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# Morris Model – Community Resilience Plan

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This community plan outlines how Minnesota's changing weather is impacting our Morris-area community and identifies steps we can take to better prepare for these changes. Additionally, this plan establishes 9 key goals to make our community more resilient.

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VERSION 1.0

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**This report was prepared by grant-supported student interns (Kyle Klausing '16 and Sophie Bishop '17) working at the University of Minnesota, Office of Sustainability and the Center for Small Towns on behalf of the Morris Model team. Grant support was provided by the Minnesota Pollution Control Agency.**

**Weather data and information came from Minnesota climatologist Mark Seeley; Minnesota Public Radio; Insurance Federation of Minnesota, Insurance Services Office; and Minnesota Climate and Health.**

**To learn more as it becomes available, visit: [www.morrismodel.org](http://www.morrismodel.org)**



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# Introduction

The Morris Model – Community Resilience Plan summarizes several resilience challenges facing our community; actions we have taken to prepare for these challenges; and shared goals we have to make our community more resilient in the future. It brings together many conversations, workshops, and meetings held over the past two years into a comprehensive and easy to read plan. Ideally, this plan will bring attention to this important work and foster greater public awareness about the realities of our changing weather.

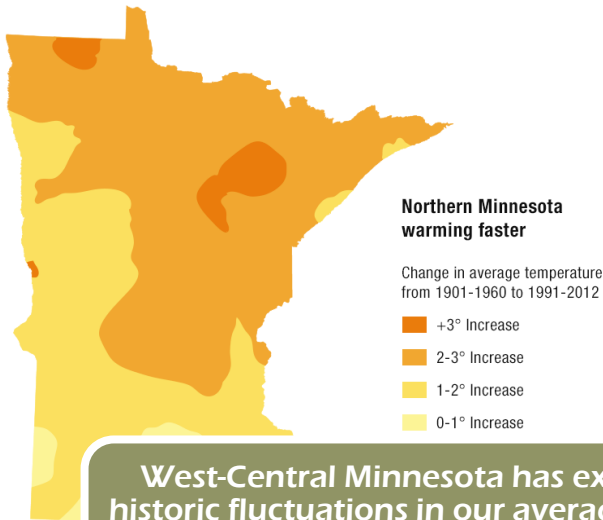
It begins by explaining how our climate and weather are changing. The report also explains the varied ways we are impacted by our weather, and how long-term shifts in temperature, precipitation, and extreme weather events create challenges to our community life. The report also summarizes our vulnerabilities to these changes. Next, the report describes the two-year process that went into developing this report. This section includes a description of our methodology and an overview of the many partnerships that went into this work. Next, the report outlines the 9 key action goals created by community leaders and experts to make Morris a more resilient town. This section explains the origin, purpose, and some progress-to-date for each goal.

This report is a work in progress. Two years ago, Morris hosted the first ever Rural Climate Dialogue organized by the Jefferson Center and the Institute for Agriculture and Trade Policy. This 3-day event brought together Morris residents to discuss the impact of Minnesota's changing weather and to identify steps they felt our community should take to prepare for it. In March of 2015, the Office of Sustainability at the University of Minnesota, Morris was awarded a grant by the Minnesota Pollution Control Agency (MPCA) to assist the community in extreme weather and resilience planning. In April, the Morris Model team hosted a public showing of the documentary *Chasing Ice*, followed by a discussion about how extreme weather was impacting our own community. During the summer and fall of 2015, student interns working at UMM continued community resilience planning with city, county, and non-governmental leaders. In November 2015, these experts and leaders came together during the Extreme Weather Action Meeting to strategize ways to better prepare for changing weather patterns. In the months that followed, concrete goals began to emerge, culminating in this community resilience plan.

We call our diverse number of community partners working together the “Morris Model” team. Government partners include the City of Morris and Stevens County. Horizon Public Health provided valuable information about climate change and its impact on public health. Other partners include Morris Area Schools, the Jefferson Center, the West Central Research and Outreach Center, and the University of Minnesota, Morris. Additionally, this plan was made possible by the contributions of many individual citizens.

You can learn more about our work at [www.morrismodel.org](http://www.morrismodel.org).

# Minnesota's Changing Weather

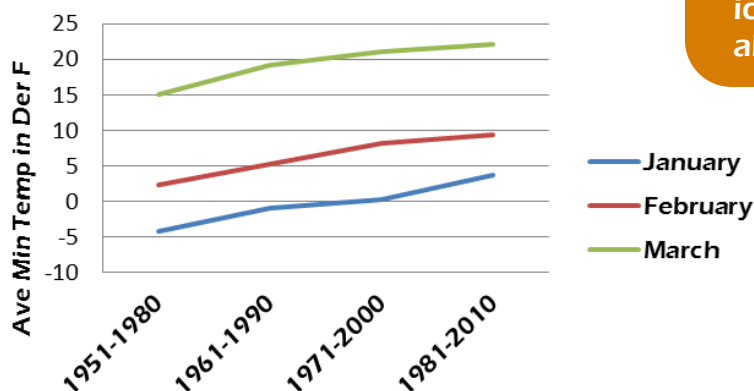


West-Central Minnesota has experienced historic fluctuations in our average long-term weather patterns. These changes exacerbate existing trends and create new problems.

## Warmer Weather

Minnesota is in the top 5 fastest-warming states. Across the state, average temperatures have risen considerably over the last 100 years. Over the last century, the average annual temperature has increased by 1.4 degrees F, with the upward trend increasingly above the 90<sup>th</sup> percentile (based on weather data for 1895). Additionally, average minimum temperatures have risen by about 13.4 degrees F during the same period.

## Average Winter min Temperatures in Milan, MN



This rise in temperature is most noticeable during winter months. The lowest average temperature for December 2015 - February 2016 was 11.8 degrees F. Also, ice cover on Lake Superior has declined by almost 80% since the 1970s.

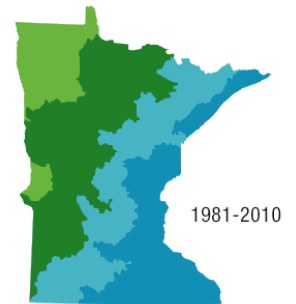
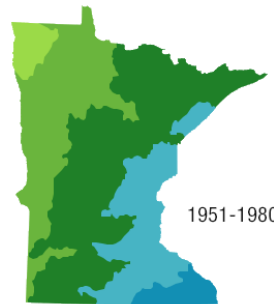
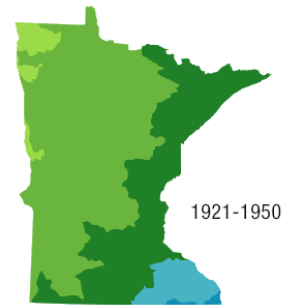
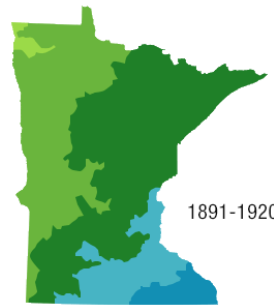
## Precipitation

Over the past several decades, Minnesota has experienced a higher level of annual precipitation.

### Precipitation change in Minnesota

Average Annual Rainfall

- Less than 20 inches
- 21-25 inches
- 26-28 inches
- 29-30 inches
- Greater than 30 inches

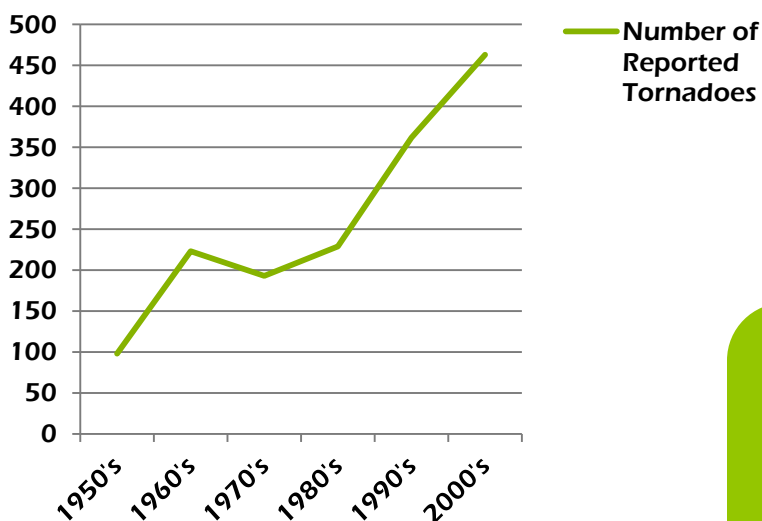


Warmer winters contribute to greater overall precipitation (especially during the change in seasons). In 1921-1950, the average annual rainfall was 21.53". By 1981-2010, the average rainfall had increased to 26.14" – an increase of 21%. Additionally, the likelihood of flash flooding events has increased due to the greater concentration of annual precipitation.

## Extreme Weather

Minnesota weather is getting weirder. Our changing climate will likely increase the number of extreme weather events in the coming decades. Tornadoes, thunderstorms, and hail are just some problems we are already dealing with. **Increased moisture and energy in the atmosphere catalyze the severity of these extreme weather events and may also increase their frequency.**

### Number of Reported Tornadoes



Higher average temperatures may contribute to more frequent and more severe tornadoes. Between 1950 and 2009, Minnesota experienced an average of 25.8 tornadoes per year. That number doubled in 2000-2009 to 43.2 per year.

# Public Safety

Extreme weather and climate change pose a serious risk to the safety and well-being of our community. This threat doesn't just pose problems down the road, but in the here and now. Whether it takes the form of health issues or weather-related injury, changing climate patterns threaten to disrupt our day-to-day lives. From a planning perspective, climate change introduces new complex problems (such as vector-borne illnesses) while also compounding existing ones (such as flooding and drought). It is important, therefore, to recognize these impacts and adjust our public safety planning to adapt to our new climate reality.



Extreme Heat



Air Pollution



Vector-Borne Diseases



Drought



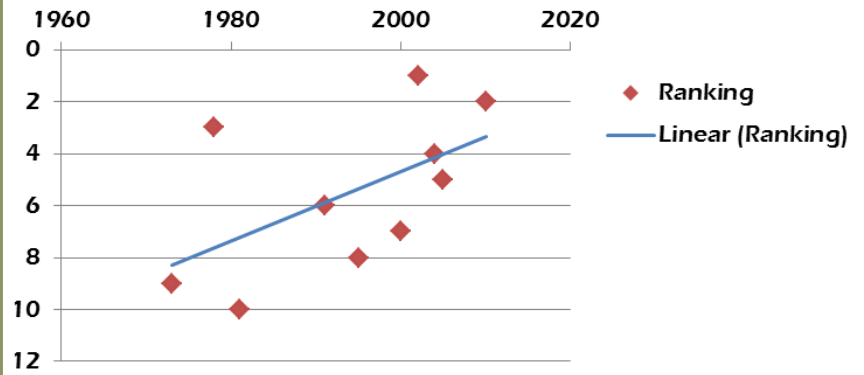
Flooding



## Flooding & Drought

Greater polarity between wet and dry cycles poses serious risks to human safety. Besides the obvious risks of drowning – flooding also brings economic devastation and new waterborne illnesses. Drought, meanwhile, exacerbates respiratory ailments and contributes to agricultural difficulties. Both drought and flooding disrupt essential services and place additional burdens on housing and food systems.

## Top 10 Flash Flooding Years from 1961-2011 in Minnesota



## Air Pollution

Air pollution (from power plants or by other human-made factors, like cars) contributes to a variety of pulmonary diseases, lung cancer, cardiovascular disease, allergies, and asthma. While pollution often creates new problems, it also exacerbates existing ones. Consequences of growing air pollution include reduced productivity at work and school, altered visibility, and other ecological damage.

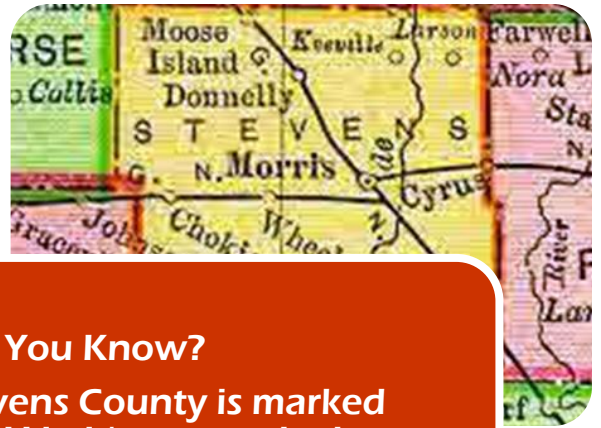


**Did You know?**  
Smog (a common manifestation of air pollution) reduces productivity at school and on the job



## Extreme Heat

Rising average temperatures make us more susceptible to extreme heat events, which disproportionately impacts elderly persons 65 years and older. Moreover, socio-economically disadvantaged communities are at a greater risk of exposure, and are physically more vulnerable to its effects. Additionally, these community members often lack the necessary resources to stay cool on hot summer days. Greater precipitation drives up humidity which makes already high temperatures feel even hotter.



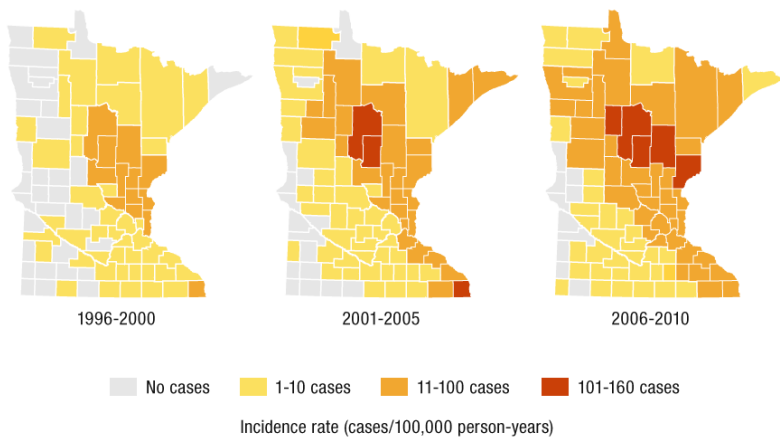
## Did You Know?

Stevens County is marked **HIGH** in its composite heat vulnerability score (a measure of socio-economic vulnerability and average temperatures).

## Vector-Borne Disease

As average temperatures steadily increase, so do disease vectors, like mosquitoes and ticks. **Over the past several decades, the disease vectors for several deadly illnesses have steadily risen north.** Such diseases include the West Nile virus, Lyme disease, and systemic disorders from Harmful Algal Blooms (HAB). The presence of these diseases doesn't just impact human populations, but it can also harm the agricultural sector (livestock, in particular, can be vulnerable to many of these diseases). Moreover, the medical toll these vector-borne diseases take has negative economic consequences.

Distribution of Lyme disease cases by county of residence



Source: Minnesota Department of Health

# Local Economy

Climate change also presents a unique challenge to our local economy. Environmental and weather-related changes threaten to disrupt supply chains, regional markets, and our labor supply. Small business in particular will increasingly find it difficult to adapt to rapid climate-related changes since they lack the same capital and infrastructure depth possessed by larger competitors. **Cutting-edge Minnesota companies, like 3M, General Mills and Best Buy are all working to adapt their supply chains to this new climate reality.**

## Agriculture

Agriculture is an important economic engine in west-central Minnesota. Corn, and soy are the primary crops produced in this region, and help attract substantial capital investment to the area. Higher average temperatures threaten annual yields, thus threatening future economic growth. This problem is further worsened by water usage practices that over time tend to lower the water table. Soil erosion, already a problem because of current farming practices, is also worsened by drought and over- production.

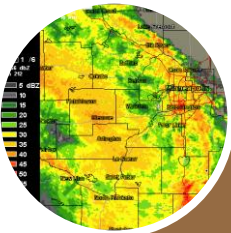
**Climate  
Change  
Threatens:**  
**Animal  
Health**  
**Food Prices**  
**Crop Yield**



Livestock also play an important role in the agricultural economy (dairy production in particular is a major source of employment for the region). More northerly disease-vectors put these animal populations at risk. Additionally, extreme weather events multiply potential dangers to agriculture. Lower crop yields, particularly in corn, also has the potential to hurt livestock. Overall, the increasing unpredictability of weather patterns will affect the agricultural sector in Minnesota and make long-term investments riskier. This could result in lost jobs and increased debt.

## Small Business

Also important to the local economy are the **hundreds** of small businesses that operate in the Morris area. Whether that business is in food service, light industry, or retail, all are subject to the consequences of our changing climate. Climate change impacts small business in several ways. First, changes in long-term weather patterns add greater stress to buildings and utilities. This increases regular maintenance costs, which over time cut into profits. Second, climate change disrupts regular markets and supply chains, which can be particularly damaging in small rural economies. Third, climate change affects human health and lowers worker productivity. These impacts combine to damage our local economy and may threaten the financial future of our community.



### Did You Know?

Minnesota is the 2nd most insured state in terms of catastrophic losses.

## Insurance

Unlike other areas of economic change, rising insurance rates are the most direct way many community members feel the full financial impact of our changing weather. As damaging weather patterns become more common, the cost of insuring property will increase. In fact, according to the Insurance Federation of Minnesota, instances of extreme weather were estimated to have increased by 15% over the past two decades. This correlates to a rapid increase in homeowners insurance premiums. In 1998, the average premium in the state of Minnesota was \$368. By 2010, it had risen to \$1056, a growth of 297%. Similar trends are also found in business-related insurance costs. Everything from transportation to agriculture has witnessed historic increases in the cost of insurance caused by worsening extreme weather events. Compared to the rest of the country, **Minnesota is the 2nd most insured state in terms of catastrophic losses.** Hail, flooding, tornadoes, and everything in between adds new costs to private property owners. Because insurance averages are taken from the state as a whole, everybody suffers from higher premiums set by insurance companies worried about riskier properties.



# Infrastructure

In addition to agriculture and private property owners, climate change also poses a challenge to creating resilient infrastructure. The growing frequency of floods, tornadoes, high intensity winds, and blizzards create new challenges to city planners. These problems represent both structural engineering problems as well as financial and policy problems. Failing to resolve these obstacles will endanger the future prosperity of our community.

## Structural Problems

From an engineering perspective, these weather developments add greater strain to city infrastructure. Pipeline ruptures, power outages, and strained services (particularly during clean-up) are just some of the severe consequences. Many aspects of city planning do not reflect changing weather patterns.

For instance, roads, while built to withstand Minnesota's rugged climate, are not prepared to handle the increasingly severe temperature fluctuations. Additionally, storm drainage system finds it increasingly difficult to keep up with the torrential downpours – contributing in part to flash flooding across the city during heavy rainfalls.



Storm debris damages city infrastructure and drains community resources

The fallout from our changing weather also threatens the financial security of our local government. Infrastructure and city services in particular will become more expensive as the frequency and cost of maintenance and updates increases. Additionally, the frequency of extreme weather events creates the potential for high-damage, high-cost disasters. Although state and federal funding is available in such cases, the unpredictability and high short-term costs of these events poses potentially catastrophic threats to fiscal sustainability.



# Resilience Goals

To prepare for present and future challenges, we have developed **9 key resilience goals**. **Resilience is the ability to recover quickly in the wake of difficult situations.** A community is resilient when it is able to effectively to prepare for and recover from difficult situations.

These resilience goals were formulated by various experts and leaders through several months of outreach, and represent a comprehensive approach to fostering a resilient community. These goals touch on infrastructure, economic development, public health, education, and emergency planning. While these goals help outline important values and priorities, they also require concerted action on the part of city and county government, schools, and community members. Some goals are more progressed than others, while some represent aspirations yet to be developed.



# Healthy Tree Canopy

A resilient tree canopy ensures a healthy community and a sustainable environment. Our city is currently dedicated to transitioning away from a singular species canopy and embracing a more diverse planting strategy. In the past, the city prioritized the planting of ash and elm trees. However, the vulnerability of these trees to disease has helped push the city in the direction of more diverse varieties such as maple and hackberries.

Morris is also committed to planting tree species that are more resilient to extreme heat and drought. The city also hopes to use the reforestation budget to expand healthy tree canopy coverage to parks and trails. **Expanded coverage will provide greater shading, which reduces the negative effects of extreme heat.** It will also increase the different types of nutrients and microbes in the soil, while simultaneously diversifying the fauna.

## Resilience

All partners are committed to planting a diverse group of trees that are resilient to drought, flooding, and disease

## Public Health

From a public health perspective, a healthy tree canopy is important because it provides greater shading for residents, thus reducing the negative effects of extreme heat



**Diversify tree species and incorporate resilient planting strategies**



**Expand tree canopy coverage, especially in areas frequented by people (parks, trails, etc.)**



# Alternative Transportation

Safe and healthy forms of transportation are essential for creating a resilient community. It is a priority for both our city government and for public health experts in the area to encourage the use of zero-carbon and energy-efficient vehicles. Walking, biking, and public transportation are all options currently in place to both promote healthy lifestyles while also easing our carbon footprint. In the future, we would like to expand existing bike paths and lanes (including a new bike lane along 7th street). We will also expand the "Safe Route to School" strategy to encourage more students to walk to school, thus reducing overall carbon emissions.



Promote public transportation as an efficient alternative to cars

- *Morris Public Transit*
- *Rainbow Rider*



Expand fuel-efficient vehicles in the car fleets

- *Lowers operational cost*
- *Reduces carbon emissions*



Implement safe walking strategies to encourage the use for sidewalks,

- *Sidewalks encourage seniors to go outside*
- *"Safe Routes to School" Initiative*



Expanded bike lanes

- *Create new bike lane along 7th street*
- *Bike sharing program*



Walking  
biking, and  
rollerblading  
are healthy  
alternatives

Public  
transportation  
is another  
resilient  
alternative



Morris is  
dedicated to  
improving the  
efficiency of  
cars already in  
use



# Renewable Energy

Renewable energy is fundamental to promoting resilient practices. Solar and wind energy in particular are viable alternatives to traditional fossil fuels that otherwise pollute our environment and contribute to greenhouse gas emissions. **Morris already has developed significant renewable energy capacity, and new plans are under development to expand this potential while bringing in new partners.** Several innovative pricing plans are available that would both meet our unique energy needs while also democratizing energy access. Community solar (individual ownership of solar panels located in a traditional multi-panel installation) is one option currently under discussion.



## Community Solar Garden

- PV solar panels currently installed at UMM
- Discussions underway for development of community solar garden or city installations
- Zoning changes to facilitate private solar ownership



## Wind Energy

- Two wind turbines operated in joint partnership between UMM and WCROC - providing 60% of campus electricity
- Explore funding options for additional development



## Biomass Gasification

- Operated by UMM to produce energy for heating and cooling and also makes electricity
- Local farmers contribute agricultural waste



# Rain Gardens

## Rain Gardens

Although we live in a rural community, Morris experiences many of the same water problems common in urbanized areas. **City streets, parking lots, densely-spaced buildings, and other artificial land covering all contribute to excessive runoff, flash flooding, and water contamination.** Many of these problems will only intensify as we begin to experience greater than average rainfalls. To better prepare for these changes, one commonsense goal is the creation of additional rain gardens by public and private buildings. By using water runoff, these gardens will help sustain a variety of vegetation (including natural prairie grasses, edible plants, and endangered plant species). Additionally, rain gardens located next to schools and government buildings will bring greater visibility to the public about the value of water conservation – thus promoting greater climate literacy. Currently, UMM, the public elementary school, and the Soil and Water Conservation District have rain gardens – however, it is a goal of our community to create additional gardens in a variety of public and private spaces.

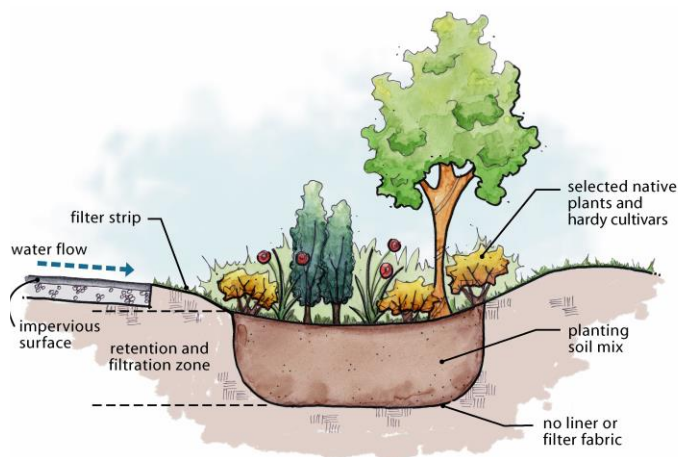


Diagram of a rain garden

Rain gardens work by diverting water run-off away from sewers and into small man-made depressions. Inside the retention zone, this water is used to hydrate a diverse population of trees, plants, and grasses, creating a self-sustaining ecosystem.

# Climate Education

## Climate Education

Climate education is very important because we need people to understand how climate change is affecting our environment, families, and man-made structures. Community members need to understand the problem so they can start preparing for the changes. Climate education for the community can be in the form of educational events, forums, and meetings.

To teach the younger generation about this, we need to incorporate climate education into our public school curriculum. Although climate science is already part of the curriculum in our public schools, more emphasis should be added on creating solutions for adapting to our changing climate. It is a goal for our community to have greater collaboration between UMM and our public schools to increase climate, weather, and energy literacy – and to build collaborative educational projects.



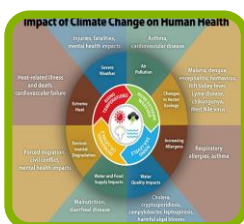
In April of 2015, there was a showing of the documentary Chasing Ice to raise awareness of the melting Arctic at our local theatre



Morris residents participated in a Rural Climate Dialogue and June 2014 to learn about and discuss extreme weather preparedness.



Community leaders and experts came together in November of 2015 to learn about the impact of extreme weather in the Morris area.



Knowing the health risks of climate change is the first step to creating a safer, more resilient community.

- Key priorities:
  - Beating extreme heat
  - Storm preparation
  - Safe drinking water



Promote climate literacy for both residents and leaders in the community

- Progress to Date:
  - Chasing Ice event on April 11, 2015
  - Extreme Weather Action Meeting on November 14, 2015
- Next Steps:
  - Have another community event about extreme weather change



# Community Garden

Community gardens promote healthy eating, community togetherness, and outdoor activities. Not only do they create public spaces for people to interact with one another, they create educational opportunities for community members of all ages. From a public health perspective, these are all goals that can help raise health standards across the board and ensure a higher quality of life for Morris residents. There are a number of land options available for locating a new garden. Leasing private farm land is another viable option. Currently, both UMM and the High School have educational gardens which students use to learn about small-scale agriculture while also learning about the nutritional benefits of eating fresh and local food.



Community gardens promote healthy eating habits and provide an opportunity for outdoor exercise



They also help educate people about food systems, and reinforce the importance of local foods



**When possible, make existing gardens more available to the public**

- Progress to Date: UMM and high school have gardens. Live to Garden program at UMM teaches students about gardening.
- Next Steps:
  - Identify more options for engaging other community members and children



**Create a community garden available for public use.**

- Progress to Date: Regional Fitness Center has a small garden for kids to learn more
- Next Steps
  - Determine viable location for community garden and community interest

# Energy Efficient Practices

The energy we use to power our homes, our businesses, and our public spaces is vital to the health and resilience of our community. Inefficient energy use, in turn, threatens our ability to sustain development in the long-term and burdens community members already struggling to make ends meet. To promote energy efficiency practices while also lowering energy bills, it is a goal of our community to implement energy audits of student and low-income rental housing. Moreover, we will work to provide access to energy saving strategies and updates to lower our total carbon footprint. This work will require broad participation among renters, landlords, and our local housing authority. We will also strive to promote energy efficiency standards in public and private buildings by modifying our zoning codes to facilitate 'green retrofits'.

Encourage energy efficient practices in public buildings (UMM, schools, city, and county)



Implement energy audits for student and low-income housing



Expand the use of LED lighting



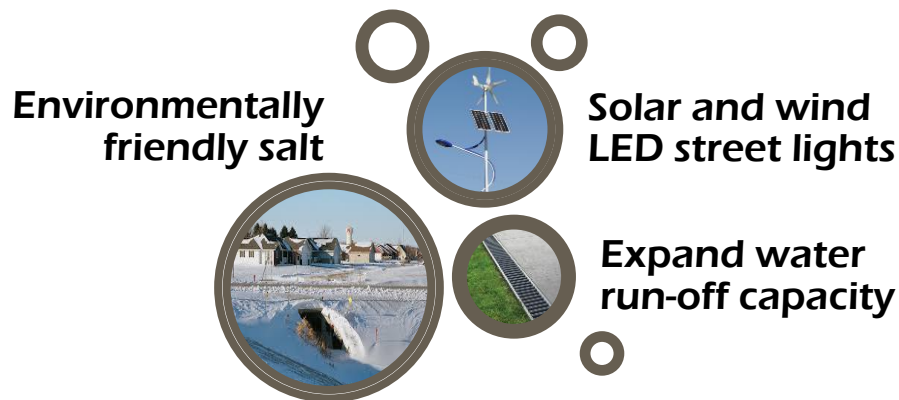
Prioritize energy efficiency during future building retrofits





# Resilient Infrastructure

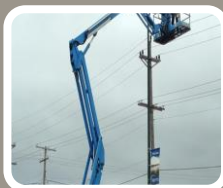
Extreme weather change represents a direct threat to the resilience of our infrastructures. Like any community, it is necessary to update and expand streets, bridges, plumbing, lighting, and other necessary systems and services. Our changing weather requires adaptation and may add greater costs to the taxpayers if not addressed. The fiscal impact of extreme weather change, therefore, necessitates investments in resilient infrastructure. These updates range from the simple (environmentally friendly salt during wintertime) to the more complex (LED retrofits for street lights). By identifying specific projects, however, we have the opportunity to lower relative infrastructure costs over the long-term while preparing our community for changes in weather patterns.



Promote practices and strategies to create community infrastructure that is resilient to our changing weather



Water Treatment Facility: redevelopment underway to improve our community's water quality and reduce salt discharge to the Pomme de Terre River



LED Streetlight Retrofit: Currently upgraded along mainstreet, future projects to come



Improvements to streets and sidewalks to improve access and increase use

# Extreme Weather Planning

As our weather continues to change, it will become necessary to modify our emergency preparations for more severe tornadoes, floods, lightning storms, and blizzards. The growing frequency and severity of these events will alter the way we think about financing, planning, and executing emergency plans. Extreme weather events will require greater communication between city, county, and state agencies. It is a goal for our community to update plans when necessary and adjust emergency planning to the realities of climate change. Moreover, a more concerted effort will be made to inform the public of the consequences of changing weather, and what they can do to become more prepared.



City, UMM, county, public schools, and public health staff members are coming together to help make Morris more resilient to extreme weather changes



Ensure that city, UMM, county, and public school emergency weather planning accounts for future weather changes

- Progress to Date:
  - UMM has been working on updating their plan
  - Stevens County has expanded emergency planning resources
- Next Steps:
  - Identify additional updates that are needed



Develop a community resilience plan

- Progress to Date:
  - First draft completed in July 2016
- Next Step
  - Use the plan to frame future resilience planning
  - Further develop the plan and gather more community feedback