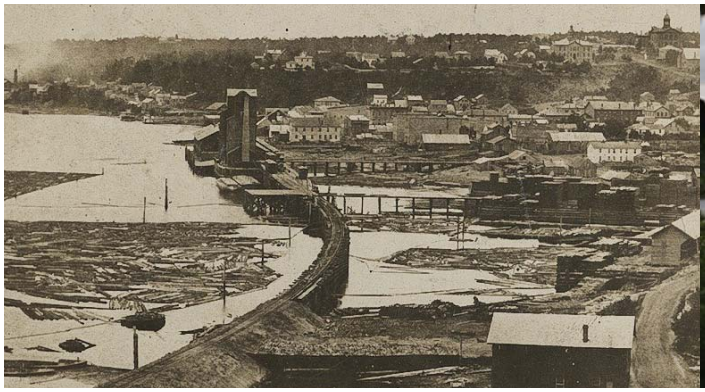


Chapter 3 - Natural Resources

Introduction

STILLWATER'S natural resources are among the defining features of the city. Balancing preservation of these features with remaining future growth is an important element of this plan, and has been articulated as a priority by city officials and residents. The city's location along the scenic St. Croix River corridor makes it a desirable environment in which to live, and this contributes to strong growth pressures in the region. Therefore, effective planning that considers the natural amenities of the region is particularly important as several resources in the city are sensitive, and vulnerable to degradation or loss if impacted beyond their capacity to recover.

Water features are among the highest profile natural amenities within the city. Brown's Creek and the St Croix River are particularly valuable. The St. Croix River is part of the National Scenic River system, and draws visitors from throughout the region for boating, fishing, and other recreation activities along the river, river bluffs, and corridor.

Brown's Creek is one of only seven DNR designated trout streams in the seven county Metro Area; this spring-fed stream supplies the cold, clean water necessary for trout habitat, and is particularly vulnerable to degradation resulting from land use changes. In addition, the springs that feed the creek often support unique, high quality wetland areas that have the potential to host rare or uncommon plant and animal species. Other important water features include two lakes-- Long Lake, and Lily Lake-- and the many wetlands found within the city including Lake McKusick. [The DNR classifies Lake McKusick as a wetland. However, residents of Stillwater refer to it as a lake. Therefore, it will be referred to as "Lake McKusick" throughout this chapter, even though technically it is classified as a wetland.]

Chapter 3 Contents

Another important feature is Jackson Wildlife Management Area (WMA), at the northeast end of Long Lake. This includes a mix of wetland and upland areas that are environmentally sensitive, and which support rare species.

Goals, Objectives, Policies & Programs

Goals and Policies

The City of Stillwater worked with citizens to develop natural resource and open space goals with supporting objectives and programs. The goals, objectives, programs and policies are the foundation of the plan, as they define what the community should preserve and protect when considering development.

Goal 1: Create a natural resource open space system that preserves protects or restores environmental resources within the city.

Goal 2: Use the natural resource open space system to connect open spaces, parks, activity centers, and neighborhoods.

Goal 3: Protect and enhance the St. Croix River as a natural open space system and recreation resource.

Goal 4: Provide opportunities for enjoyment of natural resources within all areas of the community.

A substantial list of goals and policies for natural resource protection can also be found in Section 7 of the city's 2008 Surface Water Management Plan.

Objectives

Preserve key scenic roadways, corridors and features and protect the visual beauty and semi-rural character of the road sides.

Preserve, protect and/or restore natural features including: ravine areas, shorelands and bluff lands, tree stands and individual heirloom trees, slopes, wetlands, and wildlife habitat areas.

Encourage natural drafting systems to maintain the natural character of ravines and waterways.

Maintain buffering and visual separation between developed areas and semi-rural areas.

Policies

Policy 1: The city shall allow limited controlled public access to sensitive habitat areas or areas that could be impacted by public access.

Policy 2: The city shall identify and protect neighborhood open space sites of aesthetic, recreational or natural resources value in preparing neighborhood plans.

Policy 3: Require special landscaping of all scenic routes.

Policy 4: Coordinate scenic route improvements with roadway improvements.

Policy 5: Encourage Stillwater Township to use the rural cluster concept in areas adjacent to the City of Stillwater to maintain open space/recreation opportunities.

Programs

Program 1: Maintain inventory of all ravines and remnant lands in the existing city and develop a policy regarding ravine management that balances ravine usage amongst natural resource protection, public utility and open space/recreation opportunities.

Program 2: Review ownership of ravines and remnant land and obtain control over such lands through fee ownership, open space easement, and utility easement or resource protection regulations.

Program 3: Develop environmental education programs in natural areas to study plant and animal communities.

Program 4: Identify key scenic roadways and corridors.

Program 5: Make sure open space resource areas including sensitive natural resource areas are identified and incorporated into development design.

Review of Existing Natural Resources

Natural areas

According to the original land survey notes (compiled in Minnesota between 1853 and 1856) at the time of European settlement, the vegetation of what is now eastern Washington County was comprised primarily of oak openings and barrens. This area also included small intrusions of Big Woods-Hardwoods (oak, maple, basswood and hickory) and prairie. Based on these notes, it is apparent that the city of Stillwater supported large areas of Oak Opening vegetation along with Big Woods-Hardwoods in the southwest, and prairie in the southeast portion of the city along the St. Croix River corridor.

Today, examples of this historic vegetation (as identified by the DNR's Minnesota County Biological Survey (MCBS), and by the Natural Resources Inventory (NRI) completed between 2002 to 2007) are preserved in locations scattered throughout the city. (Figure 3.1: Natural Resource Features and Corridors map)

Specific sites identified by the MCBS are as follows:

- One Shrub Swamp (located in Section 21: See Figure 3.6: Sensitive Groundwater Resources map)
- One Mixed Hardwood Swamp Seepage Subtype (located in Section 21: See Figure 3.6: Sensitive Groundwater Resources map)
- Two Maple-Basswood Forests (East Central) (located in Sections 16, 20 and 21)
- Three Oak Forests (Central) Mesic Subtype (located in Sections 21, 30 and 31)

The NRI also identified several high quality natural areas. The majority of these are scattered throughout the city, and include wetlands or wetland complexes and their surrounding upland areas. In addition, a number of high quality forest remnants are found within the city.

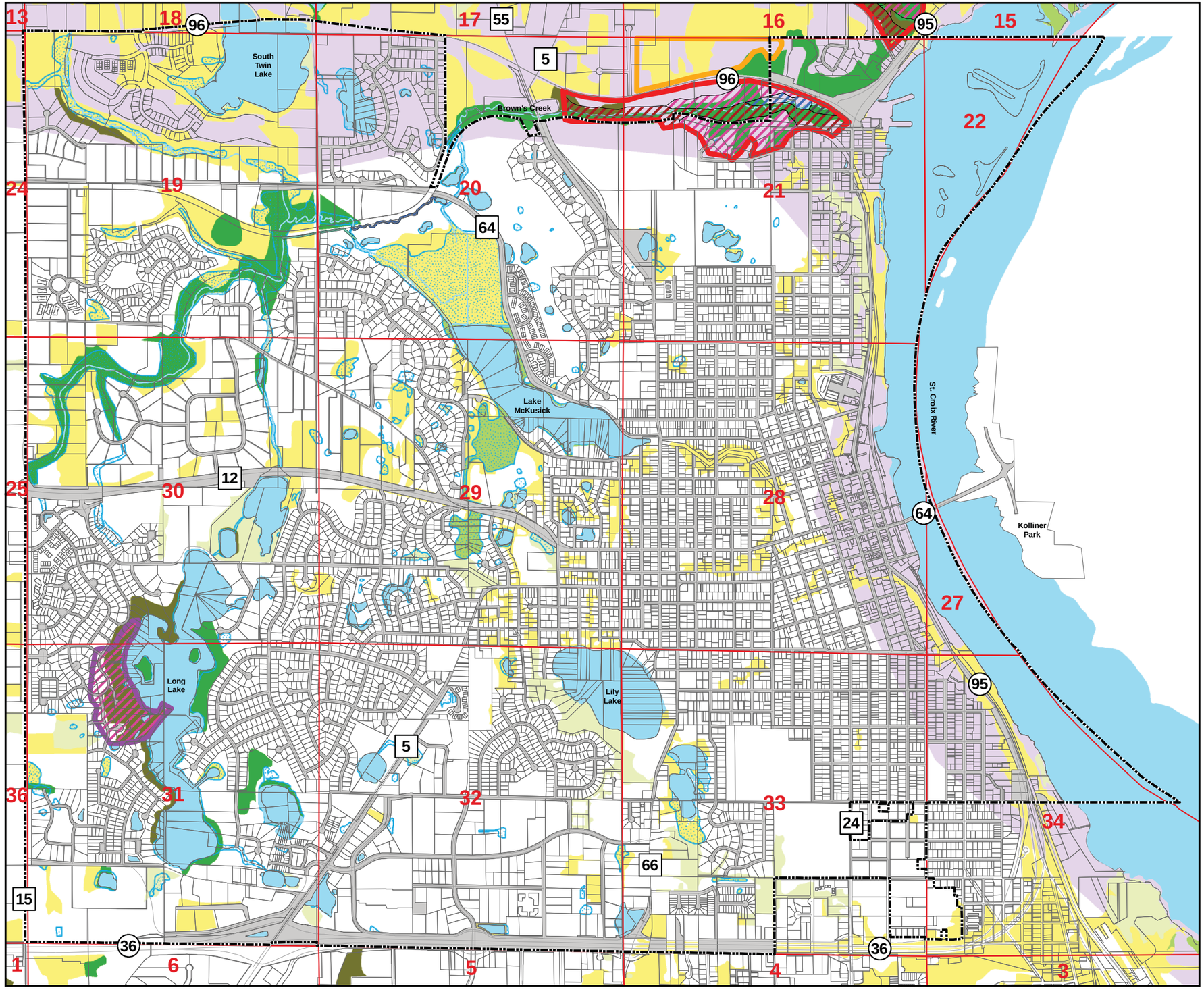
The MCBS data for Stillwater also lists rare plants and animals found during the assessment which include:

- Bald Eagle (*Haliaeetus leucocephalus*) nesting site (located in Section 22: See Natural Resource Features & Corridors map)
- Mussels Sampling Site (located in Section 27: See Figure 3.1: Natural Resource Features & Corridors map)
- Colonial Waterbird Nesting Site for Great Blue Herons (*Ardea herodias*) (located in Section 22: See Figure 3.1: Natural Resource Features & Corridors map)
- Rare plant occurrence of Kitten-tails (*Besseya bullii*) (located in Section 21: See Figure 3.1: Natural Resource Features & Corridors map)

A Sedimentary Unit or Sequence (Cambrian, Ordovician) was also found during the MCBS survey. This includes Oneota Dolomite and Jordan Sandstone (Section 28) formations that are exposed due to a road cut within the city.

These are among the defining features for Stillwater's natural resources and combined with the semi-natural areas and water features described below, form important linkages in the DNR's Metro Wildlife/Greenways corridor.

Figure 3.1 : Natural Features and Corridors



Natural Resource Features & Corridor

2008 Comprehensive Plan

N W E S

800 0 800 1,600 Feet

- Brown's Creek Diversion Structure
- Brown's Creek Channel Realignment
- Brown's Creek and Tributary
- 2030 City Limit
- 23 Public Land Survey Sections
- Exceptional Quality Natural Area
- High Quality Natural Area
- Moderate Quality Natural Area
- Low Quality Natural Area
- Semi-Natural Area
- DNR Site of High Biodiversity Significance
- DNR Site of Moderate Biodiversity Significance
- DNR Site of Low Biodiversity Significance
- Shrub Swamp
- Mixed Hardwood Swamp Seepage Subtype
- Maple-Basswood Forest (East Central)
- Oak Forest (Central) Mesic Subtype
- Metro Wildlife Corridor Focus Area
- Right-of-Way
- Open Water
- Wetland

Bonestroo

December 8, 2008

I:/510/51007001/gis/maps/MLccsNatural & semi-natural areas.mxd

Minnesota Land Cover Classification System (MLCCS)

Land cover data has been collected as part of the Minnesota Land Cover Classification System (MLCCS) managed by the Minnesota Department of Natural Resources. This inventory identifies the types and amounts of land cover, vegetation and impervious surfaces, and is very useful in water and natural resources management. MLCCS data is available for the entire city and is shown on the "Natural Resource Features and Corridors" map (Figure 3.1). MLCCS classifies the natural area quality into four categories as well as semi-natural areas. Natural areas are dominated by native vegetation communities.

Exceptional
These are the highest quality natural communities with no disturbances and natural processes intact.

High
These are good quality natural communities with natural processes intact, but show signs of past human impacts.

Moderate
These are areas with obvious past disturbance but are still recognizable as a natural community.

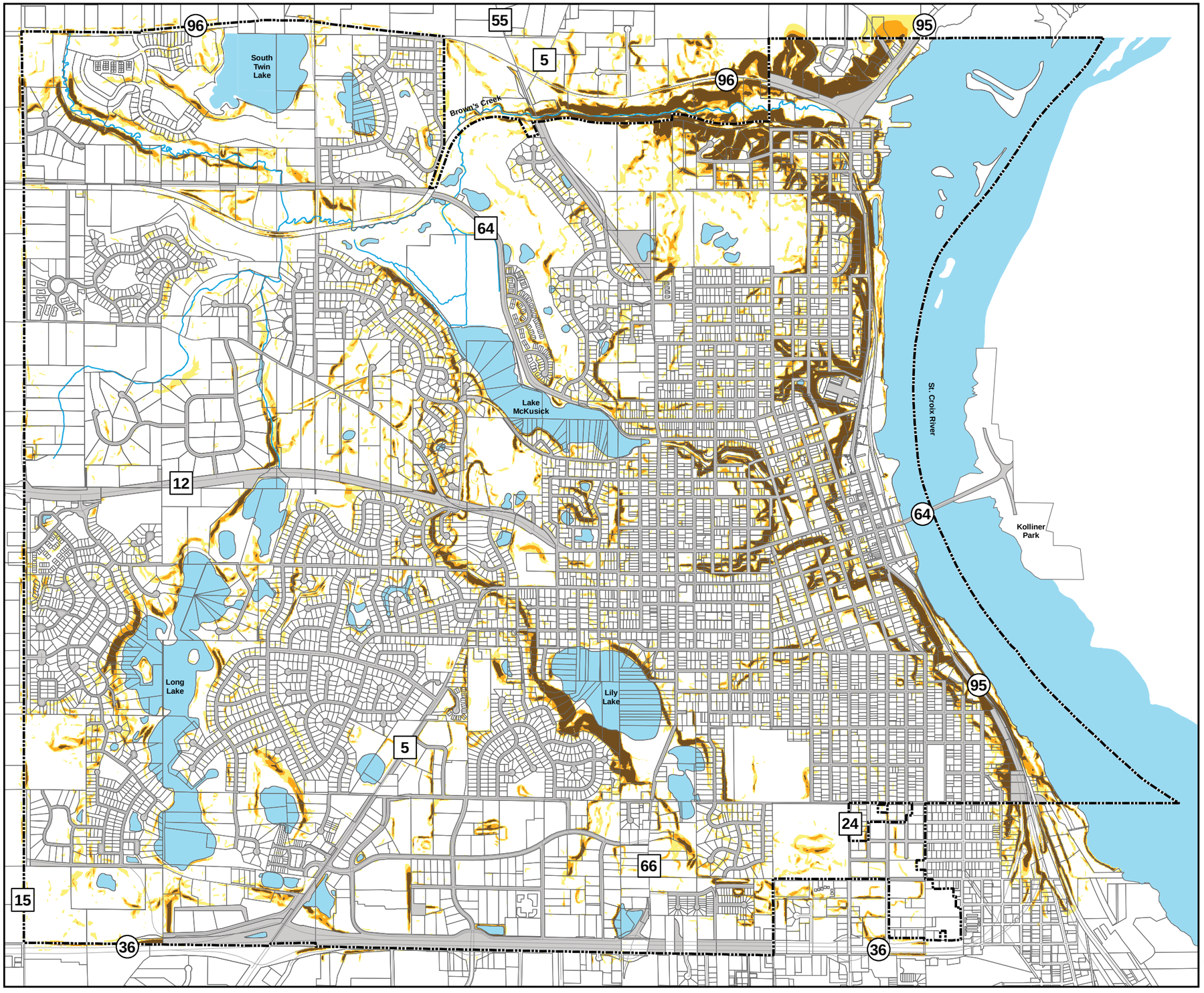
Low
These are natural communities that are in poor condition with some native species but are dominated by non-natives and/or are widely disturbed and altered.

Semi-Natural Areas
"Semi-Natural Areas" are areas of land not subject to active use, and which are not dominated by vegetation native to Minnesota. Examples include fallow pasture or crop land which has been retired, degraded wetlands dominated by reed canary grass or other invasive species, and secondary growth or disturbed woodlands, typically dominated by boxelder, green ash, and/or basswood. These areas still can offer significant benefit for wildlife and for water quality protection, and often form important buffers around and connections between remnants of native habitat. As seen on the "Natural Resource Features and Corridors" map, these form a significant percentage of the open space and undeveloped lands within the city. Sites within the greenway corridors should be considered high priority for restoration.

Steep Slopes

Ancient geologic activity in the region created the predominant land forms in modern day Stillwater. The most recent glaciers left behind the St. Croix moraine creating a band of rolling hills. During the final retreat of the glaciers, meltwater flooded the St. Croix River for many years. The river cut downward, forming the cliffs and bluffs of the river valley. Side streams also cut downward to meet the new riverbed, creating the deep ravines visible in Stillwater today. Exposed bedrock, steep slopes and groundwater springs are common features in this area. Areas of steep slopes are shown on Figure 3.2: Steep Slopes.

Figure 3.2 : Steep Slopes



Stillwater
THE BIRTHPLACE OF MINNESOTA

Steep Slopes

2008 Comprehensive Plan

N
W E
S

800 0 800 1,600 Feet

- 2030 City Limit
- Slopes 12 % to 18 %
- Slopes 18% to 24%
- Slopes 24% or more
- Open Water
- Right-of-Way

Bonestroo

August 13, 2008

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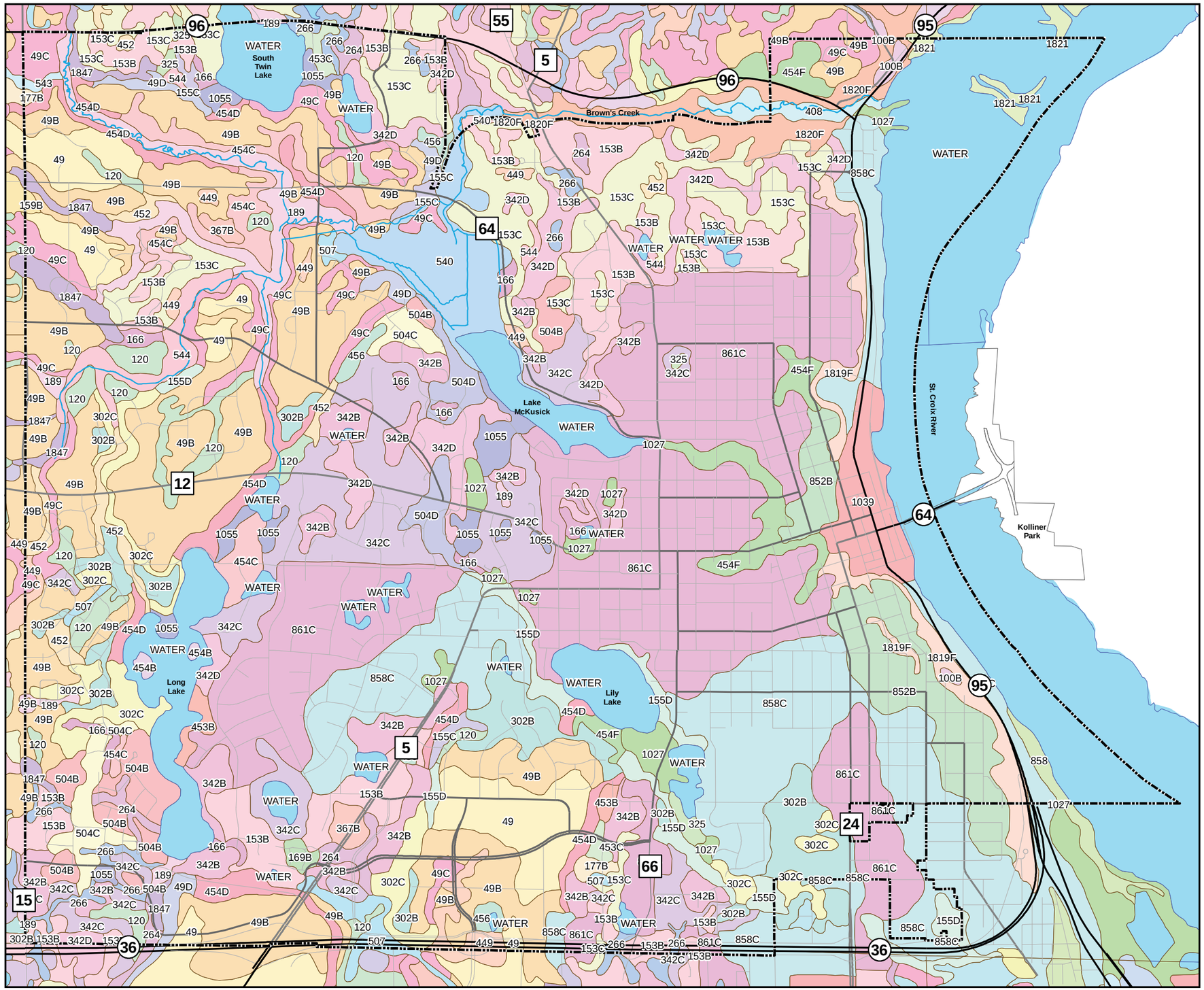
Figure 3.3 : Soils Map



Soils Map

2008 Comprehensive Plan

N W E S

800 0 800 1,600 Feet

2030 City Limit

The soil ID number and corresponding soil name can be found on Page 3-8. Data is from the US Department of Agriculture's Natural Resources Conservation Service Soil Survey.

Bonestroo

June 26, 2009

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Soils

Washington County Soil Survey

The soils of eastern Washington County around the Stillwater area are predominantly undulating to steep, well drained, medium and moderately coarse textured soils. According to the Soil Survey of Washington and Ramsey County (USDA, 1980) the dominant soil types within the City of Stillwater include Urban Land-Kingsley Complex, Santiago, Kingsley and Antigo series. A map of soil types is shown in Figure 3.3. The Soils Summary Table 3.1 shows all the soil types within the city.

Table 3.1 : Soil Summary

SOIL TYPE	SYMBOL
Copaston loam, 0-6% slopes	100B
Udorthents, wet substratum	1027
Urban lands	1039
Aquolls and Histosols, ponded	1055
Brill silt loam	120
Santiago silt loam, 2-6% slopes	153B
Santiago silt loam, 6-15% slopes	153C
Chetek sandy loam, 12-25% slopes	155D
Ronneby fine sandy loam	166
Braham loamy fine sand, 1-6% slopes	169B
Gotham loamy sand, 1-6% slopes	177B
Doreton-Rock outcrop complex, 25-60% slopes	1819F
Mahtomedi Variant-Rock outcrop complex, 25-60% slopes	1820F
Algansee loamy sand	1821
Barronett silt loam, sandy substratum	1847
Auburndale silt loam	189
Freeon silt loam, 1-4% slopes	264
Freer silt loam	266
Rosholt sandy loam, 1-6% slopes	302B
Rosholt sandy loam, 6-15% slopes	302C
Prebish loam	325
Kingsley sandy loam, 2-6% slopes	342B
Kingsley sandy loam, 6-12% slopes	342C
Kingsley sandy loam, 12-18% slopes	342D
Campia silt loam, 0-8% slopes	367B
Faxon silt loam	408
Crystal Lake silt loam, 1-3% slopes	449
Comstock silt loam	452
Demontreville loamy fine sand, 2-6% slopes	453B
Demontreville loamy fine sand, 6-12% slopes	453C
Mahtomedi loamy sand, 0-6% slopes	454B
Mahtomedi loamy sand, 6-12% slopes	454C
Mahtomedi loamy sand, 12-25% slopes	454D
Mahtomedi loamy sand, 25-40% slopes	454F
Barronett silt loam	456
Antigo silt loam, 0-2% slopes	49
Antigo silt loam, 2-6% slopes	49B
Antigo silt loam, 6-12% slopes	49C
Antigo silt loam, 12-18% slopes	49D
Duluth silt loam, 1-6% slopes	504B
Duluth silt loam, 6-12% slopes	504C
Duluth silt loam, 12-25% slopes	504D
Poskin silt loam	507
Seelyville muck	540
Cathro muck	544
Urban land-Copaston complex, 0-8% slopes	852B
Urban land-Chetek complex, 0-3% slopes	858
Urban land-Chetek complex, 3-15% slopes	858C
WATER	WATER

Water Resources

Surface Water

The city has a number of surface water resources. Defining resources include Long Lake, Lily Lake, Lake McKusick (actually a wetland), St. Croix River, and Brown's Creek. The St. Croix River is the eastern boundary of the city while Brown's Creek and its tributaries skirt portions of the city's northern and western boundaries. Lily Lake is found in the south-central portion of Stillwater while Long Lake is located in the southwestern portion of the city and Lake McKusick is near the center of the city. The St. Croix River is a very popular attraction for activities such as fishing and boating. Brown's Creek and its tributaries compose an array of wildlife and fisheries corridors which ultimately flow into the St. Croix River. Section 2.6 of the city's 2008 Surface Water Management Plan has a detailed narrative of the rivers, streams, lakes and wetlands.

Public Waters

The "Public Waters" designation includes lakes, rivers, trout streams and other bodies of water that meet the standards described in Minnesota Statutes, Section 103G.005, as well as wetlands classified as public water wetlands. Public waters wetlands include all Type 3, Type 4, and Type 5 wetlands in Stillwater that are 2 ½ acres or more in size. These sites provide public value for recreation, water quality or water supply, wildlife habitat, or are publicly owned. The DNR has regulatory authority over these areas, and specific rules are in place regarding the need for a permit or license to cross or otherwise impact these areas. The St. Croix River and Brown's Creek are public watercourses. Long Lake and Lily Lake are public water lakes. Lake McKusick, South Twin Lake, Jackson WMA, Brick Pond, and six other un-named wetlands are public waters wetlands. Figure 2.2 in the Surface Water Management Plan identifies these waters within the city. They can also be seen in Figure 3.4 of this Chapter.

Wetlands

Wetlands provide a number of valuable services to the community, including natural flood control, filtering, cleaning, and supplying water for both downstream water bodies and groundwater sources, and creating valuable habitat for fish, amphibians, waterfowl, birds, and other wildlife. Economically, they are an amenity in many developments and can provide visual and spatial buffers between homes. The State of Minnesota and the Federal Government recognize the values that wetlands provide, and have created a series of rules that protect wetlands. In the State of Minnesota, nearly all wetlands are protected by the Wetland Conservation Act.

Understanding the location of and providing adequate protection for these resources is an important consideration. There are several sources of information that can help in a preliminary determination of whether wetlands are present on a site, as described below. In all cases a review by an experienced wetland professional is recommended and in some cases required, to make a final determination regarding the presence or absence of a wetland and determine the legal boundaries of any wetlands. Appropriate permits are required prior to any activities which fill, drain, or otherwise impact a wetland.

National Wetlands Inventory

The National Wetlands Inventory (NWI) is a national assessment of wetland resources, conducted by the United States Fish and Wildlife Service between 1988 and 1992 within the state of Minnesota. The NWI survey was based strictly on aerial photography reconnaissance and interpretation, and may be less accurate than some of the other sources. However, the NWI coverage is useful in giving an estimate of the extent (i.e. approximate geographic location) and type (i.e. system, hydrologic regime, and predominant vegetation types) of wetlands within the city.

City of Stillwater Wetland Inventory and Assessment

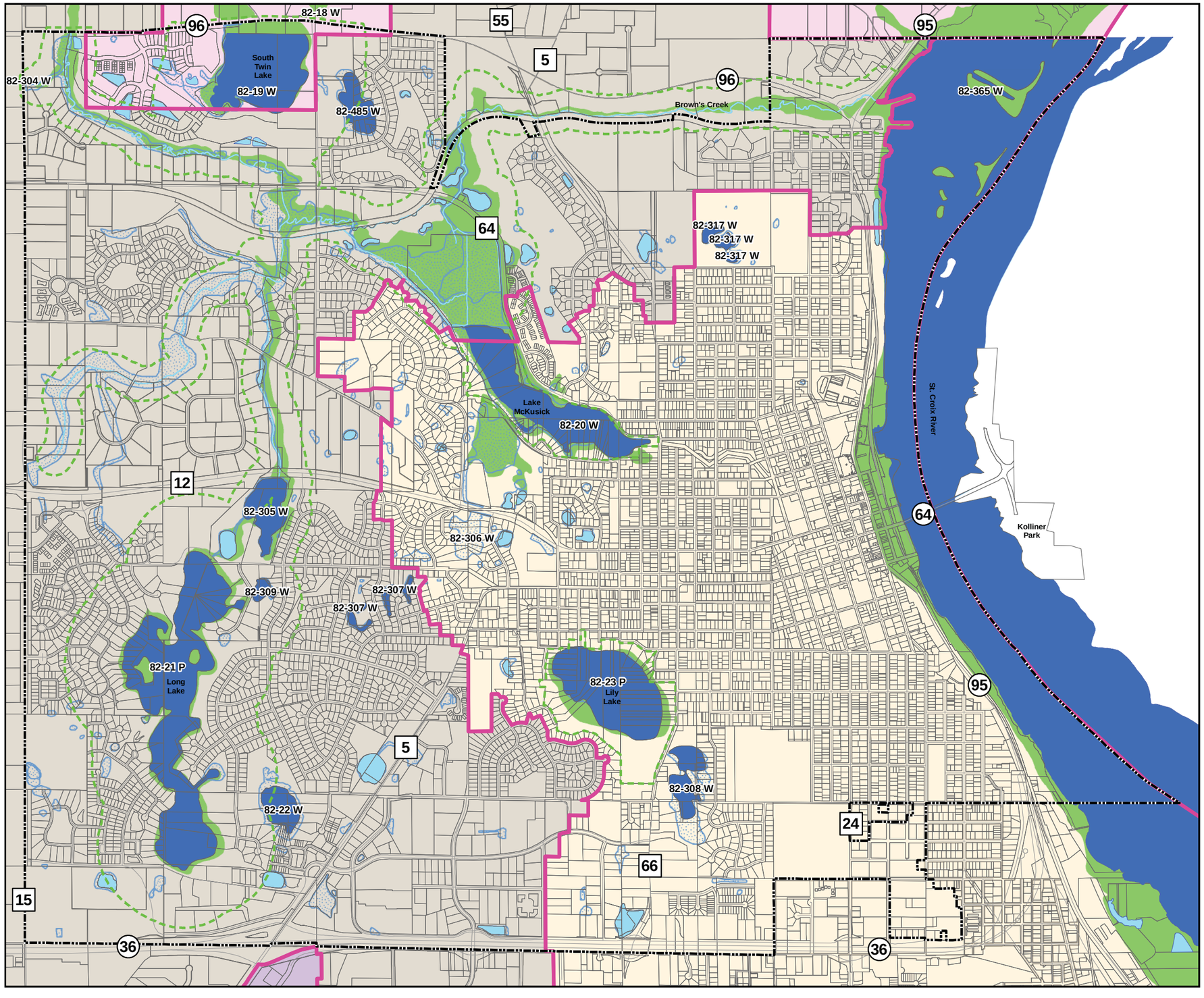
The city conducted a detailed wetland inventory in 2006. It included wetlands located within the three different watershed organizations or watershed districts within the city. These included Brown's Creek Watershed District (BCWD), the Middle St Croix Watershed Management Organization (MSCWMO), and Carnelian-Marine-St. Croix Watershed District (CMSCWD). The assessment focused on NWI wetlands which had not previously been checked by the watershed organization in which they occur. The exception was wetlands within golf courses which were either converted to water hazards or which appeared to be filled, and sites which were clearly storm ponds and removed from the inventory by city staff. These wetlands were then field verified and assessments were conducted on each wetland. Qualitative rankings were given based on criteria established by MnRAM and stormwater susceptibility. Wetlands were then assigned to different management classes according to the criteria for the governing watershed to establish rules for wetland protection and management based on the functions and values provided by each wetland. A map of the wetlands and their rankings is seen on Figure 3.5.

Floodplains are regulated by the city's Floodplain Overlay District to control development in flood prone areas and minimize losses. The Federal Emergency Management Agency (FEMA) administers the Federal Insurance Rate Maps (FIRM) for jurisdictions. The current FIRM maps were issued in 1982/84. These maps determine boundaries for purposes of flood insurance. These could vary from the 100 year or 500 year flood boundaries as determined by local watersheds. FEMA expects to release updated FIRM maps for Washington County in the near future.

Groundwater

Three main bedrock aquifer units are found in the Stillwater area. The uppermost bedrock aquifer is the Prairie du Chien-Jordan aquifer. This aquifer is comprised of the Prairie du Chien dolomite overlying the Jordan sandstone. High capacity wells are typically open to the Jordan formation, since the Jordan sandstone represents the portion of the aquifer with the highest permeability. Yields from Jordan wells typically range from 1000-2000 gpm per well. The next aquifer in the stratigraphic sequence is the Franconia-Ironton-Galesville (FIG) bedrock aquifer. Yields from the FIG aquifer are typically under 1000gpm per well, but may be much lower in the Stillwater area. The highly variable nature of this aquifer across the metro area makes performance hard to determine without site-specific aquifer pumping data. Performance of the FIG aquifer in the eastern metro tends to be somewhat less than seen in areas of the northwest and southwest metro. The lowest bedrock aquifer unit, which underlies the FIG aquifer, is the Mt. Simon bedrock aquifer. The Mt. Simon aquifer can yield water supply in the range of 700-1500gpm per well. At present, the Minnesota DNR is restricting the development of new wells in the Mt. Simon aquifer in the seven county metro area, in order to prevent excessive withdrawals from this aquifer. The deep setting of this aquifer in the Twin Cities means that recharge to the aquifer is often slower than seen in shallower aquifers, such as the Jordan aquifer. Wells, if over-pumped, can often exceed the ability of the aquifer to become recharged, causing widespread drawdown of water levels within the aquifer. Cities that already have wells open to the Mt. Simon aquifer (such as Stillwater Well No. 1) are allowed to continue use of those wells, though they may not be allowed any increases in appropriations from those wells.

Figure 3.4 : Water Resources



Stillwater
THE BIRTHPLACE OF MINNESOTA

Water Resources

2008 Comprehensive Plan

N W E S

800 0 800 1,600 Feet

- Brown's Creek and Tributary
- 2030 City Limit
- Shoreland District Boundary
- DNR Public Water
- Other Open Water
- Wetland
- 100-Year Floodplain*
- Brown's Creek Watershed District
- Carnelian-Marine-St. Croix Watershed District
- Middle St. Croix Watershed District
- Valley Branch Watershed District

*Note: The 100-Year Floodplain is based on the 1982/84 FEMA FIRM.

Bonestroo

June 30, 2009

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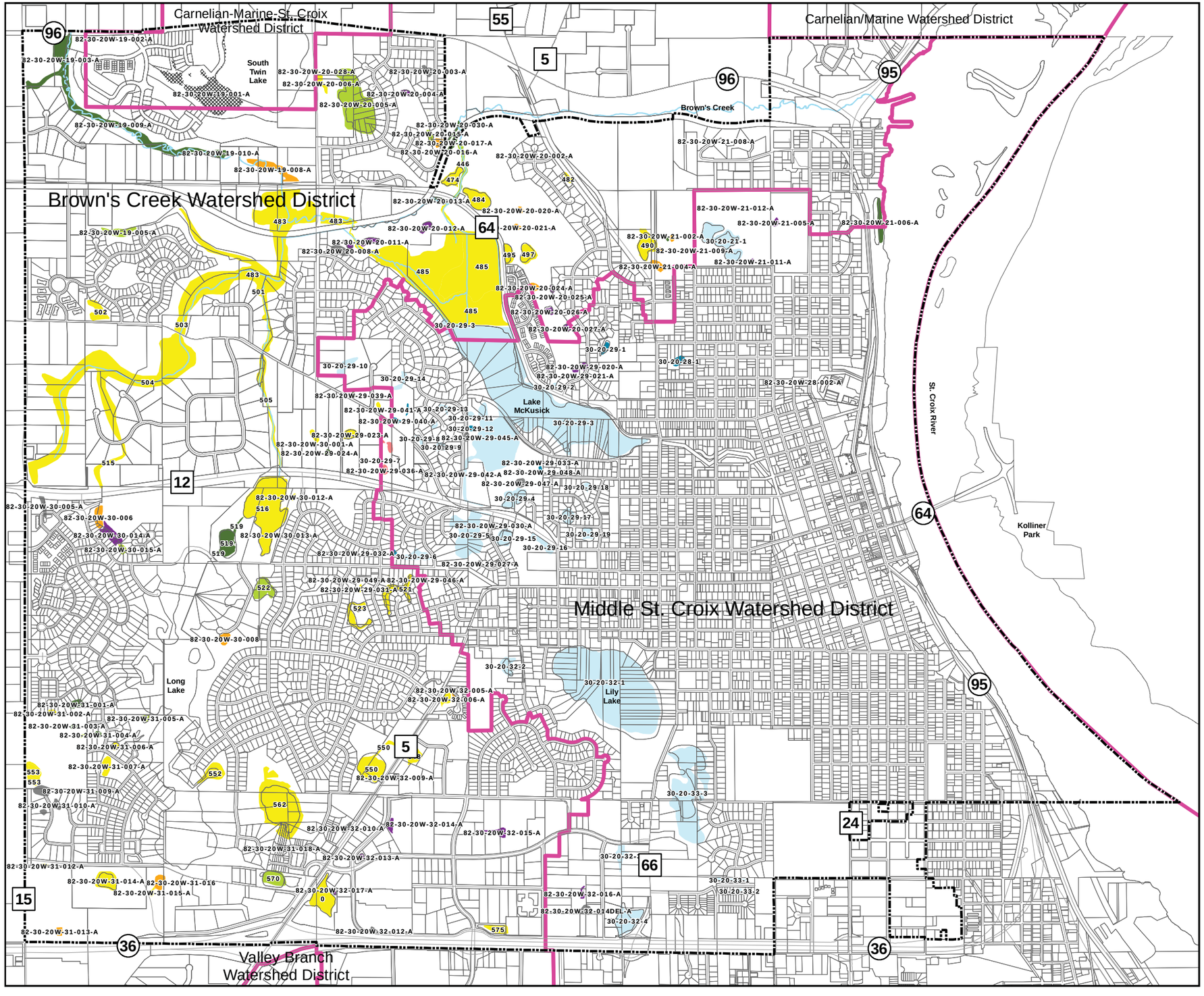
Figure 3.5 : Wetlands



Water Resources - Wetlands

2008 Comprehensive Plan

N W E S

800 0 800 1,600 Feet

- Brown's Creek and Tributary
- 2030 City Limit
- Watershed District Boundaries
- Preserve
- Manage 1
- Manage 2
- Manage 3
- A Preserve
- B Maintain
- C Manage
- Storm Pond / Golf Course
- Pending (Yet to be Classified)
- Drained / Filled / Non-Wetland
- No Access

Bonestroo

June 30, 2009

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Besides the bedrock aquifers, shallow drift aquifers are present within portions of the Stillwater area. Sample well logs from the Stillwater area show the drift aquifer does not appear to be fully saturated in all locations. Potential yields from drift aquifer wells may be sufficient for small capacity private wells, but would likely not be sufficient to support high capacity municipal wells.

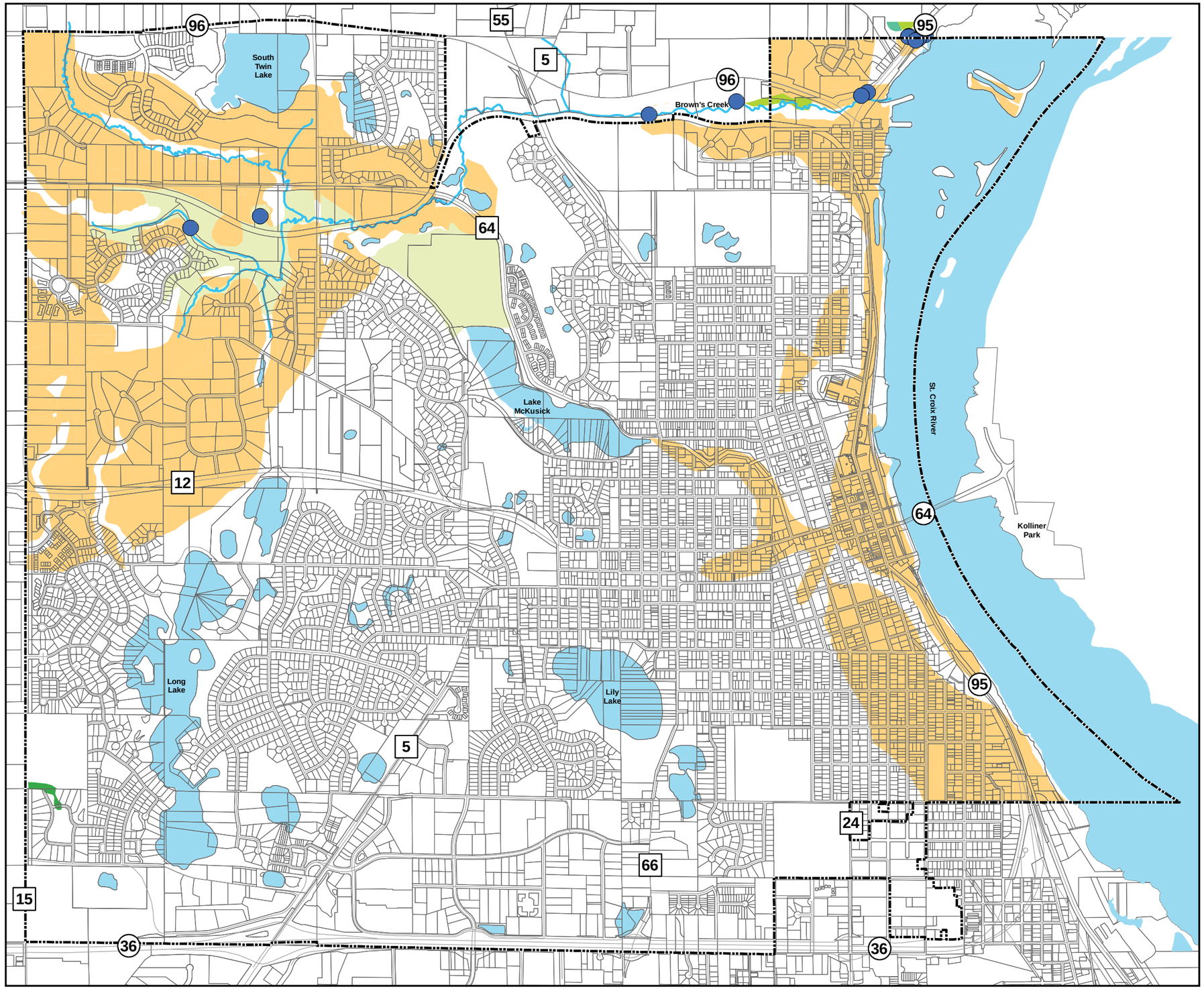
Management of groundwater in the Stillwater area should be focused on prevention of human-caused contamination from spoiling future water supplies. Figure 3.6 displays Sensitive Groundwater Resource areas including sensitive recharge areas. Care should be taken around wetlands, fens, and other natural features that recharge the groundwater. The Jordan aquifer is heavily relied upon to supply the municipal water supply wells. As such, this aquifer should be the focus of efforts to prevent impacts from contamination. The Jordan aquifer is considered to be relatively high in vulnerability and therefore is likely to become contaminated if spills or leaks go unchecked. The vulnerability of the Jordan aquifer is witnessed by widespread contamination in the Baytown area, south of Stillwater. While this contamination is unlikely to impact Stillwater's wells, it demonstrates that a single point source can be responsible for contaminating large areas of the Jordan aquifer.

At present, the City of Stillwater is developing part two of their Wellhead Protection Plan in order to manage potential sources of contamination. As future wells are added to the city's water supply system, the Wellhead Protection Plan will need to be expanded to encompass the areas that supply these wells. A side benefit of Wellhead Protection Planning is that it raises awareness in the community of the importance of groundwater protection in general. Overall efforts to protect the city's water supply wells should also result in greater protection to the aquifers that supply the area's private wells.

Also, any efforts to expand the well field and/or increase the appropriations from the current municipal wells will require working in cooperation with the DNR to ensure that the impacts to the aquifer fall within acceptable levels. While the Jordan aquifer is thought to be highly productive in the Stillwater area, excessive withdrawals from the aquifer might impact sensitive natural resources that rely on groundwater. One example is the Brown's Creek trout stream, which runs through the Stillwater area. This trout stream is dependent on groundwater discharge to maintain flows and temperatures ideal for trout habitat. Overuse of the Jordan aquifer in areas near the stream could compromise stream quality and diminish remaining trout habitat.

Washington County has adopted a groundwater plan that provides a county-wide framework for the protection and conservation of groundwater resources. While the County's plan is not specifically being adopted by reference, it is generally supported by the City.

Figure 3.6 : Groundwater Sensitive Resources



Groundwater Sensitive Resources

2008 Comprehensive Plan

N
W E
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800 0 800 1,600 Feet

- 2030 City Limit
- Springs
- Groundwater Dependent Stream
- Shrub Fen
- Black Ash Swamp Seepage Subtype
- Mixed Hardwood Seepage Swamp
- Mixed Hardwood Swamp - Seasonally Flooded
- Sensitive Recharge Areas
- Open Water

Bonestroo

October 14, 2008

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Natural Areas Protection Resources and Techniques

As demonstrated above, Stillwater is home to many high value natural resources. As the city grows, protection of these resources is critical. There are a variety of tools and strategies available to the city to manage and protect its natural resources, which are discussed below.

Sustainability
Sustainability refers to the concept of using practices and strategies on the land that can be maintained over time without damaging the environment; the intent is to balance near-term interests with the protection of the interests of future generations, to maintain and potentially improve environmental quality. Sustainability can be achieved through a variety of strategies, each using natural resources preservation as the guiding principle, while still allowing use of the land.

Low Impact Development
LID is a sustainable stormwater management strategy that focuses on managing stormwater locally, using features such as swales, green roofs, constructed wetlands, pervious pavement, and rainwater gardens to infiltrate runoff, rather than relying solely on a system of pipes and stormponds. It has significant water quality benefits and can effectively manage small to moderate rainfall events, depending on the LID design. Adding a LID ordinance to city code could benefit water resources.

Conservation Design Subdivisions
Conservation Design Subdivision is the practice of designing subdivisions to minimize their impact to the environment by using LID strategies, and thoughtful siting of homes and infrastructure to maintain the ecological integrity and function of the landscape. Once a parcel evaluation has been completed to identify areas suitable for low-impact development, subdivisions are designed to allow for more compact development or clustering of homes in smaller areas and retain larger areas of common, open space. If thoughtfully implemented, Conservation Design can foster a sense of neighborhood and community that is sometimes lost in large lot developments, and it is an effective choice for maintaining natural resource quality while allowing development. For example, in Conservation Design quality forest areas would be left largely intact, and construction activities would occur in semi-natural areas or former agricultural lands. This strategy is appropriate in areas with remnant natural areas, and is especially important for developing and maintaining connections in the Greenway Corridors.

Park Dedication Ordinance
A Park Dedication ordinance can be an effective strategy for developing and maintaining a parks and open space system within the city. The ordinance acknowledges the value that parks and open space provide for area residents, and requires that any new development include a specified area of parks and/or open space within it. In lieu of land, a specified fee may be required instead, either based on the total area of land or on the number of proposed units. Fees would then be assigned to a dedicated parks fund, and used for the permanent acquisition and development of parks. This can be a very effective tool for developing resources for parks, and allows the city flexibility in determining how and where parks are created. For example, if a proposed development is not impacting any significant natural areas and is not within an identified greenway corridor or open space, the park dedication fee may allow the city to acquire areas that help achieve the goal of developing an open-space system. Similarly, for developments proposed within the open space system, natural areas or restorable areas within the system could be required as set-aside for parks and open space.

Greenway Corridor

A greenway is defined as a *"privately or publicly owned corridor of open space which often follows natural land or water features and which is primarily managed to protect and enhance natural resources"*. However, greenways can and often do incorporate active or passive recreational trails, active recreational spaces (such as athletic fields or golf courses), and other public open spaces that may provide rudimentary ecological functions and values.

The Minnesota DNR has identified a regional greenway corridor within Stillwater as part of the Metro Wildlife Corridors project. The corridor is located along the St. Croix River and Brown's Creek. This corridor is specifically designed to incorporate high quality natural areas, existing protected and/or public open space areas such as the Wildlife Management Areas, natural corridors such as stream courses, and connecting areas between these features. The corridors are identified in the "Natural Resource Features and Corridors" map.

If gaps and missing connections within the greenway can be filled, the greenway corridor will provide a critical foundation to help the ecological systems of Stillwater and the region adapt to changing land uses and long-term, to the pressures brought by global climate change.

In reviewing the map of Natural Resource Features and Corridors, it should be noted that the Metro Wildlife Corridor is drawn at a coarse scale, and is based on data from the Mn DNR County Biological Survey completed in the late 1980's. This pre-dates the recently completed Minnesota Land Cover Mapping System data for the city. To further refine the planning process for prioritizing natural areas, the city may want to consider developing city-wide greenways that incorporate local values and priorities as well as consider high value/sensitive resource areas.

". . . A Greenways Corridor system would form the backbone for natural resources conservation within the city, and has implications for natural resources conservation across the region. . . "

A Greenways Corridor system would form the backbone for natural resources conservation within the city, and has implications for natural resources conservation across the region. Developing strategies to maintain and develop connectivity between natural and semi-natural areas within this system is fundamental to preserving an ecological system that is resilient to change over the long term, in the face of changing demands, development, and climate change.

As much as possible, development within the greenway—whether city greenway or DNR Metro Wildlife Corridor-- should use conservation design strategies, park dedication, and the strategic siting of open space and natural area parks to develop and improve habitat quality and connectivity within the greenways. Strategies to avoid parcelization and fragmentation of existing natural areas into smaller sections are especially important for maintaining ecological function of the natural areas. This protection will be further supported with the use of the Multi-Purpose Greenway Corridor and the creation of subsequent zoning protection as discussed in the Land Use Chapter.

As a reference, South Twin Lake is a headwater to the Silver Creek Corridor. This corridor is managed by the Carnelian-Marine-St. Croix Watershed District pursuant to the Silver Creek Corridor Management Plan.

Shoreland Ordinance
The city has a Shoreland Management Overlay District to protect the quality of its lakes and streams. The purpose of the ordinance is to:

- regulate the size of a building lot;
- the length of water frontage suitable for building sites;
- the alteration of shorelands of public waters;
- control alterations of the natural vegetation and the natural topography along shorelands, conserve and develop natural resources; and to
- maintain a high environmental quality.

Further details can be found in the Sec. 31-402 of the city code.

Parcel Evaluation
Parcel evaluation is a useful strategy for identifying areas where methods such as cluster development or Conservation Design subdivision may be appropriate as a way of protecting priority natural resources. One potential approach is to identify parcels with development or redevelopment potential above a specified size threshold (for example, 10 acres) and determine which of these parcels intersect with priority natural resource features. An additional level of planning would be to consider these factors and overlay them with the DNR identified greenway corridors. This may facilitate planning by allowing the city to focus conservation strategies within a defined area (the greenway corridors).

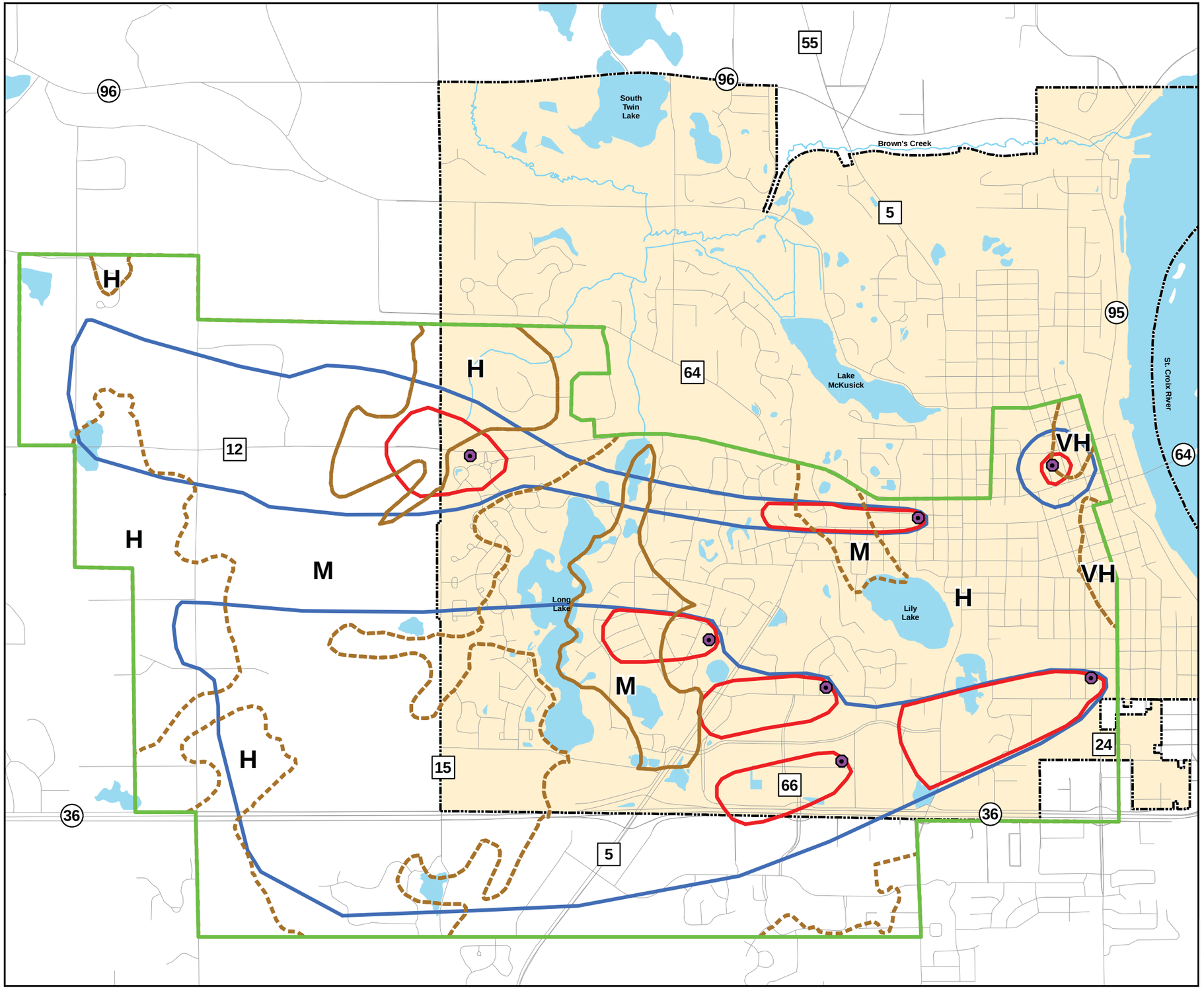
Wellhead Protection Plan
The City of Stillwater's Part 1 Wellhead Protection Plan (WHPP) was approved by the Minnesota Department of Health on September 28, 2006. It is made a part of this chapter by reference and the WHPP delineation map is included as Figure 3.7. The city is currently in the process of completing their Part 2 WHPP, which is due by April 30, 2009. The WHPP covers the seven primary water supply wells (Well Nos. 1, 5, 6, 8, 9, 10, and 11) currently online and serving the city's water supply system. All wells obtain their water from the Jordan sandstone aquifer, with Well No. 1 also open to the Franconia-Ironton-Galesville and Mt. Simon aquifer units. The Jordan aquifer that underlies the identified Drinking Water Supply Management Area (DWSMA) for the seven wells was ranked as being "vulnerable" to contamination. That means there does not appear to be sufficient geologic protection between the land surface and the Jordan aquifer to impede vertical infiltration of contaminants into that aquifer. While some areas of low permeability soil or sediment may be present, they are not present in sufficient thickness or aerial extent to warrant a non-vulnerable ranking. Management efforts to be outlined in the Part 2 WHPP will be aimed at managing all potential sources of contamination that could impact the aquifer, including storage tanks, other wells, septic system, hazardous waste generators, row crop agriculture, and any other point or non-point pollution sources.

As the City of Stillwater's water supply system expands to include more wells, the WHPP will need to be updated in order to delineate DWSMAs for those new wells, assess aquifer vulnerability for those new DWSMAs, and develop management strategies to protect the aquifer(s) feeding the city's wells.

Wetland Protection
The city's 2008 Surface Water Management Plan (SWMP) provides guidelines for wetland management and protection from stormwater runoff.

Table 6.8 in the 2008 SWMP compares the rules from the three watersheds with current city ordinances. Although most of the watersheds regulate bounce and phosphorus levels and have buffer rules, there are gaps between the watersheds and within the city that can be filled to maintain consistency within the city. The SWMP details this in Section 6.5.5.

Figure 3.7 : Wellhead Protection Areas



Drinking Water Supply Management Area (DWSMA) MN-00398 10 Year Time of Travel

2008 Comprehensive Plan

N W E S

2,000 0 2,000 Feet

- Primary Public Water Supply Well
- VH = Very High Vulnerability
- H = High Vulnerability
- M = Moderate Vulnerability
- DWSMA
- DWSMA Vulnerability Boundary
- Emergency Response Area
- Wellhead Protection Area (WHPA)
- 2030 City Limit
- Open Water
- Inside City of Stillwater

Bonestroo

June 26, 2009

I:/510/51007001/gis/maps/dwsma.mxd

Natural Resource Inventory
The MLCCS Data provides the city with extensive data related to the location and quality of natural resources in the city. The city can use this information as a basis for updating its current environmental ordinances as necessary, or for developing new approaches for protecting and enhancing its natural resources.

Future growth, changes in land use, and development of infrastructure can impact the health and function of natural communities and natural systems. The city can use its zoning and subdivision controls to avoid or minimize these impacts, and provide incentives for developers and landowners to protect or restore natural resources.

Education and Outreach
The City of Stillwater should consider pursuing education and outreach opportunities for its residents to increase awareness of Stillwater's natural resources and the importance of resource protection.

Intergovernmental coordination
Intergovernmental coordination is critical for optimal ecological function, as natural resource areas typically cross jurisdictional boundaries and because the actions of one community often impact a much larger ecosystem encompassing many surrounding communities. Coordination with other jurisdictions, including neighboring communities and appropriate watershed districts, provides opportunity for shared financial resources, as collaborative, cross-jurisdictional efforts often have better grant eligibility for conservation and planning projects.

Recommendations for City Code Revisions for Natural Resource Protection

Based on the discussion of Stillwater's natural resources and strategies for resource protection included in this Chapter, several potential revisions for Stillwater's city code are suggested. These revisions are listed below.

Include Natural Resource Data in Preliminary Plat
The city could require project proposers to identify all natural resource data from the NRI as part of the data submission for a project. This data could then be used to identify any necessary setbacks or alignments of potential greenway corridors.

Include Dedication of Natural Resources Areas as Parkland
The city could consider ordinance amendments to require developers to dedicate the natural resource areas identified on the NRI maps as open space or parks if they are located within the proposed development area. Dedication of these areas may offset at least a portion of the parkland dedication requirement. Conservation easements are another tool that can be used to protect these resources.

If the size of the natural resource area contained on the site is greater than the land dedication required by ordinance, the city could allow additional density on other portions of the site that do not contain natural resource areas equivalent to the density lost from the additional dedication.

The city may also consider adding language to the park dedication ordinance that specifically states park dedication funds may be used for the purposes of ecological restoration (restoring native plant communities) on lands available to the public. Such activities could be considered a form of park "development". This would allow for necessary active management of purchased or existing natural areas.

Consider Gross Density Calculation for Developments with Natural Resource Areas
Protection of valuable natural areas may require preventing development on certain pieces of land. In order to ensure efficient urban development and preserve the rights of landowners while protecting natural resources, density transfers or "gross density" calculations should be preferred when reviewing subdivision development plans.

The city could adopt regulations that require that all high-value natural areas, wetlands, steep slopes, their related buffers and setbacks, and other sensitive resources be put under easement while allowing the same amount of density overall for the development.

Environmental Protection Overlay Zone
Overlay districts are commonly used in zoning ordinances to identify special areas and requirements applied to these areas. The Stillwater code includes a Shoreland overlay district, a St. Croix overlay district and a Floodplain overlay district.

The Minnesota Environmental Quality Board has suggested an option of using a broader overlay district called a Sensitive Natural Environment Areas overlay district for protecting and conserving significant natural resources in the community. This overlay district can provide protection for a full range of natural community types—woodlands, prairies, wetlands, and shorelands. It could reduce the need for separate park dedication, or buffer protection elements discussed. The areas may also include natural resource corridors or greenways identified in the community.

The adoption of an environmental protection zone overlay ordinance requires that the community's resources have been inventoried. Stillwater's Natural Resource Inventory and MLCCS data meets this need. In some cases, two zones are established—Environmental Protection Zones with the highest level of protection for high quality resources, and Environmental Conservation Zones

for resources of somewhat lower quality that require a lower standard of protection. The protection zone or zones would be mapped on official city zoning maps, just as the Shoreland and Floodplain overlay zones are mapped.

The environmental protection zone ordinance then provides requirements or standards for development within these zones. Such requirements may include the following:

- Setbacks or buffers from the edge of the sensitive area
- Construction management practices to limit disturbance or damage
- Limits to vegetation removal
- Prohibition or limitation of development within the zones by regulating disturbance, lot sizes, densities, etc.
- Limit to impervious surface coverage

Given the number and diversity of high quality natural areas identified in the city's Natural Resource Inventory, an overlay ordinance of this type offers a way to provide protection to this range of resources rather than using multiple ordinances to address woodlands, wetlands, and other types of natural resources.

Other Tools for Protection and Management of Natural Areas

Ordinances are mainly a regulatory approach for protecting and managing natural resources. They can also provide incentives to natural resources protection. Many communities use a combination of regulations and incentives in protecting and managing natural resources. The regulatory approach assures that some priority resources will be protected, but is limited by laws that prohibit the "taking" of private property without adequate compensation. The incentive approach may be more politically acceptable in some cases than the regulatory approach, and may be more viable when potential "taking" is an issue.

In addition to changes in existing ordinances or adoption of new ordinances, the city can consider encouraging city residents to protect the natural resources on their properties by:

- Providing information and education to homeowners about the special features on their properties. Many landowners will take great pride in knowing that they have something special on their land, and will be eager to learn about how best to manage it.
- Informing property owners about options to donate their land as parks and open space, or protect it with a conservation easement. For some property owners, donation of land or easements provide financial and tax benefits.
- Identifying grants or other public programs that provide financial or educational benefits to owners of natural areas.
- Working with developers or property owners to encourage design strategies that protect and improve the quality of resources.
- The DNR Website (http://files.dnr.state.mn.us/assistance/landprot.pdf) contains the resource Land Protection Options, a Handbook for Minnesota Landowners. This is an outstanding tool to help individual landowners better understand their options, and also for city staff as a resource to help positively engage interested property owners.
- Another important resource for private landowners is the publication Beyond the Suburbs: A Landowner's Guide to Conservation Management. This resource can also be found on the MN DNR website at: http://files.dnr.state.mn.us/forestry/beyond_suburbs.pdf
- The city can also continue to set a good example for other landowners by protecting or restoring natural areas on city-owned properties, and by developing interpretive and educational opportunities.
- In addition, there is a variety of funding options available to assist with implementation of these and/or other activities. These include the existing park dedication fee, bond referendums, and grant opportunities.

Implementation

To implement the natural resource plan, the city will consider the following implementation measures:

In order to create or augment natural resource open space systems the City of Stillwater will consider:

- Preparing and adopting an official greenway corridor plan and supporting Sensitive Natural Environment Areas overlay district.
- Maintaining an inventory of all ravines and remnant lands in the existing city and developing a policy regarding ravine management that balances ravine usage amongst natural resource protection, public utility and open space/recreation opportunities. (program 1)
- Reviewing ownership of ravines and remnant land and obtaining control over such lands through fee ownership, open space easement, utility easement or resource protection regulations. (program 2)

To use the natural resource open space system to connect open spaces, parks, activity centers and neighborhoods the City of Stillwater will consider:

- Requiring natural resources information in all preliminary plats. (program 5)
- Requiring dedication of the natural resource areas identified on the NRI maps as open space or parks if they are located within the proposed development area. (program 5)
- Identifying key scenic roadways and corridors. (program 4)
- Ensuring open space resources areas including sensitive natural resource areas are indentified and incorporated into development design. (program 5)

To protect and enhance the St. Croix River as a natural open space system and recreation resource the City of Stillwater will consider:

- Improving public access to the river.

To provide opportunities for enjoyment of natural resources within all areas of the community the City of Stillwater will consider:

- Developing environmental education programs in natural areas to study plan and animal communities. (program 3)
- Providing education and resources to homeowners on what they can to on their property to protect natural resources. (program 3)