Chapter 2

CREEK HISTORY, BACKGROUND & EVOLUTION

This chapter will provide an overview of the history of Minnehaha Creek through the following lenses:

- Cultural and Historical Context, including the history of pre-contact and post-European settlement, urban development and the development of structures surrounding the Creek, and the history of racial covenants in the area
- Natural Resources Impact Over Time, including an overview of pre-settlement plant communities, the evolution of relationships connecting water resources, urbanization, establishment of the Minnehaha Creek Watershed District (MCWD)
- Infrastructure as it relates to water resources, including current flood modeling and mitigation studies

CULTURAL AND HISTORICAL CONTEXT

This section provides an overview of park area history, including cultural resources that have been identified within the bounds of Minnehaha Parkway Regional Trail, located in Minneapolis, Hennepin County, Minnesota. Additional information about cultural resources within and adjacent to Minnehaha Creek and Minnehaha Parkway can be found in Chapter 7, including applicable legislative requirements regarding cultural resource preservation and an overview of previous cultural resources investigations in the vicinity. The cultural resources of the area and the stories they evoke informed the interpretive theme and subthemes (see Chapter 6: Interpretive Plan) as a way of engaging visitors and enhancing their experience along the Minnehaha Parkway Regional Trail.

OVERVIEW OF AREA HISTORY

The lakes, rivers, and topography of Minneapolis are a result of the movement of glaciers during a series of ice ages thousands of years ago. The Mississippi River once flowed through present-day South Minneapolis. The river was diverted eastward to its present course because of a glacial advance (growth) at some time before 35,000 BCE, leaving behind what we now call the Chain of Lakes and Minnehaha Creek. The Minnehaha Parkway Regional Trail area has a long American Indian history, followed by industrial and recreational use tied to the development of Minneapolis and St. Paul. Present-day Minnehaha Parkway was planned around and along Minnehaha Creek as part of the City of Minneapolis's comprehensive park system as early as 1889.

Eastman Painting of a Dakota settlement (Source: Minneapolis Institute of Arts)

Eastman Painting of Minnehaha Falls (Source: Minnesota Historical Society)

PRE-CONTACT AND CONTACT HISTORY

For thousands of years prior to the arrival of Europeans, ancestors of the Siouan people (including the Missouria, Otoe, Iowa, and Dakota) were living on the land that would later become known as Minnesota. They were comprised of mobile, compact bands of hunter-gatherers about 12,000 years ago, and denser settlements proficient in ceramic manufacturing and corn-based horticulture by the 400s CE into the late 1700s. American Indians in what is now south-central Minnesota demonstrated resiliency and a complex understanding of the ecological and social environments in which they lived. The earliest Euro-Americans in the land that was to become Minnesota were French missionaries and fur traders during the mid-to-late 1600s, followed by British, and later American, traders and explorers in the 1700s and 1800s. Within 200 years of arrival, Euro-Americans dramatically altered the environment and social landscape through the fur trade, warfare, settlement, and treaties. They also forced American Indians to find new ways to adapt to an increasingly altered homeland. During the mid-1600s, the westward expansion of the fur trade and a growing European presence, as well as conflict between tribes resulted in the migration of the Ioway and Otoe south and west into Iowa and Nebraska. During this time, the Dakota more permanently settled in the area, due in part to the establishment of the Ojibwe in north and central Minnesota, and maintained a strong presence until treaties, war, disease, and forced removal diminished their numbers in the 1850s and 1860s.

Most Dakota people were forced out of their homelands of the Mni Sota region during and following the US-Dakota War of 1862, or were forced to live at the concentration camp built at Fort Snelling. Today, approximately 4,000 Dakota people live in Minnesota, with only an estimated 8 fluent speakers remaining. After generations of systemic oppression and government assimilation policies, Dakota language and culture are now being recognized and uplifted by grassroots organizations in an effort preserve and revitalize this culture. (Dakota Wicohan)

This area surrounding the Minnesota River continues to be considered sacred land to Dakota people, especially the land and water at the confluence of the Mississippi River and the Minnesota River (Bdote). Today, there are four federally-recognized Dakota tribal oyate (nations) that exist within Minnesota: the Shakopee Mdewakanton, Prairie Island Indian Community, Upper Sioux Community and the Lower Sioux Indian Community. As a testament to the resiliency of the Dakota people, tribal leaders and members from these nations, as well as nations that exist in surrounding states of North Dakota, South Dakota, Iowa, Wisconsin, as well as tribal leaders in nations in Canada, return to Minnesota to participate in cultural events and decisions regarding the Dakota community. (Minnesota Historical Society)

EUROPEAN SETTLEMENT

In 1822, 17-year old Joseph Renshaw Brown journeyed from Minnehaha Falls, located in present-day Minnehaha Regional Park, in search of its unknown western terminus; this was the first documented voyage along the entire Minnehaha Creek. Brown was a fifer and drummer boy with the U.S. Army at Fort Snelling. He was accompanied by William J. Snelling, son of Colonel Josiah Snelling, and two other soldiers from the Fort. Snelling turned back early, while Brown successfully reached the creek's source at Gray's Bay (present-day Lake Minnetonka). Following Brown's initial journey, Euro-American settlers and visitors alike were drawn to the Minnehaha Creek area. They traveled from Fort Snelling via a wagon trail along Minnehaha Creek to reach the Lake District (present-day Chain of Lakes). Brown subsequently made the first land claim in Hennepin County where Minnehaha Creek reaches the Mississippi River, and built the first cabin along the creek. He also drafted the bill that created the Minnesota Territory, introduced in 1846. Subsequently, the creek was known as Brown's Creek, Brown's River, Joe Brown's Creek, Cascade Creek, Little River, or Little Falls Creek. The name "Minnehaha" comes from the Dakota words mni (water) and gaga (falling or curling), and was used in reference to Minnehaha Falls. The name was popularized in the 1855 poem by Henry Wadsworth Longfellow titled "Song of Hiawatha."

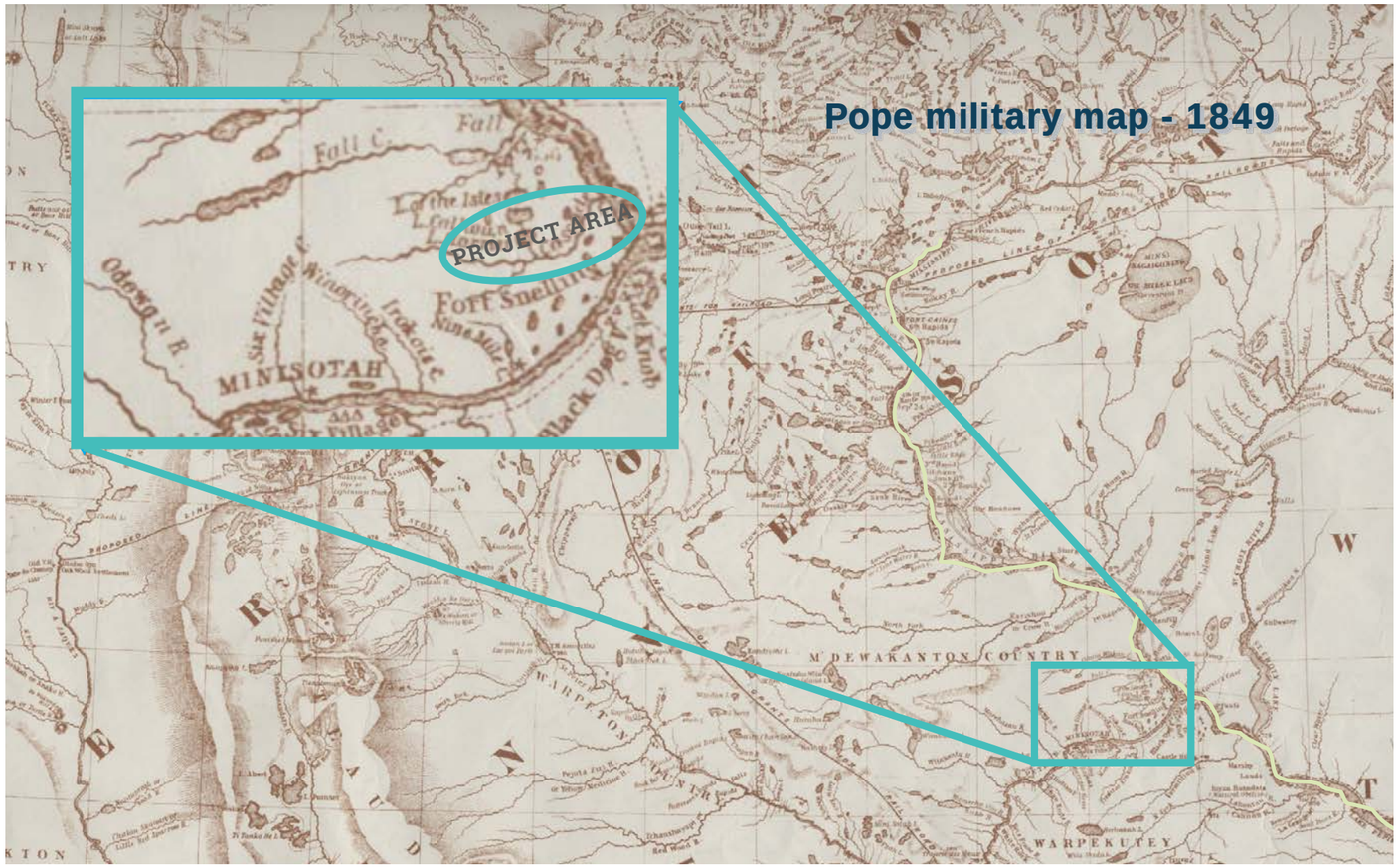


Figure 2.1 The 1849 Pope Military Map labels Minnehaha Creek "Cascade Creek"

MILLING HISTORY

By the mid-1800s, Minnehaha Creek supported a burgeoning flour-milling industry. Between 1855 and 1874, there were at least six flour mills in operation along the creek. At the east end, near Minnehaha Falls, Ard Godfrey built a sawmill in 1853 and a gristmill in 1857. The sawmill burned down in 1864 while the gristmill passed through several owners before being destroyed by fire in 1887. A second flour mill, known originally as the Richland Mill, colloquially as the Old Red Mill, and later as the Richfield Mills, was located to the southeast of Lake Harriet along Minnehaha Creek. The Richland Mill was likely demolished between 1886 and 1892. At least four more mills were located farther west along the creek. The Minnehaha Creek mills were typical 1800s flour mills, constructed of heavy timber and multi-storied to accommodate the vertical flow of the milling process. They made efficient use of their space and used wooden, overshot water wheels to harness water power from the creek. The flour mills contributed to the formation of centers of business and townships in the early years of the Minnesota Territory. For example, because the Richland Mill brought farmers together to process their wheat, the post office was established nearby. After Minnesota became a state in 1858, the government center for Richfield Township was established just south of the mill at present-day West 53rd Street and Lyndale Avenue. This area became the business, social, and political center of the township, which led to the construction of several stores, a school, and two churches as well. In 1897, Hennepin County built a wooden weir at the outlet of Lake Minnetonka and the headwaters of Minnehaha Creek, effectively bringing an end to the milling industry along the creek.

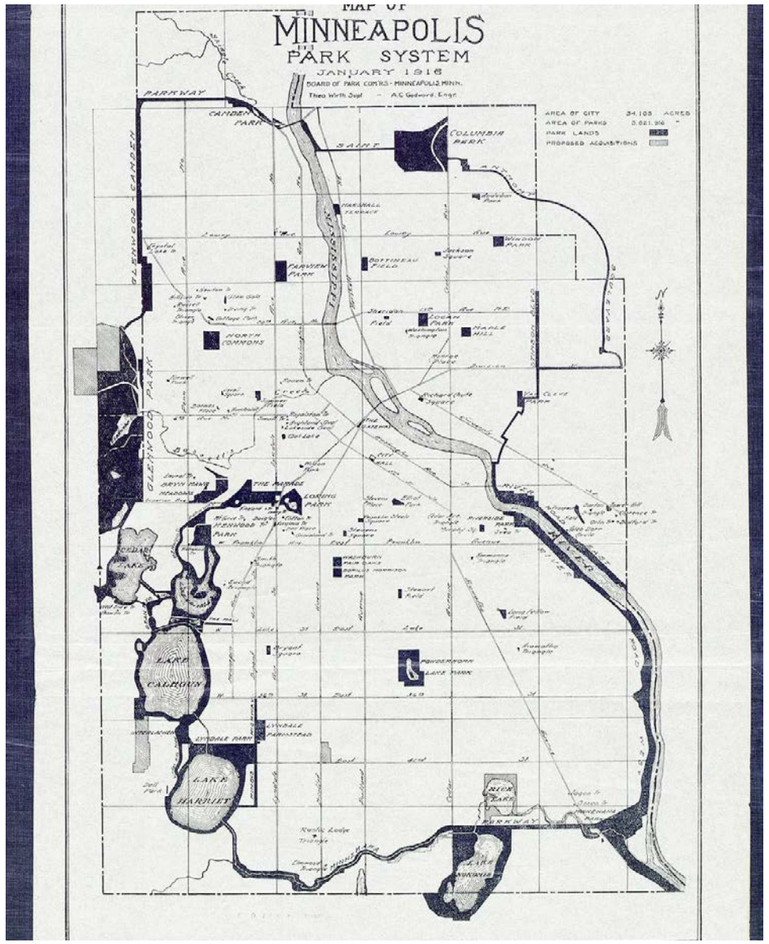
Godfrey Mills near Minnehaha Falls (Source: Minnesota Historical Society)

PARKWAY CREATION

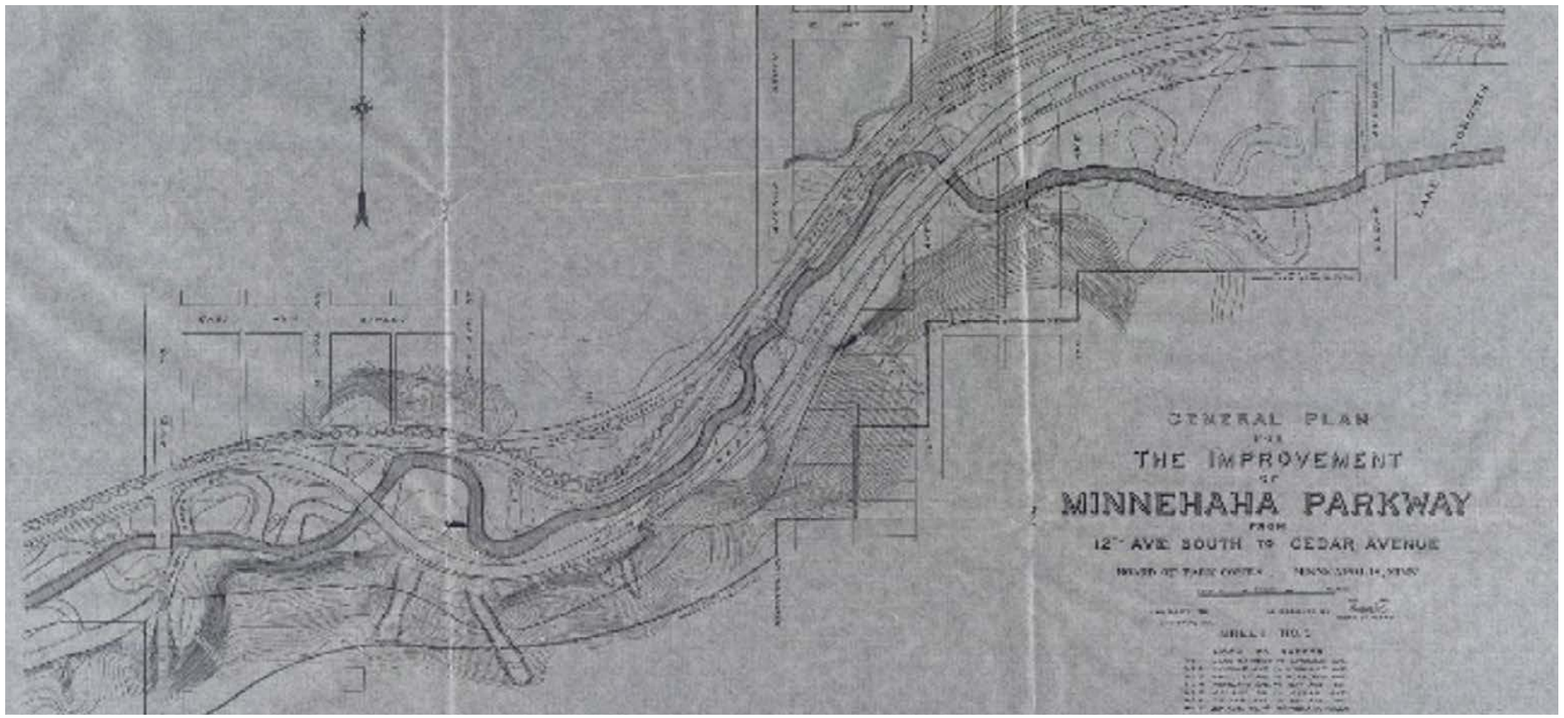
In 1883, shortly after the Board of Park Commissioners (BPC; now the Minneapolis Park and Recreation Board [MPRB]) was formed, it hired renowned landscape architect Horace William Shaler Cleveland to plan the city's comprehensive park system. Cleveland's plan was composed of a 20-mile loop of parkways to provide access to lakes and parks. His plan became known as the Grand Rounds. The park system was designed to highlight and connect Minneapolis' dramatic natural features, such as Minnehaha Falls, and picturesque landscapes. Cleveland's early maps of the park system depicted a continuous ribbon of recreational space. Minnehaha State Park (now called Minnehaha Regional Park), which is sited around Minnehaha Falls, was added to the municipal park system in 1889. This action hastened public interest in connecting the park with Lake Harriet and Bde Maka Ska (formerly Lake Calhoun) to the west. Consequently, private citizens donated land along a curved section of the creek between Lyndale Avenue on the east and 50th Street on the north to the BPC so that a road could be built along each side of the creek. The roadway was initially called Minnehaha Boulevard, and later became Minnehaha Parkway. Cleveland retained and incorporated the existing mature oak, maple, ash, and basswood trees along the land acquired for the Grand Rounds; he also introduced evergreen trees to enhance the winter landscape.

Establishment of the parkway as envisioned in 1889 continued through the end of the 1890s as the BPC purchased land and accepted subsequent donations from private property owners. In 1893, BPC President Charles Loring stated, "In securing land to complete the Minnehaha Parkway, and in building the drive from Lyndale Avenue to Minnehaha Park, you have opened for public use one of the most beautiful and useful parks in this or any other city. Its area of nearly 200 acres, stretching from the lakes to the beautiful falls of Minnehaha, contains the most picturesque and varied scenery of wooded hills, green meadows and running brook. It is a New England picture set in a prairie frame …You have saved it to be a promoter of health, a source of pleasure and recreation, and an educator of the children who will live on its borders, and enjoy the beautiful gifts of … these natural forests, meadows and streams to be within the limits of a great city."

Initially, the Grand Rounds allowed vehicular, pedestrian, and bicycle traffic. By 1907, the PBC converted the bicycle paths to bridle paths for horseback riding. The bridle paths were removed by the mid-1900s. Bicycles regained popularity in the 1960s, resulting in the construction of new bicycle paths throughout the Grand Rounds in the 1970s.



1916 Map of Minneapolis Parks (Source: MPRB)



1912 Map of Improvements to Minnehaha Parkway, including straightening the Creek (Source: MPRB)

When Theodore Wirth became superintendent of the parks system in 1906, he embarked on an ambitious plan to add additional parkway land and significantly improve the existing parks and parkways. Horse-drawn traffic gave way to automobile traffic, which led to paving the parkways and required more road maintenance. From 1922 to 1925, after some financial delays, the BPC widened and paved Minnehaha Parkway, which also became one of the first parkways to be illuminated with new electric lights. Curbs, gutters, and drainage systems were also added. Five concrete bridges were built along with sidewalks and winding footpaths. In the early 1920s, the BPC also straightened a section of the creek between Lake Nokomis and Lake Hiawatha to provide a more direct path, and in 1938, it straightened a sharp curve of Minnehaha Creek just west of Cedar Avenue to "improve water flow and reduce soil erosion". While these improvements may have produced desired results in the short-term at specific areas, soil erosion and increased flow of water have continued to pose issues in areas where these changes have been made. Wirth insisted that, despite these "corrections" to the course of the creek, great care was always taken to retain the natural landscape and "woodland atmosphere of the creek valley." Following these changes, the 1930s and 1940s also saw significant residential development along Minnehaha Parkway, which continued into the 1950s (see the Urban Development Around the Creek section that follows).

In the early 1970s, the MPRB made significant changes throughout the Grand Rounds, including narrowing roads, installing new walkways and bikeways, and updating benches, signs, and picnic tables. Along Minnehaha Parkway, trails were reoriented, several bridges were added and/or replaced, and roadways were modified. In particular, intersections were redesigned to maintain the continuity of the parkway system. Most of the signage along the parkway was added at this time. These changes were implemented to discourage commuter traffic, promote recreational driving, and create pathways that did not cross roadways.

Today, the Grand Rounds remains one of the oldest, largest, and most intact linear park systems in the country. The Grand Rounds consists of 50 miles of parkways and nearly 6,000 acres of associated parkland, including the six-mile Minnehaha Parkway segment. Minnehaha Parkway affords the driver, cyclist, or pedestrian varied views of Minnehaha Creek. The parkway and creek also connect many neighborhoods in south Minneapolis. Locals and tourists continue to be enamored by the setting of the creek, resulting in numerous artistic depictions and descriptive narratives.

BRIDGES

There are several pedestrian and vehicular bridges that cross Minnehaha Creek that were constructed as part of the development of the Grand Rounds. Since the parks system was established, some original timber bridges have been replaced with concrete and steel bridges. The vehicular bridges between Godfrey Parkway and Zenith Avenue South were built between 1902 and 2011. Some bridges feature stone facing and decorative details. Most of the vehicular bridges carry cross-streets over the creek, except for one vehicular bridge that carries the typically adjacent Minnehaha Parkway over the creek. The 1920s marked a significant period of bridge construction in which eight vehicular bridges were built around the same time as significant improvements were made to the parkway. Several bridges were also built or rebuilt in the 1970s and 1980s, along with other improvements along the Grand Rounds.

DAMS

During Wirth's tenure as superintendent of the parks from 1906 and 1935, four dams were constructed along Minnehaha Creek. These four dams were located near Lyndale Avenue, in the Washburn Park (Tangletown) area, downstream of Lake Nokomis (picture below) and downstream of Lake Hiawatha. There have been various dam structures in place at the headwaters of Minnehaha Creek which are discussed is the Lake Minnetonka Outlet Structures section that follows.

1880 Photograph of the Creek at Penn Ave (Source: MNHS)

WALLS

Throughout the Minnehaha Creek area, there are also stone and concrete walls where built to reinforce the creek's banks. Additionally, there are granite and limestone walls along the creek between Lyndale and Portland Avenues. In 1936, "eight hundred feet of rip-rap was installed at various points along the creek," in particular by 2nd, Stevens, and Luverne Avenues. Stone retaining walls were also built at 5th Avenue South in 1936-37; they were later modified by concrete walls in 1959. In 1960, a reinforced concrete wall was built near Pleasant Avenue. The walls built in the 1930s used stone quarried from a site in Minnehaha Park. The construction of many of the stone walls, as well as some bridges, was funded through the Works Progress Administration.

Approximately 15% of the Creek's streambank is armored by concrete or masonry retaining walls, rip-rap, or other protection such as gabion baskets. These are generally for the purpose of controlling erosion meandering to prevent loss of property, stabilizing steep banks, or protecting structures such as bridges and storm sewer outfalls.

Boy fishing at the dam downstream of Lake Nokomis, circa 1940s (Source: Hennepin County Library)

URBAN DEVELOPMENT AROUND THE CREEK

Land in what is now south Minneapolis was first made available for claims in 1849, after Minnesota became a territory. Early claims were made around the lakes to take advantage of the waterfront. Bureau of Land Management General Land Office (BLM GLO) plat maps from 1854 and 1888 show Minnehaha Creek and the surrounding landscape with little development. In those maps, land near lakes such as Harriet and Amelia (now Nokomis), as well as along the creek itself, was shown parceled into large plots with no urban development. By the late 1880s, south Minneapolis had been platted up to 54th Street South, which included land around Minnehaha Creek. However, very little had been constructed south of Franklin Avenue.

The western end of the creek near Lake Harriet began to be developed in the late 1800s by several prominent local families. It continued to attract wealthy Minneapolites as residents as the area developed. In the rest of south Minneapolis, development followed the streetcar corridors. After World War I and with the rise of the automobile, development rapidly increased, especially in areas not accessible by streetcar. Additionally, improvements to the park and parkway system made neighborhoods around the lakes, Minnehaha Creek, and the river more desirable. In the 1920s, particularly between what is now I-35W and Lake Nokomis, neighborhoods were designed to emphasize the landscape and picturesqueness of Minnehaha Creek. Developers aimed to preserve vegetation, hilly lots, and waterfront views. Starting in the 1930s, development ramped up to the south of Minnehaha Creek. By the 1950s, there were few empty lots left in the neighborhoods adjacent to the creek, based on Hennepin County parcel data. In south Minneapolis, it was most common to build single-family, owner-occupied houses. Housing around Minnehaha Creek and Lake Nokomis was typically above the city's average in size, value, and design quality. East of Lake Nokomis, housing was more modest and vernacular.

This housing boom in south Minneapolis meant wetlands were filled, Minnehaha Creek was straightened and ditched, and green space was converted into rooftops, pavement and concrete. All of this development resulted in increased runoff into Minnehaha Creek, which lead to an increase in flooding and pollution. In the mid-1960s, flooding along Minnehaha Creek prompted residents in 1966 to petition Hennepin County for the formation of a district to conserve waters and natural resources across the watershed. The following year in 1967 the Minnehaha Creek Watershed District was established.

HISTORY OF RACIAL COVENANTS

In in the early 1900s, across the country and in Minneapolis, real estate developers and public officials included racially restrictive language in property deeds. These racial covenants prohibited mortgages or leases to individuals of specific ethnic backgrounds, including African and Asian ethnicities. The earliest identified restrictive deed in south Minneapolis dates to 1910. In many cases, entire blocks were subject to these restrictions.

Additionally, banks practiced redlining, which placed restrictions on loans in racially mixed neighborhoods, making it difficult for non-white individuals to purchase property. Homeowners Loan Corporation Maps like the one shown below, ranked predominantly white neighborhoods "Best," which, along with discriminatory lending practices, helped to perpetuate segregation that is still present in Minneapolis today.

The greatest concentration of racial covenants was found in neighborhoods facing parkland, including those along Minnehaha Creek and Lake Nokomis. Such covenants made it nearly impossible for individuals, especially African Americans, to acquire stable and affordable housing, which in turn affected educational and job opportunities as well as health for future generations. Racial covenants were banned in Minnesota in 1953, five years after the Supreme Court declared them to be unenforceable. See Figure 2.3 for a map of racial covenants near Minnehaha Parkway.

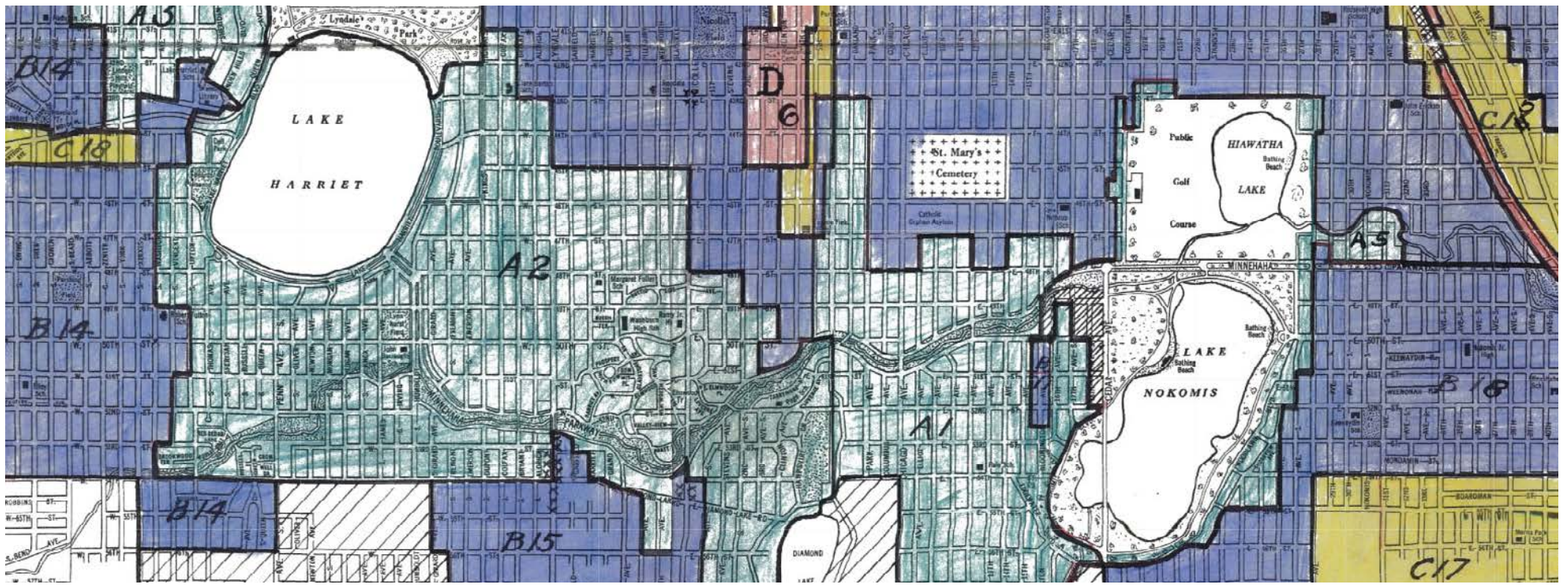


Figure 2.2 Segment of a Homeowners Loan Corporation (HOLC) Map along Minnehaha Parkway showing the area graded "Best" (green areas on map)

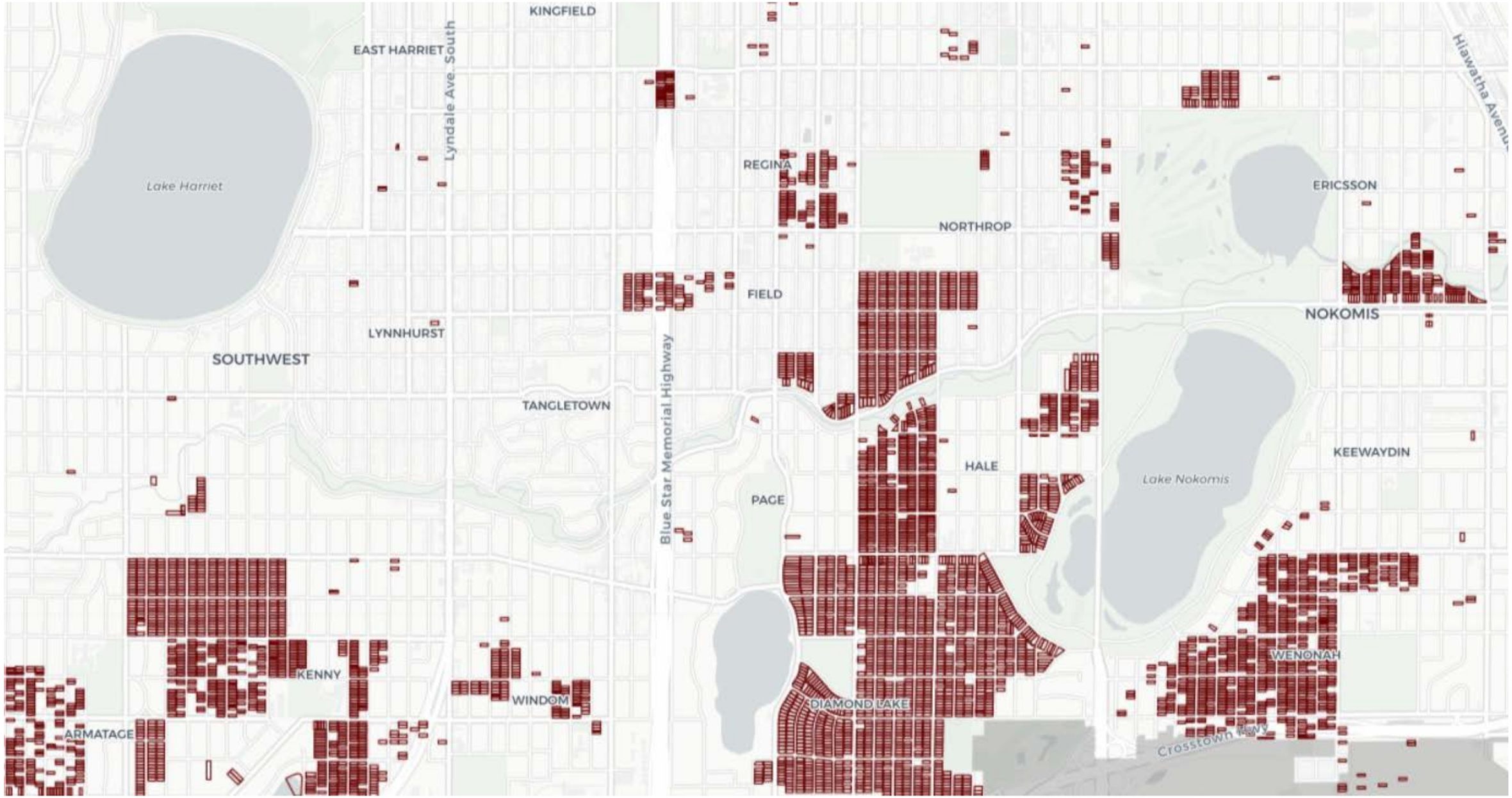


Figure 2.3 Map of Racial Covenants near Minnehaha Parkway (source: Mapping Prejudice, April 2020)

NATURAL RESOURCES IMPACT OVER TIME

PRE-SETTLEMENT VEGETATION/ PLANT COMMUNITIES

The land where Minneapolis was settled is part of the Eastern Broadleaf Forest biome. Minnehaha Creek flows through an area that was originally oak openings and barrens. Frequent fires maintained tree cover between 10-30% so that tall-grass prairie species grew in between stands of oaks. Birds perched on sturdy branches spread seeds at the base of the trees, which resulted in understory shrubs including raspberry and hazelnut. Along the Creek, floodplain forest species like cottonwood, silver maple, and green ash shaded and cooled the water.

Oak Openings and Barrens (Source: Susan Crispin, MSU)

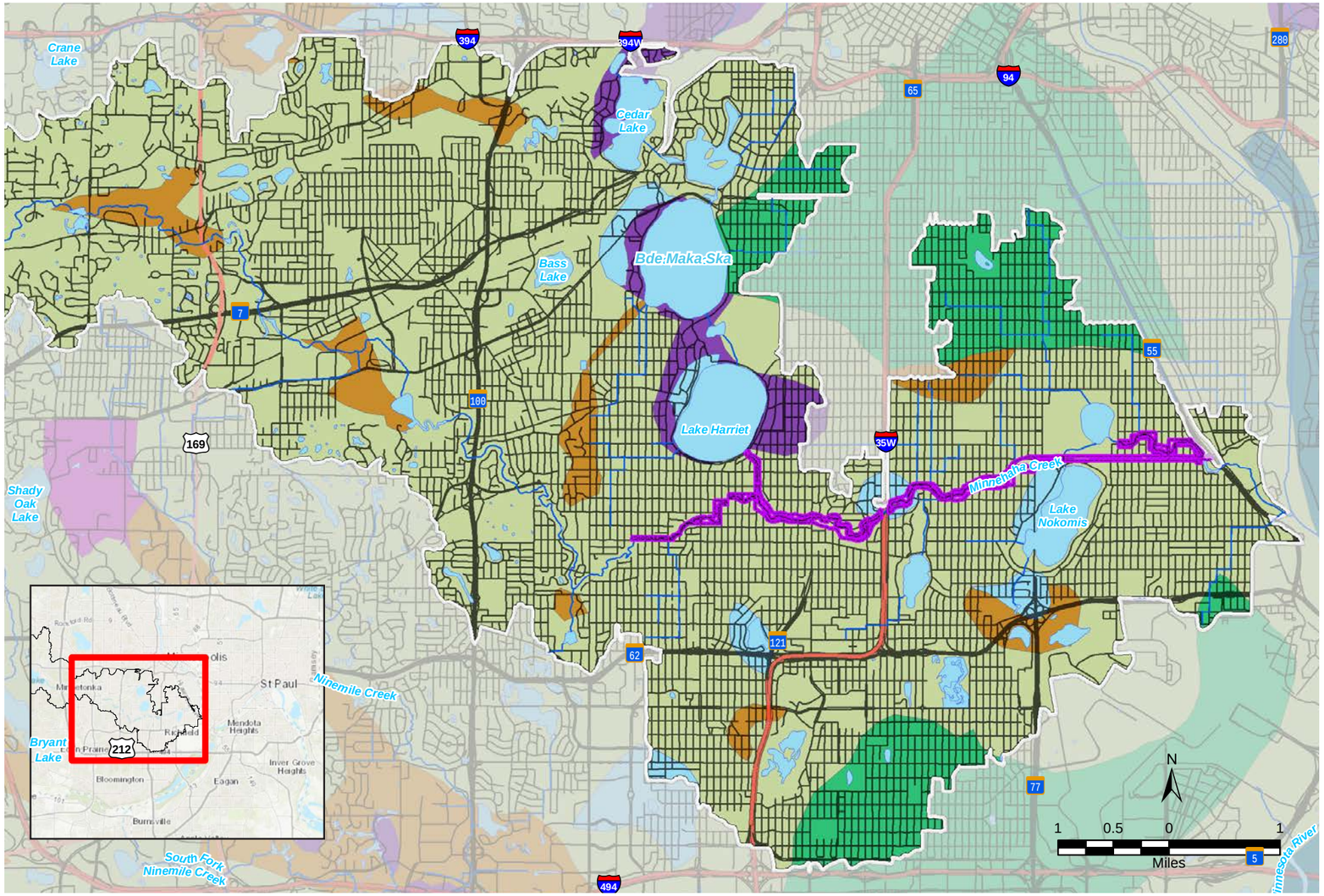
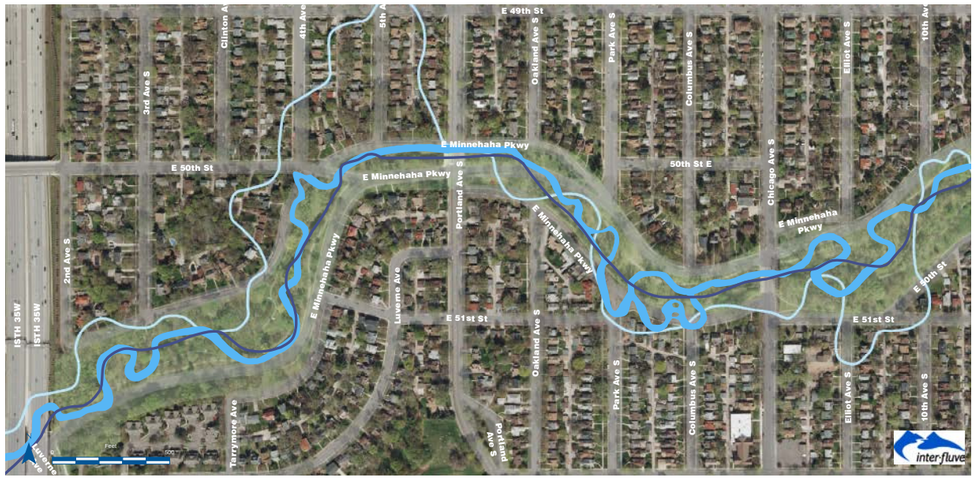


Figure 2.4 Pre-settlement Vegetation

WATER RESOURCES

PRE-SETTLEMENT WATER RESOURCES

Prior to settlement, Minnehaha Creek's alignment moved around naturally carving new flow paths (see Figure 2.5). As shown in Figure 2.6, much of Minnehaha Creek's alignment as mapped in the 1850s original land survey (denoted as the blue "Streams" line in Figure 2.6) was located approximately one to two city blocks further north than its present day location (purple dashed line denoted at "Current Minnehaha Creek Alignment in Figure 2.6). Additionally as noted in Figure 2.6, Minnehaha Creek used to flow within an approximately-sized 200-acre wetland complex located between present day Interstate 35W and Lake Hiawatha (denoted as the green "Wetlands"). This former 200-acre wetland complex would have been around the same size as present day Lake Nokomis and would have naturally buffered Minnehaha Creek and provided additional water quantity capacity.



Modern Creek Alignment
1912 Creek Alignment
1896 Lake
1896 Creek Alignment
Minnehaha Parkway

Figure 2.5 Alignments of Minnehaha Creek

Sources:

1896 alignment is based on USGS Topo 1896 Edition

1912 is based on the 1912 General Plan for Improvement of Minnehaha Parkway

Current (Modern) alignment was digitized based on recent aerial photography

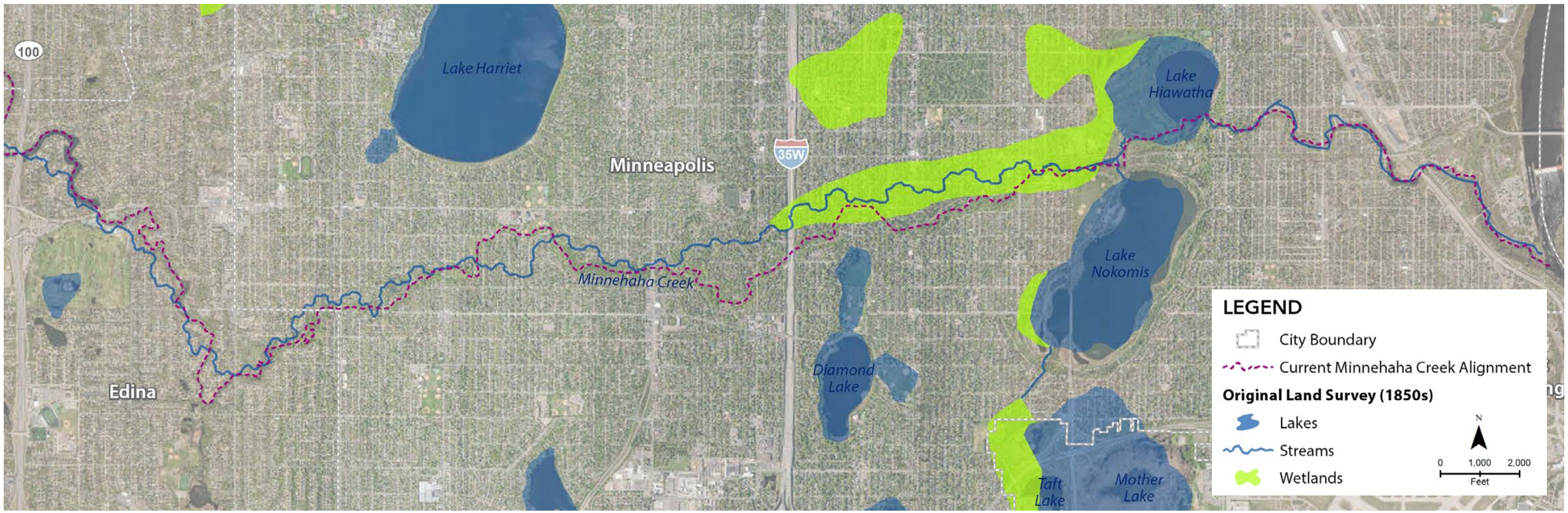


Figure 2.6 1850's Land Survey with Current Minnehaha Creek Alignment Source: MCWD

URBANIZATION AND FLOODING

Minneapolis became urbanized over the 1930s and 1940s with peak population growth in the 1950s. This urbanization occurred prior to any stormwater or wetland regulations. As a result, the 200-acre wetland complex shown in Figure 2.6 was filled, and Minnehaha Creek was ditched and straightened. The alignment was shifted and ultimately disconnected from the natural floodplain. These major landscape alterations (filling wetlands, straightening the creek) over the 1930-1950s were implemented during a time when precipitation patterns were generally much drier than today and flood risk seemed low. According to the DNR State Climatology Office, the average annual precipitation in the 1930s was 23.88 inches, in the 1940s was 25.72 inches, and in the 1950s was 24.97 inches. In comparison, the DNR State Climatology Office reported that the 2010s was the wettest decade since record keeping began in 1871, and that during this period the annual precipitation average at the Minneapolis airport was nearly 37 inches – more than six inches above average and nearly a foot more than experienced during the urbanization era of 1930s to 1950s.

Due to Minnehaha Creek's altered hydrology (altered wetlands, channel straightening, and increased impervious surfaces), flooding along the creek in Minneapolis occurs often during large or extended rain events. Images of historic flooding are shown in the images below. May and June of 1944 reported above-normal precipitation and resulted in spring flooding along Minnehaha Creek. As Minneapolis was trending towards its peak population, with more green space being converted to residential and commercial uses, flooding became more common for residents living along Minnehaha Creek.

In older communities, such as Minneapolis, storm drainage was conveyed via pipe networks before the area draining to the systems were fully developed. As the land developed over time, these storm drains often could not manage the increased amount of runoff without backing up and flooding low areas, including parks and roadways. This type of flooding is called "urban flooding", which is caused by excessive runoff due to lack of permeable area to absorb rainfall and by inadequacies of the storm drain system to handle runoff to an outfall.

In the second and third-ring suburbs, development largely occurred after stormwater regulations were in place, which means that the upper part of the Minnehaha Creek Watershed District has a greater capacity to manage flooding. Downstream, where Minnehaha Parkway Regional Trail is located, the majority of the city relies on storm sewer networks to quickly move stormwater into pipes, and discharge into water bodies via outfalls. This system of stormwater management creates large bounces (fluctuations) in the water levels of lakes and streams because they are subject to a significant inundation of runoff in a short amount of time. Additionally, increases in stream flow rates contributes to streambank erosion which negatively impacts water quality.

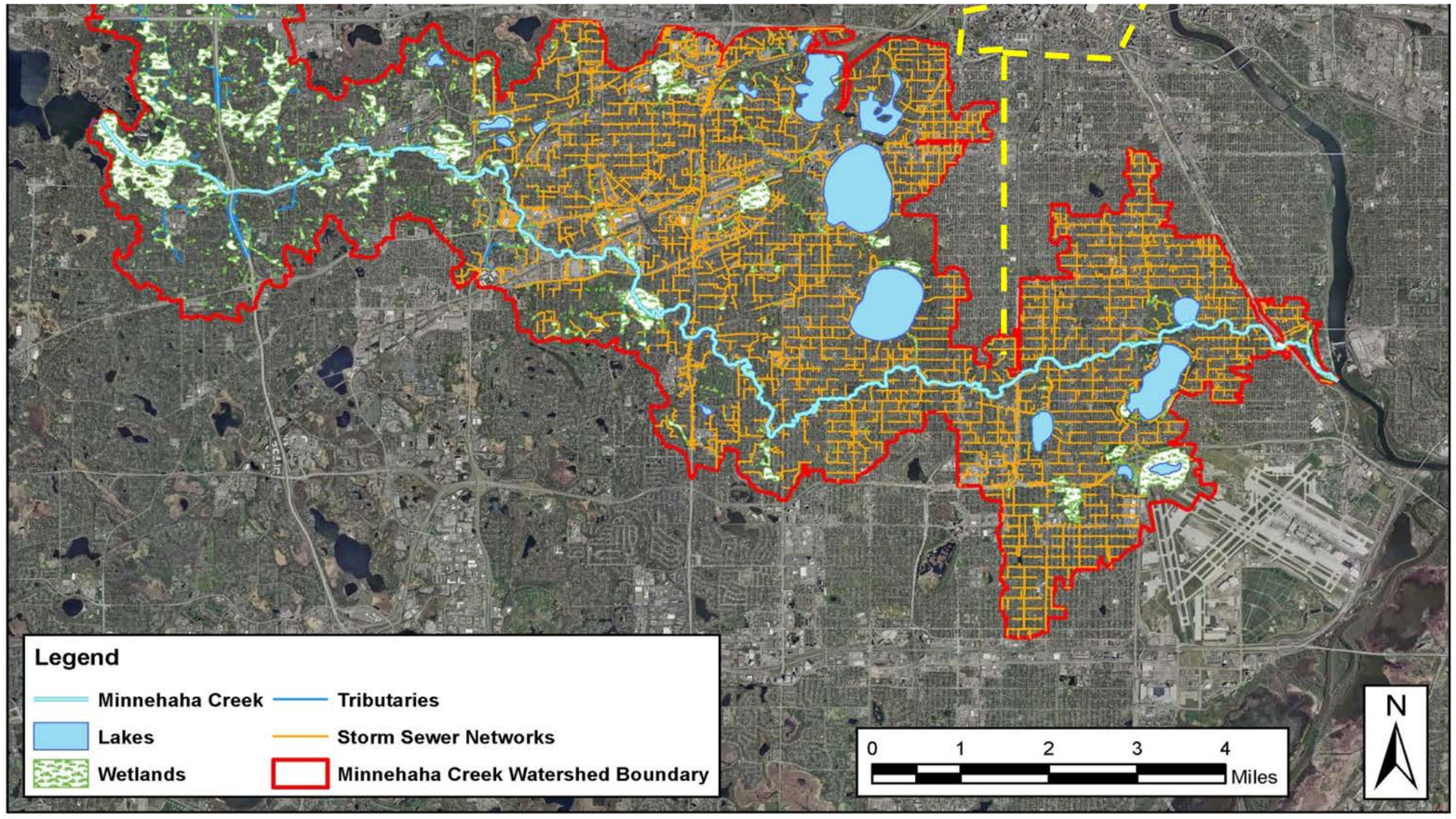


Figure 2.7 Development in Minnehaha Creek Watershed's lower subwatershed (yellow dashed line follows I-35W)

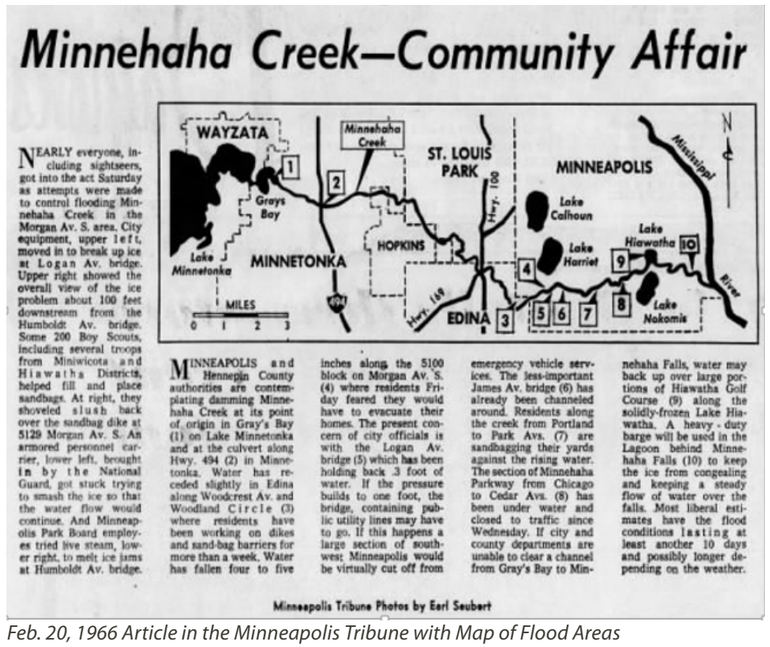
High water along Minnehaha Creek, 1944. Source: MN Historical Society

Flooding of Minnehaha Parkway at 13th Ave, 1944. Source: Minneapolis Tribune

Residents prepare for floodwaters along Minnehaha Creek in 1966

1965 and 1966 brought back-to-back years of major flooding along Minnehaha Creek. 1965 currently ranks as the fourth wettest year on record for the Twin Cities and had a particularly wet spring, including nearly eight-inches of rain in the month of May. The very next year, ice jams caused another severe flooding event along Minnehaha Creek. The February 20, 1966 Minneapolis Tribune included a full page of flood photos and the map below which details various landmarks and flood spots along the creek in February 1966. The text below this Minneapolis Tribune map noted that residents along the 5100 block of Morgan Avenue South feared they would have to evacuate their homes, residents between Portland Avenue and Penn Avenue were sandbagging their yards against the rising water, and Minnehaha Parkway from Chicago Avenue to Cedar Avenue also had to be closed for almost a week.

A February 25, 1966 Minneapolis Star article detailed a public meeting which involved officials from the city, county, state and federal agencies and was sponsored by the Citizens for Minnehaha Creek Emergency Water Control. This article described that during this meeting a resident who lived on the 5100 block of Morgan Avenue South, who was a leader of the Citizens for Minnehaha Creek Emergency Water Control group and who helped sponsor the meeting "asked for governmental action on three fronts. He suggested immediate steps be taken to control the creek waters, that safety precautions around the ice-covered area be taken and that a watershed district be formed as a long-term solution to the creek problem."



Minnehaha Creek—Community Affair

NEARLY everyone, including sightseers, got into the act Saturday as attempts were made to control flooding Minnehaha Creek in the Morgan Av. S. area. City equipment, upper left, moved in to break up ice at Logan Av. bridge. Upper right showed the overall view of the ice problem about 100 feet downstream from the Humboldt Av. bridge. Some 200 Boy Scouts, including several troops from Miniwicota and Hiawatha Districts, helped fill and place sandbags. At right, they shoveled slush back over the sandbag dike at 5129 Morgan Av. S. An armored personnel carrier, lower left, brought in by the National Guard, got stuck trying to smash the ice so that the water flow would continue. And Minneapolis Park Board employees tried live steam, lower right, to melt ice jams at Humboldt Av. bridge.

WAYZATA
Minnehaha Creek
ST. LOUIS PARK
MINNEAPOLIS
Mississippi
Grays Bay
Lake Minnetonka
MINNETONKA
HOPKINS
Hwy. 100
Lake Calhoun
Lake Harriet
Lake Hiawatha
EDINA
Hwy. 169
Lake Nokomis
River
MILES
0 1 2 3

MINNEAPOLIS and Hennepin County authorities are contemplating damming Minnehaha Creek at its point of origin in Gray's Bay (1) on Lake Minnetonka and at the culvert along Hwy. 494 (2) in Minnetonka. Water has receded slightly in Edina along Woodcrest Av. and Woodland Circle (3) where residents have been working on dikes and sand-bag barriers for more than a week. Water has fallen four to five inches along the 5100 block on Morgan Av. S. (4) where residents Friday feared they would have to evacuate their homes. The present concern of city officials is with the Logan Av. bridge (5) which has been holding back 3 foot of water. If the pressure builds to one foot, the bridge, containing public utility lines may have to go. If this happens a large section of southwest Minneapolis would be virtually cut off from emergency vehicle services. The less-important James Av. bridge (6) has already been channeled around. Residents along the creek from Portland to Park Avs. (7) are sandbagging their yards against the rising water. The section of Minnehaha Parkway from Chicago to Cedar Avs. (8) has been under water and closed to traffic since Wednesday. If city and county departments are unable to clear a channel from Gray's Bay to Minnehaha Falls, water may back up over large portions of Hiawatha Golf Course (9) along the solidly-frozen Lake Hiawatha. A heavy-duty barge will be used in the Lagoon behind Minnehaha Falls (10) to keep the ice from congealing and keeping a steady flow of water over the falls. Most liberal estimates have the flood conditions lasting at least another 10 days and possibly longer depending on the weather.

Minneapolis Tribune Photos by Earl Seubert

Feb. 20, 1966 Article in the Minneapolis Tribune with Map of Flood Areas

Feb. 19, Citizens for Minnehaha Creek Emergency Water Control Meeting Source: Minneapolis Star Tribune

ESTABLISHMENT OF MCWD

On April 12, 1966, the Hennepin County Board of Commissioners petitioned the Minnesota Water Resources Board (now the Minnesota Board of Soil and Water Resources) under authority of Minnesota Statutes Chapter 112 (now 103D) to establish the Minnehaha Creek Watershed District (MCWD). The cited purposes for the MCWD were to:

- Conserve the watershed's waters and natural resources
- Improve lakes, marshes, and channels for water storage, drainage, recreation, and other public purposes
- Reduce flooding
- Keep silt from entering streams
- Control land erosion
- Reclaim wetlands
- Control stormwater
- Preserve water quality in lakes and streams

On March 9, 1967 the Minnehaha Creek Watershed District (MCWD) was established under the authority of the state legislature through the Minnesota Watershed District Act. The Minneapolis Star published an article the next day on March 10, 1967 which noted, "The district was proposed by the Hennepin County Board last April following resolutions urging a watershed district to relieve flood problems in South Minneapolis".

MCWD initiated a regulatory program during its founding year in 1967 to mitigate the impacts of new land development on water resources within the watershed, including stormwater management rules to manage peak runoff from new land development to minimize detrimental impacts from flooding. Since 1968, MCWD has been collecting annual hydrologic monitoring data from throughout the watershed. MCWD currently has one of the best long-term water quality and quantity databases in the Twin Cities metro. MCWD's first water management plan was prepared in 1969 and focused on addressing three issues: flood control, low water levels during dry periods, and water pollution. Recommendations from this 1969 plan included reducing flooding along Minnehaha Creek by constructing an outlet control structure to regulate discharge from Lake Minnetonka and removing all sewage treatment plant effluent from Lake Minnetonka to improve water quality.

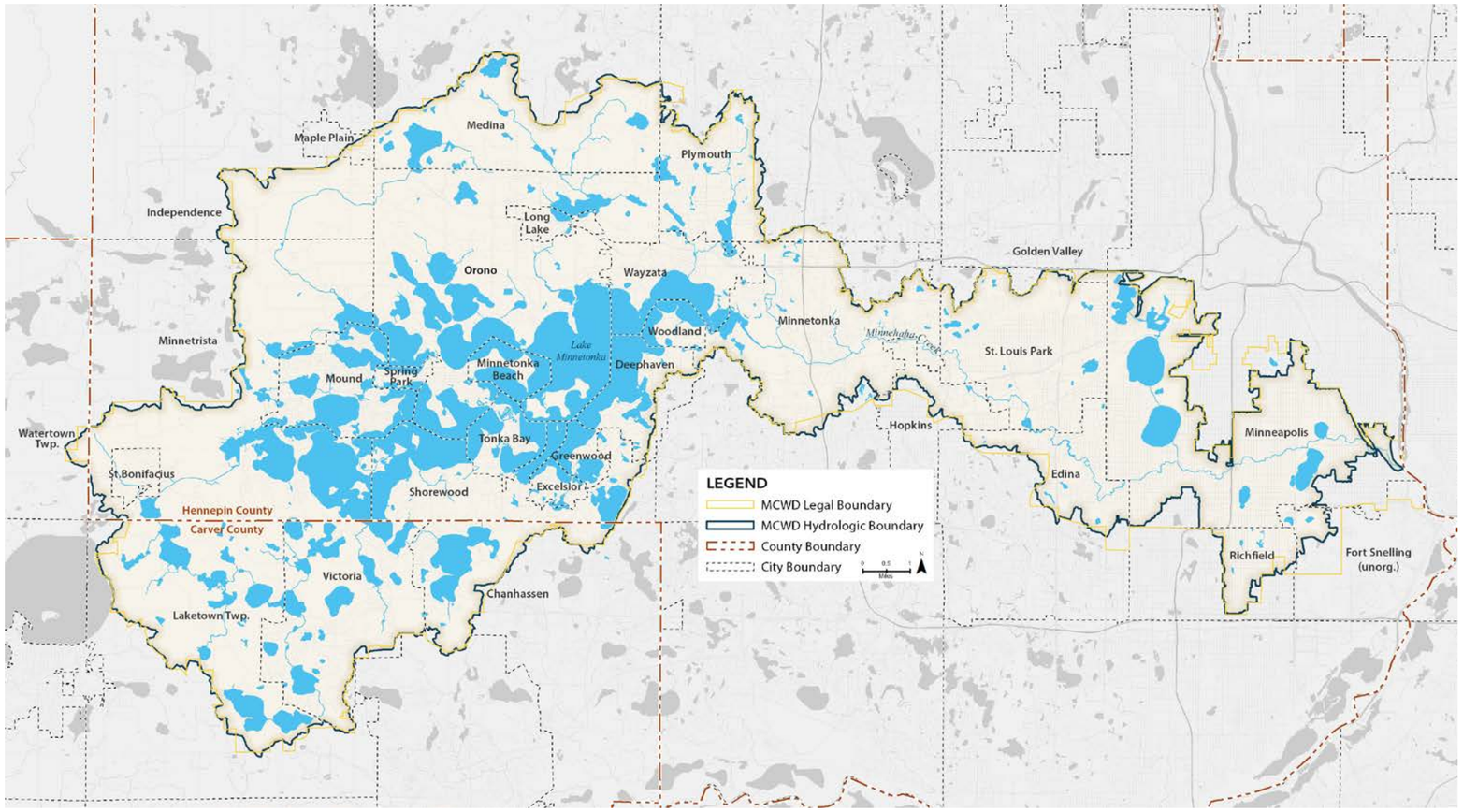


Figure 2.8 Map of the Minnehaha Creek Watershed (Source: MCWD)

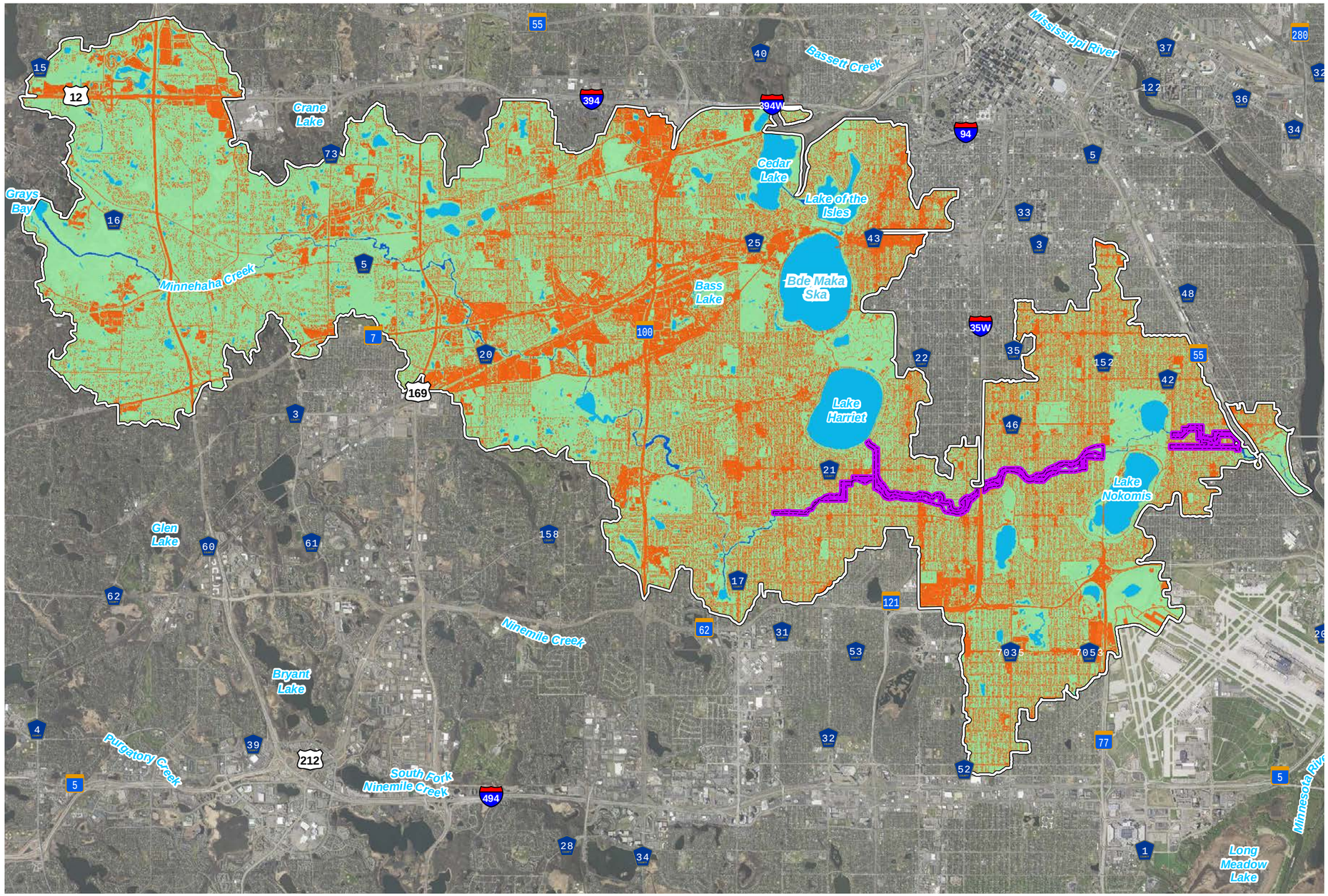


Figure 2.9 Impervious Surface within Minnehaha Creek Watershed

LAKE MINNETONKA OUTLET STRUCTURES

For over 120 years, discharges from Lake Minnetonka into Minnehaha Creek have been influenced by various outlet structures. In 1897, Hennepin County constructed an approximately 700-ft long wooden weir with a wood planking spillway that was about 130 feet wide at the outlet of Lake Minnetonka to maintain (as nearly as practicable) a lake elevation of 928.635 feet (NGVD, 1929 datum). In 1932 the wooden weir was repaired by a Hennepin County contractor. During this repair, wood sheet piling was used to create a wood weir notch approximately 200 feet long. In 1944, the wooden structure was repaired again by Hennepin County. During the 1944 repair, wood sheet piling was installed approximately two feet upstream of the 1932 wood weir structure, and when completed, the 1944 structure had timber sheet piling 213 feet long with a 194-ft timber spillway. This wooden sheet pile weir was in place for 82 years (1897-1979) and allowed water to flow into Minnehaha Creek anytime Lake Minnetonka was above 928.635 feet, including during the winter. Frequent discharges over the winter months would refreeze at downstream locations along Minnehaha Creek, forming layers of ice that resulted in ice-jams in culverts and under road bridges.

In February 1966, when the severe flooding was occurring along Minnehaha Creek, Lake Minnetonka's level was near 929.55 feet (NGVD, 1929), meaning almost one-foot of water was flowing unrestricted over the 194-foot long timber spillway structure into Minnehaha Creek. This unrestricted winter discharge caused significant ice issues along Minnehaha Creek and resulted in the severe flooding described previously.

Two years after it was established, MCWD's first water management plan was drafted in 1969 and recommended reducing flooding along Minnehaha Creek by constructing an outlet control structure at Lake Minnetonka to regulate the discharge into Minnehaha Creek.

In 1973, the cities of Minneapolis, St. Louis Park, Hopkins, and Minnetonka, as well as the MPRB, formally petitioned MCWD to undertake a series of improvements along Minnehaha Creek, including a new headwaters control structure and repair of the existing weir at the outlet of Lake Minnetonka. For approximately a decade, MCWD monitored hydrology, carried out engineering studies, developed a computer model to simulate the Lake Minnetonka watershed and operation of a variable control structure, coordinated with the U.S. Army Corps of Engineers and Minnesota DNR on permit requirements, and held numerous public meetings to gain public input on the preliminary outlet control structure designs and operating plan.

MCWD's proposal identified an adjustable dam structure that would allow Lake Minnetonka to be used as a storage reservoir and reduce downstream flooding along Minnehaha Creek. The adjustable dam was also identified to reduce winter flooding along the creek by being able to control or stop winter discharge. Ultimately the operating plan was reviewed by local communities and approved by the Minnesota DNR.

Construction of weir on Lake Minnetonka, 1897. Source: Hennepin County Library

PRESENT DAY GRAYS BAY DAM

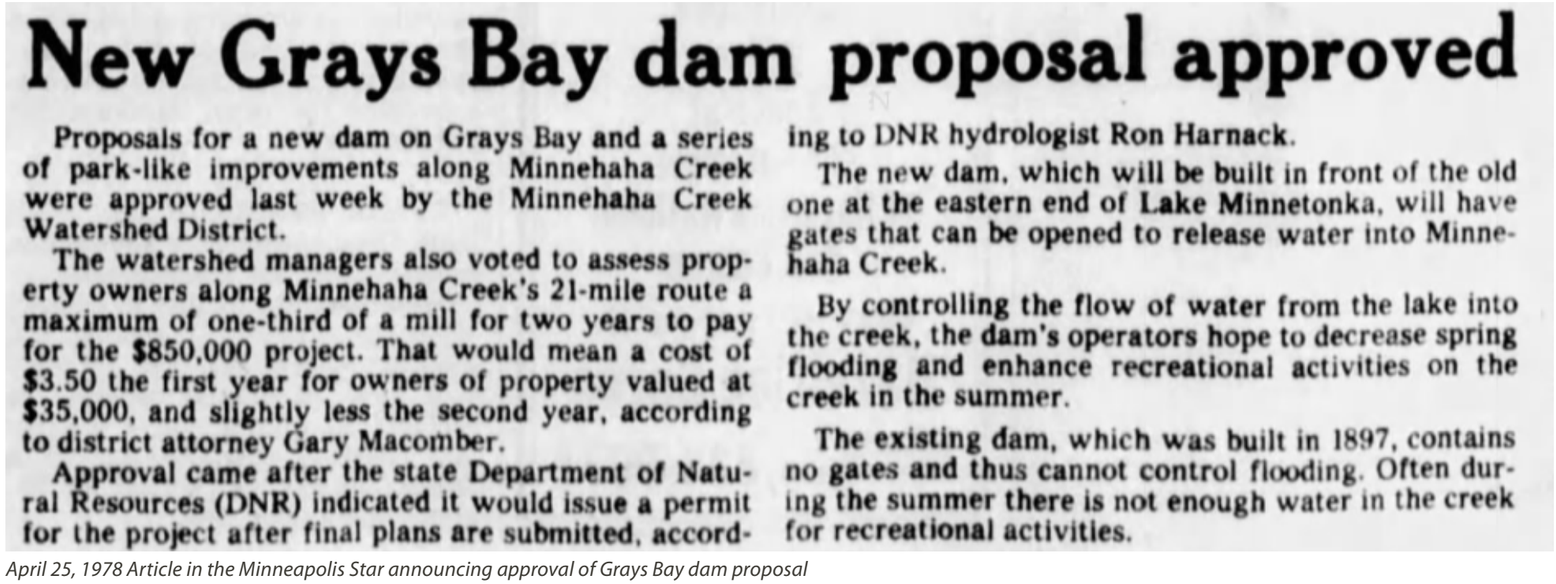
In the fall of 1979, MCWD began construction on the new Headwaters Control Structure, also known as the Gray's Bay Dam. This new structure consisted of three rectangular concrete bays, 10 feet wide, with an adjustable stainless-steel gate in each bay. In addition to the dam structure, an emergency spillway was built at the location of the previous 1944 wood sheet pile weir. The new spillway consisted of a 202-foot long steel sheet-pile weir with a uniform crest elevation of 930 feet (NGVD 1929), which allows water to flow unrestricted out of the lake if elevations are above 930 feet.

MCWD operates this structure in accordance with the Headwaters Control Structure Management Policy and Operating Procedures, which was reviewed by local municipalities and approved by the Minnesota DNR. Operation of the dam is intended to emulate the historic discharge hydrograph of the natural outlet of Lake Minnetonka. The operating plan prescribes discharge zones based on the time of year, the existing lake level, capacity of Minnehaha Creek, and forecast precipitation. The operating plan also requires that the lake be drawn down every fall to an elevation of 928.60 feet to create storage for spring snowmelt, which allows the lake to be used as a storage basin.

The management goals of the operating plan are:

1. To reduce downstream flooding by controlling the discharge to Minnehaha Creek to a rate not exceeding the maximum carrying capacity of the creek whenever the Lake Minnetonka water level is within the physical limits of control.
2. To reduce flooding on the lake by stabilizing lake levels between the elevation of the low point on the previous fixed weir (928.6) and the ordinary high water level (OHW) elevation 929.4.
3. To reduce flooding, on the lake and downstream, by temporarily increasing or decreasing discharge rates to accommodate predictable and large volumes of runoff into Lake Minnetonka or downstream prior to the time such runoff occurs.
4. To provide discharges, during and/or following dry periods, comparable to discharges that occurred historically under similar lake level conditions such that the detrimental effects of creek flow stagnation are not aggravated as a result of operating procedures.
5. To enhance recreation, wildlife and aquatic life survival, and aesthetics, when feasible and consistent with the Management Policy, by augmentation of creek flow beyond the time discharges from Lake Minnetonka have historically ceased.
6. To improve or maintain conditions on the lake and the creek, over those which existed prior to construction of the Headwaters Control Structure.

Although the goals of the Gray's Bay Dam operating plan remain the same today as they did in 1979, the information used to inform dam operations has evolved to leverage advances in forecasting, remote sensing, and modeling. After the flood of record in 2014, MCWD formed a multi-agency partnership with the National Weather Service (NWS), U.S. Geologic Survey (USGS), and Hennepin County to improve MCWD's ability to predict, observe, manage, and communicate about water level impacts across the watershed.



New Grays Bay dam proposal approved

Proposals for a new dam on Grays Bay and a series of park-like improvements along Minnehaha Creek were approved last week by the Minnehaha Creek Watershed District.

The watershed managers also voted to assess property owners along Minnehaha Creek's 21-mile route a maximum of one-third of a mill for two years to pay for the $850,000 project. That would mean a cost of $3.50 the first year for owners of property valued at $35,000, and slightly less the second year, according to district attorney Gary Macomber.

Approval came after the state Department of Natural Resources (DNR) indicated it would issue a permit for the project after final plans are submitted, according to DNR hydrologist Ron Harnack.

The new dam, which will be built in front of the old one at the eastern end of Lake Minnetonka, will have gates that can be opened to release water into Minnehaha Creek.

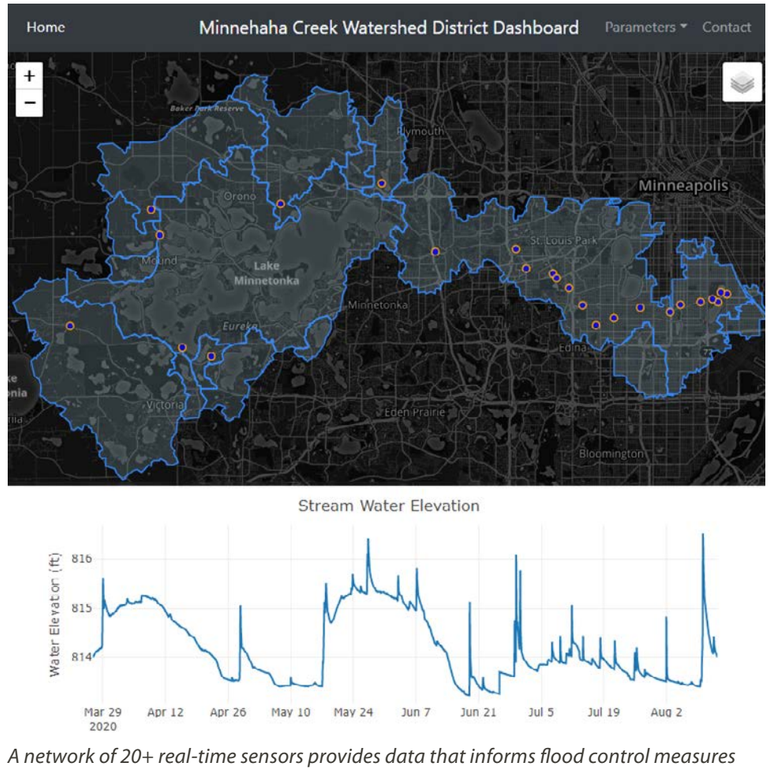
By controlling the flow of water from the lake into the creek, the dam's operators hope to decrease spring flooding and enhance recreational activities on the creek in the summer.

The existing dam, which was built in 1897, contains no gates and thus cannot control flooding. Often during the summer there is not enough water in the creek for recreational activities.

April 25, 1978 Article in the Minneapolis Star announcing approval of Grays Bay dam proposal

The NWS provides seven-day precipitation forecasts, in six-hour increments, tailored to the watershed. NWS also provides data from its hydrologic model that predicts how this precipitation will impact Lake Minnetonka's water level. Hennepin County provides data from seven weather stations across the watershed that track real-time precipitation, soil moisture, and other weather conditions. USGS sensors at the outlet of Lake Minnetonka and along Minnehaha Creek provide real-time water level data, which are supplemented by MCWD's own real-time sensor network of more than 20 water-level sensors, to gauge how the watershed responds to rain events in real time. The graphic below shows the location of the 20+ real-time sensors across MCWD. This information allows MCWD to optimize how it operates Gray's Bay dam, which controls flow from Lake Minnetonka into Minnehaha Creek, in order to maximize capacity in both and reduce flood risk.

By leveraging the unique expertise of each of these agencies, this multi-agency partnership has increased the resilience of the watershed in a changing climate. Since this partnership formed after the flooding in 2014, there has not been significant flooding in the watershed, despite the wettest six-year period on record (2014-2019).



A network of 20+ real-time sensors provides data that informs flood control measures

CLIMATE CHANGE AND 2014 FLOOD EVENT

Climate change brings with it more uncertain weather, from frequent rain events with higher intensities than previously experienced, to longer periods of drought. The Minnesota DNR State Climatology Office reports that the 2010s were the wettest decade on record in the Twin Cities since record-keeping began in 1871. Eight of the decade's 10 years were wetter than recent climatological averages, and no six-year period on record is even close to as wet as 2014 through 2019. 2014 brought the largest flood in recent history. 2016 was the second wettest year on record, and 2019 was the wettest year ever on record. During the last decade, the annual precipitation average at the Minneapolis airport was nearly 37 inches—more than six inches above average. The departure from historic precipitation patterns is shown in Figure 2.10.

In 2014, the Twin Cities saw the wettest first half of the year on record, and the month of June was the wettest month ever on record with over 11 inches of rain. Coupled with a long winter and late snowmelt, this extreme precipitation led to a record flow of 889 cubic feet per second Minnehaha Creek and prolonged flooding throughout most of the spring and summer. This record precipitation across the Twin Cities resulted in a Federal Disaster Declaration for Hennepin County. In the fall of 2014, MCWD completed a flood damage assessment of Minnehaha Creek and coordinated the results of that assessment with the Federal Emergency Management Agency (FEMA). FEMA awarded MCWD grant funds to repair the flood damage along Minnehaha Creek. MCWD implemented repairs at nine sites between 2018 and January 2020.

After the 2014 flooding and in an effort to address the flood threats caused by our changing weather, MCWD has partnered with the National Weather Service (NWS), Hennepin County, and the U.S. Geological Survey (USGS) to enhance how it operates the Gray's Bay Dam. The NWS provides MCWD with seven-day precipitation forecasts and a prediction for how that precipitation will affect water levels. With this information, MCWD can proactively create storage for the forecasted precipitation. Dam discharge can then be reduced before rainstorms and that storage is used to prevent flooding in Minnehaha Creek. MCWD also uses real time weather data provided through weather stations installed on MCWD properties, which are part of the Hennepin West Mesonet. Additionally, the MCWD, Hennepin County and the USGS have real-time water level sensors located across MCWD which provides real-time data on water level changes on the upper streams that drain into Lake Minnetonka, Lake Minnetonka itself, and along the 23 miles of Minnehaha Creek. Combined, these partnerships have greatly improved MCWD's ability to effectively predict, manage, and monitor the effects of changing weather, to improve flood resilience along Minnehaha Creek.

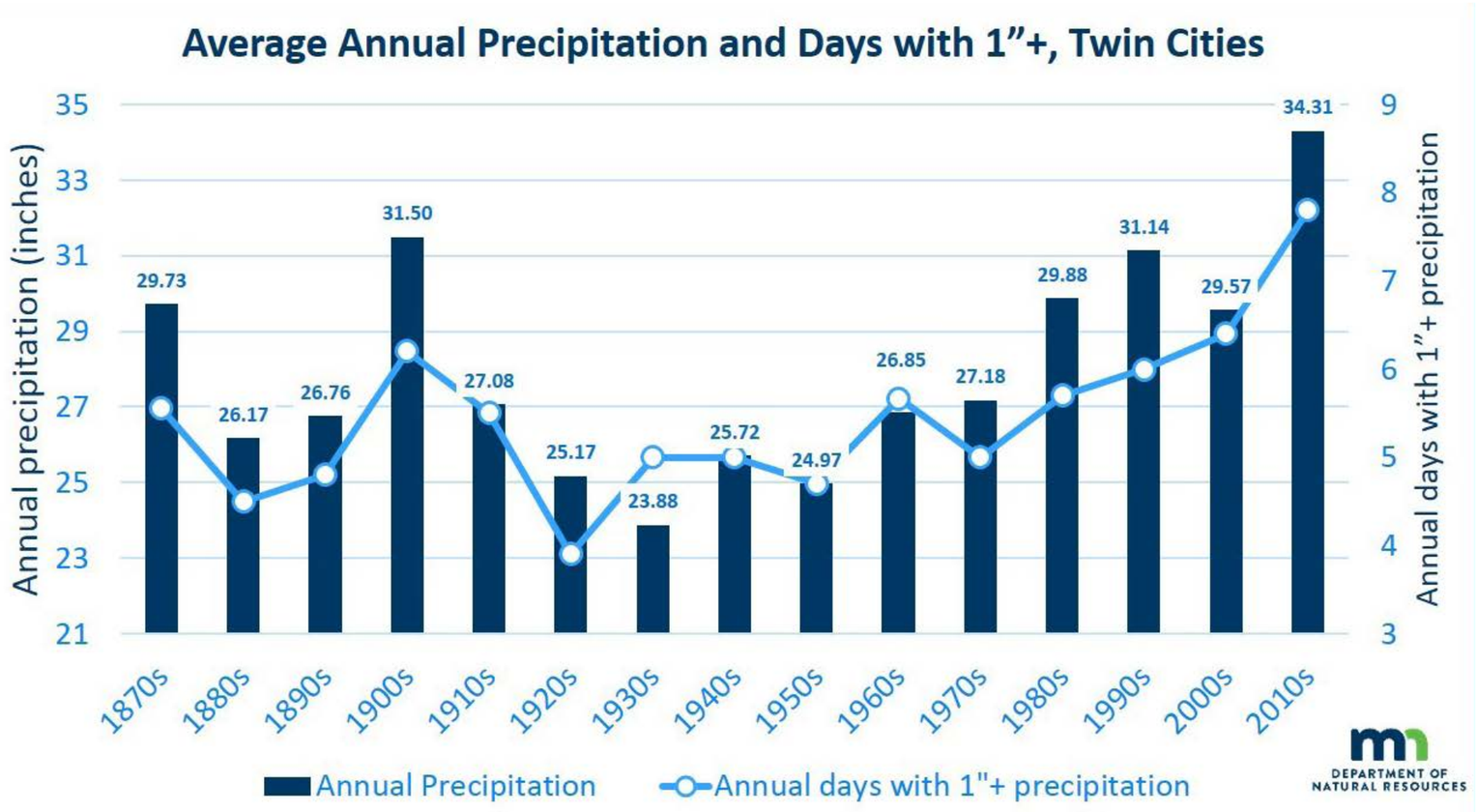


Figure 2.10 Twin Cities average annual precipitation and counts of days with heavy precipitation, defined as one inch or more falling in a calendar day. (credit: DNR State Climatology Office)

FLOOD MODELING AND MITIGATION STUDIES

MINNEHAHA CREEK FLOODPLAIN

Figure 2.11 compares the current FEMA 1% chance floodplain boundary for Minnehaha Creek in blue and the projected change to the 1% chance floodplain boundary for 2050 in orange. Current floodplain projections for the year 2050 illustrate that the future floodplain boundary will likely mimic the present day 0.2% change floodplain boundary, which would represent a five-fold increase. These 2050 projections utilized a 25% increase in current rainfall depths.

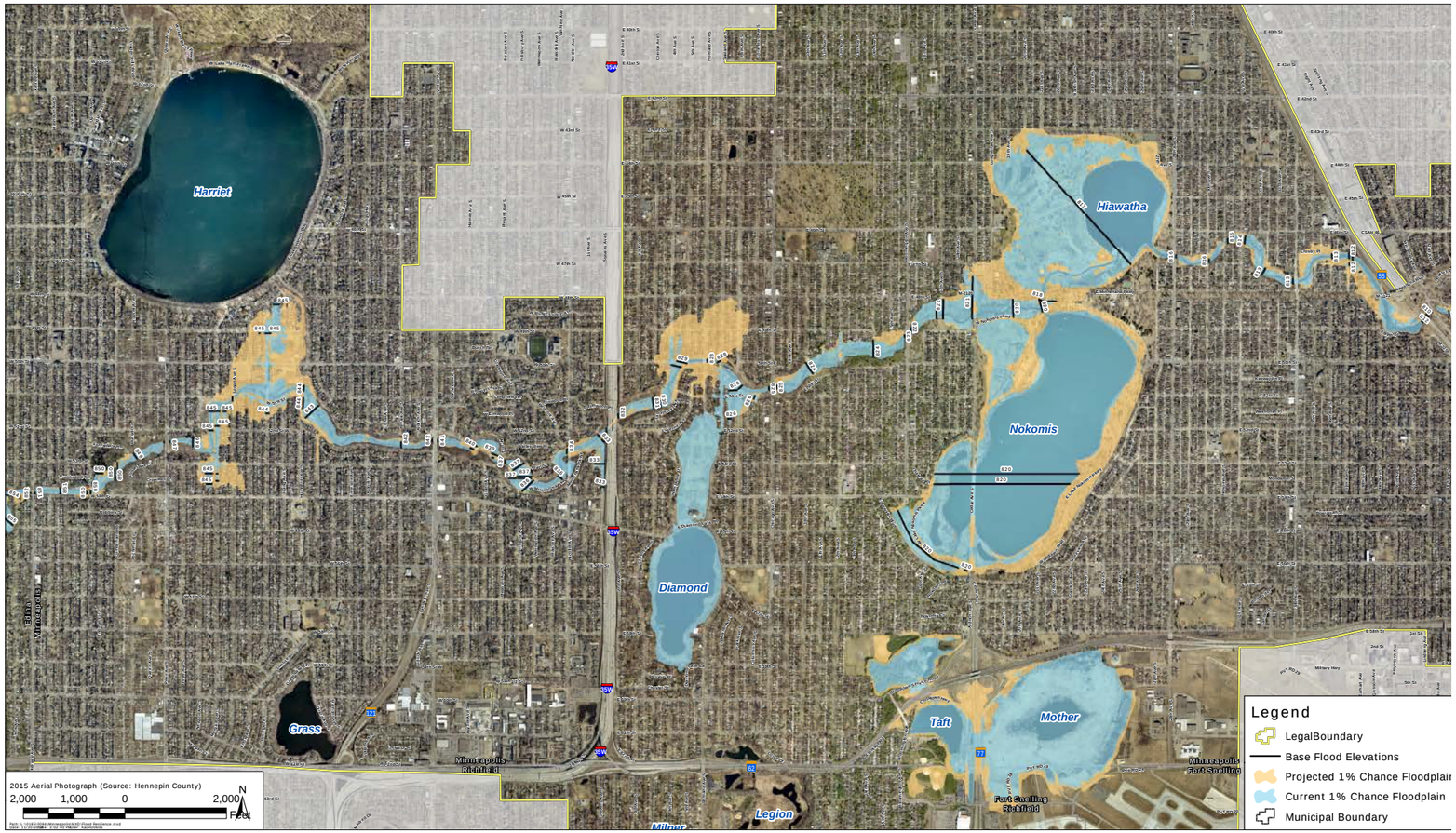


Figure 2.11 Current and Projected 100-year Flood Hazard Zones

FLOOD MODELING

The City of Minneapolis and the University of Minnesota are engaged in flood modeling in order to track and predict flood-prone areas throughout the City. Previous to starting the detailed modeling in 2014, the City could only track flood problems through eyewitness accounts. The modeling provides an objective and more thorough understanding of the extents of the potential problems. To date, the City is tracking over 150 flood-prone areas.

Figure 2.12 is an example of the output from the modeling and identifies the areas and structures that are predicted to be impacted during heavy rainfall events. It is representative of the problems throughout the city. Using this data, the City has started feasibility studies to better understand the reasons for the flooding in the specific areas and to investigate flood reduction strategies. It should be noted that the cause of localized flooding is due to a variety of site-specific conditions relating to impervious surfaces, topography, and soil conditions, combined with higher volumes of surface runoff from heavy rainfall events.

SOUTHWEST HARRIET FLOOD STUDY

The land between Lake Harriet and Minnehaha Creek is one of the areas determined to be at-risk for flooding due to the aging and undersized storm sewer pipes and the clay soil that limits the amount of infiltration. During 10- and 100-year flood events, hundreds of structures, dozens of streets, and some local parks are inundated.

In order to develop solutions to flooding in this area, the City of Minneapolis coordinated with MPRB and MCWD to produce the Southwest Harriet Flood Mitigation Feasibility Study and Stormwater Master Plan. Released in July of 2018, this study overlapped with the Minnehaha Creek FEMA flood repair efforts and the beginning of the Minnehaha Parkway Regional Trail Master Plan process, which allowed for information from the study to inform this master plan, particularly near Lynnhurst Park.

Through the study, it was determined that although most of the flooding was due to deficiencies in the City's storm sewer system, some of the flooding was due to poor drainage internal to private properties and unrelated to the City's infrastructure. The study identified several potential solutions for flooding related to the City's infrastructure including larger pipes and providing safe locations for rainwater to pond.

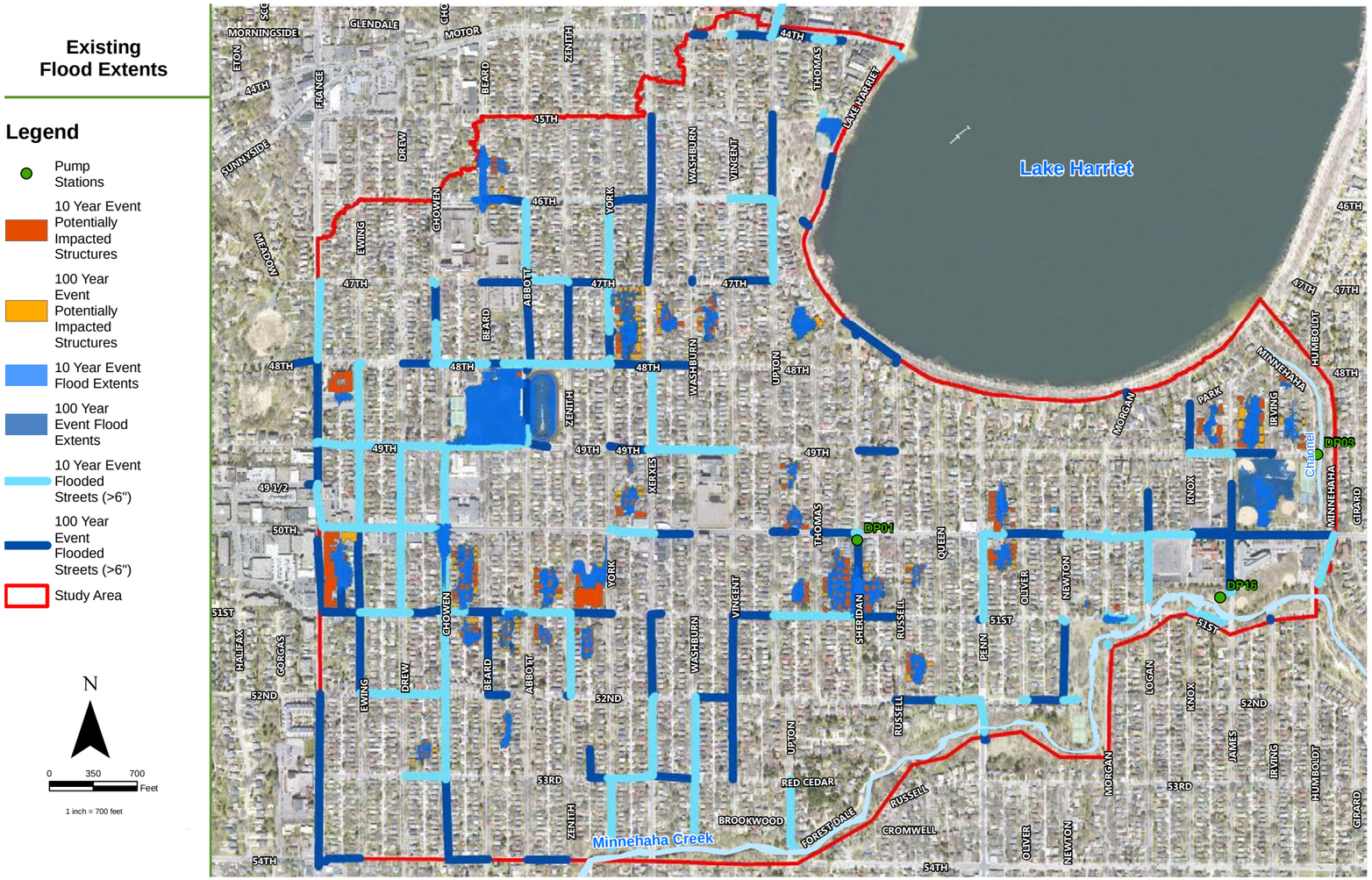


Figure 2.12 Southwest Harriet Flood Study Mapping

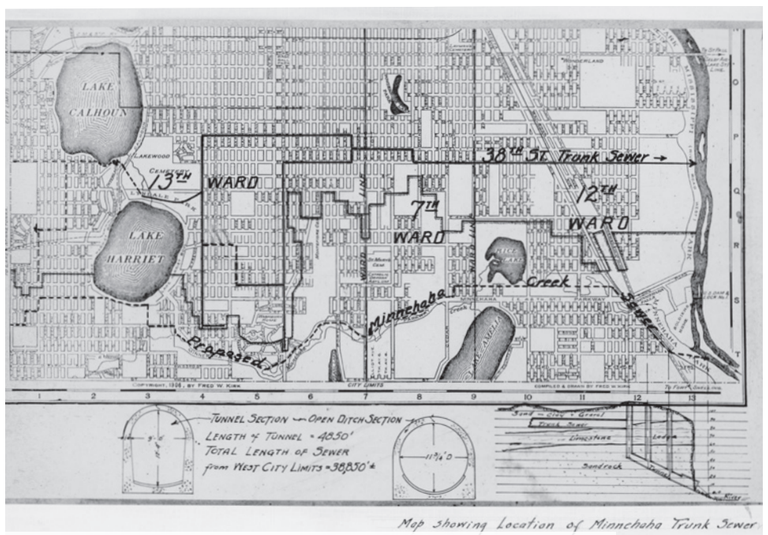
INFRASTRUCTURE

HISTORY

Minneapolis began building its sewer network in the 1870s. This initial combined system discharged all stormwater runoff and wastewater to nearby water bodies. In 1906, the City proposed a large combined trunk sewer along the Minnehaha Creek corridor. Completed between 1921-1926, the pipe's outfall into the Mississippi River was 126" in diameter. As the negative health and water quality impacts of these combined sewer overflows (CSOs) became apparent, the City started working to eliminate CSOs from its system. Until recently, one CSO into Minnehaha Creek remained. The former Minnehaha Trunk Sewer now serves as a Metropolitan Council Environmental Services (MCES) interceptor that conveys wastewater to the wastewater treatment plant.

While Minneapolis now has separate storm sewer and sanitary sewer systems, their infrastructure is aging. 80% of sanitary sewer pipes are more than 80 years old, and 50% of storm sewer pipes are more than 50 years old. Damaged, leaky, or undersized pipes can exacerbate problems like flooding, especially as extreme rainfall events become more common. Repair and replacement of this infrastructure is disruptive, and often makes the most sense when it occurs simultaneously with other projects. The partnership between the City of Minneapolis Public Works Department, MCWD, and MPRB allows infrastructure projects to be considered along with Parkway reconstruction, park and trail improvements, and Creek restoration projects in order to maximize overlapping benefits, optimize funding, and minimize disruption to neighborhoods.

1930s Construction of a Storm Tunnel Source: City of Minneapolis



Minnehaha Trunk Sewer Map,1906 (Dark lines are trunk sewers)
Source: City of Minneapolis

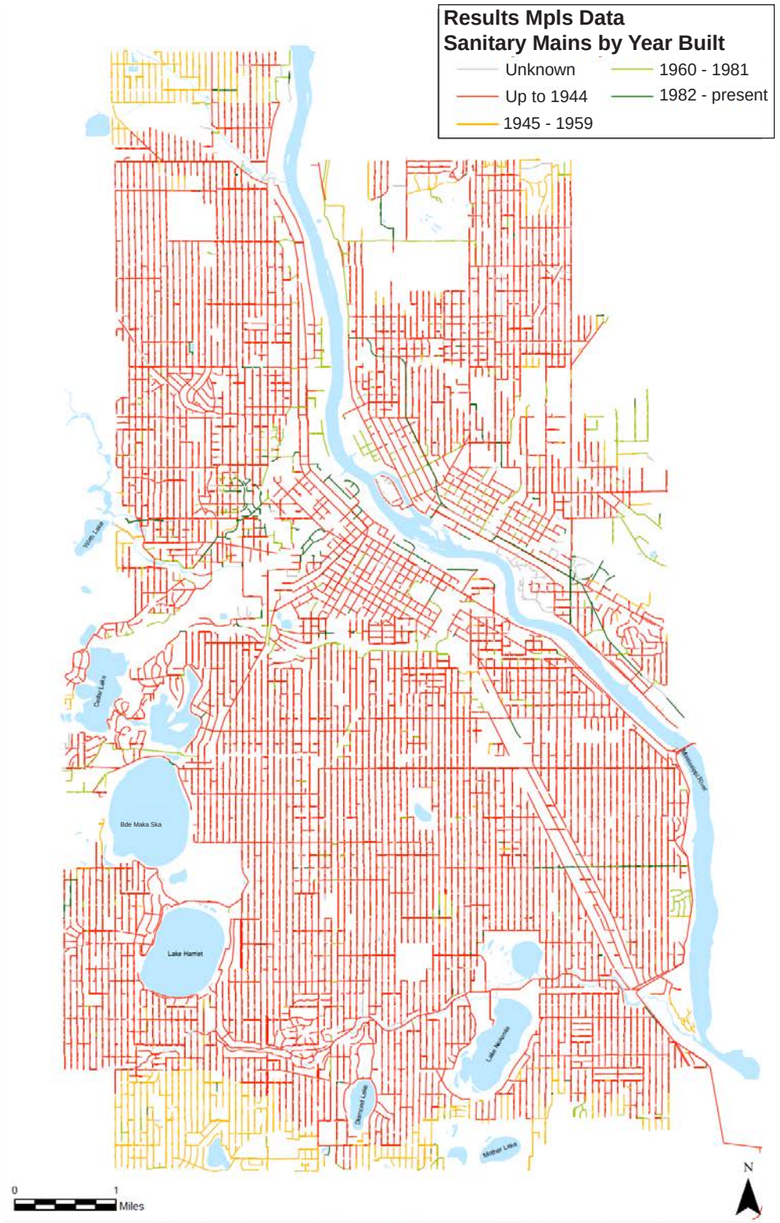


Figure 2.13 Age of Minneapolis Sanitary Sewer Infrastructure Source: City of Minneapolis

2014 Minnehaha Creek Flooding