Section 2
Potential Environmental Impacts

2.0 Potential Air Impacts

Industrial silica sand mining operations have two types of air emissions. The first is the dust from the mining, blasting, and handling of sand and the second are various pollutants emitted from the equipment used to mine, handle, process, and transport the sand. Each mine and/or processing plant can be different, and can involve equipment related to backfilling, crushing, washing, drying, screening, stockpiling, conveying, and heavy equipment for transporting the sand. Below is a list of the type of air emissions that can take place and potential regulations that apply to these phases of the operation.

2.01 Construction Impacts

Impact: Fugitive dust during construction; diesel emissions

Mitigation: Best Management Practices (BMPs) include paving or placing gravel on access roads and watering down roads or work areas with tanker trucks as needed.

Mitigation: Should require a fugitive dust prevention plan. Fugitive dust prevention methods vary somewhat for each step in the mining operation but typically involve applying water to the surface to prevent blowing dust.

2.02 Blasting Impacts

Impact: Air pollution is generally considered insignificant and controlled by several BMPs. Noise and vibration are considered primary impacts.

Mitigation: Can also require study of anticipated effects of air blast pressure and vibrations caused by blasting.

Mitigation: Can require a noise Study to address the effect of noise on nearby sensitive receptors and mitigation efforts such as time of day operational limitations, barriers and use setbacks.

2.03 Overburden Removal, Excavation and Crushers

Impacts: Fugitive dust and combustion emissions

Mitigation: Minimized by routine maintenance of equipment; water trucks may be used to eliminate fugitive dust concerns. Water bars or other wetting techniques may be used to minimize dust from crusher units.

Mitigation: Soil stockpiles can be seeded and mulched as soon as the season's work is complete.

2.04 Pumps and Washing

Impacts: Very minimal air pollutants associated with this operation

2.05 Stockpiles

Impact: Coarse sand is stockpiled at the mining site or processing site to be washed. Fugitive dust is the main concern

Mitigation: Need to have a fugitive dust prevention plan in place

2.06 Loading/Unloading at the Mine

Impact: Can include transferring raw material into trucks or railcars for transport. Unloading operations at a mine may include dumping of fines/reject sand brought from processing plants. Loading operations may or may not be within an enclosed structure. Activities can have significant dust impact and can be further regulated by specific emission limitations.

Mitigation: Activities need to follow a fugitive dust prevention plan.

2.07 Mobile Equipment on Mining Sites

Impact: Mines and processing plants will have a collection of front-end loaders, trucks, etc. that can create dust and emissions.

Mitigation: Fugitive Dust Plan
Mitigation: Paving Roadways
Mitigation: Spraying of water on dusty roads or sweeping
Mitigation: Wheel wash or tire bath
Mitigation: Posting and maintenance of speed limits

2.08 Conveyors

Impact: Used to convey sand from mine to processing or to stockpiles, can have fugitive dust impacts

Mitigation: If conveyed dry, there is a need for a fugitive dust prevention plan

2.09 Dryers

Impact: After sand is washed, and prior to being sized and stored as a final product it goes through drying. Air pollution resulting from this operation includes combustion emissions (from internal combustion engines use) and particulate.

Mitigation: Emissions and sand particulates are largely controlled by the use of a cyclone or baghouse. Collected materials in the baghouse are disposed of at the mine site as fines or rejected material.

2.10 Screening

Impact: Sand is transfer to vibrating screens. Resulting particulate from the screening process is typically controlled by the use of a cyclone or baghouse. Some facilities enclose the screening operation within a building.

Mitigation: Need to follow a fugitive dust emissions plan

2.11 Loading/Unloading at the Processing Plant Operation

Impact: Processing plant at the mine will not have unloading operations; processing plant off-site will have truck or rail unloading of raw material. Processing plant will have loading operations regardless of the site. Air pollution resulting from processing plant includes stack and particulates

Mitigation: Control of dust particulates can take place by use of a cyclone or baghouse, or unloading process through underground or covered conveyor systems.

Mitigation: May require fugitive dust prevention plan for fugitive emissions.

2.12 Inhalation Risk and Non-Carcinogenic Effect for Hazardous Air Pollutant Emissions
Impact: Can require an air quality impact assessment.

2.1 Water Resources

Water resources can be impacted by industrial silica sand mining operation in several ways. The mine may be located near a river or stream or wetland, or groundwater may be encountered as the site is being mined. Water may also be used during the mining and processing stages. Washing may require the installation of a high capacity well. Storm water needs to be managed on a mining or processing site and if there are buildings, there may be a need for water for cleaning, cooking, drinking, or sanitation.

2.11 Groundwater- Process Water

Impact: Industrial Silica Sand Mining and processing plants utilize ground water, expected average water use ranges from 420,500 gallons per day to 2 million gallons per day according to the Wisconsin DNR. Wells are classified as high capacity wells, subject to state permit requirements that are designed to prevent contamination of groundwater and prevent pollutants at the land surface from entering the underlying aquifer.

Mitigation: The DNR permit approval for a high capacity well will take into consideration operations with potential to cause significant impacts to trout streams, outstanding resource waters, exceptional resource waters, or other waters of the state. High capacity wells near springs are reviewed to determine whether construction and operation will result in substantial reductions in the flow from the spring. In the case where a high capacity well has potential to impact private water supplies, conditions of approval can be required to avoid these impacts. Good baseline information is needed for the private well owners both in terms of static water levels and water quality (arsenic, nitrate, and iron).

2.13 Groundwater – Dewatering Water

Impact: Some sand mining operations take place below the water table and may require significant groundwater pumping in order to dewater the mining area. This can lead to increased potential for impacts to groundwater and surface water.

Impact: Mines and processing plants commonly use polyacrylamides as a flocculent to remove unwanted minerals and fines from used water. The acrylamide may be present in frac sand wash water if they are used in the flocculent in their wash operations. However, acrylamides appear to be

biodegradable and unless levels are very high in the wash wastewater there may not be great potential for acrylamide to contaminate groundwater at the sand wash water storage/discharge site. The Wisconsin DNR stated that more research is needed to determine concentrations of acrylamides in frac sand wash water when mines are using polyacrylamide polymer flocculation products. There is potential health risk associated with drinking water containing high levels of acrylamide over a long period of time.

Mitigation: Sealed ponds will have very little risk for groundwater impacts.

2.14 Groundwater – Drinking Water

Impact: Public water systems are regulated by the DNR to assure safe reliable drinking water.

Mitigation: Permit requirements include operator and sampling requirements.

2.15 Surface Water Management

Impact: There is a potential for direct impact on surface water systems if a mining operation involves the removal of silica frac sand directly from the stream channel, lakebed, or the immediate stream bank or lake bank. This can lead to siltation, erosion, and loss of fish and aquatic life habitat. Indirect impacts to surface waters from mining sites include discharge of contaminated storm water runoff from the mine, dewatering processes, inadvertent releases from wastewater storage ponds. Other indirect impacts include contamination of groundwater that flows into streams and lakes, loss of wildlife habitat near stream corridors, and degradation of natural scenic beauty.

Mitigation: Storm water discharges from mining sites are regulated by the Minnesota Pollution Control Agency through WPDES Permits. Permits are required from the Minnesota DNR for Public Waters Work Permits. US Army Corp of Engineers Section 404 Permits may be required for excavation within waters and wetlands.

2.16 Wetlands

Impact: Wetlands are protected by state law because they provide valuable functions related to storm and flood water storage; groundwater recharge and discharge; filtering; shoreline protection; habitat; and recreational, cultural, educational, scientific, and natural scenic beauty benefits. One of the targeted areas for silica frac sand mining is the alluvial deposits near or within these wetlands and so there is potential for adverse impacts caused by physical alteration, discharge of fill materials, and altering of drainage patterns.

Mitigation: Permits are required from the Board of Water and Soil Resources (BWSR) related to the Wetland Conservation Act; and from the US Army Corp of Engineers; and MPCA.

2.17 Cannon River Watershed

Impact: The City of Red Wing has established special protections for the Cannon River Watershed within the city corporate boundaries according to Minnesota Statutes,

Sections 104.31-104.40, Minnesota Regulations NR 78-81, and the Management Plan for the Cannon River hereafter referred to as NR 2900 (6 MCAR 1.2900). The regulations are designed to protect the special scenic and natural resource qualities of the bluffs and shoreline of the Cannon River. Mining operations could have a negative impact on these qualities.

Mitigation: Surface mining and processing plants are not an allowed use in the Cannon River Watershed district; only underground mining would be allowed with a conditional use permit. Other restrictions related to forestry protection could severely limit underground mining operations.

2.18 Wastewater

Impact: The MnDNR regulates wastewater discharges at mine sites related to pit dewatering; and wash water generated from the mine processes.

Mitigation: DNR permits are required and mitigation involves methods of removing suspended sediments from discharges.

2.19 Erosion Control

Impacts: Typical erosion issues during construction of the site.

Mitigation: Requirements for construction site permits include preparing an erosion control plan that details BMPs that will be used to control erosion during the construction as well as the storm water management plan that details how sediments will be controlled once construction is complete.

2.2 Fisheries

Impact: Runoff from mine sites and settling ponds into cold water resources can cause high levels of turbidity for trout reproduction; runoff can cause sedimentation in streams and rivers; thermal impacts (warm water settling ponds on cold water resources); and high capacity well impact on stream flows.

Mitigation: Best Management Practices related to stormwater management for watersheds that drain into trout streams can be required.

2.3 Solid Waste Management

Impact: Mining and processing plants generate solid waste similar to other business or industries. These wastes should be recycled or disposed of at a licensed Processing Facility.

2.4 Recreation and Managed Lands

Impacts: The proximity of mining and processing plants to state and local recreational lands may have impacts to consider. Impacts such as noise, dust, lighting, traffic, air quality, loss of forest cover, and disturbance of scenic qualities may impact on the use of surrounding lands. Red Wing has several thousand acres of land that are in public and private

ownership and are currently are being managed and protected for the purpose of maintaining their open space qualities. Map 4 shows properties in Red Wing owned by the State of Minnesota, Goodhue County, City of Red Wing and other private properties with conservation easements to the Minnesota Land Trust, City of Red Wing, and the Nature Conservancy.

Mitigation: The proximity of mining and processing plant operations to the listed open space areas would require specific mitigation plans.

2.5 Endangered and Threatened Species and Habitats

Impact: The mining and processing plant operation impacts listed above in the section on recreational and managed lands can also impact on natural communities and the habitat for endangered plants and animals that are found in the Red Wing area. Map 5 shows natural communities from the Goodhue County Biological Survey completed by the DNR. In addition, Red Wing is part of two Important Bird Areas established by Audubon: the Vermillion River Important Bird Area and the Lake Pepin Important Bird Area.

Mitigation: The proximity of mining and processing plant operations to the endangered and threatened species and habitats would require specific detailed mitigation plans.

2.6 Archeological and Historic Impacts

Impact: Red Wing has a tremendous number of known historic and archaeological sites and resources. The Minnesota Cemetery Statute protects burial mounds; Red Wing's Heritage Preservation ordinance provides some protections to city designated sites and districts. Map 6 provides generalized information about potential archaeological sites in the Red Wing area. Mining and process plant operations could have a detrimental impact on these sites based on the proximity to the site and other infrastructure needs, such as road systems.

Mitigation: Many sites are not surveyed and require field investigation by a trained and certified archaeologist. Mitigation plans would be needed on a case by case basis.

2.7 Natural Scenic Qualities

Impact: Mining and processing plant operations could have a devastating impact on Red Wing natural and scenic qualities that are characterized by the Mississippi River bluffs, valleys, wetlands, and floodplains. The 2008 Open Space Preservation Plan included the identification of scenic resources with an inventory of bluff steep slopes (See Map 7) and Hydrology Resources (See Map 8) that have been identified as important community resources to preserve.

2.8 Socio-Economic

Impact: Impacts on neighboring properties: noise, increase in traffic, road deterioration, visual impacts, lighting, and property value impacts. Economic benefits include: new jobs, support of secondary jobs such as transportation, construction and equipment, infrastructure investment, added tax base

2.9 Transportation

Impacts: Vehicular traffic on local roads will have a wear and tear impact on the service life and condition of the roads, dependent on the amount of traffic.

Impact: Red Wing has rail and barge facilities and there is potential for silica/frac sand to be transported to these sites for further transportation. Most of the impacts relate truck traffic conflict, fugitive dust and surface water storm water management issues.

Mitigation: Traffic impact studies can be required for proposed mining operations in order to better understand the traffic impact to local, county, and state/federal highway systems.

Mitigation: Several Counties have required Road Maintenance Agreements including Woodbury, Chippewa County, (Olmstead County – considering). These agreements begin with a transportation impact study that identifies the impact of the use on the transportation system. Road agreements are then developed that make the applicant responsible for public improvements and maintenance associated with the identified road impacts. These agreements relate to the local road system (usually county roadways) and do not apply to the Trunk Highway system.

Mitigation: Transportation facilities for rail and barge should have fugitive dust mitigation and storm water management plans put in place.

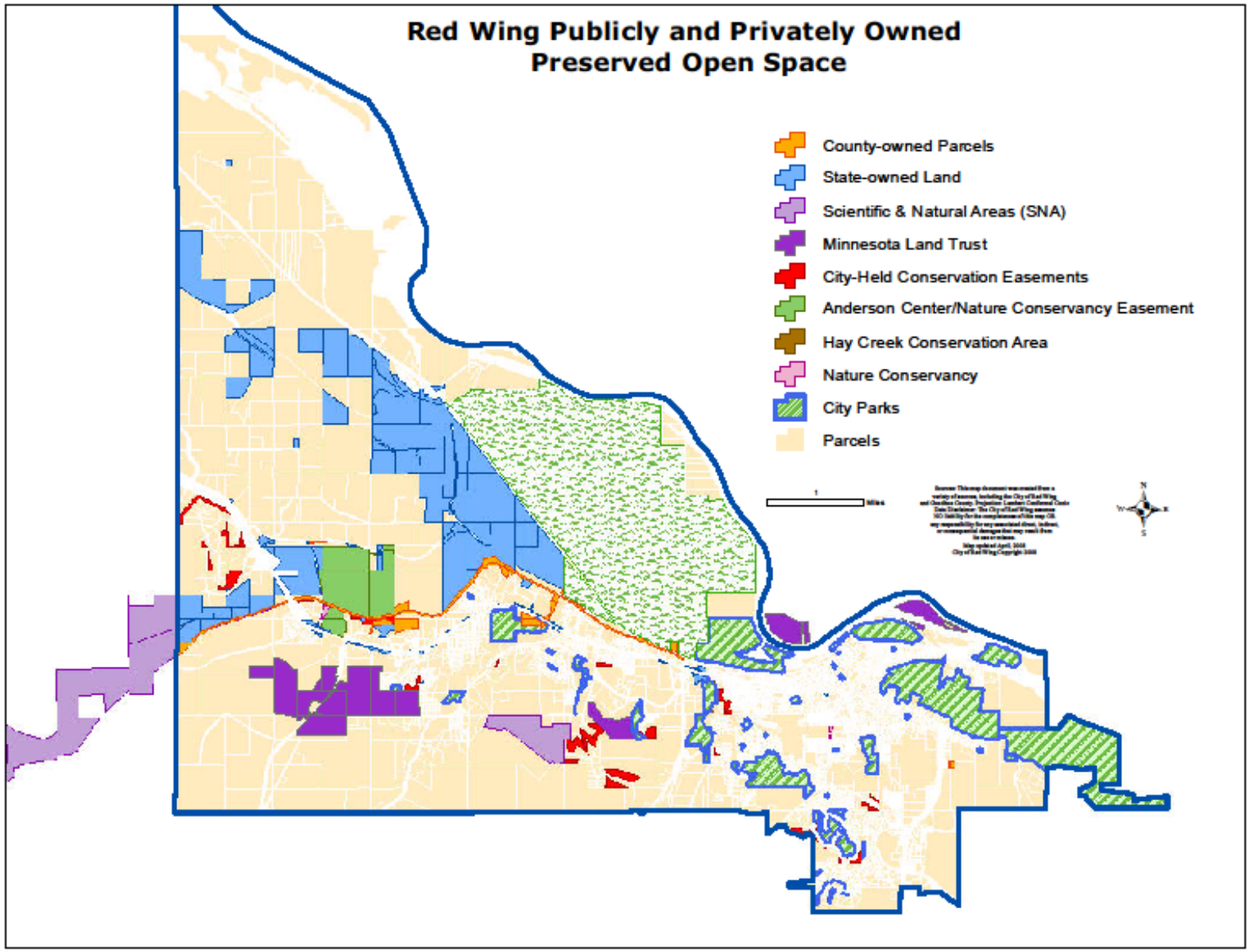
3.0 Human Health Considerations

Impact: The results of most studies suggest occupational exposure to “respirable crystalline silica” is associated with higher rates of serious lung diseases such as silicosis, chronic obstructive pulmonary disease (COPD) and others. Some disease symptoms can be treated, but these are chronic conditions that may progress to more serious and even life-threatening diseases such as lung cancer. Occupational exposure is a concern for mine and quarry workers, sandblasters and granite cutters and others. Work done by groups such as the Occupational Health and Safety Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH) and public health researchers provide a wealth of reliable information and recommendations about levels of exposure, monitoring methods, protective measures, etc. in the workplace. But currently there is almost no information available about health hazards related to casual or ambient exposure to silica sand particulate. However, on

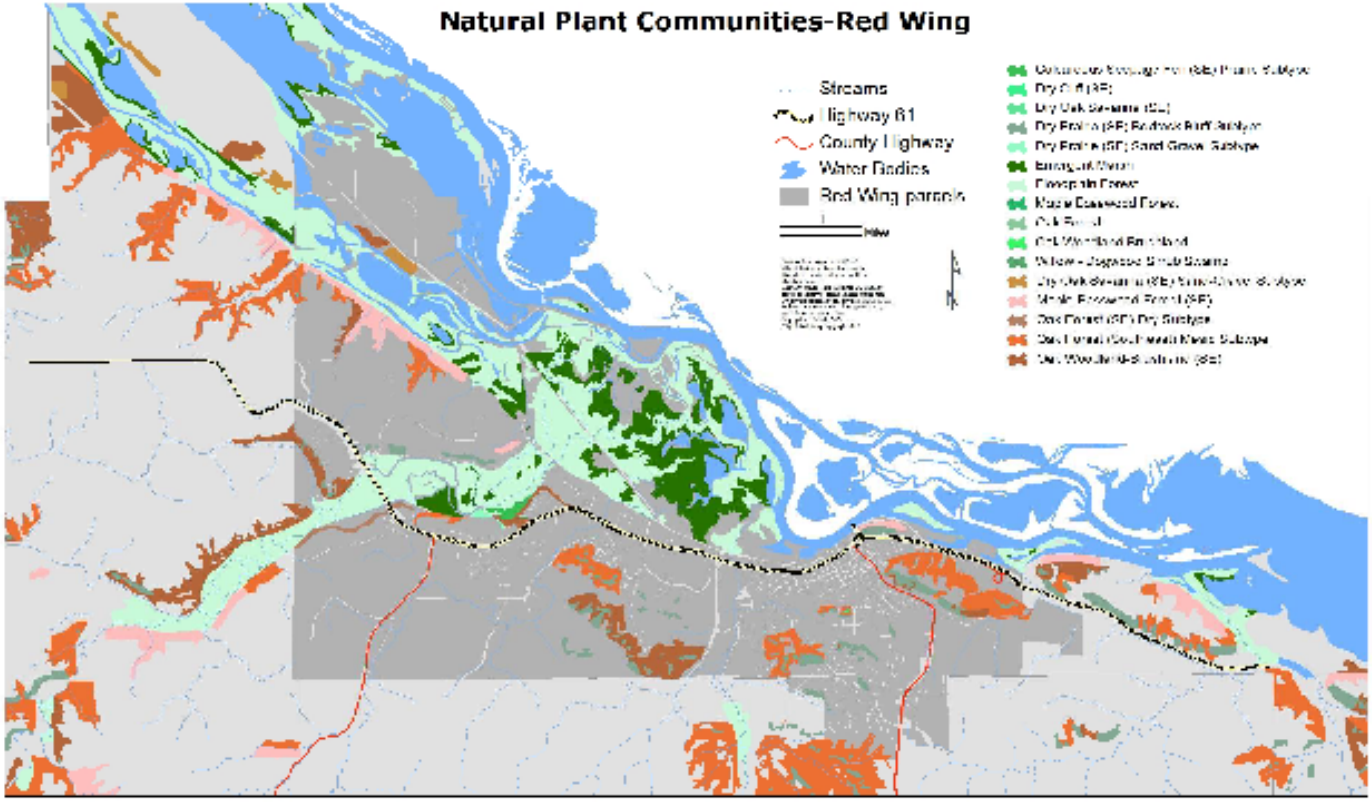
June 14, 2012, the U.S. Environmental Protection Agency (EPA) did propose to strengthen the National Ambient Air Quality Standards (NAAQS) for fine particulate pollution, also known as fine particulate matter (PM2.5). According to the EPA, an extensive body of scientific evidence shows that exposure to particle pollution causes premature death and is linked to a variety of significant health problems, such as increased hospital admissions and emergency department visits for cardiovascular and respiratory problems, including non-fatal heart attacks. PM also is linked to the development of chronic respiratory disease.

Mitigation: Common sense supports the idea that efforts should be made at minimizing the opportunities to inhale these particles. This is probably most important for people with pre-existing respiratory or other chronic conditions, the very young and the elderly. Dust control is probably the most important mitigation requirement followed by buffer requirements, and good baseline and continuous monitoring measures.

Map 4

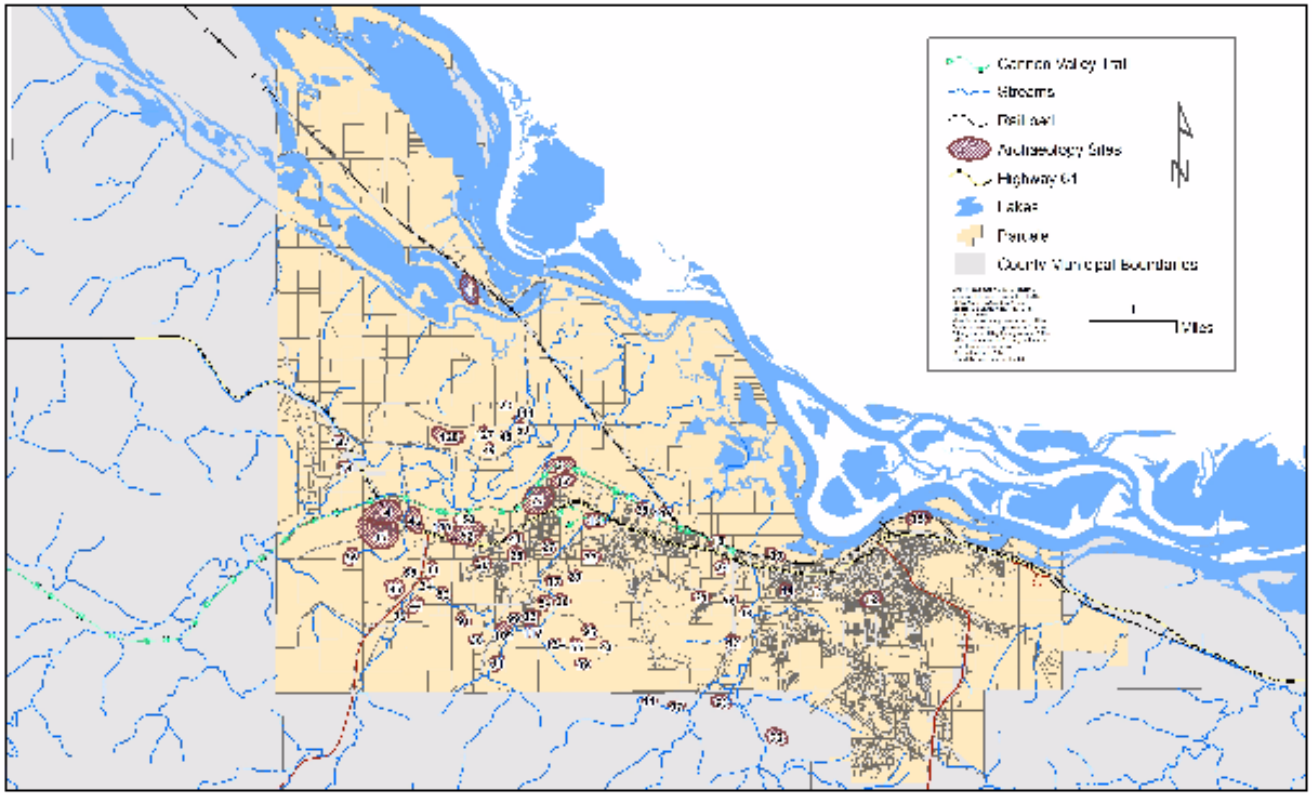

Red Wing Publicly and Privately Owned
Preserved Open Space
County-owned Parcels
State-owned Land
Scientific & Natural Areas (SNA)
Minnesota Land Trust
City-Held Conservation Easements
Anderson Center/Nature Conservancy Easement
Hay Creek Conservation Area
Nature Conservancy
City Parks
Parcels

Map 5

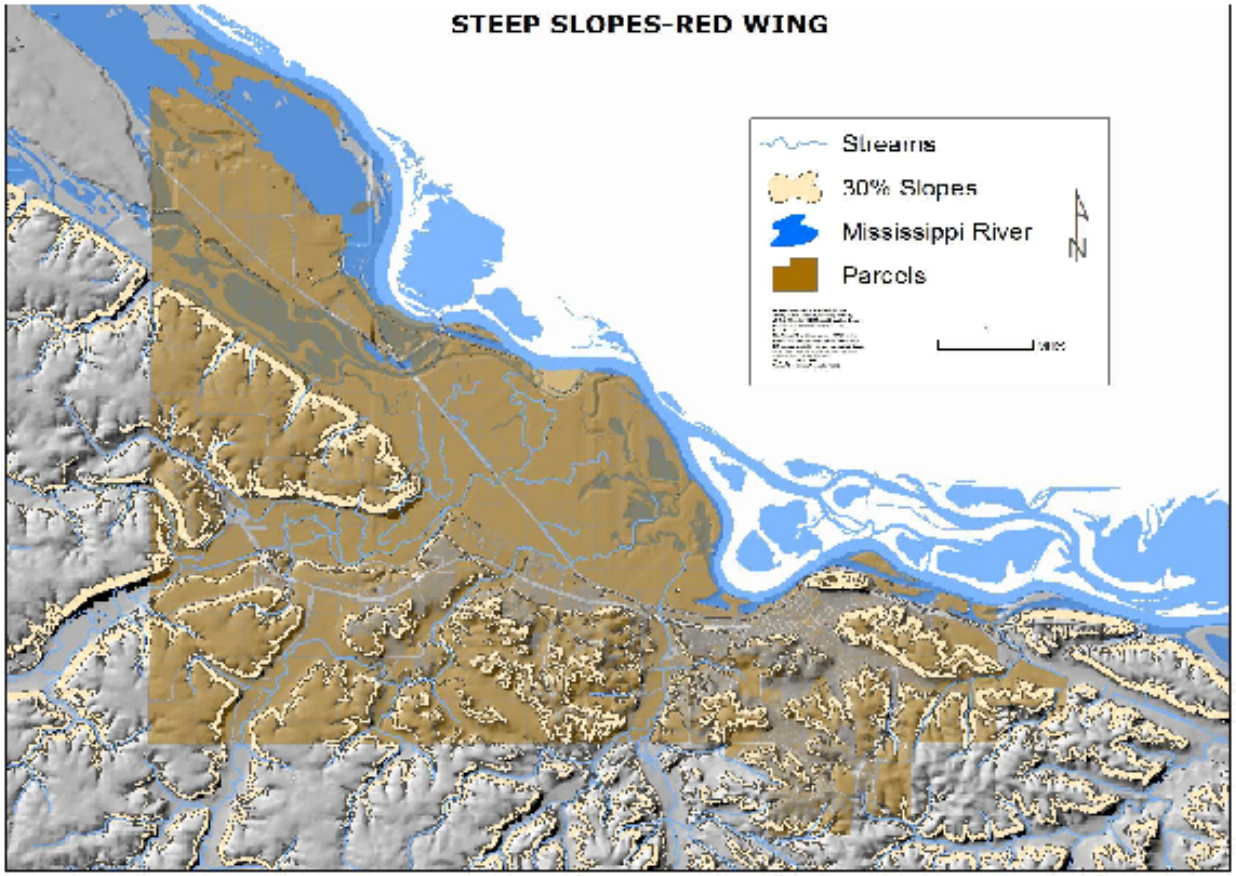

Natural Plant Communities-Red Wing
Streams
Highway 61
County Highway
Water Bodies
Red Wing parcels

Map 6

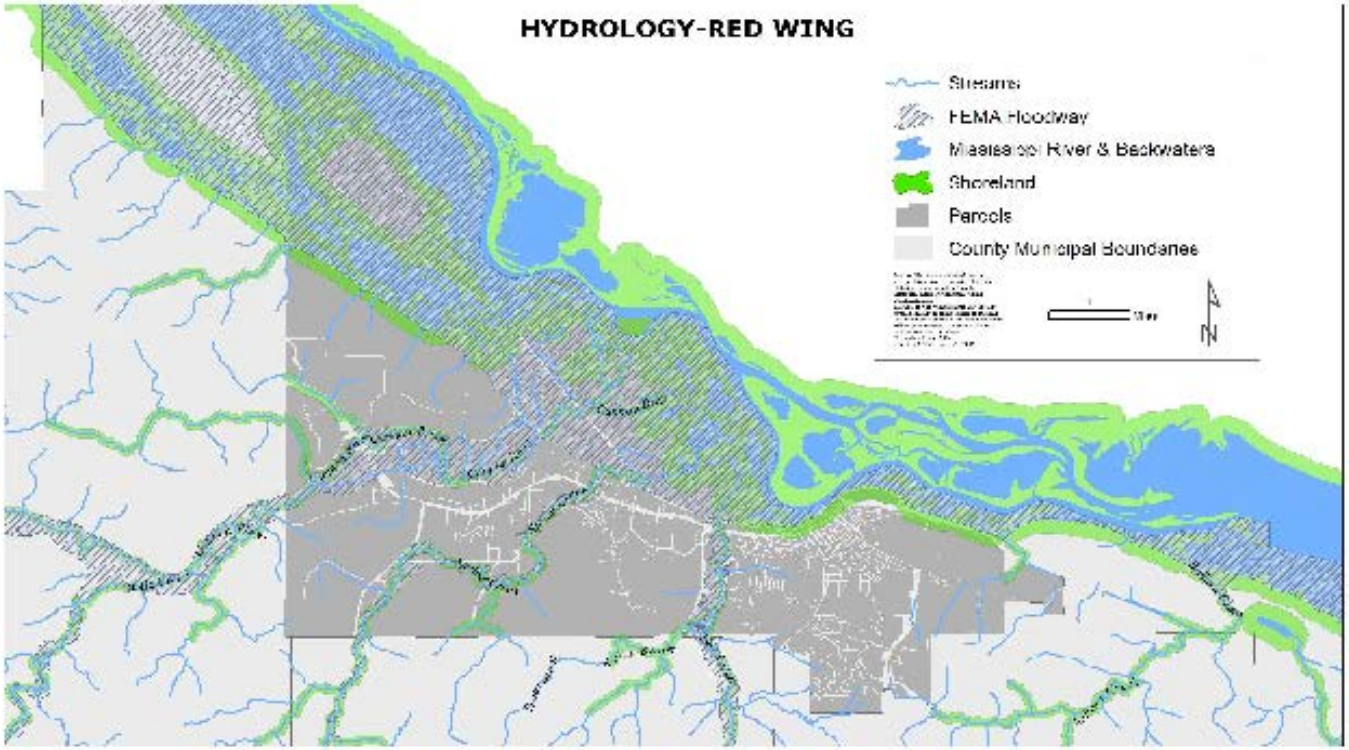
AREAS OF ARCHAEOLOGICAL CONCERN



Map 7


STEEP SLOPES-RED WING
Streams
30% Slopes
Mississippi River
Parcels
N

Map 8


HYDROLOGY-RED WING
Streams
FEMA Floodway
Mississippi River & Backwaters
Shoreland
Parcels
County Municipal Boundaries

Section 3
Red Wing Comprehensive Plan Guidance

3.0 Comprehensive Plan

The City's Comprehensive Plan is a compilation of maps and policy documents that provide decision makers with guidance for the future development of the City. On April 9, 2007, the City Council adopted a major update of the Comprehensive Plan that establishes the primary basis for guidance. Other area plans and special planning reports have also been adopted by the City Council as amendments to the Comprehensive Plan. The list of these additional special plans is listed in the Table of Contents of the Comprehensive Plan report as Volume 2 – Adopted Comprehensive Plan Elements. The 2007 Comprehensive Plan provides a great deal of guidance for the Silica Sand Mining land use; as well as the Open Space Preservation Plan that was adopted 2008.

3.1 2007 Comprehensive Plan References

The 2007 Comprehensive Plan was organized around three physical layers of the community: Community Systems, Settlement Patterns, and Design Character. These subjects became chapters 4, 5 and 6 of the Comprehensive Plan and each chapter has some relevance to the Silica/Frac sand mining issue. In Chapter 4, Community Systems, the comprehensive plan is built around the concept of preservation of the "green infrastructure". The green infrastructure includes the community systems that involve surface water, ground water, greenway corridors and patches, parkland, urban forests, green roofs, and archaeological sites and villages. Preserving the network of green infrastructure is a prominent element of the City's Comprehensive Plan. Figures 4-1 and 4-2 from the Comprehensive Plan illustrate the sensitive green landscapes and the Green Network that contributes to the overall health and livability of the city. Pertinent policy statements from Chapter 4 include:

Policy #2. Preserve a community-wide network of contiguous public open space identified as the green network in Figure 4-2.

Policy #3. Prevent new development from encroaching into the green network.

Policy #6. Protect bluffs (topographic and vegetative change) from the toe of slope to top of bluff.

9. Policy #9. Implement practices to conserve, to the fullest extent possible, water derived from underground aquifers.

Policy #15. Continue to improve internal mapping of archaeological sites and villages and direct infrastructure and development away from these locations.

Chapter 5 (Settlement Patterns) further reinforces the idea of preserving the green infrastructure by establishing a Future Land Use Map (Figure 5-1) that encourages development in activity centers and away from the green network. Chapter 6

(Design Character) encourages high quality community design and sustainable design for developments.

The final chapter of the 2007 Comprehensive Plan document is the chapter on Community Initiatives. Initiative 7 provided that the City should develop a strategy for open space preservation. The Open Space Preservation Plan is summarized in the next section of this report.

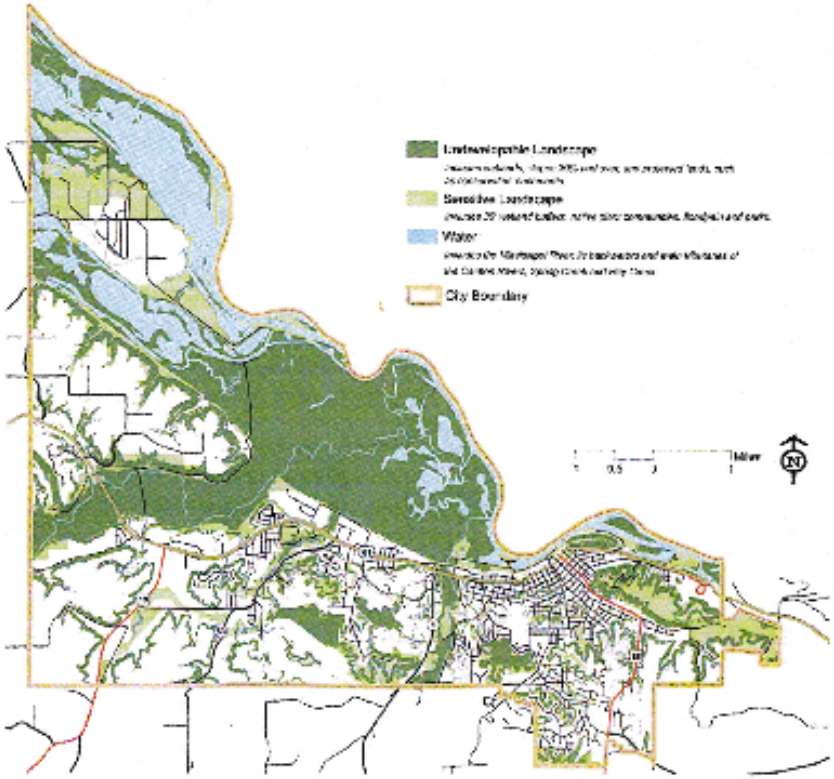


Figure 4-1. Sensitive Landscapes
Defining the City's sensitive landscapes provided a starting point to identify the green infrastructure already present and areas to conserve in the future that contribute to a broader green network.

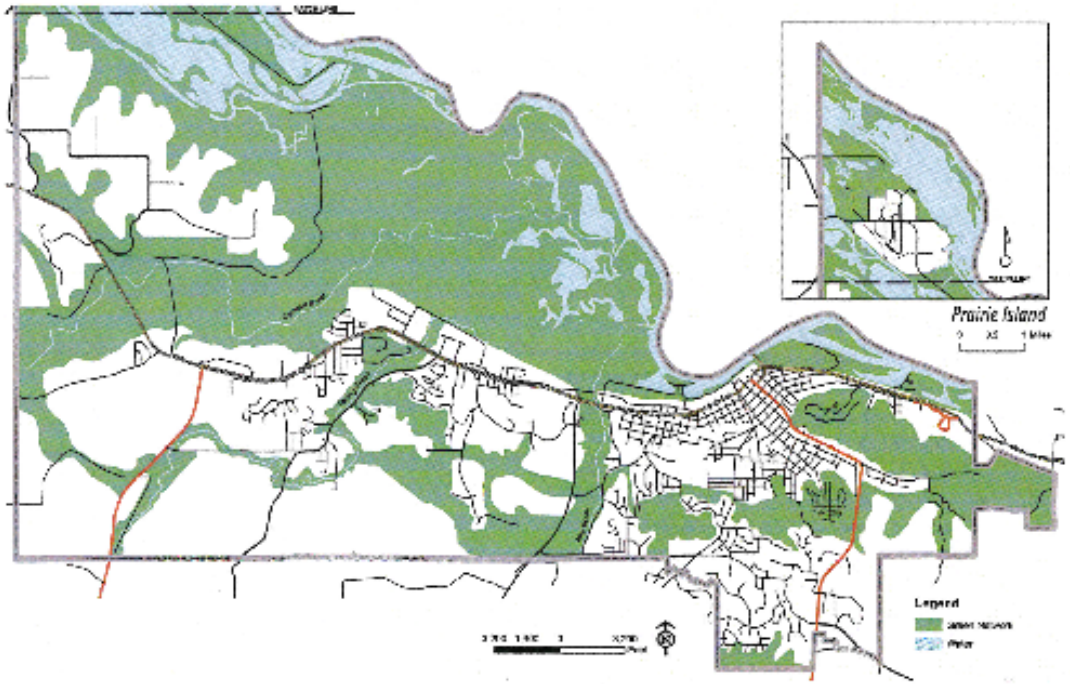
Green Infrastructure

Society's recognition of green infrastructure's importance continually evolves. Until the establishment of Central Park in New York City 150 years ago, there was little appreciation for the impact of parkland on our social and emotional well-being. Until the environmental movement of the last century, our primary interest in surface water was transportation and waste disposal.

Preserving a network of green infrastructure figures prominently in this comprehensive plan because Red Wing cannot realize their vision or claim their identity without its strong presence. Success in regard to green infrastructure means the community must strengthen existing methods and find new approaches to protecting, managing and enjoying open spaces and public waters. This plan envisions Red Wing's green infrastructure as a linked system that maintains ecological integrity, provides public access and preserves scenic character and important views. Figure 4-1 illustrates the natural systems and sensitive landscapes in Red Wing. Preservation of these lands will contribute to the overall health and livability of the city.

Green Network of Corridors & Patches

As illustrated in Figure 4-2, a green network is identified, taking advantage of existing natural systems, open



The green network in Red Wing can be defined by a series of patches (turquoise) and corridors (purple) functioning together to enhance the overall ecology of the city.

Figure 4-2. The Green Network

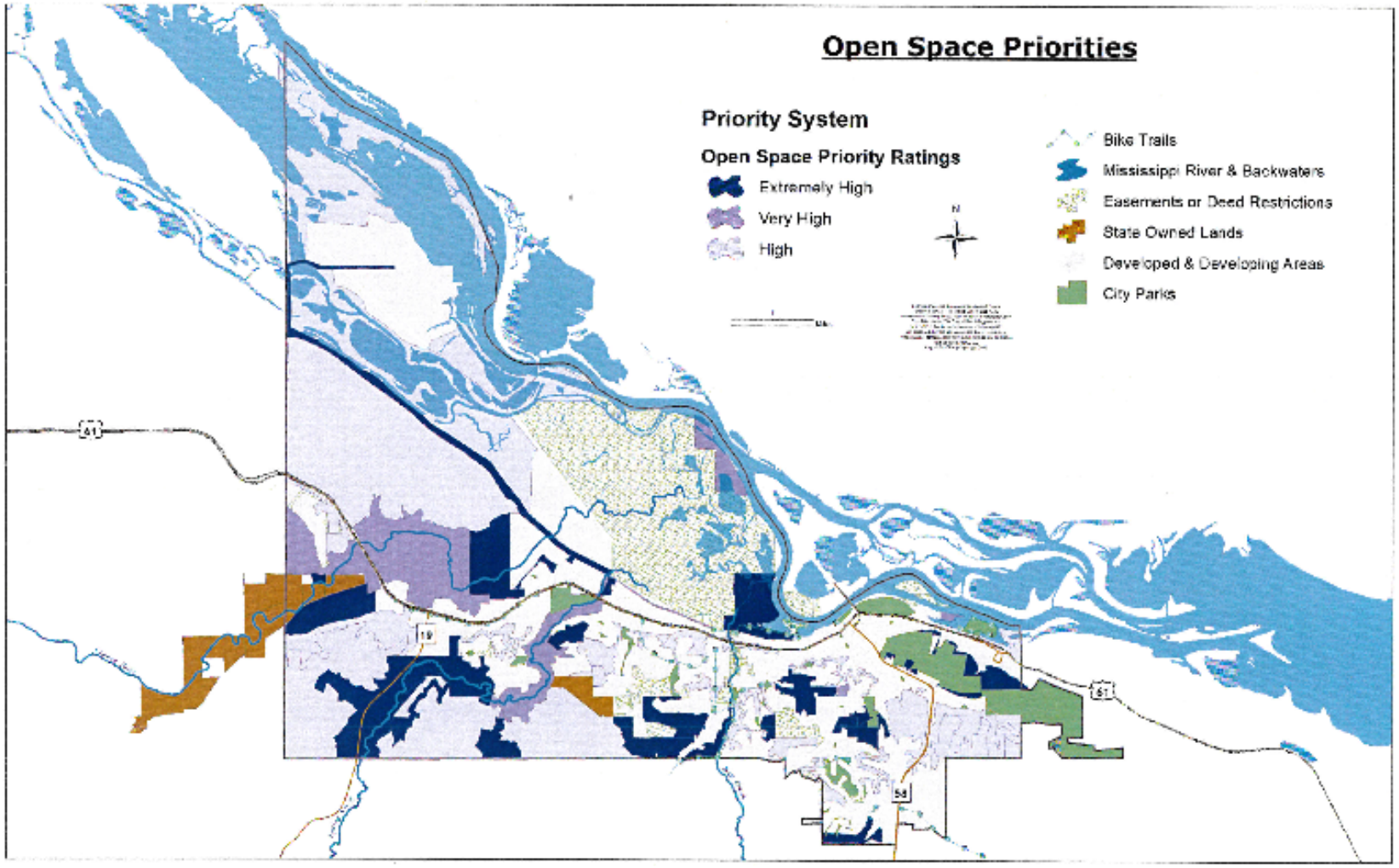
The resulting system of green infrastructure identified for Red Wing consists of wetlands, floodways, native plant communities, parks, steep slopes and legally protected lands under conservation easements or land trusts. Greenways linking the various patches of green infrastructure work to enhance the ecologically function of the system.

3.2 Open Space Preservation Plan

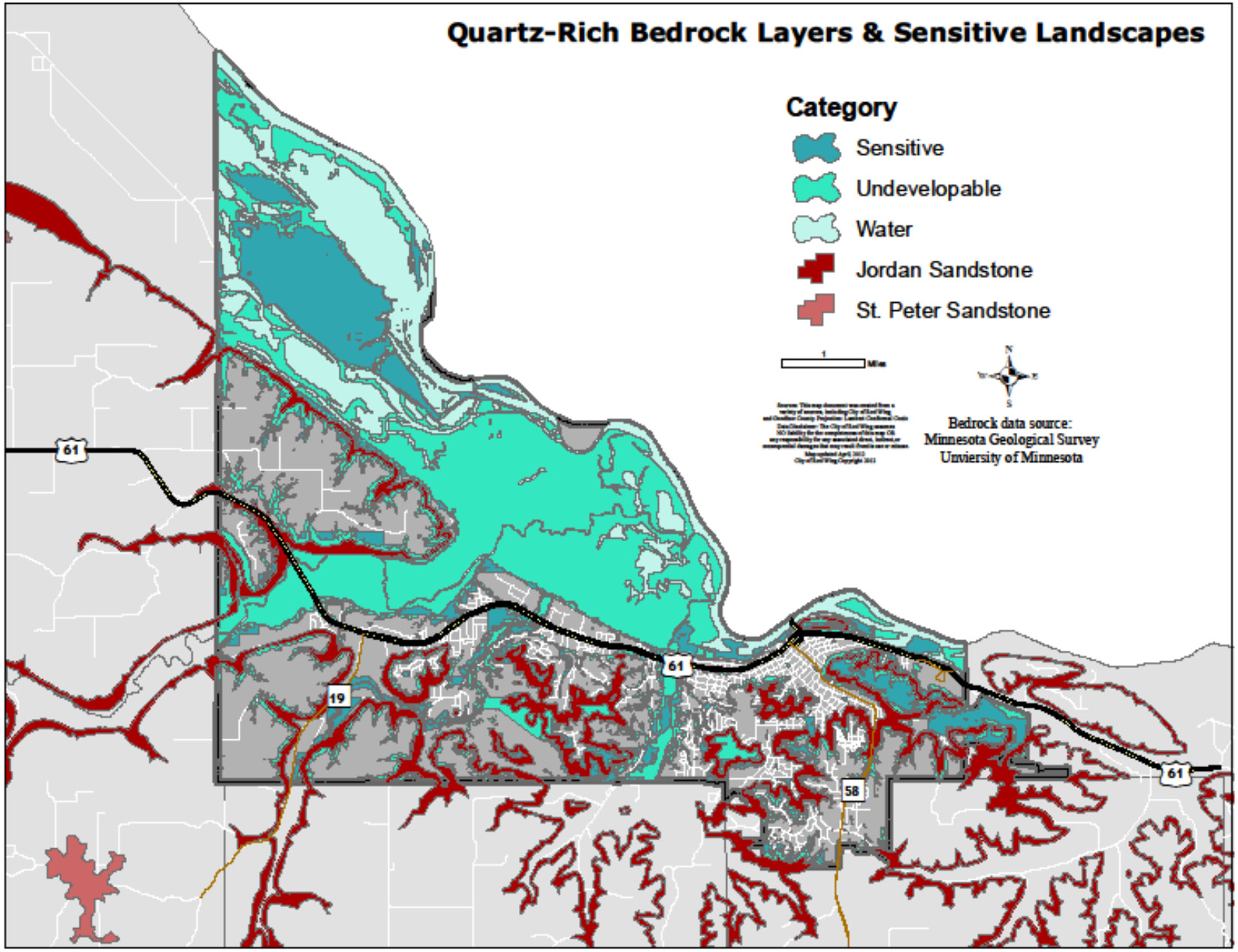
The Red Wing City Council adopted the Open Space Preservation Plan on March 24, 2008. This plan is a strategic plan implementing the vision and guiding principles of the Community Systems policies listed in the 2007 Comprehensive Plan. The Open Space Preservation Plan states that "it is the intent of the City of Red Wing to take a proactive role in preserving the "green infrastructure" systems for future generations. The plan includes a chapter inventorying cultural and natural resources in Red Wing; establishes open space preservation priorities; identifies strategies for preservation; and sets forth an action plan.

The City of Red Wing Open Space Preservation Plan combined several elements to create a classification system based on open space criteria in order to identify open spaces with high preservation value. Next, a priority system was composed based on the following resources: development threat, purchase opportunity, management opportunity, size and connectivity, active outdoor recreation, agricultural soils, archaeology, gateways, historic sites and districts, trails and pedestrian connections, urbanized forest, biological, geological, hydrological, and scenic views and vistas. The goal was to give priority to areas in need of open space preservation. Below is Map 9 showing the Open Space Priorities that resulted from this process. The purpose of the map was intended to show the general location of properties that have open space values that are priorities for preservation. The City could use this information to steer surface mining operations away from priority open space areas.

Map 9


Open Space Priorities
Priority System
Open Space Priority Ratings
Extremely High
Very High
High
Bike Trails
Mississippi River & Backwaters
Easements or Deed Restrictions
State Owned Lands
Developed & Developing Areas
City Parks
N
61
19
61
58

Map 10


Quartz-Rich Bedrock Layers & Sensitive Landscapes
Category
Sensitive
Undevelopable
Water
Jordan Sandstone
St. Peter Sandstone
1
Miles
N
W
E
S
Bedrock data source:
Minnesota Geological Survey
Unviersity of Minnesota
61
19
61
58
61