

CITY OF MINNEAPOLIS

SOURCE WATER ASSESSMENT

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PART I

INTRODUCTION

The 1996 Amendments to the federal Safe Drinking Water Act (SDWA) require the Minnesota Department of Health (MDH) to complete source water assessments for public water systems.

The requirements of the SDWA addressed herein are intended to provide Minneapolis drinking water customers with 1) a general description of the area which supplies water to the Minneapolis Water Works; 2) an overview of why this water supply is susceptible to potential contaminants; 3) a description of the contaminants of concern which may impact the users of the public water supply; and 4) to the extent practical, the origins of the contaminants of concern.

The MDH, with the assistance of the Minneapolis Water Works, assembled a team that developed the information herein. The source water assessment team included resource persons representing the following agencies: Minneapolis Water Works, Hennepin County Environmental Services, Hennepin Conservation District, Metropolitan Council, United States Geological Survey, Minnesota Pollution Control Agency, Rivers Council of Minnesota, and MDH.

Over the past few years there has been a diverse group of upper Mississippi River interests involved in the planning and implementation of the Mississippi River Defense Network. This initiative has focused on protecting the Mississippi River, from its headwaters to the Twin Cities, from contamination from oil and chemical spills.

STATUS OF THE SOURCE WATER PROTECTION AREA

Although not a requirement of the SDWA, the cities of Minneapolis, St. Paul, and St. Cloud intend to use source water assessments as the basis and framework for the development and implementation of a source water protection plan. A cooperative approach is beneficial because the public water supplies for Minneapolis, St. Cloud, and the majority of the public water supply for St. Paul are drawn from the Mississippi River. Current discussions include the establishment of a coordinating entity that would guide the development and implementation of source water protection plans for the Upper Mississippi River watershed.

DESCRIPTION OF THE SOURCE WATER

The water supply for the city of Minneapolis is the Mississippi River. The water intake and water treatment plant are located on the Mississippi River in Fridley. The watershed for the Mississippi River, above the city's water intake, is approximately 19,000 square miles. Typical draw from the river by the Minneapolis Water Works is 65 million gallons per day while flow is typically 3.9 billion gallons per day.

SOURCE WATER SENSITIVITY

In determining the sensitivity of a source water, the intrinsic physical properties of the geologic setting or landscape within the watershed must be considered. The large quantities of water in the Mississippi River and the rate at which the river water flows helps attenuate contaminants and affects their movement to the public water supply intake. Seasonal changes will also influence the sensitivity of the river to contamination. Other factors influencing the sensitivity of a surface-water body include topography, hydrology, geology, vegetation, and the distribution of various soil types within the subwatersheds of the Mississippi River. The closer the source of contamination is to the intake the greater the impact will be on the quality of the water used by Minneapolis based on the factors listed in this section. The farther the contaminant is from the intake the more likely that the factors described in this section will help attenuate the movement of contaminants to the intake.

SOURCE WATER ASSESSMENT AREA

The source water assessment area for the city of Minneapolis includes three distinct nested areas. The **inner-emergency response area** is designed to help the city of Minneapolis address contaminant releases which present an immediate (**acute**) health concern to water users. This geographic area is defined by the amount of time the city of Minneapolis needs to be notified, shut off the surface-water intake, and a “buffer” to accommodate unanticipated delays in notification and shut down. The **outer source water management area** is designed to protect water users from long-term (**chronic**) effects related to low levels of chemical contamination or the periodic presence of contaminants at low levels in the surface water used by the city of Minneapolis. Also, this area should protect users from contaminants such as pathogens which may be 1) usually present at treatable levels in the source water and 2) occasionally present an acute health concern under certain conditions, such as the low stage of the Mississippi River. The **entire watershed** is designed to provide the water supplier with a broad perspective in which to prioritize specific types of lands uses that may impact the water quality of the source water used by them.

The **inner-emergency response area**, as shown in Figure 1, can be described as subwatersheds adjacent to the Mississippi River main stem beginning at the public water intake or river mile 858.6 (as measured from the confluence of the Ohio River) and extending to river mile 884.6 which is at the confluence of the Elk River and the Mississippi River. This area encompasses portions of the Mississippi River up to the city of Elk River and the lower portions of the Crow and Rum Rivers. The inner-emergency response area also includes areas extending short distances up Rice, Coon, and Elm Creeks; the Rum River; and up the Crow River to St. Michael.

The **outer source water management area** also shown in Figure 1 can be described as those minor watersheds directly adjacent to the Mississippi River between Elk River and St. Cloud and the subwatershed extending up the Crow River to Rockford. Additional areas, such as the Rice Creek watershed, are either small subwatersheds that flow directly into the inner-emergency response area or, in some instances instead of including an entire minor watershed, the buffer area was defined by the distance between a specific land use and the inner-emergency response area. An example of land use determining where the boundary line is compared to a watershed boundary would be using a bridge or pipeline crossing a river or stream thereby defining the area downstream from the crossing as a buffer.

The assessment area described as the **entire watershed** (Mississippi River Basin) is shown as an inset map in Figure 2. Because the cities of Minneapolis, St. Paul, and St. Cloud all draw water from the Mississippi River and have common interests in drinking water issues, the source water assessment areas have been stacked to provide a connection between the three public water suppliers. Figure 2 also shows the composite source water assessment areas for these three public water suppliers.

PART II

POTENTIAL CONTAMINANTS OF CONCERN

The contaminants of concern are the contaminants regulated under the federal SDWA. They are divided into organic chemicals, inorganic chemicals, radionuclides, disinfection byproducts, and microorganisms. A listing can be found at: <http://www.epa.gov/safewater>. Of greatest concern are petroleum products, pesticides, microorganisms, and plant nutrients. The Minneapolis Water Works has also identified pharmaceuticals and endocrine disrupting chemicals as emerging issues. These types of potential contaminants are not well understood at this time.

SOURCES OF CONTAMINANTS

To the extent practical, the table below is a listing of point sources of contamination and an **estimate** of the numbers of each type located in the **inner-emergency response area** and the **outer source water management area**.

The potential sources of contamination listed in the table below represent data collected from a number of state and federal data bases. Editing the data sets for duplication and the accuracy of the locations for potential contaminant sources was not possible to perform as part of the preparation of the source water assessment.

INVENTORY OF POTENTIAL CONTAMINATION SOURCES

AREA	TOTAL	GENERAL TYPE OF POTENTIAL SOURCE
Inner Emergency Response Area	8	Aggregate Source Information System - Active Gravel Pit
Inner Emergency Response Area	1	Aggregate Source Information System - Commercial Aggregate
Inner Emergency Response Area	8	Aggregate Source Information System - Inactive Gravel Pit
Inner Emergency Response Area	3	Aggregate Source Information System - MnDOT Gravel Pit
Inner Emergency Response Area	936	EPA - Resource Conservation Recovery Act Information System
Inner Emergency Response Area	7	EPA - Resource Management Plan (RMP)
Inner Emergency Response Area	73	EPA - Toxic Release Inventory System (TRIS)
Inner Emergency Response Area	11	Golf Courses
Inner Emergency Response Area	54	Minnesota Department of Agriculture (MDA) Licensed Agriculture Chemical
Inner Emergency Response Area	8	MDA Licensed Feed
Inner Emergency Response Area	13	MDA Licensed General Retail
Inner Emergency Response Area	37	MDA Licensed Government Facility
Inner Emergency Response Area	3	MDA Licensed Horticulture Center
Inner Emergency Response Area	81	MDA Misc
Inner Emergency Response Area	6	MDA Seed
Inner Emergency Response Area	40	MDA Unknown
Inner Emergency Response Area	66	MDH - Hazardous Substance Emergency Events Surveillance
Inner Emergency Response Area	150	Metro Council - Mississippi River Crossing Data
Inner Emergency Response Area	4207	Minnesota Geological Survey (MGS) Located Wells
Inner Emergency Response Area	4019	MGS Unlocated Wells
Inner Emergency Response Area	1603	Minnesota Pollution Control Agency (MPCA) Licensed Hazardous Waste Generator

AREA	TOTAL	GENERAL TYPE OF POTENTIAL SOURCE
Inner Emergency Response Area	7	MPCA Salvage Yards
Inner Emergency Response Area	10	MPCA Feedlot Inventory
Inner Emergency Response Area	490	MPCA Leaking Underground Storage Tanks
Inner Emergency Response Area	1	MPCA CERCLIS Site
Inner Emergency Response Area	1	MPCA Hazardous waste generator
Inner Emergency Response Area	6	MPCA Hazardous Waste Generator Investigation and Clean Up List Facility
Inner Emergency Response Area	55	MPCA Metro Dump Inventory
Inner Emergency Response Area	4	MPCA No Further Remedial Action Planned
Inner Emergency Response Area	5	MPCA National Priorities List
Inner Emergency Response Area	1	MPCA Out-state Dump Inventory
Inner Emergency Response Area	6	MPCA Permanent List of Priority Site
Inner Emergency Response Area	4	MPCA Superfund Treatment, Storage, or Disposal Facility
Inner Emergency Response Area	9	MPCA Permitted Solid Waste Site
Inner Emergency Response Area	59	MPCA Voluntary Investigation and Clean Up Site
Inner Emergency Response Area	757	MPCA Registered Storage Tanks (TABS)
Inner Emergency Response Area	10	National Pollutant Discharge Elimination System
Inner Emergency Response Area	78	US Army Corps of Engineers (USACE) - Above Ground Storage Tanks
Inner Emergency Response Area	220	USACE Agricultural Pesticide Applicators
Inner Emergency Response Area	8	USACE Boat Landings
Inner Emergency Response Area	21	USACE Containment and Diversion Sites
Inner Emergency Response Area	25	USACE Fertilizer Licensees
Inner Emergency Response Area	1	USACE Pesticide Dealers
Inner Emergency Response Area	4	USACE Pipeline Crossings
Inner Emergency Response Area	531	USACE Sara Title III Hazardous Waste Sites
Inner Emergency Response Area	11	USACE Transportation Crossings
Inner Emergency Response Area	444	USACE Underground Storage Tanks
Inner Emergency Response Area	10	US Geological Survey (USGS) Cemeteries
Outer Source Water Management Area	36	Aggregate Source Information System - Active Gravel Pit
Outer Source Water Management Area	10	Aggregate Source Information System - Commercial Aggregate
Outer Source Water Management Area	17	Aggregate Source Information System - Inactive Gravel Pit
Outer Source Water Management Area	3	Aggregate Source Information System - MnDOT Gravel Pit
Outer Source Water Management Area	656	EPA - Resource Conservation Recovery Act Information System
Outer Source Water Management Area	5	EPA - Resource Management Plan
Outer Source Water Management Area	27	EPA - Toxic Release Inventory System Site
Outer Source Water Management Area	11	Golf Courses
Outer Source Water Management Area	58	MDA Licensed Ag Chemical
Outer Source Water Management Area	21	MDA Licensed Feed
Outer Source Water Management Area	17	MDA General Retail Licensed
Outer Source Water Management Area	44	MDA Government Facility License
Outer Source Water Management Area	4	MDA Horticultural Center
Outer Source Water Management Area	63	MDA Miscellaneous

AREA	TOTAL	GENERAL TYPE OF POTENTIAL SOURCE
Outer Source Water Management Area	16	MDA Seed
Outer Source Water Management Area	19	MDA Unknown
Outer Source Water Management Area	57	MDH Hazardous Substance Emergency Events Surveillance
Outer Source Water Management Area	4343	MGS Located Wells
Outer Source Water Management Area	7899	MGS Unlocated Wells
Outer Source Water Management Area	837	MPCA Licensed Hazardous Waste Generator
Outer Source Water Management Area	9	MPCA - Salvage Yards
Outer Source Water Management Area	46	MPCA Feedlot Inventory
Outer Source Water Management Area	337	MPCA Leaking Underground Storage Tanks
Outer Source Water Management Area	3	MPCA CERCLIS Site
Outer Source Water Management Area	1	MPCA De-listed Permanent List of Priorities
Outer Source Water Management Area	25	MPCA Metro Dump Inventory
Outer Source Water Management Area	4	MPCA No Further Remedial Action Planned Site
Outer Source Water Management Area	6	MPCA Out-state Dump Inventory Site
Outer Source Water Management Area	1	MPCA Permanent List of Priority Site
Outer Source Water Management Area	2	MPCA Resource Conservation and Recovery Act Treatment, Storage, and Disposal Facility
Outer Source Water Management Area	16	MPCA Permitted Solid Waste Site
Outer Source Water Management Area	45	MPCA Voluntary Investigation and Clean Up Site
Outer Source Water Management Area	649	MPCA Registered Storage Tanks
Outer Source Water Management Area	11	National Pollutant Discharge Elimination System
Outer Source Water Management Area	1	Nuclear Sites
Outer Source Water Management Area	100	USACE Above Ground Storage Tanks
Outer Source Water Management Area	58	USACE Agricultural Pesticide Applicators
Outer Source Water Management Area	7	USACE Boat Landings
Outer Source Water Management Area	42	USACE Containment and Diversion Sites
Outer Source Water Management Area	12	USACE Fertilizer Licensees
Outer Source Water Management Area	3	USACE Pesticide Dealers
Outer Source Water Management Area	4	USACE Pipeline Crossings
Outer Source Water Management Area	178	USACE Sara Title III Hazardous Waste Sites
Outer Source Water Management Area	8	USACE Transportation Crossings
Outer Source Water Management Area	349	USACE Underground Storage Tanks
Outer Source Water Management Area	33	USGS Cemeteries

To the extent practical, the table below is an estimate of percentages of land uses found within the Minneapolis source water assessment area (inner-emergency response area and outer source water management area) reflecting non-point sources of potential contamination.

**LAND USES WITHIN THE SOURCE WATER ASSESSMENT AREA
FOR THE CITY OF MINNEAPOLIS**

LAND USE	OUTER AREA	INNER AREA	% OUTER	% INNER	TOTAL ACRES	TOTAL %
Open Water	20290.416	6268.421	6.565	5.507	26558.837	6.280
Low Intensity Residential	19679.720	25692.831	6.367	22.571	45372.551	10.728
High Intensity Residential	8194.805	11985.303	2.651	10.529	20180.108	4.772
Commercial/Industrial/ Transportation	6971.856	8711.873	2.256	7.653	15683.729	3.708
Quarries/Strip Mines/Gravel Pits	1842.319	687.200	0.596	0.604	2529.519	0.598
Barren Transitional	11.342	166.129	0.004	0.146	177.471	0.042
Deciduous Forest	45662.776	9592.334	14.773	8.427	55255.110	13.065
Evergreen Forest	991.659	453.463	0.321	0.398	1445.122	0.342
Mixed Forest	715.222	290.892	0.231	0.256	1006.114	0.238
Shrubland	7.117	4.448	0.002	0.004	11.565	0.003
Pasture/Hay	70386.856	15843.631	22.773	13.918	86230.487	20.389
Row Crops	85604.667	14952.050	27.696	13.135	100556.717	23.777
Small Grains	4996.767	1230.511	1.617	1.081	6227.278	1.472
Urban/Recreational Grasses	5092.175	5626.145	1.647	4.943	10718.320	2.534
Woody Wetlands	10255.071	4093.399	3.318	3.596	14348.470	3.393
Emergent Herbaceous Wetlands	28384.031	8232.835	9.183	7.232	36616.866	8.658
Total	309086.799	113831.465	100.000	100.000	422918.264	100.000

Both point sources (such as industrial and wastewater treatment plant discharges) and non-point sources (such as runoff from agricultural and urban areas) are present in the inner-emergency response area and the outer source water management area.

In the entire Upper Mississippi River watershed, forestry/logging, mining, and recreation and tourism are predominant industries in the northern and eastern counties of the watershed, along with scattered agricultural activities. More intensive agriculture dominates the land uses in the southern and western portions of the watershed. The southern and eastern portions of the watershed are increasingly dominated by urban land uses. Approximately 30 cities are on the stretch of the Mississippi River from its headwaters to the Twin Cities. Public ownership of land is more predominant in the northern reaches, and private ownership is more predominant in the southern reaches.

The Sauk and Crow Rivers in particular are significant contributors of contaminants to the Mississippi River. Forms of pollution in the Mississippi River, and many of its tributaries, include suspended solids, nutrients, oxygen-using materials, metals, pathogenic microorganisms, and several organic and inorganic chemical constituents. The Mississippi River Defense Network included an inventory of potential oil and chemical spill sources within one mile of the Mississippi and near certain tributaries between the Mississippi River headwaters and St. Anthony Falls. Within this corridor, more than 3,300 potential spill sources were identified, including pipeline, highway, railroad river crossings and parallels, above- and below-ground petroleum and chemical storage tanks, agricultural chemical storage facilities, and hazardous waste storage facilities.

RESULTS OF MONITORING THE SOURCE WATER

Source water monitoring results can be found in the various programs present in the Mississippi River basin. Some of those programs include: Minnesota Pollution Control Agency's TMDL program, Riverwatch, County Water Planning, Minnesota Department of Natural Resources fisheries monitoring, MDH's Fish Consumption Advisory Handbook, and Clean Water Partnership diagnostic studies. Also, the United States Geological Survey conducted extensive monitoring of the entire Mississippi main stem during the period 1987-1992 and another data set (1962-1995) includes physical, chemical, and biological properties with some sites sampled above the Minneapolis water intake. The public water supplier also provides a continuous monitoring program for finish water.

For the past four years, the MDH has conducted a limited study at the Minneapolis intake for all of the SDWA pesticides and nitrates. Grab samples of both raw and treated drinking water have been collected and analyzed. These samples are collected over the May-June time frame each year to determine if additional monitoring is needed. The results of sampling for pesticides/nitrates over the past four years have not indicated any problems during this typically peak flow period.

Monitoring conducted in the Upper Mississippi River Basin (including areas outside of the source water protection areas) the Minnesota Pollution Control Agency determined that a small percentage of locations monitored or surveyed had water quality fully supporting the designated uses for the water body being monitored or surveyed. Nearly two-thirds of the sites had threatened water quality or did not support the designated use. Most monitoring upstream of the public water system intake is generally related to swimmable and fishable goals. A greater emphasis on drinking water standards in the future would be beneficial.

SUSCEPTIBILITY OF THE SOURCE WATER TO CONTAMINATION

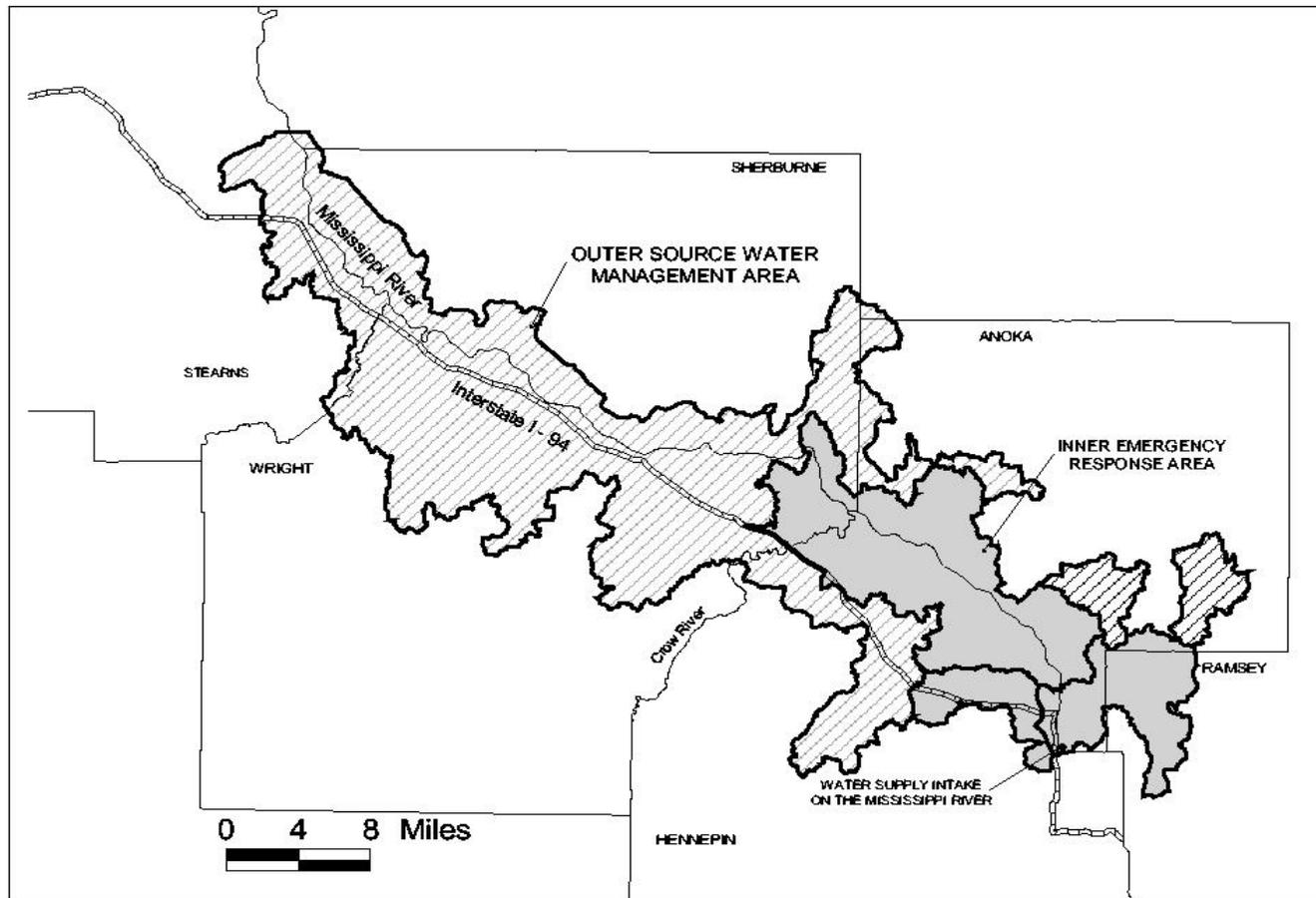
Susceptibility is defined as the likelihood that a contaminant will enter a public water supply at a level which may result in an adverse human health impact. The determination of susceptibility is on a scale of low, medium, and high. The overall susceptibility of any surface water is determined to be high because there is no practical means of preventing all potential contaminant releases into surface waters. However, a susceptibility determination for a specific public water supply system is based on comparing the sensitivity of the surface-water intake to the presence of a source which may release a contaminant of concern. This secondary analysis allows for differentiation between surface water based public water supply systems. The sensitivity of the source for Minneapolis is considered high based on the sensitivity factors. Based on a comparison of the sensitivity of the surface-water intake to the presence of potential contaminant sources, the susceptibility of the Minneapolis Water Works intake is considered to be high for a surface water based public water supply system. While it has been determined that the Minneapolis source water is highly susceptible to the source water's potential contaminant sources, it is noted that historically the city of Minneapolis Water Works has effectively treated this source water to meet drinking water standards.

USING THIS ASSESSMENT

Protecting the drinking water source is a wise and relatively inexpensive investment in the community's future. The overall intent of this assessment is to provide background information for the community to use in developing a local Drinking Water Protection Program. The assessment benefits the community by providing the following:

- ***A basis for focusing limited resources within the community to protect the drinking water source.***
The assessment provides the community with information regarding activities within the **source water protection area** that may directly affect your water supply.
- ***A basis for informed decision making regarding land use within the community.***
The assessment provides the community with a significant amount of information regarding where your drinking water comes from (the source) and what the risks are to the quality of that source. Knowing where the resource is allows communities' planning authorities to make informed decisions regarding proposed land *uses* within the source water assessment area that are compatible with both the drinking water resource and the vision of growth embraced by your community.
- ***A basis for informed source water planning efforts for the composite source water assessment areas for Minneapolis, St. Paul, and St. Cloud.***

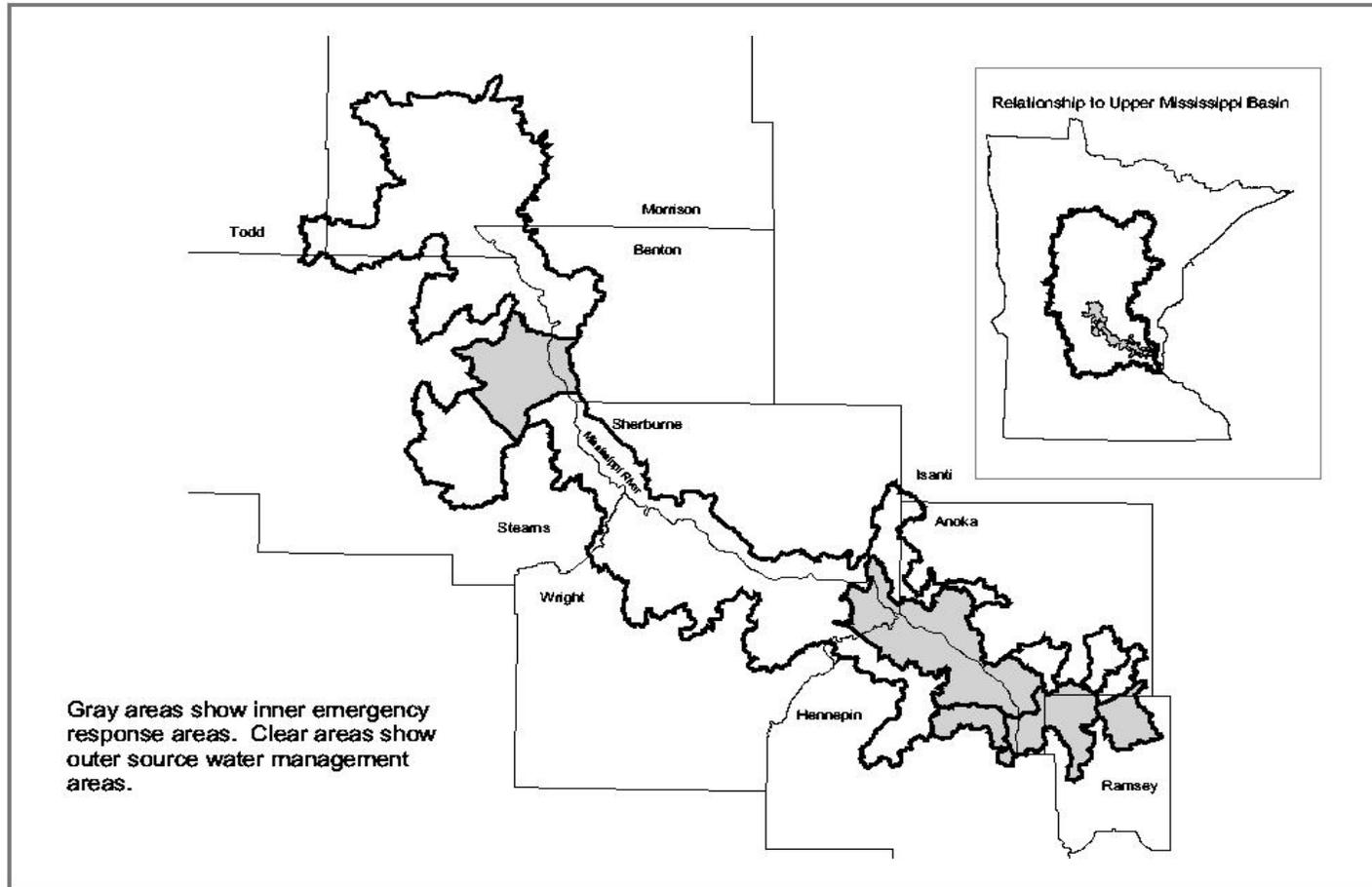
SOURCE WATER ASSESSMENT AREAS FOR THE CITY OF MINNEAPOLIS



Prepared by the Minnesota Department of Health August, 2001

FIGURE 1
SOURCE WATER ASSESSMENT AREAS FOR THE CITY OF MINNEAPOLIS

COMPOSITE SOURCE WATER ASSESSMENT AREAS FOR THE MISSISSIPPI RIVER



Prepared by the Minnesota Department of Health August, 2001

FIGURE 2
COMPOSITE SOURCE WATER AREAS FOR THE CITIES OF MINNEAPOLIS, ST. PAUL, AND ST. CLOUD