Hazard Mitigation Plan

Ozaukee County, Wisconsin

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Acronyms

ACE	Army Corps of Engineers
ADA	Americans with Disabilities Act
ALS	Advanced Life Support
ARC	American Red Cross
ARES	Amateur Radio Emergency Services
ASCS	Agriculture Stabilization and Conservation Service
ASL	Above Sea Level
ASPR	Assistant Secretary for Preparedness and Response
CAD	Computer Aided Dispatch
CAR	Communities-at-Risk
CBRNE	Chemical, Biological, Radiological, Nuclear, or Explosive
CDBG	Community Development Block Grant
CEMP	Comprehensive Emergency Management Plan
CERT	Community Emergency Response Team
CFR	Code of Federal Regulations
CI	City
CO	County
CTH	County Highway
DFIRM	Digital Flood Insurance Rate Map
DHS	U.S. Department of Homeland Security
DNR	Wisconsin Department of Natural Resources
DOD	U.S. Department of Defense
DOJ	U.S. Department of Justice
DPW	Department of Public Works
DTM	Digital Terrain Maps
EAP	Emergency Assistance Program or Emergency Action Plan
EF	Enhanced Fujita Scale
EHS	Extremely Hazardous Substance
EM	Emergency Management
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EOC	Emergency Operations Center
EOP	Emergency Operating Plan
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
F	Fahrenheit or Fujita Scale

FCC	Federal Communications Commission
FCIC	Federal Crop Insurance Corporation
FD	Fire Department
FEMA	Federal Emergency Management Agency
FIRMS	Flood Rate Insurance Maps
FMA	Flood Mitigation Assistance
FOIA	Freedom of Information Act
FOUO	For Official Use Only
FSA	Farm Service Agency
GIS	Geographic Information System
HazMat	Hazardous Materials
HazMit	Hazard Mitigation
HAZUS	Hazards United States
HAZUS-MH	Hazards United States Multi-hazard
HMGP	Hazard Mitigation Grant Program
HUD	U.S. Department of Housing and Urban Development
HVA	Hazard Vulnerability Analysis
HWY	Highway
ICS	Incident Command System
LE	Law Enforcement
LEPC	Local Emergency Planning Committee
LIDAR	Laser Imaging Detection and Ranging
LPDM	Lagrangian particle dispersion
LWM	Land and Water Management Department
MABAS	Mutual Aid Box Alarm System
MAP	FEMA's Risk Mapping, Assessment and Planning
MHz	Megahertz
MMI	Modified Mercalli Intensity Scale
MMSD	Milwaukee Metropolitan Sewerage District
MOU	Memorandum of Understanding
MPH	Miles Per Hour
MSDS	Material Safety Data Sheet
NFIA	National Flood Insurance Act
NFIF	National Flood Insurance Fund
NFIP	National Flood Insurance Program
NFPA	National Fire Protection Association
NIDIS	National Integrated Drought Information System
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration

NRP	National Response Plan
NWS	National Weather Service
OJA	Office of Justice Assistance
PA	Public Address (System)
PDM	Pre-Disaster Mitigation
PGA	Peak Ground Acceleration
PH	Public Health
RACES	Radio Amateur Civil Emergency Service
RES1	Single Family Dwelling
RES2	Manufactured Housing
RFC	Repetitive Flood Claims
SARA	Superfund Amendments and Reauthorization Act
SBA	Small Business Administration
SMART	Spatial Management, Analysis and Resource Tracking (Planning)
SMART	Suburban Mutual Aid Response Team (Law Enforcement)
SPI	Standardized Precipitation Index
SRL	Severe Repetitive Loss
STH	State Highway
SWAT	Special Weapons and Tactics
TN	Township
UASI	Urban Area Security Initiative
UC	Unified Command
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
UW	University of Wisconsin
VHF	Very High Frequency
VI	Village
VOAD	Voluntary Organizations Active in Disaster
WEM	Wisconsin Emergency Management

Introduction and Background

The Ozaukee County Hazard Mitigation Plan is intended to provide strategies for reducing susceptibility to future damage to public and private infrastructure in the county. The Ozaukee County Emergency Management Office applied for and received assistance from the Hazard Mitigation Grant Program (HMGP) to update the existing plan, which was nearing the end of its five-year life-span, in 2011 as part of FEMA-1944-DR-WI. This grant program is sponsored by the Federal Emergency Management Agency (FEMA) and is administered by the state Department of Military Affairs - Wisconsin Emergency Management (WEM). The procedures utilized in preparing this plan are based on guidance provided by FEMA and WEM and should therefore be considered consistent with the requirements and procedures in the Disaster Mitigation Act of 2000.

Section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (P.L. 93-228, as amended) is the impetus for involvement of state and local governments in evaluating and mitigating natural hazards as a condition of receiving federal disaster assistance. Federal Emergency Management Agency (FEMA) rules for implementing Section 409 are in 44 CFR Part 206 Subpart M.

Section 409 states that the county is obligated to try to reduce damage susceptibility to any hazard that has received relief funding in the past. Developing a hazard mitigation plan provides an opportunity for communities to meet this requirement by developing strategies for reduction of potential losses from future natural disasters. Hazard mitigation planning is the process of developing a set of actions designed to reduce or eliminate long-term risk to people and property from hazards and their effects. Completion of this plan should put Ozaukee County in an advantageous position when competing for pre- and post-disaster mitigation project dollars because projects have been pre-identified. The cooperation of government, private and volunteer agencies is essential in mitigation efforts and over the long term it is hoped that implementation of this plan will save taxpayer dollars because less money is needed for post-disaster recovery activities. Furthermore, mitigation planning measures incorporated in economic or community development goals support more comprehensive and effective government. This plan evaluates the risks that all natural

hazards pose to the citizens and property of Ozaukee County by presenting:

- A profile and analysis of past hazardous events
- An assessment of vulnerability of community assets
- Potential hazard mitigation strategies
- Methods for building community support

Plan Overview

The Ozaukee County Hazard Mitigation Plan provides background information on Ozaukee County and identifies those hazards that have occurred or could occur in the county. It includes a description of each hazard, its frequency of occurrence, appropriate actions in case of emergency and possible steps to mitigate the hazard. These hazards are the basis for the development of all county emergency plans.

A well-prepared plan allows emergency management to act swiftly and efficiently in the event of a hazard, reducing the damage and the cost incurred from displacing residents and businesses. Hazard mitigation activities will be emphasized in the plan as a major component of overall emergency management. The plan is intended to provide strategies for reducing future damages to public and private infrastructure in the county, including flood damage.

Previous Planning Efforts and Legal Basis

The Ozaukee County Division of Emergency Management has completed and regularly updates the Ozaukee County Hazard Analysis This Hazard Vulnerability Analysis (HVA) identifies all likely natural and technological hazards that might or have occurred within the county and is based on the State of Wisconsin's HVA. The local HVA does not generally include detailed mitigation strategies for the identified hazards.

There have also been plans and ordinances completed by individual Ozaukee County departments or municipalities, some of these were used as reference materials for this plan, including:

Ozaukee County Code of Ordinances[1]
Chapter 7 Shoreland and Floodplain Zoning
Chapter 11 Nonmetallic Mining Reclamation

City of Cedarburg Municipal/Land Use Code[2]
Title 6 Public Works
Title 7 Licensing and Regulation
Title 9 Public Utilities
Title 13 Zoning Code
Title 14 Land Division and Subdivision Regulations
Title 15 Building and Sign Code

City of Mequon Code of Ordinances[3]
Chapter 10 Buildings and Building Regulations
Chapter 30 Fire Prevention and Protection
Chapter 84 Tree Preservation
Chapter 86 Utilities

City of Port Washington Municipal Codes[4]
Chapter 5 Fire
Chapter 9 Licenses And Permits
Chapter 13 Harbors and Waters
Chapter 15 Building Code
Chapter 16 Electrical Code
Chapter 17 Plumbing Code
Chapter 18 Subdivision Control Ordinance
Chapter 20 Zoning Code
Chapter 25 Construction and effects of Ordinances

Village of Fredonia Code of Ordinances[5] (Chapters 7-15 online)
Chapter 7 Licensing and Regulations
Chapter 9 Public Utilities
Chapter 13 Zoning
Chapter 14 Subdivisions
Chapter 15 Building Code

Village of Grafton Municipal Code[6]
Title 7 Fire Prevention and Protection

[1] http://www.co.ozaukee.wi.us/Ordinances/Index.htm
[2] http://www.ci.cedarburg.wi.us/City_Info_Municipal_Code.htm
[3] http://www.municode.com/Resources/gateway.asp?pid=13876&sid=49
[4] http://www.ci.port-washington.wi.us/MunicipalCodes/Index.htm
[5] http://www.village.fredonia.wi.us/Ordinances/Index.html
[6] http://www.village.grafton.wi.us/code/contents.htm

Title 14 Trailers and Trailer Courts
Title 16 Buildings and Construction
Title 18 Subdivisions
Title 19 Zoning
Title 21 Floodplain Zoning
Title 22 Shoreland-Wetland Zoning
Title 23 Stormwater Management and Erosion Control

Village of Saukville Municipal Code[7]
Chapter 72 Building Construction
Chapter 90 Driveways
Chapter 94 Electrical Standards
Chapter 101 Fire Prevention
Chapter 115 Housing Standards
Chapter 147 Plumbing Standards
Chapter 159 Sewers
Chapter 162 Shoreland-Wetland Zoning
Chapter 176 Subdivision Regulations
Chapter 187 Trees And Shrubs
Chapter 205 Zoning

Village of Thiensville Code of Ordinances[8]
Chapter 14 Buildings and Building Regulations
Chapter 30 Environment
Chapter 34 Fire Prevention and Protection
Chapter 38 Floods
Chapter 42 Historic Preservation
Chapter 78 Utilities
Chapter 82 Zoning

Village of Bayside Municipal Code[9]

Chapter 14 Buildings and Building Regulations
Chapter 38 Environment
Chapter 42 Fire Prevention and Protection
Chapter 46 Floods
Chapter 90 Subdivisions
Chapter 102 Utilities
Chapter 106 Zoning

[7] http://www.e-codes.generalcode.com/codebook_frameset.asp?ep=fs&t=ws&cb=1791_A
[8] http://www.village.thiensville.wi.us/CodeOrdinances.htm
http://www.municode.com/Resources/gateway.asp?pid=12862&sid=49
[9] http://www.municode.com/resources/gateway.asp?pid=13080&sid=49

Town of Cedarburg Code of Ordinances[10]
Chapter 108 Building Construction
Chapter 123 Construction Site Erosion Control
Chapter 154 Fire Prevention
Chapter 184 Land Division
Chapter 186 Landmarks Preservation
Chapter 192 Licenses and Permits
Chapter 206 Mining, Nonmetallic
Chapter 214 Mobile Homes and Trailers
Chapter 242 Pollution Abatement
Chapter 320 Zoning

Town of Fredonia Code of Ordinances[11]
Chapter 5 Fire Protection
Chapter 8 Public Works
Chapter 12 License and Permits
Chapter 14 Building Code
Chapter 15 Plumbing Code
Chapter 16 Electrical Code
Chapter 17 Zoning Code
Chapter 18 Subdivision and Platting

Town of Port Washington Codes[12]
Chapter 150 Building Construction
Chapter 165 Culverts and Driveways
Chapter 190 Fire Prevention
Chapter 195 Flood Mitigation Plan
Chapter 232 Land Use Plan
Chapter 340 Zoning and Subdivisions

The local hazard vulnerability analysis serves as the starting point for the hazard mitigation plan. Other data on historical events is gathered from the National Weather Service's storm report database, recent news reports, local resources (e.g., website; local community ordinances; local plans such as the comprehensive plan, stormwater management plans), the FEMA Region V mitigation survey and from the memories of the local planning team members. Team members are presented with this educational background data and asked to rank their concern (likelihood of future occurrences and amount of disruption/damage should it

[10] http://www.e-codes.generalcode.com/codebook_frameset.asp?ep=fs&t=ws&cb=2158_A
[11] http://www.co.ozaukee.wi.us/TownFredonia/Code/Index.htm
[12] http://www.co.ozaukee.wi.us/TownPort/Codes/Index.htm

occur) on a five-point scale (very high, high, medium, low, very low). From that, team members, members of the community, survey respondents and other planning participants are asked to determine hazard mitigation strategies that might benefit their communities. Local existing plans are referenced again at this time, with the members and authors of these plans (e.g., comprehensive, stormwater management) serving as core members of the workgroup committee. The selected mitigation strategies are recorded and detailed in each chapter as well as in the table in Appendix C.

Mitigation strategies are reviewed over the five years of the plan's life by the leadership staff from the applicable departments (e.g., Emergency Management, Sheriff's Office/Communications, Highway, Land and Water Management, Planning and Parks) with the elected leaders from the jurisdictions to triage projects and determine what can and should be done within the planning period. These options are usually discussed in open meetings prior to implementation, as required by Wisconsin state law. The determining factor for most projects is obviously budget availability. The units of government have several options for funding implementation including grants, special taxing authority (for the project and/or any matching funds), general purpose revenue from existing budgets and regulatory authority, which can be used to require that an individual or business complete the project using their funds. The units of government use or improve, if necessary, the mechanisms described above to ensure the implementation of hazard mitigation ideas.

Plan Preparation, Adoption and Maintenance

The Ozaukee County Emergency Management Director contracted with Emergency Planning, Training and Exercise Consulting (EPTEC, Inc.) to draft this plan. A Hazard Mitigation Committee was organized to oversee the completion of this plan. The committee members include:

- Mark Owen, Ozaukee County Emergency Management
- Mary Fitzgerald, Ozaukee County Emergency Management
- Paul Riegel, Ozaukee County Emergency Management
- Kirsten Johnson, Ozaukee County Public Health Department
- Carolee Jacque, Ozaukee County Public Health Department
- Diana Noack, Ozaukee County Public Health Department
- Patty Ruth, Ozaukee County Public Health Department

- Andy Holschbach, Ozaukee County Planning, Resources and Land Management
- Christina Richards, Ozaukee County Land Information Office
- Beth Vargo, Ozaukee County Sheriff's Office
- Mike Yuhas, Ozaukee County Amateur Radio Emergency Services
- George King, Local Emergency Planning Committee, American Red Cross Volunteer, Ozaukee Co.
- Kevin Runkel, City of Cedarburg Emergency Management
- Randy LeRoy, City of Mequon, Columbia St Mary's
- Scott Tyler, City of Mequon Police Department
- Mark Mitchell, City of Port Washington Fire Department
- Richard Howells, Village of Belgium President
- Roger Strohm, Village of Fredonia Public Works Department
- Dan Murphy, Village of Grafton , Aurora Medical Center
- Steven Zils, Village of Grafton , Aurora Medical Center
- Bob Sehmer, Village of Grafton
- Matt Bernarski, Village of Newburg
- Mike Heili, Village of Newburg
- Jack Morrison, Village of Saukville
- Dianne Robertson, Village of Thiensville
- Danny Birenbaum, Town of Belgium
- Brian Schommer, Town of Fredonia Fire Department
- Ben Schliesman, SE Region WI Emergency Management
- Kurt Worden, WI Red Cross
- Lenora Borchardt, EPTEC, Inc. (Contractor)

An informational brochure was created and copies were distributed throughout the community at local community gathering points such as municipal halls, libraries, etc. Meetings were held with officials from the municipalities to explain and gather input regarding the program (e.g., previous occurrences, mitigation strategies.) The FEMA Region V survey was sent to the clerk and chief elected official of every municipality (town, village and city) as well as key county departments (e.g., planning, highway) for completion; surveys were received back from county offices and the incorporated municipalities as well as many of the unincorporated towns. The compiled results of the surveys, along with the cover letter, are in Appendix G.

The committee met several times, first to evaluate and incorporate input from local officials and then to review and provide input on the progress of the plan. A public notice was placed in the newspaper to invite members of the public, local officials, academia and business and industry leaders to review the plan. A working draft of

the plan was distributed to the County Emergency Management Directors from Milwaukee, Sheboygan and Washington Counties. Comments received were reviewed and incorporated into the plan as appropriate. A copy of the mitigation brochure and a list of meeting dates and informational sessions to gather public and official input can be viewed in Appendix G.

The Ozaukee County Hazard Mitigation Plan Workgroup reviewed the past events records (generally gathered from the National Weather Service) and a consensus was reached on the anticipated probability of future events. This probability was designated as "very high," "high," "medium," "low" or "very low" by the workgroup based on their evaluation and experience with the data.

The workgroup also, after reviewing the draft plan, selected the potential mitigation projects, which are listed in Appendix C (Summary of Mitigation Strategies) and discussed in more detail in each chapter's Hazard Mitigation Strategies section. The workgroup participants were given the *Mitigation Ideas: Possible Mitigation Measures by Hazard Type* (Mitigation Ideas, FEMA-R5, 9/02) booklet as an aid to generating ideas. All of the ideas generated during the workgroup meetings were incorporated into the plan and can be found in the Hazard Mitigation Strategies section of each chapter and are summarized in Appendix C. Based on the information collected, each of these projects was assigned a "very high," "high," "medium," "low" or "very low" priority based on the workgroup's internal consensus assessment during a discussion of the balances of risk, reward, cost effectiveness (cost benefit) and likelihood of local will and funding (local or grant) to complete the strategy.

The municipal leaders were briefed regarding the need to formally adopt this plan as a prerequisite for future mitigation funding eligibility. A draft was sent to Wisconsin Emergency Management (WEM) for review and tentative approval. Based on WEM's comments, a final draft plan was completed and was forwarded to FEMA for determination of approvability. Once deemed approvable by FEMA, a general meeting was held to review the plan with members of the public, local officials, academia and business and industry leaders. Information and adoption paperwork was provided to the municipal leaders advising them of the need to formally adopt this plan as a prerequisite for future mitigation funding eligibility.

A resolution was passed by the Ozaukee County Board, the Cities of Cedarburg and Port Washington; the Villages of Belgium,

Saukville and Thiensville and the Towns of Belgium, Cedarburg, Grafton and Saukville. The City of Mequon, the Villages of Bayside, Fredonia, Grafton and Newburg and the Towns of Fredonia, Port Washington and Thiensville did not adopt the plan. Scanned copies of the adoption resolutions can be found in Appendix B. The final plan has been submitted to WEM for review and certification and notice of acceptance has been received of FEMA plan approval as of {insert date}.

The Disaster Mitigation Act of 2000 requires the monitoring, evaluation and updating of the hazard mitigation plan every five years. This hazard mitigation plan is designed to be a "living" document and therefore will be reviewed and updated within five years from its approval date. The Ozaukee County Hazard Mitigation Plan Workgroup will provide leadership and guidance throughout the plan's life cycle (i.e., monitoring, evaluating and updating.) Updates will allow municipal leaders and the public to provide input into the process. The public will be notified of this opportunity via legal public notices.

The process for integrating hazard mitigation actions into other planning mechanisms will be led by the County Emergency Management Director. As he receives information between the five-year update periods (e.g., comprehensive or capital improvement plans) that might be included, it will be added to Appendix H: Inter-Revision Updates. Ozaukee County Division of Emergency Management maintains responsibility and is the point of contact for all issues (e.g., monitoring, updating and evaluating the effectiveness) regarding this plan. Municipalities can contact the County Emergency Management Director to add updated local information to Appendix H at any time. Furthermore, the County Emergency Management Director will include in the Plan-of-Work activities program the distribution of an annual letter and media press release that reaches out to the plan's stakeholders (county offices, municipalities, the public, etc.). The communications will query if there are new elements for the mitigation plan as well as asking if there are any plans (new or updates) in which the mitigation plan can and/or will be used as a source plan. Comments will be received and discussed at an annual publically-noticed open meeting of the county's Emergency Management committee. Note that after a disaster, the Emergency Management committee may also meet to discuss mitigation strategies that might be applicable. These same stakeholders will be invited to fully participate in the five-year plan update, which will be detailed in the

updated plan documents and will fully conform to FEMA's requirements.

During the plan's lifecycle, the county and incorporated municipalities will consider the strategies listed in Appendix C as they annually prioritize "regular" maintenance projects, as they set their annual budgets, after a disaster period and as grants become available that might help off-set the costs of some of the strategies listed within the plan. The latter will be instigated by notice of these opportunities by the County Emergency Management Director. These projects will be reported in the annual letter to the County Emergency Management Director. The Director will keep and compile the inter-revision data for inclusion in the five-year update, which will be coordinated through County Emergency Management beginning at least 18 months prior to expiration and at which time they will report on their progress towards meeting the hazard mitigation goals. The update will bring together many of the same workgroup members as well as any new stakeholders (e.g., elected officials, businesses, academia, members of the public) who respond to the invitation to participate and have an interest in mitigation planning.

The plan participants also recognize this document as an important planning tool within the community and will use this plan as a reference as they complete other related planning. The County Emergency Management Director, the Ozaukee County Land and Water Management and Planning and Parks Departments will use this plan as they update the Ozaukee County Comprehensive Plan as well as community ordinances such as zoning, shoreland, floodplain, wetland, etc. and in other stand-alone plans such as those for park and recreation, sustainability and farmland preservation and will refer to it as they are involved in the planning and other preparedness activities of their municipalities. Many of these plans are on a regular updating cycle and as they come up for renewal, emergency management will be notified and provide any relevant planning materials (from the hazard mitigation plan and any additional information received since the plan's approval). Municipalities with planning departments have also committed to referring to the mitigation plan in their zoning updates, flood and shoreland planning and in their comprehensive plans. After this plan has passed its reviews from Wisconsin Emergency Management (WEM) and the Federal Emergency Management Agency (FEMA) and is approved, the County Planning Department and the municipalities will receive a copy. They have committed to using and referring to the mitigation plan as they complete their

regularly scheduled reviews and updates of the aforementioned plans. Ozaukee County Emergency Management will also refer to this plan in their emergency preparedness activities.

Physical Characteristics of Ozaukee County

General Community Introduction

When European explorers first came to the land now known as Ozaukee County, they found the native Menomonee, Pottawatomi, Sac and Fox Indian tribes of the Algonquin nation living in a land of outstanding natural beauty. Dense forests of hardwoods and evergreens covered the rolling hills. In the many valleys were streams of clear, cool, ever-flowing water threading their way to the sandy shore of Lake Michigan.

Between 1670 and 1680, the first Europeans to visit this land were the French traders, LaSalle and Joliet. They came down the west shore of Lake Michigan to establish trading and military posts in the name of France. The Jesuits (i.e., Allouez, Hennepin and Marquette) came to bring Christianity to the native inhabitants. No definite settlement of the territory was made by France and in 1761 she yielded her rights to the English who claimed possession until after the Revolutionary War. By the Treaty of 1835, the Native American tribes gave up their homeland and were moved to the country west of the Mississippi.

The first sale of lands by the government in Ozaukee County was made at Green Bay on November 24, 1835 to Wooster Harrison and Associates. They acquired the lands at the mouth of Sauk Creek, platted it and called it Wisconsin City. Later the name was changed to Washington City; it is now known as Port Washington.

The land making up Ozaukee County was originally part of Milwaukee County which made up the entire southeast section of Wisconsin. In 1830, the first Wisconsin Territorial Legislature set off from Milwaukee County a portion of this land and called it Washington County.

Because of the continued great dissension between several of the communities, principally Port Washington, Cedarburg, Grafton and West Bend concerning the location of the county seat, the people finally caused the division of Washington County into two: the present Ozaukee and Washington Counties.

[13]Rich limestone deposits and excellent fishing led to early development of quarries and harbors. Harrington Beach State Park now occupies the site of one of the county's original limestone quarries. Stone removed from this quarry was shipped from a dock on Lake Michigan's shore. Limestone deposits supported another quarry and tall lime kilns rose in what later became Lime Kiln Park in the Village of Grafton.

Although steep bluffs along most of the county's coastline hinder access to the lake, settlers took advantage of the low-lying topography of portions of Port Washington and Belgium and developed a harbor that permitted the fishing industry to flourish. The quarry dock in Belgium no longer exists but the harbor in Port Washington has undergone significant improvements. The harbor supports commercial and sport fishing and tourism provides a substantial income to Port Washington businesses.

Native Americans formed trails through Ozaukee County that became major transportation routes to other areas of the state. The village of Saukville grew at the intersection of two such Indian trails. Later, settlers used the old Green Bay Road as the primary pathway between Milwaukee and Green Bay and many small communities grew along the original trail. Hamilton, an unincorporated area in the Town of Cedarburg, is one such community.

Settlers appreciated Cedar Creek and the Milwaukee River for the power these waterways could provide. Many dams were built along the county waterways to run early mills. In more modern times, where Cedar Creek drops sixty-five feet in the City of Cedarburg, the waterway powered a hydroelectric facility. However, Cedarburg now buys its power and the Wisconsin Department of Natural Resources has been inspecting these old dams. Some have been removed; others still stand.

Limestone and large water resources were not the only attributes of Ozaukee County. Fertile ground, moderate temperatures and many small creeks and streams provided an ideal foundation for agriculture, particularly dairy farming. Several of the old octagonal and stone barns, which were once commonplace in the county, remain standing today as evidence of a rich agricultural heritage.[14]

[13] http://www.co.ozaukee.wi.us

[14] Ozaukee County Flood Mitigation Plan, rev. 9/10/01, pg. 2

Plan Area

Ozaukee County is the county with smallest land area in the State of Wisconsin, covering 235 square miles of land area with rivers, streams and creeks accounting for 1,566 acres of the total. Located on 25 miles of the western shores of Lake Michigan, the county encompasses approximately 900 square miles of Lake Michigan waters. Ozaukee County is home to approximately 85,135 people.

Ozaukee County lies within the Eastern Ridges and Lowlands geographical province. Topographic features are distinct, but they are low. Alternate weak and resistant rock layers are carved by streams and weather into a belted plain. This plain has parallel strips of upland and lowland corresponding to the more important resistant and weak strata. The uplands are called cuestas. A cuesta is a ridge which has a steep escarpment on one side and a long gentle slope of the other. The topography of the Eastern Ridges and Lowlands is controlled by cuestas. The Niagara Cuesta runs through Ozaukee County. The upland on the back slope of the Niagara cuesta is a region of very moderate relief, with glacial deposits forming the greatest irregularities. The erosion of the largest streams, like the Milwaukee River, results in a maximum relief of only 100 to 120 feet by cutting into the glacial drift and the rock.[15]

Ozaukee County is bordered on the east by Lake Michigan, on the south by Milwaukee County, on the west by Washington County and on the north by Sheboygan County.

In Wisconsin, there are three types of sub-county, full-service local government units: towns, which are unincorporated, and villages and cities, which are incorporated. Ozaukee County contains the Cities of Cedarburg, Mequon, and Port Washington; the Villages of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville, and Thiensville; and the Townships of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville. (See Appendix A for a map of Ozaukee County.) The County and all municipalities except … have adopted the plan (Copies of the adoptions can be found in Appendix B.)

[15] http://www.wisconline.com

Geology

Except for a few isolated spots in Ozaukee County where dolomite bedrock is exposed at the surface, the entire county is covered with glacial deposits. Glacial material, ranging from large boulders to fine-grained clays, were deposited during the most recent Ice Age between 25,000 to 13,000 years ago. These deposits have produced rich agricultural land and diverse plant/wildlife areas, and also influence local surface water and groundwater conditions in the county.[16]

The glacial till in the western part of the county is loamy. It consists of rocky material ground by the glacier, and it contains varying amounts of dolomitic stones, gravel, quartz sand, and silt. Large stones are common on the surface.

In the eastern part of the county, the till is reddish silty clay loam. This material first was deposited as red clay in the basin of lake Superior. It then was transported from this basin by water. Later, the material was reworked by the last advance of glacial ice and mixed with small pebbles and stones.

The outwash in the county consists of loose sand and gravel that have been transported by rapidly moving water from melting ice of the glacier. The finer rock particles have been washed away. Most of the stones in the outwash have been made round and smooth by the rapidly moving water.

Many areas in the county have a cap of wind-laid silty material on them. In such areas the surface layer is silt loam. The material laid down in lakes consists of stratified silt, clay and fine sand that were deposited in the slowly moving or stagnant water of temporary lakes. Some of the lakes were formed by ice barriers and others by the digging action of glaciers.

Deposits of organic material occur throughout the county. These deposits consist of partly decomposed reeds, sedges, trees, and other organic material. Many of the deposits are deep.[17]

[16] Ozaukee Land Guide, 2001
[17] Soil Survey of Ozaukee County, September 1970

Topography

Wisconsin lies in the upper Midwest between Lake Superior, the upper peninsula of Michigan, Lake Michigan and the Mississippi and Saint Croix Rivers. Its greatest length is 320 miles and greatest width 295 miles for a total area 56,066 square miles. Glaciation has largely determined the topography and soils of the state, except for the 13,360 square miles of driftless area in southwestern Wisconsin. The various glaciations created rolling terrain with nearly 9,000 lakes and several areas of marshes and swamps. Elevations range from about 600 feet above sea level along the Lake Superior and Lake Michigan shores and in the Mississippi floodplain in southwestern Wisconsin to nearly 1,950 feet at Rib and Strawberry Hills.

The Northern Highlands, a plateau extending across northern Wisconsin, is an area of about 15,000 square miles with elevations from 1,000 to 1,800 feet. This area has many lakes and is the origin of most of the major streams in the state. The slope down to the narrow Lake Superior plain is quite steep. A comparatively flat, crescent-shaped lowland lies immediately south of the Northern Highlands and embodies nearly one-fourth of Wisconsin. The eastern ridges and lowlands to the southeast of the Central Plains are the most densely populated and have the highest concentration of industry and farms. The uplands of southwestern Wisconsin west of the ridges and lowlands and south of the Central Plains make up about one-fourth of the state. This is the roughest section of the state, rising 200 to 350 feet above the Central Plains and 100 to 200 feet above the Eastern Ridges and Lowlands. The Mississippi River bluffs rise 230 to 650 feet.[18]

Elevations in the county range from 581 feet above sea level (ASL) at Lake Michigan to about 800 feet ASL in the Town of Cedarburg. The eastern part of Ozaukee County is within the Lake Border moraines. This area, which is on red till, consists of broad, parallel ridges that have gentle side slopes. The ridges run from the north to the south parallel to the shore of Lake Michigan. In the troughs between the ridges are drainageways and low, wet, marshy areas. The general rise of the slope is from the lakeshore to the west and the eastern slope of the ridge is longer than the western slope. The steepest slopes are between the ridges where erosion has deepened the troughs. Along the lakeshore much of the red till has

[18] http://www.uwex.edu/sco/state.html

been washed away and bedrock is exposed. Consequently, the thickness of the till and the height of the bluffs vary.

In the northwestern part of the county, the relief is steep and choppy in some places. These areas, which are mainly in Town of Fredonia, have a distinct kettle moraine relief.

Along the Milwaukee River and other major streams in the county are gently sloping terraces. Many depressional areas and nearly level basins occur in the county.[19]

Lake Michigan

Lake Michigan is the third largest Great Lake by surface area and the sixth largest freshwater lake in the world. Because Lake Michigan is joined to Lake Huron at the Straits of Mackinac, they are considered one lake hydrologically.

Located on 25 miles of the western shores of Lake Michigan, Ozaukee County encompasses approximately 900 square miles of Lake Michigan waters. Steep bluffs along most of the county's coastline hindered access to the lake waters. The low laying topography of portions of Port Washington and Belgium led to the development of a harbor and permitted the fishing industry to flourish. The quarry dock in Belgium no longer exists; however, the harbor in Port Washington has undergone significant improvements that allow it to support commercial and sport fishing activities.

Shoreline erosion and bluff stability conditions are important considerations in planning for the protection and sound development and re-development of lands located along the Lake Michigan shoreline. Most of the erosion processes along the Lake Michigan shoreline are due to natural weathering. However, human activities can influence this process, causing erosion to accelerate or decelerate. Various factors contribute to bluff and beach erosion. Broad, indirect factors such as changing climate and lake levels affect the more specific, direct factors such as wave action, groundwater seepage, stormwater runoff rates/flow volumes, freeze-thaw action, lake ice movement, the type of bluff and beach material and the type of vegetative cover. Although nothing can be done to eliminate bluff erosion, control measures such as

[19] Soil Survey of Ozaukee County, 1970

vegetative covers and drainage systems can be implemented to slow down this natural process.[20]

Climate

The Wisconsin climate is typically continental with some modification by Lakes Michigan and Superior. Winters are generally cold and snowy and summers are warm. About two-thirds of the annual precipitation falls during the growing season; this is normally adequate for vegetation although there are occasional droughts. The climate favors dairy farming and the primary crops are corn, small grains, hay and vegetables. Storm tracks generally move from west to east and southwest to northeast.

The average annual temperature varies from 39°F in the north to about 50°F in the south with statewide extreme records of 114°F (Wisconsin Dells, 7/13/1936) and minus 55°F (Couderay, 2/2/1996 & 2/4/1996). During more than one-half of the winters, temperatures fall to minus 40°F or lower and almost every winter temperatures of minus 30°F or colder are reported from northern stations. Summer temperatures above 90°F average two to four days in northern counties and about 14 days in southern districts, including Ozaukee County. During marked cool outbreaks in summer months, the central lowlands occasionally report freezing temperatures.

The freeze-free season ranges from around 80 days per year in the upper northeast and north-central lowlands to about 180 days in the Milwaukee area. The pronounced moderating effect of Lake Michigan is well-illustrated by the fact that the growing season of 140 to 150 days along the east-central coastal area is of the same duration as in the southwestern Wisconsin valleys. The short growing season in the central portion of the state is attributed to a number of factors, among them an inward cold air drainage and the low heat capacities of the peat and sandy soils. The average date of last spring freeze ranges from early May along the Lake Michigan coastal area and southern counties to early June in the northernmost counties. The first autumn freezes occur in late August and early September in the northern and central lowlands and in mid-October along the Lake Michigan coastline, however a

[20] Ozaukee Land Guide, 2001

July freeze is not entirely unusual in the north and central Wisconsin lowlands.

The long-term mean annual precipitation ranges from 30 to 34 inches over most of the Western Uplands and Northern Highlands, then diminishes to about 28 inches along most of the Wisconsin Central Plain and Lake Superior Coastal area. The higher average annual precipitation coincides generally with the highest elevations, particularly the windward slopes of the Western Uplands and Northern Highlands. Thunderstorms average about 30 per year in northern Wisconsin to about 40 per year in southern counties and occur mostly in the summer. Occasional hail, wind and lightning damage are also reported.

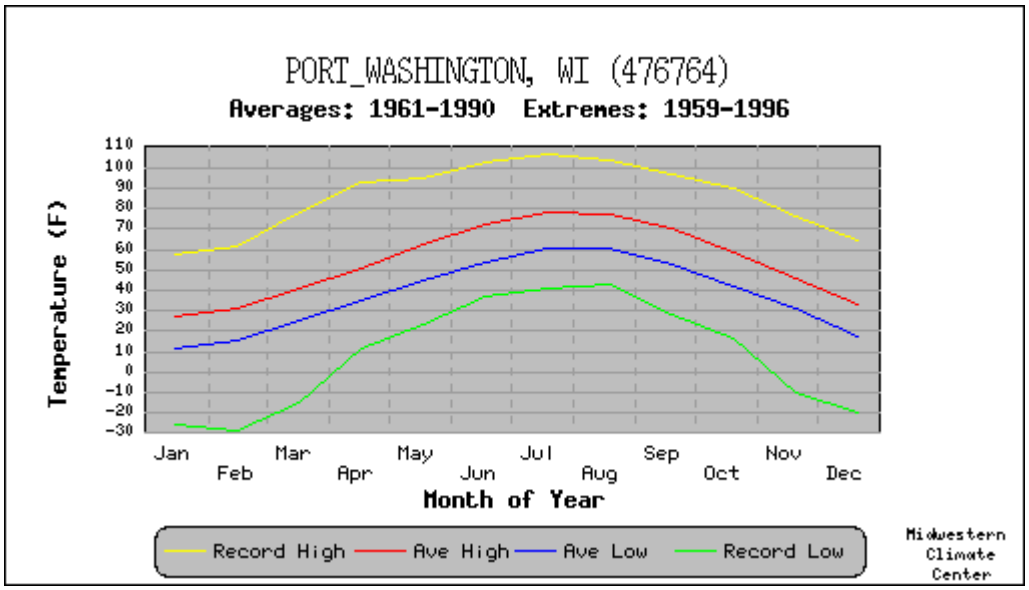
The average seasonal snowfall varies from about 30 inches at Beloit to well over 100 inches in northern Iron County along the steep western slope of the Gogebic Range. Greater average snowfall is recorded over the Western Uplands and Eastern Ridges than in the adjacent lowlands. The mean dates of first snowfall of consequence (an inch or more) vary from early November in northern localities to early December in southern Wisconsin counties. Average annual duration of snow cover ranges from 85 days in southernmost Wisconsin to more than 140 days along Lake Superior. The snow cover acts as protective insulation for grasses, autumn seeded grains, alfalfa and other vegetation.

The average growing season is defined as the number of days following the last 32°F freeze in the spring through the beginning of fall. Ozaukee County's growing season averages 170 days. Shallow lakes normally freeze in late November and remain frozen until late March or early April.[21]

[21] http://www.uwex.edu/sco/state.html

Climate Normals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Ave Daily High (F°)	27.1	31.0	40.0	50.7	61.9	72.1	78.1	77.1	69.8	58.6	45.3	32.3
Ave Daily Low (F°)	11.1	15.2	25.2	34.8	44.0	53.3	60.5	59.7	52.3	41.6	30.4	17.2
Growing Degree Days	1	1	18	64	200	384	585	564	360	152	29	3
Heating Degree Days	1423	1173	1004	666	377	124	22	32	132	462	813	1246
Cooling Degree Days	0	0	0	0	5	55	158	137	15	0	0	0
Ave Precipitation (")	1.25	1.03	1.97	2.96	2.68	3.07	3.35	3.79	3.75	2.38	2.16	1.95
Ave Snowfall (")	10.8	8.5	7.2	1.5	0.0	0.0	0.0	0.0	0.0	0.2	1.6	8.4

Data from the weather station at Port Washington, latitude 43°23' N, longitude 87°52' W, elevation 600 ft.[22]



Data Provided by the Midwestern Regional Climate Center [23]

[22] http://www.wisconline.com/counties/ozaukee/climate.html
[23] http://mcc.sws.uiuc.edu/

Hydrology

The land in Wisconsin drains into Lake Superior, Lake Michigan and the Mississippi River. The Mississippi and St. Croix Rivers form most of the western boundary. About one-half of the northwestern portion of the state is drained through the Chippewa River, while the remainder of this region drains directly into the Mississippi or St. Croix Rivers and into Lake Superior. The Wisconsin River has its source at a small lake nearly 1,600 feet above mean sea level on the Upper Michigan boundary and drains most of central Wisconsin. Most of its tributaries also spring from the many lakes in the north. Except for the Rock River, a Mississippi River tributary which flows through northern Illinois, eastern Wisconsin, including Ozaukee County, drains into Lake Michigan.

Most of the streams and lakes in the state are ice-covered from late November to late March. Snow covers the ground in practically all the winter months except in extreme southern areas. Flooding is most frequent and most serious in April due to the melting of snow and spring rains. During this period, flood conditions are often aggravated by ice jams which back up the flood waters. Excessive rains of the thunderstorm type sometimes produce tributary flooding or flash flooding along the smaller streams and creeks.[24]

Groundwater reservoirs are recharged by direct precipitation. Spring is a prime time for recharge because evapotranspiration is low and melting snow and rainfall infiltrate and percolate the water table on unfrozen ground. Fall is another prime time for high recharge. During the summer, groundwater levels drop because precipitation is lower causing losses to evaporation and transpiration to exceed precipitation. In addition, groundwater is lost to surface waters by discharge in the form of springs.[25] The winter period normally lacks infiltration because of frozen ground.

Groundwater resources constitute an extremely valuable element of the natural resource base of Ozaukee County. The groundwater reservoir not only sustains lake levels and provides the base flow of streams in the county but also comprises a major source of water for domestic, municipal and industrial water users. Like surface water, groundwater is susceptible to depletion in quantity and to deterioration in quality.

[24] http://www.uwex.edu/sco/state.html
[25] DeVaul, 1967

While some small lakes exist within the county, the most significant water features are Lake Michigan, the Milwaukee River, Cedar Creek, Pigeon Creek and their related watersheds. Surface drainage is provided by approximately 250 km of rivers, streams and creeks, all of which eventually flow into Lake Michigan. These streams are geologically young (established after the last glaciation) and as a result of inefficient drainage, many marshes, bogs and small lakes were formed in the county landscape. Perennial streams (e.g., Sauk and Sucker Creeks) maintain at least a small continuous flow throughout most of the year. Many of these streams have the capacity to support fish runs in the spring, summer and fall months.

Although most of the water that moves through streams eventually flows into inland lakes, the remainder departs the land surface and enters Lake Michigan. These water bodies are important natural resources and are protected.[26]

Soil Types

The soils in Ozaukee County are mostly nearly level to rolling. They are suitable for many different crops. Wooded areas are mainly on the steeper soils and on wet soils in low areas.

A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil. There are five soil associations in Ozaukee County.

The Kewaunee-Manawa Association is described as well drained to somewhat poorly drained soils that have a subsoil of clay to silty clay loam formed in thin loess and silty clay loam glacial till on uplands. The Ozaukee-Mequon Association is described as well-drained to somewhat poorly drained soils that have a subsoil of silty clay loam and silty clay formed in thin loess and silty clay loam glacial till on uplands. The Hochheim-Sisson-Casco Association is described as well-drained soils that have a subsoil of loam to clay loam underlain mainly by loamy till, outwash and lake-laid deposits on uplands and terraces and in lakebeds. The Houghton-Adrian Association is described as very poorly drained organic soils in basins and depressions. The Casco-Fabius Association is described as well-drained and somewhat poorly drained soils that

[26] Ozaukee Land Guide, 2001

have a subsoil of clay loam and sandy clay loam shallow over gravel and sand on stream terraces.[27]

Wetlands

From the sedge meadows of southern Wisconsin to the spruce bogs in the north, wetlands cover a wide array of landscapes. They share in common the ability to support aquatic or "water loving" plants, and provide habitat for more species of plants and animals than any other type of landscape in Wisconsin.

Habitat is not their only functional value. Wetlands can also store water to prevent flooding, purify water, protect lake and stream shores from eroding and provide recreational opportunities for wildlife watchers, anglers, hunters and boaters.[28]

Because wetlands provide many benefits to the environment, several municipal, state and federal ordinances/regulations protect wetland areas. The basic concept associated with these laws is that wetland areas on any property cannot be disturbed without a permit. Wetlands store flood waters and filter water from precipitation before it enters lakes and streams. Some wetlands also recharge local groundwater aquifers. By slowing water movement, wetlands reduce the likelihood that heavy rainfall or spring snowmelt will cause erosion and flooding. Wetlands retain eroded soil and hold nutrients that would otherwise promote excessive weed growth and algae blooms in lakes and streams. These nutrients, when held in the wetlands, produce a heavy growth of vegetation that provides nesting sites, food and cover for waterfowl, small mammals and many other types of wildlife. Wetlands also provide recreational opportunities for humans (wildlife observation, hiking, hunting, etc.)

There are three basic factors in determining whether or not a property is a wetland:

- The presence of water at, near or above the surface (hydrology).
- Water present long enough to sustain aquatic plant life (hydrophytic vegetation).

[27] Soil Survey of Ozaukee County, 1970
[28] http://dnr.wi.gov/wetlands

- Soils indicative of wet conditions (hydric soils).

Figuring out what is or is not a wetland can be extremely confusing if you only associate "wetlands" with the presence of water. It is possible that a property could have standing water for a portion of the year and still not be a wetland and it is also possible that a true wetland with all three of the above characteristics may never have water present above the land surface. There are three main levels of jurisdiction (often overlapping) concerning wetlands in Ozaukee County. These are the United States Army Corps of Engineers (all wetlands), the Wisconsin Department of Natural Resources (all shoreland wetlands) and the municipal zoning agencies. The Ozaukee County Environmental Health Department has jurisdiction over wetlands in county zoning plans while wetlands within city or village boundaries are also subject to the appropriate municipality's regulations.[29]

According to the Wisconsin Department of Natural Resources, Ozaukee County has approximately 16,265 acres of wetlands (approximately 11.0% of its total area). This is 0.3% of the total statewide acreage of wetlands.[30]

Land Use

The land in Ozaukee County consists of farmland, shoreland and forests as well as commercial, residential and industrial land. The total land area is 232 square miles. The total water area is 885 square miles.

Ozaukee County has many natural areas including:[31]

- Harrington Beach State Park is 636 acres of parkland along with a mile-long Lake Michigan beach and hiking, fishing and picnic areas where nature and cross-country ski trails are available.
- Riveredge Nature Center is a 350-acre nature sanctuary and a breeding habitat for 67 species of birds. It includes over 10 miles of hiking and cross-country ski trails along the Milwaukee River.
- The Sauk Creek Nature Preserve is located in the heart of Port Washington and this 20+ acre natural area offers hiking

[29] Ozaukee County Land Guide, 2001
[30] http://www.dnr.state.wi.us/org/water/fhp/wetlands/acreage.shtml
[31] http://www.co.ozaukee.wi.us

trails, bird-watching and fishing in the rapids of the Sauk Creek.

- The Cedarburg Bog is reputed to be one of the largest and most biologically interesting wetlands in southern Wisconsin, this 2000 + acre natural area is located 30 miles north of Milwaukee, just west of Saukville. Adjoining the bog is the UWM Field Station that provides facilities for research in wetland ecology, animal behavior, plant population biology and fish ecology.
- The Interurban Trail is a 30 mile non-vehicular recreational trail that follows the old interurban rail line. The scenic trail takes the traveler through the communities and country side of Ozaukee County. Pedestrians, bicyclist, in-line skaters and cross-country skiers are invited to use the trail.
- The Lime Kiln Park in Grafton was once part of a limestone quarry. Limestone is a rock composed of calcium, carbon and oxygen. When it is heated, the carbon escapes as carbon dioxide, leaving lime. The abundance of high magnesium limestone, called dolomite, in much of eastern Wisconsin played an important part in the development of many area communities. The kilns stopped operating in the 1920's.

Current land use is variable and includes residential, commercial, industrial, agricultural, wetlands, woodlands and unused rural/open lands. The amount of land in Ozaukee County devoted to urban land uses has increased by 170% since 1963.[32] This trend is expected to continue and intensify as more land area is converted to urban and suburban uses as more of the people who work in Milwaukee County chose to live in Ozaukee County.

Vegetation

Sugar maple, basswood and elm trees can be found throughout the county. In the west-central portion of the county, a small area of black spruce, tamarack and cedar is found.[33]

[32] SEWRPC 1997
[33] http://www.wisconline.com/counties/Ozaukee/index.html

Demographics

Human Settlement Patterns

The first evidence of human settlement in the Mississippi River Region was approximately 11,000 years ago, following closely the withdrawal of the Wisconsin glacier. These earliest known “Paleo-Indians” were hunter-gatherers that traveled in small nomadic family groups. This Ice Age era was known geologically as the Pleistocene period.

Between 1670 and 1680, the first Europeans to visit this land were the French traders to establish trading and military posts in the name of France, and the Jesuits to bring Christianity to the native inhabitants. Because the French made no definite settlement of the territory they yielded their rights to the English in 1761, who claimed possession until after the Revolutionary War. By the Treaty of 1835, the Indian tribes gave up their homeland and were moved to the country west of the Mississippi. The first sale of lands by the government in Ozaukee County was made at Green Bay in 1835 to Wooster Harrison and Associates who acquired the lands at the mouth of Sauk Creek, platted it and called it Wisconsin City. Later the name was changed to Washington City and now it is known as Port Washington.

The name Ozaukee is of Indian derivation. It means "yellow earth" and is descriptive of the sand and clay soil of the county. Among the early settlers who came into the county were the Yankees from the east who came into the settled communities to establish business, to practice their professions and to become the early political leaders. Abraham Lincoln, as a young lawyer looking for a suitable location to establish an office, visited this territory and stopped at Port Washington for a short time. Leland Stanford, a lawyer, practiced his profession here between 1848 and 1852. After being defeated for the office of district attorney, he became discouraged and left for California where he became governor of the state and with his wealth founded Stanford University.

However, the real pioneers into the county were the hardy and thrifty people from Germany, Luxemburg, Belgium and Ireland who went into the wild forest lands to develop agriculture, build homes, churches and schools. Each people preferred certain sections of the county and settled in groups so that even today we know the

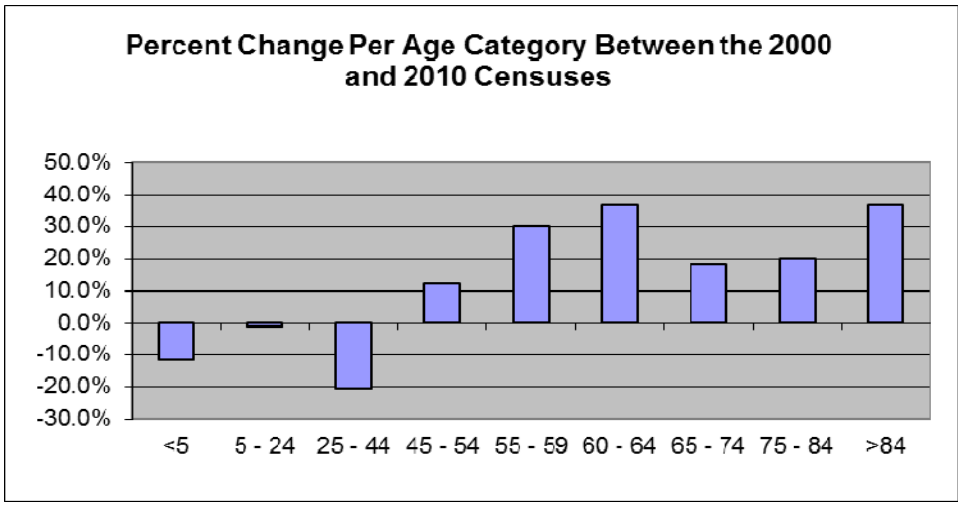
Luxemburgers are from the Town of Belgium, the Germans from Cedarburg and the Irish from Fredonia and Mequon.[34]

Population

In recent decades, Ozaukee County has experienced rapid development. The development has been accompanied by a population increase of 22% in 30 years. In 1980, the county was home to nearly 67,000 people; in 2001, there were 81,723 and according to the 2010 U.S. Census Bureau estimate, there are 86,395 people residing in Ozaukee County. In only a single year, from 1997 to 1998, public road mileage increased 1.6%, from 858.22 miles to 872.27 miles.

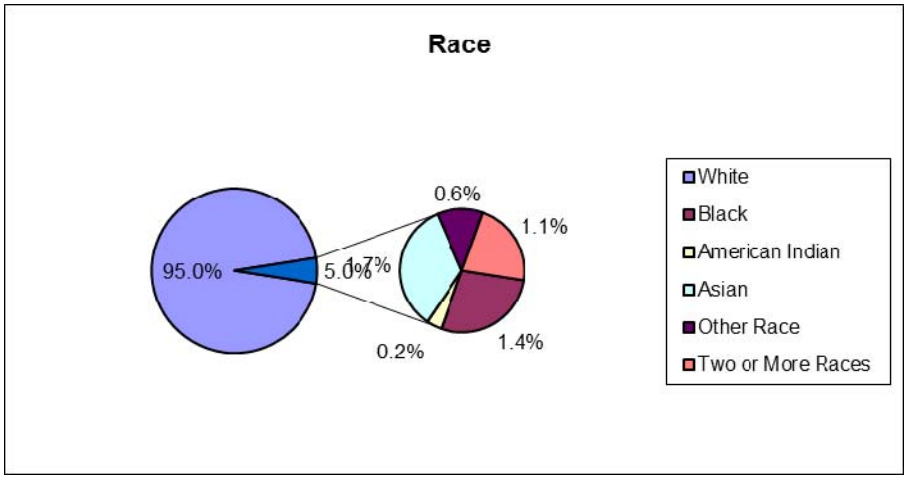
According to the 2010 U.S. census report, there are 34,228 households in Ozaukee County with an average of 2.47 people per household. This is an increase of 8,521 households over the 1990 census when 25,707 households were reported. The 2011 U.S. census numbers indicate that the median household income is $75,634 and that the per capita income is $41,272. Approximately 4.7% of the people live below the poverty line. The 2011 census also indicated that there are approximately 36,412 housing units within the county.

The population of Ozaukee County rose from 82,317 to 86,395 between the 2000 and 2010 censuses. This is an increase of 4,078 people—a population growth rate of almost 5%.

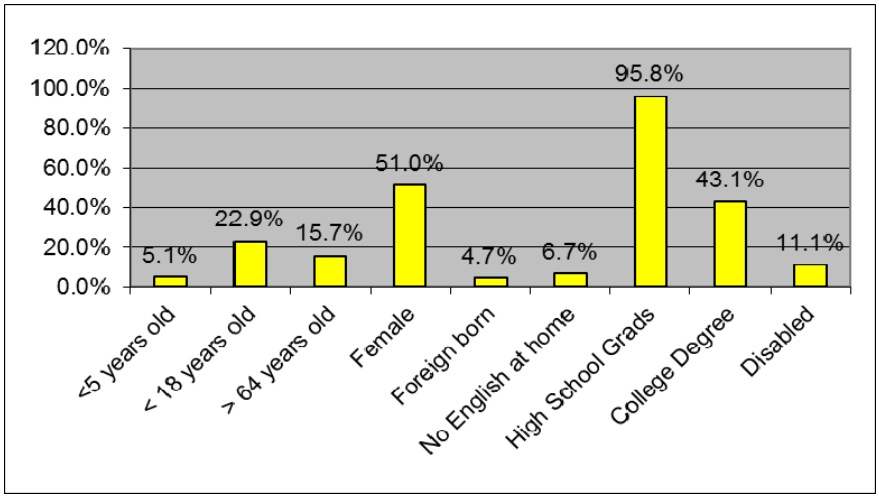


[34] http://www.co.ozaukee.wi.us

According to the 2010 U.S. Census, the overwhelming majority of people in Ozaukee County reported that they were white. People of Hispanic or Latino origin were counted as a subcategory of those reporting that they were white, as another race or as two or more races. These groups totaled 1.1% of those categories. There are no Native American tribal lands located within Ozaukee County.



Other miscellaneous demographic information reported by the census bureau is detailed below. These figures identify potential needs for special consideration in a disaster response or in recovery operation planning and implementation.[35]



* "Disabled" as a census category was not collected in 2010. The reported number is from the 2000 census.

[35] http://quickfacts.census.gov/qfd/states/55/55047.html

Ozaukee County contains the Cities of Cedarburg, Mequon and Port Washington; the Villages of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville and the Towns of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.

Transportation Network

Ozaukee County has a good transportation network. An Interstate highway, state and county roads connect the population centers. I43 runs along the eastern portion of the county, parallel to Lake Michigan. Mequon, Grafton, Port Washington and Bayside all have close access to I43. STH 57 and STH 167 intersect CTH C in Mequon. STH 181, CTH V and CTH NN pass through Cedarburg. STH 32, STH 33, CTH KK, CTH CC and CTH C all traverse Port Washington. STH 57 and CTH V pass through Thiensville. CTH V and CTH O intersect with STH 60 in Grafton. STH 33 passes through Saukville and Newburg. In Fredonia, STH 57 and CTH H intersect. CTH KW and CTH LL pass through Belgium. Ozaukee County has maintained these roads along with others to provide a safe and efficient transportation system. With continued maintenance, these roads will continue to serve the population effectively.

Land Use and Development Trends

Ozaukee County is primarily a rural community in the east-central portion of the state. The county has some natural areas that will not be developed and some rural farming areas as well as light manufacturing and other primarily service businesses that have chosen to locate in the area. As can be seen by the article in Appendix F, Ozaukee County, and many of its towns, strongly values its rural character and farming tradition and is working to preserve farmlands with its Working Lands Initiative. Another preservation project is occurring in the Town of Fredonia, where the Wisconsin Department of Natural Resources is purchasing 35 acres of wetland and farmland.

The county has been experiencing slow growth on par with other demographically similar Wisconsin counties since the economic “Great Recession” that began in 2008, which has halted growth and actually constricted the community activity in some areas. As of the time of this plan, it is expected that growth trends will mirror the

recovery of the general national, state and regional economy, which is difficult to predict at this time.

Permitting for construction projects is managed by incorporated municipalities (i.e., cities and villages) for projects within their own boundaries; Ozaukee County permits development for unincorporated areas (i.e., the towns.) A survey of large development projects (i.e., not individual, single family homes but larger projects such as new subdivisions, industrial complexes, etc.) within Ozaukee County revealed the following projected construction projects:

- Village of Belgium
    - Replacement of sanitation sewer and water pipes on Main Street (Hwy D) approx. 1 .25 miles to include home laterals.
    - Total reconstruction of Main Street roadway, to include burying of utilities (electric, cable, phone).
    - Buildings, stowage sheds, shelters, playground equipment in parks.
    - Dog park.
    - New construction- industrial/commercial and residential

- Village of Grafton
    - Continued development in the retail and residential areas

- Village of Saukville
    - Elevate CTH W from 500’ N STH 33 to 2000’ N. Road floods easily. When flooded, emergency responders have to travel 3 miles to get to home ¼ mile north.
    - Clear Milwaukee River of dead trees and other debris north to Ehlers Park to minimize backups which cause flooding.
    - Construct levee along west side of river 500’ N of HWY 33 bridge to 1000’ S of bridge.

- Village of Thiensville
    - Reconstruct Green Bay Rd; Diamond Grind Main St; Mill & overlay Division Street.
    - Downtown business district has potential for redevelopment.

Public Safety Support

Medical

The Ozaukee County Division of Emergency Management, city and county emergency services responders, hospital emergency staff and various departments have developed medical and mass casualty plans. These plans will be used in the event of a disaster. Ozaukee County communities are served by a complete range of health facilities and health professionals, including St. Mary's Hospital – Ozaukee, Mequon; Aurora Medical Center - Grafton and eight area clinics. In addition, the 23 area hospitals and 12 immediate care centers of Milwaukee County are readily accessible to Ozaukee County residents. These health care facilities will coordinate with responding agencies to ensure the best utilization of services and the least injury or loss of life from a disaster situation. It should also be noted that area hospitals have reciprocal verbal agreements for transferring critical patients during a disaster.

Ozaukee County relies on a mix of volunteer, paid-on-call and paid staff to provide pre-hospital emergency medical services to its 13 service areas of Random Lake, Waubeka, Belgium, Northern Ozaukee, Fredonia, Newburg, Saukville, Port Washington, Cedarburg, Grafton, Thiensville and Mequon. (See Ozaukee County Ambulance Zones Map in Appendix A for district boundary details.) Details for some pre-hospital medical units and their staffing are listed below:

- Belgium EMS: The Belgium Rescue Squad, Unit 753 responds to all EMS calls and fire calls within the Village and Town of Belgium. The Northern Ozaukee Ambulance (Fredonia) and Port Washington Ambulance provide transport services for the Belgium Fire Department. Random Lake (Sheboygan County) covers the northwest portion of the Town of Belgium.

- Mequon EMS: Staff is paid-on-call and serve the entire 56 square mile of the City of Mequon. They provide routine emergency medical services up to the EMT-Paramedic level.

Each of these departments provides monthly training to their staff and they participate in periodically scheduled disaster exercises

with area hospitals, other emergency medical services, law enforcement, fire services and emergency management.

Fire Service

Ozaukee County includes ten separate fire districts (i.e., Waubeka, Belgium, Fredonia, Newburg, Saukville, Port Washington, Cedarburg, Grafton, Thiensville/Mequon and Mequon), which are staffed by paid, paid-on-call or on-call volunteer firefighters who attend regularly-scheduled training activities. (See Ozaukee County Fire Zones Map in Appendix A for district boundary details.)

Hazardous materials (HazMat) response is performed by the county-wide NIMS Type III team, which is a function of the Division of Emergency Management. A-level HazMat response is sponsored by the State of Wisconsin and is provided by Milwaukee Regional Response Team #4. Some county departments also feature specialized skills such as water rescue/dive, hazardous materials and confined space entry. Additional details for some fire departments and their staffing are listed below:

- Belgium Fire: Belgium Volunteer Fire Department provides primary fire and emergency medical services for residents in the Village and Town of Belgium, covering over 36 square miles in northern Ozaukee County. Services include all aspects of fire suppression and emergency medical services. All members have certifications as a Firefighter, EMT and/or First Responder.

Combined EMS/Fire Departments

Several departments in Ozaukee County are combined fire and emergency medical services departments including:

- Mequon Fire & EMS Department: Mequon Fire Department provides fire prevention, fire suppression, rescue and, in conjunction with the ambulance department, emergency medical services. For fire prevention, the department is responsible for plan review of new construction, inspection of all commercial, industrial and multi-family residences. It also provides fire safety education. Fire suppression in the city is provided by a full-time fire chief and paid-on-call members. The department also has a dive team and confined space training. Emergency medical transport is provided by staff

that are trained to the EMT-Paramedic/Advanced Life Support (ALS) level.

- Fredonia Fire & EMS Department (aka Northern Ozaukee Ambulance): Department members are entirely volunteer with the exception of one paid EMT position. The service provides coverage for the Village of Fredonia and responds with Waubeka for calls in the Town of Fredonia. Random Lake (Sheboygan County) covers the northern portion of the Town of Fredonia. The department provides routine fire and emergency medical services and all EMTs are certified to the IV-Tech level.

- Waubeka Fire & EMS Department: The department provides routine fire and emergency medical services for portions of the Town of Fredonia and the Town of Saukville. EMTs are trained to IV-Tech level.

- Saukville Fire & EMS Department: Saukville Fire Department, a paid-on-call department, provides fire and emergency medical services for the Village of Saukville and a portion of the Town of Saukville. The department's firefighters operate and maintain engine/pumpers, a water tender and several auxiliary units; they also provide technical rescue services. The Emergency Medical Technicians are trained to provide advanced life support functions at the IV-Tech level and operate ambulances.

- Port Washington Fire & EMS Department: The department provides basic fire and emergency medical services to 25 square miles of the City and Town of Port Washington as well as providing a dive team. Personnel are paid-on-call with the exception of the Fire Chief/EMS Director, which is a full-time position. The department provides emergency medical transport up to the EMT-Paramedic/ALS level.

- Grafton Fire & EMS Department: The Village and Town of Grafton are provided routine fire and emergency medical services as well as confined space, water and trench rescue by this combined municipal department. Personnel are paid per call and a full-time Fire/EMS Chief will be hired in 2013.

- Cedarburg Fire & EMS Department: The department covers approximately 33 square miles, supplying service to the city and town of Cedarburg residents. They operate out of two stations that protect a primarily residential community with

some light industry. Services provided include fire response, emergency medical service (note that members trained to EMT-Intermediate level, which includes ambulance transporting to local hospitals), auto extrication, dive rescue and public education's "Survive Alive" program. They are currently staffed with active firefighters and EMS personnel and additional "passive" or sustaining members that help with fund raising and non-emergency operations. Cedarburg Fire Department is one of the nine departments that make up Ozaukee County mutual aid agreement and has been serving the community since 1866.

- Thiensville Fire Department & Paramedics: Besides routine fire services, the department provides the only paramedics in the county, which are paid-on-call; they also have a dive team. They cover the approximate one square mile of the Village of Thiensville.

Law Enforcement

Several departments in Ozaukee County are responsible for law enforcement duties within the county. The Cities of Cedarburg, Mequon and Port Washington and the Villages of Fredonia, Grafton, Saukville and Thiensville have their own police officers. The Ozaukee County Sheriff’s Department provides deputies for the rest of the county. (See the Ozaukee County Police Zones and the Ozaukee County ESN Zones Maps in Appendix A for district boundary details.) Also, the Wisconsin State Patrol provides limited coverage from their district office in Waukesha. Additional details for some law enforcement agencies and their staffing are listed below:

- Ozaukee County Sheriff's Office: The Ozaukee County Sheriff's Office provides law enforcement services within the county, providing primary service to several municipalities. The Sheriff's Office has full-time and part-time, sworn deputies. Their duties include patrol, jail, investigations, civil process and court services. The Sheriff's Office manages a multi-jurisdictional Special Response Team and Anti-Drug Task Force. Civilians staff the emergency communications system (i.e., 9-1-1 emergency dispatch center).

- Fredonia Police Department: The Fredonia Police Department is entirely part-time. If a widespread disaster situation were to occur in Ozaukee County, Fredonia would

be without law enforcement services as all are full-time officers with other departments. The department has squad cars fully interoperable with any agency in Ozaukee County; portable and mobile communication equipment fully compatible with any agency in Ozaukee County.

- Saukville Police Department: Law enforcement services are provided by sworn officers, dispatchers and a volunteer police reserve. Services are provided around the clock for the Village of Saukville; they also provide services on several miles of Interstate 43 when requested by the Ozaukee County Sheriff's Department. All squads are equipped with mobile data terminals and video recording equipment.

- Port Washington Police Department: The Port Washington Police Department serves and regularly patrols nearly 50 miles within the city. The department provides a multitude of services to the community in a number of areas including traffic safety; adult, juvenile and youth programs and investigative, crime prevention and general administration.

- Grafton Police Department: The Village of Grafton Police Department is a full-service law enforcement agency. The Police Department is open 24 hours a day, 365 days a year and offers a lobby safe haven for people in distress. The Police Department operates its own dispatch center which is staffed 24 hours a day, 365 days a year.

- Cedarburg Police Department: The Cedarburg Police Department is a progressive, community-oriented agency committed to providing the highest quality of police service in a professional and courteous manner.

- Mequon Police Department: The Department is a 24 hour a day, 365 day a year regular police service. The Mequon Police are equipped with Emergency 9-1-1 telephone communications and rapid response time by courteous, highly trained professional police officers.

- Thiensville Police Department: The Thiensville Police Department is a 24 hour operation. The patrol vehicles are equipped with the standard array of police equipment, as well as an AED, demand oxygen unit, laptop computer, cell phone, one 12-gauge shotgun and one semi-automatic rifle.

The department does not have any special response capability such as S.W.A.T. or narcotics.

Special Teams

The Ozaukee County Hazardous Materials Team is part of the Division of Emergency Management. The Team Leader and all members have completed EPA 165.15 and maintained competency in required areas as set forth by SARA Title III, CFR 29, CFR 29, CFR 40, CFR 49 and NFPA 471. The team is on call 24 hours a day, responding to calls in Ozaukee County and to surrounding counties if requested.

The Ozaukee County Sheriff Rescue Boat is the primary provider of emergency services for approximately 900 square miles of Lake Michigan. Patrol members routinely train with both the water-craft and helicopter assets of the U.S. Coast Guard.

Archaeological and Historical Resources

The Wisconsin Historical Society has a listing of archaeological sites that have been identified in Ozaukee County; this list is available to governmental agencies upon request. The National Register of Historic Places also includes a listing of 32 locations in Ozaukee County. [36] As mitigation projects are considered, the county is committed to ensuring that archaeological and historical sites are preserved.

Historic Sites		
Historic Site Name	**Street Address**	**Municipality**
Bigelow School	4228 West Bonniwell Road	Mequon
Bolens, Harry W., House	824 West Grand Avenue	Port Washington
Cedarburg Mill	215 East Columbia Avenue	Cedarburg
Cedarburg Woolen Co. Worsted Mill	1350 14th Avenue	Grafton
Clark, Jonathan, House	13615 North Cedarburg Road	Mequon

[36] http://www.wisconsinhistory.org/hp/register/welcome.asp

Columbia Historic District	Roughly bounded by Cedar Cr., Highland Dr. and Bridge Rd.	Cedarburg
Concordia Mill	252 Green Bay Road	Cedarburg
Covered Bridge	1 Mile North of Five Corners over Cedar Creek	Cedarburg
Day, Isham, House	11312 North Cedarburg Road	Mequon
Dodge, Edward, House	126 East Grand Avenue	Port Washington
Grafton Flour Mill	1300 14th Avenue	Grafton
Green Bay Road Historic District	149-195 (odd) Green Bay Road	Thiensville
Hamilton Historic District	Hamilton and Green Bay Roads	Cedarburg
Hilgen and Wittenberg Woolen Mill	N70 W6340 Bridge Road	Cedarburg
Hilgen, Friedrich and Louisa, House	N47 W6033 Spring Street	Cedarburg
Hoffman House Hotel	200 West Grand Avenue	Port Washington
Jahn, William F., Farmstead	12112-12116 North Wauwatosa Road	Mequon
Main Street Historic District	101 North Main Street, 105-130 South Main Street, 101 Green Bay Road and 107 West Buntrock Avenue	Thiensville
Mequon Town Hall and Fire Station Complex	11333 North Cedarburg Road	Mequon
NIAGARA (steamer)	Lake Michigan	Belgium
Nieman, Edwin J., Sr., House	13030 North Cedarburg Road	Mequon
O'Brien-Peuschel Farmstead	12510 North Wauwatosa Road	Mequon
Old Ozaukee County Courthouse	109 West Main Street	Port Washington
Payne Hotel	310 East Green Bay Avenue	Saukville
Port Washington Downtown Historic District	Roughly along N. Franklin St., from E. Jackson to E. Grand Ave.	Port Washington
Port Washington Light Station	311 East Johnson Street	Port Washington
Reichert, John, Farmhouse	14053 North Wauwatosa Road	Mequon
St. Mary's Roman Catholic Church	430 North Johnson Street	Port Washington

Stony Hill School	South of intersection of STH 84 and CTH I	Fredonia
Voight, Jacob, House	11550 North Wauwatosa Road	Mequon
Washington Avenue Historic District	Roughly bounded by Elm St., Cedar Creek, Hamilton Rd., and Washington Ave.	Cedarburg
Wayside House	W61 N439 Washington Avenue	Cedarburg

All of these sites have been reported to the State Historical Society of Wisconsin and are protected sites. If there is concern that a mitigation project will impact one of these or any other identified or suspected archeological site, the county will work with the proper authorities to ensure that all applicable laws and regulations are followed.

Hazard Analysis and Previous Mitigation Projects

The following sections identify those hazards that have occurred or could occur in Ozaukee County. Each includes a description of a hazard and its frequency of occurrence. Also included is a section that describes the general vulnerabilities of the community and its infrastructure to each particular type of hazard. More detailed and specific analyses will be conducted as projects are identified for inclusion in grant applications. As part of the application process, the methodology of data collection and future development patterns will be addressed. Estimates of potential dollar losses and the methodology used to arrive at those estimates will also be described during this application process.

Wisconsin Emergency Management (WEM) completed and regularly updates the State Hazard Mitigation Plan, which was last revised in 2011. This plan describes the hazards that have occurred or are most likely to occur within the state and includes the frequency of occurrence, potential impacts and suggested actions to mitigate the hazard. This plan is the basis for the development of all emergency management plans and is distributed upon revision to county emergency government directors and other stakeholder agencies.

The Ozaukee County Emergency Management Director develops and annually updates a listing of all hazards that have occurred or could occur within the county. This listing includes the definition, frequency of occurrence and actions to mitigate the hazard. In general, the threat of most hazards is consistent throughout the county. The hazards where there were differences identified within the county were coastal erosion, dam failure, flooding, landslides and wildfire; for those hazards, specific locations are identified.

As part of other projects, there were two additional hazard vulnerability analyses (HVA) conducted during the update of this plan. One is part of the Ozaukee County Comprehensive Emergency Management Plan (CEMP; Version 2, March, 2012) and the other was conducted by Ozaukee County Public Health, which was tasked with completing an HVA as part of their grant requirements from the State of Wisconsin – Department of Health. The Division of Emergency Management participated in each of these processes and used the outcomes as a basis for discussion

with the HazMit Workgroup. Both final documents that were produced are included in Appendix F.

For this plan the Ozaukee County Hazard Mitigation Plan Workgroup reviewed the past events records and an internal workgroup consensus was reached on the anticipated probability of future events. This probability was designated as “very high,” “high,” “medium,” “low” or “very low” by the workgroup based on their evaluation and experience with the data.

The emphasis in the following sections is on mitigation activities for each hazard as a major component of overall emergency management. Mitigation or prevention activities reduce the degree of long-term risk to human life and property from natural and man-made hazards. The cooperation of government, academia, the private sector and volunteer agencies is essential in mitigation efforts. The Ozaukee County Division of Emergency Management is committed to working with municipalities and the private sector to ensure that county mitigation information is shared and it is incorporated into their planning as appropriate.

Each community will be given a copy of the plan to use as a reference during their own preparedness activities (i.e., planning, training, permitting, zoning). Communities that have their own comprehensive plan will reference this mitigation plan and its contents in the next scheduled plan update. Municipalities that do not have comprehensive plans either are under the purview of and request assistance from the Ozaukee County Planning and Parks, Land and Water Management Department or have their own planning departments. Members of the County Planning and Parks, Land and Water Management Department and municipal planning departments were included on the Hazard Mitigation Workgroup and are aware of the benefits and requirements to utilizing this plan as they go about their preparedness activities.

Ozaukee County and its municipalities have a history of identifying, planning and completing hazard mitigation projects including these, which received supplemental funding:

Community Development Block Grant (CDBG) Emergency Assistance Program (EAP) Projects:

- EAP #08-18 Village of Bayside ($59,200) - Storm sewer
- EAP #08-67 Village of Thiensville ($505,000) -Detention pond improvements

- EAP #08-71 City of Port Washington ($206,000) - Drainage improvements

It was noted by the workgroup that there are several opportunities for grant funding from various federal and state resources including:

- **HMGP** - The Hazard Mitigation Grant Program (HMGP) is authorized by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended. The key purpose of HMGP is to ensure that the opportunity to take critical mitigation measures to reduce the risk of loss of life and property from future disasters is not lost during the reconstruction process following a disaster. HMGP is available, when authorized under the Presidential major disaster declaration, in the areas of the state requested by the governor.[37]
    - DR-1933 2010 Ozaukee County ($32,800) - Update

- **PDM** - The Pre-Disaster Mitigation (PDM) program is authorized by Section 203 of the Stafford Act, 42 U.S.C. 5133. The PDM program is designed to assist States, Territories, Indian Tribal governments, and local communities to implement a sustained pre-disaster natural hazard mitigation program to reduce overall risk to the population and structures from future hazard events, while also reducing reliance on Federal funding from future major disaster declarations.[38]
    - Pre-Disaster Mitigation (PDM) Projects Funded in the State
        - 2002 ($15,520) - Technical assistance Personnel, travel, and supplies
        - 2003 ($32,834) - Technical assistance Personnel, travel, and supplies
        - 2003C ($176,812) - Technical assistance Personnel, travel, and supplies
        - 2003C Village of Thiensville ($2,308,620) - Channelization of flood area
        - 2005C State of Wisconsin ($182,010) - Development of structure inventory database

[37] http://www.fema.gov/hazard-mitigation-grant-program
[38] http://www.fema.gov/pre-disaster-mitigation-grant-program

        - 2005C ($88,480) - Technical assistance Personnel, travel, and supplies
        - 2006C ($22,141) - Technical assistance Personnel, travel, and supplies
        - 2007C ($70,092) - Technical assistance Personnel, travel, and supplies
        - 2008C ($23,897) - Technical assistance Personnel, travel, and supplies
        - 2008C ($18,906) - Technical assistance LPDM; personnel, travel, and supplies
        - 2009C ($25,579) - Technical assistance Personnel, travel, and supplies
        - 2010C ($47,859) - Technical assistance Personnel, travel, and supplies

    - PDM Plans Funded in the State
        - 2005C Ozaukee County ($50,000) - New Plan is approved
        - 2007C ($402,574) - Update Agreement with UW for HAZUS flood risk assessment

- **FMA** - The Flood Mitigation Assistance (FMA) program is authorized by Section 1366 of the National Flood Insurance Act of 1968, as amended with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). The Repetitive Flood Claims (RFC) program has the goal of reducing flood damages to individual properties for which one or more claim payments for losses have been made under flood insurance coverage and that will result in the greatest savings to the National Flood Insurance Fund (NFIF) in the shortest period of time.[39]

    - Flood Mitigation Assistance (FMA) Projects Funded in the State
        - 2003 ($16,320) - Technical support for applicants Personnel, travel, supplies
        - 2005 ($11,464) - Technical assistance to subgrantees Personnel, travel, supplies
        - 2007 ($4,020) - Technical assistance to subgrantees Personnel, travel, supplies
        - 2010 ($8,994) - Technical assistance to subgrantees Personnel, travel, supplies

[39] http://www.fema.gov/flood-mitigation-assistance-program

- FMA Plans Funded in the State
  - 1996/1997 Ozaukee County ($9,733) - Plan is approved

- **SRL** - The Severe Repetitive Loss (SRL) program is authorized by Section 1361A of the NFIA has the goal of reducing flood damages to residential properties that have experienced severe repetitive losses under flood insurance coverage and that will result in the greatest amount of savings to the NFIF in the shortest period of time.[40]

  - List of Communities with Repetitive Loss Properties
    - CID# 550310 total 1, remaining 1

- **RFC -** The Repetitive Flood Claims (RFC) grant program was authorized by the Bunning-Bereuter-Blumenauer Flood Insurance Reform Act of 2004 (P.L. 108–264), which amended the National Flood Insurance Act (NFIA) of 1968 (42 U.S.C. 4001, et al). Up to $10 million is available annually for the Federal Emergency Management Agency (FEMA) to provide RFC funds to assist states and communities to reduce flood damages to insured properties that have had one or more claims to the National Flood Insurance Program (NFIP). FEMA may contribute up to 100 percent of the total amount approved under the RFC grant award to implement approved activities, if the applicant has demonstrated that the proposed activities cannot be funded under the FFMA program. [41]

- **406 Mitigation –** The Public Assistance-Section 406 Mitigation Funding may be considered by FEMA in a federal disaster declaration to fund mitigation measures to a public facility damaged by the event that enhance the facility's ability to resist similar damage in future events. This funding is authorized under Section 406 of The Robert T. Stafford Disaster Relief and Emergency Assistance Act and provides discretionary authority to fund mitigation measures in conjunction with the repair of the disaster-damaged facilities, which usually present themselves during the repair efforts. The mitigation measures must be related to eligible disaster-related damages and must directly reduce the potential for future, similar disaster damages to the eligible facility. This work is performed on the parts of the facility

[40] http://www.fema.gov/severe-repetitive-loss-program
[41] http://www.fema.gov/repetitive-flood-claims-program

that were actually damaged by the disaster and the mitigation provides protection from subsequent events. Mitigation measures must be determined to be cost-effective, technically feasible, and in compliance with statutory, regulatory and executive order requirements. In addition, the measure cannot cause a negative impact to the facility's operation, surrounding areas, or susceptibility to damage from another hazard.[42]

- DR-1236 1998 Village of Thiensville ($123,047) - Construction of a detention pond
- DR-1238 1998 Village of Thiensville ($60,000) - Construction of a detention pond Supplements for project under 1236-DR

- **CDBG** – The U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant-Disaster (CDBG) Recovery Assistance provides flexible grants to help cities, counties and states recover from Presidentially-declared disasters, especially in low-income areas, subject to availability of supplemental appropriations. In response to disasters, Congress may appropriate additional funding for the CDBG program as disaster recovery grants to rebuild the affected areas and provide crucial seed money to start the recovery process. Since CDBG Disaster Recovery assistance may fund a broad range of recovery activities, HUD can help communities and neighborhoods that otherwise might not recover due to limited resources. Disaster Recovery grants often supplement the disaster programs of FEMA, the SBA and the U.S. Army Corps of Engineers (i.e., these funds can be used for the local matching requirement of other federal grants).[43]

- **Municipal Flood Control Grant Program** - This Wisconsin Department of Natural Resources (DNR) grant is available to all cities, villages, towns, tribes and metropolitan sewerage districts. Assistance is provided with items such as the acquisition of property, vacant land, structure removal, flood proofing, administrative support and others.[44]

[42] http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit/hazard-mitigation-funding-under-section-406-0
[43] http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/drsi
[44] http://dnr.wi.gov/Aid/MunFloodControl.html

- **Dam Removal Grant Program** - This Wisconsin DNR grant is available to all cities, villages, towns, tribes and metropolitan sewerage districts and provides 100% of eligible project costs up to a maximum of $50,000 to remove a dam. Assistance is provided with items such as: the acquisition of property, vacant land, structure removal, flood-proofing, administrative support and others.[45]

[45] http://dnr.wi.gov/aid/damremoval.html

All Hazards

One of the bedrock principles of emergency management is to approach issues from an all-hazards perspective. This is generally very cost effective because it accomplishes preparedness and/or mitigation goals for many types of disasters with one resource. Some of the all hazards mitigation projects that Ozaukee County would like to accomplish are detailed in the following sections.

The planning committee also used the all hazards approach to identify mitigation goals for the county and all of its municipalities. The purpose hazard mitigation plan is to identify hazard areas, to assess the risks, to analyze the potential for mitigation and to recommend mitigation strategies where appropriate. Potential mitigation projects will be reviewed using criteria that stress the intrinsic value of the increased safety for people and property in relation to the monetary costs to achieve this (i.e., a cost-benefit analysis). With that in mind, the planning goals of the mitigation planning committee were:

- **Objective 1:** To preserve life and minimize the potential for injuries or death.
- **Objective 2:** To preserve and enhance the quality of life throughout Ozaukee County by identifying potential property damage risks and recommending appropriate mitigation strategies to minimize potential property damage.
- **Objective 3:** To promote countywide planning that avoids transferring the risk from one community to an adjacent community, where appropriate.
- **Objective 4:** To identify potential funding sources for mitigation projects and form the basis for FEMA project grant applications.

Vulnerability

Perhaps the largest risk that falls under the all-hazards banner is that fact that several of the municipalities have part or all of their communications networks on different bands (i.e., VHF and 800 MHz). Because these departments cannot communicate with each other, they would not be effectively coordinated in a disaster, potentially delaying critical services to citizens in need.

Hazard Mitigation Strategies

Ozaukee County and its municipalities have sought out grants and partnerships to reduce the significant costs to improving their core communication networks but much of the technology upgrade has been from county and municipal budgetary expenditures.

In this plan, many of the non-core communications projects that are listed here are either not capital improvement projects and therefore are not very expensive (e.g., upgrading Memoranda Of Understanding (MOU), updating the website) or they are projects that require significant capital outlays and are, for the most part, grant-dependent. Since the profile (e.g., economic, geographic) of an area may change between the identification of a project in this plan and the availability of grant funds, projects will be identified within the plan and be slated for detailed study and analysis at such time as grants become available. The detailed study will identify the types and numbers of existing and future structures, the potential dollar losses to vulnerable structures and the lead agency or department who will manage the project. At that point, grant-eligible projects will be evaluated using the appropriate grant criteria for factors such as:

- Overall benefit to the community
- Economic feasibility (i.e., a cost-benefit analysis)
- Compliance with environmental, social justice and other laws

The hazard mitigation strategies listed below are not “bricks and mortar” changes. Rather, they are enhancements to computer and radio equipment and plans that allow better communication with the public in times of crisis and therefore do not reduce effects for existing or future buildings and infrastructure.

Public Alert and Notification

Public alert and notification plans are vital in a time of crisis to reduce property damage and human casualties. An advance plan allows the appropriate authorities to perform their emergency duties in an efficient manner. Ozaukee County will maintain the following:

- Facilities, systems and procedures to activate warning and communication capabilities,

- Systems to support communications, including:
    - Sirens to warn the public
    - Telephone and radio to notify public personnel
    - Local television, radio and newspaper to spread warning information
    - Local law enforcement, fire and rescue communications
    - An emergency communications center,
- Ozaukee County Sheriff's Office to receive and distribute warning information to the public and emergency management agencies.

During an emergency, the general public receives information by sirens, NOAA weather radio, local broadcast or printed media, door-to-door notification by emergency services personnel and a mobile public address system. The Ozaukee County Division of Emergency Management, with assistance from the Sheriff's Office and the Public Health Department, has incorporated the use of the public notification system, MyState USA, countywide. This system makes additional notification venues available, such as phone calls, texts and e-mails; the county will continue to explore additional features and uses, as applicable, as well as promote the system to the public. It should be noted that the ability to use the NOAA weather radio system for an expanded list of emergency messages is a positive move that makes this alert and warning tool even more valuable. As a result, Ozaukee County will continue to promote increased use of these radios among the public. They have added a link to their website promoting the use of NOAA weather radios; weather radios have been promoted and sold at local grocery stores and community talks and handed out as door prizes by the Village of Grafton at the Aurora Hospital Safety Fair, May 2012. The Ozaukee County Office of Emergency Management applied for an $8,000 grant to purchase additional radios for distribution to families and individuals within the county.

Methods for notification of the special needs populations include door-to-door warnings, foreign-language media messages and closed-caption television messages. Other notices and procedures can be found in Ozaukee County's Comprehensive Emergency Management Plan (CEMP), which is reviewed and updated on a

regular schedule. Ozaukee County GIS, Public Health, Emergency Management and the court system are exploring options for a Site Notification Database for the special needs population. The Ozaukee County Health Service has a database for people who are receiving county services which works with the state's Esponder system. There would be no license required for the GIS portion. If orchestrated by the state, the county would get the benefits at little to no cost.

Ozaukee County should be capable of the following:

- Disseminate emergency warning and notification to the public though its county-wide warning systems,
- Support emergency management operations,
- Provide adequate warning and communication systems, and
- Plan for alternative means and resources in the event of a warning or communication system breakdown.

Ozaukee County will prepare facilities, systems and procedures to activate warning and communication. During an emergency, Ozaukee County will deliver prompt and accurate warnings to businesses and residents. The Division of Emergency Management plans to open discussions with municipalities concerning tornado sirens and explore options for an outdoor public address system for the downtown area of the City of Cedarburg.

Interoperable Communications

The county budget to maintain communications systems has thus far been sufficient and as technology improves and additional interoperability grant funding is made available, the County Division of Emergency Management and the Sheriff's Office will monitor and improve the system as able. As part of the communications improvement process, law enforcement agencies are going to be using digital technology; other first response agencies continue to use analog technology. The county is also exploring options to create a capability for locating a 9-1-1 call received from a cellular telephone (Reverse Enhanced 9-1-1) and to incorporate pre-arrival emergency medical instructions for the CAD system for dispatchers for the 9-1-1 system. Ozaukee County has recognized the need to improve interoperable communications between municipalities and the county by:

- Moving all of the public safety agencies to another part of the 800 MHz band. The FCC gave Nextel a license to operate near the public safety channels and this will interfere with public safety communications if they are not moved. Nextel is paying to move the public safety agencies to another part of the band. This was completed in 2012

- Determine the feasibility of bringing the Mequon, Grafton and Fredonia Departments of Public Works (DPW) onto the 800 MHz band from the VHF band. Most of the rest of the county (including most of the other DPWs and the County Highway Department) are already on the 800MHz band and this would give these critical departments the ability to communicate with Incident Command during a disaster. Past practice has dictated that the DPWs get communications equipment as it cycles out of their municipal police departments. Mequon has begun cycling radios to DPW but Grafton has not. Waiting for the cycling of communications equipment would delay the implementation of interoperability and could potentially lead to safety and mission effectiveness issues in a disaster. The communities would like to make the move sooner, if funding becomes available.

Website

Geographic information system (GIS) mapping data is available from the Ozaukee County website. The County Division of Emergency Management also has a general webpage at http://www.co.ozaukee.wi.us/EmergencyManagement/index.htm and has, in past disasters, been able to post links to disaster-specific information from FEMA, to volunteer, etc. In recognition of the importance of this communication tool, especially in pre-planning activities, county offices will review their web pages to ensure that important information and links for general preparedness topics are available from agencies such as the Department of Homeland Security/FEMA, the American Red Cross and Wisconsin Emergency Management. The County Division of Emergency Management “streams” preparedness information across the website at specific times of the year.

The Village of Saukville regularly updates their website and the Village of Thiensville is exploring options for adding a website.

Community Volunteer Organization

Ozaukee County launched a Voluntary Organizations Active in Disaster (VOAD) Council in 2000. This program became a model for similar programs around Wisconsin as VOAD and Citizen Corps Councils are merging into a single comprehensive council to coordinate the mobilization of local resources when disasters and other emergencies threaten or strike in Ozaukee County. The Council also serves as a conduit to mobilize resources and volunteers to our disaster-stricken neighbors upon request.

The Community Emergency Response Team (CERT) Program educates people about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization and disaster medical operations. Using the training learned in the classroom and during exercises, CERT members can assist others in their neighborhood or workplace following an event when professional responders are not immediately available to help. CERT members also are encouraged to support emergency response agencies by taking a more active role in emergency preparedness projects in their community. Ozaukee County, through the Division of Emergency Management, will continue to support the education and recruitment of volunteer disaster responders. Emergency Management is currently evaluating options to improve the efficiency and effectiveness of CERT.

- Restructuring CERT to focus on student groups.
- Working with the Public Health Department on an e-mail system to CERT members.

The Ozaukee County Division of Emergency Management will continue its strong relationship between volunteer groups, the county and hospitals to ensure effective, redundant communication. Emergency Management is also working to improve the relationship between and communications with American Red Cross (ARC) disaster assistance teams.

Preparedness

The National Fire Protection Association (NFPA) 704 requires the labeling of all Extremely Hazardous Substance (EHS) facilities. The Local Emergency Planning Committee (LEPC) will be approached to orchestrate a project to assist municipalities with adopting an

ordinance and to begin labeling all EHS facilities according to and in compliance with NFPA 704. The ordinance will need to be adopted by individual municipalities.

Coastal Erosion

All 15 coastal counties in Wisconsin can experience erosion, flooding and damage to shoreline structures. Coastal erosion is a naturally occurring process that can accelerate during times of high water or wave action. For example, bluff erosion is more likely to occur during major storm events due to wave action upon the shoreline. The effects of wave-induced erosion are usually greater during those periods when the level of the water is high. The freezing and thawing of lake ice also contribute to erosion.

Lake Michigan coastal erosion in Port Washington.

Physical Characteristics

Coastal erosion is defined as the wearing away of land and the loss of beach, shoreline or dune material over a period of time as a result of natural coastal processes or human influences. Characteristics such as supply of sand and processes such as sea level change, currents, tides, waves and wind are natural factors that contribute to the rate of erosion. Human-caused contributors to erosion include dredging tidal entrances, jetty and groin construction, hardening shorelines with seawall, beach nourishment and construction of harbors and sediment-trapping dams.

Coastal erosion affects Wisconsin along the shoreline of Lakes Michigan and Superior. Along the Great Lakes, cyclical changes in lake levels, disruption of long shore transport of beach building material and storms all influence the rate of erosion. According to the National Research Council, a congressionally chartered, non-profit organization that provides science and technology advice, annual variability in wave climate and lake levels causes the rates of bluff and dune erosion along the shores of the Great Lakes to vary from near zero to tens of feet per year.

As high-lake levels increase, bluff recession rates also increase. Increasing assaults by wave action against the base of the bluff cause erosion and beach-building sediments. Navigational improvements and dredge-material disposal practices deplete both tributary and shore land sources of sediment. Removing these sediments from the shore system contributes to erosion. Ice ridges that form and break up each winter along the shoreline cause erosion by trapping sand in floating fragments of ice that are carried offshore into deep water. This continual natural process is one of the principal mechanisms by which sand is lost from the near shore system.[46]

Coastal Erosion along Lake Michigan.

[46] USGS, 1992

Frequency of Occurrence

Coastal erosion is usually a gradual process, and sudden incidents prompting emergency action are rare. Such rare events include strong storms with high winds or heavy wave action that can cause sudden failure of bluffs.

All 15 coastal counties in Wisconsin experience erosion, flooding and damage to shoreline structures. Coastal erosion is a naturally occurring process that can accelerate during times of high water or wave action. For example, bluff erosion is more likely to occur during major storm events due to wave action upon the shoreline. The effects of wave-induced erosion are usually greater during those periods when the level of water is high. The freezing and thawing of lake ice also contribute to erosion.

Record snowfall in northern Wisconsin in 1996 was followed by near record high-water levels in 1997. However, unusually mild weather and light snowfall in the winters of 1998–1999 and 1999–2000 brought lake levels to below long-term averages. According to the U.S. Army Corps of Engineers' Monthly Bulletin of Lake Levels for the Great Lakes, lake levels are more than one foot below normal in Lake Michigan. Water levels on Lake Michigan recovered somewhat in 2001 but remained below normal. Heavy above average rainfall in April 2002 [133% of average] improved low lake levels by as much as eight inches in summer 2002.

Many areas of the Wisconsin Great Lakes coast are vulnerable to bluff erosion. In general, the erodible sections of the Lake Michigan shore are found between the Illinois State line to the Sturgeon Bay Canal in Door County, and in the northeastern part of Brown County on Green Bay. Along the remainder of the Lake Michigan shore, bluff erosion is limited to smaller segments of bays and clay banks.[47] In January, 2006 a 900' x 60' area fell from the bluffs in Ozaukee County; on average, there losses are two to three feet per year.

Water levels in the Great Lakes fluctuate on both a seasonal and long-term basis. Seasonally, the lakes are at their lowest levels during the winter when much of the precipitation is held on land as snow and ice. The highest seasonal levels are during the summer when snowmelt from the spring thaw and summer rains contributes to the water supply. Long-term variation of lake levels depends on precipitation and evaporation trends in the Great Lakes watershed. Lake levels rise when net water supply exceeds outflow and above

[47] Springman and Born, 1979

average lake levels can persist for extended periods even after the conditions that caused them have ended. The water volume of the Great Lakes is large and outflow from natural outlets is limited. Flow regulation structures exist in Lakes Ontario, Michigan and Superior, but their influence is limited by their size. Controlled releases strive to simulate long-term averages in an effort to serve multiple interests. The source of about 40% of Lake Superior's annual water supply is from the snowpack around its shores. Lakes Michigan and Huron get up to 30% of their yearly supply from Superior's snowmelt when it flows into the lower lakes.[48]

Vulnerability

Existing maps depicting rates of coastal erosion and the FEMA HAZUS-MH inventory of structures in the coastal zone provided the basis for estimating the potential vulnerability and losses from this hazard. The number and types of structures subjected to high and low risk of erosion were determined from these data. The erosion risk zones were established based on the distance in miles from the Coastal Area Boundary. The high erosion risk zone is defined as the area within 1/4 mile of the Coastal Area Boundary; the low erosion risk is 1/2 mile from the boundary.

Erosion issues within Ozaukee County are primarily in the City of Mequon and the City and Town of Port Washington. The high erosion risk loss estimate for Ozaukee County includes 2,198 residential structures, 25 commercial structures and two government structures for a total of 2,225 structures. The estimated cost of residential loss is $118,415,560, commercial loss is $706,580 and government loss is $49,640.

The low erosion risk loss estimate for Ozaukee County includes 3,799 residential structures, 66 commercial structures and two government structures for a total of 3,867 structures. The estimated cost of residential loss is $390,146,560, commercial loss is $4,917,800 and government loss is $99,280.

Based upon structure type and dimensions, including square footage, replacement values were estimated. The estimated replacement value was assumed to be equal to the value of a total loss of the structure due to erosion.

[48] Detroit Free Press, March 18, 2000

Replacement values for coastal structures were estimated and could be verified in future risk assessments.[49]

Hazard Mitigation Strategies

The goal of coastal erosion mitigation activities is to reduce, in a cost effective manner, the loss of lives and property due to these events.

Coastal property owners are acutely aware of hazards during periods of high-water levels and especially right after a damaging storm or a bluff failure but this awareness can fade over time if low lake levels slow the erosion rate. Lake levels were above long-term averages from 1996 to 1998. The last period of significantly higher lake levels was in 1985 to 1986, resulting in $16 million of documented damage to public facilities alone.[50]

The most effective mitigation measures are ensuring that municipalities, builders and homeowners all understand safe building procedures and that local zoning measures are current, understood and enforced. (Note: the current county ordinance, found in the Shoreland and Floodplain Ordinance, requires a 25' set-back from the bluff.) A team was established to review/evaluate the plans, which is now complete. The Army Corps of Engineers was brought in to provide expert opinions and accepted updates should be completed by 2014. Over time, ensuring adequate zoning measures and providing good public information regarding coastal erosion to those potentially affected will be the best strategies to reduce damages to existing or future buildings and infrastructure but the county also plans to continue studying the coastal erosion issue and will conduct any remediation actions that can be funded via grants or local dollars.

[49] Wisconsin Hazard Mitigation Plan, Coastal Erosion Sections in 4.2 and 4.5 and http://www.seagrant.wisc.edu/Communications/LakeLevels/index.html
[50] WCMP, 1992

Drought and Dust Storms

Two types of drought occur in Wisconsin: agricultural and hydrologic. Agricultural drought is a dry period that reduces crop yields. Hydrologic drought is a dry period of sufficient length and intensity to affect lake and stream levels and the height of the groundwater table. These two types of drought may, but do not necessarily, occur together.

Dust storms result from a combination of high winds and dry, loose soil conditions. While high winds and periods of drought have each occurred in Ozaukee County, there has never been a recorded dust storm event. Since natural hazards that have occurred in the past are more likely to occur in the future, it is unlikely that a dust storm event will occur in Ozaukee County. This assertion is further bolstered by the fact that there is very little irrigation done within the county and that the soils in Ozaukee County are not prone to blowing. While there are concerns about topsoil erosion and some mitigation activities may be planned that would reduce the effects of these types of events, they will not be a major focus of this plan.

Physical Characteristics

The understanding that a deficit of precipitation has different impacts on groundwater, reservoir storage, soil moisture, snowpack and streamflow led to the development of the Standardized Precipitation Index (SPI) in 1993. The SPI quantifies the precipitation deficit for multiple time scales. These time scales reflect the impact of drought on the availability of the different water resources. Soil moisture conditions respond to precipitation anomalies on a relatively short scale. Groundwater, streamflow, and reservoir storage reflect longer-term precipitation anomalies. For these reasons, the SPI is calculated for 3-, 6-, 12-, 24- and 48-month time scales.

The SPI calculation for any location is based on the long-term precipitation record for a desired period. This long-term record is fitted to a probability distribution, which is then transformed into a normal distribution so that the mean SPI for the location and desired period is zero. Positive SPI values indicate greater than median precipitation and negative values indicate less than median precipitation. Because the SPI is normalized, wetter and drier

climates can be represented in the same way and wet periods can also be monitored using the SPI.

The classification system shown in the SPI values table (below) defines drought intensities resulting from the SPI. The criteria for a drought event are also defined for any of the time scales. A drought event occurs any time the SPI is continuously negative and reaches an intensity of -1.0 or less. The event ends when the SPI becomes positive. Each drought event, therefore, has a duration defined by its beginning and end and an intensity for each month that the event continues. The positive sum of the SPI for all the months within a drought event can be termed the drought's "magnitude." Current SPI maps for the United States can be found at http://www.drought.unl.edu/monitor/spi.htm.

SPI Values[51]	
2.0+	Extremely wet
1.5 to 1.99	Very wet
1.0 to 1.49	Moderately wet
-0.99 to 0.99	Near normal
-1.0 to 1.49	Moderately dry
-1.5 to -1.99	Severely dry
-2.0 and less	Extremely dry

The Palmer Index is an older scale and is used more often by governmental organizations. It is effective in determining long-term drought (i.e., over several months) and is not as good with short-term forecasts (i.e., weeks.) It uses a zero as normal; drought is shown in terms of negative numbers and excess moisture is reflected by positive figures. The future incidence of drought is highly unpredictable and may also be localized, making it difficult to determine probability with any accuracy.

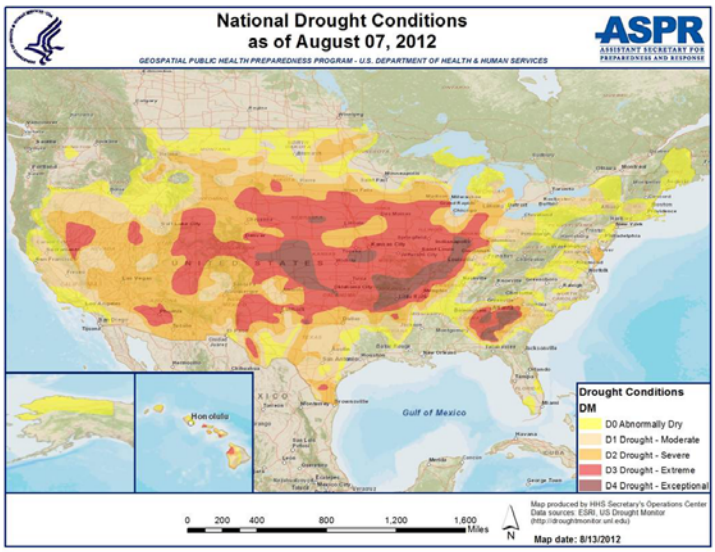
Drought conditions may vary from below-normal precipitation for a few weeks to a severe lack of normal precipitation for several months. Drought primarily affects agricultural areas because the amount and timing of rainfall has a significant impact on crop production. The severity of a drought cannot therefore be completely measured in terms of precipitation alone but must include crop yields.

[51] http://www.drought.unl.edu/whatis/indices.htm#spi

Frequency of Occurrence

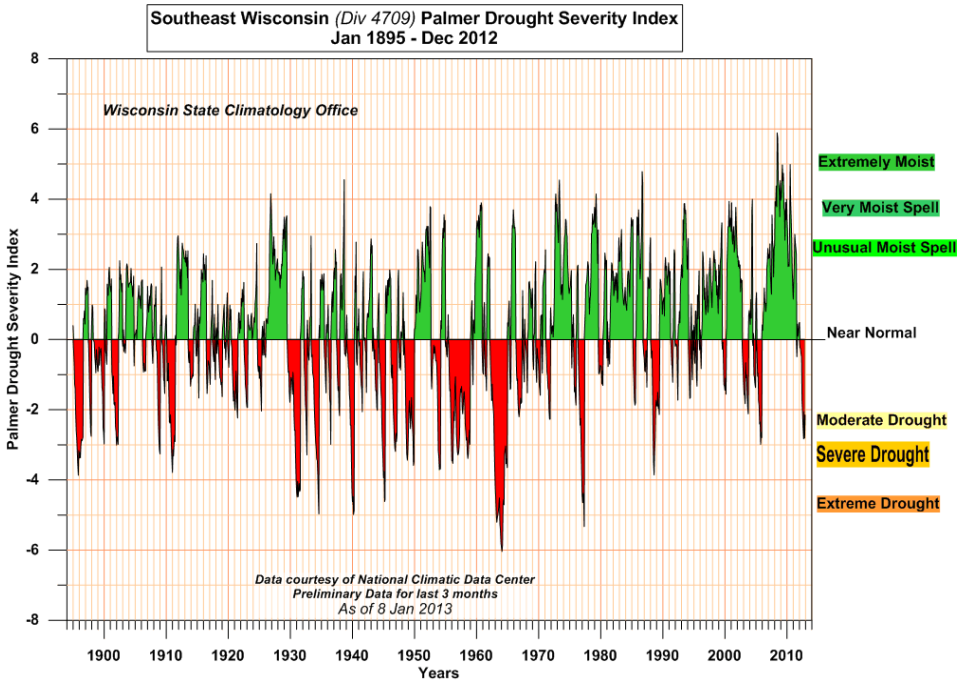
Drought is a relatively common phenomenon in Wisconsin and has occurred statewide in 1895, 1910, 1939, 1948, 1958, 1976, 1988, 1992, 2003 and 2005. The 1976 drought received a Presidential Emergency Declaration with damage to 64 Wisconsin counties, including Ozaukee. Estimated losses of $624 million primarily affected the agricultural sector. Reports show that Ozaukee County was as affected as the rest of the state in this drought, receiving money for emergency feed programs for livestock and for increased fire protection of its wilderness areas. It should be noted that only 19% ($119,434,924) of this loss was compensated by any federal program.

The 2012 heat wave resulted in significant droughts across more than half the country as well as increases in heat related illnesses and deaths. July, 2012 was the hottest month in US history, eclipsing the record set during the heart of the Dust Bowl in 1936. The worst of the heat was in the Midwest, the Plains and along the Eastern Seaboard. Most of the contiguous US had record and near-record warmth for the seven-month period, except the Pacific Northwest, which was near average. The August 7, 2012 Drought Monitor map shows 52.27% of the United States and Puerto Rico in moderate drought or worse with Ozaukee County in the D2 – Severe Drought category.[52]



[52] 2012 Heat & Drought Federal Report, HHS ESF 8, UPDATE #2, U.S. Department of Health and Human Services, Assistant Secretary for Preparedness and Response

The Palmer Index chart for the years between January, 1895 and Dec, 2012 in Southeastern Wisconsin, which includes Ozaukee County, follows[53]:



As can be seen from the frequency table above, Ozaukee County regularly experiences drought to at least a moderate level two to three times every ten years. While drought is a regular occurrence, it is generally very difficult to predict with any accuracy but according to the Wisconsin Hazard Mitigation Plan, "the NWS and National Integrated Drought Information System (NIDIS) are improving methodology to accurately forecast drought conditions." Both organizations use a combination of current and historical precipitation, streamflow, ground water, and crop data to perform short-term and long-term forecasts."[54]

On July 15, 2005, the Governor declared a drought emergency for the entire state of Wisconsin. This declaration, the first since August 2003, allowed farmers access to additional water for crop irrigation. The National Weather Service has 14 recorded drought events and zero dust storms for Ozaukee County between 1 January 1950 and 31 December 2012[55]:

[53] http://www.aos.wisc.edu/~sco/clim-watch/graphics/pdsi-ts-09-l.gif
[54] State of Wisconsin Hazard Mitigation Plan, p. 3-100
[55] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN

Year	Date	Location	Human Losses	Damage Losses
2002	8/1	Ozaukee Co	Death/Injury: 0	Property: $0 Crop: $4.4 million
2003	8/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
	9/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
	10/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
	11/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
	12/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
2005	7/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
	8/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
	9/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
	10/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
	11/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
2007	7/1	Ozaukee Co	Death/Injury: 0	Property: $0 Crop: $50,000
2012	8/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0
	9/1	Ozaukee Co	Death/Injury: 0	Property/Crop: $0

The county has not experienced any dust storms since 1950. Considering past occurrences, it can be surmised that Ozaukee County has a medium probability of drought occurrence in the future and the likelihood of damage due to drought is considered medium for agricultural losses and low for other types of losses. The probability of dust storm and damages due to dust storms would be very low.

Vulnerability

Droughts and dust storms could impact Ozaukee County disproportionately because approximately 50% of the land area is used for agricultural activities. Drought generally impacts farm output by reducing crop yields and the health and product output (e.g., milk) of livestock. As a result, a drought will seriously impact the economy of the entire county. Dust storms impact farms in the long term by blowing away the top levels of soil, which are the richest. This could economically impact the county by reducing its long-term viability for farming. Drought is also a major risk factor for wildfire.

Drought can reduce the amount of surface water available for recreational activities (e.g., boating, fishing, water skiing) and for wildlife. This is important because, for example, low water levels can lead to an outbreak of disease (e.g., botulism) in migratory bird pools.

Prolonged drought can also impact the groundwater reserves. This can reduce the ability of the municipal water services and rural individuals on wells to draw adequate fresh water. This may especially impact rural homeowners who tend to have wells that are not drilled as deeply as municipal wells. In Ozaukee County, the population that lives outside of the cities and villages are generally on well water. There could also be a safety risk during dust storms if they are severe enough to reduce the visibility of the roadways for drivers.

Hazard Mitigation Strategies

The goal of drought and dust storm mitigation activities is to reduce, in a cost effective manner, the loss of lives and property due to these events.

Some Ozaukee County communities have adopted water usage regulations during drought conditions but in general, mitigation strategies for periods of drought include preparing informational releases and plans for farmers and homeowners that can be used if needed. The Cities of Cedarburg and Mequon are preparing and publicizing water usage regulation plans (including outdoor burning restrictions) for non-farm areas during times of drought.

Ozaukee County farmers can contact the Ozaukee County U.W. Extension Office and the Department of Agriculture Stabilization and Conservation Service (ASCS) for information and guidance related to drought. Various federal and state publications are available regarding ground water movement, the hydrologic cycle and irrigation methods. These agencies are also the lead agencies for obtaining emergency food and water supplies for agricultural use and for providing information regarding crop insurance.

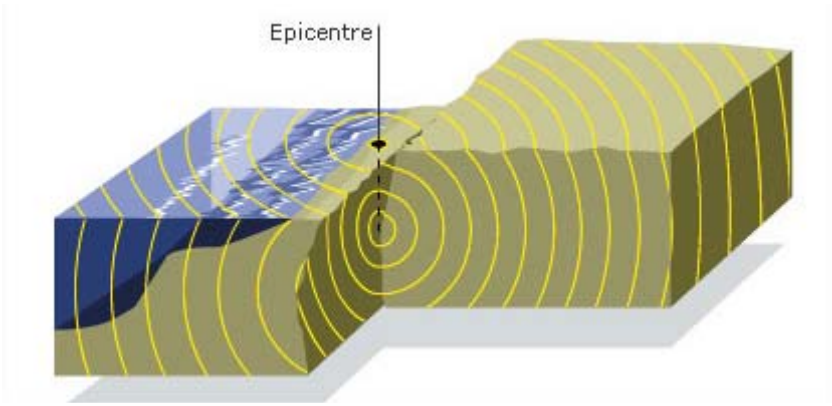
Municipalities and the county will work together to ensure that drought considerations are included in emergency plans and will provide emergency information to homeowners as needed.

The hazard mitigation strategies listed above primarily involve providing information on water conservation measures to farmers and the public. Water conservation will ensure that the resource is available for critical residential, business and agricultural uses (e.g., drinking, food irrigation, manufacturing, firefighting) and good farming practices may help prevent erosion of the rich topsoil found in Ozaukee County. Since drought and dust storms are not hazards that affect buildings or traditional infrastructure (e.g.,

bridges, culverts) these strategies did not need to be designed to reduce damages to existing or future buildings and infrastructure.

Earthquakes

An earthquake is a shaking or sometimes violent trembling of the earth which results from the sudden shifting of rock beneath the earth's crust. This sudden shifting releases energy in the form of seismic waves (wave-like movement of the earth's surface.)[56]



Physical Characteristics

Earthquakes can strike without warning and may range in intensity from slight tremors to great shocks. They can last from a few seconds to over five minutes and they may also occur as a series of tremors over a period of several days. The actual movement of the ground during an earthquake is seldom the direct cause of injury or death. Casualties usually result from falling objects and debris because the shocks have shaken, damaged or demolished buildings and other structures. Movement may trigger fires, dam failures, landslides or releases of hazardous materials that compound an earthquake's disastrous effect.

Earthquakes are measured by two principle methods: seismographs and human judgment. The seismograph measures the magnitude of an earthquake and interprets the amount of energy released on the Richter Scale, a logarithmic scale with no upper limit. For example, an earthquake measuring 6.0 on the Richter Scale is ten times more powerful than a 5.0 and 100 times more powerful than a 4.0. This is a measure of the absolute size or

[56] http://news.bbc.co.uk/2/shared/bsp/hi/pdfs/earthquake_guide.pdf

strength of an earthquake and does not consider the effect at any specific location. The Modified Mercalli Intensity (MMI) Scale measures the strength of a shock at a particular location (i.e., intensity.)

A third less often used way of measuring an earthquake's severity involves comparing its acceleration to the normal acceleration caused by the force of gravity. The acceleration due to gravity, often noted "g," is equal to 9.8 meters per second. Peak Ground Acceleration (PGA) measures the rate of change of motion relative to the rate of acceleration due to gravity and is expressed as a percentage. These three scales can be roughly correlated, as expressed in the table that follows[57]:

Earthquake PGA, Magnitude and Intensity Comparison Table

PGA [%g]	Magnitude [Richter]	Intensity [MMI]	Description [MMI]
<0.17	1.0 - 3.0	I	I. Not felt except by a very few under especially favorable conditions.
0.17 - 1.4	3.0 - 3.9	II - III	II. Felt only by a few persons at rest, especially on upper floors of buildings. III. Felt quite noticeably by persons indoors, especially on upper floors of buildings. Many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibrations similar to the passing of a truck. Duration estimated.
1.4 - 9.2	4.0 - 4.9	IV - V	IV. Felt indoors by many, outdoors by few during the day. At night, some awakened. Dishes, windows, doors disturbed; walls make cracking sound. Sensation like heavy truck striking building. Standing cars rock noticeably. V. Felt by nearly everyone; many awakened. Some dishes, windows broken. Unstable objects overturned. Pendulum clocks may stop.
9.2 - 34	5.0 - 5.9	VI - VII	VI. Felt by all, many frightened. Some heavy furniture moved; a few instances of fallen plaster. Damage slight. VII. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable damage in poorly built or badly designed structures; some chimneys broken.
34 - 124	6.0 - 6.9	VII - IX	VIII. Damage slight in specially designed structures; considerable damage in ordinary substantial buildings with partial collapse. Damage great in poorly built structures. Fall of chimneys, factory stacks, columns, monuments, walls. Heavy furniture overturned. IX. Damage considerable in specially designed structures; well-designed frame structures thrown out of plumb. Damage great in substantial buildings, with partial collapse. Buildings shifted off foundations.
>124	7.0 and higher	VIII or higher	X. Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations. Rails bent. XI. Few, if any [masonry] structures remain standing. Bridges destroyed. Rails bent greatly. XII. Damage total. Lines of sight and level are distorted. Objects thrown into the air.

[57] Wald, Quitoriano, Heaton and Kanamori, 1999

Most of Wisconsin's occurrences have not been severe, with only one registering 5.1 on the Richter Scale.

Frequency of Occurrence

Earthquakes that have affected Wisconsin from 1899 to 1987 are listed in the table that follows. The most severe earthquake in Wisconsin was the record earthquake of 1811, centered along the New Madrid Fault. Most earthquakes that do occur in Wisconsin are very low in intensity and can hardly be felt. These very minor earthquakes are fairly common, occurring every few years. Events of moderate magnitude have occurred in locations in Illinois and Michigan. Those and other stronger earthquakes centered in other parts of the country have been felt primarily in Southern Wisconsin.

Date	Location	Latitude North	Longitude West	Maximum Intensity	Magnitude
10/12/1899	Kenosha	42° 34'	87° 50'	II	3.0
3/13/1905	Marinette	45° 08'	87° 40'	V	3.8
4/22/1906	Shorewood	43° 03'	87° 55'	II	3.0
4/24/1906	Milwaukee	43° 03'	87° 55'	III	--
1/10/1907	Marinette	45° 08'	87° 40'	III	--
5/26/1909	Beloit	42° 30'	89° 00'	VII	5.1 (max)
10/7/1914	Madison	43° 05'	89° 23'	IV	3.8
5/31/1916	Madison	43° 05'	89° 21'	II	3.0
7/7/1922	Fond du Lac	43° 47'	88° 29'	V	3.6
10/18/1931	Madison	43° 05'	89° 23'	III	3.4
12/6/1933	Stoughton	42° 54'	89° 15'	IV	3.5
11/7/1938	Dubuque	42° 30'	90° 43'	II	3.0
11/7/1938	Dubuque	42° 30'	90° 43'	II	3.0
11/7/1938	Dubuque	42° 30'	90° 43'	II	3.0
2/9/1943	Thunder Mountain	45° 11'	88° 10'	III	3.2
5/6/1947	Milwaukee	43° 00'	87° 55'	V	4.0
1/15/1948	Lake Mendota	43° 09'	89° 41'	IV	3.8
7/18/1956	Oostburg	43° 37'	87°45'	IV	3.8
7/18/1956	Oostburg	43° 37'	87°45'	IV	3.8
10/13/1956	South Milwaukee	42° 55'	87°52'	IV	3.8
1/8/1957	Beaver Dam	42° 32'	98°48'	IV	3.6
2/28/1979	Bill Cross Rapids	45° 13'	89°46'	--	<1.0 MoLg
1/9/1981	Madison	43° 05'	87°55'	II	--
3/13/1981	Madison	43° 37'	87°45'	II	--
6/12/1981	Oxford	43° 52'	89°39'	IV-V	--
2/12/1987	Milwaukee	42° 95'	87°84'	IV-V	--
2/12/1987	Milwaukee	43° 19'	87°28'	IV-V	--
6/28/2004	Troy Grove, IL	41° 46'	88°91'	IV	4.2

In an article (published in 2012) in the Milwaukee Journal-Sentinel:[58]

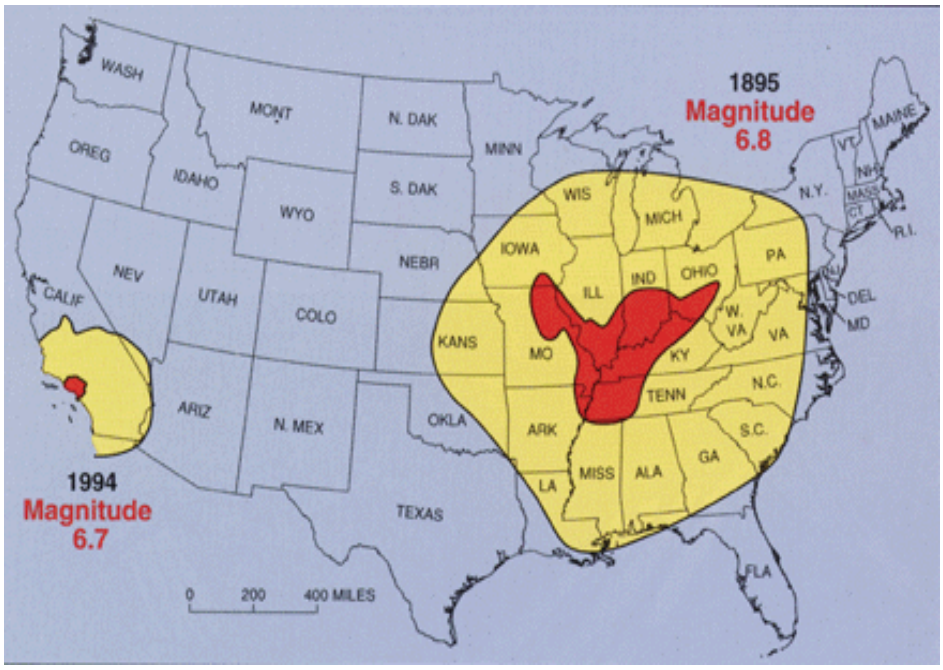
> *A 1.5-magnitude earthquake was recorded at 12:15 a.m. March 20 beneath Clintonville, according to the National Earthquake Information Center. The center is operated by the U.S. Geological Survey.*
>
> *The U.S. Geological Survey said several days of booms and vibrations that rattled windows and nerves last week likely were caused by a swarm of small earthquakes.*
>
> *Scientists at the Wisconsin Geological and Natural History Survey in Madison said the low-intensity seismic activity could have been produced by a phenomenon known as postglacial rebounding.*
>
> *Granite bedrock beneath eastern Waupaca County is slowly adjusting to a great weight being lifted off it when the last glacier melted more than 10,000 years ago. As the granite stretches, rising only a few millimeters a year, it can crack to relieve pressure, according to David Hart, a geophysicist at the Wisconsin Geological and Natural History Survey.*
>
> *As it cracks, one piece slides or shifts places, releasing enough energy to create a seismic wave that rises to the surface.*
>
> *There is no known geologic fault beneath central Wisconsin so the postglacial rebounding is the only thing stretching the bedrock crust in the state, Hart said.*

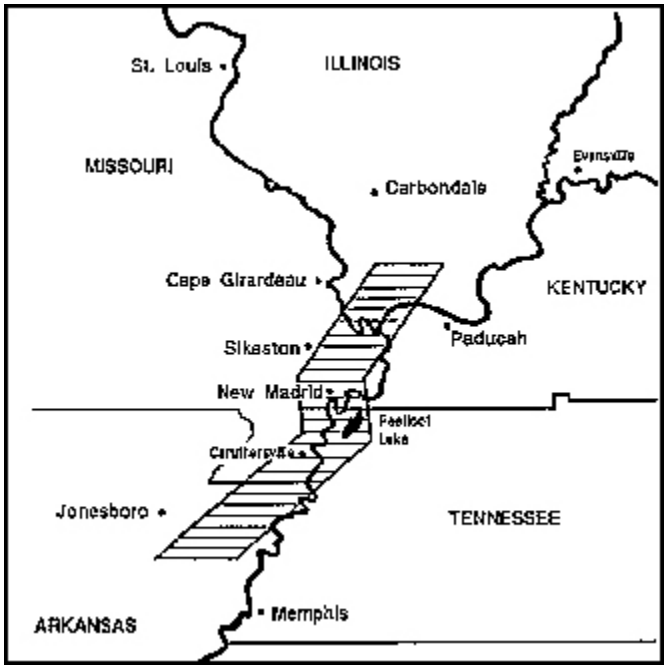
This phenomenon was widely reported in local, state and national news and drew interest from the public. An educational and informational session was held for the public in Ozaukee County, as can be seen in the clipping in Appendix F.

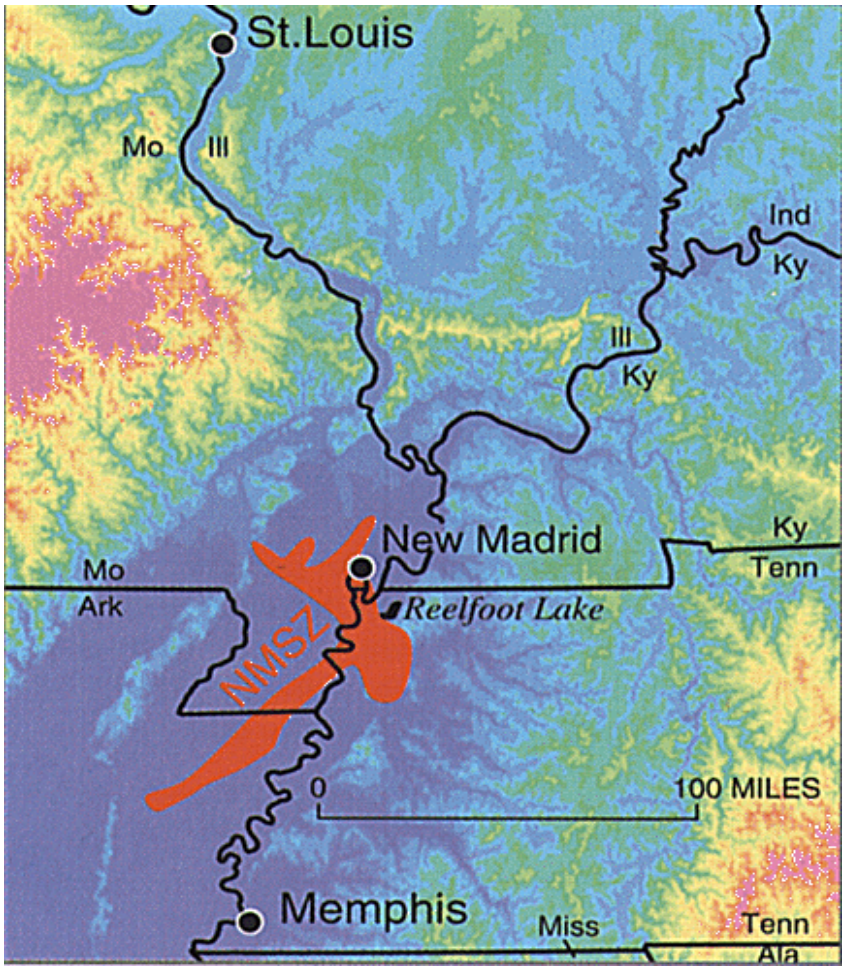
The nearest major active fault is the New Madrid Fault, stretching along the central Mississippi River Valley in Missouri. In recent years, considerable attention has focused on seismic activity in the New Madrid seismic zone that lies within the central Mississippi Valley, extending from northeast Arkansas through southeast Missouri, western Tennessee and western Kentucky to southern Illinois. Scientists at the Center for Earthquake Information have computed a set of probabilities that estimates the potential for different magnitude earthquakes to occur at the New Madrid Fault. Even an 8.3 magnitude earthquake at the New Madrid Fault, however, would cause only minor damage in the southeastern

[58] http://www.jsonline.com/news/wisconsin/rumbling-booming-resumes-in-clintonville-6e4p9o8-144653925.html

corner of Wisconsin. At this time it is not possible to predict the exact date, duration or magnitude of an earthquake.







As seen on the map in Appendix A, the earthquake threat to Ozaukee County is considered very low (the 50-year acceleration probability is 4%.) Minor damage (e.g., cracked plaster, broken windows) from earthquakes has occurred in Wisconsin but most often the results have been only rattling windows and shaking ground. There is little risk except to structures that are badly constructed. Most of the felt earthquakes reported have been centered in other nearby states. The causes of these local quakes are poorly understood and are thought to have resulted from the still-occurring rebound of the earth's crust after the retreat of the last glacial ice. The likelihood of damage from an earthquake is also very low.

Vulnerability

Any impact in the community from earthquake would likely be due to a few broken windows and personal effects that fell in the

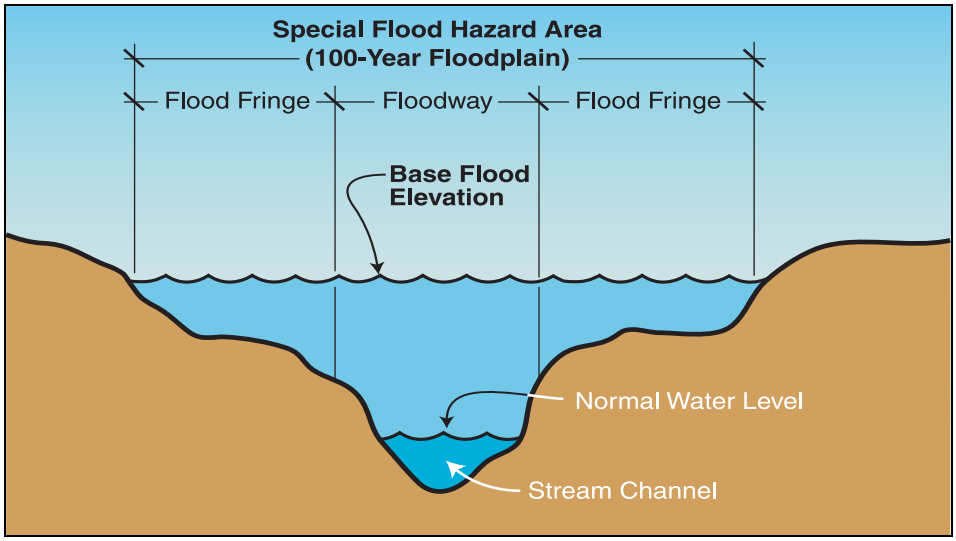
earthquake. The damage to critical infrastructure and buildings would be negligible.

Hazard Mitigation Strategies

Since Ozaukee County is not likely to suffer directly from a severe earthquake, the community impacts are not considered significant and mitigation planning for this hazard is not necessary. The goal for this section of the plan is therefore to educate on the very low risks of earthquake damage in Ozaukee County.

Flooding and Dam Failure

Flooding is defined as a general condition of partial or complete inundation of normally dry land (i.e., the floodplains) caused by the overflow of inland waters or the unusual and rapid accumulation or runoff of surface waters from any source. Floodplains are the lowlands next to a body of water that are susceptible to recurring floods.[59]



Floods are common in the United States, including Wisconsin, and are considered natural events that are hazardous only when adversely affecting people and property.

Physical Characteristics

Major floods in Wisconsin have usually been confined either to specific streams or to locations that receive intense rainfall in a short period of time.

Flooding that occurs in the spring due to snow melt or during a period of heavy rain is characterized by a slow buildup of flow and velocity in rivers and streams over a period of days. This buildup continues until the river or stream overflows its banks, for as long as a week or two, then slowly recedes. Generally the timing and

[59] FEMA, August 2001

location of this type of flooding is fairly predictable and allows ample time for evacuation of people and property.

For prediction and warning purposes, floods are classified by the National Weather Service into two types: those that develop and crest over a period of approximately six hours or more and those that crest more quickly. The former are referred to as "floods" and the latter as "flash floods". Flash flooding occurs solely from surface run-off that results from intense rainfall. Flash flooding occurs less frequently in Wisconsin than flooding associated with spring snow melt but it is unpredictable.

City of Port Washington – the area of a drainage project which will allow water to flow from the nearby bluff into Lake Michigan.

Generally the amount of damage from flooding is a direct consequence of land use. If the ground is already saturated, stripped of vegetation or paved, the amount of run-off increases, adding to the flooding. There is also a concern regarding the loss of topsoil and erosion due to flooding.

Terms commonly used when referring to flooding are "100-year flood" and "flood plain." A "100-year flood" is defined as a flood having a one percent chance of being equaled or exceeded in magnitude in any given year.

Flood Probability Terms Table[60]

Flood Recurrence Intervals	Percent Chance of Occurrence Annually
10 year	10.0%
50 year	2.0%
100 year	1.0%
500 year	0.2%

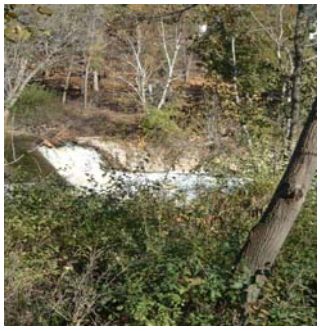
The Wisconsin Department of Natural Resource (DNR), working with local zoning offices, has designated flood plain areas as those places where there is the greatest potential for flooding. Flooding may also occur due to a dam breach or overflow. Dams are barriers built across a waterway to store, control or divert water; a dam failure is a failure of the dam that causes downstream flooding. Failures may be caused by technological events (e.g., materials failure) or by natural events (e.g., landslide, earthquake) with flooding being the most common result.

The Wisconsin DNR database lists the following small, uncontrolled agricultural dams included in Ozaukee County[61]:

Dam Official Name (Popular Name)*	Size	Latitude	Longitude	Owner Type	Waterway Name (Downstream City)
Albright, John	Small	43.2593819	-87.9470735	Private	TR-Milwaukee River
Cedarburg Woolen Mill	Large	43.30152	-87.98869	City	Cedar Creek
Columbia Mills	Large	43.3003167	-87.9751487	City	Cedar Creek
Fish Creek		43.1970381	-87.895906	Private	Fish Creek
G E Harris	Large	43.3603137	-87.9813461	Private	TR Milwaukee
Grafton	Large	43.3188497	-87.9491976	Village	Milwaukee
H Zindler Lake	Small	43.3377175	-87.0503483	Private	TRIB Cedar Creek
Hamilton Mill	Small	43.2857875	-87.9713952	Private	Cedar Creek
Harrington Beach	Small	43.4923677	-87.8029116	DNR	Puckett's Pond
Lime Kiln	Small	43.3051425	-87.9533985	Village	Milwaukee
Ozaukee County Park	Small	43.4482052	-87.972382	County	TRIB to Milwaukee R
Ron Robbins	Small	43.473894	-87.9685939	Private	TRIB Milwaukee River
Ruck	Small	43.2973031	-87.986335	Private	Cedar Creek
Thiensville	Large	43.2307214	-87.9791359	Village	Milwaukee
Waubeka	Large	43.4720165	-87.9922726	Private	Milwaukee

[60] State of Wisconsin Hazard Mitigation Plan, 4-28.
[61] http://dnrmaps.wi.gov/imf/imf.jsp?site=SurfaceWaterViewer.damsafety

Wire and Nail Factory	Large	43.3010117	-87.9698961	Private	Cedar Creek



Most of these dams (like the Lime Kiln Dam on the Milwaukee River in Grafton seen on the right) are small, mill-type dams under the jurisdiction of the DNR; many are privately owned (although the Lime Kiln Dam is public). There are three dams on Cedar Creek that are over 100 years old and are part of the historic Cedarburg downtown area. None of these dams could handle the volume of water generated by a 100- or 500-year flood without overtopping. These dams are inspected by the Wisconsin Department of Natural Resources (DNR) and the City of Cedarburg is required to have an Emergency Action Plan (EAP) and failure analysis on them. There are no dams in other counties that pose a significant flooding risk to the citizens of Ozaukee County.

Cedarburg Dam at the Highland Drive Bridge.

One potential effect of flooding is erosion. Erosion is defined as the removal of soil by the force of waves, currents and/or ice at a lakeshore or streambank or by the power of wind or water on open land. Erosion is a natural process that can be accelerated by natural disasters (e.g., flooding, heavy rains, strong winds, drought) or by human activity (e.g., removal of plants/trees, tilling.) Because

of the many waterways in Ozaukee County, there is concern about ensuring the stabilization of the shorelines.

Watersheds

Ozaukee County has seven total (with five main) watersheds. The maps in Attachment D show the watershed boundaries and 100-year flood plains for the entire county. Following is a brief description of each watershed:

Milwaukee River South

This is the largest watershed in Ozaukee County. This watershed begins in northern Ozaukee County and continues through the middle and eastern portion of the county and into northeastern Milwaukee County.

A raised sidewalk and entry to underground parking structure at a Port Washington condominium project. The basement was flooded in 2008 and recently the homeowner's association made this improvement to reduce future damages.

Sauk and Sucker Creeks Watershed

This is the second largest watershed in Ozaukee County, which begins in the south-central portion of Sheboygan County and runs through the north-central and northeastern portion of Ozaukee County.

Onion River

Most of this watershed is in Sheboygan County but a small section dips into the northeastern portion of Ozaukee County.

North Branch Milwaukee River

Most of this watershed is in Sheboygan and Washington Counties but a small portion covers the northwestern portion of Ozaukee County.

East and West Branches Milwaukee River

Most of this watershed is in Washington and Fond du Lac Counties but the far eastern tip of the watershed impinges on the northwestern/west-central portion of Ozaukee County.

Cedar Creek

This is the third largest watershed in Ozaukee County. Most of this watershed is in Washington County but the far eastern portion covers the west-central portion of Ozaukee County.

Menomonee River

This watershed is mostly covers Waukesha and Milwaukee Counties but a small portion of it is in the south eastern corner of Washington County and the southwestern corner of Ozaukee County.

Floodplain Regulations

Floodplain regulations have been in place in the cities, towns and villages of Ozaukee County for many years. The Wisconsin Department of Natural Resources (DNR) requires that each municipality approve regulations that meet DNR guidelines. These regulations and guidelines result from the value of Wisconsin lakes and waterways and a desire to preserve them and to protect the people who reside near them. Unregulated development can lead to loss of lives and property during floods.

Chapter 614, Laws of Wisconsin 1965, requires counties to adopt regulations giving all lands within 300 feet of navigable rivers or streams protection from haphazard development. Under this legislation, Ozaukee County has adopted a zoning ordinance which gives a measure of protection to watersheds. The law protecting flood plains was created to meet the following objectives:

- Reduce the hazards to life and property from flooding.
- Protect flood plain occupants from a flood which is or may be caused by their own land use, which is or may be undertaken without full realization of the danger.
- Protect the public from the burden of extraordinary financial expenditures for flood control and relief.

Encroachment on flood plains, including structures or fill, reduces the flood-carrying capacity.

Frequency of Occurrence

Wisconsin has experienced several major floods during the last two decades. The 1973 and 1986 floods revealed that no flood plains or urban areas in Wisconsin can be considered safe from damages. Mill-dams have developed leaks on occasion but have not caused any flooding problems.

Ozaukee County does have a history of flooding problems, especially along the Milwaukee River. Ozaukee County has been included in nine Presidential Disaster Declarations requests for flooding, the most recent of which are detailed below:

- FEMA-912-DR-WI: On August 6, 1991, the President declared a major disaster as a result of high winds and severe storms that occurred July 7, 1991.
- FEMA-1180-DR-WI: On July 7, 1997, the President declared a Major Disaster as a result of flooding that occurred on June 21-23. The declaration was granted for both Public and Individual Assistance as well as Hazard Mitigation.
- FEMA 1526-DR-WI: On June 18, 2004, the President declared a major disaster as a result of severe storms and flooding that began on May 19th. Ozaukee County was

eligible for both Public and Individual Assistance as well as Hazard Mitigation.

- FEMA 1768-DR-WI: On June 14, 2008, the President declared a major disaster as a result of severe storms, tornadoes and flooding. Ozaukee County was eligible for both Public and Individual Assistance as well as Hazard Mitigation.

The flooding of FEMA-1768-DR-WI was some of the most severe flooding experienced by the State of Wisconsin and Ozaukee County recently.

Following is a table with the 19 flood events, including flash flooding, recorded by the National Weather Service between 1 January 1950 and 31 December 2012:

Year	Date	Location	Human Losses	Damage Losses	Miscellaneous
1995	08/28	Port Washington	Death/Injury: 0	Property/Crop: $0	Urban Flood
1996	02/27	Ozaukee Co	Death/Injury: 0	Property/Crop: $0	Flood
	06/17	Port Washington	Death/Injury: 0	Property: $200K Crop: $0	Flash Flood
	06/18	Port Washington	Death/Injury: 0	Property/Crop: $0	Urban/Small Stream Flood
	06/18	Ozaukee Co	Death/Injury: 0	Property: $3.9M Crop: $3.0M	Flood
	06/18	Belgium	Death/Injury: 0	Property: $1.0M Crop: $0	Flash Flood
	06/18	Port Washington	Death/Injury: 0	Property: $200K Crop: $0	Flash Flood
	06/18	Port Washington	Death/Injury: 0	Property: $5.3M Crop: $0	Flash Flood
1997	06/21	Mequon	Death/Injury: 0	Property: $3.6M Crop: $0	Flash Flood
1999	05/16	Grafton	Death/Injury: 0	Property/Crop: $0	Urban/Small Stream Flood
2000	05/17	Mequon	Death/Injury: 0	Property: $75K Crop: $0	Flash Flood
2001	02/09	Ozaukee Co	Death/Injury: 0	Property: $325K Crop: $0	Flood
2002	08/13	Port Washington	Death: 0 Injury: 1	Property/Crop: $0	Urban/Small Stream Flood
	08/21	Port Washington	Death/Injury: 0	Property/Crop: $0	Urban/Small Stream Flood
2004	05/23	Ozaukee Co	Death/Injury: 0	Property: $135K Crop: $0	Flood
	06/01	Ozaukee Co	Death/Injury: 0	Property: $35.6M Crop: $216.0M	Flood
2007	7/26	Fredonia	Death/Injury: 0	Property: $100K Crop: $0	Flash Flood
2008	6/12	Mequon	Death/Injury: 0	Property: $462K	Flash Flood

				Crop: $300K	
2010	7/22	Five Corners	Death/Injury: 0	Property: $20K Crop: $1K	Flash Flood

There are also other significant flooding events from 1973 to the present that have been identified locally including:

- 1973 - The Milwaukee River between Waubedonia Park and Saukville spilled over the banks, rendering several hundred acres of farmland useless for the year. Severe basement damage occurred in all houses along the river. A Presidential Disaster Declaration was granted.
- 1980 - The Milwaukee River between Waubedonia Park and Grafton spilled over the banks causing the loss of personal property and numerous automobiles.
- 1986 - September 10. City of Port Washington and Village of Saukville business district flooded causing several thousand dollars damage to business inventories and buildings. A Presidential Disaster Declaration was granted.
- 1993 - April 20. Village of Thiensville. Flash flooding, road closures, and flooded basements occurred. Twenty-five structures in the Village of Thiensville were affected, and total damage estimates were approximately $250,000. Two residences elsewhere sustained damage as well. One, in the Town of Cedarburg, sustained approximately $11,000 in damage; the other, in the City of Port Washington, incurred approximately $1,000 in basement damage.
- 1996 - June 17. Countywide. Due to heavy rains, water levels for the Milwaukee River and Cedar Creek exceeded flood stage in the Town of Grafton, Village of Thiensville, and City of Mequon. The National Weather Service issued a river flood warning for Ozaukee County. During this storm, a strong tropical depression developed and stalled over the northeastern quarter of the county. Fifteen inches of rain fell in 24 hours causing extensive flash flooding and damage in the City of Port Washington, Town of Port Washington, Village of Belgium, and Town of Belgium. Damage estimates exceeded $10 million. A Presidential Disaster Declaration request was denied by FEMA.
- 1997 - June 21. Countywide. More than nine inches of heavy rainfall affected the southern third of Ozaukee County. Extensive flash flooding occurred in the City of Mequon and Village of Thiensville. Minor flash flooding damage occurred in the Town of Grafton and local flooding occurred in the Town of Fredonia. Major interruption of electrical power

caused sanitary sewer lift stations to fail, resulting in additional basement flooding due to sewage back-up. Damage estimates exceeded $3 million. A Presidential Disaster Declaration was granted.

The following list summarizes damages attributed to flooding in Ozaukee by the National Flood Insurance Program through 31 December 2012:[62]

Ozaukee County NFIP Loss Claims				
Jurisdiction	**Total Loss**	**Closed Loss**	**Closed Without Payment**	**Total Payments**
City of Cedarburg	7	3	4	$3,831.21
Village of Grafton	2	0	2	$0.00
City of Mequon	136	97	39	$1,266,077.98
Ozaukee Co.	33	18	15	$215,225.22
City of Port Washington	4	3	1	$12,174.73
Village of Saukville	27	16	11	$208,331.85
Village of Thiensville	69	57	12	$636,196.11

Following is the number of repetitive loss properties, by jurisdiction, through 31 July 2012. Please note that all properties are single-family residential structures unless otherwise noted.

- 12 repetitive loss properties in Mequon
- 1 repetitive loss property in Port Washington
- 1 repetitive loss properties in Grafton
- 11 repetitive loss properties in Thiensville.
    - 1 two-to-four family
    - 1 non-residential

[62] http://bsa.nfipstat.fema.gov/reports/1040.htm

- 8 other residential

A careful review of the geography and history of flooding in Ozaukee County leads to the conclusion that there is a high probability of flooding in the future and a high probability of damage and losses due to flooding. This flooding could occur due to Milwaukee River flooding, flash flooding or a dam failure.

Vulnerability

After flooding, whether caused by a storm or dam failure, there is often damage. Potential vulnerabilities due to flooding events can include flooded public facilities and schools, many of which are the community's shelters needed when individual housing is uninhabitable. Utilities are also vulnerable in floods, which can bring down electric lines/poles/transformers, telephone lines and can disrupt radio communications. The loss of communications can impact the effectiveness of first response agencies, which need to communicate via two-way radio to mount emergency response and recovery activities. The public media communications utilized by emergency managers to provide timely and adequate emergency public information can also be impacted.

Residential structures may suffer from flooded basements, damaged septic systems and damaged functionals (e.g., HVAC systems, clothes washers and driers). Homes may also be impacted by sewer back-up and, if the home is not properly cleaned after a flood, bacterial growth and mold may impact the home's air quality and cause illness among the occupants.

Businesses can suffer building and equipment damage similar to homes. Businesses may lose expensive product stored in basement or other low areas as well as the ability to operate from their facility. If the facility must close, its owners and employees will most likely suffer economic hardships beyond what their personal losses may have entailed. Agricultural business losses involve the loss of standing crops and harvests that are damaged by flooded storage facilities in the immediate time period. On a longer time scale, the erosion of rich topsoil by floodwaters can degrade the land and impact future crop yields.

Perhaps one of the most expensive types of flood damage is that to roadways, which are washed out, inundated and/or covered by debris, blocking access to emergency and general public traffic.

Drainage culverts to be installed on the State Hwy 33 reconstruction project.

For additional information about historical damages and potential future flood damage loss, including critical infrastructure information, please see Appendix E, which contains the HAZUS-MH Flood Event Report for a Flood Study Case done for the county (rev. 10/12).

Hazard Mitigation Strategies

Ozaukee County is committed to remaining compliant with the requirements of the National Flood Insurance Program (NFIP) and all other state and federal laws. According to the NFIP, the following communities participate in the program. Notes to the side indicate information from the communities regarding their understanding of their participation.

- Ozaukee County
- Cities of Cedarburg, Mequon, and Port Washington – have a floodplain ordinance and acknowledges participation in the NFIP
- Villages of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville – have a floodplain ordinance and acknowledges participation in the NFIP

There are no areas in Ozaukee County which have had special flood areas identified by FEMA but are not in the NFIP program. One hazard mitigation strategy selected is to inform the public about the availability of flood insurance; this task will be carried out by the County Division of Emergency Management. See Appendix F for additional supporting documents.

The plan is intended to identify areas that are particularly susceptible to flooding, assess the risks, analyze the potential for mitigation and recommend mitigation strategies where appropriate. The goals of this plan are:

- Goal 1: To reduce, in a cost effective manner, the loss of lives and property due to these events. Another part of this goal is to promote safety and health in areas that have been or are prone to be flooded.
- Goal 2: To preserve and enhance the quality of life throughout Ozaukee County by identifying potential property damage risks and recommending appropriate mitigation strategies to minimize potential property damage during/due to flooding.
- Goal 3: To promote countywide planning that avoids transferring the risk from one community to an adjacent community.
- Goal 4: To ensure that all communities in Ozaukee County participate in the NFIP so that all county residents have access to affordable flood insurance coverage.
- Goal 5: To identify potential funding sources for mitigation projects and form the basis for project grant applications through FEMA's Pre-Disaster Mitigation (PDM) and/or Flood Mitigation Assistance (FMA) programs.

Short term actions that can lessen the effects of flooding include:

- Issuance of early warnings through flood advisory bulletins,
- Dissemination of instructions to the public through the media.
- Preparation of congregate care facilities.
- Evacuation of people and property.

Temporary protective measures such as sandbagging, protection of buildings and other structures and cut-off of gas and electricity may

also be implemented. Presently, Ozaukee County maintains a limited stock of sandbags to assist with flood containment.

The current emphasis in flood mitigation is on long-range actions. Such actions include the adoption of proper floodplain zoning ordinances and land-use planning. There are several communities within the county that participate in a Smart Growth Comprehensive planning process. The county should become involved with these communities and their processes to ensure data sharing and consistency among the communities and to ensure that mitigation ideas are incorporated into the plan. The Land and Water Management (LWM) Department will lead this effort along with its municipal partners where applicable, and may apply for grant funding, as appropriate, to help defray costs.

There is a need for review and updating of some of the flood-related data, information and projects in the county including:

- Incorporate mitigation activities into the local comprehensive planning process {including Spatial Management, Analysis and Resource Tracking (SMART) growth plans} as applicable.

- Conduct a feasibility study (with a cost-benefit analysis) for conducting laser imaging detection and ranging (LIDAR) mapping flights for good digital terrain maps (DTM) to model the surface contours for flooding and other scenario modeling/projections. Many of the planning decisions are based on good mapping data. The data in Ozaukee County is not of the currency and detail that would be most useful for good flood management planning.

- Complete amendments and revisions to the Flood Rate Insurance Maps (FIRMS) as necessary.

- Update, as necessary, the stormwater plan.

- Update, as necessary, the water management plans and continue marking the stormwater drains.

- Participate in FEMA's Risk Mapping, Assessment, and Planning (MAP) Program, which will conduct a comprehensive study of flood hazards for Lake Michigan. See Appendix F for additional detail.

The Ozaukee County Division of Emergency Management disseminates public information materials related to flooding and will continue to have printed information as well as links to applicable sites on their webpage including providing NFIP information to citizens.

Ozaukee County has a history of expensive damage to buildings and infrastructure due to floods. In addition to the strategies listed above that deal with public information and planning, the community can make current and future buildings and infrastructure more disaster-resistant by:

- Using its maps and hydrology studies to ensure that properties at risk are identified and, as available, appropriate grants are sought and secured to mitigate losses. Good data also ensures that decision-makers can create and enforce appropriate zoning and/or building regulations to make any new structures disaster-resistant.

- Targeting old structures for buy-out and convert the land to open, public lands. This also eliminates future damages by preventing building on this land. The Town of Grafton and the Ozaukee County Parks and Planning Department will continue to explore options for home owners in the Edgewater Drive area (Town of Grafton). The county has applied for a Federal Coastal Management Grant and is looking to convert the "buy out" land to county park land. The county will also take steps to ensure that the road is of adequate height to escape flood damage. See Appendix F for additional detail.
- Continue to evaluate and update the flood gauge network in Ozaukee County. The Little Menomonee River gauge (Freistadt, WI) was added to the website, bringing the total to five gauges.[63] In 2012, the Waubeka river gauge on the Milwaukee River was disbanded because, in part:
    - The gauge had been disbanded by the NWS/NOAA after the Waubeka dam was removed but it was reactivated in 2004.
    - By 2009, a monitoring station with new technology was installed nearby in Saukville.
    - In 2012, the Newburg Dam was removed and the water level has dropped since then.
    - In April, 2011 a "Section 404 hazard mitigation grant" (FEMA-1933-DR-WI) was submitted to replace the aging monitoring equipment and relocate the gauge to

[63] http://www.co.ozaukee.wi.us/EmergencyManagement/riverguages/riverlevels.html

public property. The grant received preliminary approval however NWS/NOAA was unwilling to continue the cost share of the program, hence the application was withdrawn and the NWS was unwilling (as of 10/22/12) to take over all financial/program support for the gauge due to their budget constraints
    - If this old gauge malfunctions the NWS will have difficulty repairing it; if there is a catastrophic failure, NWS/NOAA will not repair it.
    - There are costs associated with the gauge and there has been no clear return on investment.
- Pre-identifying infrastructure (roads, bridges, culverts, shoulders) prone to flooding and directing current and future budgetary dollars towards making the infrastructure disaster-resistant as it is scheduled for routine maintenance.

Ozaukee County has applied for grant funding for three mitigation projects:

- During the flooding of June, 2008 (DR-1768-WI), Canyon Creek overflowed its banks as it enters the City Veterans Memorial Park. The flood water from the creek entered the parking garage of the Lighthouse Condominiums (415 N Lake Dr. Port Washington, 53074) causing $800,000 total damage to the condominiums, 39 cars were a total loss and the electrical system and an elevator that services the structure were also total losses. It is estimated that only 20% of the damage was covered by insurance. During the response phase, the City of Port Washington's Fire Department and Water Utility responded and installed pumps to remove the water from the underground parking garage. The South Wing wall of the Division Street Bridge was eroded and washed out soil behind the wall under the sidewalk and supporting road. A temporary repair of the washout/sink hole was completed by filling in with clear stone. They are applying for a 404-Hazard Mitigation Grant to try to make a sound, permanent repair.

- The Village of Grafton has been awarded up to $1,675,000 (50% WI DNR share) to rebuild the Bridge St./Grafton Dam, repair the abutments, widen the spillway and provide an option for drawing down the water during high-water emergencies. These repairs will bring the dam into compliance with state flood control regulation. The village

has until 2019 to complete the project. See Appendix F for additional detail.

- The Village of Newburg has been allotted up to $650,000 of federal funds from Ozaukee County to remove the Newburg Dam on the Milwaukee River to return the waterway to a more natural condition for fish and other wildlife. See Appendix F for additional detail.

Additional proposed flood mitigation strategies within Ozaukee County include:

- Ozaukee County
  - Explore ability and options to produce maps "on the fly" of damages. They will need to modernize the land records from the plan completed in 2010. Maps would be made available to the public, insurance, realtors, etc. Tied to tax rolls.

- Village of Belgium
  - Elevator Lane floods out the bike lane. Explore options for remediation (detention pond, reroute storm sewer discharge, etc.). Work has begun. Hope to complete in 2017.

- Village of Newburg
  - Obtain funding to complete current floodplain mapping for a portion of Washington County that is in the Village of Newburg. Washington County ran out of funding to complete current floodplain mapping.

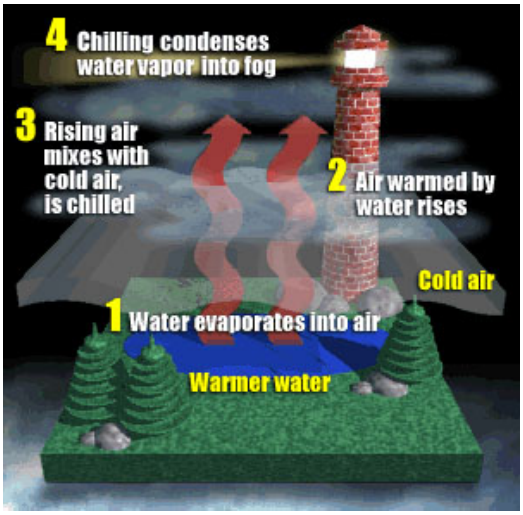
- Village of Saukville
  - Explore options to alleviate natural damming effect in Milwaukee River near Ehlers Park and HWY 33. The DNR has restricted the Village of Saukville from clearing debris (dead trees, branches, etc.) out of Ehlers Park area. The resulting blockage often floods HWY 33 and several homes.

  - In conjunction with the Town of Saukville, obtain funding to correct HWY W N 33 flooding issues. Rain causes water to overflow road. Flood closes bridge and restricts main access. Six homes and two or three businesses get wet basements. An estimate has been generated by County Highway Department.

- Village of Thiensville
    - Complete work on retention pond to keep downtown from flooding.

Fog

Because of its location next to Lake Michigan, Ozaukee County has a long history dealing with fog, which at its most basic definition is a cloud based on the ground rather than in the atmosphere.[64]



Physical Characteristics

Fog occurs when the air near the ground is saturated with moisture and condenses on tiny particles suspended in the air. These particles are called cloud condensation nuclei and actually attract water vapor molecules to their surfaces. Once condensation occurs on these tiny surfaces, the resulting liquid drops can remain suspended in the air because their weight causes them to descend slowly to the ground or be carried around by wind. The dew-point temperature, or saturation vapor pressure, can be reached by either adding more water vapor to the air or cooling the air down to the dew-point temperature. Fog is classified by the dominant formation process and exists as long as processes continue to maintain saturated conditions. There are several basic types of fog[65]:

- Radiation Fog is caused by cooling close to the earth's surface. The earth gives off long-wave radiation which on a

64 http://www.fi.edu/weather/events/fog.html

65 http://www.jsonline.com/weather/wtmj/fogtypes.stm, http://www.usatoday.com/weather/tg/wadvfog/wadvfog.htm, http://www.usatoday.com/weather/tg/wfallfog/wfallfog.htm, http://www.usatoday.com/weather/tg/wrainfog/wrainfog.htm, http://www.usatoday.com/weather/wfog.htm, http://www.cimms.ou.edu/~cortinas/1014/l12_3.html

clear night travels out into space. If the temperature drops to the dew point close to the ground, radiation fog can form. Radiation fog is also known as ground fog. The fog normally disappears soon after sunrise as the sun's warmth evaporates it.

- Valley Fog is one type of Radiation Fog that forms in mountain valleys during winter and can be more than 1,500 feet thick. Often, the winter sun is not strong enough to evaporate the fog during the day. When the air cools again the following night, the fog often becomes thicker, which makes it even harder for the sun to burn it off the following day. These fogs can last for several days until strong winds blow the moist air out of the valley. The tendency for cool, dense air to pool at the bottom of valleys also enhances valley fog.

- Advection Fog results from the movement (advection) of warm, moist air from the south over a colder land mass. During the winter this is common when snow covers much of the Midwest. The snow cools the bottom portion of the moist airmass often resulting in condensation. The thickest advection fog usually forms during nights with light winds because humid air near the ground is not mixed with the drier air above. With light winds, the fog near the ground can become thick and reduce visibilities to zero; usually the fog burns off during the day but it can last many days if it is thick enough to block out the sun's light. This type of fog can occur almost anywhere in the United States, especially during winter warm-ups and early spring thaws. It can be widespread and very dangerous to commuters and aircraft travel.

- Evaporation Fog around Wisconsin is caused by cold air crossing over warmer bodies of water. The water evaporates its moisture into the colder air which immediately condenses it into clouds and fog. This is what looks like steam over Lake Michigan, inland lakes and rivers on a cold autumn or winter day. This rising fog can be found above thermal pools in Yellowstone National Park and is what you see when cool rain hits hot pavement. This may also be called "steam fog" or "sea smoke" when it forms over oceans. Sometimes this fog is lifted quickly and forms rotating whirls of fog known as *steam devils*.

- Upslope Fog is common near the Rockies, including the Denver area. If the winds are out of the east, the air flows up as it rises in elevation approaching the mountains. This can cool the air to its dew point and result in widespread fog.
- Rain Fog is created when late afternoon or evening showers and thunderstorms during the spring and summer leave the ground soaked just as the sun sets. Though the rain usually stops overnight, the high humidity level created by the rainfall will not allow the moisture to evaporate and as a result, fog forms. This occurs especially at times when there are light winds. As the air warms up the next morning, this rain-enhanced fog will usually burn off by midday.
- Precipitation Fog forms when rain or snow falls. As precipitation falls into drier air below the cloud, the liquid drops or ice crystals evaporate or sublimate directly into water vapor. The water vapor increases the moisture content of the air while cooling the air. This often saturates the air below the cloud and allows fog to form.

Frequency of Occurrence

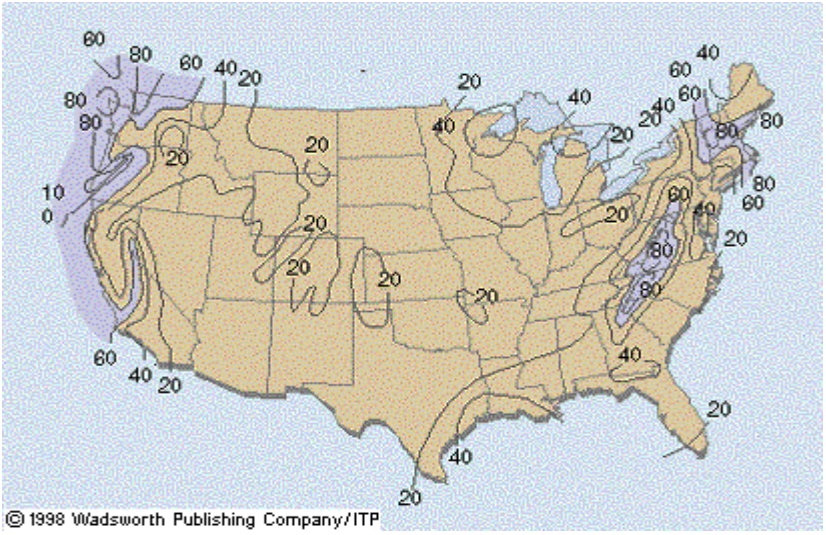
Some locations on this planet have weather conditions that are conducive to making fog frequently such as[66]:

- San Francisco, California has an average of 18 days of heavy fog each year.
- Cape Disappointment, Washington is the foggiest place on the western U.S. coast with an average of 106 days of heavy fog per year.
- The foggiest area on the east coast of the United States is found along the rockbound coast of Maine. Moose Peak Lighthouse on Mistake Island, at an elevation of 72 feet, averages 1580 hours of heavy fog each year. Many other locations have problems with fog, such as Eastport, Maine with 65 days annually and Portland, with 55 days of heavy fog each year.

66 http://www.jsonline.com/weather/wtmj/fogplaces.stm

- Inland areas with regular heavy fog include parts of the Appalachian Mountains such as a peak area in West Virginia that averages over 100 days each year. Elkins, at an elevation of 1948 feet has about 81 days annually with heavy fog.
- Milwaukee averages about 26 days with some heavy fog and this is comparable to the fog seen in Ozaukee County.

Average Annual Number of Days with Heavy Fog in the United States



Ozaukee County is geographically susceptible to issues with heavy fog and on one tragic day, 11 October 2002, 11 people died in fog-related incidents. The National Weather Service reports 64 fog events in the county between 1 January 1950 and 31 December 2012.

Year	Date	Location	Human Losses	Damage Losses
1996	5/17	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
2000	1/9	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	2/25	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	3/21	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	8/23	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	8/23	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	10/24	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	10/24	Ozaukee County	Deaths: 0	Property: $0

Year	Date	Location	Human Losses	Damage Losses
			Injuries: 0	Crop: $0
2001	1/14	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	2/24	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	3/12	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	4/7	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	5/17	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	5/24	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	5/25	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	7/18	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	7/18	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	7/30	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	8/3	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	8/23	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	12/2	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
2002	2/20	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	4/13	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	10/11	Ozaukee County	Deaths: 11 Injuries: 0	Property: $0 Crop: $0
2003	3/20	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
2004	2/27	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	9/4	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	10/10	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	10/12	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	12/6	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	12/29	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
2005	1/11	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	9/4	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	11/27	Ozaukee County	Deaths: 0	Property: $0

Year	Date	Location	Human Losses	Damage Losses
			Injuries: 0	Crop: $0
2006	3/9	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	5/9	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	9/15	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	9/23	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	11/7	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	12/11	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	12/21	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
2007	3/23	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	5/10	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	6/1	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	6/2	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	6/3	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	9/20	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	9/20	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	10/1	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	12/21	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
2008	1/5	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	2/4	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	9/23	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	9/25	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	12/26	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
2009	2/26	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	3/7	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	3/10	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	4/30	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	9/10	Ozaukee County	Deaths: 0	Property: $0

Year	Date	Location	Human Losses	Damage Losses
			Injuries: 0	Crop: $0
2010	3/10	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	5/21	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	8/1	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	12/30	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
2011	5/13	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
2012	3/23	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0
	4/12	Ozaukee County	Deaths: 0 Injuries: 0	Property: $0 Crop: $0

As can be seen by the table, dense fog events usually occur in Ozaukee County several times per year, particularly in the winter and spring months and considering its geographical location and history, the assessment workgroup believes that Ozaukee County has a high probability of fog occurrence in the future. Due to the highly localized nature of dense fog, the formation of which is dependent on microclimate conditions such as temperature, moisture, terrain, winds, etc. it is very difficult to predict. The workgroup recognized that traffic accidents are the highest hazard from dense fog and as Ozaukee County has many high traffic volume roadways, the likelihood of damage (i.e., death and/or injury) due to fog is also considered high.

Vulnerability

Fog is a concern for the boaters, both commercial and recreational, who travel on Lake Michigan. While the U.S. Coast Guard does not publish reports showing the statistics for fatalities, injuries and property damage due to boating accidents involving fog, one can make a reasonable supposition that this is a concern based on the history of events in Ozaukee County. Boaters caught in heavy fog may strike another vessel, dock or natural feature such as a rock or bluff. The loss of a vessel may be compounded by the fact that most fog occurs when the temperatures are colder and victims forced to evacuate their vessel may suffer from hypothermia more readily than they would in warmer months. Boaters may lose their way in the fog and fog makes it much more difficult for rescuers to find the victims to provide aid.

Perhaps the largest vulnerability to fog is due to automobile traffic crashes. According to the Wisconsin Department of Transportation, dense fog contributes to hundreds of car accidents per year in the state. Following are the Wisconsin Department of Transportation's statistics for fog-related traffic crashes from 1999-2004:

Death and Injury Statistics for Fog-Related Traffic Crashes						
	1999	**2000**	**2001**	**2002**	**2003**	**2004**
Total Crashes	1259	1008	1066	595	772	1141
Fatal Crashes	14	12	19	12	11	16
People Killed	15	13	22	22	11	19
Injury Crashes	528	445	425	238	274	423
People Injured	777	643	593	372	391	615
Property Damage Crashes	717	551	622	345	487	702

Traffic Conditions at the Time of Fog-Related Traffic Crashes						
	1999	**2000**	**2001**	**2002**	**2003**	**2004**
Total Crashes	1259	1008	1066	595	772	1141
Daylight	467	340	295	158	257	398
Dark/Lighted	130	107	130	324	80	140
Dark/Unlit	547	439	491	46	343	456
Dusk	9	18	16	56	7	16
Dawn	99	101	126	9	77	122
Unknown Light Conditions	7	3	8	2	8	9

Some notable fog-related traffic crashes in the area of eastern Wisconsin (which includes Ozaukee County) follow:

On the morning of Friday, October 11, 2002, 50 vehicles were involved in a massive vehicle accident on Interstate 43 in Sheboygan County near Cedar Grove, Wisconsin just north of Ozaukee County. This accident was the deadliest pile-up in Wisconsin history with ten individuals killed and over 40 people injured. Of the injured, seven were in critical condition and one was in serious condition at area hospitals immediately after the incident; 28 other people were treated and released for injuries ranging from burns to broken bones. The accident occurred as cars heading south collided into one another as some vehicles slowed down in a dense fog. This led to a chain reaction as numerous cars were unaware of the scene hidden behind a veil of fog. Chad Kruse, a driver interviewed after the accident, described it by saying, "I entered the wall of fog, like someone took a blanket and threw it over the windshield." At the same time but separate from this

incident, four other accidents occurred nearby on the interstate; all the individuals involved with these accidents survived. [67]

- Fourteen people were injured in January 1996 in a 26-car pileup on southbound I-43 near Ozaukee County Highway KK. The first driver struck said he had missed his exit because of heavy fog and had slowed down to look for another when he was hit from behind.[68]

[67] http://www.stoutonia.uwstout.edu/2002-2003/stories/021024/ne_04.html

[68] The Fog, The Deadliest Traffic Crash in Wisconsin History; Trooper Tim Austin; Wisconsin Trooper, Callan Publishing Ins., Minneapolis, MN; Spring 2003.

- In March 1990, three people were killed and 31 injured in a 52-vehicle pileup on the Tower Drive Bridge in Green Bay after dense fog and smoke from nearby paper mills created a "white wall" that reduced visibility to less than 10 feet. The accident was believed to be triggered when a tanker truck overturned and a ruptured gas tank ignited. Vehicles following too closely on the fog-shrouded bridge slammed into the tanker and were engulfed by a sheet of flames.[69]

The interstate (I-43) and other major area highways in Ozaukee County are corridors for commuters to the heavily-populated Milwaukee metropolitan area and therefore are at very high risk for large, multi-car traffic accidents, especially those nearest to Lake Michigan, which frequently generates the kind of heavy fog that can lead to traffic accidents such as those listed above.

As seen in the true examples above, fog-related incidents can cause death, injury and property loss to the vehicle owners and occupants and their insurance companies. Responding governmental agencies also may suffer losses due to the cost of response, for damage done to roadways and structures due to fires and for potential injuries to responders working in a reduced-visibility zone. Citizens may be impacted by the closure of roadways and delay of activities; businesses may suffer losses due to the absence of workers due to delay, injury and/or death and because of the delay of product on the roadways and direct loss of product in the crash (e.g., due to fire).

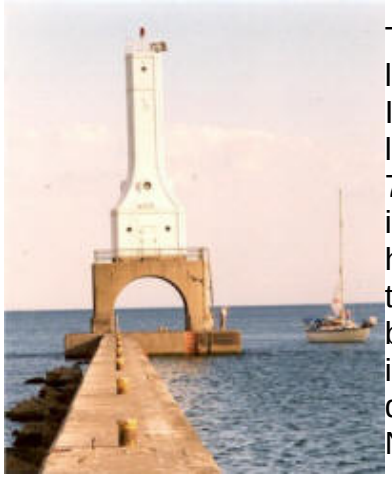
Hazard Mitigation Strategies

One strategy for assisting boaters in the fog is to have a lighthouse with visual and audio signaling. Port Washington has an operational lighthouse.

Port Washington Lighthouse History

The Port Washington lighthouse, built in 1935, is an easily accessible structure but it does take a 2,500 foot walk to stand under it. The walk is along a breakwater of steel decking, very large stones and concrete.

[69] http://www.jsonline.com/news/state/oct02/87083.asp



The red light mounted on the top of the lighthouse is classified as a harbor light. It flashes once every 6 seconds. The light is 58 feet above the breakwater and 78 feet above the surface of the water. It is visible to a boat 8 miles away from the harbor. A fog horn is also mounted on the top of the lighthouse. It gives 2 blasts in every 30 seconds at 24-second intervals. The horn is only operable during the months of April through November.

Photo by Harold Dobberpul,

Before this lighthouse was built, a light station atop St. Mary's Hill functioned in a similar manner. This station was built in 1860 and replaced a light tower that had been built in 1849 on land just east of the 1860 station. From 1860 until the mid-1970's, U. S. Coast Guard light keepers and their families lived in the light station. They first tended the tower light that rose above the station, then an 1889 wooden pier-head light and finally the current pier-head light. When the foghorn and light were automated in the mid 1970's, the keeper's post was eliminated.[70]

U.S. Coast Guard Navigation Aids

The U.S. Coast Guard marks the waters of the United States and its territories with the U.S. Aids to Navigation System. This system employs a simple arrangement of colors, shapes, numbers and light characteristics to mark navigable channels, waterways and obstructions adjacent to these. Aids to Navigation can provide a boater with the same type of information drivers get from street signs, stop signals, road barriers, detours and traffic lights. These aids may be anything from lighted structures, beacons, day markers, range lights, fog signals and landmarks to floating buoys. Each has a purpose and helps with determining location, getting from one place to another or staying out of danger. The goal of the U.S. Aids to Navigation System is to promote safe navigation on the waterway. An example of this system follows showing the

[70] http://www.co.ozaukee.wi.us/history/PortWashingtonLighthouse.htm

proper display of navigation lights for a power-driven vessel less than 65.5 feet/20 meters in length[71]:

The Coast Guard also offers boater safety classes, public informational materials and emergency rescue services for boaters.[72]

The goal of fog mitigation activities is to reduce the loss of lives and property due to these incidents. There are few cases where infrastructure would be impacted by fog so there is little that the community can do to plan future buildings and infrastructure in a way that will mitigate these problems. Most mitigation measures will involve public information about the largest dangers: automobile and boating crashes.

To help prevent automobile crashes, there are some signs along State Highway 42 warning of the potential rapid onset of fog. The Ozaukee County Division of Emergency Management and Sheriff's Office will explore areas prone to fog and evaluate if the current signage is adequate or if existing signs need to be updated. The Division of Emergency Management will also use current budget dollars to place a link on their website's preparedness page to explain safe driving procedures for driving in the fog.

71 http://www.uscgboating.org/safety/fedregs/equ_nav.htm

72 http://www.uscgboating.org/safety/aton/system.htm

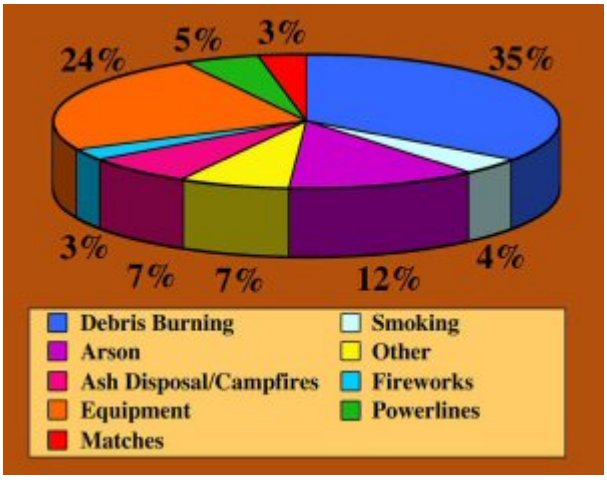
Forest and Wildfires

The forest fire and wildfire (fires on open or agricultural land) season in Ozaukee County begins in March and continues through November, although fires can occur at any time during any month of the year. Generally speaking, however, fires are more likely to occur whenever vegetation is dry as a result of a winter with little snow or a summer with sparse rainfall.

The Wisconsin Department of Natural Resources (DNR) is responsible for forest fire protection on approximately 18 million acres of forest and wild land in Wisconsin. The U.S. Forest Service maintains forest fire protection on two million acres of this land while local fire departments retain responsibility for the remaining wooded acreage.

Physical Characteristics

According to the DNR, there are approximately 1,500 fires annually that burn over 5,000 acres of the land that they protect; over 90% of these fires are human-caused. It should be noted that these figures do not include areas of the state where a local fire department has primary responsibility for service.[73]



Harrington Beach State Park, Riveredge Nature Center, the Sauk Creek Nature Preserve, the Cedarburg Bog and Lime Kiln Park are

[73] http://dnr.wi.gov/org/land/forestry/fire/fire-ps.htm

the natural areas in Ozaukee County. Local fire departments are responsible for fire protection in these open acreage areas.

Frequency of Occurrence

While the total number of open fires in Wisconsin has decreased over the years, the potential danger to lives and property remains due to the increased encroachment of development into previously open lands. Overall, the probability for a forest fire in Ozaukee County is very low and the probability of a wildfire is low. The probability of damage from forest or wildfire is also considered low. There has been one statewide wildfire event recorded since 1950 by the National Weather Service. This event occurred on 23 April 1994 and caused no injuries or deaths but did cause $500,000 in crop and property damage (each).

Vulnerability

Forest and wildfires can impact the ecology of the open lands. Ozaukee County, which has only two natural park areas, would not be greatly impacted by a wildfire although a disruption from fire could erase the usability of this habitat for wildlife and/or recreational purposes for many years.

In 2003, the National Association of State Foresters produced a Field Guidance for Identifying and Prioritizing Communities-at-Risk (CAR). The purpose of the guide was to provide states with a nationally consistent approach for assessing and displaying the risks to communities from wildfire. The DNR, in cooperation with its federal and tribal partners, began working on the statewide assessment of Communities-at-Risk in 2004.

Communities-at-Risk is a model to identify broad areas of the state that are at relatively high exposure to resource damage due to wildfire. Results of the model can then be used by local governments developing Community Wildfire Protection Plans (CWPP) and by the DNR to reduce local risks of wildland fire by prioritizing hazard mitigation and fire protection efforts.

The approach used in this risk assessment model is based on the “Methodology” section of the NASF Field Guidance document which recommends assessing and mapping four factors:

- Historic Fire Occurrence

- Hazard
- Values Protected
- Capabilities

Modifications to this methodology were made to fit the GIS mapping data layers available for Wisconsin. The Wisconsin DNR uses three factors to assess Communities-at-Risk to wildfire damage:

- Hazard – the relative likelihood that an ignited wildfire will achieve sufficient intensity to threaten life or property based on land cover type and historic fire regime.
- WUI (Values at Risk) – the relative vulnerability of each 2000 census block to wildfire damage based on housing density and spatial relationship with undeveloped vegetation based on housing density and proximity to vegetation (Wisconsin's Wildland-Urban Interface). Wisconsin's WUI was layered with a weighted vegetation layer to accentuate proximity to flammable vegetation.
- Ignition Risk – the relative likelihood of a wildfire ignition within a given 30-m pixel based on historic fire occurrence, population density and proximity to a potential ignition source.

Models were developed in GIS to create statewide grids representing each of the three weighted {Hazard (40%), WUI (30%) and Risk (30%)} inputs. This composite grid represents communities-at-risk (CAR) on a 0-9 scale of threat, with zero representing no threat and nine a very high threat. The data was then represented by municipal civil divisions (MCDs), which are city and village boundaries. Quantitative markers were assigned for five threat levels: very low, low, moderate, high and very high and those MCDs determined to have a high or very high threat of wildfire were considered CARs. 337 communities met the requirements for being "at risk."

Communities in Wisconsin vary considerably in size. This is particularly evident in a north-south pattern, with larger more rural towns in northern Wisconsin and smaller, more urban towns in southern Wisconsin. Because of this variation in size, the potential for missing areas of high risk due to smoothing out by other parts of the town was greater for larger towns. For this reason, WI DNR incorporated a "Community of Concern" category to identify those towns that have portions of their town in high risk of wildfire but were not otherwise included as a Community-at-Risk. A Community-of-Concern was determined to be an area of at least

two contiguous square miles at high or very high risk; 237 communities were named as Communities-of-Concern.[74]

As can be seen on the map in Appendix A, in Ozaukee County, there are no communities that were identified as Communities at Risk – High. One community, the Village of Saukville, was identified as a Community-of-Concern:

Hazard Mitigation Strategies

Government at all levels is developing mitigation programs in fire control and firefighting tactics with the goal of protecting lives and property from loss due to forest and wildfire. Local fire departments attend regular trainings on fire-fighting tactics to keep their skills honed. The County Division of Emergency Management assists local departments and their staff with available grant applications for training, exercising, equipment and planning as able and requested.

The Division of Emergency Management also partners with the local fire departments to provide information about fire safety and other mitigation strategies (e.g., burn bans during droughts, benefits of prescribed burns, protecting structures from wildfires), especially during Fire Safety Week in October of each year.

The Wisconsin Department of Natural Resources (DNR) does not have a forestry office in Ozaukee County and also does not pre-stage resources (e.g., rangers, equipment, supplies) there. If there was a large wildfire for which local firefighters would request state assistance, the DNR may be able to provide limited assistance based upon their deployment level at that time. The City of Port Washington is exploring options for obtaining or creating grounds suitable for wildfire training with the DNR.

The hazard mitigation strategies listed above primarily involve providing information on general fire safety measures to the public for residential and commercial structures and providing ongoing training to the firefighters who fight these types of fires. These measures provide basic fire safety information but, since Ozaukee County has few forested areas (primarily parks and other non-inhabited recreational areas) and most open areas are utilized for agriculture with no buildings or infrastructure on them, there is no

[74] Wisconsin State Hazard Mitigation Plan

need to have measures designed to reduce damages to existing or future buildings and infrastructure. The Ozaukee County Association of Fire Departments will continue utilizing the Mutual Aid Box Alarm System (MABAS) to ensure no regions of the county are left without coverage in cases of fire emergency. A Life Box system is used for ambulances and Ozaukee County Law Enforcement is using Suburban Mutual Aid Response Team (SMART) Levels for similar coverage situations.

Landslide

The term landslide includes a wide range of ground movement such as rock falls, deep failure of slopes and shallow debris flows. Although gravity acting on an over-steepened slope is the primary reason for a landslide, there may be other contributing factors. Factors likely to be seen in Ozaukee County include:

- Erosion by rivers or lakes creating over-steepened slopes.
- Rock and soil slopes being weakened through saturation by snowmelt or heavy rains.
- Excess weight from the accumulation of rain or snow, stockpiles of rock or ore, waste piles or from man-made structures stressing weak slopes to failure.[75]

Steep, eroded bluff in Port Washington.

Physical Characteristics

Landslides may include any combination of natural rock, soil or artificial fill and are classified by the type of movement and the type of material. The types of movement are slides, flows, lateral spreads and falls and topples; a combination of two or more landslide movements is a complex movement:

[75] http://landslides.usgs.gov/html_files/nlic/page5.html and http://www.eoearth.org/article/Landslide

- Slides: straight or rotating downward displacements along one or more failure surfaces of soil or rock as a single intact mass or a number of pieces
- Flows: a rapid, downhill mass movement of a “slurry” comprised of loose soil, rocks, organic matter, air and water
- Lateral spreads: large movements of rock, fine-grained soils or granular soils distributed laterally
- Falls and Topples: masses of rocks or material that rapidly detach from a steep slope or cliff that free-fall, roll or bounce.

Almost any steep or rugged terrain is susceptible to landslides under the right conditions. The most hazardous areas are steep slopes on ridges, hills and mountains; incised stream channels and slopes excavated for buildings and roads. Slide potentials are enhanced where slopes are destabilized by construction, heavy rainfall, floods or river erosion. Debris flows generally occur during intense rainfall on water saturated soil. Surface runoff channels along roadways and below culverts are common sites of debris flows.

Landslides often occur together with other major natural disasters thereby exacerbating relief and reconstruction efforts:

- Floods and landslides are closely related and both involve precipitation, runoff and ground saturation that may be the result of severe thunderstorms.
- Landslides into a reservoir may indirectly compromise dam safety or a landslide may even affect the dam itself.
- Wildfires may remove vegetation from hillsides, significantly increasing runoff and landslide potential.

Landslide from fire damage in CO (http://landslides.usgs.gov/html_files/landslides/slides/slide15.htm)

Sinkholes can form naturally in areas with karst geology (i.e., areas with limestone or other bedrock that can be dissolved by water). As the limestone rock under the soil dissolves over time from rainfall or flowing groundwater, a hollow area may form underground into which surface soil can sink. Sinkholes also can be caused by human activity such as collapsed, abandoned underground mines. Even though sinkholes have not been a factor in any natural disaster, identifying areas with karst conditions is important for not only public safety and protection of structures but because karst features provide direct conduits to groundwater. Areas with karst conditions are vulnerable to groundwater contaminants from pollutants entering a sinkhole, fissure or other karst feature.

Enlarged fracture in Brown County, WI (http://www.uwex.edu/wgnhs/enlargedjoint.htm)

Frequency of Occurrence

According to the U.S. Geological Survey, landslides are a widespread geologic hazard, occurring in all 50 states where they cause on average $1 to $2 billion in damages and more than 25 fatalities annually. Landslides pose serious threats to highways; railroads and structures that support fisheries, tourism, timber harvesting, mining and energy production. Expanding urban development and other land uses have increased the incidence of landslide disasters in the United States.

Even though there have been no recent reports of landslide in Ozaukee County, Wisconsin Emergency Management has determined that Ozaukee County has a high susceptibility and a moderate incidence of landslide with the area along Lake Michigan having the highest potential. (See the map in Appendix A.) This leads to a rating of a moderate likelihood of a landslide in the Lake Michigan area and a low likelihood in the rest of the county. In the moderate belt, there is a moderate to high probability of damage due to a landslide.

The karst potential map in Appendix A shows that Ozaukee County has a mixture of deep and shallow karst features throughout the entire county. The presence of this geologic feature supports the high probability of complications (e.g., sinkholes, fissures to groundwater) to residents. The good news is that the complications due to karst geology have a low probability of causing significant damage, injury or death.

Sinkhole in Monroe County, WI (http://www.uwex.edu/wgnhs/cavesink.htm)

Vulnerability

The most likely consequences of landslides in Ozaukee County would be damage to structures built on eroding bluffs. This has happened to several homes in other Wisconsin counties along the Mississippi River.

Cincinnati, Ohio (http://landslides.usgs.gov/html_files/landslides/slides/slide8.htm)

Karst geology, which has been identified in Ozaukee County, can lead to sinkholes under structures such as homes, businesses, roadways and railroads causing economic losses and possible injury to residents and the community.

Hazard Mitigation Strategies

The goal of landslide mitigation activities is to reduce, in a cost effective manner, the loss of lives and property due to these events. Although the physical cause of many landslides cannot be removed, geologic investigations, good engineering practices and effective enforcement of land-use management regulations can reduce landslide hazards. Karst features should be considered in land use planning, stormwater management and hazardous materials planning to avoid possible damage to structures due to sinkholes or contamination of groundwater. Ozaukee County will continue to work with its municipal partners to ensure that areas at risk of landslide and karst-related complications are identified and mitigation strategies are employed as appropriate. This will include evaluating the set-back ordinances for buildings near the Lake Michigan shore and determining if updates are needed.

The City of Port Washington has formed a committee to evaluate the needs of their breakwall. While it is still functioning, the breakwall is falling into disrepair and the ladders and support

structure are safety hazards. Once the study is complete, the committee will seek funding avenues and make plans to implement the findings. As Port Washington has been removed from Army Corps of Engineer's listing as an official "port," funding is not available.

In a mitigation project on the Lake Michigan shoreline, Concordia University completed building stabilization measures. The school has received $5 million in private donations to support this project and local governmental agencies assisted the college as requested. The project included scaling back the bluff and installing a serpentine road to the beach. Several tons of rock were also brought in to stabilize the base of the bluff because of concerns that the water and wind would eat away at the base or the flank and erode the building's support.

This coordination and cooperation among the private sector and various state, county and municipal planning and zoning departments will reduce effects on existing and future buildings and infrastructure by ensuring that safety is regulated and engineered into them.

Severe Temperatures

Characteristics

Temperature extremes can cause disruption of normal activities for the population, property loss and even the loss of life, especially among the more vulnerable members of our population such as children and the elderly.

Physical Characteristics: Heat

Heat emergencies are a result of the combination of very high temperatures and very humid conditions. The Heat Index estimates the relationship between these two conditions and reports them as a danger category, as can be seen in the following table[76]:

Heat Index and Disorders Table			
Danger Category		**Heat Disorders**	**Apparent Temperatures [°F]**
IV	Extreme Danger	Heatstroke or sunstroke imminent.	>130
III	Danger	Sunstroke, heat cramps, or heat exhaustion likely; heat stroke possible with prolonged exposure and physical activity.	105-130
II	Extreme Caution	Sunstroke, heat cramps, and heat exhaustion possible with prolonged exposure and physical activity.	90-105
I	Caution	Fatigue possible with prolonged exposure and physical activity.	89-90

The major risks to people due to extreme heat are:

- Heatstroke – a potentially lethal medical emergency where the ability of a person to thermo-regulate is compromised resulting in the rise of the body's core temperature to above 105°F (Fahrenheit).

- Heat Exhaustion – a less threatening medical condition where the victim complains of dizziness, weakness and/or fatigue. The victim may have a normal or slightly elevated

[76] FEMA, 1997; NWS, 1997

temperature and usually can be successfully treated with fluids.

- Heat Syncope – a sudden “faint” or loss of consciousness usually brought on by exercising in warmer weather than one is accustomed to, usually no lasting effect.

- Heat Cramps – muscular cramping brought on by exercising in warmer weather than one is accustomed to, no lasting effect.

Extreme heat conditions may also affect pets and livestock, decreasing agricultural output by the latter. Crops may suffer reduced yield due to extremely hot conditions.

Physical Characteristics: Cold

Wind chill is a relationship between wind and cold that is based on the rate of heat loss from exposed skin. As the wind speed increases, heat is drawn from the body, driving down skin temperature and eventually core body temperature. The following table illustrates this relationship.[77]

Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes, 10 minutes, 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

[77] National Weather Service: http://www.nws.noaa.gov/om/windchill/index.shtml

The major risks to people due to extreme cold are:

- Hypothermia – occurs when, due to exposure to cold, the body is unable to maintain its proper core temperature. It may occur in temperatures above freezing and may lead to death.

- Frostbite – describes local cooling, usually to an extremity, which occurs when exposure to cold air or liquid causes constriction of the blood vessels. There are three degrees of frostbite:

    - Frostnip – brought on by direct contact with a cold object or exposure to cold air or water. Tissue damage is minor and response to treatment is usually very good.

    - Superficial Frostbite – involves the skin and subcutaneous layers.

    - Freezing – is deep frostbite in which the skin, subcutaneous layers and deeper structures (e.g., muscles, bone, deep blood vessels, organ membranes) of the body are affected and can become frozen.

- Chilblains - lesions that occur from repeated/chronic exposure of bare skin to temperatures of 60°F or lower.

- Trench foot – a condition that occurs when the lower extremities remain in cool water for a prolonged period of time.

Frequency of Occurrence

Wisconsin has been affected by several bouts of extreme heat including during the Dust Bowl period from 1934-1936. Other heat events occurred in 1979, 1995, 2001, 2011 and 2012. Excessive heat events recorded by the National Weather Service in Ozaukee

County between 1 January 1950 and 31 December 2012 are outlined below[78]:

Year	Date	Location	Human Losses	Damage Losses	Miscellaneous
1994	6/14	Statewide	Death/Injury: 0	Property/Crop: $0	Heat Wave
1995	10/12	Statewide	Death/Injury: 0	Property/Crop: $0	Record Warmth
1998	11/23	Ozaukee	Death/Injury: 0	Property/Crop: $0	Excessive Heat
	12/1	Ozaukee	Death/Injury: 0	Property/Crop: $0	Excessive Heat
1999	7/4	Ozaukee	Death/Injury: 0	Property/Crop: $0	Excessive Heat
	7/23	Ozaukee	Death/Injury: 0	Property/Crop: $0	Excessive Heat
	7/29	Ozaukee	Death: 8 Injury: 0	Property/Crop: $0	Excessive Heat
	11/8	Ozaukee	Death/Injury: 0	Property/Crop: $0	Record Warmth
	11/13	Ozaukee	Death/Injury: 0	Property/Crop: $0	Record Warmth
2001	8/6	Ozaukee	Death: 4 Injury: 0	Property/Crop: $0	Excessive Heat
2002	4/15	Ozaukee	Death: 1 Injury: 0	Property/Crop: $0	Excessive Heat
	6/22	Ozaukee	Death: 1 Injury: 0	Property/Crop: $0	Excessive Heat
	6/30	Ozaukee	Death/Injury: 0	Property/Crop: $0	Excessive Heat
	7/1	Ozaukee	Death/Injury: 0	Property/Crop: $0	Excessive Heat
	7/8	Ozaukee	Death/Injury: 0	Property/Crop: $0	Excessive Heat
2006	7/30	Ozaukee	Death: 0 Injury: 40	Property/Crop: $0	Heat
	8/1	Ozaukee	Death: 2 Injury: 0	Property/Crop: $0	Heat
2011	7/17	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heat
	7/20	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heat
2012	6/28	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heat
	7/3	Ozaukee	Death/Injury: 0	Property/Crop: $0	Excessive Heat
	7/16	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heat
	7/23	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heat
	7/25	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heat

According to the State of Wisconsin Hazard Mitigation Plan, extreme heat is the number-one weather killer in Wisconsin with most of the heat deaths attributed to major heat waves. As can be seen by the historical tables, Ozaukee County, like the rest of the state, is likely to experience extreme heat events every two to three years with extended, major heat waves occurring about every two decades. The workgroup therefore felt that there was a medium likelihood of occurrence in any given year. The committee also felt that the loss of property, primarily crop and livestock output has a high likelihood of occurring in a drought year. The loss of life or injury to people has a medium likelihood of occurrence for the general population but the committee recognized that the likelihood

[78] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN

increases for certain populations such as the elderly, chronically ill, children, those who work outdoors and those with limited financial resources (i.e., to pay for air conditioning).

Frequency of Occurrence: Cold

Wisconsin regularly has extreme cold temperatures as part of its winter climate. Following is a chart that outlines severe cold events, including wind chills, which have been recorded by the National Weather Service in Ozaukee County between 1 January 1950 and 31 December 2012[79]:

Year	Date	Location	Human Losses	Damage Losses	Miscellaneous
1994	1/13	Statewide	Death/Injury: 0	Property/Crop: $0	Cold
1995	12/09	Ozaukee	Death: 2 Injury: 21	Property/Crop: $0	Cold
1996	1/30	Ozaukee	Death: 2 Injury: 0	Property/Crop: $0	Extreme Wind Chill
	1/31	Ozaukee	Death: 0 Injury: 10	Property/Crop: $0	Extreme Cold
	2/1	Ozaukee	Death: 4 Injury: 18	Property/Crop: $0	Extreme Cold
1997	1/17	Ozaukee	Death: 0 Injury: 3	Property: $20K Crop: $0	Extreme Cold
1999	1/5	Ozaukee	Death/Injury: 0	Property/Crop: $0	Extreme Cold
2005	12/18	Ozaukee	Death/Injury: 0	Property/Crop: $0	Cold/Wind Chill
2006	2/17	Ozaukee	Death/Injury: 0	Property/Crop: $0	Cold/Wind Chill
	2/18	Ozaukee	Death/Injury: 0	Property/Crop: $0	Cold/Wind Chill
2007	2/3	Ozaukee	Death/Injury: 0	Property: $1K Crop: $0	Cold/Wind Chill
2008	1/19	Ozaukee	Death/Injury: 0	Property/Crop: $0	Cold/Wind Chill
	1/30	Ozaukee	Death/Injury: 0	Property/Crop: $0	Extreme Cold/Wind Chill
	2/10	Ozaukee	Death/Injury: 0	Property/Crop: $0	Extreme Cold/Wind Chill
	12/15	Ozaukee	Death/Injury: 0	Property/Crop: $0	Cold/Wind Chill
	12/21	Ozaukee	Death/Injury: 0	Property/Crop: $0	Cold/Wind Chill
2009	1/14	Ozaukee	Death/Injury: 0	Property/Crop: $0	Cold/Wind Chill
2011	1/21	Ozaukee	Death/Injury: 0	Property/Crop: $0	Cold/Wind Chill

As can be seen in the above chart of cold and extreme cold temperature events, there are few years where a cold event does not occur in Ozaukee County and extreme cold happens once or twice, on average, per decade. After examining this data, the workgroup believed that cold and/or extreme cold has a medium likelihood of occurrence in any given year. Since there are no

[79] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN

crops out during the winter and most properties (homes, businesses, barns) are insulated for this climate, the loss of property due to temperature extremes is not high although individuals may suffer damage due to water main breaks and other such problems. They further believed that the loss of life or injury to people has a medium likelihood of occurrence among the general population when there are cold/extreme cold weather events. Again, the workgroup recognized that people who work outdoors, who have limited financial resources, the elderly, the young and the chronically ill have a higher risk profile.

Vulnerability

Vulnerability to temperature extremes is generally assessed on an individual basis with the most vulnerable sections of our community's population having the greatest risk. These people may include the elderly, the very young and the chronically ill. People from economically disadvantaged backgrounds, especially those listed in the categories above, are even more vulnerable since they are least able to afford the cost of adequate heating or air conditioning systems.

The Ozaukee County social services agencies are aware of many of these people who reside in our communities and they, along with the public health department, have plans and access to economic assistance programs to help these people in times of concern.

Hazard Mitigation Strategies

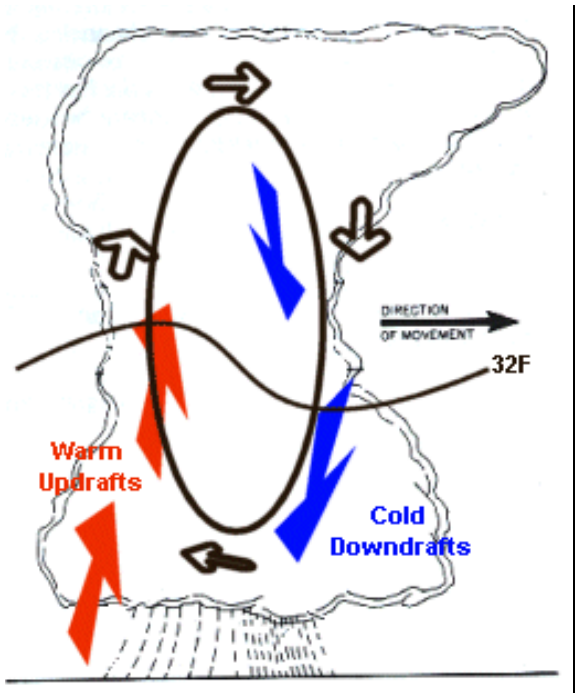
The goal of severe temperature mitigation activities is to reduce, in a cost effective manner, the loss of lives and property due to these events. Temperature extremes are difficult for a community to mitigate and the risks are to the health and safety of citizens, animals and crops. There are no strategies that need to be employed to reduce damages to buildings and infrastructure.

The Ozaukee County Division of Emergency Management participates in the statewide public information campaigns for Winter and Heat Awareness Weeks each year and provides links to personal preparedness information on its website. Informational links will be created on the Public Health website regarding safety strategies for severe weather. The Public Health Department will

also coordinate cooling and warming shelters during severe weather and inform the public.

Storms: Hail

Studies of thunderstorms indicate that two conditions are required for hail to develop: sufficiently strong and persistent up-draft velocities and an accumulation of liquid water in a super-cooled state in the upper parts of the storm. Hailstones are formed as water vapor in the warm surface layer rises quickly into the cold upper atmosphere. The water vapor is frozen and begins to fall; as the water falls, it accumulates more water vapor. This cycle continues until there is too much weight for the updraft to support and the frozen water falls too quickly to the ground to melt along the way. The graphic below depicts hail formation[80]:



Source: NWS, January 10, 2003

Injury and loss of life are rarely associated with hailstorms, however extensive property damage is possible, especially to crops.

80 Source: NWS, January 10, 2003

Physical Characteristics

Hail may be spherical, conical or irregular in shape and can range in size from barely visible in size to grapefruit-sized dimensions. Hailstones equal to or larger than a penny are considered severe.

Hail Size Estimates[81]	
Size	**Inches in Diameter**
Pea	1/4 inch
Marble/mothball	1/2 inch
Dime/Penny	3/4 inch
Nickel	7/8 inch
Quarter	1 inch
Ping-Pong Ball	1 1/2 inch
Golf Ball	1 3/4 inches
Tennis Ball	2 1/2 inches
Baseball	2 3/4 inches
Tea cup	3 inches
Grapefruit	4 inches
Softball	4 1/2 inches

Hail falls in swaths that can be from twenty to one hundred miles long and from five to thirty miles wide. A hail swath is not a large continuous path of hail but generally consists of a series of hail cells that are produced by individual thunderstorm clouds traveling in the same area.

Frequency of Occurrence

Hailstorms usually occur from May through August and Wisconsin averages two or three hail days per year. According to the Wisconsin State Hazard Mitigation Plan, from 1982 – 2003, Ozaukee County reported 19 hail events but fortunately none have led to loss of life or injury. Ozaukee County, as can be seen in the map in Appendix A, has a low probability of hail occurrence in Wisconsin. The likelihood of damage due to hail is therefore considered low.

Most hail damage occurs in rural areas because maturing crops are particularly susceptible to bruising and other damage caused by hailstones. The four months of hailstorm activity correspond to the

[81] NWS, January 10, 2003

growing and harvesting seasons for most crops. Following is a table that shows the 45 hail events recorded by the National Weather Service between 1 January 1950 and 31 December 2012.[82]

Year	Date	Location	Human Losses	Damage Losses	Miscellaneous
1961	06/22	Ozaukee	Death/Injury: 0	Property/Crop: $0	0.75 in
1967	07/11	Ozaukee	Death/Injury: 0	Property/Crop: $0	1.00 in
1970	08/26	Ozaukee	Death/Injury: 0	Property/Crop: $0	1.75 in
1974	05/16	Ozaukee	Death/Injury: 0	Property/Crop: $0	0.75 in
1975	07/19	Ozaukee	Death/Injury: 0	Property/Crop: $0	1.00 in
1976	07/30	Ozaukee	Death/Injury: 0	Property/Crop: $0	1.00 in
1979	05/18	Ozaukee	Death/Injury: 0	Property/Crop: $0	0.75 in.
1980	05/30	Ozaukee	Death/Injury: 0	Property/Crop: $0	0.75 in.
1989	05/30	Ozaukee	Death/Injury: 0	Property/Crop: $0	2.00 in.
	07/27	Ozaukee	Death/Injury: 0	Property/Crop: $0	2.00 in.
	07/27	Ozaukee	Death/Injury: 0	Property/Crop: $0	2.50 in.
1991	06/14	Ozaukee	Death/Injury: 0	Property/Crop: $0	2.00 in.
	07/01	Ozaukee	Death/Injury: 0	Property/Crop: $0	1.75 in.
1995	04/18	Port Washington	Death/Injury: 0	Property/Crop: $0	0.88 in.
1996	07/18	Port Washington	Death/Injury: 0	Property/Crop: $0	1.75 in.
1998	07/20	Port Washington	Death/Injury: 0	Property/Crop: $0	0.75 in.
1999	06/11	Cedarburg	Death/Injury: 0	Property/Crop: $0	0.75 in.
2000	03/08	Port Washington	Death/Injury: 0	Property/Crop: $0	0.75 in.
	03/08	Port Washington	Death/Injury: 0	Property/Crop: $0	0.75 in.
	03/08	Mequon	Death/Injury: 0	Property/Crop: $0	1.50 in.
	05/18	Cedarburg	Death/Injury: 0	Property: $10K Crop: $0	1.00 in.
2003	08/01	Mequon	Death/Injury: 0	Property: $0 Crop: $15K	1.50 in.
2004	05/23	Mequon	Death/Injury: 0	Property/Crop: $0	1.50 in.
	05/23	Port Washington	Death/Injury: 0	Property/Crop: $0	0.75 in.
	05/23	Mequon	Death/Injury: 0	Property/Crop: $0	0.75 in.
	06/23	Saukville	Death/Injury: 0	Property/Crop: $0	3.00 in.
	06/23	Thiensville	Death/Injury: 0	Property: $50K Crop: $0	0.75 in.
2005	06/30	Port Washington	Death/Injury: 0	Property/Crop: $0	0.75 in.
	07/04	Cedarburg	Death/Injury: 0	Property/Crop: $0	0.75 in.
2006	04/13	Saukville	Death/Injury: 0	Property/Crop: $0	1.75 in.
	05/17	Fredonia	Death/Injury: 0	Property/Crop: $0	0.75 in.
	07/17	Belgium	Death/Injury: 0	Property/Crop: $0	0.75 in.
	09/08	Grafton	Death/Injury: 0	Property/Crop: $0	0.75 in.
	09/08	Cedarburg	Death/Injury: 0	Property/Crop: $0	1.00 in.
	10/02	Belgium	Death/Injury: 0	Property/Crop: $0	0.75 in.
2007	03/21	Port Washington	Death/Injury: 0	Property/Crop: $0	0.75 in.
	03/21	Cedarburg	Death/Injury: 0	Property/Crop: $0	0.75 in.
	07/05	Belgium	Death/Injury: 0	Property/Crop: $0	0.75 in.
	09/27	Saukville	Death/Injury: 0	Property/Crop: $0	0.88 in.

[82] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN

2008	05/02	Grafton	Death/Injury: 0	Property/Crop: $0	0.75 in.
	07/02	Belgium	Death/Injury: 0	Property/Crop: $0	0.75 in.
	07/10	Cedarburg	Death/Injury: 0	Property/Crop: $0	0.75 in.
2011	05/22	Waubeka	Death/Injury: 0	Property/Crop: $0	1.00 in.
2012	05/28	Cedarburg	Death/Injury: 0	Property/Crop: $0	1.25 in.
	06/22	Belgium	Death/Injury: 0	Property/Crop: $0	1.00 in.

It should be noted that this table represents only the hail incidents reported to the National Weather Service. One limitation of the source data is that it showed no property or crop loss, death or injury while it is likely that there was some loss incurred.

After a careful review of the data by the workgroup, it was believed that there has been more accurate record-keeping and recording since the 1990's but that the table also shows an increasing frequency in the occurrence of hailstorms, with Ozaukee County having a hailstorm usually at least once per year. With that understanding, it was decided that the probability of hail is moderate to high

Vulnerability

NWS loss tables show that property damage has ranged from $0 to $50,000 (2004). Hail, typically occurring in conjunction with thunderstorms and lightning, can damage many types of infrastructure. Public and private vehicles (e.g., campers, boats, cars, trucks) are liable to have their windshields cracked, bodies dented and paint damaged as a result of hail. This damage can occur, depending on the size of the hail, whether the vehicle is moving through the storm or is stationary. Hail on the roadway can also cause vehicles to slide off the road. Vehicle damage and iced roadways are of particular concern when you consider the need for emergency vehicles such as police cars, fire trucks and ambulances to quickly move to assist victims in a disaster.

Hail can also damage critical infrastructure such as street signs, electric lines/poles/transformers, telephone lines and radio communication equipment. These pieces of infrastructure are needed by both first response agencies and the general community to ensure safe transport; warm, safe homes and good internal and external communications abilities.

Residential and business properties are liable to receive damage to signs, siding, billboards, trees and windows. Manufactured housing

is particularly vulnerable to damage due to its lower construction standards.

Hail can be particularly damaging to agricultural concerns, including farm buildings, standing crops and livestock. Hail is a localized phenomenon and it would be difficult to estimate losses.

Hazard Mitigation Strategies

The goal of mitigating for hail is to reduce the amount of financial loss due to these incidents. Insurance is the most widely used adjustment for crop and property damages due to hail. Hail crop insurance is available from two sources: commercial stock and mutual companies and the Federal Crop Insurance Corporation (FCIC). Farmers rarely purchase insurance coverage up to the full value of the losses that would result from a severe hailstorm.

The Ozaukee County U. W. Extension Office distributes information on various hail insurance options. In the event of major damage, a team composed of county and federal agricultural agency representatives and the county emergency management director have primary responsibility for assessing and documenting hail damage.

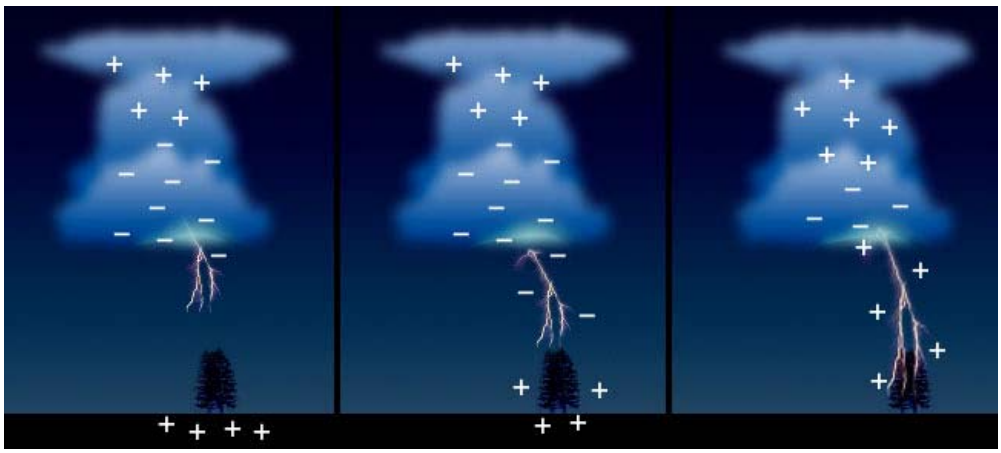
The Ozaukee County Division of Emergency Management provides hail information to the public as part of the spring severe weather awareness week. The office also provides information about hail on the website and in display racks. Federal emergency assistance is available in the form of low-interest loans when a Presidential Disaster is declared or when the United States Department of Agriculture (USDA) declares that a county is eligible for aid. Damage from hailstorms alone is generally not extensive enough to invoke a disaster declaration.

The hazard mitigation strategies listed above primarily involve providing information on safety measures and insurance to the public for agricultural concerns and residential and commercial structures. These measures provide basic safety information but, since there is little one can do to prevent hail damage, these measures will do little to reduce damages to existing or future buildings and infrastructure but the recommended insurance may make recovery easier.

Storms: Lightning

Lightning is a phenomenon associated with thunderstorms; the action of rising and descending air separates and builds-up positive and negative charge areas. When the built-up energy is discharged between the two areas, lightning is the result.[83]

Formation of Lightning



Lightning may travel from cloud to cloud, cloud to ground, or if there are high structures involved, from ground to cloud.

Physical Characteristics

The temperatures in a lightning stroke rise to 50,000°F (Fahrenheit). The sudden and violent discharge which occurs in the form of a lightning stroke is over in one-millionth of a second.

Lightning damage occurs when humans and animals are electrocuted, fires are caused by a lightning stroke, materials are vaporized along the lightning path or sudden power surges cause damage to electrical or electronic equipment. Lightning, an underestimated hazard, kills more people in an average year than do hurricanes or tornadoes.

[83] University Corporation for Atmospheric Research [UCAR]

Frequency of Occurrence

Nationwide, forty-five percent of the people killed by lightning have been outdoors, about sixteen percent were under trees, six percent were on heavy road equipment and thirty-three percent were at various unknown locations. Less than ten percent of the deaths involved individuals inside buildings; these deaths were primarily due to lightning-caused fires.

Wisconsin has a high frequency of property losses due to lightning. Insurance records show that annually one out of every fifty farms has been struck by lightning or had a fire which may have been caused by lightning. Generally, rural fires are more destructive than urban fires because of limited lightning protection devices, isolation, longer response times and inadequate water supplies. Ozaukee County has a high probability of lightning occurrence at any one location within it. This was determined by recognizing that lightning usually happens in conjunction with thunderstorms, and that Wisconsin and Ozaukee County generally have several severe thunderstorms per summer. The likelihood of damage due to lightning is considered medium for the more rural areas of the county and low for the more urban areas of the county.

The following table shows lightning events recorded by the National Weather Service between 1 January 1950 and 31 December 2012. As can be seen, property damage from lightning events has ranged from $2,000 to $1,000,000 and crop damage was reported at $5,000 in one event. This table from the NWS is obviously not reporting all of the incidents of lightning strikes but those with notable/reportable losses from the past and can reasonably be inferred to show that there is exposure to potential future losses.

Year	Date	Location	Human Losses	Damage Losses
1995	08/28	Port Washington	Death/Injury: 0	Property/Crop: $0
	10/19	Fredonia	Death/Injury: 0	Property: $53K Crop: $5K
1997	07/13	Grafton	Death/Injury: 0	Property/Crop: $0
1998	05/13	Port Washington	Death/Injury: 0	Property: $15K Crop: $0
	07/20	Grafton	Death/Injury: 0	Property: $10K Crop: $0
	07/20	Port Washington	Death/Injury: 0	Property: $8K Crop: $0
1999	08/10	Port Washington	Death/Injury: 0	Property: $10K Crop: $0
2001	04/05	Mequon	Death: 0 Injury: 3	Property: $20K Crop: $0

	08/22	Port Washington	Death/Injury: 0	Property: $15K Crop: $0
2002	08/12	Grafton	Death/Injury: 0	Property: $15K Crop: $0
2004	05/21	Port Washington	Death/Injury: 0	Property: $100K Crop: $0
	05/21	Port Washington	Death/Injury: 0	Property: $25K Crop: $0
2005	07/04	Mequon	Death/Injury: 0	Property: $500K Crop: $0
	07/21	Grafton	Death/Injury: 0	Property: $20K Crop: $0
2006	08/02	Cedarburg	Death/Injury: 0	Property: $75K Crop: $0
2007	05/01	Saukville	Death/Injury: 0	Property: $75K Crop: $0
2010	6/23	Mequon	Death/Injury: 0	Property: $1M Crop: $0
2011	7/27	Bayside	Death/Injury: 0	Property: $2K Crop: $0
	7/27	Freistadt	Death/Injury: 0	Property: $2K Crop: $0
	7/27	Thiensville	Death/Injury: 0	Property: $5K Crop: $0
2012	5/28	Cedarburg	Death/Injury: 0	Property: $20K Crop: $0

Vulnerability

Lightning, which often occurs in conjunction with thunderstorms and hail, can damage many types of infrastructure, including electric lines/poles/transformers, telephone lines and radio communication equipment. These pieces of infrastructure are needed by both first response agencies and the general community to ensure safe transport; warm, safe homes and good internal and external communications abilities.

Residential and business properties are liable to receive damage either as a result of a lightning strike causing a fire or other type of direct damage or by overloading electronic equipment (e.g., computers, televisions) that have not been properly connected to a surge protector. The latter concern is especially important to business and government, which in modern America rely on computers and other electronic equipment to manage the large amounts of data manipulated in our information-based economy.

Lightning can damage agricultural assets including farm buildings, standing crops and livestock. It is also one of the major sources of ignition for forest and wildfires.

Hazard Mitigation Strategies

The goal of lightning mitigation activities is to reduce, in a cost effective manner, the loss of lives and property due to these events. The two primary ways to effectively reduce lightning losses are modifying human behavior and protecting structures (e.g., using fire resistant materials in building construction). The use of fire resistant materials will make existing buildings and future construction less likely to catch fire or will minimize fire damage and spread due to lightning strike. Surge protectors limit data losses.

Additional municipal project ideas are listed below:

- Village of Grafton
  - Conduct cost-benefit analysis and evaluate possible solutions (surge protectors, lightning arrestors, etc.) for Radio tower adjacent to the Village of Grafton's Police Department's building.

- Village of Thiensville
  - Evaluate the need and cost for surge protectors on one lift station.

The Ozaukee County Division of Emergency Management has awareness and educational materials in a display rack and online that inform the public of safety procedures to follow during a lightning storm. Severe summer weather safety information is also emphasized during Tornado Awareness Week.

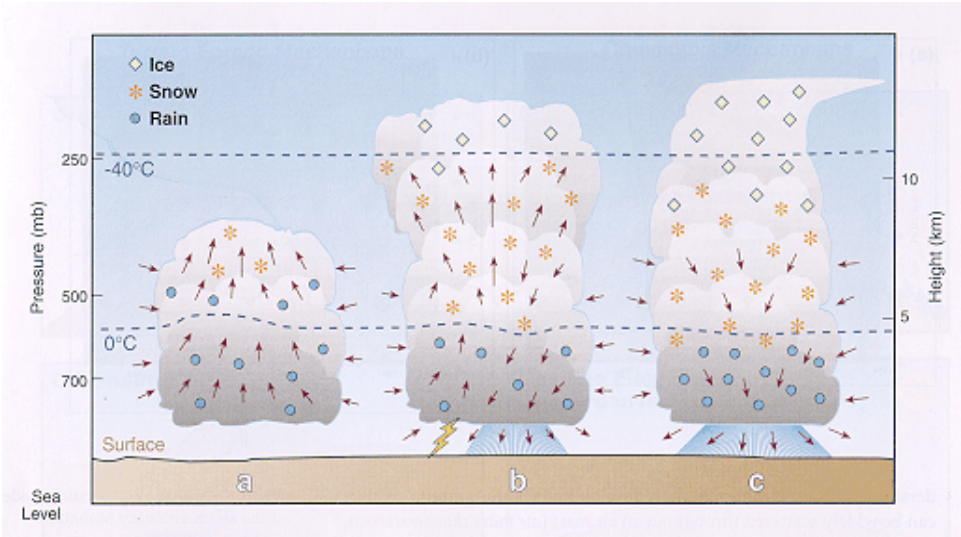
Storms: Thunderstorms

There are three distinct stages of development for thunderstorms (birth, growth, maturity), each of which can be seen in the following schematic.

In the first stage of development, an updraft drives warm air up beyond condensation levels where clouds form.

The second stage of development occurs as levels of water vapor in the expanding cloud rise past saturation and the air cools sufficiently to form solid and liquid particles of water. At this point, rain or snow begins to fall within the cloud.

A thunderstorm's mature stage is marked by a transition of wind direction within the storm cells. The prevailing updraft which initiated the cloud's growth is joined by a downdraft generated by precipitation. Lightning may occur soon after precipitation begins. Hail and tornadoes may also develop during this stage.[84]



Physical Characteristics

A thunderstorm often is born, grows, reaches maturity and dies in a thirty-minute period. The individual thunderstorm cell often travels between thirty and fifty miles per hour. Strong frontal systems may create one squall line after another, each composed of many

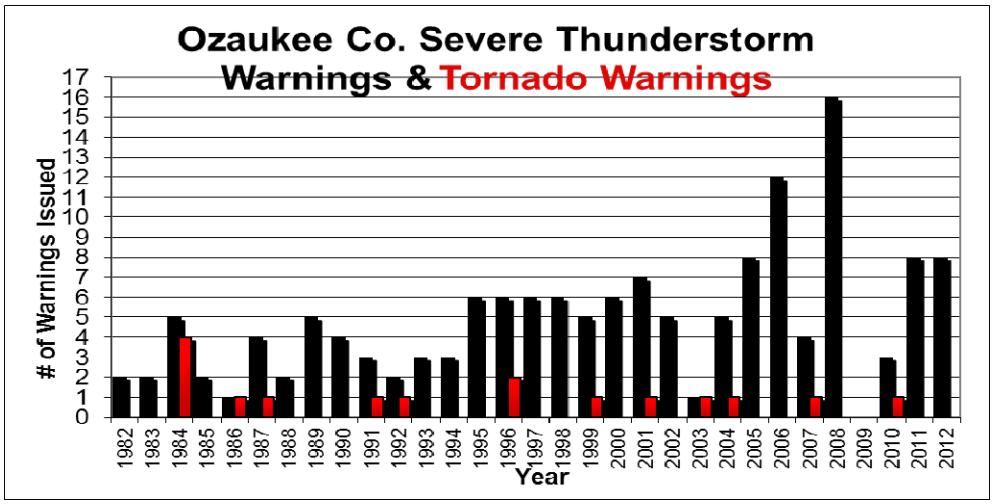
84 National Weather Service - Flagstaff

individual thunderstorm cells. These fronts can often be tracked across the state from west to east with a constant cycle of birth, growth, maturity and death of individual thunderstorm cells.

Frequency of Occurrence

Thunderstorm frequency is measured as the number of days per year with one or more incidents. There are approximately 100,000 thunderstorms in the United States every year and approximately 10% of those are considered severe (i.e., has at least ¾" hail, winds of at least 58 mph or a tornado). Most Wisconsin counties, including Ozaukee County, average between 30 and 40 thunderstorm days per year although a portion of southwestern and south-central Wisconsin average 40 to 50 thunderstorm days per year. In Ozaukee County there are typically several severe thunderstorms per year. Thunderstorms can occur throughout the year with the highest frequency during the months of May through September. The majority of storms occur between the hours of noon and midnight.

The probability of severe thunderstorms occurring in Ozaukee County is high as these storms usually occur one or more times each year during the summer in Wisconsin and Ozaukee County.



Damage from thunderstorms usually is a result of the hail, lightning, damaging winds and/or flash flooding that can occur as part of the storm. The likelihood of damage from these causes is discussed in the appropriate chapters. Although one can see from the historical data listed below, property and crop damage occurs frequently in thunderstorms and can range from $1,000 (1997) to $12 million

(1998) per storm with combined property and crop damages in the $5,000 - $30,000 range being the most common.

The following chart lists the 105 thunderstorms and high wind events that have been recorded in Ozaukee County by the National Weather Service between 1 January 1950 and 31 December 2012.

Year	Date	Location	Human Losses	Damage Losses	Miscellaneous
1960	07/22	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1961	06/22	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1975	07/19	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1976	06/13	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1977	07/06	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1978	07/31	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
1980	05/30	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind 60 kts.
	08/04	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1981	07/12	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
1982	08/03	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
	08/03	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1983	07/19	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
	07/19	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind 62 kts.
1984	06/06	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
1986	09/26	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1987	06/29	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
	07/29	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
	08/16	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
1988	06/22	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
1989	08/04	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1991	07/01	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind 62 kts.
	07/07	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1992	06/17	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
	06/17	Ozaukee	Death/Injury: 0	Property/Crop: $0	Tstm Wind
1996	07/18	Waubeka	Death/Injury: 0	Property: $20K Crop: $0	Tstm Wind
1997	04/06	Ozaukee	Death/Injury: 0	Property: $250K Crop: $0	High Wind
	05/05	Ozaukee	Death/Injury: 0	Property: $29K Crop: $0	High Wind
	06/24	Fredonia	Death/Injury: 0	Property: $1K Crop: $0	Tstm Wind
1998	03/08	Ozaukee	Death/Injury: 0	Property: $215K Crop: $0	High Wind
	05/31	Countywide	Death: 0 Injury: 4	Property: $3.5M Crop: $300K	Tstm Wind
	11/10	Ozaukee	Death: 4 Injury: 14	Property: $10.4M Crop: $1.6M	High Wind
1999	06/06	Mequon	Death/Injury: 0	Property: $3K Crop: $0	Tstm Wind
	06/06	Belgium	Death/Injury: 0	Property: $1K Crop: $0	Tstm Wind

	06/10	Fredonia	Death/Injury: 0	Property: $1K Crop: $0	Tstm Wind
	07/23	Grafton	Death/Injury: 0	Property: $5K Crop: $0	Tstm Wind
2000	05/24	Ozaukee	Death/Injury: 0	Property: $3K Crop: $0	Strong Winds
2001	04/07	Ozaukee	Death: 0 Injury: 1	Property/Crop: $0	High Wind 57 kts.
	04/11	Ozaukee	Death/Injury: 0	Property/Crop: $0	High Wind 58 kts.
	06/11	Countywide	Death/Injury: 0	Property: $75K Crop: $0	Tstm Wind 55 kts.
	07/22	Grafton	Death/Injury: 0	Property: $30K Crop: $0	Tstm Wind 52 kts.
	09/19	Ozaukee	Death/Injury: 0	Property/Crop: $0	Strong Wind
	12/05	Ozaukee	Death/Injury: 0	Property: $105K Crop: $0	Strong Winds
2002	07/08	Thiensville	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
	08/21	Fredonia	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
	09/02	Grafton	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
2003	08/01	Newburg	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	11/12	Ozaukee	Death/Injury: 0	Property: $52K Crop: $0	Strong Wind
2004	03/07	Ozaukee	Death/Injury: 0	Property: $33K Crop: $0	Strong Wind
	03/14	Ozaukee	Death/Injury: 0	Property: $52K Crop: $0	Strong Wind
	04/18	Ozaukee	Death/Injury: 0	Property: $208K Crop: $0	Strong Wind
	05/21	Cedarburg	Death/Injury: 0	Property: $50K Crop: $0	Tstm Wind 52 kts.
	05/21	Port Washington	Death/Injury: 0	Property: $150K Crop: $0	Tstm Wind 65 kts.
	06/23	Waubeka	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	06/23	Thiensville	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
	07/16	Belgium	Death/Injury: 0	Property: $5K Crop: $0	Tstm Wind 56 kts.
	12/12	Ozaukee	Death/Injury: 0	Property: $34K Crop: $0	Strong Wind
2005	07/21	Saukville	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	09/13	Mequon	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	09/13	Thiensville	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	09/13	Cedarburg	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	09/13	Port Washington	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	09/13	Waubeka	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	11/13	Countywide	Death/Injury: 0	Property/Crop: $0	High Wind 55 kts.
2006	0/24	Countywide	Death/Injury: 0	Property: $100K Crop: $0	Strong Wind 39 kts.
	03/13	Countywide	Death/Injury: 0	Property: $65K Crop: $0	Strong Wind 39 kts.
	03/31	Countywide	Death/Injury: 0	Property: $40K Crop: $0	Strong Wind 39 kts.
	05/11	Countywide	Death/Injury: 0	Property: $20K Crop: $0	Strong Wind 36 kts.

	06/21	Mequon	Death/Injury: 0	Property: $10K Crop: $0	Tstm Wind 56 kts.
	07/30	Cedarburg	Death/Injury: 0	Property: $5K Crop: $0	Tstm Wind 56 kts.
	08/01	Saukville	Death/Injury: 0	Property/Crop: $0	Tstm Wind 50 kts.
	08/01	Cedarburg	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	08/02	Saukville	Death/Injury: 0	Property: $15K Crop: $0	Tstm Wind 50 kts.
	08/02	Thiensville	Death/Injury: 0	Property/Crop: $0	Tstm Wind 50 kts.
2007	02/22	Countywide	Death/Injury: 0	Property: $2K Crop: $0	Strong Wind 39 kts.
	04/04	Countywide	Death/Injury: 0	Property: $5K Crop: $0	Strong Wind 44 kts.
	05/24	Countywide	Death/Injury: 0	Property: $2K Crop: $0	Strong Wind 39 kts.
	06/18	Mequon	Death/Injury: 0	Property: $2K Crop: $0	Tstm Wind 52 kts.
	08/22	Grafton	Death/Injury: 0	Property: $30K Crop: $0	Tstm Wind 52 kts.
	08/27	Countywide	Death/Injury: 0	Property: $10K Crop: $0	Strong Wind 39 kts.
	11/05	Countywide	Death/Injury: 0	Property: $3K Crop: $0	Strong Wind 39 kts.
	12/23	Countywide	Death/Injury: 0	Property: $5K Crop: $0	Strong Wind 39 kts.
2008	04/26	Countywide	Death/Injury: 0	Property: $5K Crop: $0	Strong Wind 43 kts.
	6/28	Cedarburg	Death: 0 Injury: 2	Property: $1K Crop: $0	Tstm Wind 57 kts.
	7/10	Saukville	Death/Injury: 0	Property/Crop: $0	Tstm Wind 50 kts.
	7/16	Saukville	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
2009	9/27	Countywide	Death/Injury: 0	Property: $5K Crop: $0	Strong Wind 43 kts.
	10/06	Countywide	Death/Injury: 0	Property: $5K Crop: $0	Strong Wind 49 kts.
2010	5/05	Countywide	Death/Injury: 0	Property: $10K Crop: $0	Strong Wind 39 kts.
	7/15	Saukville	Death/Injury: 0	Property/Crop: $0	Tstm Wind 52 kts.
	8/20	Port Washington	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	9/02	Saukville	Death/Injury: 0	Property/Crop: $0	Tstm Wind 65 kts.
	9/24	Countywide	Death/Injury: 0	Property: $1K Crop: $0	Strong Wind 39 kts.
	10/26	Countywide	Death/Injury: 0	Property: $20K Crop: $0	High Wind 50 kts
2011	2/18	Countywide	Death/Injury: 0	Property: $2K Crop: $0	Strong Wind 26 kts.
	4/15	Countywide	Death/Injury: 0	Property: $3K Crop: $0	Strong Wind 39 kts.
	5/15	Countywide	Death/Injury: 0	Property: $5K Crop: $0	Strong Wind 39 kts.
	9/03	Mequon	Death/Injury: 0	Property/Crop: $0	Tstm Wind 56 kts.
	9/29	Countywide	Death/Injury: 0	Property: $2K Crop: $0	Strong Wind 39 kts.

	10/19	Countywide	Death/Injury: 0	Property: $2K Crop: $0	Strong Wind 39 kts.
	11/29	Countywide	Death/Injury: 0	Property: $1K Crop: $0	Strong Wind 29 kts.
2012	1/01	Countywide	Death/Injury: 0	Property: $1K Crop: $0	Strong Wind 39 kts.
	3/10	Countywide	Death/Injury: 0	Property: $2K Crop: $0	Strong Wind 30 kts.
	5/28	Cedarburg	Death/Injury: 0	Property: $5K Crop: $0	Tstm Wind 56 kts.
	6/18	Countywide	Death/Injury: 0	Property: $10K Crop: $0	Strong Wind 39 kts.
	9/04	Fredonia	Death/Injury: 0	Property: $3K Crop: $0	Tstm Wind 50 kts.

Vulnerability

Thunderstorms, which often produce hail and lightning and may occasionally spawn tornadoes, high wind storms or flash flooding, can damage many types of infrastructure. Ozaukee County's thunderstorm vulnerabilities due to associated hail, lightning, winds and flood waters are discussed in the other hazard chapters of this plan.

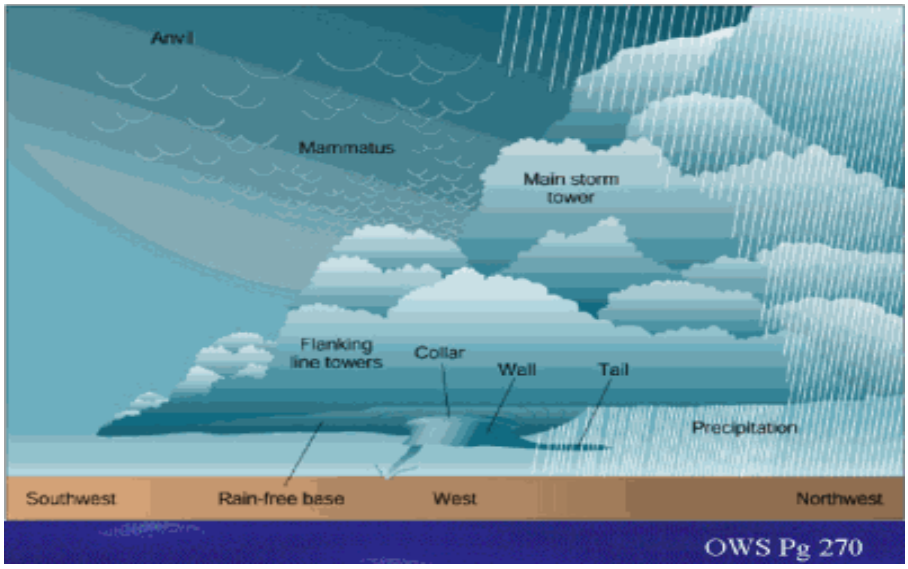
Hazard Mitigation Strategies

The goal of thunderstorm mitigation activities is to reduce, in a cost effective manner, the loss of lives and property due to these events. The Ozaukee County Division of Emergency Management has developed severe weather safety information that it disseminates to the public in a display rack and online with the goal of protecting the lives and property of citizens. During Tornado and Severe Weather Week, there is extensive media coverage of safety tips. Additionally, the department assists the National Weather Service (NWS) in conducting tornado spotter training programs and in organizing local tornado spotter networks.

The damage to buildings and infrastructure in a thunderstorm is generally caused by components of the storm such as hail, flooding, lightning or wind. A discussion of strategies to reduce effects on existing and future buildings and infrastructure is discussed in the chapters that discuss each of these components in detail.

Storms: Tornadoes and High Winds

A tornado is a violently rotating funnel-shaped column of air. The lower end of the column may or may not touch the ground. Average winds in the tornado are between 173 and 250 miles per hour but winds can exceed 300 miles per hour. It should also be noted that straight-line winds may reach the same speeds and achieve the same destructive force as a tornado.



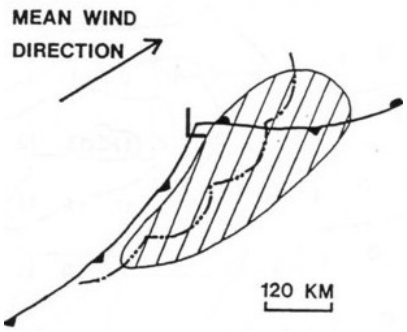
A derecho is a widespread, long-lived, violent, convectively-induced straight-line windstorm that is associated with a fast-moving band of severe thunderstorms usually taking the form of a bow echo. Derechos blow in the direction of movement of their associated storms; this is similar to a gust front except that the wind is sustained and generally increases in strength behind the "gust" front. A warm weather phenomenon, derechos occur mostly in summer, especially July, in the northern hemisphere. They can occur at any time of the year and occur as frequently at night as in the daylight hours.

The traditional criteria that distinguish a derecho from a severe thunderstorm are *sustained* winds of 58 mph during the storm as opposed to gusts, high and/or rapidly increasing forward speed and geographic extent (typically 250 nautical miles in length). In addition, they have a distinctive appearance on radar (bow echo); several unique features, such as the rear inflow notch and bookend vortex and usually manifest two or more downbursts. There are three types of derechos:

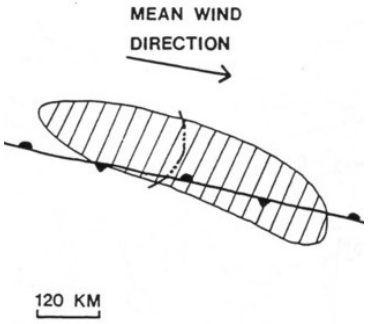
- Serial: Multiple bow echoes embedded in a massive squall line typically around 250 miles long. This type of derecho is usually associated with a very deep low. Also because of embedded supercells, tornadoes can easily spin out of these types of derechos.

- Progressive: A small line of thunderstorms take the bow-shape and can travel for hundreds of miles.

- Hybrid: Has characteristics of a serial and progressive derechos. Hybrid derechos are associated with a deep low like serial derechos but are relatively small in size like progressive derechos.[85]



Serial Derecho



Progressive Derecho

Physical Characteristics

Tornadoes are visible because low atmospheric pressure in the vortex leads to cooling of the air by expansion and to condensation and formation of water droplets. They are also visible as a result of the airborne debris and dust in its high winds. Wind and pressure differential are believed to account for ninety percent of tornado damage in most cases. Because tornadoes are associated with storm systems, they usually are accompanied by hail, torrential rain and intense lightning.

Tornadoes typically produce damage in an area that does not exceed one-fourth mile in width or sixteen miles in length. Tornadoes with track lengths greater than 150 miles have been reported although such tornadoes are rare.

[85] http://en.wikipedia.org/wiki/Derecho

Tornado damage severity is measured by the Fujita Tornado Scale, which assigns an "F" ("Fujita") value from 0 – 5 to denote the wind speed.

The Fujita Tornado Scale[86]		
Category	**Wind Speed**	**Description of Damage**
F0	40-72 mph	Light damage. Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage to sign boards.
F1	73-112 mph	Moderate damage. The lower limit is the beginning of hurricane speed. Roof surfaces peeled off; mobile homes pushed off foundations or overturned; moving autos pushed off roads.
F2	113-157 mph	Considerable damage. Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
F3	158-206 mph	Severe damage. Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; cars lifted off ground and thrown.
F4	207-260 mph	Devastating damage. Well-constructed houses leveled; structures with weak foundations blown off; cars thrown and large missiles generated.
F5	261-318 mph	Incredible damage. Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile-sized missiles fly through the air in excess of 100-yards; trees debarked.

On 1 February 2007, the National Weather Service began rating tornadoes using the EF-scale. It is considerably more complicated than the F-scale and it will allow surveyors to create more precise assessments of tornado severity. Below is a comparison between the Fujita Scale and the EF Scale:

Fujita Scale			Derived EF Scale		Operational EF Scale	
F Number	**Fastest ¼ mile (mph)**	**3 Second Gust (mph)**	**EF Number**	**3 Second Gust (mph)**	**EF Number**	**3 Second Gust (mph)**
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

Downburst Characteristics

Downburst damage is often highly localized but resembles damage caused by a tornado. In some cases, even an experienced investigator cannot identify the nature of a storm without mapping the direction of the damaging winds over a large area. There are significant interactions between tornadoes and nearby downbursts.

A classic downburst example occurred on 4 July 1977 when a severe thunderstorm moved across Northern Wisconsin. Extensive

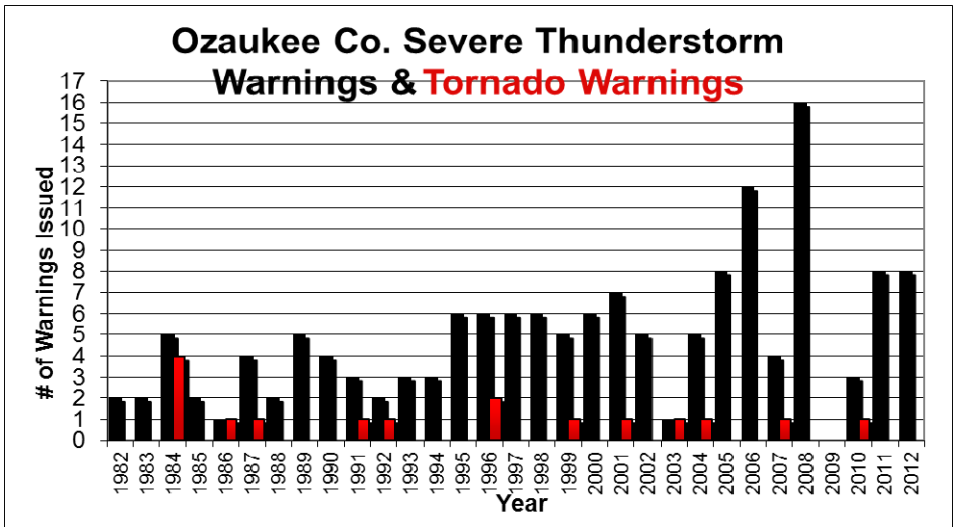
[86] FEMA, 1997

areas of tree and property damage, somewhat like a tornado, were reported. After an aerial survey was completed to map both direction and F-scale intensity of the damaging winds it was determined that no evidence of a tornado was found anywhere within the path of the damage swath, which was 166 miles long and 17 miles wide. The survey revealed that there were scattered local centers from which straight-line winds diverged outward. These local wind systems were identified as downbursts with at least 25 specific locations recognized by the low-flying aircraft.

Frequency of Occurrence

Wisconsin lies along the northern edge of the nation's tornado belt, which extends north-eastward from Oklahoma into Iowa and across to Michigan and Ohio. Winter, spring and fall tornadoes are more likely to occur in southern Wisconsin, which includes Ozaukee County, than in northern counties.

Wisconsin's tornado season runs from the beginning of April through September with the most severe tornadoes typically occurring in April, May and June. Tornadoes have, however, occurred in Wisconsin during every month except February. Many tornadoes strike in late afternoon or early evening but they do occur at other times. Deaths, injuries and personal property damage have occurred and will continue to occur in Wisconsin.



According to the National Weather Service, Ozaukee County had two funnel clouds, two water spouts and three tornadoes between

1 January 1950 and 31 December 2012. [87] Between these dates, the county had no deaths, 30 injuries and approximately $3,030,000 in damages due to these storms. The probability of Ozaukee County being struck by a tornado in the future is high and the likelihood of damage from future tornadoes is also high. All parts of Ozaukee County are equally susceptible to tornadoes.

Year	Date	Location	Human Losses	Damage Losses	Miscellaneous
1964	08/22	Ozaukee	Death: 0 Injury: 30	Property: $2.5M Crop: $0	F4
1996	07/18	Fredonia	Death/Injury: 0	Property: $300K Crop: $230K	F1
	07/18	Port Washington Airport	Death/Injury: 0	Property/Crop: $0	F0
	07/18	Dacada	Death/Injury: 0	Property/Crop: $0	Funnel Cloud
	07/18	Knellsville	Death/Injury: 0	Property/Crop: $0	Waterspout
	07/18	Port Washington	Death/Injury: 0	Property/Crop: $0	Waterspout
2004	06/23	Thiensville	Death/Injury: 0	Property/Crop: $0	Funnel Cloud

Vulnerability

Injury to people is a primary concern in tornado and high wind events. Two of the highest risk places are mobile home parks and campgrounds; Ozaukee County has several of each type of property. Both have high concentrations of people in a small area, generally have structures that provide less protection than standard construction homes generally do not provide storm shelters. Other places of concern during these types of events include critical emergency facilities such as hospitals and public works/highway garages, police stations and fire departments, which contain equipment and services needed by the public after a tornado.

Schools, in addition to holding children, are the major type of structure used as community disaster shelters and their loss might therefore affect the community on several levels (e.g., the death or injury of children, the loss of a community housing shelter). School gymnasiums are often the specific location of the community shelter but they are especially vulnerable in tornadoes because the large-span roof structure is often not adequately supported.

Community infrastructure such as power lines, telephone lines, radio towers and street signs are often vulnerable to damage from tornadoes and high winds and can be expensive to replace. The loss of radio towers that hold public safety communications

[87] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN

repeaters can adversely impact the ability of first responders to mount an effective response; damage to towers that hold public media equipment may adversely impact the ability to distribute adequate public information.

Residential property is likely to have siding and roofing materials removed, windows broken from flying debris and garages blown down due to light construction techniques. Perhaps one of the largest types of loss on private property is due to tree damage, which is generally not covered by federal disaster assistance.

Business properties are at risk for having damage to infrastructure including signs, windows, siding and billboards. Agricultural buildings, such as barns and silos, are also generally not constructed in a manner that makes them wind resistant, which can lead to the loss of livestock and harvest. Standing crops are also at risk from high winds and tornadoes.

Hazard Mitigation Strategies

The goal of tornado and high wind mitigation activities is to reduce, in a cost effective manner, the loss of lives and property due to these events. Ozaukee County has a history of damage to buildings and infrastructure due to tornadoes and high winds. Some strategies below will deal with public information and alert and notification while others will enable the community to make current and future buildings and infrastructure more disaster-resistant by enacting more “bricks and mortar” solutions.

An effective warning system is the single most important resource for alerting the public to a tornado hazard, which is critical to the main goal of saving lives and reducing property losses. Forecasting of tornadoes is difficult, however, because of the suddenness of their onset, their relatively short duration, the extreme variability of a tornado striking area, limited knowledge of tornado dynamics and the limitations of the weather observation system. Tornado sirens are municipally owned and maintained in Ozaukee County although some are activated by the county. The municipalities regularly test warning systems, repairing and upgrading as they deem necessary. (See Appendix F for additional detail on the Mequon siren project.) The Division of Emergency Management promotes the use of NOAA weather radios for public alert and notification. The office also continues to evaluate various

technologies to determine if they can be effectively integrated into the county's alert and notification systems.

During the past several years, there has been a statewide Tornado Awareness Week in late March or April. Media information packets are distributed to reemphasize and alert the public to tornado warning procedures. Ozaukee County actively promotes tornado safety public information as well as other summer severe weather public awareness and educational efforts, including applicable links on the county website. Ozaukee County also assists the National Weather Service with sponsoring tornado spotter training and in organizing local tornado spotter networks.

As part of the tornado preparedness program, the county plans to work with the municipalities to identify governmental and private buildings that can be used as tornado shelters. Most municipalities in Ozaukee County have adopted the state's uniform building codes. Ozaukee County would like to encourage the enforcement of these local building codes that improve a current or future structure's ability to withstand greater wind velocities. This should be facilitated by the fact that in late 2003, the Governor signed a law requiring municipalities to use a uniform building code inspector.

The county recognizes that mobile home parks and campgrounds are particularly vulnerable locations for people and property during a tornado. To help mitigate the danger, the county is considering projects that include:

- Providing information to builders and owners of manufactured and mobile homes regarding the use of tie-downs with ground anchors via informational links on the county website. This relatively inexpensive strategy reduces the damage to these homes in lower F-scale tornadoes.
- Identifying and constructing tornado shelters in mobile home parks and campgrounds as grant funding is available. The U. S. Department of Commerce Community Development Block Grants may be an avenue to achieve the necessary funding. If grant funding is not available, park owners will be encouraged to plan shelters on their properties.
- Ozaukee County - A storm shelter is being built for the Ozaukee County Fairgrounds.
- Village of Newburg - Explore cost and funding options for upgrading the lower level of the municipal building.

- Village of Thiensville - Upgrade the bathroom facilities in the village park to make it larger and a weather shelter structure.
- Town of Fredonia - Waubedonia Park is a rustic campground with 15-20 sites, active on summer weekends. It is connected to Hawthorne Hills with Hawthorne Hills Peters Day Camp. The park has a weather radio and a small PA system, but no place to go for shelter.
- Finally, the county would like to explore the feasibility of increasing the wind resistance of the roofs of designated community storm shelters.

Storms: Winter

Due to its position along the northern edge of the United States, Wisconsin, including Ozaukee County, is highly susceptible to a variety of winter weather storm phenomena.

Picture of snow drifts after the “Groundhog Day Blizzard” in 2011.[88]

Physical Characteristics

The National Weather Service descriptions of winter storm elements are:

- Heavy snowfall - Accumulation of six or more inches of snow in a 12-hour period or eight or more inches in a 24-hour period.
- Blizzard - An occurrence of sustained wind speeds in excess of 35 miles per hour (mph) accompanied by heavy snowfall or large amounts of blowing or drifting snow.
- Ice storm - An occurrence of rain falling from warmer upper layers of the atmosphere to the colder ground, freezing upon contact with the ground and exposed objects near the ground.

[88] http://readywisconsin.wi.gov/news/Top%20Weather%20Events%20in%20Wisconsin%20for%202011.pdf

- Freezing drizzle/freezing rain - Effect of drizzle or rain freezing upon impact on objects with a temperature of 32 degrees Fahrenheit or below.
- Sleet - Solid grains or pellets of ice formed by the freezing of raindrops or the refreezing of largely melted snowflakes. This ice does not cling to surfaces.
- Wind chill - An apparent temperature that incorporates the combined effect of wind and low air temperatures on exposed skin.

In Wisconsin, the winter storm season generally runs from November through March and Wisconsin residents are most familiar with heavy snowstorms, blizzards, sleet and ice storms. The majority of Wisconsin snowfalls are between one and three inches per occurrence, although heavy snowfalls that produce at least ten inches may occur four or five times per season. Northwestern Wisconsin encounters more blizzards than the southeastern portions of the state.

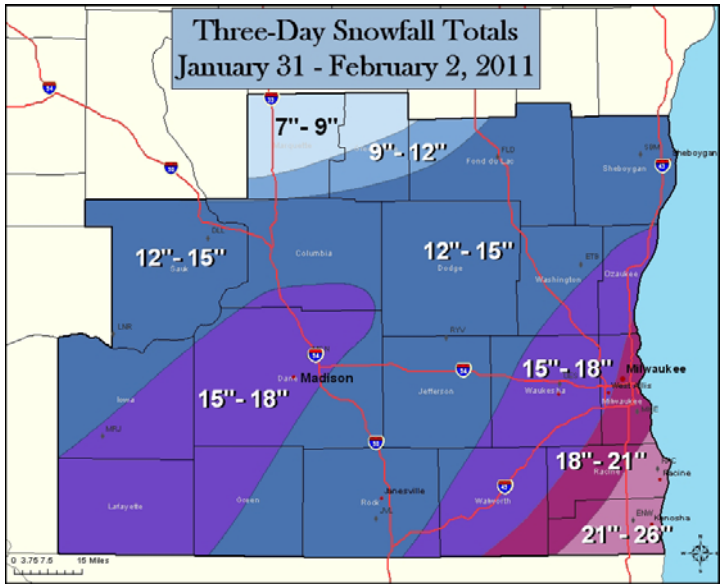
Damage from ice storms can occur when more than half an inch of rain freezes on trees and utility wires, especially if the rain is accompanied by high winds. Another danger comes from accumulation of frozen rain pellets on the ground during a sleet storm, which can make driving hazardous.

Frequency of Occurrence

Annual snowfall in Wisconsin varies between thirty inches in southern counties to one hundred inches in the north. Ozaukee County averages approximately 45 inches of snow annually. Storm tracks originating in the southern Rockies or Plains states that move northeastward produce the heaviest precipitation, usually six to twelve inches. Low pressure systems originating in the northwest (Alberta) tend to produce only light snowfalls of two to four inches. Snowfalls associated with Alberta lows occur more frequently with colder weather.

Although massive blizzards are rare in Wisconsin, blizzard-like conditions often exist during heavy snowstorms when gusty winds cause blowing and drifting of snow. For example, blizzard conditions existed in Wisconsin in February, 2011 when record snowfalls were recorded in many areas and very strong northeast

winds were gusting from 45 to 60 mph for an extended period of time. Ozaukee County received from 12 up to 18 inches associated over this three-day storm. It should be noted that there were two additional large snow storms that occurred in late February and late March of 2011.[89]



Both ice and sleet storms can occur at any time throughout the winter season from November to April. Ice storms of disastrous proportions occurred in central Wisconsin in February 1922 and in southern Wisconsin in March 1976. A Presidential Disaster Declaration occurred as a result of the 1976 storm. Utility crews from surrounding states were called in to restore power, which was off for up to ten days in some areas. Other storms of lesser magnitude caused power outages and treacherous highway conditions.

The probability that there will be severe winter storms in Ozaukee County is medium and the likelihood that those storms will cause significant damage is also medium. The following table details Ozaukee County's 87 winter storm statistics (i.e., snow and ice events) as reported by the National Weather Service including human loss and injury and property damage estimates from 1 January 1950 through 31 December 2012.[90]

[89] http://readywisconsin.wi.gov/news/Top%20Weather%20Events%20in%20Wisconsin%20for%202011.pdf and http://www.crh.noaa.gov/mkx/?n=020211_blizzard

[90] http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN

Year	Date	Location	Human Losses	Damage Losses	Miscellaneous
1993	01/13	Statewide	Death/Injury: 0	Property/Crop: $0	Heavy Snow
1994	01/05	Central and Southern	Death/Injury: 0	Property/Crop: $0	Heavy Snow
	01/23	All but far Northwest	Death/Injury: 0	Property/Crop: $0	Heavy Snow/Ice Storm
	02/07	Southern and Eastern	Death/Injury: 0	Property/Crop: $0	Heavy Snow
	02/22	Southern half of Wisconsin	Death/Injury: 0	Property/Crop: $0	Heavy Snow
	02/25	Southern half of Wisconsin	Death/Injury: 0	Property/Crop: $0	Heavy Snow
	12/05	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
1995	01/19	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
	11/26	Central and Southern	Death: 0 Injury: 1	Property/Crop: $0	Heavy Snow
	12/13	Central	Death/Injury: 0	Property/Crop: $0	Ice Storm
1996	01/05	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
	01/23	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
	01/26	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
1997	01/09	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
	03/12	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
1998	01/08	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
1999	03/09	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
2000	04/07	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	12/11	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
	12/18	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
2002	03/02	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
2003	02/03	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather/Mix
	04/04	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
2004	01/04	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather/Mix
	01/16	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather/Mix
	02/08	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather/Mix
	12/18	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather/Mix
2005	01/06	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	01/22	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	02/20	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
2006	02/16	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	11/10	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
2007	01/12	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	01/14	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	01/21	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	02/13	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	02/23	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	02/25	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	03/02	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	04/11	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	11/21	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	12/01	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	12/04	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather

	12/11	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	12/15	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
2008	01/21	Ozaukee	Death/Injury: 0	Property/Crop: $0	Heavy Snow
	01/29	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	02/09	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	02/11	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	03/21	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	11/24	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	11/30	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	11/30	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	12/01	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	12/03	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	12/16	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	12/18	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	12/21	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	12/23	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	12/24	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	12/25	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	12/27	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
2009	01/03	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	01/12	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	01/13	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	02/21	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	02/26	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	03/28	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	12/08	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	12/23	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
2010	01/07	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	02/09	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	12/09	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	12/11	Ozaukee	Death/Injury: 0	Property/Crop: $0	Blizzard
	12/20	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
2011	01/17	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	02/01	Ozaukee	Death/Injury: 0	Property/Crop: $0	Blizzard
	02/20	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm
	02/21	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	03/09	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	12/29	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
2012	01/12	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	01/17	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	01/20	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	01/22	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	02/23	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Weather
	03/02	Ozaukee	Death/Injury: 0	Property/Crop: $0	Winter Storm

Vulnerability

Winter storms present a serious threat to the health and safety of affected citizens and can result in significant damage to property.

Heavy snow or accumulated ice can cause the structural collapse of homes, commercial buildings and agricultural structures; down power lines or isolate people from assistance or services by impeding transportation by the general public, emergency responders and public transportation resources.

The loss of electrical service and/or the blocking of transportation routes can adversely affect the ability of commercial enterprises to conduct business. This economic injury may be felt by both the business owner and employees unable to work during this period.

Hazard Mitigation Strategies

The goal of winter storm mitigation activities is to reduce, in a cost effective manner, the loss of lives and property due to these events. Communities prepare for severe winter weather by ensuring that plowing and sanding equipment is operational and available to handle potential emergencies. Funding is budgeted for the overtime hours of extra personnel but in a large emergency this may not be adequate. Redundant communication modes (e.g., radio, telephone) exist between government, police, fire, EMS, hospitals and highway departments. The Ozaukee County Comprehensive Emergency Management Plan provides for coordination of public safety support agencies such as the American Red Cross and for resource acquisitions during winter emergencies.

Winter safety information is prepared and distributed to the media and the public by the Ozaukee County Division of Emergency Management during Winter Awareness Week in November. Preparedness information is also available from display racks in the courthouse and the website. During a storm, the public is advised to monitor local radio, television and NOAA weather alert radios for up-to-date forecasts.

The hazard mitigation strategies listed above primarily involve providing information on general safety measures to the public. These measures provide basic safety information but, since the response to winter storms is primarily a government and/or corporate function comprised of tasks such as clearing roads of snow and ice and repairing downed utility lines, there are few measures that can be employed to reduce damages to existing or future buildings and infrastructure.

Utility Failure

A utility emergency is a disruption to the building services, usually defined as electrical power, water, natural gas and/or sewage, which restricts the ability of people to safely occupy the facility. Electrical power or natural gas outages are often caused by a fuel shortage caused by an oil embargo, power failure or natural disaster. Disruptions to the water and sewage systems are often the direct result of a natural disaster (e.g., flooding) or are indirect losses due to another failure (e.g., a power outage disrupts the pumping of water and/or sewage).

Physical Characteristics

Modern society is very dependent on electrical power for normal living and is therefore quite disrupted by loss of power. Most power outages last about fifteen minutes to one hour. If longer, the utilities will inform the local news media of the anticipated duration of the outage. The City of Cedarburg, serviced by the Cedarburg Light and Water Utility, has its own electrical power substation; other county residents are serviced by We Energies.

Electrical substation

Thunderstorms with lightning are a possible cause of power failure. Fuel shortages can be caused by localized imbalances in supply.

Labor strikes, severe cold weather or snowstorms also can cause a local shortage.

The water and sewage systems are most often a function of a municipal system and are usually found in more urbanized areas. Rural water is often provided by individual wells found on each property and sewage is managed by a septic system, also found on each individual property. Both municipal and individual systems are vulnerable to flooding, which can overwhelm the sewage systems and contaminate both municipal and private wells. Both types of systems are also vulnerable to electrical power loss because the electrical system powers the pumps and lift stations that move and treat the water and sewage.

Frequency of Occurrence

Ozaukee County has several short power outages (i.e., lasting less than six hours) per year but does not have a history of extended power outages. The possibility always exists that a man-made or natural disaster could affect the power system for an extended period of time.

In general, Ozaukee County has a medium likelihood of utility failures with a low risk of damage, death or injury due to a loss. Obviously, power outages are more likely to occur and the severity is greater in areas of higher human population (i.e., urban areas) but the loss of power to rural customers, while affecting fewer people, generally lasts longer and can be as life-threatening, especially if a person with special needs (e.g., the elderly, the young, those on special medical equipment) is involved.

Vulnerability

The failure of a utility to function can have wide-ranging impact in Ozaukee County. People, especially special needs populations, in residential properties may not be able to safely live in their homes because of inadequate heat, the inability to cook, etc. Businesses, including the utilities themselves, may lose money due to the inability to produce goods and services for which they can bill. While there are generally back-up generators on sewage lift stations in Ozaukee County, other utilities may also be non-operational due to damaged infrastructure, which can be very expensive to replace and/or repair. Critical infrastructure such as

hospitals, schools and governmental facilities may not be able to operate or may have to operate at a reduced capacity due to the loss of utility services. Facilities with hazardous materials that are required to report under the Emergency Planning and Community Right-to-Know Act (EPCRA) may not be able to adequately control and contain their chemicals and there may be a release of hazardous materials that can impact people or the environment.

Agricultural assets may be impacted by the loss of utilities because animals require fresh water, extreme temperatures reduce the production volume of and products such as milk may not be able to be properly stored. Modern farms also require on a large amount of automation for feeding, watering and managing the wastes of the facility.

Finally, transportation on roadways may become unsafe due to the loss of directional and street lights.

Hazard Mitigation Strategies

The goal of utility failure mitigation activities is to reduce, in a cost effective manner, the loss of lives and property due to these events. Ozaukee County has worked directly with the utility companies and emergency management responders in formulating emergency management plans. During a fuel or power shortage, residents, schools, industry and businesses will be asked to take measures to conserve fuel. If the fuel shortage reaches a critical stage, all non-essential facilities will be closed and contingency plans will be activated.

In the event of a prolonged power outage, Ozaukee County has generators available to provide power for radio communication and EOC operation. Evacuation and shelter arrangements have been prepared in case of a severe power outage. It should be noted that schools are often top choices as community disaster shelters but few of the county's schools have back-up generators. Currently, the only place in the county with sufficient power to operate air handling units is the EOC. There is some emergency power to run boilers and minimal lighting in the pre-identified shelters but this would not be adequate for long-term operations. The Ozaukee County Division of Emergency Management completed a feasibility study (including a cost-benefit analysis) which evaluated the options for selectively upgrading shelter facilities for electricity

needs. After careful analysis, the county plans to explore fitting several shelters with electric panels.

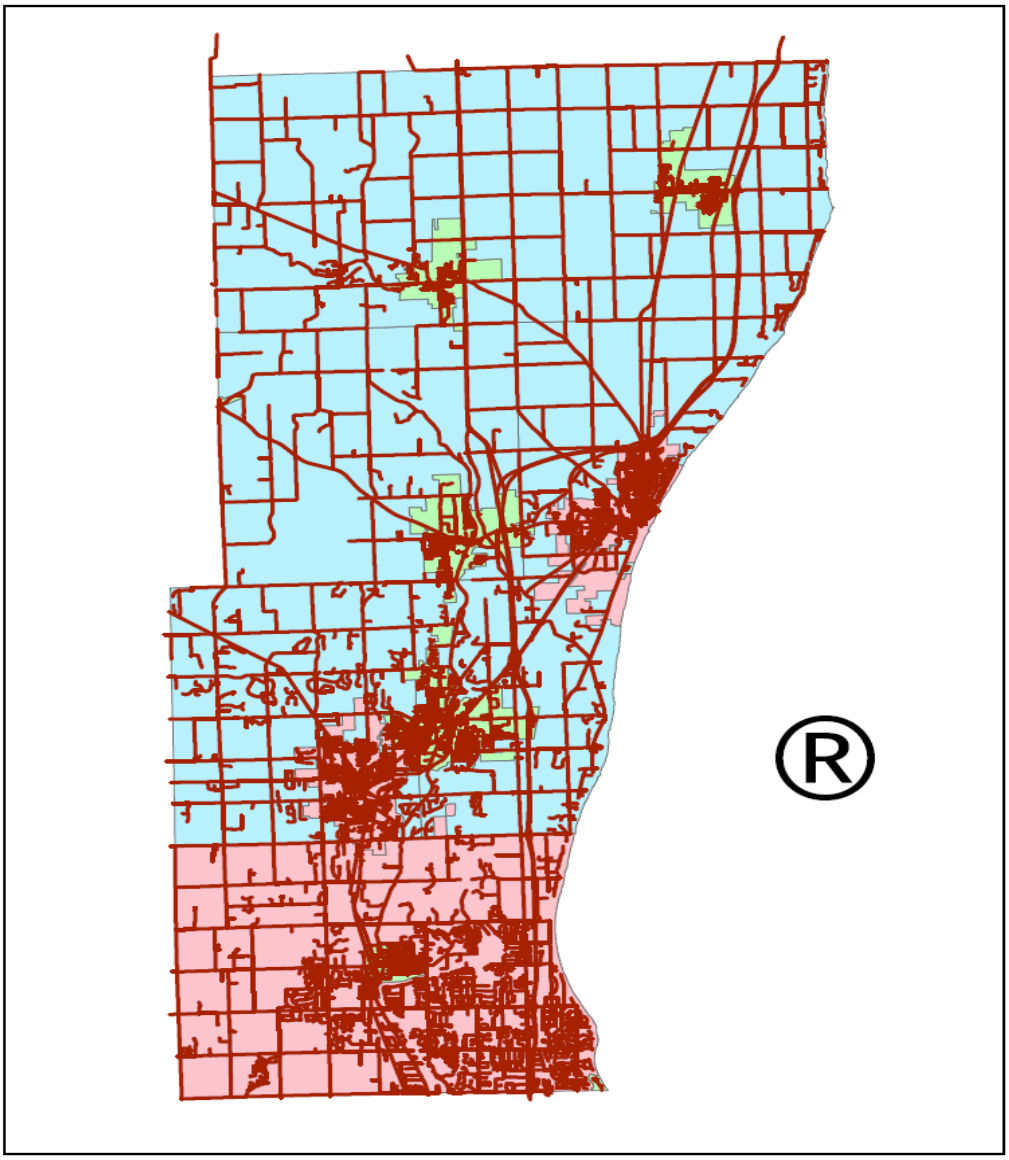
There is no redundancy for the Village of Belgium and the Church Lake region. Main Street currently has the only line. Therefore, the Village has opened discussion with WeEnergies about burying power, cable (Time Warner) and phone (Verizon) lines during their 2013-2014 Main St reconstruction.

Volcano, Hurricane and Tsunami

Due to the geographic location of Wisconsin and/or Ozaukee County, these natural hazards are not considered to be a risk and will not have mitigation strategies associated with them.

Appendix A: Maps

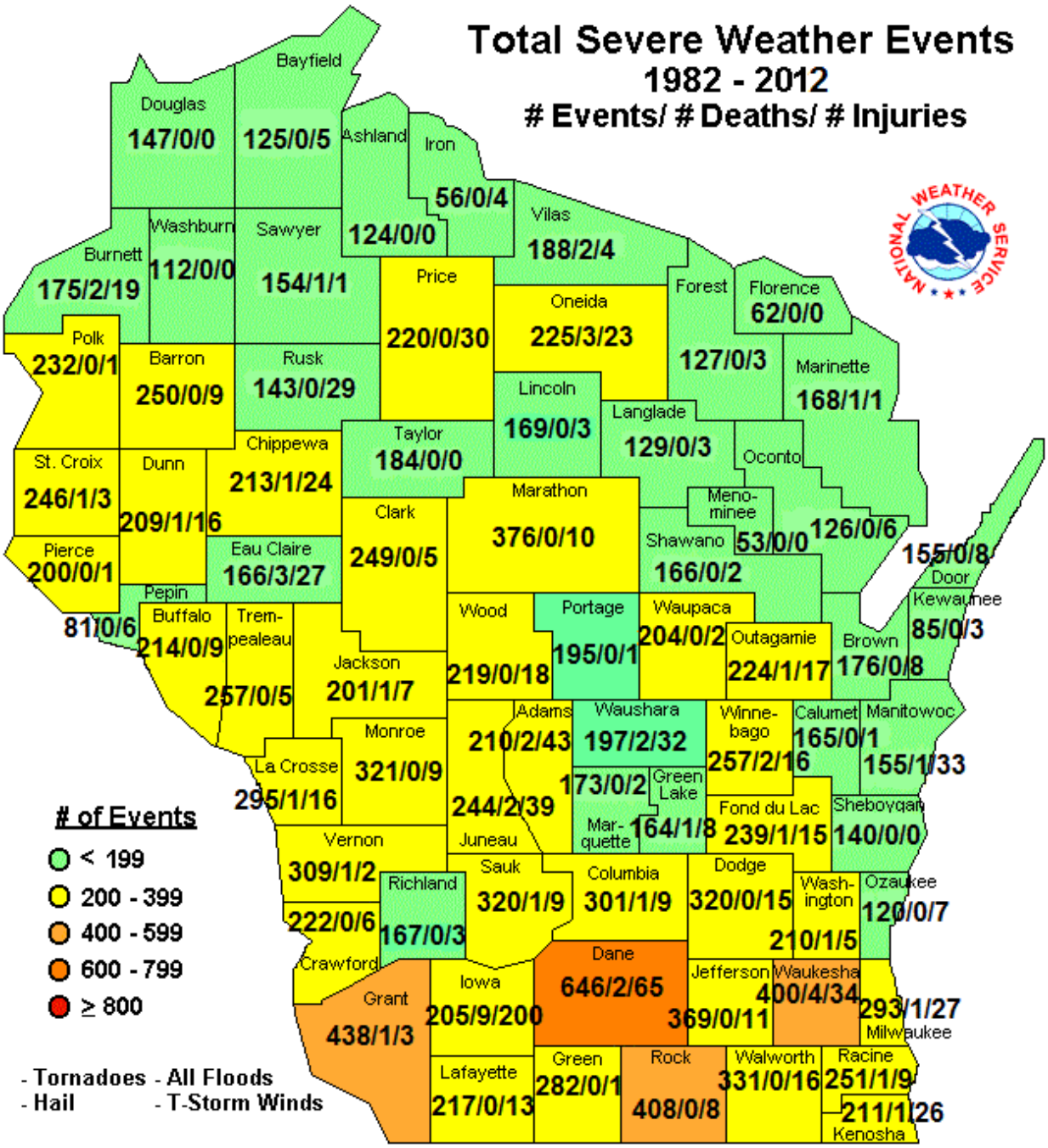
Ozaukee County Base Map



0 5,500 11,000 22,000 33,000 44,000
Feet

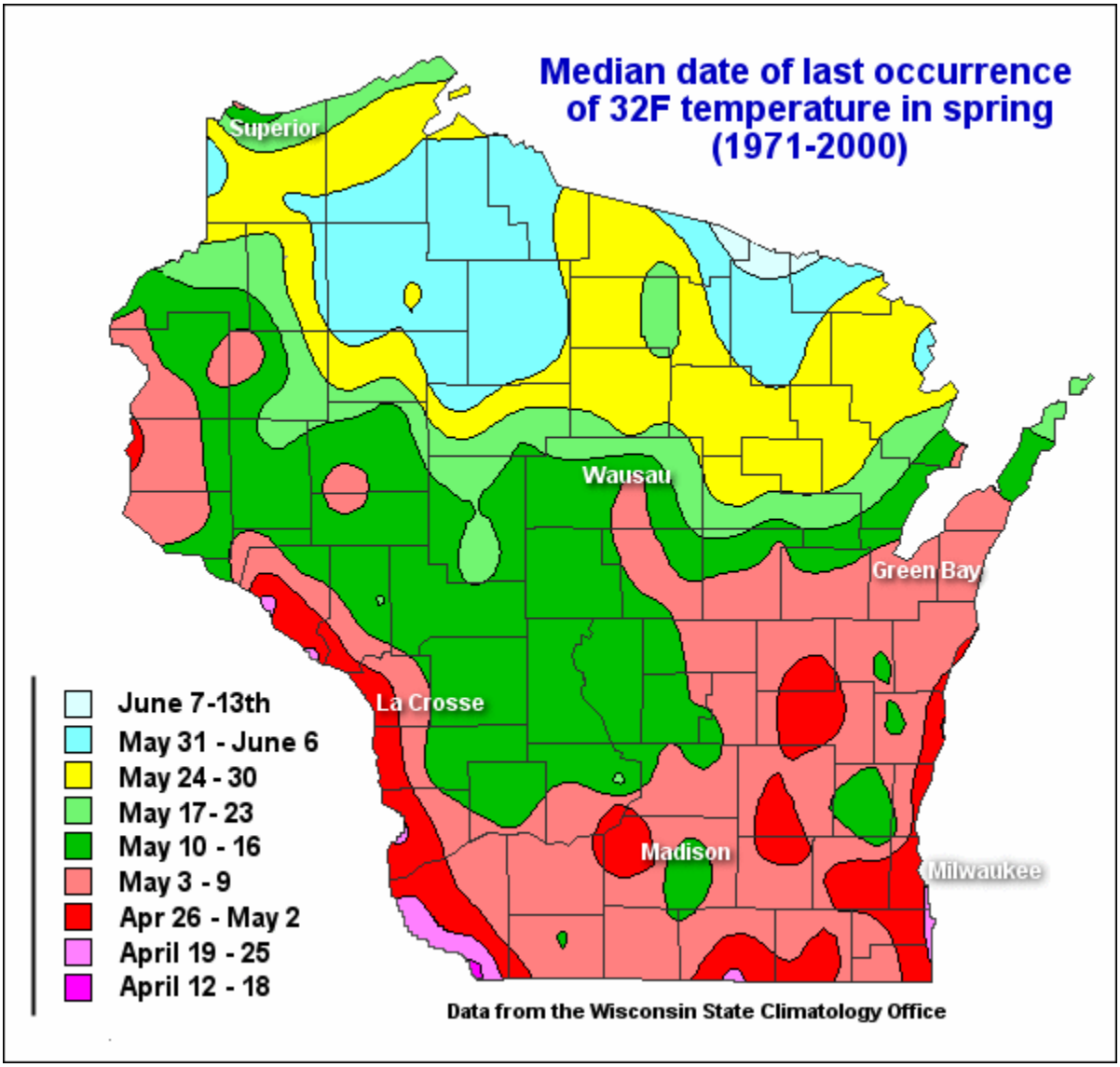
The accuracy of the information contained in this map is limited to the quality of data obtained from other Public Records. This map is not a substitute for an actual field survey.

Wisconsin Total Severe Weather Events[91]



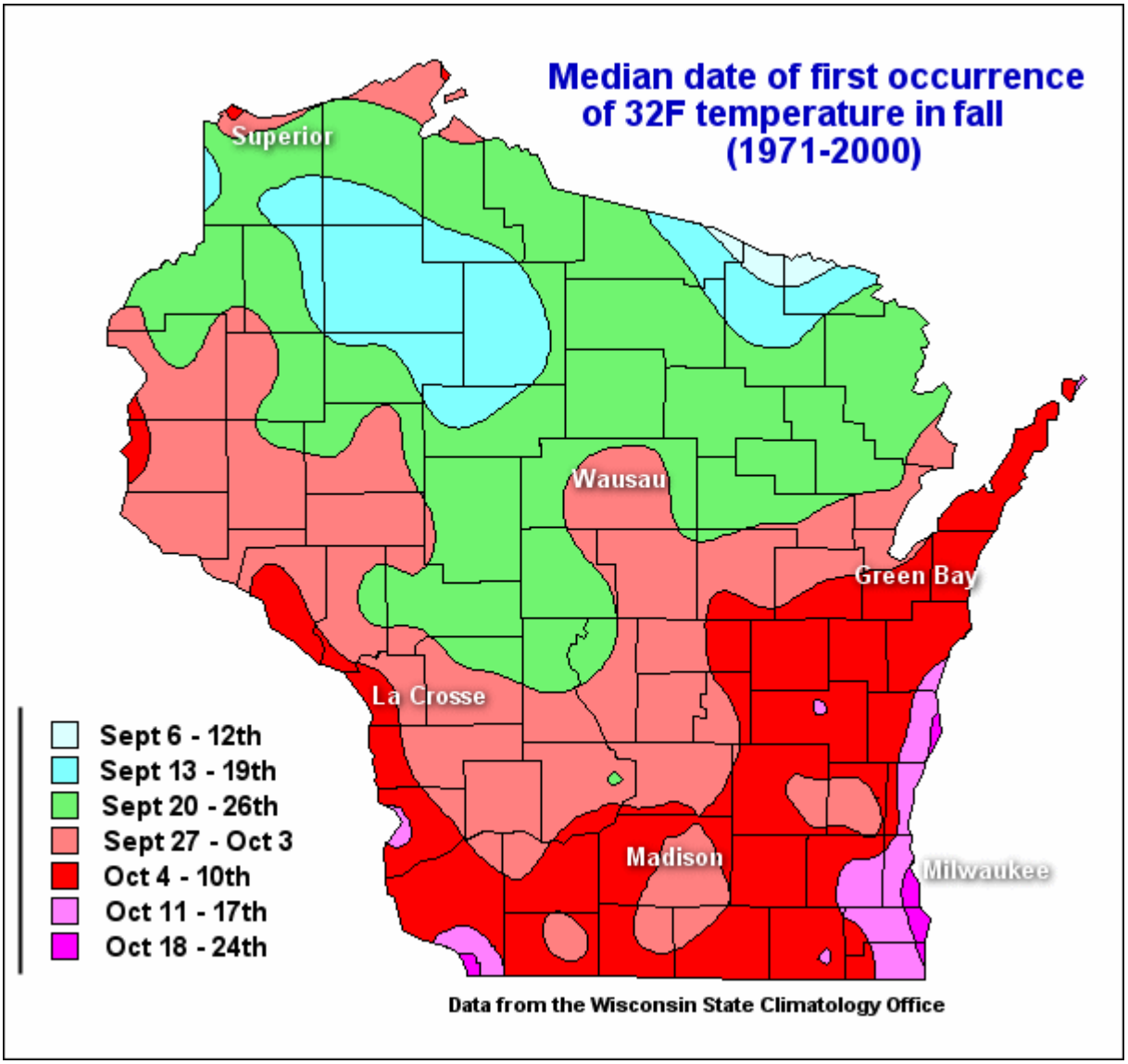
[91] The National Weather Service and Wisconsin Emergency Management

Median Date of Last Freeze[92]



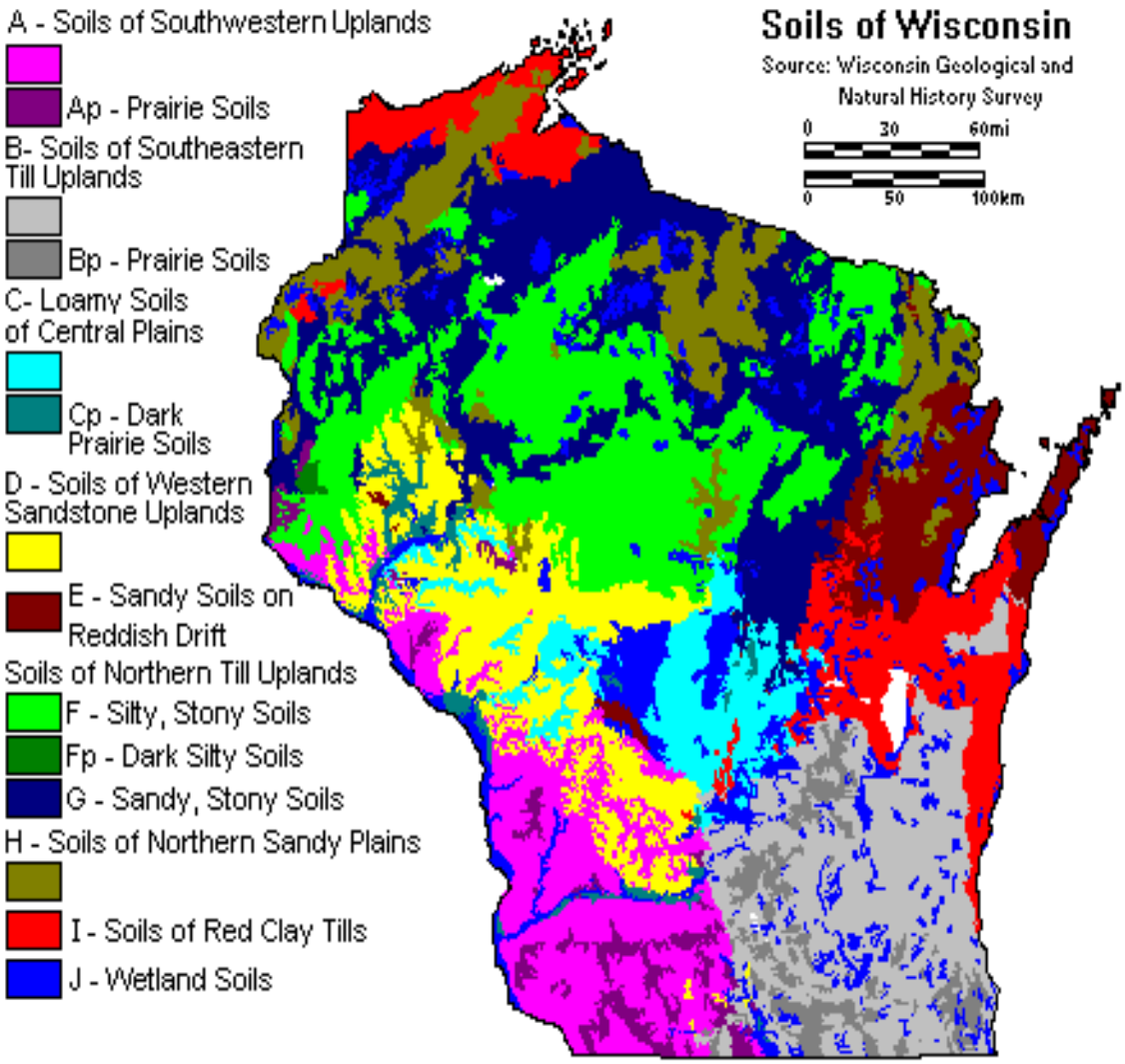
[92] http://www.crh.noaa.gov/mkx/climate/lastfrost.gif

Median Date of First Freeze[93]



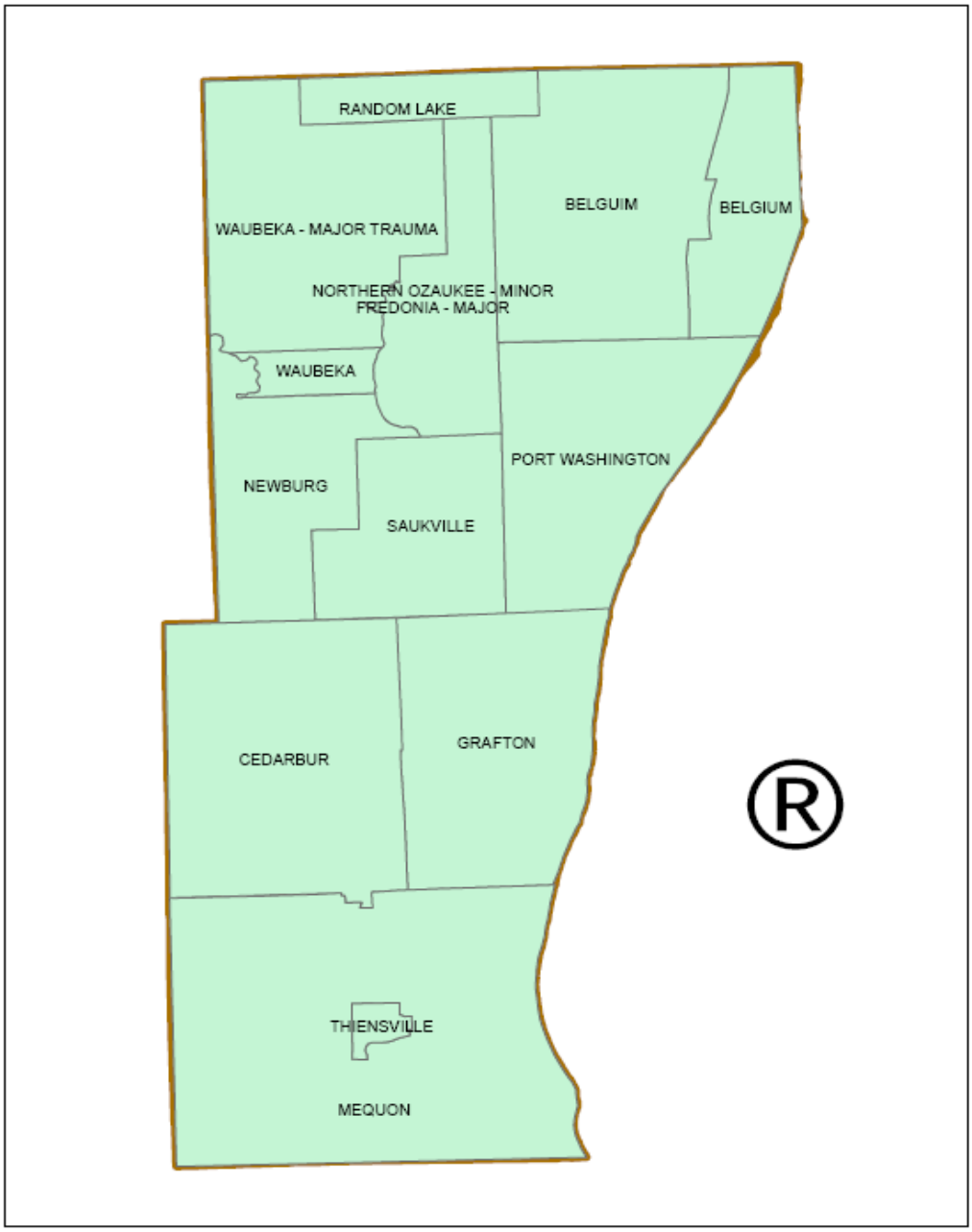
[93] http://www.crh.noaa.gov/mkx/climate/firstfrost.gif

Soils Types[94]



[94] *Soils of Wisconsin* compiled by F. D. Hole, 1973; Wisconsin Geological and Natural History Survey Map, scale (approx.) 1: 3,150,000.

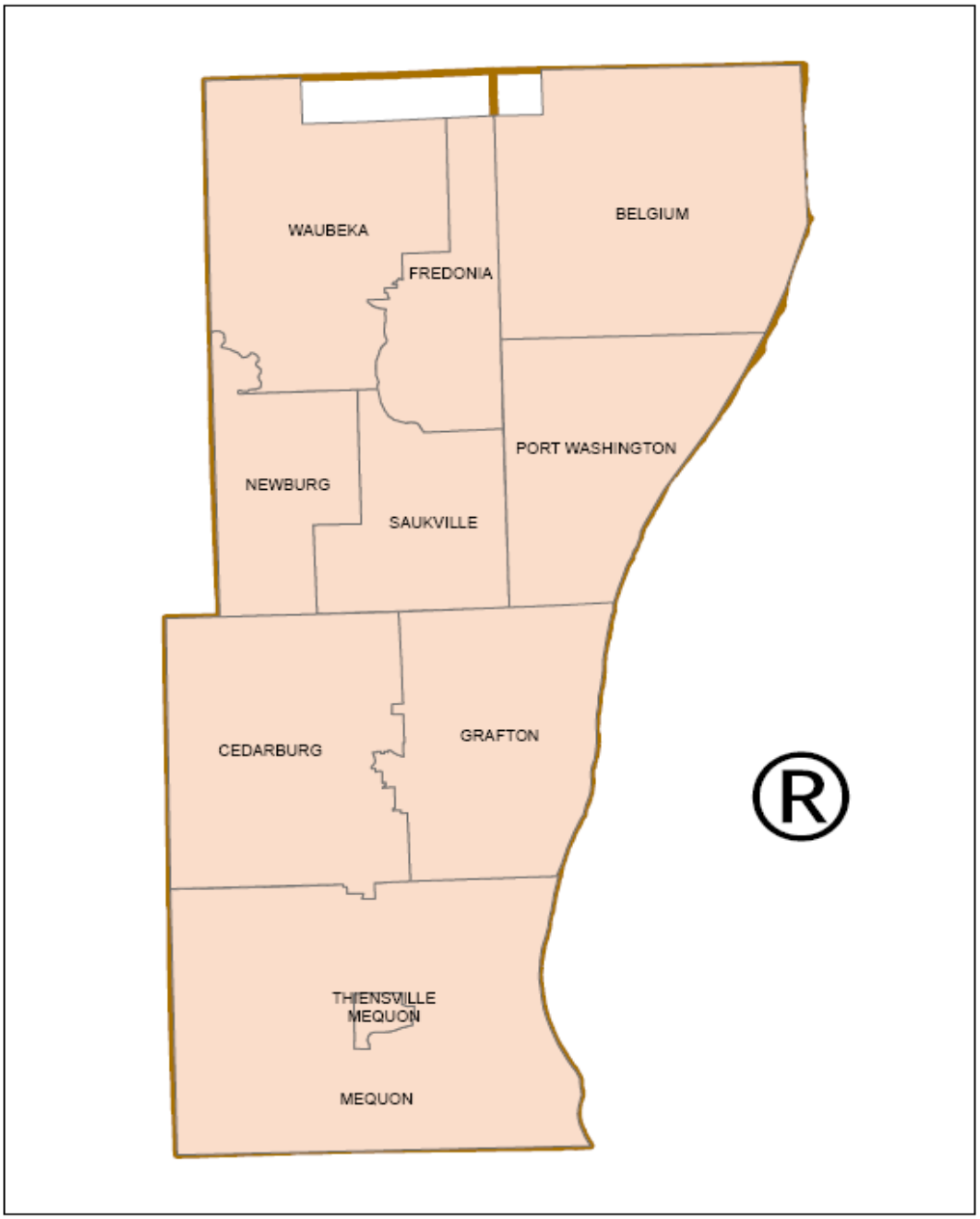
Ozaukee County Ambulance Districts



0 5,500 11,000 22,000 33,000 44,000
Feet

The accuracy of the information contained in this map is limited to the quality of data obtained from other Public Records. This map is not a substitute for an actual field survey.

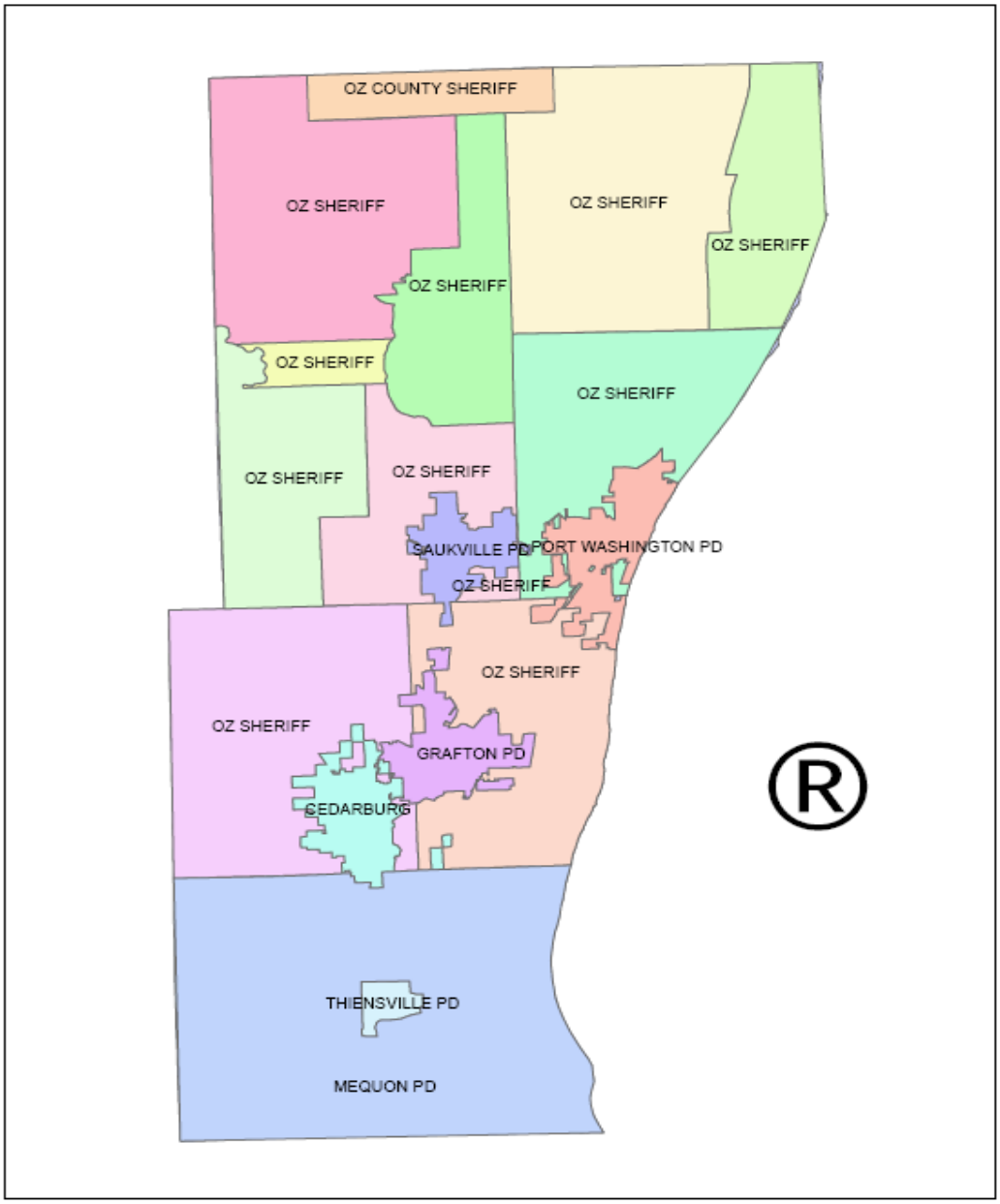
Ozaukee County Fire Districts



0 5,500 11,000 22,000 33,000 44,000 Feet

The accuracy of the information contained in this map is limited to the quality of data obtained from other Public Records. This map is not a substitute for an actual field survey.

Ozaukee County Law Enforcement Districts

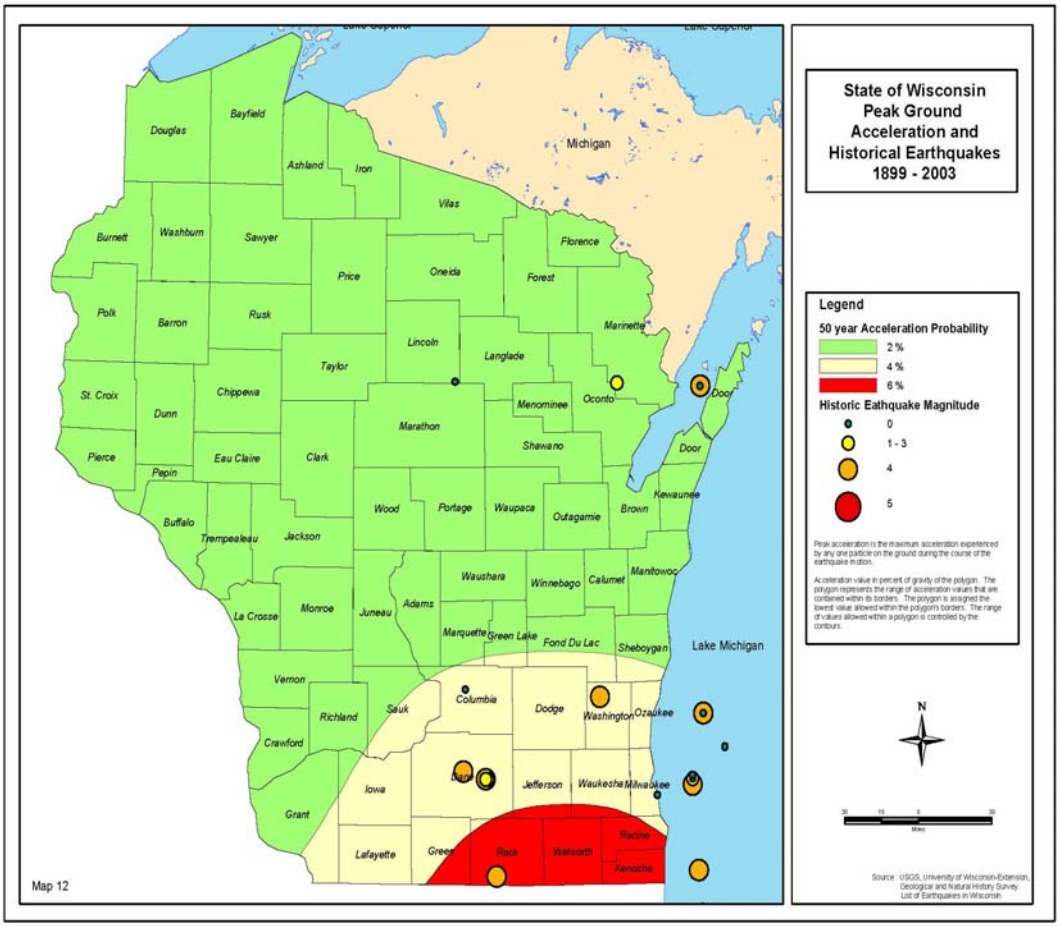


0 5,500 11,000 22,000 33,000 44,000 Feet

The accuracy of the information contained in this map is limited to the quality of data obtained from other Public Records. This map is not a substitute for an actual field survey.

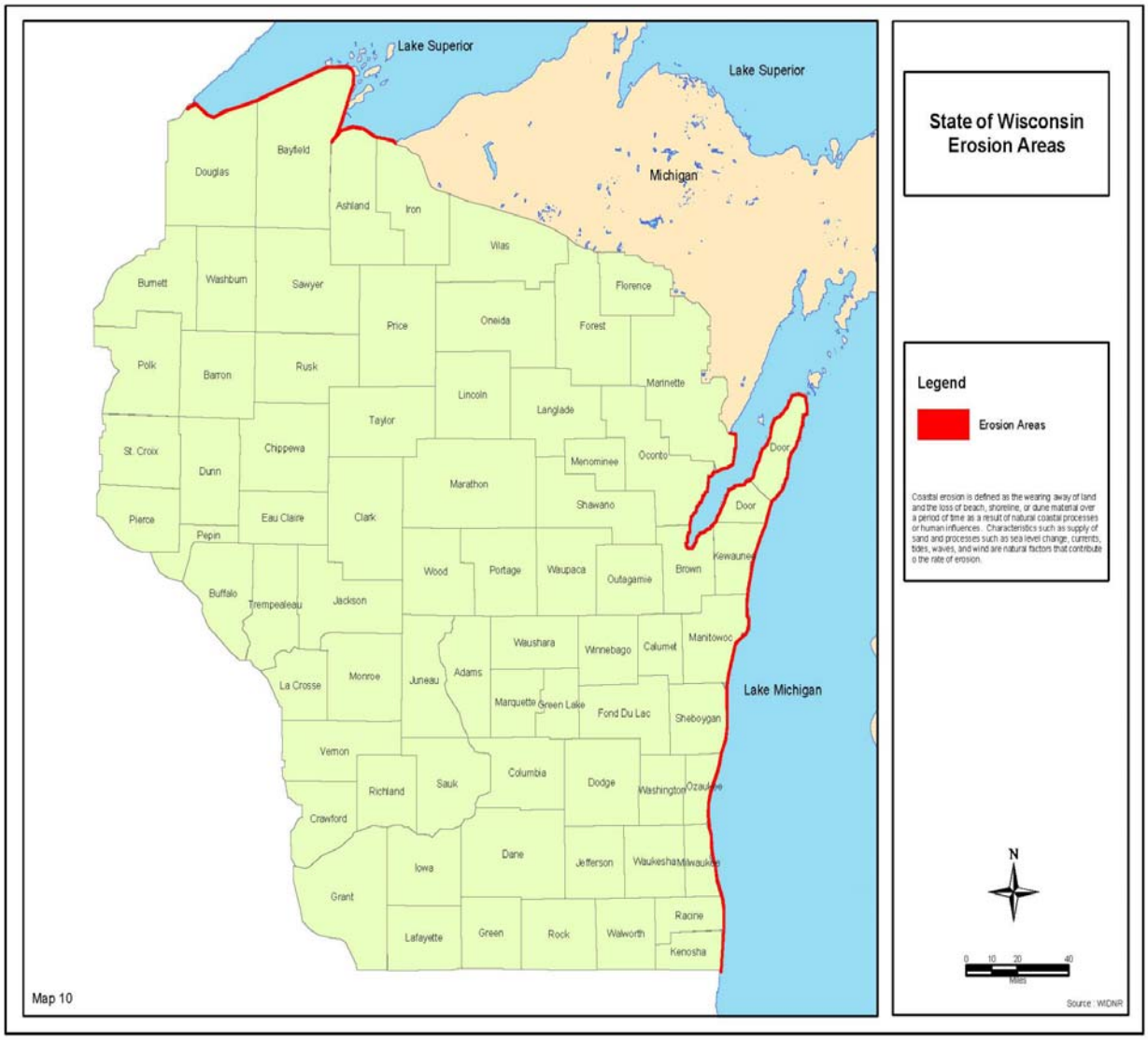
Earthquakes in Wisconsin[95]

Peak Ground Acceleration Contours and Historical Earthquakes in Wisconsin



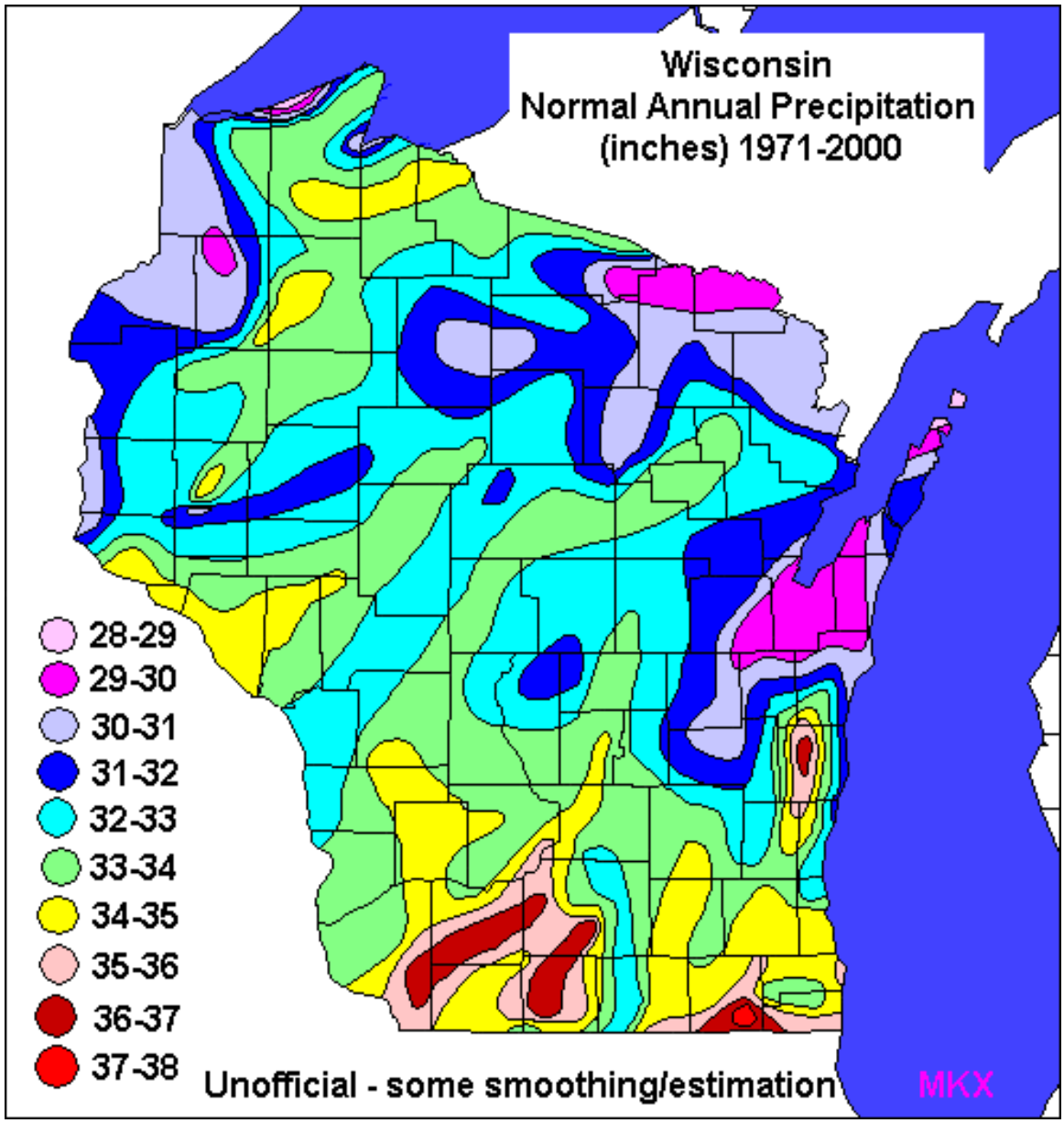
[95] Wisconsin State Hazard Mitigation Plan

Erosion Areas in Wisconsin[96]



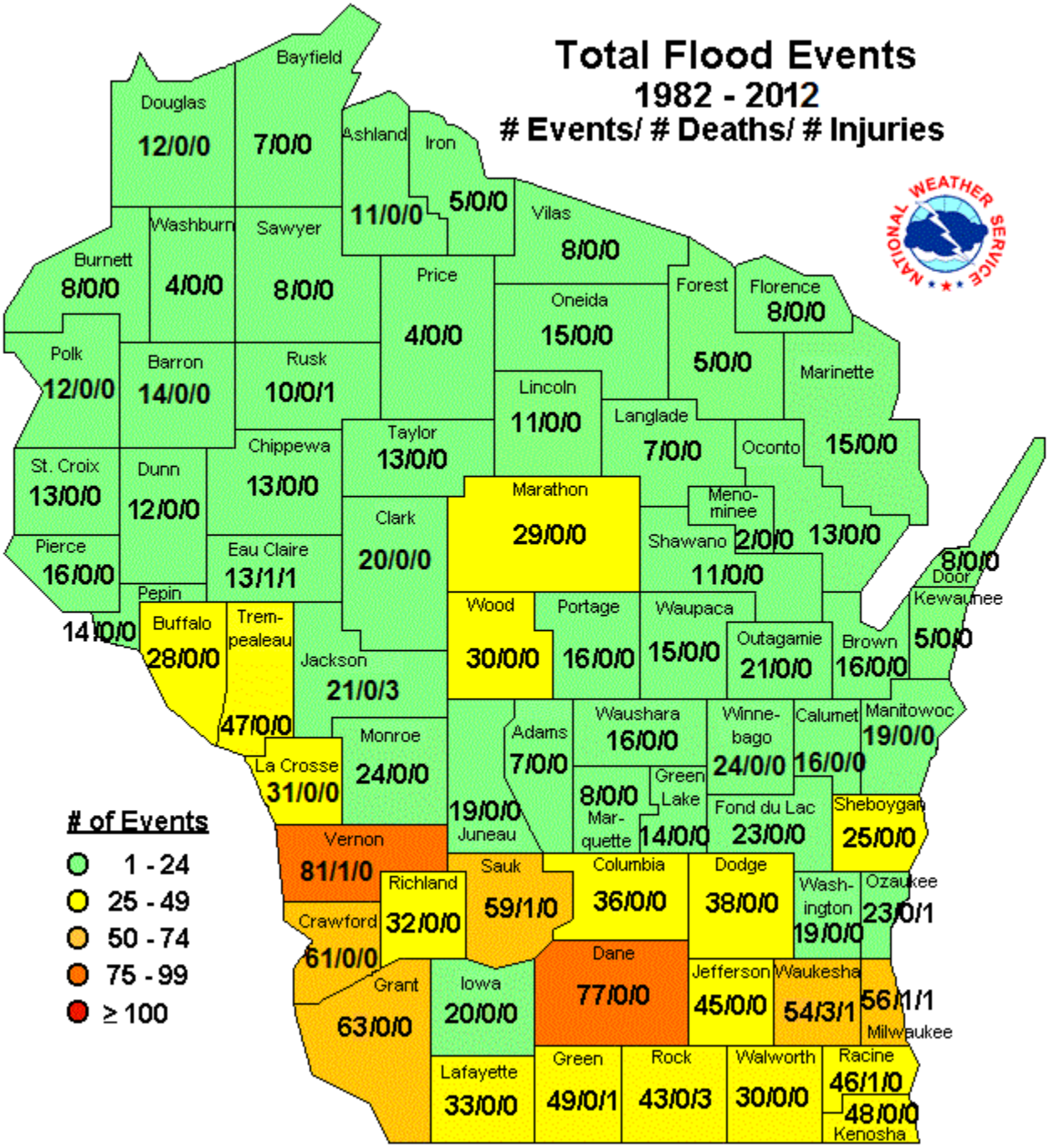
[96] Wisconsin State Hazard Mitigation Plan

Wisconsin Annual Precipitation[97]



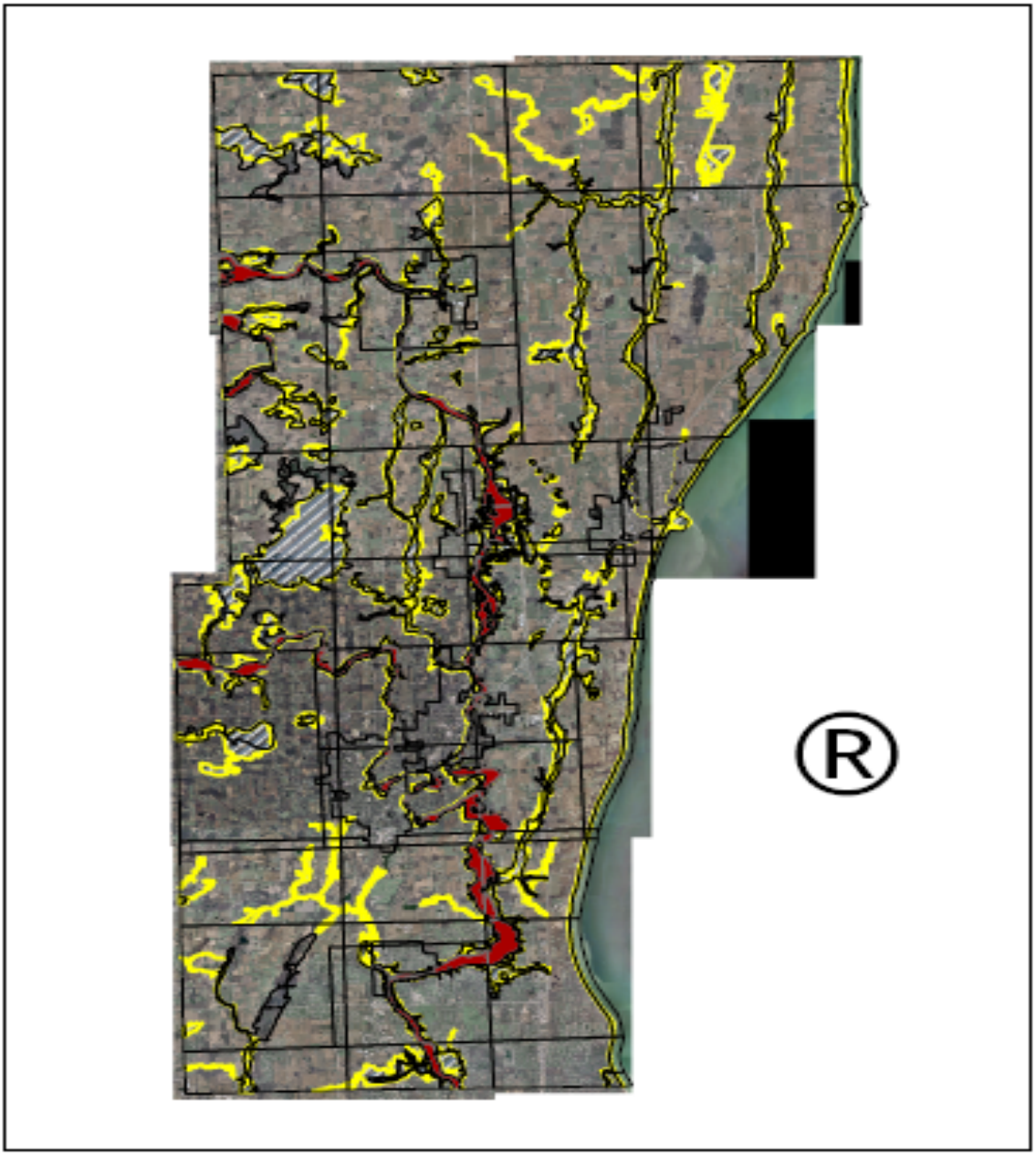
[97] http://www.crh.noaa.gov/mkx/climate/wipcpn.gif

Wisconsin Total Flood Events[98]



[98] The National Weather Service and Wisconsin Emergency Management

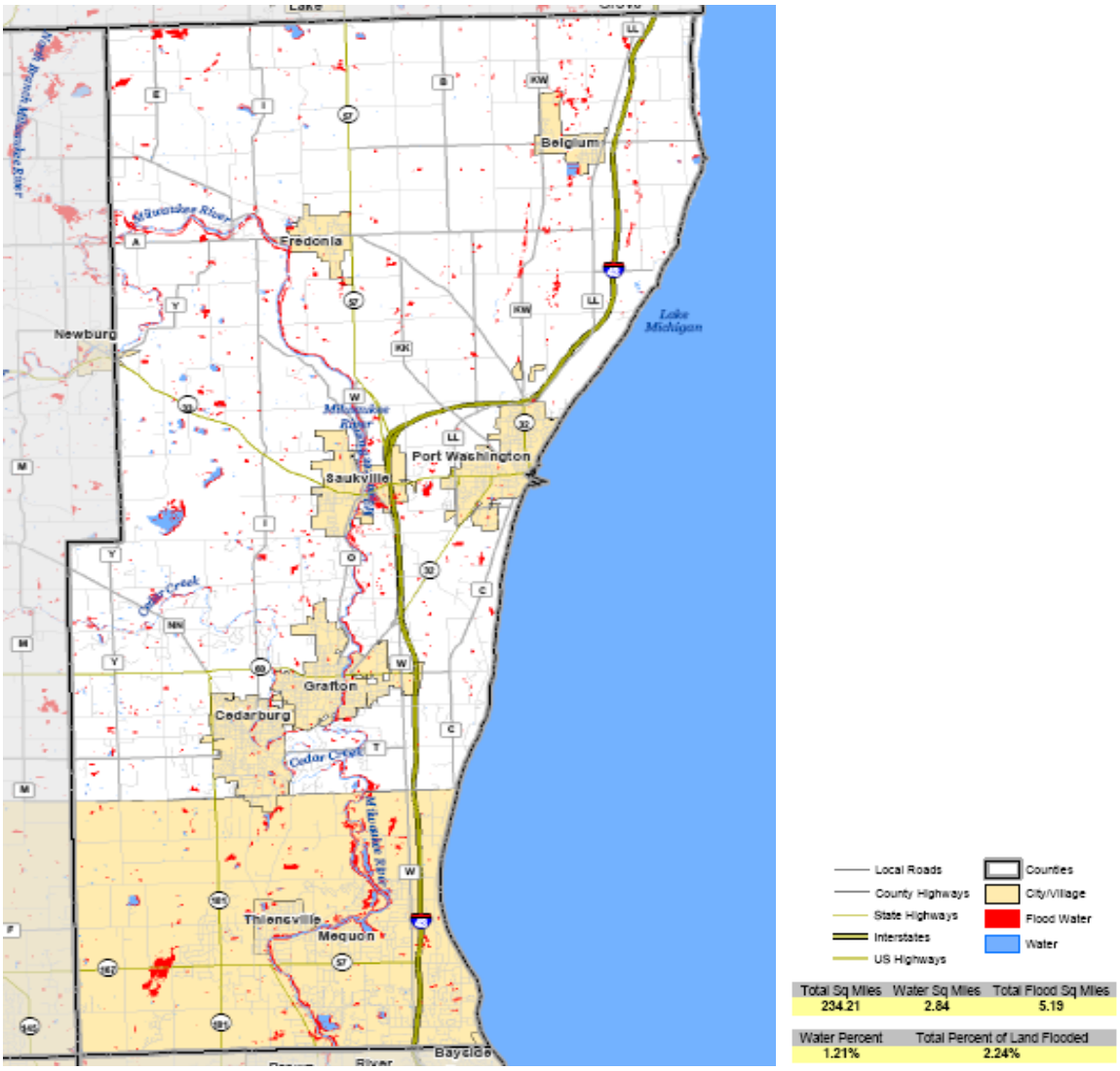
Ozaukee County Floodplain



0 5,500 11,000 22,000 33,000 44,000 Feet

The accuracy of the information contained in this map is limited to the quality of data obtained from other Public Records. This map is not a substitute for an actual field survey.

Ozaukee County Flood Extent – 2008 Floods



The red patches on this map represent the potential extent of the June 2008 flooding. Three different sensors (SAR, TM, MSI) from five remote sensing platforms (RADARSAT-1, Landsat, SPOT-2, SPOT-4 and SPOT-5) were used to compile this information. From June 15 to July 1 thirty scenes were collected, compiled and analyzed. The goals were to differentiate water from land and differentiate flood water from "normal" water. Several factors may lead to improved accuracy of the data in watersheds that drain more slowly like the Rock River watershed. Watersheds like the Kickaboo drain very quickly and may have a slightly higher degree of inaccuracy. These factors include amount of cloud cover, orbit cycle, footprint size, sensor type and ground resolution. Ground-truthing techniques were also used to help verify positive values and remove erroneous data such as false positives.

Statistics were generated using ESRI software. TIGER 2000 and the Wisconsin DNR 24k Hydro were used to aid in statistic generation. While this data could never be 100% verified it is believed to be a fairly accurate representation of the floods of 2008.

Canadian Space Agency/Agence spatiale canadienne (2008)

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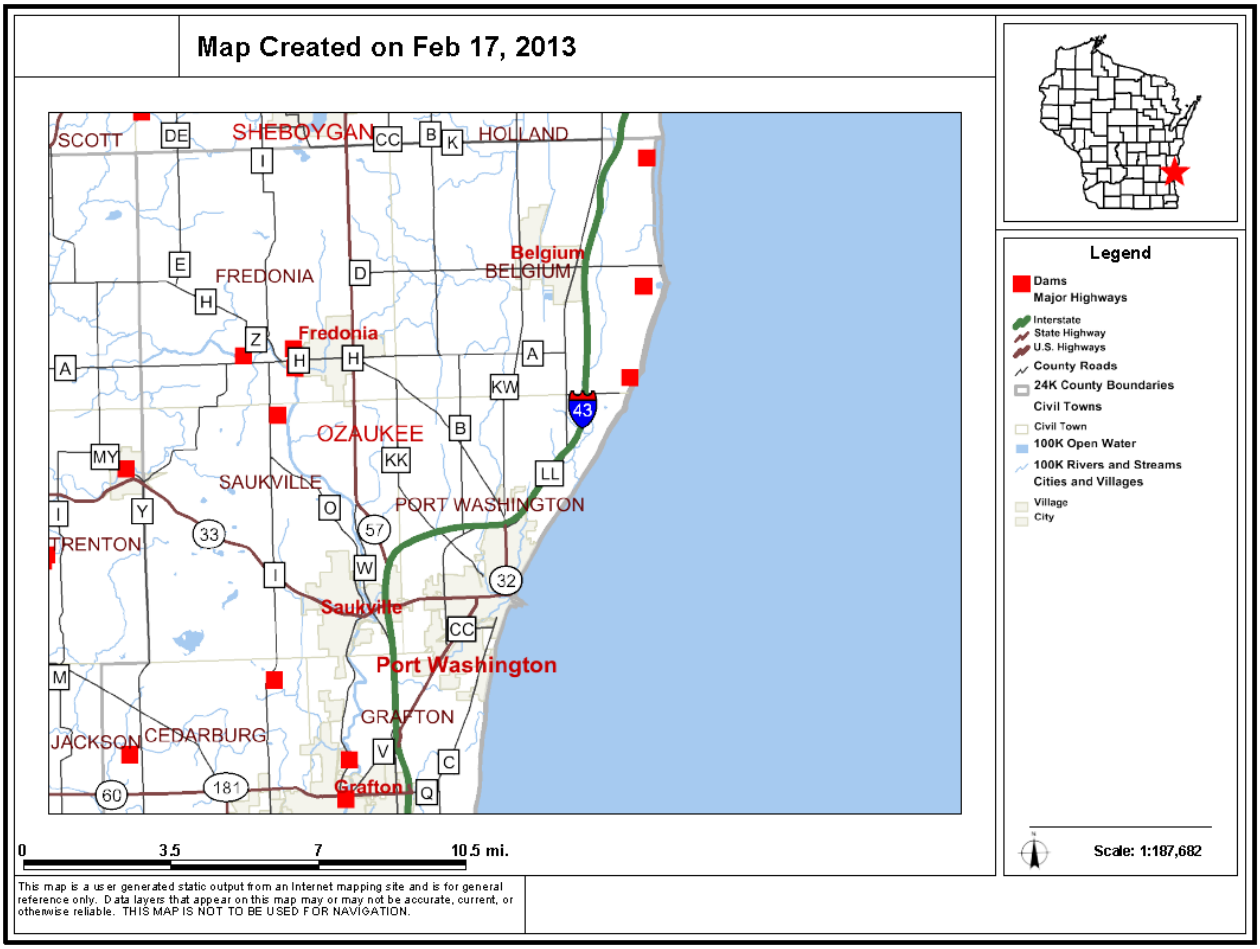
1:160,000

0 1.5 3 6 Miles

Wisconsin Emergency Management
Date: January 2009

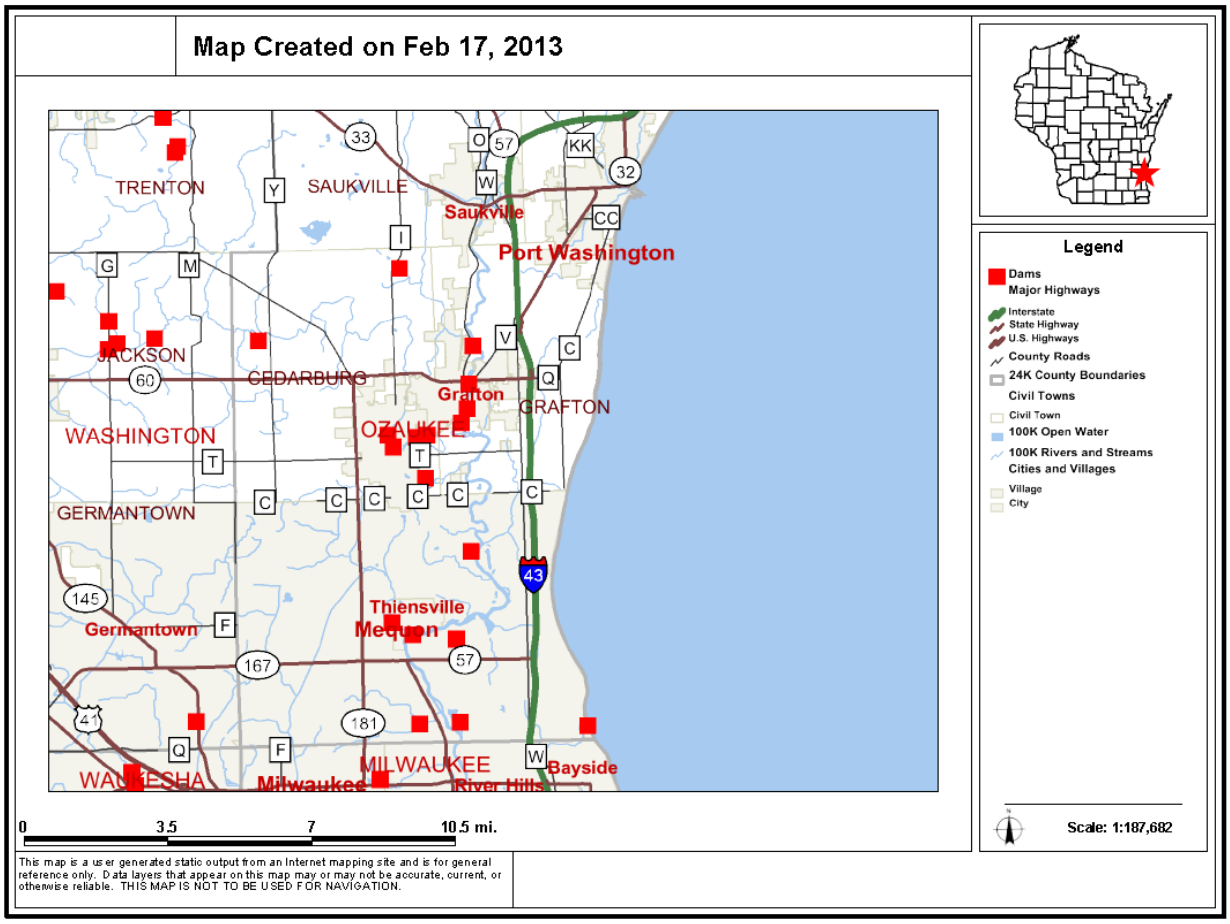
N

Ozaukee County Dams – North[99]



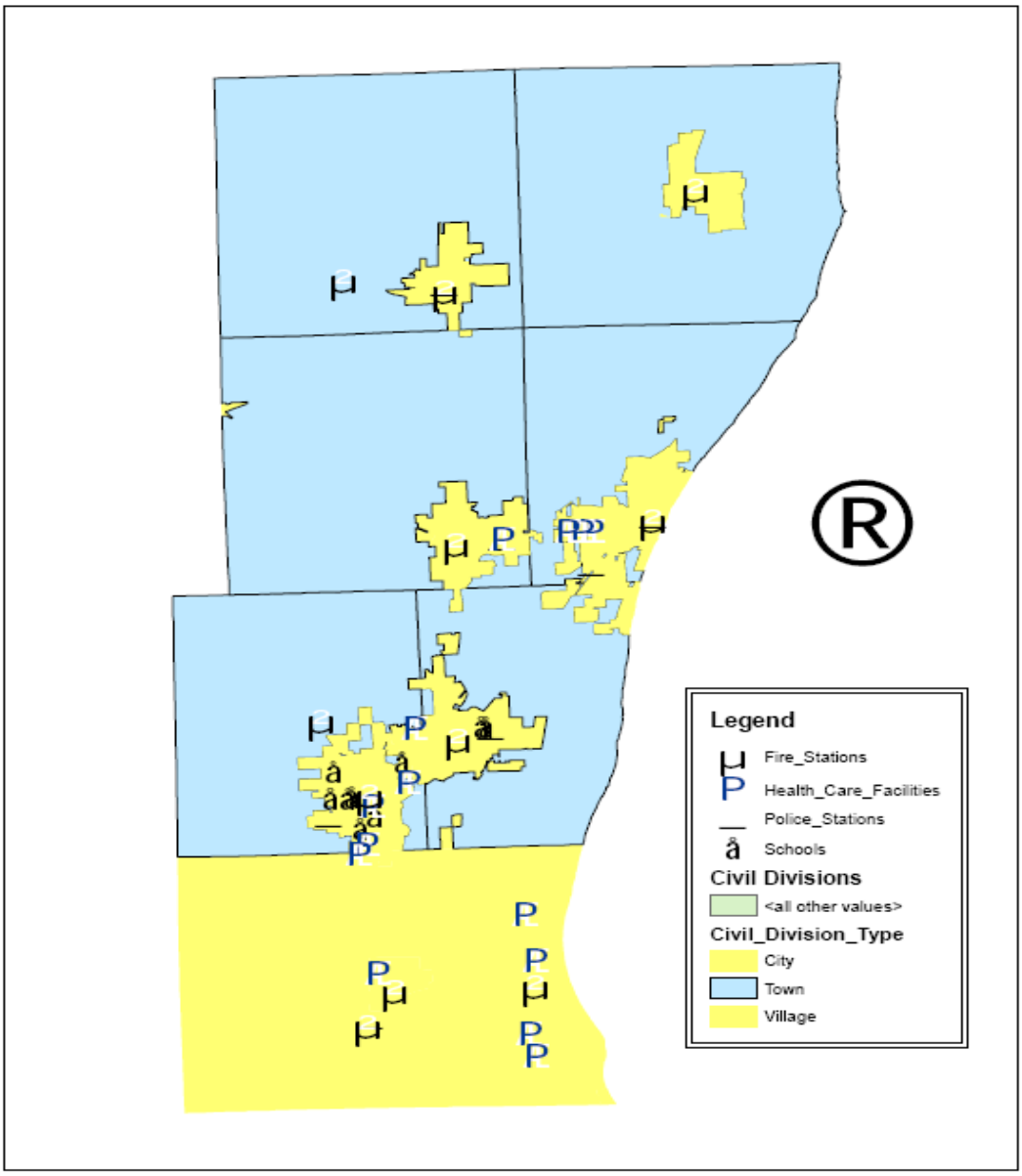
[99] http://dnrmaps.wisconsin.gov/imf/imf.jsp?site=SurfaceWaterViewer

Ozaukee County Dams – South[100]



[100] http://dnrmaps.wisconsin.gov/imf/imf.jsp?site=SurfaceWaterViewer

Ozaukee County Critical Facilities

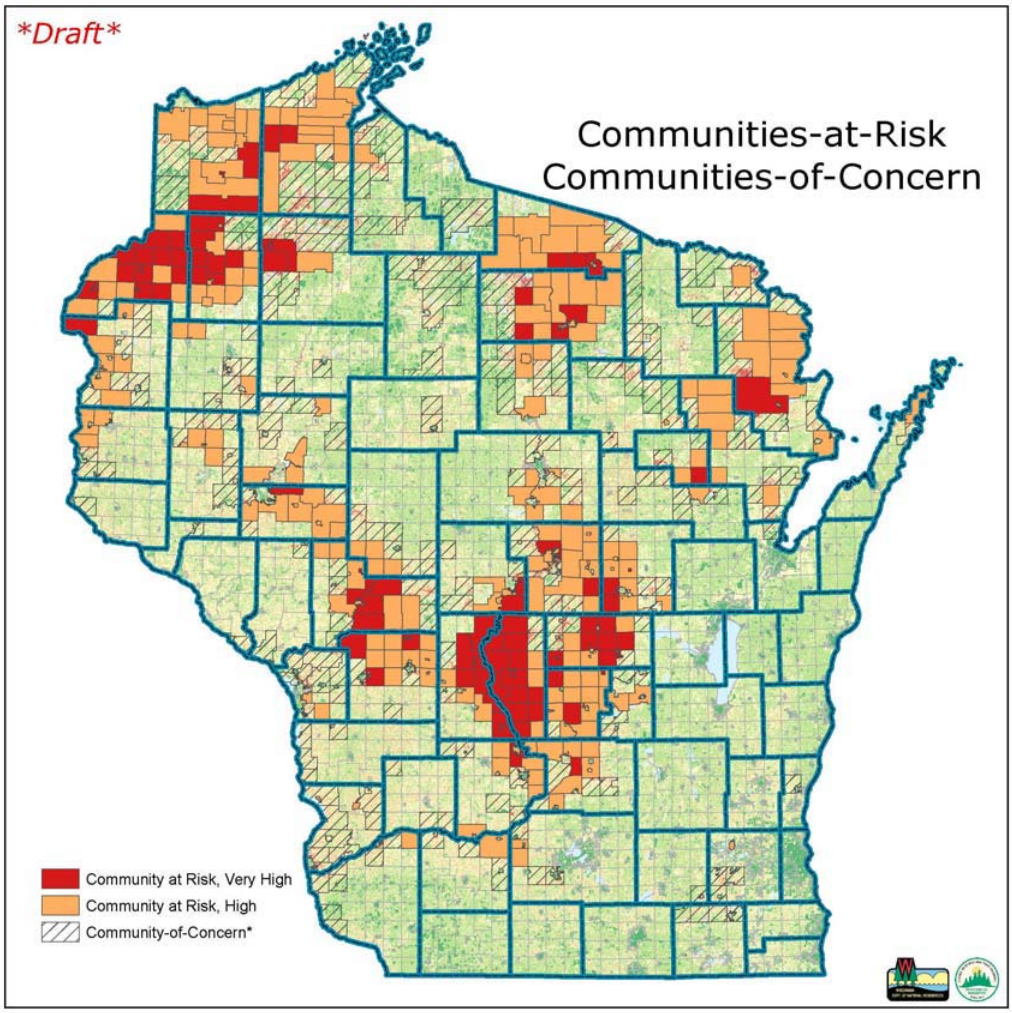


0 5,500 11,000 22,000 33,000 44,000 Feet

The accuracy of the information contained in this map is limited to the quality of data obtained from other Public Records. This map is not a substitute for an actual field survey.

* Note that the Aurora Medical Center – Grafton (at 60 and N. Port Washington Rd., Grafton) was not available as a Health Care Facility at the time of this map's creation.

Wildfire Communities at Risk[101]



Introduction to Communities-at-Risk

The purpose of this model is to identify broad areas of the state that are at relatively high exposure to resource damage due to wildfire.

As mandated by the NASF, Wisconsin's Communities-At-Risk are divided into three categories:

1) Very High
2) High
3) Community of Concern*

Defining Community

For Wisconsin, Communities-at-Risk are reported at the MCD (municipal civil division) level*. MCD was chosen due to its identifiable legal boundaries, ease in reporting, and usage in the development of Community Wildfire Protection Plans.

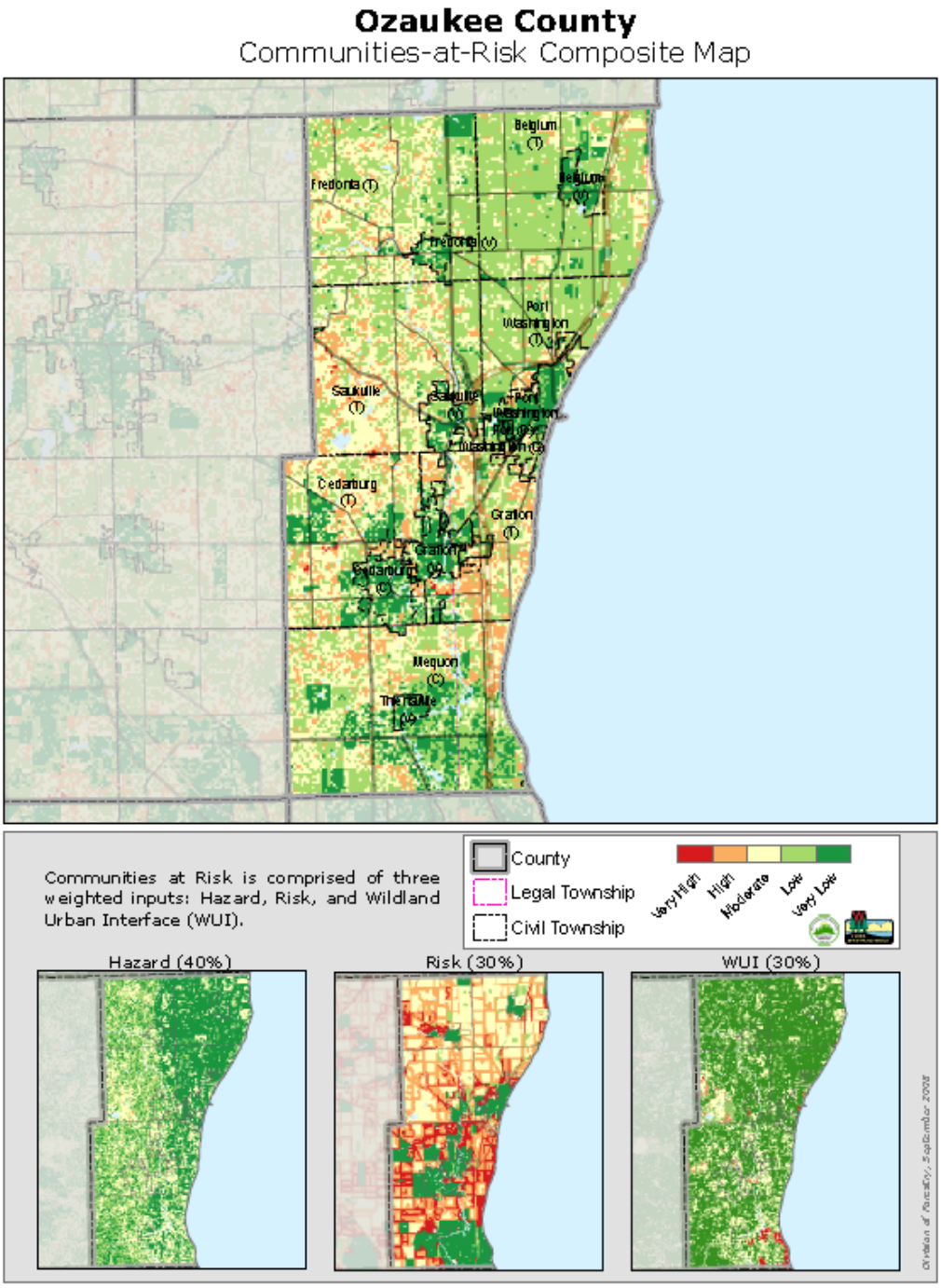
** Menominee County is an exception due to its lack of MCD's (civil townships). Therefore, Menominee county is reported by legal township.*

** A Community of Concern is a Wisconsin DNR concept whereby it is demonstrated that a significant portion of the community (more than 2 adjoining square miles) are at high or very high risk, but where the community as a whole falls below the Community-at-Risk threshold.*

10/5/07

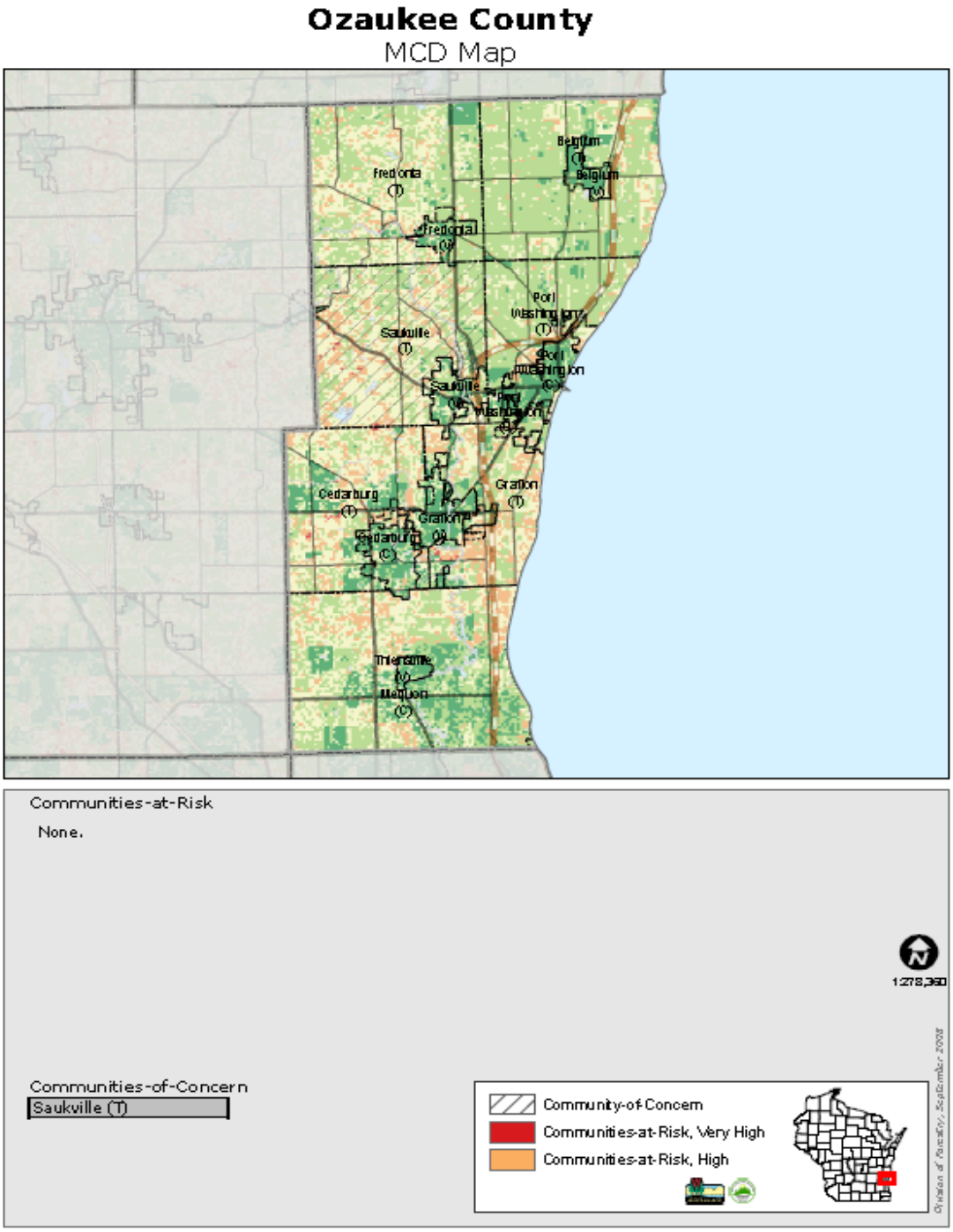
[101] Wisconsin Department of Natural Resources

Ozaukee County Communities at Risk Composite[102]



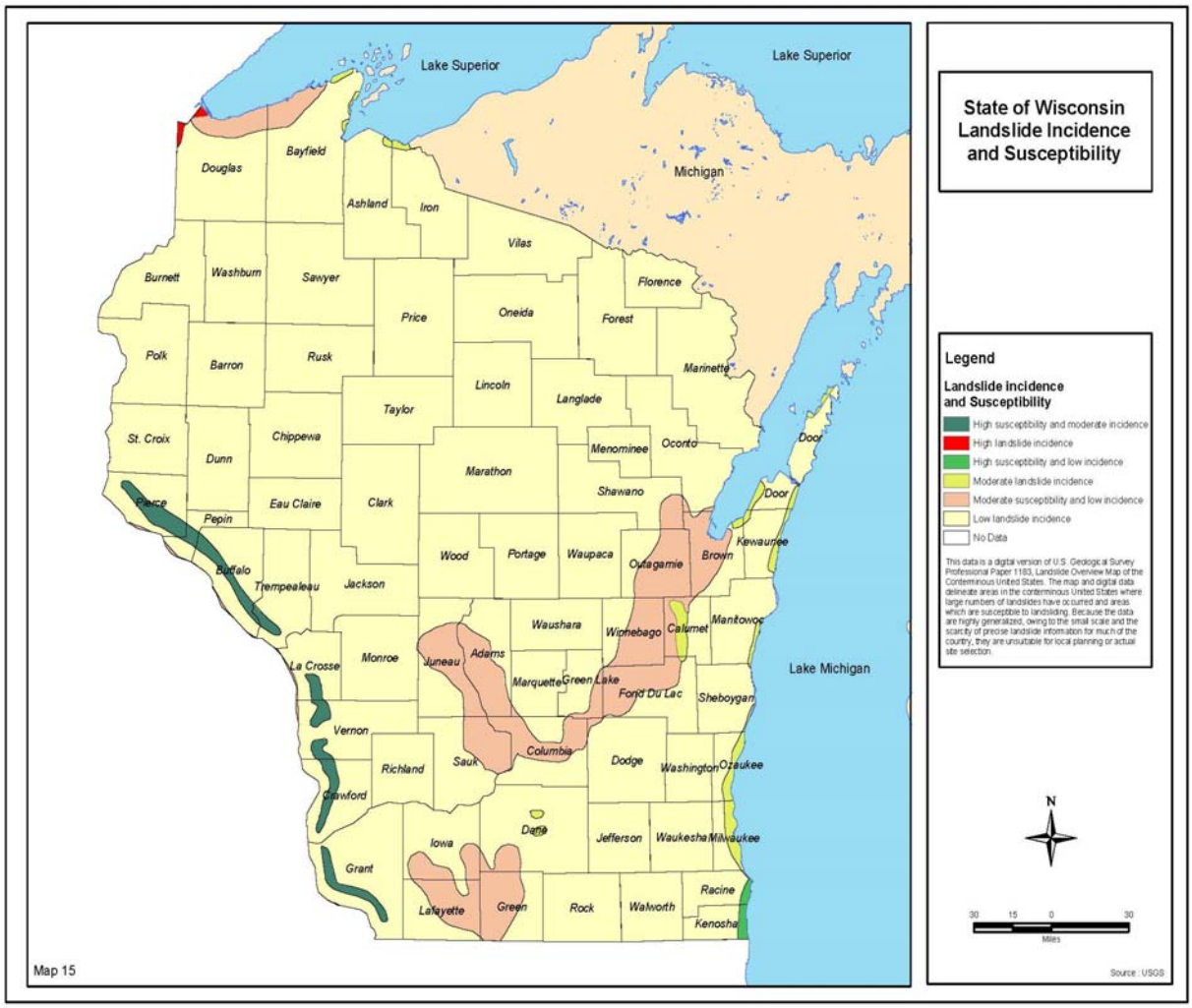
[102] Wisconsin Department of Natural Resources

Ozaukee County Communities at Risk Municipal Map[103]



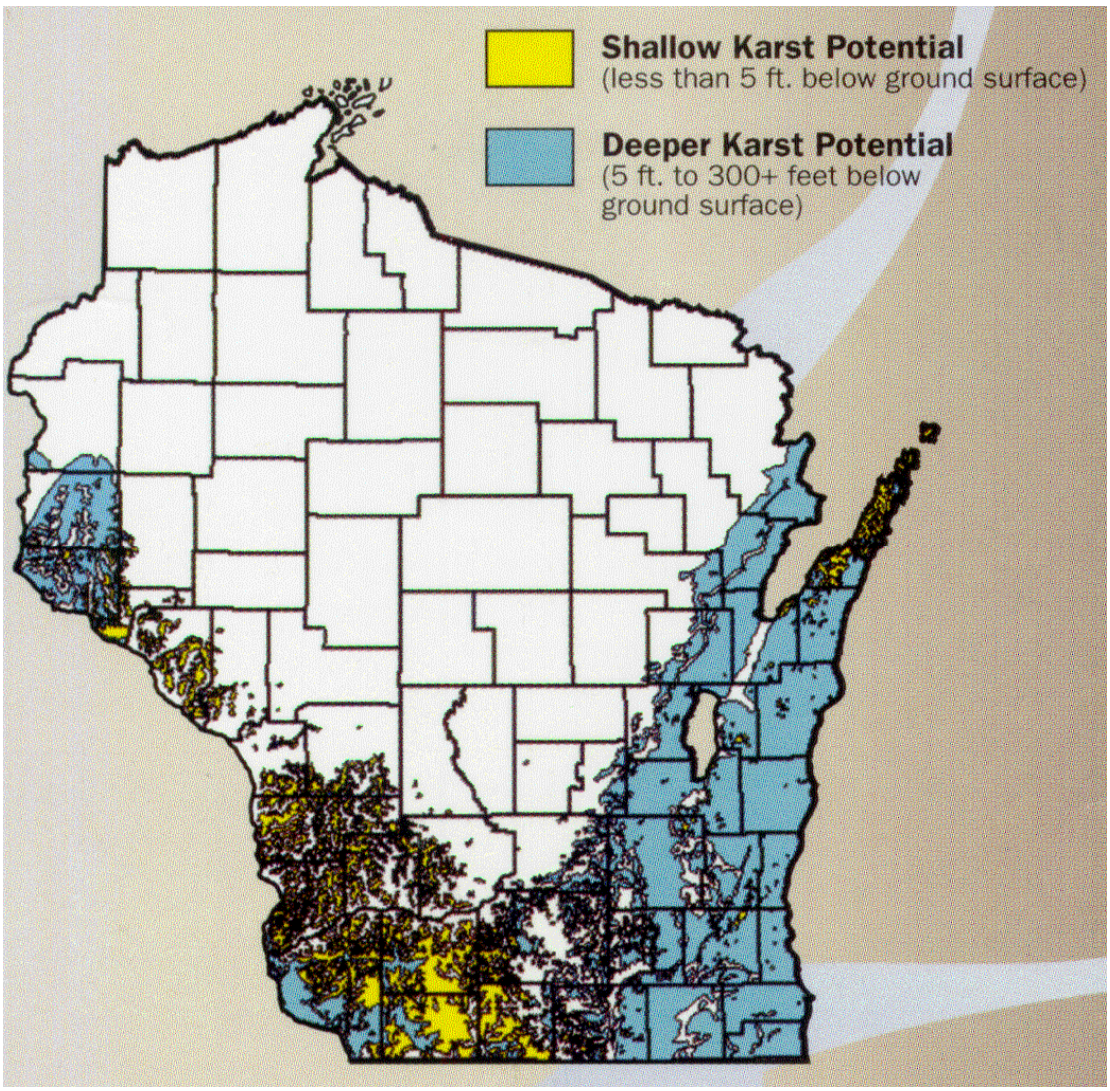
[103] Wisconsin Department of Natural Resources

Landslide Incidence and Susceptibility[104]



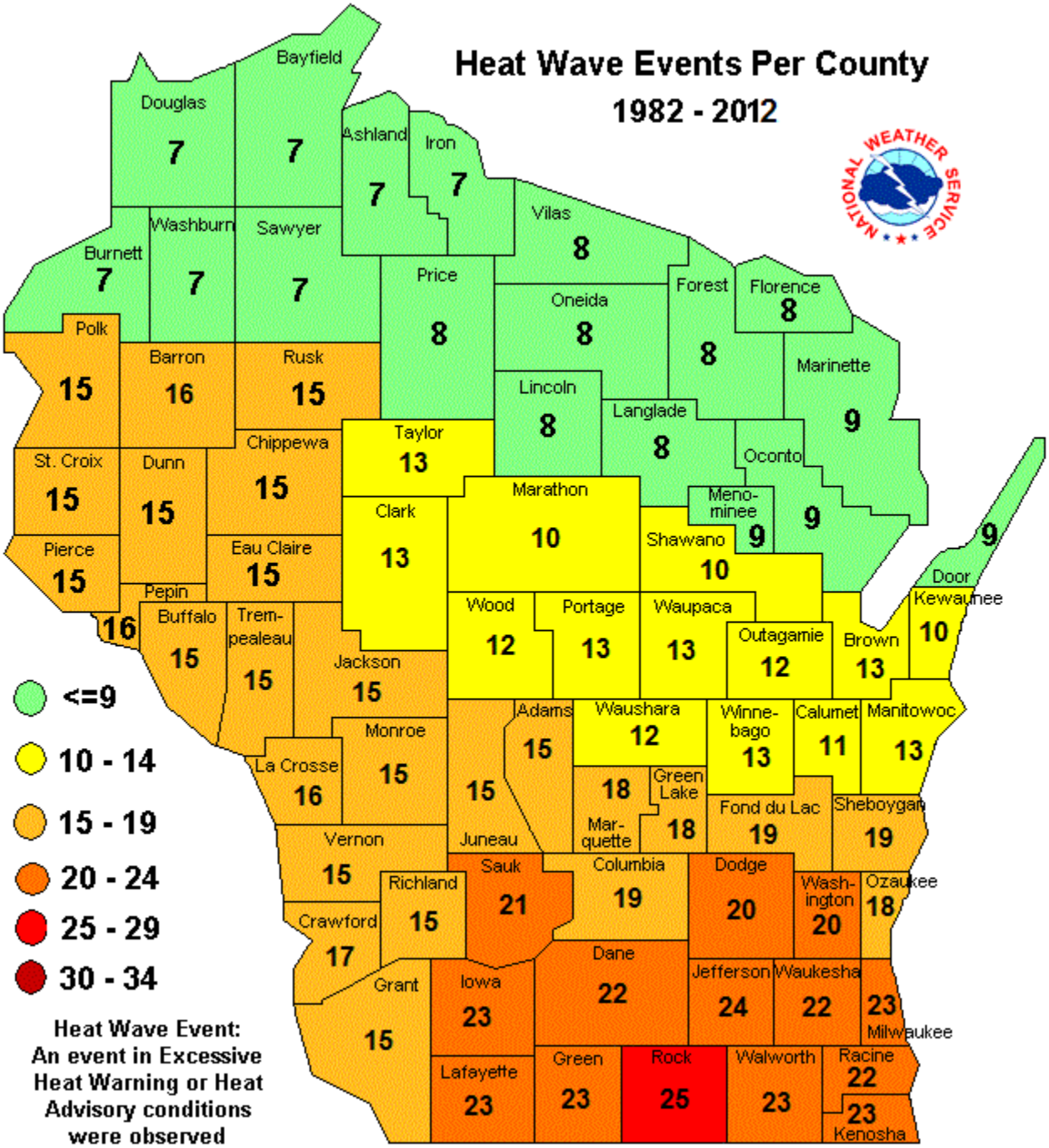
[104] Wisconsin State Hazard Mitigation Plan

Karst Potential[105]



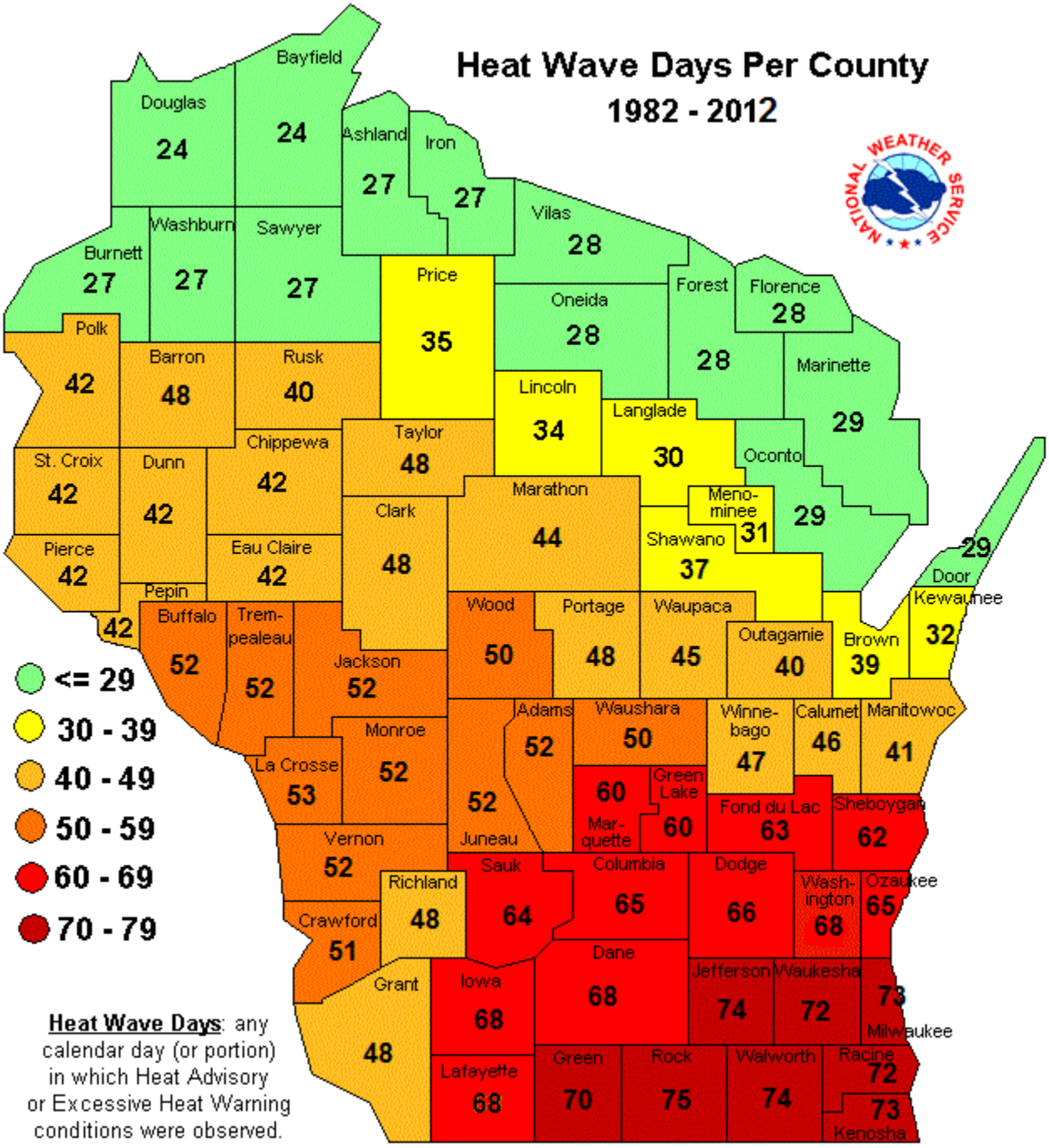
[105] Wisconsin State Hazard Mitigation Plan

Wisconsin Heat Wave Events[106]



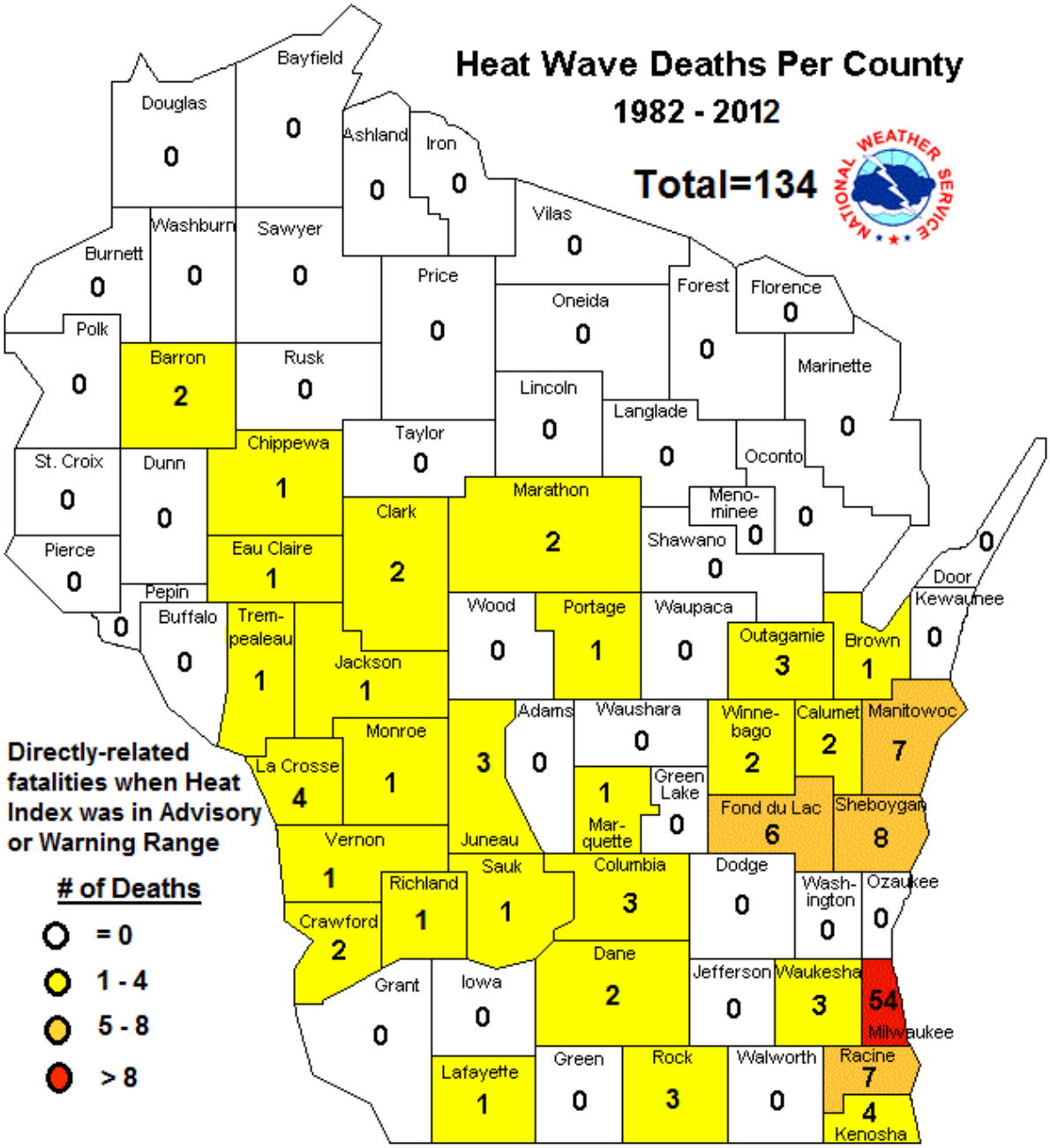
[106] The National Weather Service and Wisconsin Emergency Management

Wisconsin Heat Wave Days[107]



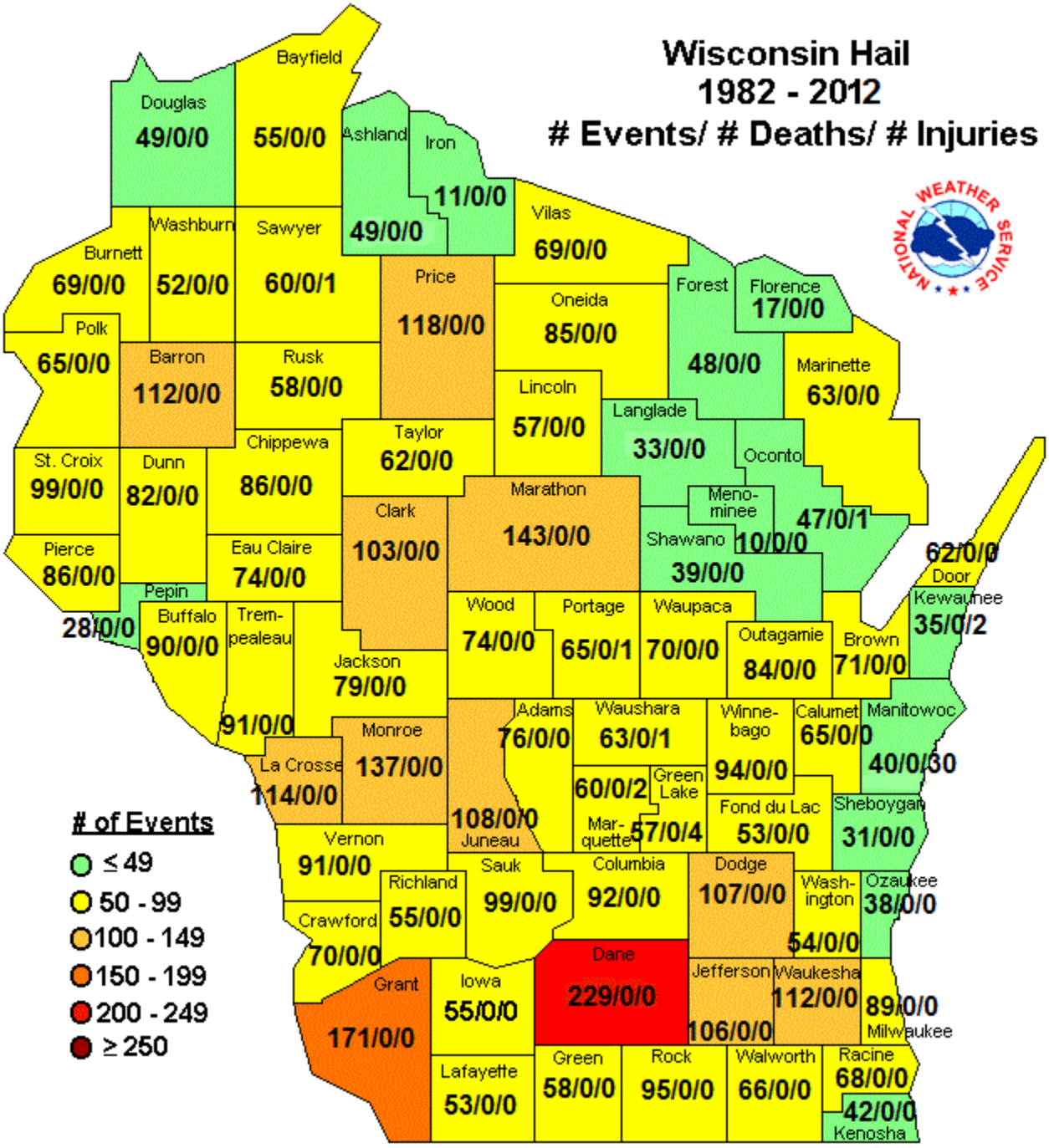
[107] The National Weather Service and Wisconsin Emergency Management

Wisconsin Heat Wave Deaths[108]



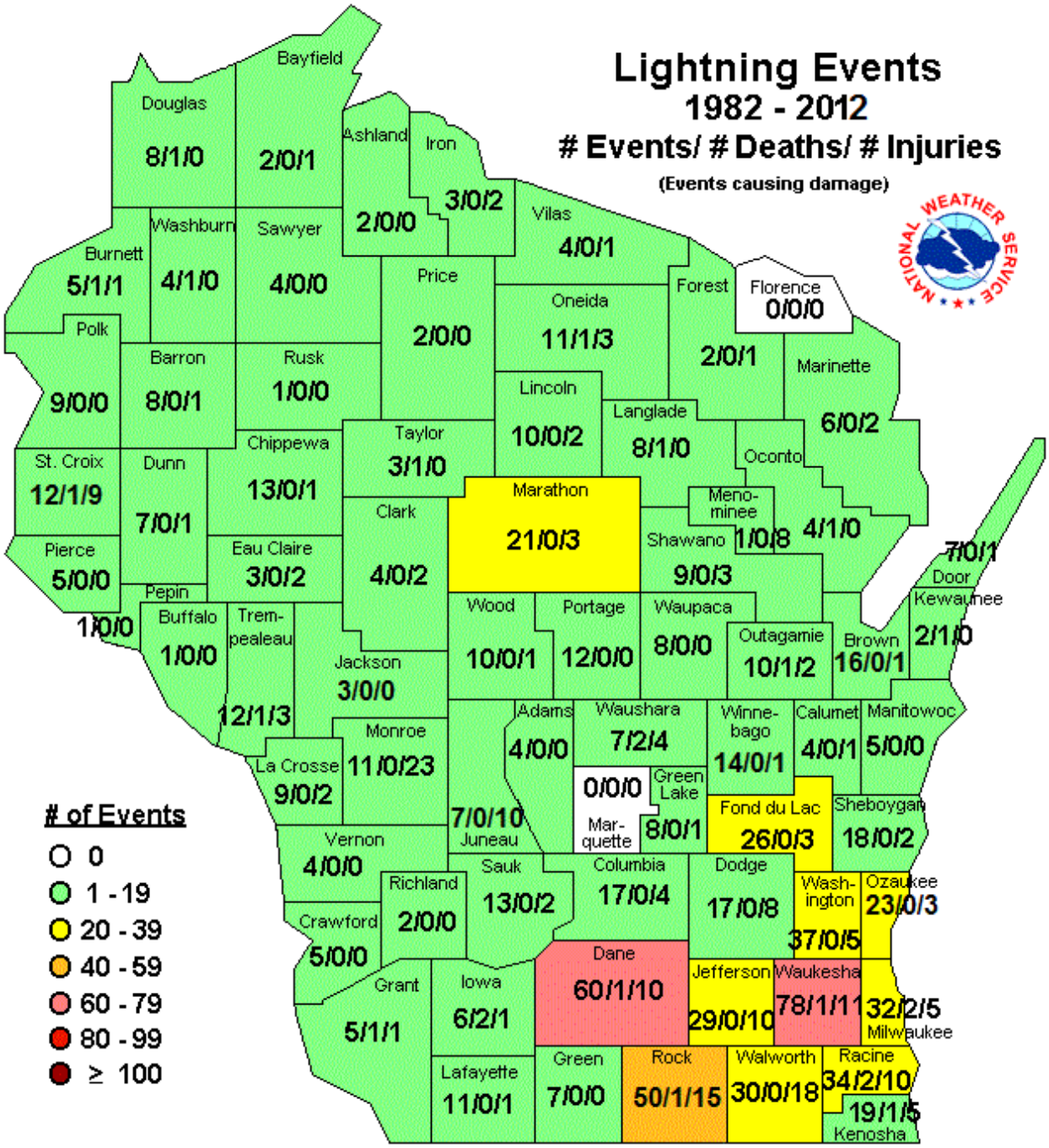
[108] The National Weather Service and Wisconsin Emergency Management

Wisconsin Hail[109]



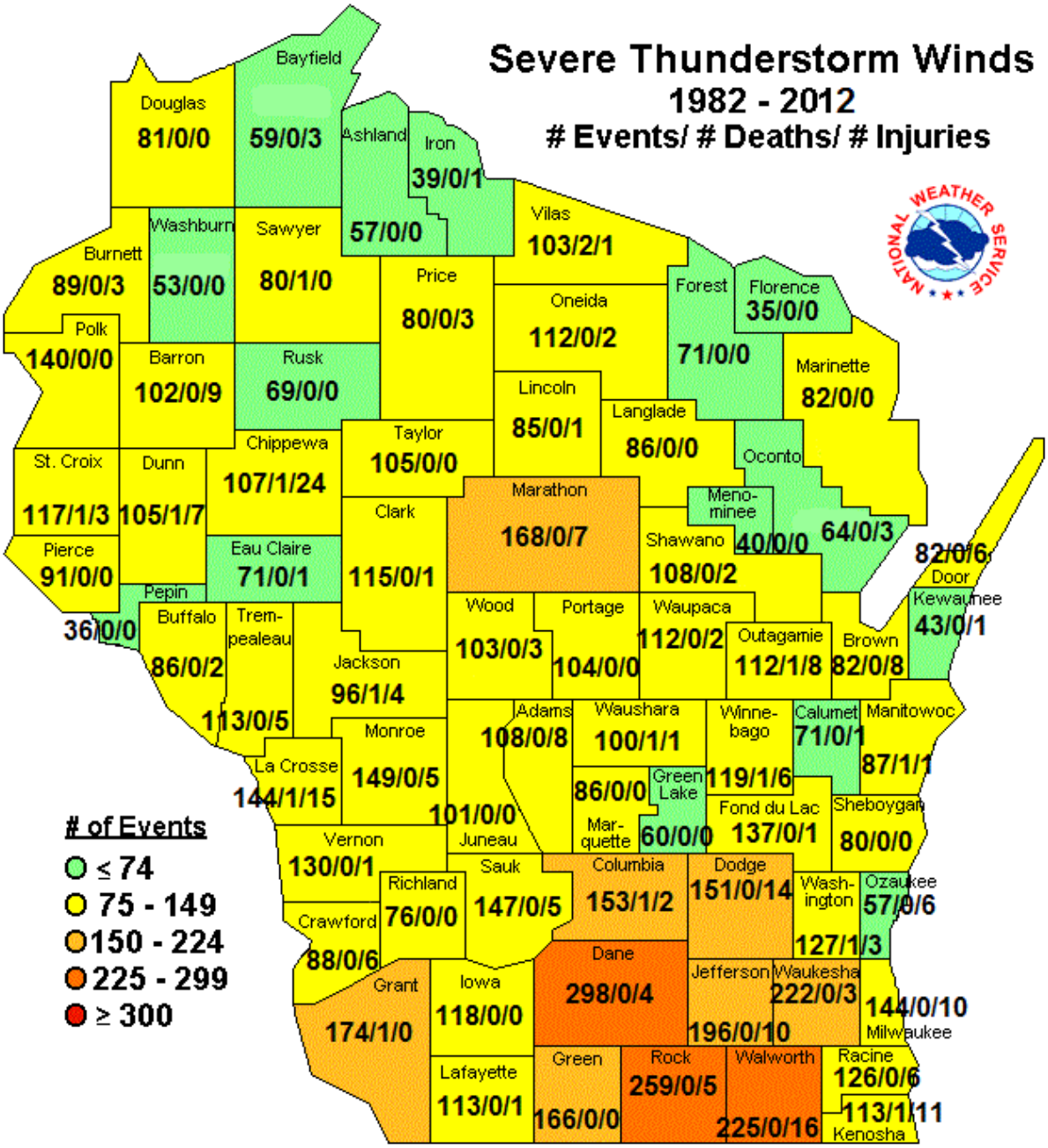
[109] The National Weather Service and Wisconsin Emergency Management

Wisconsin Lightning[110]



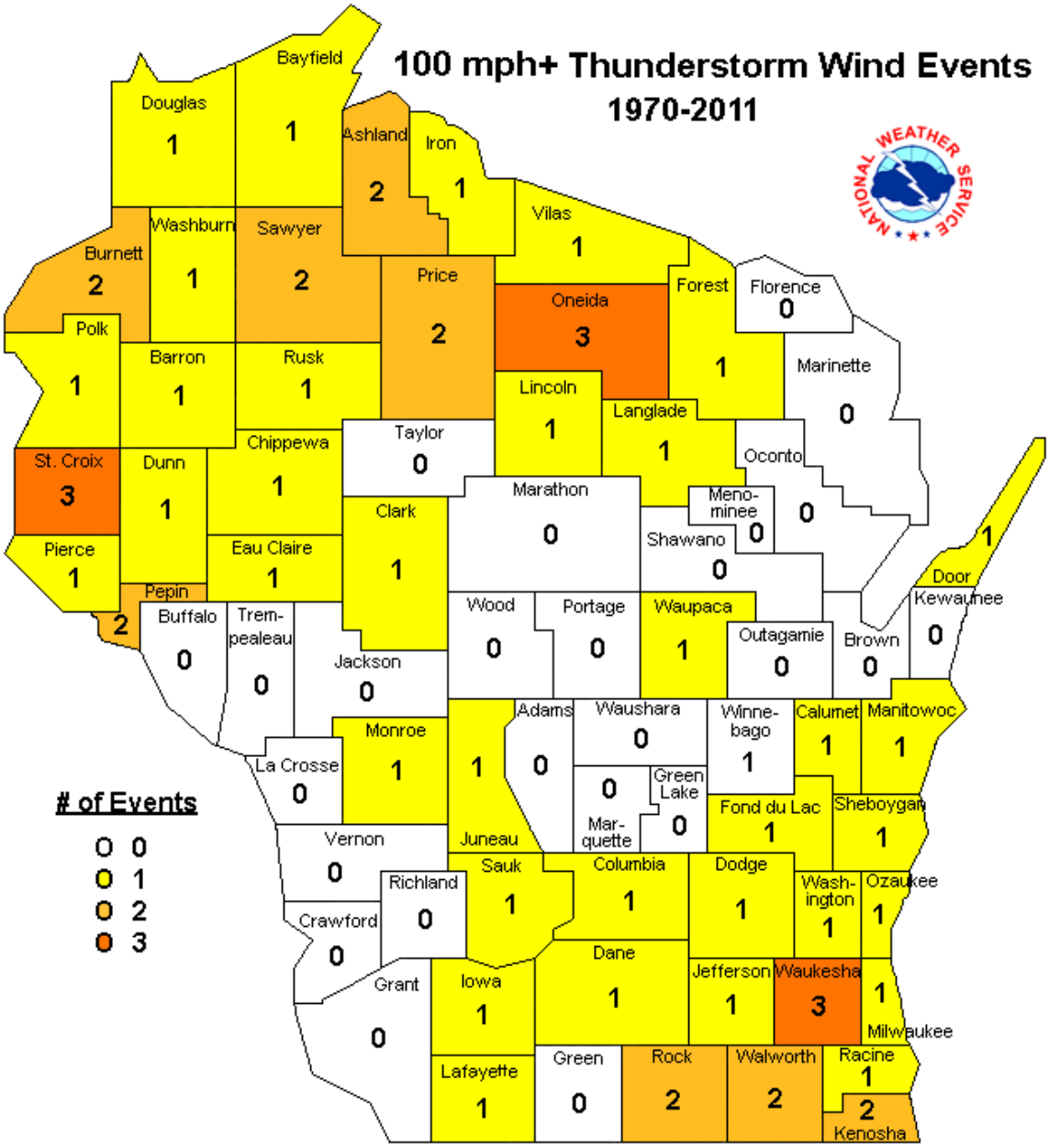
[110] The National Weather Service and Wisconsin Emergency Management

Wisconsin Severe Thunderstorm Winds[111]



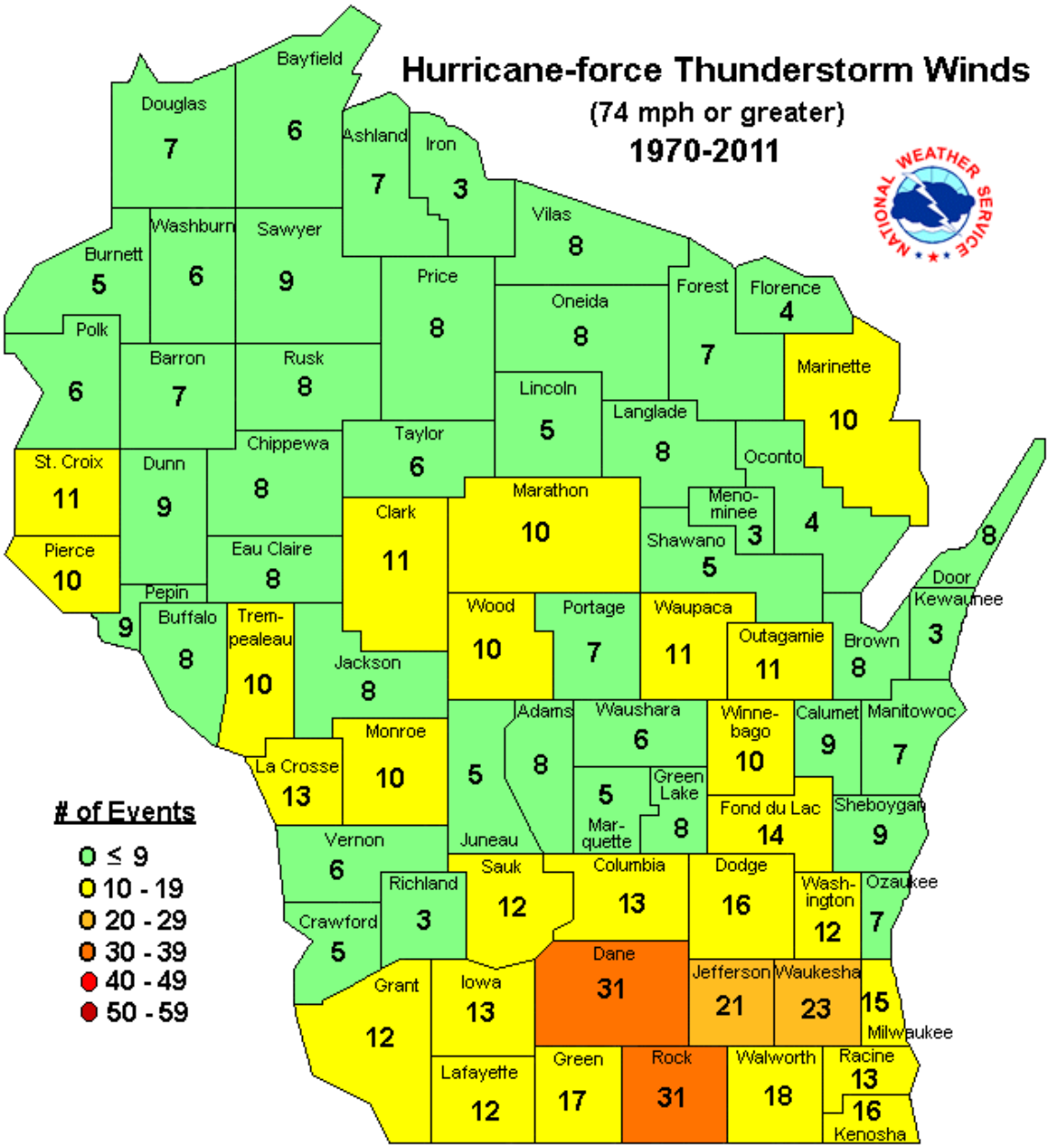
[111] The National Weather Service and Wisconsin Emergency Management

Wisconsin 100+ mph Thunderstorm Wind Events[112]



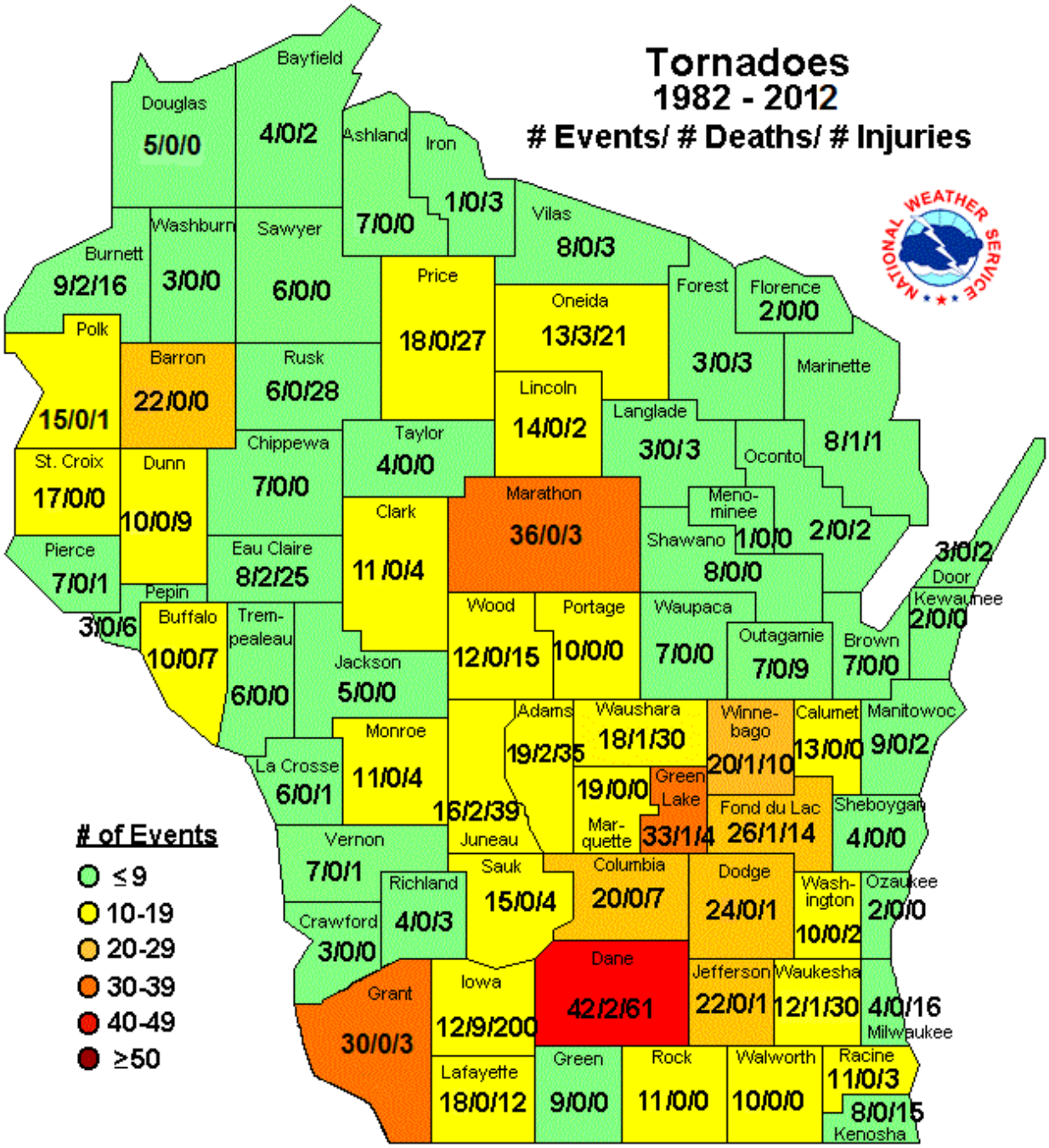
[112] The National Weather Service and Wisconsin Emergency Management

Wisconsin Hurricane-force (74+ mph) Thunderstorm Winds[113]



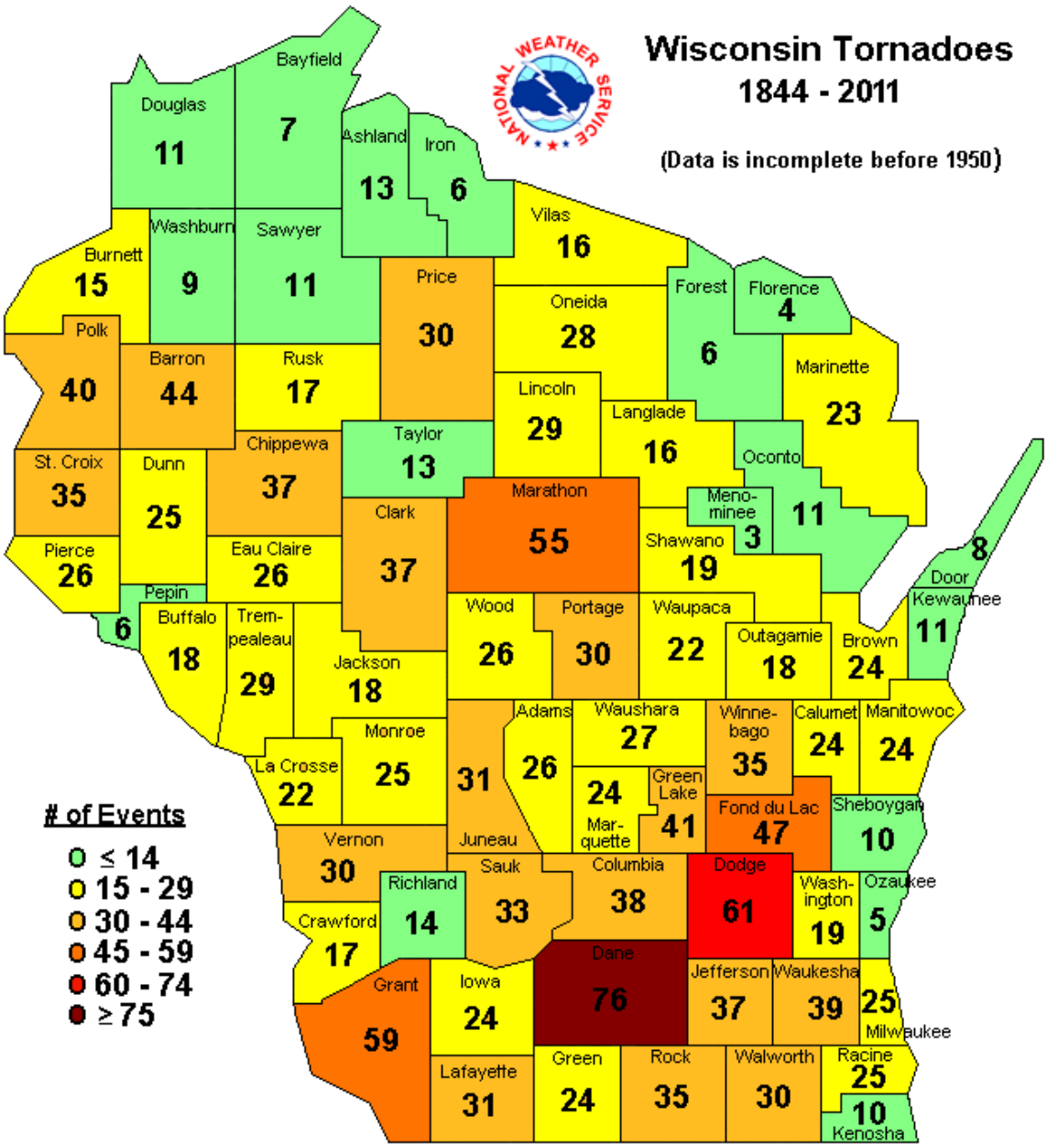
[113] The National Weather Service and Wisconsin Emergency Management

Wisconsin Tornadoes[114]



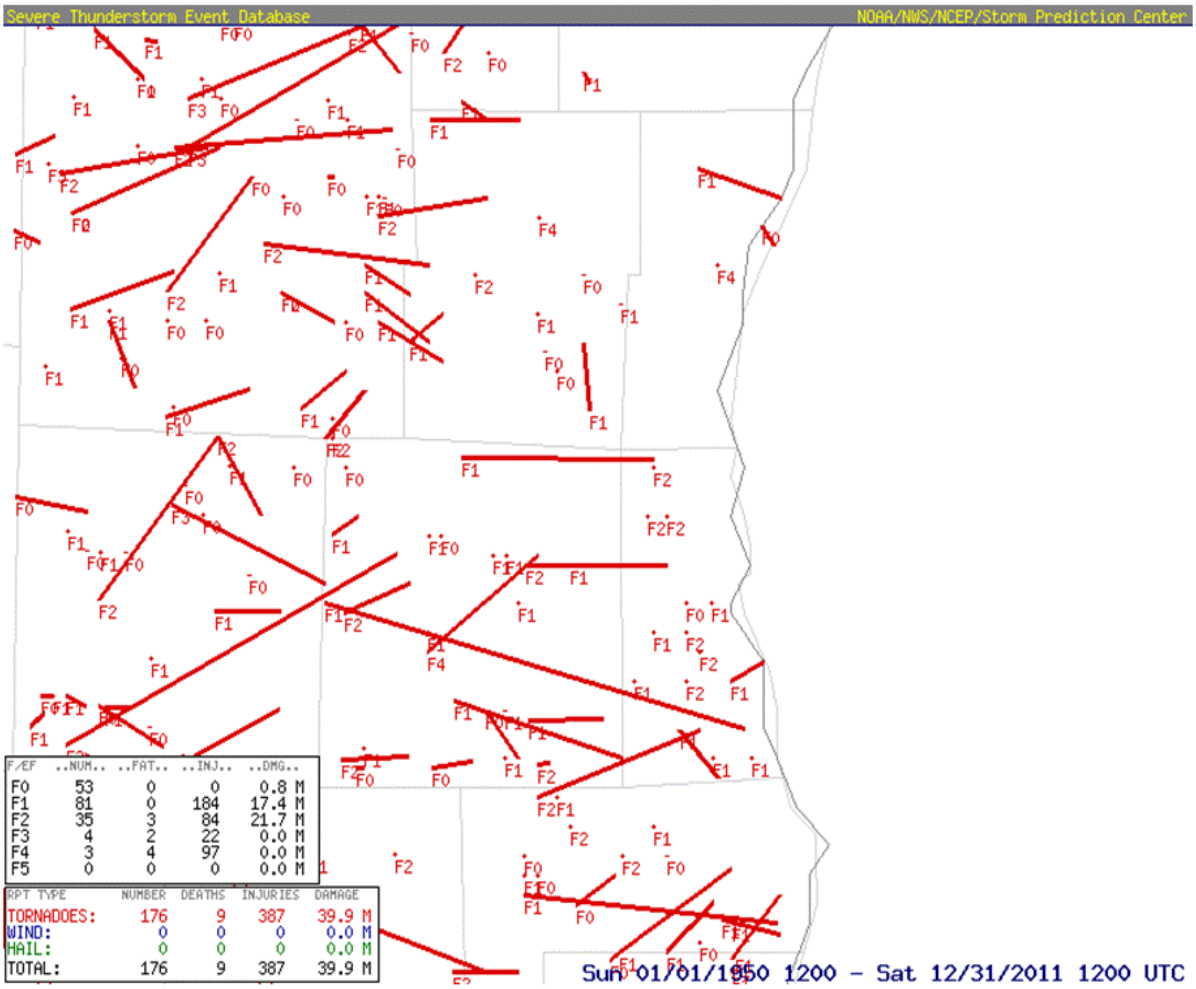
[114] The National Weather Service and Wisconsin Emergency Management

Wisconsin Tornadoes (1844-2011)[115]



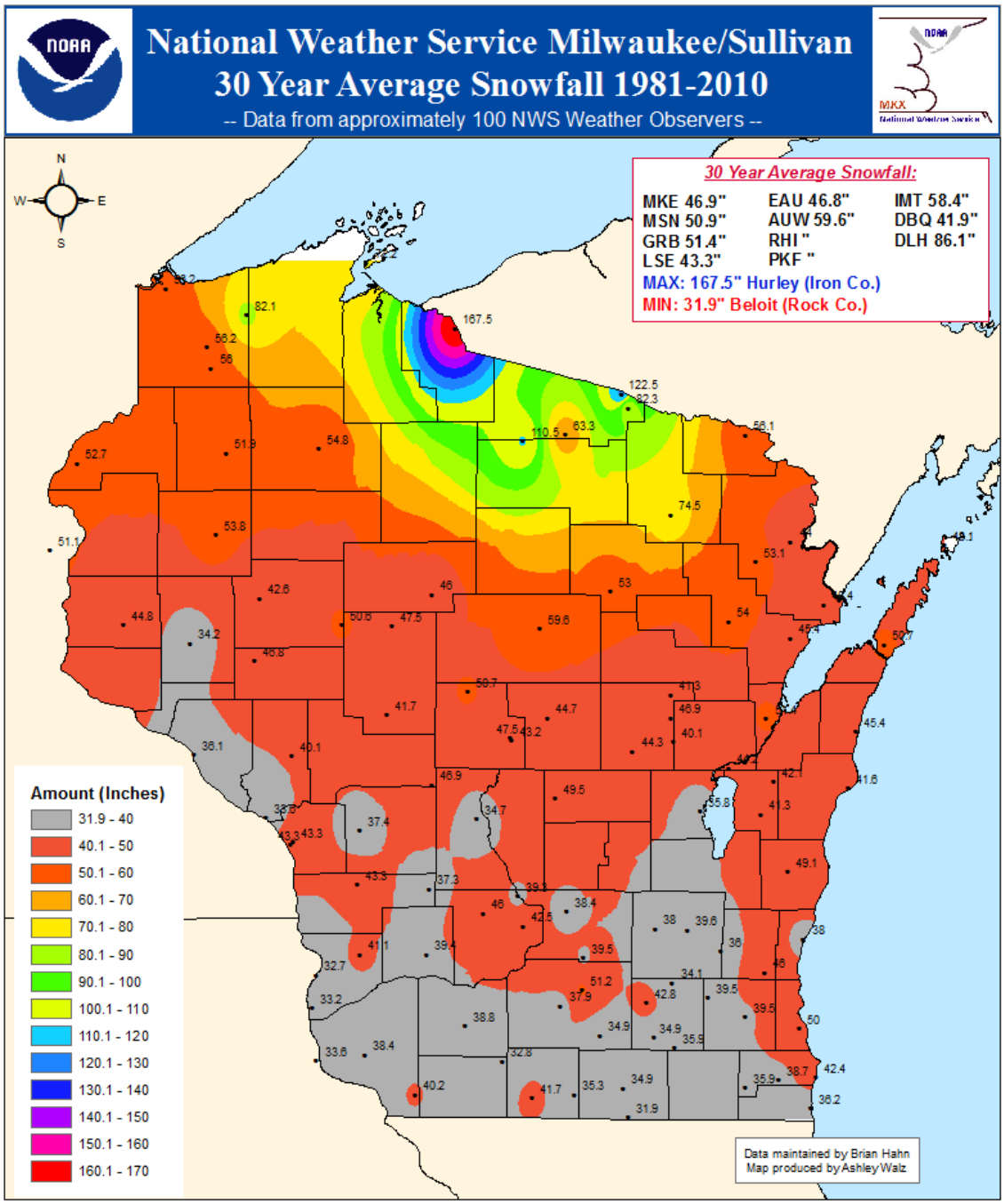
[115] The National Weather Service and Wisconsin Emergency Management

Milwaukee Area Tornado Plotting (1950-2011)[116]



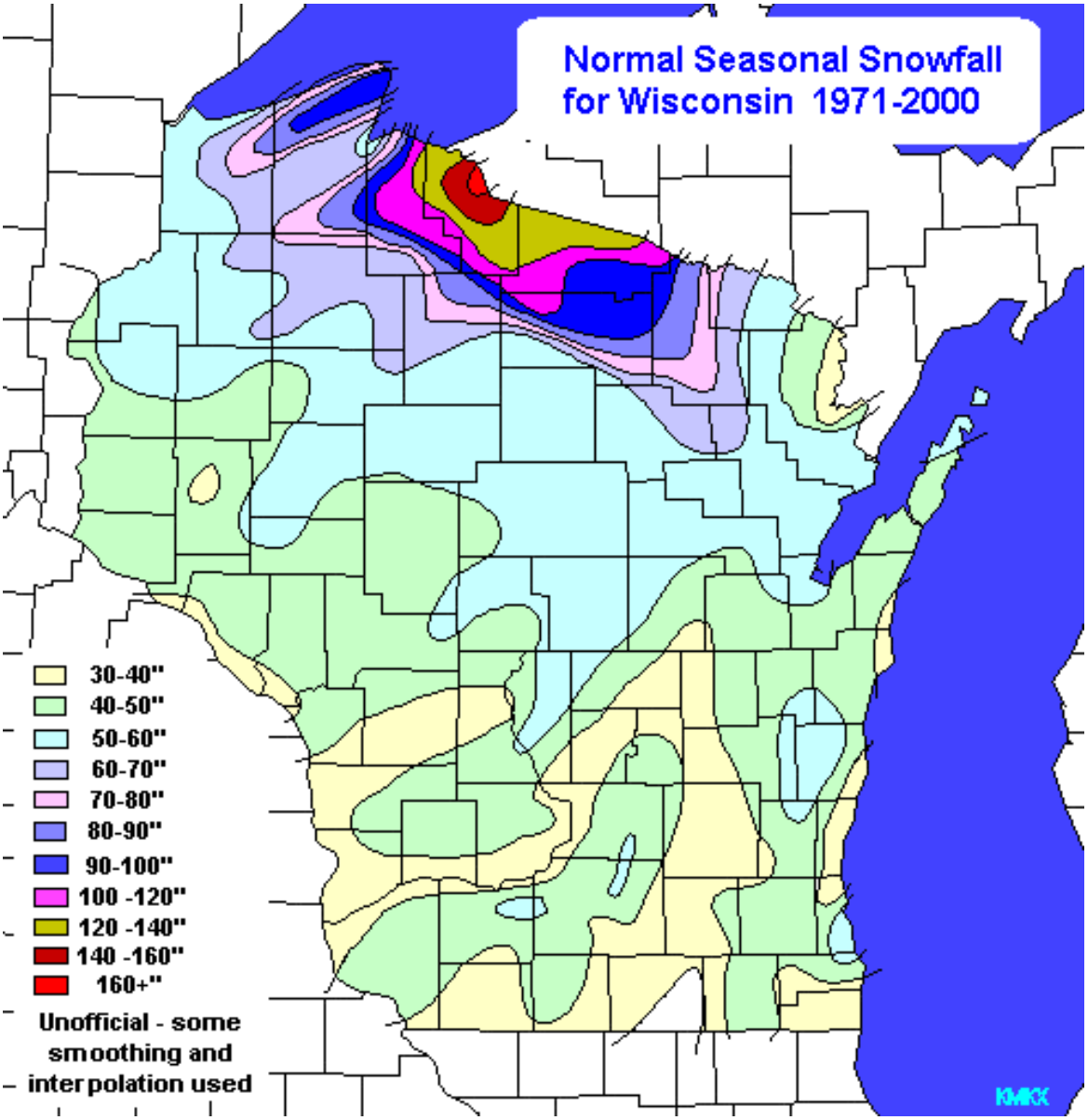
[116] The National Weather Service

Wisconsin 30-Year Average Snowfall[117]



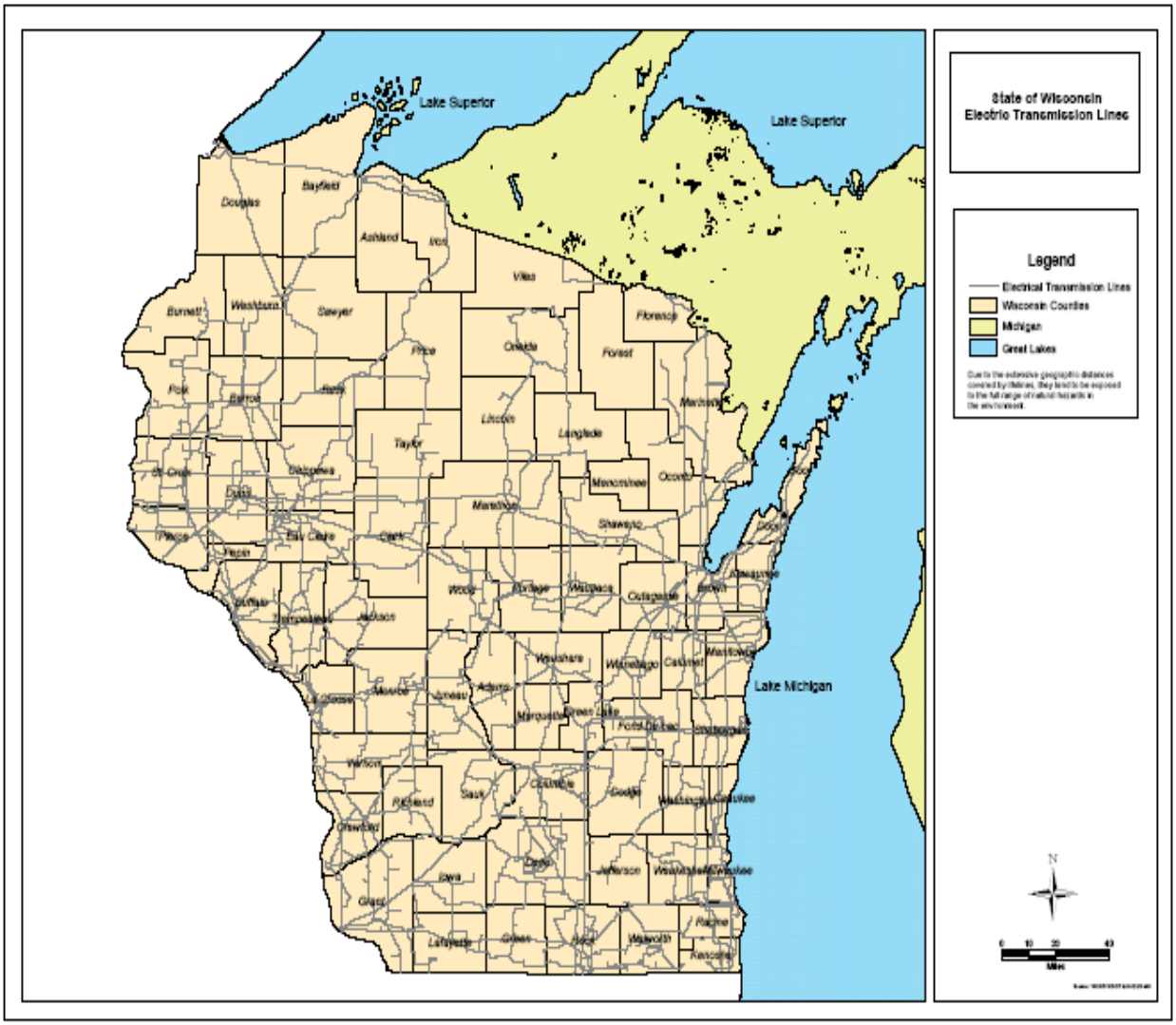
[117] The National Weather Service

Wisconsin Average Seasonal Snowfall[118]



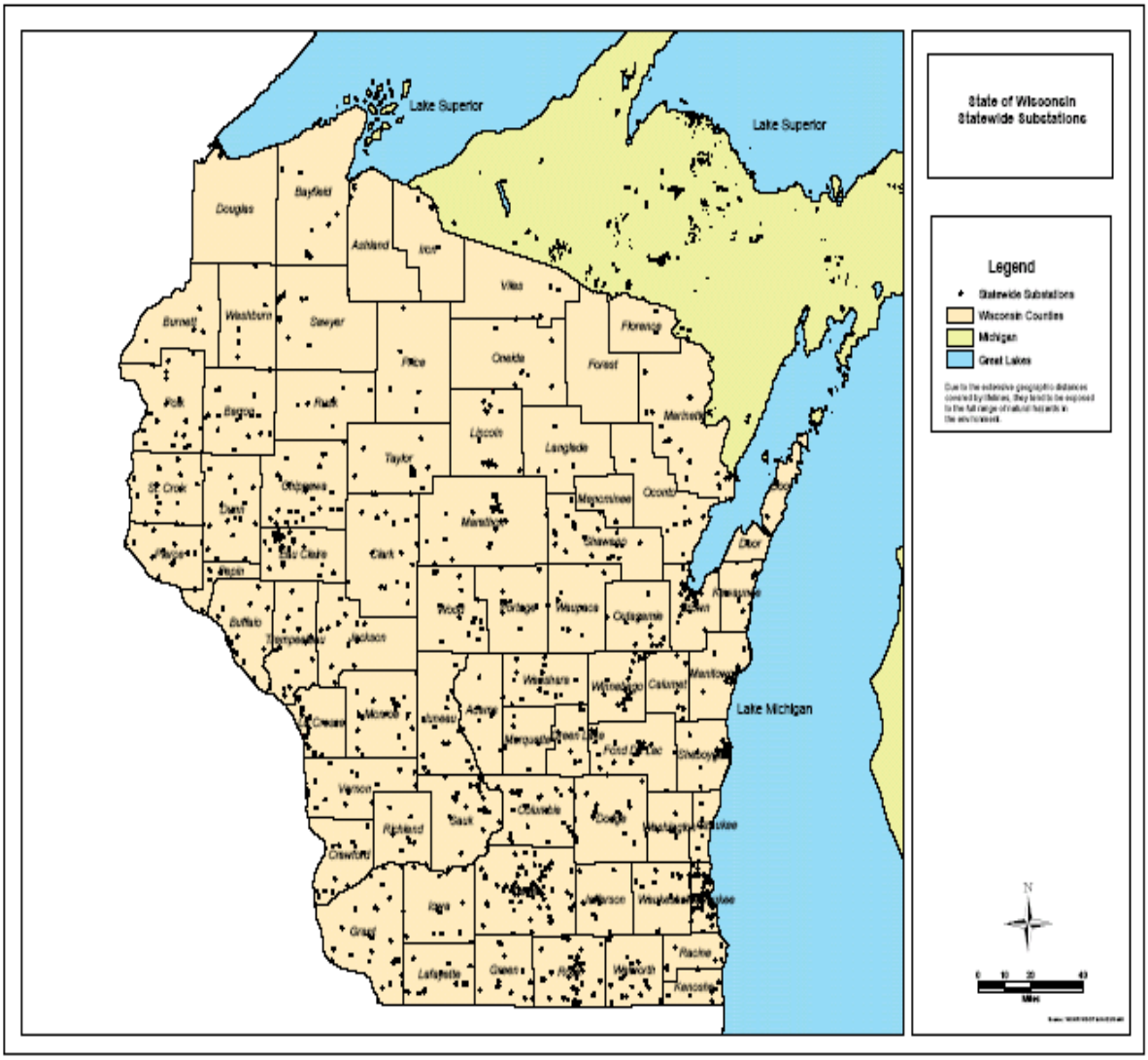
[118] http://www.crh.noaa.gov/mkx/climate/wisnow.gif

Electric Transmission Lines[119]



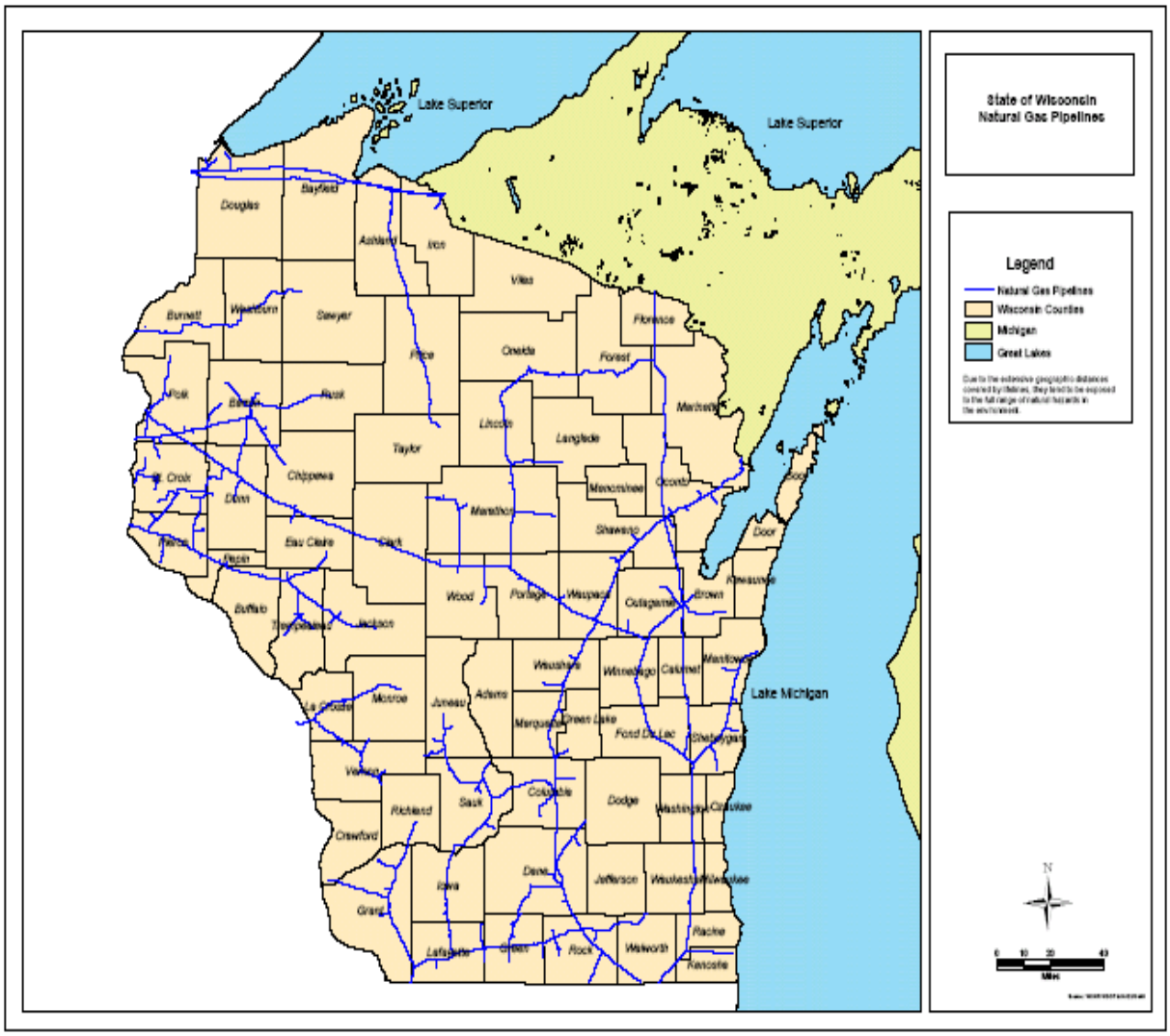
[119] Wisconsin State Hazard Mitigation Plan

Electrical Substations[120]



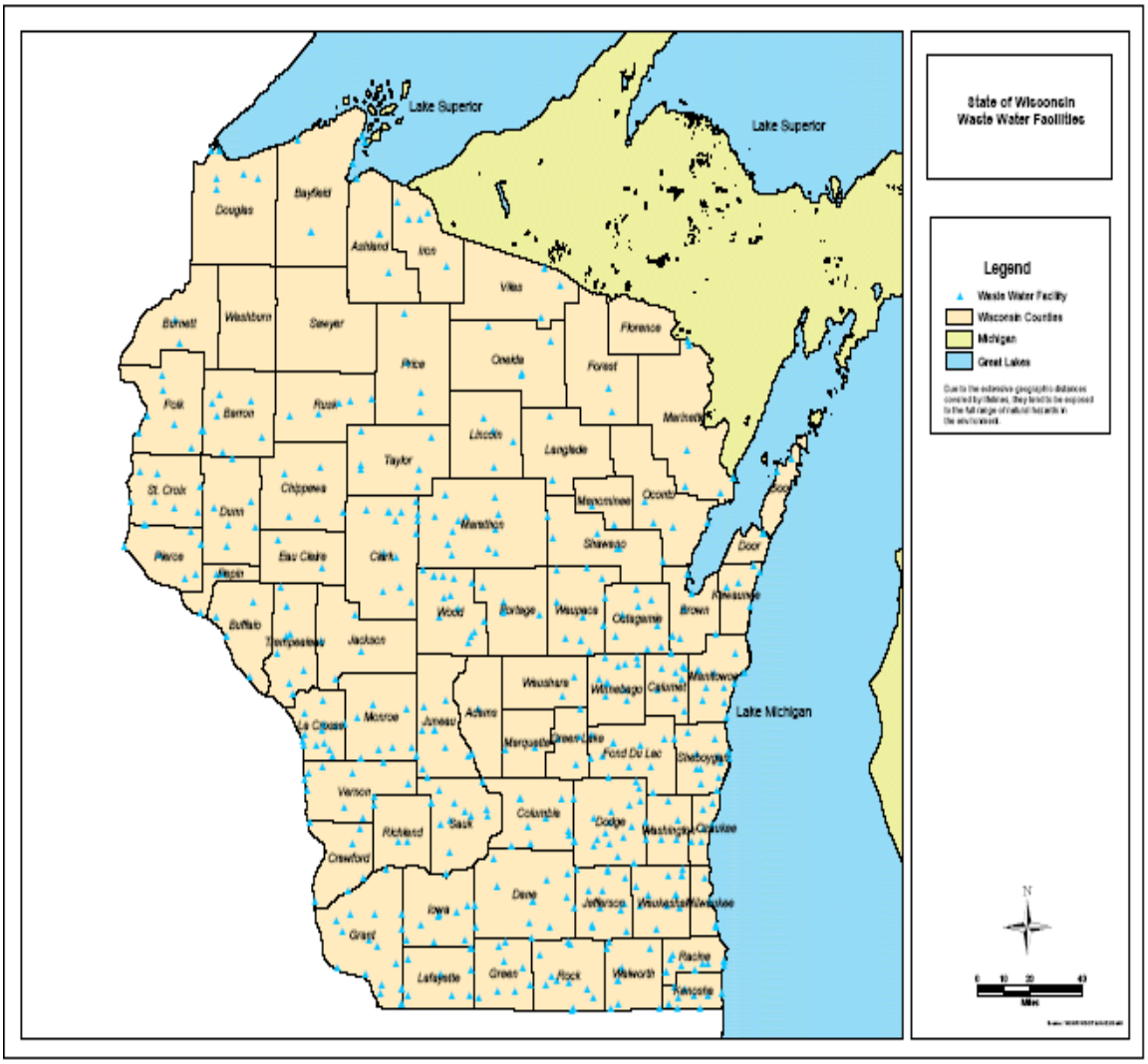
[120] Wisconsin State Hazard Mitigation Plan

Natural Gas Pipelines[121]



[121] Wisconsin State Hazard Mitigation Plan

Wastewater Facilities[122]



[122] Wisconsin State Hazard Mitigation Plan

Appendix B: Plan Adoption

This plan has been adopted by Ozaukee County and the following municipal bodies including the Cities of …; the Villages of … and the Towns of …. Scanned copies of those municipalities that adopted this plan follow.

The … did not adopt the plan.

Appendix C: Summary of Mitigation Strategies

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Comments**
All Hazards	Continue to promote the increased use of National Oceanic and Atmospheric Administration (NOAA) weather radios	Covered by annual budget	Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• The county has added a link to their website. • Weather radios have been promoted and sold at local grocery stores and at community talks. • Weather radios handed out as door prizes by VI of Grafton at the Aurora Hospital Safety Fair, May 2012. • $8000 grant received to purchase weather radios for individual and family distribution
	Continue working with and supporting the county Community Emergency Response Team (CERT) volunteer team	Covered by annual budget	Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Looking at restructure to student groups. • The Public Health Department is working with EM on e-mail to CERT members.
	Work to improve relationship and communication with American Red	Covered by annual	Div of EM	Ongoing	High	Ozaukee County; CIs of Cedarburg,	

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Comments**
	Cross (ARC) disaster assistance teams.	budget				Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Conduct a feasibility study and cost benefit analysis for installing a Reverse 9-1-1 communications system in the county	Covered by annual budget	Div of EM / Sheriff's Office	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Continue to add/update Emergency Management Department links on the existing county web site (e.g., ARC, Homeland Security / FEMA, WEM, MyState) especially focusing on preparedness bulletins. Publicize the website to show the community what is there.	Covered by annual budget	Div of EM	Ongoing	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg,	• Will add pertinent information as needed. • Updated summer 2010 for content and appearance. • Flood gauge and floodplain information available on main page. • Will stream preparedness information across website at

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Comments**
						Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	different times of the year.
	Provide the capability for the 9-1-1 Center to locate emergency calls coming in from cellular telephones	Covered by annual budget	GIS / Sheriff's Office	2010	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Completed in 2009. • Ongoing mapping to keep system updated.
	Explore feasibility of getting all municipalities on 800 MHz to increase interoperability.	Costs to be determined.	Div of EM	2018	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington	DPW of Vis of Fredonia, Grafton and Thiensville are all not on 800 mhz. They cannot communicate with the fire or police departments in emergency situations.

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Comments**
						and Saukville.	
	Determine the feasibility of bringing the Mequon and Grafton Departments of Public Works onto the 800mHz band from the VHF band (like the rest of the county.)	Unknown	CIs of Mequon and Grafton	Ongoing	Medium	Ozaukee County; CIs of Grafton and Mequon	Generally, DPW gets communication equipment as it cycles out of the police departments • Mequon has begun the process • Grafton has not included this in the budget
	The public notification system, MyState USA, will be incorporated and used countywide	Unknown	Div of EM / Sheriff's Office / PH	Ongoing	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Began use in 2008 thru Public Health prep grant. • Will attempt to market and find funding source for MyState. • Cedarburg currently uses NIXIL.
	Explore options for 9-1-1 system to incorporate pre-arrival emergency medical instructions for CAD system for dispatchers.	Covered by annual budget	Div of EM / Sheriff's Office	2013	Very High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton,	Would provide a means to: • Triage the correct level EMS to the type of call. • Evaluate affects to dispatch operations.

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Comments**
						Port Washington and Saukville.	
	Explore options for Site Notification Database for special needs population.	Unknown	GIS / Public Health / Div of EM / Courts	Ongoing	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• County Health Service has a database for people who opt in and are receiving county services. • Works with Esponder. • No license for the GIS portion. • Could be done by state and county would get the benefits.
	Regularly update information on website.	Covered by annual budget	VI of Saukville VI of Thiensville	Ongoing	Medium	VI of Saukville VI of Thiensville	VI of Saukville regularly updates their website. VI of Thiensville is looking into adding a website.
	Orchestrate project to assist municipalities with adopting an ordinance and to begin labeling all Extremely Hazardous Substance (EHS) facilities according to and in compliance with National Fire Protection Association (NFPA) 704.	Unknown	LEPC	2017	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington	• NFPA 704 requires labeling of all EHS facilities. • LEPC will take lead and work with municipalities. • Ordinance needs to be adopted by individual municipalities.

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Comments**
						and Saukville.	
	Explore options to address invasive species concerns and manage as appropriate for the community.	Unknown	VI of Fredonia DPW	Ongoing	Medium	VI of Fredonia	Current concern is on emerald ash borer. The poor management of this and other invasive species may result in weakened municipal trees which may come down in storms and/or need removal.
	Continue relationship between volunteer groups, ARES/RACES, county and hospitals for redundant communication.	$5,000	Div of EM	Ongoing	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Upgrade hardware and software. $2,000 to replace repeater.
	Open discussions with municipalities concerning tornado sirens.	Covered by annual budget	Div of EM / municipalities	2013	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	The Village of Fredonia would like to replace its warning siren.

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	Explore options for an outdoor public address system for the County Fairgrounds.	Costs unknown, Covered by annual budget	Div of EM / CI of Cedarburg	2013	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
Coastal Erosion	Ensure that municipalities, builders and homeowners understand and follow safe building zoning regulations.	Covered by annual budget	LWM	Ongoing	Medium	Ozaukee County; CIs of Mequon and Port Washington; VI of Bayside; TNs of Belgium, Port Washington.	• Covered in the Shoreland and Floodplain Ordinance in Ozaukee County (for unincorporated area/towns) and the CI of Mequon. • CI of Port Washington and north are experiencing coastal erosion. • Study and apply for grant aid for any remediation.
	Review the county ordinance provision for set-backs and ensure that it is adequate.	Covered by annual budget	LWM and Planning & Parks Dept.	2014	Medium	Ozaukee County; CIs of Mequon and Port Washington; VI of Bayside; TNs of Belgium, Port Washington.	• Discussed Wisconsin Coastal Management Program. • A team was established to review/evaluate the plans, which is now complete. Army Corps of Engineers brought in to provide expert opinions. Updates should be completed by 2014.
Drought and Dust Storms	County should be prepared to provide information to farmers during times of drought	Covered by annual budget	UW-Ext. / FSA	As needed	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside,	Information is now available to public and will continue to be.

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Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Comments**
						Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Inform farmers on purchasing crop insurance	Covered by annual budget	UW-Ext. / FSA	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Information is now available to public and will continue to be.
	Prepare/publicize water usage regulations for non-farm areas during drought.	Covered by annual budget	CIs of Cedarburg and Mequon	As needed	Low	CIs of Cedarburg and Mequon	• Information available on CI of Mequon website. • Mequon has water-table concerns on the southeast quadrant of the city.
Flooding and Dam Failure	*Conduct a feasibility study (with a cost-benefit analysis) for conducting LIDAR mapping flights for good digital terrain maps (DTM) to model the surface contours for flooding and other scenario modeling/projections	$110,000	LWM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium,	• Quoted price is still appropriate. Improving technology has not decreased the cost substantially. • Still searching for grant funding to help bring the costs within an acceptable range.

Summary of Mitigation Strategies							
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						Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Project has not been completed due to cost.
	*Continue public outreach efforts for flood mitigation efforts (including providing NFIP information to citizens).	Covered by annual budget	LWM / EM	Ongoing	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Done as part of the Community Rating System and the county was upgraded a level, which saves the public 10%. • Link is available on the EM website.
	*Complete amendments/revisions to the Flood Rate Insurance Maps (FIRMs) as necessary	Landowners cover fee	LWM	Ongoing	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg,	This is an ongoing maintenance activity.

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Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Comments**
						Fredonia, Grafton, Port Washington and Saukville.	
	* Participate in FEMA's Risk Mapping, Assessment, and Planning (MAP) Program, which will conduct a comprehensive study of flood hazards for Lake Michigan.	Covered by annual budget.	Ozaukee Co. and the CIs of Mequon & Port Washington	2015	Medium	Ozaukee County; CIs of Mequon and Port Washington; VI of Bayside; TNs of Belgium, Port Washington.	• An invitation to participate was received by Ozaukee County and the Cities of Mequon and Port Washington in July 2012.
	*Look for acceptable (environmentally, socially, cost-benefit, politically, etc.), permanent solutions for removing water and/or improved infrastructure and facilities from flood-prone areas. Seek out funding sources (grants) to execute solutions.	Covered by annual budget	Elected officials	Ongoing	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Some of the potential solutions may include acquisitions, demolitions, floodproofing or moving water to surface streams
	*Explore with the approximately 16 home owners in the Edgewater Drive area (Town of Grafton) the feasibility of a buyout or other flood mitigation program. Also, ensure that the road is of adequate height to escape flood damage.	Covered by annual budget. Explore receiving a Flood Mitigation Project for any project activity	TN of Grafton and Planning Department	2013-2014	High	TN of Grafton	• Worked with eight landowners to try to complete a buyout through HMGP but the cost-benefit analysis did not work. • State grant was explored, but the county was not eligible. The town can apply. • The county is applying for a Federal Coastal Management Grant to match State Mitigation Grant. • Convert "buy out" land to county

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							park land.
	*Update, as necessary, the stormwater plan.	Covered by annual budget.	CI of Mequon	Ongoing	Medium	CI of Mequon	
	*Update, as necessary, the water management plans. Continue marking stormwater drains.	Covered by annual budget.	CI of Cedarburg	Ongoing	Medium	CI of Cedarburg	Currently updating the plan.
	*Continue to evaluate and update the flood gauge network in Ozaukee County.	Covered by annual budget.	Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	The Little Menomonee River gauge (Freistadt, WI) was added to the website, bringing the total to five gauges. http://www.co.ozaukee.wi.us/EmergencyManagement/riverguages/riverlevels.html In 2012, the Waubeka river gauge on the Milwaukee River was disbanded due to: • This gauge was disbanded by the NWS/NOAA after the Waubeka dam was removed but was reactivated in 2004. • By 2009 a monitoring station with new technology was installed nearby in Saukville. • In 2012 the Newburg dam was removed and the water level has dropped. • In April, 2011 a “Section 404 hazard mitigation grant” (FEMA-1933-DR-WI) was submitted to replace the aging monitoring equipment and relocate the gauge to public property. The grant received preliminary approval however NWS/NOAA was unwilling to continue the cost share of the program, hence the

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							application was withdrawn and the NWS was unwilling (as of 10/22/12) to take over all financial/program support for the gauge due to their budget constraints • If this old gauge malfunctions the NWS will have difficulty repairing it; if there is a catastrophic failure, NWS/NOAA will not repair it. • There are costs associated with the gauge and there has been no clear return on investment.
	*Assist with Canyon Creek flood recovery permanent repairs project.	404 mitigation project grant application being filed	CI of Port Washington	2008 (grant application)	High	CI of Port Washington	Total damage: ▪ $800,000 to Lighthouse Condos ▪ Building electrical system & elevator lost ▪ 39 cars totaled ▪ Estimated 20% insurance ▪ A more detailed timeline will be part of the application and project, if awarded grant
	Explore ability and options to produce maps “on the fly” of damages.	Unknown	LWM / Treasurer’s Office / Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Need to modernize the land records from plan completed in 2010. • Maps would be made available to public, insurance, realtors, etc. • Tied to tax rolls.
	Elevator Lane floods out the bike lane.	Unknown	VI of Belgium	2017	High	VI of Belgium	• Possibly a detention pond or reroute

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	Explore options for remediation.		Board				storm sewer discharge. • Work has begun. Hope to complete in 2017.
	*Obtain funding to complete current floodplain mapping for a portion of Washington County that is in the Village of Newburg.	Unknown	VI of Newburg	2018	Medium	VI of Newburg	Washington County ran out of funding to complete current floodplain mapping.
	*Obtain funding to correct HWY W N 33 flooding issues.	Unknown	Co HWY Dept.	2018	Medium	VI and TN of Saukville	• Rain causes water to overflow road. • Flood closes bridge and restricts main access. • Six homes and two or three businesses get wet basements. • Estimate has been generated by County Highway Department.
	*Explore options to alleviate natural damming effect in Milwaukee River near Ehlers Park and HWY 33.	Unknown		2018	Medium	VI of Saukville	• DNR has restricted Village of Saukville from clearing debris (dead trees, branches, etc.) out of Ehlers Park area. • Floods HWY 33 and several homes.
	Increase the size of culverts to reduce flooding at: • Fredonia Ave./Co Hwy A near Fillmore St. and the railroad tracks • South Milwaukee St. by Meadow Brook Dr.						
	Raise the pedestrian bridges to protect them from flooding.	Unknown	VI of Fredonia DPW	Ongoing	Medium	VI of Fredonia	There are two bridges. One needs to be raised 2-3 ft. and one needs to be raised 1 ft.
	Complete work on retention pond to keep downtown from flooding.	Unknown	VI of Thiensville	2015	Medium	VI of Thiensville	
	*Rebuild the Bridge St./Grafton Dam to repair the abutments, widen the spillway and provide an option for drawing down the water during high-water emergencies.	Up to $1,675,000 with 50%/50% WI DNR	VI of Grafton	By 2019	High	VI of Grafton	• Will bring the dam into state flood control regulation compliance

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		grant and VI of Grafton					
	Remove the Newburg Dam on the Milwaukee River to return the waterway to a more natural condition for fish and other wildlife.	Up to $650,000 of federal funds from Ozaukee Co.	VI of Newburg with Ozaukee County	2013	High	VI of Newburg	
Fog	Provide public information via website links or brochures regarding safe driving procedures in the fog.	Covered by annual budget	Div of EM	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Maintain an operational lighthouse.	Covered by annual budget	U.S. Coast Guard	Ongoing	Low	CI of Port Washington	• The Port Washington lighthouse, built in 1935. • The red light mounted on the top of the lighthouse is classified as a harbor light. It flashes once every 6 seconds. The light is 58 feet above the breakwater and 78 feet above the surface of the water. It is visible to a boat 8 miles away from the harbor. • A fog horn is also mounted on the top of the lighthouse. It gives 2 blasts in every 30 seconds at 24-

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							second intervals. • The horn is only operable during the months of April through November.
	Maintain U.S. Aids to Navigation System.	Covered by annual budget	U.S. Coast Guard	Ongoing	Low	CI of Port Washington	• The U.S. Coast Guard marks the waters of the United States and its territories with the U.S. Aids to Navigation System. • This system employs a simple arrangement of colors, shapes, numbers and light characteristics to mark navigable channels, waterways and obstructions adjacent to these. • Aids to Navigation can provide a boater with the same type of information drivers get from street signs, stop signals, road barriers, detours and traffic lights. These aids may be anything from lighted structures, beacons, day markers, range lights, fog signals and landmarks to floating buoys. • Each has a purpose and helps with determining location, getting from one place to another or staying out of danger. • The goal of the U.S. Aids to Navigation System is to promote safe navigation on the waterway.
	Explore areas prone to fog and evaluate if signage is needed or existing signs need to be upgraded.	Covered by annual budget	Div of EM / Sheriff's Office	2014	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton,	

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						Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
Forest Fires and Wildfires	Continue to provide outreach efforts to homeowners on protecting homes and structures from wildfires.	Costs vary	Local Fire Departments	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Done annually during the fire safety week in September or October.
	Provide ample training for volunteer fire fighters for larger fires.	Costs vary	Local Fire Departments / Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton,	Volunteers trained regularly within the local departments.

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						Port Washington and Saukville.	
	Continue "burn ban" during times of drought.	Covered by annual budget	VI of Newburg Fire Dept.	Ongoing	Medium	VI of Newburg	Process works well.
	Educate towns on benefits of prescribed burns.	Covered by annual budget	CO Fire Dept. / Local Fire Depts.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Some towns (e.g., TN of Port Washington) do prescribed burns in the spring to keep load down.
	Continue refining and expanding the use of the Mutual Aid Box Alarm System (MABAS).	Covered by annual budget	Fire Chief's Association	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Used several times in VI of Newburg and worked well. • Life Box used for ambulances, as well. • Law Enforcement is using the SMART system, which is similar to MABAS.
	Exploring options for obtaining/creating	Unknown	CI of Port	Ongoing	Medium	CI of Port	DNR comes to City of Port Washington

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	grounds suitable for wildfire training with the DNR.		Washington			Washington	once every two years for wildfire training.
Landslide	Offer riverbank erosion control and technical support as well as education for landowners.	Covered by annual budget	LWM	Ongoing	Medium	CI of Port Washington	• In 1996, the city had landslides from heavy rains. • They also have river bank erosion issues.
	Form a committee to evaluate needs of the breakwall in City of Port Washington and seek funding to implement findings.	Covered by annual budget	CI of Port Washington	Ongoing	Medium	CI of Port Washington	• Breakwall in CI of Port Washington is falling into disrepair. • Taken off ACE "port" listing, so funding not available. • Functioning as a breakwater but ladders, support structure, etc. are safety hazards.
Severe Temperatures	Continue public informational campaigns about severe weather on the website and during Winter and Heat Awareness Weeks.	Covered by annual budget	Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Completed annually during campaigns in April and November.
	Create informational links on Public Health website regarding safety strategies for severe weather.	Covered by annual budget	Public Health Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg,	

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						Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Coordinate cooling and warming shelters and inform the public.	Covered by annual budget	Public Health Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
Storms: Hail	Place hail storm safety materials in county display rack, on the website and during severe weather week.	Covered by annual budget	Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington	Information available in display rack and on website.

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						and Saukville.	
	Provide information regarding the purchase of crop insurance	Covered by annual budget	UW Ext.	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Information available in display rack and on website.
Storms: Lightning	Place lightning safety materials in county display rack, on the website and during severe weather week.	Covered by annual budget	Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Information available in display rack and on website.
	Conduct cost-benefit analysis and evaluate possible solutions (surge protectors, lightning arrestors, etc.) for protecting the radio tower.	Covered by annual budget	Div of EM	2018	Medium	VI of Grafton	The radio tower is next to the police department and goes out in storms.
	Evaluate the need and cost for surge	Covered by	Div of EM	2018	Medium	VI of Thiensville	There have been no problems in the

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	protectors on one lift station.	annual budget					past. This is a proactive measure.
	Provide information regarding the use of fire-resistant materials and surge protectors.	Covered by annual budget	Div of EM	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
Storms: Thunderstorm	Place thunderstorm safety materials in county display rack, on the website and during severe weather week.	Covered by annual budget	Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Information available in display rack and on website.
Storms: Tornadoes and High Winds	Explore the feasibility of constructing tornado shelters in areas where deficient, especially in mobile home parks and campgrounds.	Costs vary	Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs	• Utilize Department of Commerce's CDBG for funding assistance. • Building a storm shelter at County

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						of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Fairgrounds.
	Waubedonia Park in the Town of Fredonia	Unknown	TN of Fedonia	2018	Medium	TN of Fredonia	• Rustic campground with 15-20 sites, active on summer weekends. • Connected to Hawthorne Hills with Hawthorne Hills Peters Day Camp. • Park has a weather radio and a small PA system. • No place to go for shelter.
	Explore the feasibility of increasing the wind resistance of the roofs of community storm shelters.	Covered by annual budget	Div of EM	As grants available	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Explore cost and funding options for upgrading the lower level of the	Unknown	VI of Newburg	2018	Low-Medium	VI of Newburg	• Lower level is not American's with Disabilities Act (ADA) compliant.

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	municipal building in the Village of Newburg.						• No public allowed. • Cannot be used as a shelter.
	Upgrade the bathroom facilities in the village park to make it larger and a weather shelter structure.	Unknown	VI of Thiensville	2018	Low	VI of Thiensville	
	Regularly test warning systems, repairing and upgrading when necessary.	Costs vary	CI of Mequon / VI of Thiensville VI of Grafton VI of Newburg VI of Saukville	Ongoing	High	CI of Mequon / VI of Thiensville VI of Grafton VI of Newburg VI of Saukville	
	Promote tornado awareness, including safety measures.	Covered by annual budget	Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Done during tornado awareness week in April and by sponsoring annual spotter classes. • Information included on the website for homes, schools and business safety measures. • NWS switching to webinar classes.
Storms: Winter	Promote winter hazards awareness, including home and travel safety measures (including website.)	Covered by annual budget	Div of EM / HWY Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside,	• Done during winter weather awareness week in November. • The county also installs snow fencing along roadways.

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						Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
Utility Failure	Open discussion with WE Energies about burying power, cable (Time Warner) and phone (Verizon) lines during 2013-2014 Main St reconstruction.	Covered by annual budget	VI of Belgium	2014	Medium High	VI of Belgium	Main St has the only line. There is no redundancy for VI of Belgium and Lake Church section.
	Explore fitting electric panels for shelters	Covered by annual budget	Div of EM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	

*** Elements that further the goals (risk analysis, risk reduction, flood insurance) of the FEMA's National Flood Insurance Program (NFIP)**
ACE = U.S. Army Corps of Engineers
ARC = American Red Cross
Div. of EM = Ozaukee County Division of Emergency Management

DPW = Department of Public Works
LEPC = Local Emergency Planning Committee
LWM = Land and Water Management Department
MMSD = Milwaukee Metropolitan Sewerage District
NWS = National Weather Service
OJA = Office of Justice Assistance
UW Ext. = University of Wisconsin – Ozaukee County Extension Office

Appendix D: Report on Previous Mitigation Strategies

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Report on Previous Mitigation Strategies**
All Hazards	Continue to promote the increased use of National Oceanic and Atmospheric Administration (NOAA) weather radios.	Covered by Dept. annual budget	EM Dept.	On-going	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• The county has added a link to their website. • Weather radios have been promoted and sold at local grocery stores and at community talks. • Weather radios handed out as door prizes by VI of Grafton at the Aurora Hospital Safety Fair, May 2012.
	Continue working with and supporting the county Community Emergency Response Team (CERT) volunteer team.	Covered by Dept. annual budget	EM Dept.	On-going	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	About 60 people have gone through the training since 2003.
	Conduct a feasibility study and cost benefit analysis for installing a Reverse 9-1-1 communications system in the county.	Covered by Dept. annual budget	EM Dept. / Sheriff's Office	On-going	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton,	Completed and going forward.

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Report on Previous Mitigation Strategies**
						Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Continue to add/update Emergency Management Department links on the existing county web site (e.g., ARC, Homeland Security/FEMA, WEM, MyState) especially focusing on preparedness bulletins. Publicize the website to show the community what is there.	Covered by Dept. annual budget	EM Dept.	On-going	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• The county now has HazMat incident reports online for the public. • Flood gauge and floodplain information available on mainpage. • Updated summer 2010 for content and appearance.
	Provide the capability for the 9-1-1 Center to locate emergency calls coming in from cellular telephones.	PSC grant received	Sheriff's Office	2010	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Completed in 2009 and going forward with system updates.
	Evaluate services, contracts and prices for a satellite telephone for the Emergency Operations Center.	$3000 – provided by UASI grant	EM Dept.	2008	High	Ozaukee County; CIs of Cedarburg, Mequon and Port	Satellite telephone purchased.

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						Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Move public safety agencies to another part of the 800 MHz band.	Costs covered by Nextel	Technology Resources Dept. / Nextel	2009	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Nextel was given an FCC license near the public safety 800 MHz channels and would interfere with communications if a move was not made. Nextel paid to move the public safety channels to another part of the band. Completed 2010.
	Determine the feasibility of bringing the Mequon and Grafton Departments of Public Works onto the 800mHz band from the VHF band (like the rest of the county).	Costs to be determined.	CIs of Mequon and Grafton	Ongoing	Medium	Ozaukee County; CIs of Mequon and Grafton	CI of Mequon has begun the process.
	The public notification system, MyState USA, will be incorporated and used countywide	PH Prep Grant	EM Dept. / Sheriff's Office / PH	Ongoing	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville;	• Began use in 2008 thru Public Health prep grant. • Will contrive to market and find funding source for MyState.

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Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Report on Previous Mitigation Strategies**
						TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Regularly update information on website.	Covered by Dept. annual budget	VI of Saukville	Ongoing	Medium	VI of Saukville	VI of Saukville regularly updates their website.
	Completed the required narrow-banding of the existing outdoor warning sirens.	Covered by Dept. annual budget	VI of Fredonia	By 2012	High	VI of Fredonia	This was required by the FCC and was completed by the village.
	Determine the feasibility of bringing the Port Washington Police Department onto the 800mHz band from the VHF band (like the rest of the county).	Costs to be determined. May seek OJA interoperability communications grant assistance.	CI of Port Washington Police Dept.	Ongoing	High	Ozaukee Co; CI of Port Washington	The city disbanded its dispatch section and needed to transfer to the 800mHz system that the rest of the county is on. Completed in 2008.
Coastal Erosion	Ensure that municipalities, builders and homeowners understand and follow safe building zoning regulations.	Covered by Dept. annual budget	LWM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Covered in the Shoreland and Floodplain Ordinance in Ozaukee County (unincorporated) and CI of Mequon.
	Evaluate the set-back ordinance for	Covered by	Planning &	2008-2014	Medium	Ozaukee County;	Evaluation complete. Army Corps of

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Report on Previous Mitigation Strategies**
	buildings near the lakeshore and determine if updates are needed.	Dept. annual budget	Parks Dept.			CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Engineers brought in to provide expert opinions. Updates should be completed by 2014.
	Provide shoreline stabilization for Concordia University.	$5 million – private donations and self-funded	Concordia University	Ongoing	High	Concordia University	Completed. • The school scaled back the bluff and installed a serpentine road to the beach. • Tons of rock was brought in to stabilize the base of the bluff because of concerns that the water/wind would eat away at the base or the flank and erode the building support.
Drought and Dust Storms	County should be prepared to provide information to farmers during times of drought.	Covered by Dept. annual budget	UW-Ext. / FSA	As needed	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Information is now available to public.
	Inform farmers on purchasing crop	Covered by	UW-Ext. / FSA	Ongoing	Low	Ozaukee County;	Information is now available to public.

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Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Report on Previous Mitigation Strategies**
	insurance.	Dept. annual budget				CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Prepare/publicize water usage regulations for non-farm areas during drought.	Covered by Dept. annual budget	CIs of Cedarburg and Mequon	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Water usage regulations now available to public on CI of Mequon's website.
Flooding and Dam Failure	Incorporate into local comprehensive planning process (including SMART growth, as applicable).	May apply for a comprehen sive planning grant to assist with costs	LWM	Now - 2010	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton,	As planning meetings were conducted to create/update plans, the PDM was used as a reference.

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Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Report on Previous Mitigation Strategies**
						Port Washington and Saukville.	
	Incorporate section on flooding into County Comprehensive Plan.	Covered by Dept. annual budget	LWM	2010	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Completed 2010
	Update County FIRMS with FEMA map modernization program.			2007	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	New floodplains were studied.
	Adopt stormwater ordinance for MS4 area (a portion of TN of Saukville).			2010	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville;	Completed 2010

Summary of Mitigation Strategies							
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						TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Continue public outreach efforts for flood mitigation efforts.	Covered by Dept. annual budget	LWM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Completed as part of the Community Rating System. • The county was upgraded a level, which saved the public 10%.
	Discuss potential regulatory and ordinance changes that would allow municipalities to manage properties in flood areas.	Covered by Dept. annual budget	LWM	2009	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	County ordinance has a mechanism to manage properties.
	Complete amendments/revisions to the Flood Rate Insurance Maps (FIRMs) as necessary.	Landowner s pay fees	LWM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium,	Ongoing maintenance activity.

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Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Report on Previous Mitigation Strategies**
						Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Explore with the approximately 16 home owners in the Edgewater Drive area (Town of Grafton) the feasibility of a buyout or other flood mitigation program. Also, ensure that the road is of adequate height to escape flood damage.	Covered by Dept. annual budget. Explore receiving a Flood Mitigation Project for any project activity	TN of Grafton / Planning Department	2010	Medium	TN of Grafton	Worked with eight landowners through HGMP. Cost-benefit analysis not beneficial.
	Provide information to citizens about the purchase of flood insurance.	Covered by Dept. annual budget	EM Dept. / LWM	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Link made available on the website.
	Obtain grant funding to build a retention pond to keep downtown from flooding.	Grant funding				VI of Thiensville	Received grant funding.
	Remove dams on Milwaukee River.	American Recovery				VI of Grafton	• One dam removed in VI of Grafton. • A second dam in VI of Grafton was

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		Funds Project					not removed, so the funds were repurposed to remove a dam in Washington County (Level 2) on the county border that affects Ozaukee County. • Tried to incorporate a "home buy out" in grant, but it was not approved.
	Assist with Canyon Creek flood recovery permanent repairs project.	404 mitigation project grant application being filed	CI of Port Washington	2008	High	CI of Port Washington	Total damage: ▪ $800,000 to Lighthouse Condos ▪ Building electrical system & elevator lost ▪ 39 cars totaled ▪ Estimated 20% insurance
	Support the Pigeon Creek restoration mitigation project.	$2,550,000 ($1.750M FEMA grant + $800K Village match	VI of Thiensville	2009	High	VI of Thiensville	• Restored the Pigeon Creek bed back to its original condition. • Removed the culverts in the Suburban Motors/Harley Davidson parking lot Widened the embankment of the Main St. bridge • Replacing 2 bridges in the Williamsburg area. • Removed the dam on the Seminary property in Mequon and stored stormwater upstream by raising Wauwatosa Road at Bonniwell about 1 ½ feet. • This project will removed 75% of the properties from the floodplain.
Fog	Provide public information regarding safe driving procedures in the fog.	Covered by Dept. annual budget	EM Dept.	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville	

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Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Report on Previous Mitigation Strategies**
						and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Maintain an operational lighthouse.	Covered by Dept. annual budget	U.S. Coast Guard	Ongoing	Low	CI of Port Washington	• The Port Washington lighthouse, built in 1935. • The red light mounted on the top of the lighthouse is classified as a harbor light. It flashes once every 6 seconds. The light is 58 feet above the breakwater and 78 feet above the surface of the water. It is visible to a boat 8 miles away from the harbor. • A fog horn is also mounted on the top of the lighthouse. It gives 2 blasts in every 30 seconds at 24-second intervals. • The horn is only operable during the months of April through November.
	Maintain U.S. Aids to Navigation System.	Covered by Dept. annual budget	U.S. Coast Guard	Ongoing	Low	CI of Port Washington	• The U.S. Coast Guard marks the waters of the United States and its territories with the U.S. Aids to Navigation System. • This system employs a simple arrangement of colors, shapes, numbers and light characteristics to mark navigable channels, waterways and obstructions adjacent to these. • Aids to Navigation can provide a boater with the same type of information drivers get from street

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							signs, stop signals, road barriers, detours and traffic lights. These aids may be anything from lighted structures, beacons, day markers, range lights, fog signals and landmarks to floating buoys. • Each has a purpose and helps with determining location, getting from one place to another or staying out of danger. • The goal of the U.S. Aids to Navigation System is to promote safe navigation on the waterway.
	Ensure signs are posted on the roads in particularly dangerous areas warning of fog potential.	Covered by Dept. annual budget	Highway Dept.	Ongoing	High	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Completed
Forest Fires and Wildfires	Continue to provide outreach efforts to homeowners on protecting homes and structures from wildfires	Costs vary	Local Fire Departments	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg,	Annually promoted during the fire safety week in September or October.

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Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Report on Previous Mitigation Strategies**
						Fredonia, Grafton, Port Washington and Saukville.	
	Provide ample training for volunteer fire fighters for larger fires	Costs vary	Local Fire Departments / EM Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Volunteer fire fighters are trained regularly by departments.
	Incorporate Mutual Aid Box Alarm System (MABAS) into fire department emergency procedures.	Covered by Dept. annual budget	Fire Chief's Association	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Utilized several times in VI of Newburg and worked well. • Life Box used for ambulances, as well. • Law Enforcement is using SMART levels.
	Village of Newburg initiated "burn ban" during times of draught.	Covered by Dept. annual budget	VI of Newburg Fire Dept.	Ongoing	Medium	VI of Newburg	Process worked well.
	City of Port Washington enacted strict vegetation ordinance to keep fuel load down.	Covered by Dept. annual	CI of Port Washington Board	2012	Medium	CI of Port Washington	

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		budget					
	Educate towns on benefits of prescribed burns.	Covered by Dept. annual budget	CO Fire Dept. / Local Fire Depts.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Some towns (TN of Port Washington) do prescribed burns in the spring to keep load down.
	City of Port Washington is exploring options for obtaining/creating grounds suitable for wildfire training with the DNR.	Unknown	CI of Port Washington Fire Dept.	Ongoing	Medium	CI of Port Washington	DNR comes to City of Port Washington once every two years for wildfire training.
Severe Temperatures	Continue public informational campaigns about severe weather on the website and during Winter and Heat Awareness Weeks.	Covered by Dept. annual budget	EM Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Completed annually during campaigns in April and November.
Storms: Hail	Place hail storm safety materials in county display rack, on the website and during Spring Awareness Week.	Covered by Dept. annual budget	EM Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton,	Completed and going forward.

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						Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
	Provide information regarding the purchase of crop insurance	Covered by Dept. annual budget	UW Ext.	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Completed and going forward.
Storms: Lightning	Place lightning safety materials in county display rack, on the website and during Spring Awareness Week.	Covered by Dept. annual budget	EM Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Completed and going forward.
	Provide information regarding the use of fire-resistant materials and surge protectors.	Covered by Dept. annual	EM Dept.	Ongoing	Low	Ozaukee County; CIs of Cedarburg, Mequon and Port	Information available via website link.

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		budget				Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	
Storms: Thunderstorm	Place thunderstorm safety materials in county display rack, on the website and during Spring Awareness Week.	Covered by Dept. annual budget	EM Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Completed and going forward.
Storms: Tornadoes and High Winds	Explore the feasibility of constructing tornado shelters in areas where deficient especially in mobile home parks and campgrounds.	Costs vary	EM Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Building a storm shelter at County Fairgrounds in CI of Cedarburg and in Waubedonia Park in the TN of Fredonia

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	Regularly test warning systems, repairing and upgrading when necessary.	$300,000 $70,000 $0		July 2012 Spring 2011 Ongoing June 2012	High High High High	CI of Mequon / VI of Thiensville VI of Grafton VI of Newburg VI of Saukville	Full siren upgrade (six –seven sirens: five or six for CI of Mequon, One for VI of Thiensville) Five new sirens: replaced three sirens and expanded two sirens. Narrow-banding siren and upgrading entire system (five sirens).
	Promote tornado awareness, including safety measures.	Covered by Dept. annual budget	EM Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	• Completed annually during Tornado Awareness Week in April and with sponsored annual tornado spotter classes. • Information to be included on the website for homes, schools and business safety measures. • NWS switching to webinar classes.
Storms: Winter	Promote winter hazards awareness, including home and travel safety measures (including website.)	Covered by Dept. annual budget	EM Dept. / HWY Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington	Completed and going forward. • Completed during winter weather awareness week in November. • The county also installed snow fencing along roadways.

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						and Saukville.	
Utility Failure	Complete a feasibility study (with cost-benefit analysis) to selectively upgrade shelter facilities for electricity needs.	Covered by budget	EM Dept.	Ongoing	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Completed. • The only place in the county with sufficient power to run air handling units was the EOC. • There was some emergency power to run boilers and minimal lighting in shelters but not for long-term operations. • Looked at shelters in the northern (Saukville, Fredonia, Port Washington, Belgium), southern (Mequon) and central (Grafton, Cedarburg) thirds of the county. • Small nursing homes have no generators, but larger facilities have generators. • During a power failure, the county is looking into using county owned buses to move special needs populations.
	Ensured a redundant water supply to St. Mary's Hospital in the City of Mequon.	ASPR grant funding Phase I $12,251 Phase II $118,078	St. Mary's Hospital	2012	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Divided project into two phases. Installed private well with a back-up generator to pump.
	Install electrical panel upgrade to County Highway Fuel & Shop.	$2,000	VI of Fredonia	2012	High	VI of Fredonia	Waubeka and Fredonia Fire Department also get fuel there.

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Report on Previous Mitigation Strategies**
	Installed a generator in the firehouse.	$25,000 Fire Grant	VI of Fredonia Fire Dept.	2007	Medium	VI of Fredonia	Now firehouse could act as a shelter. • 60 kw natural gas generator.
	Purchased new generator on a trailer, enabling movement from well to well.	$30,000	DPW	2011	Medium	Ozaukee County; CIs of Cedarburg, Mequon and Port Washington; VIs of Bayside, Belgium, Fredonia, Grafton, Newburg, Saukville and Thiensville; TNs of Belgium, Cedarburg, Fredonia, Grafton, Port Washington and Saukville.	Also put electrical panels on the well house. • 100 kw diesel generator.

Village of Thiensville Channelization Project

Photo of June 13, 2008 flood event in downtown area of Village of Thiensville.

Ozaukee County, WI – For nearly 50 years the downtown area in the Village of Thiensville had been plagued with constant flooding that repeatedly affected ten residential and thirty commercial properties because Pigeon Creek would overtop its banks during heavy rainfall. Having experienced six major flood events since 1973, four of which resulted in a federal disaster declaration, the village decided to do something about the creek. They came up with a project that not only remedied some of their woes but also received an award for ***Excellence in Project Design or Implementation*** from the Wisconsin Association for Floodplain, Stormwater and Coastal Managers.

"We had a storm in1985 and previous to that there were several storms in the early seventies and eighties that flooded downtown Thiensville," said Mike Campbell, project engineer. "As the consulting engineer, I identified major restrictions that had been placed in the creek, a lot of man-made obstacles."
Noteworthy obstacles included: (1) floodplain had been filled in (downtown area); (2) placement of two undersized, lengthy culverts; and, (3) construction of a dam upstream in the neighboring city of Mequon (which was also an obstruction to fish passage).
"When it rained, even with a 10-year storm event, Pigeon Creek would overtop its banks and downtown would flood causing damage to a number of buildings as well," said Campbell.

Applied for in 2003 and awarded in 2006, the City of Thiensville received a Pre-Disaster Mitigation grant totaling $2,308,620. The Federal Emergency Management Agency (FEMA) provided 75 percent ($1,731,460). The project was administered by Wisconsin Emergency Management. The Village Board amended the Tax Incremental Financing District to assist with the remaining funds needed to defray project cost.
The flood mitigation project was executed in three phases.

Photo of clear span bridge that replaced culverts

Phase – One: Easements were obtained to detain storm water at targeted intersections. A plate was installed on the upper half of an outlet
culvert which controls the culvert's outflow during high water events.

Phase – Two: Two restricting undersized culverts, which allowed roadway passage from a parking lot to a commercial building, were removed and replaced by a 50-foot clear span bridge.

Phase – Three: High flow channel of the creek was widened from its pre-existing footage of five to ten feet, in some areas, to 60 ft. to increase the capacity of the creek. A meandering 25 ft. wide rock lined low flow channel was created for fish passage. Invasive trees were removed and replaced with native species. Wetland and prairie plants were added along the creek's bank to prevent erosion.

The project was costly and the task tedious; however, stakeholders plowed ahead with the mitigation project. While grant funding played a primary role other things came into play. Patience, perseverance and "political will" fostered completion of the project. "We had a tough time coordinating with utility companies because the project was 'on again, off again resulting from a lack of a full commitment to move forward," said Campbell. "We had to fast track the construction contracts to. They were bumping into each other because of it."

"A motivating factor included the fact that we had an original board (no new members to question whether it was a good project), who knew about all the years of flooding and who probably thought 'If we don't do it now, folks are going to be sitting here a 100 years from now dealing with the same thing'. They didn't want to pass the problem on to another board," said Karl Hertz, Village President.

According to Andrew LaFone *["LaFond"],* Director of Public Works, the village has had three flood events in 2010 that would have normally caused road closures and property damage in the downtown area. That did not occur due partly to the project.

View of a portion of Pigeon Creek's rock lined low flow channel and newly constructed retaining wall.

"Water flows from two directions into Pigeon Creek, northeast and northwest and it all dumps in about a block and a half before Pigeon Creek gets to the Milwaukee River," said Hertz. "This project took care of the northwest water. We have executed two or three projects over the years to handle the northeast flow, including securing funding for the construction of detention ponds. One of which is located in the city of Mequon." Thiensville had

previously received a FEMA grant through the Hazard Mitigation Grant Program to construct one of the detention ponds. Hertz credits the village administrator, Dianne Robertson, for her resourcefulness in securing grants for project funding.

Heralded as a great mitigation measure, the project fostered other positive aspects including partnerships with: (1) an association, in neighboring city, Mequon, for upper storage, (2) private property owners who provided easements for the project and (3) the coordination of other agencies such as the Department of Natural Resources. It also had a positive effect for fish habitat.

"Would we do it again? Yes we would. We had an end goal in mind and we followed procedure," said Campbell. "I'm glad it's done. It had a lot of road blocks, but the project is functional and it's also beautiful. It gave Pigeon Creek a totally new look," added Robertson.

Appendix E: Flood Mitigation Supporting Documentation - HAZUS

Ozaukee County Vulnerability Report

Identify Hazards[123]

Ozaukee County covers 232 square miles and contains 1,770 census blocks. There are over 31,000 households with a population of 82,317. Ozaukee County consists of 6 cities, 8 villages, and 12 towns. There are an estimated 26,361 buildings in the region with a total building replacement value (excluding contents) of 8,425 million dollars. Approximately 98.33% of the buildings (and 73.13% of the building value) are associated with residential housing.[124]

Most flood damage in the study area has been caused by high stages on the Milwaukee River and Cedar Creek. North of Port Washington, where the bluffs are as far as 500 feet from the water's edge, flooding is possible both from high lake stages and wave action.

Flooding has occurred along the Milwaukee River watershed in 1918, 1924, 1929, 1959, 1973, 1975 and 1986. Large floods occurred along Cedar Creek in 1951, 1959, 1960 and 1975.

Floods on both streams usually occur during March and early April because of snowmelt. If there are also large amounts of rain, the floods can be of much greater magnitude, as was the case in 1959 and 1975. Large floods can also result from summer thunderstorms.

[123] From Ozaukee's Flood Insurance Study prepared in 1999
[124] 2000 Census Bureau Data

HAZUS-MH Hazard Analysis

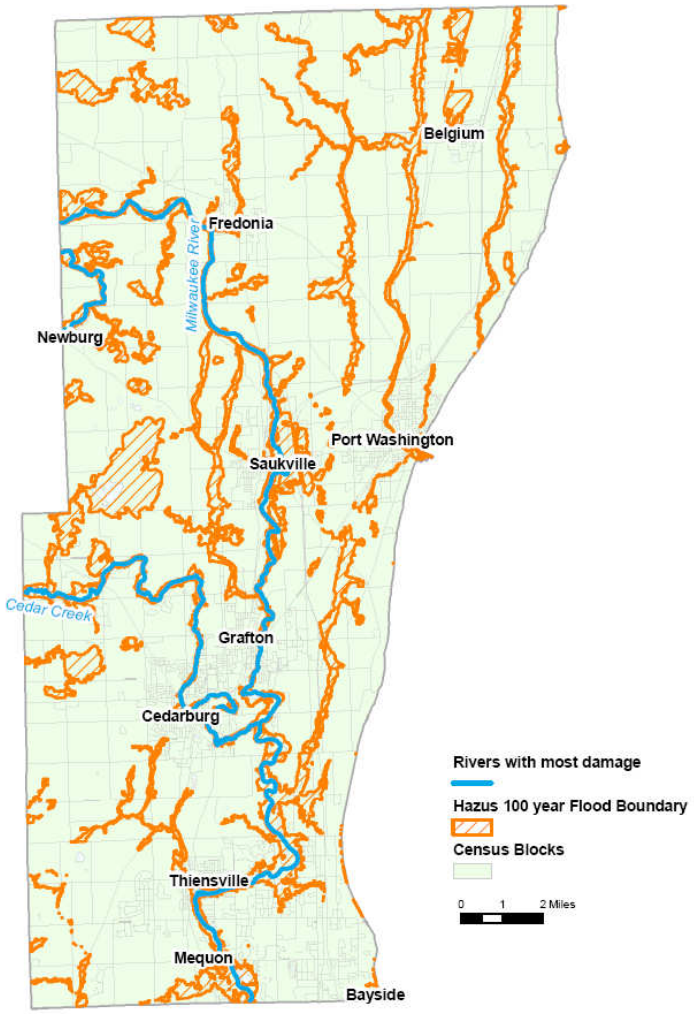
Flood analysis for Ozaukee was performed using HAZUS-MH MR3 released in July 2007. The bundled aggregated general building stock was updated to Dun & Bradstreet 2006. Building valuations were updated to R.S. Means 2006. Building counts based on census housing unit counts are available for RES1 (single-family dwellings) and RES2 (manufactured housing) instead of calculated building counts.

The site specific inventory (specifically Schools, Hospitals, Fire Stations, Emergency Operation Centers and Police Stations) was updated using the best available statewide information.

HAZUS-MH was used to generate the flood depth grid for a 100-year return period calculated by clipping the USGS 30m DEM to the DFIRM boundary.

Figure 1 depicts the flood boundary from the HAZUS-MH analysis. The majority of flooding occurs along the Milwaukee River and the Cedar Creek.

Figure 1: Ozaukee County HAZUS-MH Analysis (100-Year Flood)



HAZUS-MH Aggregate Loss Analysis

HAZUS-MH was used to estimate the damages for a 100-year flood event in Ozaukee County. An estimated 396 buildings will be damaged totaling in $107 million in building losses and $257 million in total economic losses. The total estimated number of damaged buildings, total building losses, and estimated total economic losses are shown in Table 1.

HAZUS-MH estimates 69 census blocks with losses exceeding $1 million. The distribution of losses is shown in Figure 2.

HAZUS-MH aggregate loss analysis is evenly distributed across a census block. Census blocks of concern should be reviewed in more detail to determine the actual percentage of facilities that fall within the flood hazard areas. The aggregate losses reported in this study may be overstated or understated. Examples are provided in Figures 3a and b.

Table 1: Ozaukee County Total Economic Loss - 100-Year Flood

General Occupancy	Estimated Total Buildings	Total Damaged Buildings	Total Building Exposure X 1000	Total Economic Loss X 1000	Building Loss X 1000
Agricultural	1	0	$46,346	$3,635	$842
Commercial	329	12	$1,246,192	$94,690	$24,108
Education	1	0	$235,301	$1,987	$289
Government	8	0	$47,743	$5,145	$619
Industrial	75	1	$564,756	$31,235	$7,982
Religious/Non-Profit	26	0	$123,725	$7,092	$894
Residential	25,921	383	$6,160,764	$113,475	$71,799
Total	**26,361**	**396**	**$8,424,827**	**$257,259**	**$106,533**

The reported building counts should be interpreted as degrees of loss rather than as exact numbers of buildings exposed to flooding. These numbers were derived from aggregate building inventories which are assumed to be dispersed evenly across census blocks. HAZUS-MH requires that a predetermined amount of square footage of a typical building sustain damage in order to produce a damaged building count. If only a minimal amount of damage to buildings is predicted, it is possible to see zero damaged building counts while also seeing economic losses.

.Figure 2: Ozaukee Total Economic Loss - 100-Year Flood

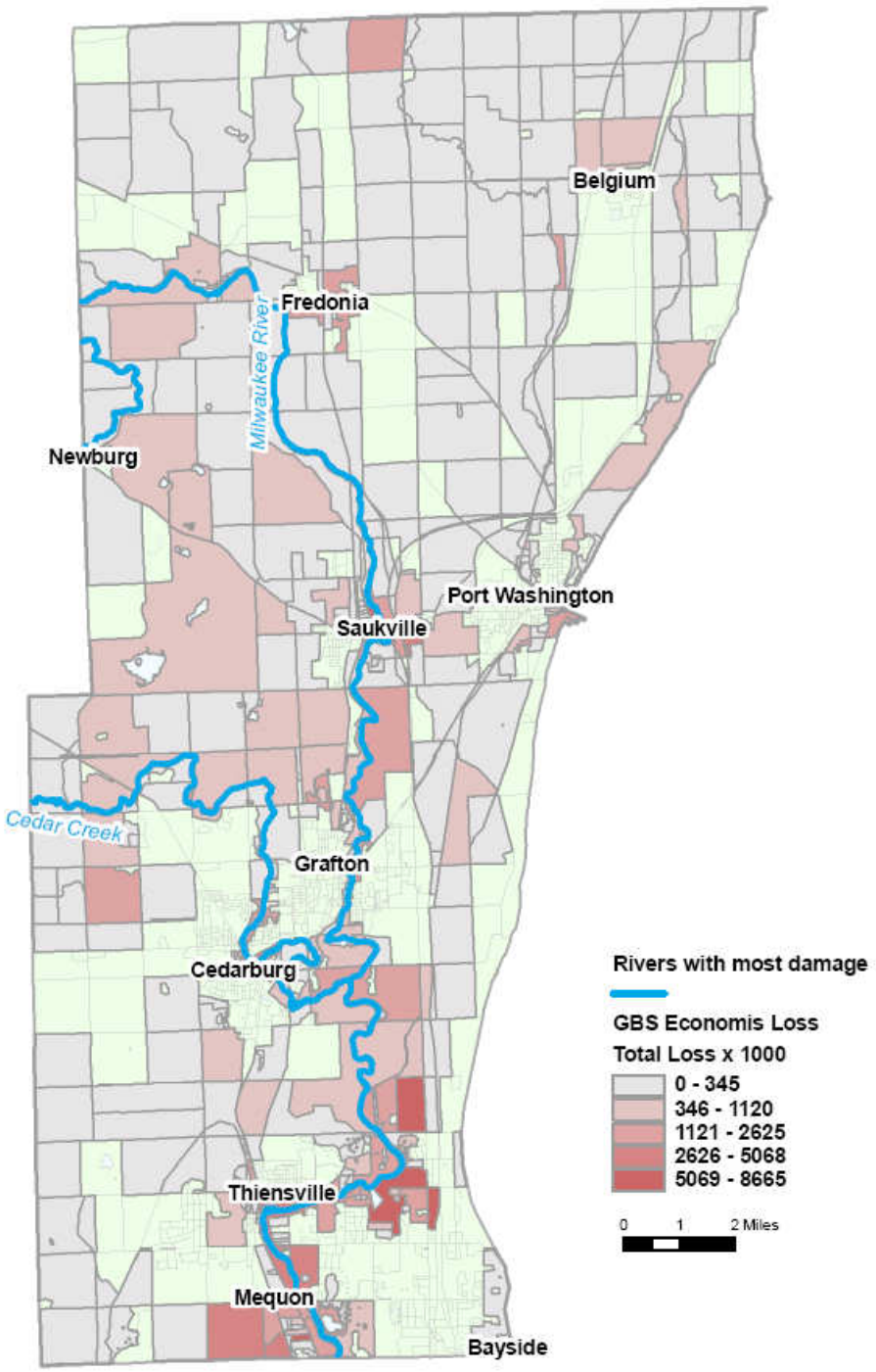


Figure 3a: Flood Damage Exposure in Mequon

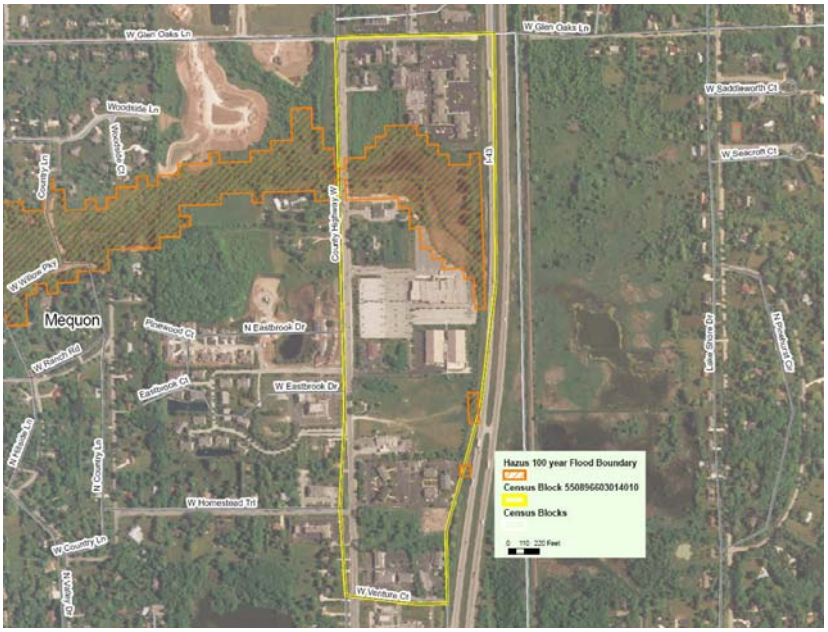


Figure 3a shows census blocks overlaid with the flood boundary and orthophoto in Mequon. Census block 550896603014010 has an estimated building loss of $1.7 million with a combined replacement cost of $6.5 million. HAZUS-MH estimates that two commercial buildings are within the calculated flood boundary for this block. The orthophoto shows some flooding in this census block but no buildings appear to be located in the floodplain boundary.

Figure 3b: Flood Damage Exposure in Thiensville

Figure 3b shows census blocks overlaid with the flood boundary and orthophoto of Thiensville. Census block 550019502002133 has an estimated building loss of $1.2 million and a combined replacement cost of $3.9 million. HAZUS-MH calculates that 0 commercial buildings and 1 residential building are within the entire census block. However, the orthophoto shows the entire census block is in the flood boundary and that there are several non-residential buildings.

HAZUS-MH Essential Facility Loss Analysis

An essential facility would encounter many of the same impacts as any other building within the flood boundary. These impacts include: structural failure, extensive water damage to the facility, and loss of facility functionality (i.e. a damaged police station will no longer be able to serve the community).

The HAZUS-MH analysis identified 2 Fire Stations, 1 Police Station, and 2 Schools that may be subject to flooding. A list of the essential facilities within Ozaukee County is included in Tables 2 and 3. Maps of essential facilities potentially at risk of flooding are shown in Figures 4a & b.

Table 2: Ozaukee Essential Facility Loss - 100-Year Flood

Class	Building Count	At Least Moderate Damage	At Least Substantial Damage	Loss of Use
Care Facilities	5	0	0	0
EOC	1	0	0	0
Fire Stations	10	2	0	0
Police Stations	12	1	0	1
Schools	40	2	0	1
Total	**68**	**5**	**0**	**1**

Table 3: Ozaukee Damaged Essential Facilities

Facility Name
Thiensville Vol. Fire Dept.
Waubeka Fire Department
Saukville Police Department
Saint Mary's Grade School*
Saukville Elementary

* Essential Facilities that may be outside of the 100 year flood boundary according to orthophoto interpretation or address verification.

**Note that the Thiensville Police and Fire Departments share the same building and therefore there would be two first response agencies without housing if this critical infrastructure was lost.*

Figure 4a: 100-Year Flood Boundary Overlaid with Essential Facilities

Figure 4b: 100-Year Flood Boundary Overlaid with Essential Facilities

Essential facility locations were imported from the best available statewide sources. Some instances have been observed where HAZUS-MH reports a site within the flood plain that cannot be confirmed by the corresponding orthophoto in Figure 4b. The essential facility damages reported by HAZUS-MH may be overstated

HAZUS-MH Shelter Requirement Analysis

HAZUS-MH estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS-MH also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 2,036 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 4,061 people (out of a total population of 82,317) will seek temporary shelter in public shelters.

HAZUS-MH State Property Loss Analysis

The flood boundaries were overlaid with State of Wisconsin property boundaries as provided by the Department of Natural Resources within Ozaukee County. Table 4 provides the names of state properties that overlay with the HAZUS-MH flood boundary. Figures 5a and 5b show examples of the inundated areas.

Table 4: Ozaukee State Property Flood Inundation

State Property	Percent Inundated	Acres Inundated
Cedarburg Bog Natural Area	79%	1322
North Branch Milwaukee River Wildlife And Farm Heritage Area	20%	138
Scattered Wildlife	85%	94
Stream Bank Easement Program	93%	91
Statewide All Regulatory-wetland Mitigation Program	56%	28
Harrington Beach State Park	4%	22
Cedarburg Habitat Preservation	94%	18
Extensive WI Habitat	31%	11

Figure 5a: Boundary of 100-Year Flood Overlaid with State of Wisconsin Properties

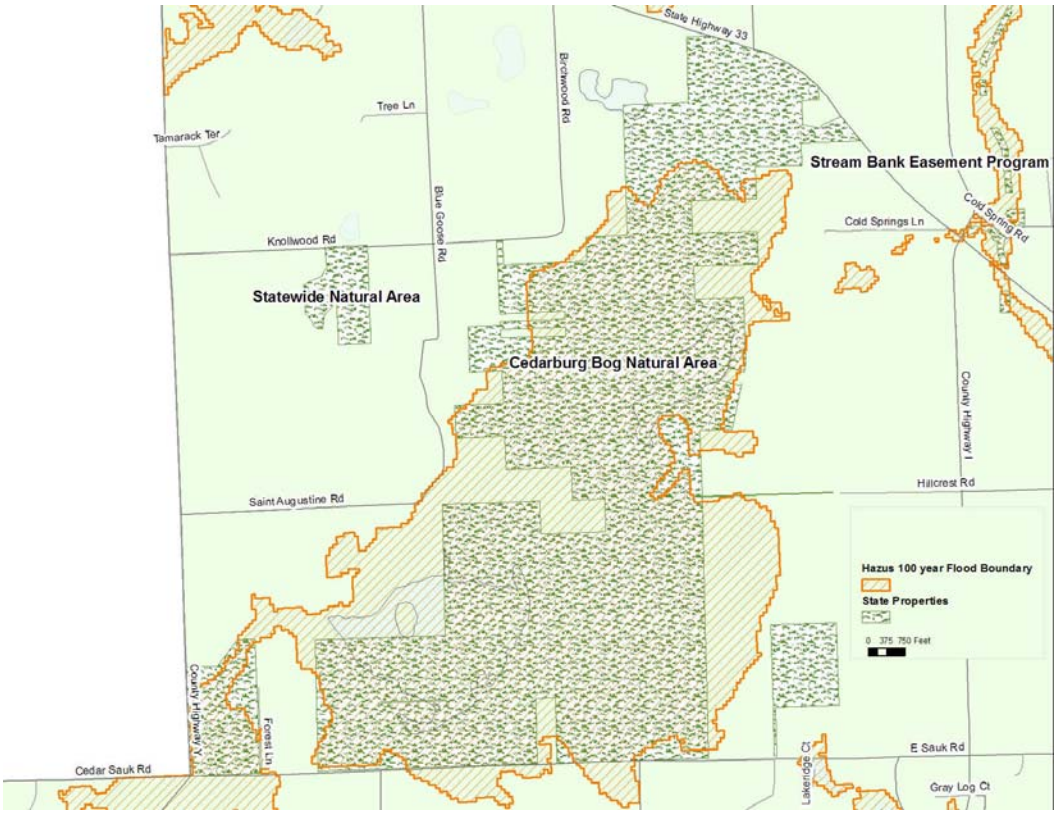
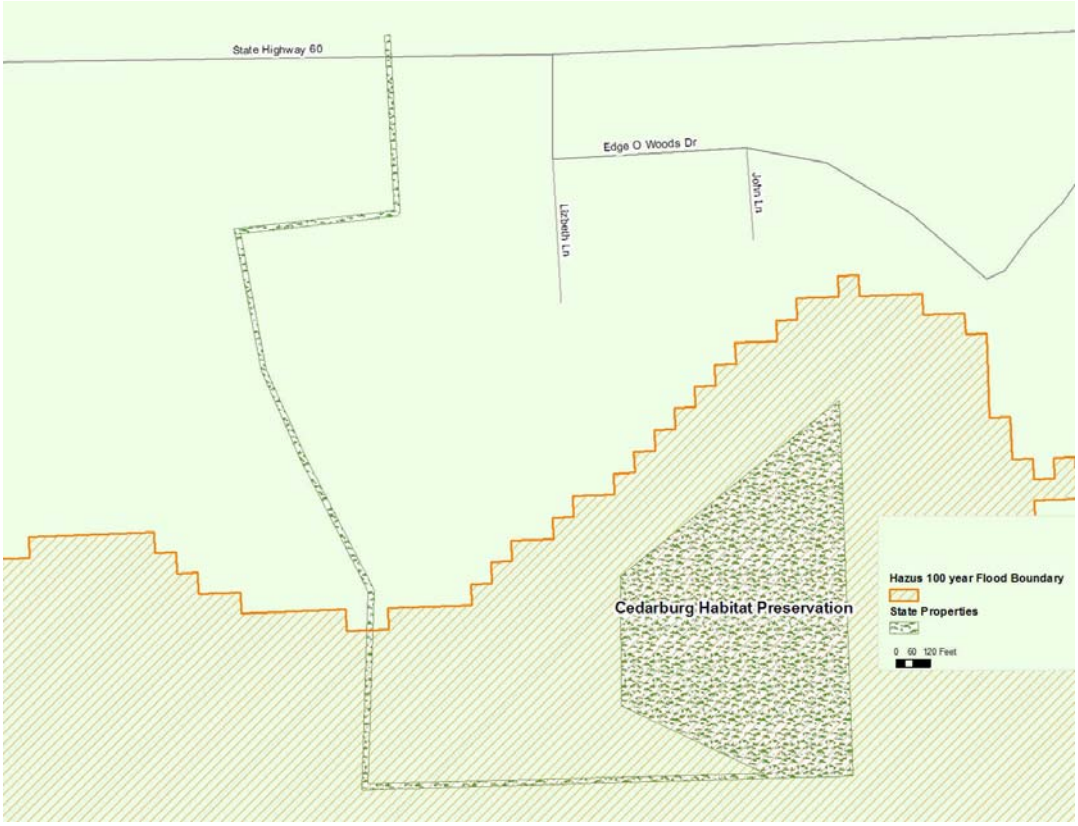
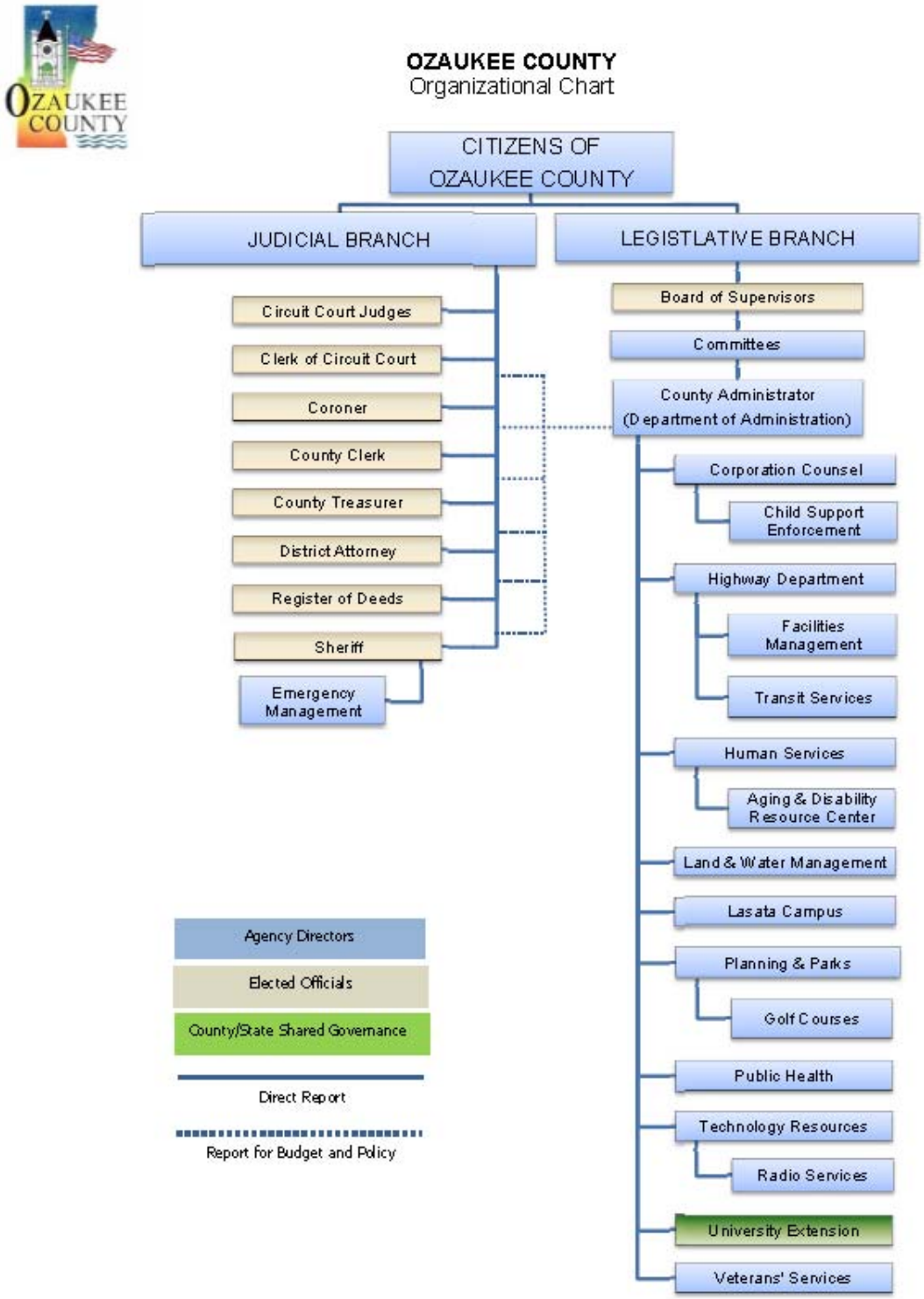


Figure 5b: Boundary of 100-Year Flood Overlaid with State of Wisconsin Properties



Appendix F: Supporting Documentation

Ozaukee County Organizational Chart



Ozaukee County Hazard Rating Summary

HAZARD RATING SUMMARY

Catastrophic	• War: Non-nuclear • War: Nuclear			
Critical	• Terrorism: Bomb Blast/ Ecological/ Economic/ Incendiary/			
Limited				
Negligible	• Mass Casualties • Explosions • Civil/Political Unrest/Disturbances • Prolonged/ Multiple Hostage Situation/Sabotage	• Earthquakes • Ice/Hail Storm • Dam/Levee Failure • Prison Jail Disturbances	• Agricultural/ Hydrologic Drought • Power/Utility Outage,	• Winter Storms • Flooding • Structural/Wild Fires, • Lightning Storms Severe Thunder Storms • Hazardous Material Accident/Incidents, Transportation Accident, • Waterborne Emergencies
	Not Occurred	*Low*	*Medium*	*High*

Frequency	
High:	At least one occurrence every 1 – 4 years.
Medium:	At least one occurrence every 5 – 10 years.
Low:	At least one occurrence every 11 – 100 years.
N/O:	Has not occurred, but for planning purposes should be evaluated as part of jurisdictions HVA.

Severity	
Catastrophic:	More than 50 deaths/injuries; Complete shutdown of critical facilities for 30 days or more; More than 50% property damage; Severe long–term effects on economy; Severely affects state/local/private sectors capabilities to begin or sustain recovery activities; Overwhelms local and state response resources.
Critical: (Major)	10–50 deaths/injuries; Shutdown of critical facilities for 8–30 days; 25–50% property damage; Short–term effect on economy; Temporarily (24–48 hours) overwhelms response resources.
Limited:	Less than 10 deaths/injuries; Shutdown of critical facilities for 3–7 days; 10–25% property damage; Temporary effect on economy; No effect on response system.
Negligible:	Minor injuries, no deaths; Shutdown of critical facilities for less than 3 days; Less than 10% property damage; No effect on economy; No effect on response system.

NOTE: *The Category of Severity is used if the hazard results in one or more of the qualifiers.*

Ozaukee County Hazard Vulnerability Analysis (Public Health)

Date of Scheduled Local Public Health Agency and Tribe Ozaukee County

List of Participating LHA/Tribes, and other Partners

WI HAZARD VULNERABILITY ASSESSMENT TOOL

Meeting Date(s): February 17, 2012

Natural/Planning Scenarios*	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Natural Disaster – Major Earthquake	1	1	1	1	1	1	1	2	2	2	2	2	2	2	0%
Natural Disaster – Major Hurricane	1	1	1	1	1	1	1	3	3	2	2	2	2	2	0%
Biological Disease Outbreak – Pandemic	2	3	3	3	3	1	3	2	2	2	2	2	2	2	43%
Biological Attack – Animal Anthrax	1	1	3	2	3	1	1	3	2	2	2	2	2	2	33%
Biological Attack – Plague	1	3	3	3	3	1	3	3	3	3	3	3	3	3	33%
Biological Attack – Food Contamination	1	2	3	2	3	1	2	3	2	3	2	2	2	2	38%
Biological Attack – Foreign Animal Disease	1	2	3	2	3	3	2	3	2	2	1	2	1	2	33%
Chemical Attack – Toxic Industrial Chemicals	1	1	1	1	1	1	1	3	3	2	2	2	2	2	0%
Chemical Attack – Chlorine Tank Explosion	1	1	1	1	1	1	1	3	3	2	2	2	2	2	0%
Chemical Attack – Nerve Agent	1	3	3	3	3	1	3	3	3	2	2	2	2	2	38%
Chemical Attack – Sarin Gas	1	3	3	3	3	1	3	3	3	2	2	2	2	2	38%
Explosive Attack – Improvised Explosive	1	1	3	3	3	1	1	2	2	2	2	2	2	2	33%
Nuclear Detonation – Improvised Device	1	2	3	3	3	1	1	3	2	3	2	2	2	2	38%
Radiological Attack – Radiological Dispersal	1	1	3	3	3	1	2	3	2	3	2	2	2	2	38%
Cyber Attack	2	1	1	1	1	2	3	1	1	2	2	2	2	2	27%
Local Planning Scenario*															
Earthquake	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0%
Drought	3	1	1	1	1	2	2	1	1	2	2	2	2	2	88%
Wild Fire	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0%
Severe Thunderstorm	3	1	1	1	1	2	1	1	1	1	1	1	1	1	33%
Tornado	2	1	1	1	1	2	1	2	2	2	2	1	2	1	33%
Flooding	3	1	1	1	2	2	2	2	2	2	2	1	1	1	63%
Flash Flooding	1	1	1	1	1	1	1	3	3	2	2	1	1	2	0%
Landfall	2	1	1	1	1	1	1	1	3	2	2	2	2	2	33%
Extreme Heat	3	1	2	1	1	1	1	2	2	2	2	2	2	2	88%
Extreme Cold	3	1	2	1	1	1	1	2	2	2	2	2	2	2	88%
Blizzard	3	1	2	1	3	1	2	2	2	2	2	2	2	2	88%
Ice Storm	3	1	3	1	3	2	2	2	2	2	2	2	2	2	63%
Human Release/Explosion (Accidental)	2	1	2	2	2	1	1	1	1	1	1	1	1	1	38%
Human Release/Explosion (Intentional)	2	1	2	2	2	1	1	1	1	1	1	1	1	1	38%
Nuclear Facility Incident (Accidental)	3	3	3	3	3	3	3	3	3	2	3	2	3	3	0%
Nuclear Facility Incident (Intentional)	1	1	1	1	1	1	1	3	3	2	3	2	3	2	38%
Tornado	3	1	3	2	3	1	2	2	2	2	2	2	2	2	67%
Pandemic	2	3	3	3	3	1	3	2	2	2	2	2	2	2	43%
Power Outage	3	2	2	2	1	1	2	3	2	2	2	2	2	2	67%
Water System Failure	1	2	2	2	1	1	2	3	1	2	1	2	1	2	0%
Major Communication Disruption	2	3	3	3	2	3	3	2	2	2	2	2	2	2	43%
Computer Failure	3	3	1	1	1	1	1	2	2	2	2	2	2	2	88%
Airplane Crash	1	1	2	1	1	1	1	3	1	2	1	2	1	2	17%
Oil Disaster	1	1	3	1	3	3	1	3	1	2	1	1	1	2	14%
Fuel Shortage	1	1	1	2	3	1	2	3	2	2	2	2	2	2	33%
Multiple Incent Building Fire	2	1	1	1	2	1	1	2	1	1	1	1	1	2	17%
Multiple Vehicle Highway Incident	3	1	2	1	3	1	1	2	1	2	1	1	1	2	43%
Hazardous Water Contamination	2	3	3	3	3	1	2	2	1	3	1	2	1	2	43%
Supply Disruption	1	1	1	1	1	3	1	3	1	3	1	2	1	3	0%
VIP Visit	2	3	3	1	3	3	1	3	1	2	1	1	1	2	38%
Community-specific Planning Scenario*															
Civil Unrest Events															0%
Hate crimes/non-violent terrorists, etc.															0%
Hillary Rose															0%
Other Federal Institutions															0%
															0%
															0%
															0%

Revision: Original

Revision Date: February 17, 2012

County Farmland Preservation Article

OZAUKEE PRESS THURSDAY, JANUARY 26, 2012 2B

County plows ahead with plan to save farms

■ *Officials say Working Lands Initiative will help retain rural character even as some towns choose not to participate*

By KRISTYN HALBIG ZIEHM
Ozaukee Press staff

Efforts to preserve farmland in Ozaukee County won't be plowed under by the fact that three townships have decided not to participate in the county's Working Lands Initiative, which strives to retain the county's rural character, officials said.

That's because the towns of Port Washington, Saukville and Grafton have each adopted their own measures to retain agricultural lands.

"They just have different ways of approaching the goal of preserving farmland," said Supr. Lee Schlenvogt of the Town of Port Washington, chairman of the Citizen Advisory Committee on the Working Lands Initiative. "It'll produce the same outcome. The only difference is that it won't provide tax credits to the farmer.

"In our township, we have a conservation ordinance that we worked very hard on."

Many of the town's farmers aren't interested in the county farmland preservation program, he noted, but they are interested in conservation subdivisions that, as the name implies, cluster homes on a parcel while preserving outlying lands in perpetuity.

"Just because a town may not want to have a (designated) farmland preservation area does not mean they aren't working to preserve farmland," said Nicole Sidoff, University of Wisconsin-Extension community development coordinator.

The reasons a town decides not to participate in the Working Lands Initiative vary, Sidoff said.

In some townships, the farmers are just not interested in it, perhaps because the tax credits offered are not large enough, she said.

In others, officials believe their ordinances and zoning laws are adequate to preserve as much farmland as possible.

Ozaukee County has been working to meet a state mandate to create a Working Lands Initiative for the past two years and has asked communities to sign on to the legislation.

The plan commissions for the most rural communities in the county — the towns of Fredonia and Belgium — have recommended approving the initiative, but the Town Boards have yet to act on the measure, Sidoff said.

Also considering the initiative is the City of Mequon, which has a significant amount of farmland on its west side, Sidoff said.

The Town of Cedarburg has already approved placing portions of the community in the plan, she added.

The initiative replaces the Farmland Preservation Program adopted in 1983.

"The old program is antiquated," Schlenvogt said. "In today's day and age, it just didn't work."

It was time to update the farmland preservation measure, Sidoff said.

"The last county plan was done in the early 1980s, and obviously the county has changed a lot since then," she said.

In its place, the state has required counties to create a Working Lands Initiative. Ozaukee County's initiative is about three-quarters complete, Sidoff said, adding it is expected to be finished by the end of the year.

The plan is to be updated every 15 years, she said.

The initiative identifies farmland preservation areas in the county based in part on local land-use maps, as well as land evaluations and site assessments, Sidoff said. These preservation areas must be designated by the local municipality as well as the county.

Property owners in these exclusive agricultural areas are then eligible for tax credits of $7.50 an acre, she said.

Unlike the farmland preservation program, if the town later opts out of the initiative, farmers do not have to repay the credits, Sidoff said.

But the initiative is about more than just designating farmland, she said. The plan will also address such issues as niche agriculture and succession planning that are intended to help retain farming in the county.

See **Farmland** *on page 13B.*

Milwaukee Journal Sentinel Dec. 9, 2012 M

LAND CONSERVATION DEAL IN THE WORKS

Town of Fredonia parcel targeted for preservation

DNR moving to acquire wetlands, farmland

By DON BEHM
dbehm@journalsentinel.com

Town of Fredonia — An unnamed stream flows out of publicly owned land at the southwest corner of Jay Road and Highway E, and wraps around a tamarack and white cedar swamp on the west end of a 76-acre property targeted for acquisition by the state Department of Natural Resources.

More than 35 acres of the parcel is wetland, with the conifer trees in the swamp bumping against red osier dogwood in an adjacent shrub-carr. Next to it, the telltale humps of hummock sedge in a wet meadow.

The east end of the property rises to meet Highway E, and offers a panoramic view of lowlands in a broad floodplain valley of the North Branch Milwaukee River, said Dale Katsma, the department's area wildlife supervisor in Plymouth.

The department has an option to purchase the 76 acres from co-owners Arline Brogli of Fredonia and Kathryn Doering of Cedarburg at a cost of $340,000, or nearly $4,474 an acre.

The U.S. Fish & Wildlife Service has approved paying $70,000 of the price with a grant from its North American Wetlands Conservation Act fund. Remaining costs of $270,000 would be paid with bond funds from the state stewardship program.

The Natural Resources Board will act on the proposal at its meeting Wednesday in Madison.

The former Brogli family farm is sandwiched between two publicly owned parcels, Katsma said. State acquisition would expand public access for fishing, trapping, hiking and cross-country skiing to a contiguous block of 181 acres south of Jay Road and west of Highway E.

Conifer swamp on the property offer deer shelter in winter and the varied terrain of the rest of the parcel provide additional wildlife habitat, he said.

Since 2002, the DNR has purchased 744 acres of land and acquired conservation easements on an additional 1,887 acres of farmland where three counties — Ozaukee, Washington and Sheboygan — meet. Conservation easements are permanent deed restrictions and generally prohibit subdivision and development of a property.

A total of 19,500 acres at the tri-county border is within a designated North Branch Milwaukee River Wildlife & Farming Heritage Area. Nine miles of the North Branch and five tributary streams flow through the area.

The North Branch area is a priority for DNR land acquisition and easement purchases, Katsma said.

This is one of the largest remaining pieces of undeveloped land in southeastern Wisconsin and it is only 35 miles from Milwaukee. The area is largely rural so protecting farms under easements will help preserve agricultural production, he said.

Though 41 acres of the former Brogli farm is cropland, around 30%, or 12 acres, are previously drained wetland and could be restored in the future.

Should the state purchase be approved by the Natural Resources Board and Gov. Scott Walker, the DNR plans to continue renting upland acres to local farmers.

Fully 500 feet of stream frontage is on the farm. The unnamed stream merges with another one from the south at Camp Awana Road.

The creek then heads west to meet the North Branch west of Fillmore Road and south of Jay Road in Washington County. The North Branch curves east to empty into the Milwaukee River south of River Road near the unincorporated hamlet of Waubeka.

Preservation effort

The state Department of Natural Resources has offered to purchase 76 acres along Highway E to protect wetlands and preserve farming heritage.

Journal Sentinel

City of Port Washington Coastal Erosion Article[125]

Lack of funds curtails city's bluff study

Community

Written by KRISTYN HALBIG ZIEHM

Wednesday, 18 July 2012 17:41

Without money for soil borings, Port aldermen table next step in battling erosion problem

Port Washington aldermen on Tuesday decided to delay action on a proposal to conduct soil borings on the north bluff, saying they don't have the needed funds to do the work right now.

Although officials had talked about taking the money from the contingency fund, City Administrator Mark Grams said that would wipe out the fund with almost half the year to go.

He suggested the city delay the work until later in the year so officials have a better idea if there will be enough surplus funds to pay for the project or until it can be included in the 2013 budget.

"How long are the bids good for?" he asked.

Delaying the project will also give the city a chance to see how well the recently installed curbs hold back runoff from the bluff, Grams said. "Let's take the opportunity to see where we are," he said.

The city received two proposals for the boring project, Public Works Director Rob Vanden Noven said, adding he did not know how long the low estimate of $14,880 from Giles Engineering would be valid.

The project would include two soil borings to a depth of about 110 feet, Vanden Noven said, and installing piezometers to determine the levels of groundwater in the bluff. The results would be analyzed by the firm, which would also make recommendations on various stabilization measures, such as installing drain wicks and cutting back the bluff.

Ald. Jim Vollmar, who has pushed the city to look into bluff stabilization measures, said it may be prudent to delay the project.

"I think we'd all like to have this done, but if there's no money to do it maybe it would be better to hold it over," he said.

Aldermen directed Vanden Noven to see how long Giles would honor its price, and said they would address the matter again at the council's Aug. 7 meeting.

But several aldermen said the city needs to continue to look at the issue of bluff stabilization.

[125] http://ozaukeepress.com/port-washington/3215-lack-of-funds-curtails-citys-bluff-study

“Our bluff is very important to us for myriad reasons,” Ald. Dan Becker said.

Ald. Joe Dean said the city needs to look at the big picture, adding the issue is a perfect one for the newly formed Environmental Planning Committee to tackle.

“I can’t imagine a higher priority for them,” he said. “I think the timing is right.”

The discussion, he said, could include not only what the city can do long and short-term but also ways to pay for it, including public-private partnerships.

The Ozaukee Washington Land Trust is interested in working with the city on the project, Dean added.

The slumping bluff has plagued the city and beach-goers for decades. In the 1980s and 90s, it wasn’t uncommon for large portions of the bluff to collapse.

In April 1993, a huge mudslide took hundreds of thousands of pounds of earth down the side of the bluff and completely across the beach, leaving a mound of clay-like earth roughly 12 feet high.

Bluff stabilization was a popular topic for years. In 2001, the city commissioned a bluff study by JJR, a firm that specializes in waterfront projects.

The controversial plan proposed by the group called for cutting back the bluff significantly, as well as constructing breakwaters and revetments to protect the base of the bluff at a cost of $4.3 million.

The plan was doomed not just because of the high pricetag but also because many people feared it would require trimming the size of Upper Lake Park too much and destroy the beach below.

Earthquake Article

OZAUKEE PRESS THURSDAY, FEBRUARY 23, 2012 7C

www.ozaukeepress.com

State's earthquakes are science topic

"Earthquakes in Wisconsin — The Dog That Didn't Bark" is the title of a presentation Tuesday, Feb. 28, by David Hart, a hydrogeologist at the University of Wisconsin in Madison.

The program will start at 7 p.m. in Room 113 at the Washington County Public Agency Center, 333 E. Washington St., West Bend.

Wisconsin has had only 18 recorded earthquakes in the last 120 years, with none greater than a magnitude 4. Illinois has had 23 earthquakes in the last 20 years with magnitudes between 3 and 5.

The area around New Madrid, Mo., has had numerous earthquakes, 50 within the last six months, and is where some of the largest earthquakes have occurred in the country. Three magnitude 8 earthquakes occurred there during the winter of 1811-1812.

What is different about Wisconsin? Is it the rocks or something else? In his presentation, Hart will offer some answers to those and other questions.

The program, which is part of the Science for Everyone series sponsored by Riveredge Nature Center and the UW-Milwaukee Field Station at the Cedarburg Bog, is free but a $5 donation is suggested.

To register, call 675-6844 or send an e-mail to fieldstn@uwm.edu.

Bridge Street Dam (Grafton) Upgrade – 1

Dam upgrade plans take shape

Ozaukee Press 12-6-12

■ Village Board sharpens focus on designs that call for flood-control structure

By STEVE OSTERMANN

Ozaukee Press staff

Grafton officials on Monday sharpened their focus on ways to upgrade the Bridge Street dam by directing an engineering firm to prepare two bid packages for renovations.

The Village Board agreed to have Ayres Associates complete design plans for two options to bring the downtown landmark into compliance with state flood-control regulations.

The least expensive option, estimated to cost $675,140, calls for repairing both abutments, widening the spillway and adding a 20-foot-wide stop-log structure on the east side to draw down the reservoir for high-water emergencies and maintenance.

The other option, estimated to cost $812,996, calls for the same repairs plus rebuilding the west-side overlook area. That upgrade would include installing a curved overlook accessed by stairs off Bridge Street, as well as a pool with cascading water.

Both options are eligible for Department of Natural Resources grants that will defray the costs.

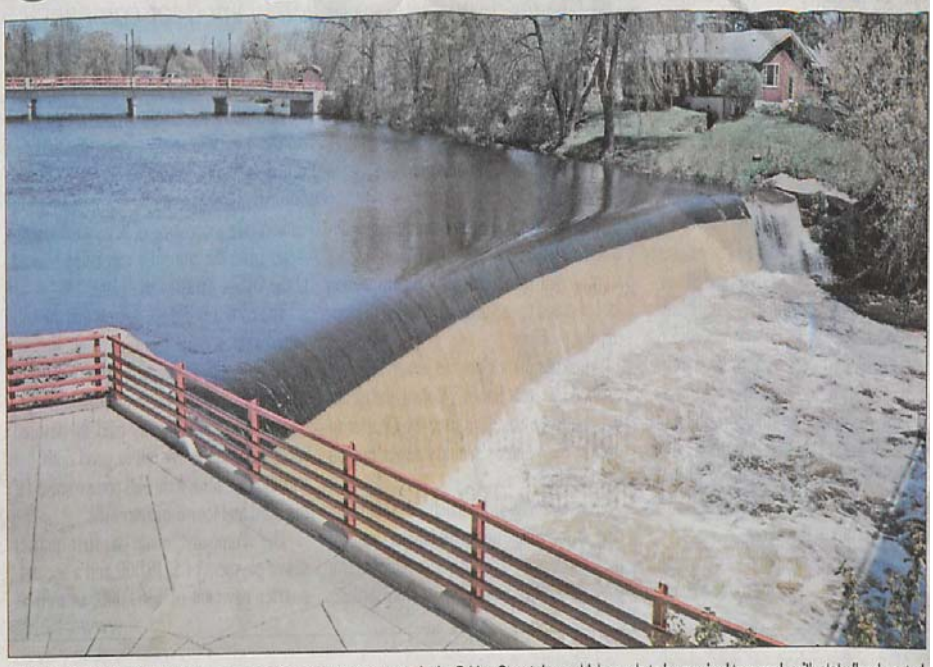
In a presentation to the board, Ayres engineer Chris Goodwin said both designs are expected to meet DNR flood-control standards because of the stop-log structure.

"The cost estimates are middle of the road," Goodwin said.

Although the board did not choose an option, members said they favored the least-expensive upgrades. Several trustees also voiced concern about the appearance of the proposed stop-log structure, which calls for an overhead trolley with a chain hoist to lift the metal logs.

Referring to a photo of a similar device installed at another Wisconsin dam, Trustee Jim Grant said the equipment had an unattractive industrial look.

"It would do the job, but it's ugly," said Grant, who suggested using an alternative design or bringing in equipment on a walkway to move logs when needed.



VILLAGE OF GRAFTON officials are proceeding with plans to upgrade the Bridge Street dam, which needs to be repaired to comply with state flood-control regulations. Preliminary designs for two upgrading options are being finalized and are expected to be submitted to the Department of Natural Resources for approval in January.

Ozaukee Press file photo

suggesting removing the chain hoist could pare $15,000 from the project cost.

However, Village President Jim Brunnquell said the hoist should be retained to ensure an efficient way to operate the structure, which would have two 6-foot-deep rows of logs.

"We've got to have a way to lift the logs. I don't think we should nickel and dime this to death," he said.

"We have to be able to manage this. It's an extension of our park system. We have to be able to manage the dam."

Brunnquell proposed that the hoist be given a decorative look to make it more attractive and blend in with the Milwaukee River setting. Village Administrator Darrell Hofland agreed, suggesting Ayres Associates be asked to include the change in design plans that will be reviewed by the board again before they are submitted to the DNR.

As another option, Goodwin suggested replacing the stop-log structure with a split-leaf gate system that could control water levels without logs or an overhead apparatus. He said that option would add $110,000 to

members to reject the idea.

Pending final board approval of the design options, plans call for the project to be submitted to the DNR in January. Following DNR feedback, the village would seek bids for both options in March and award a bid in April. Construction is expected to begin by summer.

In a report to the board, Village Engineer Dave Murphy cautioned members that no project changes can be made after the designs are bid out. Once bids are received, "the village will have the actual cost difference to determine which alternative would be the best," he said.

The DNR has awarded the village a grant that pays 50% of the first $400,000 of eligible project costs and 25% of the next $800,000, up to a maximum of $400,000.

Based on the current cost estimates, the village would have to pay $431,000 of the $675,410 cost for the basic upgrades or $534,000 of the $812,996 for renovations and the enhanced overlook. Each cost estimate includes a 15% contingency fee, which Goodwin said is standard for projects

Trustee Susan Meinecke voiced concern that the 15% fee was too low, saying the actual project cost could be higher due to unexpected expenses during construction. However, Goodwin said he is comfortable with the estimate as well as with the likelihood that the project will attract a number of bidders.

"There are a lot of contractors in the area," he said.

The village's share of the cost will be covered using funds from its downtown tax incremental financing district, which provides revenue for public improvements.

The dam repairs are included in the 2013 village budget. The project is expected to begin in 2013 because the DNR grant is only good through next year.

In 2009, the village considered razing the dam after the DNR determined the structure failed to meet flood-control standards and had to be upgraded or removed. The razing plan was dropped after a petition drive, led by the Save the Dam Association, forced a 2010 referendum in which residents voted overwhelmingly to preserve the structure until at least 2019.

Bridge Street Dam (Grafton) Upgrade – 2

OZAUKEE PRESS
GRAFTON
Thursday, January 26, 2012

Dam upgrade project raises DNR concerns

■ *Agency says village plan for work on Bridge Street facility should include floodgate, portage route*

By STEVE OSTERMANN
Ozaukee Press staff

The Village of Grafton's plans to upgrade the Bridge Street dam to comply with state flood-control requirements have hit a potential stumbling block.

Six months after an engineering firm submitted preliminary designs for the project to the Department of Natural Resources, agency officials have raised concerns about proposed work to the dam's west abutment.

In a letter to Village Engineer Dave Murphy, DNR water management engineer Tanya Lourigan stated her department wants the dam upgrades to include installing floodgates or flashboards to control water levels.

The department is also urging the village to install a portage route to allow the safe passage of canoes, kayaks and other watercraft around the dam.

In approving a preliminary design for west abutment work last fall, the Village Board decided to reconstruct a masonry wall, reconfigure an overlook area and raise the riverwalk to help alleviate flooding problems. The board rejected plans for a floodgate and portage route to save money.

The current estimated cost of the improvements without gates is $410,000, half of which would be covered by a DNR grant awarded to the village.

The grant would also reimburse the village for a smaller portions of costs over $400,000.

Village Administrator Darrell Hofland said the DNR's latest concerns do not affect the grant, which will be used to defray costs regardless of the eventual scope of the upgrades.

"The DNR's goal is for the village to be able to alter the water level during periods of flooding and to lower water levels in the impoundment if needed," he said.

However, adding a floodgate or flashboard could significantly increase the project cost. Village Engineer Dave Murphy estimated the increases of at least $50,000 for flashboards; $100,000 for stop-log structures; $300,000 for a partial gate; and $500,000 to $700,000 for a full gate.

In her letter, Lourigan said the DNR based its review of the preliminary design on requirements in the state administrative code rather than NR333, a state law regulating dams and flood control.

Hofland said Lourigan was asked to attend the Village Board's Feb. 6 meeting to discuss DNR concerns with the project.

The preliminary design for upgrade work was prepared by Bonestroo (now known as Stantec), which has done other dam-related work for the village. Hofland said the village has yet to hire a firm to do the final design.

Hofland said eight engineering firms have been contacted about the project, and four responded with proposals.

"The village is in the process of interviewing engineering firms and will hire one to design dam repairs based on DNR requirements," he said.

The board will consider a recommendation from Murphy before making a choice.

Original plans called for the abutment upgrades to be completed in 2012. However, work on the project was delayed while the village considered installing a fish passage at the dam and awaited word on its grant application.

The village rejected the $1.6 million fish passage project in September after the DNR decided a trap-and-sort facility had to be included to prevent invasive species and disease-carrying fish from traveling upstream.

The village has until 2019 to ensure the dam meets state flood-control requirements.

Edgewater Court Project (Town of Grafton) - 1

Ozaukee News-Graphic

Tuesday, September 25, 2012

Town of Grafton to assist in drainage project

By Dave Fidlin
News Graphic Correspondent

Grafton — The Grafton Town Board has approved a proposal to contribute $6,275 in work and $1,000 in landscaping toward a drainage project at a residential property, 1618 Edgewater Court.

In other business recently, the board:

■ Awarded an operator's license to Cedarburg resident Mary Robertson to serve alcoholic beverages at Edgewater Golf Club, 1796 W. Cedar Creek Road.

■ Heard an update on weed inspections in the town. Amanda Schaefer, community services manager and town clerk, said she has received "hundreds of calls" from residents about the issue.

The town last month sent notices to residents found in violation of an ordinance calling on property owners to manage the presence of noxious weeds.

Schaefer said about 85 percent of the callers were receptive to the town's letter and willing to work to remedy the issue. The other 15 percent, she said, were "extremely upset."

"It triggers a lot of emotion," Schaefer said.

Note: The first item in this section is a property for which a buy-out was explored but the project did not meet the criteria and was denied grant funding. The Town of Grafton, Ozaukee County and the Edgewater Court residents are still exploring mitigation options in that neighborhood.

Edgewater Court Project (Town of Grafton) – 2

100 Year Flood Plain Near Edgewater Drive, Grafton, WI

Fredonia Dam Removal Project

Officials seek grant for Town of Fredonia dam removal[126]

Kristyna Wentz-Graff
The dam on Crystal Springs Creek in Waubedonia Park in Fredonia is deteriorating and park officials want to remove it so spawning fish can move upstream.

Town of Fredonia - It is a dam without a purpose; the reason for its construction lost to history.

The short stone and concrete dam that impedes the flow of Crystal Springs Creek at Waubedonia Park would be removed early next year, under a proposal by the Ozaukee County Planning and Parks Department.

The dam is no more than 4 or 5 feet tall in the stream bed, but that is large enough to block passage of fish up the creek from the Milwaukee River, said Andrew Struck, director of planning and parks for the county.

Struck is seeking a $50,000 state grant to pay about half the cost of demolition and restoration of a meandering creek channel in the park, as part of the county's program to eliminate barriers to fish passage in the Milwaukee River watershed.

[126] http://www.jsonline.com/news/ozwash/oconomowoc-officials-seek-grant-for-dam-removal-d87kldg-180260921.html

The creek empties into the river less than a stone's throw from the dam.

Waubedonia Park is west of the Village of Fredonia, south of county Highways A and H. It is the oldest county park, established in 1934, and the dam was there at that time, Struck said. There is no report of its construction in state records.

The structure is failing - water pushes through cracks between stones and concrete - and there is no appetite for spending tax dollars on repairs, he said.

The only thing it does is hold back enough water to form a small, shallow pond. Even that has been reduced in size over the years as it fills with soil and sand carried downstream in the creek. The pond is 50 to 70 feet wide and no more than 100 feet long.

At first glance, the narrow and shallow creek flowing through the park does not appear to be big enough to support many large fish from the river. Fish do not need to live there, said Will Wawrzyn, a fisheries biologist with the state Department of Natural Resources in Milwaukee.

Northern pike, bullheads, Iowa darters, pearl dace and central mud-minnows only need to use the creek for a quick dash in late winter and early spring on their annual spawning run, Wawrzyn said.

By removing the dam, those fish would be able to swim up the creek. When the creek floods, the fish could swim outside its banks and get access to 4 or 5 acres of wooded wetland within the park.

The amount of wetland accessible to fish is in short supply now that nearly two centuries of development in southeastern Wisconsin eliminated most of the floodplain meadows and marshes that had existed along the river, according to Wawrzyn.

New spawning habitat

Adding 4 or 5 acres of spawning habitat, though not a large number, would help boost the population of northern pike in the river.

Each acre of seasonally flooded wetland accessible to northern pike for spawning would yield hundreds of juvenile fish, he said. Standing water is needed for about a month.

It takes three to four weeks to go from spawning to hatching of sac fry and development of free-swimming juveniles.

The park dam is southeast of a campground and riverbank picnic area.

A smattering of park users this summer volunteered the opinion they would like to see the dam removed and a more natural, free-flowing creek restored in its place.

The County Board's Natural Resources Committee this month authorized Struck to request the grant from the DNR.

Total cost of the project is estimated at $100,000, Struck, said. The bulk of the cost, about $62,000, would be spent on restoring a meandering stream bank in the park after the dam is removed.

Key pieces of the restoration are replacement of two metal culverts that carry the creek beneath park roads. The culverts are perched above the stream bed and would block fish passage if they were not replaced.

Newburg Dam Removal – 1

Milwaukee Journal Sentinel
JSOnline.com/milwaukee
Sunday, December 4, 2011
B

Spawning support: Demolition of Newburg dam planned

By DON BEHM
dbehm@journalsentinel.com

Newburg — Demolishing the historic dam on the Milwaukee River here would enable fish and other aquatic life to move freely between Grafton and West Bend for the first time since the 1840s, Ozaukee County Planning and Parks Director Andrew Struck said.

Newburg owns the dam and village officials have agreed to demolish the 125-foot-long structure next year under a partnership with Ozaukee County's program to eliminate barriers to fish passage in the Milwaukee River watershed, Struck said.

This is the only dam in the 37-mile stretch of river between the Bridge St. dam at Grafton and the Barton dam at West Bend.

A wooden dam, at county Highway MY, was built at Newburg in the 1840s and rebuilt with concrete in 1913, Struck said.

Ozaukee County has offered to spend up to $650,000 in federal funds next year on the project, from draining a 7-acre impoundment upstream of the dam to removing the 5-foot-tall wall and restoring a natural streambed, Struck said.

Depth of the wide pond varies from 6 inches to 2 feet.

On Tuesday, the County Board's Natural Resource Committee will be asked to take the first step by approving a $44,000 engineering, design and construction oversight contract with Inter-Fluve Inc. of Madison.

Eliminating this barrier would give downstream fish access to the main river channel up to West Bend as well as 33 miles of tributary streams that flow into the river between West Bend and Newburg.

Those tributaries will provide spawning habitat for the fish, Milwaukee Riverkeeper Cheryl Nenn said. The Milwaukee Riverkeeper organization, a member of the Waterkeeper Alliance, supports removing the Newburg dam.

In addition to opening a section of river to the free passage of fish, dam removal would yield significant water quality benefits, according to Nenn.

The dam holds back water in a

Please see NEWBURG, 7B

From page 1

NEWBURG

Ozaukee County has funds to remove dam

shallow, muddy impoundment, she said. As the water warms in summer, nutrients can spur blooms of nuisance algae and oxygen levels can drop so low that fish die.

"A dam is like a blocked artery," Nenn said. "It does not allow the river system to work properly."

Ozaukee County has received more than $7.2 million in federal grants to restore free passage of fish in the Milwaukee River watershed.

The bulk of the money, $4.7 million, came from federal economic recovery act funds administered by the National Oceanic and Atmospheric Administration.

The program has paid for building a fish passage around the Mequon-Thiensville dam and for removing the Lime Kiln dam on the river at Grafton.

Struck has asked NOAA to approve paying for removal of the Newburg dam as an amendment to the county's original plan. Though the dam is in Washington County, the grants given to Ozaukee County allow it to spend the dollars anywhere in the watershed, Struck said.

Funds for the work at Newburg would come out of the $1.6 million earlier allocated for construction of a fish passage around the Bridge St. dam in Grafton, Struck said.

A decision by NOAA is expected by the end of December or early January, and no money would be spent on the Newburg project until the county receives federal approval.

In September, Grafton officials decided not to build the passage after receiving an operating permit from the state Department of Natural Resources.

The state permit would have required the village to trap all fish moving through the passage and sort them by hand — allowing only lake sturgeon to be released to the river upstream of the dam.

The restrictions were aimed at reducing the risk of spreading invasive species, such as round goby and sea lamprey, and fish diseases from the lower river to the upper river beyond Grafton, DNR officials said at the time.

Lake sturgeon would have been allowed to pass around the Grafton dam because the species does not carry viral hemorrhagic septicemia, a fish disease known as VHS.

TOM LYNN / TLYNN@JOURNALSENTINEL.COM

Ozaukee County has offered to spend up to $650,000 in federal grant money to remove the dam on the Milwaukee River under Highway MY in Newburg in 2012 and restore the natural riverbed.

> *"A dam is like a blocked artery. It does not allow the river system to work properly."*
>
> Cheryl Nenn,
> Milwaukee Riverkeeper

Newburg Dam Removal - 2

Wednesday, August 22, 2012 3B

Let it flow: Demolition opens stretch of Milwaukee River

ANGELA PETERSON / APETERSON@JOURNALSENTINEL.COM

Demolition is under way Tuesday on the historic dam on the Milwaukee River at Highway MY in Newburg. Heavy equipment is used to pound the concrete dam and break it apart. Demolition of the 125-foot-long structure will restore a free-flowing stretch of the river between Grafton and West Bend for the first time in 170 years. Newburg officials agreed to demolish the dam in a partnership with Ozaukee County's program to eliminate barriers to fish passage in the Milwaukee River watershed.

Newburg Dam Removal Pictures - 3

Risk Mapping, Assessment and Planning (MAP) Program Invitation

U.S. Department of Homeland Security
536 S. Clark St. 6th Floor
Chicago, IL 60605
FEMA

July 12, 2012

Mr. Robert Brooks
County Board Chairperson, Ozaukee County
121 W Main Street, Post Office Box 994
Port Washington, Wisconsin 53074

Re: Invitation to Attend Community Meetings Regarding Lake Michigan Coastal Flood Risk

Dear Mr. Brooks:

The Federal Emergency Management Agency (FEMA) is conducting a comprehensive study of flood hazards for Lake Michigan and the rest of the United States Great Lakes through FEMA's Risk Mapping, Assessment, and Planning (MAP) Program. Data from this study will eventually be used to convey coastal flood hazard risk through revised Flood Insurance Rate Maps (FIRMs), also known as regulatory products, and new risk planning and assessment products and datasets, also referred to as non-regulatory products and datasets. Please see enclosed Risk MAP Flood Risk Products Fact Sheet. More information about the Great Lakes Coastal Flood Study may be found at http://www.greatlakescoast.org.

The goal of Risk MAP is to support actions that make communities safer from flooding. The Risk MAP program wants to achieve continued improvement of flood hazard information for the National Flood Insurance Program (NFIP); to promote increased awareness and understanding of flood risk; to increase community engagement; and to identify and support actions that local stakeholders can take to reduce natural hazard risks. For additional information on the Risk MAP Program, please visit http://www.fema.gov/plan/prevent/fhm/rm_main.shtm.

The first phase of the Risk MAP process is Discovery. Through Discovery, input provided by communities will help FEMA to better understand local coastal flood risk data and needs, and characterize local conditions that contribute to coastal flood risk.

Your Discovery Meeting is scheduled to occur:

Date/Time:	Thursday, August 16, 2012; 8:30 - 10:30 am CT
Location:	Lakeshore Technical College, Wells Fargo Conference Room
Address:	1290 North Avenue Cleveland, Wisconsin 53015

Please save this date on your calendar. At the meeting, we will review the coastal flood risk data we have gathered to date and discuss your community's coastal floodplains, mitigation plan and projects, coastal flood risk concerns, and coastal floodplain management activities. This discussion will allow us to better identify your community's coastal flood hazard needs and subsequent Risk MAP regulatory and non-regulatory products and datasets that can be delivered during the Risk MAP project. We will also discuss how the coastal flood risks and needs are related to mapping, risk assessment, Hazard Mitigation planning, and grant programs available to eligible communities. To best facilitate this discussion, we would like to request your help in inviting community leaders, emergency managers, GIS specialists, engineers, outreach specialists, and local planners to the meeting. Please RSVP to FEMA's study contractor (STARR) Scott Banjavcic at (312) 780-7755 or email to GreatLakesFloodStudy@starr-team.com no later than **August 3, 2012.** Please reference the Discovery Meeting date and time in your RSVP.

Mr. Robert Brooks
July 12, 2012
Page 2

So that we can better prepare for the upcoming Discovery Meeting, we are asking local communities to participate in an Information Exchange conference call and WebEx. This call will provide an overview of FEMA's Risk MAP program and the Discovery process, and will allow us to review with you our request for the exchange of coastal flood risk and hazard mitigation data, and to learn more about your community's coastal flood hazard risks and needs, in advance of the Discovery Meeting. The partnership and exchange of data between FEMA, the State, and your community is vital to the success of identifying flood risks and needs that may impact your citizens.

The Information Exchange conference call is scheduled to occur:

Date/Time:	Tuesday, July 24, 2012; 10:00 - 11:00 am CT
Link to WebEx:	http://e-meetings.verizonbusiness.com/nc/join.php
Meeting Number:	445288484
Call in number:	1-866-398-2885
Participant Code:	197462

If you or another community representative is unable to attend the Information Exchange conference call, we ask that you fill out and return the enclosed data request form by **August 3, 2012.** This is the same data request form that will be discussed during the conference call. The completed form can be sent to:

Via e-mail:	GreatLakesFloodStudy@starr-team.com
By mail:	Scott Banjavcic CDM Smith/STARR 125 S. Wacker Drive, Suite 600 Chicago, Illinois 60606

We look forward to working with you to reduce the risks associated with coastal flooding and increase your community's resiliency for the long term. To learn more about Discovery, please visit http://www.fema.gov/library and search keywords "Discovery brochure" or contact Ken Hinterlong, FEMA Region V Senior Engineer, at (312) 408-5529, or by email at ken.hinterlong@fema.dhs.gov. We look forward to discussing this with you during the Information Exchange call and/or seeing you at the upcoming Discovery Meeting.

Sincerely,

Christine Stack

Christine Stack
Division Director
Mitigation Division, FEMA Region V

Enclosures: Risk MAP Flood Risk Products Fact Sheet
Community Discovery Coastal Data Request Form

cc: Andy Holschbach, Director, Land and Water Management Department, Ozaukee County
Gary Heinrichs, Wisconsin Department of Natural Resources
Katie McMahan, Wisconsin Department of Natural Resources
Meg Galloway, Wisconsin Department of Natural Resources

Ozaukee County Flood Mitigation Public Information and Brochure

OZAUKEE COUNTY
LAND & WATER MANAGEMENT DEPARTMENT

Andy Holschbach, Director
Edward J. Pfister, Sanitation & Zoning Coordinator
Jeffrey P. Bell, Land & Water Coordinator
www.co.ozaukee.wi.us

September 16, 2011

XXXX
Edgewater Drive
Grafton, WI 53024

Dear XXXX:

Ozaukee County is a participant in the National Flood Insurance Program Community Rating System (CRS). As a result of our county participation in CRS, you should be receiving a 10% reduction in your flood insurance premium. The CRS program has been helpful in building Ozaukee County's floodplain management strategy.

As part of our strategy to assist landowners in areas of flooding, Ozaukee County has established on the homepage of the County website, a link to River Gauge information http://www.co.ozaukee.wi.us/index.htm . In the event of a flood, the river level information will be provide actual and predicted water levels for your reach of the Milwaukee River. I suggest you become familiar with the site as it will provide you with valuable information.

Enclosed is a brochure, *Ozaukee County Flood Information*, which also contains valuable information.

Lastly, I wanted to mention that I will be discussing the State Municipal Flood Control Program further with the Town of Grafton. This state program provides funds for acquisition and demolition in floodprone areas. The program is similar to the Flood Hazard Mitigation Grant Program which we had worked with you on this summer. This grant would require the Town of Grafton to be the applicant. Applications are due March 15.2012. The state has appropriated $3.12 million for this program. I will keep you informed as more information becomes available for this program.

Please contact me if you have any questions or concerns regarding this correspondence.

I will be in touch. Thanks.

Sincerely,

Andy Holschbach
Director

Cc: Mark Owen, Ozaukee County Emergency Management

121 W. Main Street, P.O. Box 994, Port Washington, WI 53074
Phone: (262) 284-8270 Metro: (262) 238-8313 Fax: (262) 284-8278 Metro Fax: (262) 238-8367

OZAUKEE COUNTY
LAND & WATER MANAGEMENT DEPARTMENT

Andy Holschbach, Director
Edward J. Pfister, Sanitation & Zoning Coordinator
Jeffrey P. Bell, Land & Water Coordinator
www.co.ozaukee.wi.us

September 27, 2012

See attached mailing list

Dear :

Ozaukee County is a participant in the National Flood Insurance Program Community Rating System (CRS). As a result of our county participation in CRS, you should be receiving a 10% reduction in your flood insurance premium. The CRS program has been helpful in building Ozaukee County's floodplain management strategy.

As part of our strategy to assist landowners in areas of flooding, Ozaukee County has established on the homepage of the county website, a link to river gauge information http://www.co.ozaukee.wi.us/index.htm . In the event of a flood, the river level information will provide actual and predicted water levels for your reach of the Milwaukee River. I suggest you become familiar with the site, since it will provide you with valuable information.

Enclosed is a brochure, *Ozaukee County Flood Information*, which also contains valuable information.

Finally, I wanted to mention that the State Municipal Flood Control Program is still under consideration as a potential program to assist with acquisition and demolition in flood prone areas. Applications for this program are due March 2014. This state program is similar to the Flood Hazard Mitigation Grant Program about which we contacted you in 2011. This grant would require the Town of Grafton to be the applicant. I will be in touch with you as more information becomes available from the state.

Please contact me if you have any questions or concerns regarding this correspondence. Thanks!

Sincerely,

Andy Holschbach
Director

enclosure
cc: Mark Owen, Ozaukee County Emergency Management

121 W. Main Street, P.O. Box 994, Port Washington, WI 53074
Phone: (262) 284-8270 Metro: (262) 238-8313 Fax: (262) 284-8278 Metro Fax: (262) 238-8367

Ozaukee County FLOOD INFORMATION

FLOOD HAZARD AREAS

For planning and regulatory purposes, floodplains are defined as those areas subject to inundation by the 100-year recurrence interval flood event. This flood event has a 1 percent chance of being equaled or exceeded in any given year.

Floodplains in Ozaukee County were identified as part of the Ozaukee County Flood Insurance Study (FIS) and the accompanying Flood Insurance Rate Map (FIRM).

Information on whether your property is in the 100-year floodplain in the unincorporated area can be obtained by contacting the County Land & Water Management Department or viewing information from the Ozaukee County website at http://ozaukeeco.mge.ruekert-mielke.com/. If you live in a village or City you should contact the respective municipal office. Maps are available to look at as well as other flood-related information. The Land & Water Management Department has Elevation Certificates for new development available as well. Contact the Land & Water Management Department at (262) 284-8313 or 238-8313 for further assistance.

FLOOD SAFETY

The following common sense guidelines can help you from the dangers of flooding:

- Do not drive through a flooded area. More people drown in cars than any where else. Do not drive around barriers.
- Do not walk through flowing water. Currents can be deceptive. Six inches of water can knock you off your feet.
- Stay away from power lines and electrical wires. If your house is about to be flooded, turn off the power at the service box. Electrical current can travel through water. Electrocution is the 2nd leading cause of death during floods.
- Be alert to gas leaks. Turn off the gas to your house before it floods. If you smell gas, report it to a municipal official or your gas company. Do not use candles, lanterns or open flames if you smell gas or are unsure if your gas has been shut off.
- Keep children away from the flood waters, ditches, culverts and storm drains. Flood waters can carry unimaginable items that have dislodged themselves. Culverts may suck smaller people into them rendering them helpless.
- Clean everything that has been wet. Flood water will be contaminated with sewage and other chemicals which pose severe health threats.
- Look out for animals, especially snakes. Small animals that have been flooded out of their home may seek shelter in yours.
- Do not use gas engines, such as generators, or charcoal fires **indoors** during power outages. Carbon monoxide exhaust can pose serious health hazards.

PROPERTY PROTECTION MEASURES

If your property is susceptible to flooding, there are many flood damage reduction measures you can employ.

- Watertight seals can be applied to brick and block walls to protect against low-level flooding.
- Utilities such as heating and air conditioning systems, water heaters and other major appliances can be elevated to higher floors in the structure or on raised platforms.
- Temporary measures such as moving furniture and other valuables to higher floors or sandbagging exterior openings will also help.
- Elevating or relocating the entire structure may also be a feasible option.

FLOODPLAIN PERMIT REQUIREMENTS

All development within the 100-yr. floodplain (not just construction of buildings, but filling, excavation, etc.) is required to obtain a County Conditional Use Permit. Applications must be made prior to doing any work in a floodplain area. Please contact the Land & Water Management Department to receive all the information you will need in order to properly develop in the floodplain at (262)284-8313 or 238-8313. You may report any illegal development activities to the above number as well.

SUBSTANTIAL IMPROVEMENT/DAMAGE

The National Flood Insurance Program (NFIP) requires the entire building to be brought up to current floodplain management standards if the cost of improvements to a building or the cost to repair damages (from any cause) to a building exceeds 50% of the market value of the building (excluding land value). Building improvement projects include exterior and interior remodeling, rehabilitation, additions and repair and reconstruction projects. Additionally, the cost of currently planned improvements will be added to the cost of previously made improvements and compared to the existing market value to determine if the improvements exceed 50% of the structure's value. Please contact the Land & Water Management Department at (262) 284-8313 or 238-8313 for further information.

FLOOD INSURANCE

If you do not have flood insurance, talk to your insurance agent. Most homeowner's insurance policies do not cover damage from floods. Flood insurance is only available to those participating communities in the National Flood Insurance Program (NFIP). Because of our floodplain management programs that attempt to protect us from the multiple flooding hazards, Ozaukee County is part of the NFIP and thus, residents are able to obtain flood insurance. Additionally, because the County participates in FEMA's CRS program, flood insurance premiums are discounted.

Be sure to check your policy to ensure you have adequate coverage. Usually these policies cover the building structure, but not the contents. Contents coverage can also be obtained by asking. There is a 30-day waiting period before flood insurance coverage becomes effective. Plan ahead; do not wait until a flood is predicted before purchasing flood insurance.

If you are building inside the floodplain, the purchase of flood insurance is mandatory if using a federally regulated/insured bank for a loan.

NATURAL & BENEFICIAL FUNCTIONS

Floodplains play a valuable role in providing natural and beneficial functions to the area. Floodplains that are relatively undisturbed provide a wide range of benefits to both human and natural systems. These benefits provide aesthetic pleasure as well as function to provide active processes such as filtering nutrients. Floodplains are used as a means to filter farm chemical run-off so that these areas can maintain bio-diversity and ecosystem sustainability. Some floodplains contain historic and archeological sites that provide opportunity for education and study. Floodplains enhance waterfowl, fish and other wildlife habitats and provide feeding/breeding grounds. And lastly, floodplains provide natural erosion control and open space so further flooding damage does not occur.

DRAINAGE SYSTEM MAINTENANCE

As simple as it may sound, simply keeping smaller ditches and streams free of debris can dramatically improve the run-off capacity of low-lying areas, as well as greatly reduce the occurrence blockage that significantly contributes to flooding. It is illegal to dump materials into a required waterway and violators may be fined.

FLOOD WARNING SYSTEM

Many times, flooding along the Milwaukee River and Cedar Creek can be predicted (give time of advance warning) in advance, giving ample warning for preparation and evacuation. The Milwaukee River and Cedar Creek gauge information is available at http://www.co.ozaukee.wi.us/index.htm which provides actual and predicted flood height information. However, in the event of a flash flood due a large rain event, you may be the first to notice the oncoming situation and have only hours to execute your plan. Notify the County Sheriff Department. Emergency information will be made available on the local radio and TV stations.

ADDITIONAL INFORMATION

If you should require further or more detailed information regarding flood-related issues in Ozaukee County, here are some additional sources:

- FEMA.gov website
- Ozaukee County Land & Water Management Department
  (262) 284-8313 or 238-8313
  121 W. Main Street
  Port Washington, WI 53074
- Floodplain Information on the http://www.co.ozaukee.wi.us/LandWaterManagement/

Mequon Tornado Siren Project - 1

Nov. 6 '14 Ozaukee

News Graphic / Page A7

Tornado siren to be moved after complaints

By Gary Achterberg
News Graphic Staff

Mequon — One of the city's new tornado sirens that drew complaints when it was placed near the entry to a business park will be moved to a more unobtrusive location.

Members of Mequon's public works committee voted unanimously on Oct. 30 to move the siren from a cul-de-sac on Enterprise Drive to the north side of River Barn Park on North Cedarburg Road. It will be located just east of the cemetery behind the tree line.

Moving the siren will cost the city $12,650. Committee members considered five different options for moving the siren. Some also would have had additional electrical expenses of up to $5,400; the selected option would not.

adjacent business voiced concern to the city about the aesthetics of where it was located and that it could impact future access and development at the property.

In an effort to accommodate the concerns, city staff looked for alternate locations that would provide adequate coverage and be less obtrusive.

The city recently undertook a $272,914 project to replace the aging system of seven tornado warning sirens. One of the sirens is in Thiensville; the village paid the $32,586 cost of that siren. The project came in nearly $100,000 under what initially was budgeted, said Nathan Check, the city's engineer and director of public works.

The new sirens replaced a 30-year-old system. Several of those sirens no longer worked and replacement parts were unavailable. The work was completed early this summer by American Signal Corp., which submitted the low bid for the project approved by the common council last December.

Four of the sirens were put in the same place as the old ones. Of the three that were moved, the one placed on city right-of-way on Enterprise Drive prompted a complaint. That siren had been moved about 750 feet southeast of where it had previously been located immediately adjacent to Gen Metals, 10245 N. Enterprise Drive.

The previous siren location posed maintenance and liability issues. The alternate location was picked because it was in the city right-of-way and also near an electrical source. After the siren was installed, the owner of the

In other business

In other action, committee members:

■ Decided not to take action on a residents' request for the city to put up a street light at the intersection of River Road and Madero Drive. A city memo said the resident was concerned that children were waiting for the school bus at that corner in the dark. The only person to appear at the meeting was a homeowner who said his property bordered the corner. He said the streetlight wasn't necessary, that he was concerned about light seeping into his home at night and that he did not think there were any safety issues.

Installation of the light would have cost $428 and monthly electrical costs would have been approximately $15, the memo said.

The city has approximately 250 street lights; most of them are on West Mequon Road and North Port Washington Road.

■ Approved changing the name of a street in the city from Greenbriar Lane to Greenbrier Lane. The name of the street was spelled incorrectly on a subdivision plat filed in 1979. A nearby condominium development uses the name with an "e." The homeowners association paid the costs associated with making the change.

■ Conducted a brief, informal discussion of the state Department of Transportation's long-range plans for development of Mequon Road from Pilgrim Road in Germantown to Wauwatosa Road in Mequon. The discussion centered on the possible development of a roundabout at the intersection with Wauwatosa Road.

(Gary Achterberg can be reached at gachterberg@conleynet.com.)

Mequon Tornado Siren Project - 2

aphic OZAUKEE PEOPLE Tuesday, December 20, 2011

Mequon to replace warning sirens

Seven new sirens to be installed for $261,500

By Gary Achterberg
News Graphic Staff

Mequon — The aging early warning siren system that alerts residents of Mequon and Thiensville to severe weather and other hazardous conditions will be replaced this spring.

The Mequon Common Council on Dec. 13 approved the low bid of Milwaukee-based American Signal Corp. to install seven sirens at a cost of $261,500. One of the sirens will be located in Thiensville; the village will pay $32,586 of the cost.

While most expenses, including installation, the wooden poles, training and removing the old system, are included in the bid, there are several other expenses, including electrical work, that will bring the city's total cost – after Thiensville's share – to $251,414.

The new sirens will be installed by June, said Nathan Check, the city's director of public works.

"This project will result in significant improvements to the performance and reliability of the city's emergency notification system while providing complete coverage throughout the city," Check said.

Many of the seven current radio-controlled sirens in the city are more than 30 years old. Just this year, the city has experienced operation failure with five of the sirens. Three don't work right now because the city is waiting for parts and service.

The city has spent $6,000 for repairs over the past three years, not including the sirens that now don't work. The current system also is outdated. The wide-band radio frequency that it uses will no longer be supported due to new federal narrow-band requirements. The current system can't be updated to those requirements.

> *"This project will result in significant improvements to the performance and reliability of the city's emergency notification system while providing complete coverage throughout the city."*
>
> — *Nathan Check, Mequon director of public works*

The new sirens will provide sound-level coverage of 75 decibels, which is what is recommended by the Ozaukee County Emergency Management Office and slightly louder than the 70 decibel federal emergency warning system recommendation.

A "significant portion" of the city now is not covered or has very limited coverage by the sirens, Check said in a memo to the common council.

There is no state or federal mandate for emergency warning sirens, but many local communities provide them because they recognize that it provides a valuable notification tool in an emergency, Check added.

The money for the project has been saved over the past few years through appropriations to a sinking capital fund.

Check said Thiensville will be able to at least control its siren and possibly have the capability of activating all of the sirens, if that would be necessary in an emergency. It also means that with the new equipment, it still will be possible for the village to sound its siren daily at noon, which it has done for years.

(Gary Achterberg can be reached at gachterberg@conleynet.com.)

Village of Grafton Utility Station - 1

GRAFTON
QUALITY LIFE, NATURALLY.

September 13, 2011

Sharon L. Chrusniak
671 N. Port Washington Road
Grafton, WI 53024

Dear Ms. Chrusniak:

The Village of Grafton has received a request to amend the 2035 Comprehensive (Master) Plan Land Use Map. As the owner of property adjacent to the area of the proposed amendment, you are hereby officially notified of the required public hearing to review the request:

NOTICE IS HEREBY GIVEN that a Public Hearing will be held before the Plan Commission of the Village of Grafton on **Tuesday, September 27, 2011, beginning at 6:00 p.m.**

The first matter for public review is a proposed amendment to the 2035 Comprehensive (Master) Plan Land Use Map, as requested by Pat Adams-agent for WeEnergies and property owners Paul and Jill Christensen, as follows: Modifying the land use options for a 3.06 acre parcel, to be created from the parcel known as Lot 1, CSM 1785, located at 695 Port Washington Road. The newly created Outlot will be located at the western edge of the property. The proposed land use amendment is from the current Agricultural use designation to an Institutional use designation. The Institutional land use designation only covers the proposed Outlot. (A copy of the map showing the location of the area of land use amendment is enclosed for your review.) *Note: This property has been petitioned for annexation from the Town of Grafton to the Village of Grafton by the property owners.*

This public hearing will be held in the Board Room at Grafton Village Hall, 860 Badger Circle, Grafton, WI 53024.

If you have any questions on this matter, please contact Director of Planning and Development Michael Rambousek at (262) 375-5303 or mrambousek@village.grafton.wi.us

Sincerely,

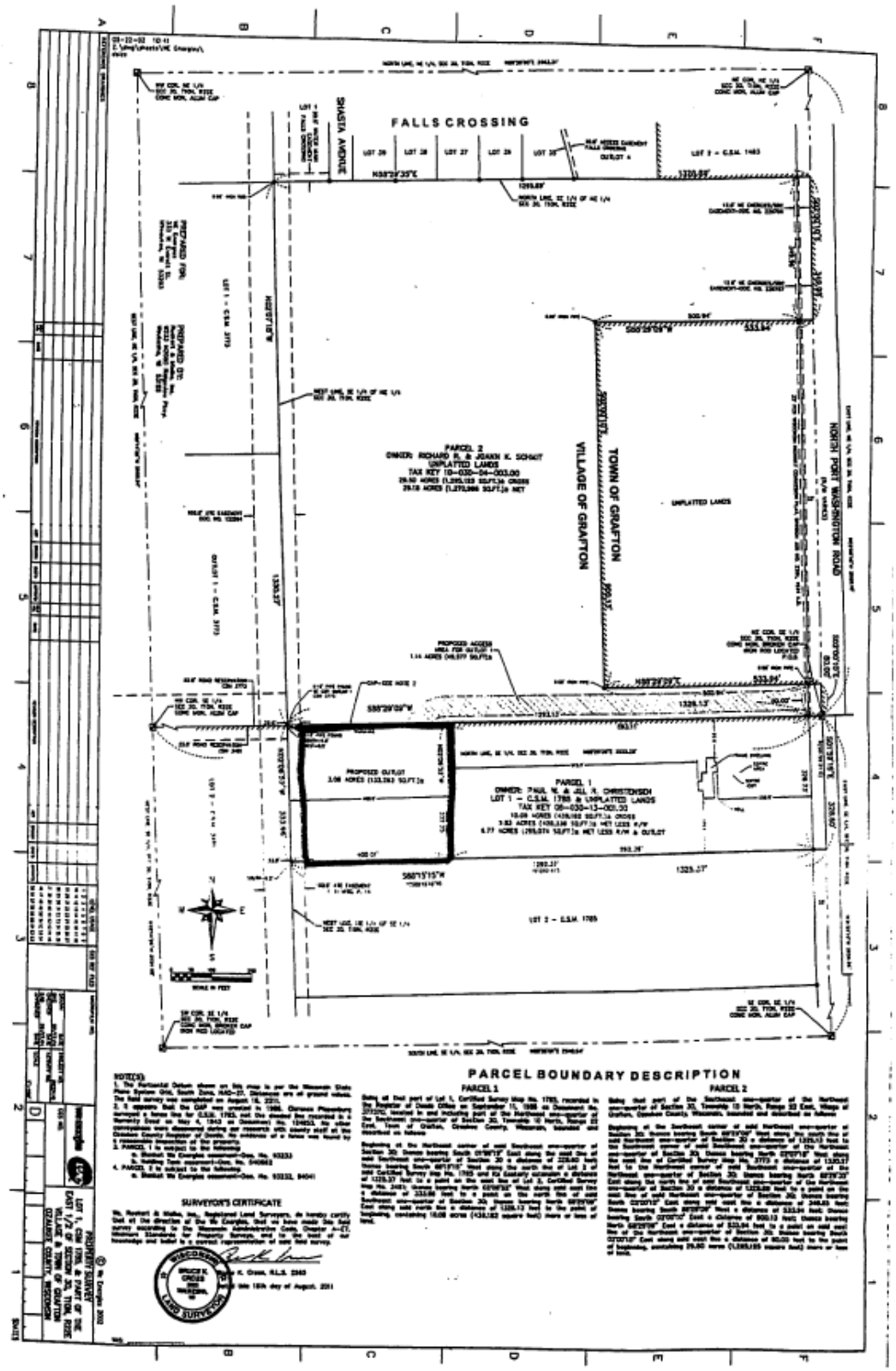
Teri J. Dylak

Teri J. Dylak, CMC
Village Clerk

Enc.

Village of Grafton • Office of the Village Clerk • 860 Badger Circle • Grafton, WI 53024
p (262) 375-5300 • f (262) 375-5312 • tdylak@village.grafton.wi.us

Village of Grafton Utility Station - 2



Appendix G: Community Input

Ozaukee County believes in the importance of gathering public input from interested parties in the community. To achieve this goal, the Emergency Management Office took every opportunity available to utilize various methods to publicize the opportunity for people to participate in the planning process and to gather input from interested parties. The table that follows outlines the major opportunities that were created to discuss the plan. The table includes dates of workgroup meetings, meetings with public officials and media opportunities for the all-hazards pre-disaster mitigation plan.

DATE	SUMMARY OF OPPORTUNITY
Oct. 2011	Letter requesting that municipalities and applicable county departments send a representative to the hazmit workgroup meetings.
10/17/2011	Memo to the city, village and town leaders informing the public of the hazmit plan update process and requesting that they complete and submit a hazmit survey to the County EM office.
11/14/2011	Initial press release informing the public of the hazmit plan update process.
12/15/2011	Article in the newspaper informing the public of the hazmit plan update process.
2/17/2012	Hazard Vulnerability Analysis/PDM Assessment meeting
2/28/2012	Hazmit workgroup planning meeting.
3/29/2012	Hazmit workgroup planning meeting.
5/7/2013	Ozaukee Co. EM director met with Roger Strohm (Village of Fredonia) to complete the hazmit survey and to select hazmit strategies for the plan.
6/6/2013	Legal public notice printed in the Ozaukee Press newspaper.

One of the main ways people were made aware of the plan was the publication of a brochure (following) that was widely distributed in the public buildings around the community including the City/County Courthouse and the library. The purpose of this brochure was to provide a general overview of the mitigation planning process, the impetus for planning and the scope of the final result.

PRESS RELEASE

1201 S. Spring St.- Port Washington, WI 53074-www.co.ozaukee.wi.us

FOR IMMEDIATE RELEASE
November 14, 2011

Contact: Mark Owen, Emergency Management Director

OZAUKEE COUNTY STARTS HAZARD MITIGATION PLAN UPDATE

(Port Washington, WI) Ozaukee County, like the rest of the State of Wisconsin, is vulnerable to a variety of disasters. Wisconsin has incurred disaster-related damages totaling $3 billion in the last three decades but future losses can be reduced through mitigation activities. A recent study by the Multihazard Mitigation Council shows that each dollar spent on mitigation saves society an average of four dollars. Since 1993 more than 400 disasters have occurred in the United States, affecting communities in all 50 states, costing the country over $500 million dollars per week and killing over 24,000 people.

Mitigation actions reduce or eliminate the long-term risk to human life and property from hazards. These preventative actions can be as simple as elevating a furnace in a basement that sometimes has water on the floor. Mitigation can also have a comprehensive approach such as relocating buildings out of the floodplain or strengthening critical facilities to prevent wind damage and provide stronger shelter.

In an effort to better prepare Ozaukee County to manage its vulnerability to disaster, Mark Owen, Ozaukee County Emergency Management Director, applied for and received a Pre-Disaster Mitigation (PDM) planning grant. This goal of this project is to complete an approvable plan update, which will serve as a roadmap that outlines potential cost-effective hazard mitigation activities, some of which might be available for future grant funding. Hazard mitigation plans and projects reduce overall risks to the population and structures while also reducing reliance on funding from actual disaster declarations. For example, the rigorous building standards adopted by 20,000 communities across the country are saving the nation more than $1.1 billion a year in prevented flood damages.

The plan is designed to look at the risks and vulnerabilities that the county faces from natural disaster and to develop mitigation strategies that might reduce future losses. As part of this planning process, Owen is assembling a workgroup to review and guide the planning activities. The workgroup is reviewing initial background information about Ozaukee County and has begun identifying strategies that might help.

Owen stated, "I am very excited about this part of the planning process. The input from the workgroup can have long-lasting impacts, making Ozaukee County safer and more disaster-resistant."

FEMA has recognized the importance of having members of the community involved in the process and Owen would like to ensure that all interested members of the community have an opportunity to provide input into the plan. If you are interested in more information about the plan or would like to provide input into the plan, please contact Mark Owen at (262) 238-8397.

###

County receives disaster mitigation grant

Port Washington — Ozaukee County Emergency Management Director Mark Owen applied for and received a Pre-Disaster Mitigation Planning grant to help manage the county's vulnerability to disasters.

The goal of the project is to complete an approvable plan update, which will serve as a roadmap outlining potential cost-effective hazard mitigation activities, some of which might be available for future grant funding.

Wisconsin has incurred disaster-related damages totalling $3 billion in the last 30 years. Activities as simple as elevating a basement furnace can help to lower future costs. A recent study by the Multihazard Council shows that each dollar spent on mitigation saves society an average of $4.

Mitigation actions reduce or eliminate the long-term risk to human life and property from hazards. Hazard mitigation plans and projects reduce overall risks to the population and structures while also reducing reliance on funding from actual disaster declarations.

For example, the rigorous building standards adopted by 20,000 communities across the country are saving the nation more than $1.1 billion a year in prevented flood damages, according to an Ozaukee County Emergency Management press release.

The plan is designed to look at the risks and vulnerabilities that the county faces from natural disaster and to develop mitigation strategies that might reduce future losses. As part of this planning process, Owen is assembling a workgroup to review and guide the planning activities. The workgroup is reviewing initial background information about Ozaukee County and has begun identifying strategies that might help.

"I am very excited about this part of the planning process," Owen said. "The input from the workgroup can have long-lasting impacts, making Ozaukee County safer and more disaster-resistant."

The Federal Emergency Management Agency has recognized the importance of having members of the community involved in the process and Owen would like to ensure that all interested members of the community have an opportunity to provide input into the plan. For more information about the plan or to provide input into the plan, contact Owen at 238-8397.

Date: 17 October 2011
To: Town, Village or City Leader
From: Mark Owen, EM Director
Re: Pre-Disaster Mitigation (PDM) Plan

Ozaukee County, like the rest of the State of Wisconsin, is vulnerable to a variety of disasters. Wisconsin has incurred disaster-related damages totaling $3 billion in the last three decades but future losses can be reduced through mitigation activities. A recent study by the Multi-hazard Mitigation Council shows that each dollar spent on mitigation saves society an average of four dollars. Since 1993 more than 400 disasters have occurred in the United States, affecting communities in all 50 states, costing the country over $500 million dollars per week and killing over 24,000 people.

Mitigation actions reduce or eliminate the long-term risk to human life and property from hazards. These preventative actions can be as simple as elevating a furnace in a basement that sometimes has water on the floor. Mitigation can also have a comprehensive approach such as relocating buildings out of the floodplain or strengthening critical facilities to prevent wind damage and provide stronger shelter.

In an effort to better prepare Ozaukee County to manage its vulnerability to disaster, Ozaukee County Emergency Management applied for and received a PDM planning grant. This goal of this grant is to complete an approvable plan update, which will serve as a roadmap that outlines potential cost-effective hazard mitigation activities, some of which might be available for future grant funding. The plan is designed to look at the risks and vulnerabilities that the county faces from natural disaster and to highlight mitigation strategies that might reduce future losses to life and property. As part of this planning process, **I need your help.**

The first step is asking that you please place an item on your **next** municipal meeting agenda to complete the attached survey. This very short survey will help us to identify the concerns that you have in your municipality and to capture ideas that you have for making your community safer and more disaster resistant. Please return your completed surveys to our consultant as soon as possible but **no later than December 2nd**:

Lenora Borchardt
EPTEC, Inc.
7027 Fawn Lane
Sun Prairie, WI 53590-9455
FAX: 608-834-0802

After receiving your surveys, the information will be incorporated into the draft plan, which is being guided by a workgroup of interested agencies and public members. I would like to extend an offer for anyone from your leadership council, your municipal staff or your general community to contact me if they would like to join the workgroup.

Finally, after the workgroup has a final draft, we will be sending copies of the plan to each of you for final review and adoption. It is important to note two things:

- Adoption of this plan will not cost your community anything. You will not be committing to completing any of the projects listed; instead it is a list of triaged ideas that can be accomplished should the funding and desire to complete them become available.
- If you do not adopt this plan, your community will not be eligible to apply for and receive mitigation project funding in the future.

Let me thank you in advance for the assistance that you are providing. This small investment of your time will help make our community a safer, healthier and more disaster-resistant community for years to come.

If you are interested in more information about the plan or would like to provide input into the plan, please feel free to contact me at (262) 238-8397 or by email at mowen@co.ozaukee.wi.us.

OZAUKEE COUNTY NATURAL HAZARDS PREPAREDNESS AND MITIGATION QUESTIONNAIRE

1. In the past five years, has your community experienced a natural disaster such as a severe windstorm, flood, wildfire, earthquake, etc.?
   - o No (If NO, skip to Question 2)
     - o Town of Belgium
     - o Town of Fredonia

   If YES, which of these natural disasters occurred? (Please check all that apply.)

Event	When event last occurred:				
	Within past year	1-5 years ago	5-15 years ago	More than 15 years ago	Never
Drought	V. of Fredonia			V. of Belgium V. of Saukville	C. of Port Washington
Dust Storm					C. of Port Washington V. of Belgium V. of Fredonia V. of Saukville V. of Thiensville
Earthquake				V. of Saukville	C. of Port Washington V. of Belgium V. of Fredonia V. of Thiensville
Flood		V. of Belgium V. of Fredonia V. of Saukville V. of Thiensville V. of Thiensville PD	V. of Thiensville	C. of Port Washington V. of Thiensville	
Lakeshore Erosion	C. of Port Washington-ongoing		V. of Thiensville		V. of Belgium V. of Fredonia V. of Saukville
Landslide/ Debris Flow		C. of Port Washington			V. of Belgium V. of Fredonia V. of Saukville V. of Thiensville
Wildfire				V. of Saukville	C. of Port Washington V. of Belgium V. of Fredonia V. of Thiensville
Windstorm/ Tornado		V. of Saukville	V. of Thiensville	C. of Port Washington V. of Belgium V. of Thiensville V. of Thiensville PD	V. of Fredonia
Severe Winter Storm	C. of Port Washington V. of Fredonia V. of Saukville V. of Thiensville PD	V. of Fredonia V. of Thiensville	V. of Belgium V. of Thiensville	V. of Thiensville	

2. For which of the following natural disasters do you think your community is at risk? (Check the appropriate box for each hazard.)

Event	Extremely Concerned	Very Concerned	Concerned	Somewhat Concerned	Not Concerned
Drought			V. of Belgium V. of Fredonia	C. of Port Washington V. of Saukville T. of Fredonia	V. of Grafton V. of Thiensville
Dust Storm					C. of Port Washington V. of Belgium V. of Fredonia V. of Grafton V. of Thiensville T. of Fredonia
Earthquake				C. of Port Washington V. of Thiensville	V. of Belgium V. of Fredonia V. of Grafton V. of Saukville T. of Fredonia
Flood	V. of Saukville	C. of Port Washington V. of Saukville V. of Thiensville V. of Thiensville PD	V. of Belgium V. of Fredonia	V. of Grafton T. of Fredonia	
Lakeshore Erosion			C. of Port Washington	V. of Thiensville	V. of Fredonia V. of Grafton V. of Saukville T. of Fredonia
Landslide/ Debris Flow			V. of Saukville	C. of Port Washington T. of Fredonia	V. of Belgium V. of Fredonia V. of Grafton V. of Thiensville
Wildfire				C. of Port Washington V. of Fredonia V. of Saukville T. of Fredonia	V. of Belgium V. of Grafton V. of Thiensville
Windstorm/ Tornado	V. of Saukville	C. of Port Washington V. of Belgium V. of Saukville V. of Thiensville PD	V. of Grafton V. of Thiensville T. of Fredonia	V. of Fredonia	
Severe Winter Storm/ Ice Storm	V. of Saukville	C. of Port Washington V. of Belgium V. of Saukville V. of Thiensville PD	V. of Fredonia V. of Grafton V. of Thiensville T. of Fredonia		

3. Has your community had damage to facilities or infrastructure (e.g., roads, public buildings, utilities?)
4.

Cities

- *Power lines down, some road damage from flooding, structural damage from microbursts – City of Port Washington*

Villages

- *Not yet – Village of Belgium*
- *Yes, due to floods. Damage to public works garage, Fredonia Avenue (Co. Hwy. A), side streets and parkland. – Village of Fredonia*
- *Yes, damage from lightning strikes – Village of Grafton*
- *2008 Flood – utilities and roads – Village of Saukville*
- *Yes, roads, public buildings, sewer utility, picnic tables, erosion of river bank – Village of Thiensville*
- *Yes – past floods have damaged roads, sanitary sewers, storm sewers, and buildings in our village park. Wind storms have damaged village signs, utility poles and village trees – Village of Thiensville Police Dept.*

Towns

- *No – Town of Belgium*
- *Some washouts and culverts, flooded roads – Town of Fredonia*

5. What facilities or infrastructure in your community do you think are especially vulnerable to damage during a natural disaster?

Cities

- *Primary power transmission towers & lines, leaving the WE Energies power plant – City of Port Washington*

Villages

- *Sewer system, waste water system, storm sewer system – Village of Belgium*
- *Roads. Pedestrian bridge. Culverts (e.g., Fredonia Ave.; cross street Fillmore at railroad tracks). – Village of Fredonia*
- *The water utilities and towers, cellular towers, computer equipment – Village of Grafton*
- *Utilities and roads – Village of Saukville*
- *Roads, public buildings, sanitary sewer, property in the open (street lights, traffic lights, street signs, picnic tables, signs for buildings), squads, public works vehicles and tools – Village of Thiensville*
- *Buildings in our village park; sanitary & storm sewer lines – Village of Thiensville Police Dept.*

Towns

- *Tornado damage – Town Government Center/Recycling Center – Town of Fredonia*

6. How important do you think each of the following projects are in mitigating (i.e., lessening the impacts of) a natural disaster in your community?

Project	Very Important	Somewhat Important	Neutral	Not Very Important	Not Important
Protecting private property	V. of Belgium V. of Saukville V. of Thiensville V. of Thiensville PD T. of Belgium	C. of Port Washington V. of Grafton T. of Fredonia	V. of Fredonia		
Protecting critical facilities (hospitals, fire stations, etc.)	C. of Port Washington V. of Belgium V. of Fredonia V. of Grafton V. of Saukville V. of Thiensville V. of Thiensville PD T. of Belgium	T. of Fredonia			
Preventing development in hazard areas	T. of Belgium	C. of Port Washington V. of Fredonia V. of Saukville V. of Thiensville V. of Thiensville PD T. of Fredonia	V. of Belgium	V. of Grafton	
Enhancing the function of natural features (streams, wetlands)	V. of Thiensville PD	C. of Port Washington V. of Belgium V. of Fredonia V. of Thiensville T. of Fredonia	V. of Grafton V. of Saukville T. of Belgium		
Protecting historical and cultural landmarks	C. of Port Washington T. of Belgium	V. of Belgium V. of Thiensville V. of Thiensville PD	V. of Fredonia V. of Saukville T. of Fredonia	V. of Grafton	
Promoting cooperation among public agencies, citizens, non-profit organizations and businesses	C. of Port Washington V. of Belgium V. of Fredonia V. of Thiensville V. of Thiensville PD	V. of Grafton V. of Saukville T. of Belgium	T. of Fredonia		
Protecting and reducing damage to utilities	C. of Port Washington V. of Belgium V. of Fredonia V. of Grafton V. of Saukville V. of Thiensville V. of Thiensville PD T. of Belgium T. of Fredonia				

Strengthening emergency services	C. of Port Washington V. of Belgium V. of Grafton V. of Saukville V. of Thiensville V. of Thiensville PD T. of Belgium	T. of Fredonia	V. of Fredonia		

7. What ideas do you have for your community to mitigate natural disasters?

Cities

- *Continue to promote public awareness in regards to severe weather watches/warnings; develop a cache of equipment (i.e. generators, de-watering pumps, etc.) to assist the public when needed – City of Port Washington*

Villages

- *We do what we can to minimize damage prior to disaster; for example, a constant ongoing visual inspection of entire village, looking for any areas that need to be updated, improved, enhanced, etc. We also do preventative maintenance. We are now doing a lot more forward thinking and thinking outside the box toward improving all aspects of the village for any circumstances that may come up – Village of Belgium*
- ***1)** Increase size of culverts (Fredonia Ave/Co Hwy A near Fillmore St. and the railroad tracks and South Milwaukee St. by Meadow Brook Dr.). **2)** Protect floodplain areas (remove or buyout businesses that are in designated floodplain areas) **3)** Raise pedestrian bridge. Rebuild and raise (2 bridges) one 2-3 ft., the other approximately 1ft. This will reduce the impact of future floods. **4)** Replace outdoor warning siren. **5)** Address concerns of emerald ash borer and other invasive species, which if not managed, results in tree removal – Village of Fredonia*
- *Appropriate planning and response resources – Village of Grafton*
- ***1)** Elevate CTH W from 500' No. STH 33 to 2000' N Road floods easily – when flooded, emergency responders have to travel 3 miles to get to home ¼ mile north **2)** Clear Milwaukee River of dead trees and other debris north to Ehlers Park to minimize backups which cause flooding **3)** Levee along west side of river 500' N of HWY 33 bridge to 1000' S of bridge – Village of Saukville*
- *Enhance public works mutual aid to assist all communities during disasters – Village of Thiensville*
- *Work has been done to mitigate flooding; additional work in this area is still needed – Village of Thiensville Police Dept.*

Towns

- *Prevent building in flood plain – Town of Fredonia*

8. Do you have any community building projects (e.g., subdivisions, office/industrial parks, roads) slated to be built in the near future? If so, what is the project called and what is its location?

Villages

- *2012 – replacement of sanitation sewer and water pipes on Main street (Hwy D) approx. 1 .25 miles to include home laterals; 2013 or 2014 – total reconstruction of Main street roadway, to include burying of utilities (electric, cable, phone); 2012 & on – buildings, stowage sheds, shelters, playground equipment in parks; 2012 & on – Dog park; 2013 & on – new construction of industrial/commercial, residential – Village of Belgium*
- *Nothing to report – Village of Fredonia*
- *Yes, we expect continued development in the retail and residential areas – Village of Grafton*
- *None – V. of Saukville*
- *Reconstruct Green Bay Road; Diamond Grind Main Street; Mill & overlay Division Street – Village of Thiensville*
- *No major developments are proposed at this time; two large areas in our downtown business district have potential for large redevelopment – Village of Thiensville Police Dept.*

Towns

- *No – Town of Belgium*
- *No – Town of Fredonia*

(Workgroup Invitation)

The Ozaukee County Emergency Management Office has received a grant from the Federal Emergency Management Agency (FEMA) and Wisconsin Emergency Management to complete an update of the Hazard Mitigation Plan for Ozaukee County because as with any plan, it needs to be evaluated and updated on a regular basis to outline progress and to set a roadmap for future mitigation efforts.

The plan reviews the risks for various natural disasters within Ozaukee County and creates a plan for addressing these risks in a cost-effective way. As I am sure you are aware, Ozaukee County has received several federal disaster declarations in recent history and we are at continued risk for future events such as flooding, high winds and tornados; this planning is intended to help reduce potential future losses. Also, the federal government requires that communities have a current hazard mitigation plan as one criterion for eligibility for some types of grants so it is critical that this plan is completed and kept updated on schedule.

This requires significant input from stakeholder agencies and the public during the planning process. I have contracted with Lenora Borchardt, EPTEC, INC., to assist me with completing this update. We would like to invite you to become a member of our planning team. This team will meet occasionally to discuss the direction of the planning and to review drafts of the plan. Team members will be asked to be available to assist the contractor answering questions needed to complete the plan and to attend these occasional meetings.

Please consider assisting with the updating of this vital plan by agreeing to join the planning team. I anxiously await notification of your decision; please reply or contact me with any questions or concerns at (262) 238-8397.

Sincerely,

Mark Owen, Director
Ozaukee County Emergency Management

HVA/PDM Assessment

02/17/2012

NAME	DEPARTMENT	PHONE	E-MAIL
Mark Owen	Ozaukee Emg. Mgmt	262-284-8397	MOwen@co.ozaukee.wi.us
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LENORA BORCHARDT	EPTEC for OZ Co EM	608-834-0802	LENORAB@EPTECinc.com
Kirsten Johnson	OCPHD	262-238-8180	Kjohnson@co.ozaukee.wi.us

(Public Posting of Meeting Notice)

Hazard Mitigation Plan Workgroup Meeting

February 28th, 2012
6:00 pm
Ozaukee County Board Room
121 W. Main St.
Port Washington, WI 53074

Questions please contact Mary Fitzgerald at 262-238-8397 or mfitzgerald@co.ozaukee.wi.us;

Hazard Mitigation Plan
Ozaukee County Administration Center

02/28/2012

NAME	DEPARTMENT	PHONE	E-MAIL
Mark Owen	OZ County Emg. Mgmt	284-8397	MOwen@co.ozaukee.wi.us
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DANNY BIRENBAUM	Belgium Fire dept	285-3257	belgiumfirewi@yahoo.com
Kevin Runkel	Cedarburg Emergency Management	(414) 254-8842	krunkel140@gmail.com
RICHARD HOWELLS	VILLAGE BELGIUM PRES.	(262) 689-8749	rhowells@village.belgium.wi.us
Kirsten Johnson	OZ. CO. Public Health	262.238 8170	kjohnson@co.ozaukee.wi.us
GEORGE KING	LEPC	262.375-3612	gking@bdpolice.org
MARC MITCHELL	PORT WASHINGTON	262-284-2891	mmitchell@ci.port-washington.wi.us
Steven Zils	Aurora	262-329-2911	steven.zils@aurora.org
Mike Yunas	OZARES	262 284 4401	Mike@mikeyunas.org
Ben Schliesman	WEM	262-782-1515	Ben.Schliesman@wisconsin.gov
Patty Ruth	OCPHD	262-284-8170	pruth@co.ozaukee.wi.us
Cristina Richards	Ozaukee Co Land Dep	262-284-8262	Cpearson@Co.OZAUKEE.WI.US.

Appendix G: Community Input

Feb. 28, 2012 Meeting Picture

(Public Posting of Meeting Notice)

Hazard Mitigation Plan Workgroup Meeting

March 29, 2012
1:00 pm – 3:00 pm
Saukville Police Department
(Behind Saukville Village Hall)
649 E. Green Bay Rd.
Saukville, WI 53080

Questions please contact Mary Fitzgerald at 262-238-8397 or mfitzgerald@co.ozaukee.wi.us;

Appendix G: Community Input

Thursday, June 6, 2013

OZAUKEE PRESS

PUBLIC NOTICES

Page 17A

(June 6, 13, 2013)

PUBLIC NOTICE

Ozaukee County completed the draft update of a Hazard Mitigation Plan, prepared in accordance with the Disaster Mitigation Act of 2000 (Public Law 106-390; DMA2K). The plan is available for review and public comment until June 21, 2013, Mondays through Fridays between 8:00 a.m. and 5:00 p.m. at Ozaukee County Sheriff's Office. Address questions regarding the plan to Emergency Management Director, 1201 S. Spring St, Port Washington, WI 53074-0245 or by calling 262-284-7172.

WNAXLP

Governmental & Public Input

Planning creates a way to solicit and consider input from diverse interests. Successful community mitigation begins with a commitment from government officials throughout the county.

Involving stakeholders is essential to building community-wide support for the plan. In addition to emergency managers, the planning process involves other government agencies (e.g., zoning, floodplain management, public works, community and economic development), businesses, civic groups, environmental groups and schools. Vital information provided by these groups helps insure that the plan is workable within the framework of the community's priorities.

Adoption of the Plan

Local units of government participating in a multi-jurisdictional planning process must adopt the final plan for the municipality to be eligible for future mitigation funds including grants available through FEMA. **Local units (i.e., towns, villages, cities) that do not participate would be NOT eligible to receive funds** until such time that they meet these requirements and adopt a plan.

History

Since 1993 more than 400 disasters have occurred in the United States, affecting communities in all 50 states, costing the country over **$500 million dollars per WEEK and killing over 24,000 people**.

Mitigation Planning Facts

► A recent study by the Multihazard Mitigation Council shows that each dollar spent on mitigation saves society an average of four dollars.

► The rigorous building standards adopted by 20,000 communities across the country are saving the nation more than $1.1 billion a year in prevented flood damages.

► Hazard mitigation plans and projects reduce overall risks to the population and structures while also reducing reliance on funding from actual disaster declarations.

► Section 409 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (P.L. 93-228, as amended) is the impetus for involvement of state and local governments in evaluating and mitigating natural hazards as a condition of receiving federal disaster assistance. Section 409 states that communities are obligated to try to reduce any hazard that has received relief funding in the past. Developing a hazard mitigation plan provides an opportunity to meet this requirement by developing strategies for reduction of potential losses from future natural disasters.

NOTES:_____

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For further information please contact:

Ozaukee County Emergency Management

1201 S. Spring Street / P. O. Box 994
Port Washington, WI 53074-0994
(262) 238-8397

Pre-Disaster Mitigation Planning

Creating Safe,

Sustainable

Communities

Prepared by:
Ozaukee County Sheriff's Office
Division of Emergency Management
1201 S. Spring Street / P. O. Box 994
Port Washington, WI 53074-0994

What is Hazard Mitigation?

Hazard mitigation is sustained action taken to reduce or eliminate long-term risk to people and their property from hazards.

Floods, ice storms, tornadoes and forest/wild fires – these are all functions of the natural environment and only become hazardous when they threaten our "built" environment with destruction. These hazards will occur one day. When this happens, the results can be appreciably different from past outcomes if our community takes action today.

Risk Reduction

The goal of risk reduction is to reduce the risk to life and property, which includes existing structures and future construction, in the pre and post-disaster environments. This is achieved through regulations, local ordinances, land use and building practices and mitigation projects that reduce or eliminate long-term risk from hazards and their effects.

Why Develop a Plan?

Mitigation plans form the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction and repeated damage. The planning process is as important as the plan itself. It creates a framework for risk-based decision-making to reduce damages to lives, property and the economy from future disasters.

State, tribal and local governments are required to develop a hazard mitigation plan as a condition for receiving certain types of non-emergency disaster assistance. The Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 93-288), as amended by the Disaster Mitigation Act of 2000, provides the legal basis for state, local and tribal governments to undertake a risk-based approach to reducing risks from natural hazards through mitigation planning.

The City of Darlington, WI was ravaged by floodwaters season after season. The community was disintegrating as people left, structures deteriorated and funds were used to repair past damages instead of build for the future. City's leaders completed a mitigation plan that identified multiple strategies to prevent future damages; many of which were covered by grants. After the flooding of 2007 and 2008, the community realized the benefits of the projects - damages were minimal, property values have increased and the citizens are proud of their work. This and other WI success stories are found at http://emergencymanagement.wi.gov/mitigation/stories.asp

Required Information

- Flood maps
- Identification of potential hazards
- History of occurrences
- Hazard impact projections
- Location of critical facilities
- Identification of high-risk facilities (schools, fire station, nursing homes, etc.)
- Location of repetitive loss structures
- Development & prioritization of mitigation projects
- Other materials as identified

Hazard Mitigation Planning Process

1. Organize Resources- From the start, communities should focus the resources needed for a successful mitigation planning process. Essential steps include identifying and organizing interested members of the community, particularly those with the technical expertise required during the planning process.

2. Assess Risks- Next, communities need to identify the characteristics and potential consequences of natural hazards. It is important to understand how much of the community can be affected by specific hazards and what the likely impacts would be for important community assets.

3. Develop a Mitigation Plan- Armed with an understanding of the risks posed by natural hazards, communities need to determine what their priorities should be and then look at possible ways to avoid or minimize the undesired effects. The result is a natural hazard mitigation plan and strategy for implementation.

4. Implement the Plan & Monitor Progress- Communities can bring the plan to life in a variety of ways ranging from implementing specific mitigation projects to changes in the day-to-day operation of the local government. To ensure the success of an on-going program, it is critical that the plan remains effective. Thus, it is important to conduct periodic evaluations and make revisions as needed.

Affidavit of Publication

STATE OF WISCONSIN
Ozaukee County } SS

William F. Schanen IV, being duly sworn, says that he is the vice president of Port Publications, Inc., publishers of the Ozaukee Press, a public newspaper of general circulation, printed and published in the city of Port Washington and county of Ozaukee, Wisconsin; that a notice, of which the printed one hereto attached is a true copy, was published in the Ozaukee Press once each week for 2 weeks successively; that the first publication thereof was on the 6 day of June A.D. 20 13, and that the last publication thereof was on the 13 day of June A.D. 20 13.

Wm F. Schanen IV

Subscribed and sworn to before me this 18th day of June A.D. 20 13

Notary Public, Ozaukee County, Wisconsin.
My commission expires 9/18/16

(June 6, 13, 2013)
PUBLIC NOTICE

Ozaukee County completed the draft update of a Hazard Mitigation Plan, prepared in accordance with the Disaster Mitigation Act of 2000 (Public Law 106-390; DMA2K). The plan is available for review and public comment until June 21, 2013, Mondays through Fridays between 8:00 a.m. and 5:00 p.m. at Ozaukee County Sheriff's Office. Address questions regarding the plan to Emergency Management Director, 1201 S. Spring St, Port Washington, WI 53074-0245 or by calling 262-284-7172.

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Appendix H: Inter-Revision Updates

This plan will undergo major revisions every five years per the FEMA requirements. Ozaukee County has recognized that there may be information that should be added to the plan between the five year updates but that the costs of continuous updates, printing and distribution can be excessive. This section is designed to hold that information that is gathered between the five year updates. It is felt that only having to reproduce and distribute one section between updates will lessen the costs to the county.

Potential Areas of Concern Identified:

- No additional concerns have been identified to date