

Introduction

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. Natural infrastructure includes 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.

Understanding the City’s natural resource infrastructure and ecosystem services are the first steps in planning where development should be encouraged and discouraged, and how best to design for maximum value to the community’s values. Ecosystem services are direct and indirect contributions of ecosystems to human well-being. They support our survival and quality of life.

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. 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, business can thrive, and natural resources are protected and enhanced. For example, houses built on unstable or wet soils without consideration given to those soils results in wet basements, cracked foundations, or unsafe structures.

Figure 7.1 shows the variety of land cover types present in Grand Rapids, including development, forest, farmland, and wetlands.

Water Resources

Grand Rapids citizens enjoy over 1,200 acres of open water within city boundary. 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 Downtown and Riverfront Plan redirects attention to the Mississippi River as an asset for the community. Water resources provide numerous ecosystem services and opportunities for recreation and enjoyment. For example:

- Lakes, wetlands, and riparian zones provide habitat for a diversity of fish, wildlife, and vegetative species
- Wetlands provide the critical function of surface water filtration
- Reservoirs and wetlands provide a natural buffer for storm water management
- Water bodies support opportunities for fishing, boating, and other aquatic activities throughout the year

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. Local land use

choices must manage excess nutrients which come from residential turf management, stormwater runoff, and agricultural practices to prevent impacting the City’s drinking water.

The Minnesota Department of Natural Resources (MnDNR) has classified lakes and rivers for development purposes. These classifications correlate with the Grand Rapids’ zoning requirements for Shoreland Overlay Areas and are shown in [Figure 7.2](#). Per the MnDNR, there are three lake classifications within the city limits; however, not all waterbodies have been identified by the MnDNR:

Natural Environment Lakes usually have less than 150 total acres, less than 60 acres per mile of shoreline, and less than three dwellings per mile of shoreline.

Recreational Development Lakes usually have between 60 and 225 acres of water per mile of shoreline, between 3 and 25 dwellings per mile of shoreline, and are more than 15 feet deep.

General Development Lakes usually have more than 225 acres of water per mile of shoreline and 25 dwellings per mile of shoreline and are more than 15 feet deep.

Within Grand Rapids city limits, Natural Environment Lakes include Horseshoe Lake, Lily Lake, and Nagel Lake. Recreational Lakes include Crystal Lake, Forest Lake, Hale Lake, and McKinney Lake. General Development Lakes include Blandin Lake and Pokegama Lake.



Watersheds

The City of Grand Rapids lies within the Mississippi River – Grand Rapids major watershed and five minor watersheds: Bass Brook, Prairie River; Pokegama Lake; and two minor watersheds of the Mississippi River - #9057 and #9064, as shown in [Figure 7.3](#). Watersheds are areas of upland that drain to a specific lake or 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 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.

Forest 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.

Open Space and Forested Land

The Existing Land Use map (**Figure 4.3**) shows large areas of forested land within the City boundaries. Most of this forested land lies in the northern half of the city. Grand Rapids has over 900 acres of protected forest land within its borders under conservation easements. Conservation easements 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.

Aggregate and Mineral Resources

Grand Rapids is located on top of geological formations that contain significant aggregate deposits and mineral resources. **Figure 7.4** illustrates aggregate deposits in southeastern Itasca County as identified by the MnDNR. Gravel deposits underlay most of the City. Additionally, active, historic, and potential pits are identified according to the MnDNR database.

The Mesabi Iron Formation also runs through an extensive area in the northern half of the City as shown on **Figure 7.4**. 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.

Steep Slopes

Figure 7.5 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.

Goals and Objectives



As noted within Chapter 3, goals and objectives were developed for each plan element in support of the 2040 Vision and Guiding Principles. The goals and objectives defined within these chapter should be considered as natural resources decisions are considered.

Goal – Statement of a desired vision (i.e., what is the future of the various elements within).

Objective – Statement of a defined action or policy that provides guidance in achieving the established goal.

Goal 1: Protect natural infrastructure economic assets for future generations. 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 clearly define where protection of these resources is a priority and promote best management practices necessary to sustain this element of natural infrastructure.

- a. **Protect mineral resources in land use decisions.** The recent establishment of two new zoning districts has provided ample protection of mineral resources from future development impacts. 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.
- c. **Recognize synergy between recreational assets and other natural infrastructure goals.** Recreation and associated tourism are basic industries, 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 sustaining natural resources and the health and safety of the community. The City should work with other public agencies, such as the Minnesota DNR, to expedite and facilitate protective policies and practices for natural resources.
- e. **Encourage educational institutions, research facilities, and local businesses to explore useful products that use natural resources in a closed-loop system.** Develop local pathways that retain primary production, intermediate production, reuse, and final consumption in the Grand Rapids area, helping to sustain the community economically, socially, and environmentally both now and in a climate-altered environment.
- f. **Maintain natural infrastructure as a tourism attraction and amenity within the community.** Recognize synergy between recreational assets and other natural infrastructure goals. Recreational tourism is a basic industry which is compatible with resource management objectives. 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.

Goal 2: Integrate natural infrastructure within the urban core of the city to support community character and access to healthy living. 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.

- a. **Create or protect buffers along the riverfront and lakes areas.** Buffers protect water quality, enhance aquatic and riparian habitats, 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 redevelopment areas.** Development design standards must consider public water supply protection, best management practices for wastewater treatment, urban forestry requirements, and stormwater management 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.
- e. **Ensure compliance with landscaping and buffering requirements.** Collaborate with property owners and developers to ensure compliance with the existing landscaping and buffering requirements within the zoning ordinance. Regularly review compliance procedures and regulations.
- f. **Support small farming and farm-to-table operations throughout the community that provide access to locally healthy foods.** Develop community gardens, farmers' markets, and agritourism corridors. Cultivate partnerships with community restaurants, educational programming, and food banks.

Goal 3: Integrate natural infrastructure within 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 Grand Rapids and the region.

- a. **Provide buffers along waterways and wetlands.** This will help mitigate shoreline erosion, filter pollutants, reduce runoff to surface waters, and provide areas for recreational enjoyment.
- b. **Support reforestation 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 redevelopment areas.** Rural development design standards must consider septic system best management practices, the water sources for private wells, trees and vegetation removal, and water quantity and quality for natural infrastructure protection.
- d. **Educate businesses, residents and visitors on the importance of protecting natural infrastructure.** This includes 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.

Goal 4: Provide support and management of the City's parks and trails to provide recreational and open space uses. 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.

- a. **Continue to promote bicycle and pedestrian connectivity within neighborhoods and between destinations.** Maintain and improve connections to pedestrian paths, bikeways, and recreational trails. Connecting all neighborhoods and commercial areas will enable greater multi-modal travel and enhance recreational options.
- 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.** Maintain and develop relationships with community civic organizations to support these efforts. 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. **Collaborate 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 Strategies



The implementation strategies defined within the following pages provide specific actions and measures that the City can deploy to meet the goals and objectives of this chapter. The strategies identified in the following table should be reviewed on a regular basis to ensure that the City continues to take action towards its desired future.

Additionally, this list should be updated and modified as strategies are accomplished.

Implementation Strategy –
Defined action or measure that the city will work towards to achieve the goals and vision of the Comprehensive Plan.

Implementation Strategy	On-Going Action	Short Term Action	Long Term Action	Responsible Parties
<p>Economic Natural Resources</p>	<p>Recognize the role of natural resources within the Grand Rapids and regional economy.</p> <p>Continue to monitor resources through the use of the resource management land use category and zoning district.</p> <p>Continue to encourage context sensitive solutions when developing near natural resources.</p>	<p>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.</p>	<p>Consider setting standards to mitigate risks to drinking water supply in all vulnerability areas.</p>	<p>Primary: Community Development, Engineering</p> <p>Secondary: Planning Commission, Public Utilities Commission</p>
<p>Surface Water Quality</p>	<p>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.</p> <p>Continue to work with the MnDNR and the Minnesota Department of Health on water quality and invasive species efforts.</p>	<p>Incorporate low-impact development practices in sensitive subwatersheds and shoreland development, particularly on Resource Management areas. Consider restoration of shoreland buffers as part of development or redevelopment.</p> <p>Expand the use of infiltration techniques along roads and when redeveloping gray infrastructure.</p> <p>Proactively work with business organizations to comply with Stormwater Utility standards. Investigate opportunities for design assistance, co-funding of watershed and buffer restoration, and publicly recognizing successful efforts.</p> <p>Properly close and seal wells and environmental borings in the High Vulnerability Drinking Water Management areas.</p>	<p>Same as Short Term Actions</p>	<p>Primary: Community Development, Engineering, Grand Rapids Public Utilities Commission</p> <p>Secondary: City Council, MnDNR, Minnesota Department of Health</p>

Implementation Strategy	On-Going Action	Short Term Action	Long Term Action	Responsible Parties
<p>Urban Forest and Greening of the City</p>	<p>Continue to monitor changes to the urban tree canopy and encourage the planting of trees and other green vegetation. Continue to enforce the landscaping requirements.</p>	<p>Review and update the landscaping requirements and enforcement as warranted.</p> <p>Support urban forest development and greening standards for the Complete Streets recommendations.</p> <p>Implement the Riverfront Framework Plan recommendations.</p> <p>Monitor and take steps toward curtailing the spread of invasive plant species.</p>	<p>Same as Short Term Actions</p>	<p>Primary: Community Development, Parks and Recreation</p> <p>Secondary: City Council</p>
<p>Parks and Trails</p>	<p>Continue to pursue trail projects that close existing gaps or provide extensions, both within the City and with surrounding jurisdictions.</p> <p>Continue to provide and improve connections to the parks and trails system for neighborhoods and visitors.</p> <p>Continue to hold biennial meetings with recreation leaders to discuss facility needs and determine programming specifics.</p>	<p>Support MnDOT’s ongoing effort to designate and improve the Mississippi River Trail.</p> <p>Determine a route for connecting snowmobile trails on the southwest and southeast of the City.</p> <p>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.</p> <p>Encourage DNR development of the McKinney Lake carry-in boat access and recreation area.</p>	<p>Incorporate parks and trails long range planning with other planning efforts throughout the community to ensure that needs are met. Continue to update the Parks and Trails Master Plan on a regular basis.</p>	<p>Primary: Parks and Recreation</p> <p>Secondary: City Council, Community Development</p>