A. Natural Infrastructure

Natural Infrastructure - Looking Back

What is natural infrastructure?

Natural infrastructure includes all systems that relate to natural resources and contribute to an improved public life. Natural infrastructure considers the full range of natural resource uses including economic, environmental, health, cultural, and aesthetic. This broad view leads us to include surface water, groundwater, stormwater, wastewater, drinking water, mineral resources, geology, topography, soils, natural areas, open space, green spaces in urban areas, habitat, vegetation, scenic views, and parks and trails in natural infrastructure.

Natural Infrastructure

The network of open space, watersheds, woodlands, managed forest, wildlife habitat, parks, mineral deposits and natural areas that provide vital services and resource that contribute to the economic health and quality of life for our communities.

Why include natural infrastructure in a comprehensive plan?

Understanding the City's natural resource infrastructure is the first step in planning where development should be encouraged or discouraged and how best to design for maximum value to the community's values. For example, houses built on unstable or wet soils without consideration given to those soils results in wet basements, cracked foundations, or unsafe structures. Beyond avoiding hazards, communities also value natural infrastructure for the health benefits it provides such as access to recreation and safe drinking water. Biological diversity and protection of ecological services are also provided by natural infrastructure. Economic activities such as mining, forestry, and agriculture are dependent on natural infrastructure. Finally, communities value natural infrastructure for quality of life benefits such as provision of scenic views and open spaces within developed areas. Understanding natural infrastructure is important in order to plan for development that respects the integrity of natural systems and incorporates natural features into development. Successful communities plan for where people can live, businesses can thrive, while protecting or enhancing natural resources.

This background assessment presents natural infrastructure information that was used in the future land use map and goals and objectives to:

- Define where to encourage protection of natural resources
- Define where to encourage development
- Define where natural systems can work with development and define neighborhoods
- Define how natural resources can be protected in development areas

Natural Infrastructure in the 2003 Comprehensive Plan

The background inventory of the 2003 Comprehensive Plan describes natural infrastructure in several sections but does not present a unified picture of current natural infrastructure. For example, the drinking water and wastewater systems are described in the Community Facilities and Services inventory. However, surface water quality is not discussed nor is the location of drinking water resources and natural areas described or mapped. Park and recreation facilities are fully described, but

not mapped. Finally, undeveloped land is described in detail by subarea in the Land Use background inventory, however, the natural infrastructure qualities of the undeveloped areas are not described or mapped.
Two sub-area plans completed as part of the 2003 Plan implementation effort do identify some natural infrastructure and set policies for building on natural assets in the development and redevelopment process.

Natural Infrastructure in the Downtown Redevelopment Master Plan, 2006

The Downtown Redevelopment Master Plan calls for implementation of trail connections from the surrounding area to the downtown to businesses. The primary "green space" in the downtown area is the Old Central School site and portions of the riverfront. These areas along with proposed re-development and extensions of trail corridors and corner lots calls for designs that incorporate trees and landscape features not only for aesthetics, but for stormwater protection, water quality enhancement, and shading and transpiration that counteracts the urban heat island of concrete and buildings. Vegetation, rain gardens, green roofs, energy efficient buildings and other sustainable development will benefit the City's natural resources and the residents/visitors quality of life in the downtown area, the City's connection to the river, and the greater natural resource infrastructure.

Natural Infrastructure in the Riverfront Framework Plan, 2009

The Riverfront Framework Plan is designed to incorporate natural resource infrastructure and trail connections along the waterfront on both the north and south side. Much of the study area along the north side of the river lies within the 100-year floodplain including the Public Library and the Rotary Tent. The 100-year and 500-year floodplains on the south side are limited to the river's edge and areas already dedicated to open space. The proposed implementation plan will benefit the City's natural resources infrastructure along the river's corridor and enhance residents' and visitors' quality of life.

2011 Natural Infrastructure background assessment

In the 2011 Comprehensive Plan Update, the City of Grand Rapids has chosen to organize natural resources and natural systems as natural infrastructure. This choice recognizes the contribution of natural infrastructure to the physical, social, and economic health of the community. The choice also acknowledges the equal status of gray and natural infrastructure in land use choices.
Updating the 2003 background inventory, this section brings together information on parks and recreation, open space, water and wetland resources, topography, geology, vegetation, and drinking and wastewater systems to form a cohesive natural infrastructure picture. Paired with housing, transportation, and land use information, a portrait of Grand Rapids' future has emerged.

Surface Water

As shown on Figure1, Grand Rapids citizens enjoy over 1,200 acres of open water within city boundaries. The Mississippi River flows through the heart of the city with the Blandin Reservoir forming a city landmark. The Prairie River flows along the northeast portion of the city's border. North of downtown lie McKinney, Crystal, and Hale Lakes with Nagel Lake straddling the northern boundary of the city. The southern half of the city includes Lily, Horseshoe Lakes and a portion of Pokegama.

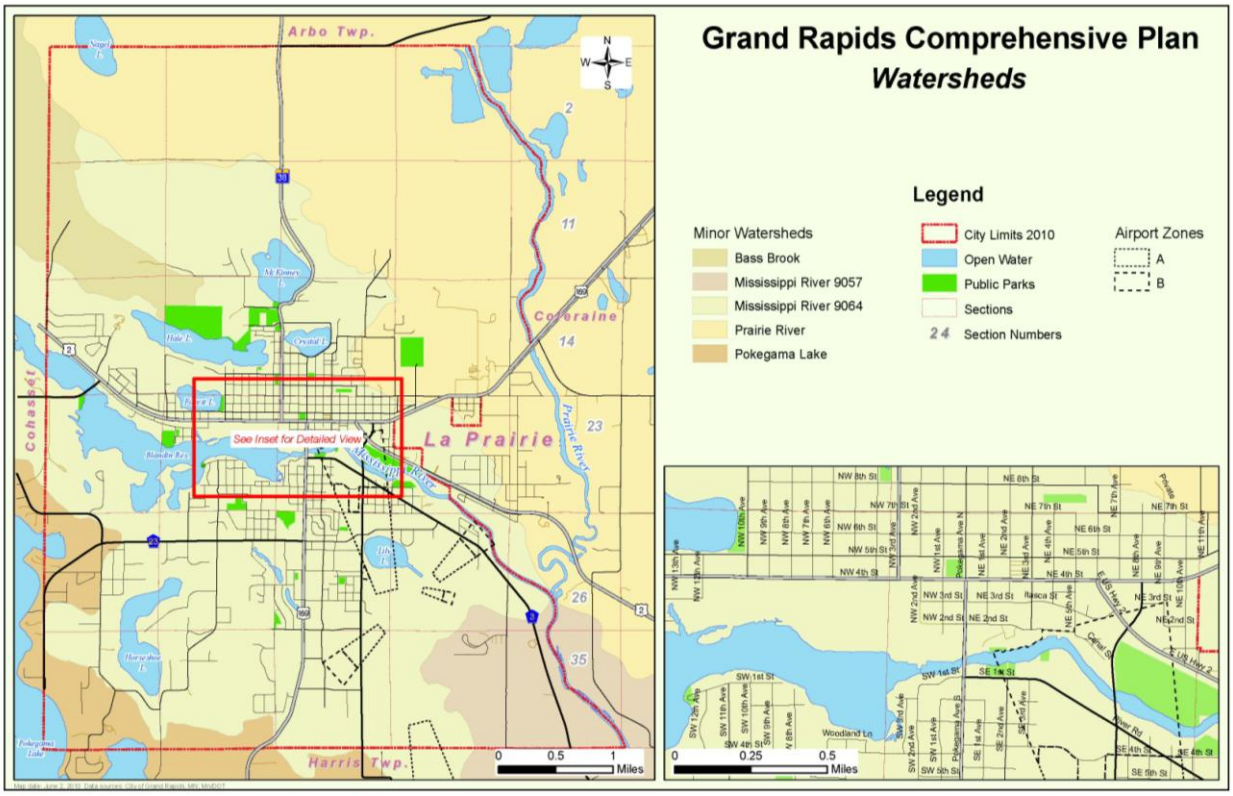
Grand Rapids residents use these water bodies for recreation and enjoy lake and river views from their homes. Recognizing the positive recreational and aesthetic attributes of water, the Grand Rapids

Riverfront Plan redirects attention to the Mississippi River as an asset for the community. Future land use choices should consider the impact of development choices on water quality and quantity. Crystal, McKinney and Hale lakes are located within city drinking water recharge areas. The Blandin Reservoir and Mississippi River through the city are listed as impaired waters for excess mercury by the Minnesota Pollution Control Agency. Horseshoe Lake was listed in 2010 as impaired for excess nutrients and a Total Maximum Daily Load (TMDL) analysis will occur at some point in the future. Excess nutrients, however, typically come from residential turf management, stormwater runoff, and agricultural practices which can be influenced by local land use choices.

Watersheds

The City's watershed system is also shown on Figure 5-11. The City of Grand Rapids lies within the Mississippi River – Grand Rapids major watershed and 5 minor watersheds: Bass Brook; Prairie River; Pokegama Lake; and two minor watersheds of the Mississippi River - #9057 and #9064. Watersheds are areas of upland that drain to a specific lake or a portion of a river. A minor watershed is a smaller watershed defined within a major watershed. Activities on the land within a watershed affect the quality and quantity of the receiving lake or river. Activities within watersheds of impaired waters are of particular interest because of the potential for managing these activities to improve the water quality. For example, stormwater runoff from impervious surfaces such as parking lots, structures, and roads can add sediments and pollutants to lakes and rivers. Slowing down or diverting stormwater runoff can reduce sediments and pollutants in lakes and rivers. The Mississippi River 9064 minor watershed drains to Horseshoe Lake which is listed as an impaired water as noted above.

Figure 5-11. Grand Rapids Watersheds

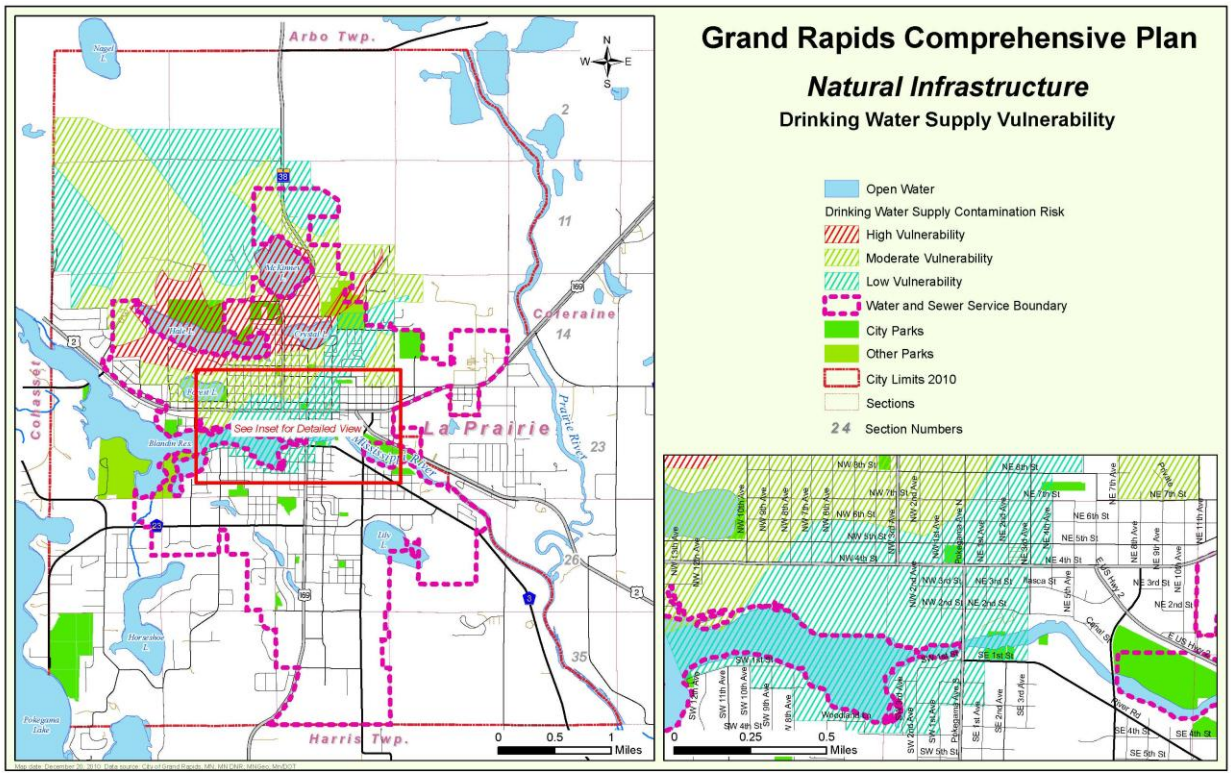


Drinking Water Supply

An adequate supply of clean drinking water is important to the health of citizens and to economic development activities. The drinking water sources are a critical component of Grand Rapids' natural infrastructure. The treatment, pumping, and delivery are part of the gray infrastructure system. The City's gray infrastructure is discussed in the Public Infrastructure and Community Services section. The drinking water resource, however, is a critical natural resource and part of Grand Rapids' natural infrastructure. The Plan thus considers the vulnerability of the City's drinking water resource as part of it natural infrastructure.

Figure 5-12 shows the Drinking Water Supply Vulnerability (DWSV) areas as defined by the Minnesota Department of Health. Vulnerability is based on factors including geologic sensitivity, type of wells, and water chemistry. High vulnerability areas (835 acres) indicate areas where pollutants travel quickly into drinking water supplies; moderate (1,766 acres) and low (1,618 acres) vulnerability areas indicate longer travel times. The City of Grand Rapids has adopted a wellhead protection plan for the management of risks within DWSV areas. DWSV areas and the wellhead protection plan should be considered as future development choices are made. Land use activities that have a high risk of contributing pollutants should be located in areas outside of DWSV areas.

Figure 5-12. Grand Rapids Drinking Water Supply Vulnerability



Wastewater Management

Managing the collection and treatment of sanitary wastewater are primary functions of the City of Grand Rapids Public Utilities Commission. Wastewater management is primarily grey, rather than natural, infrastructure, as most of the City's wastewater treatment is composed of wastewater collection and treatment facilities. Properties outside the service boundary use on-site treatment systems (septic systems) which rely on soils to treat wastewater and are part of the City's natural infrastructure. Itasca County, rather than Grand Rapids, oversees the on-site wastewater systems in the City's rural areas.

Details of the centralized wastewater system and a map showing system components are provided in the Public Infrastructure and Community Services section.

Stormwater Management

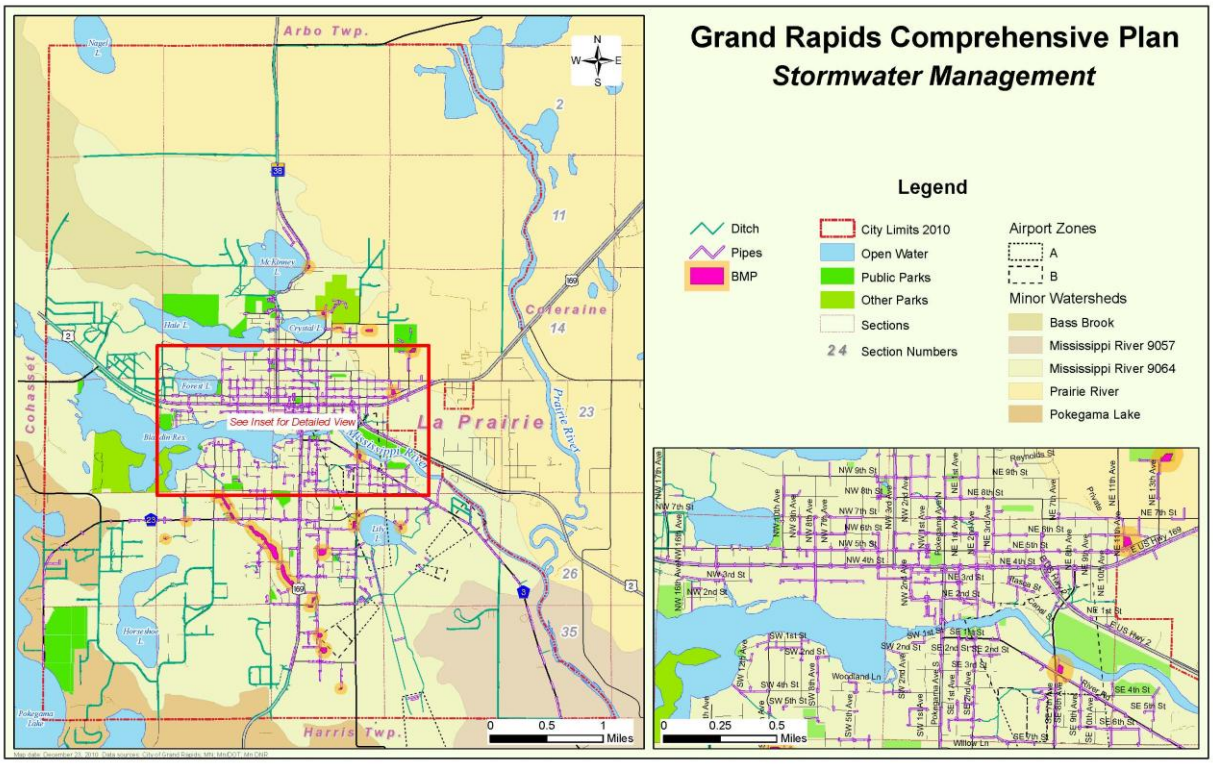
Grand Rapids has seven lakes and two rivers within its corporate boundaries. The surface waters of the City's natural infrastructure system are greatly affected by the City's stormwater management system. Figure 5-13 shows the extent of the stormwater management system in Grand Rapids, which is a combination of natural and grey infrastructure. The watersheds, natural drainageways, and infiltration areas, and vegetation (including urban forest) are natural, while pipes, constructed conveyances, and holding ponds are grey infrastructure. Discussion of the constructed elements of the stormwater system is included in the Public Infrastructure and Community Services section.

The City of Grand Rapids created a stormwater utility in 2004 to help manage and pay for infrastructure related to rain runoff and the City's surface water obligations under the Clean Water Act. A stormwater management plan was completed in 2007 and approved by the Minnesota Pollution Control Agency. The stormwater management plan describes the six National Pollution Discharge Elimination System (NPDES) stormwater permit control measures being implemented by the City's stormwater utility. These control measures are:

1. public education and outreach;
2. public involvement and participation;
3. illicit discharge detection and elimination;
4. construction site stormwater runoff control;
5. post-construction stormwater management;
6. pollution prevention/good housekeeping for municipal operations.

The City of Grand Rapids Public Works Department maintains 45 linear miles of storm sewer pipe and eight storm water retention ponds. Since 2003 the City has also installed 26 rain gardens in addition to detention ponds and sediment basins as stormwater best management practices. On-site management of stormwater is the preferred management method, which generally uses the natural rather than constructed elements of the stormwater system.

Figure 5-13. Grand Rapids Stormwater Management



Parks, Trails, and Protected Land

Grand Rapids boasts 243 acres of public parks and nearly 50 miles of City trails, and over 60 total miles. Residents and visitors alike prize the variety of year-round recreational activities these parks and trails provide. The 2003 Comprehensive Plan background inventory provides great detail about the park and recreation system in Grand Rapids. Figure 5-14 illustrates the location of existing parks and trails in the city. Table5-16 identifies details of recreational facilities in the City, including both City facilities and other facilities. Changes to the parks and trails system since 2003 include:

- Completion of 3.5 miles of the Mesabi Regional Trail which connects to 132 miles of trail between Grand Rapids and Ely.
- 7.6 miles of new city trails.
- Platting and development of Crystal Lake Park
- Creation of Pokegama Park Place (park and beach) at the Golf Course

In addition to parks and trails, Grand Rapids has significant areas of protected forest land within its borders. In 2010, over 900 acres of forested land, shown on Figure 5-14, was placed under conservation easements which prohibit future development and preserve the land for sustainable forest management and open space use. The conservation easements were part of a larger 10,000 acre forest land preservation partnership between the State of Minnesota and the Blandin/UPM forest products company. The majority of the protected forest land is located in the northern half of the city.

In addition to the park and recreation facilities in Grand Rapids, a number of regional facilities outside the City limits draw tourists to the area and into Grand Rapids. These resorts, golf courses, trails, and ski areas contribute to Grand Rapids' role as a gateway to Minnesota's northern natural and recreation areas, as conveyed in the Grand Rapids logo and identity "It's in Minnesota's Nature. . ."

Figure 5-14. Grand Rapids Parks and Trails

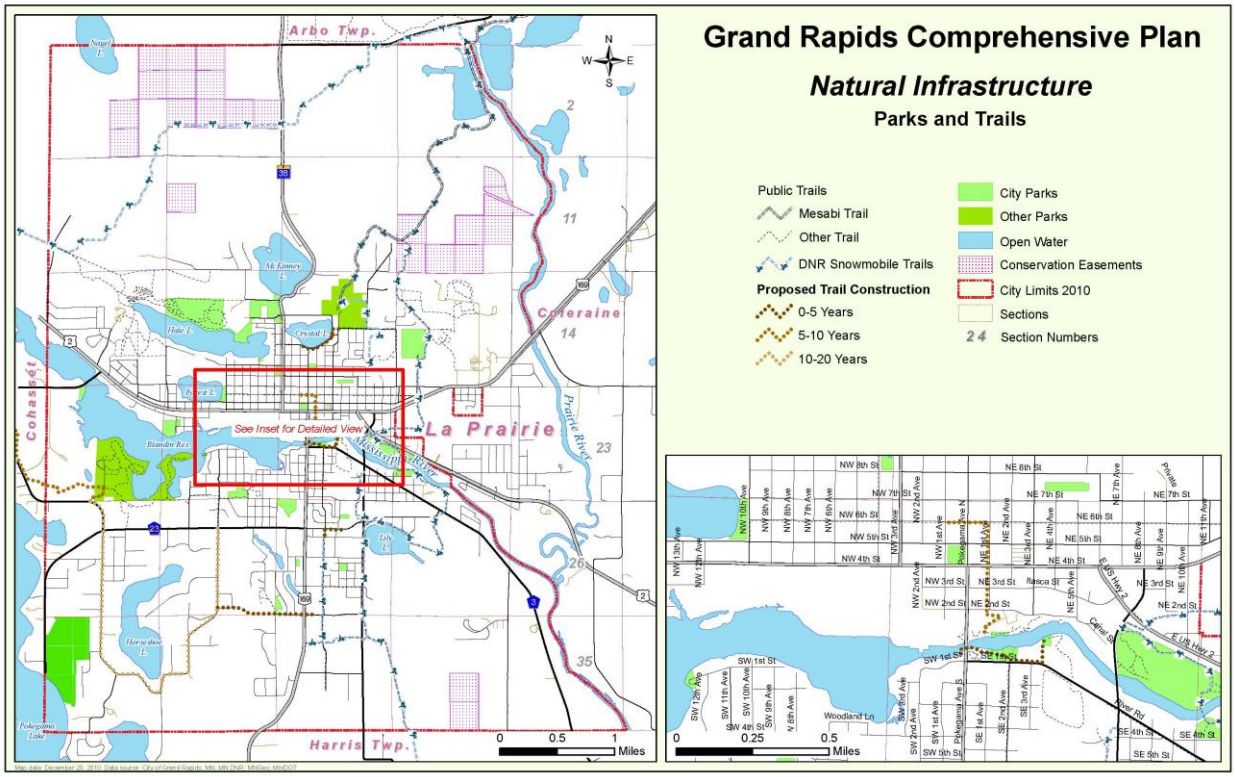


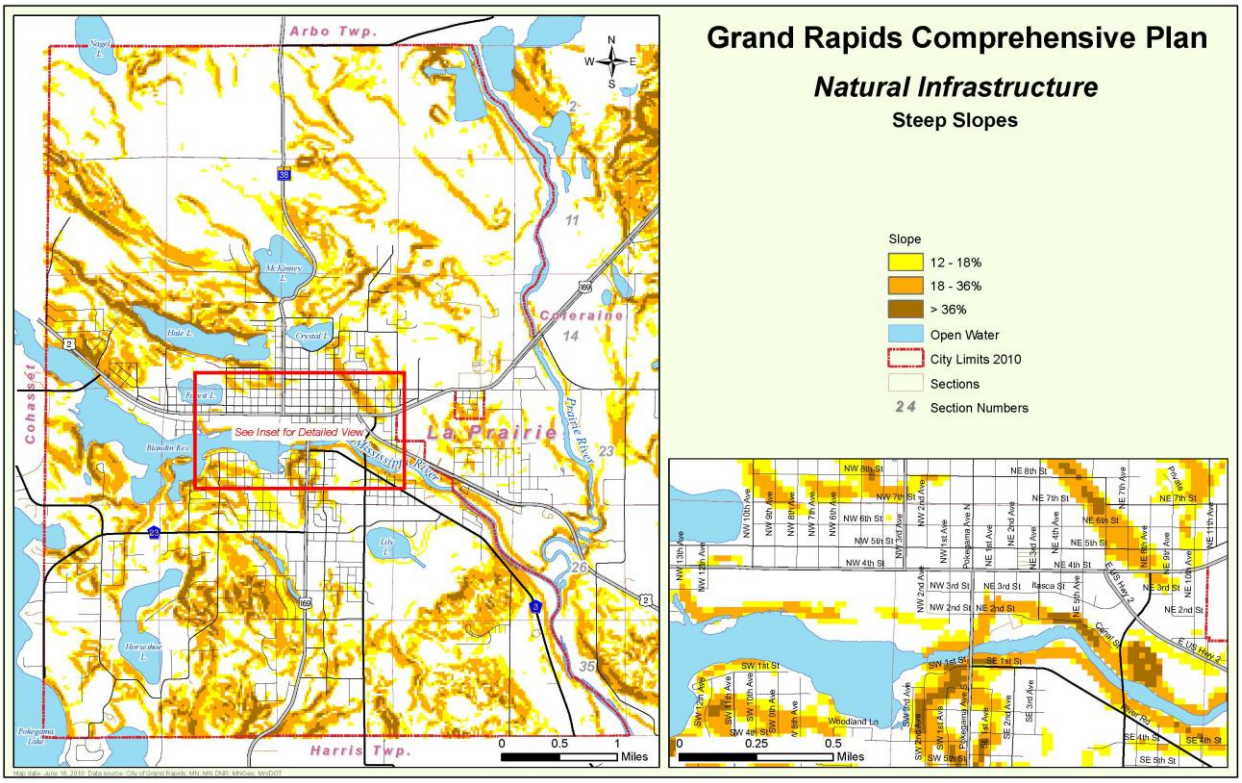
Table 5-16. Grand Rapids Parks Amenities

Park Name	Location	Amenities
American Legion Memorial Park	TH 38 & 14th St	Baseball field, CC ski trails, Park and Recreation offices, football field, picnic and park area, horseshoe area, and Ryan Flood Memorial Basketball Court
Blandin Beach (Forest Lake)	10th Ave & 6th ST NW	Playground and park area, picnic area, fence beach swimming area, raft and diving boards
Old Central School	Pokegama Ave & 4th St NW	Picnic and park area, amphitheater, yellow brick road, flower gardens, shops, and entertainment
Cody Siem Memorial Skate Park	16th Street NW	Tier I & II equipment for ages 8 and over, picnic tables
Grand Rapids Sports Complex	1100 NE 11th Ave	Four softball fields, regulation soccer field, practice area, picnic, park/play area, and concessions
Grussendorf Park	8th Ave & 6th St SW	Playground, picnic, & park area, tennis courts, softball field, hard court area, basketball court, hockey rink & warming house
Lost Creek Park	4th Ave & 8th St NW	Playground, picnic & park area, creek runs through park
Maplewood Park	5th Ave & 14th St SE	Playground, picnic and park area
Minnesota Shooting Sports Education Center	483 Peterson Road	Educational training, train the trainer programs, 4-H Shooting Sports, NRA programs, and supervised recreational shooting
Mesabi Trail		From the fairgrounds north to Ely
McGowan Park	1st Ave & 13th St SW	Playground, picnic and park area
Mississippi River Bridge Crossing	From Oakland Park to Veteran's Memorial Park	Non-motorized bridge crossing in summer, snowmobile crossing in winter
Newton Sliding Hill	4th Ave & 7th St NE	Sliding Area
Pokegama Golf Course	3910 Golf Course Road	18-hole municipal course on the shores of Pokegama Lake, also Pokegama Park Place beach
Oakland Park	11th Ave & 4th St SE	Playground, picnic & park area, softball field, bridge crossing access, practice soccer area
Riverfront Trails	Pokegama Ave & 1st St SE	Trail beginning at Blandin Park and follow along the Mississippi River
Showboat Landing (Syndicate Park)	16th Ave & 3rd St NW	Picnic and park area, fishing platform, performance area
Skogebo Park	1st Street SW	Picnic area along river
Steamboat Landing	303 SE 1st St	Picnic and park area, river access
Sylvan Landing	12th Ave & 1st ST SW	Picnic and park area, boat landing
Veteran's Memorial Park	7th Ave NE & TH 2	Playground, picnic & park area, two sheltered pavilions, electricity, water, volleyball, and horseshoes court, bridge crossing access
Willow Park	4th Ave SE	Playground, picnic, and park area
IRA Civic Center	1401 McKinney Lake Rd	Trade shows, receptions, exhibition events, concerts, meetings and conventions

Steep Slopes

Ridges with slopes of greater than 35% are found throughout the city. Figure 5-15 shows the location of steep slopes within the City of Grand Rapids. Steep slopes, when developed without consideration, can cause substantial on-site problems including slumping, erosion, and structural cracking problems. Off-site impacts from such development can include increased volume and velocity stormwater runoff, visual impacts to community character, and fragmentation of habitat. This contributes to increased pollutant loads to water bodies, greater risk of introduced and exotic species, and depletion of high quality habitat and aesthetically pleasing views of the City. Consideration of slope is also important for road construction and development.

Figure 5-15. Grand Rapids Steep Slopes



Aggregate and Mineral Resources

Grand Rapids is located on top of geological formations that contain significant aggregate deposits and mineral resources. Aggregate is used in road-building and development. Access to a local source of aggregate reduces cost for construction projects. Figure 5-16 illustrates aggregate deposits in southeastern Itasca County. Gravel deposits underlay most of the City. Deposits of significant quality correspond with current gravel mining activity in sections 3, 4, and 7, in the northern half of the city as shown on the Figure 5-16. Additional high-quality deposits lie along the southern border of the city.

The Mesabi Iron Formation also runs through an extensive area in the northern half of the City as shown on Figure 5-16. This 2,600 acre geological resource provides an economic resource throughout the

region. Iron mining has occurred in the past in the northeastern corner of the City and west of the City in and near Cohasset. The iron formation lies under many other natural systems including lakes, rivers, wetlands, forested areas, drinking water supply vulnerability areas, and steep slopes. Iron deposits are also associated with aggregate deposits in the city. Reserving future extraction opportunities for both aggregate and iron deposits should be considered as development choices are made. Mining interests are actively investigating resources in and around Grand Rapids.

Figure 5-16. Mine Lands and Iron Ore Resources of the Grand Rapids Area

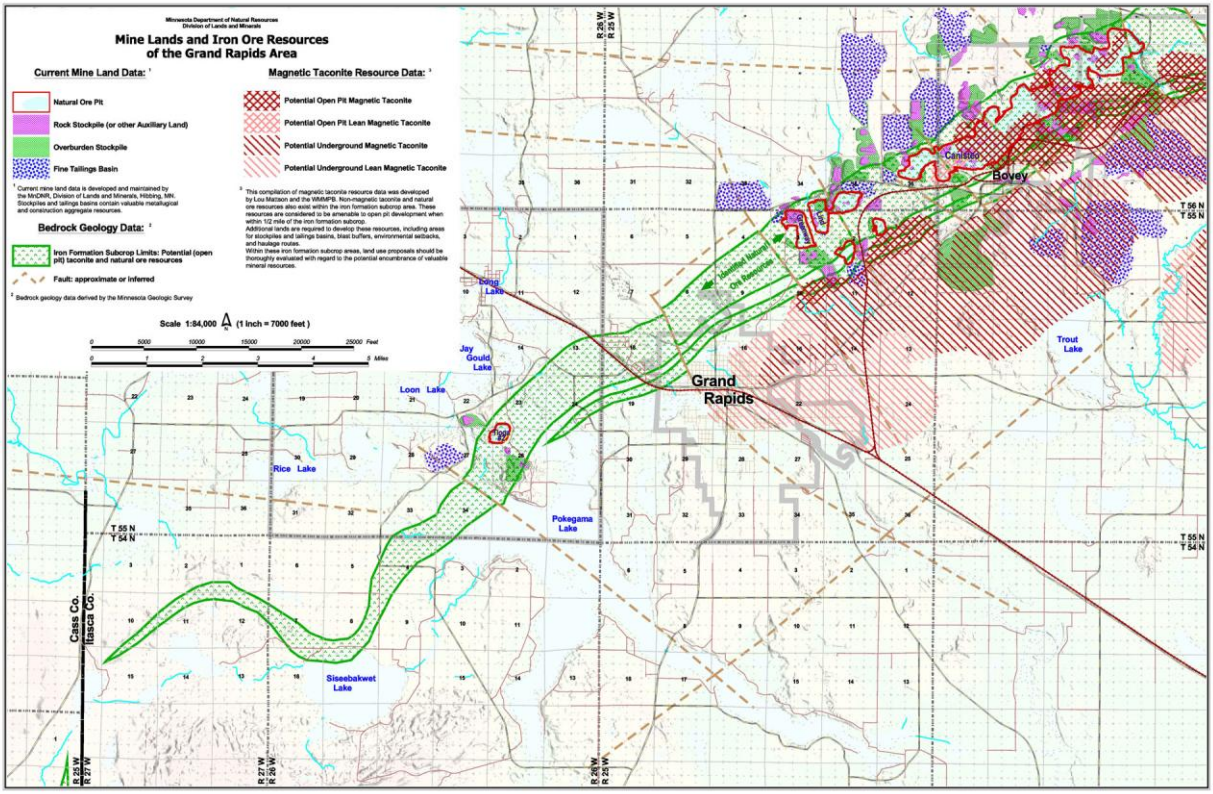
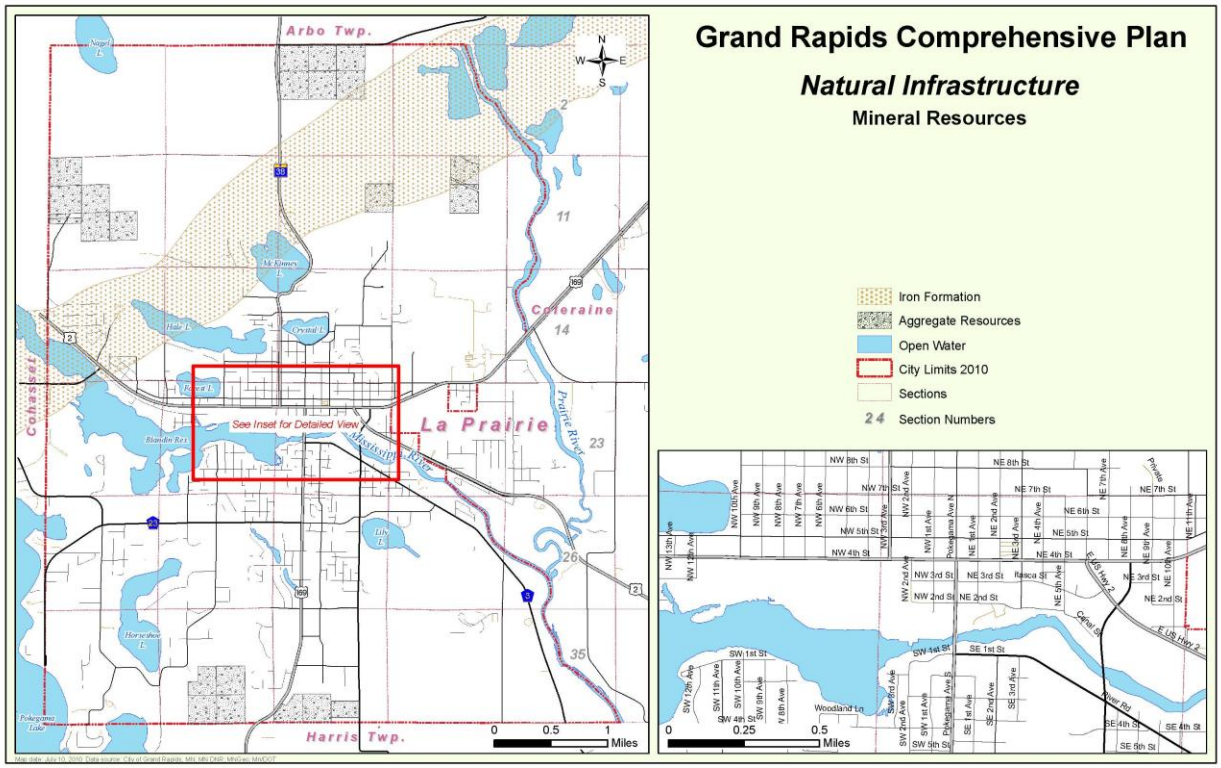


Figure 5-17. Grand Rapids Mineral Resources



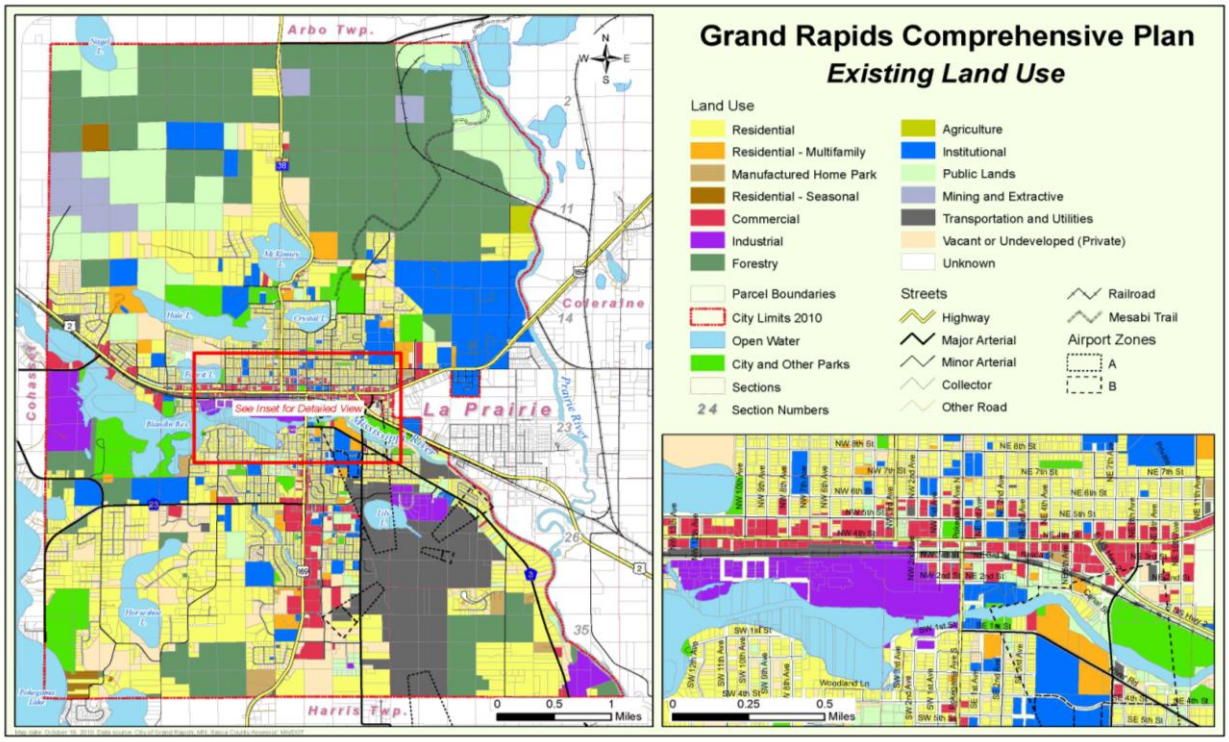
Urban Forest

The City's public and private urban areas, including residential, commercial, and industrial land uses within the urban service area, are part of the City's urban forest areas. The urban forest helps create and maintain the Northwoods character of the City, adds value to property, provides stormwater management value, and provides edge habitat for public and park lands. The City has required retention of trees within the development process as a means of retaining the character of neighborhoods and creating visual buffers. The City also maintains the urban forest on public rights-of-way and public lands within the City. An aerial photograph demonstrates the extent of the urban forest, showing the areas where the urban forest is contiguous with natural areas on the edge of the developed City, and those areas where the urban forest has not been maintained or where conditions are not conducive to trees.

Open Space and Forested Land

The Existing Land Use map shows large areas of forested land within the city boundaries. The majority of this forested land lies in the northern half of the city. As portrayed in Figure 5-14 (Parks and Trails) a significant portion of forested land is protected from development by conservation easements. Grand Rapids has over 900 acres of protected forest land within its borders under conservation easements which prohibit future development and preserve the land for sustainable forest management and open space use. The Existing Land Use map also shows hundreds of acres of public land that is not park land. Much of this is forest land held by Itasca County and managed for forestry. These forested parcels currently provide a natural landscape and support economic activity valued by residents.

Figure 5-18. Grand Rapids Existing Land Use



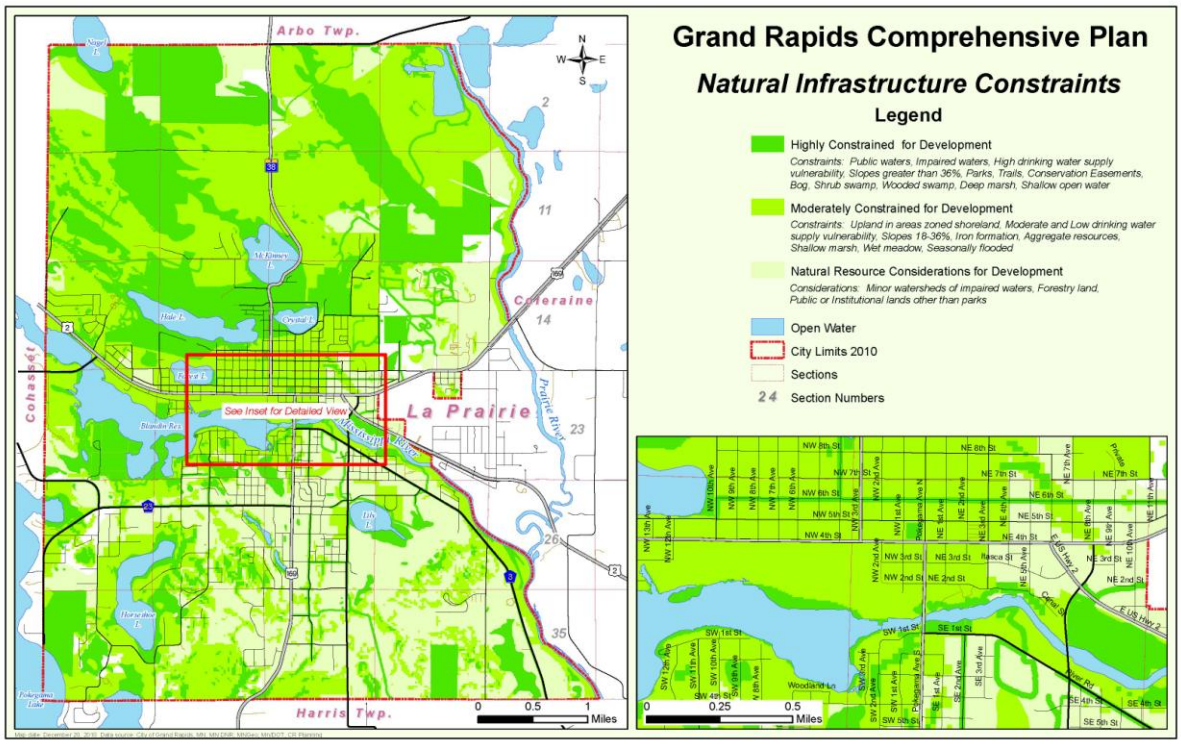
Composite Natural Infrastructure

Figure 5-19 displays many of the natural infrastructure layers on one map to allow analysis of areas most constrained for development. The map was created by setting priorities, some based on sensitivity of the resource to other activities and land uses, some on decisions by the Comprehensive Plan Steering Committee. The map key describes the sensitivity assignment. Most of the City lies within one of the sensitivity levels for natural infrastructure, demonstrating the inter-relationship of natural infrastructure and the City's other infrastructural elements.

The sensitivity designations are intended to indicate sensitivity, but not that any particular area should be protected. Sensitive natural infrastructure can coexist with other types of resources if the sensitivity is taken into consideration.

The northeast quarter of the city is most constrained from a natural infrastructure perspective. However, other areas of the city have specific natural infrastructure values that should also be considered. The information on this map will be used in conjunction with current land use information, housing needs, and economic development needs to make choices about future land use that implements the City's vision and values.

Figure 5-19. Grand Rapids Natural Infrastructure Constraints



Natural Infrastructure – Looking Forward

A number of natural infrastructure goals have been achieved since the 2003 Plan, particularly with the continued expansion of trails, green space associated with new development, and improving the stormwater management system to protect water quality. The 2010 Plan sets a number of new natural resource goals that use new information now available and reflect the continued community priority of integrating nature into the urban fabric.

The natural infrastructure inventory, the results of the community survey, and the results of the focus group process helped identify a number of issues to be addressed in the Plan:

- ***Addressing water quality issues in land use decisions.*** The City has water bodies that are designated as impaired, a situation that will require attention to watershed functions, continued implementation of the Stormwater Plan, and consideration of opportunities to restore drainage, infiltration, and buffer systems.
- ***Protecting mineral resources for future use.*** The City's mineral resources are valuable feedstocks to the region's economic engine. Aggregate is vital to road and housing development, iron ores sustain the established taconite and fledging steel industry. Some land uses are compatible with protecting access to minerals, while other land uses make extraction economically unfeasible. With the annexation of significant mineral resources in the northern part of the City, long-term decisions about the appropriate mix of resources will present challenges for years.
- ***Protecting timber and pulp resources.*** Paper and wood-based products are an important base of the City's economic base, and the forestry resources in the City are a new consideration in land use and economic development decisions. The annexation of Grand Rapids Township leaves the City in a position where there are as many acres in forest product production as there are in residential housing. This land is in private ownership, corporate ownership, and public (County) ownership. Decision-makers must prepare for choices about appropriate and economic use of forest lands in the City's rural areas.
- ***Protecting scenic and recreational areas.*** Grand Rapids has important scenic and recreation resources within City boundaries, and the annexation added additional areas. Highway 38 is designated as a scenic byway in addition to being an important highway for movement of goods and bordering the City forest and mineral rich lands. With the urban service area the City has scenic lakes and parks, including the Forest History Center and associated lands. Blandin Reservoir is both a visual asset and an economic asset.
- ***Continued interest in integrating natural elements into the City.*** Grand Rapids' community branding effort ("It's in Minnesota's Nature") was clearly reflected in public outreach during the planning process. Community member expressed a great deal of interest in continuing to build the City urban forest, improve its connection to the Mississippi River, and connect people to green spaces.
- ***Topographical and hydrological sensitivity.*** The City has widespread wetland and steep slope areas that both constrain the extension of infrastructure and development and that provide natural system benefits. Decision-makers need to make informed decisions about what is a sustainable choice for development or preservation within the context of these limitations.
- ***Drinking water supply vulnerability areas.*** Grand Rapids' drinking water supply is fairly vulnerable to surface water contamination at several points in recharge and well areas. Some of

these areas are within the City's urban service area. Some of the areas are in residential neighborhoods with a significant number of wells that are potential sites for contamination. These present dilemmas for both the City and the Public Utilities Commission in managing development and infrastructure.

- ***Addressing rural character in annexed areas***. Unlike most cities, Grand Rapids annexed a large area of land for reasons other than creating an urban reserve for future expansion. Some of the annexed areas will probably ultimately have urban services and urban density development. Very large areas, however, will only see rural development or no development at all. The City must attend to a very different set of development and character issues for an area that comprises are significant portion of the City's land area.

Natural Infrastructure – Goals and Objectives

The Comprehensive Plan update looks at the goals and objectives for natural infrastructure recognizing that these cannot be considered in isolation from the rest of the city's vision, values, and guiding principles. The goals and objectives for natural infrastructure are provided as a new category that did not exist in the 2003 Comprehensive Plan to reflect the importance of natural infrastructure as an environmental, economic, and social asset that connects all aspects of a sustainable community.

Natural Infrastructure Goals

2003 Plan Goals and Objectives

Although the 2003 Plan did not address natural infrastructure directly, it included several goals and objectives relating to natural infrastructure.

Parks and Recreation Goal 1**:** Provide and facilitate affordable recreational opportunities for all demographics to support physical and social needs within Grand Rapids.

Land Use Goal 4**:** Protect the Edge of the Wilderness National Scenic Byway Corridor.

Transportation Goal 3**:** Provide a safe, convenient, efficient, continuous, and aesthetically pleasing transportation environment that is conducive to both recreational bicycling and using the bicycle for a commuting purpose.

Land Use Goal 1, Objective 7**;** Balance open space and environmental preservation with Grand Rapids development needs.

2011 Plan Goals and Objectives

The new natural infrastructure section for the 2011 Plan update creates a hierarchy of goals and objectives and incorporates the 2003 Plan goals and objectives and that address the new challenges and opportunities described in the inventory above.

Natural Infrastructure Goal 1: Protect natural infrastructure economic assets.

Mineral resources, aggregate deposits and timber and pulp resources support Grand Rapids economic base and sustain the region's economic viability. Inappropriate development can fragment resource areas or make harvesting resources more expensive. The City must be clear and concise as to where protection of these resources is a priority and the best management practices necessary to sustain this element of natural infrastructure. The City has identified the following objectives to help define Goal 1.

a. ***Protect mineral resources in land use decisions.*** The City has potentially important mineral resources, including both iron ore and aggregate that can support industrial investment in the region. The City should ensure that land uses above and adjacent to mineral deposits will allow for eventual economic removal and use of these mineral resources.

b. ***Support continued management of forest lands for timber and pulp***. The City has significant managed forest areas, public and private, within city boundaries. Protecting the ability of local industry to harvest forest resources, and supporting sustainable forestry practices, will support economic and natural resource goals.

> ***Guiding Principles***
>
> ***Principle 2. Harmonize change with the existing community fabric and natural systems***
>
> Change is inevitable but opportunities and risks can be managed to protect and sustain community and natural infrastructure. Change can be structured to enhance rather than detract: creating synergies between new and existing businesses, transforming buildings to be more sustainable, designing new housing or commercial buildings to match existing scale.

c. ***Recognize synergy between recreational assets and other natural infrastructure goals*.** Recreation and associated tourism is a basic industry, and natural assets can be used for some recreational activities without disturbing long-term forestry or mining resources. Habitat or eco-system conservation is similarly compatible with protection of economic resources.

d. ***Support environmental permitting policies and actions*.** Environmental permits are a very important component to enforce the sustainability of the natural resource and the health and safety of the community. The city should work with the other public agencies to expedite and facilitate protective policies and practices for these markets.

e. ***Encourage education and research to explore useful products that use natural resources in a closed-loop system.*** Encourage educational institutions and research facilities to help create methods and products that sustain the community economically, socially, and environmentally both now and in a climate altered environment.

Natural Infrastructure Goal 2: Integrate the natural infrastructure within the urban core of the city.

> **Community Vision**
>
> Grand Rapids provides all residents safe, friendly, affordable housing and inclusive neighborhoods that retain and enhance nature in the City. . . . Grand Rapids is a welcoming gateway to Minnesota's Northwoods tourism.

Support natural infrastructure within the urban environment by protecting and restoring wildlife corridors, ecosystems, water quality, and recreational opportunities for the immediate area and within the context of protecting the Mississippi River watershed and lake watersheds. The City has identified the following objectives to help define Goal 2.

a. ***Create or protect buffers along the riverfront and lakes areas*.** Buffer provide for water quality protection, enhance habitat, and provide recreational and visual benefits.

b. ***Support and enhance the urban forest.*** Forests are a major component of the native ecosystems in the area and can be integrated into the urban fabric. Even in urban areas forests provide habitat, water quality and quantity protection, shade, and an aesthetically pleasing and social environment for the community.

c. ***Define the natural system infrastructure within future development and re-development areas.*** Urban areas development design standards must take into consideration public water supply protection, wastewater treatment system best management practices, urban forestry requirements, and stormwater quality and quantity for natural infrastructure protection.

d. ***Educate businesses, residents, and visitors on the importance of protecting the natural infrastructure.*** This includes providing recycling and trash containers, information on keeping invasive species out of the area's waterways and natural areas, protecting water quality, and preparing for ecosystem changes in light of climate change.

Community Values

Sustainable Natural Infrastructure

Our natural environment and natural resources are a defining and valued characteristic of our community. People, economy, and natural systems are connected in all aspects of daily life. Development should enhance natural systems, and sustainable natural systems should promote a sustainable economic base.

Natural Infrastructure Goal 3: Integrate the natural infrastructure within the rural areas.

Support natural infrastructure within the rural environment by preserving highly vulnerable natural resource areas and protecting and restoring ecosystems, water quality and quantity protection, and recreational opportunities for the surrounding area as well as for the larger context of which Grand Rapids practices contribute.

The city has identified objectives to help define Goal 3.

a. ***Provide buffers along the waterways and wetlands*.** This will help provide natural resource protection and recreational enjoyment.

b. ***Support re-forestation and other native ecosystem restoration in the context of climate change*.** These systems support ecological sustainability, water quality and quantity protection, and an aesthetically pleasing and social environment for the community.

c. ***Define the natural system infrastructure within future development and re-development areas.*** Rural development design standards must take into consideration septic system best management practices, private wells water source, trees and vegetation removal, and water quantity and quality for natural infrastructure protection.

d. ***Educate businesses, residents and visitors on the importance of protecting the natural infrastructure.*** This includes information on keeping invasive species out of the area's

Guiding Principles

Principle 1. Direct growth and development to locations that serve community vision and values.

Recognize that development and redevelopment activities should be guided to appropriate locations in order to realize the community's vision. Choices about where and how growth occurs will define community character for decades, affect the cost and quality of public services, and shape future development markets.

waterways and natural areas, protecting water quality, and preparing for ecosystem changes in light of climate change.

Natural Infrastructure Goal 4: Provide support and management of the city's parks and trails.

The city's parks and trails systems enhance the city's natural infrastructure, support the economic infrastructure, and provide for the social, mental, and physical well-being of the community.
The city has identified objectives to help define Goal 4.

a. ***Promote bicycle and pedestrian connectivity within neighborhoods and between destinations.*** Maintain and improve connections to the pedestrian, biking, and recreational trails. Connecting all neighborhoods and commercial areas will enable greater multi-modal travel and enhance recreational options.

Community Values

Cultural and Recreational Opportunities

We value the availability and quality of artistic, cultural, and recreational opportunities. Cultural and recreational opportunities contribute to our quality of life, define Grand Rapids as a regional creative destination, and enhance our City's role as a center of state tourism.

b. ***Improve access to motorized trails.*** Continue to maintain snowmobile trails and improve connections within the City to motorized trails.

c. ***Support, manage, and promote parks within City boundaries.*** Grand Rapids has a variety of parks and recreational areas within City limits. Continue to maintain parks, support information and educational programs for all types of recreation and all ages, and work with other entities to enhance the park system.

d. ***Work with adjacent local governing units and the State.*** Support the ongoing improvement and maintenance of state trails and work to provide connections between cities and townships.

Implementation Priorities

The 2003 Plan included implementation priorities for the parks, trails, and natural resource goals and objectives. While some of the recommended strategies and actions were completed, others are incomplete and need to be rolled into the new Plan. Furthermore, the new Plan includes new natural resource priorities and opportunities, including some new responsibilities assigned to the City by State and Federal agencies. Additional implementation priorities are added to address these changes.

The following long and short term actions implement the goals and objectives described above. Implementation priorities must be understood within the context of the overall Plan: Community Vision, Values, and Principles; Future Land Use Map and Policies; and, Goals and Objectives.

Economic Natural Resources

1. Incorporate long term protection of mining and forestry resources into zoning and other development regulations.
2. Within the subdivision process, develop a conservation design process for rural residential and resource management areas that allows development while protecting natural systems and economic resources consistent with those land use categories in the Future Land Use map. Consider also addressing lake shoreland areas to create a single conservation subdivision process.
3. Create a wellhead protection overlay for drinking water wells that identifies and limits land uses that put drinking water systems at risk within the high vulnerability areas. The Wellhead Protection Management area, identified in the Wellhead Management Plan defines an area where the City should adhere to best management practices for protection of groundwater. Consider setting standards to mitigate risks to drinking water supply in all vulnerability areas.

Surface Water Quality

1. Continue to implement the stormwater management plan including educational efforts on stormwater protection in urban and rural areas and encouragement of aggressive on-site management of stormwater where such management is appropriate.
2. Incorporate low-impact development practices in sensitive subwatersheds and shoreland development, particularly on Resource Management areas identified on the Future Land Use Map and in shoreland areas under public ownership. Consider restoration of shoreland buffers as part of development or redevelopment.
3. Expand the use of raingardens and infiltration techniques along roads and when redeveloping gray infrastructure.

Low Impact Development (LID)

LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that treat stormwater as a resource rather than a waste product. By implementing LID principles and practices, water can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed.

Source: U.S. EPA, www.epa.gov/owow/NPS/lid/#fact

4. Proactively work with business organizations to comply with Stormwater Utility standards. Investigate opportunities for design assistance, cofunding of watershed and buffer restoration, and publicly recognizing successful efforts.
5. Continue to work with the DNR and the Minnesota Department of Health in controlling Eurasian Milfoil in McKinney and Crystal lakes to prevent its spread to Hale Lake and the Mississippi River.

Urban Forest and Greening of the City

1. Protect existing trees adjacent to roads in urban right-of-way corridors and replant trees as needed.
2. Restore and enhance the urban forest in urban redevelopment, both commercial and residential.
3. Support urban forest development and greening standards for the Complete Streets recommendations.
4. Implement the Riverfront Framework Plan recommendations.
5. Monitor and take steps toward curtailing the spread of invasive plant species such as buckthorn.

Parks and Trails

1. Continue to seek funding for new trail connections within the urban fabric, including a new pedestrian crossing of the Mississippi River. Consider funding for trail planning, trail design, and trail maintenance. Design the trails to follow best management practices to reduce sedimentation and erosion and be accessible to all.
2. Work with LaPrairie to improve trail and pedestrian connections between the cities, particularly into the downtown and the Mississippi River trail system.
3. Support MnDOT's ongoing effort to designate and improve the Mississippi River Trail.
4. Properly close and seal wells and environmental borings in the High Vulnerability Drinking Water Management areas.
5. Supply areas that have access to City water.
6. Continue to work with pipeline and transmission entities, particularly in the Drinking Water Supply Management areas (DWSMAs) to minimize risk of contamination.
7. Continue to improve connections between established residential areas and park and recreation areas.
8. Continue to hold biennial meetings with recreation leaders to discuss facility needs and determine programming specifics.
9. Determine a route for connecting snowmobile trails on the southwest and southeast of the City.
10. Continue to incorporate bicycle and pedestrian trail search corridors into development approvals and road planning and investment. Emphasize trails that incorporate landscaping and are separate from roadways.
11. Define needs for park expansion, particularly in annexed areas, to allow for parkland dedication formula revision.
12. Encourage DNR development of the McKinney Lake carry-in boat access and recreation area.