

## Coastal Resilience Self-Assessment

This self-assessment is intended to help staff and decision-makers of Wisconsin's coastal counties and municipalities weigh the effects of coastal hazards and begin to consider planning and mitigation actions which may increase the coastal resilience of their community. Coastal resilience is the ability to respond to, withstand and adapt to the impacts of coastal hazards. The Lake Michigan bluffs, beaches and waterfront infrastructure are vulnerable to coastal hazards issues resulting from waves, erosion, flooding, coastal storms, & fluctuating water levels (see Page 2 for hazard descriptions). Proactive planning and preparation for these hazards can enhance a community's coastal resilience.

### Why should I complete this self-assessment?

The self-assessment provides a starting point to identify opportunities to increase a community's resilience to coastal hazards. The Wisconsin Coastal Resilience Project team will review your community's completed self-assessment to provide further guidance and assistance on the key issues indicated by your responses.

It is important to note that this self-assessment is not a complete vulnerability assessment nor is it intended to rank communities against each other in terms of needs or preparedness. Rather, this is an exercise to help communities consider actions that can build their resilience to coastal hazards.

### Who should use this self-assessment?

This assessment tool is intended for use by county and municipal staff and decision-makers, especially those involved with planning, zoning, engineering, public works and emergency management. It is suggested that this self-assessment be completed with a team that is representative of these areas of expertise, as well as any other relevant individuals with local knowledge of coastal hazards.

### What is in the self-assessment?

*Part 1: Identifying Coastal Hazard Risks* - This tool will help prioritize coastal hazards issues in a community based on rating (1) frequency of occurrence, (2) impact to the community and (3) level of preparedness.

*Part 2: Resilient Practices Questionnaire* - This series of yes/no questions will help identify common planning and mitigation actions that the community can implement to address coastal hazard issues.

*Part 3: Summary* – This summary asks your team to think about some top coastal resilience actions that your community could implement based on your responses to Parts 1 and 2.

### Where can I go for more information on coastal resilience topics?

A separate *Appendix B* contains links to resources for each topic covered in the self-assessment.

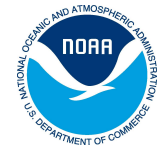
### How do I complete the self-assessment?

The assessment can be completed either (a) by hand with a printed version of the form or (b) electronically using the fill-in capabilities of this PDF form (requires Adobe Reader). Questions about the self-assessment or follow up discussions about the results may be directed to Adam Bechle at:

1975 Willow Drive, 2nd Floor  
Madison, WI 53706

Phone: 608-263-5133  
Email: bechle@aquawisc.edu

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## **Coastal Hazard Issue Descriptions**

The hazard processes that affect bluffs, beaches, and waterfront infrastructure are described briefly below. For more detailed information on these issues, an excellent review of hazard processes is available in the U.S. Army Corps of Engineers/Wisconsin Sea Grant publication [Living on the Coast](#).

### **Shoreline Recession and Bluff Failure**

Waves can erode the shoreline, causing it to recede landward and threaten property and infrastructure. Shoreline recession along bluff coasts is the result of wave erosion at the base of the bluff, which can destabilize the bluff slope and cause failure of the bluff. High lake water levels allow erosive waves to reach higher elevations on the shore, accelerating shoreline recession and bluff failure. Other factors that contribute to bluff failure include elevated groundwater (which reduces stability of the slope), stormwater runoff (which erodes the bluff surface soil) and freeze-thaw cycles (which weaken the soil strength).

### **Coastal Flooding**

Coastal storms can cause inundation of low-lying areas of the coast due to the combined effects of waves and storm surge, which is the “piling up” of water along the coast over the course of several hours due to wind and atmospheric pressure gradients. High lake water levels will contribute to an increased extent of coastal flooding for a given wave and storm surge condition.

### **Shore Protection Damage and Failure**

Large waves and storm surge can damage shore protection structures such as revetments, seawalls and groins, which typically have a lifespan from 20 to 50 years. If damage accumulates with a lack of maintenance, these structures can fail to protect the property behind them. High water levels allow waves to reach higher elevations, which can accelerate damage. Low water levels can lead erosion of the nearshore lake bed, known as downcutting, that can undermine and destabilize shore protection structures.

### **Beach Loss**

High Lake Michigan water levels inundate portions of the beach while also allowing storm waves to erode higher elevations on the beach. Increased use of structural shore protection on the coast interrupts the transport of sand along the shore by waves and currents, which can cause a reduction in beach size.

### **Beach Impairment**

Bacteria, viruses, chemicals and excess nutrients can lead to water quality issues that require beaches to be closed to protect public health and safety. A physical beach environment that retains standing water or has poor nearshore water circulation may exacerbate water quality issues.

### **Ports, Harbors and Marina Damage**

Large waves associated with coastal storms can damage port, harbor and marina infrastructure, which typically has a lifespan on the order of 40 to 50 years. High water levels allow waves to reach higher elevations on marine infrastructure, which can accelerate damage to infrastructure. Low water levels can expose normally submerged timber and rock infrastructure to air, accelerating their deterioration.

### **Port, Harbor and Marina Navigation Impairment**

Low water levels and sediment deposition can create situations where ships and boats have insufficient water depths to safely navigate and operate at ports, harbors and marinas. At low water levels, vessels may be damaged by hitting channel or slip bottoms so ships may need to carry less cargo and additional dredging may be required to allow for safe passage. Under both low and high water level extremes, operational and safety issues may arise if a large elevation difference exists between vessel and dockage.

## Part 1: Identifying Coastal Hazard Risks

Participant Affiliation/Community: \_\_\_\_\_

This matrix will help identify what coastal hazards pose the most critical risks to your community. Risk is the potential for loss due to a hazard event, a combination of (1) the probability that a hazard event will occur, (2) the consequences that the hazard would have and (3) the actions that have been taken to mitigate those consequences. An example of a completed matrix is given in *Appendix A*.

### Instructions:

For each coastal hazard issue described on Page 2, you will assign a score of **Low**, **Moderate**, or **High** for each of the following criteria.

**PROBABILITY**      The likelihood that an issue is expected to occur.

**IMPACT**              The extent to which a given coastal hazard issue can cause death or injury, property damage, or service interruption.

**PREPAREDNESS**      The level of effective planning or action that has taken place to reduce the overall impact of a hazard to your community

If you feel an issue does not apply to your community, cross out the issue and explain why. If you would like to learn more about an issue to inform your response, please provide a short explanation. If an important coastal hazard issue is not covered, use the blank rows to respond for that issue.

A RISK SCORE will be calculated for by the Wisconsin Coastal Resilience Team for each hazard based on the PROBABILITY, IMPACT and PREPAREDNESS responses (see *Appendix A* for example). The RISK SCORE becomes larger as the threat of a coastal hazard increases, allowing the relative importance of different hazards to be compared.

COASTAL HAZARD ISSUE	PROBABILITY	IMPACT			PREPAREDNESS	RISK SCORE	I need to learn more about this issue (explain)
	<i>Likelihood this issue will occur</i>	<i>HUMAN Possibility of death or injury</i>	<i>PROPERTY Physical losses and damages</i>	<i>BUSINESS/ AGENCY Interruption of services</i>	<i>Level of planning done for this issue</i>	<i>Relative threat *calculated by Coastal Resilience team</i>	
Shoreline Recession & Bluff Failure							
Coastal Flooding							
Shore Protection Damage							
Beach Loss							
Beach Impairment							
Port, Harbor, & Marina Damage							
Port, Harbor, & Marina Navigation Impairment							

## Part 2: Resilient Practices Questionnaire

The following series of yes/no questions will help identify opportunities to strengthen your community's approach to planning for and mitigating the impacts of coastal hazards.

**Instructions:** Answer each question by checking “Yes”, “No”, or “?” (meaning “not sure”). More detailed answers or explanations can be entered in the “Comments” section of each question. For instance, it may be useful to reference specific portions of a plan or strategy that addresses the question or to identify what information is needed to resolve a “?” response.

### Understanding Coastal Hazard Impacts

Knowing the locations, populations and properties that are vulnerable to coastal hazards is the starting point to developing resilient strategies to reduce the risk and avoid losses.

Understanding Coastal Hazard Impacts	Yes	No	?	Comments
1) Has your community identified or documented the damage and/or cost of past coastal hazards?				
2) Do updated maps or spatial data exist that identify areas at risk to coastal hazards?				
3) Are there any estimates of the future financial losses that may result from coastal hazards, including losses to private property, public property, infrastructure and utilities?				
4) Is your community aware of pathways for contaminants to enter the lake due to coastal hazards, such as erosion of contaminated land?				

### Hazard Mitigation Planning

An All-Hazard Mitigation Plan identifies critical hazard issues and mitigation actions that, if implemented and sustained, can reduce the long-term hazard risk posed to people and property.

Hazard Mitigation Planning	Yes	No	?	Comments
5) Does your community have a current FEMA-approved All-Hazard Mitigation Plan				
6) Does the Hazard Mitigation Plan document past coastal hazard mitigation efforts, along with their costs and effectiveness?				
7) Does the Hazard Mitigation Plan identify strategies to address all the coastal hazards of concern that you identified in <i>Part 1: Risk Perception Matrix</i> ?				

<b>Hazard Mitigation Planning (continued)</b>	<b>Yes</b>	<b>No</b>	<b>?</b>	<b>Comments</b>
8) Have the strategies from the Hazard Mitigation Plan been implemented as described?				
9) Is your community aware of FEMA's Hazard Mitigation Grant Program (HMGP) and the Pre-Disaster Mitigation Grant Program (PDM) and the types of coastal projects that may be eligible for funding?				
10) Does the Hazard Mitigation Plan identify opportunities to integrate hazard mitigation with other planning mechanisms such as land use, capital investment, economic development or other community plans?				

### Community Planning

Community planning efforts, such as comprehensive, land use, capital investment and economic development plans guide development and other investment actions by the community. Integrating strategies to mitigate the effects of coastal hazards into these plans can help reduce the exposure of development and other community assets to risk.

<b>Community Planning</b>	<b>Yes</b>	<b>No</b>	<b>?</b>	<b>Comments</b>
11) Does your community have a plan for land use that makes recommendations to reduce coastal hazard vulnerability?				
12) Do planning horizons incorporate potential long-term coastal hazards such as erosion and bluff failure?				
13) Is your community active in the National Flood Insurance Program's Community Rating System?				
14) Do plans for public infrastructure such as buildings, roads, water, sewer and other utilities include recommendations for relocation, abandonment, or protection of infrastructure at-risk to coastal hazards?				
15) Has the community considered relocation or voluntary acquisition of repetitive loss structures or those structures which are at high risk to coastal hazards?				

## Local Ordinances

Community zoning ordinance provisions can reduce the risk that new coastal development is exposed to and limit adverse impacts to the coast.

Local Ordinances	Yes	No	?	Comments
16) Do existing ordinances require new development to be set back some distance from an erosion reference feature like the receding edge of a bluff or dune?				
17) Do existing ordinances require new development in the coastal 100-year floodplain to take measures that reduce flood impacts such as elevating buildings a certain distance above the base flood elevation?				
18) Do existing permitting processes review proposed practices that may significantly affect shoreline recession and bluff slope stability, including coastal vegetation removal, stormwater management and on-site waste disposal?				
19) Are ordinances pertaining to coastal hazards consistent with those of surrounding jurisdictions in both policy and language?				

## Public Education and Engagement

Coastal properties can frequently change hands, leaving new residents unaware of or unprepared for the risks posed by living on Lake Michigan. On the other hand, long-term residents and business owners may have local knowledge of past or current hazard impacts that can inform resilience strategies.

Public Engagement	Yes	No	?	Comments
20) Is outreach focused on coastal hazard issues routinely conducted for coastal residents?				
21) Does the community have coastal hazard information such as maps and guidance on shoreline management practices available or accessible to residents upon request?				
22) Has the public been involved with identifying historic coastal hazard impacts, areas that are at risk to coastal hazards or strategies to address coastal hazards?				

## Shore Protection

Structural shore protection measures such as revetments, seawalls and groins are commonly used to protect property from flooding and erosion. To achieve the expected level of protection, these structures need to be monitored, maintained and replaced when necessary. Alternative hybrid-structural or non-structural practices may be considered due to cost, aesthetics, or adverse impacts to adjacent properties.

Shore Protection	Yes	No	?	Comments
23) Is the location of shore protection structures documented?				
24) Is the condition and expected effectiveness of shore protection structures documented?				
25) Is inspection and maintenance of shore protection structures performed routinely?				
26) Are you aware of instances where shore protection structures adversely impacted adjacent shorelines?				
27) Does your community consider hybrid-structural options (nature-based, living shoreline, or engineering with nature approaches) or non-structural options (slope stabilization, vegetation, beach nourishment, or asset relocation)?				

## Managing Water on Coastal Lands

Water on the land can contribute to coastal hazard issues, as runoff over the bluff edge will erode the bluff surface, elevated groundwater levels reduce the stability of the bluff slopes and stormwater and effluent discharges can cause water quality issues at beaches.

Managing Water on Coastal Lands	Yes	No	?	Comments
28) Is stormwater runoff directed away from bluffs?				
29) Are infiltration practices like rain gardens constructed as far from bluffs as possible?				
30) Is snow plowed and managed to direct meltwater away from bluffs?				
31) Is wastewater effluent from on-site waste disposal systems located as far from the coast as possible?				
32) Does your community have a stormwater management plan with a section related to water management along the coast?				

## Beaches

Beaches are drivers of tourism and serve important coastal access points for recreation. Beaches also act as a buffer against the impact of waves for bluffs and upland property. Understanding how natural coastal processes and hazards impact beaches is critical to maintaining these important community assets.

Beaches	Yes	No	?	Comments
33) Does your community have a beach water quality monitoring program?				
34) Do beach management plans exist that detail strategies for addressing water quality issues?				
35) Do beach management plans exist that detail strategies for addressing beach loss due to erosion or high lake level conditions?				
36) Are the natural sources of sand to the community's beaches known and are there strategies to avoid interruption of this sediment supply?				

## Ports, Harbors and Marinas (*if applicable*)

Ports, harbors and marinas are centers of commerce and recreation. The ability for these facilities to withstand coastal hazards is important to the economic security of communities that rely on them.

Ports, Harbors and Marinas ( <i>if applicable</i> )	Yes	No	?	Comments
37) Does your facility conduct a regular assessment of critical infrastructure to identify maintenance issues requiring corrective action?				
38) Does your facility have an assessment of costs to maintain, repair and replace its assets?				
39) Has your facility planned for extreme low water scenarios, including the infrastructure and maintenance needs necessary to maintain function under these conditions?				
40) Has your facility planned for extreme high water scenarios, including the infrastructure and maintenance needs necessary to maintain function under these conditions?				



### Part 3: Summary

Use your responses in *Part 1* and *Part 2* to think about possible actions that could be implemented to enhance your community's resilience to coastal hazards.

**Instructions:** List a few of the questions that generated the most interest within your team and briefly describe some actions that could be initiated in your community to address this question and increase coastal resilience. More information about resilient actions for each topic in the self-assessment can be found in the resources listed in the *Appendix B: Coastal Resilience Resources*.

*Question #*

Possible Actions

*Question #*

Possible Actions

*Question #*

Possible Actions

*Question #*

Possible Actions

List and briefly describe any other actions not covered in the questionnaire that you may want to implement in the near future to increase your community's resilience to coastal hazards.

# **Appendix**

## **for *Coastal Resilience Self-Assessment***

**Appendix A: Example for *Part 1: Identifying Coastal Hazard Risks***

**Appendix B: Coastal Resilience Resources**

**Appendix C: How was this *Coastal Resilience Self-Assessment*  
developed?**

## Appendix A: Example for Part 1: Identifying Coastal Hazard Risks

The *Identifying Coastal Hazard Risks* matrix tool is adapted from a [Hazard Vulnerability Analysis tool](#) originally developed by Kaiser Permanente. SEWRPC has used a form of this matrix to prioritize critical hazards in All-Hazards Mitigation Planning.

Below is an example of a completed *Identifying Coastal Hazard Risks* matrix with each issue rated for PROBABILITY, IMPACT and PREPAREDNESS.

COASTAL HAZARD ISSUE	PROBABILITY	IMPACT			PREPAREDNESS	RISK SCORE	I need to learn more about this issue (explain)
	<i>Likelihood this issue will occur</i>	<i>HUMAN</i> <i>Possibility of death or injury</i>	<i>PROPERTY</i> <i>Physical losses and damages</i>	<i>BUSINESS/ AGENCY</i> <i>Interruption of services</i>	<i>Level of planning done for this issue</i>	<i>Relative threat</i> <i>*calculated by Coastal Resilience team</i>	
Shoreline Recession & Bluff Failure	High	Low	High	Low	Moderate	58%	
Coastal Flooding	Low	Moderate	Moderate	Low	Low	22%	PROBABILITY may change with new FEMA flood maps
Shore Protection Damage	Moderate	Low	Moderate	Low	Low	39%	Unsure of businesses with shore protection
Beach Loss	High	Low	Moderate	Moderate	Low	67%	
Beach Impairment	Low	Moderate	Low	Moderate	Moderate	19%	
Port, Harbor, & Marina Damage	Moderate	Low	Moderate	High	Low	50%	
Port, Harbor, & Marina Navigation Impairment	Moderate	Low	Low	High	High	33%	Were boats damaged during last low water period?

**Calculating RISK SCORE** (note: this will be done for you by the Wisconsin Coastal Resilience Team or automatically by the fill-in PDF form)

First, a numeric value is assigned to the PROBABILITY, IMPACT and PREPAREDNESS responses as follows: Low = 1, Moderate = 2, High = 3

Then a RISK SCORE is then calculated for each hazard using the following formula:

$$\text{RISK (in \%)} = \frac{\text{PROBABILITY}}{3} \times \frac{\text{HUMAN} + \text{PROPERTY} + \text{BUSINESS} + (4 - \text{PREPAREDNESS})}{12}$$

### Results

In this example, the top 3 hazards based on RISK SCORE are: (1) Beach Loss – 67%, (2) Shoreline Recession & Bluff Failure - 58%, (3) Port, Harbor & Marina Damage – 50%. These results suggest that priority should be given to building resilience to these most critical coastal hazards.

## Appendix B: Resilience Resources

Listed below are resources that may be useful for learning about or addressing questions for each of the categories in the *Resilience Practices Questionnaire*. Note that some resources appear more than once if they are applicable to multiple categories.

### General Coastal Resilience Resources

[Great Lake Coastal Resilience Planning Guide](#) – A website with guidance on Great Lakes coastal hazard resilience featuring case studies, tools, maps, data and publications.

[Living on the Coast](#) – Booklet describing natural coastal processes and strategies to manage risk to coastal properties.

[Coastal Processes Manual](#) – Manual describing the methods to estimate risk to Great Lakes coastal properties from coastal hazards

[Wisconsin Coastal Atlas](#) - A web platform that provides access to maps, data, and tools to support decision-making about Wisconsin's Great Lakes coast.

### Understanding Coastal Hazard Impacts

[Wisconsin Shoreline Inventory and Oblique Viewer](#) – A web mapping tool to view shoreline condition assessments (1976 and 2007) and oblique aerial photos (1976, 2007, 2012, 2016 and 2017) for most of Wisconsin's Great Lakes coast.

[Lake Michigan Shoreline Recession and Bluff Stability in Southeastern Wisconsin: 1995](#) - A report on the 1995 status of bluff recession and bluff stability on selected bluff slopes in Kenosha, Racine, Milwaukee and Ozaukee counties shoreline.

[Coastal Processes Manual](#) – Manual describing the methods to estimate risk to Great Lakes coastal properties from coastal hazards

[Modern Studies of Coastal Erosion in Wisconsin](#) – A review of the efforts to understand and document the shoreline erosion processes and changes in coastal Wisconsin.

[Lake Level Viewer](#) – A web mapping tool to examine the potential impacts of lake level changes on shoreline position and water depth in the Great Lakes.

[Great Lakes Water Level Dashboard](#) – A dashboard interface to access and visualize over 150 years of Great Lakes water level data, as well as seasonal forecasts of future lake levels.

### Hazard Mitigation Planning

[A Guide to Hazard Mitigation Planning for Wisconsin's Coastal Communities](#) - A guide which describes how to identify, profile and mitigate coastal hazards for inclusion in an All-Hazards Mitigation Plan.

[Plan Integration for Resilience – Scorecard Guidebook](#) - A guide which describes how to evaluate how multiple community plans (i.e. hazard mitigation, land use, economic development, etc.) may affect a community's vulnerability to hazards and how to identify priorities for better integrating strategies across plans to reduce overall community vulnerability to hazards.

## **Community Planning**

[Managing Coastal Hazard Risks on Wisconsin's Dynamic Great Lakes Shoreline](#) - A report which describes coastal hazard processes, reviews past efforts to address coastal hazards in Wisconsin and provides a set of strategies for managing the risks to coastal development, including an erosion hazard model ordinance.

[Plan Integration for Resilience – Scorecard Guidebook](#) - A guide which describes how to evaluate how multiple community plans (i.e. hazard mitigation, land use, economic development, etc.) may affect a community's vulnerability to hazards and how to identify priorities for better integrating strategies across plans to reduce overall community vulnerability to hazards.

[A Guide for Planning for Coastal Communities in Wisconsin](#) – A guide which describes how to address coastal issues in a variety of community planning considerations.

## **Local Ordinances**

[Managing Coastal Hazard Risks on Wisconsin's Dynamic Great Lakes Shoreline](#) - A report which describes coastal hazard processes, reviews past efforts to address coastal hazards in Wisconsin and provides strategies for managing the risks to coastal development, including an erosion hazard model ordinance.

[Coastal Ordinance Provisions in Wisconsin Communities](#) - A report which reviews county, city, village and town ordinances in Wisconsin which contain provisions that have been adopted to reduce the risks to coastal development as of 2016.

[Protecting Coastal Investments: Examples of Regulations for Wisconsin's Coastal Communities](#) - A guide which describes the causes of coastal erosion and suggests ordinance language that can be used by communities to address locally identified needs.

## **Public Education and Engagement**

[Adapting to a Changing Coast: Options & Resources for Lake Michigan Property Owners](#) – A booklet describing actions that Lake Michigan property owners can take to address coastal erosion

[Stabilizing Coastal Slopes on the Great Lakes](#) – Fact sheet describing shoreline erosion and slope instability and steps that can be taken to address these issues

[Working with Engineers and Contractors on Shore Protection Projects](#) – Fact sheet describing the process of finding and working with qualified coastal professional

[Great Lakes Shore Protections Structures](#) – Fact sheet describing shore protection structures and their effects, both positive and negative, on the shoreline

[Natural and Structural Measures for Shoreline Stabilization](#) – Brochure about the range of green and gray shore protection infrastructure

[Wisconsin Shoreline Inventory and Oblique Viewer](#) – A web mapping tool to view shoreline condition assessments (1976 and 2007) and oblique aerial photos (1976, 2007, 2012, 2016 and 2017) for most of Wisconsin's Great Lakes coast.

## **Shore Protection**

[Great Lakes Shore Protections Structures](#) – Fact sheet describing shore protection structures and their effects, both positive and negative, on the shoreline

[Ohio Coastal Design Manual](#) – Online manual demonstrating how common Great Lakes coastal structures are designed

[Systematic Approaches to Geomorphic Engineering \(SAGE\)](#) – Website for a Community of Practice focused on advancing natural coastal infrastructure practices

[Natural and Structural Measures for Shoreline Stabilization](#) – Brochure about the range of green and gray shore protection infrastructure

[Living Shorelines Academy](#) – Web resource for natural “living” shoreline practices

[Engineering with Nature](#) – Web resource detailing United States Army Corps of Engineers approaches to align natural and engineering processes to achieve economic, environmental, and social benefits

[Engineering with Nature: Alternative Techniques to Riprap Bank Stabilization](#) – A Federal Emergency Management Agency booklet that illustrates case studies of engineering techniques that incorporate natural functionality into streambank protection

## **Managing Water on the Land**

[Stabilizing Coastal Slopes on the Great Lakes](#) – Fact sheet describing bluff stabilization, including surface water and groundwater management actions that can be taken to stabilize slopes (page 5).

[Managing Coastal Hazard Risks on Wisconsin’s Dynamic Great Lakes Shoreline](#) - A report which describes strategies for managing the risks to coastal development, including recommendations for managing surface water and ground water to stabilize slopes (page 36).

[Surface Water and Groundwater on Coastal Bluffs](#) – A guide for property owners on Puget Sound in Washington that describes options for managing surface water and groundwater on bluffs. Many of these practices may be applicable for Great Lakes coastal bluffs.

## **Beaches**

[Virtual Beach](#) – A free software program for developing and operating beach water quality models that can aid both short term decisions on testing and closures as well as long term remediation activities

[Beach Nourishment Database](#) – A database with information on beach nourishment projects nationwide, including the Great Lakes

[Lake Level Viewer](#) – A web mapping tool to examine the potential impacts of lake level changes on shoreline position and water depth in the Great Lakes.

## **Port, Harbor and Marinas**

[Great Lakes Port and Harbor Infrastructure and Dredging Cost Evaluation Matrix](#) – A matrix model to estimate the cost of building and maintaining structures at large ports in the Great Lakes

[Failing Coastal Wood Infrastructure on the Great Lakes](#) – A fact sheet on timber structure failure mechanisms and potential solutions

[Best Practice Inspection Guidelines for Great Lakes Port, Harbor and Marina Structures](#) – A fact sheet with inspection guidelines to prevent structure deterioration

[Adaptation Strategies for Great Lakes Ports, Harbors and Marinas](#) – A fact sheet on potential future Great Lakes water levels and their possible impacts

[Wisconsin Clean Marina Best Management Practices](#) – A guidebook that describes regulations and practices that address marine facilities and nonpoint sources of pollution

[Reinforcing our Waterfronts](#) – A brochure which summarizes risks to marinas and harbors as well as best practices to prepare for these risks.

## **Appendix C: How was this Coastal Resilience Self-Assessment developed?**

This *Coastal Resilience Self-Assessment* is modeled after a number of existing self-assessment tools that are aimed at identifying opportunities to develop resilience to natural hazards. Though coastal resilience indicators, metrics and rating systems exist, most of these tools focus on the issues faced by ocean coasts. While some of those resilience issues are applicable to the Great Lakes, no tool exists that is focused on the coastal hazard issues faced in the Great Lakes. We have adopted the approaches of other successful self-assessment tools, which are listed below, and incorporated many resilience recommendations for Great Lakes coastal issues into the *Coastal Resilience Self-Assessment*.

Coastal Community Resilience Indicators and Rating Systems

National Oceanic and Atmospheric Administration (NOAA)

<https://coast.noaa.gov/digitalcoast/training/resilience-indicators.html>

Maryland's CoastSmart Communities Scorecard

Chesapeake and Coastal Service

[http://dnr.maryland.gov/ccs/coastsmart/Pages/cs\\_Scorecard.aspx](http://dnr.maryland.gov/ccs/coastsmart/Pages/cs_Scorecard.aspx)

Getting to Resilience: A Community Planning Evaluation Tool

New Jersey Coastal Management Program

<http://www.prepareyourcommunitynj.org/>

The Coastal Community Resilience Index

Mississippi-Alabama Sea Grant Consortium

[http://masgc.org/assets/uploads/publications/662/coastal\\_community\\_resilience\\_index.pdf](http://masgc.org/assets/uploads/publications/662/coastal_community_resilience_index.pdf)

The Ports Resilience Index

Mississippi-Alabama Sea Grant Consortium

[http://masgc.org/assets/images/Ports\\_resilience\\_index.pdf](http://masgc.org/assets/images/Ports_resilience_index.pdf)

The Fisheries Resilience Index

Mississippi-Alabama Sea Grant Consortium

[http://masgc.org/assets/uploads/publications/1141/fisheries\\_resilience\\_index.pdf](http://masgc.org/assets/uploads/publications/1141/fisheries_resilience_index.pdf)

The Tourism Resilience Index

Mississippi-Alabama Sea Grant Consortium

[http://masgc.org/assets/uploads/publications/1142/tourism\\_resilience\\_index.pdf](http://masgc.org/assets/uploads/publications/1142/tourism_resilience_index.pdf)

Climate Adaptation Checklist

University of Wisconsin Sea Grant Institute

<https://publications.aqua.wisc.edu/product/great-lakes-coastal-community-climate-adaptation-checklist/>

Climate Ready Infrastructure and Strategic Sites Protocol (CRISSP) Risk Matrix

Great Lakes and St. Lawrence Cities Initiative

<https://glslcities.org/initiatives/municipal-climate-adaptation/crissp/>

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

Minnesota Sea Grant

<https://glslcities.org/library/a-self-assessment-to-address-climate-change-readiness-in-your-community/>