



Winnebago County

*The Wave of the Future*

# Hazard Mitigation Plan

Winnebago County, Wisconsin

March 10, 2022

Plan Provided by:  
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## Acronyms

ACE	Army Corps of Engineers
ADA	Americans with Disabilities Act
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
Bq	Becquerel, a unit of radioactivity
CAD	Computer Aided Dispatch
CBRNE	Chemical, Biological, Radiological, Nuclear, or Explosive
CDBG	Community Development Block Grant
CERT	Community Emergency Response Team
CFR	Code of Federal Regulations
Ci	Curie, a unit of radioactivity
CI	City
CO	County
COAD	Community Organizations Active in Disaster
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	Departments 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 Procedure
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 Multihazard
HMGP	Hazard Mitigation Grant Program
HUD	U.S. Department of Housing and Urban Development
HVA	Hazard Vulnerability Analysis
HWY	Highway
ICS	Incident Command System
L	Liter
LCD	Land Conservation Department
LE	Law Enforcement
LEPC	Local Emergency Planning Committee
LID	Land Information Department
LIDAR	Laser Imaging Detection and Ranging
LPDM	Lagrangian particle dispersion
LRP	Land Resources and Parks Department
LWM	Land and Water Management Department
MABAS	Mutual Aid Box Alarm System
MAP	FEMA's Risk Mapping, Assessment and Planning
ME	Medical Examiner
MHz	Megahertz
MMI	Modified Mercalli Intensity Scale
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

## Acronyms

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NFPA	National Fire Protection Association
NIDIS	National Integrated Drought Information System
NIMS	National Incident Management System
NOAA	National Oceanic and Atmospheric Administration
NRCS	Natural Resources Conservation Service
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
PSA	Public Service Announcement
POW	Plan of Work
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
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
UW Ext	University of Wisconsin – Madison Division of Extension
VHF	Very High Frequency
VI	Village
VOAD	Voluntary Organizations Active in Disaster
WEM	Wisconsin Emergency Management
WISP	Wisconsin Irrigation Scheduling Program



## Introduction and Background

The Winnebago County Hazard Mitigation Plan is intended to provide strategies for reducing susceptibility to future damage to public and private infrastructure in the county. The Winnebago County Emergency Management office applied for and was awarded a grant to update the hazard mitigation plan in 2019. This grant program is sponsored by the U.S. Department of Homeland Security - Federal Emergency Management Agency (FEMA) and is administered by the Wisconsin 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 Winnebago 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 Winnebago 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 and ensuring plan adoption

### Plan Overview

The Winnebago County Hazard Mitigation Plan provides background information on Winnebago 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 Winnebago County Office of Emergency Management has incorporated a hazard vulnerability analysis (HVA) that identifies all likely natural hazards that might or have occurred within the county into this plan; it is based on the State of Wisconsin's HVA.

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

**Winnebago County**<sup>1</sup>

Chapter 18	Subdivision and Platting
Chapter 20	Non-Metallic Mining Reclamation
Chapter 22	Comprehensive Plan
Chapter 23	Town/County Zoning Codes
Chapter 25	Construction and Effect of Ordinance

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<sup>1</sup> <https://www.co.winnebago.wi.us/GeneralCode>

Chapter 26 Floodplain Zoning Code  
Chapter 27 Shoreland Zoning Code

**City of Appleton** <sup>2</sup>

Chapter 04 Buildings  
Chapter 09 Licenses, Permits  
Chapter 11 Mobile Homes  
Chapter 17 Subdivisions  
Chapter 23 Zoning  
Chapter 24 Erosion Control

**City of Menasha** <sup>3</sup>

Title 13-1 Zoning Code  
Title 13-2 Shoreland-Wetland Zoning  
Title 14 Subdivision Regulations  
Title 15 Building Code

**City of Neenah** <sup>4</sup>

Chapter 21 Buildings and Building Regulations  
Chapter 25 Subdivisions and Other Land Divisions  
Chapter 26 Zoning

**City of Omro** <sup>5</sup>

Title 15 Buildings and Construction  
Title 16 Subdivisions  
Title 17 Zoning

**City of Oshkosh** <sup>6</sup>

Chapter 7 Building  
Chapter 14 Storm Water Management  
Chapter 30 Article III Land Use Regulations  
Chapter 30 Article XIII Subdivisions

**Town of Algoma** <sup>7</sup>

Chapter 135 Building Construction  
Chapter 225 Land Development

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<sup>2</sup> <https://www.appleton.org/government/municipal-code>

<sup>3</sup> [http://www.cityofmenasha-wi.gov/departments/city\\_clerk/city\\_code.php#](http://www.cityofmenasha-wi.gov/departments/city_clerk/city_code.php#)

<sup>4</sup> [https://library.municode.com/wi/neenah/codes/code\\_of\\_ordinances](https://library.municode.com/wi/neenah/codes/code_of_ordinances)

<sup>5</sup> [https://library.municode.com/wi/omro/codes/code\\_of\\_ordinances](https://library.municode.com/wi/omro/codes/code_of_ordinances)

<sup>6</sup> <https://www.ci.oshkosh.wi.us/WebLink/browse.aspx?startid=575047&cr=1>

<sup>7</sup> <https://www.ecode360.com/AL3573>

**Town of Black Wolf** <sup>8</sup>

Section 3                                      Zoning Districts  
Chapter 20                                      Subdivision and Platting

**Town of Clayton** <sup>9</sup>

Chapter 6 Section 6.7                      Storm Water Utility Ordinance  
Chapter 7 Section 7.10                      Subdivision Ordinance  
Chapter 9 Article 8                              Land Use

**Town of Neenah** <sup>10</sup>

Chapter 6                                      Development Ordinance  
Chapter 9                                      Licenses, Permits and Fees  
Chapter 11                                      Mobile Home Parks and Mobile Homes  
Chapter 12                                      Town Building Code  
Chapter 16                                      Construction and Effect of Ordinances  
Chapter 19                                      Storm Water Utility District

**Town of Nekimi** <sup>11</sup>

2012-12                                      Resolution Respecting Adoption of  
    Winnebago County Zoning Ordinance  
Chapter 18                                      Land Division and Subdivision  
    Regulations

**Town of Nepeuskun** <sup>12</sup>

Chapter 4                                      Zoning Permit  
Chapter 5                                      Zoning Code  
Chapter 6                                      Land Division and Consolidation  
Chapter 14                                      Farmland Preservation Ordinance

**Town of Omro** <sup>13</sup>

9-9-2002                                      Construction Site Erosion Control  
    Ordinance  
9-9-2002                                      Post-Construction Stormwater  
    Management Ordinance  
Chapter 7                                      Land Division Ordinance  
Comprehensive Plan 2015-2035

**Town of Oshkosh** <sup>14</sup>

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<sup>8</sup> <http://townofblackwolf.com/resident-info/ordinances/>

<sup>9</sup> [https://www.townofclayton.net/index.asp?Type=B\\_LIST&SEC={A5D3E281-C914-4590-A7B6-9524AFA48329}](https://www.townofclayton.net/index.asp?Type=B_LIST&SEC={A5D3E281-C914-4590-A7B6-9524AFA48329})

<sup>10</sup> <https://www.townofneenah.com/ordinances/>

<sup>11</sup> <https://www.townofnekimi.com/ordinances/>

<sup>12</sup> [www.townofnepeuskun.org/townordinances/municipal\\_code\\_draft/municipal\\_code\\_7-23-15\\_web.pdf](http://www.townofnepeuskun.org/townordinances/municipal_code_draft/municipal_code_7-23-15_web.pdf)

<sup>13</sup> <http://www.townofomro.us/ordinances.html>

<sup>14</sup> <https://townofoshkosh.com/documents/code-of-ordinances/>

Title 7 Chapter 5	Mobile Homes
Title 13 Chapter 1	Smart Growth Comprehensive Plan
Title 14 Chapter 1	Land Division and Subdivision Code
Title 15	Building Codes
Title 16	Zoning Ordinance

**Town of Poygan** <sup>15</sup>

Chapter 17	Zoning Ordinance
Chapter 18	Subdivision Ordinance

**Town of Rushford** <sup>16</sup>

Chapter 1	General Zoning and Land Use Ordinance
Chapter 2	Nonmetallic Minerals Mining Ordinance
Chapter 8	Subdivision Ordinance

**Town of Utica** <sup>17</sup>

09 2017	Zoning Ordinance
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**Town of Vinland** <sup>18</sup>

Chapter 190	Building Construction
Chapter 351	Stormwater Management
Chapter 361	Subdivision of Land
Chapter 410	Zoning

**Town of Winchester** <sup>19</sup>

Chapter 17	Zoning Ordinance
Chapter 18	Land Division and Subdivision Ordinance
Ordinance 2016-4	Adopting Amended Comprehensive Plan

**Town of Winneconne** <sup>20</sup>

Chapter 120	Building Construction
Chapter 146	Comprehensive Plan
Chapter 200	Licenses and Permits
Chapter 210	Mobile Home Parks and Trailer Camps
Chapter 275	Subdivision of Land
Chapter 310	Zoning

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<sup>15</sup> <https://www.townofpoygan.com/ordinances/>

<sup>16</sup> <http://townofrushford.org/zoning/index.htm>

<sup>17</sup> <https://www.townofutica.org/ordinances/>

<sup>18</sup> <https://www.ecode360.com/VI3589>

<sup>19</sup> <https://townofwinchesterwi.com/ordinances-resolutions/>

<sup>20</sup> <https://ecode360.com/WI2089>

**Town of Wolf River** <sup>21</sup>

Chapter 15	Building Permits
Chapter 29	Uniform Dwelling Code
Chapter 35	Ordinance to Adopt Comprehensive Plan

**Village of Fox Crossing** <sup>22</sup>

Chapter 06	Land Division Ordinance
Chapter 09	Licenses, Permits and Fees
Chapter 11	Mobile Home Parks, Mobile Homes and Recreational Campers
Chapter 13	Building Code
Chapter 18	Construction and Effect of Ordinances
Chapter 30	Comprehensive Plan
Chapter 31	Zoning Ordinance
Chapter 32	Construction Site Erosion Control
Chapter 33	Post-Construction Storm Water Management

**Village of Winneconne** <sup>23</sup>

Title 07	Licensing and Regulations
Title 13	Zoning
Title 14	Subdivision Regulations
Title 15	Building Code

The local HVA 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<sup>24</sup>, 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 rate their concern (likelihood of future occurrences and amount of disruption/damage should it occur) on a five-point scale (very high,

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<sup>21</sup> <https://www.townofwolfriver.com/ordinances-resolutions/>

<sup>22</sup> <http://www.foxcrossingwi.gov/departments/clerks-office/ordinances/>

<sup>23</sup> <http://www.winneconnewi.gov/2229/Code-of-Ordinances>

<sup>24</sup> <https://www.ncdc.noaa.gov/stormevents/>

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 detail in each chapter as well as in the table in Appendix E.

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 Resources and Parks, Land Information, Zoning) 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 Winnebago County Emergency Management Department 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:

- Brian Bending, City of Oshkosh Fire Dept
- Jesse Jensen, Winnebago County Sheriff's Office
- Brian O'Rourke, Winnebago County Planning & Zoning
- Ray Palonen, Winnebago County Highway Department
- Richard Heath, Town of Algoma Administrator
- James Rabe, City of Oshkosh Public Works
- Linda Kutchenriter, City of Omro Administrator
- Brian Noe, Town of Omro Chairman

- Chris Haese, City of Neenah Community Development
- Brian Harbison, Village of Fox Crossing Fire Chief
- Josh Janikowski, Village of Winneconne Public Works
- Cassidy Walsh, City of Appleton EM Coordinator
- Eric Rasmussen, Winnebago County EM
- Linda Kollmann, Winnebago County EM
- David Porter, Village of Winneconne Administrator
- Kaylin Van Stappen, Town of Clayton EM
- Thomas Coppola, Black Wolf Deputy Clerk / Treasurer
- 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 chief elected 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 every Winnebago County city, village and town clerk for distribution to the elected officials for discussion, review and completion. Key county departments (e.g., Planning/Zoning, Highway, Sheriff's) also received the survey with a request for completion; the completed county and municipal surveys were compiled and the results, along with the cover letter, are in Appendix G.

This project was begun in 2019, before the COVID-19 pandemic struck and altered all work for over a year. The workgroup met once in person and the second scheduled meeting was cancelled due to COVID meeting restrictions as well as the fact that many of the workgroup participants were required to focus on COVID operations to support their community. FEMA produced guidance which allowed for remote meetings when it was realized that this was going to be a protracted alteration to work. While that allowed a new mode for meeting, it did not take away the fact that many workgroup principals had limited time. There are some minor places where minor information was not available (e.g., dates of past projects, total dollar amounts spent) but it does not detract from the plan's readability or take away from highlighting the efforts that the county and its municipal partners have made in mitigating hazards. Winnebago County and its municipalities are proud to say that they came together to finish this plan to highlight strategies to make their communities more resilient over the next five years.

The committee met 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 Outagamie, Calumet, Fond du Lac, Green Lake, Waushara and Waupaca Counties. **No comments or edits were received. Unfortunately, although multiple attempts and invitations were made to members of the public, no public comments were received. OR: 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 Winnebago 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 hazard mitigation strategies from the previous version of this plan were reviewed and progress is reported in Appendix D. The workgroup also, after reviewing the updated draft plan, selected the potential new mitigation projects, which are listed in Appendix E (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 E. 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.

The resolution was passed by the Winnebago County Board, the Cities of xxx; the Villages of xxx; and the Towns of xxx. The xxx of xxx did not adopt the plan. It should be noted that the City of Appleton is predominantly in Outagamie County. Of these communities, the Cities of xxx and xxx did not fully participate in the Winnebago County planning process but did adopt the plan. The elected officials of the Village of xxx, which is wholly in Winnebago County, also chose not participate but also did adopt the plan. Scanned copies of the adoption resolutions can be found in Appendix C. 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 XXX.

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 Winnebago 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. Winnebago County 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 may solicit updates from the plan’s stakeholders (county offices, municipalities, the public, etc.). The solicitation would seek to determine if there are new elements for the mitigation plan as well as 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 publicly-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 E 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 and update community ordinances and other planning such as zoning, shoreland, floodplain, wetland, park and recreation, sustainability, and farmland preservation. They will also refer to it as they are involved in the planning and other preparedness activities of the municipalities.

Many of these plans are on a regular updating cycle and as emergency management is notified that they are up for renewal, they will provide any relevant planning materials (from the hazard mitigation plan and any additional information received since the plan's approval). Municipalities with planning departments are also encouraged to refer to the mitigation plan in their zoning updates, flood and shoreland planning and in their comprehensive plans. It should be noted that the City of Omro Comprehensive Plan was updated in 2018 and it include multiple references to this plan and contains hyperlinks to this plan within its text.

## Introduction and Background

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. Winnebago County Emergency Management will also refer to this plan in their emergency preparedness activities.

# Physical Characteristics of Winnebago County

## General Community Introduction

Winnebago County was established in 1840. With the convenience of water transportation, the area saw increasing numbers of explorers, traders and settlers arriving to stake out property boundaries and establish a mode of life for the next two centuries. Among them were many from Germany, Holland and other European countries who set the nationality and social heritage pattern of the area.

Before admission of Wisconsin to the Union, the County of Winnebago was created by separation from Brown County in 1840. The County was named for an Indian nation in the area whose land was purchased by the U.S. Government, which in turn opened the land to settlers. Abundant water, which provided access in the early days, is still a valuable asset. Winnebago County has an actual land area of 286,912 acres. Another 80,000 acres is occupied by streams, rivers and ten surveyed lakes. Lake Winnebago is the largest lake in Wisconsin and one of the largest in the nation contained in one state.

Winnebago and neighboring Fond du Lac, Calumet, and Outagamie counties rank among the fourteen most highly urbanized counties in the state, with the most rapid economic and population growth in the past decade.

The county is bounded on the north by Outagamie and Waupaca counties, with most of the eastern boundary outlined by Lake Winnebago except for a small portion adjoining Calumet County. Fond du Lac County marks the southern limits, and the counties of Green Lake and Waushara define its western border. Oshkosh is the county seat and within the county's borders are the Towns of Algoma, Black Wolf, Clayton, Neenah, Nekimi, Nepeuskun, Omro, Oshkosh, Poygan, Rushford, Utica, Vinland, Winchester, Winneconne and Wolf River; the Villages of Fox Crossing (formerly the Town of Menasha), and Winneconne; and the Cities of Appleton, Menasha, Neenah, Omro and Oshkosh.

Oshkosh, located seven miles beyond the confluence of the Fox and Wolf Rivers, at the point of their entry into the lake, was an early center of the lumber industry. Rivers and lakes brought logs from Northern Wisconsin and for many years lumbering was the leading

## Physical Characteristics

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industry of the city. Enormous fortunes were made, serving as a background for the diversified industries that followed.

Neenah-Menasha, known as the Twin Cities, is in the northern part of the county on the north end of Lake Winnebago. It's in Neenah-Menasha that the Fox River flows out of Lake Winnebago. It was here that early centers for milling wheat and lumber were situated. Later, as manufacturing grew in importance and railroads replaced rivers and lakes as a means of transportation, Neenah-Menasha became important industrial centers with the paper industry leading the way.

In May 1843, the first county board meeting was held at the home of Webster Stanley, in the Town of Winnebago. The three supervisors of the Town of Winnebago and a clerk represented the total county population of 132. The supervisors voted to raise fifty dollars by taxes for county expenses.

The first county court house was erected in 1847 in the Village of Oshkosh and was replaced by a larger structure in 1854. In 1938 the present building was erected at Jackson Street and Algoma Boulevard in the City of Oshkosh.<sup>25</sup>

## Plan Area

Winnebago County covers approximately 579 square miles with rivers, streams and creeks accounting for about 143 square miles of the total. Winnebago County is home to approximately 171907 people, according to 2019 U.S. Census Bureau estimates.

Winnebago 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 Magnesian *Cuesta* runs through Winnebago County. The *cuesta* of Lower Magnesian limestone varies in elevation from 724 feet above mean sea level (MSL) in Marinette County (near Pound) to 1240 feet above MSL in Dane

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<sup>25</sup> History from the Winnebago County Directory

County (at Lutheran Hill), showing a general increase in height from northeast to southwest.<sup>26</sup>

Winnebago County is located in east central Wisconsin and is bordered by Outagamie County to the north, Waupaca County to the northwest, Waushara and Green Lake Counties to the west, Fond du Lac County to the south and Calumet County to the east. Lake Winnebago occupies the eastern one-fifth of the county. Other significant water bodies include Lake Poygan and Lake Butte des Morts in the central part of the 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. Winnebago County contains the Cities of Appleton, Menasha, Neenah, Omro and Oshkosh; the Villages of Winneconne, Fox Crossing (formerly the Town of Menasha); and the Towns of Algoma, Black Wolf, Clayton, Neenah, Nekimi, Nepeuskun, Omro, Oshkosh, Poygan, Rushford, Utica, Vinland, Winchester, Winneconne and Wolf River. See Appendix A for a map of Winnebago County. **The County and all municipalities except for xxxx have adopted the plan.** Copies of the adoptions can be found in Appendix C.

## Geology

The entire landscape of Winnebago County reflects the influences of glacial activity. The most recent glacier to cover the county occurred about 10,000 years ago. It covered all but the southwestern part of the county and deposited the reddish clayey till present today. Southwestern Winnebago County was covered by older glacial activity that deposited brownish, loamy till.<sup>27</sup>

## 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

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<sup>26</sup> <http://www.wisconline.com/>

<sup>27</sup> Winnebago County 2021-2030 Land and Water Resource Management Plan

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.<sup>28</sup>

The topography of Winnebago County is nearly level or gently rolling with slopes of 6% or less over 90% of the terrain. Two escarpments run northeasterly across the county ranging from 750 to about 950 feet above sea level, providing land relief on the order of about 200 feet. The most prominent features are the broad expanses of lakes and adjacent marshes. Topographic features are controlled by the subsurface geology which is mainly sandstone and limestone positioned equally throughout the western and eastern parts of the county. A varying thickness of glacial till overlies the irregular surface of these rock formations. The glacial material over the limestone formation is much thinner than the material over the sandstone.<sup>29</sup>

## 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

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<sup>28</sup> <https://extension.wisc.edu/>

<sup>29</sup> Winnebago County 2021-2030 Land and Water Resource Management Plan



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 Winnebago 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 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.

## Physical Characteristics

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.<sup>30</sup>

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.<sup>31</sup> Winnebago County's growing season averages 153 days with a range of 128 to 173 days. Winnebago County's median date of last frost in the spring is May 9 and the median date of the first frost in the fall is October 4.<sup>32</sup>

Climate Normals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
<b>Ave Daily High (F°)</b>	24.1	28.7	39.8	54.5	68.0	77.4	82.5	79.6	70.9	58.9	43.3	29.0
<b>Ave Daily Low (F°)</b>	5.4	8.5	20.7	34.1	46.1	55.9	61.0	58.2	49.5	39.2	26.4	12.1
<b>Growing Degree Days</b>	0	1	21	116	319	493	653	592	373	167	28	2
<b>Heating Degree Days</b>	1556	1299	1076	621	281	56	6	22	158	498	903	1376
<b>Cooling Degree Days</b>	0	0	0	0	36	107	217	143	14	5	0	0
<b>Ave Precipitation (")</b>	1.23	1.08	2.25	2.85	3.15	3.29	3.28	3.88	3.82	2.37	2.30	1.65
<b>Ave Snowfall (")</b>	11.7	7.9	8.6	1.8	0.0	0.0	0.0	0.0	0.0	0.1	3.7	12.5

Data from the weather station at Oshkosh, latitude 44°02' N, longitude 88°33' W, elevation 750 ft.<sup>33</sup>

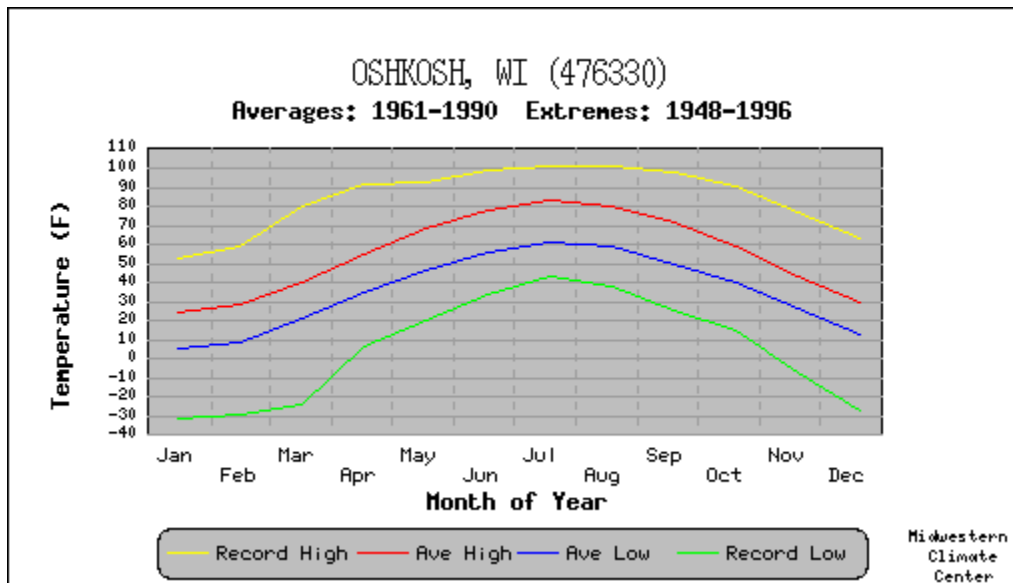
<sup>30</sup> <http://www.aos.wisc.edu/~sco/>

<sup>31</sup> <https://www.wisconline.com/counties/climatenotes.html>

<sup>32</sup> <https://www.wisconline.com/counties/winnebago/climate.html>

<sup>33</sup> <http://www.wisconline.com/counties/Winnebago/climate.html>

## Climate Normals and Growing Season Summary<sup>34</sup>



In 2012, the Wisconsin Department of Health Services (DHS), Bureau of Environmental and Occupational Health (BEOH) was awarded a grant to study and prepare for anticipated climatic effects of the public's health. The Wisconsin Climate and Health Profile Report highlights evidence-based data related to extreme weather events, corresponding health outcomes and the development of projects and best practices to adapt to and prepare for future extreme weather events.

Over the past 60 years Wisconsin has become warmer and wetter, especially during the winter months. Evidence and research drawn from the Wisconsin Initiative on Climate Change Impacts (WICCI) suggest that climate-sensitive human health impacts will likely be affected by precipitation changes, heat extremes, drought, winter weather changes, disease vectors, surface water and groundwater. Those most vulnerable to these changes include the very young, elderly, persons with chronic disease (e.g., asthma), persons of low socio-economic status, persons with mental health issues and those who are socially isolated.

Possible impacts during the four seasons include:

<sup>34</sup> Data Provided by the Midwestern Regional Climate Center <https://mrcc.illinois.edu>

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- Spring - More frequent and intense rain events may lead to more flooding with health impacts such as stress and mental health disorders; foodborne and waterborne illnesses; injuries; drowning; and death.
- Summer - Southern Wisconsin may experience approximately 28 more days exceeding 90 degrees Fahrenheit. Health impacts can include heat stress, respiratory disease, allergic reactions and death.
- Fall - Extended periods of warming could cause more drought with health impacts including water and food insecurity; respiratory distress; allergic reactions; and death.
- Winter - Warmer winters might cause more ice, sleet and rain. Health impacts may include traffic accidents, power outages, injuries and death.<sup>35</sup>

## 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, drains into Lake Michigan. The subcontinental divide traverses the county in a north-south direction in the eastern tier of communities, separating the county between the Mississippi River and the Great Lakes-St. Lawrence River drainage systems.

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

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<sup>35</sup> *Wisconsin Climate and Health Profile Report*, 2014, WI Department of Health Services, Bureau of Environmental and Occupational Health <http://www.dhs.wisconsin.gov/publications/P0/P00709.pdf>

rains of the thunderstorm type sometimes produce tributary flooding or flash flooding along the smaller streams and creeks.<sup>36</sup>

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.<sup>37</sup> The winter period normally lacks infiltration because of frozen ground.

Groundwater resources in Winnebago County are, for the most part, of very good quality and in plentiful supply. There are three aquifers that supply potable groundwater; the Sandstone, the Platteville-Decorah-Galena, and the Water Table aquifer. The Sandstone aquifer is the most extensive and the only one of the three that can sustain high-capacity pumping wells for municipal and industrial uses. The Platteville-Decorah-Galena aquifer is composed primarily of dolomite which is present in the eastern third of the County and provides adequate private water sources. Local problems in this aquifer include high sulfate, iron and arsenic concentrations along with hardness that results from the geochemistry of the dolomite formation. The Water Table Aquifer is composed of varying thicknesses of glacial sediments, primarily sand and gravel, whose seams transmit adequate amounts of water for private wells.

All of the groundwater in the county originates from local precipitation that infiltrates through the soil into recharge areas of the aquifers. Contamination risks from land use practices are the greatest threat to groundwater resources. The potential sources of contaminants are from; old unregulated landfills, old and operating quarries, underground storage tanks, on-site waste disposal systems, livestock waste handling, application and storage, commercial fertilizer application to cropland, and septic disposal. All of these sources are presently regulated or are being addressed through ordinances, state rules and/or technical assistance services provided by various county and state agencies.

Future availability of potable water is also a concern that is receiving attention. At the present time, based on the demand from agricultural, industrial, and residential uses, concerns center on the

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<sup>36</sup> <https://extension.wisc.edu/>

<sup>37</sup> DeVaul, 1967.

Fox Cities, from northeastern Winnebago County, downstream to Green Bay. A U.S.G.S Fox Cities Water Study indicates that existing potable water supplies will be adequate to meet projected demand through 2050. However, water treatment costs may be higher for communities that depend on groundwater due to a significant lowering of the prime use aquifer. Other conservation and protection options that are being considered include regulatory mechanisms and development of a groundwater withdrawal management program.<sup>38</sup>

The state has nearly 11,500 public water systems which meet the daily water needs of about 4 million people. Public water systems that are owned by a community are called municipal water systems. In addition to the public water systems, about 850,000 private wells provide drinking water to Wisconsin's population. Unlike public water systems, protection and maintenance of a private well is largely the responsibility of homeowners.

Land use decisions can have impacts on groundwater, as anything that is spilled or spread on the ground can impact the quality. As a result, pollution is a very real threat to the county's water supplies. Ways to protect groundwater include:

- Wellhead Protection Plans and Ordinances: Wellhead protection plans are developed to achieve groundwater pollution prevention measures within public water supply wellhead areas. A wellhead protection plan uses public involvement to delineate the wellhead protection area, inventory potential groundwater contamination sources, and manage the wellhead protection area. All new municipal wells are required to have a wellhead protection plan. A wellhead protection ordinance is a zoning ordinance that implements the wellhead protection plan by controlling land uses in the wellhead protection area.
- Animal Waste Management Ordinances: Most Wisconsin counties have adopted an animal waste management ordinance that applies to all unincorporated areas of the county (areas outside of city and village boundaries). While the purposes of such ordinances vary among counties, a key

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<sup>38</sup> Winnebago County 2021-2030 Land and Water Resource Management Plan

purpose is often to protect the groundwater and surface water resources. This is accomplished by regulations such as:

- Permitting of animal waste storage facilities;
- Permitting of new and expanding feedlots;
- Nutrient management;
- Prohibiting:
  - Overflow of manure storage structures;
  - Unconfined manure stacking or piling within areas adjacent to stream banks, lakeshores, and in drainage channels;
  - Direct runoff from feedlots or stored manure to waters of the state;
  - Unlimited livestock access to waters of the state where high concentrations of animals prevent adequate sod cover maintenance.
- Nitrate - Aquifers that are close to the land surface have limited natural protection which makes them vulnerable to pollution.

In 2006, the Wisconsin DNR and DATCP reported that  $\text{NO}_3\text{-N}$  is the most widespread groundwater contaminant in Wisconsin and that the nitrate problem is increasing both in extent and severity with 80% of nitrate inputs originate from manure spreading, agricultural fertilizers, and legume cropping systems. Septic systems can also be a significant nitrate source in densely populated areas, areas where fractured bedrock is near the surface, or areas with coarse-textured soils. Additionally, concentrations of  $\text{NO}_3\text{-N}$  in private wells frequently exceed the drinking water limit. For example, in 2005 11.6% of 48,818 private wells exceeded the nitrate limit.

Land use affects nitrate concentrations in groundwater with a study of over 35,000 private well samples being three times more likely to be unsafe to drink due to high nitrate in agricultural areas, especially those with sandy areas/highly permeable soils, than in forested areas. Groundwater with high nitrate from agricultural lands is more also more likely to contain pesticides than groundwater with low nitrate levels.

- Pesticides - A pesticide is any substance used to kill, control or repel pests or to prevent the damage that pests may cause. Included in the broad term “pesticide” are herbicides to control weeds, insecticides to control insects, and fungicides to control fungi and molds. Pesticides are used by businesses and homeowners as well as by farmers, but figures for the amounts and specific types of pesticides used are not generally available on a county-by-county basis. A 2005 report indicates that approximately 13 million pounds of pesticides are applied to major agricultural crops in Wisconsin each year, including over 8.5 million pounds of herbicides, 315,000 pounds of insecticides, one million pounds of fungicides, and 3 million pounds of other chemicals (this last category applied mainly to potatoes). The report also shows that herbicides are used on 100% of carrots for processing, 99% of potatoes, 98% of cucumbers for processing, 98% of soybeans, 97% of field corn, 89% of snap beans for processing, 87% of sweet corn, and 84% of green peas for processing. Insecticides are used on 97% of potatoes, 96% of carrots, and 88% of apples. Fungicides are used on 99% of potatoes, 88% of carrots, and 89% of apples.
- Arsenic - Arsenic is an element that occurs naturally in some of Wisconsin’s aquifers and may contaminate well water drawn from those aquifers. It is a particular problem in parts of the Fox River valley of northeastern Wisconsin. However, arsenic has been detected in wells in every county in Wisconsin, and arsenic concentrations greater than the drinking water limit of 10 µg/L (micrograms per liter, or parts per billion) have been documented in 51 of Wisconsin’s 72 counties.
- Contaminated Groundwater and/or Soil - Properties that were or are contaminated with hazardous substances can be found using the WDNR’s Bureau for Remediation and Redevelopment Tracking System (BRRTS).<sup>39</sup> Winnebago County has 18 open leaking underground storage tank (LUST) sites which have contaminated soil and/or

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<sup>39</sup> <https://dnr.wi.gov/topic/Brownfields/botw.html>



groundwater with petroleum, which includes toxic and cancer-causing substances. However, given time, petroleum contamination naturally breaks down in the environment. There are 48 open environmental repair (ERP) sites which are sites other than LUSTs that have contaminated soil and/or groundwater. Examples include industrial spills or dumping, buried containers of hazardous substances, and closed landfills that have caused contamination. There is also one open spill site.

- Concentrated Animal Feeding Operations (CAFO) - There are three concentrated animal feeding operations (i.e., greater than 1,000 animal units) in Winnebago County.<sup>40</sup> CAFOs are required under their Wisconsin Pollutant Discharge Elimination System (WPDES) permits to practice proper manure management and ensure that adverse impacts to water quality do not occur. Permit applicants must submit detailed information about the operation, a manure management plan, plans and specifications for all manure storage facilities, and a completed environmental analysis questionnaire. Once a WPDES CAFO permit is issued, operators must comply with the terms of the permit by following approved construction specifications and manure spreading plans, conducting a monitoring and inspection program, and providing annual reports. Other potential groundwater contaminants from agriculture include fertilizers and pesticides. Large amounts of nitrogen fertilizers are used when fields are planted continuously with corn, and they can leach into groundwater as nitrate.<sup>41</sup>
- Licensed Landfills and Superfund Sites – There are six licensed landfills and no Superfund sites in Winnebago County.<sup>42</sup> <sup>43</sup> In 1980, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as the Superfund law. The Superfund law created

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<sup>40</sup> [https://dnr.wi.gov/topic/AgBusiness/data/CAFO/cafo\\_cty.asp?CountyChoice=Winnebago&Submit=Submit](https://dnr.wi.gov/topic/AgBusiness/data/CAFO/cafo_cty.asp?CountyChoice=Winnebago&Submit=Submit)

<sup>41</sup> <https://dnr.wi.gov/topic/AgBusiness/CAFO/>

<sup>42</sup> [https://dnr.wi.gov/topic/waste/documents/faclists/WisLic\\_SWLandfills\\_byCnty\\_withWaste.pdf](https://dnr.wi.gov/topic/waste/documents/faclists/WisLic_SWLandfills_byCnty_withWaste.pdf)

<sup>43</sup> <https://dnr.wi.gov/files/PDF/pubs/rr/RR005.pdf>

a tax on the chemical and petroleum industries, which went into a trust fund to help pay for cleaning up abandoned or uncontrolled waste sites. The U.S. Environmental Protection Agency (EPA) administers the Superfund trust fund and works closely with state and local governments and tribal groups to remediate sites that may endanger public health or the environment. The contamination at many of these sites was created years ago when environmental regulations were virtually nonexistent and companies dumped or emitted hazardous materials freely into the environment. Years later the threat to humans and the ecosystems remains so great that the sites need to be cleaned up.

Since much of this contamination was caused many years ago, it can be hard to find the parties responsible, or the parties responsible may be unwilling or unable to pay for the cleanup. In these cases, the Superfund trust fund can be used to pay for most of the cleanup process. States must pay for a portion of such cleanups. CERCLA also provides EPA with enforcement tools to compel those responsible for causing the contamination to pay for the cleanup, including the issuance of administrative orders. If the trust fund is used, then EPA and the state may go to court to recover their expenditures from those who are responsible.

- Cleanup -
  - Petroleum Environmental Cleanup Fund Award - The Petroleum Environmental Cleanup Fund Award (PECFA) program was created in response to enactment of federal regulations requiring release prevention from underground storage tanks and cleanup of existing contamination from those tanks. PECFA is a reimbursement program returning a portion of incurred remedial cleanup costs to owners of eligible petroleum product systems, including home heating oil systems. This program ended by Wisconsin State statute on June 30, 2020; however, liability for clean-up did not end when the program expired. As of June 30, 2004, \$48,888,688 has been reimbursed by

the PECFA fund to clean up 345 petroleum-contaminated sites in Winnebago County.<sup>44</sup>

- Nitrate Removal Systems – No municipal water systems in Winnebago County have spent money to reduce nitrate levels. As of 2005, over 20 municipal water systems in Wisconsin had spent over \$24 million reducing nitrate concentrations in municipal water systems.<sup>45</sup>

WDNR's Outstanding and Exceptional Resource Waters Program provides a designation for Wisconsin's cleanest waters. An outstanding resource water is defined as a lake or stream that has excellent water quality, high recreational and aesthetic value, high quality fishing and is free from point source or non-point source pollution. An exceptional resource water is defined as a stream that exhibits the same high quality resource values as an outstanding resource water but that may be impacted by point source pollution or that may have the potential for future discharge from a small sewer community. There are no outstanding or exceptional resource waters in Winnebago County.<sup>46</sup>

Fourteen watersheds<sup>47</sup> are contained completely or partially within Winnebago County and are explained in greater detail in the Flooding and Dam Failure chapter of this plan.

## Soil Types

Soil is composed of varying proportions of sand, gravel, silt, clay, and organic material. The composition of a soil must be evaluated prior to any development, as varying limitations exist for each soil. Winnebago County soils are products of the deposits left after the glacier receded about 12,000 years ago. These deposits consisted of sand, gravel, large rocks, clay, limestone fragments, and igneous and metamorphic rocks.

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<sup>44</sup>[https://docs.legis.wisconsin.gov/misc/lfb/informational\\_papers/january\\_2005/0059\\_petroleum\\_environmental\\_cleanup\\_fund\\_award\\_pecfa\\_program\\_informational\\_paper\\_59.pdf](https://docs.legis.wisconsin.gov/misc/lfb/informational_papers/january_2005/0059_petroleum_environmental_cleanup_fund_award_pecfa_program_informational_paper_59.pdf)

<sup>45</sup>[https://wi.water.usgs.gov/gwcomp/find/winnebago/index\\_full.html](https://wi.water.usgs.gov/gwcomp/find/winnebago/index_full.html)

<sup>46</sup>[http://dnr.wi.gov/topic/SurfaceWater/oerw/orwerw\\_county.pdf](http://dnr.wi.gov/topic/SurfaceWater/oerw/orwerw_county.pdf)

<sup>47</sup><https://dnr.wi.gov/water/watershedSearch.aspx>

The Natural Resources Conservation Service (NRCS – formerly Soil Conservation Service) published a soil survey for Winnebago County.<sup>48</sup> There are seven major soil associations found in the county that contain multiple soil types, grouped into associations that can be used to compare the suitability of large areas for general land uses. Soil associations are groupings of soils that share a distinctive pattern of soils, relief and drainage. The seven associations are:

### **Kewaunee-Manawa-Hortonville**

This soil is well-drained to somewhat poorly drained, nearly level to sloping soils that have a loamy or clayey subsoil underlain by loamy or clayey glacial till.

### **Zittau-Poy**

This soil is somewhat poorly drained, nearly level and gently sloping soils that have a clayey subsoil underlain by sandy material.

### **Houghton-Willette**

This soil is very poorly drained, nearly level organic soils.

### **LeRoy-Ossian-Lomira**

This soil is both well-drained and poorly drained, nearly level to sloping soils that have a silty or loamy subsoil underlain by loamy glacial till or silt loam alluvium.

### **Kidder-McHenry**

This soil is well-drained, gently sloping to moderately steep soils that have a loamy subsoil underlain by loamy glacial till.

### **Oakville-Brems-Morocco**

This soil is well-drained to somewhat poorly drained, nearly level to sloping soils that have a sandy subsoil underlain by sandy material.

### **Plano**

This soil is well-drained, gently sloping soils that have a silty and loamy subsoil underlain by loamy glacial till.

The NRCS soil survey can provide very specific details on the county's soil types.<sup>49</sup>

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<sup>48</sup> <https://websoilsurvey.nrcs.usda.gov/app/>

<sup>49</sup> <http://websoilsurvey.nrcs.usda.gov/app/>

## Wetlands

According to the Wisconsin Department of Natural Resources, Winnebago County has approximately 53,271 acres of wetlands which are located in the western and northern parts of the county. The largest areas are associated with Lake Poygan, Rush Lake, Rush/Waukau Creek and the Fox, Rat and Wolf Rivers.

There are three wetland habitat types found in Winnebago County, the Emergent Wetland, the Scrub-shrub Wetland and the Forested Wetland. Each of these represents a unique ecosystem based on hydrologic conditions, vegetation, and location in relationship to other wetlands, drier upland areas, or adjacent water bodies.<sup>50</sup>

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.<sup>51</sup>

In Winnebago County, wetlands are regulated by the Wisconsin Department of Natural Resources and the Winnebago County Land and Water Conservation Department.

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

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<sup>50</sup> Winnebago County 2021-2030 Land and Water Resource Management Plan

<sup>51</sup> <https://dnr.wi.gov/topic/wetlands/>

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).
- 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.

Wetlands perform an important set of natural functions, which make them particularly valuable resources lending to overall environmental health and diversity. Some wetlands provide seasonal groundwater recharge or discharge. Those wetlands that provide groundwater discharge often provide base flow to surface waters. Wetlands contribute to the maintenance of good water quality, except during unusual periods of high runoff following prolonged drought, by serving as traps, which retain nutrients and sediments, thereby preventing them from reaching streams and lakes. They act to retain water during dry periods and hold it during flooding events, thus keeping the water table high and relatively stable. They provide essential breeding, nesting, resting, and feeding grounds and predator escape cover for many forms of fish and wildlife. These attributes have the net effect of improving general environmental health; providing recreational, research and educational opportunities; maintaining opportunities for hunting and fishing and adding to the aesthetics of an area.

Wetlands pose severe limitations for urban development. In general, these limitations are related to the high-water table and the high compressibility and instability, low bearing capacity and high shrink-swell potential of wetland soils. These limitations may result in flooding, wet basements, unstable foundations, failing pavements and failing sewer and water lines. Moreover, there are significant and

costly onsite preparation and maintenance costs associated with the development of wetland soils, particularly in connection with roads, foundations and public utilities.

## Land Use

The land in Winnebago County consists of residential, commercial, manufacturing and agricultural land. The total land area is 579 square miles and there are 143 square acres of water. There are over 91,000 acres of surface water which is the largest area of inland surface water of any county in Wisconsin.<sup>52</sup>

The Wisconsin Department of Natural Resources has identified four natural resources areas in the county.

### **Koro Prairie**<sup>53</sup>

Koro Prairie features a stretch of high-quality mesic prairie with many species of native prairie plants. Dominated by big bluestem, this site contains other common mesic prairie species such as switch grass, New Jersey tea, prairie dock, stiff goldenrod, and spiderwort. This remnant is especially noteworthy because of its location at the northeastern edge of the prairie-oak savanna region in Wisconsin. The site runs along an abandoned railroad right-of-way and frequent fires sparked by the trains helped maintain the fire-adapted prairie vegetation. Other species include mountain mint, shooting star, narrow-leaved loosestrife, turk's cap lily, culver's root, and Riddell's goldenrod. Koro Prairie is owned by Winnebago County and was designated a State Natural Area in 1990.

### **Oshkosh-Larsen Trail Prairies**<sup>54</sup>

Oshkosh-Larsen Trail Prairies features a series of three low prairie remnants along a 4-mile segment of a former railroad right-of-way. The prairie contains a diversity of native prairie species. Grasses include little blue-stem, Indian grass, prairie drop-seed, and prairie cord grass. Forbs include heath aster, shooting-star, sunflowers, blazing-star, downy phlox, rattlesnake root, mountain mint, compass plant, prairie dock, Riddell's goldenrod, downy gentian, stiff gentian, and valerian. The wet-mesic prairie remnants are especially noteworthy because of their location at the northeastern edge of the prairie-oak savanna region in Wisconsin. Oshkosh-Larsen Trail Prairies are owned by Winnebago County and designated a State Natural Area in 1980.

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<sup>52</sup> Winnebago County 2021-2030 Land and Water Resource Management Plan

<sup>53</sup> <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=225>

<sup>54</sup> <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=155>

### **Rush Lake** <sup>55</sup>

Rush Lake State Natural Area features one of the state's most important wetland communities due to its rich wildlife populations. Most significant is the migratory and breeding bird populations that frequent this site each year. The lake provides habitat for many bird species including large populations of two rare species. Other birds include black crowned night heron, least bittern, American bittern, American black duck, yellow-headed blackbird, and black tern. The adjacent 3100-acre Rush Lake is a shallow, marshy seepage lake surrounded by cattails, sedge meadow, wet prairie, and shrub-carr with clear, hard water that is highly productive. Lake vegetation consists of numerous aquatic species with abundant rushes, water lilies, pondweeds, and Chara present. Tussock and cespitose sedges with blue-joint grass, joe-pye weed, marsh fern, turtlehead, marsh pea, swamp lousewort, and northern bog aster dominate the sedge meadow. Other communities include oak openings, and southern dry-mesic forest on the surrounding uplands. Rush Lake is owned by the DNR and was designated a State Natural Area in 1993.

### **Winchester Meadow** <sup>56</sup>

Winchester Meadow features a large, open sedge meadow-marsh situated in an extensive depression northwest of Lake Winneconne. The site boasts a diverse flora composed of woolly-fruit sedge, tussock sedge, blue-joint grass, marsh bellflower, blue-flag iris, marsh fern, marsh cinquefoil, and soft-stem bulrush. Shrub cover is mostly low with numerous species of willow, white meadowsweet, and bog birch. Some of the wetter areas contain small pools with at least three species of bladderwort present. The outer portions of the meadow are mostly tussock sedge with lake sedge and slender willow while the inner region is dominated by wire-leaved sedge mixed with lesser amounts of lesser panicled sedge, Buxbaum's sedge with patches of tussock sedge and large patches of cattails and soft-stem bulrush. The site is notable for its lack of invasives. Four rare birds are also present. Winchester Meadows is owned by the DNR. The site was purchased by the Northeast Wisconsin Land Trust and later transferred to the DNR. It was designated a State Natural Area in 2012.

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<sup>55</sup> <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=331>

<sup>56</sup> <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=661>



## Vegetation

Mostly oak savanna. Northwest and western shore of Lake Winnebago: sugar maple, basswood, and elm. Central and northwest: sugar maple.<sup>57</sup>

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<sup>57</sup> <http://www.wisconline.com/counties/Winnebago/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 region was occupied by several Native American tribes in the period of European encounter, including the Sauk, Fox, Menominee, and Ojibwa (known as Chippewa in the US). French traders from what is now Canada had early interaction with them, as did French Jesuit missionaries, who sought to convert them to Catholicism. European and American settlement encroached on their traditional territories, and the United States negotiated treaties in the mid-19th century to keep pushing the Indians to the west.

Winnebago County was created in 1840 by European Americans and organized in 1848. The name Winnebago is of Algonquin origin, with variations used by the Fox and Potawatomi to refer to the Fox River below Lake Winnebago, which sometimes got muddy and full of fish. It means 'people dwelling by the fetid or ill-smelling water', which may also refer to a sulfur spring. The county seat, Oshkosh, was incorporated as a city in 1853, when it already had a population of nearly 2,800.

Chief Oshkosh was the namesake for the county seat. A leader of the Menominee in the region, he was successful in gaining authorization from the federal government for 2500 of his people to

remain in Wisconsin, at a time when the government was pushing for their removal west of the Mississippi River.<sup>58</sup>

## Population

In the 2010 U.S. Census, the county was home to 166,994 people and according to the 1 July 2019 U.S. Census Bureau estimate<sup>59</sup>, there were 171,907 people residing in Winnebago County for an increase of 2.9%.

According to the 2015-2019 U.S. census estimate, there were 70,594 households in Winnebago County with an average of 2.30 people per household. The 2015-2019 U.S. census numbers indicate that the median household income was \$58,543 and that the per capita income is \$32,571. Approximately 9.7% of the people live below the poverty line. The 2019 census estimate also indicated that there were approximately 76,303 housing units within the county as of 1 July.

According to the U.S. Census report, the majority of people in Winnebago County reported that they were white (91.8%) with 88.0% stating they were white alone. People of Hispanic or Latino origin were counted as a subcategory of those reporting that they were white. Those reporting as two or more races were 1.8%. American Indians account for 0.8% of the population of Winnebago County. Black or African American alone was 2.5% and Asian alone was 3.1%.

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.

- People under 5 years old: 5.5%
- People under 18 years old: 20.4%
- People over 65 years old: 16.8%
- Females: 49.7%
- Foreign born: 3.5%
- People with a disability, under 65 years old: 8.4%

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<sup>58</sup> [https://en.wikipedia.org/wiki/Winnebago\\_County,\\_Wisconsin](https://en.wikipedia.org/wiki/Winnebago_County,_Wisconsin)

<sup>59</sup> <https://www.census.gov/quickfacts/fact/dashboard/winnebagoountywisconsin,US/PST045219>

Winnebago County contains the Cities of Appleton, Menasha, Neenah, Omro and Oshkosh; the Villages of Winneconne and Fox Crossing (formerly the Town of Menasha); and the Towns of Algoma, Black Wolf, Clayton, Neenah, Nekimi, Nepeuskun, Omro, Oshkosh, Poygan, Rushford, Utica, Vinland, Winchester, Winneconne and Wolf River.

## Transportation Network

Winnebago County has a good transportation network that connects the county's inhabitants and visitors to commercial, recreational and educational sites. These roadways support the majority of the traffic movement within the county.

To help plan for current and future traffic conditions, it is useful to categorize roads based on their primary function. Functional classification is the process by which highways are grouped into classes according to the character of services they are intended to provide, ranging from a high degree of travel mobility to land access functions.<sup>60</sup> Winnebago County roads and their classifications include:<sup>61</sup>

**Rural Principal arterials** serve corridor movements having trip length and travel density characteristics of an interstate or interregional nature.

- U.S. Highway 10
- U.S. Highway 21
- Highway 23
- WI Highway 26
- Interstate 41
- U.S. Highway 45

**Rural Minor arterials**, in conjunction with principal arterials, server moderate to large-sized places (cities, villages, towns and clusters of communities) and other traffic generators providing intra-regional and inter-area traffic movements.

- WI Highway 44
- U.S. Highway 45
- Highway 49

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<sup>60</sup> <https://wisconsindot.gov/Pages/projects/data-plan/plan-res/function.aspx>

<sup>61</sup> <https://wisconsindot.gov/Documents/projects/data-plan/plan-res/functional/rural/winnebago.pdf>

- WI Highway 76
- WI Highway 91
- Highway 96
- WI Highway 116

**Rural Major Collectors**, provide service to smaller-to-moderate places and other intra-area traffic generators, and link those generators to nearby larger population centers (cities, villages and towns) or higher function routes.

- Highway 110
- County Road A
- County Road C
- County Road D
- County Road E
- County Road F
- County Road FF
- County Road G
- County Road GG
- County Road I
- County Road II
- County Road K
- County Road M
- County Road N
- County Road R
- County Road RP
- County Road S
- County Road T
- County Road W
- County Road XX

**Rural Minor Collectors**, provide service to all remaining smaller places, link the locally important traffic generators with their rural hinterland, and are spaced consistent with population density so as to collect traffic from local roads and bring all developed areas within a reasonable distance of a collector road.

- County Road B
- County Road F
- County Road FF
- County Road GG
- County Road H
- County Road HH

- County Road I
- County Road K
- County Road M
- County Road MM
- County Road N
- County Road W
- County Road XX
- County Road Z

All other rural roads not classified as arterials or collectors are referred to as local function roads. A map in Appendix A shows the various roads in the county and their classifications.

The 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.

Winnebago County has railroad lines that are primarily freight lines because, except for the far southeastern part of Wisconsin (i.e., the Milwaukee to Chicago corridor), few passenger trains are used within the state.

Winnebago County is served by one public-use airport – Wittman Regional Airport. It is located in the city limits of Oshkosh and is located on approximately 1,500 acres of land. A small portion of the Outagamie County Regional Airport is located in Winnebago but it is primarily located in Outagamie County.<sup>62</sup>

## Land Use and Development Trends

According to the Winnebago County 2021-2030 Land and Water Resource Management Plan, agriculture remains the dominant land use in the county and is expected to maintain that role well into the 21st century while urban development in the form of residential, commercial, industrial and highway expansion is expected to put continuous pressure on the county's natural resource base. The Fox River Valley is one of the fastest urbanizing areas in Wisconsin. Based on the Wisconsin Agricultural Statistics, 400 acres of farmland have been converted to some other use in the last six years. These changes often result in an increased impairment of natural resources

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<sup>62</sup> <http://wittmanairport.com/>

due to the impacts associated with construction site erosion, increased volume of runoff, and polluted runoff.

Current land use is variable and includes residential, commercial, industrial, agricultural, wetlands, woodlands and unused rural/open lands. The Wisconsin Department of Revenue (WDOR) tax assessment data classifies the land use in Winnebago County as follows:

- *Agricultural (Includes WDOR categories of Forest, Agricultural Forest and Other)* - Lands devoted primarily to agriculture, small-scale agricultural forestation and lands that are producing, or are capable of producing, commercial forest products (as defined by State of Wisconsin Statute 70.05) and other supporting activities. Also includes lands containing dwelling units and related improvements associated with agricultural use. This category does not include forests or woods that are in parks or that are not being forested under WDOR definitions.
- *Residential* - Lands containing dwelling units and related improvements not associated with agricultural use.
- *Commercial* - Lands, including improvements, devoted primarily to commercial operations, including, but not limited to dining, lodging, and retail sales establishments.
- *Manufacturing* - Lands, including improvements, devoted primarily to manufacturing and industrial operations, including, but not limited to, assembling, processing, and fabricating.
- *Undeveloped* - Lands generally unfit for any of the aforementioned uses, including, but not limited to, parks, hunting grounds, wetlands, ponds, gravel pits, and road rights of way.

**Land Uses Changes Based on 2019 WDOR  
Winnebago County Tax Assessment Data <sup>63</sup>**

<b>Land Use Category</b>	<b>2018 Equalized Value</b>	<b>2019 Equalized Value</b>	<b>Percent Change</b>
Agricultural	\$401,600	\$404,200	1%
Agricultural	\$156,800	\$151,100	-4%
Forest			
Forest	\$225,500	\$217,300	-4%
Residential	\$647,478,100	\$688,866,700	6%
Commercial	\$22,967,200	\$23,683,100	3%
Manufacturing	\$562,700	\$573,900	2%
Undeveloped	\$617,400	\$609,700	-1%
Other	\$3,238,900	\$3,193,500	-1%
<b>Total</b>	<b>\$675,648,200</b>	<b>\$717,699,500</b>	<b>6%</b>

The following projects were identified for future development within the county:

City of Omro:

- The city is expecting a couple of small housing developments as well as a duplex on a cul de sac with 8 lots (Springview Acres).
- There also may be another development extending on the east side of town with about 20 homes.

Village of Fox Crossing

- Neenah High School
- 2 parcels for ponds, County CB and E. Shady Lane. Ponds not installed yet.
- An un-named third project.
- All high, 2023, funded by stormwater utility.
- All tied to reconstruction of roads.

VI Winneconne

- Possible elementary school
- 16-20 acres in industrial park to hopefully develop
- New road – 13<sup>th</sup> Avenue connecting to Hwy 116
- Subdivision of up to 40 homes

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<sup>63</sup> <https://www.revenue.wi.gov/SLFReportsassessor/2019socwinnebago.PDF>



TN Algoma:

- Michel's Quarry is mixed use and includes a recreational area. It is a TIF area and is expected to begin in 2022.
- Remington Development which will be mixed use with the potential for a new municipal center as well as expanded recreational opportunities, commercial, apartment complexes, and single-family homes.
- Lake Vista Estates, 89 new homes being built over five years with the first expected to be available in 2020.

## Public Safety Support

The Winnebago County Dispatch Center is the 9-1-1 Public Safety Answering Point (PSAP) and Dispatch Center for the county. The communications center is staffed with trained dispatchers and is managed as part of the Sheriff's Office.

The departments listed below provide ongoing training to their staff and participate in periodically scheduled disaster exercises with area hospitals, other emergency medical services, law enforcement, fire services and emergency management.

## Medical

The Winnebago County Office 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.

The following hospitals serve Winnebago County and its residents:

- ThedaCare Regional Medical Center – Neenah, Inc.
- Ascension NE Wisconsin – Mercy Campus
- Advocate Aurora Medical Center Oshkosh
- Winnebago Mental Health Institute
- Children's Hospital of Wisconsin-Fox Valley

There are many other hospitals in surrounding counties and areas. 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.

### Pre-Hospital Emergency Medical Providers

Winnebago County relies on a mix of volunteer, paid-on-call and paid staff to provide pre-hospital emergency medical services (See the EMS Zones Map in Appendix A for district boundary details). The following departments in Winnebago County provide pre-hospital emergency medical services at the first responder, EMT, and air ambulance levels:<sup>64</sup>

- **Algoma (Town of) First Responders** - License Level: Emergency Medical Responder
- **Appleton Police Department** - TEMS Team - License Level: TEMS Team
- **Clayton Fire Rescue** - License Level: Emergency Medical Responder
- **Fox Crossing Fire Department** - License Level: Emergency Medical Responder
- **Gold Cross Ambulance Service Inc - Menasha** - License Level: Paramedic with Critical Care Endorsement
- **Neenah (Town of) Fire Department First Responders** - License Level: Emergency Medical Responder
- **Neenah-Menasha Fire Rescue** - License Level: Emergency Medical Responder
- **Nekimi First Responders** - License Level: Emergency Medical Responder
- **Omro Rushford First Responders** - License Level: Emergency Medical Responder
- **Oshkosh (City of) Fire Department** - License Level: Paramedic

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<sup>64</sup> <https://www.dhs.wisconsin.gov/ems/provider/winnebago.htm>

- **Oshkosh (Town of) First Responders** - License Level: Emergency Medical Responder
- **Theda Star Air Medical** - License Level: Paramedic with Critical Care Endorsement
- **Utica First Responders** - License Level: Emergency Medical Responder
- **Vinland (Town of) First Responders** - License Level: Emergency Medical Responder
- **Winchester Emergency Medical Services** - License Level: Emergency Medical Responder
- **Winneconne Poygan First Responders** - License Level: Emergency Medical Responder

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

There are seventeen fire departments that serve areas of Winnebago County.<sup>65</sup> The location of each of the fire stations and fire service areas can be found in Appendix A.

- |                                       |                                     |
|---------------------------------------|-------------------------------------|
| • Algoma Fire Department              | • Oshkosh Fire Department           |
| • Appleton Fire Department            | • Poy Sippi Fire Department         |
| • Boom Bay Fire Department            | • Town of Neenah Fire Department    |
| • Clayton Fire Department             | • Town of Oshkosh Fire Department   |
| • Fox Crossing Fire Department        | • Utica Fire Department             |
| • Neenah-Menasha Fire Department      | • Van Dyne Fire Department          |
| • Nekimi Fire Department              | • Vinland Fire Department           |
| • Omro-Rushford Joint Fire Department | • Winchester Fire Department        |
|                                       | • Winneconne-Poygan Fire Department |

<sup>65</sup> <https://www.firedepartment.net/directory/wisconsin/winnebago-county>

### Law Enforcement

Law enforcement agencies are responsible for response to criminal incidents, traffic incidents and other requests for law enforcement services; investigation of criminal offenses and apprehension of the perpetrators; investigation for law violations; maintenance of a smooth, orderly and safe flow of traffic; and public information activities.

The Sheriff is the chief law enforcement officer in the county and is responsible for the protection of life and property within the boundaries of Winnebago County. The Sheriff's Office provides law enforcement service on a 24-hour basis to unincorporated areas of the county or to those jurisdictions that do not maintain full-time police service. The Winnebago County Sheriff's office staffs the following divisions and special teams:<sup>66</sup>

- Patrol
  - Special Weapons and Tactics (SWAT)
  - Tactical Response Unit
  - Dive/Rescue Team
  - Aire/Huskey Ice Rescue
  - Honor Guard
  - Boat Patrol Unit
  - K-9 Unit
  - Accident Reconstruction Team
  - Hostage Negotiator Team
- Detective
  - Child Abduction Response Team (CART)
  - Crime Stoppers
  - Metropolitan Enforcement Group (MEG)
- Corrections
- Records
- Civil Process
- 911
- Community
  - Neighborhood Watch
  - Cyber Crime
  - Chaplain Program
  - Identify Theft

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<sup>66</sup> [Sheriff's Office | Winnebago County](#)

- WI Crime Prevention Practitioners Association
- D.A.R.E. Program
- Family Watchdog
- Crime Prevention Fund
- National Crime Prevention Council
- Crisis Intervention Team (CIT)
- Crime Stoppers
- Emergency 911 Cell Phones
- Recreation
  - ATV
  - Boating
  - Snowmobile

A number of local law enforcement departments are also responsible for protecting and serving the citizens of the many municipalities within the county. Those departments include:

- Appleton Police Department
- Fox Crossing Police Department
- Menasha Police Department
- Neenah Police Department
- Omro Police Department
- Oshkosh Police Department
- University of Wisconsin - Oshkosh Police Department
- Winneconne Police Department

The Wisconsin State Patrol and Wisconsin Department of Natural Resources also provide law enforcement services within the county. The Wisconsin State Patrol provides limited coverage from their east-central region office in Fond du Lac.<sup>67</sup> See the Winnebago County Law Enforcement District Map in Appendix A for district boundary details.

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<sup>67</sup> <http://wisconsin.gov/Documents/about-wisdot/who-we-are/dsp/dsp-regions-map.pdf>

### Special Teams

In the event of a hazardous materials incident occurring in Winnebago County, the Oshkosh Fire Department's hazardous materials response team is prepared to respond anywhere in the county, 24-hours a day, at the request of the local responders. The team 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.

Hazardous materials response is also performed by Type II and Type III Teams.<sup>60</sup> Wisconsin Emergency Management (WEM) contracts and manages twenty-two Regional Hazardous Materials Response Teams. The teams are divided into Task Forces (i.e., Northeast Task Force, Northwest Task Force, Southeast Task Force, Southwest Task Force). These Task Forces are then divided into Type I, Type II and Type III teams, all with complimentary capabilities and training requirements.

The Wisconsin Hazardous Materials Response System may be activated for an incident involving a hazardous materials spill, leak, explosion, injury or the potential of immediate threat to life, the environment, or property. The Wisconsin Hazardous Materials Response system responds to the most serious of spills and releases requiring the highest level of skin and respiratory protective gear. This includes all chemical, biological, or radiological emergencies.

In addition, there are regional bomb squad teams, dive teams and special weapons and tactics (SWAT) teams available throughout the state.

### Archaeological and Historical Resources

The National Register of Historic Places also includes a listing of locations in Winnebago County.<sup>68</sup> As mitigation projects are considered, the county is committed to ensuring that archaeological and historical sites are preserved.

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<sup>68</sup> <https://nationalregisterofhistoricplaces.com/wi/winnebago/state.html>

Historic Sites		
Historic Site Name	Address	Municipality
Algoma Boulevard Historical District	Algoma Blvd. from Woodland Ave. to Hollister Ave.	Oshkosh
Algoma Boulevard Methodist Church	1174 Algoma Blvd.	Oshkosh
Amos House	1157 High Ave.	Oshkosh
Augustin, Gustav, Block	68 Racine St.,	Menasha
Babcock, Havilah, House	537 E. Wisconsin Ave.	Neenah
Banta, George Sr. and Ellen, House	348 Naymut St.	Menasha
Beals, Edward D. & Vina Shattuck, House	220 N. Park Ave.	Neenah
Bell Site	Address Restricted	Algoma
Bergstrom, George O., House	579 E. Wisconsin Ave.	Neenah
Black Oak School	5028 S. Green Bay Rd.	Nekimi
Bowen, Abraham Briggs, House	1010 Bayshore Dr.	Oshkosh
Brainerd Site	Address Restricted	Neenah
Brin Building	1 Main St.	Menasha
Brooklyn No. 4 Fire House	17 W. Sixth Ave.	Oshkosh
Buckstaff Observatory	2119 N. Main St.	Oshkosh
Carpenter Site	Address Restricted	Eureka
Chicago and Northwestern Railroad Depot	500 N. Commercial St.	Neenah
Chief Oshkosh Brewery	1610 Doty St.	Oshkosh
Cole Watch Tower	W of Omro on WI 21	Omro

Historic Sites		
Historic Site Name	Address	Municipality
Daily Northwestern Building	224 State St.	Oshkosh
Doty Island	Address Restricted	Menasha
Doty Island Village Site	Address Restricted	Neenah
East Forest Avenue Historic District	Generally bounded by E Forest Ave., Webster St., Hewitt St. and 11th St.	Neenah
First Methodist Church	502 N. Main St.	Oshkosh
First Presbyterian Church	110 Church Ave.	Oshkosh
Frontenac	132-140 High St. and 9 Brown St.	Oshkosh
Gram, Hans, House	345 E. Wisconsin Ave.	Neenah
Grand Loggery	Doty Park (Lincoln St.)	Neenah
Grignon, Augustin, Hotel	SE Corner of Main and Washington St.	Butte des Morts
Guenther, Richard, House	1200 Washington Ave.	Oshkosh
Hawks, Frank Winchester, House	433 E. Wisconsin Ave.	Neenah
Hooper, Jessie Jack, House	1149 Algoma Blvd.	Oshkosh
Irving Church Historic District	Roughly bounded by W. Irving Ave., Franklin St., Church Ave., Wisconsin St. and Amherst Ave.	Oshkosh
Jennings, Ellis, House	711 E. Forest Ave.	Neenah
Jersild, Rev. Jens N., House	331 E. Wisconsin Ave.	Neenah
Kamrath Site	Address Restricted	Winneconne
Kerwin, Judge J.C., House	516 E. Forest Ave.	Neenah
Koch, Carl, Block	2 Tayco St.	Menasha



Historic Sites		
Historic Site Name	Address	Municipality
Larson Brothers Airport	WI 150	Clayton
Lasley's Point Site	Address Restricted	Winneconne
Lindsley, Perry, House	1102 E. Forest Ave.	Neenah
Lutz, Robert, House	1449 Knapp St.	Oshkosh
Mayer- Bankerbob House	809 Ceape Ave.	Oshkosh
Menasha City Hall	124 Main St.	Menasha
Menasha Dam	Fox R. at Mill St.	Menasha
Menasha Lock Site	Address Restricted	Menasha
Metzig Garden Site	Address Restricted	Wolf
Morgan, John R., House	234 Church Ave.	Oshkosh
Neenah United States Post Office	307 S. Commercial St.	Neenah
North Main Street Historic District	Roughly N. Main St. from Parkway Ave. to Algoma Blvd., and Market St. NW to High Ave.	Oshkosh
Omro Downtown Historic District	Jct. of Main St. and S. Webster Ave.	Omro
Omro High School, Annex and Webster Manual Training School	515 S. Webster St.	Omro
Omro Village Hall and Engine House	144 E. Main St.	Omro
Orville Beach Memorial Manual Training School	240 Algoma Blvd.	Oshkosh
Oshkosh Grand Opera House	100 High Ave.	Oshkosh
Oshkosh State Normal School Historic District	800, 842 and 912 Algoma Blvd., and 845 Elmwood Ave.	Oshkosh

Historic Sites		
Historic Site Name	Address	Municipality
Overton Archaeological District	Address Restricted	Oshkosh
Oviatt House	842 Algoma Blvd.	Oshkosh
Paepke, Henry, House	251 E. Doty Ave.	Neenah
Paine Art Center and Arboretum	1410 Algoma Blvd.	Oshkosh
Paine Lumber Company Historic District	Off Congress Ave. roughly between High, New York and Summit Aves., and Paine Lumber Access Road	Oshkosh
Pollock, William E., Residence	765 Algoma Blvd.	Oshkosh
Read School	1120 Algoma Blvd.	Oshkosh
Riverside Cemetery	1901 Algoma Blvd.	Oshkosh
Security Bank	903 Oregon St.	Oshkosh
Sensenbrenner, J. Leslie, House	265 N. Park Ave.	Neenah
Shattuck, Franklyn C., House	547 E. Wisconsin Ave.	Neenah
Sherry, Henry, House	527 E. Wisconsin Ave.	Neenah
Smith, Charles R., House	824 E. Forest Ave.	Neenah
Smith, Henry Spencer, House	706 E. Forest Ave.	Neenah
Smith, Hiram, House	336 Main St.	Neenah
Tayco Street Bridge	Tayco and Water Strs.	Menasha
Trinity Episcopal Church	203 Algoma Blvd.	Oshkosh
US Post Office – Menasha	84 Racine St.	Menasha
Upper Main Street Historical District	163-240 Main, 3 Mill, 56 Racine & 408 Water Strs.	Menasha
Van Ostrand, Dewitt Clinton, House	413 Church St.	Neenah

Historic Sites		
Historic Site Name	Address	Municipality
Vining, Gorham P., House	1590 Oakridge Rd.	Neenah
Wall, Thomas R., Residence	751 Algoma Blvd.	Oshkosh
Washington Avenue Historic District	Roughly bounded by Merritt Ave., Linde and Lampert Strs., Washington Ave., Bowen and Evan Strs.	Oshkosh
Washington Street Historic District	214-216 Washington St.	Menasha
Waterman, S.H., House	1141 Algoma Blvd.	Oshkosh
Whiting, Frank B., House	620 E. Forest Ave.	Neenah
Wing, William C., House	143 N. Park Ave.	Neenah
Winnebago County Courthouse	415 Jackson St.	Oshkosh
Wisconsin Avenue Historic District	106-226 W. Wisconsin Ave., 110 Church St.	Neenah
Wisconsin National Life Insurance Building	220 Washington Ave.	Oshkosh

The Wisconsin Historical Society maintains a list of archaeological sites and cemeteries known as the Archaeological Site Inventory Database (ASI); this list is available to governmental agencies upon request. These sites cover an extended period of time and include campsites/villages/communities, cabins/homesteads, sugar mapping sites, cemetery/burial mounds, trading/fur posts, mill/sawmills, and kilns.

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 Winnebago 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 November, 2021. 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.

For this plan the Winnebago County Hazard Mitigation Plan Workgroup reviewed 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 workgroup understands that historical weather data provided by the National Weather Service does not include events which may adversely affect their communities but fall below the reporting thresholds. However, each weather event was analyzed for historic frequency and averages over the last 25 years and is noted within each section. Additionally, a table with this information is included in Appendix B Frequency of Occurrence.

## Hazard Analysis and Previous Mitigation Projects

Hazard	Likelihood of Occurrence*	Severity of Effects if It Does Happen*	Misc. Notes
Drought/Dust Storm	2	Agriculture – 4 The rest – 2/3	Concerns about wells with extended drought
Earthquake	1	1	
Flood – Flash Flood & River Flood	Flash – 5 River – 5	Flash – 3-5 River – 3-5	
Flood – Dam Break	1-2	4-5	Especially the Fox River and Wolf River
Wildfire	3	3	Mostly environmental concerns; also requires railroad shutdown
Severe Temperature (Hot)	3	3	
Severe Temperature (Cold)	3	3	Water Supply
Hail	2	2	Roof, cars, crops
Lightning	4	2	Data systems, wildland fires
Thunderstorm	5	2	
Tornado	2	5	
Derecho (High Wind)	3	4	
Winter Storm (Snow & Ice)	4	3	Ice shoves (wind-blown ice on Lake Winnebago)

## Hazard Analysis and Previous Mitigation Projects

Hazard	Likelihood of Occurrence*	Severity of Effects if It Does Happen*	Misc. Notes
Utility Failure	Gas – 1 Electric – 3 Water – 1 Sewer – 3 Cellular – 2	Gas – 1 (summer) Gas – 4 (winter) Electric – 4 Water – 4 Sewer – 4 Cellular – 4	

\*5 point scale - Very Low (1), Low (2), Medium (3), High (4), Very High (5)

For the purposes of this document, “Frequency of Occurrence” section will use the following descriptors, as selected by the hazard mitigation planning workgroup when they evaluated the history and their experiences and expectations for the probability of future events. These descriptors are generally assigned the probabilities below, unless otherwise defined within the chapter’s text.

Descriptor	Number	Definition
Very Low	1	0% - 20% chance of a damaging incident occurring annually
Low	2	20% - 40% chance of a damaging incident occurring annually
Medium	3	40% - 60% chance of a damaging incident occurring annually
High	4	60% - 80% chance of a damaging incident occurring annually
Very High	5	80% - 100% chance of a damaging incident occurring annually

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 Winnebago County Office of Emergency Management

## Hazard Analysis and Previous Mitigation Projects

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 comprehensive plans 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 or request assistance from the Winnebago County Planning and Zoning Department; others have their own planning departments. Members of the Winnebago County Planning and Zoning Department and municipal planning departments were included on the Hazard Mitigation Workgroup and are aware of the benefits and requirements to using this plan as they go about their preparedness activities.

Winnebago County and its municipalities have a considerable history of identifying, planning and completing hazard mitigation projects including these (listed below), which received supplemental funding. It was also noted by the workgroup that there are several opportunities for grant funding from various federal and state resources including:

**Community Development Block Grant (CDBG)** - The U.S. Department of Housing and Urban Development (HUD) Community Development Block Grant-Disaster 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).<sup>69</sup>

### **CDBG Emergency Assistance Program (EAP) Projects:**

- None

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<sup>69</sup>[http://portal.hud.gov/hudportal/HUD?src=/program\\_offices/comm\\_planning/communitydevelopment/programs/drsi](http://portal.hud.gov/hudportal/HUD?src=/program_offices/comm_planning/communitydevelopment/programs/drsi)

## Hazard Analysis and Previous Mitigation Projects

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, when authorized under the Presidential major disaster declaration, is available in all areas of the state following a Presidential disaster declaration.<sup>70</sup>

Hazard Mitigation Grant Program (HMGP) Projects Funded in Winnebago County:

- DR-1526 2004 City of Oshkosh (\$394,654) – Acquisition of 2 residential structures
  - DR-1933 2010 City of Oshkosh (\$2,064,738) – Construction of Armory Stormwater Detention Basin
  - DR-4383 2018 (\$30,392.00) – 2019 PDM Plan 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.<sup>71</sup>

Pre-Disaster Mitigation (PDM) Projects and/or Plans Funded in Winnebago County<sup>72</sup>

- 2002 Winnebago County \$58,849 – Plan is approved
- 2002 WEM All \$15,520 Technical assistance Personnel, travel, and supplies

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<sup>70</sup> <http://www.fema.gov/hazard-mitigation-grant-program>

<sup>71</sup> <http://www.fema.gov/pre-disaster-mitigation-grant-program>

<sup>72</sup> Note that several grants to the State of Wisconsin/WEM are listed when searching for Winnebago County projects. These state projects are deemed as benefiting the state's counties but are not listed in this plan because they were not directly received by the county.



## Hazard Analysis and Previous Mitigation Projects

- 2003 WEM All \$32,834 Technical assistance  
Personnel, travel, and supplies
  - 2003C WEM All \$176,812 Technical assistance  
Personnel, travel, and supplies
  - 2005C State of Wisconsin All \$182,010 Development  
of structure inventory database
  - 2005C WEM All \$88,480 Technical assistance  
Personnel, travel, and supplies
  - 2006C WEM All \$22,141 Technical assistance  
Personnel, travel, and supplies
  - 2007C WEM All \$70,092 Technical assistance  
Personnel, travel, and supplies
  - 2007C WEM All \$402,574 Update Agreement with  
UW for HAZUS flood risk assessment
  - 2008C WEM All \$23,897 Technical assistance  
Personnel, travel, and supplies
  - 2008C WEM \$18,906 Technical assistance LPDM;  
personnel, travel, and supplies
  - 2008C Winnebago County \$21,290 – Update is  
approved
  - 2009C WEM All \$25,579 Technical assistance  
Personnel, travel, and supplies
  - 2010C WEM All \$47,859 Technical assistance  
Personnel, travel, and supplies
  - 2013C Winnebago County \$18,994 – Update, plan is  
approved
- **BRIC** – The Building Resilient Infrastructure and  
Communities (BRIC) was created as Section 1234 of the Disaster  
Recovery Reform Act of 2018, which will replace the PDM Grant  
Program. BRIC is built upon lessons learned from that program  
and is funded based on a formula of obligations from the previous  
year for all active disasters, not just one disaster.<sup>73</sup>
  - **FMA** - The Flood Mitigation Assistance (FMA) program is  
authorized by Section 1366 of the National Flood Insurance Act

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<sup>73</sup> [Building Resilient Infrastructure and Communities | FEMA.gov](https://www.fema.gov/building-resilient-infrastructure-and-communities)

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.<sup>74</sup>

- **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.<sup>75</sup>
- **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.<sup>76</sup>
- **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

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<sup>74</sup> <http://www.fema.gov/flood-mitigation-assistance-program>

<sup>75</sup> <http://www.fema.gov/severe-repetitive-loss-program>

<sup>76</sup> <http://www.fema.gov/repetitive-flood-claims-program>

facility. This work is performed on the parts of the facility 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.<sup>77</sup>

- **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.<sup>78</sup>
  - MFC-70266-A-02, City of Oshkosh (\$350,000) – 1 vacant land acquisition
  - MFC-70266-04-Anch, City of Oshkosh (\$800,000) – Channel restoration project
  - MFC-70266-04-Saw, City of Oshkosh (\$101,500) – FEMA to fund entire project – withdrawn
  - MFC-70266-08, City of Oshkosh (\$200,000) – Basin drainage improvements
  - MFC-71018-16, City of Oshkosh (\$360,706.30) – Detention Pond Construction
  
- **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.<sup>79</sup> Winnebago County has not received any dam removal grants.

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<sup>77</sup> <http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit/hazard-mitigation-funding-under-section-406-0>

<sup>78</sup> <http://dnr.wi.gov/Aid/MunFloodControl.html>

<sup>79</sup> <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 Winnebago 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 for this entire plan, as determined by 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 Winnebago 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 one of the largest risks that falls under the all-hazards banner is the continuing challenge of securing funding to keep up with the rapid technological changes and advances in the public safety communications infrastructure. When departments cannot communicate with each other, they cannot be effectively coordinated in a disaster which could cause potential delays in providing critical services to citizens in need.

Another vulnerability is the fact that not all agencies that work together in disaster response and recovery can communicate with one another (i.e., are interoperable). Local first response agencies are generally able to communicate with one another but communications-related issues will remain ongoing challenges as technologies evolve and departments acquire equipment suitable for their response.

Also, it is a continuing challenge to ensure that emergency services can notify the public in a timely manner. Because of the nature of modern society, adequate notification requires multiple outlets but managing the usage, cost and updates of these systems is an ongoing project for all communities.

## Hazard Mitigation Strategies

Winnebago 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. Winnebago County should be capable of the following:

- Disseminate emergency warning and notification to the public through 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.

During an emergency, the general public receives information by sirens, FEMA's Integrated Public Alert & Warning System (IPAWS)<sup>80</sup>, reverse notification systems (AlertSense<sup>81</sup>), NOAA weather radio, local broadcast or printed media, and if needed by door-to-door notification by emergency services personnel and a mobile public address system. 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. The county emergency management office and the municipalities will also support public information campaigns on these technologies.

Methods for notification of people with functional and access needs include door-to-door warnings, foreign language media messages and closed-caption television messages. Other notices and procedures can be found in Winnebago County's Emergency Response Plan which is reviewed and updated on a regular schedule.

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<sup>80</sup> [Integrated Public Alert & Warning System | FEMA.gov](https://www.fema.gov/ipaws)

<sup>81</sup> [Public Signup \(alertsense.com\)](https://www.alertsense.com)

During an emergency, Winnebago County will deliver prompt and accurate warnings to businesses and residents. Winnebago County will ensure facilities, systems, and procedures to activate warning and communication are viable including:

- Sirens to warn the public. Winnebago County and any applicable municipalities will maintain and upgrade their early warning sirens and the equipment (e.g., towers, generators) that support them, as needed.
- Telephone and public-safety banded two-way radio infrastructure for public agency personnel.
- Local television, radio and newspaper connections to spread warning information.

## Interoperable Communications

The county budget to maintain communications systems has thus far been sufficient. As technology improves and additional interoperability grant funding is made available, Winnebago County Emergency Management, the 911 dispatch center, and the county's municipalities will monitor and improve the system as able. Potential projects include:

- The Town of Algoma would like to evaluate options for creating and stocking a command center/EOC to provide workspace for emergency operations. This is a low priority that would occur using annual budget dollars by 2026.

## Website

Geographic information system (GIS) mapping data is available from the Winnebago County website<sup>82</sup>. The County Emergency Management Office also has a general webpage<sup>83</sup> and social media sites 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 these communication tools, especially in pre-planning activities, county offices will review their online presence to ensure that important information and links for general preparedness topics are available from agencies such as the Department of

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<sup>82</sup> [GIS | Winnebago County](#)

<sup>83</sup> [Emergency Management | Winnebago County](#)

Homeland Security/FEMA, the American Red Cross and Wisconsin Emergency Management. The county and its municipalities will also look for ways to publicize websites and social media pages with emergency information (i.e., preparedness, response, recovery).

### Community Preparedness (Planning, Training & Exercising)

Winnebago County, in partnership with its municipalities, has a comprehensive preparedness program and will work on the following preparedness programs that support mitigation goals:

- Continue providing community disaster education presentations to citizens, public agencies, private property owners, businesses, and schools. Share electronically as well as doing interviews and presentations.
- Work with the schools within the County to promote hazard mitigation education and awareness and discuss ways to better integrate mitigation into the curriculum.
- Identify, improve, and sustain collaborative programs focusing on the real estate and insurance industries, public and private sector organizations, and individuals to avoid activity that increases risk to natural hazards.
- Maintain and use the ArcGIS Survey123 program, a geographic database for natural disaster events that graphically displays damage areas and automatically calculates financial impact.



## 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.



Agricultural drought in a Wisconsin corn field in 2012.

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 Winnebago 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 Winnebago County. 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 online.<sup>84</sup>

<b>SPI Values<sup>85</sup></b>	
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

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<sup>84</sup> <https://www.ncdc.noaa.gov/temp-and-precip/drought/nadm/indices/spi/div#select-form>

<sup>85</sup> <https://drought.unl.edu/ranchplan/DroughtBasics/WeatherandDrought/MeasuringDrought.aspx>

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.

### Frequency of Occurrence

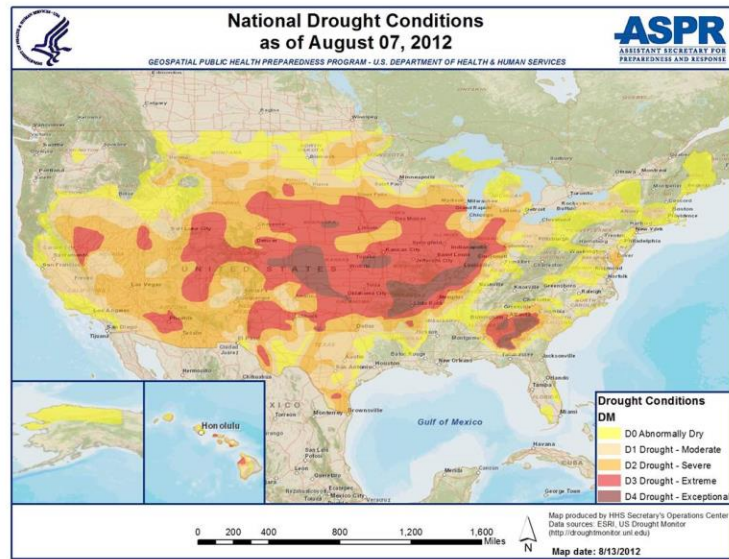
Drought is a relatively common phenomenon in Wisconsin and has occurred statewide in 1895, 1910, 1939, 1948, 1958, 1976, 1988, 1992, 2003, 2005 and 2012. The 1976 drought received a Presidential Emergency Declaration with damage to 64 Wisconsin counties, including Winnebago. Estimated losses of \$624 million primarily affected the agricultural sector.

The 2012 heat wave resulted in significant droughts across more the half the country as well as increases in heat related illnesses and deaths. Although June, 2021 was the hottest month in U.S. history, conditions in July, 2012 caused severe drought conditions that eclipsed 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 Winnebago County in the D2 – Severe Drought category.<sup>86</sup>

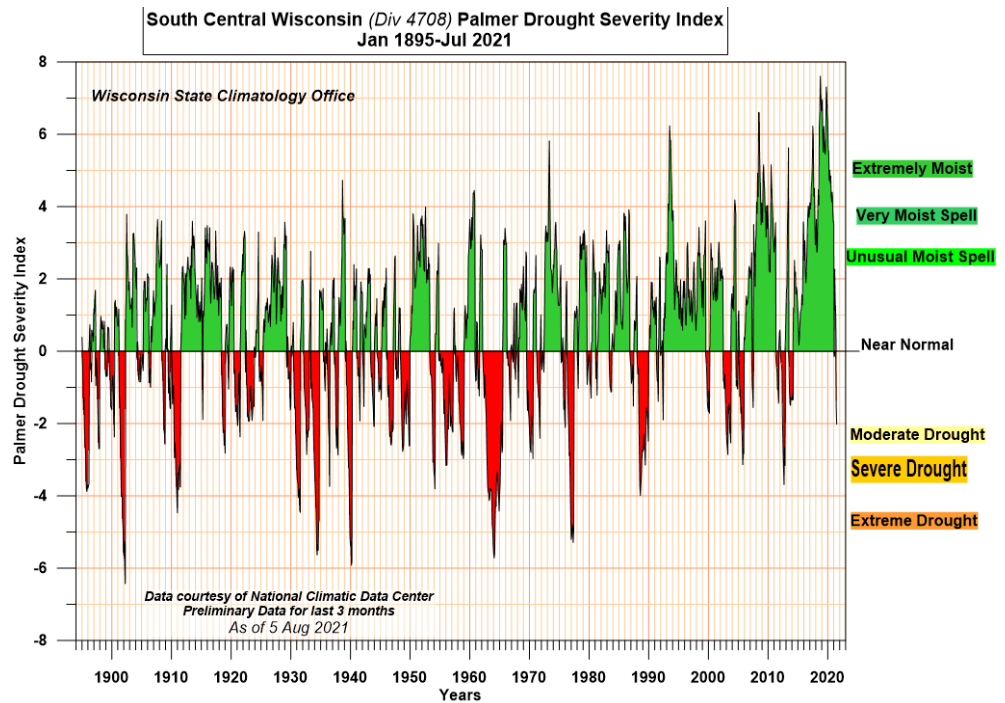
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<sup>86</sup> 2012 Heat & Drought Federal Report, HHS ESF 8, UPDATE #2, U.S. Department of Health and Human Services, Assistant Secretary for Preparedness and Response

# Drought and Dust Storms



The Palmer Index chart for the years between January 1895 and July 2021 in East Central Wisconsin, which includes Winnebago County follows:<sup>87</sup>



As can be seen from the frequency table above, Winnebago County regularly experiences drought to at least a moderate level two to three times every ten years. While drought is a regular occurrence,

<sup>87</sup> <http://www.aos.wisc.edu/~sco/clim-watch/graphics/pdsi-ts-08-l.gif>

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.”<sup>88</sup>

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 summer of 2012 was also extremely hot and dry across much of the United States, including Wisconsin. A table showing the drought events recorded by the National Weather Service for Winnebago County can be found in Appendix B.

Considering past occurrences, it can be surmised that Winnebago County has a low probability of drought occurrence in the future and the likelihood of damage due to drought is considered high for agricultural losses and low to medium for other types of losses. Over the past 25 years a drought has occurred five times for an average of less than one time per year.

## Vulnerability

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. The concern for agricultural losses due to drought is difficult to estimate because each incident will impact the county differently based on the length of the drought, when it occurs in the planting season and which crops were planted in various locations in that particular season but one can see, by looking at the agricultural statistics listed below, that this sector is an important part of the Winnebago County economy and that the losses could be considerable:

- Average size of farms: 177 acres
- Average value of agricultural products sold per farm: \$60,541

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<sup>88</sup> State of Wisconsin Hazard Mitigation Plan

- Average value of crops sold per acre for harvested cropland: \$168.55
- The value of livestock, poultry, and their products as a percentage of the total market value of agricultural products sold: 66.62%
- Harvested cropland as a percentage of land in farms: 67.75%
- Average number of cattle and calves per 100 acres of all land in farms: 17.42
- Corn for grain: 38,112 harvested acres
- All wheat for grain: 7,610 harvested acres
- Soybeans for beans: 32,189 harvested acres
- Vegetables: 961 harvested acres
- Land in orchards: 57 acres <sup>89</sup>

Drought is also a major risk factor for wildfire and 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 Winnebago 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 Winnebago County communities have adopted water usage regulations during drought conditions but in general, mitigation strategies for periods of drought include preparing informational

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<sup>89</sup> [http://www.city-data.com/county/Winnebago\\_County-WI.html](http://www.city-data.com/county/Winnebago_County-WI.html)

releases and plans for farmers and homeowners that can be used if needed.

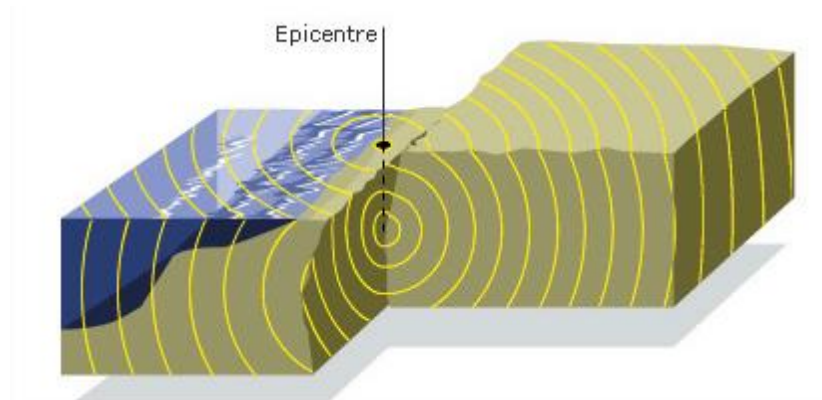
Winnebago County farmers can contact the Winnebago County University of Wisconsin – Madison Division of Extension and its federal partners from the U.S. Department of Agriculture for information and guidance related to drought. Various federal and state publications are available regarding ground water 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 non-farm concerns 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 Winnebago 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.)<sup>90</sup>



### 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 principal 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 strength of an earthquake and

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<sup>90</sup> [http://news.bbc.co.uk/2/shared/bsp/hi/pdfs/earthquake\\_guide.pdf](http://news.bbc.co.uk/2/shared/bsp/hi/pdfs/earthquake_guide.pdf)



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: <sup>91</sup>

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.

<sup>91</sup> Wald, Quitoriano, Heaton and Kanamori, 1999

## Earthquakes

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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

Also in Wisconsin, a 2012 article published in the Milwaukee Journal-Sentinel discussed an incident in Waupaca County that was not an earthquake as traditionally discussed and understood. This episode is highlighted in this plan because it was widely reported in the state and could be a concern for Winnebago County citizens:<sup>92</sup>

*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.

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

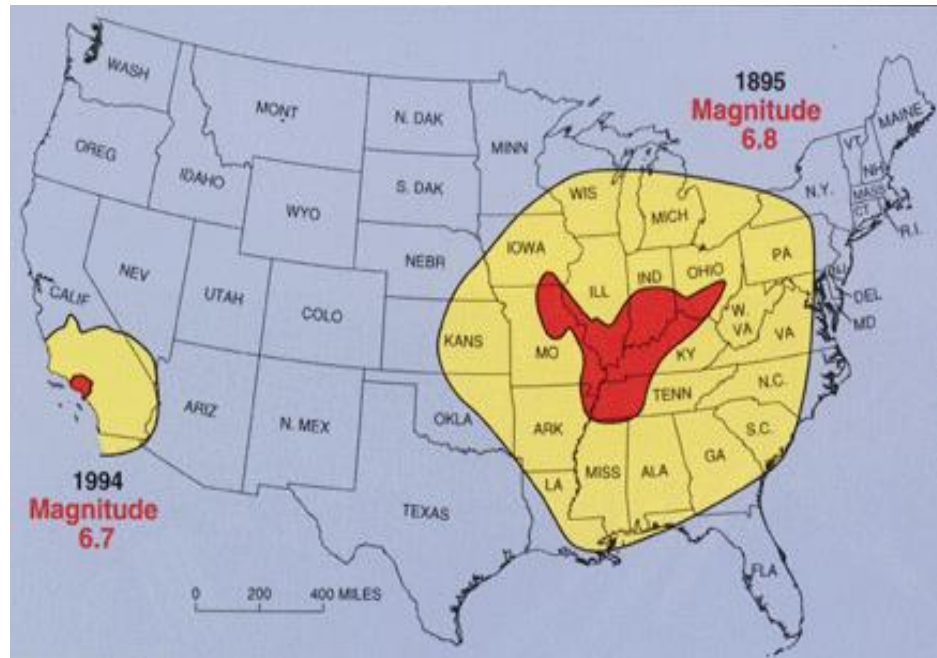
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<sup>92</sup> <http://www.jsonline.com/news/wisconsin/rumbling-booming-resumes-in-clintonville-6e4p9o8-144653925.html>

## Earthquakes

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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 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 Winnebago 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

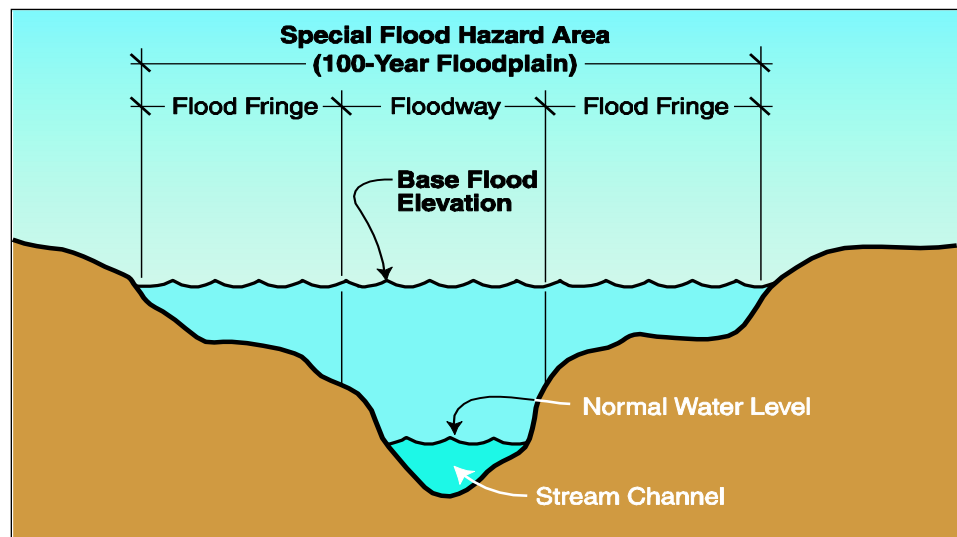
Any impact in the community from earthquake would likely be due to a few broken windows and personal effects that fell in the earthquake. The damage to critical infrastructure and buildings would be negligible although there could be indirect effects from any unlikely losses to the electrical grid, transportation routes/goods shipments and pipelines.

## Hazard Mitigation Strategies

Since Winnebago 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. If there is ever a need, obviously emergency resources will be mobilized but the goal for this section of the plan is therefore to educate on the low risks of earthquake damage in Winnebago 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.<sup>93</sup>



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 location of this

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<sup>93</sup> FEMA, August 2001

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.

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<sup>94</sup>**

<b>Flood Recurrence Intervals</b>	<b>Percent Chance of Occurrence Annually</b>
10 years	10.0%
50 years	2.0%
100 years	1.0%
500 years	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

<sup>94</sup> State of Wisconsin Hazard Mitigation Plan

## Flooding and Dam Failure

be caused by technological events (e.g., materials failure) or by natural events (e.g., landslide, earthquake) with flooding being the most common result.

According to the Wisconsin Department of Natural Resources (WDNR) Dam Safety Program there are approximately 3,800 dams in existence in the State of Wisconsin. Since the late 19<sup>th</sup> century, more than 700 dams have been built, then washed out or removed. Since 1967, approximately 100 dams have been removed. Almost 60% of the dams in Wisconsin are owned by a former company or private individual, 9% by the State of Wisconsin, 17% by a municipality such as a township or county government and 14% by other ownership types.

The federal government has jurisdiction over most large dams in Wisconsin that produce hydroelectricity - approximately 5% or nearly 200 dams. The Wisconsin Department of Natural Resources regulates the rest of the dams. A dam with a structural height of over 6 feet and impounding 50 acre-feet or more, or having a structural height of 25 feet or more and impounding more than 15 acre-feet is classified as a large dam. There are approximately 1,160 large dams in the State of Wisconsin.

The Wisconsin DNR database lists the following small, uncontrolled agricultural dams included in Winnebago County<sup>95</sup>

Dam Official Name	Size	Latitude	Longitude	Owner	Waterway Name (Downstream City)
Neenah	LARGE	44.18611	-88.4564		FOX R
Menasha	LARGE	44.20071	-88.4463		FOX R.
Eureka	LARGE	43.99402	-88.8754		FOX R.
Rush Lake	SMALL	43.9419	-88.7744	Pinnow	WAUKAU CREEK
Sawyer Creek	SMALL	44.00986	-88.601		SAWYER CREEK
Bridges, R.C. No.1		44.16367	-88.482		NEENAH SLOUGH
Bridges, R.C. No.2		44.16966	-88.4788		NEENAH SLOUGH
Water Treatment Basin		44.02957	-88.5162		MILLER BAY
Huelster, Michael		43.90325	-88.8509	Huelster	TR RUSH LAKE
Waukau Creek	SMALL	43.99415	-88.7715		RUSH CREEK
Landig	SMALL	44.09491	-88.8417	Landig	UNNAMED DITCH
Winnebago County Comm Park		44.07232	-88.5321		
Zacher		44.08563	-88.5147	Zacher	
Walleyes For Tomorrow		43.99145	-88.8718	Dave	MARSHES OF FOX RIVER
Sippel	SMALL	44.20941	-88.6799	Sippel	
Wiesner	SMALL	44.12794	-88.5659	Wiesner	TRIB TO BUTTE DES MORTS

<sup>95</sup> <https://dnr.wi.gov/damsafety/damSearch.aspx>



Dam Official Name	Size	Latitude	Longitude	Owner	Waterway Name (Downstream City)
Rush Lake Wings	SMALL	43.93832	-88.8502		UNNAMED TRIB TO RUSH LAKE
Foote	SMALL	44.0028	-88.7124		UNNAMED STREAM
Koch, John	SMALL	44.01775	-88.8089	Koch	UNNAMED
Speigelberg	SMALL	44.11008	-88.648	Goubeaux	UNNAMED TRIB TO LK BUTTE DES
Pelz	SMALL	44.04441	-88.8551	Pelz	UNNAMED
Baer	SMALL	44.13991	-88.6404	Baer	UNNAMED
Honey Creek	SMALL				HONEY CREEK
Uihlein Marsh					TRIBUTARY TO WAUPACA CREEK
Borgardt	SMALL	43.90278	-88.6565	Borgardt	UNNAMED
Borgardt	SMALL	43.90377	-88.6547	Borgardt	UNNAMED
Wisdot Oshkosh Wetland Site	SMALL	44.08696	-88.5604	Buchholz	TRIB TO LAKE BUTTE DES MORTS
Wisdot Oshkosh Wetland Site 2	SMALL	44.08494	-88.5617	Buchholz	TRIB TO BUTTE DES MORTS
Hay Wetland Restoration					
Demke	SMALL	43.92467	-88.6696		

Most of these dams are small, mill-type dams under the jurisdiction of the DNR and are also privately owned. 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 largest are 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 Winnebago County.

The Wisconsin Department of Natural Resources assigns hazard ratings to large dams within the state. When assigning hazard ratings, two factors are considered: existing land use and land use controls (zoning) downstream of the dam. Dams are classified into three categories that identify potential hazards to life and property downstream should the dam fail. A high hazard indicates that a failure would most probably result in the loss of life. A significant hazard indicates a failure could result in appreciate property damage. A low hazard exists where failure would result in only minimal property damage and loss of life is unlikely.

For Winnebago County, only the Neenah dam has a high hazard rating. The county will be bringing together a workgroup to review the high-hazards dam areas in the county to evaluate risk and discuss strategic planning. The other dams in Winnebago County are considered low-hazard.

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).

## Watersheds

There are 14 watersheds in three basins covering Winnebago County, including the Wolf River Basin, the Upper Fox River Basin, and the Lower Fox River Basin. For water resource planning purposes, each river basin is further divided into watersheds. Following is a brief description of each watershed:

### **Lake Winnebago**<sup>96</sup>

The Lake Winnebago Watershed is located in Fond du Lac, Winnebago and Calumet counties. It is 131,956 acres in size and contains 335 miles of streams and rivers, 131,607 acres of lake, and 119 acres of wetlands. Ninety-nine percent of the watershed is open water.

### **Wolf River Basin**

#### **Lower Wolf River**<sup>97</sup>

The Lower Wolf River watershed is 120 square miles and covers parts of Outagamie, Waupaca and Winnebago Counties. This includes a portion of the mainstem Wolf River from the junction with the Embarrass River to the mouth of the Waupaca River, including the lower portion to the Weyauwega millpond. The mainstem Wolf River flows within the watershed for about 19 miles and contains a diverse warm water sport fishery. Wetlands adjacent to the river provide excellent spawning grounds for these fish. Those portions of the watershed within Winnebago and Outagamie counties are in the Lower Fox River Designated Planning Area.

#### **Walla Walla and Alder Creeks**<sup>98</sup>

The Walla Walla and Alder Creek Watershed (locally known as Walla Walla Creek Watershed) lies in portions of Waupaca, Waushara and Winnebago Counties on the northwest shore of Lake Poygan. Those portions of the watershed within Winnebago County are in the Lower

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<sup>96</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924771>

<sup>97</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924877>

<sup>98</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924926>

Fox River Designated Planning Area. The Winnebago Comprehensive Management Plan rated this watershed a high priority due to critical animal waste problems and soil loss. The Wolf River Basin Plan data indicates polluted runoff problems with excess vegetation and habitat deterioration. Approximately 20 percent of the watershed (in the western part) is highly susceptible to groundwater contamination (WDNR and WGNHS, 1987).

#### **Pine and Willow Rivers** <sup>99</sup>

The Pine River and Willow Creek watershed is the southernmost watershed of the Wolf River Basin and is located in Waupaca, Waushara and Winnebago counties. This watershed covers 286 square miles. This watershed drains directly to Lake Poygan, and the surface water drainage from the majority of this watershed is filtered by the Poygan Marsh Wildlife Area. The soils, geology and other physical resources of this watershed's western half indicate the area is highly susceptible to groundwater contamination from poor land use practices (WDNR and WGNHS, 1987) The Pine River Willow Creek Watershed was selected as a priority watershed in 1995, and will expire at the end of the year 2009. The priority watershed plan was prepared cooperatively by the WDNR, the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP), the Waushara County Land Conservation Department, the Winnebago Land and Water Conservation Department, with assistance from the University of Wisconsin-Extension, and the USDA Natural Resources Conservation Service (NRCS).

#### **Arrowhead River and Daggetts Creek** <sup>100</sup>

The Arrowhead River and Daggetts Creek Watershed covers approximately 135 square miles in Winnebago, Waupaca and Outagamie counties. A small part of the watershed, about 1 percent, is located in Waupaca County. The Winnebago Comprehensive Management Plan (WCMP) rated an 8.2-mile priority strip along the Arrowhead River as high priority for NPS pollution abatement activities. Major problems in this watershed include excessive vegetation, dissolved oxygen standard violations, and critical levels of soil loss. The watershed contributes an estimated 0.5 pounds of phosphorus per acre per year to the Lake Winnebago pool lakes.

### **Upper Fox River Basin**

#### **Big Green Lake** <sup>101</sup>

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<sup>99</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924915>

<sup>100</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924876>

<sup>101</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924895>

The Big Green Lake Watershed is located primarily in Green Lake County, but extends east into Fond du Lac County and edges just a bit into the southwestern corner of Winnebago County. The watershed is 68,676 acres in size and contains 141 miles of streams and rivers, 655 acres of lakes and 5,102 acres of wetlands.

At the time of the 2010 Census, the Wisconsin Population Lab determined the Big Green Lake Watershed hosted 12,429 inhabitants. The majority of the land cover in the Big Green Lake Watershed is dominated by Agriculture (65%) followed by Open Land and Water (15.53%). Forest also covers a sizeable portion of the watershed (8.76%) followed by Wetlands, which constitute approximately five and three-quarters of the watershed. The last reasonably sized land cover is Suburban (3.22%). The remainder of land cover constitutes slightly over one and a half percent of the total land cover; these include Urban (0.87%), Grassland (0.81%) and Barren (.07%).

### **Fox River – Berlin** <sup>102</sup>

The Fox River-Berlin Watershed is located primarily in Green Lake County, but extends into parts of Waushara, Winnebago and Marquette counties. The watershed is 133,595 acres in size and contains 328 miles of streams and rivers, 453 acres of lakes and 41,067 acres of wetlands. The watershed is dominated by agriculture (41%), wetlands (30%), forest (12%) and grassland (11%) and is ranked high for nonpoint source issues affecting groundwater and medium for nonpoint source issues affecting streams.

### **Fox River** <sup>103</sup>

The Fox River Watershed is located primarily in Winnebago County but extends west to Green Lake County and south to Fond du Lac County. The watershed is 76,643 acres in size and contains 236 miles of streams and rivers, 3102 acres of lakes and 13,826 acres of wetlands. The watershed is dominated by agriculture (66%) and wetlands (18%) and is ranked high for nonpoint source issues affecting streams, lakes and groundwater.

### **Lake Butte des Morts** <sup>104</sup>

The Lake Butte des Morts Watershed is located entirely within Winnebago County. The watershed is 50,973 acres in size and contains 128 miles of streams and rivers, 85 acres of lakes and 1498 acres of wetlands. The watershed is dominated by agriculture (59%)

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<sup>102</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924749>

<sup>103</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924853>

<sup>104</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924748>

and open water (16%) and is ranked high for nonpoint source issues affecting streams and groundwater.

**Fond du Lac River** <sup>105</sup>

The Fond du Lac River watershed is located primarily in Fond du Lac County, but extends north to the southeast corner of Winnebago County along the western shore of Lake Winnebago. The watershed is 156,632 acres in size and contains 461 miles of streams and rivers, 991 acres of lakes and 16,649 acres of wetlands. The watershed is dominated by agriculture (66%), grasslands (12%) and wetlands (11%) and is ranked high for nonpoint source issues affecting streams and groundwater.

**Lake Winnebago – North and West** <sup>106</sup>

The small watershed of Lake Winnebago -North and West, is located along the west shore of Lake Winnebago in Winnebago County and the north shore of the lake in Calumet County. The watershed is 14,549 acres in size and has only 14 miles of streams and rivers, 183 acres of lakes and 573 acres of wetlands. It is dominated by agriculture (58%) and sub urban land use (17%). The watershed is ranked high for nonpoint source issues affecting streams and groundwater.

**Lower Fox River Basin**

**Little Lake Butte des Morts** <sup>107</sup>

The Little Lake Butte des Morts (LLBDM) Watershed drains to the Fox River beginning at the outlet of Lake Winnebago (Neenah & Menasha dams) to where the Appleton dam is located, which holds back the Fox River to form the impoundment. The 44 square mile (113 square Kilometers) watershed includes many unnamed tributaries to the Fox River as well as one named stream, Neenah Slough. The Little Lake Butte des Morts Watershed was added to the Lower Fox River Basin in 1995, when the basin and watershed boundaries of the Upper & Lower Fox River basins were revised. Modifications were made to the boundaries to show correct drainage to Lake Winnebago and to the Lower Fox River Basin. The Little Lake Butte des Morts ranked as a high-priority for streams under the Nonpoint Source Pollution Abatement Program basin plan ranking process. The watershed's land area is almost entirely within Winnebago County with the remaining small percent in Calumet County. The watershed also includes the cities of Neenah, Menasha

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<sup>105</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924747>

<sup>106</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924746>

<sup>107</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924908>

and the southern edge of Appleton. Many of the small, urbanized unnamed tributaries to LLBDM are severely impacted by stormwater runoff via storm sewers and direct runoff. Many industrial and municipal dischargers are located within the basin. Agriculture is the predominant land use in the outlying areas of the watershed. Many of the unnamed streams have been ditched and are heavily impacted by stormwater runoff. There are two municipal point source dischargers and 15 industrial point source dischargers in the Little Lake Butte des Morts Watershed: Grand Chute Menasha West, Neenah Menasha Sewerage Commission, American National Can Co. (2 facilities), Beloit Manhattan Inc., Galloway Co., James River Corp. (Fort-James) (2 facilities), Kimberly Clark Corp. (3 facilities), Mead Corp. Gilbert Paper Co., Menasha Electric & Water Utility, PH Glatfelter Co. Bergstrom Paper Div., US Papers Mills Menasha and Wis. Tissue Mills.

### **Fox River – Appleton** <sup>108</sup>

The Fox River - Appleton Watershed includes a 39 square mile (102 square kilometers) area of land in southcentral Calumet County. This includes the city of Appleton. The main tributary to the Fox River is Mud Creek and there are many unnamed tributaries. The headwaters were mainly agricultural and are rapidly becoming developed by industrial parks. This, of course, results in large increases of stormwater velocities to these streams. Construction of these new businesses also creates large erosion problems and heavy doses of sediment to the streams. In 1992 a watershed assessment was conducted by WDNR to determine the impacts of nonpoint source pollution on water quality. The Fox River - Appleton Watershed was ranked "High" for streams. The watershed is now eligible for selection as a priority watershed under the Wisconsin Nonpoint Source Pollution Abatement Program. There are two municipal point source dischargers and four industrial point source dischargers in the Fox River - Appleton Watershed: Appleton City, Heart of the Valley Metro. Sewerage District, Anchor Food Products, Foremost Farms USA Coop Appleton (2 facilities) and Thilmany Division International Paper.

### **Plum and Kankapot Creeks** <sup>109</sup>

Historical data indicates water quality problems in the Plum Creek Watershed. Problems with low dissolved oxygen, high nutrient levels and sediment levels which were attributed primarily to nonpoint pollution. Poor land practices in the Plum Creek Watershed (84

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<sup>108</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924659>

<sup>109</sup> <https://dnr.wi.gov/water/watershedDetail.aspx?key=924658>

square miles, 102 square kilometers), cause nonpoint source pollution that degrades water quality in the upper reaches of the Plum Creek. The headwaters are intensively farmed and cropland erosion, streambank pasturing and barnyard runoff are common. The lower reaches have very steep banks which prohibit pasturing and cropping. In 1992 a watershed assessment was conducted by WDNR to determine the impacts of nonpoint source pollution on water quality. A predominately agricultural watershed, the Plum Creek Watershed was ranked "High" for streams. The watershed is now eligible for selection as a priority watershed under the Wisconsin Nonpoint Source Pollution Abatement Program. Refer to the 1994 Plum Creek Watershed Nonpoint Source Assessment Report by Mary Gansberg for more information. There is one municipal point source discharger and five industrial point source dischargers in the Plum Creek Watershed: Holland Town Sanitary District No. 1, Appleton Papers Inc Locksmill, Interlake papers, Kerwin Paper Co. Div. Riverside Corp., White Clover Dairy Co Inc. and White Clover Dairy Inc. Sherwood.

## Floodplain Regulations

Floodplain regulations have been in place in the cities, villages and towns of Winnebago County for many years. The Department of Natural Resources 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, Winnebago 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.

Winnebago County does have a history of flooding problems and has been included in six Presidential Disaster Declarations requests for flooding, the most recent of which are detailed below:<sup>110</sup>

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

The following list summarizes damages attributed to flooding in Winnebago County by the National Flood Insurance Program through 27 July 2020:

<b>Jurisdiction</b>	<b>Total Loss</b>	<b>Total Payments</b>
Unincorporated Winnebago County	2	\$13,076
City of Omro	3	\$19,722
City of Oshkosh	19	\$1,125,123

There were 11 repetitive loss properties through 18 February 2019. Nine of the properties are single-family residential structures and two are non-residential. The total NFIP claims shown above include the repetitive loss properties.

<sup>110</sup> <https://www.fema.gov/disasters>



Tables showing the flood and flash flood events recorded by the National Weather Service can be found in Appendix B. A careful review of the geography and history of flooding in Winnebago County leads to the conclusion that there is a very high probability of flooding in the future and a medium to high probability of damage and losses due to flooding. This flooding could occur due to urban stream flooding, flash flooding or, less likely, due to a dam failure. It was also determined that there was a low probability of a dam break in the county and a low probability of damage and losses due to a dam break.

## 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 dryers). 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.

Appendix A contains maps depicting the floodplain in Winnebago County. Appendix F contains excerpts from the Winnebago County HAZUS report. HAZUS-MH uses state-of-the-art geographic information system (GIS) software to map and display hazard data and the results of damage and economic loss estimates for buildings and infrastructure. FEMA HAZUS-MH data were used to estimate the number of structures located within the one-percent chance, or 100-year floodplain, based upon Flood Insurance Rate Maps (FIRMs) published by the Federal Emergency Management Agency (FEMA), the results of which are outlined in the report.

## Hazard Mitigation Strategies

Winnebago 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.<sup>111</sup>

- County of Winnebago
- City of Appleton
- City of Menasha
- City of Neenah
- City of Omro
- City of Oshkosh
- Village of Fox Crossing
- Village of Winneconne

There are no areas in Winnebago County which have had special flood areas identified by FEMA but are not in the NFIP program.

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<sup>111</sup> <https://www.fema.gov/cis/WI.pdf>

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 Winnebago 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 Winnebago 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, Winnebago County has quick access to 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 and enforcement of proper floodplain zoning ordinances and land-use planning. There are

several communities within the county engaged in various planning processes (e.g., comprehensive, stormwater). The county is involved with these communities and their processes to ensure data sharing and consistency among the communities. For local communities, securing state and federal grants is key to accomplishing all phases of project work. The county and its municipalities will seek out all opportunities for grants (e.g., BRIC, HMGP, FMA) to assist with the costs of mitigation measures, as they arise, such as buy-outs, elevations, and floodproofing.

- The county and its municipalities will revise existing floodplain regulations to ensure they comply with the most recent (2013) model floodplain regulations developed by the Wisconsin Department of Natural Resources.

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

- Continue updating GIS mapping data on the planned cycle.
  - Maintain topographic maps for purpose of current information inclusive of updated aerial photography.
  - Update orthophotos (aerial photography).
  - Complete new LIDAR flight for updated elevations.
- Complete amendments and revisions to the Flood Rate Insurance Maps (FIRMS) as necessary.

The Winnebago County Emergency Management Office disseminates public information materials related to flooding and the National Flood Insurance Program (NFIP) and will continue to have links to applicable sites on their webpage. The county and municipal zoning offices will also work together to ensure that floodplain ordinance outreach within the community continues and to ensure that homeowners and builders follow floodplain regulations.

The county and its municipalities will evaluate the support for and the feasibility of becoming part of the Community Rating System (CRS) to lower flood insurance premiums for property owners. This has been considered previously but has not been accomplished because the benefit-cost analysis did not work out.

Winnebago 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.
- Looking for acceptable (environmentally, socially, cost-benefit, politically, etc.), permanent solutions for removing water from flood-prone areas. Seek out funding sources (grants) to execute solutions. Some of the potential solutions may include acquisitions, demolitions, floodproofing or moving water to surface streams.
- 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. Also performing preventative maintenance in areas of concern. Areas of concern include:
  - Multi-community Projects
    - Design and budget for stormwater management facilities consistent with adopted stormwater management plans than have been or will be prepared /amended.
      - City of Omro: The city does not currently have a stormwater management plan, though it has been discussed in the past. There are about six retention ponds. Will create a plan with a consistent view of how to handle stormwater management.
      - Village of Fox Crossing: Ongoing, acquiring land and installing ponds now.

- Village of Winneconne: In the process of creating a stormwater utility and anticipating it will be passed in 2021 and enter into force by 2022.
- Town of Algoma: Constructed Jones Detention Pond in summer of 2020 and looking to acquire Honey Creek Detention Pond fall of 2020. Anticipate constructing Irvine Detention Pond in late fall 2020 with completion in summer 2021.
- Town of Black Wolf: Budgeted and planned for the fiscal year as needed due to accumulation.
- Identify and remediate those culverts and bridges that are undersized or are otherwise unable to handle expected flood flows.
  - Ongoing for all.
  - City of Omro: Identification of locations was completed in 2020. The following issues identified will require planning prior to implementation:
    - Highway 21 floods and the city is considering placing valves to prevent further flooding.
    - Culverts on Lincoln are being replaced this week (Aug., 2020) for \$100,000.
    - West Larrabee & Michigan Street storm sewer needs upgraded and sidewalks raised.
    - Monroe St and E Ontario also floods and will need to be designed and engineered for future upgrades.
- Prepare a strategy to prioritize road improvements for public roadways that are susceptible to flooding.
  - A strategy is needed for Highway 21 in front of Scott Park.

- Facilitate post-flood recovery plans and programs to help county residents rebuild and implement mitigation measures to protect against future floods.
- Explore options for improving the ability of local units of government to report flooding, receive information, and request assistance. Explored with WEM to determine if Survey123 or WebEOC can assist with this need.
- Provide information and offer education to make people aware of natural floodplain resources and functions and how they can protect them. The county leads this effort with annual campaigns during spring's Severe Weather Awareness Week. Municipalities amplify the county's messages locally.
- Work with DNR to prepare Emergency Action Plans for large dams in the County. A map showing all dam locations with each categorized located in the County Comprehensive Plan.
  - City of Oshkosh: The Amory Detention Dam does not have a finalized EAP. It has been started working on it with consultants and is expected to take two years to complete.
- All projects identified in stormwater management plans that will lessen flooding should be accomplished when funding is available for them.
  - Ongoing for all.
  - City of Menasha and Village of Fox Crossing:
    - Develop a Manitowoc/ Brighton Beach Roads Storm Water Project. The project plan has been completed and starting to work with Heckrodt now.

- Valley Road Storm Water project. The project plan is done. Construction is planned for 2024-2025.
  - Village of Fox Crossing: Completed as funding becomes available. Some have been completed. Two pieces of land were just purchased to add ponds.
  - Town of Algoma: In progress. In addition to the three stormwater ponds, Omro Road will be reconstructed with a storm sewer system to control flooding and persistent drainage issues along Omro Road. Replacement of Honey Creek Bridge with a new single cement culvert will occur in 2021.
- 
- Winnebago County
    - Conduct a study for the Lower Fox Basin and the Upper Fox/Wolf Basins (Fox-Wolf Basin Watershed Study) that would identify where flood structures could be used to reduce flooding impacts downstream. If approved, this study/modeling would be conducted by the U.S. Army Corps of Engineers. This project would not only assist with identifying flood mitigation projects, but will also result in improved water quality.
    - Continue to get landowners in compliance with the State Agricultural Performance Standards. These projects, which include large-scale wetland restorations, work to improve water quality along with providing flood storage.
    - Continue the MS4 work to improve water quality and provide flood storage in the permit area. As part of the Municipal Separate Storm Sewer System (MS4 Permit) the Facilities Department inspects and maintains 11 detention ponds within the MS4 Permit area. Additionally, the Winnebago County stormwater management facilities are comprised of swales located



adjacent to the county roadway system and wet and dry ponds. Inspection and maintenance of the county-owned swales is an on-going effort by Highway Department staff.

- Develop a computerized database containing information on culverts under public roadways in the county. There are several current efforts related to culverts that provide GIS a variety of source data for culverts a variety of source data for culverts. LWCD has a culvert layer produced from aerial photography that is comprehensive but does not have field measurements. The Highway Department has a similar dataset but specific to roads they maintain. Highway participates with the WDOT in a Culvert Asset Management Program. This is primarily a county initiative that is supported by the submission of data by the municipalities, as requested, for inclusion on GIS data layers that will be shared between the county and the municipalities.
- City of Neenah
  - Winneconne/Harrison Pond - Started in Fall of 2020, primarily residential benefit.
  - S. Commercial Street Flood Control - Ongoing project. S. Commercial St reconstruction.
  - S. Park Avenue Flood Prevention - Coordinate with S. Park Avenue reconstruction tentatively scheduled for 2025.
- City of Omro
  - Seek grant funding for a river gauge for the Fox River in Omro - This has been worked on before in conjunction with County EM. EM put in a request to the county to pay for the gauge. The request was approved by the EM Committee but denied by Personnel and Finance. The town could pursue this at their own expense. The NWS has money available if it fits into their river forecasting. They pay for the gauge and

installation and then maintenance and upkeep are local responsibilities. Funding would depend on the cost (e.g., if too expensive, a grant or other funding source would be needed.) Right now, they judge flood levels by how much water is in Scott Park.

- Grant Street storm sewer installation - Partially completed in 2019 – design and engineering only. Money is budgeted (\$60K), but consideration is being given for alternate solutions. If the project moves forward, further money may be needed for street repairs. In 2019, the city also did ditching on East Main Street by the Bowhunters Club.
  - Highway 21 in front of Scott Park is susceptible to flooding. The city received a quote in the amount of \$17,960 for Tideflex valves to reduce flooding for this area. The quote includes furnishing and installing four valves ranging from 12 inches to 24 inches. The quote does not include other possible costs including replacement, cleaning or jetting of piping. The city may budget \$20K for this project and would apply for grants if available.
- City of Oshkosh
    - Gallups Creek Flood Study - Currently underway and close to finalizing.
    - Johnson Creek Flood Study - Consultant working on study.
    - Johnson Creek Detention - Enhanced preservation. Not sure the exact direction of the project at this time.
    - West Murdock Avenue Watershed Upgrades - The study has not yet been initiated and therefore no projects have been identified yet.
    - \*Analyze repetitive flood properties and identify feasible mitigation options for each. Ongoing. Continuing to work on watershed-wide analyses with 3-4 flood analysis studies underway.

- Fernau Watershed Detention Basin #2 (with Town of Oshkosh) - Construction of second identified detention basin to reduce flooding within the watershed.
  - Anchorage Court Watershed Storm Sewer Upgrades - Significant storm sewer upgrades necessary to alleviate flooding in this low-lying watershed on the north side of the city. Flooding impacts businesses, single and multi-family residential properties, the CN Railroad, WPS Electrical Substation, and a Wastewater Utility Pump Station.
  - Sawyer Creek Watershed Detention Basin (with Town of Algoma) - Final detention basin recommended within the Sawyer Creek Watershed Storm Water Management Plan.
  - Stringham Watershed Box Culvert - Replacement of a downstream most portion of a very old and failing box culvert system.
- Village of Fox Crossing
    - Stroebe Island causeway reconstruction/stabilization. Project planning began in 2021 along with the reconstruction of the causeway. Preliminary work is happening now with water and sewer.
  - Town of Algoma
    - Analyze and review ways to retain and control water in Honey Creek and its tributaries to ensure that excessive volumes of rain will not flood the SW quarter of the Town of Algoma. The northern end of the town near Horse Shoe Road should also be looked at for ways to reduce flooding. Any mitigation project resulting from this analysis would also allow safer water flows to Lake Butte des Morts. In progress. Algoma will be seeking grant funding in FY 22/23 for the expansion of the Thackery Road detention pond and begin regrading the drainage easements in the area of Algoma to

reduce flooding and to improve drainage. In addition, a stormwater analysis is being conducted for the NE part of Bellhaven Estates with the long-term goal of converting the dry pond to a wet pond with the Town assuming ownership and maintenance of it. The Town is using the county highway department to complete regrading of several ditches throughout Algoma to improve the flow of stormwater and improve drainage.

- Create a Storm Water Assessment for the Town of Algoma. A longer-term initiative is for the Town to create a stormwater utility to pay for the poor drainage and stormwater flow in many parts of Algoma. Will use a contracted engineer.
  - Implement the recommendations for a regional detention pond system along Honey Creek (to Lake Butte de Morts) listed in The Stormwater Management Plan (McMahon v. 2018). In progress. The Town intends to apply for funding from the WDNR to help restore several stretches of Honey Creek to help with flow and lessen the possibility of flooding. This includes the three detention ponds on or near Honey Creek (i.e., Jones Pond, Honey Creek Pond, Irvine Pond).
  - EB4 Thackery Dr. Detention Basin - In progress. This is within the 5-year capital improvement plan.
  - WB2-WB6 Horseshoe Road Detention Basin - Longer-term goal (8-10 years) that will be part of a new development/TIFF district.
  - Leonard Point Lane Detention Basin - Longer-term goal (8-10 years) This detention pond will be reviewed again one the Town begins reconstruction of Leonard Point Road.
- Town of Clayton
    - Stormwater development projects (east side):

- 8.2-acre pond creation on property north of Breezewood and west of Carden.
  - Pond creation on a property north of JJ and east of Balfour that will be part of a public park, which is under preliminary design.
- Town of Neenah
    - Planning for Green Valley Ditch Flood Control
  - Town of Omro
    - East Reighmoore Rd Flood Prevention
    - West Reighmoore Rd Flood Prevention
    - Sammers Bay Culvert for Flood Prevention
    - Sand Pit Road Culvert Replacement
    - Youngs Channel Road Flood Proofing
  - Town of Wolf River
    - River gauge for the Town of Wolf River (Fremont) south of Fremont

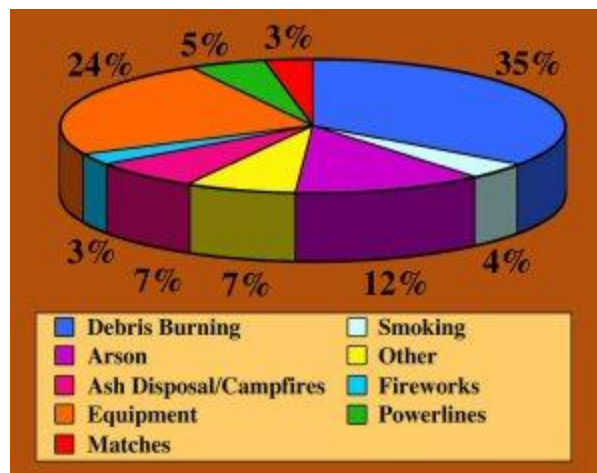
## Fires (Grassfires and Wildfires)

The grassfire and wildfire (fires on open or agricultural land) season in Winnebago 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

The Wisconsin DNR has previously reported that approximately 1,500 fires annually 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.



## Frequency of Occurrence

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).

According to the Wisconsin DNR Fire Managements Dashboards<sup>112</sup>, there have been seven wildland fires reported since 2016 in Winnebago County. The causes of these fires have ranged from lightning strikes (Marion Fire) to fireworks and other recreational causes. The costs of these fires have all ranged between \$0.00 and \$30,000.

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. The Wisconsin DNR has not designated Winnebago County a “Community at Risk” or a “Community of Concern” for forest fires, as there are few forested areas in the county. The county does have open grassland fires every summer but they are usually contained relatively quickly (i.e., as compared to forest fires) and cause minimal damage to infrastructure. With the recent trends of higher average temperatures and shifting rainfall patterns, there is a concern that wildland fires may increase but there is no existing data to show trending at this time. Overall, the probability for a wildfire in Winnebago County is medium. The probability of damage from wildfire is considered also medium.

## Vulnerability

Grassfires and wildfires can impact the ecology of the open lands. Winnebago County has four state natural areas: Koro Prairie, Oshkosh-Larsen Trail Prairies, Rush Lake, and Winchester Meadow<sup>113</sup>. The county has five state wildlife areas: Deppe, Glacial Habitat Restoration Areas, Jaeger’s Island, Rat River, and Wolf River<sup>114</sup>. It has two county parks: Community Park and Asylum Point Park and Lighthouse and multiple recreational trails, boat landings, and nature preserves<sup>115</sup>. All would be impacted by a wildfire since a

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<sup>112</sup> [Fire Management Dashboards \(wi.gov\)](#)

<sup>113</sup> [State natural areas | Wisconsin DNR](#)

<sup>114</sup> [State wildlife areas listed by county | Wisconsin DNR](#)

<sup>115</sup> [Parks | Winnebago County](#)

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.<sup>116</sup>

Winnebago County does not have any communities identified as Communities at Risk (High or Very High) or Community-of-Concern.<sup>117</sup>

## 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 grassfire and wildfire. Local fire departments attend regular trainings on open land firefighting tactics, NIMS/ICS management systems, and other coordination initiatives to keep their skills honed. The County Emergency Management Office assists local departments and their staff with available grant applications for training, exercising, equipment, and planning as able and requested.

The emergency management office also partners with the local fire departments to provide information on the County Emergency

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<sup>116</sup> Wisconsin State Hazard Mitigation Plan

<sup>117</sup> <https://dnr.wi.gov/topic/forestFire/documents/communitiesAtRiskWildfire.pdf>

## Fires

Management website about fire safety and other mitigation strategies to the public (e.g., protecting structures from wildfires, ask people not to burn combustibles), especially during Fire Safety Week in October of each year.

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 Winnebago County has few forested areas (primarily parks and other non-inhabited recreational areas) and most open areas are used for agriculture with no buildings or infrastructure on them, there is no need to have measures designed to reduce damages to existing or future infrastructure.

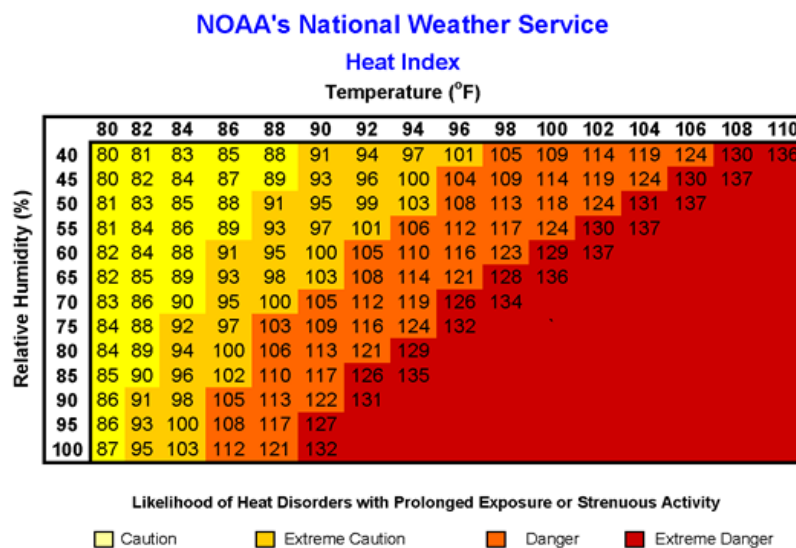
# Severe Temperatures

## 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. <sup>118</sup>

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

<sup>118</sup> FEMA, 1997; NWS, 1997

## Severe Temperatures

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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 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.

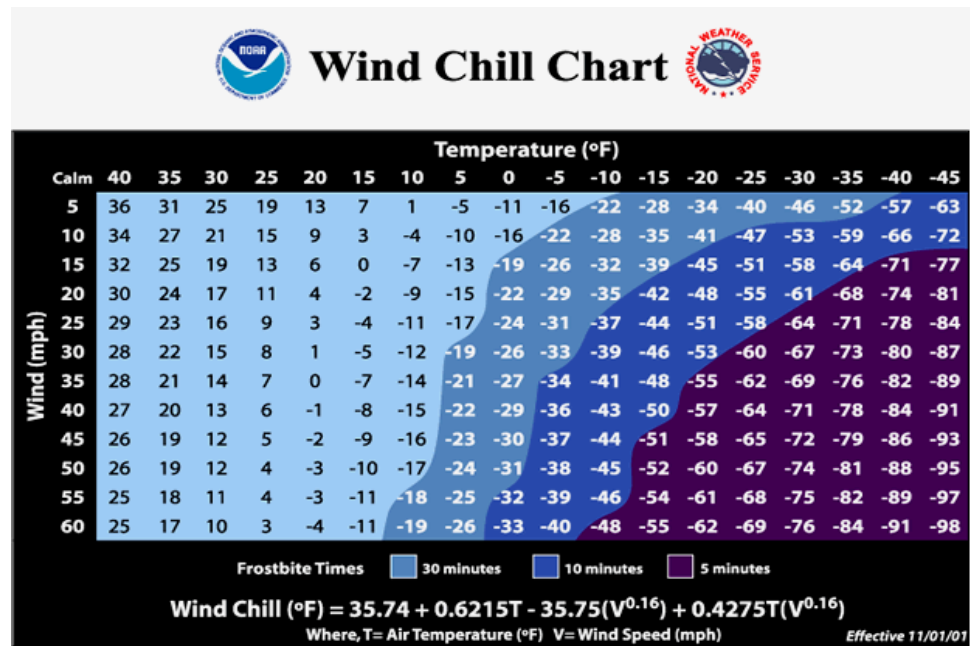
Extreme heat conditions may also affect pets and livestock, decreasing agricultural output by the latter. Crops may suffer reduced yield due to extremely hot conditions.

## 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.<sup>119</sup>

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<sup>119</sup> <https://www.weather.gov/safety/cold-wind-chill-chart>



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.

## Severe Temperatures

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- 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: Heat

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.

Tables showing the excessive heat and heat events recorded by the National Weather Service in Winnebago County <sup>120</sup> can be found in Appendix B.

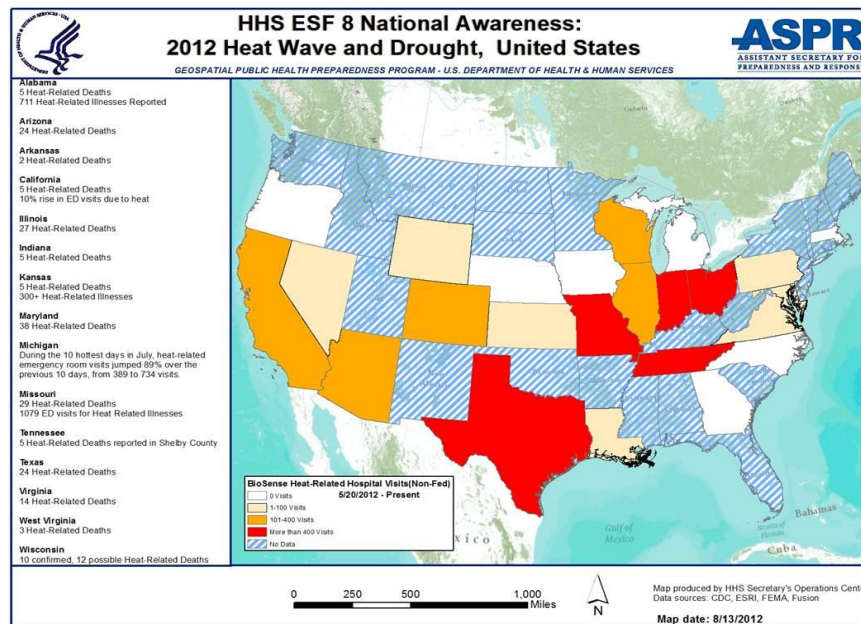
It should be noted that during the summer of 2012 much of the country, including Winnebago County, experienced a heat wave, resulting in significant droughts across more the half the country as well as increases in heat related illnesses and deaths. July was the hottest month in US history, eclipsing 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.

With the increase in heat-related illnesses comes an increase in emergency department (ED) admission across the country. Dehydration, heat exhaustion and heat stroke were the most common cause for patients' heat-related ED admissions. Most heat-related visits occurred in patients between the ages of 19 and 70. In Wisconsin, there were ten confirmed and possibly 12 heat-related deaths.<sup>121</sup>

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<sup>120</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

<sup>121</sup> 2012 Heat & Drought Federal Report, HHS ESF 8, UPDATE #2, U.S. Department of Health and Human Services, Assistant Secretary for Preparedness and Response



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, Winnebago 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 there was a medium likelihood of losses due to the heat. The committee recognized that the likelihood 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 heating and air conditioning).

## Frequency of Occurrence: Cold

Wisconsin regularly has extreme cold temperatures as part of its winter climate. Tables that outline extreme cold/wind chill and cold/wind chill events which have been recorded by the National

## Severe Temperatures

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Weather Service in Winnebago County<sup>122</sup> can be found in Appendix B.

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 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 also medium 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

There has been a trend toward higher temperatures that is expected to continue. As with drought, periods of high temperatures can cause decreased poultry and bovine production rates, which impact the economy of the community's large agricultural base.

More frequent and longer sub-zero stretches have been noted during the winter. These, coupled with concerns about utility failures, can disrupt agriculture, particularly with water supply disruption and with wind chill effects posing a risk to livestock and farmer health. Temperature extremes also pose significant problems for functional needs populations such as the elderly, the young, and the disabled. The primary general effects of extreme cold consist of water lines and mains freezing and breaking, disrupting water supply; shutting down of rural bus lines due to safety risks for children; and school closings, most often due to wind chill concerns.

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.

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<sup>49 & 122</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>



The Winnebago 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

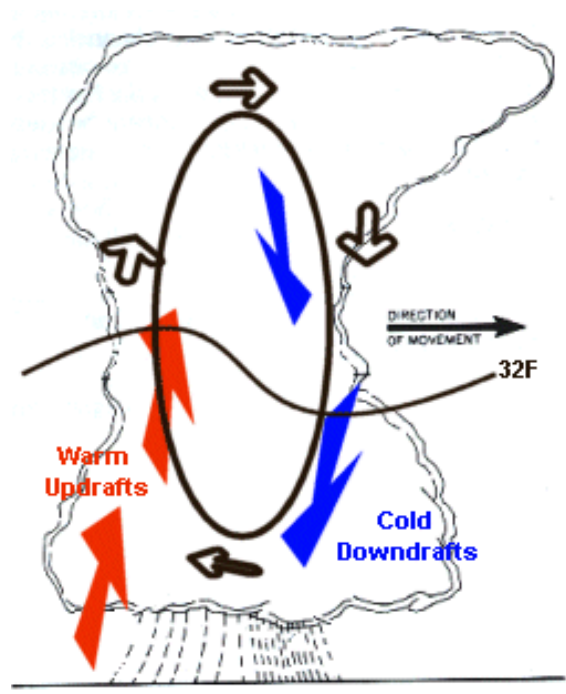
The goal of severe temperature mitigation activities is to reduce, in a cost-effective manner, the loss of lives and property due to these events. Temperature extremes are difficult for a community to mitigate and the risks are to the health and safety of citizens, animals and crops. There are no strategies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

Winnebago County Emergency Management participates in the statewide public information campaigns for Winter and Heat Awareness Weeks each year in spring and fall and they provide links to personal preparedness information on their website. Winnebago County Public Health and Human Services Departments, with the support of Emergency Management and the municipalities, support partnerships with NGO/private organizations (e.g., ADVOCAP, American Red Cross) that assist vulnerable people during periods of extreme temperature. Furthermore, these agencies will support Human Services and the private utility providers, as needed, by amplifying public messaging about grant programs that helps economically disadvantaged residents pay for utility expenses.

The county and its municipal and private sector partners will continue to review, update and support these projects over time.

## 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:<sup>123</sup>



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

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<sup>123</sup> 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.

<b>Hail Size Estimates<sup>124</sup></b>	
<b>Size</b>	<b>Inches in Diameter</b>
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. Winnebago County has a low probability of hail occurrence in Wisconsin. The likelihood of damage due to hail is also considered low. Over the past 25 years hail has occurred 106 times for an average of just over 4 times per year.

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 growing and harvesting seasons for most crops. A table showing the

<sup>124</sup> NWS, January 10, 2003

## Storms: Hail

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hail events recorded by the National Weather Service in Winnebago County<sup>125</sup> can be found in Appendix B.

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 1990s but that the table also shows an increasing frequency in the occurrence of hailstorms.

## Vulnerability

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.

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<sup>125</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

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 Winnebago County University of Wisconsin – Madison Division of Extension 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 county and its municipalities will continue to update and monitor their public early warning system and network. The county continually maintains and tests warning systems and conducts public education campaigns on the various systems (e.g., NOAA weather radios, sirens, IPAWS, AlertSense). The county and/or its municipalities will seek grant funding, as applicable for projects such as the purchase and distribution of NOAA weather radios, upon request from the public.

The Winnebago County Emergency Management Office 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 on social media. Resources and information are shared electronically on severe weather as well as interviews and presentations on severe weather. Red Cross volunteers are reaching out to update shelter and facility surveys. Covid-19 has delayed or limited our accessibility to visit or contact shelters. As volunteers are able, virtual or phone updates are being conducted.

## Storms: Hail

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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.<sup>126</sup>

### 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 strike 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.

<sup>126</sup> 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. Winnebago County has a high probability of lightning occurrence; the likelihood of damage due to lightning is considered low for people in the county with potentially higher probability of damage for things such as computers.

A table showing the lightning events recorded by the National Weather Service (NWS) in Winnebago County<sup>127</sup> can be found in Appendix B. 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.

## 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

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<sup>127</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>



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 and agencies ensure that electronic systems are mechanically protected from lightning and other hazards as systems are bought and/or upgraded. Staff also conduct regular back-up of data and failure plans are in place for critical systems.

The Winnebago County Emergency Management Office has awareness and educational materials online that inform the public on how to get early warnings for lightning hazards as well as safety procedures to follow during a lightning storm. Severe summer weather safety information is also emphasized during Tornado Awareness Week.

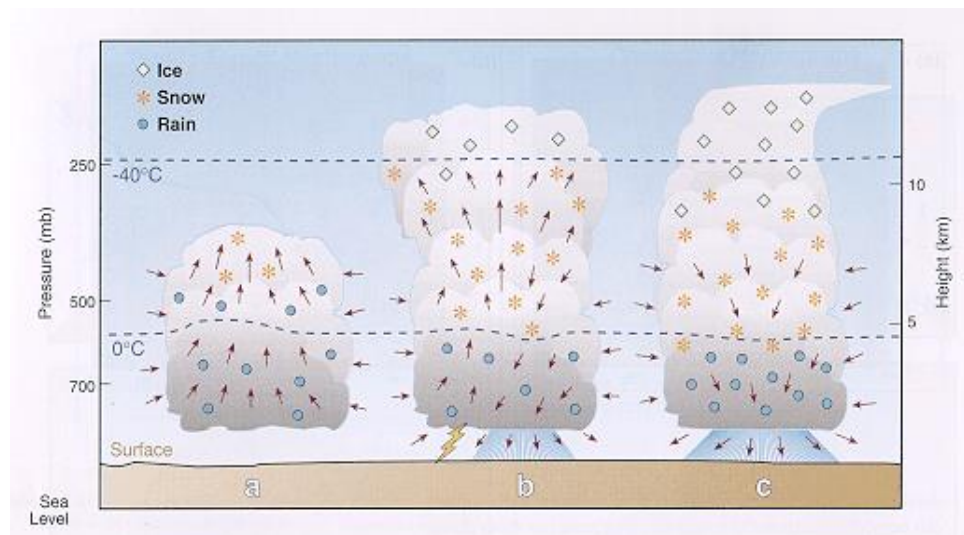
## Storms: Thunderstorms

There are three distinct stages of development for thunderstorms (birth, growth, maturity) each of which can be seen in the following schematic. <sup>128</sup>

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.



### 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

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<sup>128</sup> 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, average between 30 and 40 thunderstorm days per year. In Winnebago 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 thunderstorms occurring in Winnebago County is very high as these storms usually occur one or more times each year during the summer in Wisconsin and Winnebago County. The probability of damage due to a thunderstorm is considered to be low and the likelihood of injury/death to people is also considered to be low. However, damage from thunderstorms usually is a result of the hail, lightning, winds and/or flash flooding that can occur as part of the storm. The likelihood of damage from these causes is in discussed in the appropriate chapters.

Tables showing the thunderstorm events that have been recorded by the National Weather Service in Winnebago County can be found in Appendix B.<sup>129</sup>

## 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. Winnebago County's thunderstorm vulnerabilities due to associated hail, lightning, winds and flood waters are discussed in the other hazard chapters of this plan.

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<sup>129</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

## Hazard Mitigation Strategies

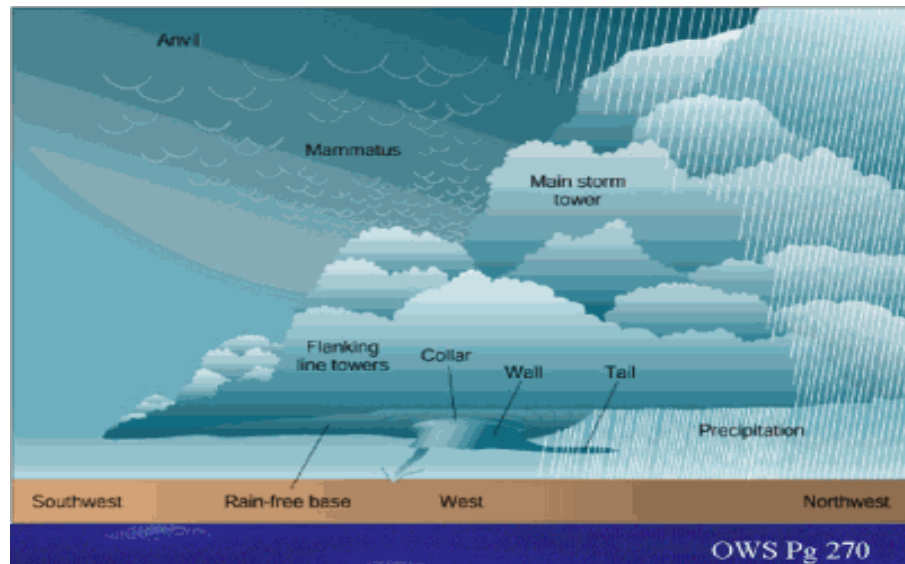
The goal of thunderstorm mitigation activities is to reduce, in a cost-effective manner, the loss of lives and property due to these events.

Winnebago County Emergency Management has developed severe weather safety and alert and notification information that it disseminates to the public online via their website and on social media, with the goal of protecting the lives and property of citizens. During Tornado Awareness 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.

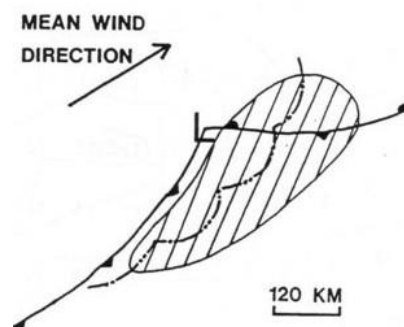


A derecho is a widespread, long-lived, violent, convectively-induced straight-line windstorm that is associated with a fast-moving band of severe thunderstorms usually taking the form of a bow echo. Derechos blow in the direction of movement of their associated storms; this is similar to a gust front 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.

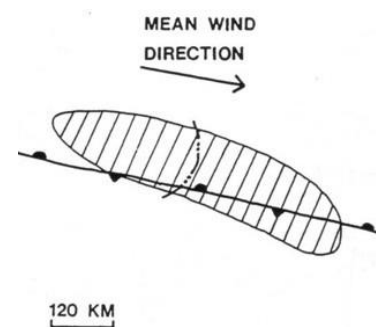
The traditional criteria that distinguish a derecho from a severe thunderstorm are *sustained* winds of 58 mph during the storm as opposed to gusts, high and/or rapidly increasing forward speed and geographic extent (typically 250 nautical miles in length). In addition, they have a distinctive appearance 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:<sup>130</sup>

- **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.
- **Low Dewpoint:** Occurs in an environment of comparatively limited low-level moisture, with appreciable moisture confined to the mid-levels of the atmosphere.



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

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<sup>130</sup> <http://en.wikipedia.org/wiki/Derecho>

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.

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 <sup>131</sup>		
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

<sup>131</sup> FEMA, 1997

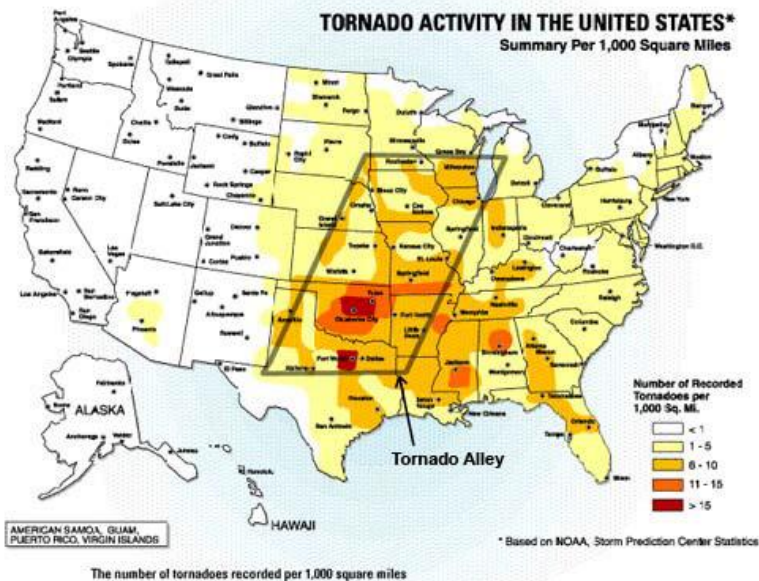
## Downburst Characteristics

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 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 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 of the year. 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.

Tables showing the frequency of high winds, funnel clouds and tornadoes as reported by the National Weather Service can be found in Appendix B.<sup>132</sup> There have been 12 funnel clouds reported for the county. The probability of Winnebago County being struck by a tornado in the future is low and the likelihood of damage from future incidents is very high. The probability of high wind (derecho) and downburst is medium and the likelihood of damages is high. All parts of Winnebago County are equally susceptible to tornadoes and high winds.

## 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; Winnebago County has some 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.

<b>Mobile Home Parks</b> <sup>133 134</sup>	
<b>Park Name</b>	<b>Location</b>
Lakeview	Oshkosh
Edison Estates	Oshkosh
Harbor Lights Mobile Home Park	Menasha

<sup>132</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

<sup>133</sup> <https://www.mobilehome.net/mobile-home-park-directory/wisconsin/county/winnebago-county>

<sup>134</sup> <https://www.mhvillage.com/Communities/MobileHomeParks.php?State=WI&County=Winnebago>

Willow Pines Mobile Estates	Larsen
River Lane Mobile Home Village	Omro
Bridgeview Gardens	Neenah
Jim's Friendly Village	Menasha
Rolling Meadows MHC	Larsen
River Lane Mobile Village	Omro
Five Oaks	Menasha
Patrician Village	Oshkosh
Krug Estates	Menasha
Riverview	Omro
Wheaton's Resort	Larsen
<b>Campgrounds</b> <sup>135</sup>	
<b>Campground Name</b>	<b>Location</b>
Circle R Campground	Oshkosh
Hickory Oaks Campground	Oshkosh
Kalbus Country Harbor	Oshkosh
Waco	Neenah
Huckleberry Acres Campground	New London
Eureka Dam Campsite	Omro
Sunnyview Expo Center	Winnebago

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

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<sup>135</sup> [http://www.hikercentral.com/campcounty/Wisconsin\\_Winnebago.html](http://www.hikercentral.com/campcounty/Wisconsin_Winnebago.html)

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 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. Winnebago 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 maintained in Winnebago County by emergency management. Also, County Emergency Management, in partnership with the

municipalities, promotes multiple channels for public notification including NOAA weather radios, IPAWS, and the AlertSense reverse notification system. The department also continues to evaluate various technologies to determine if they would increase preparedness.

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. Winnebago 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. Winnebago 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 seek grants for the construction of tornado shelters as requested, especially in mobile home parks and campgrounds. 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.

The county and its municipalities would like to consider an ordinance that would require new mobile home parks and future expansions of current parks to provide for a tornado shelter.

The American Red Cross also evaluates structures for use as community shelters; they are currently re-evaluating the list for to ensure that all of the information is current.

## Storms: Winter

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



Picture of snow drifts after the "Groundhog Day Blizzard" in 2011.

### 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.
- Freezing drizzle/freezing rain - Effect of drizzle or rain freezing upon impact on objects with a temperature of 32 degrees Fahrenheit or below.

## Storms: Winter

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- 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. 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, near 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. It should be noted that there were two additional large snow storms that occurred in late February and late March of 2011.

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.

Tables showing winter storm statistics as reported by the National Weather Service can be found in Appendix B.<sup>136</sup> The tables show that there is little property damage but this does not take into account the public costs of managing the snow and ice as well as the costs of managing utility repair to power, telephone and water lines. There are five recorded blizzard events for the county.

The probability that there will be severe winter storms in Winnebago County is high and the likelihood that those storms will cause significant damage is medium.

## 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.

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<sup>136</sup> <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

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 Winnebago County Emergency Response 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 Winnebago County Emergency Management and amplified by its municipalities online (i.e., websites and social media) during Winter Awareness Week in November and as needed around severe weather events. Information distributed includes home and travel safety measures. During a storm, the public is advised to monitor local radio, television, social media, and NOAA weather alert radios for up-to-date forecasts. The Winnebago County Highway Department and its partner municipal Departments of Public Works, along with private resources, are responsible for much of the response to and recovery from winter storm events.

The hazard mitigation strategies listed above involve providing information on general safety measures to the public, which provide basic safety information and increasing the road condition information and salt stores. Since 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 (discussed in the next chapter), they are reasonable 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 that 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. 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.

Electric service is provided in Winnebago County by Alliant Energy, Wisconsin Electric Power and Wisconsin Public Service Corporation. American Transmission Company (ATC) operates the transmission lines providing power to the county. Natural gas is provided by Wisconsin Public Service Corporation and Alliant Energy.

## Utility Failure

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Electrical substation

Rural residents usually heat their homes with propane. During the winter of 2014 there was a propane shortage due to five factors:

1. An increase in the amount of propane used to dry corn due to a late crop harvest coinciding with heavy rains depleted supplies last fall.
2. From November 28 to December 18 a major pipeline supplying propane to Wisconsin, Minnesota and Iowa was temporarily closed for maintenance.
3. Colder-than-normal winter temperatures.
4. An increase in exports of propane.
5. Constrained rail service.

On January 25, 2014 the Governor declared a state of emergency in response to the shortage and the state provided and estimated \$31.2 million in funding to residents of Burnett, Polk and Washburn Counties. During this period, suppliers were rationing propane forcing people to use alternative heat sources, which can cause carbon monoxide poisoning or may lead to fires.

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

Winnebago County has some short power outages (i.e., lasting less than six hours) each 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.

The workgroup agreed that Winnebago County has a between a very low to medium likelihood of utility failures with a high risk of damage, death or injury due to a loss; with the exception of gas service being very low during summer months. The probabilities depend on the type of utility. 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 functional and access 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 Winnebago County. People, especially those with functional and access needs, 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. Other utilities may also be non-operational due to damaged infrastructure, which can be very expensive to replace and/or repair. While there are many back-up generators on sewage lift stations around Winnebago County, not all are covered and 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. EPCRA facilities 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 extreme temperatures reduce the volume of livestock products 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.

Winnebago 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. Winnebago County plans to continue to actively evaluate the utility systems' preparedness in cases of disaster in order to create mitigation strategies for likely scenarios.

In the event of a prolonged power outage, Winnebago 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.

Several municipalities have concerns about their ability to run critical infrastructure such as municipal service/public buildings and shelters during a disaster. The following communities would like to evaluate and add generating capabilities to critical community infrastructure:

- Winnebago County – Sunnyview Expo Center is our largest and most utilized community wide shelter. We are looking to install

a back-up generator to ensure it is available in the case of a power outage.

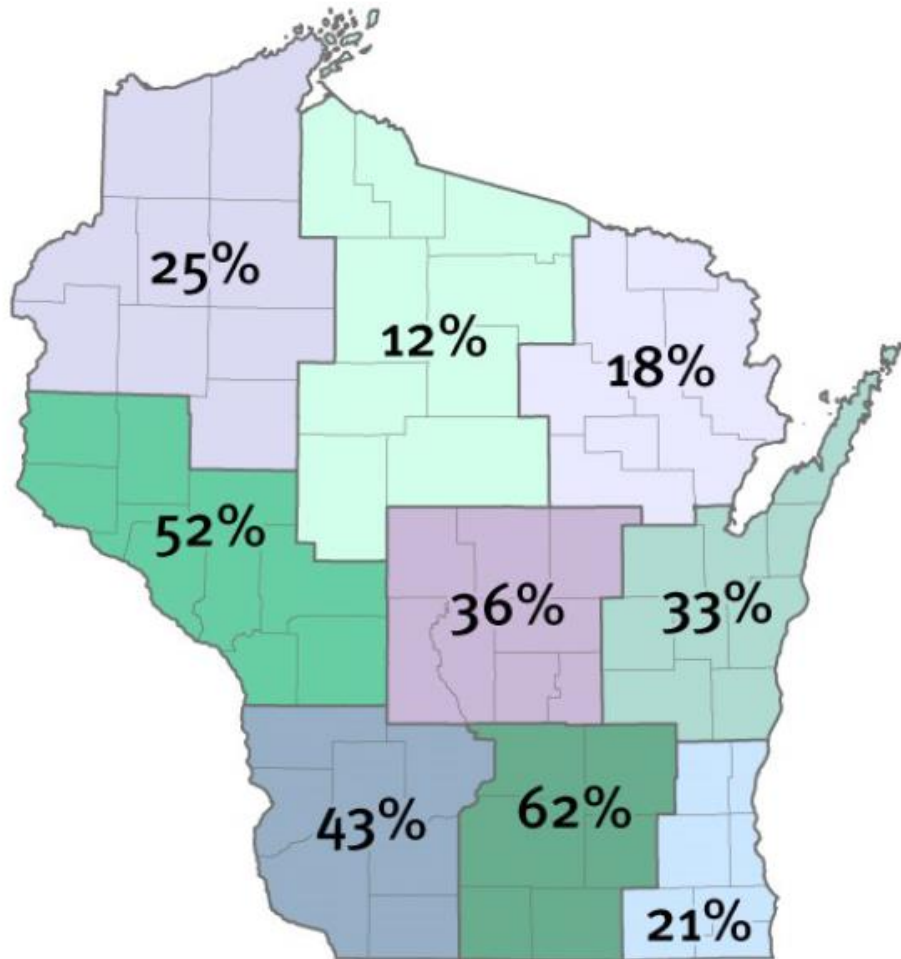
- City of Appleton - Fire Station on Lynch Avenue has a back-up generator which is currently in good shape. Will be ongoing for maintenance of equipment.
- City of Omro – Could use one at the community center, which also serves as a Red Cross shelter. However, it may not be the community center much longer which would mean the loss of the shelter. The concern is high but the situation is in flux. May be also be needed at Community Center and possibly schools (the high school is an ARC shelter).
- City of Oshkosh – Fire Station 15 (also primary EOC) needs one
- Village of Fox Crossing - Generator is there but does not power most things. Plans in the works to add to the building in three phases (first starting now) and add generator power for the entire complex at that time.
- Village of Winneconne – Have four portable generators; looking at replacing 2 older ones but would not be able to do that with budget, would have to be grant funding. Getting a panel at Village Hall would be good, as the building houses police and the library.
- Town of Clayton - Elementary School (which is a Red Cross shelter)

# Appendix A: Maps

## Winnebago County Base Map



## Percentage of Private Wells with Detectable Herbicides or Herbicide Metabolites (2001)<sup>137</sup>

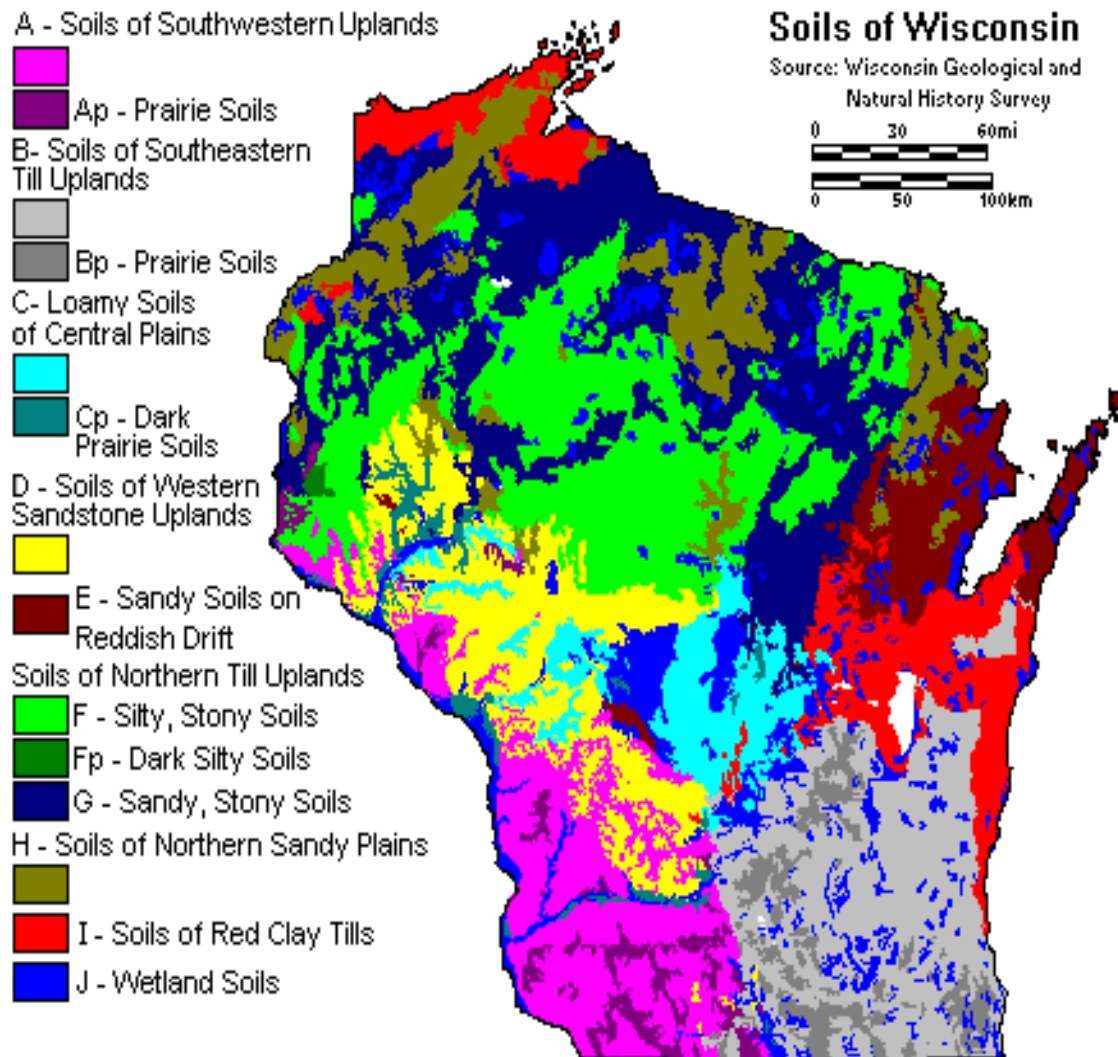


Herbicide data: Wisconsin Department of Agriculture, Trade and Consumer Protection, 2002, Agricultural chemicals in Wisconsin groundwater: final report, [http://www.datcp.state.wi.us/arm/agriculture/land-water/environ\\_quality/pdf/arm-pub-98.pdf](http://www.datcp.state.wi.us/arm/agriculture/land-water/environ_quality/pdf/arm-pub-98.pdf)

Figure created for the "Protecting Wisconsin's Groundwater Through Comprehensive Planning" web site, 2007, <http://wi.water.usgs.gov/gwcomp/>

<sup>137</sup> <https://wi.water.usgs.gov/gwcomp/find/winnebago/pesticidestate.html>

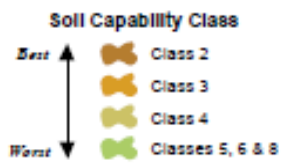
## Soils Types<sup>138</sup>



<sup>138</sup> Source: *Soils of Wisconsin* compiled by F. D. Hole, 1973; Wisconsin Geological and Natural History Survey Map, scale (approx.) 1: 3,150,000.



# Soil Classes



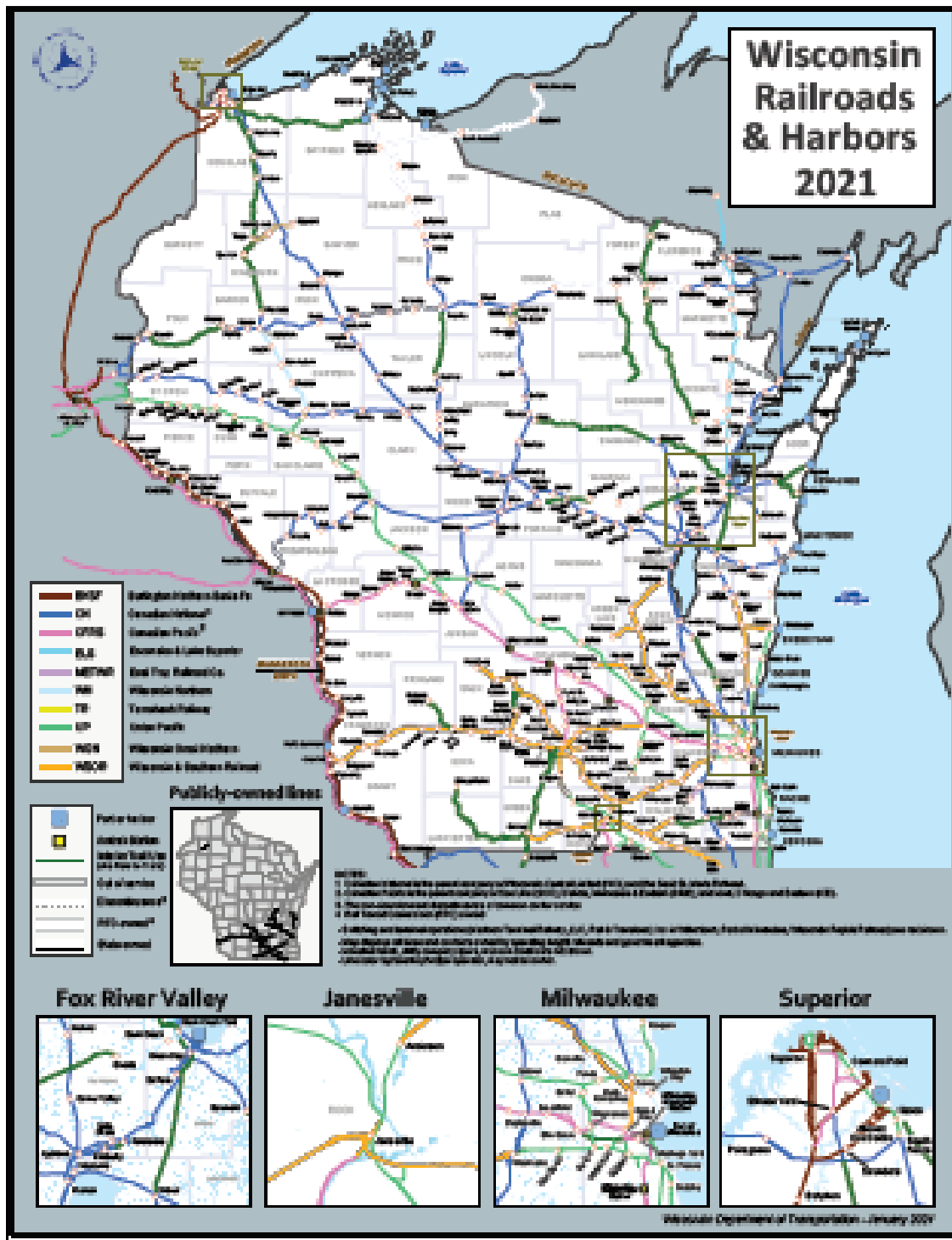
# Winnebago County Road Map



# Winnebago County Road Functional Classification

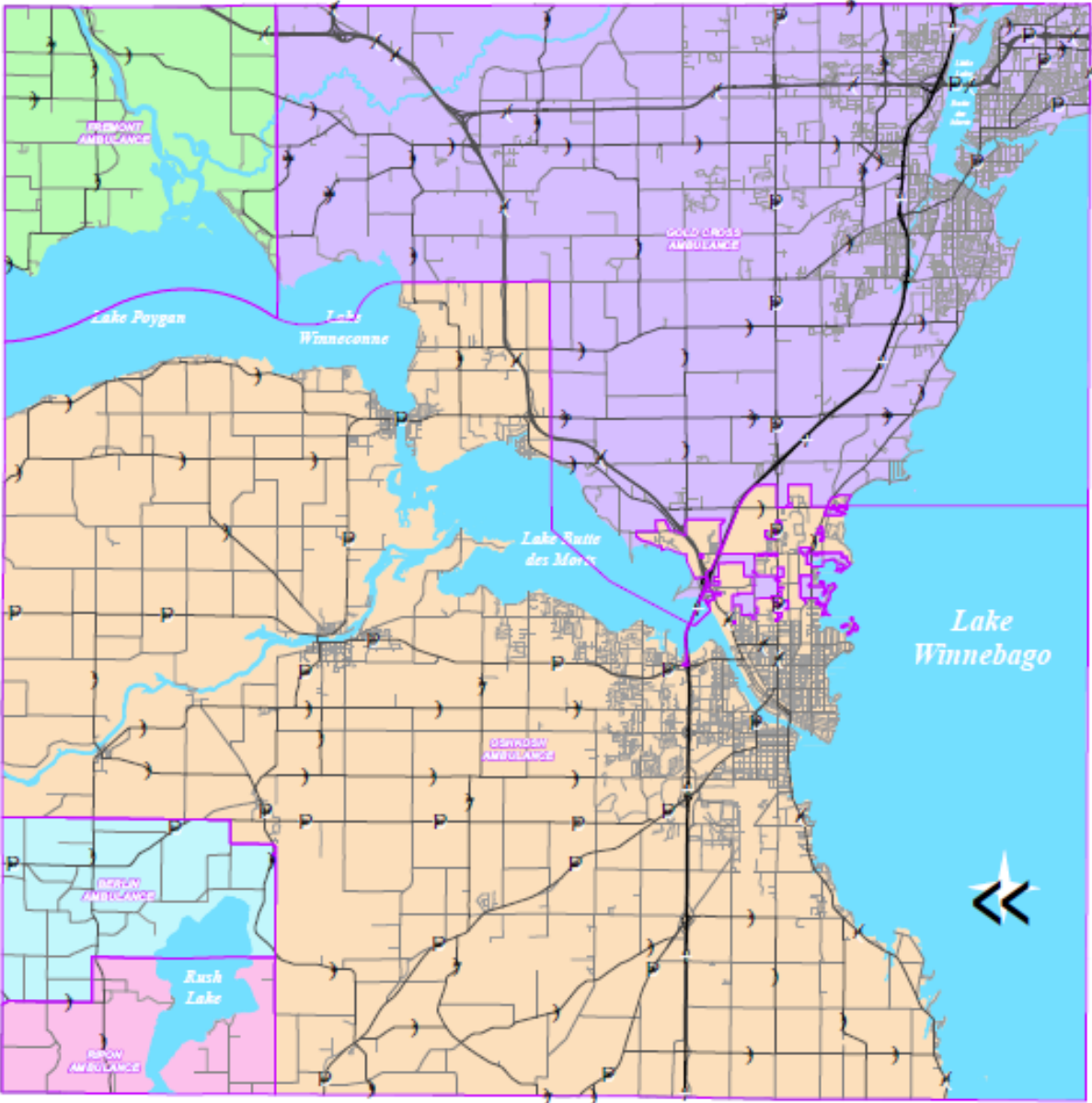


Wisconsin Railroads and Harbors 139



139 <https://wisconsin.gov/Documents/travel/rail/railmap.pdf>

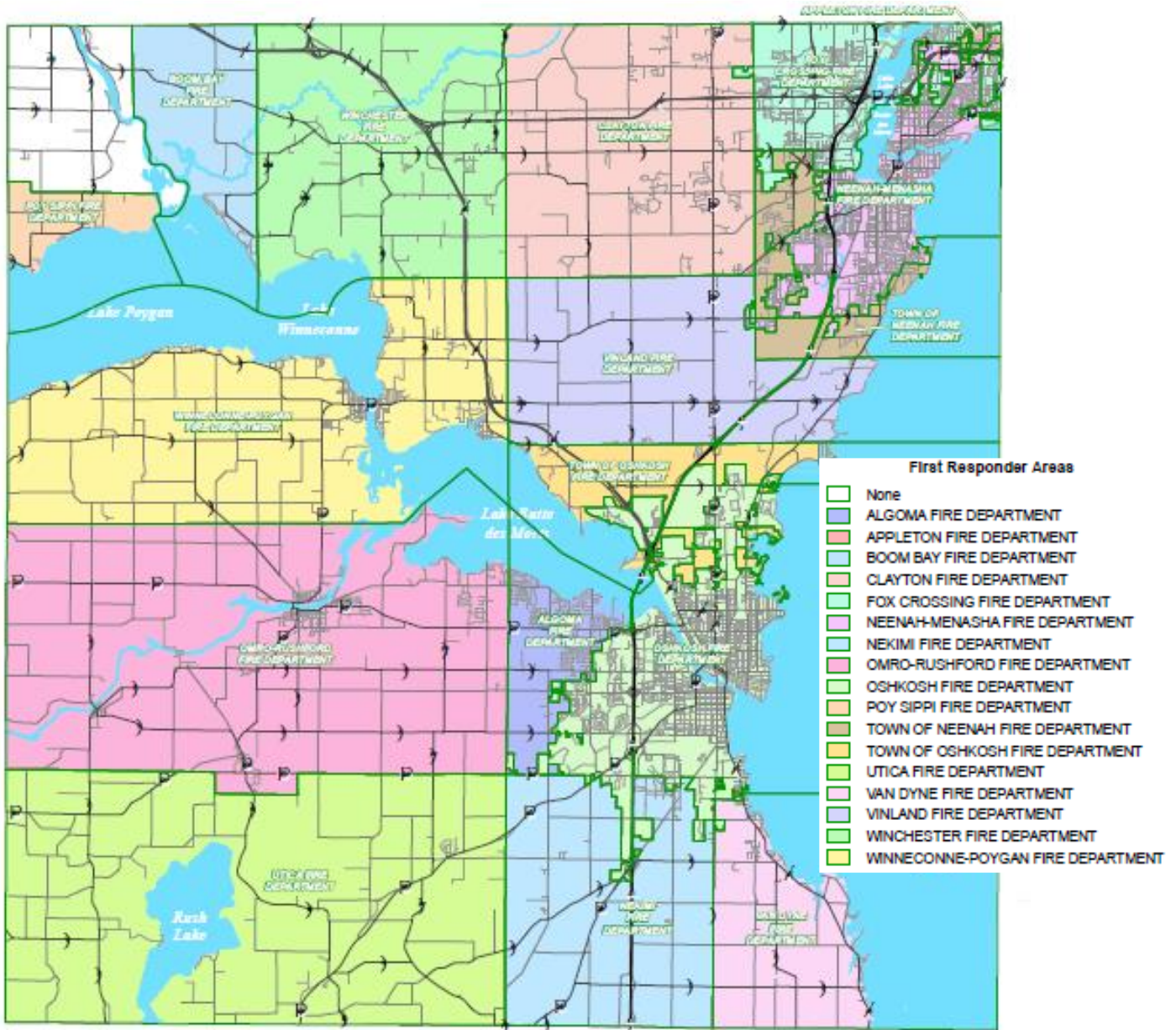
# Winnebago County EMS Service Areas



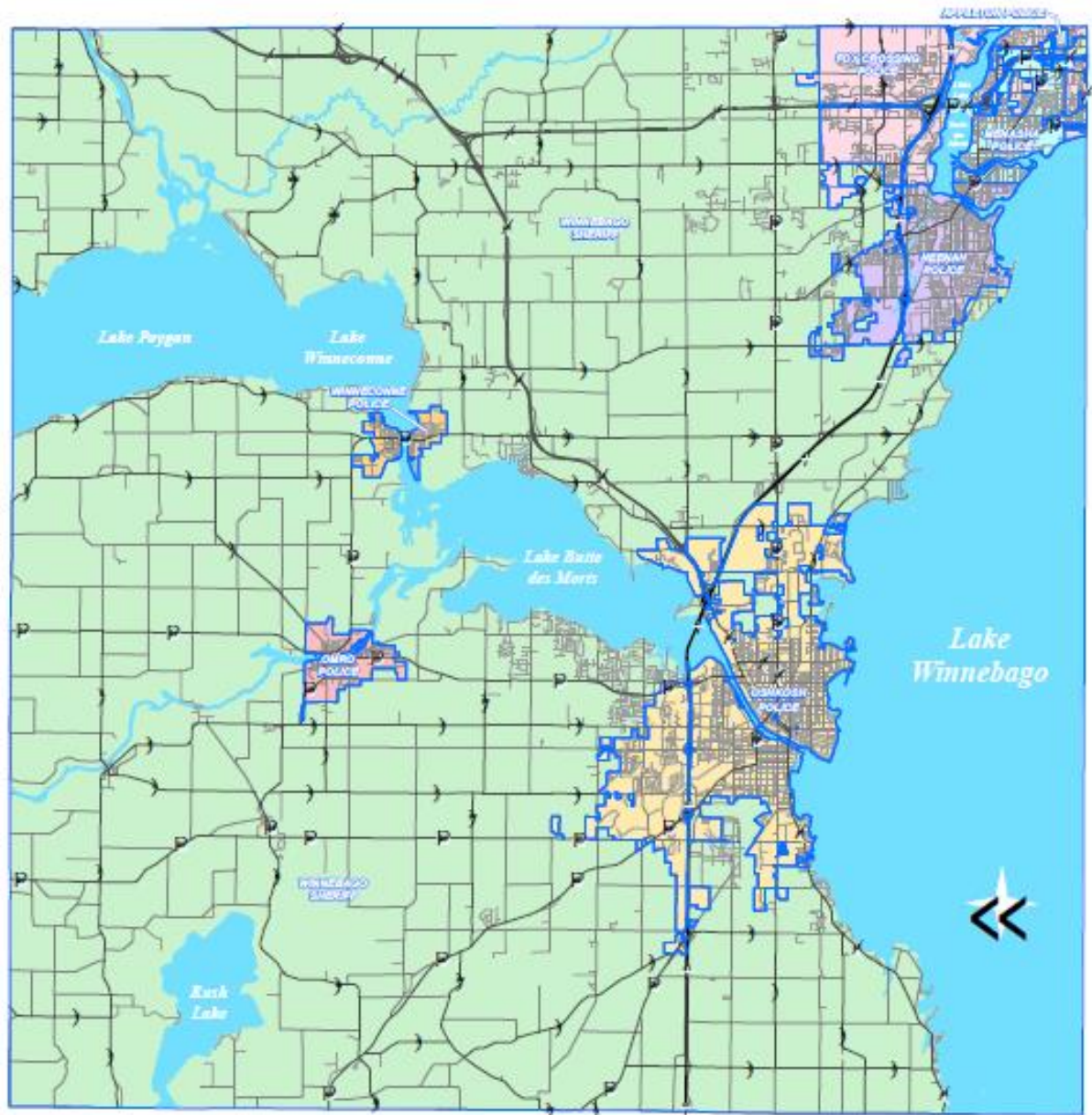
**Ambulance Service Areas**

- BERLIN AMBULANCE
- FREMONT AMBULANCE
- GOLD CROSS AMBULANCE
- OSHKOSH AMBULANCE
- RIPON AMBULANCE

## Winnebago County First Responder Providers



# Winnebago County Law Enforcement Districts

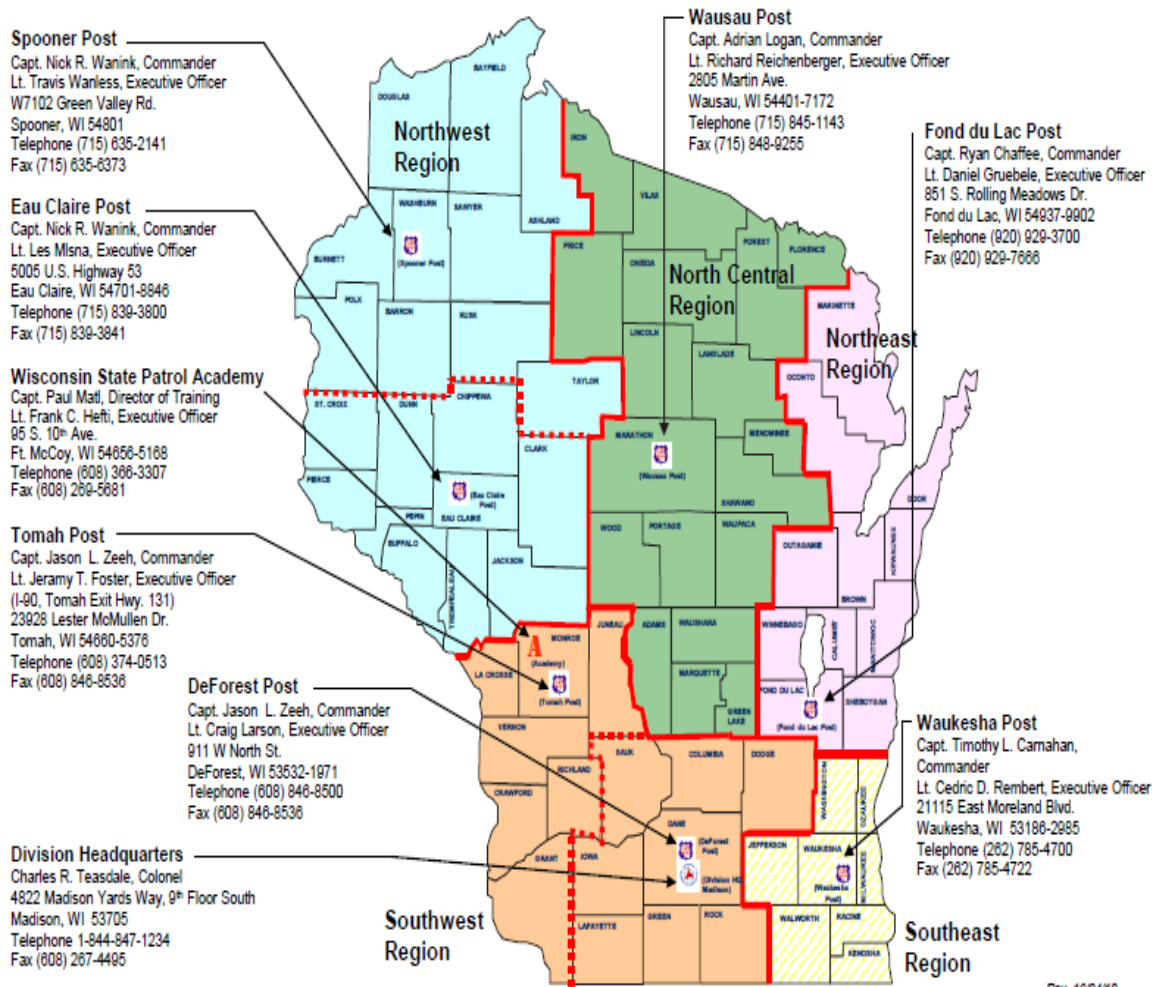


- Law Enforcement Areas**
- APPLETON POLICE
  - FOX CROSSING POLICE
  - MENASHA POLICE
  - NEENAH POLICE
  - OMRO POLICE
  - OSHKOSH POLICE
  - WINNEBAGO SHERIFF
  - WINNECONNE POLICE

# Wisconsin State Patrol Regions



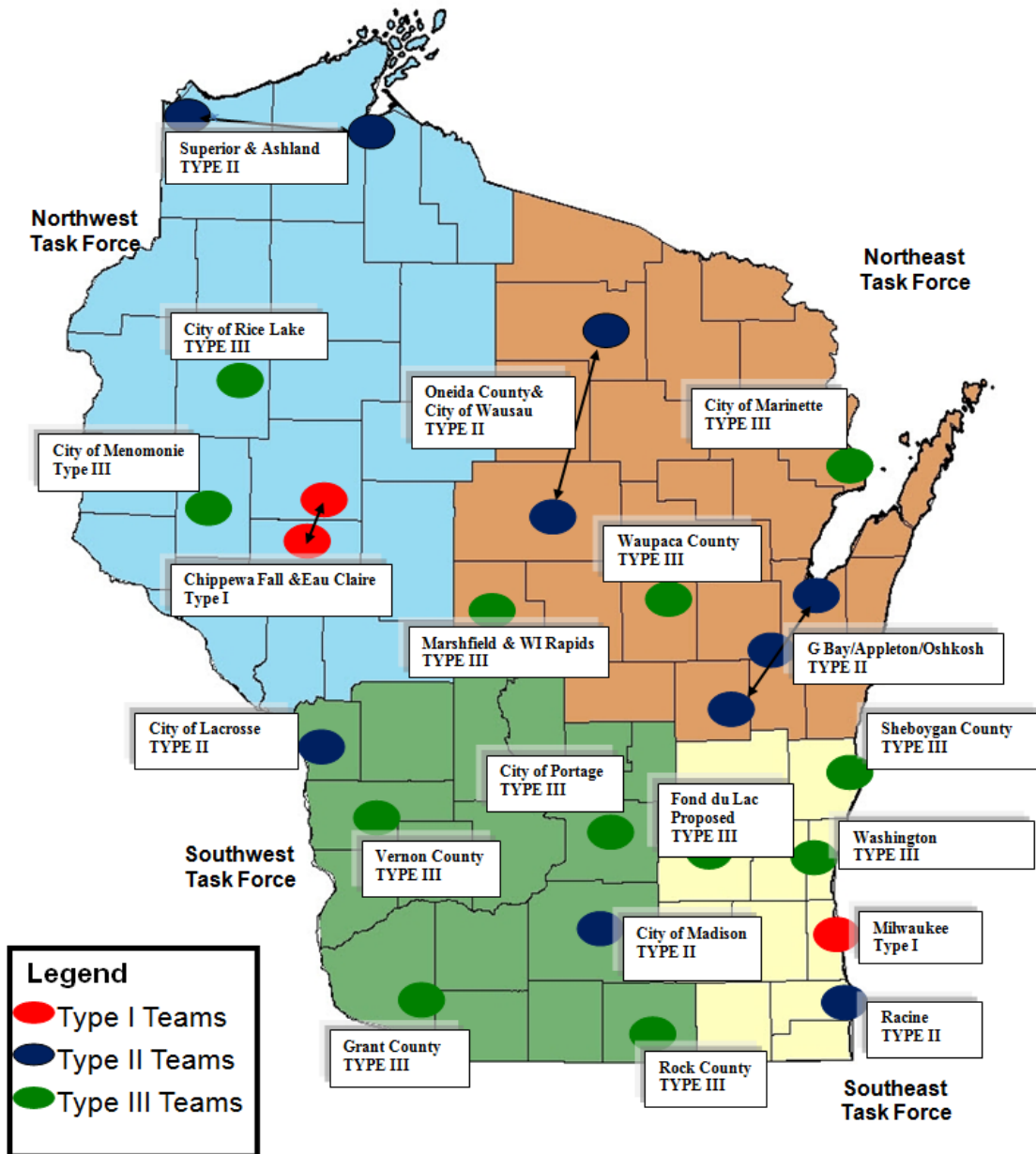
## Division of State Patrol Regions Map



Rev. 10/24/18

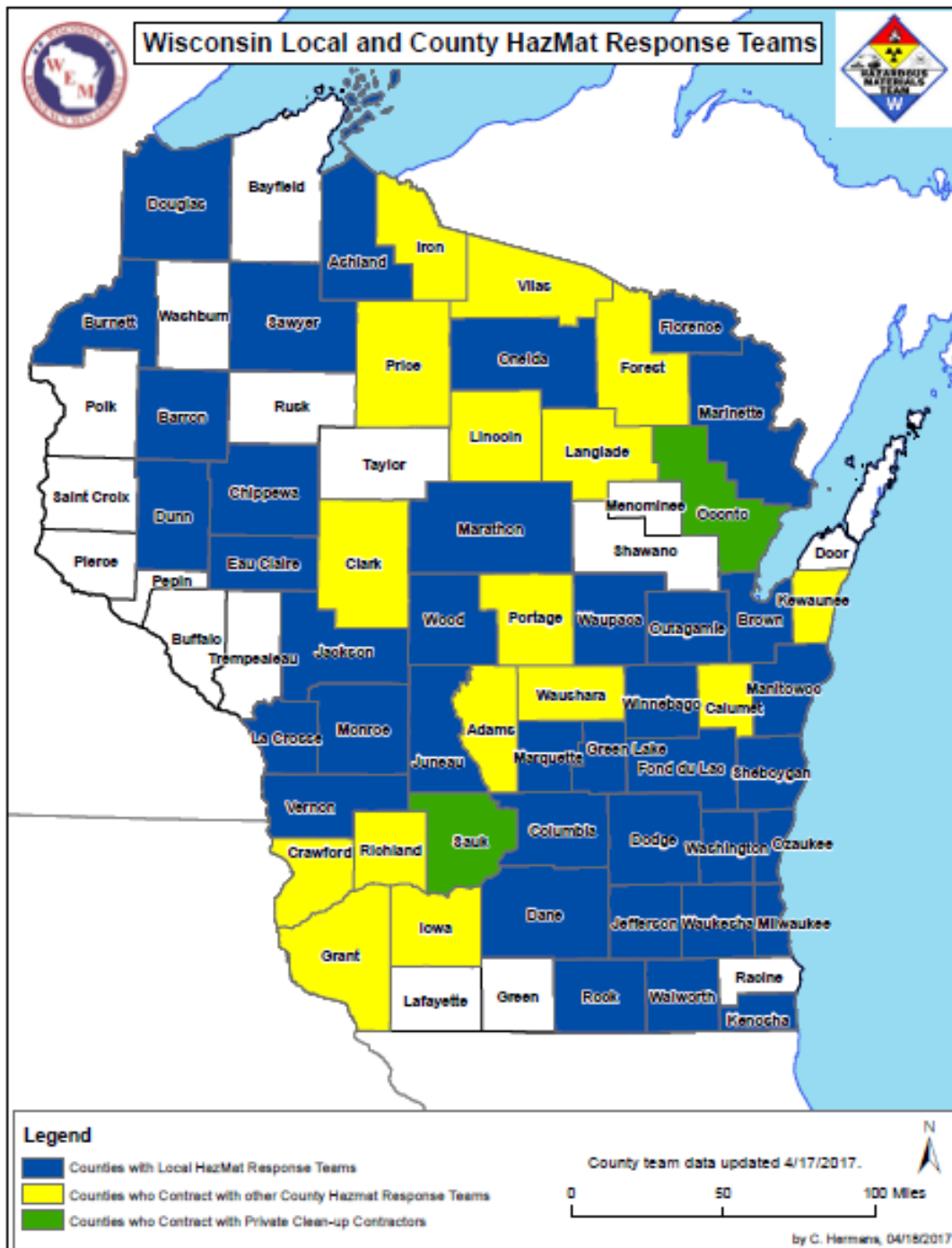


# Wisconsin's Regional & County/Local HazMat Response Teams<sup>140</sup>



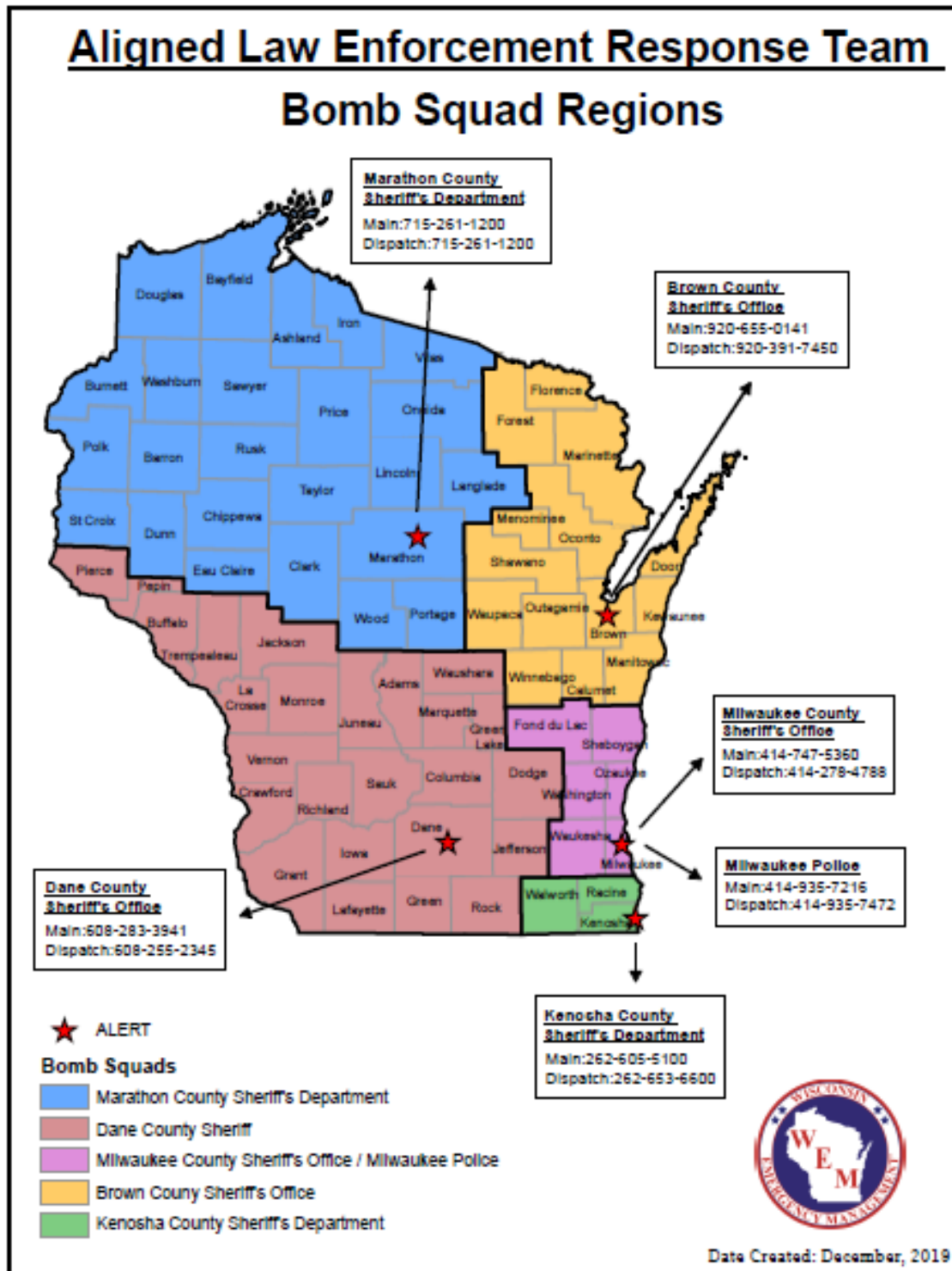
<sup>140</sup> <http://www.wsfca.com/files/cache/c1e510bdc2d15a686a3e1793a4418804.jpg>

# Wisconsin Hazardous Materials Response Teams<sup>141</sup>

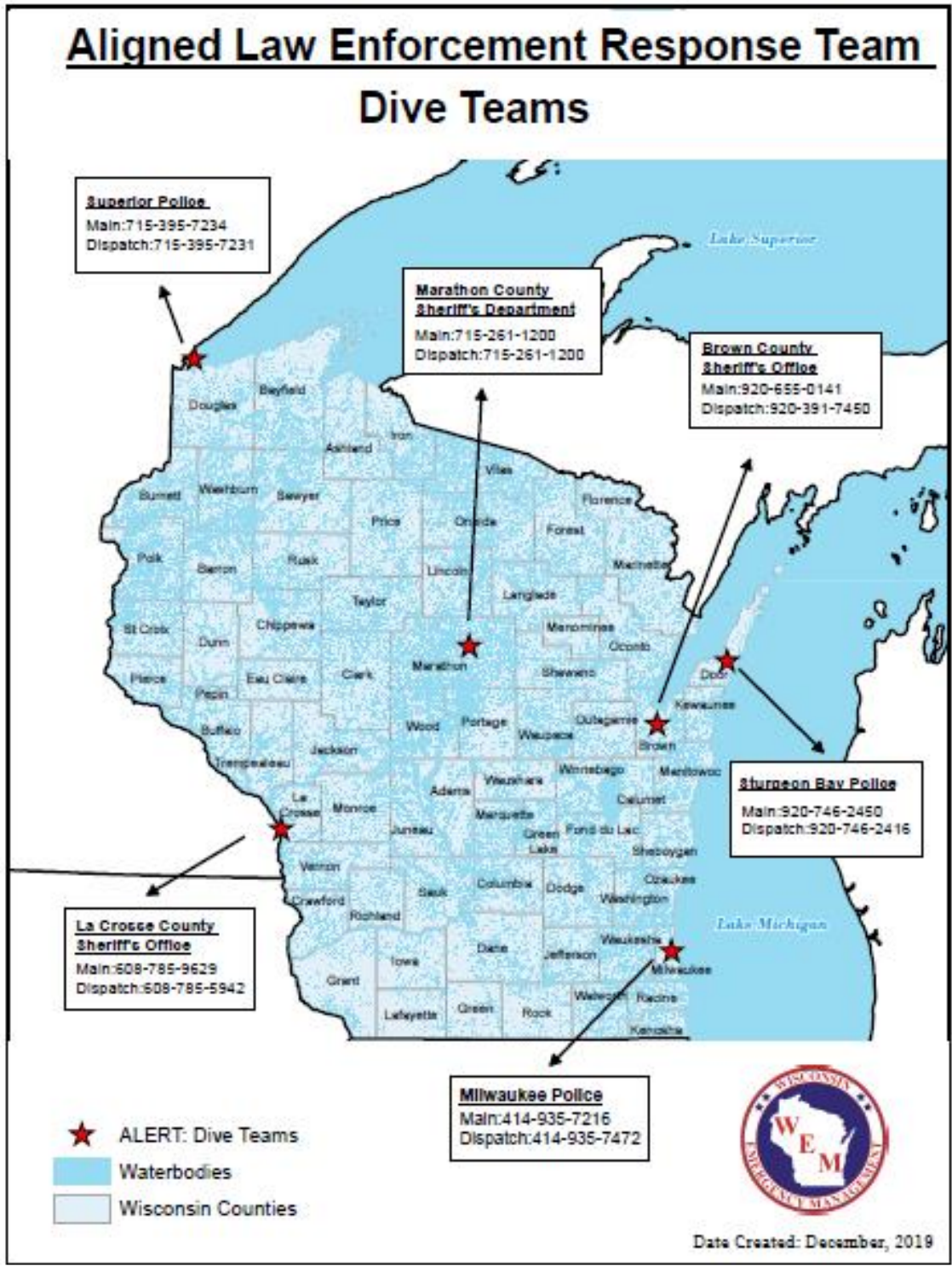


<sup>141</sup> [https://dma.wi.gov/DMA/divisions/wem/response/images/HazMat\\_County\\_Teams.pdf](https://dma.wi.gov/DMA/divisions/wem/response/images/HazMat_County_Teams.pdf)

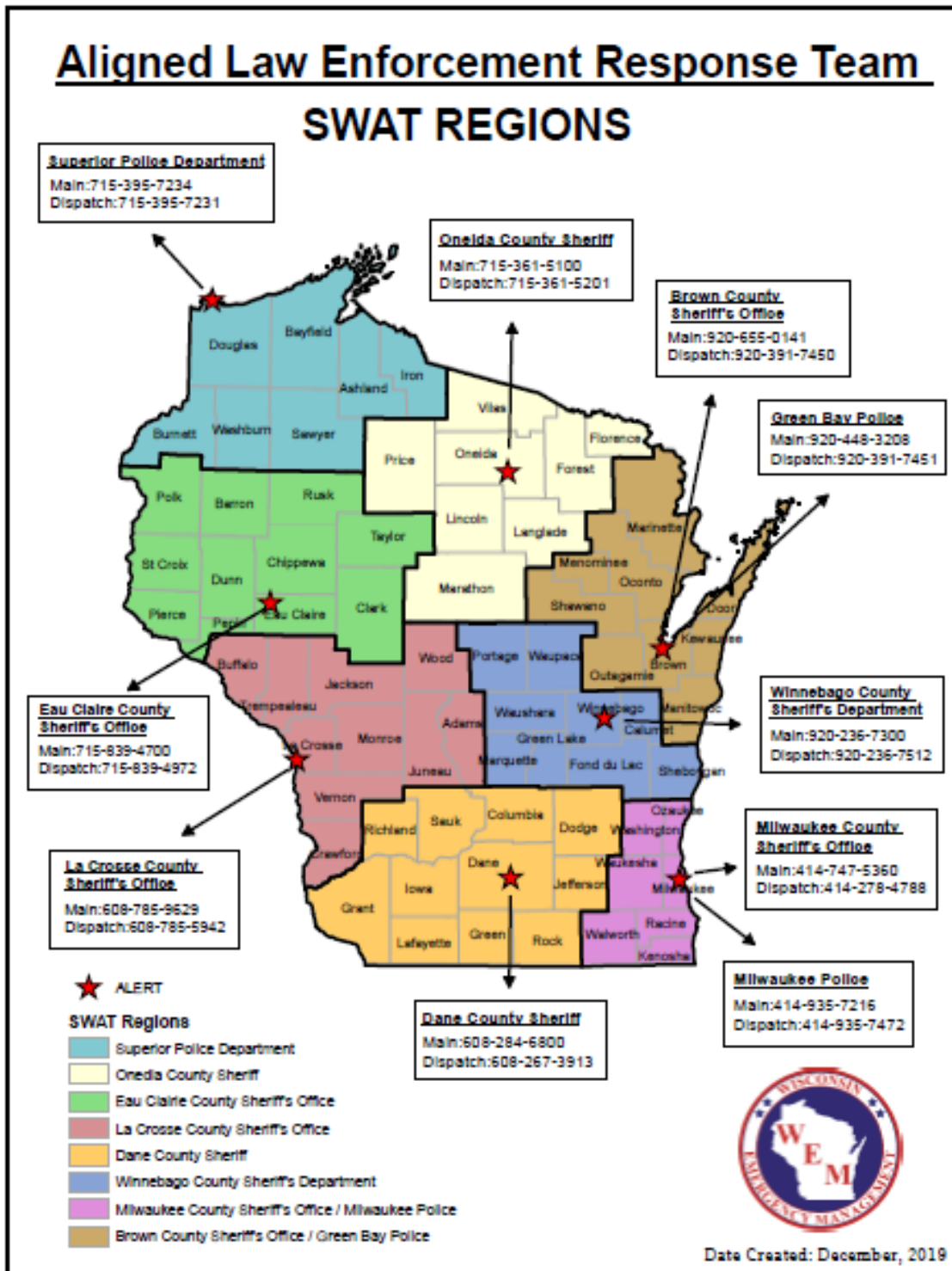
# Wisconsin Bomb Squad Regions



# Wisconsin Dive Teams

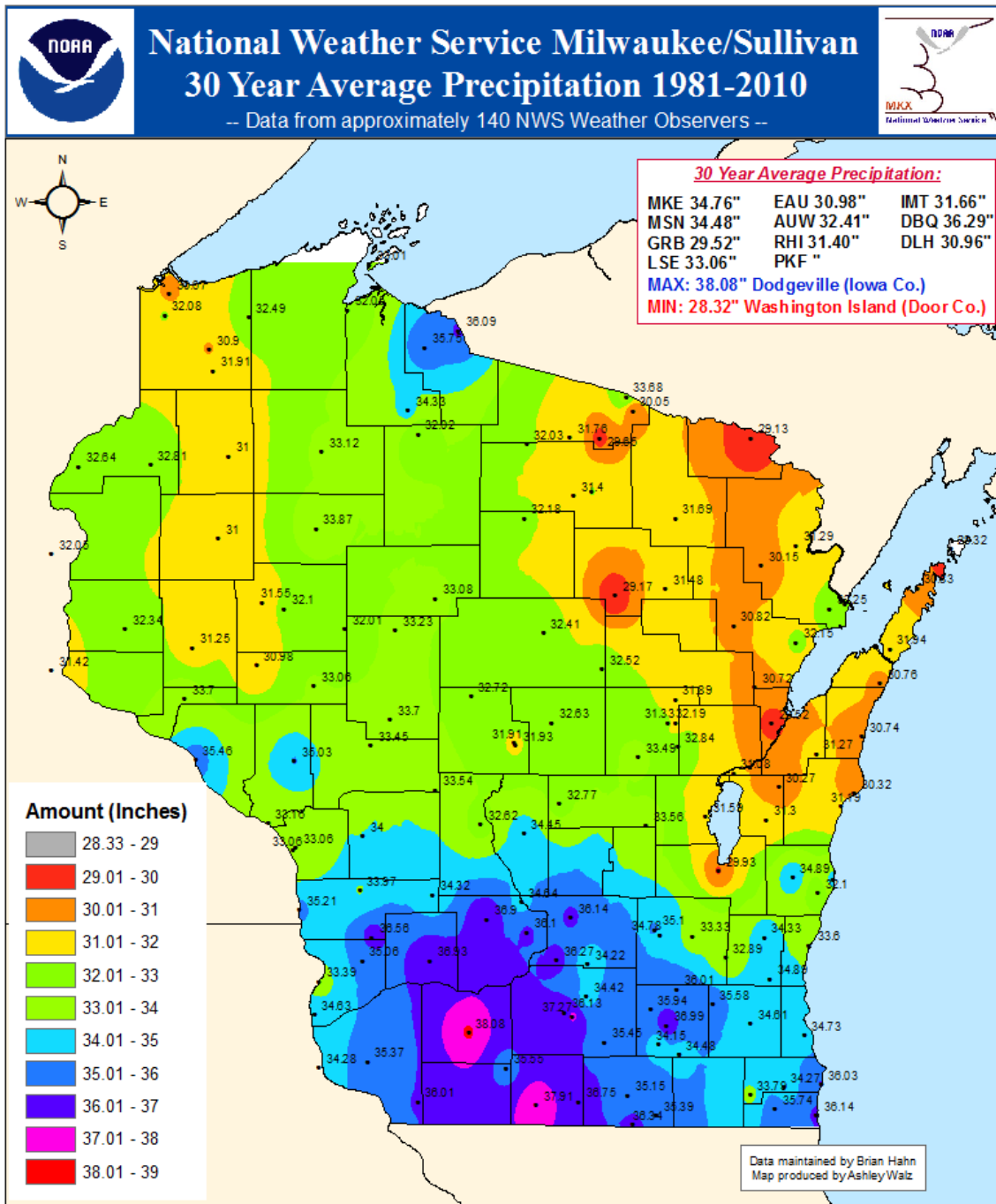


# Wisconsin SWAT Regions



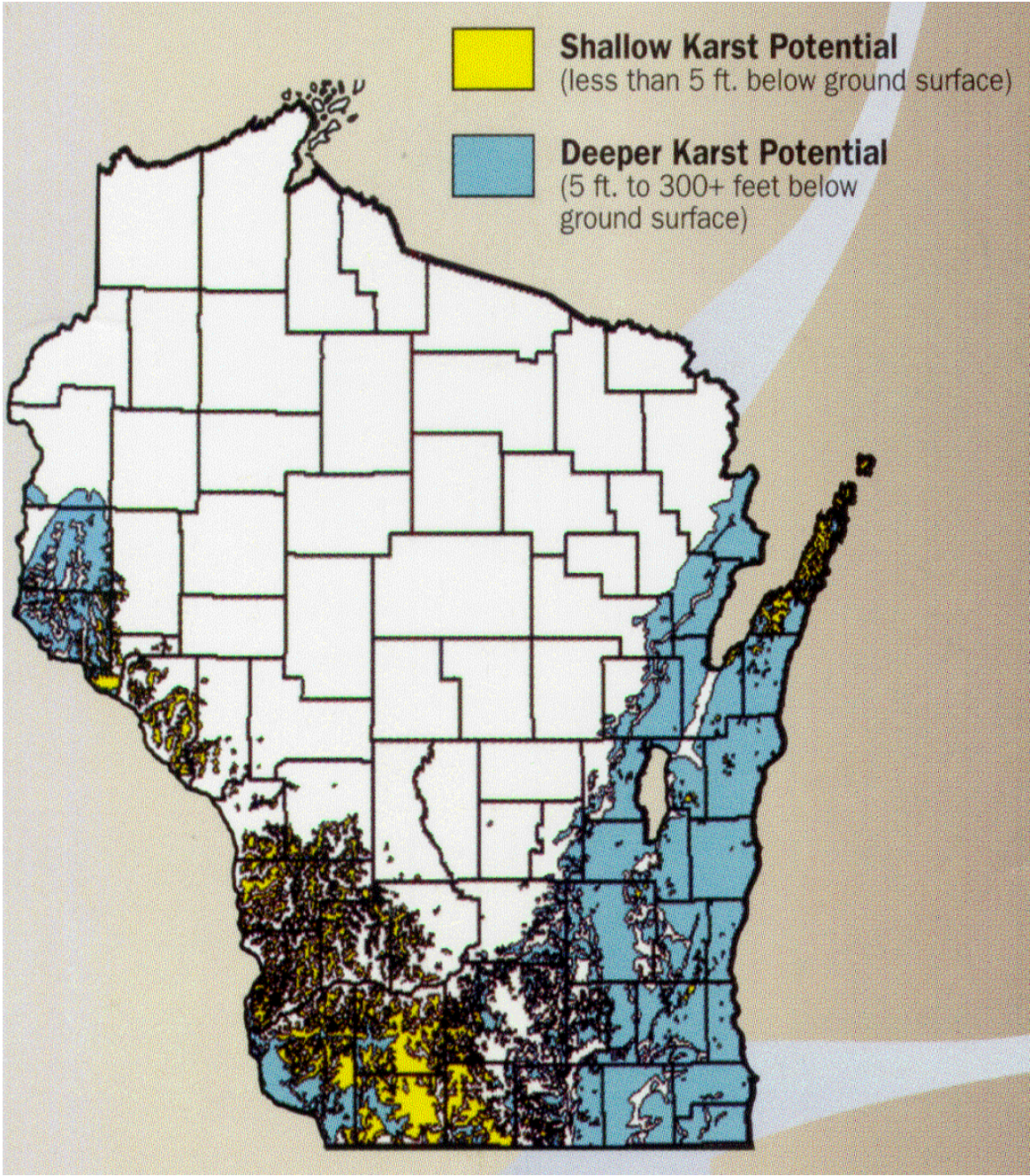
142

# Wisconsin 30-Year Average Precipitation <sup>143</sup>



<sup>143</sup> [http://www.crh.noaa.gov/images/mkx/climate/avg\\_30\\_year\\_precip.png](http://www.crh.noaa.gov/images/mkx/climate/avg_30_year_precip.png)

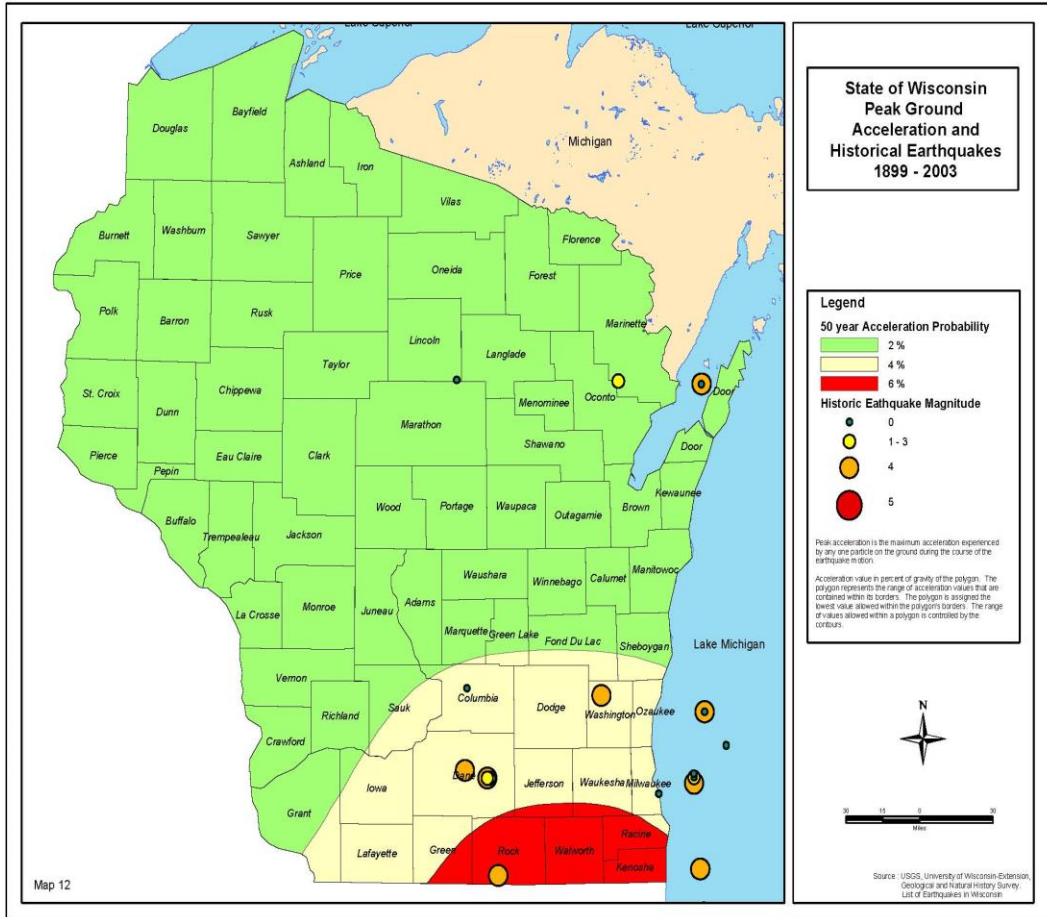
Karst Potential <sup>144</sup>



<sup>144</sup> Wisconsin State Hazard Mitigation Plan

# Earthquakes in Wisconsin <sup>145</sup>

## Peak Ground Acceleration Contours and Historical Earthquakes in Wisconsin





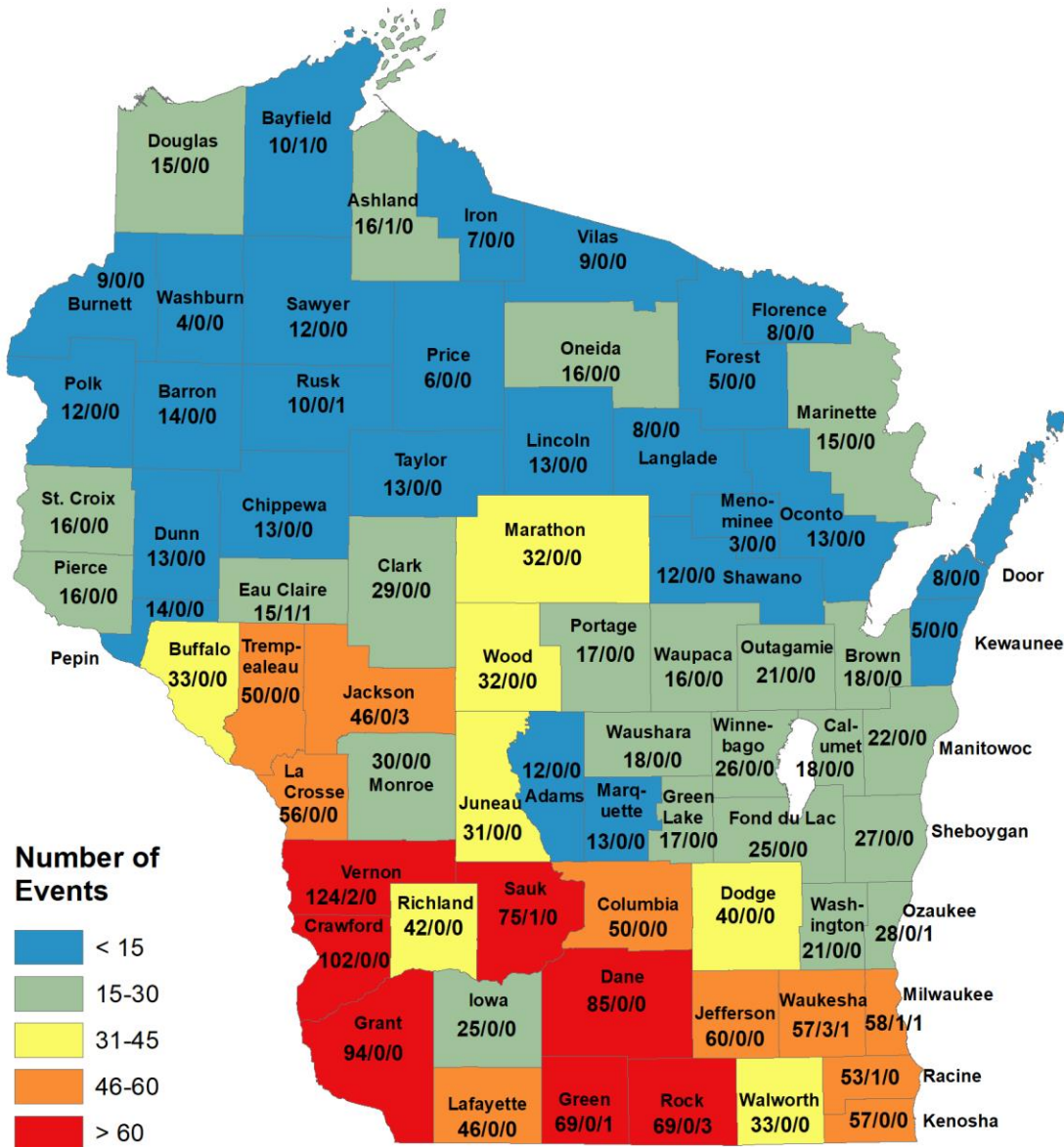
# Wisconsin Total Flood Events



## Wisconsin Flood Events

1844 - 2018

# Events / # Deaths / # Injuries



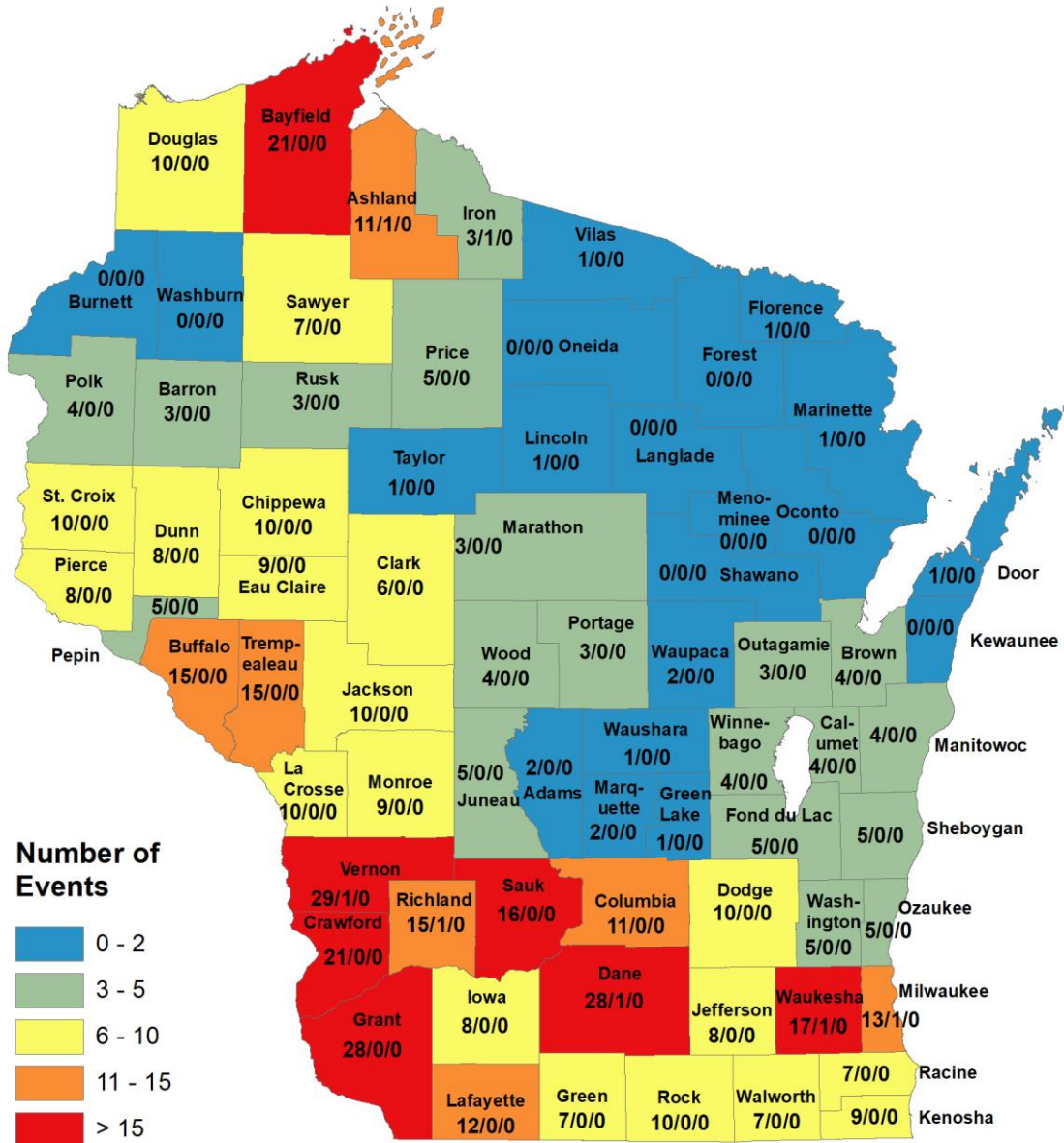
# Wisconsin Flash Flood Events



## Wisconsin Flash Flood Events

2006 - 2018

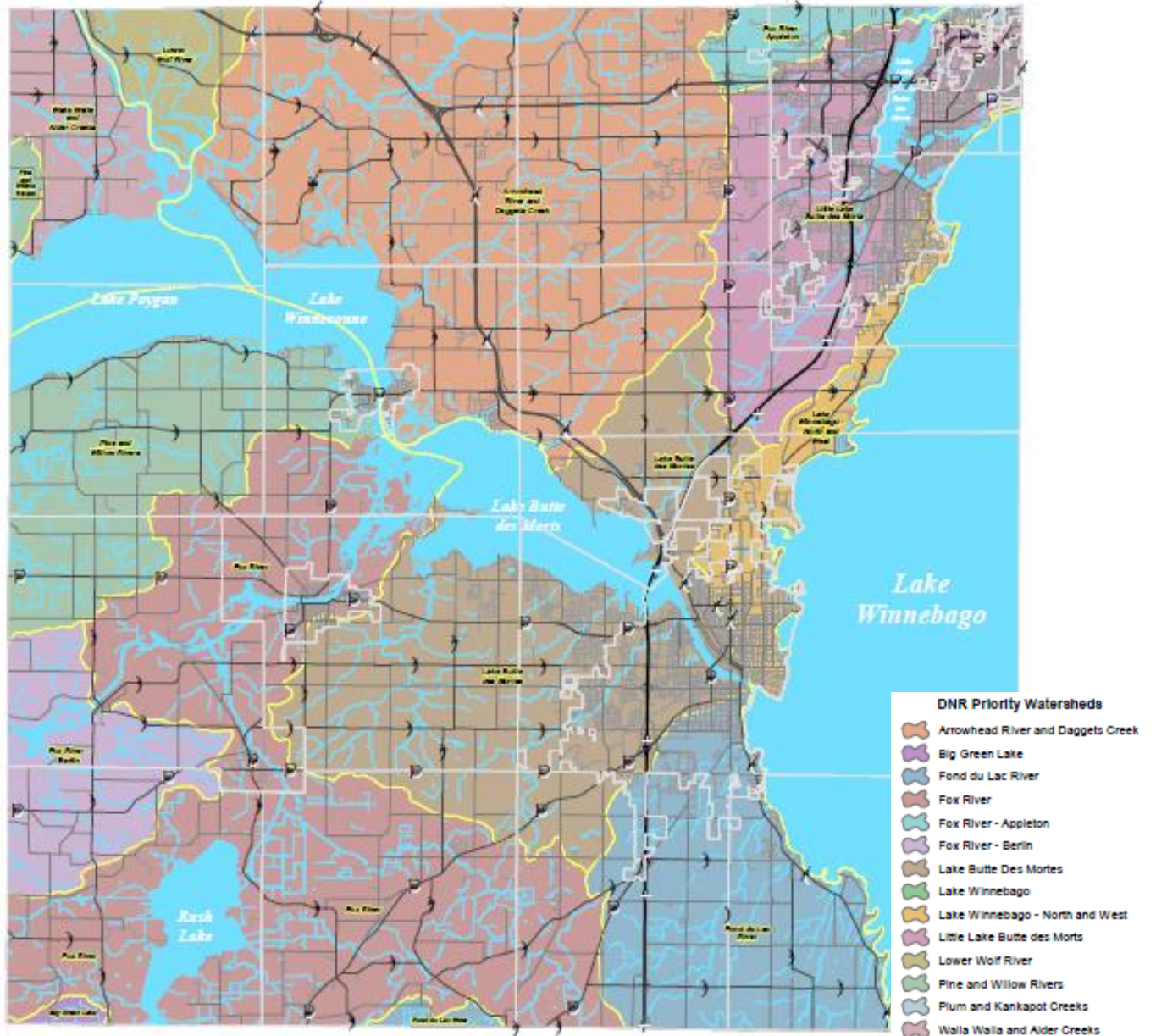
# Events / # Deaths / # Injuries



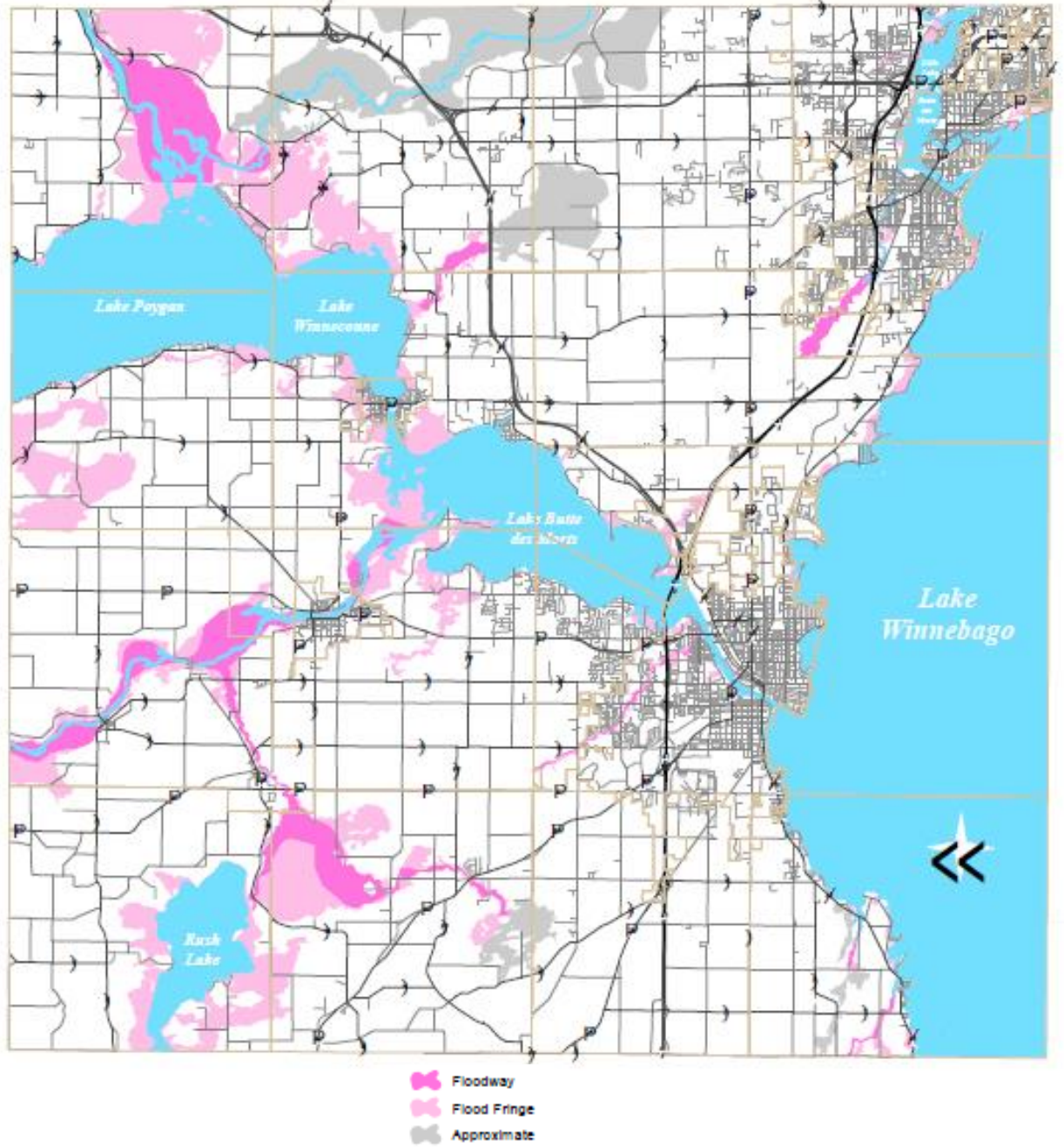
# Winnebago County Dams



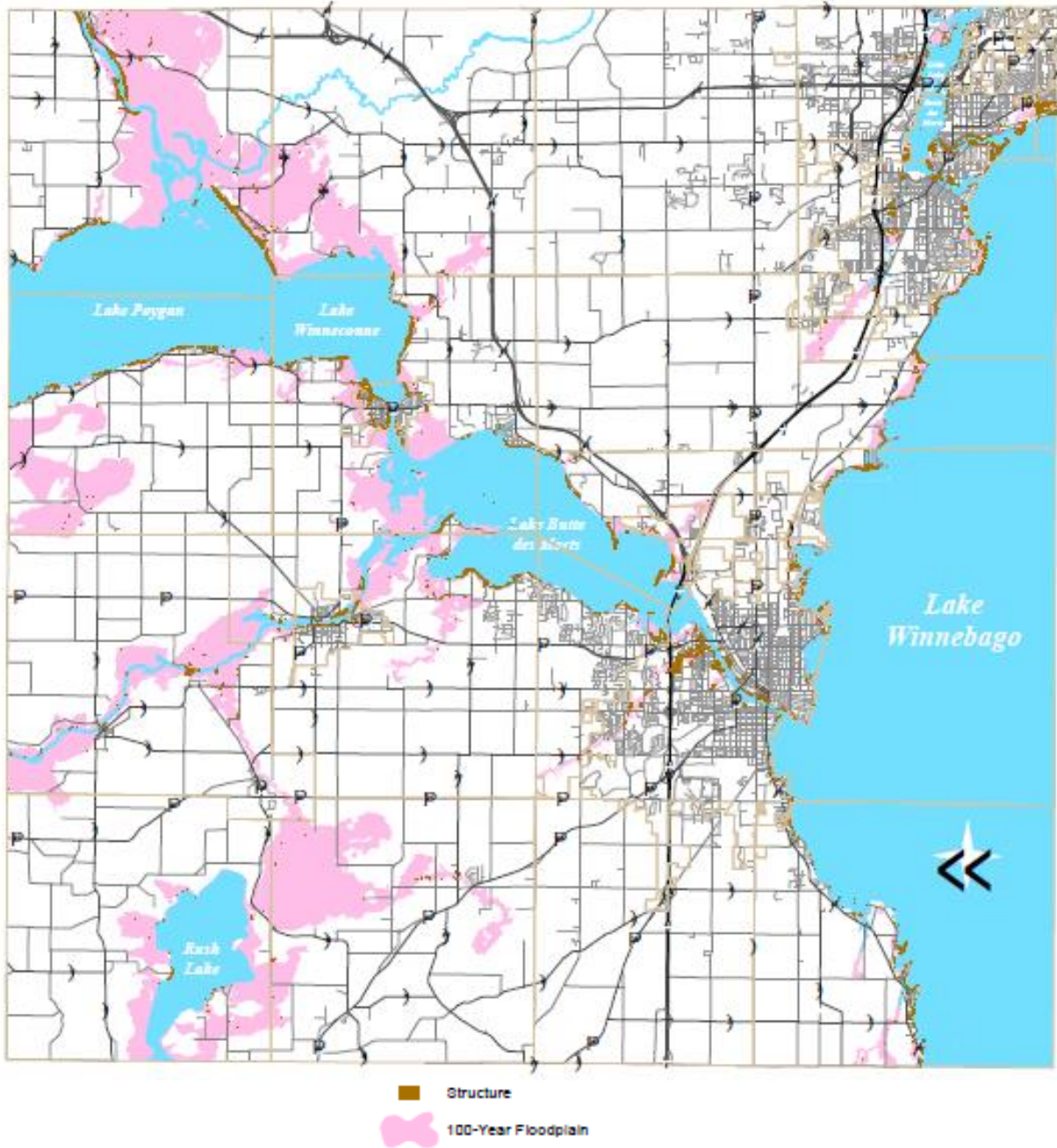
## Winnebago County Watersheds



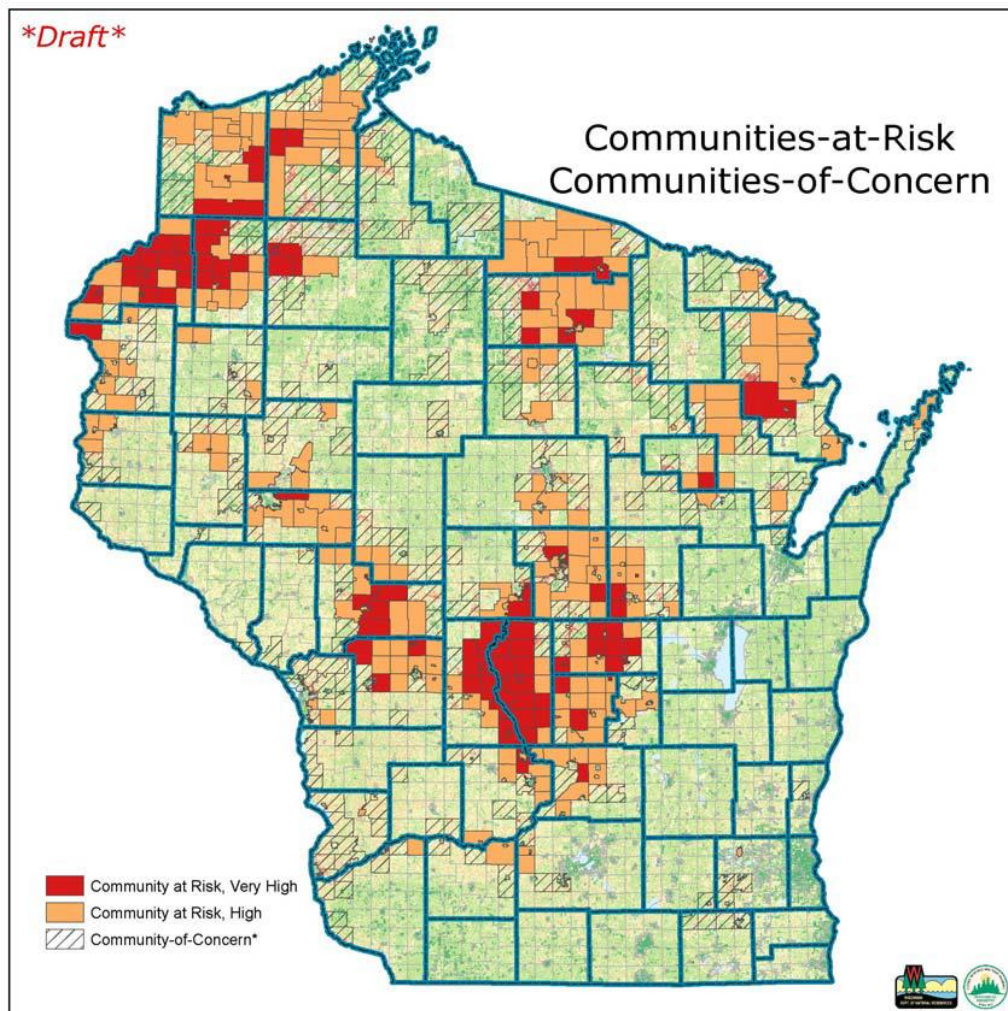
# Winnebago County Floodplain Map



## Winnebago County Structures Within 100-Year Floodplain



# Wildfire Communities at Risk <sup>146</sup>



### Introduction to Communities-at-Risk

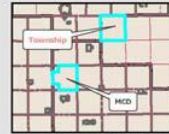
The purpose of this model is to identify broad areas of the state that are at relatively high exposure to resource damage due to wildfire.

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

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

\* 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.

### Defining Community

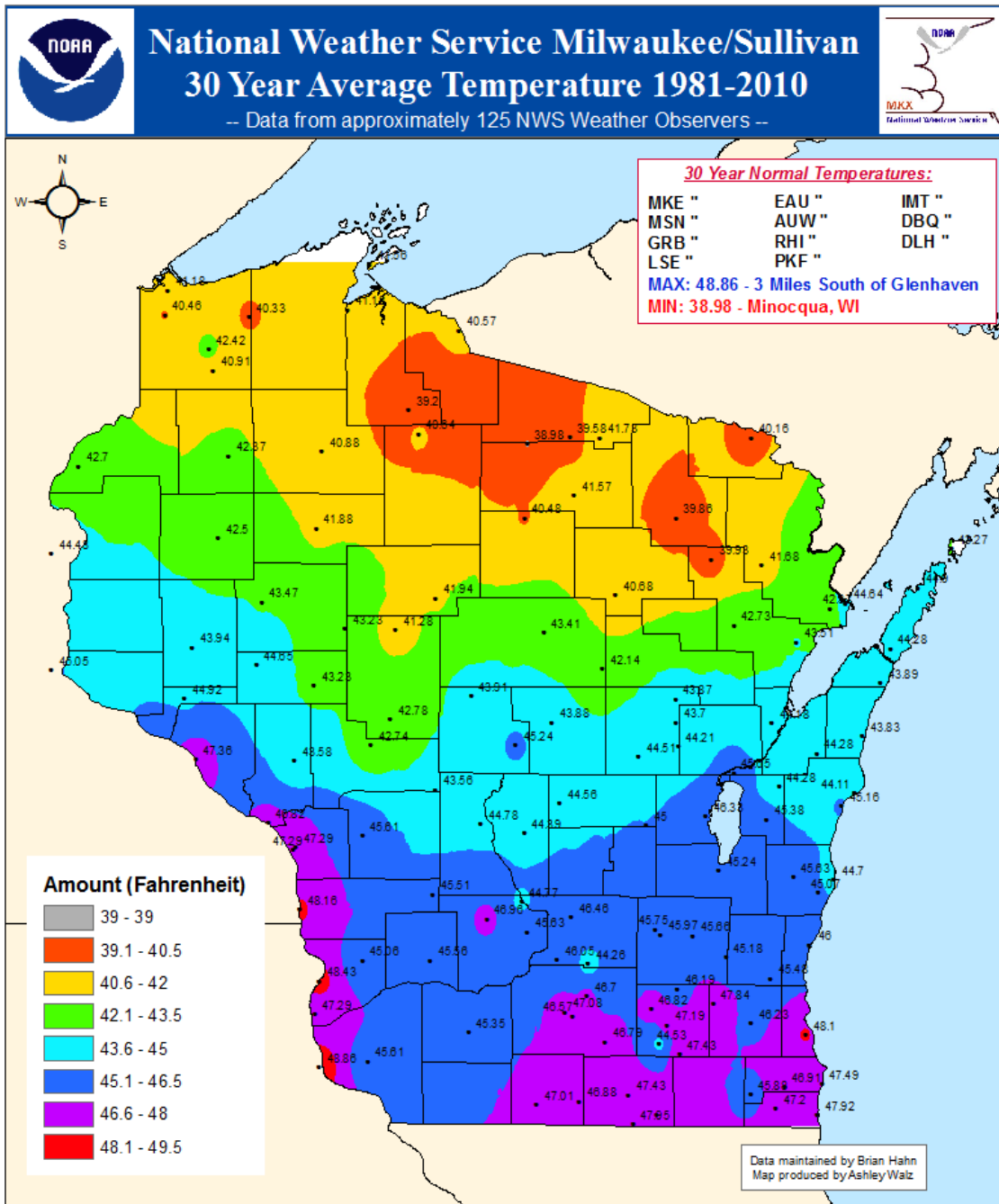


For Wisconsin, Communities-at-Risk are reported at the MCD (municipal civil division) level\*. MCD was chosen due to its identifiable legal boundaries, ease in reporting, and usage in the development of Community Wildfire Protection Plans.

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

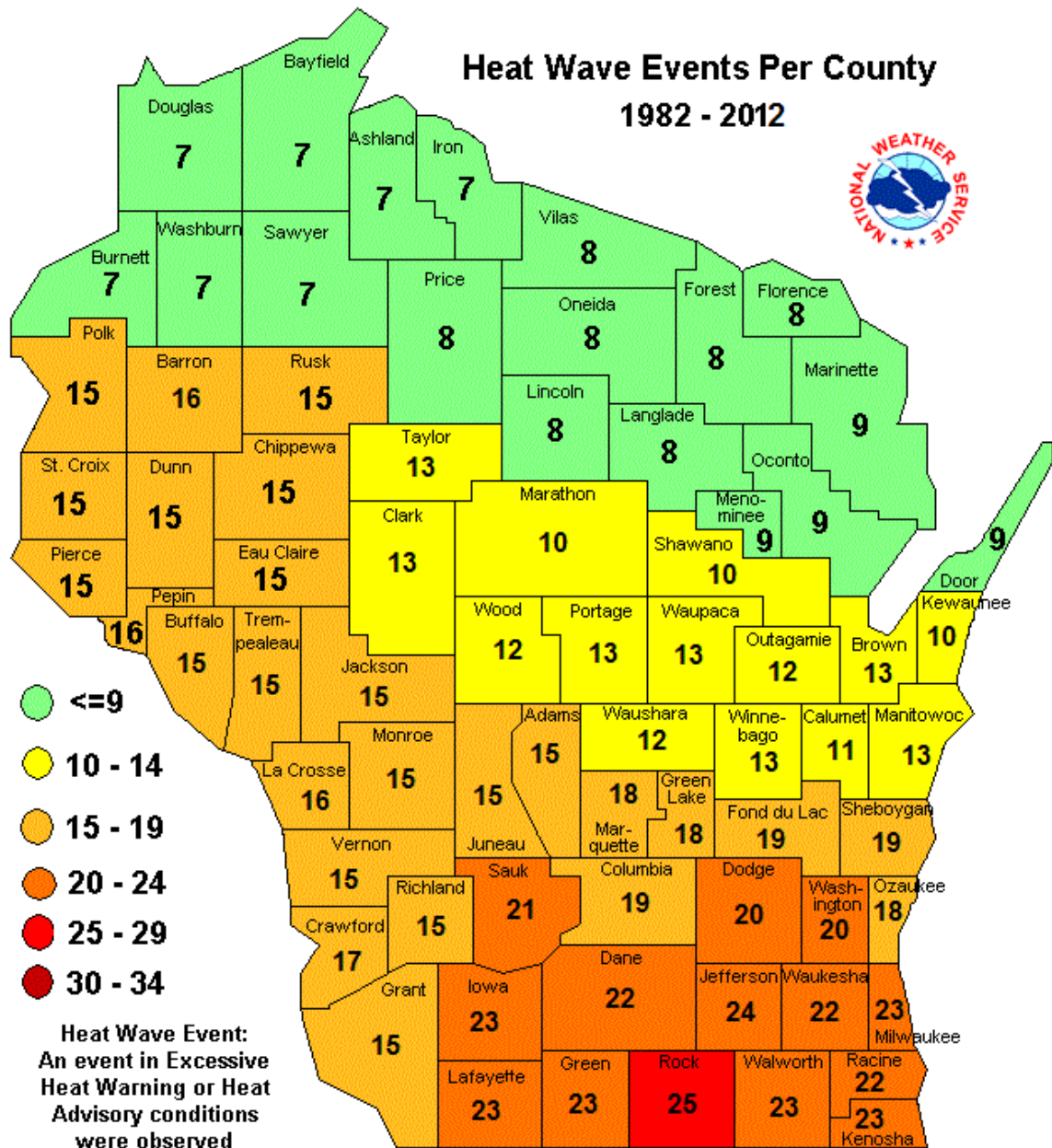
10/5/07

# Wisconsin 30 Year Average Temperature

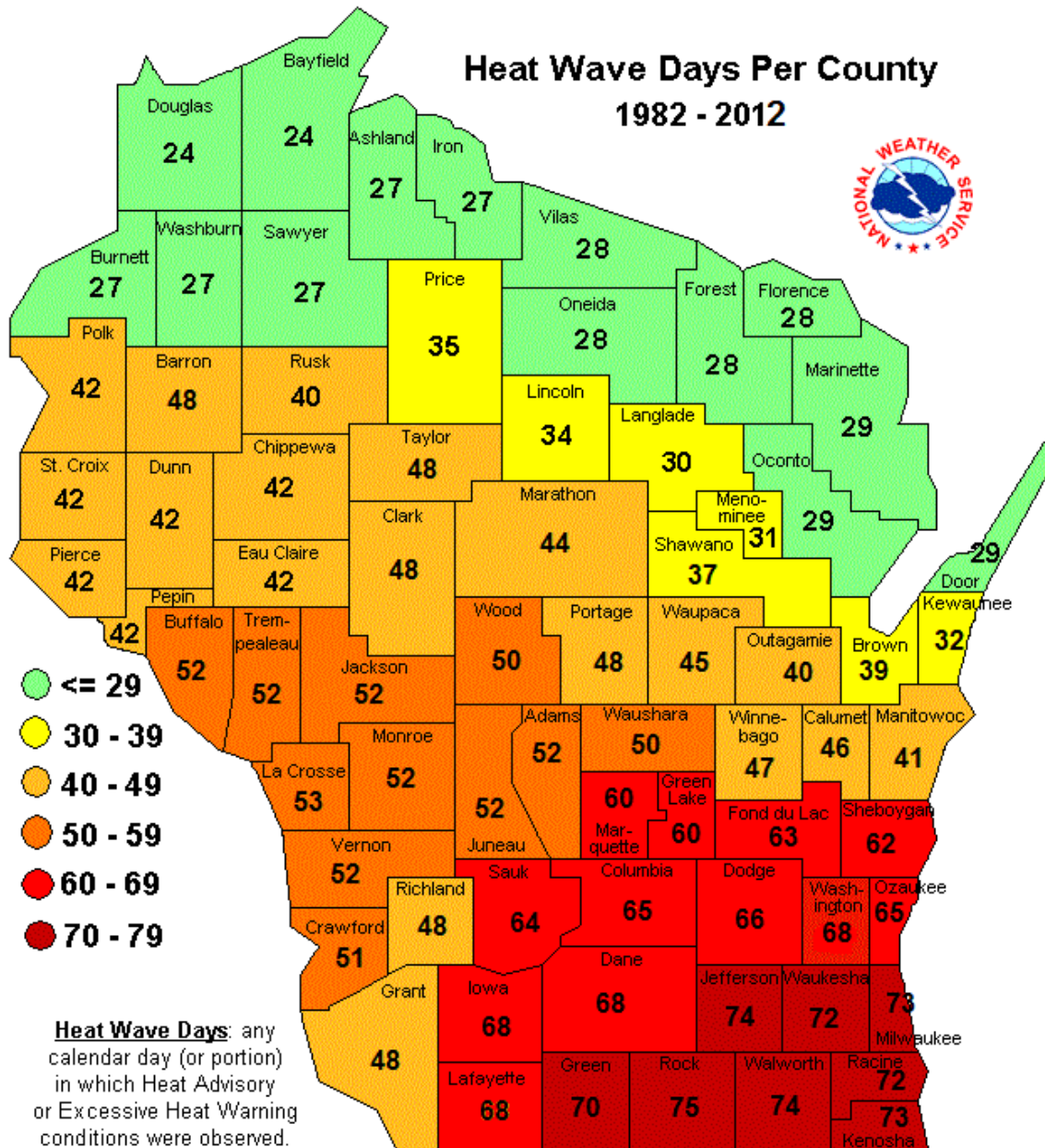




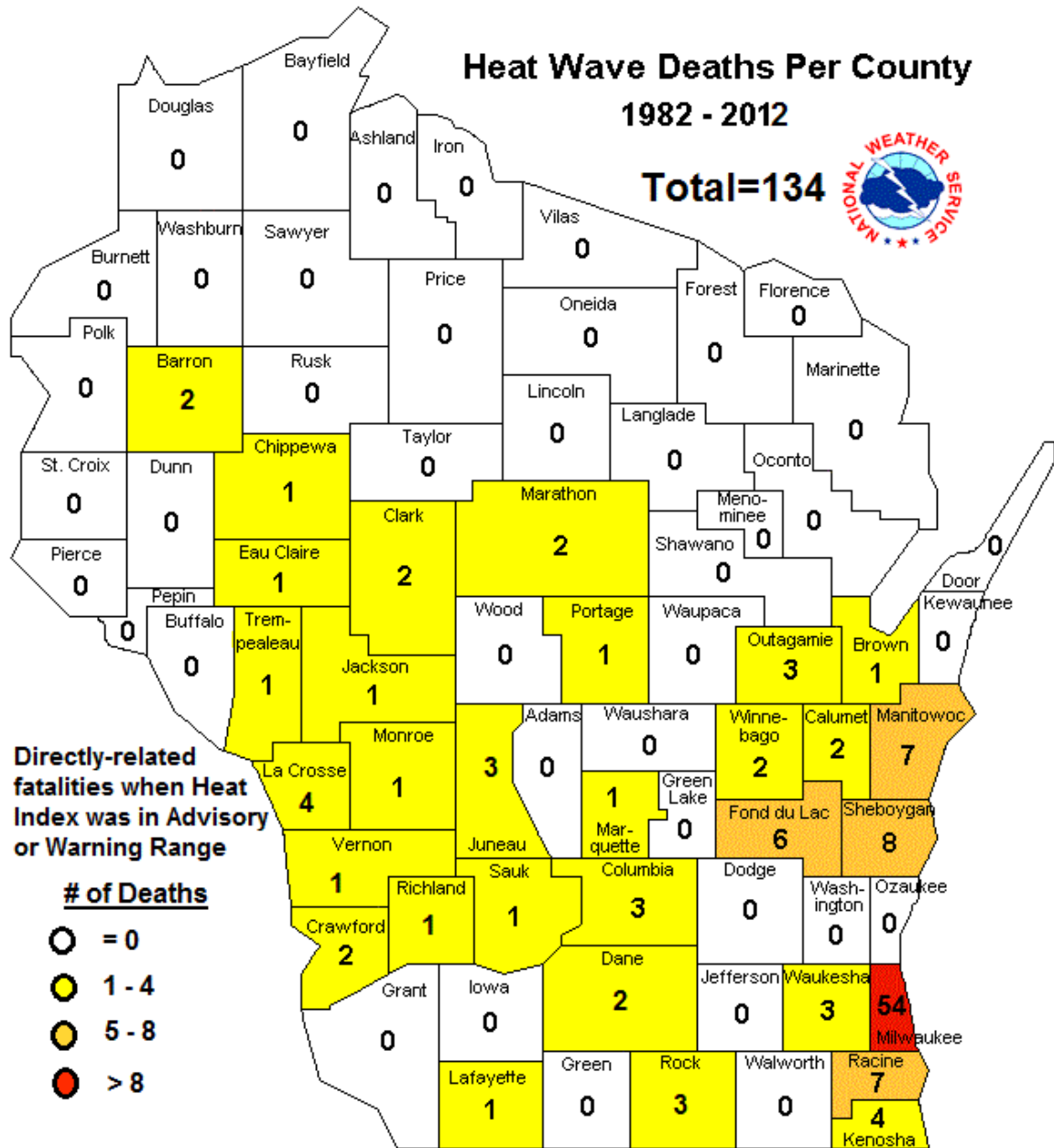
# Wisconsin Heat Wave Events



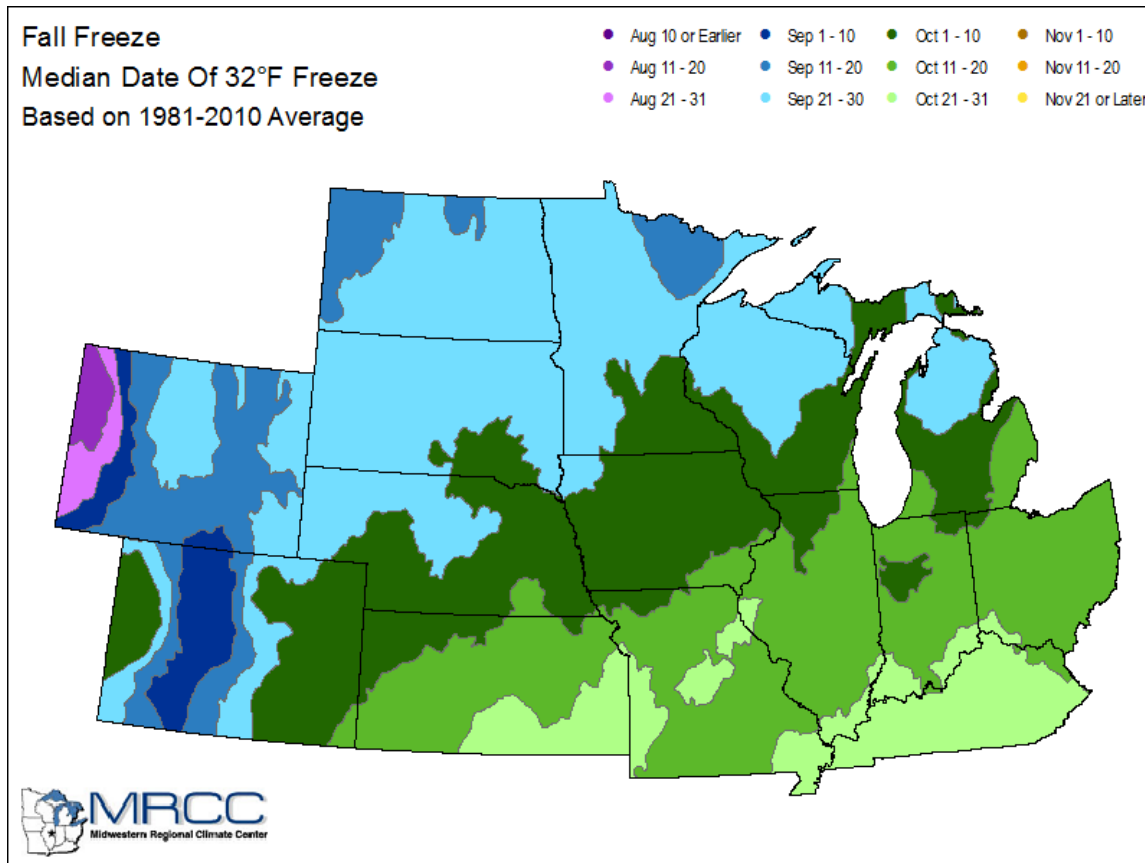
## Wisconsin Heat Wave Days



# Wisconsin Heat Wave Deaths

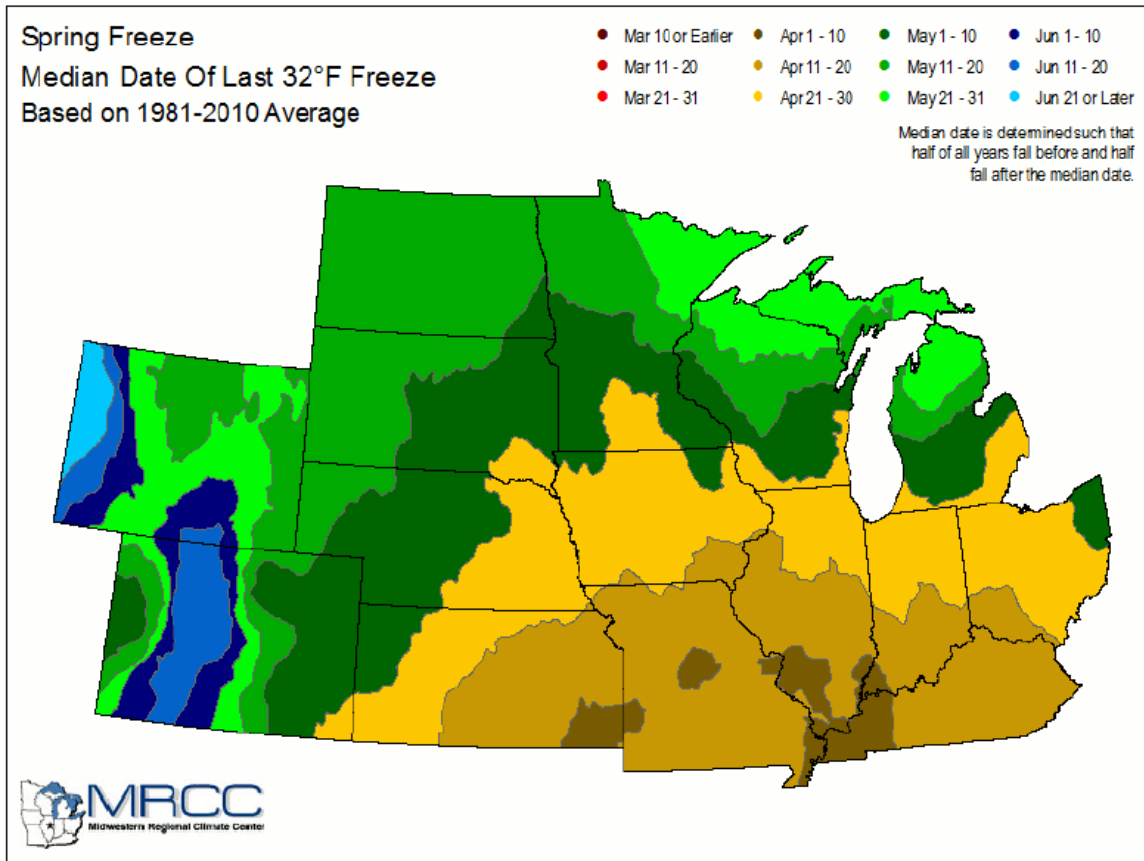


## Median Date of First Freeze<sup>147</sup>



<sup>147</sup> <http://www.crh.noaa.gov/images/mkx/climate/FallFirstFreeze.png>

# Median Date of Last Freeze<sup>148</sup>



<sup>148</sup> <http://www.crh.noaa.gov/images/mkx/climate/springlastfreeze.png>

# Wisconsin Hail Events



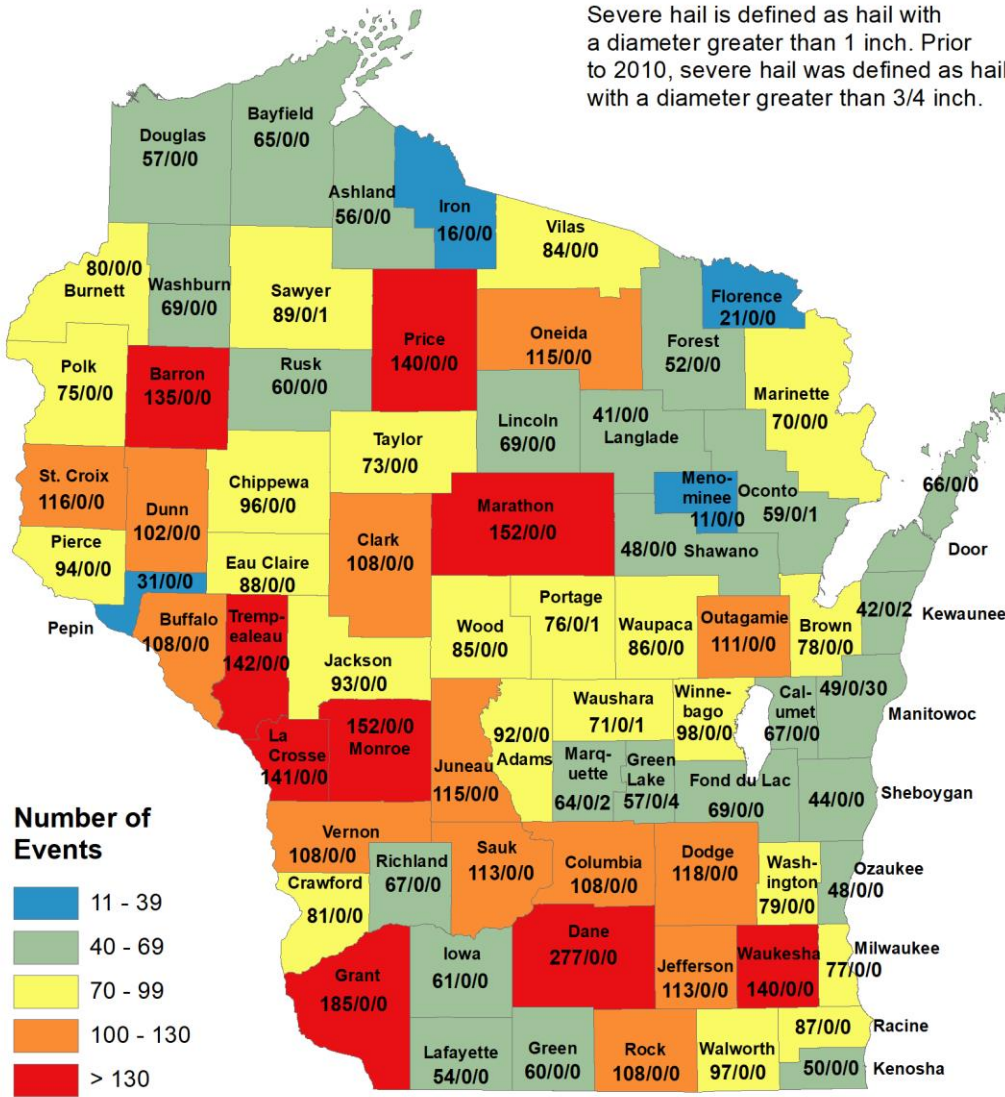
## Wisconsin Severe Hail Events

1982 - 2018

# Events / # Deaths / # Injuries



Severe hail is defined as hail with a diameter greater than 1 inch. Prior to 2010, severe hail was defined as hail with a diameter greater than 3/4 inch.



# Wisconsin Lightning Events



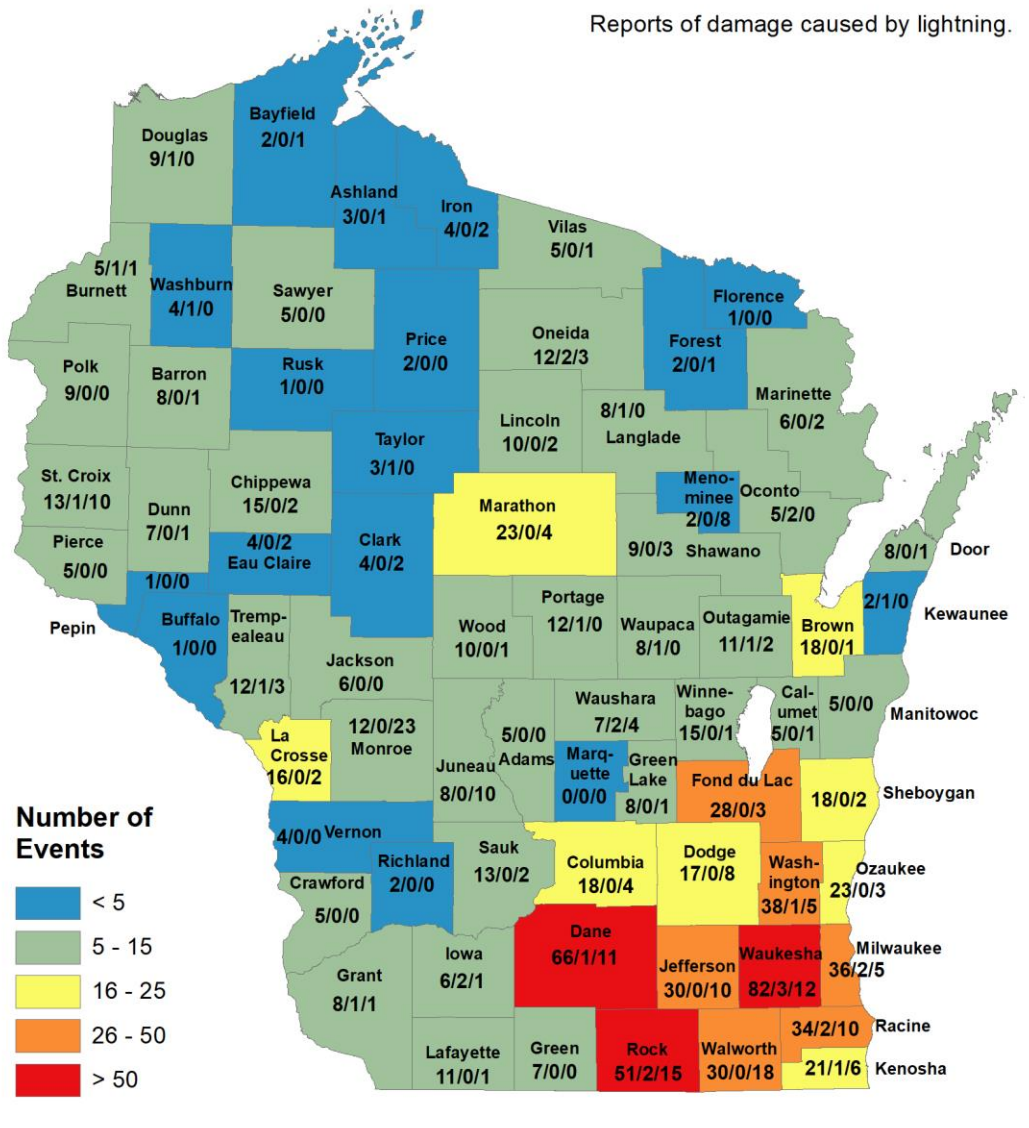
## Wisconsin Lightning Events

1982 - 2018

# Events / # Deaths / # Injuries



Reports of damage caused by lightning.



# Wisconsin Severe Thunderstorm Winds



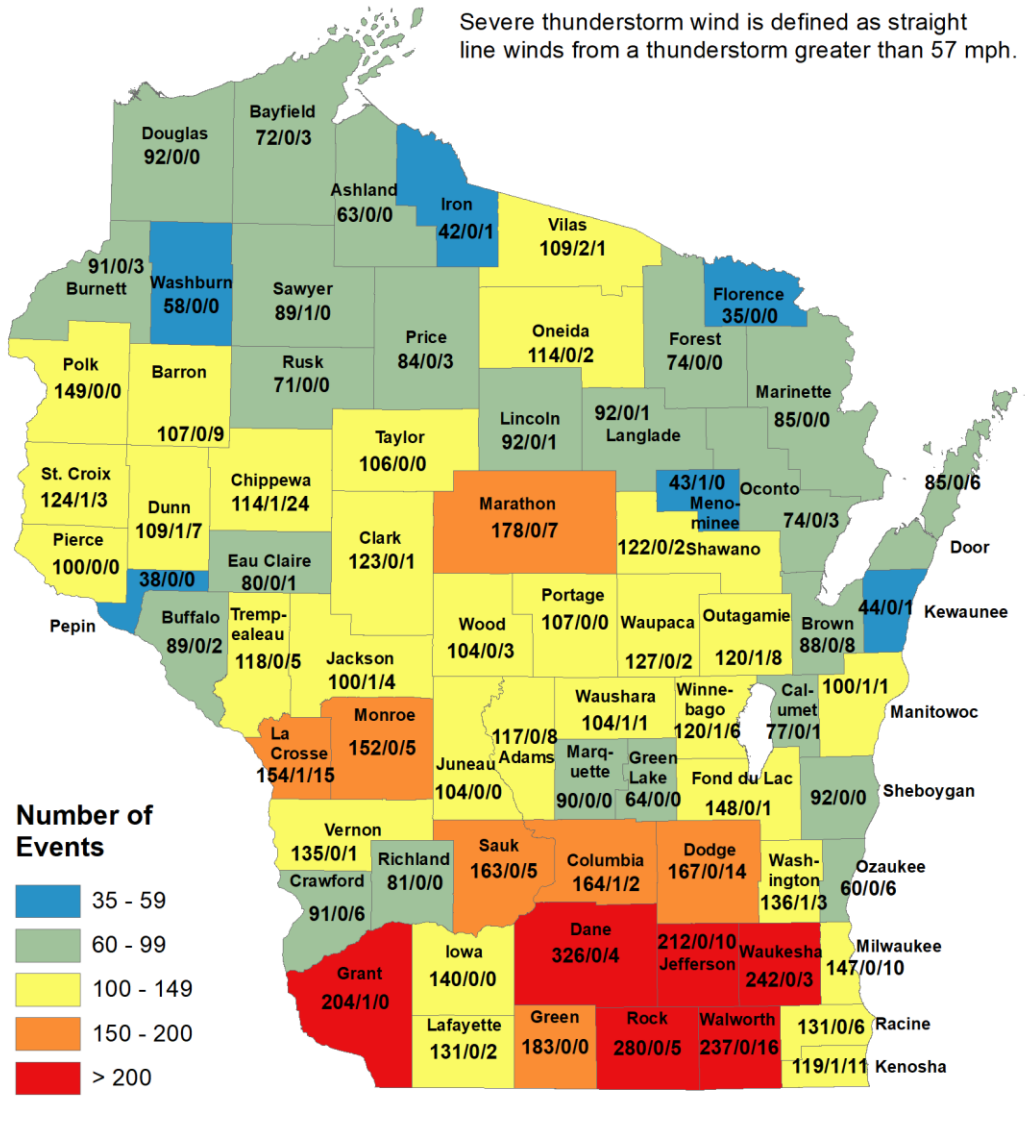
## Wisconsin Severe Thunderstorm Wind Events

1844 - 2018

# Events / # Deaths / # Injuries

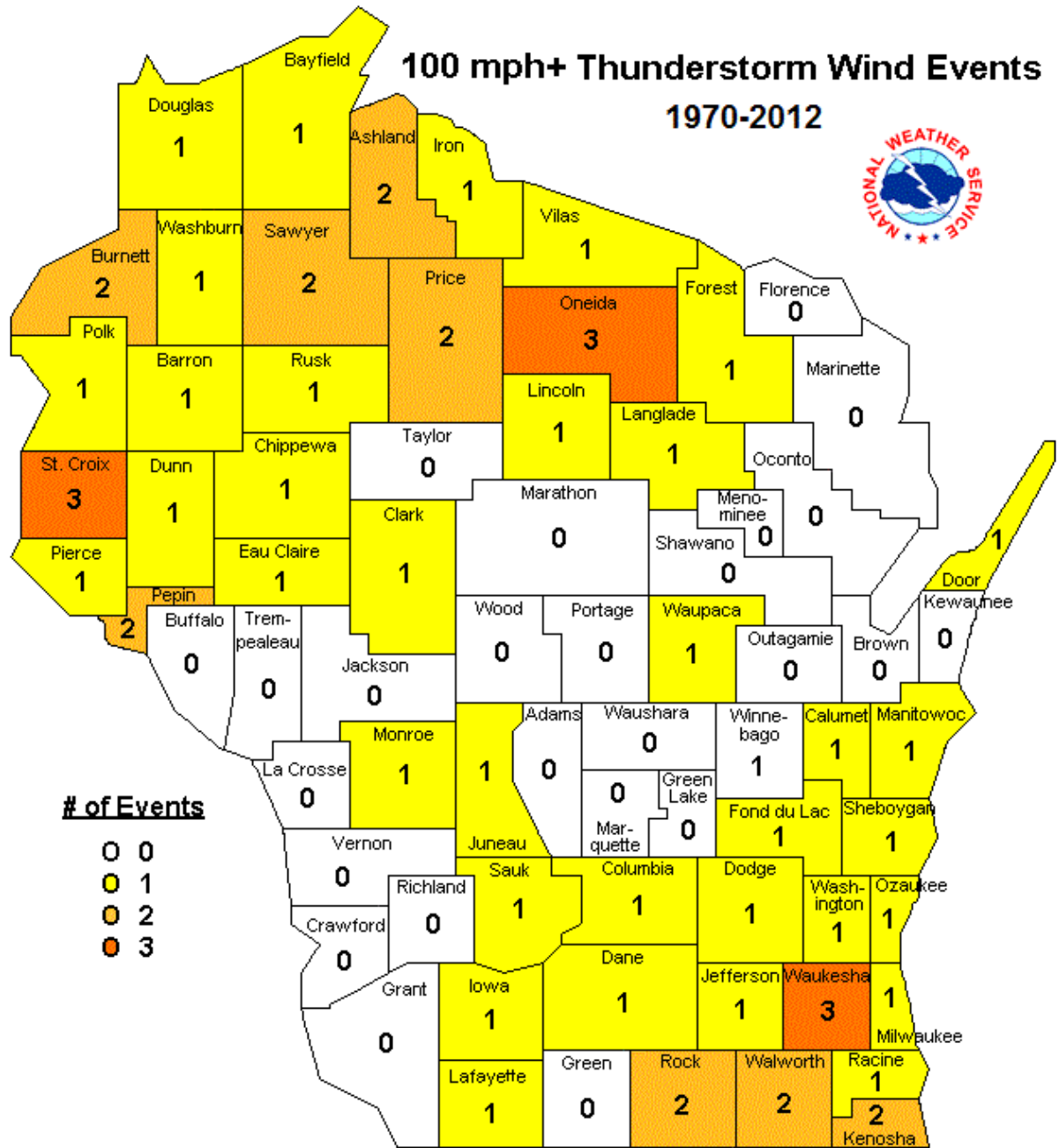


Severe thunderstorm wind is defined as straight line winds from a thunderstorm greater than 57 mph.

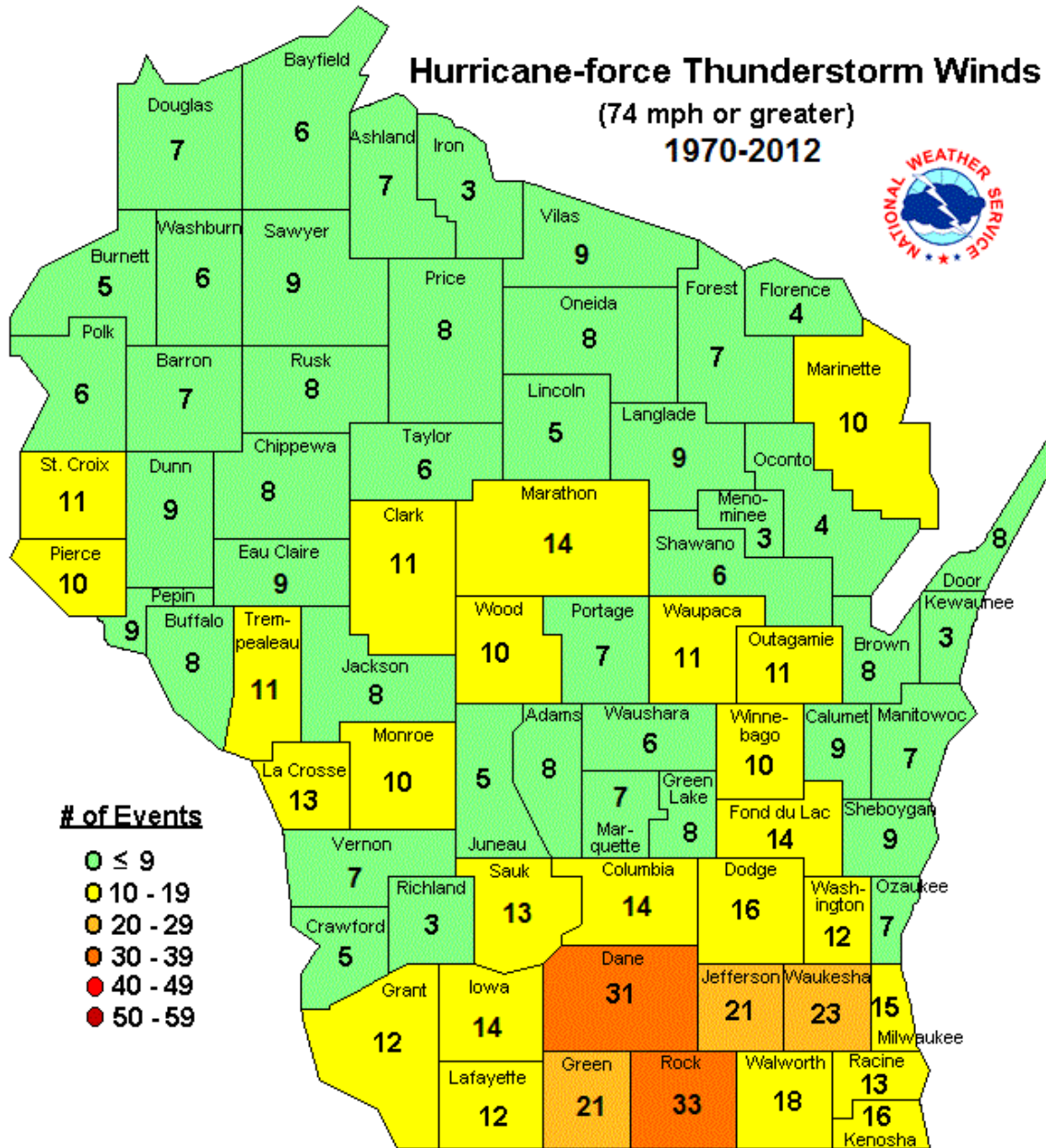




# Wisconsin 100+ mph Thunderstorm Wind Events



## Wisconsin Hurricane-force (74+ mph) Thunderstorm Winds



# Wisconsin Tornado Events



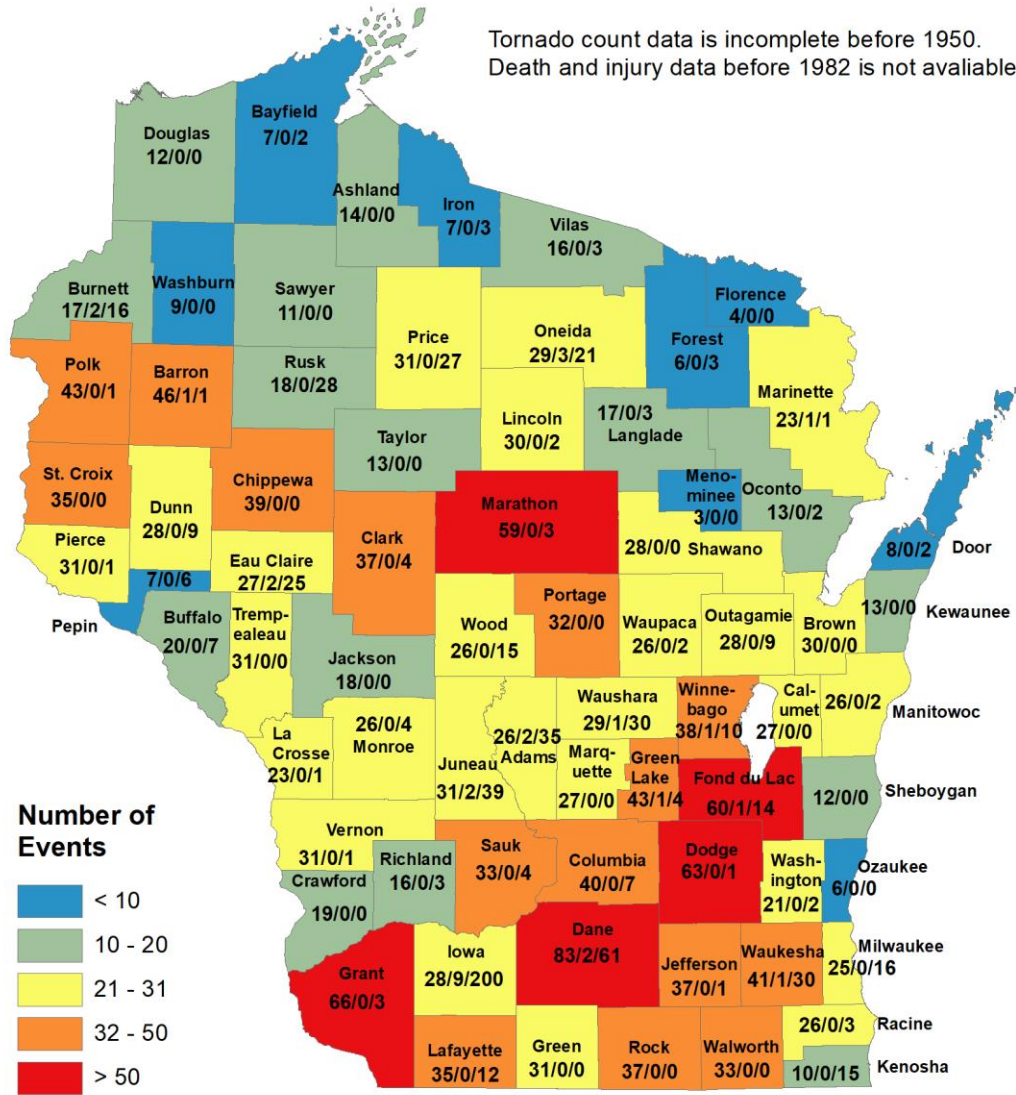
## Wisconsin Tornado Events

1844 - 2018

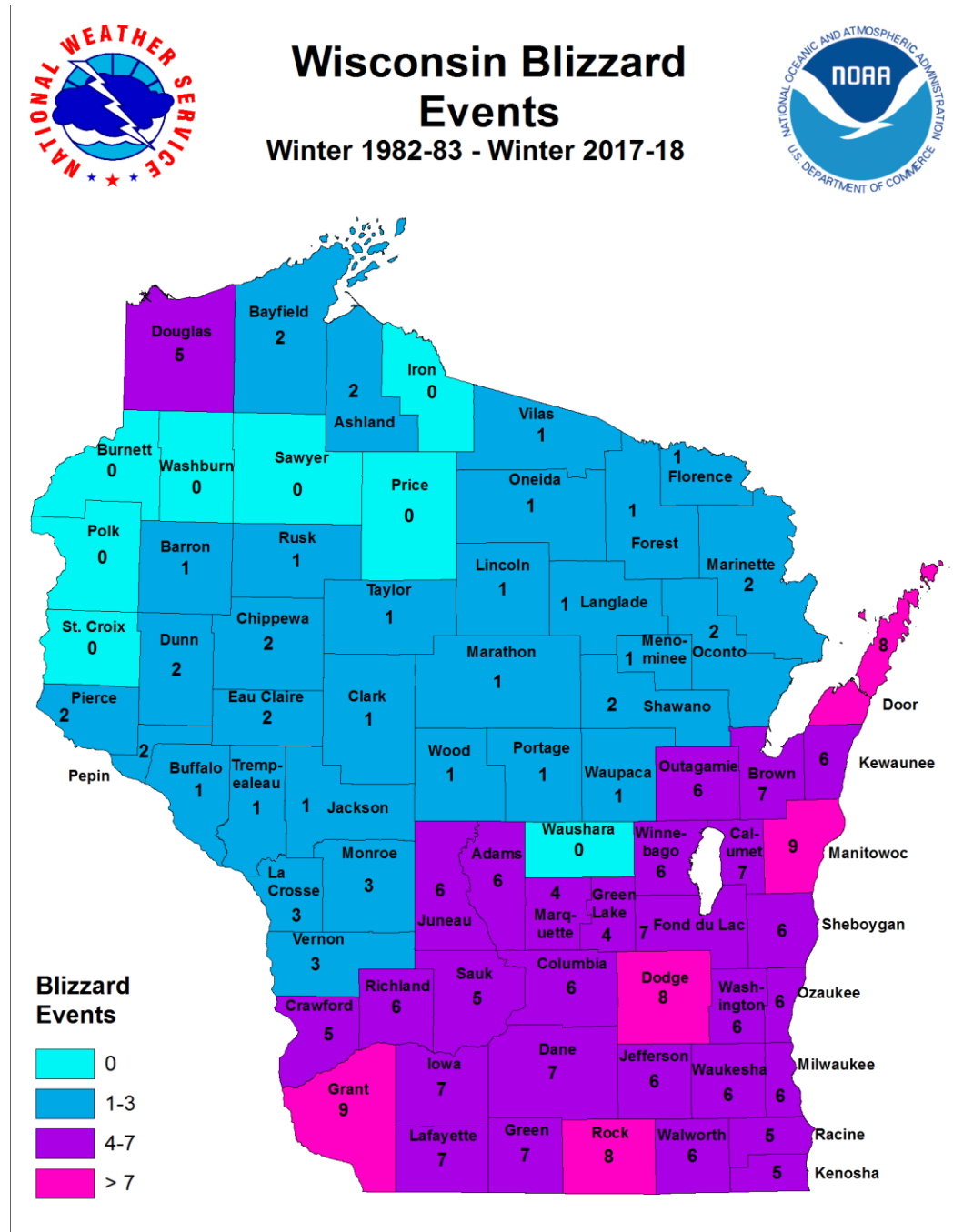
# Events / # Deaths / # Injuries



Tornado count data is incomplete before 1950.  
Death and injury data before 1982 is not available.



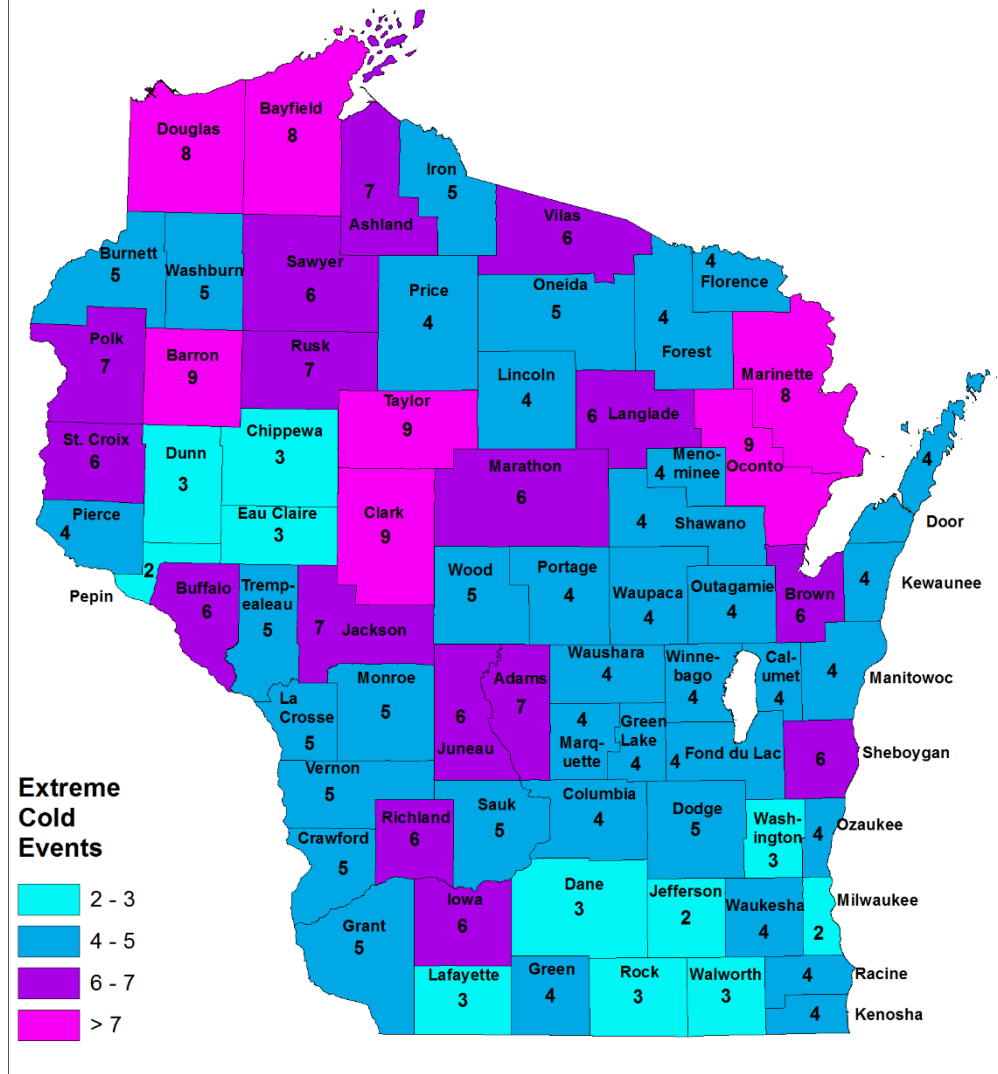
# Wisconsin Blizzard Events



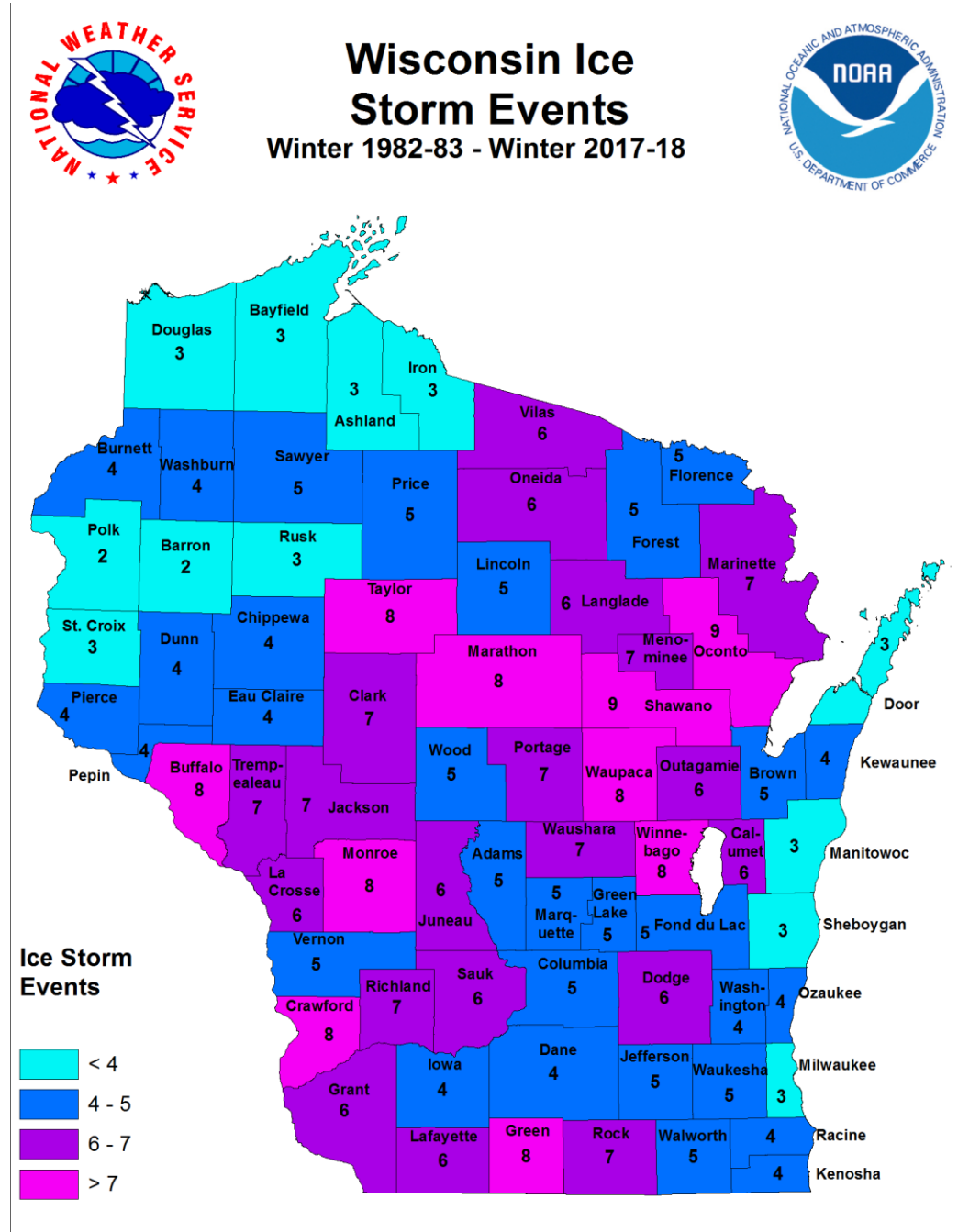
# Wisconsin Extreme Cold Events



## Wisconsin Extreme Cold Events Winter 1982-83 - Winter 2017-18



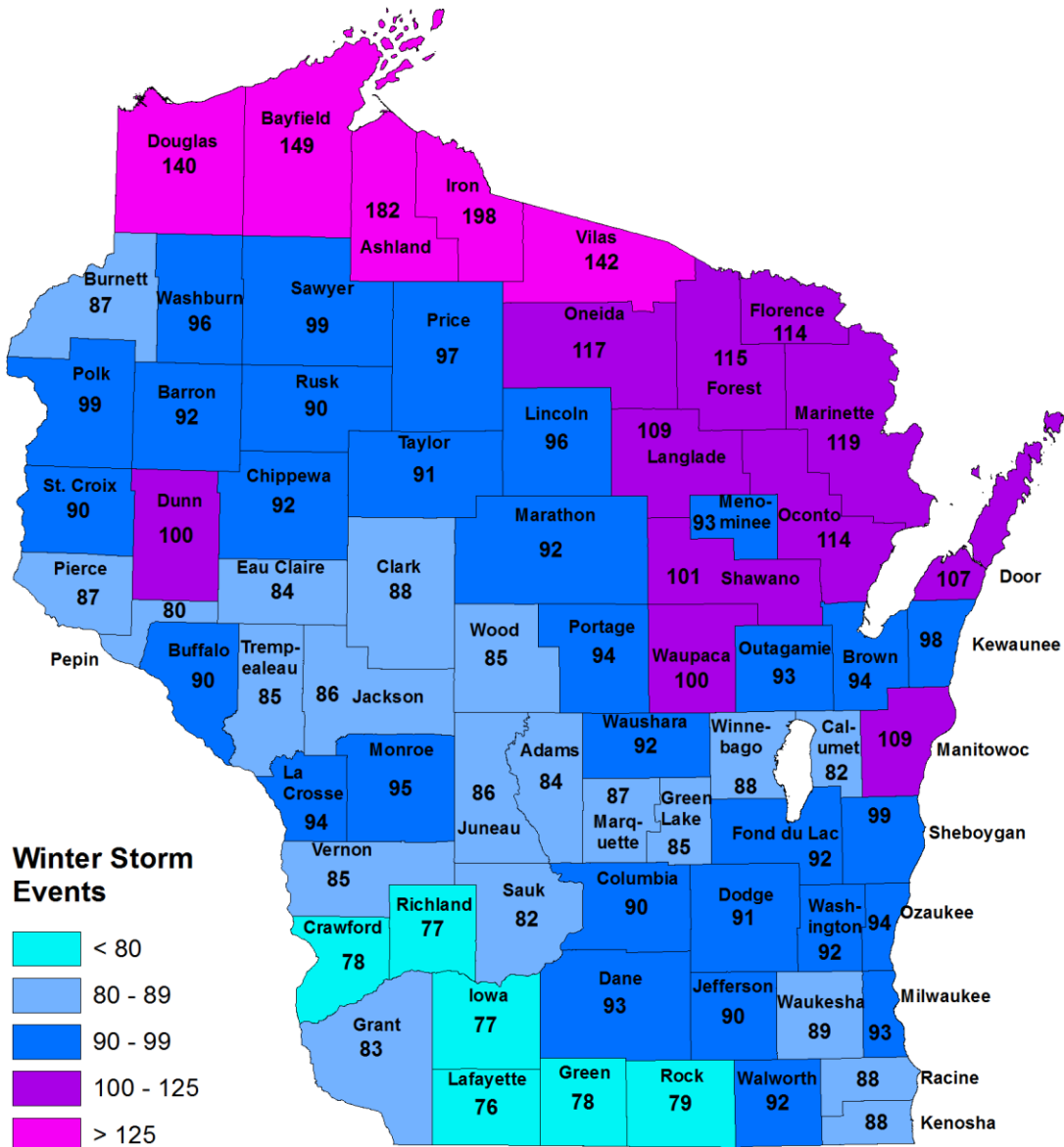
# Wisconsin Ice Storm Events



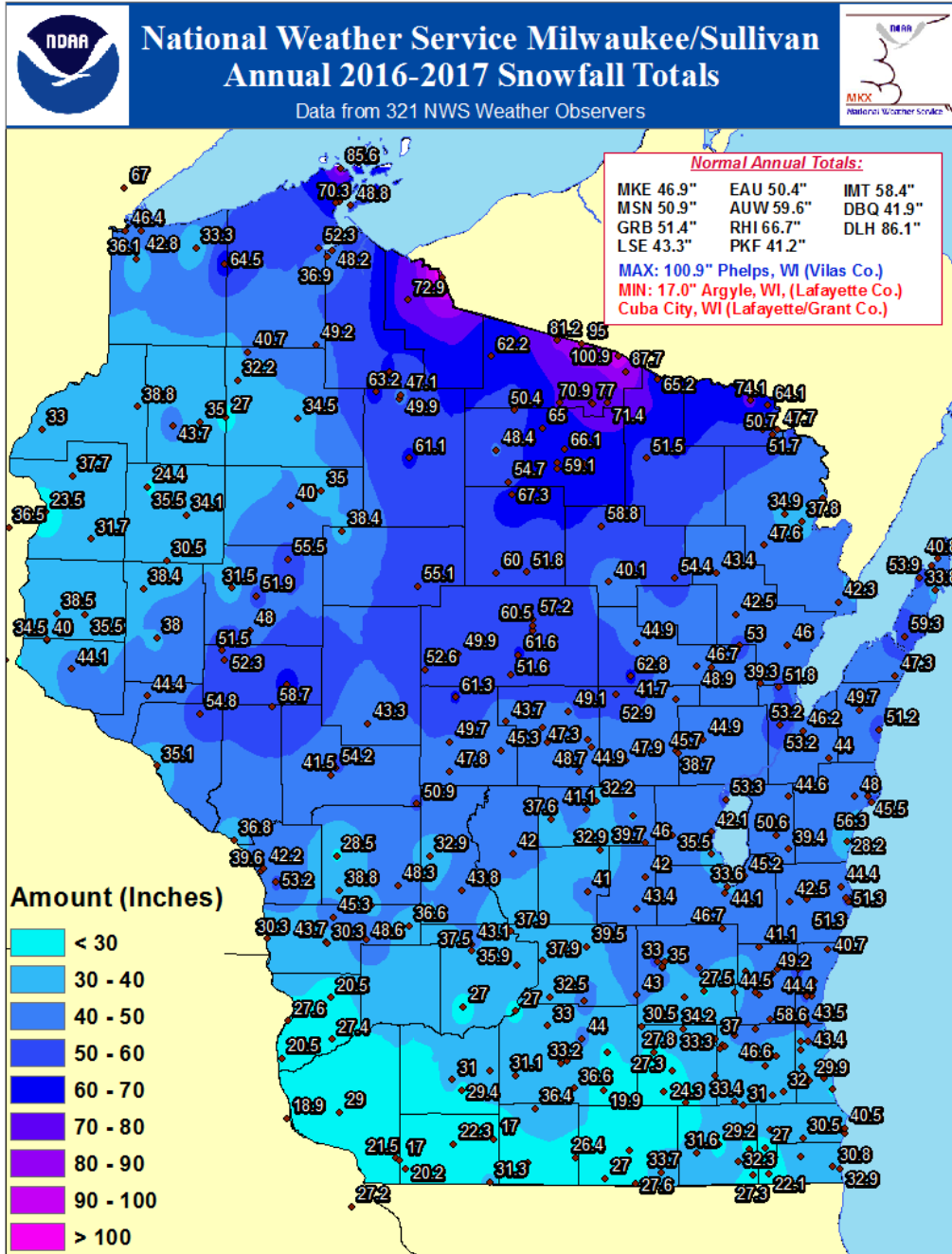
## Wisconsin Winter Storm Events



### Wisconsin Winter Storm Events Winter 1982-83 - Winter 2017-18



# Wisconsin Annual 2016-2017 Snowfall Totals





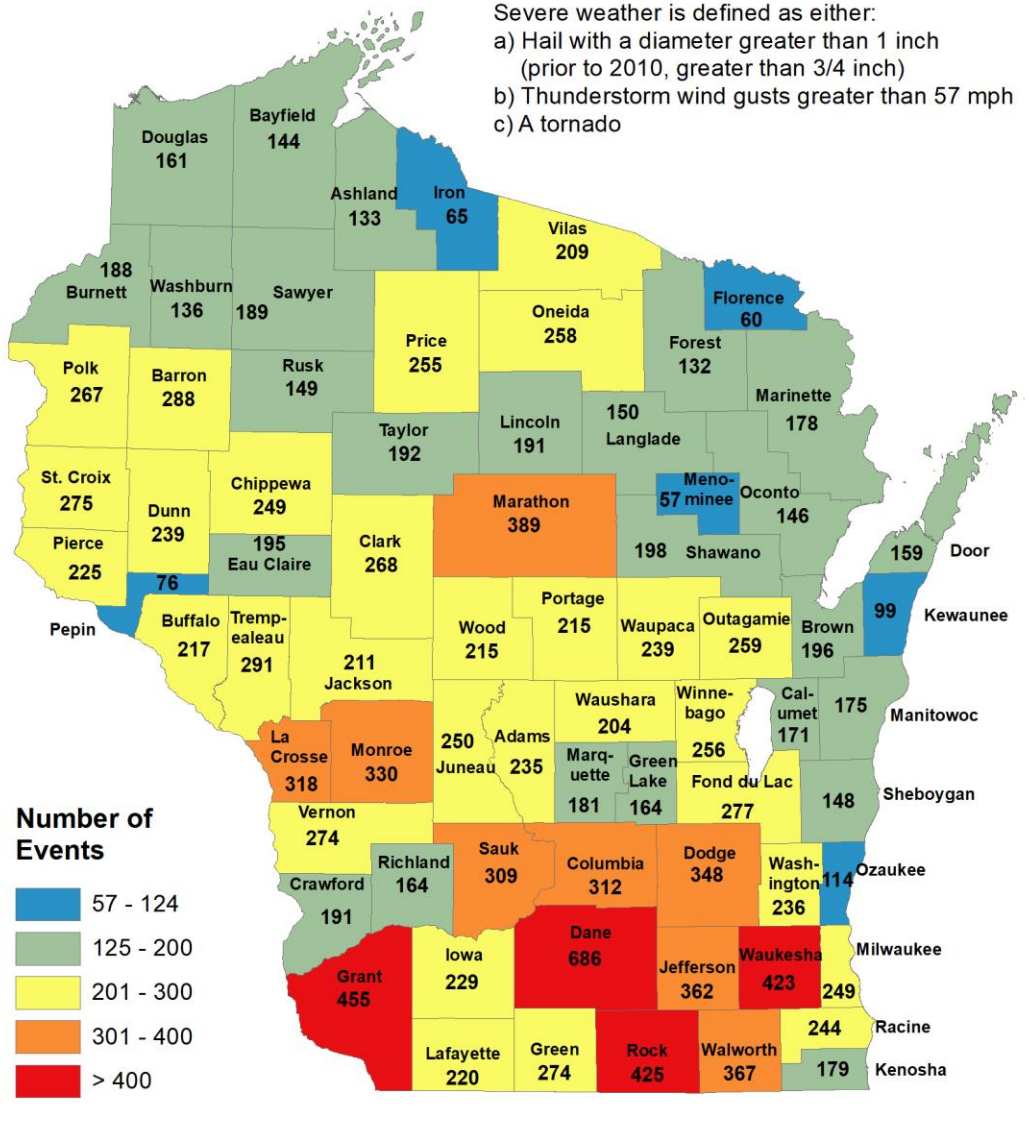
# Wisconsin Total Severe Weather Events



## Wisconsin Total Severe Weather Events 1844 - 2018



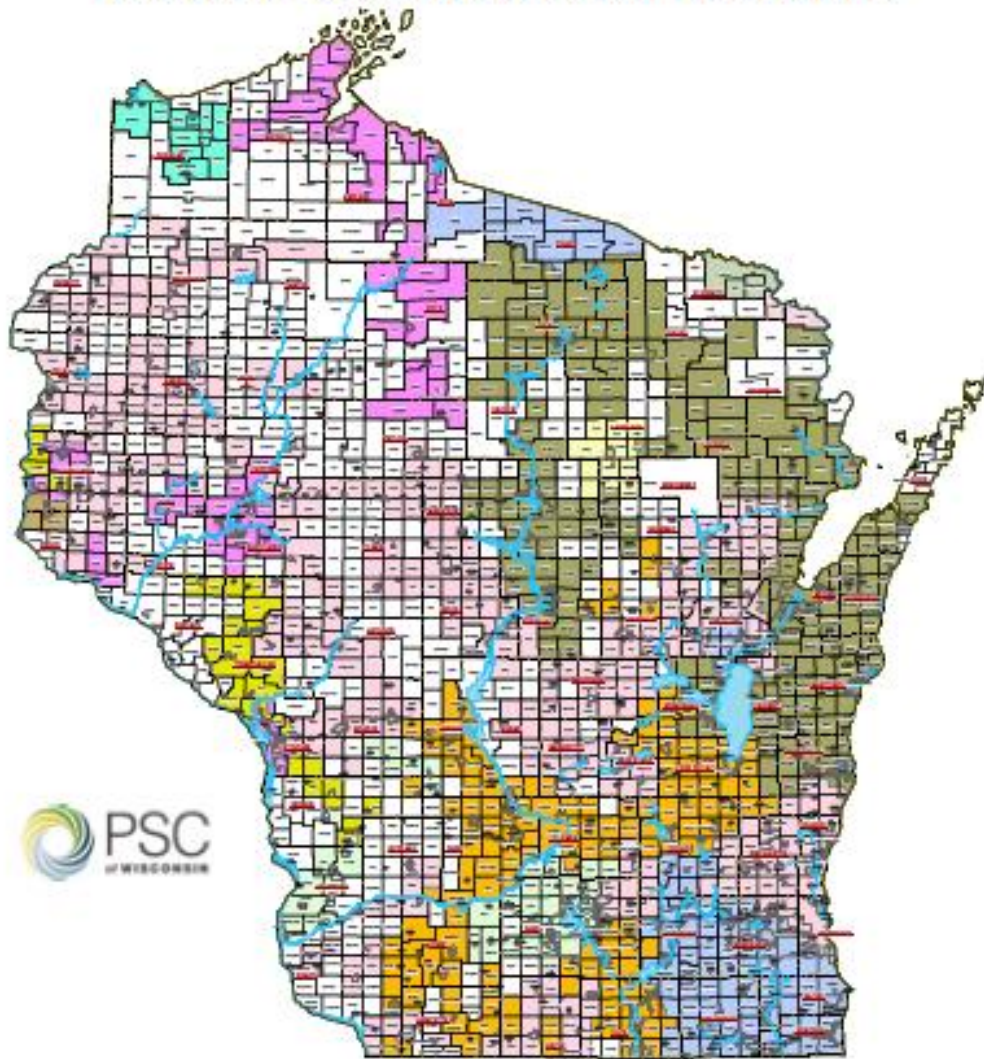
Severe weather is defined as either:  
 a) Hail with a diameter greater than 1 inch (prior to 2010, greater than 3/4 inch)  
 b) Thunderstorm wind gusts greater than 57 mph  
 c) A tornado





Natural Gas Service Territories <sup>150</sup>

**Wisconsin Natural Gas Service Territories**



**Wisconsin Natural Gas Utilities**

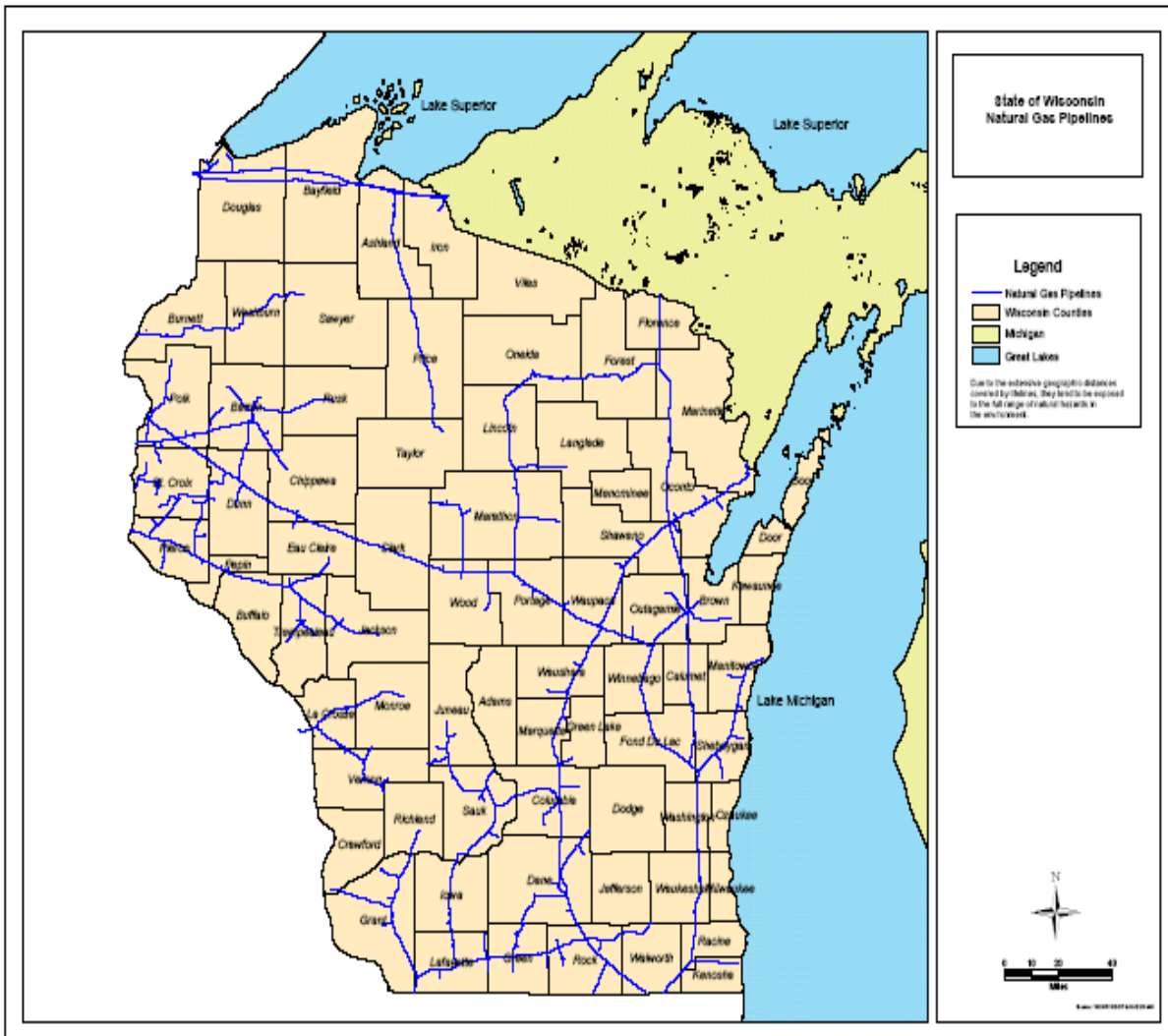
- |   |  |
|---|--|
| City Gas Company                          | Superior Water, Light, & Power Company |
| Florence Utility Commission               | Wisconsin Electric Power Company       |
| Madison Gas and Electric Company          | Wisconsin Gas                          |
| Midwest Natural Gas Incorporated          | Wisconsin Power and Light Company      |
| Northern States Power Company - Wisconsin | Wisconsin Public Service Corporation   |

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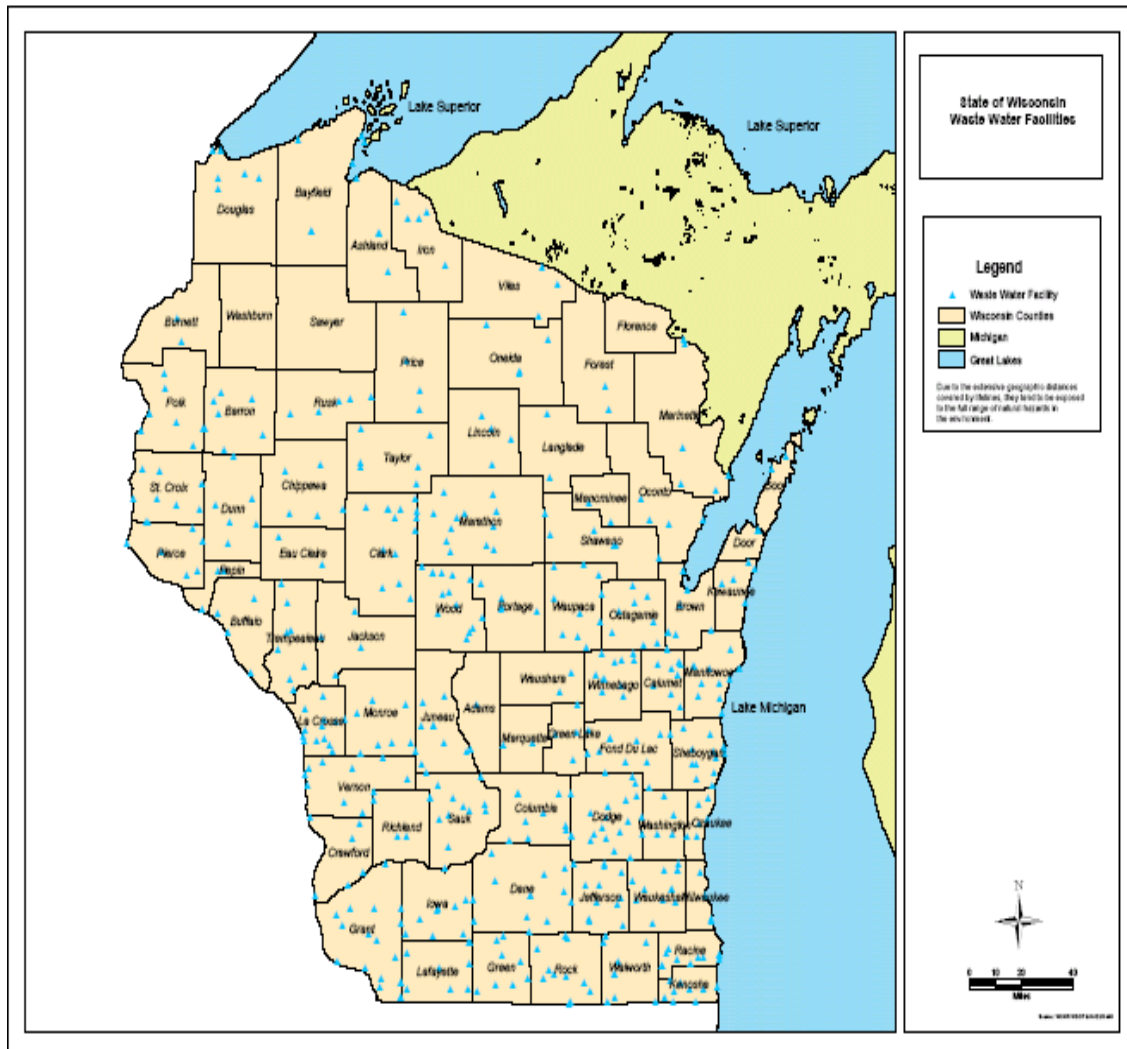
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150 [https://psc.wi.gov/SiteAssets/Maps/Natural\\_Gas\\_30x42\\_PUBLIC.pdf](https://psc.wi.gov/SiteAssets/Maps/Natural_Gas_30x42_PUBLIC.pdf)

# Natural Gas Pipelines



# Wastewater Facilities <sup>151</sup>



<sup>151</sup> Wisconsin State Hazard Mitigation Plan

## Appendix B: Frequency of Occurrence <sup>152</sup>

As noted earlier in this plan, the Winnebago County Hazard Mitigation Plan Workgroup reviewed past events records and an internal workgroup consensus was reached on the anticipated probability of future events, as well as the severity of the effects of those events. The probabilities and severities were designated as “very high,” “high,” “medium,” “low” or “very low” by the workgroup based on their evaluation and experience with the data. This is the main rating system used for this plan as it comes directly from those living in the area and reflects their current impressions, though they note that climate and weather systems are dynamic events.

The workgroup understands that historical weather data provided by the National Weather Service does not include events which may adversely affect their communities but fall below the reporting thresholds. Each weather event was analyzed for historic frequency and averages over the last 25 years (i.e., from 1 October 1995 through 1 October 2020) and is noted below with each hazard.

### DROUGHT

*There were 5 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	03/10/1999	0	0	0	0
WINNEBAGO COUNTY	07/19/2005	0	0	0	0
WINNEBAGO COUNTY	07/24/2012	0	0	0	0
WINNEBAGO COUNTY	08/01/2012	0	0	0	0
WINNEBAGO COUNTY	10/09/2012	0	0	0	0

### FLASH FLOOD

*There were 5 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
MENASHA	07/30/2003	0	0	\$44,500	\$5,500
OSHKOSH	06/12/2008	0	0	\$18.6M	\$4.5M
OMRO	07/14/2010	0	0	0	0
WITTMAN FLD OSHKOSH	07/14/2010	0	0	0	0
WINNECONNE	05/03/2012	0	0	\$200,000	0

<sup>152</sup> <https://www.ncdc.noaa.gov/stormevents/>

Appendix B: Frequency of Occurrence

**FLOOD**

*There were 10 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	06/16/1996	0	0	0	0
MENASHA	06/10/1999	0	0	0	0
OSHKOSH	06/27/1999	0	0	0	0
MENASHA	08/14/2000	0	0	0	0
WINNEBAGO COUNTY	03/05/2004	0	0	0	0
WINNEBAGO COUNTY	05/21/2004	0	0	0	0
WINNEBAGO COUNTY	06/11/2004	0	0	\$876,000	0
WINNEBAGO COUNTY	06/15/2004	0	0	0	0
WINNEBAGO COUNTY	07/01/2004	0	0	0	0
OSHKOSH	06/08/2008	0	0	\$625,000	0

**HEAVY RAIN**

*There were 11 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
OMRO	07/14/2010	0	0	0	0
NEENAH	06/21/2011	0	0	0	0
NEENAH	06/18/2012	0	0	0	0
(OSH)WITTMAN FLD OSH	07/02/2012	0	0	0	0
NEENAH	06/15/2013	0	0	0	0
LARSEN	04/12/2014	0	0	0	0
(OSH)WITTMAN FLD OSH	04/12/2014	0	0	0	0
FISK	06/01/2014	0	0	0	0
OSHKOSH	06/24/2014	0	0	0	0
OSHKOSH	08/18/2014	0	0	0	0
MENASHA	12/13/2015	0	0	0	0

Appendix B: Frequency of Occurrence

**EXCESSIVE  
HEAT**

*There were 4 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	02/26/2000	0	0	0	0
WINNEBAGO COUNTY	02/29/2000	0	0	0	0
WINNEBAGO COUNTY	03/05/2000	0	0	0	0
WINNEBAGO COUNTY	07/03/2012	0	0	0	0

**HEAT**

*There were 6 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	11/29/1998	0	0	0	0
WINNEBAGO COUNTY	02/11/1999	0	0	0	0
WINNEBAGO COUNTY	07/23/1999	1	0	0	0
WINNEBAGO COUNTY	11/08/1999	0	0	0	0
WINNEBAGO COUNTY	07/31/2006	0	0	0	0
WINNEBAGO COUNTY	07/16/2012	0	0	0	0

**EXTREME  
COLD/WIND CHILL**

*There were 4 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	01/30/2008	0	0	0	0
WINNEBAGO COUNTY	02/10/2008	0	0	0	0
WINNEBAGO COUNTY	01/06/2014	0	0	0	0
WINNEBAGO COUNTY	01/27/2014	0	0	0	0



Appendix B: Frequency of Occurrence

<b>COLD/WIND CHILL</b>					
<i>There were 4 events reported over the 25-year period from 10/1/95-10/1/20.</i>					
<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	01/30/1996	0	0	0	0
WINNEBAGO COUNTY	02/01/1996	0	0	0	0
WINNEBAGO COUNTY	02/17/2006	0	0	0	0
WINNEBAGO COUNTY	01/02/2018	0	0	0	0

<b>HAIL</b>						
<i>There were 106 events reported over the 25-year period from 10/1/95-10/1/20.</i>						
<i>Location</i>	<i>Date</i>	<i>Diameter</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	03/27/1991	0.75 in.	0	0	0	0
WINNEBAGO COUNTY	05/31/1991	0.75 in.	0	0	0	0
WINNEBAGO COUNTY	06/25/1992	0.75 in.	0	0	0	0
WINNEBAGO COUNTY	08/01/1992	1.75 in.	0	0	0	0
OSHKOSH	05/25/1994	0.75 in.	0	0	0	0
OSHKOSH	09/08/1994	0.88 in.	0	0	0	0
OMRO	05/13/1995	0.75 in.	0	0	0	0
NEENAH	07/18/1996	0.75 in.	0	0	0	0
WINCHESTER	03/29/1998	2.00 in.	0	0	0	0
MENASHA	03/29/1998	1.50 in.	0	0	0	0
OSHKOSH	05/12/1998	1.00 in.	0	0	0	0
MENASHA	05/12/1998	1.00 in.	0	0	0	0
MENASHA	08/14/1998	1.75 in.	0	0	0	0
APPLETON	08/23/1998	2.00 in.	0	0	0	0
OSHKOSH	09/01/1998	1.00 in.	0	0	0	0
OSHKOSH	06/10/1999	1.00 in.	0	0	0	0
OSHKOSH	06/11/1999	0.88 in.	0	0	0	0
WINCHESTER	06/16/1999	0.75 in.	0	0	0	0
WINCHESTER	08/12/1999	1.75 in.	0	0	0	0
OMRO	05/12/2000	2.00 in.	0	0	\$10.4M	0
WINCHESTER	05/31/2000	1.00 in.	0	0	0	0
NEENAH	05/31/2000	1.75 in.	0	0	0	0
NEENAH	08/08/2000	0.75 in.	0	0	0	0
NEENAH	05/25/2001	0.75 in.	0	0	0	0

## Appendix B: Frequency of Occurrence

OMRO	04/18/2002	0.88 in.	0	0	0	0
NEENAH	05/06/2002	1.50 in.	0	0	\$400,000	0
FISK	05/06/2002	0.88 in.	0	0	0	0
WINCHESTER	05/30/2002	0.75 in.	0	0	0	0
MENASHA	05/30/2002	1.00 in.	0	0	0	0
PICKETT	08/21/2002	0.75 in.	0	0	0	0
EUREKA	09/02/2002	1.75 in.	0	0	0	0
OSHKOSH	04/15/2003	0.75 in.	0	0	0	0
OSHKOSH WITTMAN	07/30/2003	1.00 in.	0	0	0	0
MENASHA	07/30/2003	1.25 in.	0	0	0	0
OSHKOSH	07/30/2003	1.00 in.	0	0	0	0
OSHKOSH	07/13/2004	0.75 in.	0	0	0	0
OMRO	10/23/2004	1.00 in.	0	0	0	0
OSHKOSH	05/06/2005	0.88 in.	0	0	0	0
WINNEBAGO	05/06/2005	1.25 in.	0	0	\$100,000	0
OSHKOSH	06/09/2005	0.75 in.	0	0	0	0
FISK	07/25/2005	0.75 in.	0	0	0	0
OSHKOSH	03/11/2006	0.75 in.	0	0	0	0
NEENAH	04/13/2006	0.88 in.	0	0	0	0
LARSEN	06/02/2006	0.75 in.	0	0	0	0
LARSEN	06/02/2006	1.00 in.	0	0	0	0
WINNEBAGO	06/02/2006	0.75 in.	0	0	0	0
OSHKOSH	06/02/2006	0.75 in.	0	0	0	0
WINNEBAGO	06/02/2006	0.88 in.	0	0	0	0
OSHKOSH	06/02/2006	1.00 in.	0	0	0	0
EUREKA	07/01/2006	1.75 in.	0	0	0	0
OSHKOSH	07/17/2006	1.00 in.	0	0	0	0
PICKETT	07/22/2006	0.75 in.	0	0	0	0
WINCHESTER	10/02/2006	0.75 in.	0	0	0	0
OSHKOSH	10/02/2006	0.88 in.	0	0	0	0
LAKE POYGAN	06/07/2007	1.00 in.	0	0	0	0
(OSH)WITTMAN FLD	10/18/2007	1.00 in.	0	0	0	0
WINCHESTER	04/25/2008	1.00 in.	0	0	0	0
OSHKOSH	06/22/2008	0.75 in.	0	0	0	0
OSHKOSH	06/22/2008	0.75 in.	0	0	0	0
WITTMAN FLD OSH	06/22/2008	1.00 in.	0	0	0	0
WINCHESTER	06/28/2008	0.75 in.	0	0	0	0
LARSEN	06/28/2008	0.75 in.	0	0	0	0
MENASHA	06/28/2008	0.75 in.	0	0	0	0
OSHKOSH	07/02/2008	0.88 in.	0	0	0	0

Appendix B: Frequency of Occurrence

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MENASHA	07/16/2008	1.00 in.	0	0	0	0
OMRO	07/16/2008	0.88 in.	0	0	0	0
MENASHA	07/21/2008	0.88 in.	0	0	0	0
MENASHA	08/01/2008	0.88 in.	0	0	0	0
MENASHA	08/01/2008	0.75 in.	0	0	0	0
MENASHA	08/01/2008	1.00 in.	0	0	0	0
MENASHA	08/01/2008	1.25 in.	0	0	0	0
MENASHA	08/01/2008	0.88 in.	0	0	0	0
WINCHESTER	05/04/2010	0.75 in.	0	0	0	0
OSHKOSH	07/10/2010	1.00 in.	0	0	0	0
WITTMAN FLD OSH	07/10/2010	0.75 in.	0	0	0	0
OSHKOSH	07/10/2010	1.25 in.	0	0	0	0
LAKE BUTTE DES MORTS	07/18/2010	0.88 in.	0	0	0	0
MENASHA	07/20/2010	1.75 in.	0	0	0	0
MENASHA	07/20/2010	1.25 in.	0	0	0	0
MENASHA	07/20/2010	1.75 in.	0	0	\$9M	0
WINCHESTER	04/10/2011	0.75 in.	0	0	0	0
LAKE WINNECONNE	04/10/2011	2.75 in.	0	0	0	0
WINCHESTER	05/22/2011	4.25 in.	0	0	0	0
LAKE POYGAN	05/22/2011	1.00 in.	0	0	0	0
WINCHESTER	05/22/2011	1.50 in.	0	0	0	0
OSHKOSH	05/22/2011	1.00 in.	0	0	0	0
MENASHA	05/22/2011	0.88 in.	0	0	0	0
PICKETT	06/06/2011	1.00 in.	0	0	0	0
OSHKOSH	05/27/2012	0.75 in.	0	0	0	0
ZITTAU	06/18/2012	1.75 in.	0	0	0	0
NEENAH	06/18/2012	1.25 in.	0	0	0	0
MENASHA	06/18/2012	1.00 in.	0	0	0	0
WINCHESTER	06/18/2012	2.25 in.	0	0	0	0
OSHKOSH	07/02/2012	1.75 in.	0	0	\$250,000	0
OSHKOSH	09/19/2012	0.75 in.	0	0	0	0
PICKETT	04/12/2014	1.00 in.	0	0	0	0
OSHKOSH	04/12/2014	0.75 in.	0	0	0	0
LARSEN	08/01/2014	0.75 in.	0	0	0	0
WINCHESTER	08/01/2014	1.50 in.	0	0	0	0
MENASHA	08/18/2014	0.88 in.	0	0	0	0
FISK	08/02/2015	1.00 in.	0	0	0	0
LARSEN	08/14/2015	1.00 in.	0	0	0	0

Appendix B: Frequency of Occurrence

LARSEN	08/14/2015	1.00 in.	0	0	0	0
ALLENVILLE	06/06/2016	0.75 in.	0	0	0	0
BUTTE DES MORTS	08/10/2017	0.75 in.	0	0	0	0

**LIGHTNING**

*There were 9 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
OSHKOSH	06/15/1997	0	0	\$1,000	0
OSHKOSH	06/20/1998	0	0	0	0
OSHKOSH	06/10/1999	0	0	0	0
NEENAH	06/10/1999	0	0	0	0
ZITTAU	06/11/1999	0	0	\$1,000	0
MENASHA	08/27/2004	0	1	0	0
WINNEBAGO	04/06/2010	0	0	\$1,000	0
FISK	05/03/2012	0	0	\$750,000	0
NEENAH	08/26/2018	0	0	\$2,000	0

**THUNDERSTORM WIND**

*There were 110 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>KTS</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	04/29/1991		0	0	0	0
WINNEBAGO COUNTY	08/25/1992		0	0	0	0
WINNEBAGO COUNTY	08/25/1992		0	0	0	0
OSHKOSH	07/04/1994		0	0	\$5,000	\$5,000
WINNEBAGO COUNTY	07/29/1994		0	0	\$5,000	\$5,000
NEENAH	07/31/1995		0	0	0	0
NEENAH	08/09/1995		0	0	\$100,000	\$20,000
POYGAN	08/09/1995		0	0	\$50,000	\$30,000
OSHKOSH	08/09/1995		0	0	\$200,000	\$10,000
OSHKOSH	08/09/1995		0	0	\$25,000	\$30,000
OSHKOSH	08/11/1995		0	0	\$20,000	0
WINCHESTER	08/13/1995		0	0	0	0
OSHKOSH	08/23/1995		0	0	0	0
OSHKOSH	08/28/1995	57	0	0	\$175,000	\$50,000

Appendix B: Frequency of Occurrence

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OSHKOSH	08/28/1995		0	0	\$1,000	0
OSHKOSH	06/29/1996		0	0	\$5,000	0
NEENAH	07/18/1996	52	0	0	0	0
OSHKOSH	07/18/1996		0	0	\$5,000	0
NEENAH	08/07/1996		0	0	\$5,000	0
WINCHESTER	07/14/1997	59	0	0	\$2,000	0
NEENAH	07/16/1997	61	0	0	\$50,000	0
OSHKOSH	07/16/1997	58	1	0	\$150,000	0
OMRO	05/15/1998	52	0	0	0	0
OSHKOSH	05/15/1998		0	0	\$1,000	0
OMRO	05/28/1998	52	0	0	0	0
MENASHA	05/31/1998	75	0	1	\$300,000	0
PICKETT	05/31/1998	61	0	0	0	0
OMRO	06/20/1998		0	0	\$1,000	0
OSHKOSH	06/20/1998	52	0	0	0	0
OSHKOSH	06/25/1998	55	0	0	0	0
MENASHA	08/14/1998	60	0	0	0	0
FISK	09/01/1998	50	0	0	0	0
WINNECONNE	06/06/1999		0	0	\$10,000	0
OSHKOSH	06/10/1999	50	0	0	0	0
WINNECONNE	07/08/1999	52	0	0	0	0
OSHKOSH	07/08/1999	50	0	0	0	0
OSHKOSH	07/08/1999	56	0	0	0	0
OSHKOSH	07/30/1999	50	0	0	0	0
LARSEN	08/14/2000	50	0	0	\$25,000	0
OSHKOSH	08/14/2000	50	0	0	0	0
OSHKOSH	04/12/2001	50	0	0	0	0
MENASHA	04/23/2001	52	0	0	0	0
OMRO	06/11/2001	65	0	2	\$4.5M	0
NEENAH	08/12/2001	50	0	0	0	0
WINCHESTER	09/07/2001	50	0	0	0	0
OSHKOSH	09/07/2001	50	0	0	0	0
NEENAH	09/07/2001	50	0	0	0	0
NEENAH	09/07/2001	55	0	0	0	0
WINNECONNE	07/30/2002	57	0	0	0	0
NEENAH	07/30/2002	56	0	0	\$60,000	0
OSHKOSH	06/25/2003	50	0	0	0	0
WINNECONNE	07/30/2003	50	0	0	0	0
OSHKOSH	10/23/2004	50	0	0	0	0

## Appendix B: Frequency of Occurrence

WINNECONNE	10/23/2004	50	0	0	0	0
OSHKOSH	06/05/2005	50	0	0	0	0
PICKETT	07/23/2005	50	0	0	0	0
EUREKA	07/25/2005	50	0	0	0	0
OSHKOSH WITTMAN FLD	09/13/2005	60	0	0	\$33,000	0
NEENAH	07/30/2006	54	0	0	0	0
OSHKOSH	07/30/2006	50	0	0	0	0
WINCHESTER	06/07/2007	52	0	0	0	0
OSHKOSH	06/12/2008	52	0	0	0	0
WINNECONNE	07/10/2008	50	0	0	0	0
LAKE BUTTE DES MORTS	07/12/2008	52	0	0	0	0
OSHKOSH	07/16/2008	50	0	0	0	0
NEENAH BRENNAND ARPT	07/21/2008	50	0	0	0	0
MENASHA	07/21/2008	52	0	0	0	0
NEENAH	08/01/2008	52	0	0	0	0
EUREKA	04/30/2010	52	0	0	0	0
ZITTAU	05/04/2010	74	0	0	0	0
WINNECONNE PLMMR ARP	05/04/2010	52	0	0	0	0
OSHKOSH	07/14/2010	52	0	0	0	0
OMRO	07/14/2010	52	0	0	0	0
OSHKOSH	07/14/2010	52	0	0	0	0
NEENAH	08/20/2010	56	0	0	0	0
OSHKOSH	08/20/2010	56	0	0	0	0
NEENAH	08/20/2010	52	0	4	0	0
NEENAH	04/10/2011	87	0	0	\$5M	0
FISK	04/10/2011	65	0	0	0	0
OSHKOSH	06/08/2011	50	0	0	0	0
NEENAH	07/17/2011	52	0	0	0	0
MENASHA	07/18/2011	65	0	0	\$50,000	0
WITTMAN FLD OSH	07/30/2011	50	0	0	0	0
EUREKA	09/02/2011	50	0	0	0	0
WITTMAN FLD OSH	09/02/2011	64	0	0	0	0
MENASHA	09/02/2011	55	0	0	0	0
LARSEN	07/02/2012	52	0	0	0	0
LARSEN	07/02/2012	52	0	0	0	0
OSHKOSH	07/02/2012	61	0	0	\$20,000	0

Appendix B: Frequency of Occurrence

OSHKOSH	07/02/2012	52	0	0	0	0
WITTMAN FLD OSH	07/02/2012	51	0	0	0	0
FISK	07/02/2012	61	0	0	0	0
WITTMAN FLD OSH	07/26/2012	43	0	0	\$5,000	0
LARSEN	08/02/2012	52	0	0	0	0
RUSH LAKE	06/01/2014	61	0	0	0	0
WITTMAN FLD OSH	06/16/2014	50	0	0	0	0
ZITTAU	07/13/2015	52	0	0	0	0
MENASHA	07/13/2015	52	0	0	0	0
OSHKOSH	07/18/2015	52	0	0	0	0
WITTMAN FLD OSH	07/18/2015	57	0	3	0	0
NEENAH	07/18/2015	50	0	0	0	0
WITTMAN FLD OSH	06/05/2016	52	0	0	0	0
WITTMAN FLD OSH	06/12/2017	52	0	0	0	0
EUREKA	06/14/2017	52	0	0	0	0
WITTMAN FLD OSH	06/14/2017	52	0	0	0	0
ALLENVILLE	06/14/2017	52	0	0	\$5,000	0
MENASHA	06/14/2017	56	0	0	0	0
WINCHESTER	08/27/2018	52	0	0	0	0
NEENAH	08/27/2018	52	0	0	0	0
NEENAH	08/28/2018	54	0	0	0	0

**HIGH WIND**

*There were 8 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>KTS</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	04/06/1997		0	0	2.00K	0.00K
WINNEBAGO COUNTY	03/09/1998		0	0	1.00K	0.00K
WINNEBAGO COUNTY	06/28/1998	57	0	0	5.00K	0.00K
WINNEBAGO COUNTY	11/10/1998	63	0	0	115.00K	0.00K
WINNEBAGO COUNTY	02/25/2001		0	0	0.00K	0.00K
WINNEBAGO COUNTY	04/07/2001	54	0	0	0.00K	0.00K
WINNEBAGO COUNTY	10/26/2010	50	0	0	0.00K	0.00K
WINNEBAGO COUNTY	03/08/2017	55	0	0	0.00K	0.00K

## Appendix B: Frequency of Occurrence

### STRONG WIND

There were **19** events reported over the 25-year period from 10/1/95-10/1/20.

<i>Location</i>	<i>Date</i>	<i>KTS</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	10/30/1996		0	0	\$80,000	0
WINNEBAGO COUNTY	03/17/1999		0	0	0	0
WINNEBAGO COUNTY	12/26/1999		0	0	0	0
WINNEBAGO COUNTY	03/25/2000		0	0	0	0
WINNEBAGO COUNTY	04/05/2000		0	0	0	0
WINNEBAGO COUNTY	04/20/2000		0	0	0	0
WINNEBAGO COUNTY	06/21/2000		0	0	0	0
WINNEBAGO COUNTY	10/25/2001		0	0	0	0
WINNEBAGO COUNTY	12/05/2001		0	0	0	0
WINNEBAGO COUNTY	02/11/2002		0	0	0	0
WINNEBAGO COUNTY	03/09/2002		0	0	0	0
WINNEBAGO COUNTY	05/09/2002		0	0	0	0
WINNEBAGO COUNTY	11/12/2003	41	2	0	0	0
WINNEBAGO COUNTY	05/05/2010	43	0	0	\$2,000	0
WINNEBAGO COUNTY	10/14/2014	43	0	0	\$5,000	0
WINNEBAGO COUNTY	12/23/2015	47	0	0	\$1,000	0
WINNEBAGO COUNTY	11/18/2016	46	0	0	\$10,000	0
WINNEBAGO COUNTY	03/08/2017	39	0	1	0	0
WINNEBAGO COUNTY	07/19/2017	43	0	0	\$4,000	0

### TORNADO

There were **19** events reported over the 25-year period from 10/1/95-10/1/20.

<i>Location</i>	<i>Date</i>	<i>Strength</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
MENASHA	08/23/1998	F0	0	0	0	0
WINNECONNE	05/06/2002	F0	0	0	0	0
OSHKOSH WITTMAN FLD	05/06/2002	F0	0	0	0	0
OSHKOSH WITTMAN FLD	06/08/2003	F0	0	0	0	0
OSHKOSH WITTMAN FLD	06/08/2003	F0	0	0	0	0
OSHKOSH WITTMAN FLD	05/06/2005	F0	0	0	0	0



Appendix B: Frequency of Occurrence

OSHKOSH	06/09/2005	F0	0	0	0	0
WINNECONNE	06/10/2005	F0	0	0	0	0
OSHKOSH	06/10/2005	F0	0	0	0	0
OSHKOSH	06/10/2005	F0	0	0	0	0
OSHKOSH	06/10/2005	F0	0	0	0	0
NEENAH	08/18/2005	F0	0	0	\$1,000	0
MENASHA	07/19/2008	EF1	0	0	\$75,000	0
ZITTAU	05/04/2010	EF1	0	0	\$10,000	0
WINCHESTER	05/04/2010	EF0	0	0	\$25,000	0
LAKE POYGAN	04/10/2011	EF1	0	0	\$1.37M	0
WITTMAN FLD OSH	07/27/2014	EF0	0	0	0	0
WINCHESTER	08/18/2014	EF0	0	0	0	0
APPLETON	06/14/2017	EF0	0	0	\$5,000	0

**FUNNEL  
CLOUD**

*There were 12 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
NEENAH	06/16/1999	0	0	0	0
NEENAH	05/06/2002	0	0	0	0
MENASHA	05/30/2002	0	0	0	0
OMRO	06/08/2003	0	0	0	0
OSHKOSH	06/08/2003	0	0	0	0
FISK	06/03/2007	0	0	0	0
OSHKOSH	06/03/2007	0	0	0	0
OSHKOSH	08/13/2008	0	0	0	0
OSHKOSH	07/19/2010	0	0	0	0
OSHKOSH	09/01/2010	0	0	0	0
LAKE WINNECONNE	04/10/2011	0	0	0	0
LAKE POYGAN	07/09/2013	0	0	0	0

**WINTER  
WEATHER**

*There were 10 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
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Appendix B: Frequency of Occurrence

WINNEBAGO COUNTY	01/16/1996	0	0	0	0
WINNEBAGO COUNTY	02/06/1996	0	0	0	0
WINNEBAGO COUNTY	02/07/1996	0	0	0	0
WINNEBAGO COUNTY	02/25/1996	0	0	0	0
WINNEBAGO COUNTY	04/03/1996	0	0	0	0
WINNEBAGO COUNTY	12/27/1996	0	0	0	0
WINNEBAGO COUNTY	01/01/1997	0	0	0	0
WINNEBAGO COUNTY	10/26/1997	0	0	0	0
WINNEBAGO COUNTY	01/04/1998	0	0	0	0
WINNEBAGO COUNTY	01/22/1999	0	0	0	0

**WINTER  
STORM**

*There were 27 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	01/26/1996	0	0	0	0
WINNEBAGO COUNTY	01/08/1998	0	0	0	0
WINNEBAGO COUNTY	03/08/1998	0	0	0	0
WINNEBAGO COUNTY	01/02/1999	0	0	0	0
WINNEBAGO COUNTY	01/03/2000	0	0	0	0
WINNEBAGO COUNTY	02/08/2001	0	0	0	0
WINNEBAGO COUNTY	03/02/2002	0	0	0	0
WINNEBAGO COUNTY	01/21/2005	0	0	0	0
WINNEBAGO COUNTY	02/16/2006	0	0	0	0
WINNEBAGO COUNTY	02/24/2007	0	0	0	0
WINNEBAGO COUNTY	04/11/2007	0	0	0	0
WINNEBAGO COUNTY	12/01/2007	0	0	0	0
WINNEBAGO COUNTY	01/29/2008	0	0	0	0
WINNEBAGO COUNTY	02/17/2008	0	0	0	0
WINNEBAGO COUNTY	02/26/2009	0	0	0	0
WINNEBAGO COUNTY	03/08/2009	0	0	0	0
WINNEBAGO COUNTY	12/08/2009	0	0	0	0
WINNEBAGO COUNTY	12/11/2010	0	0	0	0
WINNEBAGO COUNTY	02/20/2011	0	0	0	0
WINNEBAGO COUNTY	12/20/2012	0	0	0	0
WINNEBAGO COUNTY	01/30/2013	0	0	0	0

Appendix B: Frequency of Occurrence

WINNEBAGO COUNTY	12/22/2013	0	0	0	0
WINNEBAGO COUNTY	01/14/2014	0	0	0	0
WINNEBAGO COUNTY	12/28/2015	0	0	0	0
WINNEBAGO COUNTY	02/02/2016	0	0	0	0
WINNEBAGO COUNTY	03/23/2016	0	0	0	0
WINNEBAGO COUNTY	04/03/2018	0	0	0	0

**HEAVY SNOW**

*There were 19 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	01/23/1996	0	0	0	0
WINNEBAGO COUNTY	01/25/1996	0	0	0	0
WINNEBAGO COUNTY	12/23/1996	0	0	0	0
WINNEBAGO COUNTY	02/04/1997	0	0	0	0
WINNEBAGO COUNTY	03/13/1997	0	0	0	0
WINNEBAGO COUNTY	01/14/1998	0	0	0	0
WINNEBAGO COUNTY	01/12/2000	0	0	0	0
WINNEBAGO COUNTY	02/05/2004	0	0	0	0
WINNEBAGO COUNTY	02/20/2005	0	0	0	0
WINNEBAGO COUNTY	03/18/2005	0	0	0	0
WINNEBAGO COUNTY	12/14/2005	0	0	0	0
WINNEBAGO COUNTY	02/14/2008	0	0	0	0
WINNEBAGO COUNTY	12/08/2008	0	0	0	0
WINNEBAGO COUNTY	12/19/2008	0	0	0	0
WINNEBAGO COUNTY	04/19/2011	0	0	0	0
WINNEBAGO COUNTY	03/02/2012	0	0	0	0
WINNEBAGO COUNTY	12/28/2012	0	0	0	0
WINNEBAGO COUNTY	02/17/2014	0	0	0	0
WINNEBAGO COUNTY	12/16/2016	0	0	0	0

**BLIZZARD**

*There were 5 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	01/29/1996	0	0	0	0

Appendix B: Frequency of Occurrence

WINNEBAGO COUNTY	01/02/1999	0	0	0	0
WINNEBAGO COUNTY	02/16/2006	0	0	0	0
WINNEBAGO COUNTY	12/11/2010	0	0	0	0
WINNEBAGO COUNTY	02/01/2011	0	0	0	0

**ICE STORM**

*There were 3 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	02/26/1996	0	0	0	0
WINNEBAGO COUNTY	01/01/2005	0	0	0	0
WINNEBAGO COUNTY	04/09/2013	0	0	0	0

**DENSE FOG<sup>153</sup>**

*There were 12 events reported over the 25-year period from 10/1/95-10/1/20.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WINNEBAGO COUNTY	01/17/1996	0	0	0	0
WINNEBAGO COUNTY	05/09/1996	0	0	0	0
WINNEBAGO COUNTY	06/10/1996	0	0	0	0
WINNEBAGO COUNTY	09/06/1996	0	0	0	0
WINNEBAGO COUNTY	09/21/1996	0	0	0	0
WINNEBAGO COUNTY	10/16/1996	0	0	0	0
WINNEBAGO COUNTY	10/21/1996	0	0	0	0
WINNEBAGO COUNTY	01/02/1997	0	0	0	0
WINNEBAGO COUNTY	02/11/1999	0	0	0	0
WINNEBAGO COUNTY	12/13/1999	0	0	0	0
WINNEBAGO COUNTY	01/09/2000	0	0	0	0
WINNEBAGO COUNTY	02/24/2000	0	0	0	0

<sup>153</sup> This hazard was not selected for inclusion as an independent hazard; it has minimal effect in the county and there are few hazard mitigation strategies that could be impactful and pass a benefit-cost analysis.

## Appendix C: Plan Adoption

This plan has been adopted by Winnebago County and its major municipal bodies including the Winnebago County Board, the Cities of xxx; the Villages of xxx; and the Towns of xxx. The xxx of xxx did not adopt the plan. Scanned copies of those municipalities that adopted this plan follow.



**STATE OF WISCONSIN**  
*DEPARTMENT OF MILITARY AFFAIRS*  
**DIVISION OF EMERGENCY MANAGEMENT**

Greg Engle  
Acting Administrator

Tony Evers  
Governor

March 10, 2022

Eric Rasmussen, Director  
Winnebago County Emergency Management  
4311 Jackson Street  
Oshkosh, WI 54902

Dear Eric:

Wisconsin Emergency Management (WEM) has reviewed the *Hazard Mitigation Plan, Winnebago County, Wisconsin*. The Federal Emergency Management Agency (FEMA) and WEM have signed a Program Administration by States operational agreement, dated October 29, 2018, allowing WEM to review local mitigation plans to ensure they meet the required criteria for a multi-jurisdiction hazard mitigation plan outlined in 44 CFR Part 201.

The county and participating jurisdictions *must now adopt* the plan to have a FEMA-approved hazard mitigation plan and be eligible for funding through the Hazard Mitigation Grant Program (HMGP), Building Resilient Infrastructure and Communities (BRIC) program, and the Flood Mitigation Assistance (FMA) program.

I have emailed a copy of both the FEMA Local Mitigation Plan Review Tool and “Katie’s Plan Review Tool” for your records.

If you have any questions, please email me at [emily.cohen@wisconsin.gov](mailto:emily.cohen@wisconsin.gov) or Robyn Fennig at [robyn.fennig@wisconsin.gov](mailto:robyn.fennig@wisconsin.gov).

Sincerely,

A handwritten signature in black ink, appearing to read 'Emily Cohen'.

Emily Cohen  
Lead Planning Grant Manager  
Wisconsin Emergency Management

Enclosure

Cc: Robyn Fennig, Hazard Mitigation Section Supervisor, WEM  
Guen Drewes, State Hazard Mitigation Officer, WEM  
Steve Fenske, East Central Region Director, WEM  
Lenora Borchardt, Emergency Manager, EPTEC

## Appendix D: Report on Previous Mitigation Strategies

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
Drought and Dust Storms	Create an ordinance to prioritize or control water use during drought conditions.	Covered by annual budget	Co. Board		Low	Winnebago County and all municipalities within	<i>Will be dropped moving forward; some municipalities already have an ordinance and others do not plan to.</i>
	Maintain the "Ellenbecker" program, a geographic database for natural disaster events that graphically displays damage areas and automatically calculates financial impact.	Covered by annual budget	Planning, Zoning & GIS; EM	Ongoing	Low	Winnebago County and all municipalities within	<i>Ellenbecker is no longer used; ArcGIS Survey123 is now used through WEM. Moving forward, this strategy will be removed from other categories and placed only in the All-Hazards category.</i>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
<b>Extreme Temperatures (Cold and Heat)</b>	Call a meeting of public and nonprofit organizations that may be able to mobilize a volunteer corps of individuals willing to assist vulnerable people during periods of extreme temperature.	Covered by annual budget	PH, EM, Human Svcs, ADVOCAP, ARC, municipalities	Ongoing	Low	Winnebago County and all municipalities within	<i>PH and Human Services, with the support of EM and municipalities, regularly work on this topic with VOAD agencies. Will carry forward with edited text.</i>
	Publicize available programs that help residents pay for their utility expenses.	Covered by annual budget	Human Services, utility companies, municipalities	Ongoing	Low	Winnebago County and all municipalities within	<i>Human Services agencies and utilities annually provide notification about utility grants. Will carry forward with edited text.</i>
	Maintain the "Ellenbecker" program, a geographic database for natural disaster events that graphically displays damage areas and automatically calculates financial impact.	Covered by annual budget	Planning, Zoning & GIS; EM	Ongoing	Low	Winnebago County and all municipalities within	<i>Ellenbecker is no longer used; ArcGIS Survey123 is now used through WEM. Moving forward, this strategy will be removed from other categories and placed only in the All-Hazards category.</i>
	Investigate the possibility of establishing a database of individuals who are vulnerable to extreme temperature and who have voluntarily placed their name on the call list	Covered by annual budget	EM, Human Services			Winnebago County and all municipalities within	<i>Will be dropped moving forward; power companies have this information and data is shared in aggregate.</i>



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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
<b>Public Education</b> <i>**Note that the previous version of this plan used this category but moving forward in the updated plan, these items will be moved to the All-Hazards category</i>	Continue providing community disaster education presentations to citizens, public agencies, private property owners, businesses, and schools.	Covered by annual budget	EM, ARC	Ongoing	Low	Winnebago County and all municipalities within	<i>EM - resources and information is shared electronically on disaster safety as well as interviews and presentations on safety and preparedness</i>  <i>ARC - Ongoing-Be Red Cross Ready program provides a national standardized preparedness education program for adults to prepare for and respond appropriately to disasters. The curriculum focuses on preparedness essentials, get a kit, make a plan, be informed, and localized hazards specific to the community.</i>  <i>Will carry forward.</i>
	Keep the County's website up-to-date and continue to provide hazard related information that is easily accessible.	Covered by annual budget	EM, IS	Ongoing	Low	Winnebago County and all municipalities within	<i>Ongoing and will carry forward, also utilizing social media.</i>
	Work with the schools within the County to promote hazard mitigation education and awareness and discuss ways to better integrate mitigation into the curriculum.	Covered by annual budget	EM, ARC	Ongoing	Low	Winnebago County and all municipalities within	<i>EM - Serve on school safety committees as well as promote the STEP program.</i>  <i>ARC - Ongoing-Red Cross Pillowcase Project and Prepare with Pedro Programs help to educate students from K-5<sup>th</sup> grades on natural hazards, teach safety and emotional coping skills, as well as the importance of personal preparedness. Students learn how to create their own</i>

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							<p><i>emergency supply kits, record emergency contact numbers and create a list of essential items to help prepare them for disaster. Over 250 students participated in Winnebago County in 2019-20.</i></p> <p><i>Will carry forward.</i></p>
	Identify, improve, and sustain collaborative programs focusing on the real estate and insurance industries, public and private sector organizations, and individuals to avoid activity that increases risk to natural hazards.	Covered by annual budget	EM, ARC	Ongoing	Low	Winnebago County and all municipalities within	<p><i>EM - resources and information is shared electronically on natural hazards as well as interviews and presentations on natural hazards</i></p> <p><i>ARC - Ongoing participation in Red Cross Ready Rating, an OSHA approved Emergency Action Plan (EAP) Tool &amp; Training program. Ready Rating helps organizations commit to preparedness, by helping them to develop an EAP to meet their facilities and equipment needs. Training and exercises are held regularly and by request. Plans are updated annually for continuation of Red Cross certification.</i></p> <p><i>Will carry forward.</i></p>
	Continue to work with the Winnebago County Public-Private Partnership, Inc. to provide educational resources.	Covered by annual budget	EM	Ongoing	Low	Winnebago County and all municipalities within	<p><i>This group was discontinued locally. Will be dropped.</i></p>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Maintain the "Ellenbecker" program, a geographic database for natural disaster events that graphically displays damage areas and automatically calculates financial impact.	Covered by annual budget	EM; Planning, Zoning & GIS	Ongoing	Low	Winnebago County and all municipalities within	<i>Ellenbecker is no longer used; ArcGIS Survey123 is now used through WEM. Moving forward, this strategy will be removed from other categories and placed only in the All-Hazards category.</i>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
<b>Severe Storms, Hail &amp; High Winds</b>  <i>**Note that the previous version of this plan combined multiple hazards into this one category but moving forward in the updated plan, these items will be separated into the appropriate</i>	Continue to update and/or monitor the County's public early warning system and network.	Covered by annual budget	EM	Ongoing	High	Winnebago County and all municipalities within	<i>CO Winnebago: Continually maintain and test warning system. Ongoing and will carry forward.</i>  <i>CI Neenah: Does not want to carry forward.</i>
	Produce and distribute emergency preparedness information related to thunderstorms, snow storms, hailstorms, lightning, and windstorm hazards.	Covered by annual budget	EM, ARC, municipalities	Ongoing	Medium	Winnebago County and all municipalities within	This is done all through the year as needed and special focus is given to the spring and autumn winter awareness weeks (April and November). County EM spearheads the activities with support from the municipalities and other partners.  <i>CO Winnebago: EM - resources and information is shared electronically on severe weather as well as interviews and presentations on severe weather / ARC - In progress-ongoing, Red Cross volunteers are reaching out to update shelter and facility surveys. Covid-19 has</i>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
<i>hazard categories.</i>							<p><i>delayed or limited our accessibility to visit or contact shelters. As volunteers are able, virtual or phone updates are being conducted. Will carry forward.</i></p> <p><i>CI Menasha: Continuous – look for additional opportunities to disseminate information. Carry forward.</i></p> <p><i>VI Winneconne: We are happy to distribute information; production would benefit from county or regional collaboration. Carry forward.</i></p> <p><i>CI Oshkosh: Roll into weather awareness weeks and municipalities will support county efforts in conjunction with WEM.</i></p>
	Identify and pursue funding opportunities to develop and implement local and county mitigation activities.	Covered by annual budget	EM	Ongoing	High	Winnebago County and all municipalities within	<p><i>CO Winnebago: as requested by municipalities, we would work with them to pursue funding for mitigation opportunities. Ongoing and will carry forward.</i></p> <p><i>CI Menasha: Although our Health Dept. has secured general Emergency Preparedness funds, nothing specific to storms. Will carry forward.</i></p> <p><i>CI Neenah: Does not want to carry forward.</i></p>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<i>CI Oshkosh: Will be dropped.</i>
	Install lightning grade surge protection devices for critical electronic components used by government, public service, and public safety facilities, such as warning systems, control systems, communications, and computers.	Covered by annual budget or specialized equipment grants	IS	Ongoing, as needed	High	Winnebago County and all municipalities within	<p>Agencies ensure that electronic systems are mechanically protected from lightning and other hazards as systems are bought and/or upgraded. Staff also conduct regular back-up of data and failure plans are in place for critical systems.</p> <p><i>County: Install lightning grade surge protection devices for critical electronic components used by government, public service, and public safety facilities, such as warning systems, control systems, communications, and computers.</i></p> <p><i>VI Winneconne: Installed UPS protection at WWTP, wells, lift station and Village Hall around 5 years ago. Will be dropped.</i></p> <p><i>CI Omro: generally use surge protection. Will be dropped.</i></p>
	Apply for mitigation funding to purchase NOAA weather radios for county residents.	TBD	IS		Medium	Winnebago County and all municipalities within	<p><i>CO Winnebago: Focus and efforts have switched to mobile alerting applications. Will be dropped.</i></p> <p><i>CI Menasha: Our Health Dept had worked others to be able to help provide radios in the past. Will carry forward.</i></p>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>CI Neenah: Does not want to carry forward.</i></p> <p><i>CI Appleton: Radios were purchased in partnership with Outagamie County. Will be dropped.</i></p> <p><i>VI Winneconne: Will be dropped.</i></p> <p><i>CI Oshkosh: Drop and use previous strategy which will go in All Hazards section moving forward.</i></p>
	Maintain the "Ellenbecker" program, a geographic database for natural disaster events that graphically displays damage areas and automatically calculates financial impact.	Covered by annual budget	Planning, Zoning & GIS; EM		Low	Winnebago County and all municipalities within	<i>Ellenbecker is no longer used; ArcGIS Survey123 is now used through WEM. Moving forward, this strategy will be removed from other categories and placed only in the All-Hazards category.</i>
	Install a backup generator or a prewired hook-up at critical facilities related to public safety.	TBD	EM	2026	Low	Winnebago County and all municipalities within	<p><i>CO Winnebago: currently working on this project for Sunnyview Expo Center. Ongoing and will carry forward.</i></p> <p><i>CI Menasha: Completed in 2015. Back-up power is available at the Public Protection Facility (Police/Fire), Fire Station 36, Public Works Facility and City Hall. Does not want to carry forward.</i></p> <p><i>CI Neenah: Police, fire, City Hall, and lift station have generators; also have portable generators. Will carry forward as a very low priority.</i></p>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>CI Omro: Using portable at water plant #1 and both the west and industrial lift station (Installed are approximately \$25,000 each). Will be part of well #3 that is currently being installed. May be needed at Community Center and possibly schools. Carry forward.</i></p> <p><i>CI Appleton: Fire Station on Lynch Avenue has a back-up generator which is currently in good shape. Will be ongoing for maintenance of equipment. Carry forward.</i></p> <p><i>VI Winneconne: We have back-up generators at our WWTP and pre-wired connections and portable generators for our wells and lift stations. Have panels at wells and lift stations; have 4 portable generators; looking at replacing 2 older ones but would not be able to do that with budget, would have to be grant funding. Getting a panel at Village Hall would be good, as the building houses police and the library. Carry forward.</i></p> <p><i>CI Oshkosh: Many city facilities have their own dedicated back-up generators. Have portable generators for smaller facilities that do not have one. Fire Station 15 (also primary EOC) needs one. \$120K. 2021. Very High.</i></p>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<i>CI Omro: City Hall has a permanent generator. Schools have asked for the city to pay for generators but the city was unable to. Unsure whether the schools got generators. Could use one at the community center, which also serves as a Red Cross shelter. However, it may not be the community center much longer which would mean the loss of the shelter. The concern is high but the situation is in flux. Will carry forward if it remains a shelter. with a priority level of medium, completion in 2026 and costs being staff time.</i>
	Work to become a Storm Ready community.	Covered by annual budget	Village officials		Low	VI Winneconne	<i>No tangible reason to keep this. Will be dropped.</i>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
<b>Tornadoes</b>	Annually, update the contact telephone number for each of the shelters.	Covered by annual budget	EM, ARC	Ongoing, as needed	High	Winnebago County and all municipalities within	<i>EM – defer to Red Cross ARC - In progress-ongoing, Red Cross volunteers are reaching out to all shelter contacts to get updates for</i>



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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							county shelter listings. Delayed or slow response due to Covid-19.  Carry forward.
	Conduct a facility survey every three years of each shelter in the county and update records accordingly.	Covered by annual budget	EM, ARC	2024	High	Winnebago County and all municipalities within	EM – defer to Red Cross  ARC - In progress-ongoing, Red Cross volunteers are reaching out to update shelter and facility surveys. Covid-19 has delayed or limited our accessibility to visit or contact shelters. As volunteers are able, virtual or phone updates are being conducted.  Will carry forward.
	Apply for mitigation funding to purchase NOAA weather radios for county residents.	Covered by annual budget	EM	Ongoing, as requested	Medium	CO Winnebago, CI Menasha, CI Appleton, CI Omro, CI Oshkosh, WI Winneconne, TN Rushford, TB Algoma	Technological and demographic changes show that fewer urban residents are relying on weather radios (and are using cell phones). County EM has a minimal number of radios kept in stock for at-cost sale to residents. This strategy will continue for communities that have residents requesting this technology.  CO Winnebago: switching focus and efforts to mobile alerting systems like AlertSense. Will be dropped.  CI Menasha: Our Health Dept had worked others to be able to help provide radios in the past. Will carry forward.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>TN Rushford: Not completed and does not want to carry forward.</i></p> <p><i>TN Algoma: The Town would work with the county on this goal.</i></p> <p><i>CI Appleton: Radios were purchased in partnership with Outagamie County. Will be dropped.</i></p> <p><i>CI Omro: Use general statement</i></p> <p><i>VI Winneconne: Will be dropped.</i></p> <p><i>CI Oshkosh: City is not purchasing – county initiative and/or rural. Will be dropped.</i></p>
	Study the feasibility of and support for adopting a local regulation which would require new mobile home parks and future expansions of existing parks to provide for a tornado shelter.	Covered by annual budget	Planning, Zoning, GIS	2026	Medium	Winnebago County and all municipalities within	<p><i>CO Winnebago: Ordinance could be amended making this a requirement for all new parks TBD by Zoning Administrator. Carry forward.</i></p> <p><i>CI Menasha: Will discuss with Community Development Department/Planning. Will carry forward.</i></p> <p><i>CI Neenah: No current or planned mobile home parks. Does not want to carry forward.</i></p> <p><i>VI Winneconne: We do not have mobile home parks in our community.</i></p> <p><i>CI Oshkosh: This is not happening. Will be dropped.</i></p>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<i>CI Omro: Have a mobile home park with no shelter, residents use City Hall which is 1.5 miles away but police have to remember to open it. They may be building a new City Hall. Had discussions as to the city needing to supply the shelter. Owners should be encouraged to put in their own shelters, though this puts a burden on the owners and may make it less affordable for residents. Will be dropped but may consider for the future.</i>
	Evaluate the need for constructing tornado shelters to serve vulnerable residents and construct facilities where needed	Covered by annual budget	EM, local partners	2026	High	Winnebago County and all municipalities within	<p>The county will assist municipalities with seeking grant funding if residents request a shelter be installed.</p> <p><i>CO Winnebago: Ongoing and will carry forward.</i></p> <p><i>CI Menasha: Will discuss with Community Development/Health Depts. Will carry forward.</i></p> <p><i>CI Omro: Needed in Omro. Closest shelter is 1 mile from mobile home park at City Hall and police need to remember to open it after hours. Carry forward.</i></p> <p><i>TN Clayton: Project planning and execution would depend upon available grant money. Carry forward.</i></p>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>TN Rushford: Not completed and does not want to carry forward.</i></p> <p><i>TN Algoma: Only place for a shelter would be at Jones Park but is likely to be cost-prohibitive. Will be dropped.</i></p> <p><i>CI Appleton: Evaluated and no need. Will be dropped.</i></p> <p><i>CI Oshkosh: Refer to county, supported by City. Medium. 5 years. Ongoing.</i></p> <p><i>CI Omro: FEMA has pre-approved design plans that would save the cost of engineering. Grant funding would cover part of the cost to build but the facility could not be multi-use. Will carry forward with a timeline of as needed, budget to be determined and a low to medium priority.</i></p> <p><i>CI Neenah: No mobile home parks. Will be dropped.</i></p>
	Maintain the "Ellenbecker" program, a geographic database for natural disaster events that graphically displays damage areas and automatically calculates financial impact.	Covered by annual budget	Planning, Zoning, GIS		Low	Winnebago County and all municipalities within	<i>Ellenbecker is no longer used; ArcGIS Survey123 is now used through WEM. Moving forward, this strategy will be removed from other categories and placed only in the All-Hazards category.</i>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Apply for mitigation funding to purchase NOAA weather radios for county residents.	Covered by annual budget	Town officials		Low	TN Black Wolf	<i>Town has tornado siren. Will not be carried forward.</i>
	Evaluate the need for constructing tornado shelters to serve vulnerable residents and construct facilities where needed	Covered by annual budget	Town officials		Low	TN Black Wolf	<i>At this time the elementary school is the location. Will not be carried forward.</i>
	Apply for mitigation funding to purchase NOAA weather radios for county residents.	Covered by annual budget	Village officials		Medium	VI Fox Crossing	<i>In the previous plan, this strategy was for the former Town of Menasha. This was completed in 2017 and will not be carried forward.</i>
	Evaluate the need for constructing tornado shelters to serve vulnerable residents and construct facilities where needed	Covered by annual budget	Village officials	2026	Medium	VI Fox Crossing	<i>In the previous plan, this strategy was for the former Town of Menasha. An additional generator to power a second EOC was added on the east side but nothing for shelters. Will be carried forward.</i>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
<b>Wildland Fires</b>	Provide education to county and municipality personnel about federal cost-share and grant programs, Fire Protection Agreements, and other related federal programs so the full array of assistance available to local agencies is understood.	Covered by annual budget	EM; Planning, Zoning & GIS	Ongoing	Medium	Winnebago County and all municipalities within	<i>Information is shared with local fire agencies when received from WEM or FEMA. Ongoing and will carry forward.</i>
	Develop a database to keep track of wildfire events in the County.	Covered by annual budget	EM			Winnebago County and all municipalities within	<i>CO Winnebago: Compiled by DNR. Will be dropped. CI Menasha: Belief is not necessary at the municipal level. Does not want to carry forward. VI Winneconne: Does not want to carry forward. CI Oshkosh: The DNR already has this. Will be dropped.</i>
	Maintain the "Ellenbecker" program, a geographic database for natural disaster events that graphically displays damage areas and automatically calculates financial impact.	Covered by annual budget	EM; Planning, Zoning & GIS			Winnebago County and all municipalities within	<i>Ellenbecker is no longer used; ArcGIS Survey123 is now used through WEM. Moving forward, this strategy will be removed from other categories and placed only in the All-Hazards category.</i>
	Apply for federal and state grants to enhance the capability of local fire departments.	Covered by annual budget	Fire Depts., EM	Ongoing, as applicable	Medium	Winnebago County and all municipalities within	<i>TN Black Wolf: The FD will request for applicable grant. Will not be carried forward. CI Menasha: Belief the risk is small enough not to warrant. Does not want to carry forward.</i>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>CI Omro: Apply for DNR grant annually. Carry forward.</i></p> <p><i>TN Clayton: Received DNR grants in 2019 and 2020 for wildland fire gear and additional hose line; portable pump and firefighting foam. Applied for FEMA grant for nozzles and are waiting on results.</i></p> <p><i>TN Rushford: Not completed and does not want to carry forward.</i></p> <p><i>CI Oshkosh: Will apply as needed. Will add training to this strategy moving forward</i></p> <p><i>TN Algoma: Always applying, not a lot of open land but FD is always seeking new tools to assist with mutual aid response.</i></p> <p><i>VI Fox Crossing: In the previous plan, this strategy was for the former Town of Menasha. Received a DNR grant in 2020 for wildland FF PPE, dual bank radio chargers, backpack extinguishers, etc. The Village applies for this grant most years for various items. Will be carried forward.</i></p> <p><i>TN Algoma: Ongoing as needed and funds become available. Will carry forward</i></p>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
<b>Flooding and Dam Failure</b>	*Apply for funding through the federal BRIC, Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), and the Pre-Disaster Mitigation (PDM) Program as well as any other resources that may be available to help mitigate damages (e.g., buy-out, elevate, floodproof) at repetitive loss sites	Covered by annual budget	EM and municipal leaders	Ongoing	High	Winnebago County and all municipalities within	<p><i>CI Menasha: Since 1987 there have been only two times in the early 1990s that there was flooding with the Lower Fox River along Fox Street where we had to sandbag; there has been nothing since. Will not carry forward.</i></p> <p><i>CI Neenah: The city will take advantage of opportunities that are cost-effective and meet this strategy. Carry forward.</i></p> <p><i>CI Oshkosh: This is an ongoing strategy with no end date. As new studies are completed, the recommendations are evaluated for funding alternatives. Carry forward.</i></p> <p><i>PLUS: Carry forward. High, 5 years, department budget for funding. Benefit cost analysis used. 2016 Armory Area Wet Detention basin. Originally submitted thru PDM. Got extra \$250K via hazmit versus PDM Grant was \$2M. total was \$2.8M. Received an award in 2016 facilitated by WEM.</i></p>



Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>CI Appleton: WIS DOT project (Shindler Pond) completed in 2019. Will be dropped. The city also noted that if a resident comes to them for information they will assist. They are also participating in the PDM process and will adopt the updated plan.</i></p> <p><i>VI Winneconne: There are not many repetitive loss sites but as potential projects arise, funding will be sought. Will carry forward.</i></p>
	Design and budget for stormwater management facilities consistent with adopted stormwater management plans than have been or will be prepared /amended.	Project costs are TBD and will be completed as budgets allow	EM and municipal leaders	Ongoing	High	Winnebago County and all municipalities within	<p><i>Fox Crossing: Ongoing, acquiring land and installing ponds now. Will carry forward.</i></p> <p><i>CI Menasha: Completed March 2018 but continuous as there area ever-evolving stormwater concerns with long-term financial commitments that need to be met. Carry forward.</i></p> <p><i>CI Neenah: As budget conditions allow, these measures will be implemented. Carry forward.</i></p>

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Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>CI Oshkosh: This is an ongoing strategy with no end date. As new studies are completed, the recommendations are programmed into the annual capital improvement program. Carry forward. High, 5 years, department budget for funding</i></p> <p><i>TN Clayton: This is an ongoing process. Carry forward.</i></p> <p><i>TN Rushford: Not completed and does not want to carry forward.</i></p> <p><i>TN Algoma: In progress. Constructed Jones Detention Pond in summer of 2020 and looking to acquire Honey Creek Detention Pond fall of 2020. Anticipate constructing Irvine Detention Pond in late fall 2020 with completion in summer 2021. Carry forward.</i></p> <p><i>CI Appleton: No known flooding areas for Winnebago County portion of the City of Appleton. Will be dropped.</i></p> <p><i>VI Winneconne: In the process of creating a stormwater utility and anticipating it will be passed in 2021 and enter into force in late 2021 or early 2022 Carry forward.</i></p>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>CI Omro: Do not currently have a stormwater management plan, though it has been discussed in the past. Have about six retention ponds. Will carry this strategy forward for the purpose of creating a plan with a consistent view of how to handle stormwater management. Medium, 2026.</i></p> <p><i>TN Black Wolf: Budgeted and planned for the fiscal year as needed due to accumulation. Will be carried forward. \$40K.</i></p>
	Develop a computerized database containing information on culverts under public roadways in the county.	Covered by annual budget	Planning/ Zoning, GIS, municipal leaders	2026	High	Winnebago County and all municipalities within	There are several current efforts related to culverts that provide GIS a variety of source data for culverts. LWCD has a culvert layer produced from aerial photography that is comprehensive but does not have field measurements. The Highway Department has a similar dataset but specific to roads they maintain. Highway participates with the WDOT in a Culvert Asset Management Program. This is primarily a county initiative that is supported by the submission of data by the municipalities, as requested, for inclusion on GIS data layers that will be shared between the county and the municipalities.

Appendix D: Report on Previous Mitigation Strategies

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>CO Winnebago: Planning, Zoning, GIS - Land and Water Conservation as well as Highway have developed GIS culvert layers. These layers need to be consolidated into one comprehensive dataset. Carry forward.</i></p> <p><i>CI Menasha: Completed in the 1990s. All pipes, including culverts, are continually updated on our systems maps. Does not want to carry forward</i></p> <p><i>CI Oshkosh: Will support the county as requested and able.</i></p> <p><i>CI Appleton: No known flooding areas for Winnebago County portion of the City of Appleton. Will be dropped.</i></p> <p><i>VI Winneconne: We have a stormwater layer on our GIS map that shows culverts and other stormwater facilities. Will support the county as requested and able.</i></p> <p><i>CI Omro: Will talk to county about preferences. High, 2026</i></p>
	Identify those culverts and bridges that are undersized or are otherwise unable to handle expected flood flows.	TBD	Highway, municipal leaders	2026	High	Winnebago County and all municipalities within	<i>CO Winnebago: Highway Dept. - Carry forward.</i>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>CI Menasha: Completed in 2019 but continues due continuous monitoring and evaluation of the city's storm sewer system. Carry forward.</i></p> <p><i>CI Oshkosh: This is an ongoing strategy. As new watershed studies are undertaken, new crossings are identified. Carry forward. Also, CI Oshkosh: medium-high. 5 yrs., dept budget. Looking at as part of watershed wide analyses. Replacing as necessary.</i></p> <p><i>CI Appleton: No known flooding areas for Winnebago County portion of the City of Appleton. Will be dropped.</i></p> <p><i>VI Winneconne: Will drop as they have addressed all local issues but will support the county as requested.</i></p> <p><i>CI Omro: Identification of locations was completed in 2020. Issues identified:</i></p> <p><i>Highway 21 floods and the city is considering placing valves to prevent further flooding.</i></p> <p><i>Culverts on Lincoln are being replaced this week (Aug., 2020) for \$100,000.</i></p>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>West Larrabee &amp; Michigan Street storm sewer needs upgraded and sidewalks raised. Monroe St and E Ontario also floods and will need to be designed and engineered for future upgrades.</i></p> <p><i>Carry forward.</i></p>
	Prepare a strategy to prioritize efforts to ensure that existing culverts and bridges are retrofitted to handle expected flood flows.	TBD	Highway, municipal leaders	2026	High	Winnebago County and all municipalities within	<p><i>CO Winnebago: Highway Dept. - Carry forward.</i></p> <p><i>CI Menasha: Continuous; included in the evolving stormwater action plan. Carry forward.</i></p> <p><i>CI Neenah: As new bridges and culverts are installed; they will be evaluated to minimize flood impacts. Carry forward.</i></p> <p><i>CI Omro: Some retrofitting of culverts has been done. Work on Sunset Court alleviated problems downstream. This was completed in 2016 at a cost of \$60K. Problems were mainly flooding in yards. They had also identified a possible project on West Main Street by the Highway 21 bridge but that is done for now due to previous work that has been done and this may not be necessary. Will carry forward.</i></p>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>CI Oshkosh: Will continue to monitor and evaluate infrastructure for problems. Will carry forward. MED, 5 yrs., dept budget</i></p> <p><i>CI Appleton: No known flooding areas for Winnebago County portion of the City of Appleton. Will be dropped.</i></p> <p><i>VI Winneconne: Will be dropped.</i></p>
	Prepare a strategy to prioritize road improvements for public roadways that are susceptible to flooding.	Covered by annual budget	Highway, Planning/ Zoning, GIS, municipal leaders	2026	High	Winnebago County and all municipalities within	<p><i>CO Winnebago: Carry forward.</i></p> <p><i>CI Menasha: No known issues with susceptible roadway flooding requiring improvements. Will not carry forward.</i></p> <p><i>CI Oshkosh: Will continue to monitor and evaluate infrastructure for problems. Will carry forward. MED, 5 yrs., dept budget</i></p> <p><i>CI Appleton: No known flooding areas for Winnebago County portion of the City of Appleton. Will be dropped.</i></p> <p><i>VI Winneconne: Each road reconstruction includes curb, gutter, and related stormwater engineering to prevent flooding and maximize longevity. Will carry forward.</i></p>

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Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<i>CI Omro: This has been discussed and a strategy for Highway 21 in front of Scott Park will be added to Appendix E. Carry forward.</i>
	Identify specific areas with flood mitigation value and develop appropriate strategies for protection.	Covered by annual budget	Highway, Planning/ Zoning, LWCD, municipal leaders	2026	High	Winnebago County and all municipalities within	<i>CO Winnebago: Carry forward.</i>
	Establish a framework to compile and coordinate surface water management plans and data throughout Winnebago County.	Covered by annual budget	LWCD		High	Winnebago County and all municipalities within	<i>CO Winnebago: LWCD - - The 2021-2030 Land &amp; Water Resource Management Plan for the County was recently completed. Will be dropped.</i>
	Facilitate post-flood recovery plans and programs to help county residents rebuild and implement mitigation measures to protect against future floods.	Covered by annual budget	EM, Planning/ Zoning, LWCD	2026	High	Winnebago County and all municipalities within	<i>This is done after disasters and there were no major disasters in the county in the last five years. Carry forward to be done as needed.</i>
	*Distribute National Flood Insurance Program information.	Covered by annual budget	EM, Planning/ Zoning, GIS	Ongoing	High	Winnebago County and all municipalities within	<i>Ongoing. Carry forward.</i>
	Explore options for improving the ability of local units of government to report flooding, receive information, and request assistance.	Covered by annual budget	EM, Planning, Zoning, GIS	Ongoing	Medium	Winnebago County and all municipalities within	<i>Planning, Zoning, GIS - This topic should be explored with WEM to determine if Survey123 or WebEOC can assist with this need. Carry forward.</i>



Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Maintain the "Ellenbecker" program, a geographic database for natural disaster events that graphically displays damage areas and automatically calculates financial impact.	Covered by annual budget	EM		Low	Winnebago County and all municipalities within	<i>Ellenbecker is no longer used; ArcGIS Survey123 is now used through WEM. Moving forward, this strategy will be removed from other categories and placed only in the All-Hazards category.</i>
	Create a brochure containing information about various flood dangers that exist in Winnebago County.	Covered by annual budget	EM		Low	Winnebago County and all municipalities within	<p><i>CO Winnebago: efforts are switching to electronic methods of information sharing. These are available. Will be dropped.</i></p> <p><i>CI Menasha: Completed in 2018 and on the City's website. Does not want to carry forward.</i></p> <p><i>CI Appleton: No known flooding areas for Winnebago County portion of the City of Appleton. Will be dropped.</i></p> <p><i>VI Winneconne: Will be dropped.</i></p> <p><i>CI Oshkosh CI Oshkosh: Flood info put out with spring weather awareness week. Will continue to be part of that series of public info campaigns. Led by the county, benefitting the communities. Done every yr. for 5 yrs. Will be dropped.</i></p> <p><i>CI Omro: Municipality will support as requested. Will be dropped.</i></p>

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Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Provide information and offer education to make people aware of natural floodplain resources and functions and how they can protect them.	Covered by annual budget	EM	Ongoing	Low	Winnebago County and all municipalities within	<p><i>The county leads this effort with annual campaigns during spring's Severe Weather Awareness Week. Municipalities amplify the county's messages locally.</i></p> <p><i>CO Winnebago: Ongoing and will be carried forward.</i></p> <p><i>CI Menasha: Although we do have information and links on our website for stormwater information/education, I do not believe what we have would satisfy this strategy. Will carry forward.</i></p> <p><i>CI Omro: Information is available if requested. Carry forward.</i></p> <p><i>CI Appleton: No known flooding areas for Winnebago County portion of the City of Appleton. Will be dropped.</i></p> <p><i>VI Winneconne: Will support county efforts.</i></p> <p><i>CI Oshkosh: Flood info put out with spring weather awareness week. Will continue to be part of that series of public info campaigns. Led by the county, benefitting the communities. Done every year for 5 yrs. Does via social media and television.</i></p>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Review and update the “Riverview Lane Emergency Action Plan” as adopted by the Board of County Supervisors on July 16, 1991.	Covered by annual budget	EM, Planning/ Zoning, GIS	Ongoing	Low	Winnebago County	<i>Monitor and updated, as required. Drop going forward.</i>
	Work with DNR to prepare Emergency Action Plans for large dams in the County.	Covered by annual budget	Planning, Zoning, GIS, Dam Owners	2023	Medium	Winnebago County and all municipalities within	CO Winnebago: Map showing all dam locations with each categorized located in the County Comprehensive Plan. Ongoing and will carry forward.  <i>CI Oshkosh: The Amory Detention Dam does not have a finalized EAP. Started working on it with consultants and with staff changes and it took two years to complete. Carry forward. 2023. High. Dept budgets, not part of grant. \$50-100K.</i>
	Further study what the potential hazards are for the critical facilities that are located in the 100-year floodplain.	Covered by annual budget	Planning/ Zoning		Low	Winnebago County and all municipalities within	<i>Not completed and will be dropped.</i>
	All projects identified in stormwater management plans that will lessen flooding should be accomplished when funding is available for them.	Covered by annual budget	EM and municipal leaders	2026	High	Winnebago County and all municipalities within	CO Winnebago: Continual application by municipalities as funding is available. Ongoing and will carry forward.  <i>CI Menasha: Completed in 2018. Continues and part of Stormwater Action Plan. Will carry forward.</i>  <i>CI Omro: Ongoing. Carry forward.</i>

Appendix D: Report on Previous Mitigation Strategies

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<p><i>CI Oshkosh: This is an ongoing task. As new watershed studies are completed, projects get added to the list to be scheduled. Carry forward.</i></p> <p><i>TN Clayton: This is an ongoing project. Carry forward.</i></p> <p><i>TN Rushford: Not completed and does not want to carry forward.</i></p> <p><i>TN Algoma: In progress. In addition to the three stormwater ponds, Omro Road will be reconstructed with a storm sewer system to control flooding and persistent drainage issues along Omro Road. Replacement of Honey Creek Bridge with a new single cement culvert will occur in 2021. Carry forward.</i></p> <p><i>CI Appleton: No known flooding areas for Winnebago County portion of the City of Appleton. Will be dropped.</i></p> <p><i>VI Fox Crossing: In the previous plan, this strategy was for the former Town of Menasha. Completed as funding becomes available. Some have been completed. Two pieces of land were just purchased to add ponds. Will carry forward</i></p>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<i>CI Neenah. Would like to carry forward.</i>
	Develop a Manitowoc/ Brighton Beach Roads Storm Water Project.	Multi-million dollar project	Municipal leaders	2026	Medium	CI Menasha VI Fox Crossing	<i>In the previous plan, this strategy was for the former Town of Menasha. The project plan has been completed and starting to work with Heckrodt now. Will carry forward.</i>
	Replace the existing four 60-inch culverts with one 20-foot clear span box culvert or a bridge on County Road N, ¼ mile east of James Rd.	TBD	Highway			Winnebago County	<i>Completed in 2018. Per Highway Dept., replaced in 2018 w/ 19'10" (w) x 7'8" (h) x 63' (long) Aluminum Box Structure. Will be dropped.</i>
	Valley Road Storm Water project	\$7M	Highway, VI Fox Crossing, CI Menasha	2025	High	CI Menasha VI Fox Crossing	<i>In the previous plan, this strategy was for the former Town of Menasha. It is a joint project with County, CI Menasha, and VI Fox Crossing. Scheduled for 2021. The project plan is done. Construction is planned for 2024-2025.</i>
	Stroebe Island causeway reconstruction/stabilization	TBD	VI Fox Crossing	2026	High	VI Fox Crossing	<i>In the previous plan, this strategy was for the former Town of Menasha. Project planning began in 2021 along with the reconstruction of the causeway. Preliminary work is happening now with water and sewer and completion is two years out. Will carry forward.</i>

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Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Stormwater diversion and Red Oak Ravine reconstruction.	\$1.2M	VI Fox Crossing	2018	High	VI Fox Crossing	<i>In the previous plan, this strategy was for the former Town of Menasha. Ravine was stabilized and rip rap was installed. Will be dropped.</i>
	Planning for Green Valley Ditch flood control	Unknown	VI Fox Crossing	2020	High	VI Fox Crossing	<i>In the previous plan, this strategy was for the former Town of Menasha. Redid the culvert and regraded. Will be dropped.</i>
	Evaluate the support for and the feasibility of becoming part of the Community Rating System to lower flood insurance premiums for property owners.	Covered by annual budget	EM and municipal leaders	2026	High	Winnebago County and all municipalities within	<p><i>CI Menasha: Has not been addressed but will explore. Will carry forward.</i></p> <p><i>CI Neenah: At this point the program has not been cost-effective. Will carry forward</i></p> <p><i>CI Oshkosh: Evaluate cost-benefit analysis to see if this is feasible. Medium. 5 yrs. Dept budget</i></p> <p><i>CI Appleton: No known flooding areas for Winnebago County portion of the City of Appleton. Will be dropped.</i></p> <p><i>VI Winneconne: 33-40% of buildings are in the 100-year floodplain. Will move forward and do a cost/benefit analysis. To date, the BCA has not worked out. Medium, 2026, cost would just be staff time.</i></p>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							<i>CI Omro: Cost/benefit just not there. May consider adding in the future. Will be dropped.</i>
	Establish a workgroup to evaluate flooding from Seventh Street to Eighth Street from Grove Street to Melissa Street	Covered by annual budget	Municipal leaders	2019	High	CI Menasha	<i>Completed in 2019. Met and reviewed system maps; suspect maintenance issues and cleaned storm lines. Have not had any issues since. Will be dropped.</i>
	*Revise existing floodplain regulations to ensure they comply with the most recent (2013) model floodplain regulations developed by the Wisconsin Department of Natural Resources.	Covered by annual budget	Municipal leaders	2026	High	Winnebago County and all municipalities within	<p><i>CI Neenah: Needs to verify. Will carry forward.</i></p> <p><i>CI Appleton: This is on-going work for the city to always comply with regulations. Will carry forward and remain compliant.</i></p> <p><i>VI Winneconne: Earlier this year, the Village ordinances were updated to incorporate the most recent state statutes and regulations. Will be dropped.</i></p> <p><i>CI Omro: Need to review for currency. Carry forward.</i></p> <p><i>CI Oshkosh: update to regs in 2017 but not everything up to standards. James Rabe (I think) was supposed to get back to you on this and whether or not this should be put on moving forward.</i></p> <p><i>VI Fox Crossing Need to review for currency. Carry forward.</i></p>

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Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Commerce Court Pond Expansion and Storm Sewer Extension	\$900K	Municipal Leaders	2018	High	CI Neenah	<i>Completed in 2018, \$900K, expanded pond by 25%, protects residential and industrial properties. Will be dropped.</i>
	Winneconne/Harrison Pond	\$600K	Municipal Leaders	2021	High	CI Neenah	<i>Started in Fall of 2020, will complete in 2021, \$600K, High, primarily residential benefit.</i>
	S. Commercial Street Flood Control	\$8M	Municipal Leaders	2025	High	CI Neenah	<i>Ongoing project. S. Commercial St reconstruction. Carry forward.</i>
	Cecil Street Flood Prevention					CI Neenah	<i>Rock elevations limited ability to affect the complete plan. Will be dropped.</i>
	S. Park Avenue Flood Prevention	\$4M	Municipal Leaders	2025	Medium	CI Neenah	<i>Coordinate with S. Park Avenue reconstruction tentatively scheduled for 2025. Carry forward.</i>



Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	River gauge for the Fox River in Omro	TBD	Municipal Leaders	2026		CI Omro	<i>This has been worked on before in conjunction with County EM. EM put in a request to the county to pay for the gauge. The request was approved by the EM Committee but denied by Personnel and Finance. The town could pursue this at their own expense. The NWS has money available if it fits into their river forecasting. They pay for the gauge and installation and then maintenance and upkeep are local responsibilities. Funding would depend on the cost (e.g., if too expensive, a grant or other funding source would be needed.) Right now, they judge flood levels by how much water is in Scott Park. Carry forward to seek grant funding.</i>
	Sunset Court/ Waukau Road Stormwater Management	\$60K	Municipal Leaders	2016	High	CI Omro	<i>Completed in 2016 for about \$60K. Will be dropped.</i>
	Brooke - Ashley Court (Natrop Landings) Storm Sewer	\$64K	Municipal Leaders	2018	High	CI Omro	<i>Alleviated a wet area between Watrop Landing Development and McKinley and brought water along Scott Street into the sewers rather than the ditches. Will be dropped.</i>

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Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Grant Street Storm sewer design, engineering, and installation	\$60K+	Municipal Leaders	2026	High	CI Omro	<i>Partially completed in 2019 – design and engineering only. Money is budgeted (\$60K), but consideration is being given for alternate solutions. If the project moves forward, further money may be needed for street repairs. Will carry forward for installation only. In 2019, the city also did ditching on East Main Street by the Bowhunters Club.</i>
	Implement specified stormwater mitigation projects enumerated in stormwater management plans and studies.	Covered by annual budget	Municipal leaders	2026	Medium	CI Oshkosh	<i>This is an ongoing task with no end date. As new watershed studies are completed, the projects will be added to the list to be completed.</i>
	Libbey / Nicolet Detention Basin	\$4.8M (~\$355K WDNR grant)	Municipal leaders	2019	High	CI Oshkosh	<i>Wet &amp; dry regional basin. Received DNR money to offset small portion of project. Benefit/cost analysis would not work for FEMA grant.</i>
	Campbell Creek Westhaven East					CI Oshkosh	<i>Common Council directed staff to abandon this project. Will be dropped.</i>
	Sawyer Creek Westhaven West					CI Oshkosh	<i>Common Council directed staff to abandon this project. Will be dropped.</i>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Glatz Creek stormwater structures	\$7M	Municipal leaders	2018	High	CI Oshkosh	<i>Started with relief sewer being constructed. Completed 3 phases between 2013 and 2018. Was high priority due to extensive flooding. Completed and will be dropped</i>
	Stringham Creek South Park Ponds	\$2.8M	Municipal leaders	2018	High	CI Oshkosh	<i>Complete reconstruction in lagoon and added control structures to reduce downstream flooding. Project completed with all city funding.</i>
	Fernau Watershed Detention	\$3.1M	Municipal leaders	By 2020	High	CI Oshkosh	<i>Regional stormwater detention basin completed with all local funding.</i>
	Gallups Creek Flood Study	\$150-200K.	Municipal leaders	2021	High	CI Oshkosh	<i>Currently underway and close to finalizing.</i>
	Gallups Creek Detention	\$1.5-2M	Municipal leaders	2025	High	CI Oshkosh	<i>Bridge culvert replaced last year. Have additional plans for more work that will be implemented once the study is done</i>
	Johnson Creek Flood Study	\$200-250K	Municipal leaders	2021	High	CI Oshkosh	<i>Consultant working on study.</i>
	Johnson Creek Detention	TBD	Municipal leaders	2026	High	CI Oshkosh	<i>Enhanced preservation. Not sure the exact direction of the project at this time.</i>

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Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	West Murdock Avenue Watershed Upgrades	\$150K	Municipal leaders	2026	Medium	CI Oshkosh	<i>The study has not yet been initiated and therefore no projects have been identified yet.</i>
	*Analyze repetitive flood properties and identify feasible mitigation options for each.	Covered by annual budget	Municipal leaders	2026	High	CI Oshkosh	<i>Ongoing. Continuing to work on watershed-wide analyses with 3-4 flood analysis studies underway. Carry forward</i>
	Analyze and review ways to retain and control water in Honey Creek and its tributaries to ensure that excessive volumes of rain will not flood the SW quarter of the Town of Algoma. The northern end of the town near Horse Shoe Road should also be looked at for ways to reduce flooding. Any mitigation project resulting from this analysis would also allow safer water flows to Lake Butte des Morts.	\$1.5-1.8M	Municipal leaders	2026	Medium	TN Algoma	<i>In progress. Algoma will be seeking grant funding in FY 22/23 for the expansion of the Thackery Road detention pond and begin regrading the drainage easements in the area of Algoma to reduce flooding and to improve drainage. In addition, a stormwater analysis is being conducted for the NE part of Bellhaven Estates with the long-term goal of converting the dry pond to a wet pond with the Town assuming ownership and maintenance of it. The Town is using the county highway department to complete regrading of several ditches throughout Algoma to improve the flow of stormwater and improve drainage. Carry forward.</i>

Report on Previous Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Create a Storm Water Assessment for the Town of Algoma.	\$50-75K	Municipal leaders	2026	High	TN Algoma	<i>A longer-term initiative is for the Town to create a stormwater utility to pay for the poor drainage and stormwater flow in many parts of Algoma. Will use a contracted engineer for the work. Will carry forward.</i>
	Implement the recommendations for a regional detention pond system along Honey Creek (to Lake Butte de Morts) listed in The Stormwater Management Plan (McMahon v. 2018).	\$750K	Municipal leaders	2022	Very High	TN Algoma	<i>In progress. The Town intends to apply for funding from the WDNR to help restore several stretches of Honey Creek to help with flow and lessen the possibility of flooding. This includes the three detention ponds on or near Honey Creek (i.e., Jones Pond, Honey Creek Pond, Irvine Pond). Will carry forward.</i>
	EB4 Thackery Dr. Detention Basin	\$250K	Municipal leaders	2028	Low	TN Algoma	<i>In progress. This is within the 5-year capital improvement plan. Will carry forward.</i>
	WB1 – WB4 Hy 21 & Leonard Point Rd Detention Basin	Unknown	Municipal leaders	2020	High	TN Algoma	<i>Completed Aug., 2020. This was encompassed in the regional detention pond goal. Will be dropped.</i>
	WB2-WB6 Horseshoe Road Detention Basin	\$500K	Municipal leaders	2031	Low	TN Algoma	<i>Longer-term goal (8-10 years) that will be part of a new development/TIFF district. Will carry forward.</i>

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Leonard Point Lane Detention Basin	TBD	Municipal leaders	2026	Low	TN Algoma	<i>Longer-term goal (8-10 years) This detention pond will be reviewed again one the Town begins reconstruction of Leonard Point Road. Will carry forward.</i>
	Planning for Green Valley Ditch Flood Control	TBD	Municipal leaders	2026	Medium	TN Neenah	<i>Project continues to be considered. Will carry forward.</i>
	East Reighmoore Rd Flood Prevention	TBD	Municipal leaders	2026	Medium	TN Omro	<i>Project continues to be considered. Will carry forward.</i>
	West Reighmoore Rd Flood Prevention	TBD	Municipal leaders	2026	Medium	TN Omro	<i>Project continues to be considered. Will carry forward.</i>
	Sammers Bay Culvert for Flood Prevention	TBD	Municipal leaders	2026	Medium	TN Omro	<i>Project continues to be considered. Will carry forward.</i>
	Sand Pit Road Culvert Replacement	TBD	Municipal leaders	2026	Medium	TN Omro	<i>Project continues to be considered. Will carry forward.</i>
	Youngs Channel Road Flood Proofing	TBD	Municipal leaders	2026	Medium	TN Omro	<i>Project continues to be considered. Will carry forward.</i>
	River gauge for the Town of Wolf River (Fremont) south of Fremont	TBD	Municipal leaders	2026	Low	TN Wolf River	<i>Project continues to be considered. Will carry forward.</i>

\* Designates an element that supports the NFIP.

## Appendix E: 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 providing community disaster education presentations to citizens, public agencies, private property owners, businesses, and schools. Share electronically as well as doing interviews and presentations.	Covered by annual budget	EM, ARC	Ongoing	Low	Winnebago County and all municipalities within	
	Keep the County's website up-to-date and continue to provide hazard related information that is easily accessible. Also use social media.	Covered by annual budget	EM, IS	Ongoing	Low	Winnebago County and all municipalities within	
	Work with the schools within the County to promote hazard mitigation education and awareness and discuss ways to better integrate mitigation into the curriculum.	Covered by annual budget	EM, ARC	Ongoing	Low	Winnebago County and all municipalities within	The Red Cross Pillowcase Project and Prepare with Pedro Programs help to educate students from K-5 <sup>th</sup> grades on natural hazards, teach safety and emotional coping skills, as well as the importance of personal preparedness. Students learn how to create their own emergency supply kits, record emergency contact numbers and create a list of essential items to help prepare them for disaster. Over 250 students participated in Winnebago County in 2019-20.
	Identify, improve, and sustain collaborative programs focusing on	Covered by	EM, ARC	Ongoing	Low	Winnebago County and all municipalities within	Red Cross Ready Rating is an OSHA-approved Emergency Action

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Summary of Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	the real estate and insurance industries, public and private sector organizations, and individuals to avoid activity that increases risk to natural hazards.	annual budget					Plan (EAP) Tool & Training program. Ready Rating helps organizations commit to preparedness by helping them to develop an EAP to meet their facilities and equipment needs. Training and exercises are held regularly and by request. Plans are updated annually for continuation of Red Cross certification.
	Maintain and use the ArcGIS Survey123 program, a geographic database for natural disaster events that graphically displays damage areas and automatically calculates financial impact.	Covered by annual budget	EM; Planning, Zoning & GIS	Ongoing	Low	Winnebago County and all municipalities within	Used through Wisconsin Emergency Management.
	Evaluate options for a command center/EOC for emergency communications and operations.	Covered by annual budget	Municipal Officials	2026	Low	TN Algoma	
<b>Drought and Dust Storms</b>	Provide information to the public, including farmers, on water conservation measures that can be employed during a drought.	Covered by annual budget	EM, FDs, LWCD, UW Ext., municipalities	Ongoing, as needed	Low	Winnebago County and all municipalities within	



Summary of Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
<b>Flooding and Dam Failure</b>	*Apply for funding through the federal BRIC, Hazard Mitigation Grant Program (HMGP), Flood Mitigation Assistance (FMA), and the Pre-Disaster Mitigation (PDM) Program as well as any other resources that may be available to help mitigate damages (e.g., buy-out, elevate, floodproof) at repetitive loss sites.	Covered by annual budget	EM and municipal leaders	Ongoing	High	Winnebago County and all municipalities within	Although there are no specific projects at this time, the county and all municipalities will participate as needs arise.
	Study for the Lower Fox Basin and the Upper Fox/Wolf Basins (Fox-Wolf Basin Watershed Study) that would identify where flood structures could be used to reduce flooding impacts downstream.	TBD	Report Out - LWCD	2025	High	All communities in the Lower Fox and Upper Fox and Wolf basins.	If approved, this study/modeling would be conducted by the U.S. Army Corps of Engineers. This project would not only assist with identifying flood mitigation projects, but will also result in improved water quality.
	Continue to get landowners in compliance with the State Agricultural Performance Standards.	TBD	Report Out - LWCD	Ongoing	High	Winnebago County and all municipalities within	These projects, which include large-scale wetland restorations, work to improve water quality along with providing flood storage.
	Continue the MS4 work to improve water quality and provide flood storage in the permit area.	TBD	Report Out - LWCD, Facilities Dept. & Highway	Ongoing	Ongoing	The MS4 Area falls in the Lower Fox River and Upper Fox River basins.	As part of the Municipal Separate Storm Sewer System (MS4 Permit) the Facilities Department inspects and maintains 11 detention ponds within the MS4 Permit area. Additionally, the Winnebago County stormwater management facilities are comprised of swales located adjacent to the county roadway system and wet and dry ponds. Inspection and maintenance of the county-owned swales is an on-

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							going effort by Highway Department staff.
Design and budget for stormwater management facilities consistent with adopted stormwater management plans than have been or will be prepared /amended.	Project costs are TBD and will be done as budgets allow	EM and municipal leaders	Ongoing	High	Winnebago County and all municipalities within	The county and all municipalities will participate as needs arise; those with specific projects are listed below.	
			2026	High	VI Fox Crossing	Ongoing, acquiring land and installing ponds now.	
			2021	High	TN Algoma	Constructed Jones Detention Pond in summer of 2020 and looking to acquire Honey Creek Detention Pond fall of 2020. Anticipate constructing Irvine Detention Pond in late fall 2020 with completion in summer 2021.	
			2022	High	VI Winneconne	In the process of creating a stormwater utility and anticipating it will be passed in 2021 and enter into force by 2022.	
			2026	Medium	CI Omro	Do not currently have a stormwater management plan, though it has been discussed in the past. Have about six retention ponds. Will create a plan with a consistent view of how to handle stormwater management.	
					TN Black Wolf		

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		\$40K		2026	High		Budgeted and planned for the fiscal year as needed due to accumulation.
	Develop a computerized database containing information on culverts under public roadways in the county.	Covered by annual budget	Planning/ Zoning, GIS, municipal leaders	2026	High	Winnebago County and all municipalities within	There are several current efforts related to culverts that provide GIS a variety of source data for culverts. LWCD has a culvert layer produced from aerial photography that is comprehensive but does not have field measurements. The Highway Department has a similar dataset but specific to roads they maintain. Highway participates with the WDOT in a Culvert Asset Management Program. This is primarily a county initiative that is supported by the submission of data by the municipalities, as requested, for inclusion on GIS data layers that will be shared between the county and the municipalities.
	Identify and remediate those culverts and bridges that are undersized or are otherwise unable to handle expected flood flows.	TBD	Highway, municipal leaders	2026	High	Winnebago County and all municipalities within  CI Omro	The county and all municipalities will participate as needs arise; those with specific projects are listed below.  Identification of locations was completed in 2020. The following issues identified will require planning prior to implementation:

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							<p>Highway 21 floods and the city is considering placing valves to prevent further flooding.</p> <p>Culverts on Lincoln are being replaced this week (Aug., 2020) for \$100,000.</p> <p>West Larrabee &amp; Michigan Street storm sewer needs upgraded and sidewalks raised.</p> <p>Monroe St and E Ontario also floods and will need to be designed and engineered for future upgrades.</p>
	Prepare a strategy to prioritize road improvements for public roadways that are susceptible to flooding.	<p>Covered by annual budget</p> <p>\$20K and will apply for grants as they are available</p>	<p>Highway, Planning/ Zoning, GIS, municipal leaders</p> <p>City officials</p>	<p>2026</p> <p>2026</p>	<p>High</p> <p>High</p>	<p>Winnebago County and all municipalities within</p> <p>Cl Omro</p>	<p>The county and all municipalities will participate as needs arise; those with specific projects are listed below.</p> <p>A strategy is needed for Highway 21 in front of Scott Park. The city received a quote in the amount of \$17,960 for Tideflex valves to reduce flooding for this area. The quote includes furnishing and installing four valves ranging from 12 inches to 24 inches. The quote does not include other possible costs including replacement, cleaning or jetting of piping. The city may budget \$20K for this project and would apply for grants if available.</p>

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Facilitate post-flood recovery plans and programs to help county residents rebuild and implement mitigation measures to protect against future floods.	Covered by annual budget	EM, Planning/ Zoning, LWCD	2026	High	Winnebago County and all municipalities within	This is done as needed after disasters.
*Distribute National Flood Insurance Program information.	Covered by annual budget	EM, Planning/ Zoning, GIS	Ongoing	High	Winnebago County and all municipalities within	
Explore options for improving the ability of local units of government to report flooding, receive information, and request assistance.	Covered by annual budget	EM, Planning, Zoning, GIS	Ongoing	Medium	Winnebago County and all municipalities within	Explored with WEM to determine if Survey123 or WebEOC can assist with this need.
Provide information and offer education to make people aware of natural floodplain resources and functions and how they can protect them.	Covered by annual budget	EM	Ongoing	Low	Winnebago County and all municipalities within	The county leads this effort with annual campaigns during spring's Severe Weather Awareness Week. Municipalities amplify the county's messages locally.
Work with DNR to prepare Emergency Action Plans for large dams in the County.	Covered by annual budget	Planning, Zoning, GIS, Dam Owners	2026	Medium	Winnebago County and all municipalities within	CO Winnebago: Map showing all dam locations with each categorized located in the County Comprehensive Plan.
	\$50-100K		2023	High	CI Oshkosh	The Amory Detention Dam does not have a finalized EAP. It has been started working on it with consultants and is expected to take two years to complete.
All projects identified in stormwater management plans that will lessen flooding should be accomplished when funding is available for them.	Covered by annual budget	EM and municipal leaders	2026	High	Winnebago County and all municipalities within	The county and all municipalities will participate as needs arise; those with specific projects are listed below.

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			Municipal leaders	2021		TN Algoma	In progress. In addition to the three stormwater ponds, Omro Road will be reconstructed with a storm sewer system to control flooding and persistent drainage issues along Omro Road. Replacement of Honey Creek Bridge with a new single cement culvert will occur in 2021.
				2026		VI Fox Crossing	Completed as funding becomes available. Some have been completed. Two pieces of land were just purchased to add ponds
		Multi-million dollar project	Highway, VI Fox Crossing, CI Menasha	2025		CI Menasha& VI Fox Crossing	Develop a Manitowoc/ Brighton Beach Roads Storm Water Project. The project plan has been completed and starting to work with Heckrodt now.
	\$7M					Valley Road Storm Water project. The project plan is done. Construction is planned for 2024-2025.	
	Stroebe Island causeway reconstruction/stabilization	TBD	VI Fox Crossing	2023	High	VI Fox Crossing	Project planning began in 2021 along with the reconstruction of the causeway. Preliminary work is happening now with water and sewer.
*Evaluate the support for and the feasibility of becoming part of the Community Rating System to lower flood insurance premiums for property owners.	Covered by annual budget	EM and municipal leaders	2026	Medium	Winnebago County and all municipalities within	The county and all municipalities will evaluate but this has been an issue when considered previously because the benefit-cost analysis did not work out.	

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	*Revise existing floodplain regulations to ensure they comply with the most recent (2013) model floodplain regulations developed by the Wisconsin Department of Natural Resources.	Covered by annual budget	Municipal leaders	2026	High	Winnebago County and all municipalities within	
	Winneconne/Harrison Pond	\$600K	Municipal Leaders	2021	High	CI Neenah	Started in Fall of 2020, primarily residential benefit.
	S. Commercial Street Flood Control	\$8M	Municipal Leaders	2025	High	CI Neenah	Ongoing project. S. Commercial St reconstruction.
	S. Park Avenue Flood Prevention	\$4M	Municipal Leaders	2025	Medium	CI Neenah	Coordinate with S. Park Avenue reconstruction tentatively scheduled for 2025.
	Seek grant funding for a river gauge for the Fox River in Omro	TBD	Municipal Leaders	2026		CI Omro	This has been worked on before in conjunction with County EM. EM put in a request to the county to pay for the gauge. The request was approved by the EM Committee but denied by Personnel and Finance. The town could pursue this at their own expense. The NWS has money available if it fits into their river forecasting. They pay for the gauge and installation and then maintenance and upkeep are local responsibilities. Funding would depend on the cost (e.g., if too expensive, a grant or other funding source would be needed.) Right now, they judge flood levels by how much water is in Scott Park.
	Grant Street storm sewer installation	\$60K+	Municipal Leaders	2026	High	CI Omro	Partially completed in 2019 – design and engineering only.

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							Money is budgeted (\$60K), but consideration is being given for alternate solutions. If the project moves forward, further money may be needed for street repairs. In 2019, the city also did ditching on East Main Street by the Bowhunters Club.
	Gallups Creek Flood Study	\$150-200K.	Municipal leaders	2021	High	CI Oshkosh	Currently underway and close to finalizing.
	Gallups Creek Detention	\$1.5-2M	Municipal leaders	2025	High	CI Oshkosh	Bridge culvert replaced last year. Have additional plans for more work that will be implemented once the study is done
	Johnson Creek Flood Study	\$200-250K	Municipal leaders	2021	High	CI Oshkosh	Consultant working on study.
	Johnson Creek Detention	TBD	Municipal leaders	2026	High	CI Oshkosh	Enhanced preservation. Not sure the exact direction of the project at this time.
	West Murdock Avenue Watershed Upgrades	\$150K	Municipal leaders	2026	Medium	CI Oshkosh	The study has not yet been initiated and therefore no projects have been identified yet.
	*Analyze repetitive flood properties and identify feasible mitigation options for each.	Covered by annual budget	Municipal leaders	2026	High	CI Oshkosh	Ongoing. Continuing to work on watershed-wide analyses with 3-4 flood analysis studies underway.
	Fernau Watershed Detention Basin #2	\$5,400,000	City of Oshkosh	2024-2025	High	City of Oshkosh Town of Oshkosh	Construction of second identified detention basin to reduce flooding within the watershed.
	Anchorage Court Watershed Storm Sewer Upgrades	\$3,272,000	City of Oshkosh	2021-2023	High	City of Oshkosh	Significant storm sewer upgrades necessary to alleviate flooding in



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							this low-lying watershed on the north side of the city. Flooding impacts businesses, single and multi-family residential properties, the CN Railroad, WPS Electrical Substation, and a Wastewater Utility Pump Station
	Sawyer Creek Watershed Detention Basin	\$6,800,000	City of Oshkosh	2021-2023	High	City of Oshkosh Town of Algoma	Final detention basin recommended within the Sawyer Creek Watershed Storm Water Management Plan.
	Stringham Watershed Box Culvert	\$4,149,000	City of Oshkosh	2023-2024	Very High	City of Oshkosh	Replacement of a downstream most portion of a very old and failing box culvert system.
	Analyze and review ways to retain and control water in Honey Creek and its tributaries to ensure that excessive volumes of rain will not flood the SW quarter of the Town of Algoma. The northern end of the town near Horse Shoe Road should also be looked at for ways to reduce flooding. Any mitigation project resulting from this analysis would also allow safer water flows to Lake Butte des Morts.	\$1.5-1.8M	Municipal leaders	2026	Medium	TN Algoma	In progress. Algoma will be seeking grant funding in FY 22/23 for the expansion of the Thackery Road detention pond and begin regrading the drainage easements in the area of Algoma to reduce flooding and to improve drainage. In addition, a stormwater analysis is being conducted for the NE part of Bellhaven Estates with the long-term goal of converting the dry pond to a wet pond with the Town assuming ownership and maintenance of it. The Town is using the county highway department to complete regrading of several ditches throughout Algoma to improve the flow of stormwater and improve drainage.

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	Create a Storm Water Assessment for the Town of Algoma.	\$50-75K	Municipal leaders	2026	High	TN Algoma	A longer-term initiative is for the Town to create a stormwater utility to pay for the poor drainage and stormwater flow in many parts of Algoma. Will use a contracted engineer.
	Implement the recommendations for a regional detention pond system along Honey Creek (to Lake Butte de Morts) listed in The Stormwater Management Plan (McMahon v. 2018).	\$750K	Municipal leaders	2022	Very High	TN Algoma	In progress. The Town intends to apply for funding from the WDNR to help restore several stretches of Honey Creek to help with flow and lessen the possibility of flooding. This includes the three detention ponds on or near Honey Creek (i.e., Jones Pond, Honey Creek Pond, Irvine Pond).
	EB4 Thackery Dr. Detention Basin	\$250K	Municipal leaders	2028	Low	TN Algoma	In progress. This is within the 5-year capital improvement plan.
	WB2-WB6 Horseshoe Road Detention Basin	\$500K	Municipal leaders	2031	Low	TN Algoma	Longer-term goal (8-10 years) that will be part of a new development/TIFF district.
	Leonard Point Lane Detention Basin	TBD	Municipal leaders	2026	Low	TN Algoma	Longer-term goal (8-10 years) This detention pond will be reviewed again one the Town begins reconstruction of Leonard Point Road.
	Stormwater development projects (east side)	\$1.7M  TBD	TN Clayton	2026 (as budget allows)	High	TN Clayton	<ul style="list-style-type: none"> <li>8.2-acre pond creation on property north of Breezewood and west of Carden.</li> <li>Pond creation on a property north of JJ and east of Balfour that will be part of a public</li> </ul>

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							park, which is under preliminary design.
	Planning for Green Valley Ditch Flood Control	TBD	Municipal leaders	2026	Medium	TN Neenah	Project continues to be considered.
	East Reighmoore Rd Flood Prevention	TBD	Municipal leaders	2026	Medium	TN Omro	Project continues to be considered.
	West Reighmoore Rd Flood Prevention	TBD	Municipal leaders	2026	Medium	TN Omro	Project continues to be considered.
	Sammers Bay Culvert for Flood Prevention	TBD	Municipal leaders	2026	Medium	TN Omro	Project continues to be considered.
	Sand Pit Road Culvert Replacement	TBD	Municipal leaders	2026	Medium	TN Omro	Project continues to be considered.
	Youngs Channel Road Flood Proofing	TBD	Municipal leaders	2026	Medium	TN Omro	Project continues to be considered.
	River gauge for the Town of Wolf River (Fremont) south of Fremont	TBD	Municipal leaders	2026	Low	TN Wolf River	Project continues to be considered.

<b>Summary of Mitigation Strategies</b>							
<b>Hazard Type</b>	<b>Mitigation Measures</b>	<b>Costs of Project</b>	<b>Responsible Management</b>	<b>Project Timetable</b>	<b>Project Priority</b>	<b>Community(ies) Benefitting</b>	<b>Comments</b>
<b>Fires</b>	Provide education to county and municipality personnel about federal cost-share and grant programs, Fire Protection Agreements, and other related federal programs so the full	Covered by annual budget	EM; Planning, Zoning & GIS	Ongoing	Medium	Winnebago County and all municipalities within	

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	array of assistance available to local agencies is understood. Apply for federal and state grants, as able.						
	Conduct public education campaigns about fire mitigation strategies.	Covered by annual budget	Fire Depts., EM	Ongoing, as applicable	Medium	Winnebago County and all municipalities within	Many departments participate in Fire Safety Week campaigns annually in October.
	Conduct open land fire and emergency operations interagency training and coordination initiatives. Put on training for fire departments on open fire suppression and safety. Work together to ensure NIMS/ICS are in place and practice implementation.	Covered by annual budget	WDNR/ Local Fire Departments/ EM	Ongoing	Medium	Winnebago County and all municipalities within	

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Severe Temperatures (Cold and Heat)	Support partnerships with NGO/private organizations that assist vulnerable people during periods of extreme temperature.	Covered by annual budget	PH, EM, Human Services ADVOCAP, ARC, municipalities	Ongoing	Low	Winnebago County and all municipalities within	PH and Human Services, with the support of EM and municipalities, regularly work on this topic with VOAD agencies.
	Support Human Services and utilities by amplifying public messaging about grant programs that help residents pay for utility expenses.	Covered by annual budget	Human Services, utility companies, municipalities	Ongoing	Low	Winnebago County and all municipalities within	Human Services agencies and utilities annually provide notification about utility grants.

Summary of Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
Storms: Hail	Continue to update and/or monitor the County's public early warning system and network.	Covered by annual budget	EM	Ongoing	High	Winnebago County and all municipalities within	Continually maintain and test warning system and conduct public education campaigns on the various systems (e.g., NOAA weather radios, sirens, IPAWS, AlertSense). Will seek grant funding, as applicable.
	Produce and distribute emergency preparedness information to the public related to thunderstorms, snow storms, hailstorms, lightning, and windstorm hazards and ways to mitigate the hazard.	Covered by annual budget	EM, ARC, municipalities	Ongoing	Medium	Winnebago County and all municipalities within	Ongoing through the year as needed and special focus is given to the spring and autumn winter awareness weeks (April and November). County EM spearheads the activities with support from the municipalities and other partners.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
<b>Storms: Lightning</b>	Continue to update and/or monitor the County's public early warning system and network.	Covered by annual budget	EM	Ongoing	High	Winnebago County and all municipalities within	Continually maintain and test warning system and conduct public education campaigns on the various systems (e.g., NOAA weather radios, sirens, IPAWS, AlertSense). Will seek grant funding, as applicable.
	Produce and distribute emergency preparedness information to the public related to thunderstorms, snow storms, hailstorms, lightning, and windstorm hazards and ways to mitigate the hazard.	Covered by annual budget	EM, ARC, municipalities	Ongoing	Medium	Winnebago County and all municipalities within	Ongoing through the year as needed and special focus is given to the spring and autumn winter awareness weeks (April and November). County EM spearheads the activities with support from the municipalities and other partners.
	Install lightning grade surge protection devices for critical electronic components used by government, public service, and public safety facilities, such as warning systems, control systems, communications, and computers.	Covered by annual budget or specialized equipment grants	IS	Ongoing, as needed	High	Winnebago County and all municipalities within	Agencies ensure that electronic systems are mechanically protected from lightning and other hazards as systems are bought and/or upgraded. Staff also conduct regular back-up of data and failure plans are in place for critical systems.  Install lightning grade surge protection devices for critical electronic components used by government, public service, and public safety facilities, such as warning systems, control systems, communications, and computers.

Summary of Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefiting	Comments
Storms: Thunderstorms	Continue to update and/or monitor the County's public early warning system and network.	Covered by annual budget	EM	Ongoing	High	Winnebago County and all municipalities within	Continually maintain and test warning system and conduct public education campaigns on the various systems (e.g., NOAA weather radios, sirens, IPAWS, AlertSense). Will seek grant funding, as applicable.
	Produce and distribute emergency preparedness information to the public related to thunderstorms, snow storms, hailstorms, lightning, and windstorm hazards and ways to mitigate the hazard.	Covered by annual budget	EM, ARC, municipalities	Ongoing	Medium	Winnebago County and all municipalities within	Ongoing through the year as needed and special focus is given to the spring and autumn winter awareness weeks (April and November). County EM spearheads the activities with support from the municipalities and other partners.  Resources and information are shared electronically on severe weather as well as interviews and presentations on severe weather. Red Cross volunteers are reaching out to update shelter and facility surveys. Covid-19 has delayed or limited our accessibility to visit or contact shelters. As volunteers are able, virtual or phone updates are being conducted.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
<b>Storms: Tornadoes &amp; High Winds</b>	Annually, update the shelter information (e.g., contact telephone numbers, facility survey) for each of the shelters.	Covered by annual budget	ARC, with EM support	Ongoing, as needed	High	Winnebago County and all municipalities within	In progress - Red Cross volunteers are reaching out to all shelter contacts to get updates for county shelter listings. Delayed or slow response due to Covid-19.
	Study the feasibility of and support for adopting a local regulation which would require new mobile home parks and future expansions of existing parks to provide for a tornado shelter.	Covered by annual budget	Planning, Zoning, GIS	2026	Medium	Winnebago County and all municipalities within	CO Winnebago: Ordinance could be amended making this a requirement for all new parks referred to the Zoning Administrator.  CI Menasha: Will discuss with Community Development Department/Planning.
	Evaluate the need for constructing tornado shelters to serve vulnerable residents and construct facilities where needed	Covered by annual budget	EM, local partners	2026	High	Winnebago County and all municipalities within	FEMA has pre-approved design plans that would save the cost of engineering. Grant funding would cover part of the cost to build but the facility could not be multi-use.  The county will assist municipalities with seeking grant funding if residents request a shelter be installed. Potentially interested municipalities include the Cities of Menasha, Omro, and Oshkosh; the Village of Fox Crossing; and the Town of Clayton.  In Omro, the closest shelter is 1 mile from mobile home park at City Hall and police need to remember to open it after hours.



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<b>Storms: Winter</b>	Continue to update and/or monitor the County's public early warning system and network.	Covered by annual budget	EM	Ongoing	High	Winnebago County and all municipalities within	Continually maintain and test warning system and conduct public education campaigns on the various systems (e.g., NOAA weather radios, sirens, IPAWS, AlertSense). Will seek grant funding, as applicable.
	Produce and distribute emergency preparedness information to the public related to thunderstorms, snow storms, hailstorms, lightning, and windstorm hazards and ways to mitigate the hazard.	Covered by annual budget	EM, ARC, municipalities	Ongoing	Medium	Winnebago County and all municipalities within	Ongoing through the year as needed and special focus is given to the spring and autumn winter awareness weeks (April and November). County EM spearheads the activities with support from the municipalities and other partners.

<b>Summary of Mitigation Strategies</b>							
<b>Hazard Type</b>	<b>Mitigation Measures</b>	<b>Costs of Project</b>	<b>Responsible Management</b>	<b>Project Timetable</b>	<b>Project Priority</b>	<b>Community(ies) Benefitting</b>	<b>Comments</b>
<b>Utility Failure</b>	Install a backup generator or a prewired hook-up at critical facilities related to public safety.	\$500,000	EM, Parks, Facilities	2026	High	Winnebago County and all municipalities within	Sunnyview Expo Center is our largest and most utilized community wide shelter. We are looking to install a back-up generator to ensure it is available in the case of a power outage.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
		\$120K	City officials	2021	Very High	CI Oshkosh	Fire Station 15 (also primary EOC) needs one
		Covered by annual budget	City officials	2026	Medium	CI Omro	Could use one at the community center, which also serves as a Red Cross shelter. However, it may not be the community center much longer which would mean the loss of the shelter. The concern is high but the situation is in flux. May be also be needed at Community Center and possibly schools (the high school is an ARC shelter.
		TBD	City officials	2026	Low	CI Appleton	Fire Station on Lynch Avenue has a back-up generator which is currently in good shape. Will be ongoing for maintenance of equipment.
		TBD	Village officials	2026	Low	VI Winneconne	Have 4 portable generators; looking at replacing 2 older ones but would not be able to do that with budget, would have to be grant funding. Getting a panel at Village Hall would be good, as the building houses police and the library.
		\$100K	VI officials	2021-2022	High	VI Fox Crossing	Generator is there but does not power most things. Plans in the works to add to the building in three phases (first starting now)

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							and add generator power for the entire complex at that time.
		TBD	TN Clayton	2025	Low	TN Clayton	Elementary School (which is a Red Cross shelter)

\* Designates an element that supports the NFIP  
 The communities in Winnebago County include: the Cities of Appleton, Menasha, Neenah, Omro, and Oshkosh; the Villages of Fox Crossing and Winneconne; and the Towns of Algoma, Black Wolf, Clayton, Neenah, Nekimi, Nepeuskun, Omro, Oshkosh, Poygan, Rushford, Utica, Vinland, Winchester, Winneconne, and Wolf River.

## Winnebago County HAZUS Vulnerability Assessment

### Risk Assessment

♦ **Overview**

This section describes the natural hazards affecting the region with special emphasis on Winnebago County. We look at the nature of the hazard and its history and impact. Once the risks are identified, Part 4 assesses what is most vulnerable to these hazards and where these vulnerabilities exist.

According to records maintained by the National Climatic Data Center, there have been 265 events since 1950 (Table 3-1). Most of the events were thunderstorm or wind related (41.0%). Hail accounted for just over 20 percent of all events.

**Table 3-1. Frequency of Weather Events: 1950 to 2003 (May 31)**

Event Description	Number	Percent of Total
Blizzard	2	0.8
Blowing snow	1	0.4
Dry	1	0.4
Dry microburst	1	0.4
Extreme temperature	13	4.9
Flood	4	1.5
Fog	12	4.5
Freezing rain	4	1.5
Glaze	5	1.9
Hail	58	21.9
Heavy snow	14	5.3
Ice shoves	Unknown	
Ice storm	2	0.8
Lightening	10	3.8
Selche	2	0.8
Snow	2	0.8
Tornado	16	6.0
Thunderstorm - winds	111	41.9
Winter storm	7	2.6
	265	100

Source: National Climatic Data Center database accessed on September 3, 2003

**Exhibit 3-1. Summary of Disaster and Emergency Declarations; Winnebago County**

Year	Description	Type
1974	Tornado	Presidential Disaster
1976	Drought	Presidential Emergency
1990	Flooding/Tornado	Presidential Disaster
1993	Flooding	Presidential Disaster
2001	Severe storms/flooding/tornado	Presidential Disaster

Source: Wisconsin Emergency Management

Appendix D includes a listing of these events which are grouped by type. The appendix also records the number of reported deaths and injuries that could be related to the weather event.

As described in the following sections, there are a number of natural hazards that have caused significant damage in the county over the years. On six occasions damage warranted a disaster declaration or an emergency declaration (Exhibit 3-1). Table 3-4 at the end of Part 3 provides a listing of the historical frequency of each hazard, the anticipated probability that each hazard may happen again, and the extent of damage and risks that would be incurred should the hazardous event occur. The ratings of 1, 2, 3 (Low, Medium, and High) were determined by the Hazard Mitigation Planning Committee. Based on the historical data that is available hazard probabilities have also been determined. These probabilities can be found in the discussion of the particular hazard.



A dam failure involves the sudden release of water due to a structural failure. Currently there are approximately 3,800 dams in Wisconsin and since 1967, 100 have been decommissioned and removed. Most of the dams are rather low and impound small quantities of water.

Winnebago County  
Hazard Mitigation Plan

Part 3  
Risk Assessment

Table 3-2. Large Dams In Wisconsin by Hazard Ranking: 2003

Hazard Ranking	Number	Percent Of Total
Low hazard	1,386	73
Significant hazard	252	13
High hazard	262	14
Total	1,900	100

Source: Wisconsin Department of Natural Resources, Dam Safety Program

Less than one-third of the dams are classified as a large dam<sup>1</sup>. The Dam Safety Program within the Wisconsin Department of Natural Resources (DNR) is charged with regulating most of the large dams in Wisconsin<sup>2</sup>. DNR assigns a hazard rating to each dam under its oversight based on two factors (existing land use downstream and land use controls such as zoning downstream of the dam)<sup>3</sup>. A dam rated as a high hazard indicates that a failure would most probably result in the loss of life. A significant hazard indicates that a dam failure could result in appreciable property damage. A low hazard dam is where a failure would result in only minimal property damage and where loss of life is unlikely. As shown in Table 3-2, more

than 7 of 10 large dams in Wisconsin are classified as low hazard.

Between 1990 and 1995, there were over 75 documented dam failures. The majority of these resulted from the 1993 floods that affected much of the state. For emergency planning purposes, dam failures are characterized as rainy day failures or sunny day failures. Rainy day failures occur during or immediately after periods of heavy rain and/or snowmelt. The additional water may overtop the dam or create excessive pressure resulting in a failure. Sunny day failures result from poor dam maintenance, damage/obstruction of outlets, or terrorism.

Table 3-3. Regulated Dams; Winnebago County : 2003

DNR Reference Number	Official Name	Owner Name	Ownership		Hazard Ranking
			Type	Classification	
601	Neenah	Neenah & Menasha Power Co.	Utility	Large	High
757	Menasha	Daen NCC	Private	Large	High
1591	Eureka	Wisconsin DNR	Public	Large	High
1592	Rush Lake	Town of Nepeuskun	Public	Small	n/a
1593	Sawyer Creek	Westhaven Golf Course	Private	Small	n/a
2307	Bridges, R.C. NO.1	Unknown	Private	Small	n/a
2308	Bridges, R.C. NO.2	Unknown	Private	Small	n/a
3056	Water Treatment Basin	Winnebago County	Public	Small	n/a
3427	Huelster, Michael	Michael Huelster	Private	Small	n/a
3583	Waukau Creek	Winnebago County	Public	Unclassified	n/a
3610	Landig	Paul and Sherri Landig	Private	Small	n/a
4873	Winnebago County Comm Park	Winnebago County	Public	Unclassified	n/a
4877	Zacher	Skip Zacher	Private	Small	n/a
4920	Walleyes for Tomorrow	Walleyes for Tomorrow	Private	Small	n/a
4987	Sippel	Keith Sippel	Private	Small	n/a
5149	Wiesner	Ken Wiesner	Private	Small	n/a
5301	Rush Lake Wings	Wisconsin DNR	Public	Small	n/a
5322	Foote Dam	Wisconsin DNR	Public	Small	n/a
5467	Koch, John	John Koch	Private	Small	n/a
5468	Spiegelberg	Wisconsin DNR/DOT	Public	Small	n/a
5562	Pelz Dam	Unknown	Unknown	Small	n/a

Source: Wisconsin Department of Natural Resources, Dam Safety Program

<sup>1</sup>A large dam has (1) a structural height of over 6 feet and impounds more than 50-acre feet or more of water or (2) a structural height of 25 feet or more and impounds more than 15-acre feet.  
<sup>2</sup>The Federal Energy Regulatory Agency (FERC) regulates those dams used to produce hydroelectric power. As of 2002, there were 119 dams under the jurisdiction of FERC.  
<sup>3</sup>The hazard rating is not based on the physical attributes, quality or strength of the dam itself, but rather relates to the potential for loss of life or property damage should the dam fail.

According to the Dam Safety Program, there are 21 dams in Winnebago County (Map 3-1 and Table 3-3). Only three are classified as a large dam and each of these are classified as a high hazard. To date there have not been any dam failures. The probability of failure is very low due to the small damage potential these dams have. The three dams that are classified as being large are not expected to do much damage to public or private infrastructure. As part of the County CRS rating the issue of Dam safety is taken into consideration, and the County is given credit for the level of dam safety that is in the County. The County currently has the highest level of CRS that is possible without adopting building codes.

The three large dams in the county do not have Emergency Action Plans (EAP) and are not currently in the process of completing a plan. An EAP is required by Wisconsin Administrative Code NR 335.07, which meet the large dam criteria or pose a threat to life or property. The plan must be prepared for the area downstream of the dam. When creating an EAP the dam operator must consult the local units of government that lie downstream as well as the county emergency management department. There have been no recorded dam failures in the county in recent history. Because of this we can determine that there is a very low probability of a dam failure ever occurring. When the EAP's for the dams are completed they should examine the probability of dam failures in greater depth. Additionally, the EAP will discuss probable damage estimates to existing and any future infrastructure in the area.

♦ **Flooding**

Flooding occurs when a stream, lake or other body of water overflows its banks onto normally dry land (riverine flooding), or when storm water collects on the surface of the ground (storm water flooding). Riverine flooding can develop slowly over a period of days or occur rapidly (flash flooding) following an intense rain event and/or rapid snow melt<sup>4</sup>. Within the County there is a high probability that another flood will occur again, however many measures are being taken to identify buildings that are vulnerable, improvements have been made to dams and the County has an inventory of structures that lie within the floodplain.

**Table 3-4. Public Assistance Grants In Winnebago County: For Damages Occurring In April & May 2001**

Jurisdiction	Total Grant Payment
Town of Algoma	\$77,282.05
Town of Black Wolf	\$10,307.21
Town of Clayton	\$8,675.59
Menasha Joint Sewer Service District	\$4,221.88
Menasha Utilities	\$94,944.71
City of Menasha	\$113,351.07
Town of Menasha	\$99,618.73
City of Neenah	\$178,094.85
City of Omro	\$21,342.46
Town of Omro	\$10,316.36
Oshkosh Area	\$11,728.51
City of Oshkosh	\$1,288,383.50
Town of Oshkosh	\$32,260.84
Parkview Health	\$9,605.96
Town of Vinland	\$9,265.48
Town of Winchester	\$16,708.42
Winnebago County	\$128,886.98
Town of Winneconne	\$67,655.69
Village of Winneconne	\$51,856.56

Source: WEM

Flooding has been a principal cause of damage in 16 out of 24 Presidential Disaster Declarations in Wisconsin from 1971 through 2001. In Winnebago County there were 2 declarations made during that period (Exhibit 3-2). In 1990, Winnebago County requested and obtained Federal assistance for flooding. Also, from April 16 to May 11, 2001, another presidential disaster was declared. Table 3-4 shows the total grant payment that each community received from Public Assistance Grants due to the event. In addition to the Public Assistance Grants, the Individual and Family Grant Program gave 11 grants as a result of the 1993 flood for the amount of \$16,798.03. In 2001, a total of 40 Individual and Family Grant Program grants were issued as a result of storms and heavy flooding totaling \$78,138. As of late spring 2004 the county experienced major flooding damages. A Presidential Disaster Declaration was given to the county to assist with damage cleanup in June of 2004. The total amount of damage is currently unknown. The Oshkosh area appears to have the largest amount of damages at this point with at least 600 homes claiming damages. Many culverts throughout the county have washed out and the National Guard and crews of workers from the prison were called in to assist with sandbagging efforts in Omro. During the time when the county was experiencing the largest amount of flooding STH 21 was closed to traffic and some homeowners were evacuated.

It is evident that flooding in the county can occur at any time during the year. Most commonly though, flooding occurs from early spring through mid-fall. Most of the major flood events on the Fox River and Wolf River have occurred in the early spring and are the result of spring rains and/or snowmelt. In comparison, the remaining rivers and creeks are much smaller and are

most responsive to locally heavy rains. Exhibit 3-3 shows the mean stream flow of the Fox River at Oshkosh between 1992 and 2002. During that

<sup>4</sup>For prediction and warning purposes, the National Weather Service defines a flash flood as a flood event that crests within a 6-hour period. Normal flooding crests over a period of 6 hours or more.

**Exhibit 3-2. Flood Emergencies and Disasters: 1971 to 2000**



Source: Wisconsin Emergency Management

period, high flood waters were recorded in 1993 and 1996. Although stream flows typically peak in spring, a summer flood event occurred in July of 1993. There is a 1:100 chance that a base flood, or a 100-year flood, could occur in any given year.

Major flood events in the county occurred in 1881, 1922, 1929, 1943, 1951, 1952, 1960, 1973, 1976, 1990, 1993, 2001, and 2004. The flood of 1922 was by far the most destructive. It was estimated to be a 60-year flood. Considerable damage was inflicted on the shoreline communities of Neenah and Menasha. The flood of 1960 (May) also caused considerable damage to the cities of Neenah and Menasha. A stiff wind pushed the already heightened lake waters into residential areas. Officials estimated that this flood was a 25-year flood.

The maximum recorded flood height in Menasha occurred during the 1881 flood. Because no discharge was recorded, no estimate of the flood's frequency is available. Although this flood was believed to be the worst in recorded time, damage was not extensive in that development at that time was widely dispersed and not significantly affected.

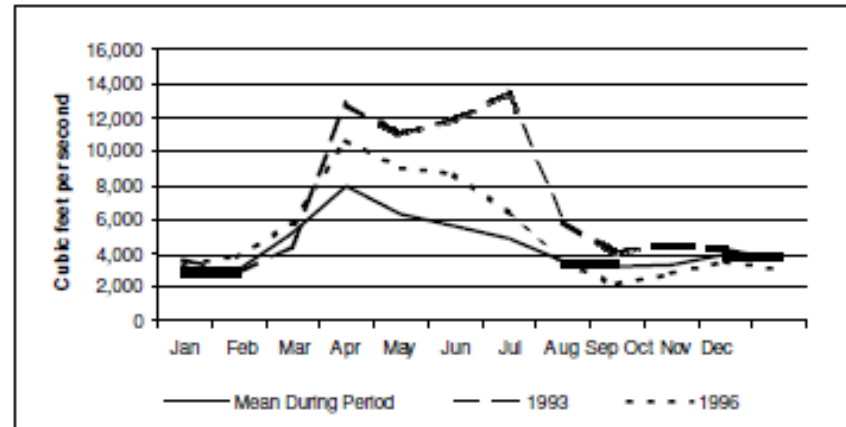
Flooding in the City of Omro has occurred on several occasions. The worst flood was estimated to be a 50-year flood.

Sawyer Creek flows in a northeasterly direction through the City of Oshkosh to empty into the Fox River. Between U.S. Highway 41 and Sawyer Street, flooding potential is significant because of the amount of development in that area. Flooding also affects Westfield Street, as well as a large number of residences on the south side of the creek. Bridge overtopping occurs further downstream at Ninth Street and Oakwood Road.

Flooding in the Village of Winneconne is caused by the backwater from dams and natural obstructions downstream near Lake Winnebago. During the flood of 1922, record peak discharges were observed. Since 1918, there have been 3 significant flood events estimated to be a 50-year flood, 30-year flood, and 10-year flood.

Since 1900, there have been 10 cases of minor localized flooding caused by heavy rainfall and runoff from Lake Winnebago and the lower Fox River (Exhibit 3-4). Over the years a number of structural flood protection measures have been taken in the area to lessen flooding damage. The major improvements have occurred at the Neenah and Menasha dams, which were constructed in the mid-1800s. Because of these projects, lake levels prior to 1937 are not representative of present conditions consistent with the River and Harbor Act of 1882, and as far as the capacity of the Fox River below Neenah and the security and capacity

Exhibit 3-3. Mean Streamflow of the Fox River at Oshkosh 1992 to 2002 and Selected Years



Source: United State Geological Service

Exhibit 3-4. Minor Flood Events; Winnebago County: 1900 to 2003

April 19-28, 1922	September 10-13, 1986
April 5-6, 1929	June 16, 1996
May 11-18, 1969	June 10, 1999
June 22-29, 1969	June 27, 1999
March 23-27, 1973	August 14, 2000

Source: Winnebago County Hazard Analysis - 2002



of the structure will allow, the dams at Neenah and Menasha are operated to prevent Lake Winnebago from rising higher than the regulatory elevation of 747.51. Floodwaters exceeding this elevation are allowed to flow downstream subjecting downstream communities to whatever flooding may occur. Consequently, the dams offer marginal flood protection for those events exceeding a 10-year flood. The original dam at Neenah was built by private interests in 1850-51. The Menasha dam was also built by private interests but was later sold to the United States and flowage damages exceeding \$592,000 was paid to upstream property owners. The Menasha dam was rebuilt in 1937 and constructed to comply with provisions of the River and Harbor Act of 1882, which required alterations to the Menasha Dam and channel "not inconsistent with security to navigation, ... to reduce and to maintain the water of Lake Winnebago ... at their natural height."<sup>5</sup>

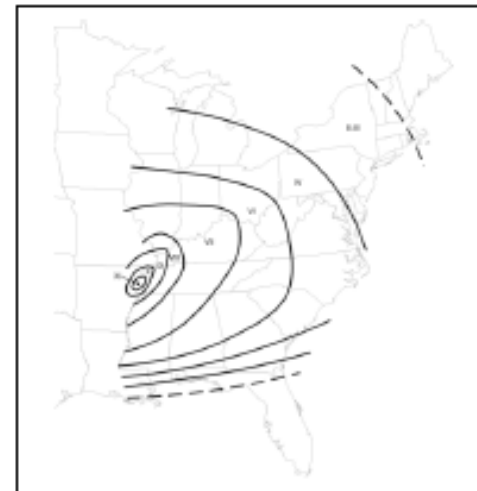
Flooding on the Fox River is somewhat ameliorated by lakes Poygan and Winnebago in that they are able to retain large volumes of flood water. In many locations breakwaters and seawalls have been constructed on Lake Winnebago to help minimize damage from high waters and wave action. Sawyer Creek flows freely and is unregulated. A number of other structures have been constructed over the years but really have little value. The large lakes in Winnebago County are able to store large volumes of floodwaters and help to minimize flood damage. It is not currently known the future type or number of structures in the 100-year floodplain. Floodplain regulations are implemented in the 100-year floodplain, which is a measure of keeping track of new structures in this area.

The county has a floodplain management ordinance and has been using it to ensure that land uses within the 100-year floodplain comply with appropriate development standards. From 1991 to 2002, the county issued about 32 floodplain permits annually for unincorporated areas (Table 3-5). Nearly one-quarter of the issued permits were for boat houses and new residential and additions accounted for roughly one-half of the total. No floodplain permits were issued for commercial or industrial projects.

The County manages floodplain activities in a variety of ways as a requisite of their participation in the National Flood Insurance Program (NFIP) and Community Rating System (CRS). These activities and actions are only applicable to the unincorporated areas of the county. The following is a list of some of the activities that the county participates in:

- Regulatory (permitting, construction certification, enforcement - through county shoreland zoning jurisdiction).
- Public information (inquiries, permittees, annual notices to lenders, realtors, insurance agencies).
- Mapping (enforcement of floodplain maps, adoption of new maps and studies when available and appropriate). The entire area of Winnebago County has had digital floodplain maps prepared by the DNR, certified by FEMA, and adopted by all

Exhibit 3-5. Effects of an Earthquake along the New Madrid Seismic Zone



Source: Mid-America Earthquake Center, University of Illinois at Urbana-Champaign

<sup>5</sup> Source: *Disposition Report - Fox River Project*, 1988; Army Corps of Engineers.

- applicable communities. These maps provide a seamless floodplain for the entire county, and remain valid even if property is annexed.
- Flood preparedness (credit for CRS program provided via state requirements).

The county currently has a CRS rating of Class 8. Additional credits for CRS could be obtained; however, no additional credit for insurance reduction is possible because the administering agency for the CRS requires that any classification above Class 8 requires adoption and enforcement of a building code. This is not currently something that the County is going to do.

Other floodplain management done within the county is required by the state to administer floodplain management activities within the floodplain area. The activities include:

- Permit issuing requirements;
- Management of construction elevations sufficient to meet state and federal guidelines;
- Requiring permittees to submit FEMA elevation certificates properly completed by a Registered Land Surveyor, architect, or engineer in the case of minor buildings not requiring FEMA elevation certification (i.e., certifying that construction requirements such as anchoring, meeting stress loads, etc, were met.
- Enforcement of requirements to require (a) filing of certificates, (b) insuring requirements were met via review of certificate, (c) taking appropriate enforcement action, including citation action, to require compliance.

♦ **Ice Shoves**

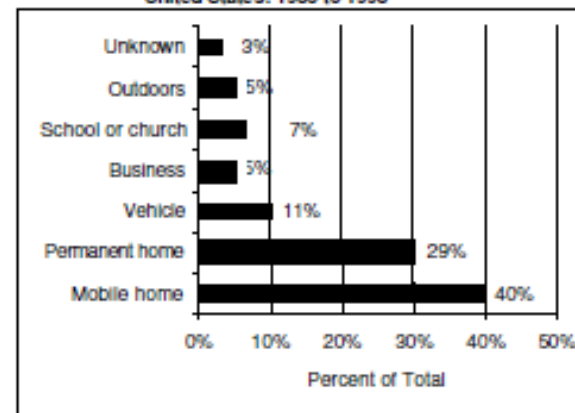
Ice shoves (also referred to as ice flows) occur on the larger lakes in the county when the ice breaks up in early spring and wind piles the ice blocks or sheets near the shoreline or on dry land. Given the prevailing winds during that time of year, ice shoves, when they occur, typically effect the northern and western shorelines. The weather, wind intensity and direction, and water levels all interact to create ice shoves. On some of the larger lakes, the piles of ice can reach 15 feet or higher. Damage is primarily limited to dock damage and temporary road closures. Eleven of the 22 local jurisdictions border a lake with the potential of ice shoves. As shown on Table 3-5 the historical hazard frequency of ice shoves is low and the anticipated probability that ice shoves will occur in the 11 at risk jurisdictions is also low. Because of the low probability of damage from an ice shove ever occurring a vulnerability assessment has not been completed for this hazard.

♦ **Earthquake**

An earthquake is an event caused by a sudden shift between two or more rock masses. The motion in the earth's crust is caused by energy travelling through the earth's underground and surface. Earthquakes in



Exhibit 3-6. Tornado Deaths by Location/Circumstance; United States: 1985 to 1998



Source: National Weather Service

Wisconsin are not common and the ones that do occur are generally not detectable and cause relatively minor damage. From 1899 to 2003, there have been 24 seismic events affecting the state. Most are low-magnitude and quite localized. The exception occurred in 1909 when an earthquake measuring 5.1 was registered in the Beloit area.

The closest active fault is found along the central Mississippi River Valley in Missouri and is known as the New Madrid Fault. More than 200 earthquakes a year originate in this area. While most are quite small and not detected without earthquake sensors, about 9 events a year are felt in that area. A magnitude 8.3 earthquake would be devastating to the immediate area, but only minor Wisconsin as shown in Exhibit 3-5. The Federal Emergency Management Agency *State and Local Mitigation Planning: How To Guide* notes that in places with such a low risk of seismic damage it is unnecessary to further examine potential damages as a result of an earthquake. The probability of an earthquake occurring in Wisconsin is extremely low and if one did occur the damages would not be large at all. The probability of any earthquake occurring that would actually cause damage in the county is virtually non-existent; a vulnerability assessment for this hazard has not been done. Because this risk is so low earthquakes will not be profiled in this document.

Exhibit 3-7. Tornadoes in Region: 1844 to 2000



Exhibit 3-8. Hurricane-Force Thunderstorm Winds in Region: 1970 to 2001



• **Tornado / High Winds**

A tornado is an intense rotating column of air that touches the ground. They result from a thunderstorm cloud system and typically appear as a funnel. Wind speeds between 100 and 200 miles per hour are common, although winds exceeding 300 miles per hour have been reported.

Tornadoes are generally short-lived covering 4 miles on average. At the extreme, tornadoes have lasted for more than 20 minutes and have traveled up to 300 miles. The path of destruction is generally confined to a swath 300 to 400 yards wide. However, tornadoes on occasion have cut a swath of destruction a mile wide.

*Nationally, 4 out of 10 tornado deaths occurred in mobile homes.*

Destruction caused by a tornado results from high wind velocities and drastic changes in atmospheric pressure. These high winds can uproot trees and destroy buildings, while flying and falling debris can also cause serious injury and death.

Between 1985 and 1999, more than 800 people died from a tornado in the United States. More than two-thirds of the casualties occurred in people's homes and those in mobile homes accounted for 4 in 10 deaths. When one considers that mobile homes make up a relatively small proportion of the overall housing stock, this data is striking and highlights a significant safety issue (Exhibit 3-5).

Wisconsin is situated on the northern edge of "tornado alley"<sup>6</sup> and sees, on average, 22 tornadoes touch down each year in the state. The state ranks 15<sup>th</sup> in the nation in the number of tornadoes that touch down. Based on the historical data that from 1844 to the year 2000, 20 tornadoes occurred in the county it can be determined that approximately every 7.8 years 1 tornado occurs somewhere in the county resulting in a 1:7.8 probability (Exhibit 3-7 and Table 3-5). It is impossible to determine when a tornado will occur or the extent of the damage it will cause but due to the location of the state and the weather patterns that are prevalent in Wisconsin it is likely that a tornado will occur.

Tornadoes occur most frequently in the late afternoon and early evening, but can occur at any time. They occur most frequently between the months of April and September. However, they have occurred in Wisconsin in every month with the exception of February. The most severe storms occur in April, May, and June. Although tornadoes have been reported in every county in the state, they have historically been more predominate in the western and southern counties. Between 1844 and 2001, 11 counties in the state have had 30 or more -- Winnebago County had 20. Three counties (Dane, Dodge, and Grant) have had the most with 52, 51, and 50 respectively (Exhibit 3-7).

The last reported tornado in Winnebago County occurred in 1974 when a F3 tornado (Exhibit 3-8) caused considerable damage to parts of the city of Oshkosh. An F2 tornado touched down in 2002 (May), but did not cause much damage. Although damage from the tornado was minimal, the city of Menasha sustained between \$400 thousand and \$500 thousand in hail damage to homes and businesses. Since that time, numerous funnel clouds have been sighted, but none of them touched down.

*Of all the natural hazards, heat results in the highest number of fatalities in Wisconsin.*

Hurricane force winds are also common and are associated with severe thunderstorm activity. According to the National Weather Service, Wisconsin has experienced hurricane force winds of 75 mph or higher about 4 times a year on average. In the last 30 years, there have been instances where thunderstorms produced winds in excess of 100 mph, which is equivalent to a Category 2 Hurricane. Over this period, there have been 10 thunderstorm events in Winnebago County producing winds in excess of 75 mph (Exhibit 3-8). There is a good

chance that at some point the county will experience an event that involves high winds. Based on the historical data that tells us in the last 30 years, 10 periods of high winds have occurred there is a 1:3 chance that a period of high winds could occur in any given year.

A weak tornado near Lake Poygan: May 8, 2002

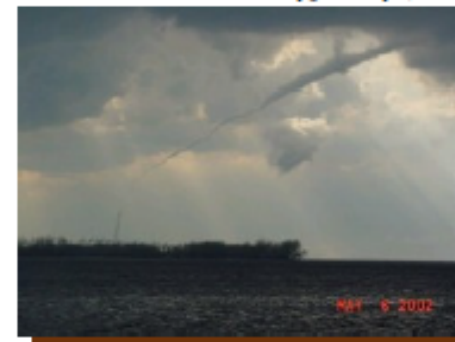


Photo credit: Brad Sall

<sup>6</sup>Tornado alley is an area that is known for the frequency and severity of tornadoes. In general, it extends northeastward from Oklahoma into Iowa and then across Michigan and Ohio.



**Temperature**

Wisconsin is known for the extremes in temperature it experiences. During the summer months heat can be especially deadly. Very warm temperatures or warm temperatures with high humidity can cause heat stroke and heat exhaustion. Heat stroke if left untreated can result in death.

From 1982 to 2001, 109 people have died in the state as a result of a heat wave. This mortality rate is the highest of all natural disasters and is more than 4 times greater than the next most deadly hazard – tornadoes.

Exhibit 3-10. Heat Wave Days; Wisconsin: 1982 to 2001



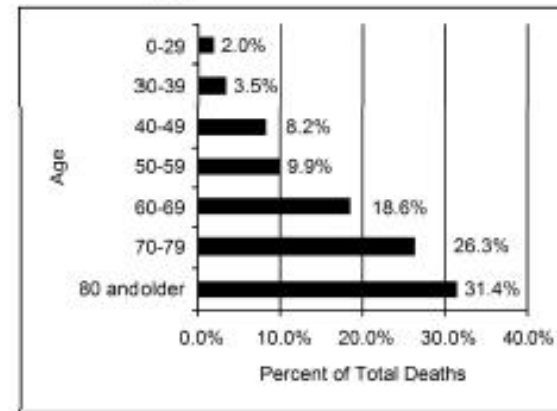
Source: National Weather Service

As shown in Exhibit 3-9, excessive heat disproportionately affects the elderly. People over 60 years of age accounted for three-quarters of the fatalities throughout the United States in 1995. The heat waves of 1995 were especially deadly. In Wisconsin there were 2 heat waves: mid-June and mid-July of that year. In all over 150 people died directly or indirectly from the heat. It is not currently known if any of these deaths occurred in Winnebago County, the statistics were only reported on a statewide basis. During the latter heat wave, temperatures rose to between 100 and 108 with heat indexes of 120 to 130. In the last 53 years there have been 4 periods of extreme cold, this translates into a probability of a 1:13 change of a period of extreme cold occurring in any given year.

Exhibit 3-10 depicts the number of heat wave days on a statewide basis between 1982 and 2001. The southern and western portions of the state experienced the highest number of heat wave days followed by the next tier of counties. In the past 53 years there have been 9 periods of record warmth or heat showing us that there is a 1:6 probability that in any given year a period of record warmth or heat may occur.

Temperature extremes are most likely to affect the poor, elderly, or the very young members of a population, as they are more susceptible to temperature related deaths and injury. Cold weather in Wisconsin is also of great concern. The same population of people that is vulnerable to extremely warm weather conditions are vulnerable to extremely cold weather conditions. During periods of extreme cold problems with freezing pipes and water main breaks are highly likely to occur. The following jurisdictions have reported the instances of past water main breaks. Due to accessibility

Exhibit 3-9. Heat Related Fatalities by Age, United States: 1995



Source: National Weather Service

of records kept on the issue it is not known if the breaks occurred in warm or cold months, it can be assumed that at least half of the breaks occurred in colder months. In 2002 in the Town of Menasha there were 33 water main breaks, there were 127 in 2003 and 9 as of March 2004. In Neenah there were 76 water main breaks, there were 37 in 2002 and 62 in 2003. Oshkosh had a total of 77 breaks in 2003 and to date there have been 18 for 2004. The remainder of the jurisdictions did not report the amount of breaks. Based on the jurisdictions that did report one can assume that on average a jurisdiction may have around 68 breaks per year. This number is a very rough average because there are some jurisdictions in the County that have a far larger area than others have that is serviced by water mains. Another factor that needs to be considered is the age of the pipes in each of the jurisdictions. A community that has a large area with older pipes will have a greater amount of water main breaks through out the year than a community with a small coverage area and new pipes. Further investigation of the costs that communities incur as a result of water main breaks may be necessary.



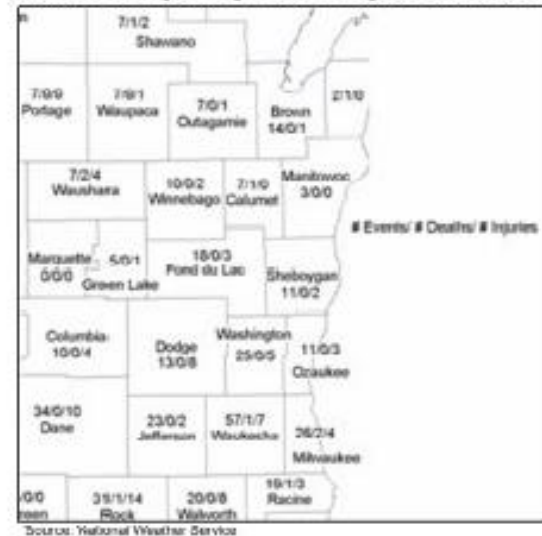
♦ **Severe Storms/Hail**

Storms of all kinds are a major hazard in Wisconsin. Winter storms, consisting of snow and ice, can cause traffic accidents, damage trees and buildings, bring down power and telephone lines. Winters with high snowfalls can also cause financial strains on local communities.

All parts of the state are obviously subject to winter storms. However, snowfall amounts vary widely from southern to northern Wisconsin. Likewise, the duration of winter weather also varies from north to south. The first snowfall of the year of an inch or more can occur as early as the first weeks of November in northern counties to early December in the southern part of the state. The winter storm season in Wisconsin generally runs from November to March. A snowfall and accumulation of 4 or more inches in a 12-hour period is considered a heavy snowfall. A storm with sustained wind speed in excess of 30 miles per hour accompanied by heavy snow or large amounts of blowing or drifting snow is classified as a blizzard.

Although ice storms are not as common as snowstorms, they can cause many problems. Freezing rain can break off large trees limbs, snap power poles, and bring down utility lines. Hazardous driving conditions often result in numerous traffic accidents. Unlike many of our neighboring states to the south, local communities in Wisconsin are able to adequately respond to icy roads because of our investment in snow removal equipment. There is a 1:27 probability of an ice storm (as classified by the National Climatic Data Center) may occur in a given year.

Exhibit 3-11. Lightning Events in Region: 1982 to 2001



Record snow falls during the winters of 2000 and 2001 caused an economic strain on county and local budgets to pay for personnel costs for snow removal and high gas and road salt prices. A hazard that is common during heavy snow events or during winters with a large amount of snowfall is the possibility of roof collapse. There is a concern for large span roofs in the county due to their susceptibility to collapse. High risk critical facilities in the county are hospitals and schools, there are 59 schools in the county and 15 hospitals, or health care clinics, in the county that are of concern due to the large roofs they may have. There are no specific records available regarding instances of large span roofs collapsing in the county.

Due to the northern climate present in the state and the fact that in the past years there has been a history of severe snow storms in the County there is a high probability that in the future the County will see more severe snow storms. According to the National Climatic Data Center there have been 7 winter storms in the last 53 years. This historical data may translate into a 1:7.5 chance that a winter storm may occur in any given year.

Thunderstorms are quite common in all parts of the state and bring a host of threats, including lightening and hail. Wisconsin averages between 30 to 45 thunderstorms a year. Thunderstorms are severe and violent forms of convection produced when warm moist air is overrun by dry cool air. As the warm air rises, large thunderheads form (cumulo-nimbus clouds) and cause strong winds, lightening, hail, and rain. On June 11, 2001, a severe thunder storm with microburst winds of between 48 and 71 mile per hour caused \$15 million in damages countywide. This storm led to a Presidential Disaster Declaration. Because there have been a significant number of severe storms in the past there is a high probability that the County will also experience severe thunderstorms in the future (see also Table 3-5). In the 53 year time period records are available for there have been 112 thunderstorm. It may be assumed that there is about a 1:6 chance that a thunderstorm may occur in any given month.

Lightening is a sudden and violent discharge of electricity from within a thunderstorm and is seen as flow of electrical current between clouds and from clouds to the ground. Lightening is a threat that people often ignore, but it can cause damage to electronic equipment, start buildings on fire, cause grass and forest fires, and injure or kill humans and livestock. According to statistics kept by the National Weather Service, southeastern Wisconsin sees the highest number of lightening events in the state. Waukesha County had the most events (37) between 1982 and 2001, which was twice the number of the next highest county total in Rock County. Winnebago County had 10 events over this period, with 2 injuries and no fatalities (Exhibit 3-12). In 2000, Winnebago County experienced five severe lightening storms that caused \$15,000 of damage to the County's outdoor warning sirens. In the past 19 years there have been 10 lightening events in the county. The probability of a lightening event occurring in any given year is about 1:2.

A hailstorm occurs when atmospheric water particles form into round or irregular masses of ice that fall to earth. Hailstorms occur with thunderstorms and can affect a swath up to 100 miles long and 5 to 30 miles wide. The distribution of hail in these areas is often irregular. Some areas are especially hard hit while others may only receive small amounts of hail. Most typically hail strikes are one-half mile wide and 5 miles long. On average, there are two to three hail days per year in the state according to the National Weather Service. About 20 percent of all severe weather events in Wisconsin are hail events with hail at least  $\frac{3}{4}$  inch in diameter.<sup>7</sup> Hailstorms are known to break windows, dent vehicles and structures, cause damage to roofs and batter crops, resulting in significant agricultural losses. Serious injury to people as a result of a hailstorm is rare. Between 1993 and 2000, there have been 16 major hailstorms in Wisconsin that resulted in significant crop and property damage. While most hail is comparatively small, hail up to 3 inches in diameter have been reported in the state.

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<sup>7</sup> Hail becomes reportable at  $\frac{3}{4}$  of an inch.

Since 1982, Winnebago County has experienced 37 hail events. In May of 2000, there was a hailstorm event with hail 2" in diameter. It caused \$21 million in damages, but fortunately did not cause any deaths or injuries. All portions of the county have been affected over the years with hail ranging in size from pea-sized to two inches in diameter. There is a high probability that another hail storm will occur in the county in the future (Table 3-4). Based on data from the past 22 years it can be determined that once every 7 months (1:7) there is a probability of having a hailstorm.

◆ **Drought**

A drought is an extended period of unusually dry weather, which is often accompanied by high temperatures and low humidity. A drought can run for months or years. Generally speaking, there are two types of drought. An agricultural drought results in a significant drop in crop yield, while a hydrologic drought negatively affects lake and stream levels and the height of the groundwater table. Although these types of droughts may occur at the same time, it is possible to have one without the other. Five drought periods stand out in terms of impact to the state and its residents: 1987-1988, 1976-1977, 1955-1959, and 1929-1934.

The drought of 1987-1988 by most accounts was the most severe drought in Wisconsin in recent memory. Agricultural losses were estimated at \$1.3 billion in the state. Crop losses of 50 percent or more were common place. On the domestic side, some wells (especially shallow residential ones) dried up as the water table dropped in response to the limited rainfall.

In 1976, Winnebago County suffered severe crop yield decline and many domestic wells dried up. An agricultural disaster was declared that covered 64 counties in the state. In 1988, Winnebago County was designated for federal drought assistance. In 2003 the County Farm Service Agency reported that \$5,025,811 was requested by area farmers in the form of loans to help cover the damage due to drought conditions. The crop that was affected the most was soybeans.

During times of drought it may be estimated that less than 3 percent of wells in an area will be impacted. Another effect of drought conditions is that open areas are more susceptible to wildfires. Other direct effects of drought include reduced crop, rangeland, and forest productivity, reduced water levels, increased livestock and wildlife mortality rates, and damage to wildlife and fish habitat. There have been approximately 11 years of drought since 1934. Based on this historical data it appears that there is a 1:6 chance of a drought occurring in any given year. However, due to the type of soils that exist in Winnebago County and the location it is in the state drought conditions do not have as drastic of an effect on farmers in Winnebago County as it does in other locations in the state.

◆ **Wildland Fire**

A wildland fire is an uncontrolled fire occurring in natural vegetation such as in a forest, shrub area, marsh, or grassland. While wildland fires can occur any time during the year, the prime period extends from March through November. Wildland fires are more likely to occur whenever vegetation is dry a result of a winter with little snow or a summer with sparse rainfall. The most common sources of ignition include lightning, human carelessness, and arson. It is also often the case that when prescribed burns are done they may get out of control and the property owner is not able to



contain them. According to the DNR marsh and grassland fires are most common from April to mid-May unless there is a drought year in which organic and peat soils are problematic and may be involved in large fires that are more difficult to put out.

Over the years, a number of small wildland fires have occurred in the county. With the increasing number of recreational and seasonal homes in the county, the potential of wildland fires continue to increase as well. According to the DNR there are approximately 20 several acre fires each year that may cost a local fire department anywhere from \$250 to \$500 to put out. It is estimated that every 10 years there is a 200 to 500 acre fire which costs several thousand dollars to extinguish. There is not currently a state or countywide database that records every brush or marshfire that occurs. Only the larger, more threatening fires that require state assistance in addition to local assistance are recorded. Generally local fire departments are able to manage small fires. According to the DNR that has not been a large fire that consumed hundreds of acres in the County in recent history. Based on this information it can be determined that there is a 1 in 10 chance that a large scale wildfire will occur. If 10 small scale wildfires happen then there is a 1 in 36.5 probability that a fire will occur on any given day of the year and if 20 occur each year then there is a 1 in 18 probability will occur on any given day of the year.



♦ **Surficial Land Failure**

Surficial land failures include a wide range of geological phenomena like landslides and sinkholes. A landslide is a movement of earth materials downhill in response to gravity. Often landslides occur when the soil becomes super saturated with water and the soil loses its structure and becomes unable to support its weight and that of the water it contains. This movement can be gradual, but typically is sudden.

Sinkholes form when the underlying bedrock is composed of limestone or other bedrock that can be easily dissolved by water. As groundwater passes through these bedrock formations, it slowly eats the bedrock away. When the structural support is gone, the overlying soil falls into the resulting hollow depression. Formation of sinkholes is especially a threat when limestone is at or near the surface.

Given the county's flat topography there is little threat of a landslide and sinkholes are not considered a threat either. Table 3-5 notes that there is a low probability of landslides occurring in the County.

♦ **Summary**

As part of the evaluation process, hazards were objectively ranked to identify those hazards with the highest priority. The entire planning committee team worked together on determining the severity of each event and the amount of damage it would do in the county. The rank of the various hazards that could affect Winnebago County are shown in Table 3-5. The hazards are ranked on the probability that they may occur, how many people are at risk, the amount of damage they may cause, and the magnitude of structures that may incur damage. Tornadoes and high winds have the highest rank on the list followed by storms and thunderstorms and the danger of flooding.

Table 3-5. Comparative Analysis of Natural Hazards; Winnebago County: 2003

Natural Hazard	1	2	3	4	5	6	7	8	9	10	11
	Historical Hazard Frequency (1,2,3)	Anticipated Hazard Probability (1,2,3)	Historical Health and Public Safety (1,2,3)	Residential Damage (1,2,3)	Business Damage (1,2,3)	Public Costs (1,2,3)	Magnitude Of Population At Risk (1,2,3)	Magnitude Of Homes At Risk (1,2,3)	Magnitude Of Businesses At Risk (1,2,3)	Magnitude Of Public Infrastructure At Risk (1,2,3)	Rating Total
Dam failure	1	1	1	1	1	1	1	1	1	1	10
Flooding – riverine	3	3	2	3	2	2	2	2	1	2	22
Flooding – storm water	2	2	1	2	2	3	2	2	1	1	18
Ice shoves	1	1	1	1	1	1	1	1	1	1	10
Earthquake**	1	1	1	1	1	1	1	1	1	1	10
Tornado / high winds	2	2	2	3	2	3	3	3	3	2	25
Extreme temperature **	2	2	1	1	1	1	1	1	1	1	12
Storms – hail **	3	3	1	2	1	2	1	2	2	1	18
Storms – snow **	3	3	1	1	1	2	1	1	2	1	16
Storms - thunderstorm	3	3	2	3	2	2	1	1	1	2	20
Drought	2	2	1	1	1	1	1	1	1	1	12
Wildland fire	2	2	1	1	1	1	1	1	1	1	12
Land failure – subsidence	1	1	1	1	1	1	1	1	1	1	10
Land failure – mass movement	1	1	1	1	1	1	1	1	1	1	10

Notes: This matrix is based on a qualitative assessment and is intended to identify those hazards posing the greatest concern.  
 A low, medium, or high numerical rating of 1, 2 or 3, respectively, is assigned to each criterion and then the ratings for each hazard are totaled.  
 \*\* The ratings for these hazards are based on occurrences in the surrounding subregion.  
 Column 1 refers to the frequency of past occurrences.  
 Column 2 refers to the probability of the hazard occurring again.  
 Column 3 refers to the degree of past hazard events causing injuries, sickness and/or deaths.  
 Column 4 refers to the degree of past hazard events causing damages to homes  
 Column 5 refers to the degree of past hazard events causing damages to businesses  
 Column 6 refers to the amount of local, state, and federal funds expended on past hazard recovery activities.  
 Column 7 refers to the amount of the area's population still vulnerable to injury, sickness, and/or death.  
 Column 8 refers to the amount of homes still vulnerable to damages.  
 Column 9 refers to the amount of businesses still vulnerable to damages or interruption of business trade. Column 10 refers to the amount of infrastructure that is susceptible to damages.  
 Column 11 is the raw score for the hazard.

## Appendix G: Community Input

Winnebago 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
1/14/20	All municipalities received the PDM survey and cover letter (attached). Municipalities were encouraged to complete the survey at open meetings and most did, receiving public comment as the survey was completed.
1/15/20	Press release given to all media in Winnebago County. The releases invited public participation in the planning process but none participated.
1/28/20 & 1/29/20	Winnebago Co. PDM informational brochure (attached) was distributed throughout the community at public locations. The brochure was distributed at the following libraries: Neenah, Menasha, Oshkosh, Omro and Winneconne.
2/18/20	First workgroup meeting (two times) to review/rank the vulnerabilities, review the planning process, the previous plan and to discuss the plan update, including new hazmit strategies.
9/1/20 & 9/2/20	<p>Other workgroup meetings were held to review and report out on the previous hazmit strategies and to select new hazmit strategies via Zoom due to the COVID-19 pandemic:</p> <ul style="list-style-type: none"> <li>• James Rabe and Brian Bending, CI Oshkosh (9/1/20)</li> <li>• Chris Haese, CI Neenah; David Porter, VI Winneconne; Richard Heath, TN Algoma; and George Dearborn and Todd Sweeney, VI Fox Crossing (9/1/20)</li> <li>• Linda Kutchenriter, CI Omro and Cassidy Walsh, CI Appleton (9/2/20)</li> </ul>
date	Plan sent to the county emergency management directors from contiguous counties requesting review, comments and edits.

Appendix G: HAZUS Vulnerability Assessment

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date	Each municipality posted the discussion and adoption of the updated hazmit plan per WI state law. Plan was discussed and adopted in a public meeting.
date	Legal Public Notice printed notifying the public of the public review and comment period

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.

Cover Letter to Municipal Officials 1/14/2020

ERIC R. RASMUSSEN  
Deputy Director

erasmussen@co.winnebago.wi.us



4311 Jackson Street  
Oshkosh WI 54901  
Office (920) 236-7464  
Cell (920) 410-1495  
Fax (920) 303-3175

Date: 14 January 2020

To: Town, Village or City Leader  
County Department Manager

From: Eric Rasmussen, EM Deputy Director

Re: Hazard Mitigation Plan Update

Winnebago County, like the rest of the State of Wisconsin, is vulnerable to a variety of disasters. Wisconsin has incurred disaster-related damages totaling nearly \$3 billion in the last three decades, with almost half of that occurring in the 1990s alone. These losses can be reduced through mitigation activities. It is estimated that for every dollar spent on mitigation, \$6 in future damages can be avoided. Hazard mitigation breaks the cycle of damage and repair.

Mitigation actions reduce or eliminate the long-term risk to human life and property from hazards. These preventative actions can be simple such 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 Winnebago County to manage its vulnerability to disaster Winnebago County Emergency Management applied for and received a hazard mitigation planning update grant. This goal of this grant is to complete an approvable updated plan, 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 me **by February 14th**.

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.

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## Appendix G: HAZUS Vulnerability Assessment

ERIC R. RASMUSSEN  
Deputy Director

erasmussen@co.winnebago.wi.us



4311 Jackson Street  
Oshkosh WI 54901  
Office (920) 236-7464  
Cell (920) 410-1495  
Fax (920) 303-3175

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 will 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 (920) 236-7464 or by email at [erasmussen@co.winnebago.wi.us](mailto:erasmussen@co.winnebago.wi.us).

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### List of Municipal Officials Receiving the Letter Above

TOWN OF ALGOMA	ATTN: DEBORAH STARK	15 NORTH OAKWOOD ROAD	OSHKOSH WI 54904
TOWN OF BLACK WOLF	ATTN: SUSAN SNYDER	380 E BLACK WOLF AVENUE	OSHKOSH WI 54902
TOWN OF CLAYTON	ATTN: HOLLY STEVENS	8348 COUNTY ROAD T	LARSEN WI 54947
TOWN OF NEENAH	ATTN: ELLEN SKERKE	1600 BREEZEWOOD LANE	NEENAH WI 54956
TOWN OF NEKIMI	ATTN: TOM POLLACK	3790 PICKETT ROAD	OSHKOSH WI 54904
TOWN OF NEPEUSKUN	ATTN: REBECCA PINNOW	8605 LAKE ROAD	RIPON WI 54971
TOWN OF OMRO	ATTN: PAULA D. BEULEN	4205 RIVERMOOR ROAD	OMRO WI 54963
TOWN OF OSHKOSH	ATTN: JEANNETTE MERTEN	1076 COZY LANE	OSHKOSH WI 54901
TOWN OF POYGAN	ATTN: JULIA REINERT	7839 OAK HILL ROAD	OMRO WI 54963
TOWN OF RUSHFORD	ATTN: PEGGY HENDRICKS	3413 COUNTY ROAD K	OMRO WI 54963
TOWN OF UTICA	ATTN: JENNY SONNLEITNER	6570 BRADLEY AVENUE	PICKETT WI 54964
TOWN OF VINLAND	ATTN: JENNIFER BROWN	6085 COUNTY ROAD T	OSHKOSH WI 54904
TOWN OF WINCHESTER	ATTN: HOLLY STEVENS	6214 FURMAN ROAD	LARSEN WI 54947
TOWN OF WINNECONNE	ATTN: YVONNE ZOBEL	6494 COUNTY ROAD M	WINNECONNE WI 54986
TOWN OF WOLF RIVER	ATTN: SUSAN GILBERT	PO BOX 338	FREMONT WI 54940
VILLAGE OF FOX CROSSING	ATTN: KAREN BACKMAN	2000 MUNICIPAL DRIVE	NEENAH WI 54956
VILLAGE OF WINNECONNE	ATTN: JACQUIN STELZNER	PO BOX 488	WINNECONNE WI 54986
CITY OF APPLETON	ATTN: KAMI LYNCH	100 N APPLETON STREET	APPLETON WI 54911
CITY OF MENASHA	ATTN: DEBBIE GALEAZZI	100 MAIN STREET SUITE 200	MENASHA WI 54952
CITY OF NEENAH	ATTN: PATTY STURN	211 WALNUT STREET	NEENAH WI 54956
CITY OF OMRO	ATTN: BARBARA VAN CLAKE	PO BOX 399	OMRO WI 54963
CITY OF OSHKOSH	ATTN: PAMELA R. UBRIG	PO BOX 1130	OSHKOSH WI 54903-1130

Jerry Bougie - Winn Co Planning - Interoffice  
Tom Davies - LWCD - Interoffice  
Ray Palonen - Highway - Interoffice

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**Press Release 1/15/2020**

ERIC R. RASMUSSEN  
Deputy Director

erasmussen@co.winnebago.wi.us



4311 Jackson Street  
Oshkosh WI 54901  
Office (920) 236-7464  
Cell (920) 410-1495  
Fax (920) 303-3175

15 January 2020

For More Information, Contact Eric Rasmussen (920-236-7464)

For Immediate Release

**Winnebago County Receives A Hazard Mitigation Planning Update Grant**

(Oshkosh, WI) Winnebago County, like the rest of the State of Wisconsin, is vulnerable to a variety of disasters. Wisconsin has incurred disaster-related damages totaling nearly \$3 billion in the last three decades, with almost half of that occurring in the 1990s alone. These losses can be reduced through mitigation activities. It is estimated that for every dollar spent on mitigation, \$6 in future damages can be avoided. Hazard mitigation breaks the cycle of damage and repair.

Mitigation actions reduce or eliminate the long-term risk to human life and property from hazards. These preventative actions can be simple such 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 Winnebago County to manage its vulnerability to disaster, Winnebago County Emergency Management applied for and received a hazard mitigation planning update grant. The goal of this grant is to update an approvable plan, 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. As part of this planning process, Eric Rasmussen, Deputy Director for Winnebago County Emergency Management, is assembling a workgroup to review and guide the planning activities. The workgroup is reviewing initial background information about Winnebago County and has begun identifying strategies that might help.

Rasmussen stated, "I am very excited about this part of the planning process. The input from the workgroup can have long-lasting impacts, making Winnebago County safer and more disaster resistant."

FEMA has recognized the importance of having members of the community involved in the process and Rasmussen 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 Eric Rasmussen at 920-236-7464.

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**Invitation Sent 1/29/2020 Via Email for Workgroup Meeting**

From: Rasmussen, Eric <ERasmussen@co.winnebago.wi.us>  
Sent: Wednesday, January 29, 2020 9:16 AM  
To: 'Rabe, James E.' <jrabe@ci.oshkosh.wi.us>; 'Bending, Brian' <bbending@ci.oshkosh.wi.us>; Jensen, Jesse <JJensen@co.winnebago.wi.us>; ORourke, Brian <BORourke@co.winnebago.wi.us>; 'ethan.kroll@appleton.org' <ethan.kroll@appleton.org>  
Cc: Lenora Borchardt <lenoraborchardt@hotmail.com>; Kollmann, Linda <LKollmann@co.winnebago.wi.us>  
Subject: Hazard Mitigation Plan Update

Good morning!

You are receiving this email as a member of the work group for the Winnebago County Hazard Mitigation Plan Update. Please save the date for our initial meeting on February 18, 2020 from 3-5 pm. This meeting will be held in the Rick Meyer Community Room of the Winnebago County Sheriff's Office.

Our consultant Lenora Borchardt is copied on this email and will provide more information leading up to this meeting. If you have any questions, please let one of us know.

Thank you for your participation in this plan update and helping make Winnebago County a more resilient community!

Thank you,  
Eric Rasmussen  
Deputy Director  
Winnebago County Emergency Management  
Office (920)236-7464  
Cell (920)410-1495



**Workgroup Meeting 2/18/2020**

Kick-Off Meeting 2/18/2020

Signature	Name	Municipality	Email
<i>Brian Bending</i>	Brian Bending	City Of Oshkosh Fire Dept	bbending@ci.oshkosh.wi.us
<i>Jesse Jensen</i>	Jesse Jensen	WSO	JJensen@co.winnebago.wi.us
<i>Brian O'Rourke</i>	Brian O'Rourke	Winnebago County Planning & Zoning	BORourke@co.winnebago.wi.us
<i>Ray Palonen</i>	Ray Palonen	Winnebago County Highway	RPalonen@co.winnebago.wi.us
<i>Richard Heath</i>	Richard Heath	Town of Algoma Administrator	townadmin@townofalgoma.org
<i>James Rabe</i>	James Rabe	City of Oshkosh Public Works	jrabe@ci.oshkosh.wi.us
<i>Linda Kutchenrider</i>	Linda Kutchenrider	City of Omro Administrator	lkutch@omro-wi.com
<i>Brian Noe</i>	Brian Noe	Town of Omro Chair	chairman@townofomro.us
<i>Chris Haese</i>	Chris Haese	City of Neenah Community Development	chaese@ci.neenah.wi.us
<i>Brian Harbison</i>	Brian Harbison	Village of Fox Crossing Fire Chief	bharbison@foxcrossingwi.gov
<i>Josh Janikowski</i>	Josh Janikowski	Village of Winneconne Public Works	fieldsuper@winneconnewi.gov
<i>Cassidy Walsh</i>	Cassidy Walsh	City of Appleton EM Coordinator	Cassidy.Walsh@Appleton.org
<i>Adam Alix</i>	Adam Alix	City of Menasha - Unconfirmed	aalix@ci.menasha.wi.us
<i>Eric Rasmussen</i>	Eric Rasmussen	Winnebago County EM	erasmussen@co.winnebago.wi.us
<i>Linda Kollmann</i>	Linda Kollmann	Winnebago County EM	lkollmann@co.winnebago.wi.us
<i>Lenora Borchardt</i>	Lenora Borchardt	Eptech	lenoraborchardt@hotmail.com
<i>David Porter</i>	David Porter	Village of Winneconne Administrator	administrator@winneconnewi.gov
<i>Kaylin Van Stappen</i>	Kaylin Van Stappen	Town of Clayton EM	emergencymanager@townofclayton.net
<i>Thomas Coppola</i>	Thomas Coppola	Black Wolf Deputy Clerk / Treasurer	thomas@townofblackwolf.com
<i>TSOTS DOEMEL HWY DEPT</i>			
<i>David Tracey</i>	David Tracey	Fox Crossing Utilities Supt	dtracey@foxcrossingwi.gov
<i>George D. [unclear]</i>	George D. [unclear]	Fox Crossing [unclear] Comm [unclear]	G.D.[unclear]@foxcrossingwi.gov



Article in the Oshkosh Herald 1/23/2020

## County receives hazard mitigation planning grant

Winnebago County Emergency Management has received a hazard mitigation planning update grant from the Federal Emergency Management Agency.

The goal of the grant, administered through Wisconsin Emergency Management, is to update an approvable plan that outlines potential hazard mitigation activities, some of which might be available for future grant funding. The plan looks at the risks and vulnerabilities the county faces from natural disaster and highlights strategies that might reduce future losses.

Eric Rasmussen, deputy director for

Winnebago County Emergency Management, is assembling a workgroup to review and guide the planning activities.

"I am very excited about this part of the planning process," Rasmussen said in a media statement. "The input from the workgroup can have long-lasting impacts, making Winnebago County safer and more disaster resistant."

He said all interested members of the community have an opportunity to provide input into the plan and can contact him at 920-236-7464 for more information.

Oshkosh Herald

1-23-2020

## WINNEBAGO COUNTY, WISCONSIN NATURAL HAZARDS PREPAREDNESS & MITIGATION QUESTIONNAIRE

1. In the past five years, has your community experienced a natural disaster such as a severe windstorm, flood, wildfire, earthquake, etc.?

Event	When event last occurred:				
	Within past year	1-5 years ago	5-15 years ago	More than 15 years ago	Never
<b>Drought</b>	TN Vinland		CI Menasha TN Omro	CI Oshkosh TN Utica TN Wolf River	CI Appleton TN Algoma TN Poygan VI Winneconne
<b>Dust Storm</b>					CI Appleton CI Menasha CI Oshkosh TN Algoma TN Omro TN Poygan TN Utica TN Wolf River VI Winneconne
<b>Earthquake</b>					CI Appleton CI Menasha CI Oshkosh TN Algoma TN Poygan TN Utica TN Wolf River VI Winneconne
<b>Flood</b>	TN Omro TN Utica TN Vinland TN Wolf River	CI Appleton CI Menasha TN Algoma VI Fox Crossing	CI Oshkosh CO Planning	VI Winneconne	TN Poygan
<b>Lakeshore Erosion</b>	TN Omro TN Poygan TN Wolf River	TN Algoma		CI Menasha	CI Appleton CI Oshkosh TN Utica VI Winneconne
<b>Landslide/ Debris Flow</b>	TN Wolf River				CI Appleton CI Menasha CI Oshkosh TN Algoma TN Omro TN Poygan TN Utica VI Winneconne
<b>Wildfire</b>		TN Algoma TN Omro		TN Utica	CI Appleton CI Menasha TN Poygan TN Wolf River VI Winneconne
<b>Windstorm/ Tornado</b>	CI Appleton TN Wolf River	CI Menasha TN Algoma TN Omro TN Utica VI Fox Crossing	CI Oshkosh	VI Winneconne	TN Poygan
<b>Severe Winter Storm</b>	CI Appleton TN Algoma TN Poygan TN Wolf River	CI Menasha CI Oshkosh TN Omro TN Utica VI Winneconne			

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
<b>Drought</b>	TN Algoma		TN Rushford	TN Clayton TN Omro TN Wolf River	CI Appleton CI Oshkosh TN Poygan TN Utica VI Winneconne
<b>Dust Storm</b>				CI Appleton	CI Appleton TN Algoma TN Clayton TN Omro TN Poygan TN Rushford TN Utica TN Wolf River VI Winneconne
<b>Earthquake</b>				TN Black Wolf	CI Appleton CI Oshkosh TN Algoma TN Clayton TN Omro TN Poygan TN Rushford TN Utica TN Wolf River VI Winneconne
<b>Flood</b>	TN Algoma TN Vinland	CI Oshkosh TN Omro TN Wolf River	TN Black Wolf TN Rushford TN Utica TN Winchester VI Fox Crossing VI Winneconne	TN Clayton TN Poygan	CI Appleton
<b>Erosion</b>	TN Algoma	TN Omro	CI Oshkosh CO LWCD CO Planning TN Winchester TN Wolf River	TN Clayton TN Poygan TN Rushford VI Winneconne	CI Appleton TN Utica
<b>Landslide/ Debris Flow</b>		CI Appleton	TN Winchester	TN Rushford TN Wolf River	CI Oshkosh TN Algoma TN Clayton TN Omro TN Poygan TN Utica VI Winneconne
<b>Wildfire</b>	TN Algoma	CI Appleton	TN Clayton TN Winchester	TN Omro TN Utica	CI Oshkosh TN Poygan TN Rushford TN Wolf River VI Winneconne
<b>Windstorm/ Tornado</b>	CI Oshkosh TN Algoma	TN Clayton VI Winneconne	TN Omro TN Rushford TN Utica TN Wolf River	TN Poygan TN Winchester	CI Appleton

<b>Severe Winter Storm/ Ice Storm</b>	CI Oshkosh TN Algoma	TN Clayton TN Wolf River VI Winneconne	CO LWCD TN Omro TN Rushford TN Utica TN Winchester VI Fox Crossing	TN Black Wolf TN Poygan	CI Appleton
<b>Other: Record Rainfalls</b>			CO LWCD		
<b>Other: Wind Sheer</b>			VI Fox Crossing		

**3. Has your community had damage to facilities or infrastructure? If yes, please describe the damage. (e.g., roads, public buildings, utilities)**

- CI Appleton: Yes - July of 2019, windstorm caused damage to traffic signals and trees.
- CI Oshkosh: Flooding in 2008 damaged several public buildings.
- TN Algoma: Honey Creek bridge.
- TN Clayton: Most recently, in the Spring of 2019, the Town of Clayton experienced flooding which caused damage to multiple roadways. In most cases, this damage was limited to the shoulder and edges of pavement which required repair. In one instance, the damage of the roadway was too severe to reopen the roadway. This portion of roadway is still closed and the Town Board is in the process of investigating options, possibly a permanent closure or converting to a Rustic Road.
- TN Omro: Flood damage to roads and culverts; wind damage to trees.
- TN Poygan: I am sure there has been but not that the Town has been made aware of.
- TN Winchester: The frontage roads along STH 45 have steep slopes and they have been collapsing/sliding. We believe they were not constructed properly by WISDOT.
- TN Wolf River: One culvert on Tonn Line Road.
- VI Winneconne: Annual Spring thaw causing flooding at the WWTP due to I & I from aging infrastructure; in 2014 the water tower froze due to a lightning strike taking out power and controls and then a polar vortex.

**4. What facilities or infrastructure in your community do you think are especially vulnerable to damage during a natural disaster?**

- CI Appleton: Facilities/Infrastructure in the Winnebago County area of the City of Appleton that is vulnerable to damage during a natural disaster include trees, electrical lines, traffic signals, telecommunications (Spectrum) and transmission lines (WE Energies).
- CI Menasha: Overhead utilities.
- CI Oshkosh: Roadways - flooding in 2008, many areas became inaccessible.

## Appendix G: Community Input

- TN Algoma: Oakwood School, Algoma Town Hall, Algoma Fire Department, Algoma Sanitary District, Honey Creek Pond Dam, Lutheran Homes of Oshkosh and Kobussen Transportation facility.
- TN Black Wolf: Residential homes and businesses adjacent to Lake Winnebago.
- TN Clayton: Much of our power is via overhead lines which are susceptible to storm damage resulting in loss of power and blockage of roadways. Also, Clayton's wastewater treatment plan on Grandview Road is listed within the 100-year floodplain.
- TN Omro: Low-lying area along the Fox River.
- TN Poygan: Road, phones and electricity.
- TN Rushford: Property on waterways.
- TN Winchester: Roads, overpasses and bridges.
- TN Wolf River: Electrical
- VI Fox Crossing: Roadways, railroad, high-pressure gas lines, high-power electrical lines and substations.
- VI Winneconne: Wells, wastewater treatment plant, water towers and aging infrastructure.

### 5. 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
<b>Protecting private property</b>	CI Appleton TN Algoma TN Black Wolf TN Neenah TN Omro TN Vinland TN Wolf River	CI Oshkosh CO Planning TN Clayton TN Poygan TN Rushford TN Winchester VI Fox Crossing VI Winneconne	CI Menasha TN Utica		
<b>Protecting critical facilities (hospitals, fire stations, etc.)</b>	CI Appleton CI Menasha CI Oshkosh CO LWCD CO Planning TN Algoma TN Clayton TN Neenah TN Winchester TN Wolf River VI Fox Crossing VI Winneconne	TN Rushford TN Utica			TN Poygan
<b>Preventing development in hazard areas</b>	CO Planning TN Algoma TN Neenah TN Omro	CI Menasha CI Oshkosh TN Utica TN Winchester VI Winneconne	TN Clayton TN Poygan TN Rushford TN Wolf River VI Fox Crossing		CI Appleton
<b>Enhancing the function of natural features (streams, wetlands)</b>	CI Oshkosh TN Black Wolf TN Neenah	CI Menasha CO Planning TN Algoma TN Clayton TN Omro TN Poygan	CI Appleton CO LWCD TN Rushford TN Winchester TN Wolf River VI Winneconne		

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		TN Utica VI Fox Crossing			
<b>Protecting historical and cultural landmarks</b>	CO LWCD CO Planning TN Neenah	CI Appleton CI Menasha CI Oshkosh TN Algoma TN Utica TN Winchester	TN Clayton TN Omro TN Rushford TN Wolf River VI Fox Crossing	VI Winneconne	TN Poygan
<b>Promoting cooperation among public agencies, citizens, non-profit organizations and businesses</b>	CI Appleton CO LWCD CO Planning TN Algoma TN Black Wolf TN Clayton TN Neenah TN Omro TN Wolf River VI Fox Crossing VI Winneconne	CI Menasha CI Oshkosh TN Utica TN Winchester	TN Rushford		
<b>Protecting and reducing damage to utilities</b>	CI Appleton CI Menasha CI Oshkosh CO LWCD CO Planning TN Algoma TN Clayton TN Neenah TN Omro TN Utica TN Winchester TN Wolf River VI Fox Crossing VI Winneconne	TN Poygan	TN Rushford		
<b>Strengthening emergency services</b>	CI Appleton TN Algoma TN Black Wolf TN Neenah TN Utica TN Winchester TN Wolf River VI Winneconne	CI Menasha CI Oshkosh TN Omro TN Poygan VI Fox Crossing	TN Rushford		

**6. Do you have any community building projects (e.g., subdivisions, office/industrial parks, roads) slated to be built in the near future? If so, please describe it (e.g., project name, location, type, size)?**

- CI Appleton: Revitalization of Fleet Farm in the former Secura Property.
- CI Appleton: Reconstruct Valley Road from a rural road to an urbanized facility with curb and gutter and storm sewer within the next 5 years.
- CI Oshkosh: There are several projects under development - Oshkosh Corp campus (commercial/office); Sandust District (mixed-use entertainment district); Morgan District (mixed-use commercial/residential).
- TN Algoma: (1) Lake Vista Estates - 89 residential homes (single family and condos), parcel numbers 00200281905, 0020030, 00200281904 east of Leonard Point Road and south of Leonard Point Lane and adjacent to Jones Park. (2) Reconstruction of Omro Road, a 1.8 mile stretch from STH 21 on the west to Brooks Lane to the east. Includes three new detention ponds - Honey Creek Pond, Jones Pond at Omro Road and SR 21 and FKC at Omro

Road and just west of Ran-Lie Street. (3) Additional improvements at Jones Park and Town Hall Park.

- TN Black Wolf: No large projects planned; possibility of single-family homes on single lots.
- TN Clayton: (1) Subdivisions on Center Road, north of Shady. 13-lot subdivision which includes a pond with a dry hydrant. (2) Stormwater installation east of 76 in the area of Highways 10 and II. (3) Road connection at American Drive off of 76 to American Drive at Clayton Avenue (approximately 3/4 mile. (4) Stormwater management - pond at northwest corner of Highway 10 and Clayton Avenue (approximately 1.5-acre surface area at \$1.4M); dry pond at southwest corner of Highway 10 and Clayton Avenue; pond north of Breezewood, west of Carden (8.2 acres at \$1.7M); pond/park north of JJ, east of Balfour (still in planning stages).
- TN Omro: Ormano Beach first addition; Sand Hill Farms Phase III.
- VI Fox Crossing: Village storage building (30-40K square feet) and OSMS (private medical facility).
- VI Winneconne: (1) Northeast side of the Village, potential new sub-development which would include a connector street to the Town; (2) new businesses are being added to the Industrial Park.

## **7. What ideas do you have for your community to mitigate natural disasters?**

- CI Appleton: Listed are ideas for mitigation strategies for the city in the Winnebago region:
  - Burying utility lines throughout the city.
  - Mutual Aid agreements for equipment during times of disaster is another mitigation strategy for the city.
  - Investing in additional equipment for emergency storm cleanup.
  - Strengthening and redundant emergency communication projects.
- CI Oshkosh: Updated emergency response plans; continue to train to better acquaint city staff with the EOC; develop public/private partnerships; strengthen intergovernmental relations.
- CO LWCD: Maintain a good Emergency Management Department and county plan.
- TN Algoma: Be prepared in the event of a flood - evacuation sites designated; transportation system established; education on emergency routes, drainage easements (purpose and maintenance) and flood insurance; prepare town hall for ICC; ensure all plans are updated and goals are being implement (e.g., stormwater management and emergency management plans); current training of firefighters and first responders.
- TN Black Wolf: The Town appointed a Planning and Zoning Committee, as well as a Stormwater Utility Committee to monitor and review elevation, floodplain protection and public outreach projects throughout the Town. The Committee is positioned to review problematic areas and address concerns due to increased water levels, property acquisition and relocation should a natural disaster arise. The Town is strategic in posing ideas that are reviewed with the Town Board to ensure organizational and environmental effectiveness. The collective units monitor the



comprehensive plan and will ally partnerships with FEMA on an individual basis on behalf of the private citizens. The partnerships will help with the assessment of any structural, equipment or vehicle damage. The town may have the infrastructure professionally inspected if there are concerns that damage could pose a safety hazard. The town has a radio to alert and communicate any possible earthquakes. In the event of severe ice storm, the town has a partnership with the County as a resource for salting, plowing and all pre-work related.

- TN Clayton: Aside from projects, Pioneer Road and Shady Lane in the northern part of our town are low-lying and frequently flood. We would like to investigate options to mitigate the flooding. This may involve working with the DNR, as they have land in that location; or investigating the possibility of raising that portion of roadway.
- TN Omro: Investigate raising of roads in low-lying area along Fox River; improve drainage along lakeshore to prevent localized flooding.
- TN Poygan: Insurance on Town properties; some signage available but should reach out to the County for help.
- TN Utica: Keeping waterways and ditches clear.
- TN Vinland: Flooding - new culverts.
- TN Winchester: Continued implementation of zoning and development codes to prevent or minimize the chances of issues.
- VI Fox Crossing: (1) Involve community stakeholders in LEPC and (2) provide access to information and culture of FEMA programs.
- VI Winneconne: (1) Improve stormwater collections; (2) updating utility infrastructure (e.g., water mains, sanitary sewers, storms sewers, etc.); (3) urbanizing village streets to include curb and gutter and storm sewers; (4) continue urban forestry programs to remove aged and hazard trees.

### **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 ineligible to receive such funds until such time that they meet these requirements and adopt a plan.

### **HISTORY**

Floods and storms have killed over 2,000 people in the U.S. in the last decade. Hundreds of disasters have occurred in the past 25 years, costing the country millions of dollars every week.

### **MITIGATION PLANNING FACTS**

▶ A 2017 study has shown that mitigation saves society an average of \$6 for every \$1 spent through federal agency grant programs.

▶ 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.

▶ According to the National Oceanographic and Atmospheric Administration, 2017 was the costliest year ever for weather and climate disasters in the United States, totaling \$215 billion in disasters. That's \$5.9 million dollars every week!

NOTES: \_\_\_\_\_

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For further information please contact:

**Winnebago County  
Emergency Management**  
4311 Jackson Street  
Oshkosh, WI 54901  
(920) 920-236-7464

## **Pre-Disaster Mitigation Planning**

*Creating Safe,  
Sustainable  
Communities*



Prepared by:  
Winnebago County Emergency Management  
4311 Jackson Street  
Oshkosh, WI 54901  
(920) 236-7464

## Appendix G: Community Input

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### 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.

*Like many other people, the residents of Merkel, Texas didn't think much about flooding. Besides, it had not flooded in Merkel for 45 years. It wasn't until the heavy summer rains came that residents realized flooding can hit anyone, at any time. After the flooding finally subsided, officials knew they had to do something: mitigate.*

### 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-** Communities next 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.

## Appendix H: Inter-Revision Updates

This plan will undergo major revisions every five years per the FEMA requirements. Winnebago 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.

Information for inclusion in this section should be provided to the Winnebago County Emergency Management Director.

Potential Areas of Concern Identified:

- No additional concerns have been identified to date