

# Water Supply



Beneath the surface of the Twin Cities region lies an underground system of water-bearing rock layers, or aquifers, which together with the Mississippi River provide the region with an abundant water supply. While the resource is relatively plentiful, it cannot be taken for granted. The region must address water availability, management

and use to ensure a sustainable supply for future generations.

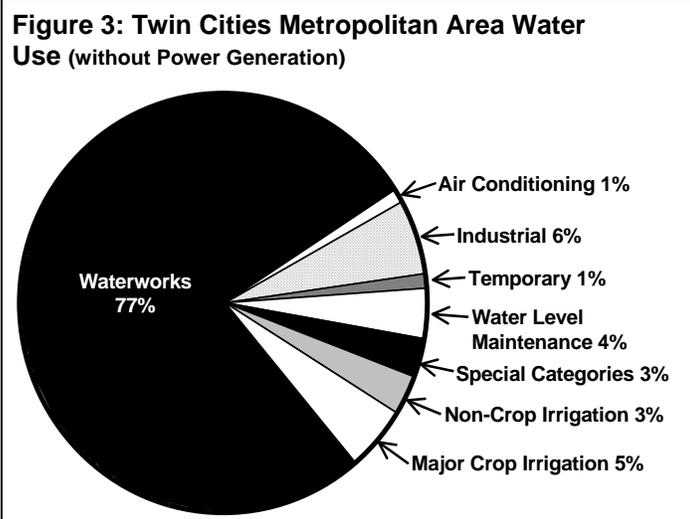
It is difficult to accurately determine the total volume of groundwater available in the region or how much is available locally before a shortage will occur. The increasing amount of impervious surface caused by development reduces groundwater recharge, but the effects have not been quantified. In addition, the impact on surface waters from groundwater withdrawals has not always been considered as water supplies have been developed. Both surface water and groundwater resources must be protected to guarantee supply for the future.

## Regional Water Demand

Regional water demand in 2003 totaled over 1.3 billion gallons per day (BGD). About 65 percent of the demand was for power generation, and this water was returned to the region's three major rivers in almost the same volume as was withdrawn. The remaining 35 percent was withdrawn by municipalities (waterworks) for domestic, commercial and industrial uses; self-supplied commercial/industrial uses; agricultural and non-crop irrigation; water-level maintenance; special categories; and air-conditioning uses.

Figure 3 shows the percentage of water use for all categories except power generation. Waterworks accounts for approximately 77 percent of the water used once power

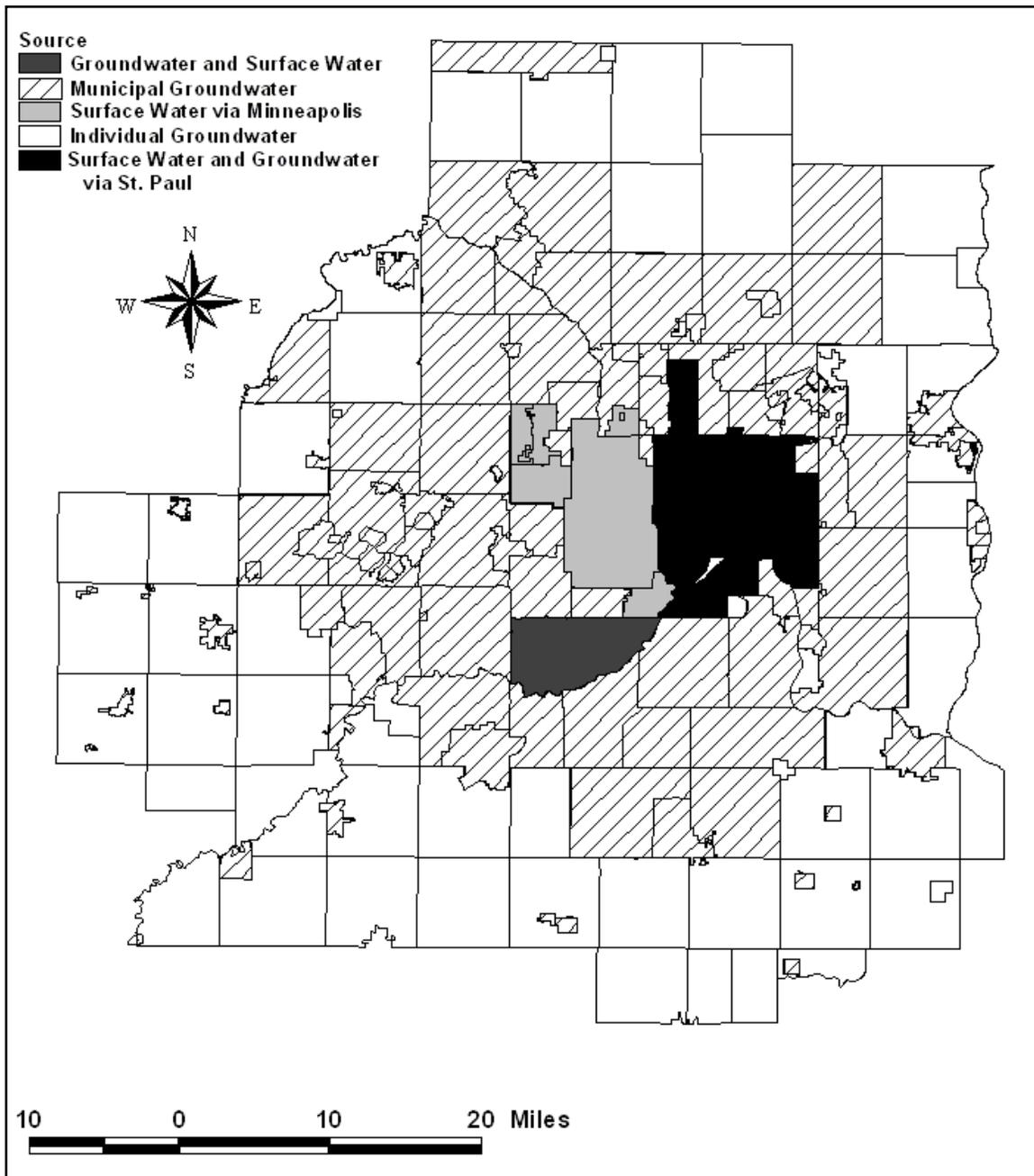
generation is factored out. Modeled projections for residential, commercial, industrial, institutional and "unaccounted for" water use show a rise of about 29 percent—or about 112 million gallons per day—from 2000 to 2030 due to increases in population and associated economic activity.



## Regional Water Sources

The source of water by community is shown in Figure 4. The central cities and many first-ring suburbs are served by water drawn from the Mississippi River, while the rest of the suburbs are served by groundwater. Minneapolis and the suburbs it serves rely solely on water from the Mississippi River, whereas St. Paul and its suburban clients supplement Mississippi River water with tributary inflow to its Vadnais Lake reservoir system and with high-capacity groundwater wells.

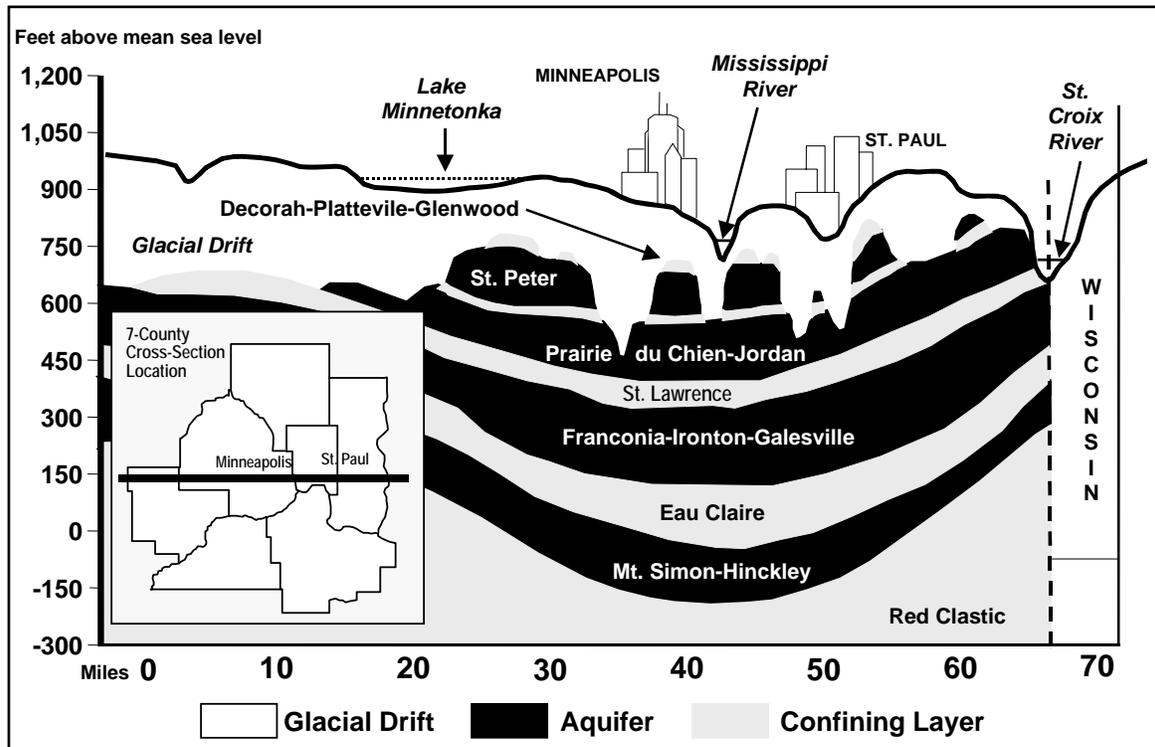
**Figure 4: Twin Cities Metropolitan Area Water Sources**



**Note:** Some communities shown as having a municipal water supply may also have a portion of the population served by private wells.

Figure 5 illustrates the 1,000-foot-thick layer of inter-bedded aquifers (water-bearing rock units) and aquitards (confining layers) that comprise the Twin Cities aquifer basin. There are five principal aquifers along with the confining layers in the basin. Nearly two-thirds of the municipal wells tap the high-yielding Prairie du Chien-Jordan aquifer. The remaining third use water from the drift (unconsolidated glacial material on top of the bedrock), and the Franconia-Ironton-Galesville and Mount Simon-Hinckley bedrock aquifers. This groundwater system is the lifeblood for growth in the suburban part of the region.

**Figure 5: Twin Cities Metropolitan Area Aquifer Basin**



The region's forecasted population growth of nearly one million new residents between 2000 and 2030 will place additional stress on the finite water supply available in the region. Although in most years water demands have been met without difficulty, there have been some periods, such as the drought of the late 1980s, when local scarcity became a problem. As the population increases, this region must plan to ensure a viable supply of water.

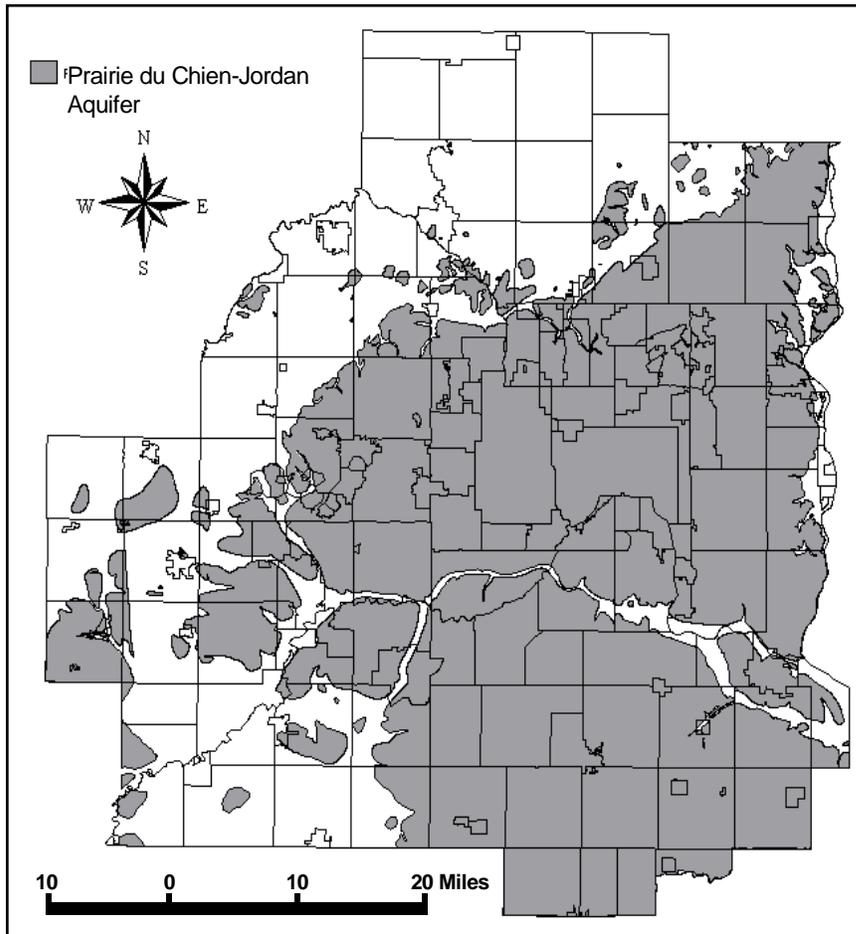
## Potential Limitations on Supply

Potential water supply limitations stem from several factors, including:

- Lack of access to the Prairie du Chien-Jordan (PDCJ) aquifer in certain areas, some of which are projected for significant population growth.
- Competing demand between groundwater withdrawals and surface water features or other groundwater users in the area.
- Reduced recharge caused by land-use changes and climate variations.
- Contamination of the Mississippi River above the surface water supply intakes.
- Aquifer contamination.

Figure 6 shows that approximately one-third of the region does not have access to the high-yielding PDCJ aquifer.

**Figure 6: Extent of Prairie du Chien-Jordan Aquifer in TCMA**



Rapidly growing portions of the region in northern and western Hennepin County and Anoka County will need to rely on bedrock aquifers that are less productive, or on the surficial drift aquifer that is vulnerable to contamination. In areas like the southwest metro and southern Washington County, community water needs compete with the groundwater needs of natural features like trout streams, fens and bubbling springs. In other

areas, the quantity of available water is limited by issues such as:

- **Nitrates.** Elevated concentrations of nitrates in groundwater originate from agricultural practices and individual sewage treatment system (ISTS or septic tank) use. Levels of nitrates approaching the drinking water standard have forced communities to suspend pumping in some wells and to blend water from high- and low-nitrate wells to reach acceptable levels.
- **Radium.** Radium occurs naturally in bedrock aquifers at varying concentrations. Naturally occurring contaminants must be treated or blended to meet drinking water quality standards, resulting in increased cost for communities that tap aquifers with elevated radium levels.
- **Industrial pollution.** Several communities have had to address water resources contaminated by industrial pollution.

Options for communities facing water supply limitations include: more and geographically scattered wells in shallower and/or deeper aquifers; inter-community sharing via pipe; increased conservation to reduce demand; tapping surface waters such as the Mississippi River; purchase of water from a large system with excess water availability; and limitations on development.

## Ensuring Supplies for Future Growth

### POLICY

**The Metropolitan Council will work with state agencies and communities to promote and support the efficient use of water resources to ensure that supplies are adequate for the region's projected growth.**

### IMPLEMENTATION STRATEGIES

- *The Council will update the regional water supply plan at least every 10 years. Elements of the regional water supply plan will include:*
  - *An evaluation of existing and expected water use and supply in the metropolitan area.*
  - *An assessment of water supplies available in the metropolitan area.*
  - *An assessment of alternatives to meeting water demands in areas where it is determined that there are potential limitations on future withdrawals.*

Under Minnesota 2005 First Special Session Laws, Chapter 1, the Council is required to carry out planning activities addressing the water supply needs of the metropolitan area. These activities include developing a technical information base for water supply, preparing a water supply master plan, providing guidance for local water supply systems and regional investments, and preparing recommendations addressing the governmental structure and necessary funding to improve water supply management in the metropolitan area.

- *The Council will review local water supply plans as required by state statute for consistency with Council and DNR plan requirements and Council policy.*

Minn. Stat. 473.859 requires communities to prepare water supply plans as part of the local comprehensive planning process. Appendix B2-c of this *Policy Plan* includes a list of the requirements for local water supply plans. The Council uses this format to comment on water supply issues, and to encourage communities to use water resources wisely and work together cooperatively to guarantee the efficient supply of water for the projected growth of the region. Interconnection of municipal water supplies, increased distribution of Mississippi River water where feasible, sustainable groundwater development, and water conservation are the preferred methods of meeting the region's water supply needs.

- *The Council will establish subregional task forces as needed and lead discussions among communities that may face water supply limitations. The Council will assist these communities to explore options and develop plans to meet projected demand.*

Currently Council staff facilitates the Southwest Metropolitan Groundwater Work Group. This group is working to manage the needs of several communities in Dakota and Scott Counties so that water demands are met efficiently with minimal adverse impacts to other users and natural resources. The Council also established a Northwest Metropolitan Water Supply Work Group to address the water supply needs for rapidly developing communities in northwestern Hennepin and west-central Anoka Counties. Through forums such as these, the Council facilitates solutions to regional water supply issues.

- *The Council will participate in regional planning efforts for drought and emergency conditions.*

The Mississippi River is the primary or sole source of water for 16 communities within the metropolitan area. These communities provide water service to approximately 870,000 people. The Council works with partners such as the River Defense Network and the Upper Mississippi Source Water Protection Planning Group (Appendix D) to help protect the river from drought or contamination.

- *The Council will work with partners to develop an institutional framework for coordinated regional and subregional water supply planning and management.*

In order to ensure a sustainable and reliable long-term supply of high quality water, the region needs a comprehensive water supply planning process to evaluate water resources and plan for their efficient use. Currently most supplies are developed without an assessment of the potential impact on other users or natural resources. Furthermore, water supply capital investments are typically based on local interests without looking at regional interests. No funding mechanisms exist to support water supply research and planning projects that meet local needs while also providing regional benefits. An institutional framework for water supply planning and management needs to be developed. The Council will take an active role in developing that framework.

- *The Council will promote water conservation measures in communities throughout the region.*

Efficient use of water by communities, private landowners, industries and operational organizations remains an issue in the region. Although many conservation programs are in place, implementation has been uneven. Many communities still install wells to meet peak nonessential demand for uses like watering lawns and filling swimming pools, without conservation. Eliminating the use of groundwater for once-through cooling water (air conditioning) and reducing water uses in industrial practices where possible are other ways to conserve water. The Council has a statutory responsibility to review local water supply plans, and will use this process to promote water conservation efforts.

- *The Council will encourage public and private entities to pursue environmentally sound and cooperative water use practices, joint planning efforts and implementation efforts.*

In past studies of the regional water supply system, the Council has proposed that communities could gain some economic and water resource efficiencies by sharing source, treatment and/or storage facilities. The Minneapolis and St. Paul systems provide a model for distribution of water from a central supplier. This model could be used in other places in the region where one community with access to a good supply could develop excess capacity for distribution to neighboring communities. This type of system could be successful where competing uses or local shortages exist. Another model is joint development among communities of a surface water or groundwater source, which could occur in any situation within the region where communities are close enough to share a resource.

- *The Council will investigate reusing wastewater effluent and, when cost-effective, implement reuse.*

The Council discharges significant amounts of treated wastewater to area rivers every day. Potential opportunities for reuse of wastewater effluent include irrigation, groundwater recharge, and industrial processing or cooling. For example, with the expansion of the Empire Wastewater Treatment Plant, the Council has investigated the reuse of its effluent for these purposes in order to reduce the need for higher treatment standards at this facility in the future.

A cost-benefit analysis will need to be completed to determine when and where it would be environmentally and economically feasible to reuse treated wastewater.

## **Protecting Water Supplies**

Protection of the region's water supply is vital to the region's continued growth and economic prosperity. The Mississippi River provides surface water for the Minneapolis and St. Paul water supply systems. St. Paul also receives some of its water supply from the Vadnais Chain of Lakes and from groundwater. Historically these sources have been reliable, but they could be adversely impacted by chemical spills, terrorist activities, nonpoint source pollution and drought.

The average annual flow in the Mississippi River far exceeds the demand placed on it for water supply, but a wise-use ethic guarantees that water is not wasted and that excess pumping and treatment costs do not occur. Although water in the river has been sufficient, conservation prepares users in the event river flow dramatically drops or system infrastructure fails during low flow.

The protection of drinking water sources is both a land-planning and a pollution-management effort. Land uses with potential to contaminate runoff or cause infiltration that impacts a drinking water source need to avoid areas that contribute directly to the water supply. In addition, best management practices should be employed to avoid release of contaminants. Land management practices that could impact water supplies include animal feedlots, individual sewage treatment systems, excessive use of fertilizer on agricultural land, facilities that handle or store hazardous materials, and highway and rail lines that carry toxic materials. Effort is needed to control the use of contaminating materials near water supply sources so that spills, seepage, or similar accidents do not render a water source unusable.

The protection of drinking water sources from terrorist activities is also a concern today. The Public Health Security and Bioterrorism Preparedness and Response Act of 2002 required all cities with water supplies serving over 3,300 people to develop vulnerability assessments of their local water supply systems and prepare or update their Emergency Response Plans. In addition, the 1996 amendments to the federal Safe Drinking Water Act requires the Minnesota Department of Health to produce source water assessments outlining potential vulnerabilities to their source waters for all Minnesota's public water systems. The groundwater suppliers in the state are also required to prepare wellhead protection plans to address potential source water contamination. Surface water suppliers are not required to prepare source water protection plans. However, several suppliers have elected to do so. For example, under the *Upper Mississippi River Source Water Protection Project* the cities of St. Paul and Minneapolis, along with St. Cloud, are working jointly to develop surface water protection plans to guide efforts to improve and protect the quality of the water that provides their public water supplies. These cities

draw most or all of their drinking water from the Mississippi River. The Metropolitan Council is a participant in and sponsor of this project.

The primary elements of these source water protection plans are 1) identify and define the source water protection area, 2) identify the point and nonpoint contaminant sources and their locations that pose threats to the quality of the source water, 3) describe practices and strategies to respond to the identified contaminant threats to the source water, and 4) formulate a plan to implement the source water protection practices and strategies.

## **POLICY**

**The Council will work with regional partners to protect the water supply system for the region.**

## **IMPLEMENTATION STRATEGIES**

- *The Council will work with local governments, regulatory agencies, water suppliers and water users to assess the use, capacity, quality and vulnerability of the regional water supply system along with identifying prime areas for recharge.*

As the region accommodates a larger population and a greater degree of growth, several factors will lead to more frequent water supply problems. These include higher demand for water, lower recharge resulting from more imperviousness, contamination of groundwater due to land use and natural compounds in geologic material, and urbanization of areas in which our most productive aquifer is absent. A comprehensive assessment of the long-term sustainability and vulnerability of current and projected withdrawals is needed.

- *The Council will promote development practices and patterns that protect the integrity of the region's water supply through the review of comprehensive plans, water supply plans, local stormwater management plans, and other environmental review documents.*

Council staff reviews local water supply plans, local comprehensive plans, and other environmental documents. Staff will continue to review these documents for consistency with regional plans, forecasts and policies, and consistency with local conservation programs and plans.

- *The Council will promote the use of best management practices for stormwater runoff to protect and improve water quality and maximize groundwater recharge.*

Groundwater recharge is necessary to ensure that the region has an adequate long-term water supply. A potential problem in this area relates to the ability of the groundwater system to recharge as land continues to be covered with impervious surfaces. It stands to reason that increasing impervious surface will decrease the amount of water that can soak through soils to recharge the groundwater aquifers. However, little research has been done in this area.

Developments that use progressive stormwater management practices can help to offset the reduction of water reaching the aquifer system caused by increased impervious surface. The Council will encourage development techniques that promote infiltration, such as rain gardens, as part of a low-impact development approach to surface water management.