

Ozaukee County Hazard Mitigation Plan: Local Planning Team Meeting

May 16, 2019



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Southeastern Wisconsin Regional Planning Commission

Chapter 3

Analysis of Hazard Conditions

- Local Input
- State Hazard Mitigation Plan
- Past Hazard Identification
 - 2008 Plan HVA
 - 2013 Plan HVA
- 2018 Hazard Identification
 - LPT Hazard Vulnerability Assessment Tool
- Relatable Plans, Maps, Assessments



Hazard Mitigation Plan

Ozaukee County, Wisconsin

Ozaukee County Reported Weather Hazard Events: 1950-2017

Table 3.3
Weather Hazard Events Recorded in Ozaukee County, Wisconsin from 1950 through 2017 (Sorted by Number of Events)

Event	Number of Events ^a	Deaths ^b	Injuries	Property Damage ^c (2017 dollars)	Crop Damage ^c (2017 dollars)
Winter Storms (1996-2017)	169	0	0	3,515,535	360,371
Fog (1996-2013)	79	0	0	0	0
Thunderstorm Winds (1960-2017)	71	0	6	6,155,282	1,353,525
Hail (1961-2017)	58	0	0	7,898,813	778,452
Strong/High Winds (1964-2017)	56	0	0	2,128,957	52,430
Temperature Extremes (1995-2017)	52	0	0	2,227	74,818
Flood (1996-2015)	24	0	1	26,358,798	12,269,778
Lightning (1968-2012)	23	0	3	2,738,275	8,503
Drought (2002-2012)	5	0	0	0	5,398,246
Tornado (1964-2015)	5	0	30	20,220,862	357,512
Wild and Forest Fire	0	0	0	0	0
Dust Storm	0	0	0	0	0
Total	542	0	40	69,018,749	20,653,635

NCDC and USDA Risk Management Agency data

Summary and Ranking of Hazards

Table 3.5

Summary of Hazards to be considered in the Ozaukee County Hazard Mitigation Plan

Hazard	Risk of Occurrence (high, medium, or low)	Damage to Property (high, medium, or low)	Threat to Life Safety (high, medium, or low)	Duration of Impact (long, moderate, or short)	Size of Area Affected (large, medium, or small)
Flooding	High	High	Medium	Moderate	Large
Thunderstorm, High Winds, Hail, Lightning	High	Medium	Medium	Long	Large
Coastal Erosion	Medium	High	Medium	Long	Medium
Winter Storms	Medium	Medium	Medium	Moderate	Large
Tornadoes	Low	High	High	Short	Small
Temperature Extremes	Medium	Low	High	Long	Large
Drought	Medium	Low	Low	Long	Large
Contamination or Loss of Utility Systems	Low	Low	Medium	Moderate	Medium
Fog	Medium	Low	Low	Short	Medium

Additional Hazards Considered:

- Mudslides/Landslides
- Wildfires
- Dust Storms
- Earthquakes
- Hazardous Materials Incident
- Cyber-Security
- 9-1-1 Interruptions

Hazard Vulnerability Analysis Procedure

FEMA and WEM Guidelines:

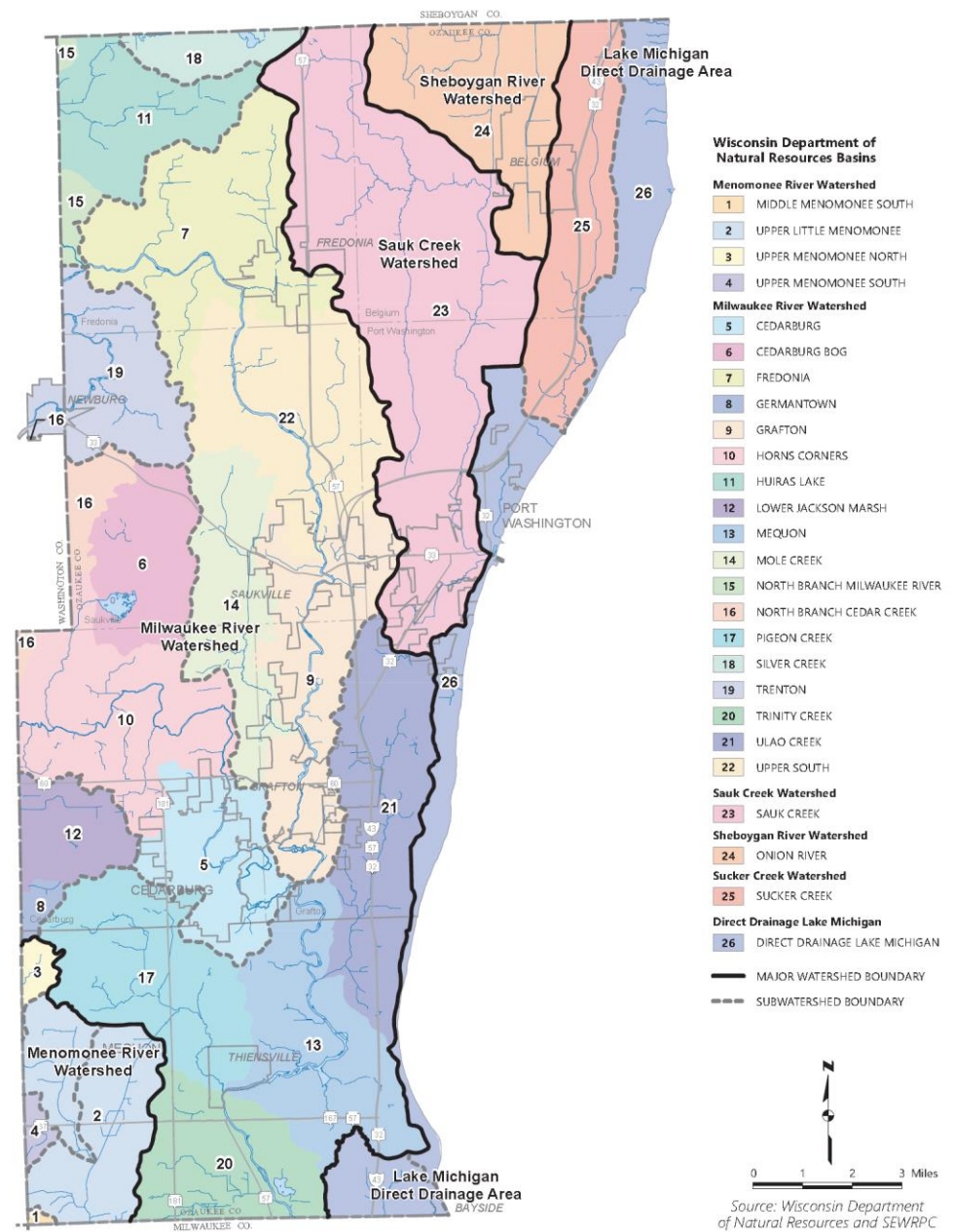
1. Profile of Hazards
2. Inventory of Assets Within the County
3. Estimation of Losses
4. Vulnerability Under Future Conditions
 - i.e.: Climate Change

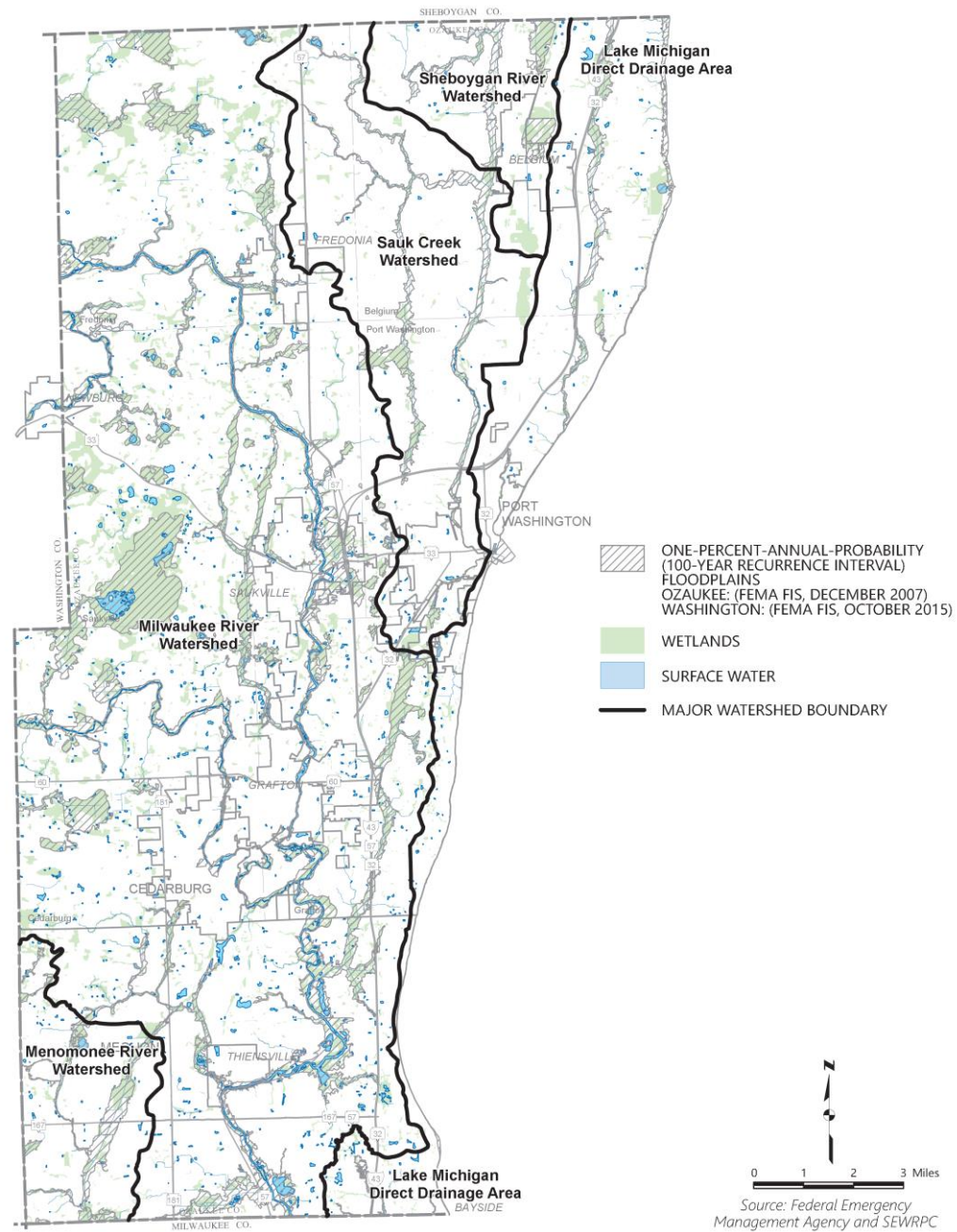
How Hazard Vulnerability Assessment's Are Structured in Chapter 3

FOR EACH HAZARD TYPE:

- Definition and General Description of Hazard
- Historical and/or Recent Events that Affected County
- Vulnerability and Community Impact
- Potential Future Changes
- Multi-Jurisdictional Risks

Hazard Vulnerability Assessment For Flooding and Associated Stormwater Drainage Problems





Ice Jams



ICE JAM ON MILWAUKEE RIVER
OZAUKEE COUNTY



Choked with ice, water rose dangerously close to riverfront houses in Grafton (left).

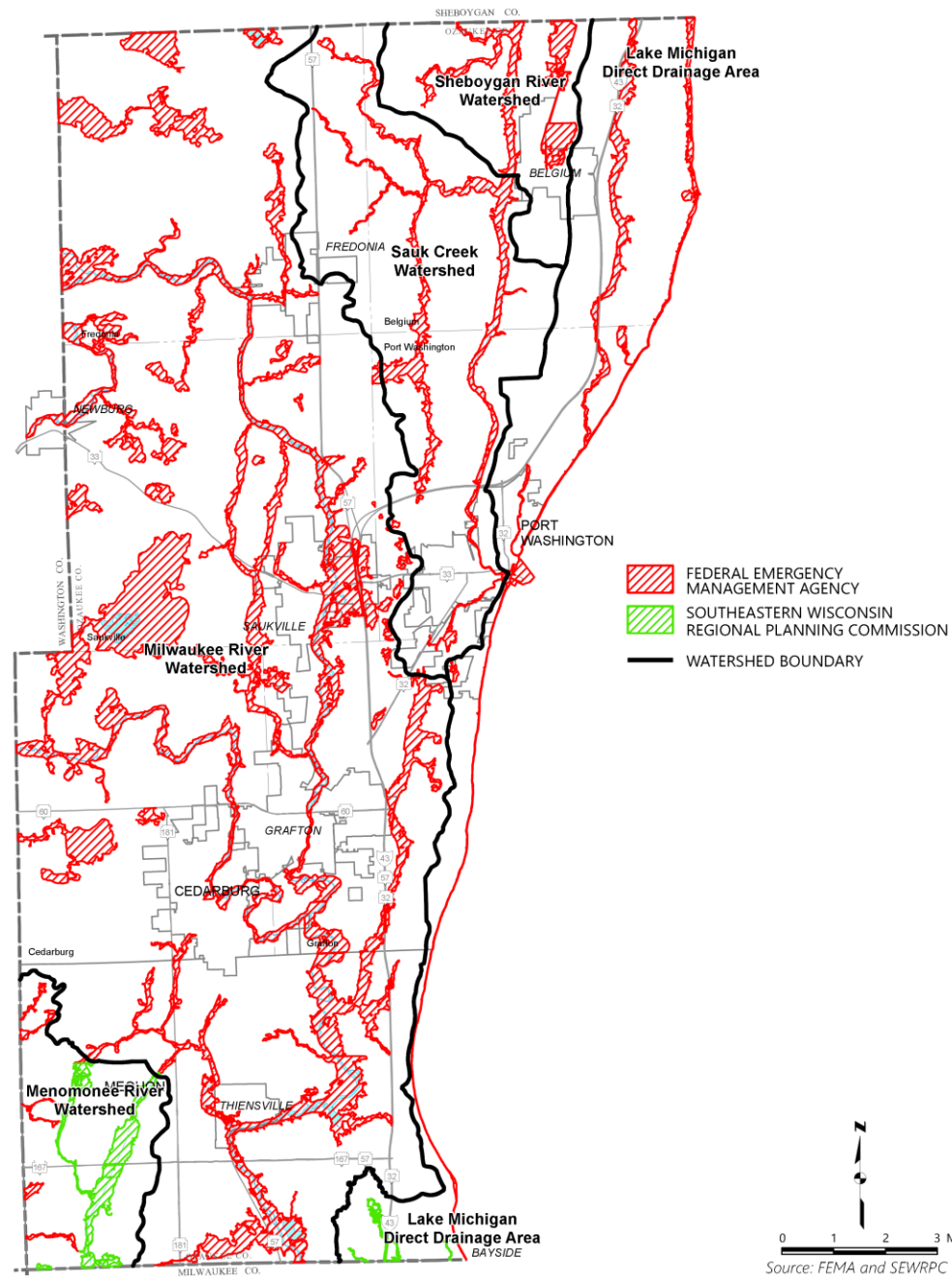
Photos by Sam Arndt

Map 3.1

Sources of Flood Hazard Data for the Stream Reaches in Ozaukee County: 2018



FEMA



0 1 2 3 Miles
Source: FEMA and SEWRPC

Parcel-Based Loss Analysis

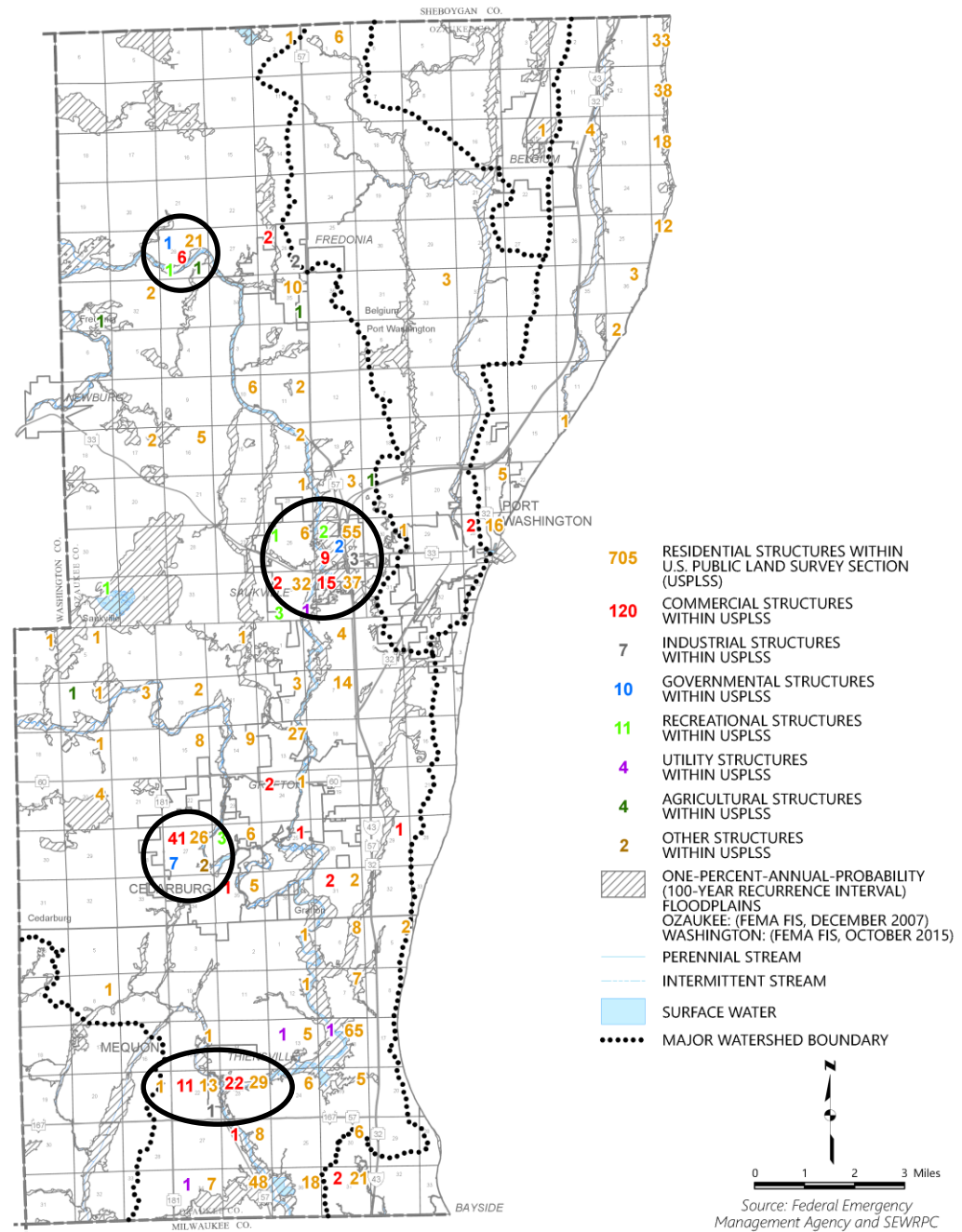


Table 3.8**Estimated Flood Damages for a One-Percent Annual Probability Flood in Ozaukee County**

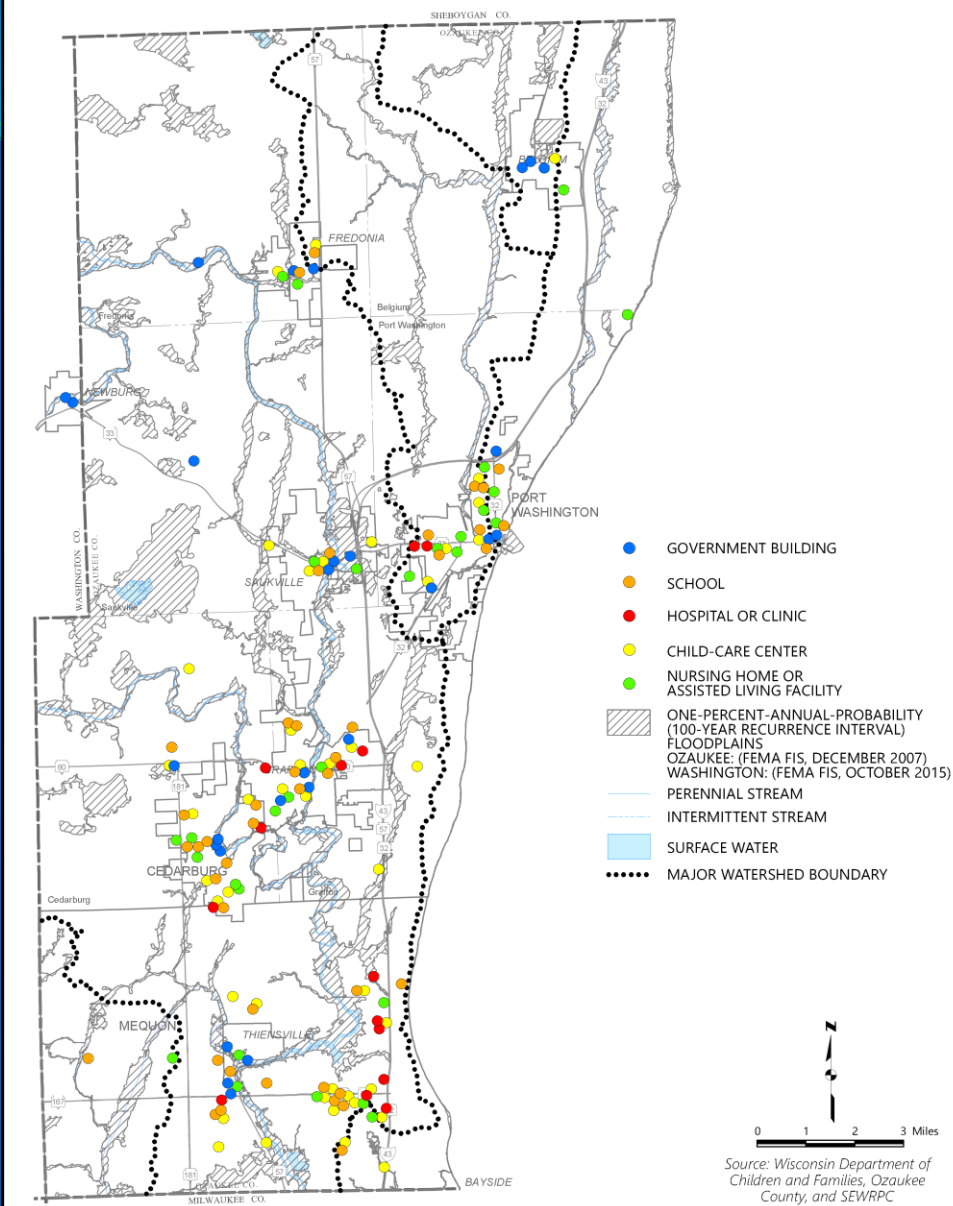
Municipality	Number of Structures in Floodplain	Flood Damages ^a		
		Direct (\$)	Indirect (\$)	Total (\$)
Cities				
Cedarburg	84	5,671,300	2,068,570	7,739,870
Mequon	228	5,349,600	858,470	6,208,070
Port Washington	25	640,370	143,150	783,520
Villages				
Bayside ^a	0	0	0	0
Belgium	1	4,610	690	5,300
Fredonia	15	73,890	17,670	91,560
Grafton	25	184,910	46,150	231,060
Newburg ^a	0	0	0	0
Saukville	164	4,450,360	1,160,550	5,610,910
Thiensville	65	1,953,330	549,540	2,502,870
Towns				
Belgium	116	1,477,650	221,660	1,699,310
Cedarburg	39	720,210	114,120	834,330
Fredonia	39	376,640	74,540	451,180
Grafton	32	450,980	78,310	529,290
Port Washington	4	42,260	6,580	48,840
Saukville	26	326,520	49,050	375,570
Total	863	21,722,630	5,389,050	27,111,680

Note: Estimated damages are based on assessed improvement values in 2018.

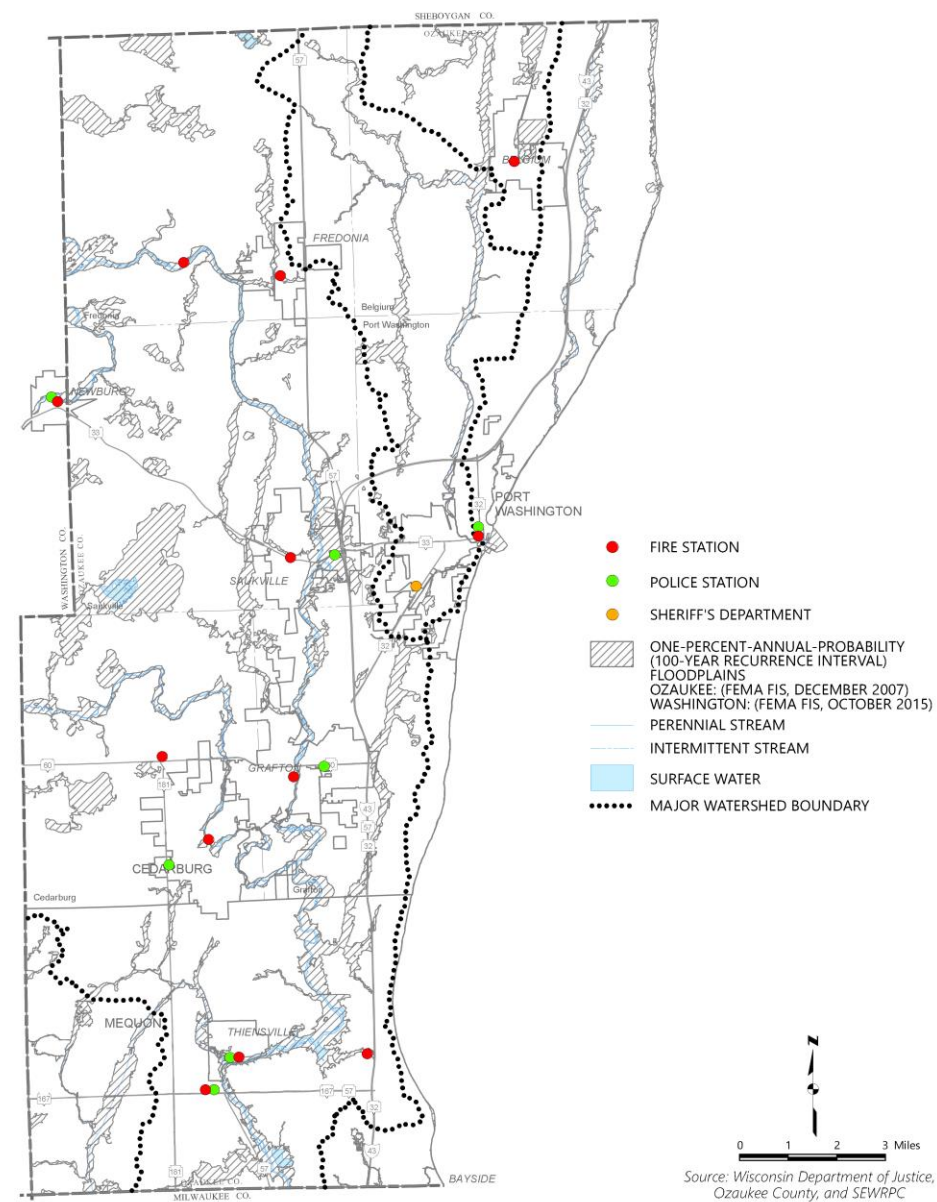
^aOnly the portion of the community within Ozaukee County was analyzed for this assessment.

Source: Wisconsin Department of Natural Resources and SEWRPC

Map 3.4
Locations of Critical Community Facilities in Relation to Floodplains in Ozaukee County: 2015



Map 3.5
Law Enforcement and Fire Station Facilities in Relation to Floodplains in Ozaukee County: 2015



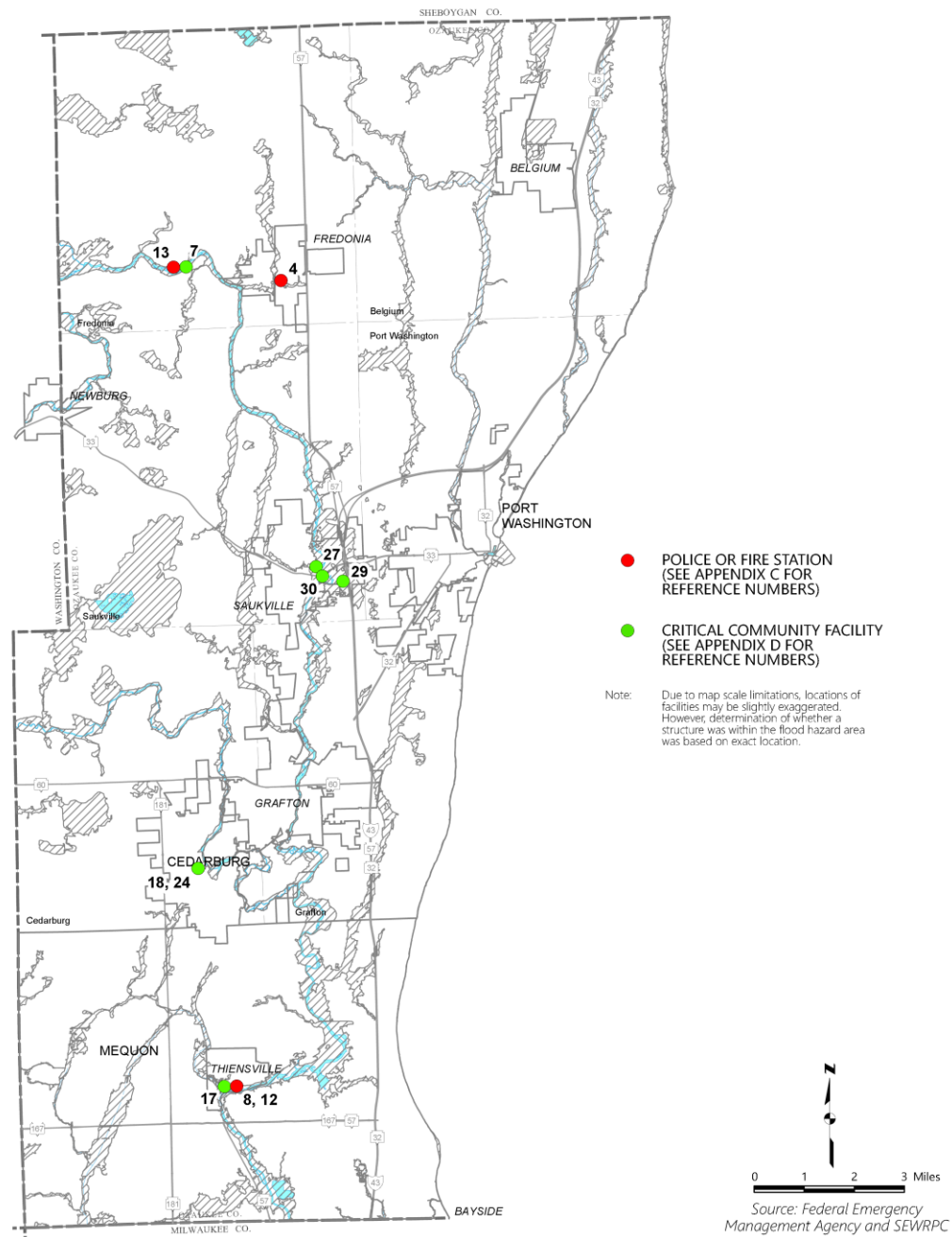


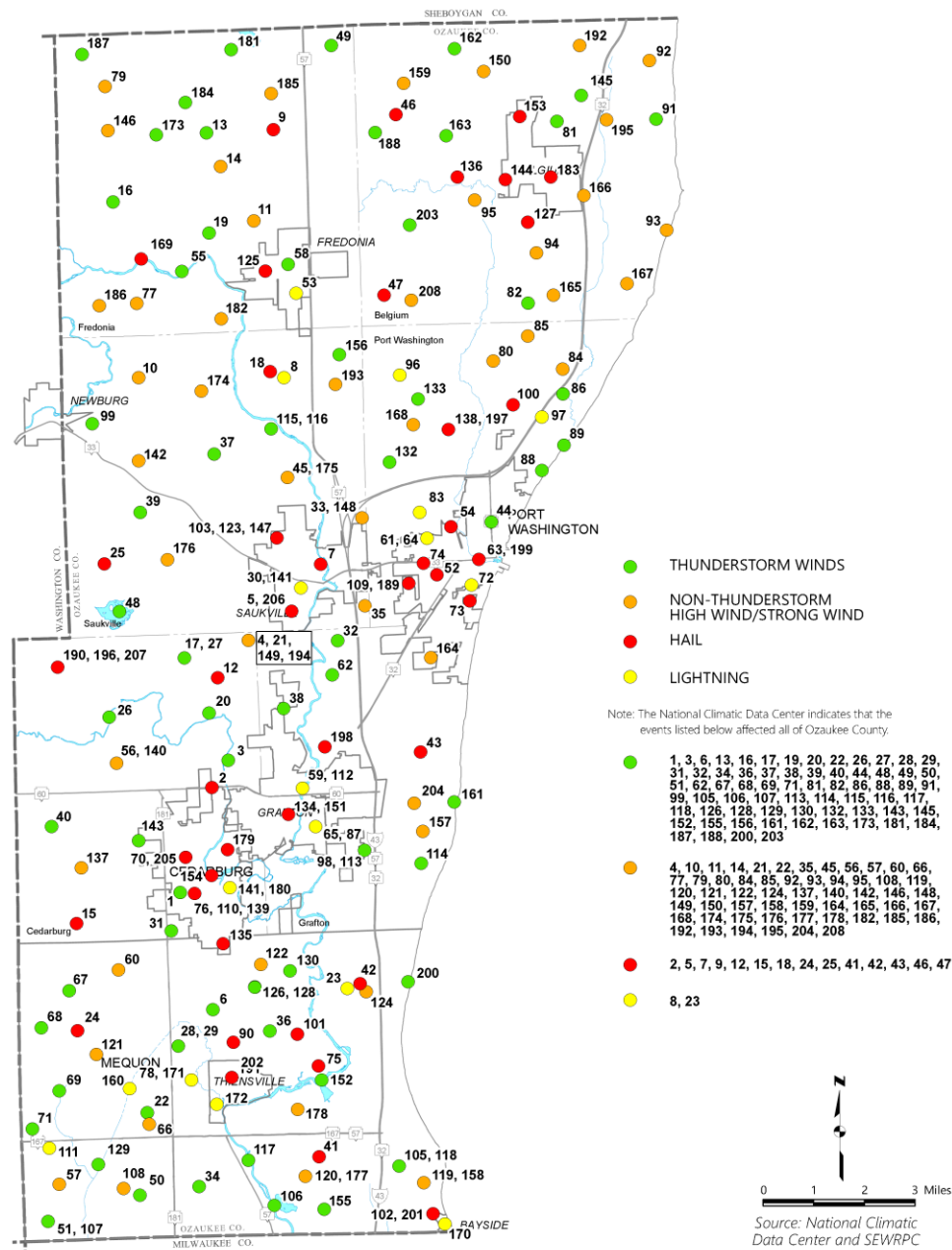
Table 3.9
Communities in Ozaukee County with Special Flood and
Related Stormwater Drainage Considerations: 2018

Civil Division	Reason for Consideration
Cities	
Cedarburg	84 structures estimated to be in flood hazard area, including the <u>Public Library and Post Office</u>
Mequon	228 structures estimated to be in flood hazard area, including <u>14 repetitive loss structures</u>
Port Washington	25 structures estimated to be in flood hazard area, including one repetitive loss structure; known roadway flooding problems
Villages	
Belgium	1 structure estimated to be in flood hazard area
Fredonia	15 structures estimated to be in flood hazard area including the Fire Department; known roadway flooding problems
Grafton	25 structures estimated to be in flood hazard area; known roadway flooding problems
Saukville	164 structures estimated to be in flood hazard area, including the <u>Saukville Elementary School, the Post Office, and one repetitive loss structure</u> ; known roadway flooding problems
Thiensville	65 structures estimated to be in flood hazard area, including the <u>Police Department, the Fire Department, the Village Hall, and 11 repetitive loss structures</u>
Towns	
Belgium	116 structures estimated to be in flood hazard area
Cedarburg	39 structures estimated to be in flood hazard area
Fredonia	39 structures estimated to be in flood hazard area, including the <u>Town Hall and the Waubeka Fire Department</u>
Grafton	32 structures estimated to be in flood hazard area
Port Washington	4 structures estimated to be in flood hazard area
Saukville	26 structures estimated to be in flood hazard area

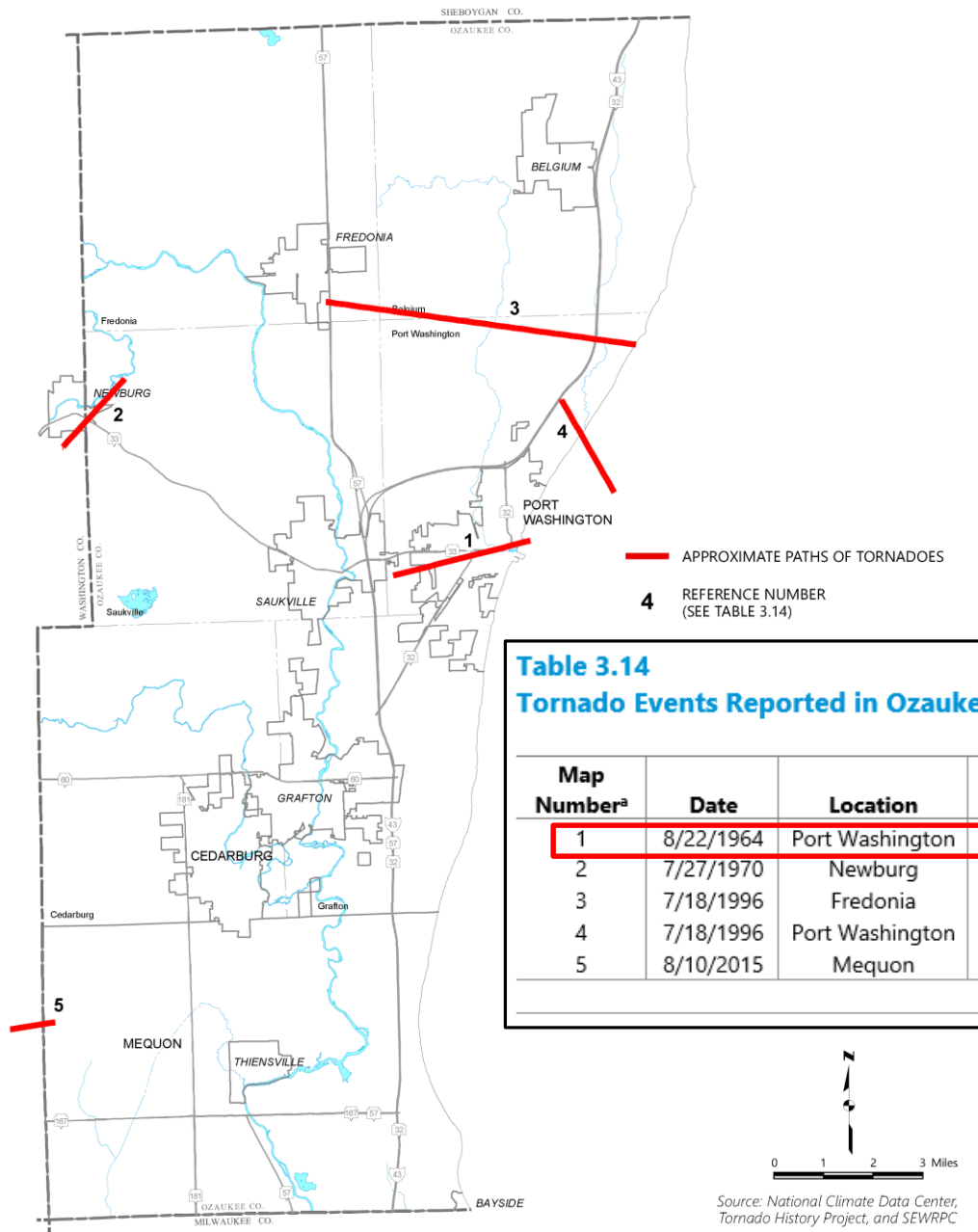
Source: Ozaukee County and SEWRPC

Hazard Vulnerability Assessment For Thunderstorm Wind, Non-Thunderstorm High Wind, Hail, and Lightning

Map 3.8
Thunderstorm Wind, Non-Thunderstorm High-Wind, Hail, and Lightning Events Reported
within Ozaukee County, July 1960-December 2017



Map 3.9
Estimated Location and Tracks of Tornadoes Occurring in Ozaukee County



Hazard Vulnerability Assessment For Tornadoes

Table 3.14
Tornado Events Reported in Ozaukee County: 1964 Through 2017

Map Number ^a	Date	Location	Magnitude (Fujita)	Deaths	Injuries	Property Damages (2017 dollars)	Crop Damages (2017 dollars)
1	8/22/1964	Port Washington	F4	0	30	19,753,500	0
2	7/27/1970	Newburg	F0	0	0	0	0
3	7/18/1996	Fredonia	F1	0	0	466,320	357,512
4	7/18/1996	Port Washington	F0	0	0	0	0
5	8/10/2015	Mequon	EF0	0	0	1,042	0
Total				0	30	20,220,862	357,512

Source: National Climate Data Center, Tornado History Project, and SEWRPC

Hazard Vulnerability Assessment For Extreme Temperatures

"Heat and cold are two of the most underrated, least understood, and deadly of all the natural hazard events that impact Ozaukee County. "

Table 3.17
Level of Risk for Persons in High Risk Groups
Associated with the Heat Index

Heat Index (°F)	Category	Possible Heat Disorders for Persons in High-Risk Groups
80-90	Caution	Fatigue possible with prolonged exposure and/or physical activity
90-105	Extreme Caution	Sunstroke, muscle cramps, and/or heat exhaustion possible with prolonged exposure and/or physical activity
105-129	Danger	Sunstroke, muscle cramps and/or heat exhaustion likely. Heatstroke possible with prolonged exposure and/or physical activity
130 or above	Extreme Danger	Heat stroke or sunstroke likely

Source: National Weather Service

"...areas within Ozaukee County that have highest vulnerability to an extreme heat event include portions of the City of Mequon, the City and Town of Port Washington, the Villages of Grafton and Thiensville, and the City and Town of Cedarburg."

Ozaukee County Heat Vulnerability Index

The Ozaukee County Heat Vulnerability* analysis was created by the Building Resilience Against Climate Effects program within the Wisconsin Department of Health Services. The data displayed in the map is meant to serve as an informational tool to better understand the spatial distribution of human populations most vulnerable to extreme heat related events.

Ozaukee County Vulnerability (county based quantiles)

by Census Block Group

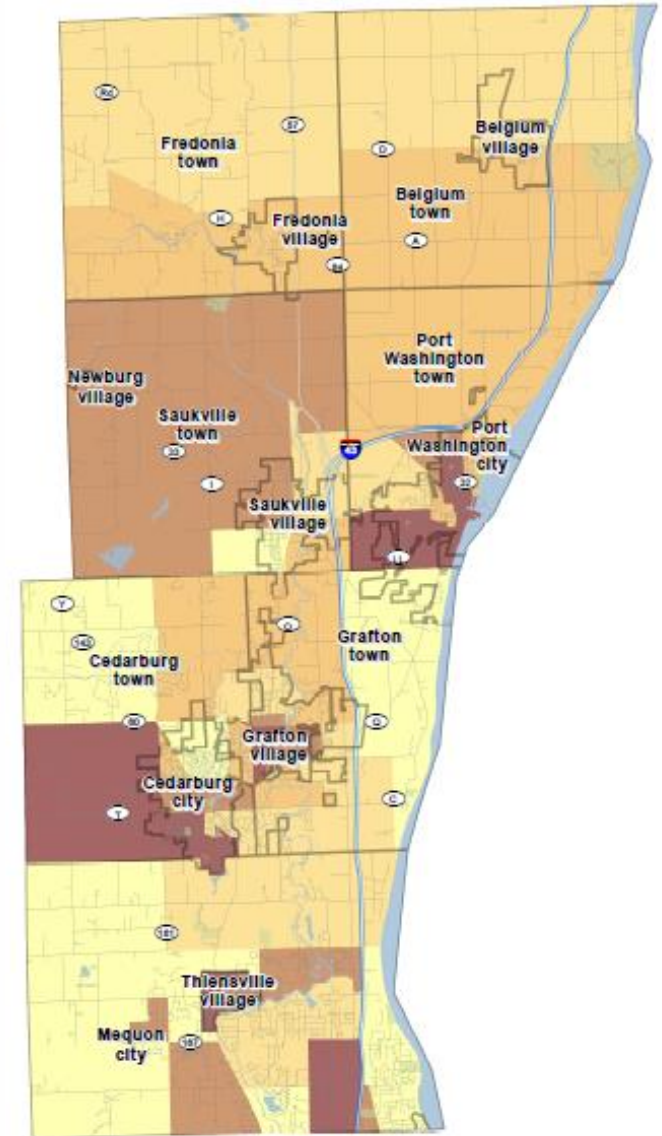
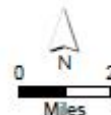


* The Ozaukee County Heat Vulnerability Index is based on the Wisconsin Heat Vulnerability Index** but has a reduced number of health-related indicators. It is representative of the heat vulnerability in Ozaukee County, and is not representative of the vulnerability compared to the other counties in Wisconsin.

** The Wisconsin Heat Vulnerability Index is based on multiple indicators associated with risk for heat-related illness and mortality. The index analysis was created as a measure of vulnerability by U.S. Census block groups during an extreme heat event. The measure includes: health factors, demographic and household characteristics, natural and built environment factors (e.g., air quality, temperature, land cover) and population density.

Reference Data

Park / Forest Water
Municipal Boundary



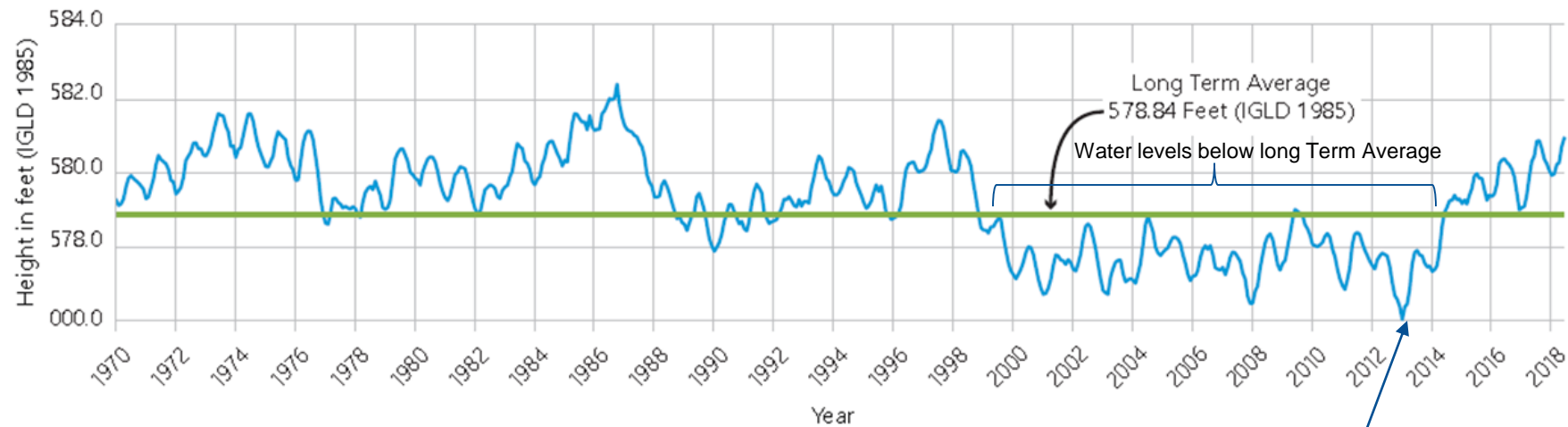
Map created by the Bureau of Information Technology Services in cooperation with the BRACE Program, Bureau of Environmental & Occupational Health, Division of Public Health, Department of Health Services, State of Wisconsin - P-21084 (5/2015)

Maps and related information are provided as a public service for informational purposes only. We make no warranties on the accuracy of content. Use of information from this document is at your own risk.

Hazard Vulnerability Assessment For Lake Michigan Coastal Hazards

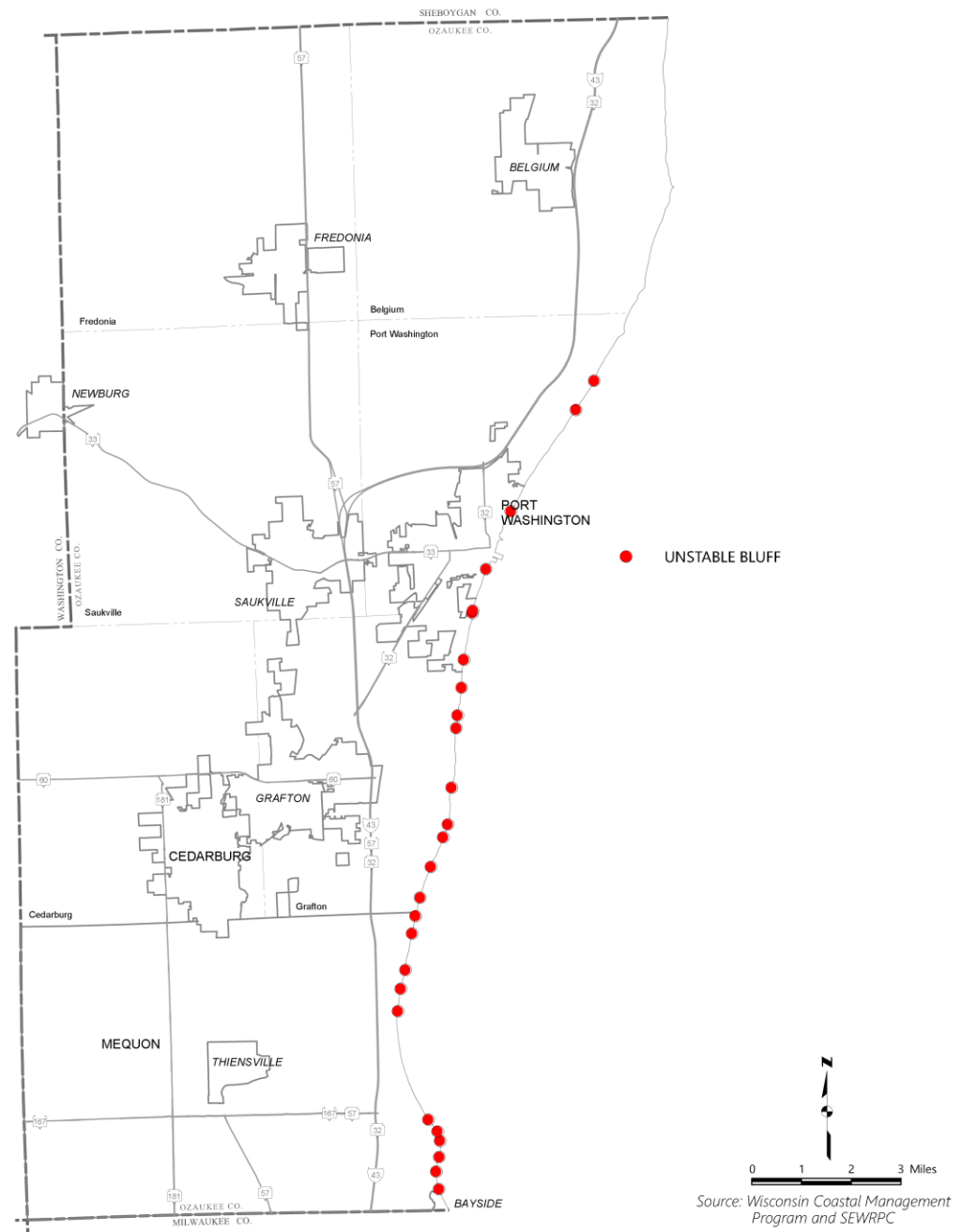


Figure 2.1
Great Lakes Water Levels: Lake Michigan-Huron



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

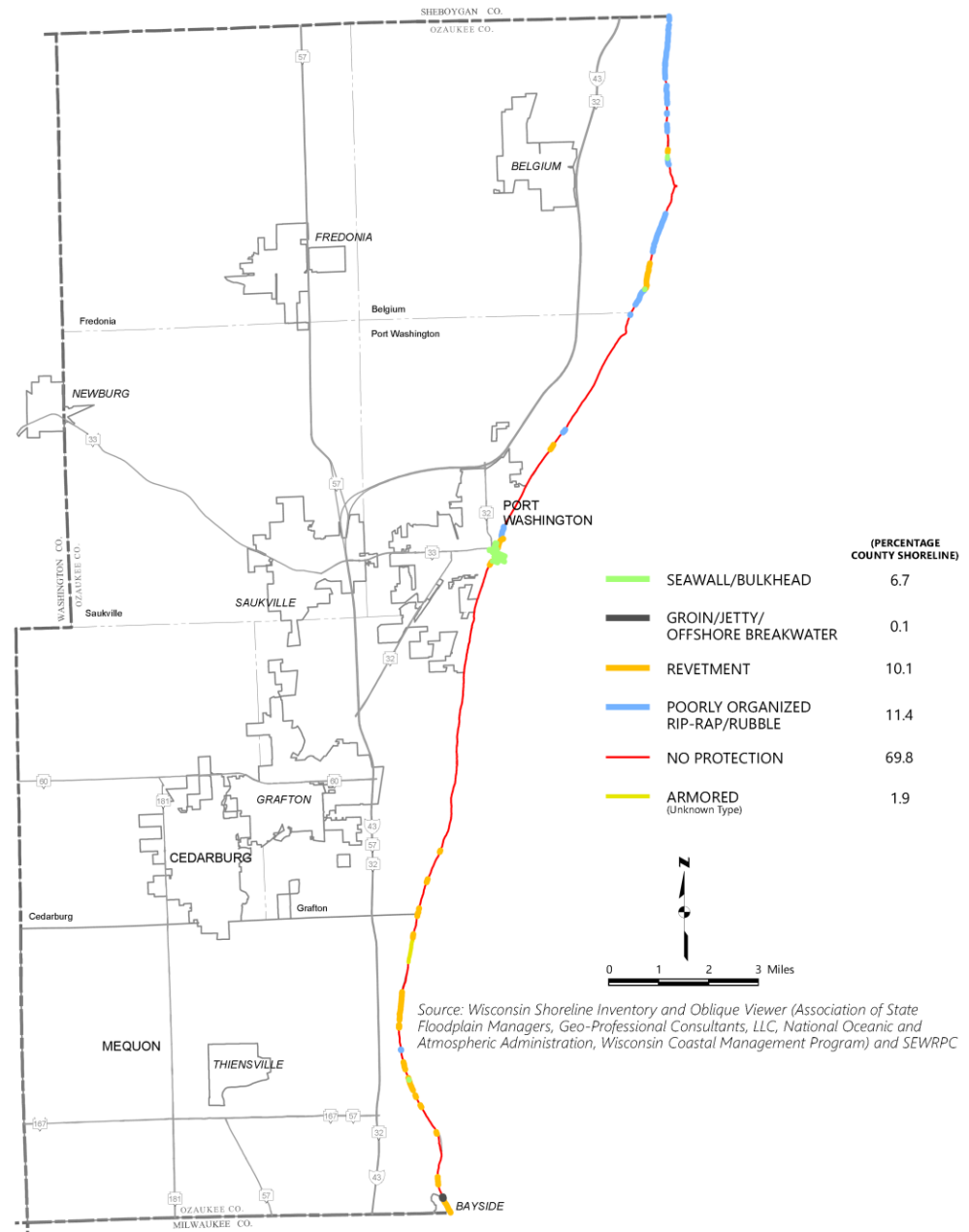
"Communities that exhibited unstable bluffs during the 1995 surveys included—from south to north—the Village of Bayside, City of Mequon, Town of Grafton, and the City and Town of Port Washington."



Nearly 70 Percent of Shoreline in Ozaukee County Was Unprotected in 2007.

Most Common Type of Shore Protection in the County Was:

- Poorly organized riprap or rubble (11.4 percent)
- Revetment (10.1 percent)
- Seawall or bulkhead (6.7 percent)
- Unknown armor types (1.9 percent)
- Offshore breakwater, groins, or jetties (0.1 percent)



- In 2007, almost 60 Percent of the County's Bluffs Showed Some Level of Failure.
- Bluffs Considered to be Unstable or Failing were Located:
 - Village of Bayside
 - City of Mequon
 - Town of Grafton
 - City and Town of Port Washington
- Same Communities that Exhibited Bluff Failure in the 1995 Study

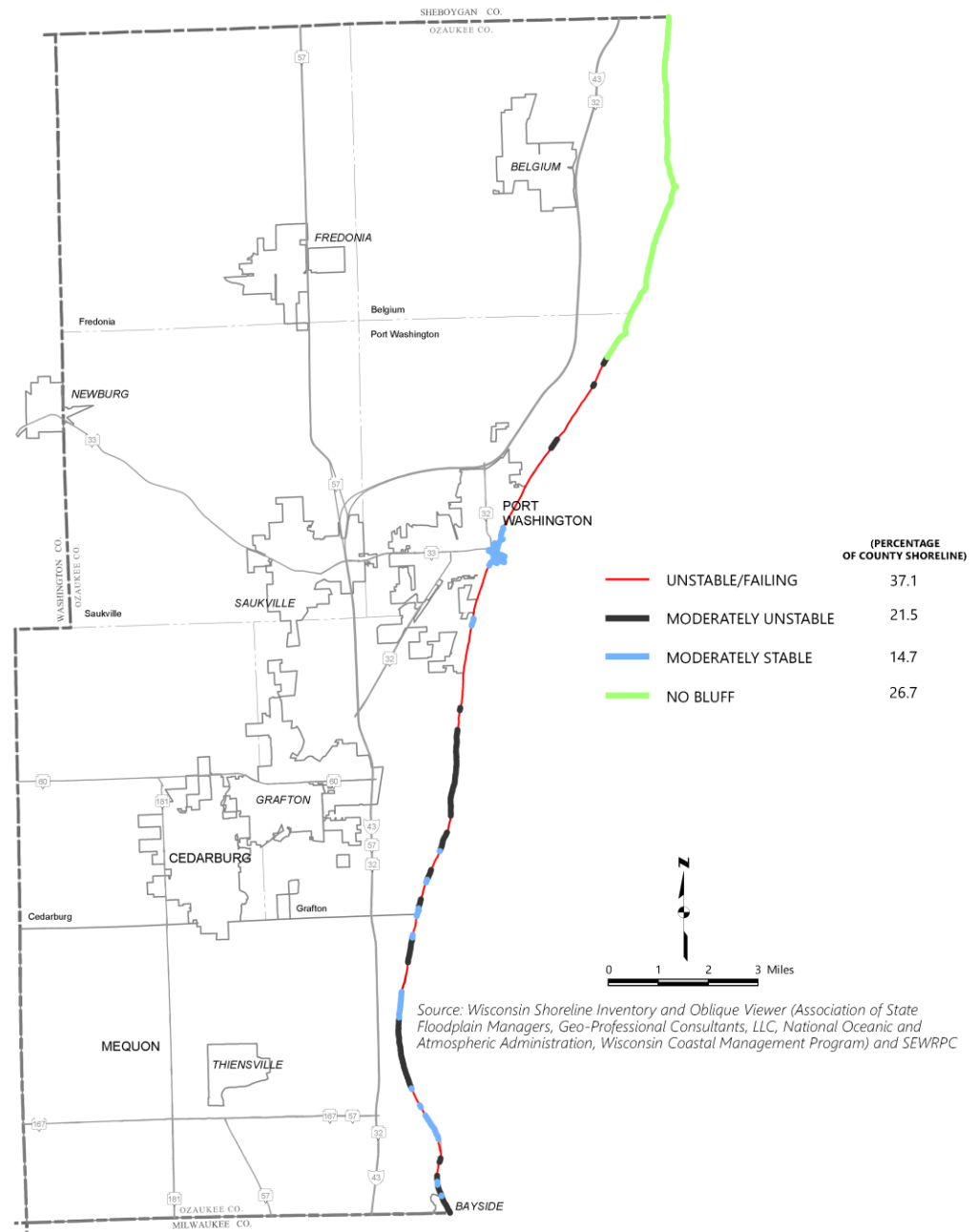
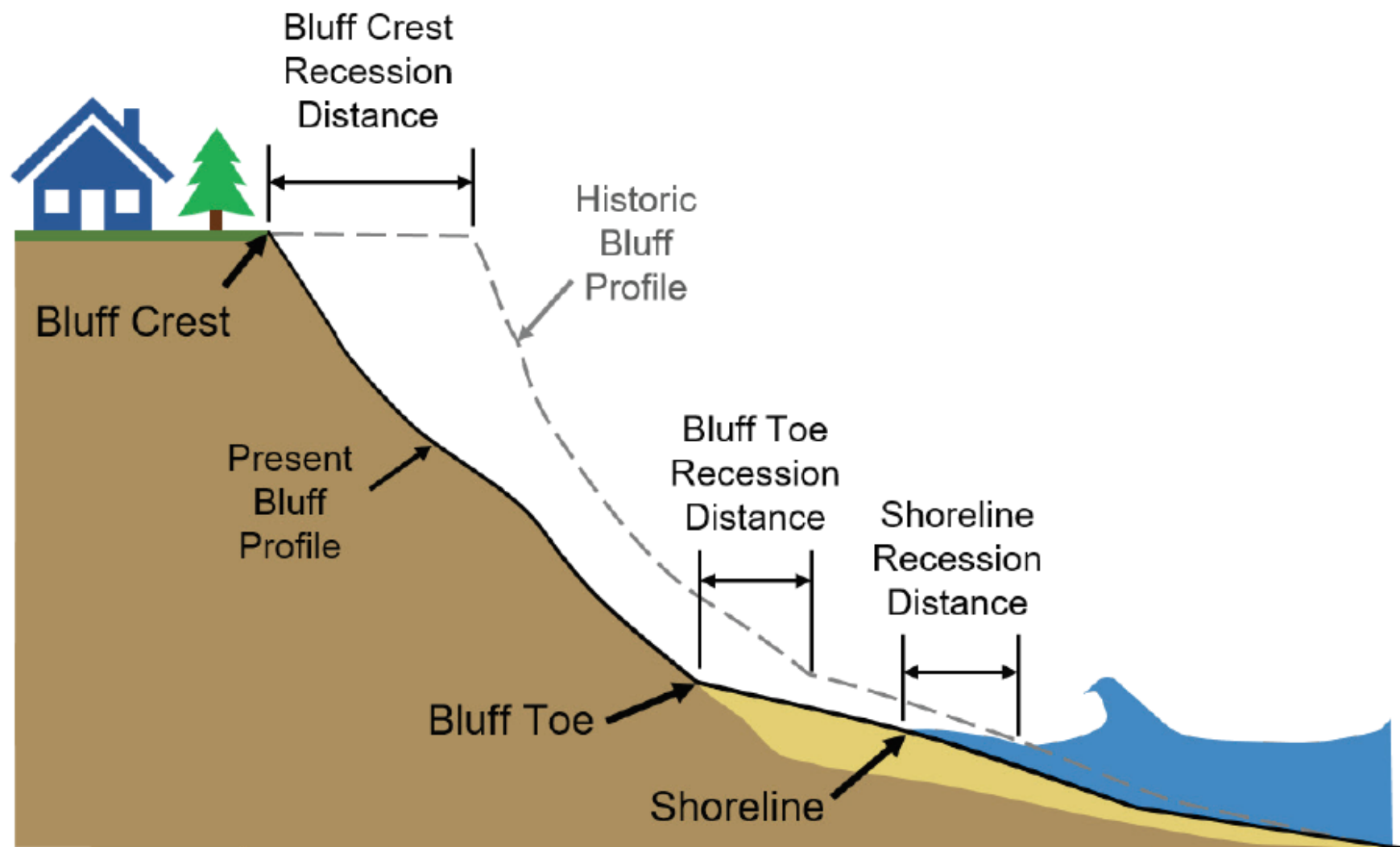
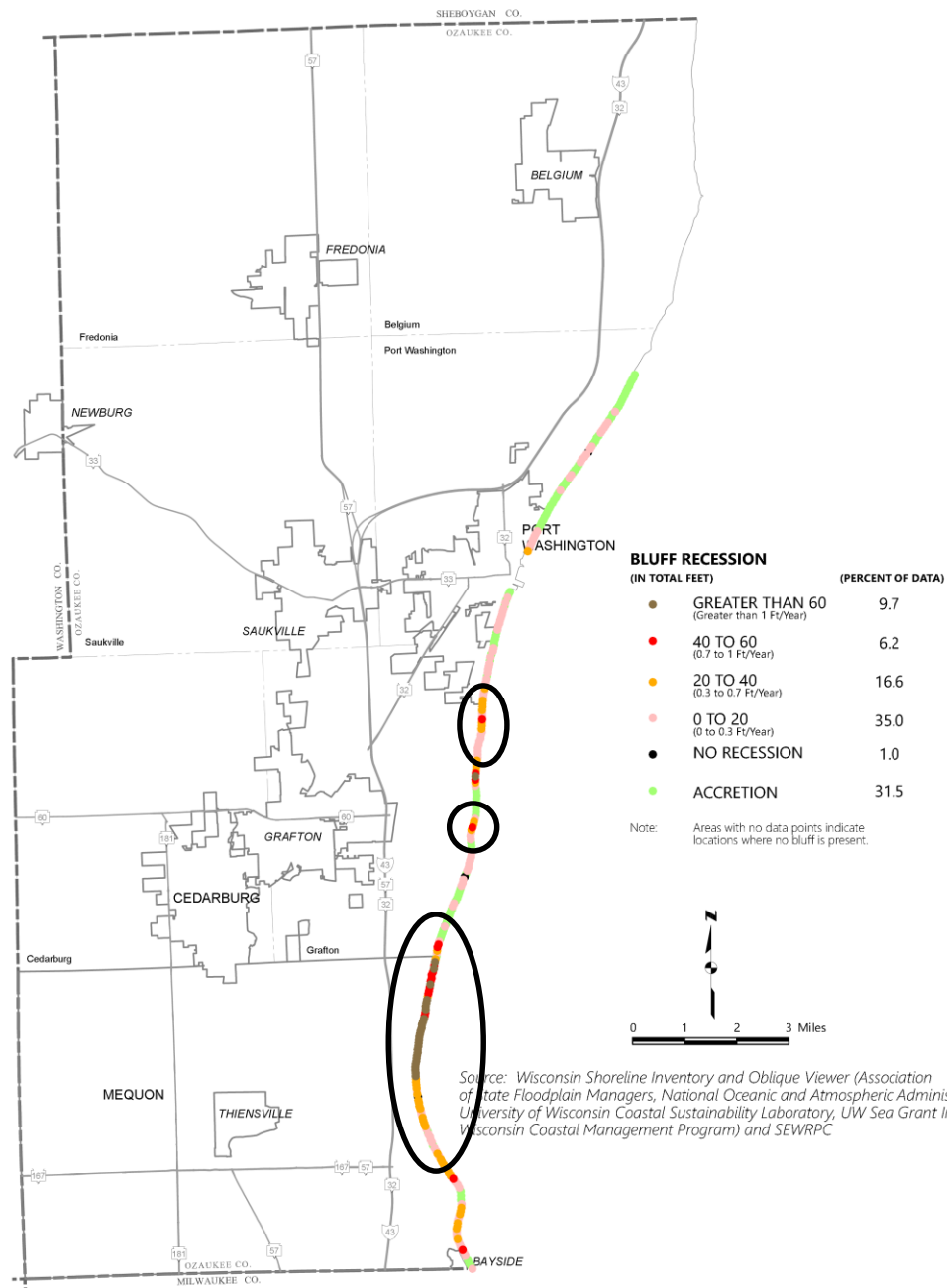


Figure 3.7
Bluff Recession Schematic

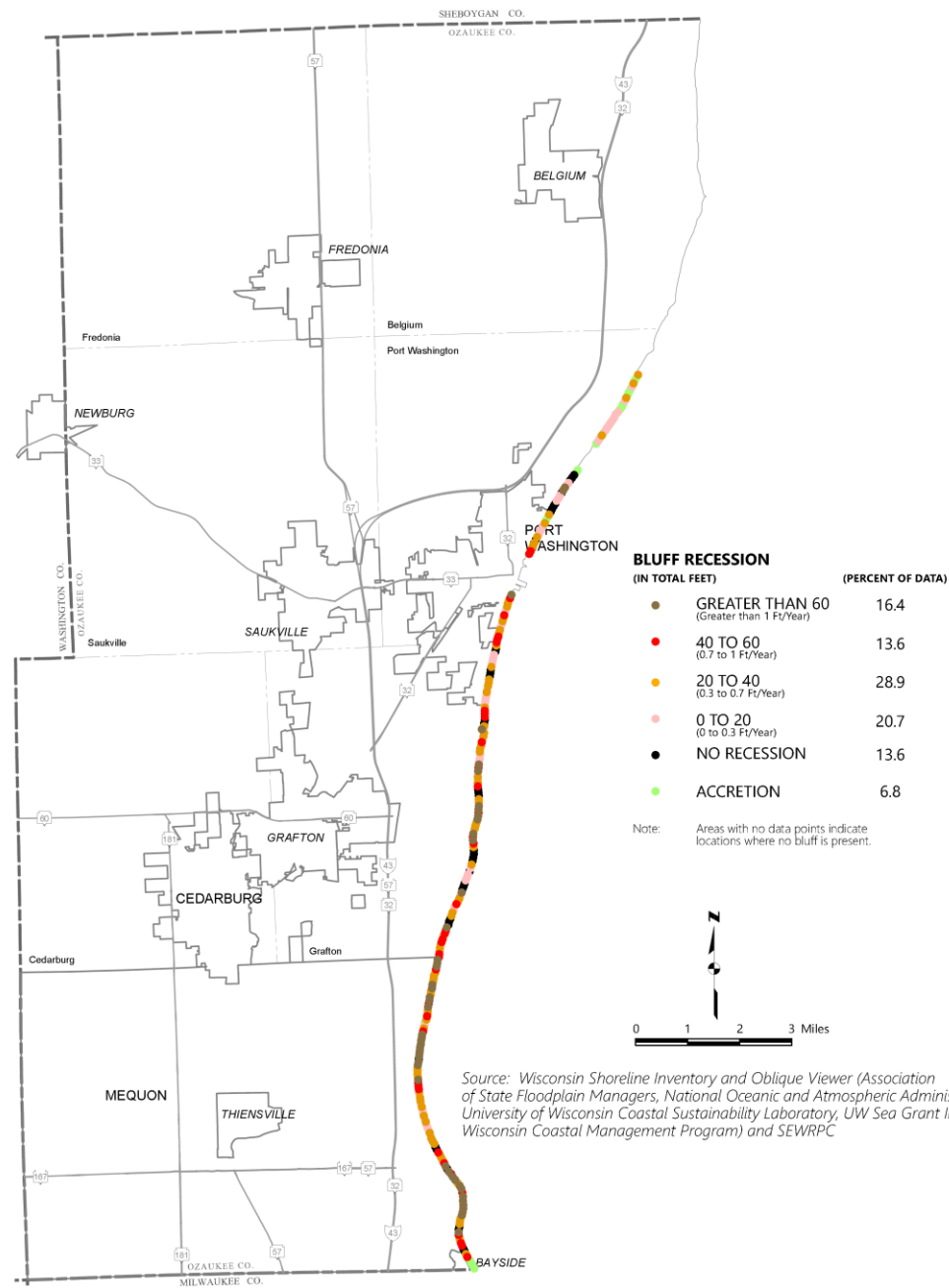


Source: Wisconsin Coastal Management Program

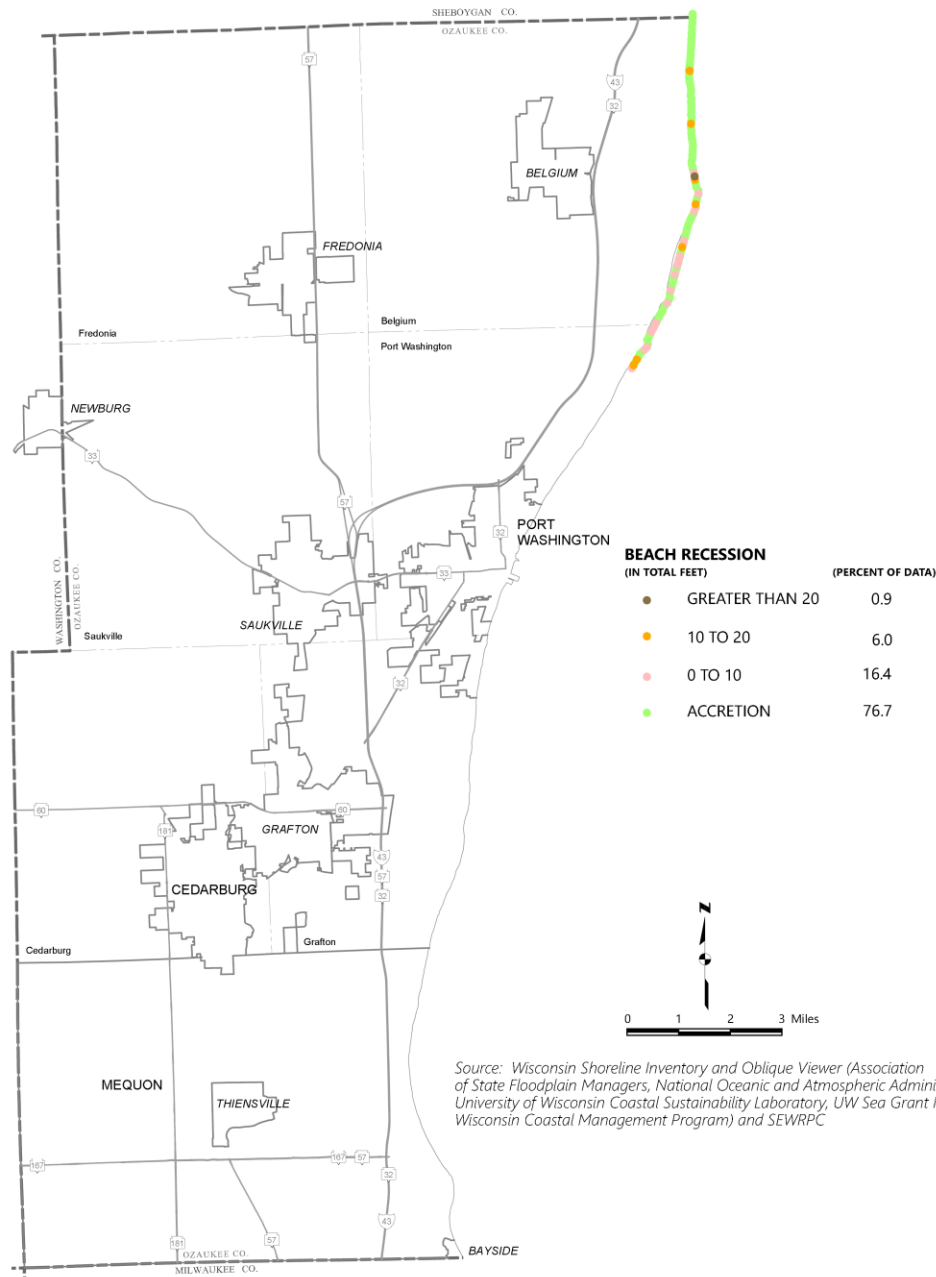
Map 3.14
Long Term Bluff Toe Recession in Ozaukee County: 1956-2015



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



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



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

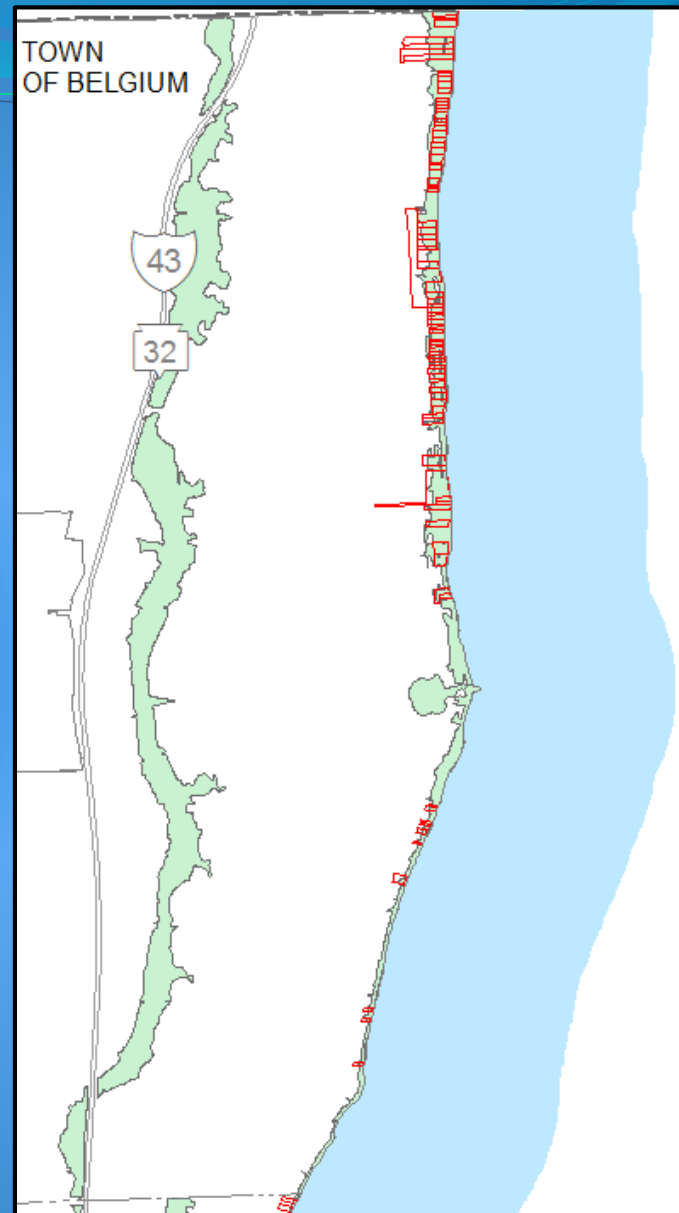
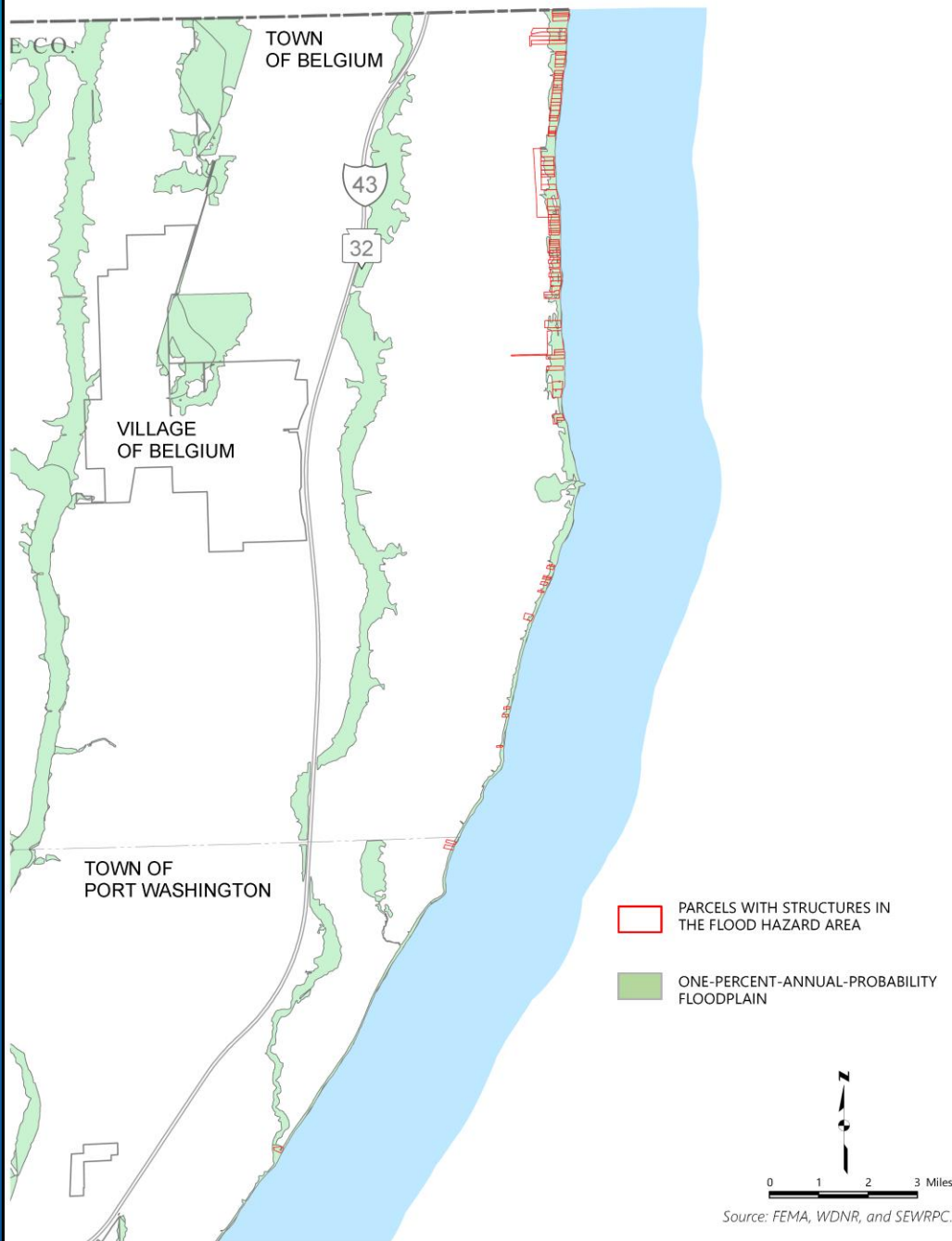


Table 3.21**Parcels Within the Low and High Risk Coastal Erosion Zones in Ozaukee County: 2016**

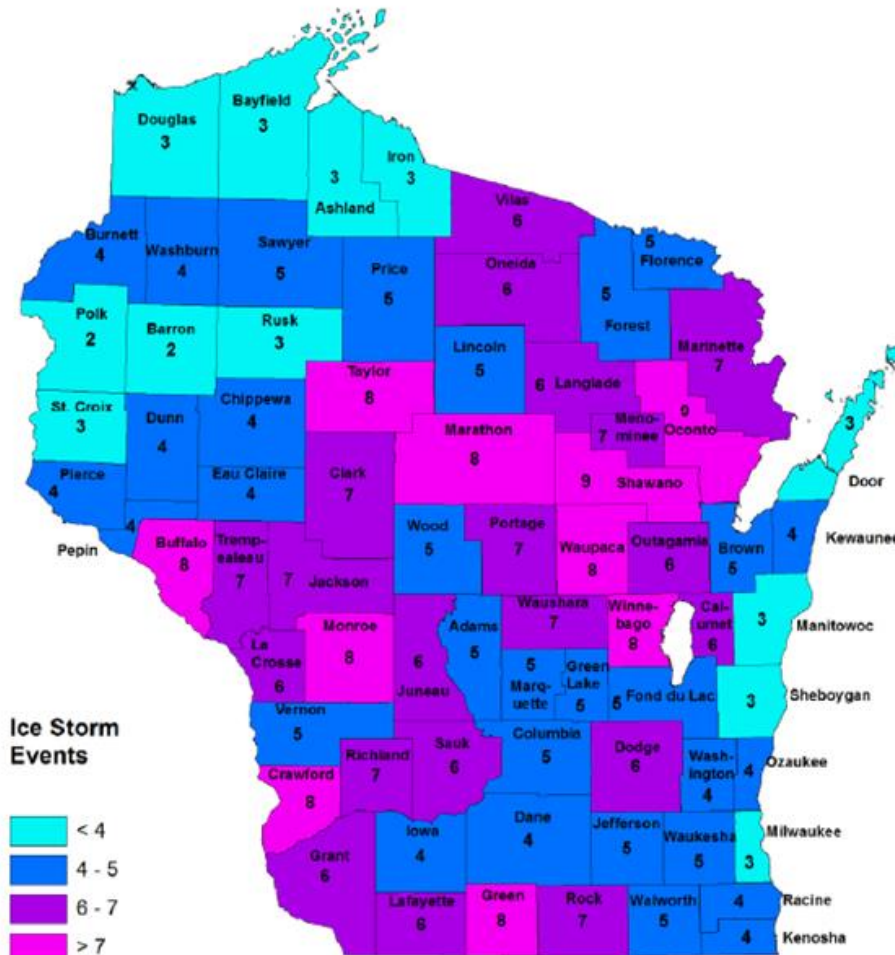
Ozaukee County	Improved Parcels in Erosion Risk Zone				Value of Improvements (2016 dollars)			
	Residential	Commercial	Manufacturing	Total	Residential	Commercial	Manufacturing	Total
Low-Risk Zone (within 0.5 miles)	2,556	154	13	2,723	561,999,600	85,203,700	11,789,700	658,993,000
High-Risk Zone (within 0.25 miles)	1,276	92	3	1,371	331,067,500	28,625,300	980,200	360,673,000
Total	3,832	246	16	4,094	893,067,100	113,829,000	12,769,900	1,019,666,000

Source: Wisconsin Emergency Management

Hazard Vulnerability Assessment For Winter Storms

Groundhog Day Blizzard of 2011

Figure 3.8
Number of Ice Storm Events in Wisconsin by County: 1982-2016



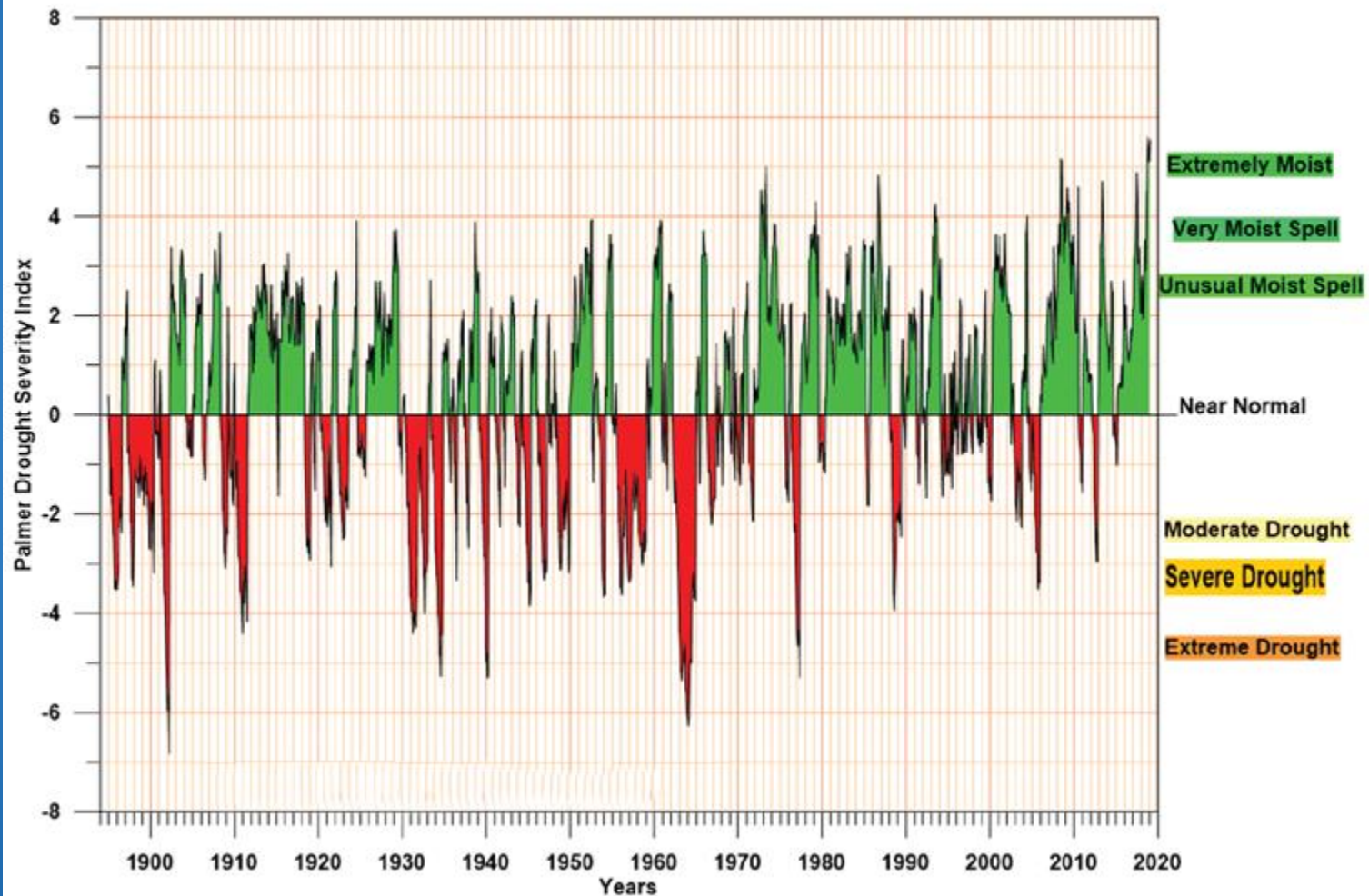
m/article/looking-back-at-groundhog-day-blizzard-of-2011



Hazard Vulnerability Assessment For Drought

Figure 3.10

Palmer Drought Severity Index for Southeastern Wisconsin: 1895 Through 2018

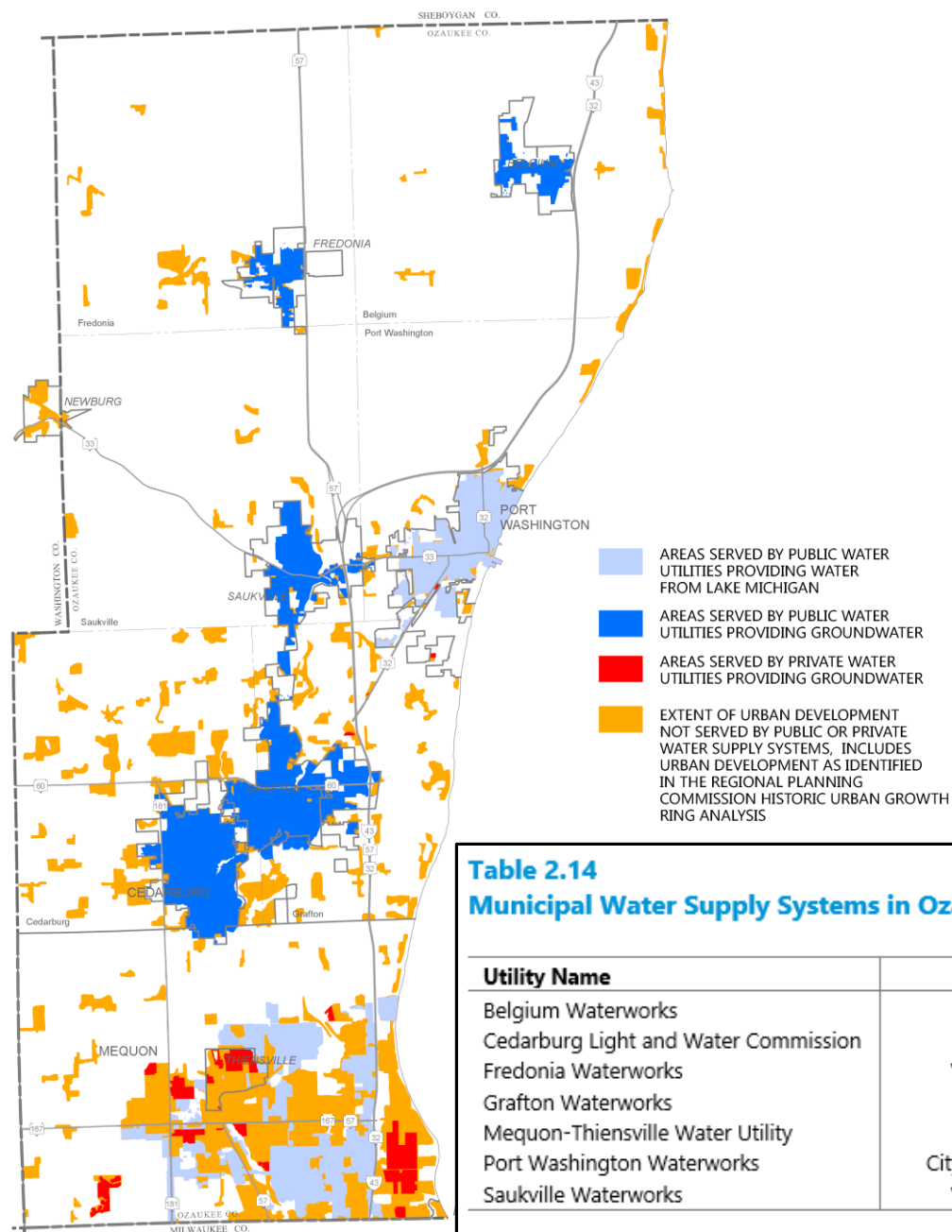


Source: University of Wisconsin Atmospheric and Oceanic Sciences

Hazard Vulnerability Assessment For Utility Failure:

- **Contamination or Loss of Water Supply**
- **Electrical Disruption or Outages**
- **Sewerage System Disruption, Failure, or Loss**
- **Natural Gas Utility Disruption or Loss**

Map 2.15
Areas Served by Public and Private Water Utilities Within the Ozaukee County Planning Area: 2010



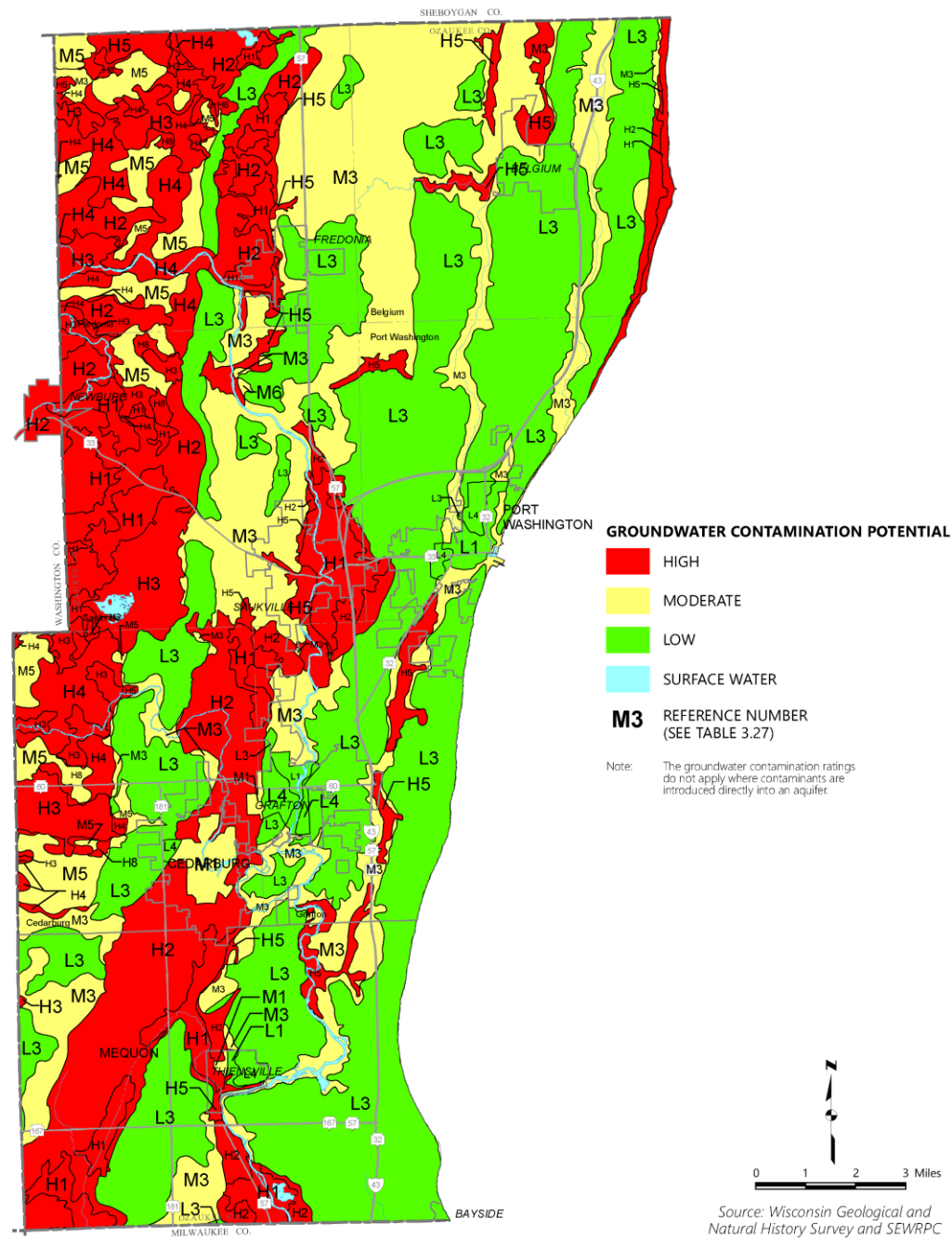
Contamination or Loss of Water Supply

Table 2.14
Municipal Water Supply Systems in Ozaukee County

Utility Name	Civil Division	Population Served	Source
Belgium Waterworks	Village of Belgium	2,245	Groundwater
Cedarburg Light and Water Commission	City of Cedarburg	11,900	Groundwater
Fredonia Waterworks	Village of Fredonia	2,191	Groundwater
Grafton Waterworks	Village of Grafton	11,490	Groundwater
Mequon-Thiensville Water Utility	City of Mequon	11,152	Lake Michigan
Port Washington Waterworks	City of Port Washington	11,439	Lake Michigan
Saukville Waterworks	Village of Saukville	4,465	Groundwater

Source: Wisconsin Department of Natural Resources and SEWRPC

Map 3.20
Potential for Shallow Groundwater Contamination in Ozaukee County

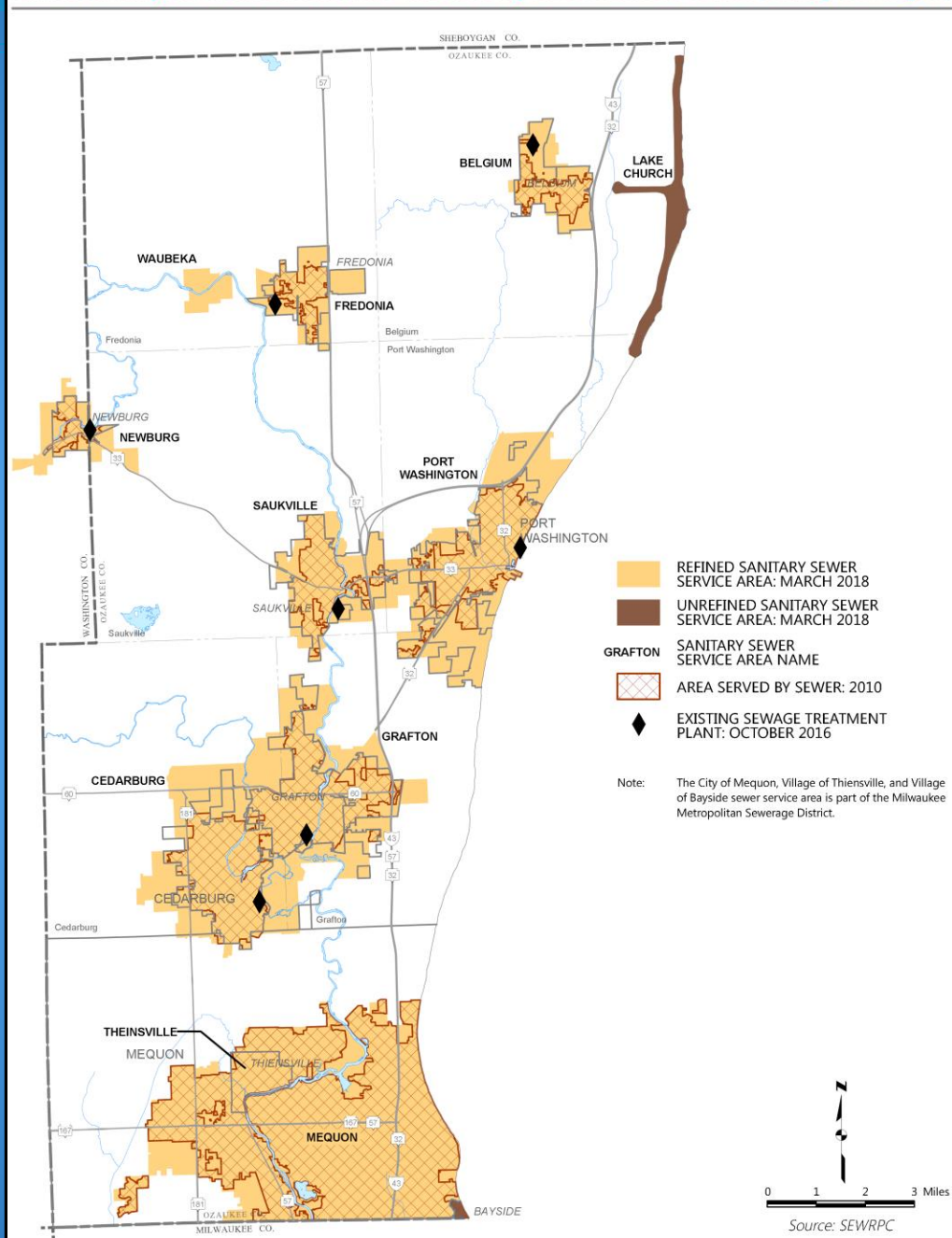


Electrical Disruption or Outage

Port Washington Generating System



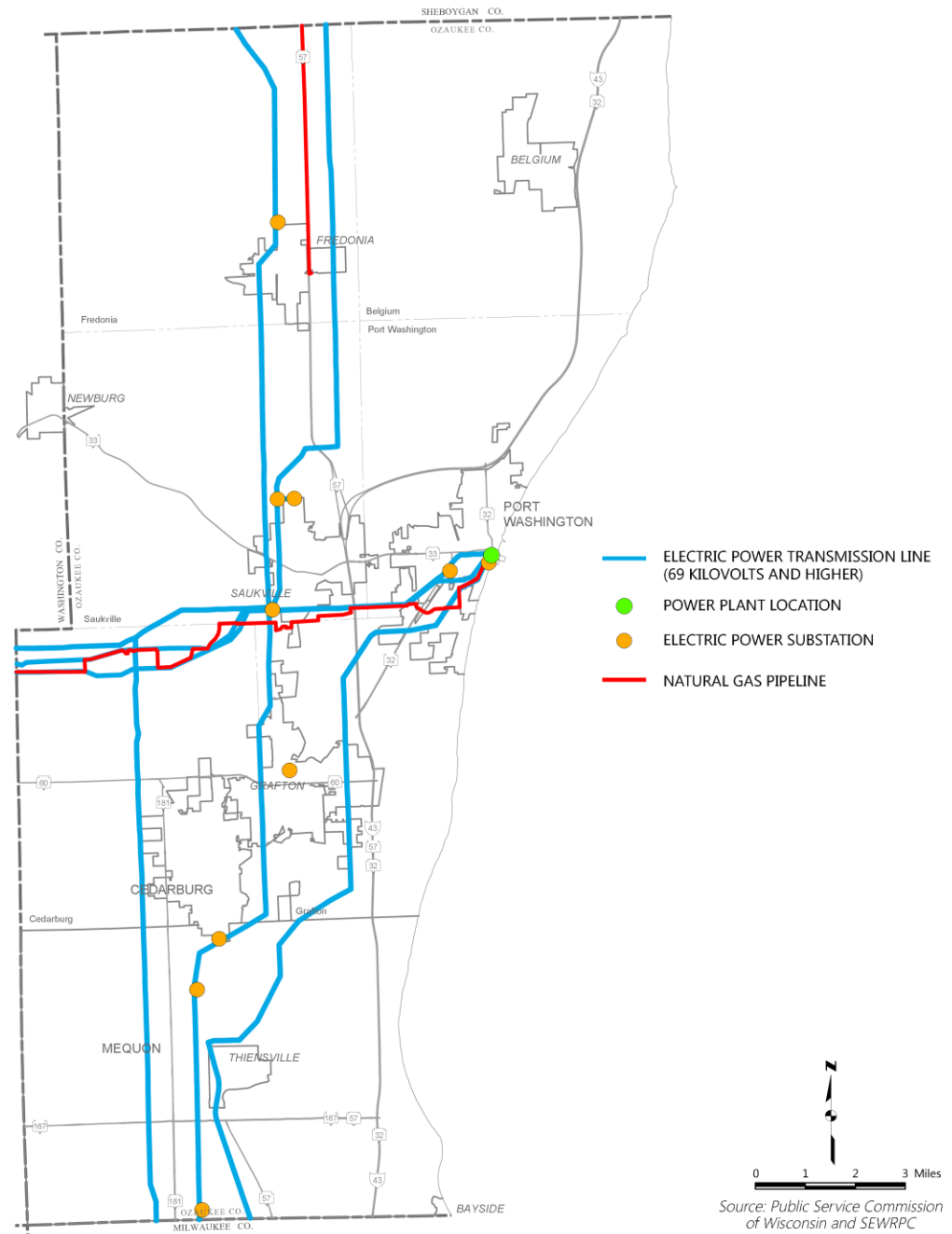
Sewerage System Disruption, Failure, or Loss



Natural Gas Utility Disruption or Loss

Map 2.17

Electric Power Transmission Lines, Power Plants, Substations, and Natural Gas Pipelines in Ozaukee County: 2015



Source: Public Service Commission
of Wisconsin and SEWRPC

Vulnerability Assessment for Fog



Chapter 4

Hazard Mitigation Goals

1. Preserve Life and Minimize the Potential for Injuries
2. Preserve and Enhance the Quality of Life Throughout Ozaukee County by Identifying Potential Property and Crop Damage Risks...
3. Promote Countywide Coordination, Planning, and Training...
4. Maintain Various Land Uses that Preserve and Protect Natural Resources of the County...
5. Increase Public Awareness to Hazards...
6. Identify Potential Funding Sources to Assist Mitigation Projects and Programs...

Next Steps...

- LPT Provide Any Additional Comments Edits
- Edits to be Incorporated Into Draft Chapters 3 and 4
- Public Meeting....June 2019?
- Chapters 5 and 6

Project Web Site

- <http://www.sewrpc.org/SEWRPC/communityassistance/Hazard-Mitigation-Planning.htm>
 - Agendas and other meeting materials
 - Summary notes from meetings
 - Presentations
 - Draft chapters as they are completed
 - Comment screen
 - Other ways to send a comment
- Email to mbeauchaine@sewrpc.org