
8. Watershed Description

The legal boundary of the SWWD is roughly 65,000 acres and closely approximates the hydrologic boundary. The boundary (both legal and hydrologic) of the SWWD overlaps two major (HUC 8) basins defined by the United States Geological Survey as shown in Map 3.1. These watersheds are the Mississippi River (Twin Cities) and St. Croix River (cataloguing units 07010206 and 0703005, respectively), which are each part of separate broader subregions. The two basins within the SWWD share a common climate which is described below followed by discussion of the two basins.

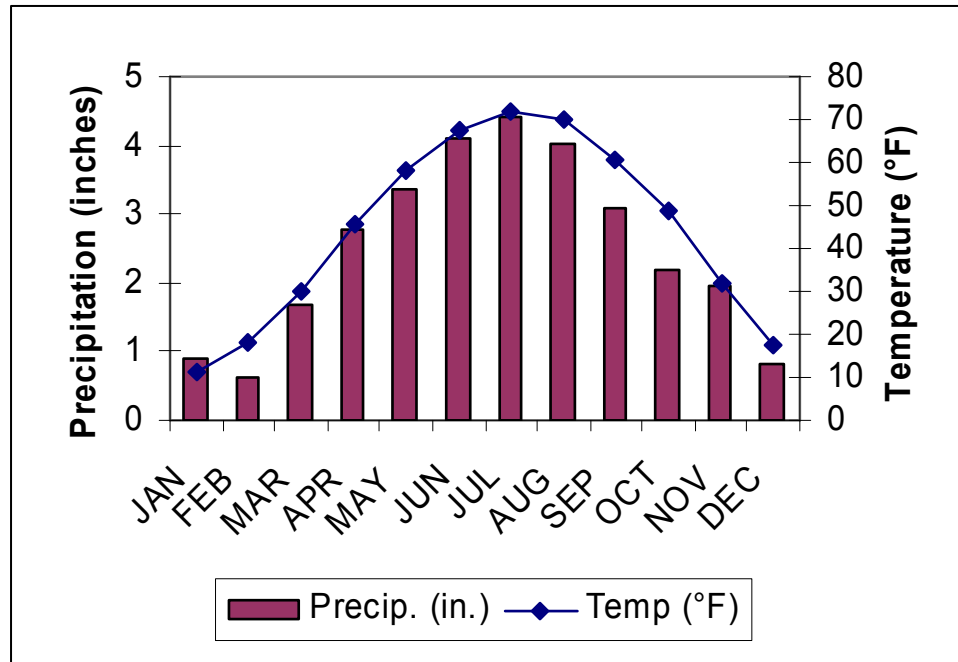
8.1 Climate

The temperature and precipitation patterns for the region (as well as human activities) shape the existing landforms. In warm months, precipitation intensity can often be extreme resulting in erosion or flooding. In cold months, the temperature and precipitation patterns affect the accumulation of snow and ice. The occurrence of frozen ground and duration of soil frost is a significant characteristic of the region. The temperature and precipitation patterns interact to influence the use and performance of BMPs such as infiltration basins, road deicing compounds, or erosion control measures.

Monthly average temperature and precipitation are shown in Figure 8.1 on the next page. This represents a 30-year normal from 1971-2000 as recorded at Hastings Dam 2 (station 213567). The 30-year average annual precipitation depth is approximately 30 inches and snowfall depth averages about 41 inches. At this station, the period of record (1893-2001) shows the maximum 1-day precipitation depth as 8.06 inches.

The 30-year average annual temperature is about 44 degrees Fahrenheit. For the area, soils typically initially freeze as early as the first week of November but on average this occurs by the first week of December. Soil frost typically reaches maximum depth in late February and is gone by the first week of April in the south, mid-April in the north. Soil frost will thaw from both above and below, leaving a mid-profile ice lens to thaw last.

Figure 8.1 – Mean monthly temperature and precipitation at station 213568.



8.2 Mississippi River Basin

8.2.1 Topography and Drainage

The drainage pattern of portions of the district draining to the Mississippi River is generally from north to south. Strong changes in elevation are evident across the watershed, ranging from a high of roughly 1,100 feet above mean sea level in Oakdale to 687 feet which is the normal pool elevation of the Mississippi River. Elevations of basins and lakes tend to decrease from north to south in the watershed usually following the buried bedrock valley. Generally the topography of the watershed is characterized by two distinct regimes, roughly separated by Highway 61. Topography and relief of the District is shown in Map 8.1.

The landscape north of Highway 61 is characterized by ridges and knolls separated by areas of flat and wide valleys and draws. Landlocked basins and elongated depressional areas are also found in the terrain. The northern area transitions south towards the Mississippi River from a series of depressions into broad plateaus with pronounced ravines and natural drainageways which dissect the land.

The topography south of Highway 61 generally presents more subtle changes in elevation with steep ravines generally less evident. However, where the landscape approaches the River the drop in elevation is rapid and the topography is almost bluff-like. A wide flat river terrace area is present in southwest and west portion of the district below Highway 61. The terrace areas are very sandy and in their natural state do not appear to produce significant runoff.

Three major surface drainageways exist in the watershed. A central drainageway begins in Oakdale and Lake Elmo near the headwaters of the district and continues south approximately 7 miles to Bailey Lake at Dale Road. The outlet for Bailey Lake is a pump station that discharges into a large infiltration basin in Woodbury, known as CD-P85. A permanent outlet to drain south to the Mississippi River from the infiltration basin is planned to accommodate flood conditions during ultimate development conditions. This would utilize the existing easterly drainageway which runs south through the Cottage Grove Ravine Regional Park.

The easterly drainageway is an intermittent stream ravine which runs north to south with some minor landlocked basins and two DNR protected waters within the ravine. The downstream portion of the easterly drainageway (from 80th Avenue south to the river) is listed as a DNR protected water. A box culvert exists beneath Highway 61 to convey flow to the Mississippi River, but some obstructions between the culvert and the Regional Park pond in the past have caused flooding of the park entrance road. The recent high water levels in the Regional Park pond appear to be caused by higher than normal groundwater elevations in the area.

The westerly drainageway runs northwest to southeast, starting in the southwestern corner of Woodbury and outlets into the Mississippi River just east of the terminus of 110th Street South in Cottage Grove. The westerly drainageway is comprised of two escarpments: the central ravine and the west draw. Approximately 9,300 acres of land naturally drains through the westerly drainageway. This waterway must pass through three water bodies before reaching the Mississippi River. The channel and water bodies are protected by the DNR.

8.2.2 Soils

Soils within the Mississippi River basin of the South Washington Watershed are generally characterized by moderate to high permeability. Hydrologic soil groups established by the Natural Resources Conservation Services (NRCS) provide a classification for the behavior of soils when thoroughly wet. Hydrologic soil groups found within the District are shown on Map 8.2. This classification system is useful because there are numerous distinct soil types found within the District yet many of them respond similarly to infiltrating precipitation.

Soil units are named according to the predominant soil type; therefore, the soils making up one unit can occur in other units, but in a different pattern. The most common soils, such as those in the Antigo-Chetek-Mahtomedi map unit and the Sparta-Dickman-Hubbard map unit, are formed dominantly in outwash under deciduous hardwood forest or prairie. The Antigo-Chetek-Mahtomedi soils are well drained to excessively drained, medium textured to coarse textured soils, typical on low convex side slopes or knolls, crests and side slopes. The Sparta-Dickman-Hubbard soils are somewhat excessively drained and are coarser textured soils than the Antigo type. These soils occupy broad flats and knolls. The surface layer is dark brown-black loamy sand, while the subsoil is dark brown sandy loam in the upper part and dark brown sand underneath. Typical seasonal high water tables for these soils are below a depth of 6 feet. Other soils in SWWD's Mississippi River basin are also well drained and sandy loam types. General soil types are shown in Map 8.3.

8.2.3 Geology

8.2.3.1 Bedrock Geology

The bedrock geology of the Mississippi River basin of the SWWD was established during the Paleozoic era, over 250 million years ago. Broadly, the bedrock geology is characterized by sedimentary rock formations. Essentially these bedrock formations represent the bottoms of shallow seas which covered much of the Upper Midwest during the Paleozoic era.

There are six bedrock formation groups which are found beneath the surface of the basin. The location and extent of these bedrock formations are shown in Map 8.4. (Refer to the Washington County Geologic Atlas Plate 2 for more information and schematics of the bedrock sedimentary stratigraphic column.) These formations range from 100 feet thick to over 200 feet thick and are significant for their water-bearing properties.

The bedrock geology in the watershed was altered by glacial processes during the Pleistocene epoch, approximately 1.5 million years ago. The present layering of the bedrock formations is a manifestation of these processes. As a result, formations such as the Decorah Shale, Platteville and Glenwood, and St. Peter Sandstone overlay deeper bedrock formations such as the Prairie du Chien, Jordan Sandstone, and St. Lawrence-Franconia. This layering pattern is expressed in the topographic character of the District.

The most prominent feature is a north-south trending bedrock valley cutting through the center of the watershed. The valley was formed by a glacial river tributary to the Mississippi River. The valley was excised into the Jordan sandstone, creating a hydraulic connection between overlying glacial sediments and deeper aquifers.

8.2.3.2 Surficial Geology

The landscape of the Mississippi River basin of the SWWD is dominated by sediments dating from the late Wisconsinan glaciation, roughly 10,000 to 35,000 years ago. During glacial retreat, ice blocks were left behind in topographic lows on the bedrock surface. Melting of these ice blocks created many of the land-locked depressions and small lakes in Woodbury and Cottage Grove.

Glacial meltwater created wide outwash plains throughout much of the watershed, creating regionally valuable sand and gravel deposits. The thickness of these glacially derived sediments ranges from less than ten feet in portions of Cottage Grove, to greater than 300 feet in the central buried bedrock valley cutting through Woodbury and Cottage Grove. The surficial geology of the District is shown on Map 8.5.

The marked lack of outwash in southern Cottage Grove is due to variation in water level in the Mississippi River over time. Two separate terraces are apparent along the river in southern Cottage Grove. These terraces correspond to various periods of river downcutting in response to water level changes. The lack of glacial sediments in these terrace areas is cause for concern because of the proximity of the Jordan sandstone to the surface, and the potential for surface water impacts to the aquifer.

8.2.4 Water Resources

8.2.4.1 Surface Waters

Surface waters within the District's Mississippi River basin include shallow and deep lakes, ponds, wetlands, and intermittent streams. Many of these are designated as protected waters by the Minnesota DNR. These surface waters have local, and in some cases regional, significance. The Mississippi River is the surface water ultimately receiving flows from the district, which has national significance. Surface waters and protected water status are shown on Map 8.6.

The abundance of lakes and wetlands is greater in the northern portion of the watershed. Landlocked wetlands and ponds are scattered throughout the district. Pump stations exist on several water bodies to move water downstream. There are 8 major water bodies in the watershed where water quality data has been or is currently collected. These lakes are: Armstrong, Colby, Gables, La, Markgrafs, Powers, Ravine, and Wilmes.

Predominantly these lakes are shallow (maximum depth less than 15 feet) and show wetland characteristics which affects management efforts and appropriate uses. The characteristics of surface waters are discussed in more detail in Section 4.3. Standards for receiving waters are discussed in Section 6.5.

None of the surface waters are used as a source of water supply. Ponds and lakes in the district are typically used for indirect contact recreation such as boating and fishing. Wetlands provide aesthetics and wildlife value but also serve stormwater management functions.

Wetlands included in the National Wetland Inventory (NWI) cover approximately 718 acres within the district's Mississippi River basin. Roughly one-third of the NWI identified wetlands are classified as Type 5 which are generally shallow open water habitats. Wetlands that range in classification from Type 1 through Type 4 comprise two-thirds of NWI wetlands in the district. There are a very small percentage of Type 6 and Type 7 wetlands, together comprising roughly 24 acres. More discussion on wetland management standards is presented in Section 6.4.

There are two surface waters identified by the MPCA as impaired in the District (Map 8.7). These waters include the Mississippi River and the lower reach of the eastern drainageway through the Cottage Grove Ravine Park. However, the water body in the Park (commonly referred to as Ravine Lake) is not listed as impaired. Further elaboration of impaired waters is presented in Section 5.1.

8.2.4.2 Groundwater

There are four major aquifers available for use in the District's Mississippi River basin. The water table aquifer is generally unconfined and recharged through direct infiltration from precipitation and leakage from surface water bodies. The water table aquifer has not been a major source for groundwater development, although the capability of the unit to produce water is high, particularly in the major and minor buried bedrock valleys. Water quality is generally very good, with the exception of locally impacted areas.

The Prairie du Chien-Jordan aquifer is the source for all high capacity wells in the basin. The Franconia-Ironton-Galesville aquifer is not used in the basin, primarily because of the availability of the Prairie du Chien-Jordan aquifer. Currently, the Mount Simon aquifer is not an important water source for the basin, although it could be in the future if water quality impacts or excessive head loss become a problem with the Prairie du Chien-Jordan aquifer.

In most areas in the District's Mississippi River basin, the sensitivity to groundwater impacts is high or very high (Map 8.8). This indicates that the residence time of groundwater in this system is on the order of weeks to years. This means that water infiltrating in the watershed will reach the water table system in a very short period of time, leaving little opportunity for attenuation of compounds through degradation. See the Washington County Geologic Atlas Plate 6 for more detailed information.

8.2.5 Unique and Natural Features

8.2.5.1 Overview

There are two programs administered by the Minnesota DNR to obtain and manage information regarding the distribution and occurrence of important flora and fauna in the state. These programs are the Natural Heritage and Nongame Research Program and the Minnesota County Biological Survey (MCBS).

Natural communities identified by the MCBS generally are ones that have had the least amount of human disturbance. Natural communities are classified primarily by vegetation and major habitat features and ranked by overall biological diversity and significance. Various remnant natural communities exist in the basin, many of which foster native plants or rare species. The notable natural features are shown on Map 8.9.

The DNR's inventory of natural resources within the watershed revealed three main areas of concern due to the existence of rare features occurring within the watershed. In no specific order, the three areas are the Cottage Grove Ravine Regional Park, areas along the Mississippi River across from Grey Cloud Island, and areas along the Mississippi River in the eastern part of the Watershed. While these three areas support a range of significant communities and species, of particular note is that all three areas support unique natural Dry Prairie communities. Occurrences of rare plants and animals of special concern, as well as state threatened plants, were found in these Dry Prairies.

8.2.5.2 Wildlife and Recreation Areas

A state-owned Scientific and Natural Area (SNA) exists in the basin. The Grey Cloud Dunes SNA was acquired by the Minnesota DNR in 1998. There also is a Regional Park, which is managed by Washington County Parks, and the Mississippi National River and Recreation Area (MNRRA), which covers broad areas along the Mississippi River including areas of the river within the watershed.

The MNRRA has guidelines set up to protect, preserve, and enhance nationally significant resources in the Mississippi River corridor through out the Twin Cities Metropolitan area. The area designated as the MNRRA within the watershed boundary is not owned by the Federal or State governments. Areas designated as a MNRRA have management guidelines that have been written in a Comprehensive Management Plan provided by the

National Park Service. These were written to provide a management framework to assist the State of Minnesota and its units of local government in the development and implementation of integrated resource management programs for the Mississippi River corridor in order to ensure orderly public and private development in the area. The SWWD supports these efforts and encourages the cities to use land use planning as a means of protecting the natural character of the Mississippi River.

8.2.6 Land Use and Cover

The classification of land within the SWWD's Mississippi River basin can generally be based in two categories: land use and land cover. It is important to distinguish between these categories because they describe different systems. Land use describes the generally activities associated with a particular parcel of property such as residential housing. Land cover is a classification based on the amount and type of vegetation and artificial cover present at a particular area.

The existing land use within the basin is shown on Map 8.10, based on data produced by the Metropolitan Council in 2000. The map illustrates that there is a substantial amount of agricultural land in production. However, the rapid rate of development and growth within the cities of Woodbury and Cottage Grove makes any "existing" land use outdated almost immediately.

Future development is anticipated throughout the watershed. Future land use based Metropolitan Council data for the year 2020 is shown on Map 8.11. The City of Woodbury completed the Woodbury East AUAR in 2002, this includes development of approximately 1800 acres including residential, commercial/retail, school facilities, and transportation upgrades. The City of St. Paul Park and Grey Cloud Island Township have completed the Rivers Edge AUAR, including 640 acres of mixed use development. This project will include multi-family housing, townhomes, a City Center mixed use, and single family residential. The City of Cottage Grove, in addition to the West Draw Development is planning several redevelopments and is master planning the East Ravine including approximately 3500 acres of commercial/retail, medium to low density residential and mixed use areas. Other growth zones include the I-94 corridor and Highway 61 redevelopment. All of this proposed development will be phased over the next 15 years.

Land cover within the basin is categorized by the Minnesota Land Cover Classification System (MLCCS). The general cover types currently inventoried in the watershed are shown on Map 8.12. Land cover classification is not complete within the district; only about 77% of the district has MLCCS data. The northern area of the district which is mostly developed does not have any MLCCS mapping.

8.2.7 Sources of Pollution

Potential water pollution point sources such as solid waste sites; unused, unsealed wells; storage tanks; and permitted wastewater discharges can contribute to water pollution. These activities are regulated and must meet permit conditions and standards. There are eight permitted discharges within the SWWD's Mississippi River basin, including the Metropolitan Council's Eagles Point wastewater treatment plant. Permitted wastewater

discharges and other potential pollution risk factors in the SWWD identified by the MPCA are shown on Map 8.13.

Abandoned and unsealed wells provide direct conduits for migration of pollutants to the groundwater. The SWWD, in conjunction with the Washington County Health and Environmental Land Management department, inventory known well locations throughout the watershed.

Landfill sites can be potential sources of groundwater impacts; one closed site exists within the watershed. The MPCA maintains a list of sites as well as monitors ongoing investigation and remedial efforts. For further information visit the MPCA website at <http://www.pca.state.mn.us/cleanup/landfills.html>.

Disposal of household hazardous wastes can be a problem for many residents of the watershed. For lacking knowledge about disposal areas and impacts to downstream waterbodies, residents may dump household hazardous wastes such as used motor oil and lawn chemicals into storm sewers. Citizens should be aware that the Washington County Department of Health, Environment, and Land Management has a program for collection of household hazardous wastes. The county operates a year-round collection site in Oakdale and a summer collection site in Cottage Grove. Residents can contact the county at 651-430-6655 for more information.

8.3 St. Croix River Basin

The majority of the text below was taken directly from the Lower St. Croix Watershed Management Organization Watershed Management Plan prepared by Emmons and Olivier Resources, Inc (2009)

8.3.1 Topography and Drainage

The topography of SWWD's St. Croix River basin was formed by glacial and post-glacial processes and is illustrated in Map 8.1. The drainage pattern is well established and dendritic (USDA, 1977). The watershed is dominated by exposed bedrock and dissected till and outwash plain known as the Kenyon-Taopi Plain. This plain is a sloping, silt mantled, eroded till plain characterized by long swells and swales. The significant geomorphic features in the watershed are characterized by numerous well-defined stream channels, steep ravines, and river bluff and terrace deposits. In addition, the presence of karst features including sinkholes and springs define many of the watershed landforms. Additional information on karst features within the basin is available in the LSCWMO Karst Feature Inventory and Management Plan.

8.3.2 Soils

A soils map of the District is shown on Maps 8.2 and 8.3. As the maps illustrate, the soils are classified into groups based upon the hydrologic features of the soils. Hydrologic soil groups are used to estimate the amount of runoff generated for a given rainfall event. Vegetation, soils composition, and slope all contribute to the runoff potential of a soil. There are four hydrologic soil groups: A, B, C, and D. Combinations of these soil groups also result in A/D and B/D type soils and indicates two distinct soils with depth (USDA, 1977).

8.3.3 Geology

Geology is divided into bedrock and surficial geology. The surficial geology contains sediments that were deposited during glacial and post glacial times. Remnant glacial deposits in the watershed consist of eroded till and outwash plains, relics of the Illinoian Glaciation which ended 130,000 years ago. Surficial geology is illustrated in Map 8.5. Detailed description of each surficial deposit can be found on the Geologic Atlas of Washington County, Minnesota available online at <http://www.geo.umn.edu/mgs>.

Bedrock is commonly found at or near the surface throughout most of the watershed. Lying beneath the surficial sediments are marine sedimentary rocks of Early Paleozoic age (525 to 400 million years old). Shallow seas covered Southeastern Minnesota and parts of adjacent states during most of this period. Sand accumulated on near shore beaches and sand dunes, clay and silt accumulated in offshore deeper water areas, and carbonate which forms limestone and dolostone formed in banks and reefs just off shore. Bedrock geology is illustrated in Map 8.4.

The nine bedrock groups in SWWD's St. Croix River basin which subcrop (are exposed in the subsurface directly below the surficial sediment) or outcrop (are exposed directly at the surface) are from youngest to oldest: Platteville-Glenwood Formations, St. Peter Sandstone, Prairie du Chien Group, Jordan Sandstone, St. Lawrence Formation, Franconia Formation, Iron-ton-Galesville Sandstone, Eau Claire Formation, and the Mt. Simon Sandstone.

Notable bedrock features include the Hudson-Afton Anticline which extends across the basin from the southwest through the city of Afton and a series of faults. The anticline overlies a block-fault zone of Proterozoic material. The uplift of the anticline resulted in selective stream erosion that has exposed deep bedrock units along the St. Croix River near Afton (Swanson and Meyer, 1990).

As part of the Cottage Grove Area Nitrate Study Report (Barr, 2003), faults were mapped by the Minnesota Geological Survey (MGS) and the Minnesota Pollution Control Agency (MPCA) throughout the basin. Faulting may extend northward through the city of Afton, but this area was out of the extent of this study and was therefore not evaluated. Faults trend generally northeast-southwest. Faulting has displaced the Jordan Sandstone as much as 175 feet within the basin. Displacement has resulted in the Jordan abutting the permeable Shakopee Dolomite of the Prairie du Chien. Faults were found to be areas of high horizontal and vertical permeability.

A large portion of the basin has been identified as an active karst region (Alexander, 2004). Karst regions are the result of soluble bedrock that is slowly dissolved by infiltrating rainwater. Surface water systems are typically very well connected to the groundwater system in karst regions. This allows for surface contaminants to reach bedrock aquifers quickly. Additional information on karst features and their management within the LSCWMO is available in the LSCWMO Karst Feature Inventory and Management Plan.

8.3.4 Water Resources

8.3.4.1 Surface Waters

The District's St. Croix River basin is generally well drained through a series of streams. The drainage system is characterized by numerous streams and creeks including the two main perennial drainage ways, Trout Brook and O'Connors Creek (landlocked), and more than twenty smaller intermittent and perennial tributaries. Due to the rural character of the basin, there are few constructed stormwater ponds and stormwater management practices. Some ravines within the watershed have constructed earthen dams that stabilize the grade and control erosion and sedimentation. Additionally, new developments in the watershed have implemented stormwater management practices.

The District's St. Croix River basin contains a number of valuable water resources. The main surface water features include the St. Croix River, an Outstanding Resource Value

Water (ORWW), Trout Brook, O'Connors Creek and Lake, and a number of small, unnamed tributaries to the St. Croix River. There are also several small wetlands located in the watershed. The location of all identified surface water resources are found on Map 8.6

8.3.4.2 Groundwater

There are five aquifers used in the District's St. Croix River basin. The aquifers, from youngest to oldest, include the: Quaternary, Prairie du Chien-Jordan, Franconia-Ironton-Galesville, the Eau Claire, and Mt. Simon (Swanson and Meyer, 1990). The Quaternary Aquifer is located in surficial deposits. Because these deposits tend to be thin and bedrock is close to the surface, this aquifer is not significantly used as a source of drinking water in the watershed.

The bedrock aquifers of principal importance in the basin are the combined Prairie Du Chien-Jordan and the combined Franconia-Ironton-Galesville. These formations provide the major source of well water and also provide regional groundwater discharge to the St. Croix and Mississippi Rivers. The remaining aquifers are used very little.

The Prairie du Chien-Jordan Aquifer system provides for most of the groundwater uses in the basin. This aquifer lies directly below the surficial deposits except in cases where remnant St. Peter or Platteville Glenwood Formations overly the Prairie du Chien-Jordan Aquifer. The recharge zone for the Prairie Du Chien-Jordan aquifer occurs both within and outside the surface watershed. Fractures, joints, faults, and solution cavities control the flow in the aquifer.

8.3.5 Unique and Natural Features

The SWWD St. Croix River basin contains a number of unique features and scenic areas which contribute to the overall quality of life within the basin. These features include parks and open spaces, rare species, unique habitats, and rivers of regional significance.

Parks and open spaces include Afton State Park, Point Douglas Park, St. Croix Bluffs Regional Park, Lost Valley Prairie Scenic and Natural Area, Carpenter Nature Center. In addition to the parks and open space, there are numerous acres of prime farmland as defined by the Natural Resources Conservation Service (NRCS).

Numerous rare biological features have been surveyed by the DNR through the Minnesota County Biological Survey (MCBS) for Washington County (DNR, 1990). The goal of the MCSB is to identify significant natural areas and to collect and interpret information on the distribution and ecology of rare plant species, animals, and native plant habitats. Products of this program result in a map for each county assessing the status and distribution of the state's flora, fauna, and native plant communities. Rare species found in the LSCWMO include vascular plants, birds, colonial water birds, amphibians and reptiles, and mussels.

These rare species are predominantly found along the St. Croix Rivers and smaller tributary streams. Native plant habitats identified in the basin include dry prairie, floodplain forest, moist cliff, oak forest, maple-basswood forest, white pine-hardwood forest, and oak woodland-brushland.

The St. Croix River (an ORVW) as well as its confluence with the Mississippi River provide for scenic views and unique features. The portion of the St. Croix River within the SWWD is classified as recreational and includes a large portion of Lake St. Croix. This lake within the River stretch extends from Stillwater to the confluence with the Mississippi River at Point Douglas, MN.

8.3.6 Land Use and Cover

The classification of land within the SWWD St. Croix River basin can generally be based in two categories: land use and land cover. It is important to distinguish between these categories because they describe different systems. Land use describes the general activities associated with a particular parcel of property such as residential housing. Land cover is a classification based on the amount and type of vegetation and artificial cover present at a particular area.

Current land use in the District's St. Croix River basin is predominantly agricultural and undeveloped and is illustrated in Map 8.10. The basin is unique in that it is located adjacent to the largely developed SWWD Mississippi River basin and contains a number of natural resources. Development pressures and changes in agricultural land uses within the basin will likely increase over the next five to ten years. The basin is not included in the current Metropolitan Urban Service Area (MUSA). The MUSA is the outer edge of the metropolitan urban area, that part of the region which local and regional services are committed and which have urban levels of regional sewer and transportation service.

Land cover within the SWWD St. Croix River is categorized by the Minnesota Land Cover Classification System (MLCCS). Current MLCCS land cover classifications are illustrated in Map 8.12. Detailed MLCCS data are available in community Natural Resource Inventories as well as online at <http://www.dnr.state.mn.us/mlccs/index.html>.

8.3.7 Sources of Pollution

Potential sources of pollution include municipal, commercial, and industrial dumps, old or unregulated landfills, leaking underground storage tanks, accidental spills, disposal of household wastes, fertilizers, pesticides, animal wastes, and road salts. The MPCA monitors the locations of potential contamination sources such as Leaking Underground Storage Tanks (LUST), Hazardous Waste Generator/Investigation and Cleanup sites, and Metropolitan Area Waste Disposal Sites. Additional information is available from the MPCA. The Washington County Groundwater Plan identifies locations and types of potential hazards and discusses the county's policies for contaminant prevention. Specific locations of potential point sources of groundwater contamination identified by the plan within the watershed included ISTS, pipelines, and community septic systems (Washington County, 2003b).