24-08	Routine 6 m	0.6			
06-24-08	Routine 7 m	0.65			
06-24-08	Routine 8 m	0.7			
06-24-08	Routine 8.25 m		5.3	0.520	
06-24-08	Routine 9 m	0.65			
06-24-08	Routine 10 m	0.5			
06-24-08	Routine 11 m	0.5			
06-24-08	Routine 12 m	0.48			
06-24-08	Routine 13 m	0.45			
06-24-08	Routine 14 m	0.45			
06-24-08	Routine 15 m	0.45			
06-11-08	Routine 0 m		2.6 <	0.170	
06-11-08	Routine			0.170	
05-19-08	Routine 0 m	13.8	2.9 <	0.210	0.46
05-19-08	Routine 1 m	13.5			

05-19-08	Routine 2 m	12.15				
05-19-08	Routine 3 m	9.34				
05-19-08	Routine 4 m	7.12				
05-19-08	Routine 5 m	7.1				
05-19-08	Routine 6 m	2.18				
05-19-08	Routine 7 m	0.18				
05-19-08	Routine 8 m	0.15				
05-19-08	Routine 9 m	0.14			0.370	
05-19-08	Routine 10 m	0.13				
05-19-08	Routine 11 m	0.12				
05-19-08	Routine 12 m	0.11				
05-08-08	Routine 0 m	16.5	3.1	0.16	0.210	0.3
05-08-08	Routine 1 m	15.3				
05-08-08	Routine 2 m	13.6				
05-08-08	Routine 3 m	11				
05-08-08	Routine 4 m	9.3				
05-08-08	Routine 5 m	7.6				
05-08-08	Routine 6 m	5.3				
05-08-08	Routine 7 m	1.4				
05-08-08	Routine 8 m	0.16				
05-08-08	Routine 9 m	0.12				
05-08-08	Routine 10 m	0.11				
05-08-08	Routine 11 m	0.08			0.250	
05-08-08	Routine 12 m	0.07				

Year 2007 Data

Environmental Data Access

Print Report New Search



Lake Station Information

Station Name:	AUGUSTA
Waterbody Name:	
Data Steward Org:	MPCA
Station ID: (Lake ID)	19-0081-00-202
Hydrologic Unit Code (HUC):	07020012
Assessment Unit:	
Period of Record:	2007 through 2013
Lat/Lon	44.877789,-93.156888

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Year 2008 Data

Year 2007 Data

Station Data

Sample Date	Type	Depth	BOD	Chl-a	Trans	DO	TKN	NO2NO3	pH	Pheo	TP	TSS	Turb	FC	Ecoli	Secchi
	Information															
10-08-07	Routine	0 m				12.2	3.8 <				0.15					0.3
10-08-07	Routine	1 m				11.8										
10-08-07	Routine	2 m				6.4										
10-08-07	Routine	3 m				4.4										
10-08-07	Routine	4 m				4.1										
10-08-07	Routine	5 m				0.3										
10-08-07	Routine	6 m				0.2										
10-08-07	Routine	7 m				0.1										
10-08-07	Routine	8 m				0.1										
10-08-07	Routine	9 m				0.1										
10-08-07	Routine	10 m				0.1					0.68					
10-08-07	Routine	11 m				0.1										
09-22-07	Routine	0 m					6.8 <				0.51					0.3
09-22-07	Routine	1 m														
09-22-07	Routine	2 m														
09-22-07	Routine	3 m														
09-22-07	Routine	4 m														
09-22-07	Routine	5 m														
09-22-07	Routine	6 m														
08-17-07	Routine	0 m					2.9 <				0.11					0.3
08-17-07	Routine	1 m														
08-17-07	Routine	2 m														
08-17-07	Routine	3 m														

08-17-07	Routine	4 m				
08-17-07	Routine	5 m				
08-17-07	Routine	6 m				
08-17-07	Routine	7 m				
08-17-07	Routine	10 m			0.59	
08-03-07	Routine	10 m			0.53	
08-03-07	Routine	0 m	5.8	3 <	0.13	0.1
08-03-07	Routine	1 m	4.7			
08-03-07	Routine	2 m	1.7			
08-03-07	Routine	3 m	0.5			
08-03-07	Routine	4 m	0.4			
08-03-07	Routine	5 m	0.3			
08-03-07	Routine	6 m	0.2			
08-03-07	Routine	7 m	0.2			
08-03-07	Routine	8 m	0.1			
08-03-07	Routine	9 m	0.1			
08-03-07	Routine	10 m	0.1			
08-03-07	Routine	11 m	0.1			
07-19-07	Routine	10 m			0.13	
07-19-07	Routine	0 m		3.7 <	0.26	0.15
07-19-07	Routine	1 m				
07-19-07	Routine	2 m				
07-19-07	Routine	3 m				
07-19-07	Routine	4 m				
07-19-07	Routine	5 m				
07-19-07	Routine	6 m				
07-19-07	Routine	7 m				
07-19-07	Routine	8 m				
07-19-07	Routine	9 m				
07-19-07	Routine	10 m				
07-19-07	Routine	11 m				
06-20-07	Routine	0 m		2.5 <	0.18	0.3
06-20-07	Routine	1 m				
06-20-07	Routine	2 m				
06-20-07	Routine	3 m				
06-20-07	Routine	4 m				
06-20-07	Routine	5 m				
06-20-07	Routine	6 m				
06-20-07	Routine	7 m				
06-20-07	Routine	8 m				
06-20-07	Routine	9 m				
06-20-07	Routine	10 m			0.61	
06-20-07	Routine	11 m				
06-08-07	Routine	0 m		2.6 <	0.17	0.3
06-08-07	Routine	1 m				
06-08-07	Routine	2 m				
06-08-07	Routine	3 m				
06-08-07	Routine	4 m				
06-08-07	Routine	5 m				
06-08-07	Routine	6 m				
06-08-07	Routine	7 m				
06-08-07	Routine	8 m				
06-08-07	Routine	9 m				
06-08-07	Routine	10 m			0.57	
05-10-07	Routine	0 m	14.1	3.5 <	0.19	0.3
05-10-07	Routine	1 m	16.1			
05-10-07	Routine	2 m	8.3			
05-10-07	Routine	3 m	7.6			
05-10-07	Routine	4 m	6.6			
05-10-07	Routine	5 m	5			
05-10-07	Routine	6 m	4.5			
05-10-07	Routine	7 m	4			
05-10-07	Routine	8 m	3			

APPENDIX F

Water Body Categories from 2001 Classification System

The 2001 plan required the member cities to manage the non-intercommunity water bodies to achieve the cities' goals, while the WMO was responsible for monitoring the intercommunity water bodies. The classifications were preliminary due to limited amounts of water quality information. Member cities classified their water bodies individually based on their level of use.

Category I - Water bodies in this category are typically used for swimming and other direct contact recreational activities. These water bodies have the highest/best water quality and are usually the most popular water bodies with the public.

- Rogers Lake – Mendota Heights
- Sunfish Lake – Sunfish Lake

Category II - Water bodies in this category are typically used for indirect contact recreational activities such as boating and fishing that involve incidental contact with surface water. These water bodies have poorer water quality than Category I water bodies, but are still popular with the public.

- Seidl's Pond – South St. Paul/Inver Grove Heights
- Thompson Lake – West St. Paul
- Marthaler Pond – West St. Paul
- 19-93 W – Mendota Heights
- Wood Duck Pond – Sunfish Lake
- Horseshoe Lake – Sunfish Lake

Category III - Water bodies in this category serve important functions for wildlife habitat and aesthetic enjoyment, and may also provide opportunities for warm-water fishing, provided winterkill does not occur. These water bodies have poorer water quality than Category I and II water bodies and typically are not viewed as swimmable.

- Dickman Lake/Loch Gregor – Inver Grove Heights/Sunfish Lake
- Bohrer Pond – Inver Grove Heights/South St. Paul
- Hornbean Lake – Sunfish Lake/Inver Grove Heights
- Pickerel Lake – Lilydale/St. Paul
- Schmitt Lake – Inver Grove Heights/Sunfish Lake/West St. Paul
- Lily Lake – West St. Paul
- Mud Lake – West St. Paul
- Dodge Nature Center Ponds – West St. Paul
- Friendly Marsh – Mendota Heights
- 19-103 P, 19-227 W, 19-228 W, 19-118 W, 19-108 W, 19-235 W, 19-232 W – Mendota Heights

Category IV - Nutrient Traps. Water bodies in this category are intended to reduce downstream loading of phosphorus and other nutrients that contribute to water pollution. These water bodies are designed to have phosphorus removal efficiencies of at least 50%.

- Golf Course Pond – Inver Grove Heights/West St. Paul
- LeVander Pond – South St. Paul
- Anderson Pond – South St. Paul
- 19-229 W, 19-234 W, 19-231 W, 19-233 W – Mendota Heights

Category V - Sediment Traps. These water bodies are similar to Category IV water bodies, but are too small to effectively remove a significant fraction of nutrients. These basins will generally have phosphorus removal efficiencies of less than 50%.

- 19-119 W, 19-104 W – Mendota Heights

The monitoring effort required for water bodies using this classification system is as follows:

Water Body Classification	**Type of Monitoring**
Category I	Survey Level – minimum requirement Management Level– only under certain conditions.
Category II/III	Secchi disk monitoring (i.e. MPCA's Citizen Lake Monitoring Program).
Category IV/V	As required by city maintenance plans and policies.