CHAPTER 3

THE ENVIRONMENT

VISION STATEMENT:

Red Wing recognizes the value of nature and seeks to minimize environmental impact while leaving a sustainable legacy.

February 25, 2019

Introduction

Red Wing is an exceptional city, not least because of the natural environment in which it was built. The coursing rivers and creeks, rocky bluffs, ravines, woods and prairies that frame Red Wing, give it character, and offer residents sources of wonder and respite that is always within reach. The natural environment serves other purposes as well, providing habitat for animals, cleaning the air, cooling surface temperatures, and soaking up water.

Red Wing values its wealth of environmental assets and has a commitment to taking care of them. By strategically preserving, restoring, and developing sensitively within its natural environment, Red Wing can harness the ecological functions of the land to prevent flooding, promote the health of its residents, and provide recreational opportunities.

The community has an impressive history of addressing environmental sustainability beginning at least as early as the 1980s, when the Red Wing Community Energy Program was initiated and approved by the City Council. One of the results of the *2007 Comprehensive Plan* was the establishment in 2008 of the Sustainability Commission to act as a formal advisory body to the City Council. In addition to the Sustainability Commission, there are a variety of community groups that convene around environmental issues including Red Wing's Citizens' Climate Lobby, Conservation Minnesota, Audubon Minnesota, Minnesota GreenStep Cities, and the Red Wing Environmental Learning Center (ELC).

In 2011, the City Council unanimously voted to have the city participate in the Minnesota GreenStep Cities, a program that sets tiered commitments for city sustainability actions. Red Wing accomplished Step Five of the Minnesota GreenStep Cities program in 2018. In 2014, the city was selected to participate in Xcel Energy's Partners in Energy program. This program resulted in the completion of the *Green Wing Energy Action Plan*, which was adopted by the City Council in 2015.

The Environment chapter of the *Red Wing 2040 Community Plan* builds upon all of these cumulative efforts. Environmental Resiliency was one of ten key community topics identified as critical to planning for Red Wing's future out to the year 2040. During the extensive 2017 community engagement process for the *Community Plan*, participants were asked "What would make Red Wing a better place to live?" Of all the responses received, 1,178 responses related to the environmental resiliency topic. Environmental resiliency was the second most popular topic, exceeded only by the Economy topic. Based on the prior sustainability plans/studies, the community engagement input, and best practices, the Environment Chapter focuses on the following key issues:

- Green Infrastructure
- Open Space Preservation
- Water Quality
- Air Quality
- Waste Reduction
- Energy Consumption
- Renewable Energy
- Climate Action

Community Engagement

A summary of input collected from the community is included on the following two pages.

COMMUNITY
SNAPSHOT

RED WING SUSTAINABILITY COMMISSION

Red Wing is gaining recognition for its sustainability efforts. In 2018, our city earned a Minnesota Clean Energy Community award for success in conservation, energy efficiency, and renewable energy-generation programs. We're also a top-ranked Minnesota "Green Step City" in sustainability and quality-of-life goals using a 29 best-practices guide for future initiatives.

THE ENVIRONMENT

What would make Red Wing a better place to live?

1,178

responses across all 2017 community engagement events and surveys mentioned attention to environmental resiliency as something that would enhance life in Red Wing. The top suggestions are shown to the right.

Open Space Preservation and Conservation

Red Wing's parks and natural setting are highly valued by its residents. This fact is reflected in the 97% of respondents to the 2017 Community Survey that cited support for open space preservation and conservation efforts.

Investments in Renewable Energy

92% of respondents to the 2017 Community Survey support continued efforts by the City to encourage the use of renewable energy for businesses and homes. See the sidebar on the following page for more on what the City of Red Wing is doing to promote renewable energy by using solar power.

Recognizing Climate Change

86% of respondents to the 2017 Community Survey think that global warming should be recognized by the City in its actions and policies.

What do folks like most about living in Red Wing?

30 / 4,160
Responses mentioned the environment, including:

14 Natural Surroundings and the River

6 Opportunities for Environmental Education

4 Resource Preservation

3 Other Preservation

Encouraging Green Living and Sustainability

90% of 2017 Community Survey respondents support Red Wing's efforts to become more sustainable, of which, a full 45% believe it's "very important." During summer engagement events, people mentioned ways the City could encourage residents to make smart choices a part of their everyday lives by improving non-motorized and public transportation networks, incorporating modern, efficient technologies, and expanding local food options.

Improving Waste Management

A variety of waste management practices were also mentioned by community engagement participants, such as reducing littering; providing organics recycling or composting services; adding more recycling receptacles downtown; and moving towards single-sort recycling.

Promoting Education and Awareness

Exploring nature can build people's attachment to place and encourage them to want to take care of it. Educating residents and visitors about the value of Red Wing's natural landscapes was important to some community engagement participants, including the role that Red Wing plays in the health of the Mississippi River ecosystem.

Did You Know?

Red Wing is Powered by the Sun

The City of Red Wing has installed six solar arrays that produce 240,000 kWh (kilowatt hours) of energy, or about 3.6% of the City government's electricity needs. In 2016, the City entered into a solar garden subscription for 5.6 million kWh annually with a solar garden provider (Innovative Power Systems) that will eventually supply all of the City government's energy requirements and save the city an estimated $6.6 million over the course of the 25-year agreement.

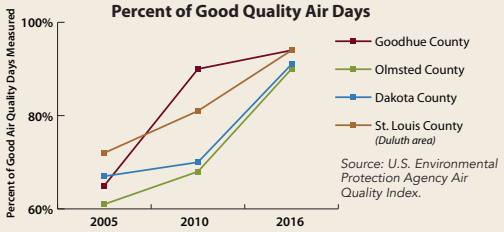
Red Wing 2017 Report Card

Red Wing has a history of being environmentally active and is working toward becoming a more sustainable city.

How can we best measure and track our metrics to ensure we're moving in the right direction?

Air Quality

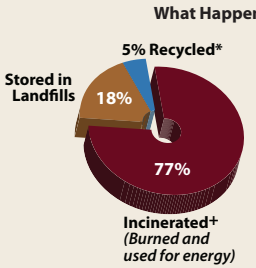
Our county's percent of good quality air days increased 45% since 2005, following a nationwide trend of lower air pollution emissions.



Source: U.S. Environmental Protection Agency Air Quality Index.

Solid Waste

RW is a regional hub for managing solid waste and recyclables. In 2016 the RW Solid Waste Campus handled just over 19,000 tons of garbage, with RW producing an estimated 8,000 tons. Here's where the garbage went:



* This is recyclable material pulled from residential and commercial garbage (material from curbside recycling is calculated separately).

\+ This waste is processed to remove recyclables and hazardous material, then shredded, then burned at the Xcel Steam Plant where it's converted into energy via steam turbines.

Source: Red Wing Solid Waste Campus. Numbers reflect most but not all the solid waste collected from local commercial entities.

Recycling

The city's curbside recycling program collects between 2,500 and 4,000 tons of recycled material annually.* That equals roughly 1/4 to 1/3 the total solid waste collected in Red Wing.

65% of residents use the curbside recycling program all or some of the time.

What would make more of us recycle regularly?

Source: Red Wing Solid Waste Campus.
** These numbers are estimates; Red Wing measurements are not currently calculated separately.*

Green Infrastructure

What is Green Infrastructure?

Even though infrastructure is usually thought of as something built, or what we are calling "grey infrastructure" in this plan, the word can also describe natural and unbuilt landscapes and systems that harness ecological functions to reduce flooding and pollution. Known as "green infrastructure," these features can take many forms, including waterways, drainage channels, rural and urban forests, greenway corridors, parks and open spaces, stormwater areas, and green roofs. Like grey infrastructure, green infrastructure has limited value unless it is networked to form a system. Like a disconnected pipe or a dead-end street, an unconnected patch of open space is not living up to its full potential. However, when properly arranged and linked, green infrastructure offers a myriad of benefits, especially when it comes to stormwater and runoff management.

Red Wing's Green Infrastructure

We are fortunate in the fact that Red Wing contains many environmental resources that the city views as its green infrastructure. These resources include the city's rivers, creeks, wetlands, natural springs, steep slopes, river bluffs, forests, prairies, native plant communities, agricultural land, groundwater aquifers, stormwater areas, and scenic natural views. In addition, the city has many cultural resources, including archaeological sites, historic sites and districts, active outdoor recreation areas (parks and open spaces), trails and sidewalks, the urbanized forest, and cemeteries.

Surface Water

Red Wing's surface water is primarily in the form of rivers and creeks. Red Wing's primary waterway is the Mississippi River, which is fed by the Vermillion River, Cannon River, Spring Creek, and Hay Creek, all of which run through Red Wing. These rivers and creeks contribute mightily to Red Wing's identity as a river town, and they are remnants of historic flows that carved Red Wing's dramatic topography.

Urban Forest

Minnesota communities have an enviable blanket of street trees, wooded parkland, and trees on private lands. These urban forests reduce the urban heat island effect, benefit wildlife, improve air quality, and make cities like Red Wing comfortable and beautiful places to live. Maintaining our urban forest in the face of a changing climate requires continual diligence. Incidences of drought, high-intensity rain events, and temperature fluctuations are impacting tree health as stress weakens their immunity and diseases and pests that were not previously hardy here become active threats. The forestry and nursery industries, as well as university researchers, are working feverishly on the urban forest problems that are occurring. We should stay attuned to new research and work with other communities to prepare an urban forestry strategy that mitigates the disease and hardiness problems rapidly moving our way from other parts of the country. Tree

Red Wing's urban forest provides beauty and comfort and needs to be guarded against disease and hardiness problems

preservation, planting a diverse mix of species, choosing hardy varieties that are resilient to climate change, and reducing the occurrence of invasive species are all important ways to improve the urban forest.

Scenic Views

Red Wing's high points offer tremendous opportunities to view the Cannon and Mississippi River Valleys and also offer great "bird's eye" views of our city's early design patterns. Scenic views are also part of Red Wing's rural landscape, and preservation of key corridors and open space areas helps preserve some of the rural character that makes Goodhue County and Red Wing special. The greenway infrastructure system should include preservation of scenic views as well as access to the points that offer the ability to take in scenic views, such as at He Mni Can-Barn Bluff and Memorial Parks.

View of He Mni Can-Barn Bluff from Sorin's Bluff (Memorial Park) (top) and of the Mississippi River from He Mni Can-Barn Bluff (bottom)

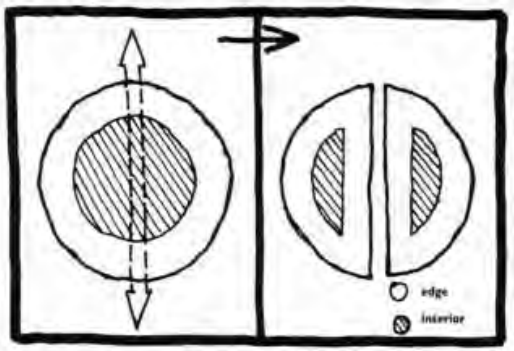
Green Network of Corridors and Patches

The green network is intended to enhance Red Wing's ecology and establish the community as a healthier, more livable, and more sustainable place. As illustrated in Figure 3.1, we have identified a green network that takes advantage of existing natural systems, open space, parks, and conservation areas to create green corridors or greenways, which are defined as linear parks or open spaces that preserve natural resources and scenic areas; accommodate movement, including walking and bicycling; improve surface water quality; and provide animal habitat.

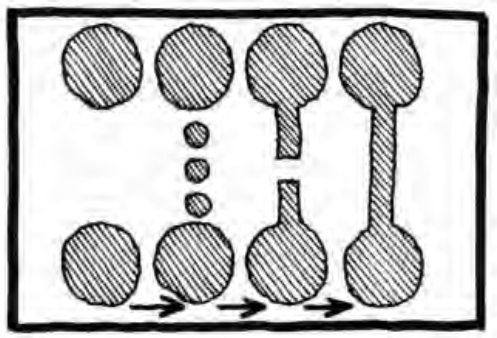
Greenways can also accommodate vehicle movement. In cases in which greenways follow right-of-ways, roads should have a "parkway" character with broad right-of-ways, deep structure setbacks, and expansive open space features. In locations in which housing is already built adjacent to the road that is functioning as part of the greenway, streetscapes should emphasize narrow pavement widths, eco-friendly stormwater management practices and extensive boulevard tree plantings. Wildlife "underpasses" should also be developed in appropriate places to mitigate barriers to species movement. Ultimately, these parkways will create pleasant driving and recreational experiences while preserving ecology and enhancing views, thus adding to Red Wing's quality of life.

Like any well-functioning system, a fundamental component of a healthy green infrastructure system is connection. Greenways serve as essential links between larger areas of open space and high-quality habitat, referred to here as "green patches." Providing for greenway corridors that are at least 150 feet wide is appropriate for species movement between patches and contributes to a higher functioning ecological system.

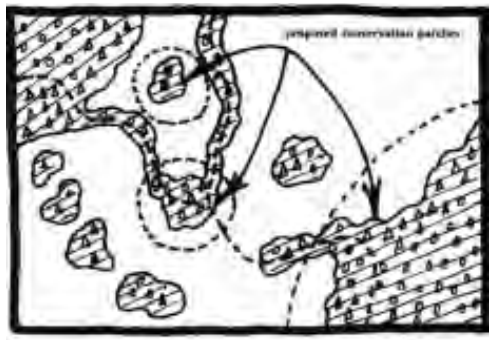
FIGURE 3.1 DIAGRAMS FROM LANDSCAPE ECOLOGY PRINCIPLES IN LANDSCAPE ARCHITECTURE AND LAND-USE PLANNING BY DRAMSTAD, OLSON AND FORMAN (1996).



Larger patches increase the amount of interior, high-quality habitat and associated species.

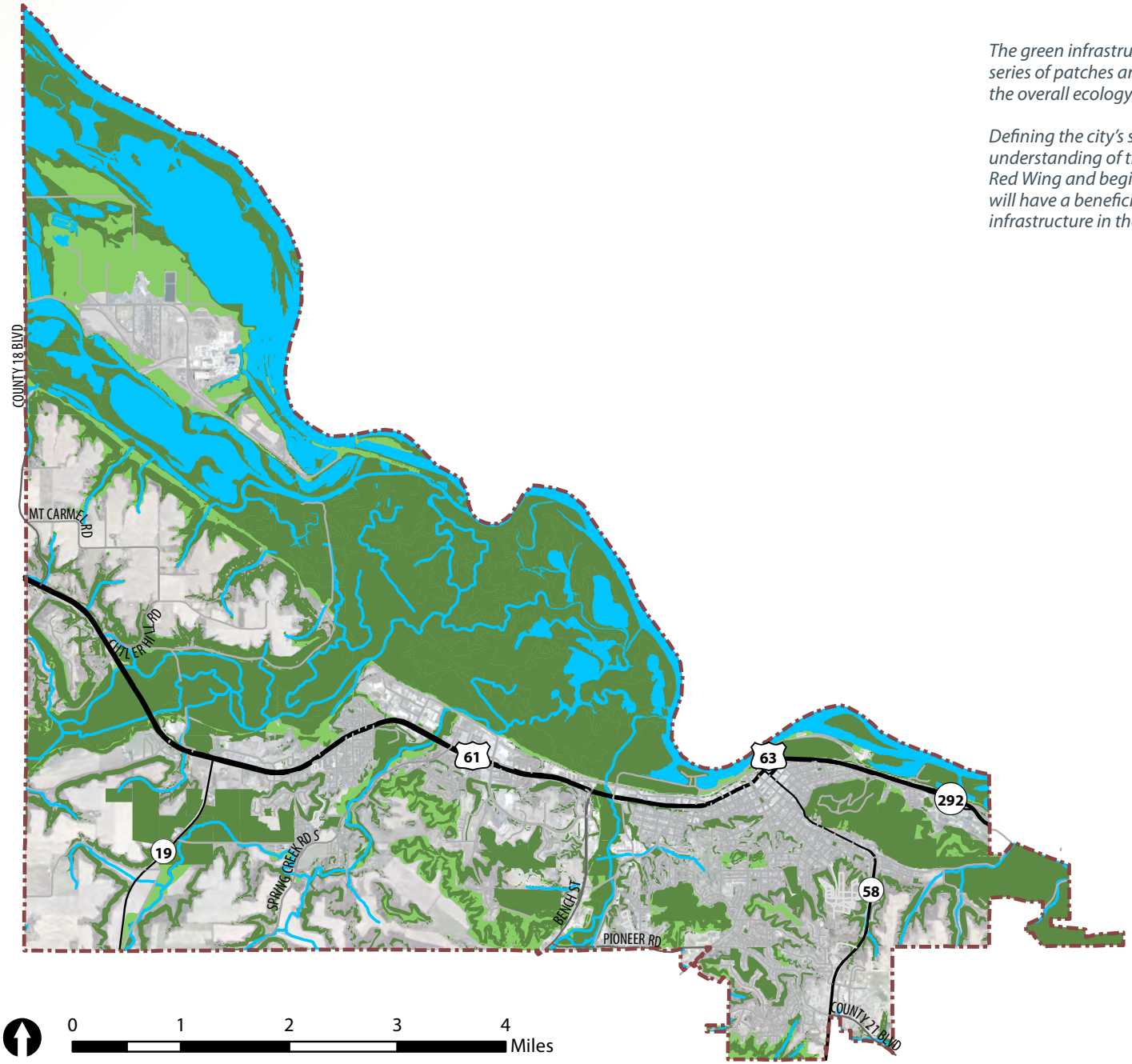


Creating connectivity between patches provides for movement of interior species.



The green network should include patches and connective greenways that contribute to the overall ecological function of the system.

FIGURE 3.2 RED WING'S CURRENT GREEN INFRASTRUCTURE



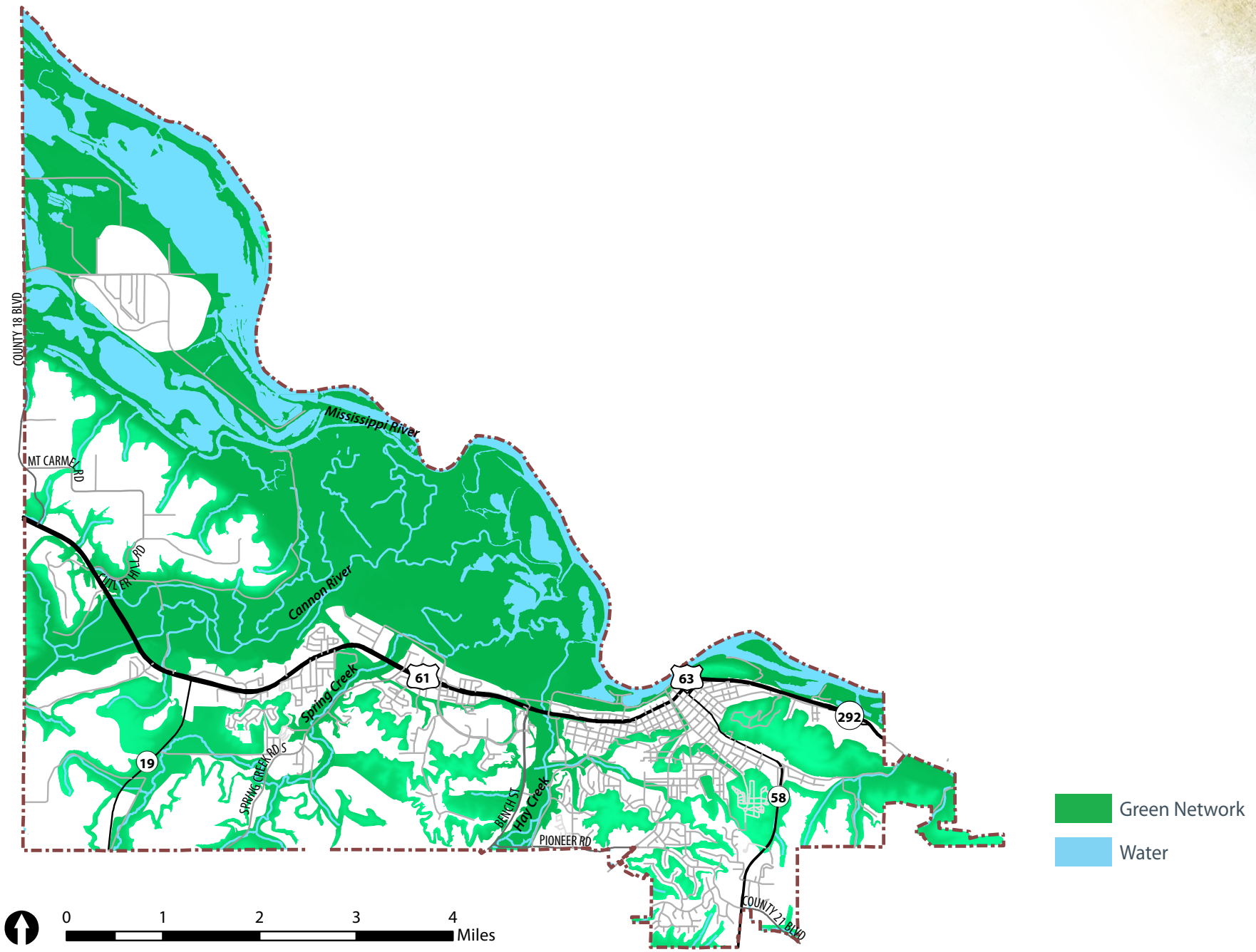
The green infrastructure network in Red Wing can be defined by a series of patches and corridors functioning together to enhance the overall ecology of the city.

Defining the city's sensitive landscapes provides a basic understanding of the green infrastructure already present in Red Wing and begins to highlight areas where conservation will have a beneficial impact on the broader network of green infrastructure in the future.

Undevelopable Land
(Steep Slopes, Wetlands, Conservation Easements, and Parks)

Sensitive Landscapes
(Native Plant Communities, 1% Floodplain, 30' Wetland Buffer)

FIGURE 3.3 RED WING'S FUTURE GREEN NETWORK



Open Space Preservation

Over recent decades, the city has experienced significantly higher growth in its land consumption/development than its population growth. This trend in land consumption presents potential threats to our city's valued natural and cultural resources over time. The community's concerns over pressure on our natural and cultural resources were identified in Red Wing's *2007 Comprehensive Plan* and followed up with the adoption of the *2008 Open Space Preservation Plan*.

The city made a commitment to harnessing the benefits of green infrastructure in our community's *2007 Comprehensive Plan*, which used green infrastructure as a central organizing feature. This *2040 Community Plan*, which includes the *2008 Open Space Preservation Plan*, is based on the practice of preserving the city's green infrastructure. Protection from future development impacts can be achieved through identified priority preservation strategies, such as land use planning policies, development ordinances, conservation easements, open space best management practices, land acquisition for conservation (e.g. city, DNR, Nature Conservancy, land trusts), and other methods.

The city's approach focuses on minimizing the fragmentation of open space by applying infill development and redevelopment in major activity areas in our community before expanding into new growth areas. In addition, some natural and cultural resource areas may be in need of protective, restorative and/or enhancement measures that might include tree planting, removal of invasive species, reintroducing native vegetation, and addition of pollinator-friendly landscapes.

WHAT WE HEARD

"If you have a connection to something, you will protect it more."

Jason Jech, Executive Director of the Environmental Learning Center, 2018

Based upon the recommendations of the *2008 Open Space Preservation Plan*, this *2040 Community Plan* provides an inventory of the city's environmental resources and identifies the community's priorities for open space preservation. The priority preservation areas are mapped and include the following:

Extremely High Priorities

- Red Wing Sportsman's Gun Club and Siewert Bluff
- Cannon Valley Trail and River Corridor
- Spring Creek Corridor
- Hay Creek Corridor
- East End Recreation Area
- Tyler Hills Development and Med Tech Park Area
- Abandoned Railroad Trail
- Red Wing Golf Club
- Archaeology Site 169
- Highway 58 Gateway

Very High Priorities

- Sand Hill
- Xcel Energy Property between He Mni Can-Barn Bluff and Colvill Park

High Priorities

- Highway 61
- Lehrback and Langsdorf Valleys

Since 2007, the city has accomplished the following:

- Open space priorities established in the *2008 Open Space Preservation Plan*
- Silica sand mining prohibited in Red Wing in the *2008 Open Space Preservation Plan*
- 737 acres of the green infrastructure network preserved between 2008-2018
- 33 miles of hike/bike/ski/snowshoe trails improved since 2012
- Numerous conservation easements established, protecting over 200 acres of riverfront and bluffland
- Restoration and stewardship projects with Friends of the Bluffs, the Sustainability Commission, and Live Healthy Red Wing along the riverfront, at He Mni Can-Barn Bluff Park, and Memorial Park

These previous efforts have added ecological and recreational value to the city, and through this *2040 Community Plan*, we will continue to prioritize our green infrastructure network in order to capitalize on the following benefits:

- Access to nature
- Increased biodiversity
- Resilience in the face of climate change
- Reduced heat island effect
- Better air and water quality

- Improved quality of life for residents
- Promotion of outdoor physical activity
- Higher property values
- Energy efficiency through reduced heating and cooling costs

We all benefit from Red Wing's natural beauty, but our bluffs, rivers, and prairies also require us to think carefully about how we develop (and redevelop) residentially and commercially in the future; only 2% of our land is vacant and available; 23% of the land is zoned for agriculture; 27% is protected green space (land under public protection or conservation easements), and 15% is natural open space (bluffs, prairies, wetlands, steep hillsides, and park areas).

Source: City of Red Wing Community Development Department, 2017

Preserving a network of green infrastructure figures prominently in the 2040 Community Plan because it is an integral part of Red Wing's identity, provides cost-effective services, and makes the city more resilient. To achieve success in regards to green infrastructure means strengthening our existing methods and finding new approaches to protecting, managing, and enjoying open spaces and public waters.

Part of Red Wing's vision for green infrastructure includes a linked system that maintains ecological integrity, provides public access, and preserves scenic character and important views. The natural systems and sensitive landscapes in Red Wing are illustrated in Figure 3.1. Preservation of these lands will contribute to the overall health and livability of the city, and the resulting green infrastructure system will consist 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 will enhance the ecological functionality of the system.

Water Quality

Red Wing's surface water is predominantly in the form of river and creek watercourses with four primary tributaries that reach the Mississippi River: Vermillion River, Cannon River, Spring Creek, Hay Creek, and Bullard Creek. The latter creeks are protected for trout habitat by the state of Minnesota and can often face issues related to erosion of sediment from urban and agricultural areas, such as turbidity (sediments rising, clouding the water). The Cannon River, Vermillion River, and Spring Creek are currently listed on the state's Impaired Public Waters list primarily because of factors occurring upstream of these streams in Red Wing. Water pollution can be caused by leaking storage tanks (above-ground and underground), hazardous waste generators, agricultural runoff and erosion, urban stormwater runoff and erosion, pesticides, and roadway de-icing salt. The benefits of managing surface water include the natural protection and preservation of natural surface water as well as groundwater recharge areas, prevention of soil erosion into surface water streams, mitigating flooding impacts, and protecting and improving fish and wildlife habitat and water recreational facilities.

Stormwater Management Plans

To address these matters, the city has a local *Surface Water Management Plan (SWMP)* that was adopted in 2015 to safeguard water resources, effectively manage these resources, and meet the requirements of the National Pollution Discharge Elimination System (NPDES) Permit. Ongoing projects include the repair of stormwater tunnels, maintenance of stormwater ponds, and the repair or replacement of pipes that are in poor condition. The city's NPDES MS4 general permit was reissued in 2017. Shortly thereafter, the city made significant amendments to the storm water management regulations that are a part of the zoning land use regulations.

Many best practices to address water and air pollutants are happening in Red Wing on a daily basis. Along with the SWMP, the city has an aggressive *Stormwater Pollution Prevention Plan (SWPPP)* that aims to continually identify and enhance stormwater treatment, where needed, in order to minimize pollutant runoff in stormwater, using measurable control activities. The *SWPPP*, initiated in 2007, complies with the Federal Clean Water Act. Recent stormwater quality improvement

efforts by the city's Utilities Department include:

- Increasing efficiency and accuracy of stormwater pond measurements
- Exploring further areas of community participation
- Getting more feedback from the public on actions they would like to see regarding our city's stormwater management

Pesticides Reduction

Pesticide-related concerns are becoming more prevalent around the country as citizens realize the inherent public health risks and environmental impacts associated with substances that either control or kill plant or animal pests. However, it's not easy to simply ban pesticide use in public parks and on city property and transition to best practices. This hurdle is caused by preemption laws that began being established nationwide starting in 1991, and which were backed by the pesticide industry. In most states, local communities are not authorized to establish regulations that are stricter than state-level regulations as a result of the state rules preempting local control. In fact, local communities in Minnesota do not have the authority to regulate pesticides and must seek approval through governmental channels for stronger rules, which means outlawing pesticide use must be done through state legislation. However, smaller strides are being achieved by protecting bees via the creation of pollinator-friendly landscapes that enable the reduction of pesticides.

Drinking Water Protection

In addition to the plans noted above, the city also has a *Water Supply Plan*, *Water Conservation Plan*, and a *Wellhead Protection Plan*. The source of the city's drinking water comes from five wells, ranging from 630 to 665 feet deep that draw water from the Mt. Simon aquifer. The city's water system processes 1.5 to 2.0 million gallons per day from these wells—two in Burnside and three more adjacent to the Twin Bluff area. Water levels are monitored to ensure that withdrawal does not exceed recharge. Red Wing's drinking or tap water is of excellent quality and tested/sampled annually for potentially toxic contaminants in cooperation with the Minnesota Department of Health, with guidelines provided by the U.S. Environmental Protection Agency as well as the Safe Drinking Water Act. The city's drinking water is also sampled monthly for total coliform bacteria analysis.

The Utility Department publishes an annual Consumer Confidence Water Quality Report. The city's water usage has declined by about 20 percent since 2006 due to less water irrigation and sprinkling as well as more efficient appliances, which puts the city well below the benchmark established by the Department of Natural Resources on water being used per capita.

Stormwater Best Management Practices

A primary way communities can affect surface water quality is by treating stormwater runoff before it enters natural water bodies. Stormwater management emphasizes Best Management Practices (BMPs) and other green solutions to cleaning stormwater runoff. Stormwater managment is also described in the Utilities chapter (see Chapter 5). Thoughtful design of both parkland and the built environment can reduce harmful impacts, mitigate potential problems, and actively improve the city. Best management practices are vital components of green infrastructure and encompass a variety of tools and methods that can be applied throughout Red Wing to manage stormwater and provide numerous other benefits to the community.

Public Access and Use

Public access of the waterfront can take on many forms including active or passive parkland, trails, overlooks, marinas, harbors and quasi-public facilities (like the Environmental Learning Center).

In every instance, public use of the waterfront use of the waterfront should be balanced with ecological integrity and function. One example of this approach is to place trails at the outside edge of a habitat corridor along a stream and only periodically provide direct waterfront access that uses context-sensitive design techniques to minimize habitat impact, keep the habitat area intact, and reduce disturbance.

Ecologically Healthy Shorelines and Floodplains

Streams and rivers need ecologically robust shorelines and ample floodplains to remain healthy, and healthy shorelines provide fish and wildlife habitat, buffer flooding, and cleanse stormwater runoff. The shoreline zone includes the stream, the riverbank, several hundred feet on either side of the waterway, plus floodplains that may reach beyond the immediate corridor. Attention to

Restored shoreline habitat

shorelines and floodplains in combination with sustainable land management practices farther "up-slope" in watersheds would significantly reduce the damage and impacts of flooding and improve the health of our surface waters.

Native shoreline habitat and topography should be preserved or restored in Red Wing's stream and river corridors, allowing them to become the community's primary open space greenways and linking them with other community greenways that are preserved along bluff corridors, steep draws, and other sensitive landscapes. In places like the downtown riverfront, where it is not feasible to restore broad habitat corridors along the shoreline, helpful design strategies like bioengineering of the riverbank, native landscape plantings, and minimal use of paving and turf grass can be implemented. Native stream and river corridors can also become a primary conduit for Red Wing's trail system, provide stormwater treatment, preserve views, provide environmental education, and celebrate community identity.

Raingardens and Bioretention Basins

Making sure that landscapes include vegetated areas for stormwater collection helps reduce runoff, mitigates flooding, and cleans water before it recharges an aquifer or enters rivers and streams. Raingardens capture and temporarily store runoff, using plants and soil to filter or infiltrate stormwater. They can be strategically located to collect runoff from impervious surfaces like parking lots and prevent sediment, chemicals, and other pollutants from contaminating surface water bodies. They are an attractive and effective method of preventing nonpoint source pollution and help manage stormwater close to its source rather than downstream.

Raingardens and bioretention basins for stormwater management

Vegetated Buffer Strips

Vegetated buffer strips are densely vegetated swaths of land that filter sheet flow from adjacent surfaces before it can reach a water body. Water flowing through a buffer strip slows down and drops out sediment and other pollutants. The vegetation in the buffer may also absorb some of the runoff. While turf is common, planting perennial native vegetation is typically more effective at removing sediment and nutrients, can help landscapes resist drought and remain healthy in the face of climate change, and also provides valuable habitat. Vegetated buffer strips are essential components of healthy shorelines, rivers, streams, and ditches, and are also suited to treating runoff from roads, roof downspouts, or small parking lots, especially as a pretreatment system for stormwater destined for a raingarden or other bioretention basin.

Turf Reduction and a Vegetated Buffer Strip

Turf Reduction

Reducing turf in our parks and other city-managed lands would have a multitude of benefits. Turf grass is a maintenance-intensive groundcover, requiring irrigation, fertilizer, and frequent mowing in order to meet aesthetic standards. It also provides few benefits, other than offering an easy walking surface. Targeting underutilized turf areas (spaces not used for active recreation, picnicking, circulation, or gathering) and converting them to low irrigation or maintenance landscapes, native meadows, shrub beds, flowering lawns, or no-mow fescue lawns would make those areas more resilient to drought, more beneficial as habitat, better at reducing stormwater runoff, and would increase biodiversity. These lawn alternatives also require less fertilizer, oil, gasoline, and time to maintain.

Green Roofs

Green roofs (living vegetation planted on rooftops) positively impact numerous environmental concerns such as heat-island effect, stormwater runoff,

heating and cooling, energy consumption, and loss of habitat. Green roofs have been in existence for hundreds of years—especially in agricultural buildings in various parts of the world—but in the last three decades they have been gaining acceptance as a viable roofing technique for commercial and residential buildings. In many parts of Europe, green roofs on commercial buildings are becoming the norm. Here in the United States green roofs are still the exception, although high-profile examples like the Chicago City Hall have started a green roof movement that is rapidly spreading across the country. Many believe it is only a matter of time before improved technology and the demand for greater environmental performance compels most new urban downtown, industrial and big-box retail structures to include green roofs.

In Red Wing's future, green roofs can become a legitimate component of our green infrastructure. Through environmental performance-based provisions in stormwater and subdivision ordinances, we can lead new development toward innovative solutions, including green roofs. We can also set an example by constructing green roofs on new and retrofitted civic buildings, as well as on private development using city or Port Authority assistance. Red Wing's commitment to green roofs could also lead to design assistance and construction grants from energy providers and non-profit organizations.

Cisterns and Rain Barrels

After green roofs, cisterns and rain barrels are the next line of defense against runoff. These storage containers capture water directly off of roofs or other impervious surfaces and hold it until it can be used as irrigation or released when runoff levels have subsided and it won't contribute to flooding or erosion downstream. Rain barrels are small and

Green roofs can reduce stormwater runoff and the urban heat-island effect

Cisterns for irrigation

can be hooked up to residential gutters or small commercial or office buildings. Cisterns are larger and often designed as an architectural feature in conjunction with a building. They can also be constructed underground as a way to store runoff while still maintaining usable space for amenities such as sports fields, plazas, or parking lots.

Pervious Pavement

Porous asphalt, pervious concrete, permeable pavers, and grass or gravel-filled grid paver systems are all types of paving that allow water to infiltrate rather than run off. These systems support vehicle and pedestrian traffic while allowing precipitation to filter through the paved surface and into the ground or off-site via pipes. Pervious pavement reduces peak flow during rain events, which reduces downstream erosion and flooding potential. Implementing a pervious pavement system is a great choice for space-limited locations in which stormwater requires detention and treatment without restricting available parking. Although infiltration capacity of these systems tends to decrease over time, most permeable pavements maintain average rates of infiltration in excess of what they would ever experience from natural precipitation. Maintenance of permeable paving requires special equipment, including a high-strength regenerative air vacuum, which, if purchased by the city, could be used to maintain pervious pavement across Red Wing.

Stormwater Planters

Basically the city-dwelling cousin of the raingarden, stormwater planters perform a similar service, collecting and filtering or infiltrating runoff. But the stormwater planter's form and features are designed to fit into an urban streetscape. Long, rectangular basins nestled between the street and the sidewalk feature curbed edges, often with a short railing that separates the planter from foot traffic. Curb cuts allow water to flow in off of the sidewalk and sometimes from the street itself. Low-growing plants have a neat appearance and maintain

Stormwater planters are an attractive and beneficial way of collecting stormwater runoff

sightlines for drivers and pedestrians. Stormwater planters have the added benefit of providing a safe buffer between traffic and pedestrians on the sidewalk, enhancing safety in addition to treating runoff and beautifying the public realm.

Tree Trenches

Another streetscape BMP, tree trenches add another layer of function to traditional street trees by actively collecting and filtering stormwater. Instead of planting trees in isolated holes along a road, tree trenches use a continuous strip of excavated land between the road and the sidewalk. The trench can fill up with runoff during a storm and also provides more room for the trees' roots to spread out, which ensures healthy trees that receive enough water and oxygen. The trench is typically surfaced with permeable pavers, which maintain circulation for pedestrians, but still allow runoff to filter through and be collected in the trench and taken up by the trees.

Tree trench

Water Quality Partnerships

A great example of the influence of public/private partnerships can be seen along the Vermillion River corridor in Dakota County. There, many partner organizations have cooperated to protect a sensitive trout stream by investing money and expertise into water quality monitoring, shoreline restoration, acquisition of conservation easements and watershed conservation practices. Because Red Wing's streams and rivers extend well beyond community boundaries, similar partnerships with surrounding communities, regulatory agencies, and non-profit organizations are critical.

Air Quality

Air pollution can be caused by smoking, vehicle emissions, power plant emissions, factory emissions, wood stoves, outdoor biomass burners/boilers, and other sources. Federal and state regulations are in place to control air pollution from these identified sources. Additional improvements to air quality could be achieved by shifts from fossil fuel to clean energy fuels, particularly for vehicle emissions.

Good quality air days have increased in Goodhue County by 45 percent since 2005 due to a nationwide trend of lower air pollution emissions, according to the U.S. Environmental Protection Agency Air Quality Index (Table 3.1).

TABLE 3.1 U.S. EPA - AIR QUALITY INDEX

Air Quality Index Measures five of the main pollutants regulated by the 1990 Clean Air Act. Data below is the % of days measured during the year that are classified as "Good" and the # is the number of days measured that were classified as "Unhealthy).		2005	2010	2016
Goodhue County	% of Days Measured that were "Good"	65.1	90.4	94.4
	# of Days Measured that were "Unhealthy"	5	1	0

Source: U.S. Environmental Protection Agency – Data available for 20 counties in Minnesota

Waste Reduction

The community has a history of commitment to reducing its waste. The city provides solid waste management services, including weekly collection of solid waste and recyclable materials. Residents may also deliver yard waste to the solid waste campus at no cost. The city of Red Wing is among the nearly 30 percent of Minnesota communities that have organized garbage and recycling collection services coordinated or provided by a public entity. Instead of being dumped in a landfill, garbage collected weekly by the city is delivered to the city's Solid Waste Campus where it is sorted and processed for sale as recycled material or into fuel for electricity generation.

Solid waste is 'processed' which entails removing recyclables, hazardous materials, and non-burnable substances. This processed waste is then shredded to generate refuse-derived fuel (RDF) which is used to generate energy while reducing the need for fossil-fuels. The processed municipal waste provides RDF for the local Xcel Energy Steam Plant, where it's converted to energy via steam turbines—a low-cost fuel option to generate electricity and reduce the amount of material going to landfills.

Approximately 5 percent of the waste stream is pulled-out as recyclable material, 77 percent is used to create energy, and the remaining 18 percent of the solid waste is stored in landfills. The city's RDF agreement with Xcel Energy extends from March 1, 2018 to December 31, 2027. During this time-frame, the forecasted tonnage of RDF to be consumed will increase by 6,000 tons in 2018, 20,000 tons from 2019-2022, and 30,000 tons from 2023-2027. According to city records, the Xcel Energy Landfill that produces RDF-ash generated at Xcel Energy's Steam Plan has a lifespan of 23 years—as approved by the Minnesota Pollution Control Agency (MPCA), based on their approval date in May 2012. The facility will require a lateral and vertical cubic yards expansion to a total permitted capacity of 2,434,800 cubic yards during this period. Consequently, the landfill will be at capacity in 2035.

The city's Solid Waste Campus is a regional hub for managing solid waste and recyclable (reuse) materials. Garbage brought to the Solid Waste Campus on Bench Street includes all residential waste and a vast majority of the commercial waste generated within the city, as well as waste from other localities in the region. The city and Goodhue County have both approved a plan that will route all solid waste in the county to Red Wing's Solid Waste Campus for at least 20 years. This plan will also bring the city's landfill into the state of Minnesota's Closed Landfill program, removing the city from any liability related to the landfill.

The city has provided recycling services for residents, businesses, and multi-family units since 1994. Participation in recycling has been stagnant at 60-65 percent. The city has approved and is working on the implementation of a single-sort recyclable material collection program which will aggregate or co-mingle recyclables for further processing at an off-site vendor facility sometime in 2019, which aligns with the city's *Strategic Plan*. (These recyclables will be taken to a 'clean' materials recovery facility and sorted into various commodity streams for sale to markets, like plastics, metal and paper. Additionally, the process is estimated to increase the citizen participation recycling rate and increase recyclable volume by 15-20 percent). The program will gain financial support from a $250,000 greater Minnesota recycling grant from the MPCA. Additionally, it is hoped that some of the costs associated with off-site processing will be recouped through a rebate on commodity sales—although commodity prices are highly variable.

The city also has an organics management program presently in the form of composting for leaves, weeds, grass clippings, and compostable yard waste. Residents can deposit their materials free-of-charge at the Solid Waste Campus during regular hours of operation. Residents are encouraged to compost at home as well to reuse it in their yards and gardens. The city plans to introduce organic curbside-recycling by 2021 when residents will buy compostable bags from the city, place their organic refuse into them, and then put those bags into their regular garbage container. The organics will be delivered to the Solid Waste Campus, where it will be placed into newly created, on-campus compost ponds—still keeping yard waste and wood chips separate, and with the ability to sell the compost.

Energy Consumption

Building Energy Use

Xcel Energy provides electric and natural gas services to businesses and residents in Red Wing (a small area of residential is served by Dakota Electric). A few residents may use heating fuel, biomass, or propane as their primary heating source, which is not captured in this data. Natural gas is primarily used for space and water heating, cooking, and various industrial processes. Electricity is used for appliances, water and space heating, space cooling, lighting, commercial and industrial processes, as well as other electronic devices.

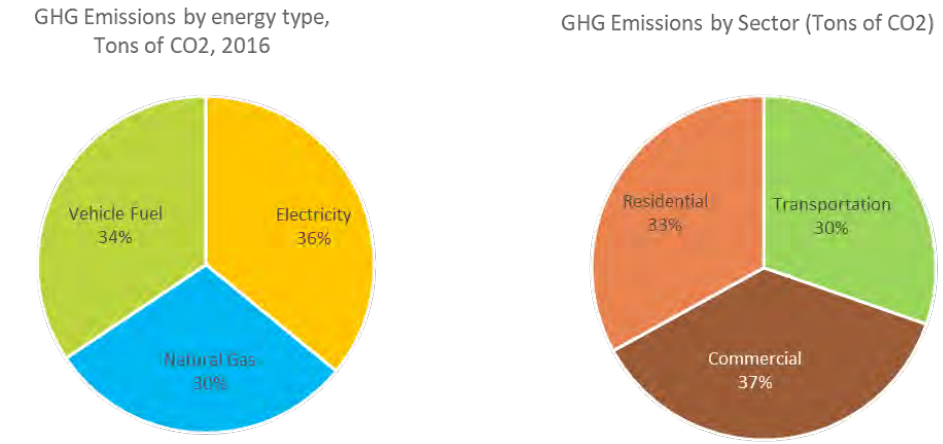
The table and graphs to the right provide a summary snapshot of the total energy used in Red Wing in 2016.

TABLE 3.2 ENERGY USE IN RED WING BY SECTOR

SECTOR	ENERGY (MMBTU)	EMISSIONS (TONNES CO2)	% OF TOTAL EMISSIONS
COMMERCIAL/INDUSTRIAL	985,627	74,274	37%
RESIDENTIAL	612,189	66,896	33%
TRANSPORTATION	735,023	61,449	30%

Source: Xcel Energy Community Energy Report (2016); Regional Indicators Initiative (2016)

FIGURE 3.4 GREENHOUSE GAS EMISSIONS IN RED WING BY ENERGY TYPE AND SECTOR, 2016

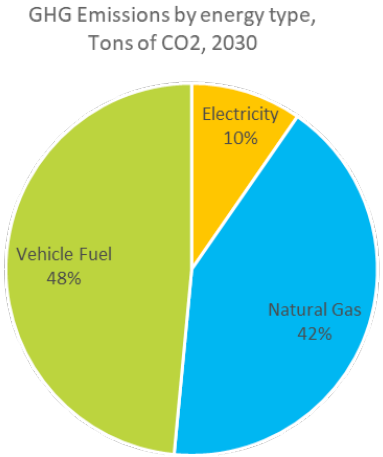


Source: Xcel Energy Community Energy Report (2016); Regional Indicators Initiative (2016)

From these graphs, it can be seen that energy use and greenhouse gas emissions are generally evenly spread across sectors. Further breakdown of this information, demonstrates that our community consumes a greater share of natural gas (63 percent) as compared to electricity (37 percent) in terms of MMBtu for building energy use. However, from a GHG standpoint, electricity makes up a greater share (55 percent) than natural gas (45 percent) due to greater carbon intensity of electricity generation as compared to the combustion of natural gas.

Xcel Energy, however, has taken great strides in the past decade to move toward low-carbon generation. The company has announced that it will develop a plan to be 85 percent carbon free by 2035, which has significant impact on the emissions profile for Red Wing and other communities in its service territory. If the city were to take no action to reduce its emissions between now and 2035, the share of emissions from electricity would be reduced from 36 percent to 10 percent (Figure 3.5). The planned generation mix includes approximately 25 percent of generation coming from nuclear energy, some of which comes from the Prairie Island facility in Red Wing. The plant is scheduled to close in the mid-2030s and should be a consideration locally for the Red Wing community, in terms of its impact on jobs and tax base, as well as safety and environmental justice impacts.

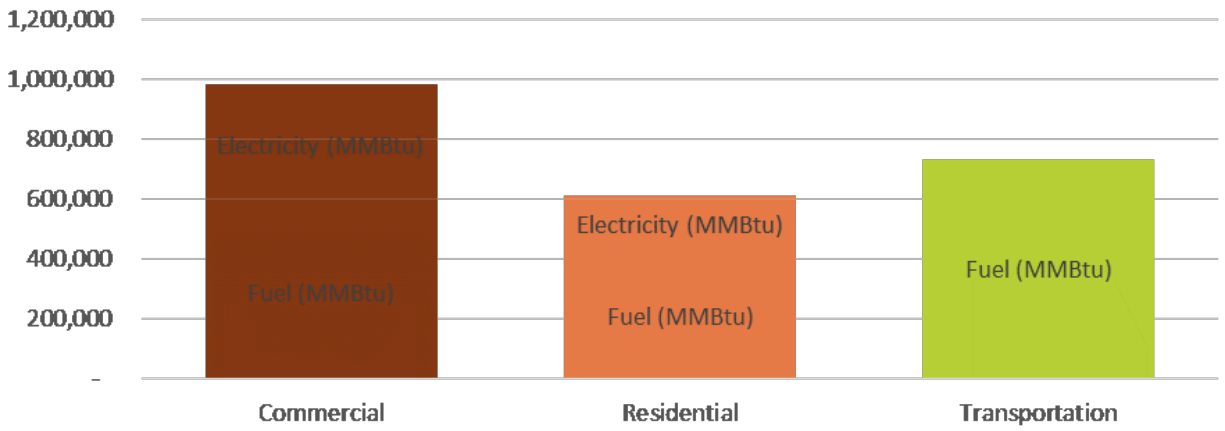
FIGURE 3.5 PLANNED GREENHOUSE GAS EMISSIONS IN RED WING BY ENERGY TYPE, 2030



Source: Xcel Energy Community Energy Report (2016); Xcel Energy Planned emissions, presentation from CEO, Regional Indicators Initiative (2016)

The city's efficiency resource is measured by looking at current energy use. The greater the energy consumption, the greater resource available for Red Wing to be more efficient. The largest energy consumption occurs in the transportation and commercial sectors, suggesting greater opportunity for efficiency (note: residential GHG emissions appear higher relative to energy consumption due to Dakota Electric's generation mix).

FIGURE 3.6 ENERGY EFFICIENCY POTENTIAL



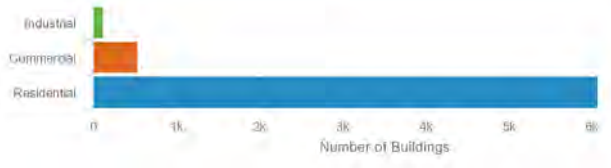
Source: Xcel Energy Community Energy Report (2016); Xcel Energy Planned emissions, presentation from CEO, Regional Indicators Initiative (2016)

TABLE 3.3 SOLAR REWARDS PROGRAM PARTICIPATION

On-site Solar (Solar*Rewards)	Total Installations
Community - Business Total	8
Community - Residential Total	10
Windsource	Number of Customers
Community - Business Total	0
Community - Residential Total	253
Energy Conservation	Number of Projects
Community - Business Total	64
Community - Residential Total	492

Source: Xcel Energy Community Energy Report 2016

FIGURE 3.7 BUILDING STOCK SUMMARY



Source: U.S. Department of Energy State and Local Energy Data

The city of Red Wing participated in Xcel Energy's Partners in Energy (PiE) program to develop an energy action plan for the community. The energy plan profiled the electricity and natural gas consumption in the city and laid out goals to increase participation in energy efficiency and renewable energy in both the residential and commercial sectors.

The specific goals are to increase participation by 10 percent in some kind of energy efficiency (rebate programs) and renewable energy programs (Windsource® and Solar*Rewards®) for both residential and commercial customers during the first phase of the two-year plan, which ended in 2017. The development of the energy plan included a robust community engagement effort that built community interest and motivation to increase efficiency and renewable energy action in the community. The city fell short of the 700-home residential goal, reaching 514 homes, however it exceeded the commercial goal of 100 businesses with 223 small to midsized businesses incorporating some form of energy-efficiency strategy.

At the time of the energy action plan, nearly 200 residents had participated in Home Energy Squad, and just over 400 rebates were given for designated energy efficiency improvements. Over 100 rebates were given to businesses for energy efficiency improvements as well. In terms of renewable energy, 147 residents were signed up for Windsource®, and there were seven total applications filed for the Solar*Rewards, the production incentive program offered by Xcel. Table 3.3 summarizes this information for 2016.

As the city looks to expand its efficiency outreach efforts, it should consider the areas that can have the biggest impact. As mentioned, the commercial sector uses a greater share of energy and associated emissions as compared to the residential sector. However, there are significantly fewer commercial buildings than residential (Figure 3.7). Because there is a greater energy intensity (MMBtu/square foot) among commercial energy use, a single successful commercial efficiency improvement may reap the efficiency benefits of dozens of residential successes.

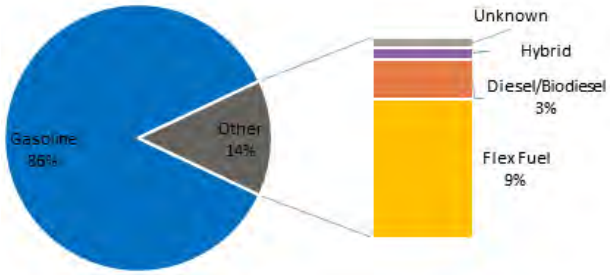
Transportation Energy Use

Transportation energy is almost exclusively attributable to car and truck travel, and is estimated by the vehicle miles traveled (VMT) within the city boundaries (regardless of through traffic or with an origin or destination in the city). VMT does not capture energy attributable to rail and airplanes, but those are generally a very small portion of transportation energy. Regional Indicators Initiative data shows that 142,291,278 vehicle miles were traveled within Red Wing in 2016. The greenhouse gas emissions associated with this travel is approximately 61,449 tonnes of CO_2e, or about 30 percent of the city's total GHG emissions.

The U.S. Department of Energy reports that there are 17,000 light duty vehicles in the Red Wing market with an average fuel economy of 22 miles per gallon, slightly higher than the national average of 21.64 (Alternative Fuels Data Center). 86 percent of these vehicles use gasoline as the primary fuel; flex fuel (e85) makes up the next highest fuel source.

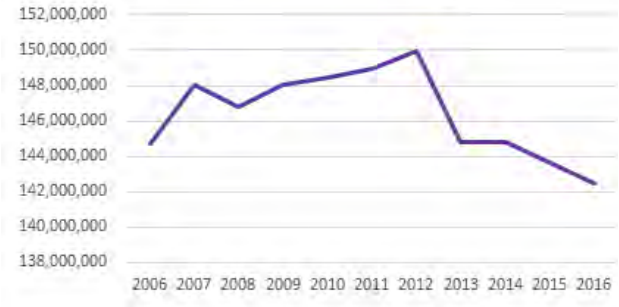
Regional Indicators Initiative data includes VMT from the Minnesota Department of Transportation (MNDOT) for communities dating back to 2006. The annual VMT in Red Wing has been declining steadily after several years of rising, peaking in 2012. Figure 3.9 illustrates the trend over that time period.

FIGURE 3.8 LIGHT DUTY VEHICLES BY FUEL TYPE



Source: U.S. Department of Energy State and Local Energy Data

FIGURE 3.9 VEHICLE MILES TRAVELLED TRENDS, RED WING



Source: Regional Indicators Initiative 2005-2016

We are the first generation to fully understand climate change, and the last generation to be able to do something about it.

Petteri Taalas
Secretary-General of the World Meteorological Organization
2018

Renewable Energy

Solar Resources

The University of Minnesota developed a high-resolution statewide solar resource map that allows cities to calculate how much electricity they could potentially receive from locally installed solar energy systems. This data (see Figure 3.10) was used to calculate the solar resource, or the city's "solar reserves," in Red Wing. The solar reserves are how much solar energy is reasonably economically available for development, and is measured similar to the manner in which oil or gas reserves are measured. The solar map shows the good sites for solar installations and helps identify where there may be land use conflicts with solar development. Table 3.4 shows the amount of solar energy reasonably available for development in Red Wing. The gross potential includes the total available resource, regardless of location; rooftop capacity and generation include only the resource available on the rooftops of commercial buildings located in the city.

The total capacity of the economic rooftop solar resource in Red Wing is 85 MW, equal to approximately 63 percent of all the electricity consumed in the city. This means that if the city wanted to maximize its entire commercial rooftop solar resource, it could set a solar generation goal of up to 63 percent on-site solar generation (note: this is an upper limit and does not consider individual site limitations due to roof structure, ownership, or local regulations that might limit solar installations). If buildings undergo high levels of energy efficiency investment, the solar resource could meet a higher percentage of electric needs. The efficiency and solar resources are, in this analysis, calculated independently of each other.

FIGURE 3.10 RED WING'S ROOFTOP SOLAR RESOURCE POTENTIAL

FIGURE 3.11 SOLAR GENERATION POTENTIAL

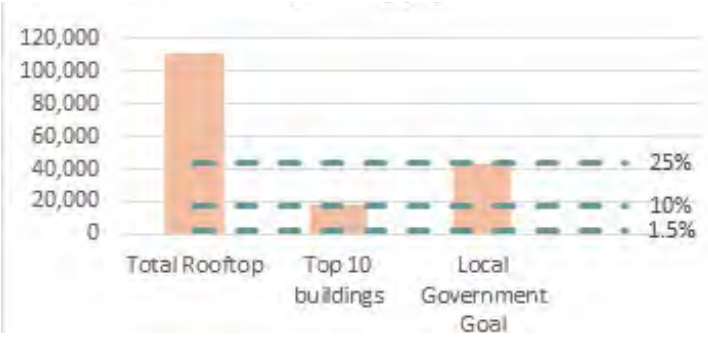


TABLE 3.4 RED WING SOLAR RESOURCE

Total Generation Potential	Rooftop Generation Potential	Rooftop Capacity	Top 10 Rooftop Potential
1,111,343 MWh/year	111,134 MWh/year	85 MW	18,246 MWh/year

Did You Know?

Solar arrays on all major City of Red Wing-owned properties are expected to live 40 years or more and create about two and a quarter million dollars of electricity during that time.

Source: City of Red Wing, 2018

Solar installations are not limited to rooftop applications. This analysis does not include ground-mount systems, but the city will want to develop criteria for where they would and would not allow solar installations. For instance, commercial parking lots or public right-of-ways may make good solar resources, while areas planned for future development or park space may not. These criteria can be used to recalculate potential solar generation and redefine future solar goals for local development.

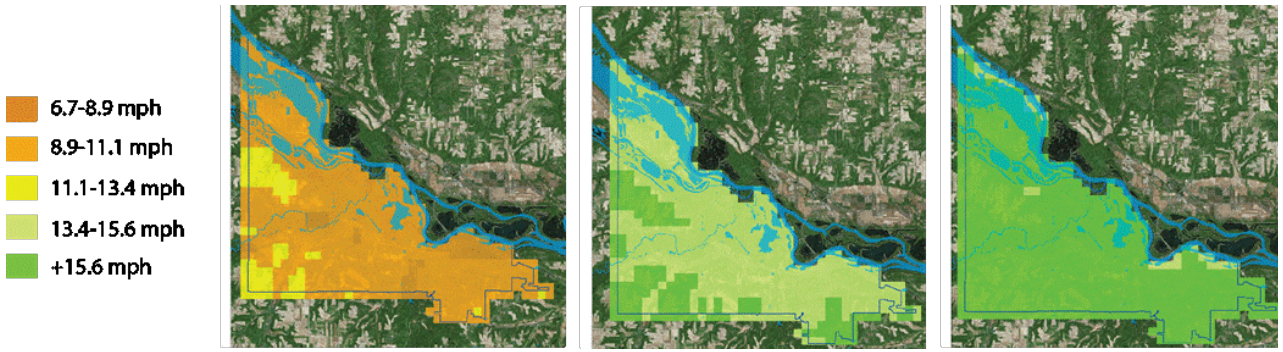
Red Wing is a Step 5 GreenStep city and reported six city-owned solar sites with a capacity of 217 kW for 2016. The city also has subscribed to a community solar garden to receive the equivalent of 57 percent of its total electricity consumption from solar energy beginning in 2017. There are plans for additional solar to be developed.

Wind Resources

A good wind energy site needs to meet a number of characteristics, the most important of which is a good wind resource. Other characteristics include soils that can support the weight of the turbine; a site large enough to accommodate safety setbacks from neighboring properties, structures, or other uses; and surrounding land uses for which the visual impact and potential nuisances will not create a conflict. Regarding the wind resource, the height the rotor needs to be above any disturbance within an ideal radius of 500 feet. The Distributed Wind Energy Association offers this guidance:

> The industry guidance on minimum wind turbine height states that the lowest extension of a wind turbine rotor must be 60 feet above the ground, assuming no surrounding obstacles. Where obstacles are present, the wind turbine rotor should be at least 30 feet above the tallest obstacle within a 500-foot radius. If trees are not fully grown, then the

FIGURE 3.12 WIND SPEEDS AT DIFFERENT TOWER HEIGHTS, 30 METERS, 80 METERS, AND 100 METERS (FROM L TO R)



Source: MN Department of Commerce

tower height must be adjusted for the growth over the next two or so decades, the life of the wind turbine.

Red Wing is a rural community with agricultural characteristics and is suitable for wind development. The Minnesota Department of Commerce developed wind speed maps at a 500-meter resolution to give a general sense of the wind resource at various tower heights. These are not adequate for a specific site assessment (Figure 3.12).

A good rule of thumb is that 12 mph is typically the minimum average annual wind speed for a good wind resource. At 30 meters, much of Red Wing has an average wind speed of approximately 11-13 miles per hour, right around the optimal speed needed for a productive wind energy system. At 80 meters and higher wind speeds, there is ample resource for wind turbines to capture energy. There are a number of small wind systems in and around communities near Red Wing, though there do not appear to be any wind turbines in Red Wing. Community characteristics and desires, along with land use should be taken into consideration for wind energy systems.

Climate Action

Red Wing community leaders and residents have been instrumental over the past decades in spawning new avenues and projects to help mitigate and adapt to the potential impact of climate change. In the mid-1980s, the Red Wing Community Energy Program was initiated and approved by the City Council that launched an investment in energy-saving upgrades to municipal buildings, ultimately leading to six buildings being equipped with renewable energy solar electric panels. Additionally, the program spurred energy efficient lighting improvements in the city's parking ramps as well as street lights that are less visually polluting, and all city traffic lights are composed of energy-efficient light-emitting diodes (LEDs). Over the years, many of these projects have been done in collaboration with Xcel Energy, which includes energy rebate benefits for customers. Since 2016 the city has been participating in a solar garden subscription with a solar garden provider that provides 100 percent of the city's electrical use. Also, the Red Wing High School District solar garden will supply 57 percent of the city's solar garden subscription.

Strong civic engagement concerning the environment advanced with the creation of the city of Red Wing Sustainability Commission, in 2008, for the purpose of providing advice to the City Council about environmental issues and initiatives facing the city. Some recent activities supported by the Sustainability Commission have been gaining the City Council's approval to endorse prudent local, state, and federal legislation that addresses climate change, holding workshops to educate the public on solar garden subscriptions, holding a film festival on climate change, providing a car show during Earth Week featuring electronic vehicles (EVs), as well as informing the public through the media about the Sustainability Commission's work to establish plug-in charging stations for electronic vehicles in Red Wing. Also, the Sustainability Commission is exploring the potential for wind as a source of energy.

In the city of Red Wing's 2016 *Strategic Plan*, three goals and a number of actions were established relating to sustainability and adapting to potential climate change impacts—encompassing planning, operations and budget processes. The City Council has recently strengthened staff support for the Sustainability Commission by approving a half-time position for a coordinator to lead in the city's resiliency planning. Also beneficial to the city is the Sustainability Commission's efforts to educate both the City Council and residents about the science of climate change and about actions that promote more reliance on renewable energy instead of fossil fuel energy. In March 2018, Red Wing received the Minnesota Clean Energy Community award from the Minnesota Commerce Department in recognition for its conservation endeavors due, in part, to the execution of the *Green Wing Plan* as well as community energy efficiency and renewable energy generation.

IMPLEMENTATION
SNAPSHOT

"While mitigation and adaptation efforts have expanded substantially in the last four years, they do not yet approach the scale considered necessary to avoid substantial damages to the economy, environment, and human health over the coming decades."

Source: Fourth National Climate Assessment, Volume II, U.S. Global Change Research Program, Washington, D.C., 2018

In Red Wing, the Sustainability Commission has made developing a Climate Change Action Plan a high priority to assist in the country's efforts to lessen the effects of climate change.

Key Environment Directions

- Continuing participation in Minnesota Green Steps program in order to advance our rating.
- Continuing participation in Xcel Energy's Partners in Energy (P.I.E.) program branded as "Green Wing Partners in Energy" including the Local Government Project for Energy Planning (LoGoPEP) program for energy data profiling.
- Work to preserve priority areas identified in the *Open Space Preservation Plan*.
- Study of relevant sustainability issues that may impact the community's future, including codes, ordinances, and statutes that can impact sustainability initiatives and may need to be changed if they impede sustainability efforts.
- Wind Energy Ordinance that regulates the potential installation of wind energy conversion systems within city limits.
- Revisit the city's rules about energy conservation in order to set an example for the community and save taxpayer money.
- Consider establishment of a Sustainability Fund derived from 25 percent of the savings from the solar subscriptions in order to advance sustainability initiatives and educational outreaches.
- Address "Getting Around" in Red Wing to include sustainability issues like a transportation hub compatible with the city *Transportation Plan*.
- A more focused and more comprehensive Climate Action Plan to address potential climate change impacts and adaptation.
- Improve measuring and monitoring of air pollution sources and recycling of materials.

Terminology

Goals:

Goals are broad statements that describe a desired outcome. They are often long-term and aspirational in scope.

Strategies:

Strategies are policies, projects, programs, and practices that support one or more of the plan's goals. They address the "who, what, when, where, and how" of reaching a goal and may involve multiple sub-strategies and actions. Strategies may be ongoing and may or may not have definitive start and completion dates.

Goals, Strategies, and Actions

Goal 3.A: Establish climate action plan

Strategy 3.A.1: Reduce CO_2 and other toxic gases by 80 percent on or before year 2040

- Develop and implement an ongoing public information campaign about climate change.
- Continue to highlight sustainability initiatives and opportunities through expanded communication efforts and the annual Earth Day celebration.
- Achieve 50 percent of local vehicle use with either electric or non-or low-carbon fuels; and 100 percent low-carbon vehicles use for the city, other public entities, and corporate fleets by 2030.
- Achieve 100 percent renewable electric energy for residential /commercial use by 2040.
- Achieve 100 percent of the city's total municipal electricity consumption from solar by 2020.
- Encourage resident participation in renewable energy incentive programs.
- Reduce energy consumption in large and medium size commercial and industrial buildings by 30 percent by 2030.
- Reduce energy consumption in residential buildings by 35 percent by 2030.
- Continue participation in the Minnesota Green Steps Cities program.

Strategy 3.A.2: Establish green building policies

- Establish a green building policy that applies to new and renovated buildings. This policy should be aimed at improving energy efficiency and making sure that buildings are operated in an environmentally responsible manner.

Strategy 3.A.3: Develop a climate action plan education program

- Develop environmental curriculum in all schools, including a focus on climate change, and recognize local citizens who are demonstrating sustainable life-style activities or leadership.

Strategy 3.A.4: Create a climate change adaptation section to the plan

- Create a plan that prepares the community to handle conditions that may manifest and hinder activities of daily living, like damage to the national grid due to flooding that hampers local communications or major changes in weather impacting agriculture and the public.

Goal 3.B: Conserve energy and champion renewable energy

Strategy 3.B.1: Focus on transportation initiatives

- Continue to implement the city's *Complete Streets Policy* and the city's *Bicycle and Pedestrian Master Plan* to encourage carbon free multimodal transportation.
- Develop a capital improvement plan to convert the city's fleet of vehicles to electric.
- Build infrastructure enabling electric vehicles (EVs) with 'permitting' that makes it easier to install charging units for buildings/parking lots—require for all new buildings (residential/commercial).
- Expand on the Red Bike Demonstration Project and continue to encourage a robust bicycle sharing or bicycle renting program.
- Support Amtrak service expansion and other transportation alternatives such as high speed rail, commuter bus and train service, etc.

Strategy 3.B.2: Encourage building efficiency

- Continue to partner to encourage commercial and residential building conservation improvements through programs and incentives.
- Research methods to encourage solar domestic water heaters and solar heater technology.

Strategy 3.B.3: Promote clean electricity

- Educate, promote, and provide incentives to encourage commercial and residential participation in solar energy projects.
- Continue to participate in the Local Government Project for Energy Planning Program (LoGoPEP) that provides energy related planning tools to local governments.
- Re-evaluate the city's solar zoning regulations to ensure that they provide adequate standards and are not inhibiting solar development.
- Consider establishment of wind energy zoning regulations to clarify where wind energy can be developed and what the local regulations are for those developments.
- Support EV charging stations and grants for them.
- Partner with third party developers to convert city park system to renewable energy (see Ramsey County program).

Goal 3.C: Preserve, protect, and restore our natural resources.

Strategy 3.C.1: Encourage public and private property owners to use diverse, indigenous, drought tolerant flora and trees to harmonize with nature and be adaptable to climate change as needed

- Consider amending the city ordinances to allow more flexibility for property owners

to grow pollinator-friendly landscapes and promote and encourage these landscapes.

» Consider adopting a pollinator friendly resolution as outlined by the Pollinator Friendly Alliance.

» Consider working with the Audubon Society to become designated as an official Minnesota Bird City.

» Develop a community forest management plan that evaluates community tree canopy trends and develop targets for tree planting and replacement.

» Identify and convert public properties that can be transitioned from lawn turf to natural landscapes.

» Identify key streets that may be developed as Living Streets

Strategy 3.C.2: Encourage community support for vegetation management, including brush removal of invasive plants in parks and open spaces to maintain natural landscape

» Continue to partner with U.S. Fish and Wildlife Service, Department of Natural Resources, Minnesota Land Trust, local groups, volunteers, and others to manage prairie and forest restoration projects on public and private properties.

» Educate, promote and seek financial incentives for property owner efforts to remove invasive plants on their properties and teach owners about the value of natural landscapes.

Strategy 3.C.3: Preserve the community-wide network of contiguous public open space identified as the green network in Figure 3.2.

» Prevent new development from encroaching into the green network.

» Protect bluffs from the top of slope to the top of bluff (including from development).

» Conduct ongoing habitat restoration and management within the green network.

Strategy 3.C.4: Support additional open space preservation endeavors.

Strategy 3.C.5: Implement practices to conserve, to the fullest extent possible, water derived from underground aquifers.

Strategy 3.C.6: Locate new parks in areas connected to the green network if possible.

Strategy 3.C.7: Ensure equitable access to the natural environment to facilitate attachment and support for preservation efforts and promote a healthy mind and body.

Strategy 3.C.8: Use xeriscaping and turf reduction to reduce the need for irrigation, mowing, and fertilizer on City lands.

Goal 3.D: Substantially reduce solid waste going into landfills or incinerators

Strategy 3.D.1: Emphasize and expand recycling efforts

» Establish a system to gather data to determine and monitor levels of household and commercial recycling within the city and within the city's service area for solid waste processing.

» Establish a policy and time frame to place more recycling containers at event sites and provide educational promotion.

» Support conversion to universal, recyclable products like containers and 100 percent recyclable electronics.

» Promote reuse of materials and consider establishing a swap-area at the waste campus or curbside give-away for reuse items once a month.

Strategy 3.D.2: Expand Red Wing's organic composting

» Consider establishing a household organics collection system.

» Establish an appropriate animal waste collection site.

» Provide education, grants or other incentives to encourage home composting.

Strategy 3.D.3: Boost waste reduction

» Encourage new businesses in Red Wing to reprocess incinerated material.

» Implement a campaign to reduce littering.

» Lobby for the use of biodegradable products.

» Consider adoption of an ordinance to replace plastic eating utensils at restaurants or to ban plastic bags, balloons and straws, etc.

Goal 3.E: Reduce toxic chemicals and other pollutants that get into our local surroundings

Strategy 3.E.1: Continue to improve storm water management

» Continually update and implement the city's *Storm Water Management Plan*.

» Encourage needed green infrastructure features, such as stormwater ponds and infiltration basins, to be designed as natural open space amenities for the surrounding neighborhoods.

» Educate residents and visitors on the Mississippi River's role in the health of our ecosystem.

- Maximize stormwater infiltration and surface filtration to minimize need for underground stormwater infrastructure.
- Require compliance with the Clean Water Act, including supporting recommendations on stormwater, wastewater, and drinking water regulations impacting use, reuse, and limitations.
- Support programs educating the general public about ways to reduce water usage and manage stormwater on their properties, including rain barrel and raingarden workshops.

Strategy 3.E.2: Reduce pesticides and other pollutants

- Encourage city municipal reduction of use of pesticides that get onto streets and lawns.
- Educate the public about the use of pesticides and their impact.
- Consider the establishment of a city 'honey-bee haven' ordinance that would reduce specific use of pesticides with safer, organic products.
- Eliminate non-biodegradable synthetics from the community by creating a public-private program that strives to reduce known toxic chemicals and synthetic materials at work sites, waterways, public parks, and golf courses.

Strategy 3.E.3: Promote green building

- Develop educational program to help builders and residents understand how they can eliminate toxic building materials, and encourage the use of sustainable materials such as hemp Crete.

Strategy 3.E.4: Reduce air pollution

- Evaluate the sources of air pollution in Red Wing to determine what targets can be established to make the most impact on air pollution sources within the community.
- Develop educational programs that are aimed at reducing engine emissions and consider regulations aimed at reducing motor idling.

Online Library

You can see all of the foundational work of Red Wing 2040 on the City's website, *www.red-wing.org/red-wing-2040.html*

TABLE 3.5 STRATEGY MATRIX

Strategy	SHARE Principle(s)	Who can help achieve this?	Timing
Goal 3.A: Establish climate action plan			
» Strategy 3.A.1: Reduce CO2 and other toxic gases by 80 percent on or before year 2040	Sustainable, Healthy, Resilient	Local government, Sustainability Commission, utilities, private sector, nonprofit environmental organizations	Long Term
» Strategy 3.A.2: Establish green building policies	Sustainable, Healthy, Accessible, Resilient, Equitable	Community Development, Planning Commission, Sustainability Commission	Short Term
» Strategy 3.A.3: Develop a climate action plan education program	Sustainable, Healthy, Accessible, Resilient, Equitable	Local school district, Sustainability Commission, civic engagement	Short Term
» Strategy 3.A.4: Create a climate change adaptation section to the plan	Sustainable, Healthy, Resilient	Local, state, federal governmental agencies; private sector and other stakeholders including residents	Long Term
Goal 3.B: Conserve energy and champion renewable energy			
» Strategy 3.B.1: Focus on transportation initiatives	Sustainable, Healthy, Accessible, Resilient, Equitable	Public and private sector including developers	Short Term
» Strategy 3.B.2: Encourage building efficiency	Sustainable, Healthy, Resilient	Utility companies/private enterprise, local government	Ongoing
» Strategy 3.B.3: Promote clean electricity	Sustainable, Healthy, Resilient	Private sector enterprises including utility companies, solar gardens, car manufacturers	Ongoing
Goal 3.C: Preserve, protect, and restore our natural resources.			
» Strategy 3.C.1: Encourage public and private property owners to use diverse, indigenous, drought tolerant flora and trees to harmonize with nature and be adaptable to climate change as needed	Sustainable, Healthy, Resilient,	City government, local nurseries, local garden clubs	Ongoing
» Strategy 3.C.2: Encourage community support for vegetation management, including brush removal of invasive plants in parks and open spaces to maintain natural landscape	Sustainable, Healthy, Resilient	City government, residents, local garden club	Ongoing

Strategy	SHARE Principle(s)	Who can help achieve this?	Timing
» Strategy 3.C.3: Preserve the community-wide network of contiguous public open space identified as the green network in Figure 3.2.	Sustainable, Healthy, Accessible, Resilient	Public Works & Community Development Departments	Long
» Strategy 3.C.4: Support additional open space preservation endeavors.	Sustainable, Healthy, Accessible, Resilient	Public Works & Community Development Departments	Short
» Strategy 3.C.5: Implement practices to conserve, to the fullest extent possible, water derived from underground aquifers.	Sustainable, Healthy, Accessible, Resilient	City government, County and State government, Sustainability Commission, residents, businesses	Long
» Strategy 3.C.6: Locate new parks in areas connected to the green network if possible.	Sustainable, Healthy, Accessible, Resilient	Public Works & Community Development Departments	Long
» Strategy 3.C.7: Ensure equitable access to the natural environment to facilitate attachment and support for preservation efforts and promote a healthy mind and body.	Healthy, Accessible, Equitable	Public Works & Community Development Departments	Long
» Strategy 3.C.8: Use xeriscaping and turf reduction to reduce the need for irrigation, mowing, and fertilizer on City lands.	Sustainable, Resilient	City government, Sustainability Commission, Goodhue SWCD	Short
Goal 3.D: Substantially reduce solid waste going into landfills or incinerators			
» Strategy 3.D.1: Emphasize and expand recycling efforts	Sustainable, Healthy, Accessible, Resilient	City's Public Works Department; private haulers; communications staff	Short Term
» Strategy 3.D.2: Expand Red Wing's organic composting	Sustainable, Healthy, Accessible, Resilient	City's Public Works Department, private sector enterprise, residents; local coalition to replace incinerator site	Short Term
» Strategy 3.D.3: Boost waste reduction	Sustainable, Healthy, Resilient	City government, civic engagement, lobbying, and private enterprise	Short Term

Strategy	SHARE Principle(s)	Who can help achieve this?	Timing
Goal 3.E: Reduce toxic chemicals and other pollutants that get into our local surroundings			
» Strategy 3.E.1: Continue to improve storm water management	Sustainable, Healthy, Resilient	City Public Works Department, Port Authority as well as appropriate State and Federal offices and nonprofit organizations	Ongoing
» Strategy 3.E.2: Reduce pesticides and other pollutants	Healthy, Resilient,	City's Public Works Department, City Council, residents	Short Term
» Strategy 3.E.3: Promote green building	Sustainable, Healthy, Resilient	Local Sustainability Commission, HRA, Planning Commission, Chamber of Commerce, other stakeholders involved with residential/ commercial construction	Ongoing
» Strategy 3.E.4: Reduce air pollution	Sustainable, Healthy, Resilient	City's lobbyist, citizens group, environmental nonprofit, Minnesota Highway Patrol, City of Red Wing Police Department, Minnesota Pollution Control Agency, Environmental Protection Agency, other Federal units.	Ongoing