Section 3
Land and Water Resources Assessment

Overview

This section of the Minneapolis Local Surface Water Management Plan focuses on the physical characteristics of the City. Detailed information is provided for each water resource that is listed as a public water by the Minnesota Department of Natural Resources (also termed protected water). Summaries of water quality monitoring studies are provided; with detailed information contained in Appendix H. Detailed copies of the figures are available from Minneapolis Public Works – Engineering Services (612-673-2405).

Population and Land Area

Minneapolis is the largest city in Minnesota and the county seat of Hennepin County. The 2000 census noted a total population of 383,000, which is spread over 81 neighborhoods (Figure 3-1). The City has 19 lakes and about 151 parks that are wholly or partially within MPRB property, comprising a total of 10 square miles out of a total City area of 59 square miles (Figure 3-2). The Mississippi River and approximately 13 miles of creek (Bassett, Minnehaha, and Shingle) wind through the City.

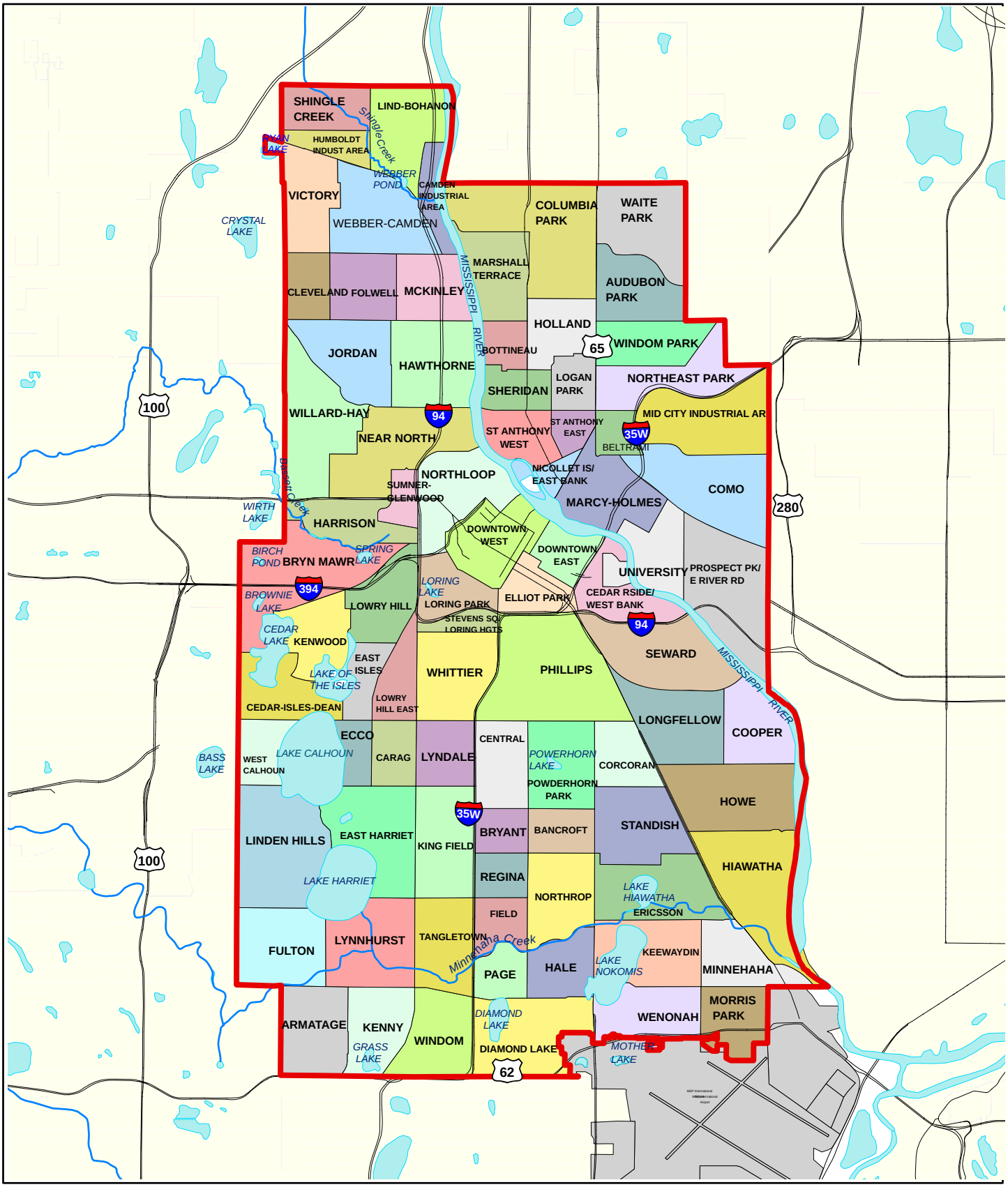
Soils

Minneapolis surface soils are highly variable and altered, which is typical of urban cities. According to the University of Minnesota Department of Soil, Water, Climate and Land Management, underlying soils in Minneapolis can be broadly classified as two main soil types: sandy/loamy or silty. Figure 3-3 shows the general location of these two classifications in the City. More detailed soil information is contained in the Soil Survey of Hennepin County, available from the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS). Recent trends in stormwater management are an increasing use of infiltration or filtration techniques. The information contained in this LSWMP is not of sufficient detail to determine if a site is suited for stormwater infiltration. Designers should conduct on-site soil investigations to ensure proper design, construction and operation of a soil based stormwater management practice.

Climate

Precipitation

Minneapolis has a continental climate, strongly influenced in the summer months by weather systems that originate in the Gulf of Mexico and the Pacific Ocean. Average annual temperatures and precipitation are listed in Table 3-1. Precipitation in the form of snowfall is included in these values and is described in terms of water equivalent. Growing season (May-September) precipitation averages 17.6 inches, or about 60 percent of the annual precipitation.



City of Minneapolis

Neighborhoods

Local Surface Water Management Plan

Figure 3-1

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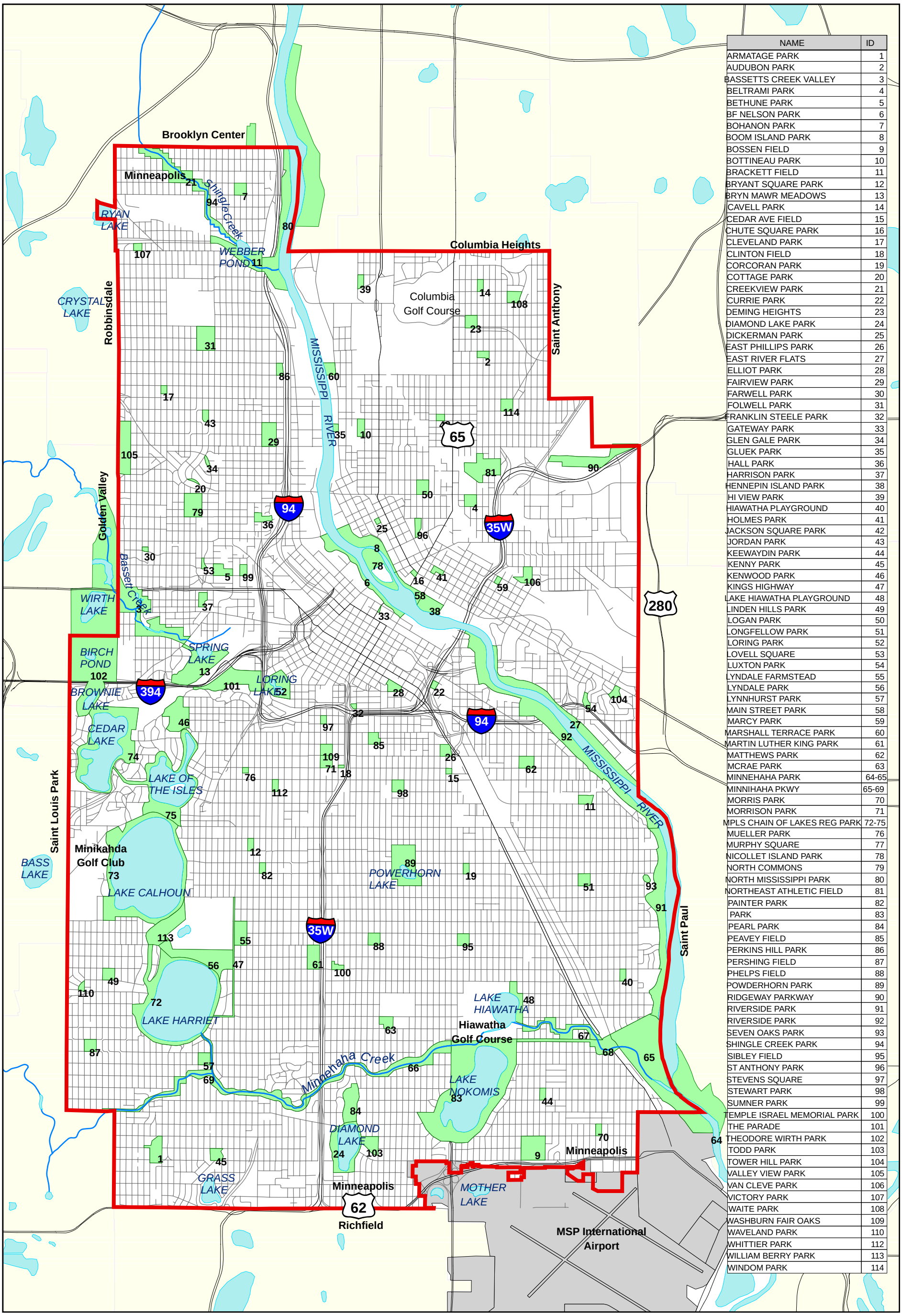
Genearl City Boundary
River/Stream
Lake



NAME	ID
ARMATAGE PARK	1
AUDUBON PARK	2
BASSETTS CREEK VALLEY	3
BELTRAMI PARK	4
BETHUNE PARK	5
BF NELSON PARK	6
BOHANON PARK	7
BOOM ISLAND PARK	8
BOSSEN FIELD	9
BOTTINEAU PARK	10
BRACKETT FIELD	11
BRYANT SQUARE PARK	12
BRYN MAWR MEADOWS	13
CAVELL PARK	14
CEDAR AVE FIELD	15
CHUTE SQUARE PARK	16
CLEVELAND PARK	17
CLINTON FIELD	18
CORCORAN PARK	19
COTTAGE PARK	20
CREEKVIEW PARK	21
CURRIE PARK	22
DEMING HEIGHTS	23
DIAMOND LAKE PARK	24
DICKERMAN PARK	25
EAST PHILLIPS PARK	26
EAST RIVER FLATS	27
ELLIOT PARK	28
FAIRVIEW PARK	29
FARWELL PARK	30
FOLWELL PARK	31
FRANKLIN STEELE PARK	32
GATEWAY PARK	33
GLEN GALE PARK	34
GLUEK PARK	35
HALL PARK	36
HARRISON PARK	37
HENNEPIN ISLAND PARK	38
HI VIEW PARK	39
HIAWATHA PLAYGROUND	40
HOLMES PARK	41
JACKSON SQUARE PARK	42
JORDAN PARK	43
KEEWAYDIN PARK	44
KENNY PARK	45
KENWOOD PARK	46
KINGS HIGHWAY	47
LAKE HIAWATHA PLAYGROUND	48
LINDEN HILLS PARK	49
LOGAN PARK	50
LONGFELLOW PARK	51
LORING PARK	52
LOVELL SQUARE	53
LUXTON PARK	54
LYNDALE FARMSTEAD	55
LYNDALE PARK	56
LYNNHURST PARK	57
MAIN STREET PARK	58
MARCY PARK	59
MARSHALL TERRACE PARK	60
MARTIN LUTHER KING PARK	61
MATTHEWS PARK	62
MCRAE PARK	63
MINNEHAHA PARK	64-65
MINNIHAHA PKWY	65-69
MORRIS PARK	70
MORRISON PARK	71
MPLS CHAIN OF LAKES REG PARK	72-75
MUELLER PARK	76
MURPHY SQUARE	77
NICOLLET ISLAND PARK	78
NORTH COMMONS	79
NORTH MISSISSIPPI PARK	80
NORTHEAST ATHLETIC FIELD	81
PAINTER PARK	82
PARK	83
PEARL PARK	84
PEAVEY FIELD	85
PERKINS HILL PARK	86
PERSHING FIELD	87
PHELPS FIELD	88
POWDERHORN PARK	89
RIDGEWAY PARKWAY	90
RIVERSIDE PARK	91
RIVERSIDE PARK	92
SEVEN OAKS PARK	93
SHINGLE CREEK PARK	94
SIBLEY FIELD	95
ST ANTHONY PARK	96
STEVENS SQUARE	97
STEWART PARK	98
SUMNER PARK	99
TEMPLE ISRAEL MEMORIAL PARK	100
THE PARADE	101
THEODORE WIRTH PARK	102
TODD PARK	103
TOWER HILL PARK	104
VALLEY VIEW PARK	105
VAN CLEVE PARK	106
VICTORY PARK	107
WAITE PARK	108
WASHBURN FAIR OAKS	109
WAVELAND PARK	110
WHITTIER PARK	112
WILLIAM BERRY PARK	113
WINDOM PARK	114

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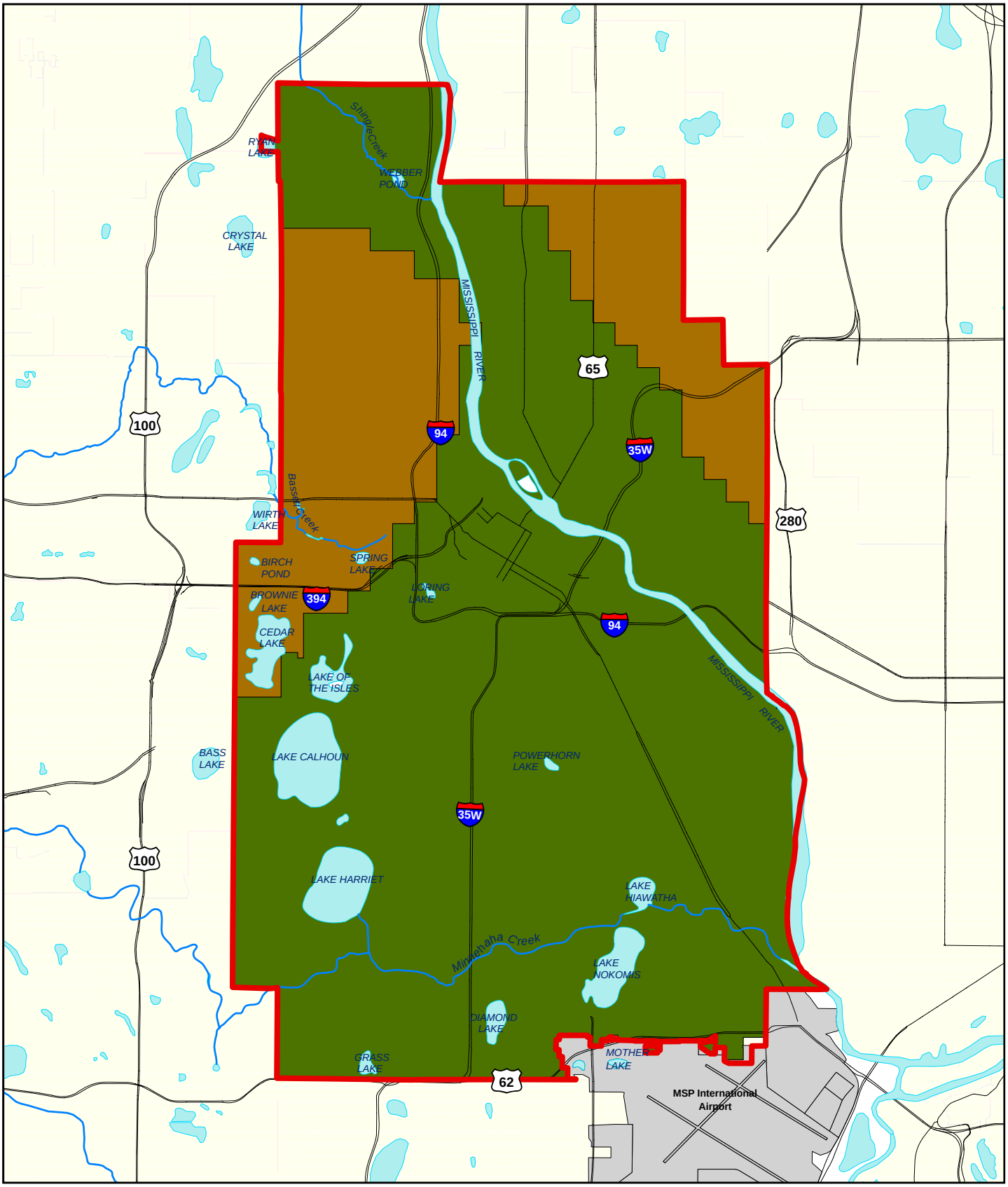
City of Minneapolis

Minneapolis Lakes Streams and Parks

Local Surface Water Management Plan

Figure 3-2

General City Boundary
River/Stream
Lake
Park



City of Minneapolis

Soil Classification

Local Surface Water Management Plan

Figure 3-3

Source: University of Minnesota Department of Soil, Water, Climate, and Land Management

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- General City Boundary
- River/Stream
- Lake
- Sandy Soil
- Loamy or Silty Soil

Table 3-1. Temperature and Precipitation Monthly Averages

Measure	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Mean Temperature (degrees Fahrenheit)	49.6	33.0	19.5	13.5	17.7	30.3	46.2	58.2	68.0	73.2	70.7	61.6	N/A
Mean Precipitation (inches)	2.07	1.47	0.92	0.86	0.84	1.61	2.21	3.43	4.22	3.62	3.43	2.91	27.58

(Source: University of Minnesota, Department of Soil, Water and Climate, 1981 – 2005)

Snowfall and Snowmelt

In the winter months (November - March), snow predominates in Minneapolis. Table 3-2 lists average monthly snowfalls for the city. Snowfall occurs throughout the winter in small, low-flow events and generally does not affect surface water management. The spring snowmelt, on the other hand, can be the single largest water event of the year. The spring snowmelt occurs over a comparatively short period of time (e.g., approximately two weeks) in March, or April. The Minnesota Stormwater Manual recommends that the stormwater management practices be designed to accommodate the full volume of this snowmelt. The average annual snowmelt can be computed by multiplying the average snow water equivalent by the average depth of snow during the last two weeks of March, less the depth of snow that is expected to infiltrate through the thawing soils. Additional information on the annual volume of snow melt can be found at Analysis of Snow Climatology.

Table 3-2. Snowfall Monthly Averages

Measure	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Season Total
Mean Snowfall (inches)	0.6	6.2	8.8	10.0	7.8	9.4	3.6	0.2	0.0	0.0	0.0	0	45.8

(Source: University of Minnesota, Department of Soil, Water and Climate, 1884 – 2005)

Topography

The Minnesota landscape is a product of the continental glaciers that covered it. It consists of gently rolling and steep hills, numerous marshes and lakes, and extensive outwash plains. The City of Minneapolis has a relatively flat topography resulting from outwash deposited 14,000 years ago by the Des Moines Lobe of the late Wisconsin glaciations.

Bedrock, examples of which can be seen exposed along the Mississippi River bluffs, is not continuous beneath the glacial drift (gravelly material deposited by glaciers). For example, the Chain of Lakes exists where valleys filled with glacial drift and buried the bedrock. Glacial drift deposits are up to 300 feet thick under Lakes Calhoun and

Harriet. In contrast, at Minnehaha Falls along the Mississippi River, glacial drift is completely eroded, exposing the bedrock underneath.

The Mississippi River has a distinct geologic stratigraphy with a layer of glacial till and river deposits overlying oceanic limestone, shale and sandstone bedrock. Under Minneapolis, groundwater is primarily located in unconsolidated deposits and bedrock formations from the surface down to about 300 feet. Most groundwater under Minneapolis makes its way to the Mississippi River and its tributaries.

Topography divides Minneapolis into four main watersheds: Mississippi River, Bassett Creek, Minnehaha Creek, and Shingle Creek. About 51 percent of the land area in Minneapolis falls within the MWMO boundary, 36 percent is within the MCWD and approximately 13 percent falls within the BCWMC and SCWMC boundaries. Figure 1-3 and Table 3-3 depict the jurisdictional watershed boundaries within Minneapolis.

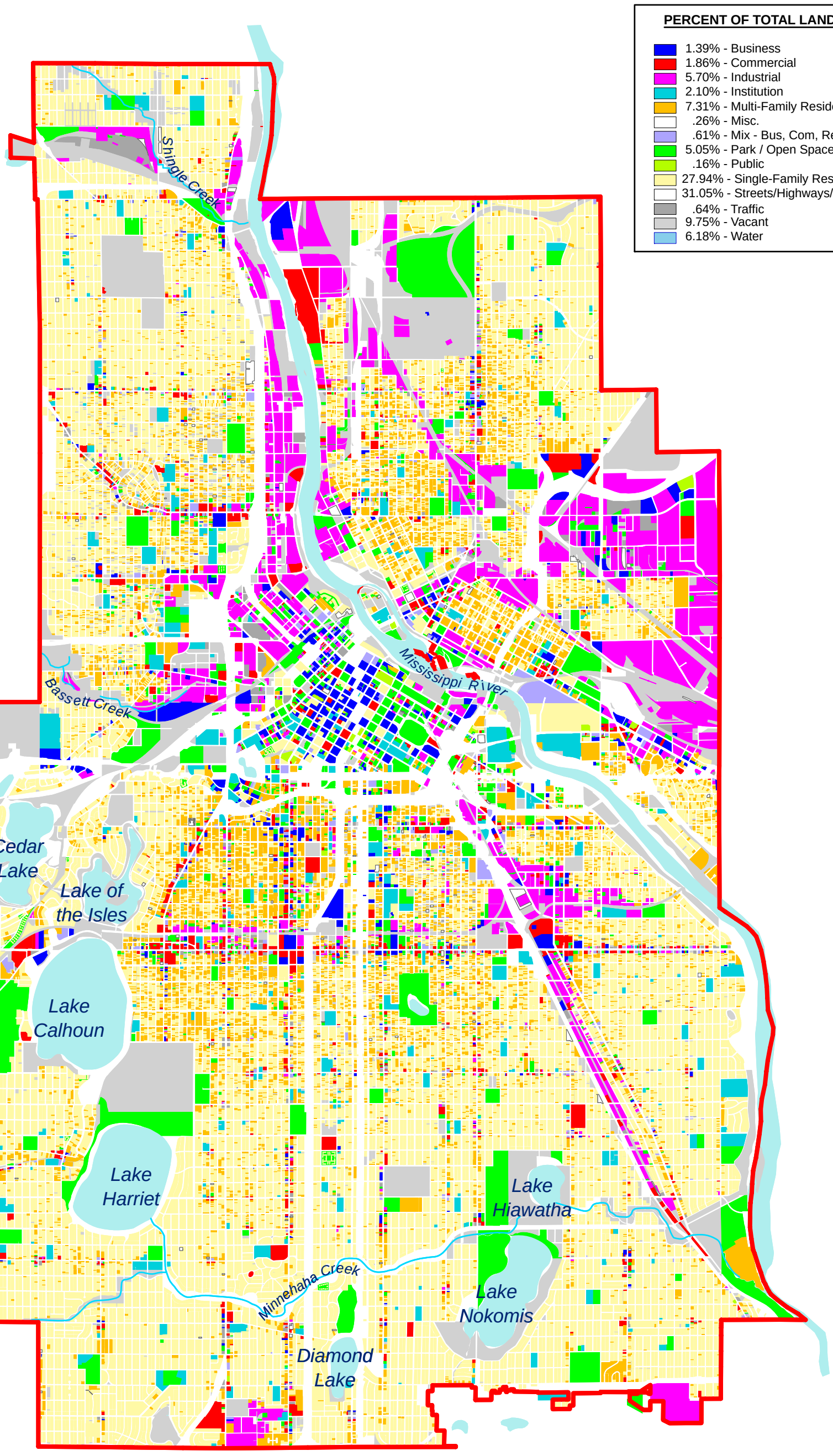
Table 3-3. Area of the City Within Each of the Major Jurisdictional Watersheds

Watershed	Area	% of City	% of Watershed
Bassett Creek WMC	1,800 acres	5	7
Minnehaha Creek WD	13,400 acres	36	9
Mississippi WMO	19,900 acres	54	94
Shingle Creek WMC	2,000 acres	5	7

Note: Percentages are rounded. (Source: City of Minneapolis)

Land Use

Minneapolis is a fully developed City with more than 50 percent of its total area residential. Public and recreational usage represents the next highest area at 16 percent, followed by industrial land use. Highways constitute about 3 percent of the City's land area. About one square mile of vacant land remains scattered throughout the City (State of the City Report, 2001). Figure 3-4 shows the City's land use distinguished by the categories mentioned in this paragraph, as well as additional minor categories. Future land use maps are being revised and are not available as of the publication date of this report.



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City of Minneapolis

Land Use

Local Surface Water Management Plan

Figure 3-4

Land Use data obtained from City of Minneapolis

Business
Commercial
Industrial
Institution
Multi-Family Residential
Misc.
Mix - Bus, Com, Residenti
Park / Open Space
Public
Single-Family Residential
Streets/Highways
Traffic
Vacant
Water

Non-residential land use dominates the north central and northeast portions of the City. Notable within these areas are downtown, the industrial corridor that abuts the river north of downtown, and the industrial area in the eastern part of the City that is tucked between I-35 West and the Mississippi River. Distinct commercial/industrial corridors include:

- Lake Street
- Hiawatha Avenue
- West Broadway
- University Avenue
- Washington Avenue

Multifamily residential is concentrated around the downtown core and thins out into single family residential toward the periphery of the City.

Minneapolis has 770 square feet of parkland for every resident. There is a park within six blocks of every Minneapolis resident. In total, the Minneapolis Park System consists of about 151 parks and 170 park properties that encompass nearly 6,400 acres of land and water. The MPRB has about 24 miles of shoreline along lakes and 14 miles of shoreline along the Mississippi River (Figure 3-2).

Land use in the Upper Mississippi River corridor has been in a state of constant flux for the last 125 years. This has provided opportunities for the City to implement policies that encourage light industrial and park development to coexist with some of the more traditional warehousing and industrial uses. Riverfront living has become popular and residential development is replacing industrial uses along the river.

Pollutant Sources

Minneapolis has established a Contaminated Sites Working Group within the Department of Regulatory Services – Environmental Management. This group maintains information on brownfield sites, Superfund sites and other contaminated properties. The most current information on pollutant sites in Minneapolis can be found at Environmental Management - Land.

Industrial Discharges

Wastewater - Industrial sites that discharge wastewater into City sanitary sewers are required to meet the pre-treatment requirements of the Metropolitan Council Environmental Services (MCES). The most current information on permit requirements and permits issued in Minneapolis can be found at MCES - Standard Industrial Discharge Permits. Industrial sites that discharge treated wastewater directly into surface waters are required to obtain an NPDES permit from the Minnesota Pollution Control Agency. Current holders of NPDES industrial permits should be obtained directly from the MPCA.

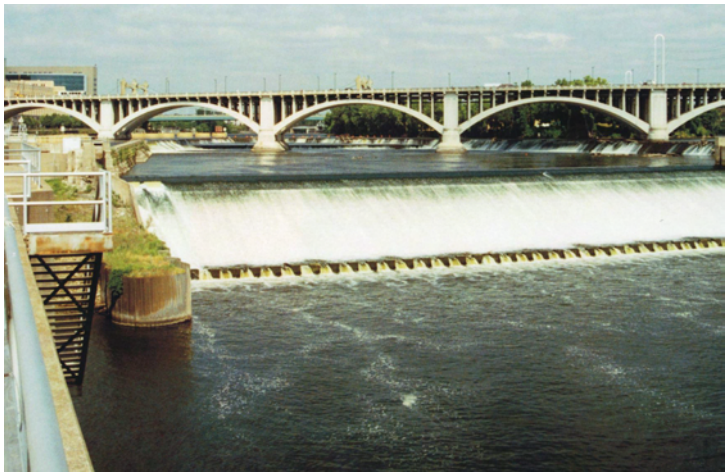
Stormwater – Certain industrial sites that discharge stormwater are required to obtain a NPDES Industrial Stormwater Discharge Permit from the MPCA. Permits are required regardless of whether the discharge is to the City stormwater drainage system or directly to surface waters. Information on industries that are required to be permitted and how to obtain a permit is available from the Stormwater Program for Industrial Activity - MPCA. Current holders of NPDES industrial permits should be obtained directly from the MPCA.

Minneapolis Waterbodies and Watersheds

Minneapolis is defined by its extensive system of surface waters. These water resources are vital to the health, safety, and welfare of the City's citizens and visitors. A brief description of the surface waters (rivers, streams, lakes, and wetlands) serving Minneapolis follows.

River

The Mississippi River has historically been the City's source of commerce, recreation, and drinking water. Approximately 12.2 miles of the Mississippi, with a local drainage area of 19,900 acres, flows from northwest to southeast through the City. Maintaining good water quality in the Mississippi is vital to providing the City's primary drinking water supply, protecting the health of citizens who use the river for recreation, and maintaining the natural habitat of the river.



The Corps of Engineers operates Upper St. Anthony Lock & Dam on the Mississippi River. (Source: John Kuhne)

The Upper Mississippi River watershed comprises 189,000 square miles of land in five states: Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The upper river extends 750 miles from the river's headwaters in northern Minnesota to its confluence with the Ohio River in southern Illinois. The Upper Mississippi River above St. Paul has a drainage area of about 12 million acres.

The Upper Mississippi provides recreational opportunities for people who live in the Twin Cities Metropolitan Area. Its numerous riverside parks and trails are popular destinations for hiking, biking, fishing, and bird watching. Numerous cities draw drinking water from the river.

The City's location at the upper extent of the navigational system, built and maintained by the USACE, has been a significant driver for the City's commerce. The Corps also maintains a flood protection system along the Mississippi River. The St. Paul District of the USACE operates and maintains 13 locks and dams on the river, beginning at Upper St. Anthony Falls in downtown Minneapolis and ending at Lock

and Dam 10 in Guttenberg, Iowa. Each dam represents a critical step in the "stairway of water" that makes navigation possible between Minneapolis and St. Louis.

The Upper St. Anthony Dam is also located on the River at mile 854. The dam consists of a horseshoe dam with a chord dam downstream of the horseshoe and a concrete overflow spillway. The lock is also 56 feet wide by 400 feet long. Both the upper and lower dams were constructed and became operational in September 1963.

Lower St. Anthony Falls Dam is located on the Mississippi River mile 853.9 in Minneapolis. The dam consists of a concrete spillway 275 feet long with four Tainter Gates. The lock is 56 feet wide by 400 feet long.

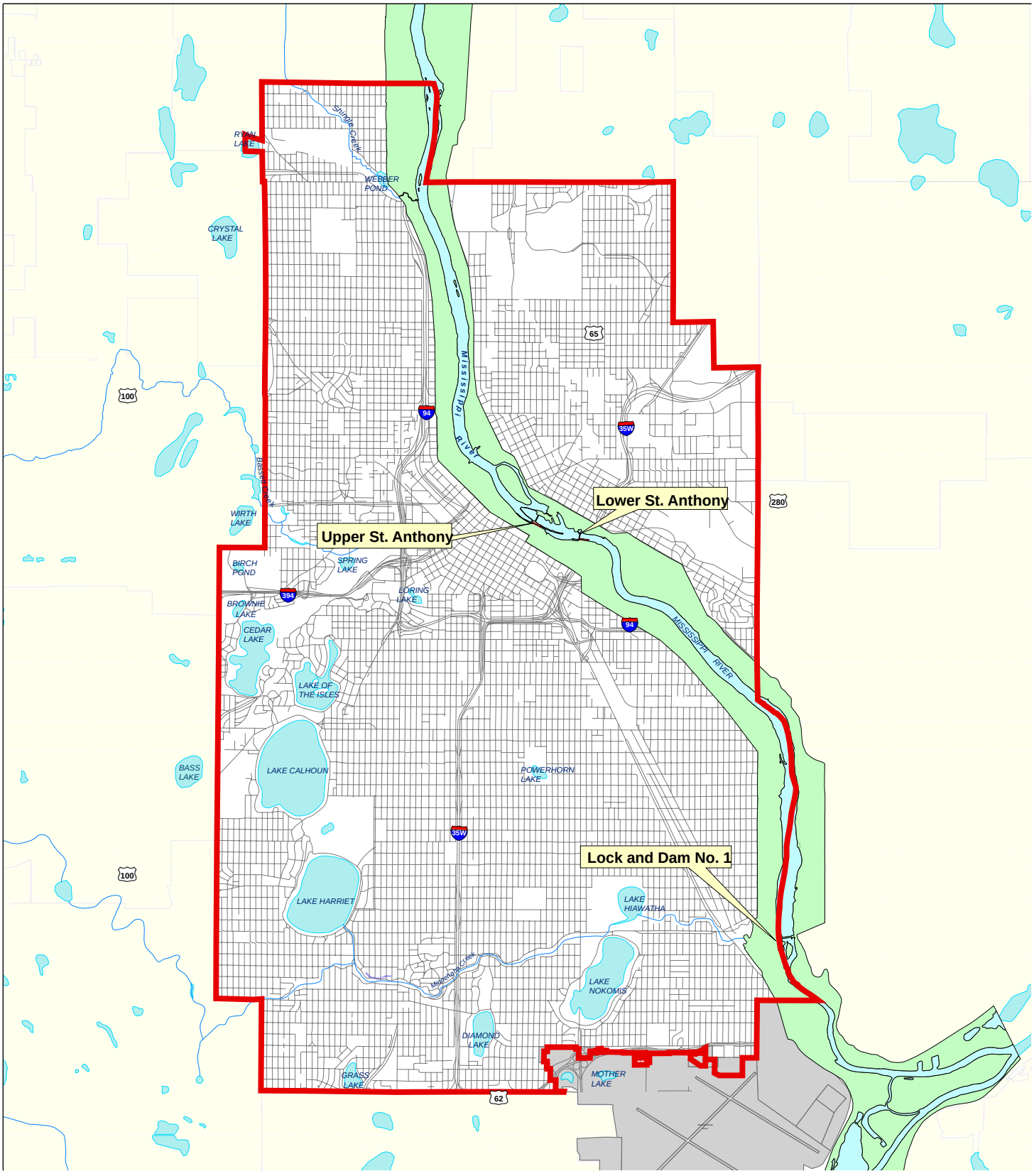
Lock and Dam 1 is located on the Mississippi River at mile 847.9 in Minneapolis. It was constructed in 1917. Major reconstruction took place in 1929, 1932 and 1978-1983. Figure 3-5 shows the locations of these locks and dams.

Although water quality in the Upper Mississippi has improved tremendously in the last 25 years, parts are still considered impaired for aquatic consumption and recreation.

The Metropolitan Council, the USACE, the United States Geological Survey (USGS), the MPCA and the Minnesota Department of Health (MDH) are involved in monitoring the Mississippi River. Water quality in the Upper Mississippi has improved tremendously in the last 25 years, increasing the ability of the riverine ecosystem to recover from stressors. Mayflies demonstrated a dramatic recovery and submerged aquatic vegetation recovered after a drought in the 1980s. The MPCA's 2006 Impaired Waters List identifies the Mississippi River as impaired for aquatic consumption, aquatic life and aquatic recreation (Appendix F). The pollutants that are listed include fecal coliform, mercury and PCBs.

Minnesota Rule 7050 classifies the beneficial use of the segment of the Mississippi River through Minneapolis as Class 2Bd (north City limits to St. Anthony Falls), Class B (St. Anthony Falls to Lock and Dam #1), and Class 1C (below Lock and Dam #1). The Minnesota Pollution Control Agency, in its 305.B Assessment of Stream Conditions, categorizes the quality of this segment through Minneapolis as 5A. It is listed as 5A, meaning that it is impaired or threatened by multiple pollutants with no completed TMDL plans. Segments of the river designated as impaired are listed in Appendix F.

Mississippi River TMDL studies are at initial stages of development. Two water quality efforts which will likely affect Minneapolis include the Lake Pepin TMDL Study and the Upper Mississippi River Basin Water Quality Plan.



City of Minneapolis

Mississippi River Locks and Dams

Local Surface Water Management Plan

Figure 3-5

Source: USACE

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- Major Freeways/Highways
- River/Stream
- City Boundary
- Lock and Dam
- Lake

The area of Minneapolis that drains to the Mississippi River has been organized into the Mississippi Watershed Management Organization. Other members include the MPRB, the City of Lauderdale, the City of St. Anthony, and the City of St. Paul. In 2001 the organization became the first joint powers watershed organization to obtain Special Taxing District designation from the Minnesota Legislature (MS 276.066). This allowed the MWMO to hire full time staff and implement new programs. Significant programs include:

- Capital improvement grants for stormwater management and combined sewer overflow corrections
- Non-point source education programs
- Stewardship grants
- Monitoring and research
- Land acquisition

Very little remains of the native landscape in the Twin Cities, and what remains can be found mostly along the Mississippi River. Among a number of plans for improvement in and along the river is the USACE Environmental Pool Plan. The Pool Plans have been developed with the view of establishing common habitat goals and objectives for the Upper Mississippi River and serve as a guide toward a sustainable ecosystem (see Appendix D).

Streams

Three tributaries to the Mississippi River – Bassett Creek, Minnehaha Creek, and Shingle Creek – originate in communities west of the City and flow through Minneapolis to the Mississippi River (Figure 3-2). Bassett Creek meanders westerly from Medicine Lake, through the municipalities of Plymouth and Golden Valley and through Theodore Wirth Park. Near Irving Ave. N. in Minneapolis, Bassett Creek flows into a tunnel system completed by the USACE in 1990. The original Bassett Creek connected to the Mississippi River just south of Plymouth Avenue North. After construction of the tunnel project, the Creek now discharges to the River downstream of St. Anthony Falls. The main stem of Shingle Creek begins in Brooklyn Park in northwestern Hennepin County and flows generally southeast to its confluence with the Mississippi River in Minneapolis. Minnehaha Creek flows from Lake Minnetonka and meanders easterly and southeasterly through Minnetonka, Hopkins, St. Louis Park, Edina and Minneapolis. Brownie, Cedar, Lake of the Isles, Calhoun, Harriet and Hiawatha flow into Minnehaha Creek. Over the years, these streams have been altered to improve drainage, enhance recreation, facilitate transportation, and support development. Table 3-4 summarizes the physical information for the Minneapolis segments of each of these streams.

Table 3-4. Key Streams and Relative Data

Name	Drainage Area		Length within Minneapolis (miles)
	Total	Percent of City	
Bassett Creek	1,800 acres	5	3.0
Minnehaha Creek	13,400 acres	36	7.7
Mississippi River	19,900 acres	54	12.2
Shingle Creek	2,000 acres	5	2.2

Bassett Creek

Bassett Creek was named after Joel B. Bassett, one of the earliest settlers in North Minneapolis. It flows 12 miles from Medicine Lake to the Mississippi River.

Development has drastically altered the creek and its watershed. Wet, swampy banks were filled and trees were cut to accommodate development. Early development, consisting mostly of sawmills and railroads, led to the influx of more industrial and commercial development. Inexpensive homes were constructed on small lots to accommodate the influx of immigrants.

The City is preparing a master plan to improve Bassett Creek, which has been heavily impacted by development. (Source: BCWMC)

In the late 20th century, as part of a number of flood control projects, Bassett Creek was channelized and the last few miles diverted into underground pipes that empty into the Mississippi River. The creek has problems with phosphorus and sedimentation that are typical of urban streams in watersheds with high percentages of impervious surfaces.

In 1969, the nine communities in the watershed formed the Bassett Creek Flood Control Commission. In 1982, in accordance with the Metropolitan Surface Water Management Act, the Bassett Creek Water Management Commission was created. Its mission is to control flooding and to maintain and enhance the quality of the surface and ground water resources in the watershed.

The Bassett Creek watershed is nearly 40 square miles in area and is divided into four major subwatersheds. The City of Minneapolis lies in the main stem subwatershed.

Bassett Creek was added to the MPCA's list of impaired waters in 2004 (Appendix F) for impaired aquatic life.

The City is currently preparing the Bassett Creek Valley Master Plan to provide guidance for restoring some of the creek's natural features. The general goals of the master plan are to improve water quality, control erosion, restore native vegetation,

and integrate the creek into the park system through a corridor to the Mississippi River.

Stream monitoring is performed in cooperation with the Metropolitan Council Environmental Services, the MPRB and BCWMC as part of the Watershed Outlet Monitoring Program (WOMP). The WOMP2 station on Bassett Creek is located approximately ¼ mile upstream of where the creek enters the City of Minneapolis storm drainage system. The Bassett Creek Watershed Management Commission has, through its Capital Improvement Plan, identified water quality improvements throughout the creek's watershed.

The BCWMC maintains a list of capital improvement projects aimed at improving the water quality of the main stem of Bassett Creek. There are no projects located within Minneapolis, or which would manage runoff from Minneapolis, in the current 5-year CIP. Two stormwater basin projects which would manage runoff from Minneapolis drainage areas are identified for future funding by the BCWMC. One is located in Bryn Mawr Meadows Park, near the intersection of Laurel Ave and Morgan Ave S. The second is in Golden Valley/Theodore Wirth Park westerly of the intersection of Xerxes Ave N and 14th Ave N.

Minnehaha Creek

Minnehaha Creek originates at the mouth of Lake Minnetonka (Gray's Bay Dam) located in the City of Minnetonka. The Creek flows 22 miles through the cities of Minnetonka, Hopkins, St. Louis Park, Edina and Minneapolis and ends at the confluence with the Mississippi River in south Minneapolis. Just upstream of the Mississippi River is Minnehaha Falls, a 53-foot waterfall made famous by the 1855 publication of the poem *The Song of Hiawatha* by Henry Wadsworth Longfellow.

Streambank stabilization is a main stakeholder concern for Minnehaha Creek; many residents use this creek for recreation. (Source: John Kuhne)

The MCWD monitors Minnehaha Creek as part of their Annual Hydrologic Data monitoring program. Water quality and flow in the creek are monitored at eight locations. Phosphorus and total suspended solids (TSS) concentrations in Minnehaha Creek are comparable to the North Central Hardwood Forest ecoregion mean, which is generally a result of the good quality of water discharged into the creek from Lake Minnetonka. Simply explained, nutrient and sediment loads increase upstream to downstream, although the impoundments at the major grade controls impact those concentrations. While the flow-weighted average chloride concentrations in the creek were lower than the state chronic standards of 230 ug/L,

several individual grab samples did exceed that standard. None exceeded the acute standard of 830 ug/L.

Grab samples from seven sites in the creek were tested for the presence of *E. coli* bacteria. While the acute standard was not violated in 2004, the 30-day geometric mean standard was violated at five sites on the lower creek for the months of September and October 2004. In 2005, the MCWD expanded the creek monitoring to additional sites and adjusted sampling frequency to identify the source or sources of *E. coli*. Samples are also being analyzed for traces of caffeine, which may indicate that human waste is one of the sources of *E. coli*. Results are pending.

Dissolved oxygen was measured at eight locations and generally maintained levels greater than the 5 mg/L State of Minnesota standard for class 2B waters. Measurements did dip below the 5 mg/L standard periodically, depending on flow in the creek and on location relative to large riparian wetland complexes. Minnehaha Creek was added to the MPCA's list of Impaired Waters in 2006 (Appendix F) for impaired aquatic life.

Biologic Integrity. Minnehaha Creek is listed on the State of Minnesota's 303(d) list of Impaired Waters for impaired biotic integrity. The most limiting factor for the ecology of Minnehaha Creek is its variability of flow, which ranges from intensive periods of high volume and velocity flow to periods of low or no flow. During those latter periods, much of the channel runs dry, leaving few pools or backwaters to serve as refuge for fish and macroinvertebrates. The creek also has a lack of physical complexity. The channel is mostly of relatively constant dimensions, has very small amounts of woody debris, and little variation in depth and slope. These factors severely limit opportunities for aquatic life to sustain viable populations.

Stakeholders focused on improving aquatic life and enhancing erosion control at Minnehaha Creek.

Creek Visioning. In 2005 the MCWD undertook a joint partnership with the USACE to develop a large-scale, long-term vision for Minnehaha Creek to serve as guidance for organizations that share creek corridor management responsibilities. A Citizen Advisory Committee of community representatives and a Technical Advisory Committee of agency representatives developed a common vision and management recommendations through a stakeholder input process.

The 2005 MCWD Minnehaha Creek Visioning Partnership Final Report presents the results of that process and summarizes the Partnership's recommendations for future creek management. Erosion control and support of aquatic life were overall the highest ranked priorities for improvement. However, when considered reach by reach, support and maintenance of recreation were the highest priority for the reaches upstream of the Browndale dam, followed by improvement of aquatic life and erosion control. Erosion control and streambank stabilization were the highest priorities for the reach downstream of the Browndale dam. The Partnership recommended the

MCWD consider bioengineered stabilization techniques over hard armoring where possible, and that habitat improvement be focused on the management of riparian vegetation and retention of large woody debris rather than in-stream habitat management. The Partnership also recommended that water quality be improved through the reduction of peak stormwater flows, pretreatment of discharges, application of BMPs and good housekeeping practices in the subwatershed, and repair of existing erosion.

An important part of the visioning process was the discussion of several streamflow management scenarios developed by the Corps to model what would happen with changes to the operation of the Grays Bay dam. The dam is managed to discharge water from Lake Minnetonka into Minnehaha Creek only when the DNR-established runout elevation of the lake is exceeded. During dry periods the lake level falls and there is minimal discharge; flow in the creek falls to minimal flow-related aquatic habitat conditions and canoeing is not possible. The Corps developed a number of scenarios that would provide targeted releases for recreation or habitat purposes, and then modeled the resulting impact on water level in Lake Minnetonka; the percent of time creek flow fell within optimal conditions for aquatic habitat and recreation; the percent of time potentially erosive flows could be expected; and resulting estimated water quality. Each scenario attempted to balance these often competing interests. The Partnership ultimately recommended that further study be completed to find a way to optimize and balance year round minimum flows and moderate extreme flows with recreational and lake uses.

Shingle Creek

Shingle Creek flows through the northern edge of Minneapolis. The main stem of Shingle Creek begins in Brooklyn Park in northwestern Hennepin County and flows southeast to its confluence with the Mississippi River in Minneapolis. Shingle Creek is formed at the junction of Bass Creek and Eagle Creek, two of the minor tributaries in the watershed. The creek historically flowed into Webber Pond before discharging to the river, but it now bypasses the pond. The creek is approximately 11 miles long and drops approximately 66 feet from its source to its mouth.

Sampling in Shingle Creek at Queen Avenue has revealed that the creek is a warm water fishery, mainly home to white sucker fish. (Source: SCWMC)

Presettlement vegetation in the watershed consisted of oak-savannah, prairie, and maple-basswood communities. Urban development has left little of the original vegetation. In 1997, the 2,000 acres of Shingle Creek Watershed within the City of Minneapolis consisted of the following land use proportions:

- 50 percent residential
- 12 percent commercial and industrial
- 22 percent parks and vacant
- 16 percent open water, right-of-way, other uses

Several cities, including Minneapolis, work cooperatively to manage recreational parks and trails within the vicinity of Shingle Creek.

Shingle Creek is classified as a warm water fishery from the analysis of fish samples taken at two sites in Minneapolis (Queen and Zane Avenue). White sucker dominates, though representatives of all feeding groups were present. Shingle Creek is isolated from the Mississippi River by a waterfall in Webber Park that prevents any migration of fish upstream.

In 1999, a hydrologic study of the Shingle Creek watershed by the SCWMC was completed using the HydroCAD computer model. The model was used to refine maximum discharge rates established in the First Generation Watershed Management Plan, prepared by the SCWMC. That plan determined a maximum allowable discharge of 1310 cubic feet per second [cfs] for Minneapolis and also set a target of reducing this discharge to 810 cfs by the year 2020.

There are two monitoring sites on Shingle Creek within the City of Minneapolis. An outlet monitoring site is located on Shingle Creek at 45th Avenue. Cumulative drainage area at this point is about 40.6 square miles, or 92 percent of the watershed. Stream stage is continuously recorded, and a range of events are sampled and analyzed for total phosphorus (TP), dissolved phosphorus (DP), total suspended solids (TSS), volatile suspended solids (VSS), Nitrate+Nitrite, and chloride. The site has been monitored since 1997.

The second site is on Shingle Creek at Queen Avenue near the border between Minneapolis and Brooklyn Center. Cumulative drainage area at this point is about 30.9 square miles, or 70 percent of the watershed. This site was maintained by the USGS as part of their National Water Quality Assessment (NAWQA) Program. Water quality monitoring was discontinued in 1999. However, flow is still being monitored by the USGS at this site.

Shingle Creek is listed on the 2006 MPCA list of impaired waters for chloride, low oxygen and impaired aquatic life (Appendix F).

Lakes

Nineteen lakes exist partially or wholly within the City with most integrated into the City's parks as shown in Figure 3-2. These lakes are the focus of the City's park system, providing residents with numerous opportunities for land and water based recreation. Table 3-5 provides details of the City's lakes and wetlands which are listed

by the DNR as a public water. As property owner of record for much of the shoreline in the City, the MPRB is responsible for maintaining the shoreline, and has created an effective program of lake management, further detailed at Minneapolis Park & Recreation Board - Water Quality.

Table 3-5. Lakes and Wetlands on DNR Public Waters List

Watershed	Water Resource	DNR Lake ID	Watershed Area (acres) in City	Surface Area (acres)	Watershed to Lake Area Ratio	Mean Depth (feet)	Max. Depth (feet)
BCWMC	Bassett's Pond*	27-0036		0.3			
	Birch Pond	27-0653	31	4	7.8	-	-
	Spring Lake	27-0654	45	3	15	10	28
	Wirth Lake*	27-0037	348	40	8.7	12	25
MCWD	Brownie Lake	27-0038	34	11	3.1	22	50
	Cedar Lake	27-0039	224	172	1.3	20	51
	Lake of the Isles	27-0040	760	111	6.8	9	31
	Lake Calhoun	27-0031	1,249	421	73.0	30	90
	Cemetery Lake	27-0017	205	11	18.6	na	na
	Sanctuary Marsh	27-0665	68	3	22.7	na	na
	Lake Harriet	27-0016	863	342	2.5	29	82
	Diamond Lake	27-0022	685	55	12.5	3	7
	Lake Nokomis	27-0019	620	206	3	14	33
	Lake Hiawatha	27-0018	1,008	55	18.3	16	31
	Powderhorn Lake	27-0014	286	12	23.8	4	20
	Grass Lake	27-0681	386	26	14.8	2	5
	Taft Lake*	27-0683	100	14	7.1	-	-
	Mother Lake*	27-0023	49	48	1	2	5
	Legion Lake	27-0024	49	71	0.7	-	-
MWMO	Loring Pond	27-0655	24	7	3	4.9	17
SCWMC	Webber Pond	27-1118	2	3	0.7	3	7
	Ryan Lake	27-0058	49	29	1.7	15	33
	Crystal Lake*	07-0034	470	5	na	na	na

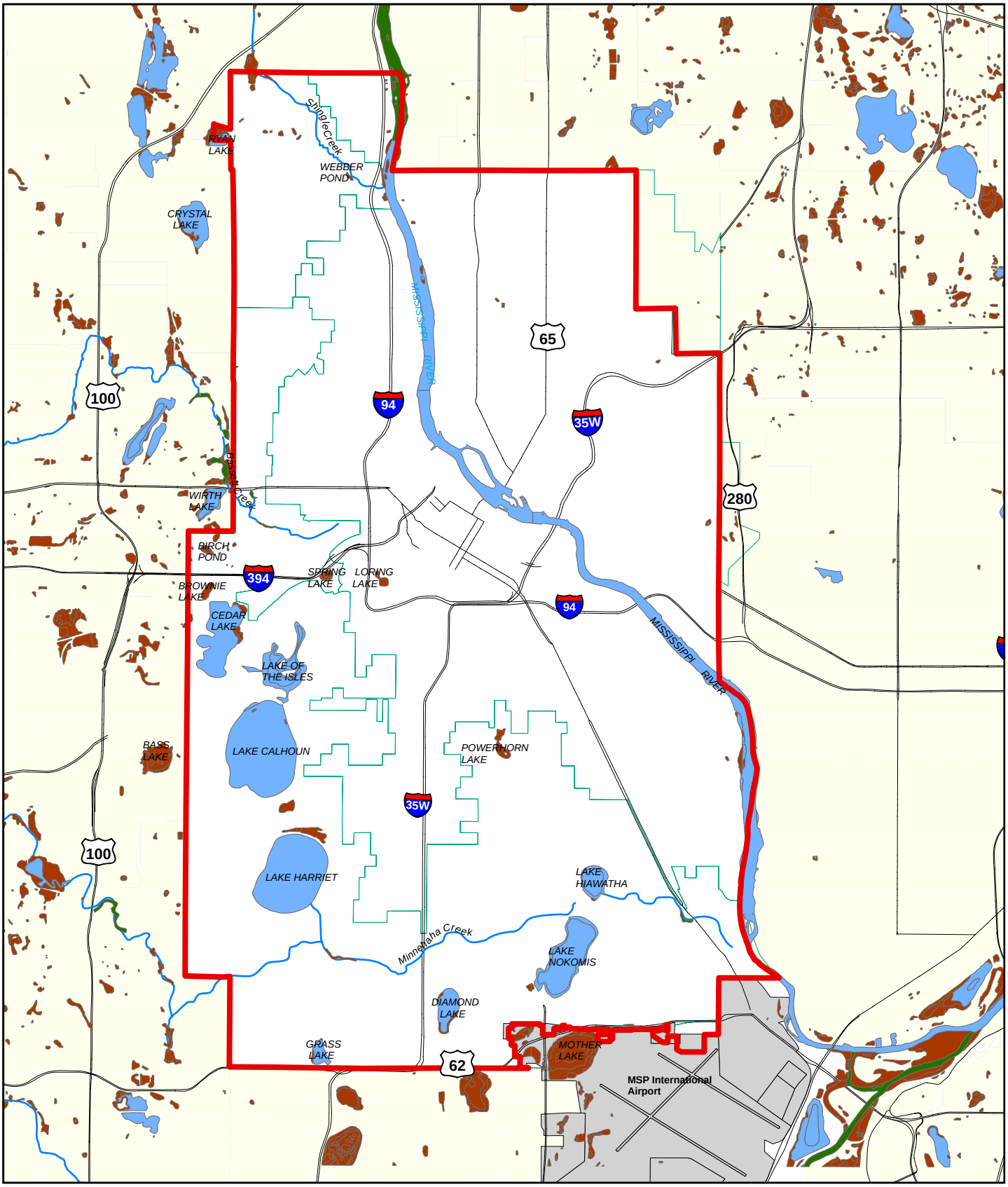
* Lakes outside corporate limits of Minneapolis that receive discharge of stormwater runoff from areas within the City.

Wetlands

Minneapolis has several wetlands within its boundaries, as shown on Figure 3-6. None of the City's wetlands remain in a natural state, though some of the wetlands in Theodore Wirth Park and T.S. Roberts Bird Sanctuary may come close. The Hennepin County Wetland Health Evaluation Project (WHEP) is an ongoing wetland monitoring program that uses an MPCA-developed approach to measure vegetation and invertebrate diversity. To date, this monitoring program has monitored wetlands contained in Table 3-6.

Table 3-6. WHEP Monitoring Program

	2002	2003	2004	2005
Amelia Pond		X	X	
Cedar Meadows				X
Diamond Lake	X			X
Grass Lake		X	X	
Roberts		X	X	X
Solomon Park Wetland				X
Wirth Golf Course	X	X	X	



N
W E
S

Miles

1 0 1

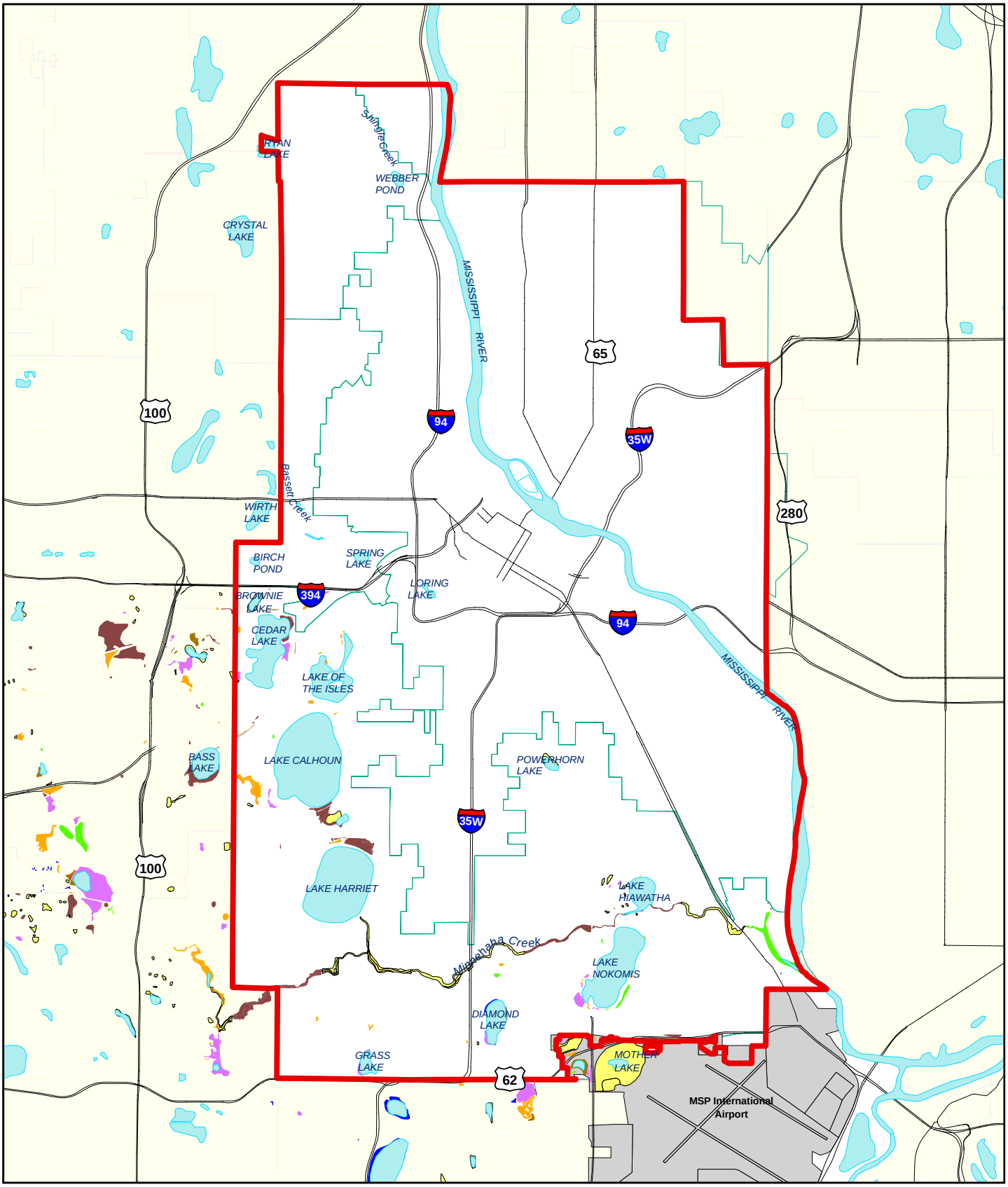
City of Minneapolis

NWI Wetlands

Local Surface Water Management Plan

Figure 3-6

Watershed Boundary
Highway
Lacustrine Wetland
Palustrine Wetland
Riverine Wetland



City of Minneapolis

MCWD Function and Value Assessment

Local Surface Water Management Plan

Figure 3-7

N
W E
S

Miles

1 0 1

Watershed Boundary
Highway
Type 1
Type 2
Type 3
Type 4
Type 5
Type 6
Type 7
Type 8

Monitoring results indicate that all of these wetlands have suffered negative consequences from their watersheds being fully developed. According to the report, the wetlands appeared to have both poor vegetation and poor invertebrate species richness and diversity, which would likely benefit from restoration efforts.

In 2003, the MCWD completed a Function and Values Assessment of wetlands within their jurisdiction. Figure 3-7 presents the wetland locations identified in that effort. Neither the NWI coverage provided in Figure 3-6 nor the MCWD mapping reflected in Figure 3-7 should be used in place of actual wetland delineations. Each is merely a planning tool to aid in stormwater management decisions.

Groundwater

There is no single source for groundwater data in Minneapolis. Information is available from the following sources:

- The Minneapolis Department of Regulatory Services – Environmental Management maintains permits for construction or sealing of wells.
- The MPRB monitors groundwater levels at wells located on park property. Locations of MPRB wells are contained in the MPRB 2004 Water Resources Report.
- The Minnesota Department of Natural Resources issues groundwater appropriation permits, and maintains ground water resources data at Ground water: Minnesota DNR.
- The USGS maintains a nationwide inventory of groundwater data, which can be found at USGS Ground-Water Data for the Nation. There are no sites in Minneapolis currently being monitored by the USGS.
- The MPCA collects information on the quality of groundwater in Minnesota.

The Minnehaha Creek Watershed District has been monitoring the groundwater levels in an area of southwestern Minneapolis that contributes to Coldwater Springs (located outside the municipal limits of Minneapolis). Although not currently in effect, the MCWD is considering future implementation of groundwater protection measures in the area of influence for this spring.

Unique Features/Fish &Wildlife Habitat/Scenic Areas

Maps noting unique features, fish habitat, wildlife habitat, and scenic areas of Minneapolis which are contained in the Watershed Management Plans of BCWMC, MCWD, MWMO & SCWMC are included in this LSWMP by reference.

Existing Land and Water Resources Management Activities

City of Minneapolis and Minneapolis Park and Recreation Board

At the time that the City adopted Chapter 54 into the Code of Ordinances, the City also approved a set of pollutant reduction goals for new developments. These goals were based on the most current water quality studies during 2001. These reduction goals will be maintained by the City until new goals for any water resource through formal goal establishment, such as an approved TMDL Plan or an approved Water Resources Management Plan.

The City of Minneapolis and the MPRB jointly implement stormwater and surface water monitoring activities, which are summarized in Appendix G and in their annual reports, NPDES Stormwater Annual Report and MPRB 2004 Water Resources Report.

In 2006, the City of Minneapolis and the MWMO implemented a joint program to monitor the outfalls to the Mississippi River. The Mississippi Watershed Management Organization's Monitoring Program was established to provide a scientific basis for identifying and evaluating water quality and quantity issues and implementing solutions to improve water quality and reestablish natural water regimes in the watershed. The MWMO currently monitors water quality at six locations in the Mississippi River, five stormwater outfalls to the Mississippi River and Loring Pond (the only lake in the watershed). Fecal coliform and *E. coli* data are collected from the River to assess pollutants listed on the Minnesota "Polluted Waters" list for the Total Maximum Daily Load (TMDL) process. Data are collected from the stormwater outfalls to assess the volume and rate of water movement in the watershed and to develop a record of baseline data to characterize water quality in the watershed and identify pollutants that exceed water quality standards. Data collected include the physical, chemical and biological constituents: temperature, transparency, specific conductivity, pH, dissolved oxygen, bacteria, nutrients, sediment, inorganic compounds, organic compounds and metals. Fecal coliform and *E. coli* data are collected from Loring Pond. The MWMO also monitors Best Management Practices (BMPs) to determine their effectiveness on reducing water loss and improving water quality. More information about the MWMO Monitoring Program can be found at www.mwmo.org.

Watersheds

Each watershed district/organization in Minneapolis has implemented programs to improve the quality of surface waters. Programs include monitoring activities, education programs, standards for new and re-developments and structural stormwater BMPs. A list of all monitoring activities in Minneapolis is contained in Appendix G. Reports and studies are contained in Appendix H. The most current information is available directly from each watershed district/organization. Contact information is contained in Appendix A, and at the following websites:

Bassett Creek Watershed Management Commission
(www.bassettcreekwmo.org)

Minnehaha Creek Watershed District
(www.minnehahacreek.org)

Mississippi Watershed Management Organization
(www.mwmo.org)

Shingle Creek Watershed Management Commission
(www.shinglecreek.org)

Existing Assessment Studies

Impaired Waters

Lake assessments are prepared for the U.S. Congress under Section 305(b) of the Clean Water Act to estimate the extent to which Minnesota water bodies meet the goals of the Clean Water Act. The MPCA 305(b) Report includes information about waters of the state: healthy, threatened, and impaired. This information is intended to be shared with planners, citizens and other partners in basin planning and watershed management activities. The lakes in Minneapolis on the 305(b) Report are shown in Table 3-7.

Table 3-7. 305(b) Assessments of Lake Conditions in Minneapolis

Lake	Swimming		Trophic State
	Use	Data	
Brownie	PS	M	Eutr
Calhoun	ST	M	Eutr
Cedar	ST	M	Eutr
Diamond	NS	M	Hyper
Harriet	FS	M	Meso
Hiawatha	NS	M	Eutr
Isles	NS	M	Hyper
Loring (S. Bay)	PS	M	Eutr
Nokomis	NS	M	Eutr
Powderhorn	NS	M	Hyper
Ryan	NS	E	Hyper
Webber	PS	M	Eutr
Wirth	NS	M	Eutr

Use: PS=Partial support; NS=Not supporting; ST=Supporting but threatened
Data: M=Monitored (current); E=Evaluated
Trophic State: Eutr=Eutrophic; Hyper=Hypereutrophic; Meso=Mesotrophic

The 305(b) list includes only those waters that are either threatened or impaired. If monitoring and assessment indicate that a water body segment is impaired by one or more pollutants, it is placed on the 303(d) list and then a strategy needs to be developed that would lead to the attainment of the state Water Quality Standard (WQS) contained in Minnesota Rule 7050. The TMDL process involves four phases:

- Assessment and listing
- TMDL study
- Implementation plan development and implementation
- Effectiveness monitoring

A number of surface waterbodies in Minneapolis, including segments of the Mississippi River, are listed in the state impaired waters list (303(d) list). Impaired waters are those streams, rivers and lakes that currently do not meet their designated use and associated WQS. Appendices E and F list all the City's surface waters on the State's 2006 305(b) and 303(d) list.

Current TMDL Studies (2006)

In cooperation with the Minnesota Pollution Control Agency (MPCA), the Shingle Creek Watershed Management Commission and the Minnehaha Creek Watershed District have begun the monitoring and implementation plan development phases of the TMDL process for waterbodies in their jurisdictions which are listed on the MPCA 303(d) report. This site also includes a document that lists the overall status of each TMDL study underway in the State. The following summarizes the status of the active TMDL projects which affect Minneapolis:

Crystal Lake

Although not in Minneapolis, runoff from a 470 acre area drains to Crystal Lake. The SCWMC has initiated a TMDL project, which is currently in a monitoring phase. Recommendations from the TMDL Implementation Plan could affect Minneapolis. Results of the Crystal Lake TMDL study are not yet available.

Ryan Lake

In August 2005, the Shingle Creek Watershed Management Commission released the first phase of Ryan Lake TMDL Study in conjunction with their study of Twin Lakes in Robbinsdale. The report includes information on the monitoring, but does not yet include allocation of sources of pollutants or implementation recommendations.

Nine Lakes

The Minnehaha Creek Watershed District has begun a TMDL study of nine lakes within their watershed. Six of those lakes are within Minneapolis: Brownie Lake, Diamond Lake, Lake of the Isles, Lake Hiawatha, Lake Nokomis and Powderhorn Lake. The MPCA has put this TMDL project on hold until they finalize new policies on water quality standards that affect lake TMDL projects.

Shingle Creek Chloride

The Shingle Creek Watershed Management Commission has completed a TMDL study and draft implementation plan for mitigation of chloride impairment of Shingle Creek. Implementation activities are being coordinated by the Minnesota Pollution Control Agency. Detailed discussion of Minneapolis winter street maintenance activities, including revised activities based on the results of this study, are contained in Section 4, System Inventory and Related Activities.

Mississippi River - Lake Pepin

The Minnesota Pollution Control Agency is coordinating a turbidity and lake eutrophication TMDL project for Lake Pepin on the Mississippi River. The tributary area for Lake Pepin includes the entire watersheds of the Minnesota River, St. Croix River and upper Mississippi River. The upper Mississippi River watershed includes the entire City of Minneapolis. The most recent timeline schedules monitoring and modeling activities through 2007, analysis of scenarios in 2008 and completion of an

implementation plan in 2009. It is possible that recommendations of the implementation plan will affect Minneapolis.

Minneapolis Park and Recreation Board

The Environmental Operations Section of the Minneapolis Park and Recreation Board (MPRB) implemented a lake water quality monitoring program in 1991 as part of a diagnostic study for the Chain of Lakes Clean Water Partnership. The Chain of Lakes includes Brownie, Cedar, Isles, Calhoun and Harriet. The monitoring program was expanded in 1992 to include Hiawatha, Nokomis, Diamond, Powderhorn, Loring, Webber and Wirth lakes. Spring Lake was added on a limited basis in 1993. Grass and Ryan lakes were added on a limited basis in 2002.

Rehabilitation efforts have returned Lakes Calhoun and Harriet to pre-European settlement conditions.

The MPRB uses the Trophic State Index (TSI) as a benchmark for comparison of water quality across all lakes in the City. TSI is calculated from water transparency, chlorophyll-a values and surface phosphorus values to produce a score from 0-100. Historical TSI scores from 1991 to 2004 for the monitored lakes (Appendix E) are used to calculate trophic state trends.

The water quality of Lake Calhoun and Lake Harriet has improved to pre-European settlement conditions. Rehabilitation efforts have helped these urban lakes tremendously.

The other assessments and monitoring that MPRB performs are:

- Phytoplankton and Zooplankton Monitoring
- Lake Aesthetic and User Recreation Index
- Exotic Aquatic Plant Management
- Lake Levels and Ice dates
- Winter Ice Cover
- Aquatic Plants
- Fish Kills
- MPRB Monitoring
- Watersheds Outlet Monitoring Program Monitoring
- Public Beach Monitoring
- NPDES Monitoring
- Stormwater BMP Monitoring

For detailed information, refer to MPRB Annual Water Resources Report

Lake Assessment Studies by Watershed Districts and Organizations

In addition to the ongoing lake monitoring by the Minneapolis Park and Recreation Board, monitoring is performed by each of the Minneapolis watershed districts/organizations. Tables summarizing the most recent monitoring efforts can be

found in the annual assessment completed by the Minneapolis Park and Recreation Board and in Appendix G.

Completed and Ongoing Water Quality Related Efforts

To improve water quality and/or prevent degradation of the existing water quality, many public agencies have completed a number of monitoring programs, surveys and water quality improvement projects. See Appendix H.

Green Report

In July 1993, a group known as the Water Quality Management Citizen Advisory Committee presented Mayor Sharon Sayles Belton with the Green Report, which evaluated the Chain of Lakes and recommended strong measures for preserving and improving them. The committee urged the City and MPRB to proceed with similar evaluations and water quality improvement projects for the other waters in the City that were not covered in the Green Report.

The Green Report outlined measures to improve and preserve major water resources.

Funded by a Clean Water Partnership grant and made up of members of the MPRB, City Council, neighborhood groups, and community organizations, the committee developed a report that moved quickly from an assessment of the Chain of Lakes to goals, recommendations, and implementation steps. With support from their technical staff, the committee reported on the state of the Chain of Lakes. Their findings for each lake were:

Cedar Lake: The technical data showed Cedar Lake to be eutrophic. Furthermore, Secchi disk TSI values increased rapidly through the 1960s. In fact, the water quality of Cedar Lake was found to be worse than predicted by water quality modeling, suggesting that internal loading played a significant role.

Improvement efforts have improved Lake Calhoun's conditions to better than mesotrophic (Source: MPRB)

Lake of the Isles: Lake of the Isles was found to be eutrophic and had the highest measured total phosphorus concentrations in the entire chain. Algal blooms were frequent. Water quality in the lake was actually better than predicted by modeling likely due to the presence of milfoil, a plant that utilizes phosphorus from the water.

Lake Calhoun: Like Cedar Lake and Lake of the Isles, the committee found in 1993 that Lake Calhoun was eutrophic. Another concern identified at Lake Calhoun was the fish consumption advisory issued by the MPCA in May 1993 due to elevated levels of mercury found in fish pulled from the lake.

Lake Harriet: Lake Harriet was the only lake of the four that was mesotrophic – indicating a significantly lower total phosphorus concentration than the other lakes.

The committee considered Lake Harriet as a model for what might be accomplished at Cedar Lake and Lake Calhoun. One of the key indicators of Lake Harriet's good water quality was the persistence of daphnia, a zooplankton, throughout the year. As noted for the other lakes, the persistence of daphnia occurs when algal blooms are limited.

The LSWMP goals echo many of the goals identified in the Green Report. Both the Green Report and the LSWMP emphasize public education and protecting public health. Specifically, the plans address protection of swimmers from bacteria and protection and warning to consumers of the lakes' fish. Both the Green Report and the LSWMP share goals for reduction of in-lake pollutants – primarily phosphorus – and implementation of BMPs.

The committee indicated some mean TSI goals in the five- to 10-year timeframe. At present, the City, MPRB, and MCWD have implemented sufficient BMPs that these TSI goals are now being met at Cedar, Calhoun, and Harriet, and are nearly being met at Isles. Finally, the Green Report had a goal to improve government management of water quality issues. This involves coordination among different agencies and jurisdictions as well as improvement of management within MPRB and the City.

Blue Water Commission

In May 1998, another citizen group, the Blue Water Commission, presented its findings to the residents of Minneapolis. Their recommendations for improving the water quality of Lake Nokomis and Lake Hiawatha echoed the earlier work done for the Chain of Lakes. The Blue Water Commission was primarily made up of MPRB members and neighborhood representatives. Also represented were the City of Minneapolis, Hennepin County, MCWD, the City of Richfield, and the Metropolitan Airports Commission. Much of the information that the commission weighed was provided by a diagnostic study funded by MCWD.

The Blue Water Commission findings were similar to those summarized in the Green Report for the Chain of Lakes – namely that Hiawatha and Nokomis are eutrophic and that the process of eutrophication was continuing. The commission also identified fecal contamination and fish kills as primary among the many other concerns associated with the lakes. The commission organized their concerns around central themes such as:

- ***Swimability*** - interference by algae and weeds, fecal contamination, and swimmer's itch
- ***Fishability*** – safety of fish consumption, fish kills, and weeds impeding fishing
- ***Aesthetics*** – odor, clarity, algal blooms and shoreline aesthetics
- ***Plant Diversity and Wildlife*** – namely reduction in exotic species
- ***Shoreline Environment*** – vegetation restoration and elimination of sediment deltas

These concerns led the Blue Water Commission to recommend implementation steps. These recommendations included a strong emphasis on reducing phosphorus inputs into both lakes. Since the commission's report, the City, MPRB, and MCWD have implemented several projects that follow directly from the report recommendations.

Modifications to the Lake Nokomis outlet structure were made to reduce phosphorus inputs from the creek into the lake. Grit chambers were installed on the east side of Lake Nokomis, carp were removed, and treatment wetlands were constructed on the west side of Nokomis. Additionally, the City banned the use of phosphorus in fertilizer, a ban that was subsequently followed by the statewide ban.

Surface Water Quality Monitoring Task Force

Minneapolis set a water protection trend by banning the use of phosphorous in fertilizer; the state followed suit.

A Water Monitoring Task Force was created by the City Council resolution on July 15, 2003. The purpose of this task force is to:

- Oversee existing water quality monitoring data in Minneapolis
- Improve the coordination of water quality monitoring data and protocols
- Establish public health standards
- Develop strategies to reduce water quality problems identified through monitoring efforts

Public Works and the MPRB are jointly responsible for direction and coordination of the task force. The task force included representatives from Minneapolis Regulatory Services, Minneapolis Health & Family Support, as well as the watershed organizations within City boundaries.

Task force objectives include:

1. Evaluate existing monitoring – the task force will consider which parameters are the most important for monitoring and discuss methods for standardizing the use of monitoring data.

2. Coordinate monitoring standards and data sharing – the task force will consider ways to improve data sharing both among agencies and with the public.

3. Develop strategies to reduce water quality problems – the task force will review findings from previous reports and use recent monitoring to look ahead to future improvements.

4. Develop standards and policies across watersheds to ensure public health.

5. Recommend policy changes for the evaluation of standards.

One of the first items to come out of the task force meetings is a revised classification system for the City's lakes, called the Minneapolis Lakes Recreational/Aesthetic Indicator (Appendix J).

Minneapolis Lakes Recreational/Aesthetic Indicator Development

To provide clarity to management decisions, the task force has developed a different classification system. The report that summarizes this system is included as Appendix J. This system is presently being used by the MPRB. The proposed system considers four aspects of water quality:

- Environmental quality
- Aesthetic considerations
- Public health
- Recreational interferences

The indicator for the environmental quality measure is the trophic state index used widely in Minnesota. High TSI numbers indicate euthrophication of a water body as manifested in algal blooms during the summer.

The second measure is public health, and the indicator for this is *E. coli*. High levels of this bacterium result from fecal contamination and lead to beach closings. As it most directly impacts swimming, this indicator is of primary importance only on lakes with beaches.

The third measure takes into account aesthetic considerations. These are subjective measures that include odor, water color, and the presence of debris. Assessment of these indicators will focus on areas where people come into close contact with the lake, like piers, docks, landings and beaches.

The final measure is recreational interference and the indicator is the extent to which weeds and other aquatic vegetation interfere with boating and swimming.

The classification system consists of value rankings for each indicator, ultimately creating a score for each of the four measures. Annual reporting of these scores would be a benchmark of overall lake condition.

Source Water Assessment

In 1996, amendments to the Safe Water Drinking Act required source water assessments to be prepared for public water systems. Minneapolis' own assessment, completed in 2001, meets the requirement by providing information on:

- The area which supplies drinking water to the Minneapolis Water Works
- An overview of why this source is susceptible to potential contamination
- A description of the contaminants of concern

- The source of the contaminants of concern, as possible

Minneapolis obtains its drinking water from the Mississippi River and the Minneapolis Water Works intake is in Fridley. On average, the Water Works takes 65 million gallons per day of the estimated 3.9 billion gallons of daily flow. The susceptibility of the supply to contaminants is generally dependent on the proximity of the source to the intake. This geographic variability leads to a three-layer approach to describing vulnerability.

The Source Water Protection Project focuses on improving water supplies for communities along the river.

The area most directly connected to the supply and the area over which a spill or contamination could quickly reach the intake is termed the "inner emergency response area." This area includes subwatersheds immediately adjacent to the river from the intake upstream to Elk River – a distance along the river of 26 miles. The "outer source water management area" is conceived as an area where protection against chronic sources of contamination is emphasized or where periodic low levels of contamination occur. This management area consists of those subwatersheds immediately adjacent to the river from Elk River to St. Cloud. Notably, the furthest extent of the Minneapolis "outer source water management area" generally coincides with the downstream portion of the City of St. Cloud's "inner emergency response area." The final assessment area is the entire Mississippi watershed, above the Twin Cities, approximately 19,000 square miles.

The Source Water Assessment document lists potential contamination sources. These sources are derived from a number of state and federal databases. The overall intent of the assessment is to provide public information. In the document's own words, "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."

Upper Mississippi River Source Water Protection Project (UMRSWPP)

In 2001, the City of St. Cloud (as primary sponsor) partnered with Minneapolis Water Works, St. Paul Water Utility, Minnesota Department of Health and Metropolitan Council to implement the Upper Mississippi River Source Water Protection Project (UMRSWPP). Source assessments were completed in 2001 and are available from the MN Department of Health. As of 2005, the cities were collaborating to prepare source water protection plans using Federal Clean water Act Section 319 funding. Major elements of the project include:

- Delineation of protection areas
- Time of travel estimates
- Inventory of potential contaminant sources
- Investigation of areas of surface/ground water interaction

- Development of a process to formally designate source water protection areas
- Education and outreach
- Communication to wellhead protection teams
- Identification and accommodation of high priority land uses