

# Southeastern Wisconsin **Regional Planning Commission**



## **Lake Michigan Coastal Hazards and Hazard Mitigation Planning** **Ozaukee County Hazard Mitigation Plan Update (2020)**

Aaron Owens – Senior Planner, SEWRPC  
CALM Network Meeting  
June 22, 2022

# Outline

## ➤ Background

- Hazard Mitigation Planning
- Ozaukee County

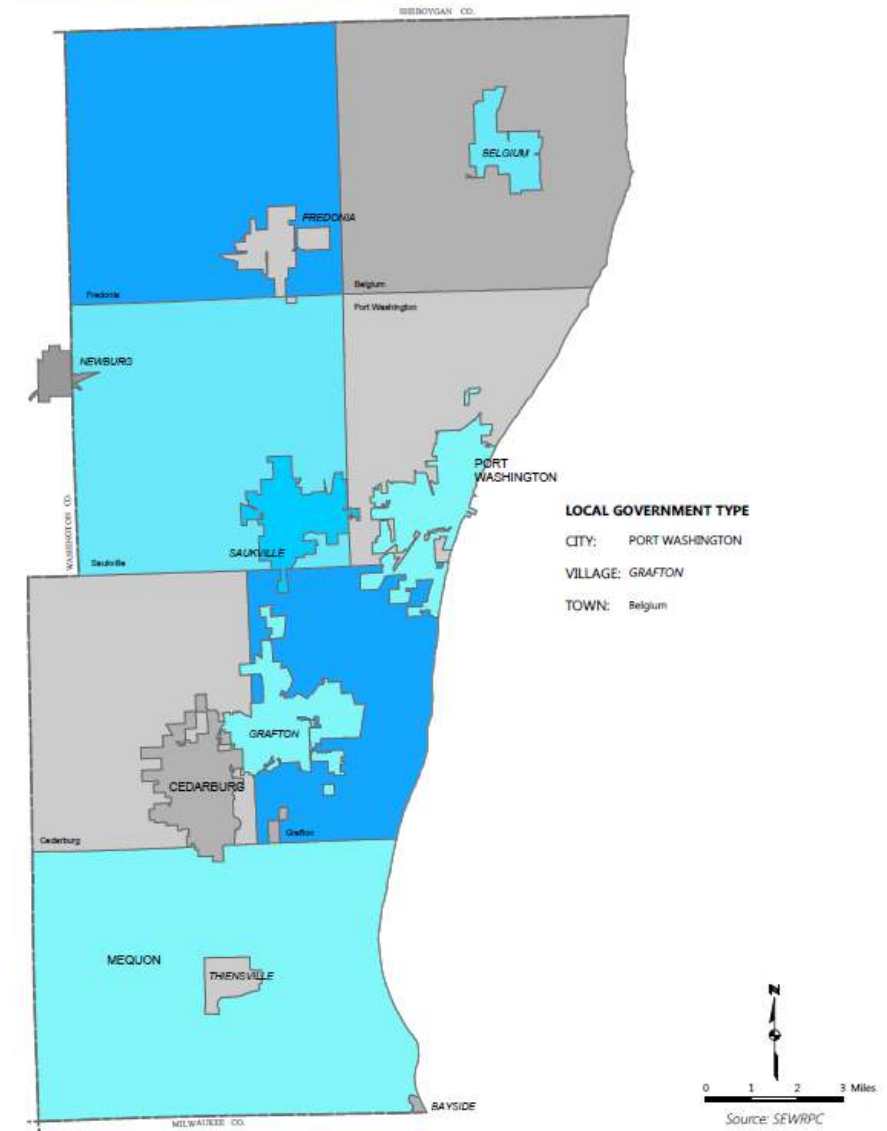
## ➤ Vulnerability Assessment for Lake Michigan Coastal Hazards

- Historic Reports, New Resources, Tools Used
- Coastal Hazard Assessment for Ozaukee County – Findings
- Potential Future Changes?

## ➤ Relationship of Hazard Mitigation Goals and Objectives to Other Planning Efforts

## ➤ Coastal Hazard Mitigation Strategies for Ozaukee County

Map 1.1  
Civil Division Boundaries in Ozaukee County: 2018



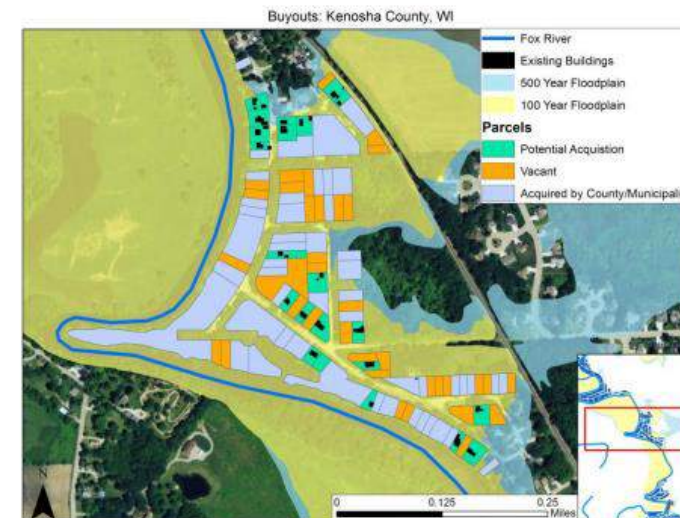
# What is Hazard Mitigation



- "Mitigation is **any sustained action taken to eliminate or reduce the long-term risk** to human life and property from natural and technological hazards" – *FEMA*
- Focuses on reducing the impacts of disasters **BEFORE** they occur



Figure 4: Map of Buyout Area- Middle Peninsula, Fox River

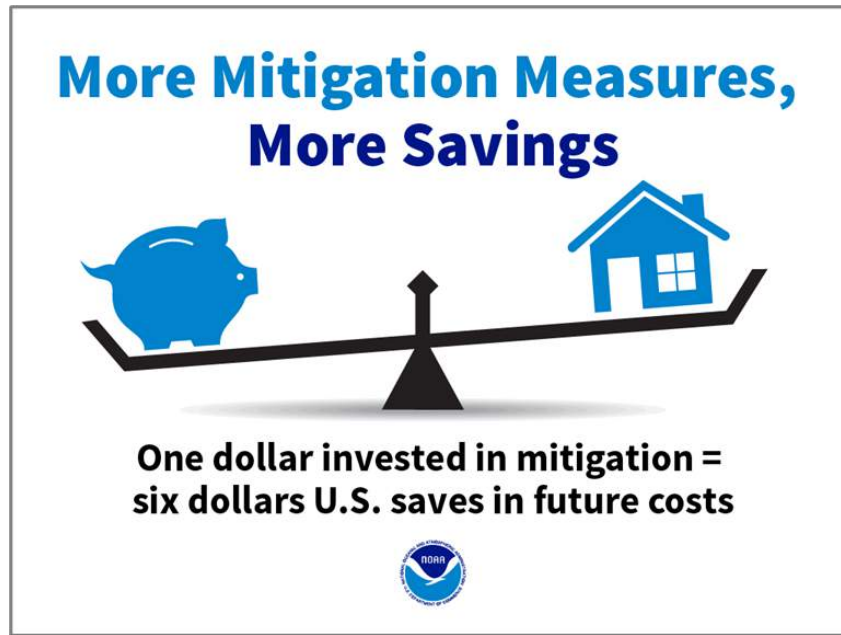


- Mitigation is **NOT**:
  - Emergency Response
  - Crisis Management
  - Disaster Preparation and Recovery



# Why Do We Mitigate?

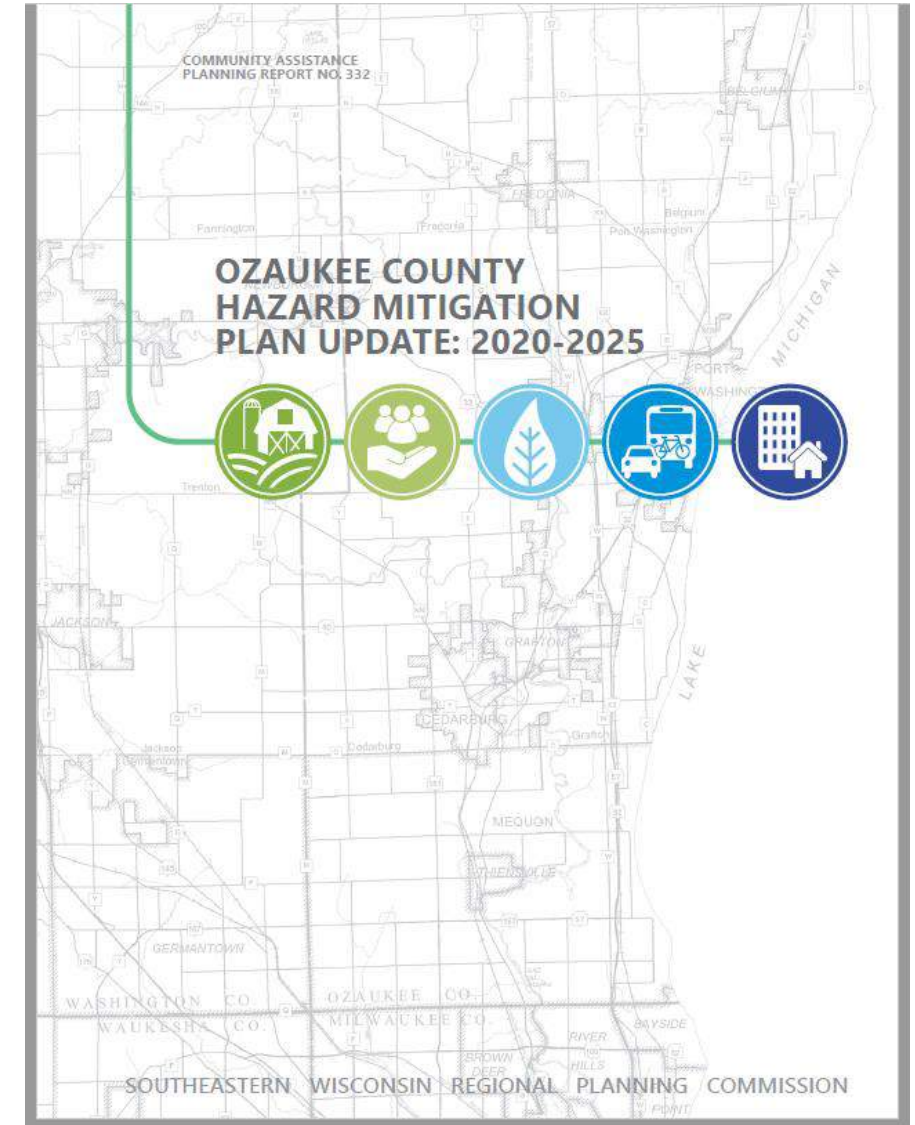
- Disasters Cost Society Too Much
- State and Federal Aid is Insufficient
- Help Prevent Future Damage
- Promotes More Disaster-Resilient and Sustainable Communities
- Fosters Partnerships Among All Levels of Government
- Develop and Strengthen Non-Governmental and Private Partnerships



# ●●●●● Ozaukee County Hazard Mitigation Plan Update 2020-2025



- Original Plan 2008 (flood mitigation); First Updated as HMP 2013
- Development of Plan Update ~ 2017
- Plan Components Included:
  - Basic Study Area Inventory
  - Analysis of Hazard Conditions and Risk Assessment
  - Hazard Mitigation Goals and Objectives
  - Mitigation Strategies
  - Plan Implementation, Maintenance, and Adoption
- 9 Types of Hazards Analyzed





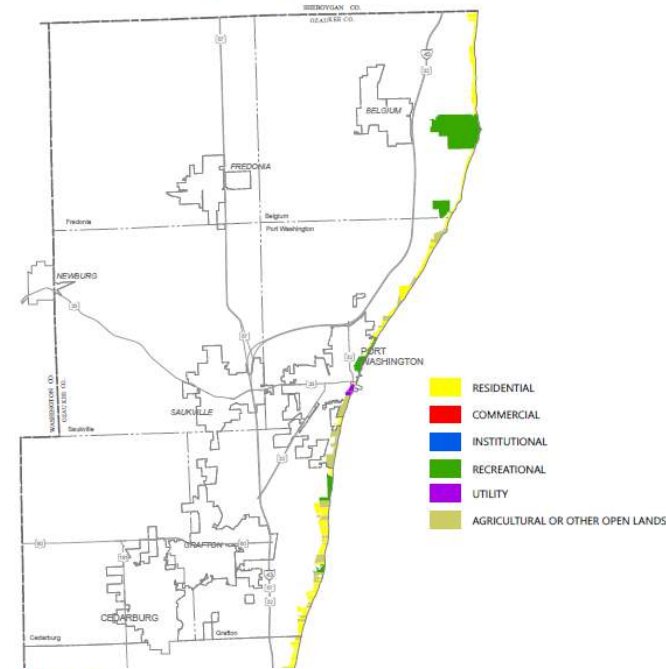
# Ozaukee Co Coastal Inventories and Assessments



## ➤ Plan First Summarizes Inventories and Past Studies

- Coastal Land Use Analysis
- Lake Water Levels
- Shoreline Erosion and Bluff Stability Study (w/ *Coastal Management*, 1977)
- Lake Michigan Shoreline Recession and Bluff Stability in SE WI (*SEWRPC and WCMP*, 1997)
- Integrated Assessment on Water Level Variability and Coastal Shores in Northern Milwaukee County and Southern Ozaukee County (*UW Sea Grant*, 2015)

Map 2.9  
Parcel Land Uses Located Along Lake Michigan Coastline: 2015



Map 2.10  
Lake Michigan Shoreline Erosion and Bluff Stability Analysis for Ozaukee County: 1995

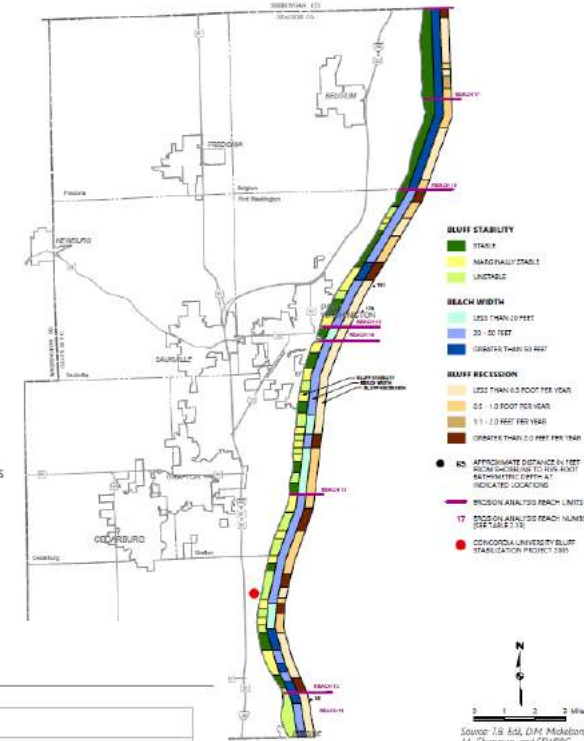
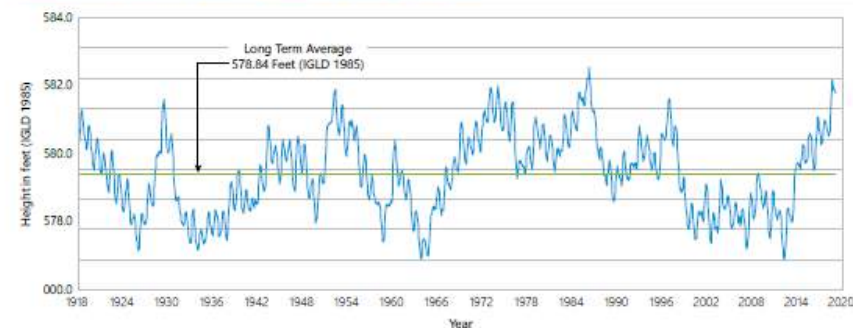


Figure 2.1  
Lake Michigan Mean Monthly Water Levels 1918-2019



Source: National Oceanic and Atmospheric Administration Great Lakes Environmental Research Laboratory and SEWRPC



# ●●●●● Assessment of Coastal Hazard Conditions



➤ Focused on 3 Types of Lake Michigan Coastal Hazards

## Erosion of Coastal Bluffs and Beaches



## Coastal Flooding



## Damage and Failure of Shoreline Protection Structures





# ●●●●● Southeastern Wisconsin Coastal Resilience Project (2017)



## ➤ Proposed Actions:

- “Community of Practice” Network – Continuing through CALM
- Guidance on Implementing Risk-Reduction Practices
- Identify Local Resilience Opportunities
- Future Scenarios of Shoreline Recession

## ➤ Outcomes:

- **Improved Awareness of Coastal Hazards Risk – Existing Tools and Resources**
- Enhanced Capacity to Build Resilience to Coastal Hazards
- Educational Documents and Tools

**Coastal Resilience Self-Assessment**

**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. *Note: Using the 10-in form requires Adobe Reader for proper saving.*

COASTAL HAZARD ISSUE	PROBABILITY Likelihood this issue will occur	IMPACT			PREPAREDNESS Level of planning done for this issue	RISK SCORE Relative threat calculated by Coastal Resilience Team	I need to learn more about this issue (explain)
		HUMAN Possibility of death or injury	PROPERTY Physical losses and damages	BUSINESS/ AGENCY Interruption of services			
Shoreline Recession & Bluff Failure						0	
Coastal Flooding						0	
Shore Protection Damage						0	
Beach Loss						0	
Beach Impairment						0	
Port, Harbor, & Marina Damage						0	
Port, Harbor, & Marina Navigation Impairment						0	

Coastal Resilience Self-Assessment

*Remember to save your progress*

## Great Lakes Beach Resiliency Guide

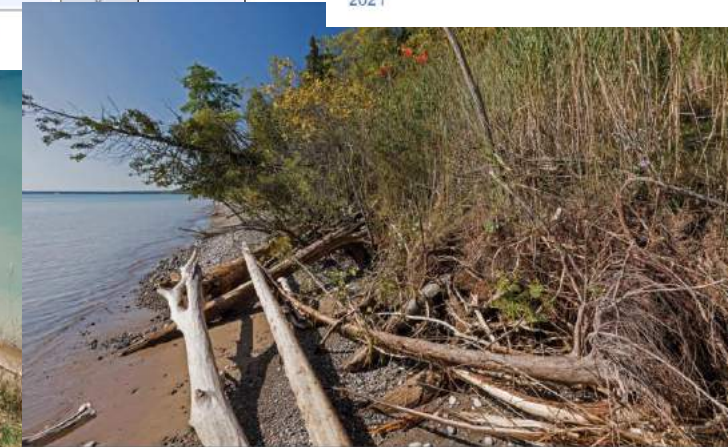


1<sup>st</sup> Edition  
2021



### A PROPERTY OWNER'S GUIDE TO Protecting Your Bluff

UNIVERSITY OF WISCONSIN SEA GRANT INSTITUTE



### Nature-Based Shoreline OPTIONS FOR THE GREAT LAKES COASTS

UNIVERSITY OF WISCONSIN SEA GRANT INSTITUTE





# ●●●●● Wisconsin Shoreline Inventory and Oblique Photo Viewer



- Web-based tool to visualize changes in Wisconsin's Great Lakes shoreline over time
- Geolocated oblique photos (1970s to 2021)
- Inventories (GIS Shapefiles Available for Download):
  - Shoreline Protection
  - Assessment of Bluff Conditions Over Time
  - Measured Short- and Long-Term Recession (SE WI Only)

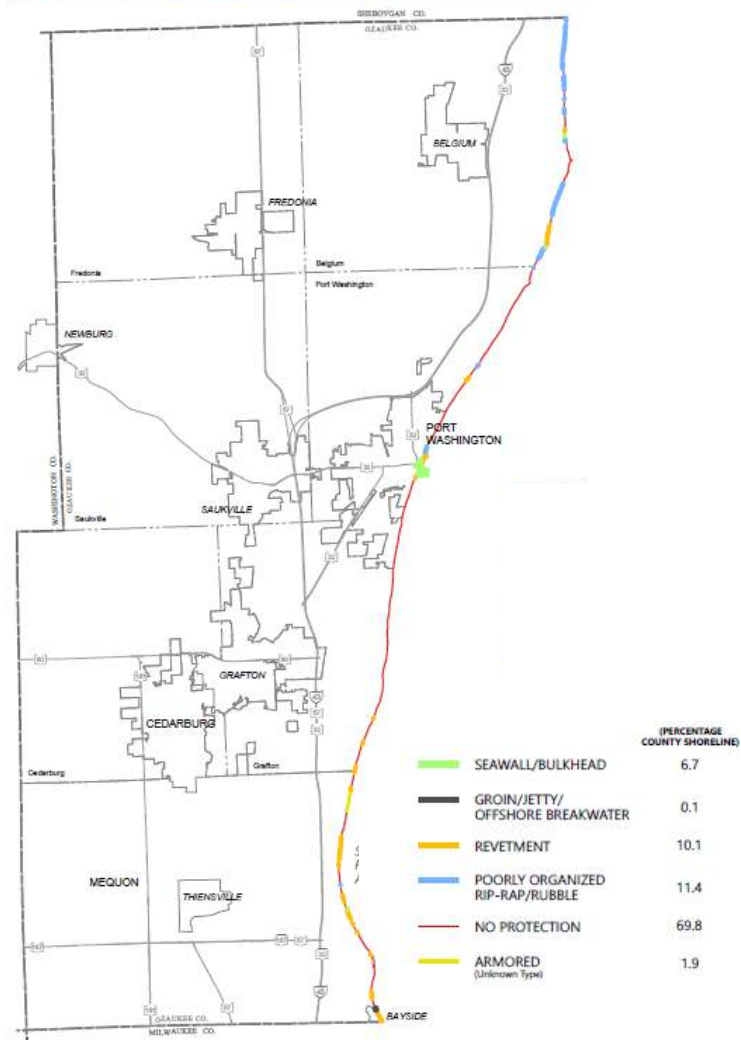




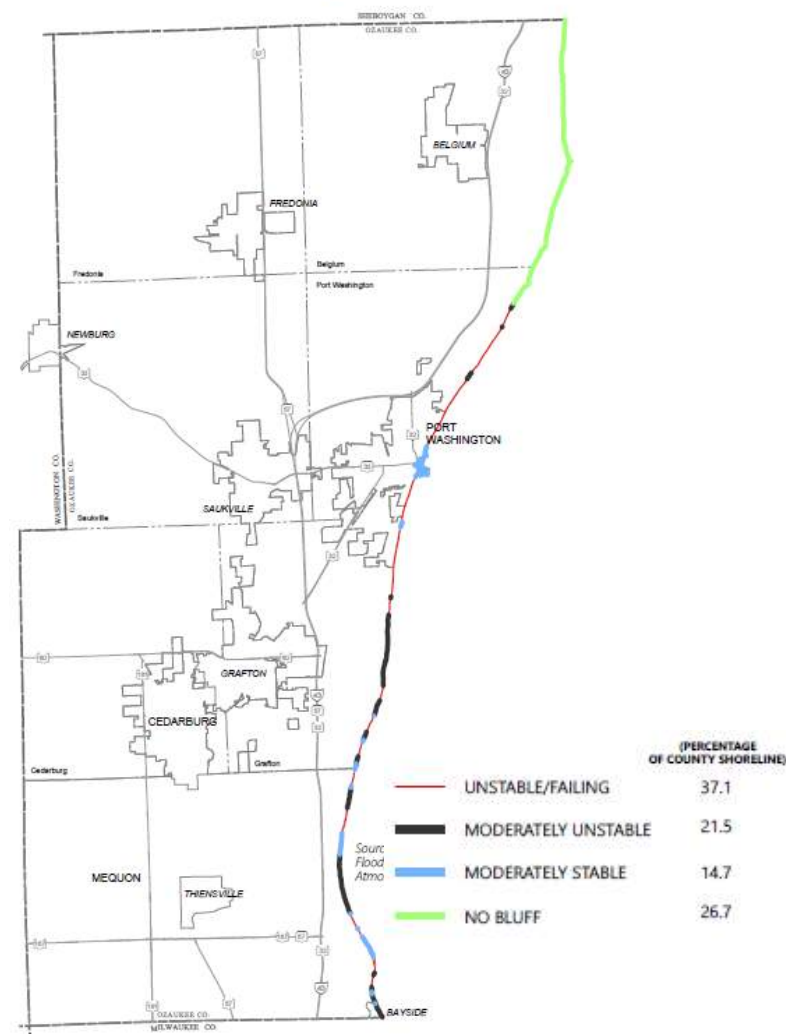
# Shore Protection, General Bluff Conditions, Types of Bluff Failure: 2007



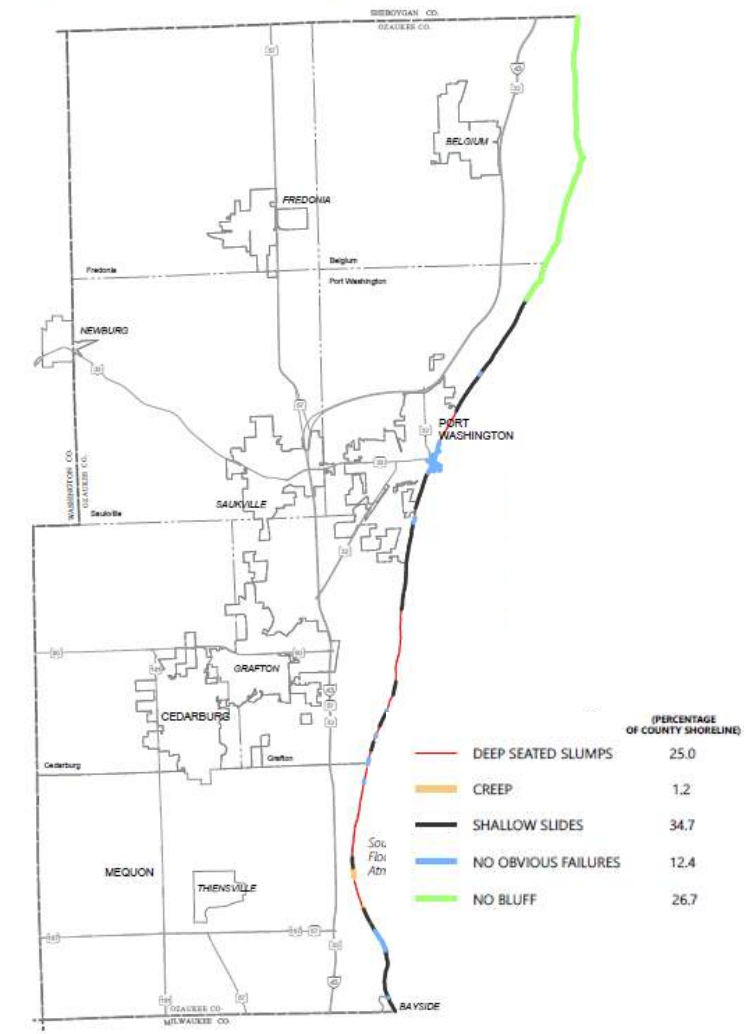
Map 3.11  
Types of Shore Protection in Ozaukee County: 2007



Map 3.12  
General Bluff Conditions in Ozaukee County: 2007



Map 3.13  
Types of Bluff Failure in Ozaukee County: 2007

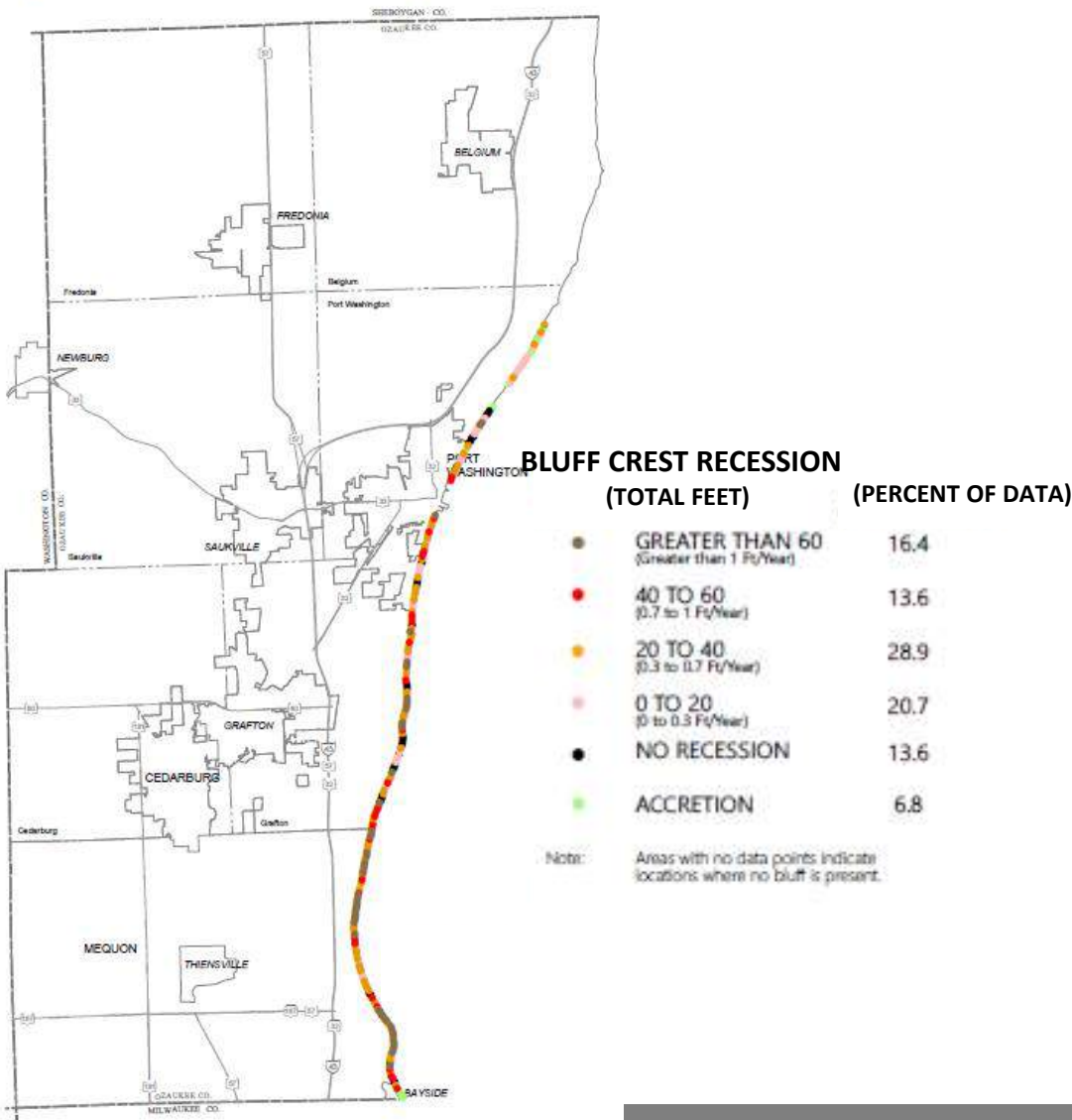




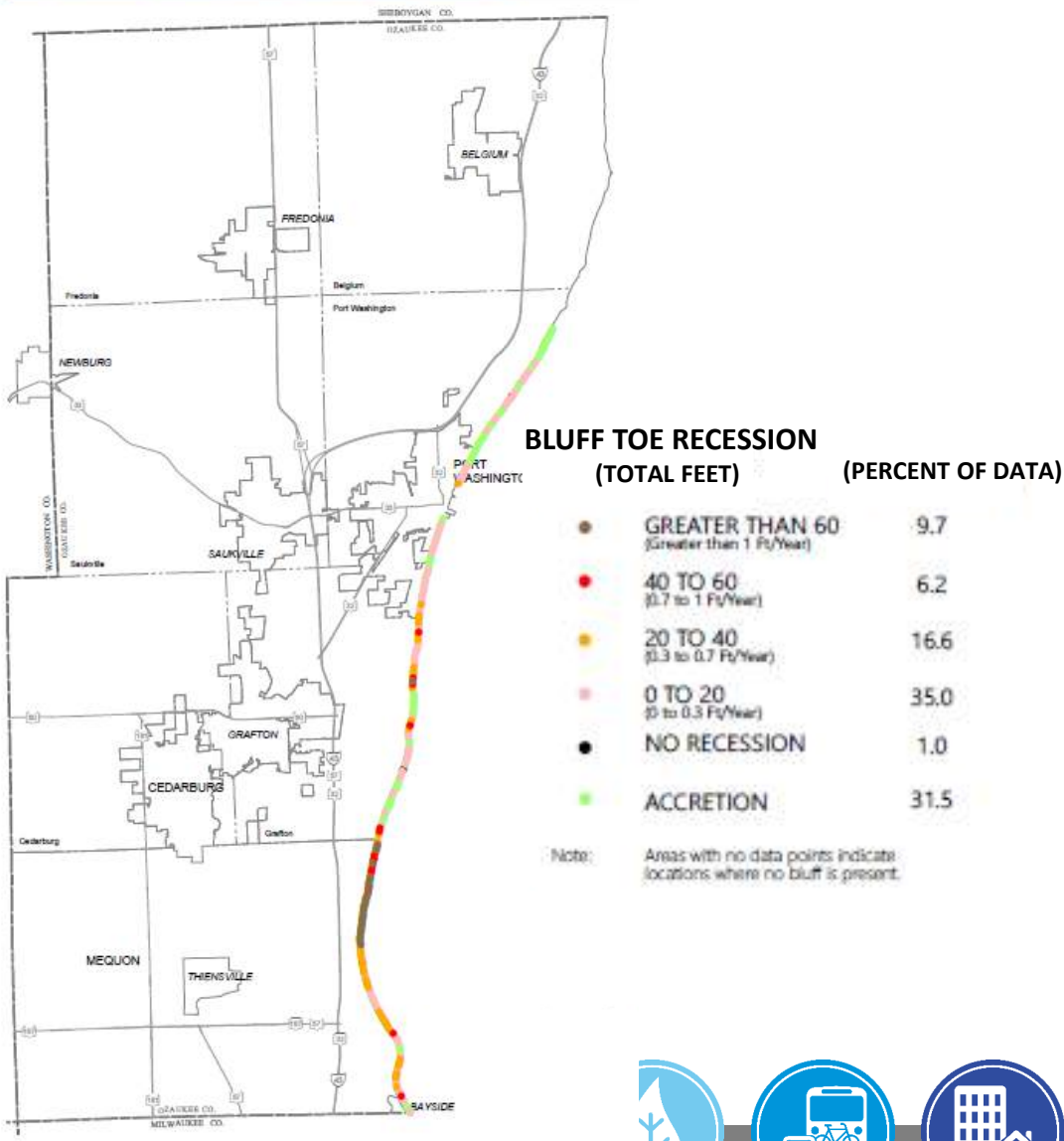
# Long-Term Bluff Crest and Bluff Toe Recession: 1956-2015



Map 3.15  
Long Term Bluff Crest Recession in Ozaukee County: 1956-2015



Map 3.14  
Long Term Bluff Toe Recession in Ozaukee County: 1956-2015



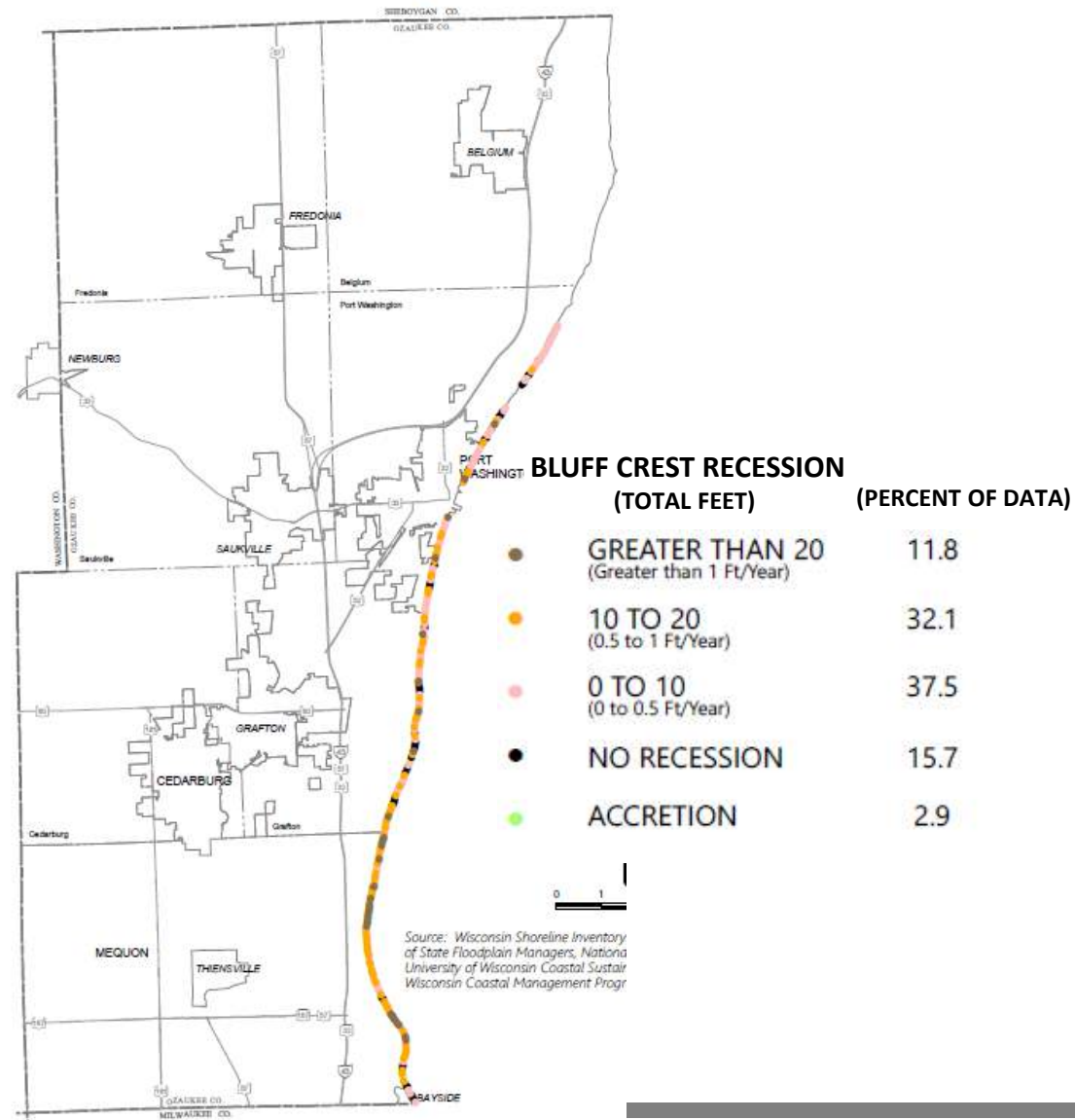




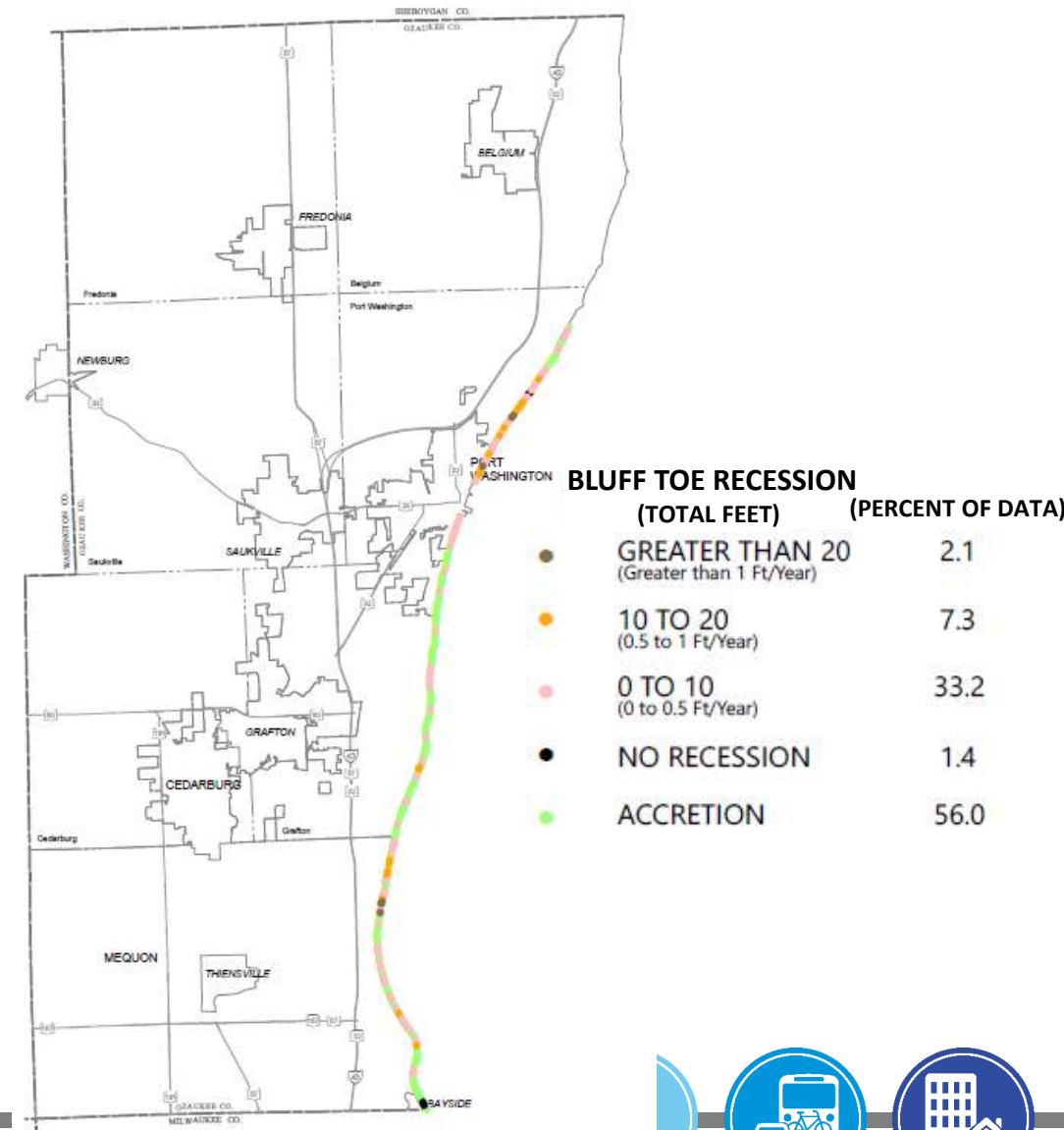
# Short-Term Bluff Crest and Bluff Toe Recession: 1995-2015



Map 3.17  
Short Term Bluff Crest Recession in Ozaukee County: 1995-2015



Map 3.16  
Short Term Bluff Toe Recession in Ozaukee County: 1995-2015

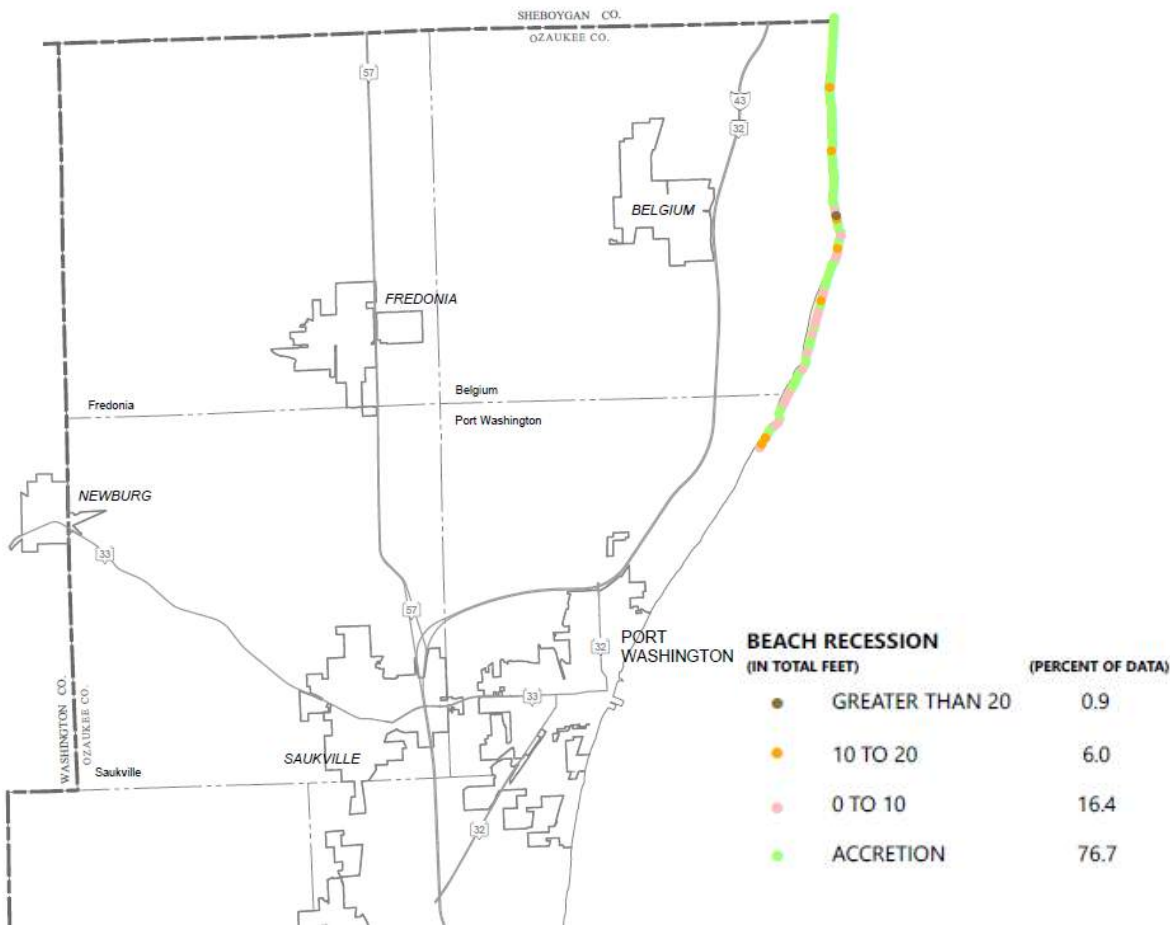




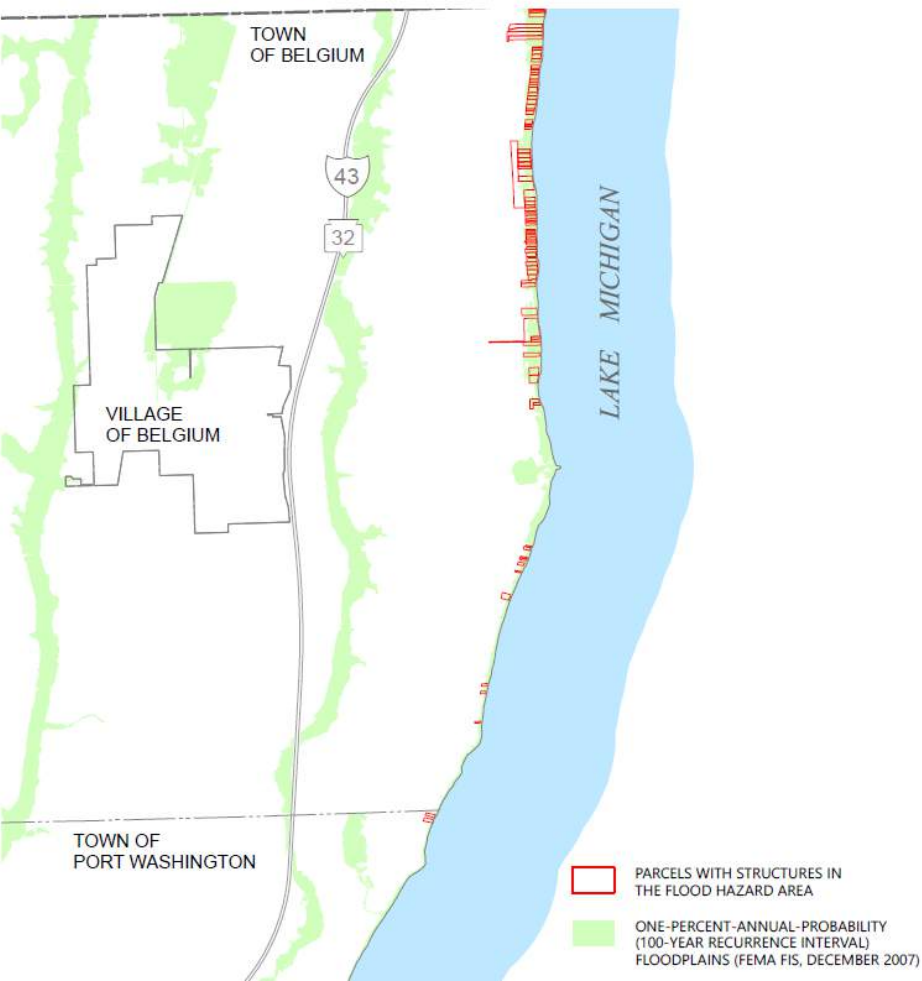
# Short-Term Beach Recession and Structures Within Coastal Flood Hazard Area



Map 3.18  
Short Term Beach Recession in Ozaukee County: 1995-2015



Map 3.19  
Location of Structures Along the Lake Michigan Coast that are Within  
the One-Percent-Annual-Probability Flood Hazard Area: 2015



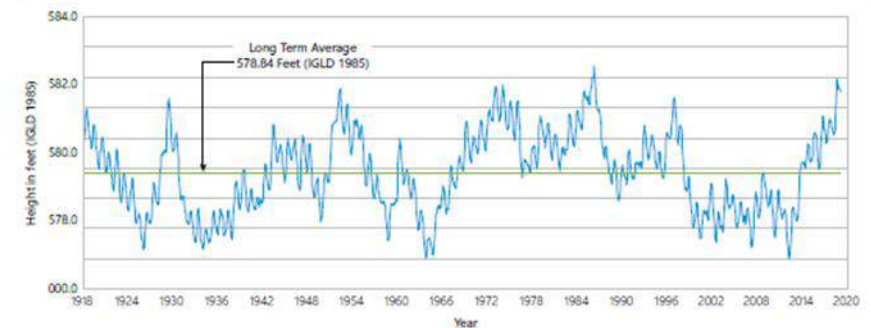
# ●●●●● Potential Future Changes in Coastal Hazard Conditions



- Changes in Land Use – Potential Future Increase in Coastal Development?
- Climate Change Impacts (Unknown!)
  - Increased Precipitation = Increased Water Levels?
  - Increased Temperatures + Decreased Ice Cover + Increased Evaporation = Lower Water Levels?
  - Large Variability in Lake Michigan Water Levels Expected to Continue
- Increases in Wind Strengths and Altered Wind Directions/Patterns
  - Higher Winds + Prevailing East Winds + Less Ice Cover = Greater Offshore Wave Development



Figure 2.1  
Lake Michigan Mean Monthly Water Levels 1918-2019



Source: National Oceanic and Atmospheric Administration Great Lakes Environmental Research Laboratory and SEWRPC





# Ozaukee County Hazard Mitigation Goals

1. Preserve Life and Minimize Potential for Injury
2. Preserve and Enhance Quality of Life by Identifying Potential Property and Crop Damage Risks
3. Promote Countywide Coordination, Planning, and Training that Avoids Transferring Risk of Hazards From One Community to an Adjacent Community
- 4. Maintain Special Distribution of the Various Land Uses that Preserves and Protects the Natural Resources of the County**
5. Increase Public Awareness to Hazards that Threaten Life and Property
6. Identify Potential Funding Sources that can Assist in the Implementation of Mitigation Projects and Programs



# Alternative Mitigation Strategies



## ➤ Coastal Mitigation Strategies Presented in 4 Main Categories

1. Regulations and policy measures
2. Bluff toe and bluff face mitigation measures
3. Near-shore and shoreline mitigation measures
4. Informational and educational programming



# 1.) Regulations and Policy Mitigation Measures



- **Continue to participate in FEMA's NFIP and RiskMAP floodplain mapping program for updated Lake Michigan coastal V and VE flood hazard zones**
- **Develop and enforce consistent County and municipal shoreland regulations and policies relating to setbacks for new development or redevelopment**
- Continue working with WCMP and UW-Sea Grant and re-examine as necessary the County's current zoning ordinances, regulations, and comprehensive plans
- Continue to participate in SE WI Coastal Resilience Project's "Community of Practice" meetings

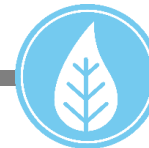




## 2.) Bluff Top & Bluff Face Mitigation Measures



- **Develop and encourage bluff top BMPs with priority in areas where significant bluff crest recession has been observed**
- **Review and implement findings of up-to-date geotechnical engineering studies**
- Bluff slope stability analysis should be based on the highest groundwater conditions
- Maintain bluff stability by regrading and terracing the angle of the bluff face to create a less steep slope between top and toe of bluff (licensed engineer)
- **Consider relocating buildings determined to be at high-risk for sustaining damages from bluff recession/failure**
- Consider acquisition/demolition of buildings that cannot be relocated safely or economically or where bluff recession has progressed to point of catastrophic failure or where failure imminent within 5 years
- Develop long-term protection measures for critical community facilities, utilities, and historical facilities located in the high-risk coastal hazard zone
- **Continue to enforce County setback regulations along coastal bluffs and ravines**



### ●●●●● 3.) Near-Shore and Shoreline Protection Measures



- **Conduct an updated inventory and assessment of the condition and effectiveness of all shoreline protection structures along Lake Michigan coast**
- **Ensure breakwater walls and piers within Port Washington harbor are properly designed and constructed**
- **Construct and maintain shoreline protection structures where public infrastructure is at risk**
- Placement of temporary emergency material to protect a structure or infrastructure
- **Consider acquisition/demolition of structures estimated to be within the coastal 1%-annual-probability flood hazard area**
- **To the degree possible, landowners should consider nature-based shoreline protection measures**



## ●●●●● 4.) Public Informational and Educational Programming

- Make coastal hazard information readily available to the public
- **Continue to work with WCMP to develop, refine, and distribute guidance and education to local decision-makers, developers, consultants, and homeowners**
- Work with WCMP to continue to conduct public outreach within the County and to provide technical assistance to decision-makers and landowners
- Provide information on shoreland erosion related hazards to serve as a “fair warning” guide for groups such as realtor-brokers, shoreland property owners, developers, lending institutions, and prospective buyers
- **Continue to promote awareness of flood insurance to residents along the County’s low-lying coast in the Towns of Port Washington and Belgium**





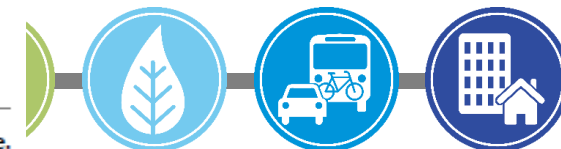
# Plan Recommendations Summary and Implementation Blueprint



**Table 6.1**  
**Ozaukee County Hazard Mitigation Plan Summary and Implementation Plan**

Mitigation Measures	Status	Priority	Implementation Timetable	Designated Department, Management Agency, or Personnel	Potential Funding Programs (see Appendix G)
Lake Michigan Coastal Hazards					
Regulations and Policy Measures					
Continue to participate in FEMA's NFIP and RiskMAP floodplain mapping program for updated Lake Michigan coastal V and VE zones	Implemented	High	Ongoing, several map updating efforts are underway	FEMA, OCLWM, OCPP	1, 2, 3, 4, 14, 15, 19, 20, 45, 76, 78, 80, 82
Develop and enforce consistent county and municipal shoreland regulations and policies (i.e., ordinances) relating to setbacks along bluffs and ravines	Partially Implemented	High	In place and ongoing	WDNR, OCLWM, OCPP, Municipal Planning Commissions	
Bluff Top and Face Mitigation Measures					
Develop and encourage bluff top and face best management practices	Not Implemented	High	As needed and as funding and opportunities become available	WDNR, WCMP, UW-Sea Grant, OCLWM, OCPP	
Continue to implement engineering studies that assess the variables influencing bluff stability and shoreline recession which determine the stable slope angle setback	Partially Implemented	High	As needed	WDNR, WCMP, OCLWM, OCPP	
Consider relocating buildings within high-risk bluff failure areas	Not Implemented	High	Implement after surveys of structures are complete	USACE, FEMA, WEM, WDNR, OCDEM, OCLWM, OCPP, Municipal Council/Boards, Engineering and Planning Commissions	
Continue to enforce County coastal ravine setback regulations	Implemented	High	In place and ongoing	WDNR, OCLWM, OCPP	
Conduct an updated assessment of the condition and effectiveness of all shoreline protection structures in the County	Partially Implemented	Medium	Assessment to be done every 10 years	WDNR, UW-Sea Grant Institute; Municipal Council/ Boards, Public Works, and Engineering Departments, and Private Landowners	
Ensure breakwater walls and piers within and around the Port Washington harbor are properly designed and constructed to withstand the severe environmental conditions of Lake Michigan	Implemented	Medium	Repair work to the Port Washington harbor breakwater walls was ongoing during the draft phase of this report	City of Port Washington Common Council and Public Works Department	

Table continued on next page.





A background image showing a group of people clapping their hands, suggesting an audience or a celebratory event. The image is slightly blurred, focusing attention on the text in the foreground.

# Special Acknowledgments

- Megan Shedivy – SEWRPC Planner
- Laura Herrick – SEWRPC Chief Environmental Engineer
- Scott Ziegler – Ozaukee County Emergency Manager
- Ozaukee County Hazard Mitigation Local Planning Team
- Wisconsin Coastal Management Program – Adam Bechle
- SE WI Coastal Resilience Project Team

# Thank You

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