

**A Self-Assessment
to Address
Climate Change
Readiness in Your
Community**

**Michigan and the
Great Lakes Region**

A Self-Assessment to Address Climate Change Readiness in Your Community

Communities within the Great Lakes region have been and always will be impacted by climate, whether it is an extreme rainfall event, drought, intense heat wave, or some other type of event. Climatologists have found that weather in the region is shifting. This shift may include more frequent extreme storm events in our communities, increasing temperatures, reduced ice cover, and greater wind speeds. What do these changes mean for our communities when for decades we have been planning, making decisions, and building infrastructure based on a stable climate?

This question led to the creation of this community climate change readiness self-assessment. The purpose of this self-assessment is to provide community leaders, administrators, planners, engineers, public work directors, and/or natural resource managers with a simple and inexpensive method to review their community's potential vulnerabilities to climate trends and to begin the conversation of how and when to incorporate these trends into planning and projects within our communities. In order to cover all aspects of knowledge in each community, it is recommended that more than one department within the city or township complete the section(s) of the assessment that best fit their knowledge area. Another possibility is to have the various departments complete all sections to provide information on where staff may/may not agree on the various scenarios given. The goal of this assessment is to find ways to best help communities become more resilient to climate change through education and planning by reducing impacts and costs through climate change adaptation policies and procedures.

This self-assessment is a checklist tailored for the Great Lakes region. It is not designed to be a complete vulnerability assessment, but rather a tool used to identify key areas where communities are likely to be most at-risk, and a way to start the process of working with communities to determine where a more thorough review of vulnerability may be needed.

Please complete the tables that follow along with the *Climate Change Readiness Index* at the end of the document according to the instructions provided. Then, if you would like assistance identifying your next steps, you may return the document to Laura Holladay at Michigan Sea Grant (see last page for address). Ms. Holladay will use this information to continue the conversation, and she is available for consultation with your community for climate change adaptation information, education, planning, and project implementation.

Credit: This document, A Self-Assessment to Address Climate Change Readiness in Your Community, was created by Diane Desotelle of Minnesota Sea Grant in 2012.

1. Critical Infrastructure Flooding Readiness

If your community's critical infrastructure is located in areas impacted by the floodplain and/or either of the listed storm event scenarios, place a check mark in that column. Typically, floodplains are determined by the 100-year, 24-hour storm event, but keep in mind that a heavier shorter duration storm event or more frequent longer duration storms with the same amount of precipitation can also lead to equivalent flooding depending on the land cover and soils in your area.

Infrastructure	Scenario	Scenario	Scenario
	Located in the Floodplain ¹ ?	Flooding expected due to 100-year, 24-hour storm ² ?	Flooding expected due to storm event 50% greater than column 2 ³
Sewage Treatment System			
Power grid			
Drinking Water System			
Roadways/evacuation routes			
Railways/evacuation routes			
Petroleum/chemical storage facilities			
Total Check Marks (infrastructure)			

¹ The land area covered by the floodwaters of the 100-year flood on Federal Emergency Management Agency (FEMA) National Floodplain Insurance Program (NFIP) maps. The area where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies (See Appendix A).

² The 100-year, 24-hour storm (ranges from 4 inches to 6 inches for Michigan) based on data from Bulletin 71, Rainfall Frequency Atlas of the Midwest (see Appendix B).

³ One and a half times the 100-year, 24-hour storm (about 6 inches to 9 inches for the Michigan) based on data from Bulletin 71.

2. Critical Facilities Flooding Readiness

If your community's critical facilities are located in areas impacted by the floodplain and/or either of the listed storm event scenarios, place a check mark in that column.

Facilities	Scenario	Scenario	Scenario
	Located in the Floodplain ¹ ?	Flooding expected due to 100-year, 24-hour storm ² ?	Flooding expected due to storm event 50% greater than column 2 ³
Police station(s)			
Fire station(s)			
City Hall			
Emergency operation centers			
Evacuation Shelter(s)			
Hospital(s)			
Communications center(s)			
Public Works Facilities			
Total Check Marks (facilities)			

¹ The land area covered by the floodwaters of the 100-year flood on Federal Emergency Management Agency (FEMA) National Floodplain Insurance Program (NFIP) maps. The area where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies (see Appendix A).

¹ The 100-year, 24-hour storm (ranges from 4 inches to 6 inches for Michigan) based on data from Bulletin 71, Rainfall Frequency Atlas of the Midwest (see Appendix B).

¹ One and a half times the 100-year, 24-hour storm (about 6 inches to 9 inches for the Michigan) based on data from Bulletin 71.

3. Built Environment and Infrastructure

Climate trends for the Great Lakes region over the past decades, and predictions into the future, include an increase in the frequency and severity of extreme storm events with flooding, greater wind speeds, and longer and more frequent periods of drought. Water levels in the Great Lakes may also fluctuate. These changes may impact the safety and effectiveness of your community’s infrastructure (i.e., storm sewers, waste and drinking water systems, roads and bridges, detention basins, ports, marinas, docks). For each issue below, check yes or no as they apply to your community’s unique setting.

Built Environment and Infrastructure	Yes	No
Does critical infrastructure (i.e., storm sewer, culverts) exist that is susceptible to extreme storm events?		
Is there significant shoreline infrastructure (residences, water and wastewater treatment, tourism, transportation, industry) within the Special Flood Hazard Areas (100-year flood on NFIP maps)?		
Will it take more than 3 days to clear roads and bridges blocked by storm debris after a 100-yr storm event or greater?		
Will it take more than 3 days for road washouts to be passable after a 100-yr storm event or greater?		
Will ports and marinas be affected by an extreme weather event (high winds, water levels fluctuations)?		
Are there shoreline structures in your region, such as levees, piers, or breakwaters, susceptible to extreme storm events, large waves or water level fluctuations ¹ ?		
Is there land subsidence today in the shoreline areas of your community that threaten the built environment?		
Is it difficult for public transportation routes to reach residents unable to evacuate on their own if evacuation is required for health and safety purposes?		
Total Number of Yes and No answers		

¹ For water level fluctuations, consider the highest and/or lowest water level on record as a benchmark for an extreme water level.

4. Operations and Maintenance

Briefly assess if your community has experienced a need for additional infrastructure operations or maintenance work associated with extreme storm events, drought, high winds, increased temperatures, fluctuating water levels, or other climate-related events. **Check “yes” if these experiences have increased in the last ten years and “no” if it is within the expected operations and maintenance programming.** In the comment section, mention if your community has adjusted its work plans to do maintenance because of seasonal climate and if it was a benefit or a cost.

Operations and Maintenance	Yes	No	Comment
Snowplowing and snow removal has an increasing trend.			
Storm sewer system repair, including conveyances, inlet/outlet structures or best management practice (BMP) maintenance is on the rise.			
Road buckle and pot holes maintenance is on the rise.			
Sanitary sewer overflow (sanitary waste overflowing into storm sewer system) is occurring more frequently.			
Beach closures from water quality, erosion, or high water, is more frequent.			
Urban tree maintenance and replacement is on the rise.			
Total Number of Yes and No answers			

5. Water Resources

Climate trends for the Great Lakes region include an increase in frequency and severity of extreme storm events with flooding, greater wind speeds, and more frequent periods of drought. When it comes to your community's unique setting and being able to provide clean water and sustain water quality, check "yes" or "no" to each issue as they apply.

Water Resources	Yes	No
Has the area faced a drought in the past during which it failed to meet local water demands or needed implement water use restrictions?		
Have private well owners or community groundwater supplies shown reductions in capacity or water quality associated from drought or flooding?		
Does the area have invasive species management issues in protected habitat areas?		
Do you have water resources that could be threatened or impacted from the result of a wildfire (i.e. increased erosion and sedimentation)?		
Are there beneficial uses ¹ for designated waterbodies in the area that cannot always be met today due to water quality issues?		
Does your community wastewater treatment plant discharge untreated sewage during rain events?		
Is shoreline erosion above and beyond natural occurrences currently being observed in your area?		
Total Number of Yes and No answers		

¹To satisfy Clean Water Act requirements, each state is required by the EPA to specify beneficial uses (or designated uses) for their waterbodies. These include: domestic consumption, aquatic life, recreation, industrial consumption, agricultural, wildlife, aesthetics, navigation, etc.

6. Ecosystems and Habitats

The Intergovernmental Panel on Climate Change (IPCC) defines vulnerability as “the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change.” Vulnerability consists of the following: exposure to climate change (i.e., magnitude of the changes experienced); species sensitivity to these changes; and the capacity to adapt to these changes. Certain ecosystems and habitats are more vulnerable to climate change than others. Check “yes” or “no” to the questions below in relation to those places in your community.

Ecosystems and Habitats	Yes	No
Does local water quality have the potential to be contaminated by extreme storm events, drought, or increasing temperatures?		
Does your area include inland or coastal aquatic habitats susceptible to erosion and sedimentation issues?		
Are there aquatic plant and animal populations in the area susceptible to increasing water temperatures, fluctuating water levels, or increasing volume and velocity of stormwater runoff?		
Are there terrestrial plant and animal populations in the area susceptible to increasing temperatures, increased stormwater runoff, or drought?		
Are there rivers, streams or lakes in your area with instream flow requirements, listed as impaired or on your state’s 303(d) ¹ list, or other known stressors to aquatic life?		
Are there exposed estuaries, wetlands, or beaches that are susceptible to more frequent coastal storms and or water level fluctuations in your area?		
Are you aware of new plants or animals that have moved into the area in the last 10 – 20 years including invasive species?		
Are corridors for species to naturally migrate away from threats potentially blocked by existing or future development (i.e., roads, buildings) or resource extraction (i.e. timber management, mining)?		
Are there recognized threats due to the introduction and/or spread of invasive species (aquatic or terrestrial) to local ecosystems?		
Total Number of Yes and No answers		

¹303(d) list of impaired waters by state:

http://iaspub.epa.gov/waters10/attains_nation_cy.control?p_report_type=T

7. Tourism and Recreation

Tourism and recreation have been and will be affected by climate in the Great Lakes region. For example, communities often have events or festivals that are season dependent, such as the John Beargrease Sled Dog Marathon in Duluth Minnesota, where the event may need to be rescheduled or cancelled entirely due to climate related impacts. Furthermore, general recreation and tourism activities that rely on snow cover or the timing of harvest (apples) may affect resorts, hotels, shops and other venues that depend on visitors. Consider the questions and check “yes” or “no” as they apply to your area.

Tourism and Recreation	Yes	No	Explanation/Comment
Has the community experienced negative impacts to winter tourism and recreation due to climate?			
Has the community experienced negative impacts to summer tourism and recreation due to climate?			
Will climate reduce the number of expected visitors to your area for recreation and tourism in the next 10 to 20 years?			
Will park and recreation facilities be affected by climate due to increasing maintenance, changes in design or structure of facilities, etc.?			
Total Number of Yes and No answers			

8. Business Plans and Equipment

What assets do the retail stores for basic needs (grocery, gas, hardware) in your area have to re-open after a power outage, flooding, or other impacts due to an extreme weather event (precipitation or heat related)? If more than 50 percent of the businesses have the following equipment or plans, check “yes”. If fewer than 50 percent have the equipment or plans, check “no”.

Business Plans and Equipment	Yes (50% or more)	No (Less than 50%)
Generators		
Backup options for basic needs (water, waste, communications)		
Plans to bring in staff to help re-open the business		
Plans for re-stocking		
Total Number of Yes and No answers		

9. Community Plans

Community plans and plan updates provide an opportunity to incorporate climate change education and adaptation into the process. This category seeks to identify specific community plans underway in the near future where climate education and associated climate change adaptation can be incorporated. **Check “yes” if the particular plan in question exists and has climate adaptation incorporated in the plan, otherwise check “no”. Please provide the year in which the plan will be amended or updated in any event. If the particular plan does not exist, please explain in the comment column.**

Community Plans	Yes	No	Update Year	Comment
Does your community have a Hazard Mitigation Plan or Emergency Preparedness Plan that includes climate adaptation?				
Does your community have an evacuation plan?				
Does your community have a stormwater plan that includes climate adaptation?				
Does your community have a land use plan that considers climate adaptation?				
Does your community have a local/regional transportation plan that includes climate adaptation?				
Does your community have a tourism, recreation or parks plan that considers climate adaptation?				
Does the Chamber of Commerce have a local/regional plan that considers climate adaptation?				
Is your community involved in any way with private, local or state forestry management planning and projects and is climate adaptation incorporated in the plan?				
Total Number of Yes and No answers				

Determining Your Community's Climate Change Readiness Index

Refer to page 2 and 3 to determine whether your Readiness Index for infrastructure and facilities is LOW, MEDIUM, or HIGH. Use the matrix chart below, which is based on the total number of check marks in both shaded boxes of category 1.

Category 1. Critical Infrastructure Flooding Resilience

Number of check marks	Readiness Index
13-18	LOW
7-12	MEDIUM
0-6	HIGH

Community's critical infrastructure Readiness Index is _____

Category 2. Critical Facilities Flooding Resilience

Number of check marks	Readiness Index
17-24	LOW
9-16	MEDIUM
0-8	HIGH

Community's critical facilities Readiness Index is _____

Categories 3-9: Built Environment and Infrastructure, Operations and Maintenance, Water Resources, Ecosystems and Habitats, Tourism and Recreation, Business Plans and Equipment, and Community Plans

Refer to pages 4 through 10 to determine whether your Resilience Index for these various categories is LOW, MEDIUM, or HIGH.

Categories 3-8	Total Yes answers (shaded box of given table above)	Translate Total Answers from Column 1 of this table to a Readiness Index	Readiness Index	Comments
Category 3: Built Environment & Infrastructure		0 to 2 (HIGH) 3 to 5 (MEDIUM) 6 to 8 (LOW)		
Category 4: Operations and Maintenance		0 to 1 (HIGH) 2 to 4 (MEDIUM) 5 to 6 (LOW)		
Category 5: Water Resources		0 to 2 (HIGH) 3 to 5 (MEDIUM) 6 to 7 (LOW)		
Category 6: Ecosystems & Habitats		0 to 2 (HIGH) 3 to 6 (MEDIUM) 7 to 9 (LOW)		
Category 7: Tourism and Recreation		0 to 1 (HIGH) 2 (MEDIUM) 3 to 4 (LOW)		
Category 8: Business Plans & Equipment		4 (HIGH) 2 to 3 (MEDIUM) 0 to 1 (LOW)		
Category 9: Community Plans		6 to 8 (HIGH) 3 to 5 (MEDIUM) 1 to 2 (LOW)		

Interpreting Readiness Index for Climate Change Results

Readiness Index:

A readiness index is an indicator of your community's ability to restore and maintain an acceptable level of functionality following impacts related to climate change. Notice that your readiness index is identified as low, medium, or high for the different sections. Consider addressing these categories in more detail with a vulnerability assessment as suggested by the indicator level and in conjunction with a planning process or project design.

LOW Readiness Index:

A low readiness index indicates this category is a high priority for implementing a vulnerability assessment to help further define climate change impacts and provide information for adaptation planning and design in the very near future.

MEDIUM Readiness Index:

A medium readiness index indicates that work could be done to improve community climate change readiness as opportunities arise to update plans and incorporate designs more resilient to climate change.

HIGH Readiness Index:

A high readiness index indicates your community is either prepared or not highly affected by projected climate trends as we understand them today. However, there may be specific vulnerabilities within each category that may warrant attention. A high readiness does not indicate lack of impact.

Next Steps

Regardless of your community's readiness index scores, reviewing each individual issue where there appears to be potential vulnerabilities and identifying either a short or long-term plan to address these issues will increase your community's capacity to remain resilient during times of extreme storm events. Learning about and investigating stressors due to climate change and continuing to stay abreast of climate change information as it becomes available for your locale is important for the economic, social, and environmental health of your community.

Please send this completed document(s) to your Sea Grant program educator (listed below), who will use this to provide suggestions on educational materials and programs about climate change issues and tools and resources to help your community adapt to a changing climate.

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Ann Arbor, MI 48104

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Email: hollad@umich.edu

Appendix A

Federal Emergency Management Agency (FEMA) Flood Map Resources	
FEMA's Map Service Center	
Website	https://msc.fema.gov/
Features	<ul style="list-style-type: none">➤ Search for "Flood Maps" by address in the "Product Search by..." box on the top left of the page➤ Or click "Flood Maps" under "What are you looking for?" to search by state then county and city➤ <i>Item ID with "IND" towards the end is the index map for each state</i>
Individual State Organizations in the Great Lakes Region¹	
Illinois	http://www.illinoisfloodmaps.org/
Indiana	http://www.in.gov/dnr/water/5647.htm
Michigan	<i>No state-level resource available at this time</i>
National Flood Insurance Program	
Website	http://www.fema.gov/business/nfip/

¹Websites from various state programs/organizations that provide state-level flood maps without going through FEMA's Map Service Center. These websites are a little more user-friendly, or provide information for specific county contacts if you have questions.

Appendix B

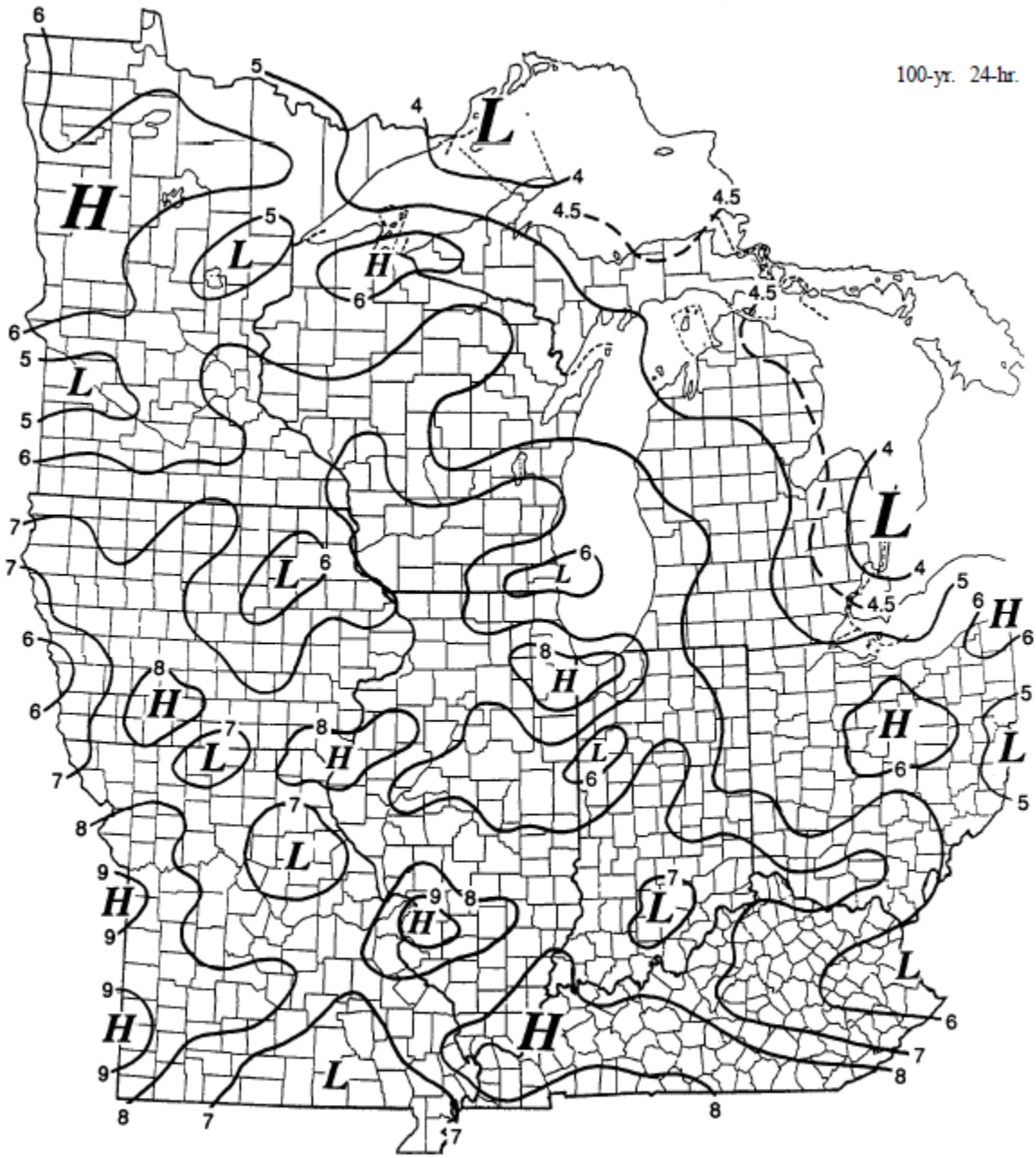


Figure 6. Concluded

*The 100-year, 24-hour rainfall analysis from Bulletin 71,
Rainfall Frequency Atlas of the Midwest (1992)*