

Chapter VI. Resource Management Plan

This chapter of the comprehensive guide plan presents an inventory and resource protection strategies for the natural resources in Minnetonka. It is intended to complement the preceding chapters that center upon the built environment - Chapters IV - Land Use and V-Housing. The wide variety of natural resources, many of which are preserved or maintained in their natural state, have attracted the variety of land uses and housing opportunities that currently exist in Minnetonka.

Further, the overall policies and the 2030 Minnetonka Vision found in Chapter III provide a context for the resource protection strategies described later in this chapter. It is recognized that continued efforts are needed to protect, manage and enhance important natural resources. Equally important is the need to balance development opportunities with responsible natural resource management strategies and programs, as well as provide on-going educational efforts for residents and businesses in Minnetonka.

The first sections (A and B) of this chapter present an overview of the existing upland and water resources found in Minnetonka. Particular emphasis is given to existing natural resources that influence or are affected by community development activities. Much of the information contained within this section was obtained from studies and inventories conducted by the city or by other agencies in collaboration with the city. The resources that are important in Minnetonka include the following features:

- * Topography, with particular emphasis on steep slopes (over 12 percent and 18 percent)
- * Natural communities of quality vegetation, and
- * Water resources (including sub-surface and the quantity and quality of surface waters - wetlands, floodplains, lakes and creeks).

The later portions of this chapter identify specific management goals, practices and policies with particular emphasis on storm water management as it affects surface water quantity and quality. Section C this chapter includes the goals for upland and water resource areas, with emphasis on water resource protection goals identified in the *2008 Water Resources Management Plan (2008 WRMP)*.

Section D identifies the management practices for water resources and incorporates a summary of the more specific management practices included in the 2008 WRMP. The 2008 WRMP is referenced as an integral but separate part of the 2030 Comprehensive Guide Plan. Specific management information, policies and programs are included in the 2008 WRMP for more detailed guidance on stormwater management and water resource protection activities and programs, requirements for activities that affect the water resources in the city such as specific development/redevelopment projects and other land disturbance activities, and implementation tools.

The last portion of this chapter (Section E) identifies the existing and planned implementation strategies that the city will continue to utilize in the future to protect and manage important natural resources.

A. Upland Areas Existing Conditions

An understanding of the existing natural environment is needed to:

- * guide new development and redevelopment,
- * protect, manage and restore significant natural resources such as trees, water and desirable habitat areas,
- * determine requirements for municipal utility and roadway services, and
- * comply with State and regional resource management requirements.

The natural resource information provides a basis and framework for the development of more detailed planning documents used by the city to plan and engineer public facilities such as the water supply and sanitary sewer system, and provide detailed regulation and management (i.e. 2008 WRMP) of potential impacts resulting from private and public development activities.

1. Ecological Classification

The Minnesota Department of Natural Resources (MnDNR) utilizes a classification system to describe areas within Minnesota that have similar natural characteristics (i.e. climate, geology, topography, soils, hydrology, and vegetation). According to the MnDNR Ecological Classification System, Minnetonka lies within the Minnesota and Northeast Iowa Morainal Section of the Eastern Broadleaf Forest Province of Minnesota.

At the time of early settlement in the county by European immigrants in the mid 18th century, the vegetation of western and central portions of the county was comprised “primarily of oak openings and barrens, with occasional inclusions of maple-basswood forest, conifer bogs and swamps, wet prairies and open water lake systems”. Minnetonka is situated in an area of Hennepin County where alterations to the original water and vegetation resources occurred because of farming and settlement activities.

According to the MnDNR, the city is located at the western edge of a predominant vegetation type in Hennepin County that is typified by oak openings and barrens. Directly to the west of the city, the vegetation represents a maple basswood forest characteristic of the “Big Woods” ecological subsection. It’s topography is gently to moderately rolling with soils formed from glacial outwash tills. Lakes and wetlands are common and drainage is to the Mississippi River.

2. Geological History and Landscape Formation

The landscapes of Minnetonka were formed by a series of melting and receding glaciers that left earth and rock material over bedrock. In the north part of the city, the depth to bedrock is 100’-200’ and in the southern part of the city, the bedrock depth ranges from 200’ to 300’. Platteville and Glenwood, St. Peter Sandstone, and “ribbons” of the Prairie du Chien bedrock groups underlie the city.

The glacial sediments created surface materials that resulted in areas of sand, gravel and clay over the upland areas and materials that are organic in nature along streams and the lake areas. The southern two-thirds of Minnetonka contain many areas of sand and gravel deposits.

Several sand and gravel pit operations removed large quantities of materials before significant development occurred in the city as shown on Figure VI-1. Many of the quarry operations changed the original landscape where sand and gravel extraction occurred, resulting in significant reclamation efforts to prepare property for urban development. Today, remaining sand and gravel deposits are covered primarily by existing residential developments.

Please Refer to Topography Map (Figure VI-1)

3. Topography

An understanding of the local topographical characteristics of Minnetonka is important because the location and extent of terrain changes influence development patterns, and the characteristics and investments needed for local municipal services. Interesting and varied topography provide pleasing vistas for neighborhoods and contribute to community character. However, careful consideration of the topography is necessary to:

- * protect topographic resources such as vegetation, steep slopes and views,
- * prevent erosion and sedimentation resulting from building and construction activities, and
- * determine the appropriate location and level of investment needed for municipal services such as lift stations, public water storage facilities, sanitary sewer line locations and roadway location and design.

The topography of Minnetonka is characterized by gently rolling terrain with several areas of steep slopes. The higher areas of the city (1,126' elevation adjacent to Williston Road, south of TH 7) are located in the west central portion of the city. The lower areas of the city are in the north and west near Lake Minnetonka, and the southwest corner near Purgatory Creek where the elevation ranges from 860' - 870' as shown on Figure VI-1.

Figure VI-2 shows that areas of steep slopes (over 12 percent) are scattered throughout Minnetonka with pronounced areas over 18 percent in the north and south parts of the city. Although significant development has occurred over the past thirty years, many steep slope areas have been preserved due to municipal management standards and sensitive development strategies.

4. Vegetation

In 2000 - 2002, the city and the Hennepin Conservation District conducted an inventory of the land cover to assess the ecological quality of natural communities (vegetation and habitat areas) in Minnetonka. The inventory was conducted in accordance with the MnDNR Minnesota Land Cover Classification System. Although the inventory covered the entire city, it was focused upon the city's open spaces and public parks, quality wetlands targeted for preservation, high quality natural areas, and other selected areas of the city. The document titled, *The Land Cover Classification and Natural Resource Inventory for city of Minnetonka*, 2004 serves as the basis for information of this section of the Comprehensive Plan.

Chart1 to the right summarizes the general land cover types by acreage within the city.

The categories of land cover type are described as follows:

Artificial surfaces - urban land uses and artificial surfaces

Planted and maintained vegetation - includes maintained parklands, planted conifer stands, large lawns, recreational fields, and other maintained vegetation types not associated with impervious areas.

Forest cover - includes native community remnants such as maple-basswood forest, mesic (with moderate moisture) oak forest, tamarack swamp, lowland hardwood forest, and floodplain forest.

Non-native forest types within the city were predominantly disturbed second growth forest types comprised of elm, box elder, ash, and cottonwood, with occasional oak, basswood, and maple. Many degraded second-growth forest stands were frequently invaded by buckthorn,

Please Refer to Steep Slopes Map (Figure VI-2)

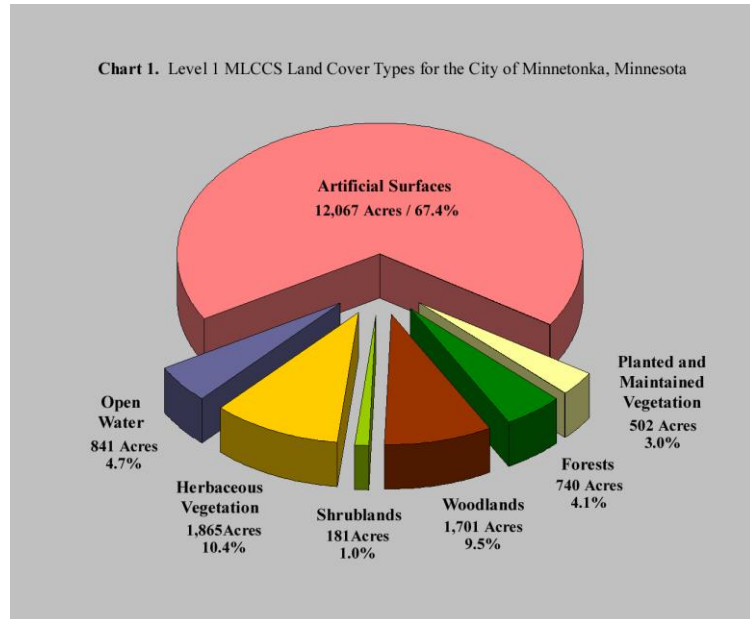
most commonly along the forest edges

Woodland - includes the two woodland types documented within the city, oak woodlands and altered/non-native deciduous woodlands.

Shrublands - predominantly associated with wetland systems in the form of native willow swamps and non-native dominated shrub swamps. In addition, one sphagnum bog was documented in association with a tamarack swamp southwest of Glen Lake on the Hennepin County home school property.

Herbaceous vegetation - includes natural communities such as cattail marshes, rich fens, a mixed emergent marsh, restored prairies, and non-native dominated cover types such as non-native species dominated wetlands (reed canary grass, cattail monotypes, and purple loosestrife), fallow old-fields, and other fallow herbaceous land.

Open water - the various lakes, creeks, and open water wetlands within the city.



The plant species that affected the quality of the natural plant communities in Minnetonka include those that are invasive in nature and pose potential threats to the biological diversity of native habitats. These invasive plant species include purple loosestrife, common buckthorn, garlic mustard, reed canary grass and giant reed grass.

The city contains over 230 individual natural community remnants totaling 1,793.5 acres that have been assessed for their ecological quality. The quality remnants are comprised of numerous types of natural communities consisting of forest, woodland, upland grassland, shrubland, and herbaceous wetland types. There are many other woodlands, forests, and wetlands within the city that were considered too disturbed and altered by past and present land use impacts to be classified as natural communities.

A ranking of the condition and quality of each natural community was assigned in the study according to the MnDNR Natural Heritage ranking scheme (A, B, C, and D) of which the “A” ranking are of highest quality. The highest quality natural communities include a large portion of the species typical of the community with few weedy plants present, most natural processes occurring, including disturbances such as fire or flooding, and little or no evidence of human disturbances. Most suburban settings contain “C” and “D” ranked stands unless preservation methods were applied before disturbance by land use practices (agriculture, development, etc.) at the time of settlement.

All natural community remnants within the city were determined to be “C” or “D” rank. Figure VI-3 depicts the natural communities in the city and the following describes each natural community type and the quality rankings occurring within the city.

Please Refer to Natural Communities Map (Figure VI-3)

a. Forests (Upland)

1.) Mesic Oak Forest

There are over forty mesic oak forest remnants in the city and appear to have been disturbed by historic and/or recent land use practices. The stands are second-growth forests and historically were dominated by northern red, white, or bur oaks and occur on sites where few severe fires occurred before settlement. Other tree species commonly present with the oaks include basswood, green ash, bitternut hickory, big-toothed aspen, and butternut.

The “C” ranked stands have often been grazed but not heavily enough to destroy the ground layer or result in dominance by invasive shrubs that characteristically establish following heavy grazing; if the site has been logged in recent past, the community remains intact and some tree regeneration (including oak species) is occurring; and young second growth (20-60 years old) stands that originated with good regeneration following clear cutting or burning

The “D” ranked stands are characterized by heavily cut or heavily grazed forests with a dense shrub layer of invasive shrubs; and a ground layer of generally low diversity, with either compacted soils, or very loose, exposed soils with very few herbaceous plants, or dominated by invasive shrubs or by exotic species.

2.) Maple Basswood Forest

Eight maple-basswood forest remnants were documented within Minnetonka with the majority located in the southwest corner of the city near and around low to moderate density residential developments. These forest remnants appear to have been severely impacted by past land use practices.

The few maple basswood forest remnants remaining in the city lack diversity within the subcanopy, shrub layer, and herbaceous layer. Although mature stands of sugar maple, basswood, and oak do exist, these forest stands will require many years of restoration and management to return them to high-quality, diverse, sustainable systems.

The tree canopy of undisturbed maple-basswood forests is comprised mostly of basswoods, sugar maples, and (formerly) American elms. Other mesic trees, such as slippery elms, northern red oaks, bur oaks, white ashes, and green ashes are sometimes dominant locally.

b. Forests (Lowland)

1.) Tamarack Swamps

Three tamarack swamps were documented within the city. Minnetonka lies along the southwestern range of Tamarack Swamp in Minnesota, and these remnants are somewhat rare and unique to the southern and western twin cities area. Tamarack swamps within the city are relatively young stands, with most of the tamarack under 30’ in height. In addition, all of these remnants have invasive species such as cattails, reed canary grass, and purple loosestrife encroaching into the herbaceous and shrub layer.

2.) Lowland Hardwood Forest

Several lowland hardwood forests exist in the city and all remnants are “D” quality natural community remnants. American elms and black ashes are common canopy dominants, but most stands are mixed, with slippery elms, rock elms, basswoods, bur oaks, hackberries, yellow birches, green ashes, black ashes, quaking aspens, balsam poplars, and paper birches as important species.

3.) Floodplain Forests

Numerous small floodplain forests remnants were documented within the city, and are very disturbed, small and fragmented. The remnants are considered “D” quality natural communities.

Floodplain forest is a seasonally wet forest community that occurs throughout Minnesota on the active floodplains of major rivers and their tributary streams. The canopy of the community is dominated by deciduous tree species tolerant of inundation, abrasion, and other disturbances associated with flooding. The canopy is either composed of a mixture of tree species or strongly dominated by a single tree species, such as silver maple or eastern cottonwood. Areas beneath tree-canopy openings in the forests either are dominated by short-lived herbaceous plants or, where erosion and disturbance from flooding tend to be repeated and severe, remain unvegetated.

c. Woodlands

1.) Oak Woodlands and Oak Brushlands

Numerous stands of oak woodland/brushland are located within the city and nine were assessed as “C” quality natural community remnants. In the Big Woods, oak woodlands are dominated by white oak in areas with coarse-textured soils or in areas prone to occasional fires. Natural woodlands are now extremely rare in this area because of logging, grazing, and fire suppression.

The principal species in the tree canopy are bur oak, northern pin oak, white oak, and northern red oak. Aspens may form up to 70% of the tree canopy cover. Significant diversity exists in the underlying brush layer, which may include blackberries, raspberries, gooseberries, dogwoods, cherries, hazelnuts, prickly ashes, and sprouts of oak and quaking aspen.

d. Shrublands

1.) Willow Swamp

Seven willow swamps were documented within city wetlands and all were assessed as “C” quality natural communities. Minnetonka’s willow swamps often included invasive species such as reed canary grass and purple loosestrife. Willow swamps are a type of wetland and include a canopy of medium to tall shrubs dominated by willows and red-osier dogwood.

e. Herbaceous Wetlands

1.) Cattail Marsh

Numerous cattail marshes were found within the city and most were assessed as “C” quality. These marshes do not include those that have been invaded by reed canary grass. A cattail marsh is an emergent marsh dominated by cattails and occurs most commonly along lake margins and in shallow basins. Associated species vary widely, but some of the most common ones are certain sedges, bulrushes, and broad-leaved herbs such as northern marsh fern, swamp milkweed, jewel-weed, broad-leaved arrowhead, mad-dog skullcap, marsh skullcap, and blue vervain.

2.) Rich Fen Floating Mat Subtype

There are eight rich fen wetlands in the city and five were assessed as “C” quality natural communities. These fens occur within small, topographically pronounced depressional wetland basins throughout the city. Although rich fen communities are historically somewhat rare in central Minnesota, there were likely many small rich fen wetland communities

scattered throughout the city's many small depressional wetlands prior to European settlement (circa 1850).

Due to land use changes over the past 150 years and associated stormwater impacts, many fens within the city have converted to monotypic cattail and reed canary grass dominated wetlands. Furthermore, invasive weeds such as reed canary grass, purple loosestrife, and cattails are encroaching on the edges of these remaining fens, and are threatening the persistence of these diverse and unique communities within the city.

Within one of Minnetonka's rich fens, a small population of water willow, (state special concern) was found. Water willow is a shrub-like plant within the loosestrife family, the same family as purple loosestrife.

3.) Mixed Emergent Marsh

One mixed emergent marsh was documented within the Minnetonka, and was assessed to be a "D" quality. Mixed emergent marsh is a broad community type, encompassing all marshes dominated by species other than cattails. Within high quality, undisturbed mixed emergent marshes, bulrushes are the most common dominants, especially hard-stemmed bulrush, river bulrush, softstem bulrush. Common reed grass, spike rushes, and (in some river backwaters) prairie cord grass are less common dominants.

Many mixed emergent marsh species are sensitive to fertilizer run-off and other artificial disturbances, and tend to convert to cattail marshes or become strongly dominated by reed canary grass or common reed grass, species that increase in abundance with disturbance.

4.) Wet Meadow

Three wet meadow remnants were documented within the city, were found to be low in native species diversity, and were all assessed as "D" quality communities. The ground layer of higher-quality wet meadow communities is composed of dense, closed stands of predominately wide-leaved sedges or grasses. Forb cover and diversity usually are high and forbs such as spotted joe-pye weed, common mint, turtlehead, and swamp milkweed are conspicuous. Shrub cover in wet meadows ranges from zero to 70% and is composed of Bebb's willows and pussy willows.

Wet meadow tends to succeed to shrub swamp communities in the absence of fire. Water-table lowering caused by drought or by ditching promotes succession of wet meadow to shrub swamps. Wet meadows on organic soils, like other communities that occur on organic soils, recover very slowly, if at all, once altered by artificial flooding or draining.

f. Upland Grasslands

1.) Mesic Prairie

There are seven prairie communities within the city. There are no native prairie remnants in the city and the five mesic prairies appear to have been planted within the past ten years. Generally, they are less diverse than native prairie remnants, and contain exotic weed species such as smooth brome and Kentucky blue grass among others. Non-native dominated upland grasslands occasionally support scattered native prairie grasses, such as big bluestem, little blue stem, and Indian grass.

Big bluestem, Indian grass, and prairie drop seed are the major native species on most sites, with little bluestem and porcupine grass important on drier sites, and switch grass and prairie cord grass common on wetter sites. The variation in species composition is caused by the amount of soil moisture.

Fragmentation of upland prairie since European settlement has reduced fire frequency throughout the prairie and deciduous forest-woodland zones, and most prairie remnants have more brush and trees than were present in the past. The introduced grass Kentucky bluegrass is present at most sites and is a function of the site's disturbance history.

2.) Dry Prairie

The two dry prairie remnants are located in Minnetonka, with the larger prairie (near the Williston Road water storage facility) ranked as a "C" quality and the smaller (near Purgatory Park) was assessed as "D" category. The "C" ranked prairie was partially replanted in the mid-1980s, after the installation of water storage tanks. This prairie remnant contains many native grasses and forbs typical of dry prairie, such as bib bluestem, little bluestem, Indian grass, etc.

5. Wildlife Communities

Many areas within the city have excellent habitat for a variety of wildlife species. Habitat alone, however, does not assure the presence of wildlife population. Other factors such as native range and land use patterns have a significant effect on wildlife habitat and migration pattern.

The primary wildlife habitat areas within Minnetonka are the extensive wetland and floodplain areas and the wooded hillsides adjacent to these areas. Through careful planning and management, Minnetonka has been able to preserve this wildlife heritage and yet allow urban development.

The principal species of wildlife in Minnetonka are the ringed neck pheasant, several species of waterfowl, white tail deer, coyote, gray squirrel, fox, red squirrel, muskrat, mink, beaver, skunk and raccoon. As development has continued in the city, conflicts between human activities and certain wildlife communities (geese, deer and coyote, for example) have increased.

Three records of state-listed or otherwise rare plant and animal species were known to have occurred within Minnetonka. The dragon's mouth orchid (not currently listed but very rare in the metro region) was documented 1931 in the tamarack swamp/graminoid bog complex associated with Glen Lake. Follow-up surveys for this orchid in 1998 and 2003 were unable to relocate this population, and it may have been destroyed.

Two state listed animals were also recorded in the past within Minnetonka. In 1981, a Blanding's turtle (State Threatened) was discovered along a horse trail near Crane Lake in the northeastern part of the city. However, there have been no sightings of this turtle since the 1981 observation. Also, a pair of Red-Shouldered Hawk (State Special Concern) was documented in 1992 and in 1994, nesting within a deciduous woodlot along the Minnetonka/Deephaven border.

B. Existing Conditions - Water Resources

Much of the developed landscape of Minnetonka is shaped by its existing water features and resources. Surface waters have contributed to the attractive landscapes and recreational opportunities within the city, while underground water resources support the municipal water system as well as support the ecosystem of the region and state.

The interrelatedness of the subsurface and surface water resources requires that responsible planning and management activities take place by a variety of organizations, including the city to:

- * ensure that the water quantity supply and control is protected and managed,
- * maintain water quality, and
- * preserve water quality resources for habitat areas and aesthetic qualities.

The following section identifies characteristics of the water resources in Minnetonka, and planning activities to manage impacts caused by land use, development and other land disturbing activities. An inventory of existing subsurface and surface water conditions in Minnetonka are included within this section along with a synopsis of more detailed water planning activities recently completed by the city in its 2008 WRMP.

1. Subsurface Water Resources

The glacial activity and underlying bedrock provided the sub-surface water resources that exist in the city today. The sandy layers of outwash deposits of receding glaciers are the main areas for groundwater and some water producing wells. The depth to groundwater in Minnetonka is only a few feet in the low land areas, and 40 to 50 feet in higher topographic areas. The groundwater elevation is approximately 920 feet mean sea level (MSL) and the flow direction is to the east.

Due to the composition of surface materials, certain areas of Minnetonka are more susceptible to potential water table pollution than other areas. The source water sensitivity of the groundwater to potential pollution in Minnetonka is high in certain locations and very high in areas where the water table is less than 10 feet from the surface. Source water susceptibility refers to the likelihood that a contaminant will reach the source of drinking water and reflects the assessment of well and aquifer sensitivity, and water quality data. The susceptibility of the city's source water is considered high due to high tritium content in water within the bedrock aquifer and the natural geologic conditions.

Three main bedrock aquifers underlay Minnetonka and include the Prairie du Chien-Jordan, Franconia-Ironton-Galesville, and Mt. Simon-Hinckley. The Prairie du Chien-Jordan aquifer is a sandstone aquifer that ranges in thickness from zero to 140 feet. The water table is at approximately 875 feet mean sea level (MSL) and the flow direction is east/southeast. In addition, the potential yield from the aquifer is greater than 2,000 gallons per minute. This aquifer's sensitivity to contamination is low to very low, and it is the primary source of potable water for Minnetonka.

The Franconia-Ironton-Galesville aquifer is at approximately 855 feet MSL and the potential yield is 400 to 800 gallons per minute. The deepest aquifer is the Mt. Simon-Hinckley aquifer where the water table level is 675 to 650 feet MSL and the flow direction is to the east/southeast.

2. Surface Water Resources

Minnetonka has many lakes, ponds, and creeks within and along its boundaries. Water entering the city drains from west to east in the north and from north to south in the south. Generally, there is a continuous natural drainage that is augmented by storm water facilities and county ditches. The major drainage ways in Minnetonka include Minnehaha, Purgatory and Nine Mile Creeks. These drainageways channel storm and snow melt runoff into major tributaries, provide recreational opportunities and contribute to the natural aesthetic setting of the city.

a. Lakes

The lakes in the city include Lake Minnetonka (Wayzata and Grays Bay and Libbs Lake), Gleason Lake, Windsor Lake, Lake Rose, Wing Lake, Glen Lake, Holiday Lake, Lone Lake, Shavers Lake, Shady Oak Lake, Lake Minnetoga (Mud Lake), and Spring Lake. The lakes all have moderate depths for their size and all are small to very small, except Lake Minnetonka.

The city undertakes a sample of the lakes within the city on a three year rotational basis to rate eutrophication (the process of nutrient enrichment where a water body becomes filled with aquatic plants and low in oxygen content). A lower number is an indication of less eutrophication than a higher number. The 2003 - 2005 data for the lakes in the city is shown below (the next sample data will be available in 2009):

| Lake | 2003 - 2005 | 2006 |
|---------------------------|-------------|------|
| Crane Lake | 54 | |
| Libbs Lake (Lake Mtk.) | 51 | 48 |
| Glen Lake | 47 | |
| Holiday Lake | 79 | 82 |
| Lake Rose | 66 | 62 |
| Lone Lake | 52 | 52 |
| Mud Lake (Lake Minnetoga) | 55 | |
| Shady Oak Lake | 45 | 45 |
| Shavers Lake | 54 | |
| Windsor Lake | 73 | |
| Wing Lake | 66 | 71 |

Those lakes with significant eutrophication (characterized by frequent and severe nuisance algal blooms and low transparency) have ratings over 57 and include Holiday Lake, Lake Rose, Windsor Lake and Wing Lake.

b. Watersheds and Drainageways

Additionally, there are four creek watersheds within the city - Nine Mile Creek, Bassett Creek, Purgatory Creek, and Minnehaha Creek. Nine Mile Creek starts in Minnetonka and flows south into Edina. Minnehaha Creek starts at Grays Bay and flows east to the Mississippi River. Purgatory Creek runs from north to south and has a portion of its headwaters in the west central portion of the city. Bassett Creek lies north of the city and drains the northeast corner of Minnetonka.

The functions of the natural drainage ways can be significantly disrupted when land use patterns change unless proper management is followed and maintained on a continuous basis. Land use changes increase runoff volume from paved and hard surfaced areas, introduce pollutants to lakes and wetlands, and potentially increase occurrences of erosion and siltation from increased runoff volume.

The protection and regulation of the city's shoreland areas is part of a statewide effort to protect water quality and aesthetic values of public waters. The public waters (as defined by the MnDNR) in Minnetonka are shown on Figure VI-4. The lakes within the city; Minnehaha, Purgatory and Nine Miles Creeks; and an unnamed tributary of Glen Lake are the public waters where shoreland management is applicable. The MnDNR defines shoreland areas as the land within 1000 feet of the ordinary high water level of a lake and 300 feet from the top of bank of a creek or the landward extension of the associated floodplain, whichever is greater.

3. Wetland and Floodplain Areas

Minnetonka is known by many throughout the region for the amount and variation of its wetland and floodplain resources. The city was spared much of the wetland and floodplain destruction that occurred in the heavily agricultural areas and subsequent suburban development because of the recognition of the values associated with wetland and floodplain areas.

In the early 1970s, the city began to regulate and manage wetlands and floodplains to prevent water pollution and protect the functions of wetland areas. Because of the early water management efforts of the city, these areas have been preserved from development and other pressures. City leaders recognized that wetlands and floodplain areas perform important functions to:

- * provide habitat for waterfowl and other wildlife,
- * store and stabilize water to prevent flooding and alleviate impacts from drought;
- * recharge and store groundwater supplies,
- * cleanse and purify surface waters by removing nutrients, and other contaminants present in storm water runoff.
- * contribute to the open space landscapes, and
- * enhance urban development activities.

Approximately 2,810 acres of land in Minnetonka are designated wetlands (inventoried by the city) and floodplains designated by the city and the Flood Emergency Management Agency (FEMA), and 643 acres are lakes and creeks. Many wetlands and floodplain areas are under protection as designated park land or open space. All of the wetlands and floodplains are presently protected by city management regulations.

a. Wetlands

Wetlands are shallow depressions of marsh, peat bog and swamp and are not deeper than six and a half feet. In some cases, the wetlands in Minnetonka serve as sumps in that they drain very quickly and do not support a type of wetland vegetation. Other wetlands in the city are waterlogged or flooded year round or during the growing season and support wetland vegetation and associated wildlife habitat.

There are eight different types of wetlands in the state, that are characterized by:

Please Refer to Public Works Inventory Map (Figure VI-4)

- * vegetation that is adapted to growing in wet environments such as rushes, sedges, wildflowers, and certain trees and shrubs,
- * hydric (wet) soils or those soils that are normally saturated or wet, and
- * seasonal differences in water at or near the soil surface.

Minnetonka contains seven of the eight wetland types as described in the following table and shown on Figure VI-5. Some wetlands have dual designations due to individual characteristics.

| Wetland Type | Soil | Hydrology | Vegetation | Common Sites |
|---|--|--|--|--|
| Type 1 - Seasonally Flooded Basin or Flat | Usually well-drained during much of the growing season | Covered with water or waterlogged during variable seasonal periods | Varies greatly according to season and duration of flooding from bottomland hardwoods to herbaceous plants | Upland depressions, bottomland hardwoods (floodplain forests) |
| Type 2 - Wet Meadow | Saturated or nearly saturated during most of the growing season | Usually without standing water during most of the growing season but waterlogged within at least a few inches of the surface | Grasses, sedges, rushes, various broad-leaved plants | May fill shallow basins, sloughs, or farmland sags; may border shallow marshes on the landward side and include low prairies, sedge meadows, and calcareous fens |
| Type 3 - Shallow Marsh | Usually waterlogged early during growing season | Often covered with 6 inches or more of water | Grasses; bulrush; spikerush; and various other marsh plants, such as cattail, arrowhead, pickerelweed, and smartweed | May nearly fill shallow lake basins or sloughs; may border deep marshes on landward side, commonly as seep areas near irrigated lands |
| Type 4 - Deep Marsh | Inundated | Usually covered with 6 inches to 3 feet or more of water during growing season | Cattail, reed, bulrush, spikerush, and wild rice; open areas may have pondweed, naiad, coontail, water milfoil, waterweed, duckweed, water lily, and spatterdock | May completely fill shallow lake basins, potholes, limestone sinks, and sloughs; may border open water in such depressions |
| Type 5 - Shallow Open Water | Inundated | Usually covered with less than 10-foot-deep water; includes shallow ponds and reservoirs | Fringe of emergent vegetation similar to open areas of Type 4 | Shallow lake basins and may border large open water basins |
| Type 6 - Shrub Swamp | Usually waterlogged during growing season | Often covered with as much as 6 inches of water; water table is at or near the surface | Includes alder, willow, buttonbrush, dogwood, and swamp privet | Along sluggish streams, drainage depressions, and occasionally on floodplains |
| Type 7 - Wooded Swamp | Waterlogged within a few inches of the surface during the growing season | Often covered with as much as 1 foot of water; water table is at or near the surface | Hardwood and coniferous swamps with tamarack, northern white cedar, black spruce, balsam fir, balsam poplar, red maple, and black ash; deciduous sites frequently support beds of duckweed and smartweed | Mostly in shallow ancient lake basins, old riverine oxbows, flat terrains, and along sluggish streams |

Please Refer to Wetland Types and Floodplain Areas Map (Figure VI-5)

b. Floodplains

Floodplains are areas adjacent to creeks and lakes that are subject to periodic inundation. The 100-year floodplain elevation is the boundary of floodplain as defined by local, state and federal governments. A 100 year flood is considered one that has a 1 percent chance of occurring in any given year. Floodplain regulations not only fall under the auspices of the city of Minnetonka, but also involve the Watershed Districts, the MnDNR and FEMA.

The floodplain areas in Minnetonka are shown on Figure VI-6. Generally, the floodplain areas within the city align the edges of lakes and follow the major creeks.

Please Refer to 100-Year Floodplain Map (Figure VI-6)

C. Resource Management Goals

The following goals provide guidance for the management of important natural resources including upland areas, topography and water resources in accordance with community values articulated in Chapter I and the overall policies found in Chapter III of this plan. Additionally, this section includes a summary of the major goals and policies of the 2008 Water Resources Management Plan.

1. Upland Areas Goals

- Goal 1: To manage and balance future growth to encourage protection of natural resources and enhance environmental features in the city including significant vegetation, slopes and water resources.
- Goal 2: To encourage woodland and tree preservation throughout the city and reasonably limit the loss of mature trees during land development activities.
- Goal 3: Require all development and land disturbing activities to comply with the requirements of the 2008 Water Resources Management Plan, as may be amended, and the appropriate watershed management district rules and requirements.

2. Overall Water Quality Goals

- Goal 1: Manage the water resources within the city, with input from the public, so that the beneficial uses of wetlands, lakes and creeks remain available to the residents including aesthetic appreciation, wildlife observation, swimming, boating or other activities.
- Goal 2: Manage water on a regional basis to protect designated water bodies and meet regional water quality standards.
- Goal 3: Reduce unlawful discharge to the city's storm sewers and receiving waters.
- Goal 4: Work to meet the phosphorous load reductions required by the city's NPDES permit and the four watershed district organizations.

3. Creek Goals

- Goal 1: Maintain or enhance the natural beauty, public access and wildlife habitat value of creeks running through the city.
- Goal 2: Implement creek restoration measures whenever necessary to maintain health, safety, and ecological integrity.
- Goal 3: Minimize the volume of stormwater runoff entering creeks.

4. Wetlands Goal

- Goal 1: Continue to protect and restore wetlands to improve or maintain their functions and values in accordance with the Minnesota Wetland Conservation Act and the city's wetland district provisions of the zoning ordinance.

5. Education and Public Involvement Goals

- Goal 1: Continue to involve and educate the residents in water resource related issues.
- Goal 2: Continue to offer programs, educational opportunities and information that facilitate an understanding of water resource issues in the city and areas downstream of Minnetonka.

6. Water Quantity and Flooding Goals

- Goal 1: Manage the rate and volume of runoff entering rivers, creeks, lakes and wetlands within the city.
- Goal 2: Manage floodplain areas to minimize flooding and protect the functions of the floodplain.
- Goal 3: Protect the public from flooding through measures that ensure public safety and prevent inundation of occupied structures.
- Goal 4: Minimize flooding potential while minimizing, to the greatest extent practical, the public capital expenditures necessary to control excessive volumes and rates of runoff.

7. Groundwater Goal

- Goal 1: Protect groundwater quality and quantity to preserve it for sustainable and beneficial purposes.
- Goal 2: Encourage efforts to conserve water supply use and provide water supply protection education for residents and businesses.

8. Erosion and Sedimentation Goal

- Goal 1: Prevent sediment from entering the city's surface water resources and control the erosion and sedimentation in drainage ways within the city.

9. Funding Goal

- Goal 1: Provide sufficient funding to implement measures and policies contained in this plan and the 2008 Water Resources Management Plan.

D. Water Resources Management

Previous water management planning activities were conducted by the city in 1982 and 1999. The city's 1982 water resources management plan (WRMP) established an integrated stormwater management system for the city, primarily controlling water quantity, and represented a "first generation" plan. In 1999, the city adopted a "second generation" WRMP that included previous stormwater management efforts along with new requirements to integrate flood control with wetland and water quality needs.

The 2008 WRMP incorporates stormwater management planning activities, as mandated by several federal, state and regional laws and programs, with water resource protection and preservation policies and requirements that meet metropolitan and the four watershed management organization goals. Further, the 2008 WRMP meets the requirements of the federal Environmental Protection Agency requirements for the Phase 1 National Pollutant Discharge Elimination System (NPDES) program for large municipal separate stormwater systems (referenced as MS4's).

This plan establishes detailed management strategies for water resources and stormwater within the city that support the policies listed in Chapter III of this plan. The 2008 WRMP includes:

- * a detailed inventory of water resources data;
- * a listing of applicable state, federal and regional water resource regulations;
- * specific water resource management goals and policies that meet state statute and Metropolitan Council requirements;
- * an assessment of specific city water resources issues; and
- * identifies implementation strategies to achieve the goals and policies including funding priorities.

The complete 2008 WRMP is an integral part of this comprehensive guide plan however, is a separate document due to its detail.

The following summarizes the important aspects of the 2008 WRMP affecting Minnetonka water resources.

1. Wetland Protection

In Minnetonka, the wetland protection and management program is based upon a classification system, and hierarchy of planning activities. The classification system is based upon a hydrologic and water quality analysis of each wetland and includes factors such as resource significance, local management potential, and susceptibility to stormwater input as detailed in the 2008 WRMP.

The planning activities identify the permitted actions for each wetland that avoids, minimizes, and mitigates impacts consistent with individual wetland classification, adequate flood control and water quality protection. The wetland management system reflects a "no net loss" of wetland function and values, as regulated by the state Wetland Conservation Act.

The wetland management classification system is based upon the following four categories for stormwater inflow purposes and management practices:

| Wetland Management Classification | Actions |
|-----------------------------------|--|
| Preserve | Avoid and preserve if at all possible. No change in hydrology. No increase in nutrient load. |
| Manage 1 | Minimize impacts. Control change in hydrology. Remove sediment and pre-treat water entering |
| Manage 2 | Minimize impacts. Control change in hydrology. Remove sediment from water entering. |
| Utilize | Use for flood storage and pretreatment of water entering other wetlands. |

Figure VI-7 depicts the management classification of the wetland areas.

The city's 2008 WMRP identifies the wetlands that are susceptible to degradation by stormwater impacts and indicates protection and/or restoration methods to preserve wetland attributes, consistent with the classification, flood control and water quality protection. The management practices result in a "no net loss of wetland function and values" in keeping with the state Water Conservation Act requirements.

2. Water Quality

The city's water quality protection system is designed to preserve beneficial uses of designated water bodies and wetland functions. A citywide water quality management program was developed based on sampling, classification, and the water quality modeling results. The city's water quality program includes three components: a management system, management standards, and educational and related programs.

The city established a water quality classification system for water bodies to meet the water quality goals of the city and the four watershed management organizations. The classification system is based on the desired water quality that corresponds to the expected use of the water body. The city used the following criteria to determine the classification of water bodies for water quality protection:

- Ability to apply zoning restrictions or other means to avoid development pressures or other activity that are not consistent with the expected use,
- Ability to purchase property or use existing city property to implement Best Management Practices (BMPs) or measures to protect the expected use,
- The relative position of the wetland within the watershed and the relationship to other surface waters, and
- Local perceived resource significance.

The classification system also considers the wetland management classification of adjacent wetlands. This ensures that the management plan avoids or minimizes impacts to wetland functions and values. A summary of the sampling data of the major water bodies in the city is included in the 2008 WRMP. Water bodies where the expected use classifications warranted protection were classified with "water quality protect" local management potential designation.

There are several important creeks in the city, including Minnehaha Creek, Nine Mile Creek, and Purgatory Creek, that are impacted by the water quality of the upstream water bodies as well as the stormwater runoff reaching the creeks. Poor water quality usually indicates a

Please Refer to Wetland Classification Map (Figure VI-7)

situation where the resource receives more nutrients, or other pollutants, than can be processed naturally.

Additionally, several water bodies are listed on the draft 2008 MPCA impaired waters list:

- 1.) Minnehaha Creek - fish bioassessment, fecal coliform and chloride
- 2.) Nine Mile Creek - chloride, fish bioassessment, turbidity
- 3.) Windsor Lake - total phosphorus
- 4.) Lake Minnetonka - mercury

Water bodies on the impaired waters list are required to have an assessment (known as a total maximum daily load (TMDL) analysis) completed that addresses the causes and sources of the impairment. Water bodies on this list have exceeded the water quality criteria established by the MPCA for one or more measured parameters.

Additionally, the Metropolitan Council has a Priority Lakes list based on size, their high regional recreational value, primary water supply capabilities and high water clarity. The only lake within the city currently listed on the current Metropolitan Council priority waters list is Lake Minnetonka.

3. Water Quantity Control

Flood control planning depends on allocating flood storage in wetlands with minimal impact to wildlife or water quality functions. The city uses its hydrologic/hydraulic model to evaluate stormwater storage needs with respect to wetland protection and water quality goals. As with wetland protection and water quality, flood control planning depends on allocating flood storage in wetlands with minimal impact to wildlife or water quality functions.

E. Implementation Practices and Strategies

The following section indicates the protection and management practices to protect natural resources identified in this chapter. The management practices follow the policies for the natural environment included in Chapter III - Overall Policies.

Further, additional and more specific goals, policies and priorities for implementation strategies for water resource management are included in the 2008 Water Resource Management Plan, and are incorporated by reference in the 2030 Comprehensive Guide Plan.

1. Steep Slopes

- * Continue enforcement of development regulations to limit construction activities on steep slopes (over 12 percent and 18 percent).
- * Continue to regulate construction practices to prevent erosion and preserve significant vegetation on slopes.

2. Significant vegetation

- * Continue to limit removal of significant trees to encourage preservation of natural communities; and require a reasonable amount of replacement when new development or redevelopment is proposed.
- * Continue restoration efforts and management program within city parks.
- * Encourage private efforts to manage woodlands, such as currently practiced within the Cargill Corporate Park.
- * Continue education programs such as the “backyard conservation” program for:
 - restoration of native plant species,
 - removal and control of buckthorn, garlic mustard and other invasive species, and
 - replanting woodland herbaceous plants.

3. Erosion and sedimentation

- * Continue to enforce zoning and subdivision ordinance provisions for erosion and sediment control, tree preservation, and steep slope protection.

4. Shoreland Protection

- * Continued enforcement of the shoreland protection zoning district, as amended. Within the shoreland area, certain uses, setbacks of structures, amount of impervious surface, grading, certain building dimensions and buffers are regulated in compliance with MnDNR rules, along with flexibility, to protect the integrity of the shoreland area.
- * Continue application of regulations within city’s WRMP to control for the rate and quality of water run-off into surface water resources, including lakes, creeks and wetland areas. Run-off from proposed land use activities must also comply with requirements of the watershed districts, the state and the federal government.
- * Provide education to residents of the benefits of various shoreland protection measures and programs.

5. Wetland Protection

Since 1973, the city has regulated wetlands within its zoning ordinance. On a consistent basis, the city has strengthened the ordinance over the years to prevent wetland destruction and degradation. The city plans to continue with the utilization of programs (for example, parts of the city Environmental Stewardship Program) to manage wetland resources:

1.) Protection

- * Continue to enforce the wetland district provisions of the zoning ordinance, and update as necessary to incorporate new provisions of the 2008 WRMP and requirements of state and local management organizations, as appropriate.
- * Continue to serve as the local government authority to enforce the state Wetland Protection Act passed in 1991, and as amended.
- * Continue to coordinate activities with the four watershed management districts/organizations in the city to protect and manage wetlands.

2.) Wetland Buffers

Wetland buffers (measured in distance landward from the wetland edge) are beneficial to maintain the health of wetlands and help improve water quality. The use of native vegetation mixtures (maintained or planted) as a buffer help filter sediment, nutrients, and other pollutants before they drain into the wetland. In addition, the native vegetation provides food and shelter for a variety of desirable wildlife species.

A native vegetation buffer adjacent to the wetland reduces the impact of lawn care practices such as the increase for nutrients from lawn use that may infiltrate the wetlands. These excess nutrients can increase the growth of undesirable algae and noxious weeds.

- * Continue to require wetland buffers for new land use activities that occur adjacent to wetland areas, creeks and shallow lakes (as regulated by the shoreland ordinance, as may be amended).
- * Continue to manage buffer area size and type based upon the wetland management classification, adjacent lake and creek characteristics, and the type of activity. The city's wetland and shoreland zoning districts and WRMP include requirements for the buffer areas.

3.) Monitoring

- * Continue lake, creek and wetland monitoring activities. The city cooperates with monitoring activities conducted by the four watershed management organizations, other government entities, and utilizes consultants, trained citizen volunteers to monitor wetlands using methods developed by the MPCA. The volunteers catalog plant and invertebrate species diversity and richness. Data is summarized in an annual report and reviewed by city staff to determine the health of our water resources.

6. Floodplain Protection

- * Continue application of the floodplain district provisions of the zoning ordinance to protect existing floodplain areas by regulating:
 - uses within and adjacent to the 100 year floodplain; and
 - establishing minimum setbacks and building elevations to protect property.

- * Continue to participate in the FEMA floodplain management program which, in part, allows property owners to qualify for flood insurance.

7. Wildlife Management

- * The city has instituted programs to educate residents and reduce the populations of certain animal species on public properties.

8. Groundwater

To protect the water supply and subsurface water resources from potential contamination, the city has started to implement the wellhead protection plan, as approved by the Minnesota Department of Health. Additionally, the city uses the development review process to protect its drinking water source areas.

- * To reduce the potential adverse affects of pollutants from surface infiltration, the city will consider the state Department of Health's *Evaluating Proposed Stormwater Infiltration Projects in Vulnerable Wellhead Protection Areas*, as amended, as guidance in evaluating all proposed stormwater projects within or adjacent to vulnerable portions of the Drinking Water Supply Management Areas (DWSMA).
- * The city will utilize additional information (when available) in determining the potential adverse effects of stormwater infiltration to the vulnerable DWSMA. If the proposed infiltration/discharge is determined by the City to potentially cause adverse effects to the local drinking water supply, the City will prohibit the construction of the infiltration area or incorporate the necessary BMPs to reduce the identified pollutant(s) prior to infiltrating into the vulnerable portions of the DWSMA.

9. Review of Development and Land Disturbing Activities

In addition to the regulating activities noted above, the city actively reviews development proposals and requires permits for most land disturbing activities. The zoning and subdivision ordinances specify the requirements that are designed to manage activity that affect natural resources, including those that impact water resources. Water resource or stormwater-related city permits and/or approvals are required for most projects that involve preliminary and final plats, site plans, rezonings, land alterations, wetland or floodplain alteration permits among others.

Additionally, the city informs developers and other project applicants about the requirements of other review agencies including the watershed management organizations. By agreement, the city currently has full water resource permitting authority with the Riley-Purgatory Bluff Creek watershed district and permitting authority for certain activities with the Minnehaha Creek watershed district.

- * The city will continue to regulate development and land disturbing activities with the development review (zoning and subdivision) ordinances.
- * The city will review and incorporate stormwater design criteria for development as identified in the 2008 WRMP.
- * The city will continue to be proactive in using development controls and other tools to encourage improvements to the stormwater systems presented by redevelopment in compliance with the policies and requirements of the 2008 WRMP.
- * The city will review and update its existing ordinances and processes to ensure conformance with the policies and goals of the 2008 WRMP, the requirements of the four watershed management organizations of the city, and the NPDES MS4 Permit

requirements.

- * The city will review the need to amend current standards for water quality treatment best management practices for development projects, to achieve higher levels of water quality treatment than is currently required.

10. Municipal Stormwater System Management and Non-Degradation Requirements

Due to its population, Minnetonka is required to obtain a Municipal Separate Storm Sewer System (MS4) permit for managing non-point source storm water. A permit must be filed with the state Pollution Control Agency (MPCA) that indicates how the city will regulate and improve storm water discharges. The permit must include a Stormwater Pollution Prevention Program (SWPPP) that indicates how the city will meet the permit requirements.

The permit conditions require that the city continue to use best management practices (BMPs) and other strategies to meet the following other measures:

- * public outreach and education
- * public participation/involvement
- * illegal discharge detection and elimination
- * construction site runoff control
- * post construction runoff control
- * pollution prevention/good housekeeping

The 2008 WRMP explains in detail the requirements of the MS4 program in Minnetonka and the on-going detailed activities to achieve permit compliance.

In addition, Minnetonka is one of 30 cities in Minnesota selected to complete a pollutant loading assessment and non-degradation report to determine the need for additional measures to reduce pollutant loading. This report must assess the volume of total suspended solids (soil, sand and silt), phosphorus and water in storm water runoff and establish a plan and implementation measures to keep pollutant loadings at 1988 levels. This approach should result in the following:

- * Receiving water quality should be improved for lakes, wetlands and streams in the city,
- * Channel erosion and stream morphology changes will be minimized,
- * Further protection will be provided for the physical and biological integrity of the stream and wetland corridors.
- * Controlled “bounce” and duration of inundation in the city’s wetlands and preservation of the functions and values for each type of wetland classification.

11. Funding and Capital Improvement Programs

The capital improvement and implementation programs of the 2008 WRMP, along with the existing Surface Water Utility Fund provides adequate tools to correct current and future problems. The stormwater utility revenue is generated by fees according to impervious surface coverage and it is the primary funding source for all stormwater improvements related to the WRMP. The city periodically reviews this program to determine its adequacy for funding needed projects and programs.

- * The city will continue to use the Surface Water Utility Fee program to fund stormwater related activities.
- * The City will continue its efforts to actively seek opportunities and apply for grants

and other funding as it becomes available. These funds can provide an important resource for funding water resource projects.

12. Partnerships

The Bassett Creek, Minnehaha Creek, Nine Mile Creek and Riley Purgatory watershed management organizations provide funds and assistance toward solving various water resource problems and completing water resource projects. These organizations have a long record of working successfully with the individual cities toward meeting shared goals.

- * The City will continue to collaborate and contribute to these organizations and take advantage of the available benefits.
- * The city will seek permitting authority for water related projects within the Bassett Creek and Nine Mile Creek watershed management organizations in an effort to streamline the permit review process and eliminate duplicated efforts.

13. Education and Public Involvement Program

The city maintains various education and communication programs (website, mailings and informational meetings) aimed at water resources issues. The City develops and distributes articles and information regarding the stormwater planning activities, along with those of the watershed district organizations, including information on:

- stormwater issues,
 - non-point source pollution,
 - NPDES regulation and guidance,
 - annual public meetings,
 - illegal discharges,
 - erosion control,
 - shoreline management,
 - local agency contacts,
 - stormwater website links,
 - composting and pollution prevention.
- * The city will continue to offer education and communication programs for stormwater management and resource protection activities.