



Hazard Mitigation Plan

Waushara County, Wisconsin

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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

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 Waushara County Hazard Mitigation Plan is intended to provide strategies for reducing susceptibility to future damage to public and private infrastructure in the county. The Waushara County Emergency Management office applied for and was awarded a grant to update the hazard mitigation plan in 2020. 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 Waushara 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 Waushara 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 Waushara County Hazard Mitigation Plan provides background information on Waushara 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 Waushara 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 Waushara County departments or municipalities, which were used as reference materials for this plan, including:

Waushara County¹

Chapter 8	Buildings and Building Regulations
Chapter 18	Floods
Chapter 42	Subdivisions
Chapter 58	Zoning

¹ https://library.municode.com/wi/waushara_county/codes/code_of_ordinances

City of Berlin ²

Chapter 14	Buildings and Building Regulations
Chapter 62	Subdivisions
Chapter 82	Zoning

City of Wautoma ³

Chapter 12	Buildings and Building Regulations
Chapter 30	Historic Preservation
Chapter 34	Manufactured and Mobile Homes
Chapter 42	Planning and Development
Chapter 52	Subdivisions
Chapter 66	Zoning

Village of Coloma ⁴

Chapter 207	Building Construction
Chapter 265	Floodplain Zoning
Chapter 420	Subdivision of Land
Chapter 480	Zoning

Village of Plainfield ⁵

Title 10, Chapter 3	Building Regulations
Title 10, Chapter 5	Subdivision Regulations
Title 10, Chapter 6	Zoning
Title 10, Chapter 10	Construction Site Erosion Control

Village of Wild Rose ⁶

Chapter 7-7	Mobile Homes
Chapter 10-3	Building Regulations
Chapter 10-4	Floodplain Zoning
Chapter 10-5	Zoning

The Villages of Hancock, Lohrville and Redgranite and the Towns of Bloomfield, Coloma, Deerfield, Hancock, Leon, Mount Morris, Oasis, Plainfield, Poy Sippi, Rose, Saxeville and Warren have no online

² https://library.municode.com/wi/berlin/codes/code_of_ordinances

³ https://library.municode.com/wi/wautoma/codes/code_of_ordinances

⁴ <https://ecode360.com/CO3611>

⁵ <http://plainfieldwis.com/forms-ordinances/>

⁶ <https://ecode360.com/WI3923>

ordinances. The Towns of Aurora⁷, Dakota⁸, Marion⁹, Richford¹⁰, Springwater¹¹ and Wautoma¹² have no relevant ordinances online.

As part of its Building Science program, FEMA studies how natural hazards affect structures. As part of this focus, it tracks building code adoption status for jurisdictions across the country through a searchable portal organized by hazard.¹³

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 database¹⁴, 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, 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, Parks, Land Records, Zoning and Land Conservation) with the elected leaders from the jurisdictions to triage projects and determine what can and should be done within the planning period. Agencies within the county that have the authority to regulate development include Zoning administration for Waushara County, the City of Berlin and the Village of Coloma. These options are

⁷ <https://townaurora.com/ordinances.php>

⁸ <https://www.townofdakota.org/ordinances>

⁹ <https://townshipofmarion.com/ordinances>

¹⁰ <https://townofrichford.com/ordinances-resolutions/>

¹¹ <https://townofspringwater.com/ordinances-resolutions/>

¹² <https://www.townofwautoma.com/ordinances-resolutions/>

¹³ <https://stantec.maps.arcgis.com/apps/MapSeries/index.html?appid=a053ac48343c4217ab4184bc8759c350>

¹⁴ <https://www.ncdc.noaa.gov/stormevents/>

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 Waushara 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:

- Allen Luchini, Waushara County Emergency Management
- Norman Duesterhoeft, Waushara County Emergency Management
- Waushara County GIS
- Waushara County Highway Department
- Todd Wahler, Waushara County Zoning and Land Conservation
- Tommy Bohler, City of Wautoma
- Brenda Walker, Village of Coloma
- Ellen Caswell, Village of Red Granite
- Chris Sorenson, Town of Leon
- Town of Mount Morris
- Larry Albright, Town of Poy Sippi
- Town of Saxville
- Paul Zimmer, Town of Springwater
- Lenora Borchardt, EPTEC, Inc. (Contractor)

Remote participants included:

- Gary Podoll, City of Berlin/Green Lake County
- Tom Monacelli, Village of Lohrville
- Brenda Black, Village of Plainfield
- Allen Luchini – Village of Wild Rose

Additionally, each community was provided a survey to complete that requested information on their hazards, their future development, and a request for ideas for mitigation and road projects. The results of this survey can be found in Appendix G. The City of Berlin, which is mostly in Green Lake County, and the Villages of Plainfield and Wild Rose completed the surveys, which were returned by the community clerks. Additional communications with each of the communities to elicit plan information were conducted by the first emergency management director but any logs or notes created were not provided in the transition.

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 Waushara County city, village and town clerk for distribution to the elected officials for discussion, review and completion. Key county departments (e.g., Zoning and Land Conservation, 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 2021. The workgroup met twice online (due to COVID meeting protocols) during 2021 and 2022. During 2022, the county emergency management director changed employment. A new director was hired and sought information to complete the plan from records, municipalities, departments, and other sources. It was determined that some information may have been missing from the previous director. There are some 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. Waushara 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 contiguous counties (i.e., Adams, Green Lake, Marquette, Portage, Waupaca,

Winnebago). No comments or edits were received. Unfortunately, although multiple attempts and invitations were made to members of the public through press releases, no public comments were received. An additional effort was made to reach those whose primary language is not English, as well as underserved populations and those who may not have traditional access to the information being provided. A copy of the supporting materials, including community fliers, the mitigation brochure, a list of meeting dates and informational sessions to gather public and official input, etc. can be viewed in Appendix G.

The Waushara 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 Waushara 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 Berlin is predominantly in Green Lake County. Of these communities, the Villages of xxx and xxx did not fully participate in the Waushara County planning process but did adopt the plan. The elected officials of the Village of xxx, which is wholly in Waushara 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 Waushara 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. Waushara 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.

Waushara County and the municipalities at all levels within the State of Wisconsin (i.e., city, village, town) are individually empowered to enact all of the hazard mitigation strategies in this plan. Realistic constraints to enacting include adequate budgeting and that, as unincorporated municipalities, towns are unable to independently receive federal grants. The County has a history of working collaboratively to support town initiatives. 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 offset 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. The plan was adopted but after discussions with the communities, it was unclear if it was incorporated into their plans. There is also no evidence that this plan was integrated with other planning efforts.

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.

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

Physical Characteristics of Waushara County

General Community Introduction

Waushara County was established by an act of the Wisconsin Legislature on February 15, 1851. It originally consisted of a single organized Town of Waushara. In 1852 the county achieved full organization. The county seat was first located at Sacramento and was relocated to Wautoma in 1854.¹⁵

Waushara County is located slightly southeast of central Wisconsin. The largest urban areas are the City of Wautoma and the Village of Redgranite, both of which are located in the south central part of the county. Marquette and Green Lake Counties bind the county to the south; as do Portage and Waupaca Counties to the north; to the west Adams County; and to the east by Winnebago County. Waushara County lies 110 miles northwest of Milwaukee, 85 miles southwest of Green Bay, 60 miles west of the Fox Valley, 70 miles south of Wausau, 90 miles north of Madison and 120 miles east of La Crosse. Major metropolitan areas outside of Wisconsin with transportation linkages to Waushara County are Chicago, 230 miles southeast; Minneapolis-St. Paul, 220 miles northwest; and Duluth, 290 miles north.

On October 18, 1846 the Menominee Tribe ceded their land, including Waushara County, to the United States Government. In 1848 Isaac and William Warwick, the first white settlers to the area, built a log cabin in the Town of Marion. During the winter of 1848 to 1849, Philip Green settled on the site of the former Village of Wautoma. Other settlers soon followed. By 1849 a crude dirt road was built between Berlin (Strong's Landing) and Wautoma (Shumway Town). The 1849 road roughly corresponds with present day County Highway F. The community of Sacramento, located on the south side of the Fox River, was platted in either 1849 or 1850 and a post office was established for the community in 1852. During 1849 and 1850 other settlers began gathering and making settlements in other parts of what is now Waushara County. On February 15, 1851 the Wisconsin Legislature established Waushara County and selected Sacramento as the county seat. The county originally consisted of a single town - the Town of Waushara. In 1852

¹⁵ <http://genealogytrails.com/wis/waushara/>

Waushara County was organized for judicial purposes and in September 1854 the county seat was moved to Wautoma.¹⁶

Plan Area

Waushara County covers approximately 638 square miles or 408,122 acres. Out of the total acreage, approximately 128,000 acres are forested; 193,000 acres are cropland; and 6,105 acres are surface water that are more than 40 acres in size.¹⁷ Waushara County is home to approximately 24,828 people, according to 2021 U.S. Census Bureau estimates.¹⁸

Waushara County lies within the Central Plain geographical province. The Central Plain of Wisconsin is a crescent-shaped belt covering about 13,000 square miles. All of it is floored by the weak Cambrian sandstone, except in the northwest where the removal of the sandstone has exposed the underlying Keweenaw lavas over a small area. The surface elevation ranges from 1,242 feet in the western part of the crescent to 785 feet in the central part of the plain and 685 feet near the eastern end of the lowland. The general slope is very gradual.

All the characteristics of the sandstone plain are normal to an inner lowland of a belted plain. The name inner lowland is used in connection with slightly dissected coastal plains. Where uplift takes place in a coastal plain, made up of alternate layers of weak and resistant rock which dip gently toward the ocean, it will be carved by streams and the weather.¹⁹

Waushara County is located in east central Wisconsin and is bordered by Portage and Waupaca Counties to the north; Marquette and Green Lake Counties to the south; Adams County to the west; and Winnebago County to the east.

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. Waushara County contains the Cities of Berlin (primarily in Green Lake County) and Wautoma; the Villages of Coloma, Hancock, Lohrville, Plainfield, Redgranite

¹⁶ Waushara County Comprehensive Plan

¹⁷ Waushara County Land and Water Resource Management Plan

¹⁸ <https://www.census.gov/quickfacts/fact/table/wausharacountywisconsin/PST045221>

¹⁹ <http://web.archive.org/web/20201129140804/https://www.wisconline.com/wisconsin/geoprovinces/centralplain.html>

and Wild Rose; and the Towns of Aurora, Bloomfield, Coloma, Dakota, Deerfield, Hancock, Leon, Marion, Mount Morris, Oasis, Plainfield, Poy Sippi, Richford, Rose, Saxeville, Springwater, Warren and Wautoma. See Appendix A for a map of Waushara 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 most recent glaciation of Wisconsin encompassed this area and left a variety of glacial features. Waushara County has a diverse landscape ranging from broad, flat outwash plains and lake basins to rough, broken glacial moraines and areas of pitted outwash. The western edge of the county is a flat outwash plain. A narrow moraine is on the eastern boundary of the plain and extends through the villages of Coloma, Hancock and Plainfield. To the east of the villages of Wild Rose, Wautoma and Richford, the area gradually flattens into a rolling plain. The eastern one-third of the county is a gently rolling lake plain.²⁰

Topography

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

The Northern Highlands, a plateau extending across northern Wisconsin, is an area of about 15,000 square miles with elevations from 1,000 to 1,800 feet. This area has many lakes and is the origin of most of the major streams in the state. The slope down to the narrow Lake Superior plain is quite steep. A comparatively flat, crescent-shaped lowland lies immediately south of the Northern

²⁰ Waushara County Land and Water Resource Management Plan

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.²¹

Evidence of several phases of the Wisconsin Glacier can be found in the county. The western edge of the County is a flat outwash plain. Central Waushara County (City of Wautoma, Village Wild Rose and surrounding towns) gradually flattens to a rolling plain as you move eastward across the county. The eastern third of the County is a gently rolling lake plain. Within Waushara County, land relief is approximately 390 feet, from a low of 750 feet above sea level near Poygan Marsh to a high of 1,137 feet at the Nordic Mountain Ski Hill (a granite monadnock located in the Town of Mount Morris). Less than ten percent (9.2%, 37,698 acres) of the County is classified as having slopes in excess of 12 percent. Steep slopes are scattered throughout Waushara County and are generally found in conjunction with moraines, drumlins, and other glacial features.²²

Climate

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

The average annual temperature varies from 39°F in the north to about 50°F in the south with statewide extreme records of 114°F (Wisconsin Dells, 7/13/1936) and minus 55°F (Couderay, 2/2/1996 & 2/4/1996). During more than one-half of the winters, temperatures fall to minus 40°F or lower and almost every winter temperatures of minus 30°F or colder are reported from northern stations. Summer

²¹ <https://extension.wisc.edu/>

²² Waushara County Comprehensive Plan

temperatures above 90°F average two to four days in northern counties and about 14 days in southern districts, including Waushara 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.

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

Demographics

cover acts as protective insulation for grasses, autumn seeded grains, alfalfa and other vegetation.²³

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.²⁴ Waushara County's growing season averages 133 days with a range of 115 to 152 days. Waushara County's median date of last frost in the spring is May 17 and the median date of the first frost in the fall is September 26.²⁵

Climate Normals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Ave Daily High (F°)	24.1	29.5	41.2	57.8	70.9	79.3	83.2	80.5	71.8	60.2	43.5	28.3
Ave Daily Low (F°)	3.7	7.8	20.2	33.3	44.4	53.8	58.6	56.3	48.5	38.1	25.6	10.3
Growing Degree Days	0	2	28	154	355	516	638	579	375	185	32	2
Heating Degree Days	1584	1296	1063	582	266	59	11	28	164	490	912	1417
Cooling Degree Days	0	0	0	0	40	107	194	133	17	0	0	0
Ave Precipitation (")	0.80	0.90	2.03	2.58	3.27	3.64	3.60	3.92	4.19	2.28	1.92	1.16
Ave Snowfall (")	10.9	9.3	9.8	2.6	0.1	0.0	0.0	0.0	0.0	0.4	4.3	11.6

Data from the weather station at Hancock Exp Farm, latitude 44°07' N, longitude 89°32' W, elevation 1076 ft.²⁶

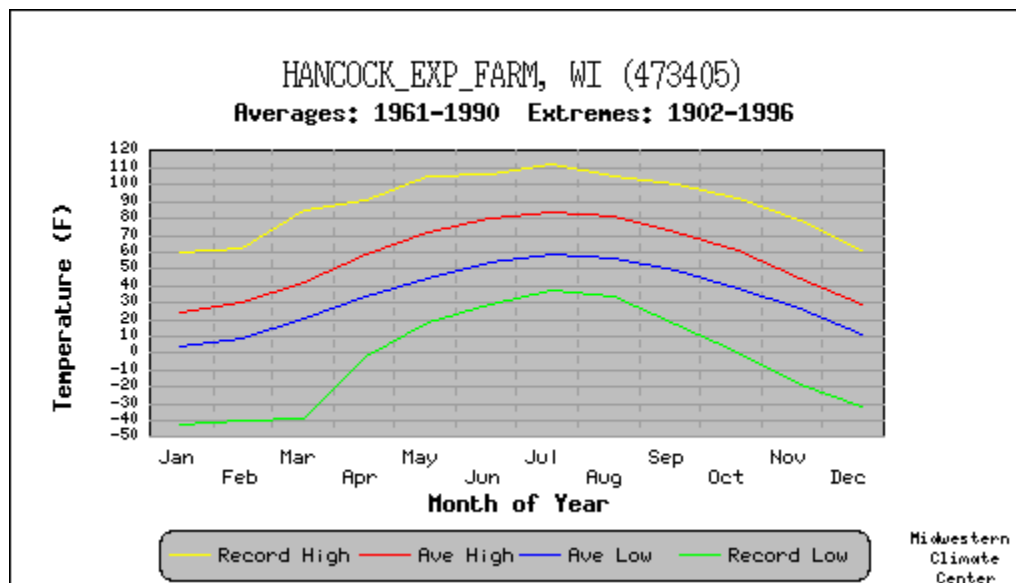
²³ <http://www.aos.wisc.edu/~sco/>

²⁴ <https://www.wisconline.com/counties/climatenotes.html> (currently archived)

²⁵ <https://www.wisconline.com/counties/climatenotes.html> (currently archived)

²⁶ <https://www.wisconline.com/counties/climatenotes.html> (currently archived)

Climate Normals and Growing Season Summary²⁷



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:

²⁷ Data Provided by the Midwestern Regional Climate Center <https://mrcc.illinois.edu>

- 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.²⁸

Climate change is defined as *“Changes in average weather conditions that persist over multiple decades or longer. Climate change encompasses both increases and decreases in temperature, as well as shifts in precipitation, changing risk of certain types of severe weather events, and changes to other features of the climate system.”*²⁹

The Climate Change Explorer³⁰ looks at the top climate concerns for the county using the 2018 National Climate Assessment. It compares projections for the middle third of this century (2035 to 2064) with average conditions observed from 1961 to 1990. Some concerns for the county, which are more thoroughly addressed in relevant chapters of this plan, include:

- Extreme temperatures in Waushara County have historically averaged 91°F. Extreme temperatures on the hottest days of the year are projected to increase by 8°F.
- Historically, the county has averaged 12 dry spells per year, which is defined as periods of consecutive days without precipitation. Projections show that number is not likely to increase.
- Intense rainstorms, those that drop two or more inches in one day, have averaged zero in the past and that count is not projected to increase.
- Changing seasonal patterns may affect agricultural productivity.

²⁸ *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>

²⁹ U.S. Global Change Research Program, 4th National Climate Assessment

³⁰ <https://crt-climate-explorer.nemac.org/>

The county can use the tool to explore further and to monitor changing conditions over the life of this plan. Future updates will include current data and address any significant changes to climate-related concerns. Population data showing potential Social Vulnerabilities is provided in the Demographics chapter of this plan.

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 rains of the thunderstorm type sometimes produce tributary flooding or flash flooding along the smaller streams and creeks.³¹

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

³¹ <https://extension.wisc.edu/>

discharge in the form of springs.³² The winter period normally lacks infiltration because of frozen ground.

The county is served by municipal water systems and private wells. Municipal water systems are located in the cities of Wautoma and Berlin, and the villages of Coloma, Hancock, Plainfield and Redgranite. Groundwater is the source of drinking water throughout the county. The majority of homes within Waushara County are served by private wells. Some private wells located in this area contain nitrate levels that are higher than the EPA Safe Drinking Water Act standards of 10 mg/L. Water sample tests from 1990 – 2001 revealed that 96 wells within Waushara County exceeded the 10 ppm threshold level for nitrate. For conversion purposes, 1 part per million (ppm) is the same concentration as 1 mg/L. Existing and new high capacity wells for irrigation, predominately in the western half of the county is causing tension between farmers and non-farmers, because of the fluctuation of surface water levels and the perceived connection between ground and surface water levels.

Low lake levels and poor groundwater quality in some areas have been concerns for Waushara County communities. Portions of Waushara County, especially the northwest portion, are particularly susceptible to groundwater quantity issues due to a regional groundwater divide. High capacity wells used by agricultural operations and incorporated communities may also cause greater strain on local supplies. In addition, the fish hatchery that was recently refurbished in the Wild Rose area by the DNR has caused additional concerns about the quantity of the local water supply.

The water quality in some parts of the county has degraded. Though the source of the problem remains unclear, a number of pesticides, herbicides and other fertilizers used in traditional agricultural practices have been found in the local water supply. The increase in nitrates, phosphorus and other chemicals in the water might be related to upstream agriculture production practices.³³

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

³² DeVaul, 1967.

³³ Waushara County Farmland Preservation Plan

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 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 NO₃-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 NO₃-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).³⁴ Waushara County has no open leaking underground storage tank (LUST) sites which have contaminated soil and/or groundwater with petroleum, which includes toxic and cancer-causing substances. Given time, petroleum contamination naturally breaks down in the environment. There are two 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 are no open spill sites.
- Concentrated Animal Feeding Operations (CAFO) - There are two concentrated animal feeding operations (i.e., greater than 1,000 animal units) in Waushara County.³⁵ 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

³⁴ <https://dnr.wi.gov/topic/Brownfields/botw.html>

³⁵ https://dnr.wi.gov/topic/AgBusiness/data/CAFO/cafo_cty.asp?CountyChoice=Waushara&Submit=Submit

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.³⁶

- Licensed Landfills and Superfund Sites – There are no licensed landfills and no Superfund sites in Waushara County.³⁷ ³⁸ In 1980, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as the Superfund law. The Superfund law created 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

³⁶ <https://dnr.wi.gov/topic/AgBusiness/CAFO/>

³⁷ https://dnr.wi.gov/topic/waste/documents/faclists/WisLic_SWLandfills_byCnty_withWaste.pdf

³⁸ <https://dnr.wi.gov/files/PDF/pubs/rr/RR005.pdf>

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, \$8,520,368 has been reimbursed by the PECFA fund to clean up 61 petroleum-contaminated sites in Waushara County.³⁹
 - Nitrate Removal Systems – No municipal water systems in Waushara 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.⁴⁰

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

³⁹https://docs.legis.wisconsin.gov/misc/lfb/informational_papers/january_2005/0059_petroleum_environmental_cleanup_fund_award_pecfa_program_informational_paper_59.pdf

⁴⁰https://wi.water.usgs.gov/gwcomp/find/Waushara/index_full.html

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 eight outstanding and 26 exceptional resource waters in Waushara County.⁴¹

Ten watersheds⁴² are contained completely or partially within Waushara County and are explained in greater detail in the Flooding and Dam Failure chapter of this plan.⁴³

Soil Types

Soils provide the physical base for development and agriculture within a community. Knowledge of their limitations and potential difficulties is important in evaluating crop production capabilities and other land use alternatives such as residential development and utility installation. The criteria considered by the Natural Resource Conservation Service (NRCS) in establishing the severe rating of soils include wetness, shrink-swell potential, bearing strength, susceptibility to flooding, land spreading, slope steepness and frost action. Severe soil limitations do not necessarily exclude areas from being developed, but instead indicate that more extensive construction measures must be taken to prevent environmental and property damage. Soils are classified according to their associations, which are a grouping of similar soil types based on geographic proximity, physical characteristics and permeability.⁴⁴

There are eight major soil associations within Waushara County:

Plainfield-Okee-Richford Association soils are sloping to steep sandy soils located on moraines, hills and terraces. Plainfield soils are rapidly permeable and excessively drained, while Okee and Richford soils are moderately permeable and somewhat excessively drained. Slopes range from 6 to 30 percent. While some of the Richford soils are used for cropland, most acreage in this association is used for woodlands. These soils are especially suited for pine species. This association is found in the central part of the county,

⁴¹ http://dnr.wi.gov/topic/SurfaceWater/oerw/orwerw_county.pdf

⁴² <https://dnr.wi.gov/water/watershedSearch.aspx>

⁴³ Waushara County Comprehensive Plan

⁴⁴ Waushara County Comprehensive Plan and Farmland Preservation Plan

from the outer moraine east through the area of drumlins and pitted outwash plans, stopping short of the area that includes the former lake plain.

Plainfield-Richford-Boyer Association soils are nearly level and gentle sloping soils that are well drained to excessively drained sandy soils located on outwash plains and terraces. Most acreage in this association is used as irrigated cropland; a few areas are suitable for woodlands. Soil erosion and very rapid permeability are the main concerns with this association. This association is found in the western part of the county from the outer moraine east and through the towns of Marion, Dakota and Mount Morris.

Kingsville-Meehan Association soils are nearly level and gently sloping soils that are poorly drained sandy soils located on glacial outwash plains, glacial depressions, and lake basins. Most of the acreage in this association is used as cropland; some areas are used as pasture or woodlands. Many of the areas are drained and used as irrigated cropland. The main concerns of this association are wetness and low available water capacity. This association is found in the western corner of the County in the towns of Plainfield and Hancock; and through the central portion of the County in the towns of Richford, Dakota, Wautoma, Springwater, Mount Morris and Leon.

Houghton-Adrian-Willette Association soils are nearly level poorly drained, mucky soils; located in depressions of outwash plains, glacial lake basins, and moraines. Most of the acreage in this association is used for water tolerant native vegetation; however a few areas can be drained and used for specialty crops. The main management concerns are wetness, subsidence when the soils are drained, and a short growing season caused by cold air flowing into depressions. This association is found in the central portion of the County in the towns of Richford, Dakota, Wautoma and Mount Morris; and in the eastern tier of the County in the towns of Warren, Leon, Saxeville, Aurora, Poy Sippi and Bloomfield.

Hortonville-Symco-Manawa Association soils are nearly level to sloping, well-drained to somewhat poorly drained, silty, loamy, sandy soils, located on moraines and in glacial lake basins. The majority of acreage in this association is used for cropland with some areas used as pasture or woodlands. The majority of soils in this association are poorly suited for septic absorptions fields. Soil erosion is the only major management concern for this association. This association is found in the eastern tier of the County in the towns of Warren, Leon, Saxeville, Aurora, Poy Sippi and Bloomfield.

Plainfield-Pearl-Leola Association soils are moderately well drained sandy soils which are nearly level to gently sloping. These soils are found in glacial outwash plains. The soils within this association range from well to moderately drained (Plainfield and Pearl) to poorly drained (Leola). Most of the acreage in this association is used as irrigated cropland with some areas used as pasture or woodlands. The main concerns of this association are low available water capacity, soil blowing and wetness. This association is found in the western corner of the county in the towns of Plainfield and Hancock and a small area in the Town of Dakota.

Poy-Zittau-Poygan Association soils are somewhat poorly to poorly drained, clayey and silty soils which are nearly level and gently sloping. These soils are found in depressions and drainageways in glacial lake basins and on moraines. Most of the acreage in this association is drained and used as cropland. Some areas are used as pasture or woodlands. The major management concerns are wetness and the low or moderate available water capacity. This association is found in the eastern tier of the County in the towns of Warren, Aurora, Poy Sippi and Bloomfield.

Morocco-Kingsville-Keowns Association soils are nearly level and gently sloping, to poorly drained, sandy and silty soils, located in drainageways and depressions in glacial lake basins. Most of the acreage in this association is used as cropland; however some areas are used as pasture or woodlands. The Morocco and Keowns soils are suited to trees, but the Kingsville soils are poorly suited to this use due to wet conditions during the growing season. The main management concerns are wetness, low available water capacity, and hazard of soil blowing in the areas of the Morocco and Kingsville soils. This association is found in small areas in the eastern tier of the County in the towns of Leon, Bloomfield, Warren and Marion.

The NRCS soil survey can provide very specific details on the county's soil types.⁴⁵

Wetlands

Wetlands perform many indispensable roles in the proper function of the hydrologic cycle and local ecological systems. In terms of hazard

⁴⁵ <http://websoilsurvey.nrcs.usda.gov/app/>

mitigation, they act as water storage devices in times of high water. Wetlands are able to absorb excess water and release it back into the watershed slowly, preventing flooding and minimizing flood damage. Wetland's capacity for stormwater storage becomes increasingly important as more impermeable surfaces are developed.

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.⁴⁶

Not including small tracts of wetland less than five acres, approximately 15 percent (59,964 acres) of Waushara County is classified as wetlands. They are scattered throughout the county and are generally associated with the county's stream corridors and lake shorelines, with the eastern part of the county having the largest concentration of wetlands.⁴⁷

In Waushara County, wetlands are regulated by the Wisconsin Department of Natural Resources and the Waushara County Zoning and Land 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 nesting sites, food and cover for waterfowl, small mammals and

⁴⁶ <https://dnr.wi.gov/topic/wetlands/>

⁴⁷ Waushara County Farmland Preservation Plan

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

County land use categories are agricultural, residential, commercial, industrial, transportation, utilities/communications, institutional facilities, recreational facilities, water features, woodlands and other open land. Waushara County encompasses approximately 407,914 acres. Approximately 8 percent (7.7%) of the total area is developed. Overall, cropland (irrigated and non-irrigated) accounts for 29 percent (29.1%) of the total land use; while woodlands (planted and unplanted) make up another 46 percent (45.5%).⁴⁸

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

Bass Lake Fen⁴⁹

Bass Lake features a 20-acre calcareous fen located on the undeveloped shore of Bass Lake. The fen is exceptionally diverse with many small springs, openings, and ponds providing a calcium-rich habitat that supports 125 species of plants. Several rare species adapted to the



alkaline conditions grow here including. Scattered shallow, marl-bottom ponds are dominated by needle spike rush, small bladderwort, grass-leaved pondweed, and Smith's bulrush. To the east, the fen grades into sedge meadow and the two communities are bordered on the north by tamarack swamp and on the south by shrub-carr. The five-acre Bass Lake is a clear fertile lake, some 27 feet deep, with a sandy marl bottom and a population of fern pondweed, a species not usually found in south or central Wisconsin. The lake's outlet stream is a small tributary to Little Lunch Creek and the Fox River drainage. The lake has a good warm water fishery and is an important waterfowl area. Sandhill cranes, which nest nearby, use the area extensively. Bass Lake is owned by the DNR and was designated a State Natural Area in 1983.

⁴⁸ Waushara County Comprehensive Plan

⁴⁹ <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=178>

Bohn Lake ⁵⁰

Bohn Lake is a 13-acre, 24-foot deep hard-water seepage lake that is part of a geologically significant tunnel channel. Often part of a larger tunnel valley system, a tunnel channel is a large cavern created by a meltwater river flowing beneath the glacial ice. As a seepage lake, the Bohn Lake shoreline fluctuates anywhere from four to six feet depending on the hydrologic cycle and in some dry years contains little water. In wet years, abundant vegetation grows in distinctive concentric rings around the lake due to its fluctuating nature. Each ring has a different combination of species



including numerous sedges, spike rushes, bulrushes, panic grasses, and silverweed. The lake also contains an abundance of floating leaved aquatics such as water-lilies. The uplands, especially those to the north, contain formerly grazed but highly restorable savanna. Many spring-blooming savanna indicators are present including shooting star and puccoon. Other plants include New Jersey tea, lance-leaved ground-cherry, Canadian milk-vetch, round-headed bush-clover, and hoary vervain. Animal life is diverse with birds such as turkey, tree swallow, northern oriole, great-crested flycatcher, eastern wood pewee, chipping sparrow, eastern bluebird, red-eyed vireo, and wood thrush. Numerous invertebrates also use the area and include white-faced pondhawk dragonfly and pearl crescent, red admiral, and banded hairstreak butterflies. Bohn Lake is owned by the DNR and was designated a State Natural Area in 2008.

Karner Blue Meadow ⁵¹

Karner Blue Meadow features a dry sand prairie that is home to a strong population of the federally endangered Karner blue butterfly (*Lycaeides melissa samuelis*). The Karner blue is one of many plants and animals native to the sandy oak savannas and dry prairie habitat that have declined dramatically over the past several decades. Historically, the Karner blue occurred from eastern Minnesota, across the Great Lakes and into New England but has now disappeared from numerous states due to habitat loss, fragmentation, and a lack



⁵⁰ <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=530>

⁵¹ <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=327>

of natural disturbance, such as wildfire. The Karner blue is restricted to habitats that contain wild lupine, a beautiful purplish-blue flowering plant -the larval butterfly's only food plant. A plant of dry sand prairies and other open communities, lupine is abundant throughout this natural area. Other plants include blazing-star, flowering spurge, wormwood, spiderwort and New Jersey tea. The natural area borders Bonneville Lake, a 15-acre seepage lake surrounded by marshy vegetation. The lake supports a diverse aquatic invertebrate fauna, including several species of dragonflies. The Wisconsin DNR is working in conjunction with multiple corporate and private landowners to ensure that management activities, such as fire, brushing, and mowing, help ensure the long-term protection of the Karner blue butterfly. Karner Blue Meadow is owned by the DNR and was designated a State Natural Area in 1998.

Lunch Creek Wetlands ⁵²

Lunch Creek Wetlands contains one of the most diverse and species rich sedge meadows in Wisconsin situated within a mainly undisturbed watershed, an uncommon occurrence in Wisconsin. This large wetland complex is free of exotic species and dominated by fen



and sedge meadow communities containing a total of 115 plant species. Many uncommon species are present including fringed gentian, Kalm's lobelia, and grass-of-parnassus. Wetland air photos show patterning - a rare phenomenon seen only at two other natural areas in Wisconsin-Cedarburg Bog and Bogus Swamp. The patterning is evident on the ground where high and low areas often show dramatic differences in plant species presence with wire grass sedges found in lower "impoundment" areas and a forb dominated sedge meadow directly adjacent to it. A fen-like meadow emanates from the uplands and upland islands surrounding the lower areas. Much of the meadow is dominated by wiregrass and blue-joint grass with other species including marsh milkweed, spring-cress, marsh thistle, boneset, swamp loosestrife, swamp lousewort, prairie blazing-star, and mountain mint. The area also provides ideal habitat for grassland and wetland birds. Over 5,000 sandhill cranes roost here in October and early November. Lunch Creek Wetlands is owned by the DNR and was designated a State Natural Area in 2000.

⁵² <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=333>

Mecan Springs ⁵³

Situated in the bottom of a moraine depression, Mecan Springs protects the large clearwater springs which are the headwaters to the Mecan River. The river is a hardwater stream that flows southeasterly through Marquette County and into Green Lake County where it joins the Upper Fox River. A



Class I trout stream, the Mecan River system contains some of the finest trout streams in central Wisconsin and supports excellent natural trout reproduction in the small, upstream gravel bottom pools and long-run riffle areas. Fen vegetation is present in the saturated soils of the Mecan Springs area. Sandhill cranes, northern bobwhite quail, and bald eagle use the area. Mecan Springs is owned by the DNR and was designated a State Natural Area in 2002.

Plainfield Tunnel Channel Lakes ⁵⁴

The Plainfield Tunnel Channel Lakes provide specialized habitat for one of a rare member of the bean family which grows here and nowhere else. It is adapted to the sandy shores of shallow seepage lakes whose shorelines fluctuate widely over months or years depending on rainfall and drought patterns. When the shore is exposed,



seeds in the seed bank germinate, grow, flower, and drop seeds. The plant requires open, sunny habitat and relies on periodic flooding to kill shade-producing trees that invade the shoreline in dry years. The plant survives inundation - up to years at a time - by persisting in the lake bottom's seed bank until the water levels drop. Protected are the shorelines of three lakes in a string of 13 lakes and ponds lying in a "tunnel channel" created by a meltwater river flowing beneath the glacial ice. The lake basins were created from buried blocks of ice left behind when the tunnel collapsed. Why the rare plant is endemic to Central Wisconsin is unknown but it may be related to the effects of the glacial lake, which once covered the area 10,000 years ago. While shading and competition by trees and other plants

⁵³ <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=370>

⁵⁴ <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=226>

are the primary natural threats, trampling by humans and disturbance from off-road vehicles pose far more serious threats to these sensitive plants. Plainfield Tunnel Channel Lakes are owned by the DNR and were designated a State Natural Area in 1990.

Upper Fox Headwaters⁵⁵

Upper Fox Headwaters contains three distinct units: Zinke Lake, Upper Chaffee Creek Meadow, and Caves Creek. Zinke Lake is a small hard water spring lake with a tamarack-dominated shore. The water is deep, clear, and cold with limited aquatic vegetation that



includes common horsetail, common pondweed, chara, and water milfoil. The spring outlet has a soft sandy bottom and contains white water crowfoot. Other plants include marsh-marigold, lousewort, cow parsnip, ironweed, bulbet water-hemlock, showy goldenrod, and Missouri goldenrod. The lake's outlet stream is also used by brook trout for spawning. Upper Chaffee Creek Meadow contains a wetland complex of fen, wet-mesic, and wet prairie with over 100 native plant species present. Running through the site is Chaffee Creek. The creek valley varies between very wet sedge meadow through fen-like areas along the gentle slope north of the creek and grading to wet-mesic prairie. Grasses include big and little blue-stem, blue-joint grass, and slender wheat grass. Featured forbs are marsh pea, Michigan lily, western sunflower, pale-spike lobelia, Kalm's lobelia, grass-of-parnassus, marsh fern, and swamp lousewort. Caves Creek contains spring seeps and runs, a 2-acre spring pond, sedge meadow and tamarack swamp, and oak barrens. The spring seeps are floristically rich and are surrounded by a diversity of wetlands. The barrens lies on a south-facing slope and contains a good diversity of prairie species including little blue-stem, June grass, flowering spurge, and bird's-foot violet. Upper Fox Headwaters is owned by the DNR and was designated a State Natural Area in 1998.

Vegetation

Oak savanna. East: sugar maple, basswood and elm, and small areas of sedge meadow.⁵⁶

⁵⁵ <https://dnr.wi.gov/topic/Lands/naturalareas/index.asp?SNA=265>

⁵⁶ <http://www.wisconline.com/counties/Waushara/index.html> (currently archived)

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.

The earliest inhabitants of Waushara County were Native Americans. Considerable evidence of their civilization has been found in the county. A total of 332 mounds, 49 camp and village sites, two spirit stones, two cemeteries, and several other archeological sites have been identified within the County.⁵⁷

Population

In the 2010 U.S. Census, the county was home to 24,496 people and according to the 1 July 2021 U.S. Census Bureau estimate⁵⁸, there

⁵⁷ Waushara County Comprehensive Plan

⁵⁸ <https://www.census.gov/quickfacts/fact/dashboard/Wausharacountywisconsin,US/PST045219>

were 24,828 people residing in Waushara County for an increase of 1.4%.

According to the 2016-2020 U.S. census estimate, there were 10,053 households in Waushara County with an average of 2.28 people per household. The 2016-2020 U.S. census numbers indicate that the median household income was \$54,320 and that the per capita income is \$29,296. Approximately 10.5% of the people live below the poverty line. The 2021 census estimate also indicated that there were approximately 14,777 housing units within the county as of 1 July.

According to the U.S. Census report, the majority of people in Waushara County reported that they were white (94.8%) with 88.9% 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 1.4%. American Indians account for 0.9% of the population of Waushara County. Black or African American alone was 2.3% and Asian alone was 0.6%.

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: 4.3%
- People under 18 years old: 18.1%
- People over 65 years old: 25.3%
- Females: 46.9%
- Foreign born: 2.5%
- People with a disability, under 65 years old: 10.5%

The Climate Change Explorer⁵⁹ utilizes U.S. Census data to find disadvantaged communities that may suffer extreme adverse impacts due to climate change and/or natural hazards. Additional data can be found by clicking on the link to Explore Neighborhoods at Risk.

Waushara County contains the Cities of Berlin (primarily in Green Lake County) and Wautoma; the Villages of Coloma, Hancock, Lohrville, Plainfield, Redgranite and Wild Rose; and the Towns of Aurora, Bloomfield, Coloma, Dakota, Deerfield, Hancock, Leon,

⁵⁹ <https://crt-climate-explorer.nemac.org/>

Marion, Mount Morris, Oasis, Plainfield, Poy Sippi, Richford, Rose, Saxeville, Springwater, Warren and Wautoma.

Transportation Network

Waushara 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.

Although private vehicles are the primary mode of transportation in Waushara County, there are several biking and pedestrian opportunities available to the residents and visitors. The primary transportation system consists of a hierarchal network of state and county highways, as well as other local roads and streets that pass through or near the county. The entire transportation network in Waushara County is comprised of 1,331 miles of local roads, county highways, interstate and state highways. County highways compromise about one quarter (25.1%) of the road network.⁶⁰

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.⁶¹ Waushara County roads and their classifications include:
⁶² ⁶³

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

- Interstate 39
- WI Highway 21

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.

⁶⁰ Waushara County Comprehensive Plan

⁶¹ <https://wisconsin.gov/Pages/projects/data-plan/plan-res/function.aspx>

⁶² <https://wisconsin.gov/Documents/projects/data-plan/plan-res/functional/rural/waushara.pdf>

⁶³ Waushara County Comprehensive Plan

- WI Highway 73
- WI Highway 22
- WI Highway 49

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.

- County Road V
- County Road C
- County Road CH
- County Road GG
- Main Street (Village of Hancock)
- County Road BB
- County Road P
- County Road J
- WI Highway 152
- Division Street (City of Wautoma)
- County Road A
- County Road H
- County Road G
- County Road W
- 21st Lane
- County Road F
- County Road E
- County Road EE
- County Road XX
- County Road D
- County Road I

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 CC (Town of Coloma)
- 4th Avenue (Town of Coloma)
- County FF
- South Main Street (Village of Hancock)
- East South Lake Street (Village of Hancock)

- County O
- County V
- County B
- 10th Drive (Town of Oasis)
- Apache Avenue (Town of Oasis)
- County J (Town of Oasis)
- 10th Court (Town of Richford)
- Czech Road (Town of Richford)
- County JJ
- County AA
- County Y
- County YY
- County K
- County W
- Archer Lane (Town of Springwater)
- 24th Avenue (Town of Springwater)
- Aspen Avenue (Town of Springwater) and Aspen Court (Town of Saxeville)
- County S
- County EE (Village of Lohrville)
- County N
- County TT (Town of Saxeville)
- County NN (Town of Saxeville)
- County A
- County M
- County HH (Town of Bloomfield)
- County XX
- 34th Road (Town of Aurora)
- County X (Town of Aurora)

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.

The four airports most convenient to Waushara County residents that provide scheduled commercial air service are Central Wisconsin Regional Airport in Mosinee; Outagamie County Regional Airport in Appleton; Dane County Regional Airport in Madison; and Austin Straubel Airport in Green Bay.

Other airports/airfields offering a lesser range of services include those in Oshkosh, Stevens Point, Wisconsin Rapids, Wautoma, Waupaca and Wild Rose.

Two Basic Utility airport facilities are located in Waushara County. A Basic Utility (BU) airport is capable of handling single engine piston aircraft and smaller twin engine aircraft. Basic Utility airport facilities are sub-classified as class B (BU-B) and class A (BU-A) according to the gross weight and wingspan of the aircraft. These aircraft typically seat up to six persons and are used for private corporate travel, charter flying, recreational flying and crop dusting.

The Wautoma Municipal Airport is a BU-B facility located southwest of the City of Wautoma in the Town of Dakota. The airport has two paved runways measuring 1,190 feet and 3,300 feet in length and a turf runway measuring 2,280 feet. Aircrafts with gross weights of less than 12,500 pounds and wingspans less than 49 feet can be accommodated at this airport. Besides serving local air needs, the airport is utilized by pilots attending the annual EAA fly-in in Oshkosh. The Wild Rose Idlewild Airport is BU-A facility. The airport can accommodate aircraft with gross weights less than 6,000 pounds and wingspans less than 49 feet. A helipad is also located at the Wild Rose Community Memorial hospital for “flight for life” emergencies.

Several private airports are located throughout Waushara County. Private facilities are generally characterized by short (2,500 to 3,000 feet) turf covered runways. Private runways primarily provide services for recreational flyers.

Rail service to Waushara County was discontinued several decades ago. The nearest rail service is available at Stevens Point, which is a division headquarters for the Canadian National railroad. Other rail lines include the Union Pacific, which passes through southern Marquette County; and the Canadian Pacific Railway, which has a major yard facility in Portage. All three lines generally connect Chicago with the Twin Cities and points westward. Amtrak utilizes the Canadian Pacific line to provide passenger service.

There are no commercial ports in Waushara County. The nearest commercial port is located in Green Bay. Passenger ferries are

located in Manitowoc and Milwaukee. Both ports offer passage across Lake Michigan to Lower Michigan.

There is no scheduled bus service within the county. However, the Department of Aging administers two programs on a county-wide basis that serve the elderly and disabled residents of Waushara County. These two programs are a volunteer driver program and a mini-bus program. The mini-bus program is based in the City of Wautoma and provides transportation for both medical and personal trips. Other members of the public can also utilize the mini-bus if space is available. ⁶⁴

Land Use and Development Trends

Land use is an important determinant in the potential impact a particular hazard may have, and an action which may be taken to mitigate the hazard impacts. An understanding of the amount, type and spatial distribution of urban and rural land uses within the county is an important consideration in the development of a sound hazard mitigation plan.

The dominant land use in Waushara County is agriculture and forestry. Land area in the county is approximately 34 percent forested, comprised of 139,802 acres of woodland. Agricultural land covers another 28.8 percent of the county's land area. The main agricultural practices are irrigated vegetables, silvaculture (Christmas trees) and dairy farming. Agriculture is scattered throughout the county but much of it is located on the western side.

Land in residential development makes up approximately 4 percent of the total county area. Residential concentrations are scattered throughout the county. Much of the scattered rural development is related to direct recreational demand as various types of housing have clustered along streams and lakes. Between 1990 and 2000, residential densities increased throughout the county and the state. During this time period, residential densities in the county increased by about 12 percent from 19.56 units per square mile to 21.83 units per square mile.

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

⁶⁴ Waushara County Comprehensive Plan

assessment data classifies the land use in Waushara 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 2021 WDOR
Waushara County Tax Assessment Data ⁶⁵**

Land Use Category	2020 Equalized Value	2021 Equalized Value	Percent Change
Agricultural	\$23,948,700	\$24,913,900	4%
Agricultural Forest	\$39,500,000	\$40,603,200	3%
Forest	\$162,999,500	\$164,268,300	1%
Residential	\$2,195,005,100	\$2,359,248,700	7%
Commercial	\$199,018,900	\$204,458,900	3%
Manufacturing	\$22,114,800	\$22,308,400	1%
Undeveloped	\$53,143,800	\$51,930,500	-2%
Other	\$130,278,400	\$135,206,700	4%

⁶⁵ <https://www.revenue.wi.gov/SLFReportsassessor/2021socWaushara.PDF>

Total	\$2,826,009,200	\$3,002,938,600	6%
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There were no large-scale projects identified for future development within the county.

Public Safety Support

The type and location of public emergency services are important considerations in hazard mitigation planning because of the potential direct involvement of such facilities in certain hazard situations. The location of these services are shown on maps in Appendix A.

To coordinate these services, Waushara County has created an emergency operations plan (EOP). The plan provides a general overview for county and municipal emergency response personnel during response to a number of disasters. This document serves to coordinate the county and local units of government during times of response and recovery. It also provides a link between the county and municipal plans.

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

Medical

The Waushara 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 hospital serves Waushara County and its residents:

- Thedacare Medical Center - Wild Rose, Inc.

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.

Ambulance Service

Waushara 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 Waushara County provide ambulance service:⁶⁶

- Berlin Emergency Medical Service
- Coloma Volunteer Fire Department First Responders
- Marion Area First Responders
- New Berlin (City of) Fire Department
- Pella First Responders
- Plainfield Fire Department First Responders
- Poy Sippi Volunteer Fire Department
- Redgranite Area Fire District First Responders
- Saxeville Springwater Volunteer Fire Department
- Waushara County Emergency Medical Services
- Wautoma Area Fire District First Responders
- Wild Rose Fire Department First Responders

Each of these departments provides monthly training to their staff and they participate in periodically scheduled disaster exercises with other area healthcare providers, emergency medical services, law enforcement, fire services and emergency management.

Fire Service

There are 11 fire departments that serve areas of Waushara County. A map showing the location of each of the fire service areas can be found in Appendix A.

- Berlin (located outside of the county)

⁶⁶ <https://www.wi-emss.org/lms/public/portal#/lookup/service>

Demographics

- Coloma
- Hancock
- Neshkoro (located outside of the county)
- Plainfield
- Poy Sippi
- Saxeville
- Redgranite
- Wautoma
- West Bloomfield/Tustin
- Wild Rose

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 Waushara County Sheriff's Department provides service to all the towns and villages for law enforcement and also provides dispatch services to the entire county. The following departments supplement the Sheriff's Department:

- Coloma Police Department
- Hancock Police Department
- Marion Town Police Department
- Plainfield Police Department
- Redgranite Police Department
- Wautoma Police Department
- Wild Rose Police Department

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 Waushara 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 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.⁶⁷ See the Waushara County Law Enforcement District Map in Appendix A for district boundary details.

Special Teams

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.⁸⁰ Hazardous materials response in Waushara County is performed by Type II and Type III Teams.

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.

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

Archaeological and Historical Resources

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

Historic Sites		
Historic Site Name	Address	Municipality
Kimball, Alanson M., House	204 Middleton St.	Pine River
Waushara County Courthouse, Waushara County Sheriff's Residence and Jail	209 St. Marie St.	Wautoma
Whistler Mound Group	(address restricted)	Hancock

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.

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

Hazard Analysis and Previous Mitigation Projects

The following sections identify those hazards that have occurred or could occur in Waushara 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. It should be noted that there have been no changes in the county or participating jurisdictions since the last plan update.

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 Waushara 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*	Location (if the risk is not equal for the entire jurisdiction)	Misc. Notes
Drought and Dust Storms	Drought – Medium Dust - Medium	Drought – Crop - Medium Other - Low Dust – Low	Equal	Serious accident on I-39 in 2020 (30+ cars) opened a FAC for victims. Dust from potato fields before crop cover. Much of co is forested or not impacted – localized to western part.
Earthquake	Low	Low	Equal, Appendix A	
Flood – Flash Flood & River Flood	Flash – High Riverine - Medium	Flash – Medium Riverine – Medium	88-99, Appendices A & B	Wautoma has a lot of road flooding in rains. Many of the roads have had infrastructure improvements (but not at hwy). City hall has flooded – the pipe there may be undersized. Received CDBG grants to update the Prairie area. Fast snow/ice melt causes road flooding

Hazard Analysis and Previous Mitigation Projects

Hazard	Likelihood of Occurrence *	Severity of Effects if It Does Happen*	Location (if the risk is not equal for the entire jurisdiction)	Misc. Notes
				(very flat) 50+” in 72 hrs. Riverine – Fox River in SE corner of Co. 2+ mi Town of Aurora, N City of Berlin. South side is worst problem (N side is marsh, etc.) TN Wautoma – high water near homes but drains
Flood – Dam Failure	Medium – varies by dam and its engineering & maintenance	Low – but varies by dam	88-99, Appendices A & B	Recently upgraded several dams but some are still in poor shape
Fire – Forest and Wildfire	Medium	Medium	109-111, Appendix A	Have had a lot of moisture – growing undergrowth. DNR has been busy managing open lands.
Severe Temperatures	High	Medium – county has a high pop of elderly and economically disadvantaged	Equal	
Storms: Hail	High	Low generally but higher (medium) for crops, roof, siding, cars	Equal	
Storms: Lightning	Very high	Low	Equal	Some power outages every year.

Hazard Analysis and Previous Mitigation Projects

Hazard	Likelihood of Occurrence *	Severity of Effects if It Does Happen*	Location (if the risk is not equal for the entire jurisdiction)	Misc. Notes
Storms: Thunderstorm	Very high	High	Equal, Appendix B	Power outages 2017 – severe hundred \$K in damages (forest) to straight-line winds
Storms: Tornadoes and High Winds	Medium	High	137-139, Appendix B	Tornado in 2019 & 2020 – no damage
Storms: Winter	High	Snow – Medium Ice – High	Equal	
Utility Failure	Medium-High	Med-High	Equal	Every summer, a couple of power outages happen per yr (usually wind damage) Short duration normally but a wind storm can cause more wide-spread damage that takes longer to recover CI Wautoma is in very, very good shape – has done upgrades in utilities.

*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 National Risk Index (NRI) is an online tool provided by the Federal Emergency Management Agency (FEMA) which uses the best available source data to help illustrate communities most at risk of natural hazards. It calculates a baseline relative risk measurement for 18 natural hazards based on expected annual loss, social vulnerability and community resilience.

Although 18 natural hazards are part of this data, some have no value as they do not pose a risk to Waushara County; or are otherwise not specifically addressed in this plan.⁶⁹ Information for the remaining NRI hazards is included in the relevant chapters.

It should be noted that the NRI information may not necessarily match the hazard ratings above and is only being included for reference. General county statistics are below. The data is current as of November 2021.

⁶⁹ Hazards from the NRI data that are not included in this plan: Avalanche, Coastal Flooding, Hurricane, Landslide, Tsunami and Volcanic Activity.

Hazard Analysis and Previous Mitigation Projects

Ratings Summary

Risk Index	Very Low
Expected Annual Loss	Very Low
Social Vulnerability	Relatively Moderate
Community Resilience	Relatively Moderate

Risk Index Overview

Rating	Very Low
Score	7.79
National Percentile	10.60
State Percentile	7.34

Social Vulnerability

Rating	Relatively Moderate
Score	37.21
National Percentile	38.25
State Percentile	35.53

Community Resilience

Rating	Relatively Moderate
Score	54.63
National Percentile	54.59
State Percentile	56.91

Expected Annual Loss

Rating	Very Low
Score	9.90
National Average	13.33
State Average	10.85
Total (\$)	2,184,436.17
Building Value (\$)	1,171,093.39
Population Fatalities	0.11
Population Equivalence (\$)	854,050.78
Agricultural Value (\$)	159,292.00

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 Waushara County Office of Emergency Management is committed to working with municipalities and the private sector to ensure that county mitigation information is shared and it is incorporated into their planning as appropriate.

Each community will be given a copy of the plan to use as a reference during their own preparedness activities (i.e., planning, training, permitting, zoning). Communities that have 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 Waushara County Zoning and Land Conservation Department; others have their own planning departments. Members of the Waushara County Zoning and Land Conservation 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.

Waushara 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).⁷⁰

CDBG Emergency Assistance Program (EAP) Projects:

- EAP #05-03, Berlin City, Green Lake and Waushara Counties \$356,314 - Rehabilitation of damaged housing units, replacement of wells/septic systems and water/sewer lines, construction of replacement housing units, demolition and clearance of hazardous structures, and acquisition/relocation.

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

- **HMGP** - The Hazard Mitigation Grant Program (HMGP) is authorized by Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended. The key purpose of HMGP is to ensure that the opportunity to take critical mitigation measures to reduce the risk of loss of life and property from future disasters is not lost during the reconstruction process following a disaster. HMGP is available, when authorized under the Presidential major disaster declaration is available in all areas of the state following a Presidential disaster declaration.⁷¹

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

- DR-959 1992 Waushara County (\$38,868) – Geographic Information System (GIS) mapping of an area of the 100-year floodplain of the Pine River.
- **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,

⁷⁰ https://www.hud.gov/program_offices/comm_planning/communitydevelopment

⁷¹ <http://www.fema.gov/hazard-mitigation-grant-program>

while also reducing reliance on Federal funding from future major disaster declarations.⁷²

Pre-Disaster Mitigation (PDM) Projects and/or Plans Funded in Waushara County⁷³

- 2002 WEM All \$15,520 Technical assistance Personnel, travel, and supplies
- 2003 WEM All \$32,834 Technical assistance Personnel, travel, and supplies
- 2003C WEM All \$176,812 Technical assistance Personnel, travel, and supplies
- 2005C Waushara County \$37,000 – Plan is approved
- 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
- 2009C WEM All \$25,579 Technical assistance Personnel, travel, and supplies
- 2010C WEM All \$47,859 Technical assistance Personnel, travel, and supplies
- 2013C Waushara County \$40,500 – Update, plan is approved

⁷² <http://www.fema.gov/pre-disaster-mitigation-grant-program>

⁷³ Note that several grants to the State of Wisconsin/WEM are listed when searching for Waushara 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.

- **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.⁷⁴
- **FMA** - The Flood Mitigation Assistance (FMA) program is authorized by Section 1366 of the National Flood Insurance Act of 1968, as amended with the goal of reducing or eliminating claims under the National Flood Insurance Program (NFIP). The Repetitive Flood Claims (RFC) program has the goal of reducing flood damages to individual properties for which one or more claim payments for losses have been made under flood insurance coverage and that will result in the greatest savings to the National Flood Insurance Fund (NFIF) in the shortest period of time.⁷⁵
- **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.⁷⁶
- **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.⁷⁷

⁷⁴ [Building Resilient Infrastructure and Communities | FEMA.gov](https://www.fema.gov/building-resilient-infrastructure-and-communities)

⁷⁵ [http://www.fema.gov/flood-mitigation-assistance-program](https://www.fema.gov/flood-mitigation-assistance-program)

⁷⁶ [http://www.fema.gov/severe-repetitive-loss-program](https://www.fema.gov/severe-repetitive-loss-program)

⁷⁷ [http://www.fema.gov/repetitive-flood-claims-program](https://www.fema.gov/repetitive-flood-claims-program)

- **406 Mitigation** – The Public Assistance-Section 406 Mitigation Funding may be considered by FEMA in a federal disaster declaration to fund mitigation measures to a public facility damaged by the event that enhance the facility's ability to resist similar damage in future events. This funding is authorized under Section 406 of The Robert T. Stafford Disaster Relief and Emergency Assistance Act and provides discretionary authority to fund mitigation measures in conjunction with the repair of the disaster-damaged facilities, which usually present themselves during the repair efforts. The mitigation measures must be related to eligible disaster-related damages and must directly reduce the potential for future, similar disaster damages to the eligible facility. This work is performed on the parts of the facility 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.⁷⁸
- **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.⁷⁹ Waushara County has not received any grants under this program.
- **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.⁸⁰ Waushara County has not received any dam removal grants.

⁷⁸ <http://www.fema.gov/public-assistance-local-state-tribal-and-non-profit/hazard-mitigation-funding-under-section-406-0>

⁷⁹ <http://dnr.wi.gov/Aid/MunFloodControl.html>

⁸⁰ <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 Waushara 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 Waushara 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

Waushara 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

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. Waushara 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, the mass notification system, 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. Many municipalities promote the mass notification system by including letters with tax and utility bills; and on their websites and social media. 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 Waushara County's Emergency Operations Plan which is reviewed and updated on a regular schedule.

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

- Sirens to warn the public. Waushara 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. They will also promote the program as needed and necessary.

- Telephone and public-safety banded two-way radio infrastructure for public agency personnel.
- Local television, radio and newspaper connections to spread warning information.

Website

The County Emergency Management Office also has a general webpage 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 and municipalities 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 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)

Waushara 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.
- Develop a Plan Implementation Steering Committee to monitor progress on mitigation strategies using the final appendix of this revised plan (Appendix E).
- Provide information and guidance to increase community awareness of and resilience to climate change impacts, to include educating residents about the causes and effects of

climate change, how it affects the residents, and what they could be doing to help improve the situation.

- Encourage residents and businesses to conserve energy whenever possible.
- Incorporate recommendations of this plan into the county's Comprehensive Plan.
- Coordinate with county business owner groups to help encourage business continuity planning.
- Analyze county and municipal fire and police stations to make sure they are hazard resistant.
- Ongoing maintenance and updating of disaster plans and property value information as needed.
- Continue to mobilize weather spotters.
- Continually update countywide maps (aerial photos, parcels, building footprints, critical facility locations, etc.).
- Install/maintain quick-connect emergency generator hook-ups for critical facilities.
- Coordinate with local businesses to develop mutual aid agreements.
- The Village of Coloma will continue funding the volunteer Fire Department and continue the use of weather spotters.
- The Village of Plainfield will continue funding the volunteer Fire Department, including upgrades of equipment.
- The Village of Wild Rose will work with the county on updates to this plan.
- The Village of Redgranite will keep an updated list of resources and coordinate with mutual aid groups and private contractors in the area.
- The Village of Plainfield will contact local businesses with the availability of equipment the Village could get for help with storm damage. The Village has a plan that lists contractors they would use during emergencies and disasters.

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 Waushara County, there has never been a recorded dust storm event, although dust from potato fields caused a serious accident on I-39 in 2020 involving 30 or more vehicles and resulted in the opening of a Family Assistance Center. Most of the county is forested and not impacted; dust is localized to the western part of the county. Since natural hazards that have occurred in the past are more likely to occur in the future, there is a medium likelihood that a dust storm event will occur in Waushara County and a low impact if a dust storm did happen. 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.⁸¹

SPI Values ⁸²	
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

⁸¹ <https://www.ncdc.noaa.gov/temp-and-precip/drought/nadm/indices/spi/div#select-form>

⁸² <https://drought.unl.edu/ranchplan/DroughtBasics/WeatherandDrought/MeasuringDrought.aspx>

terms of negative numbers and excess moisture is reflected by positive figures. The future incidence of drought is highly unpredictable and may also be localized, making it difficult to determine probability with any accuracy.

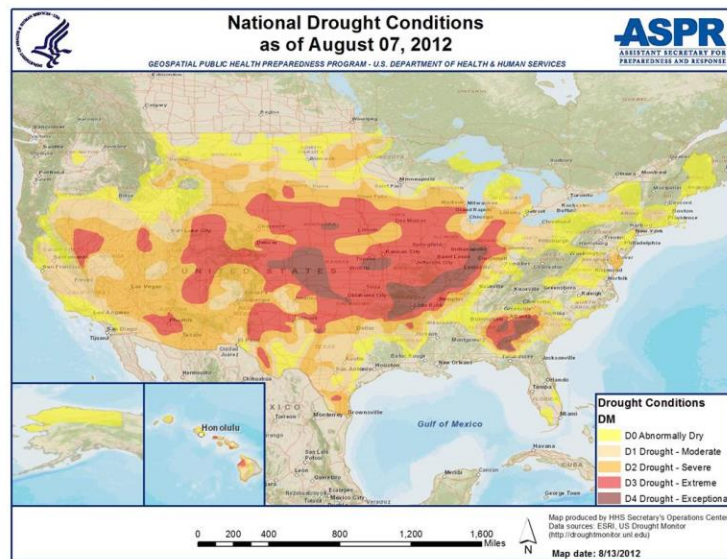
Drought conditions may vary from below-normal precipitation for a few weeks to a severe lack of normal precipitation for several months. Drought primarily affects agricultural areas because the amount and timing of rainfall has a significant impact on crop production. The severity of a drought cannot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

Frequency of Occurrence

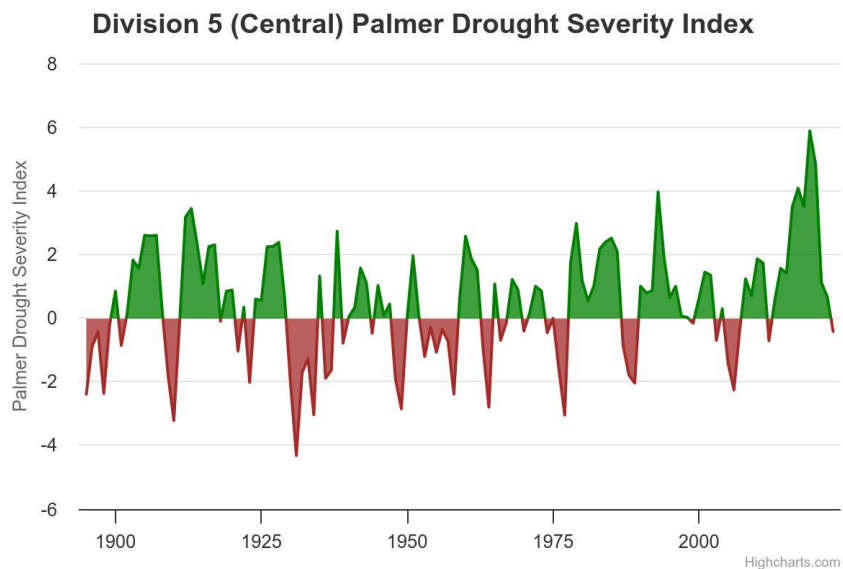
Drought is a relatively common phenomenon in Wisconsin and has occurred statewide in 1895, 1910, 1939, 1948, 1958, 1976, 1988, 1992, 2003, 2005 and 2012. The 1976 drought received a Presidential Emergency Declaration with damage to 64 Wisconsin counties, including Waushara. Estimated losses of \$624 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 Waushara County in the D2 – Severe Drought category.⁸³

⁸³ 2012 Heat & Drought Federal Report, HHS ESF 8, UPDATE #2, U.S. Department of Health and Human Services, Assistant Secretary for Preparedness and Response



The Palmer Index chart for the years between January 1895 and June 2022 in Central Wisconsin, which includes Waushara County,⁸⁴ follows:⁸⁵



As can be seen from the frequency table above, Waushara County regularly experiences drought to at least a moderate level two to three times every ten years. While drought is a regular occurrence, it is generally very difficult to predict with any accuracy but according

⁸⁴ Note that while Waushara County is considered to be in the East Central region by most agencies, for this study, it was included within the Central Wisconsin region.

⁸⁵ <https://www.aos.wisc.edu/~sco/clim-watch/graphics/pdsi-ts-05-l.gif>

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, groundwater, and crop data to perform short-term and long-term forecasts.”⁸⁶

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 Waushara County can be found in Appendix B.

Considering past occurrences, it can be surmised that Waushara County has a medium probability of drought occurrence in the near future, and the likelihood of damage due to drought is considered medium for agricultural losses and low 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.

It should also be noted that Waushara County, like the rest of the world, is experiencing a changing climate. The University of Wisconsin-Madison, Nelson Institute for Environmental Studies has partnered with the Wisconsin Department of Natural Resources to publish information in the Wisconsin Initiative on Climate Change Impacts.⁸⁷ This study shows a scientific consensus that, “Wisconsin is likely to become a much warmer state over the next few decades, with average temperatures more like those currently experiences in states hundreds of miles to our south.” Additionally, “our state is also likely to become somewhat wetter, with a modest increase in total precipitation and in the number of intense rainfall events. The amount of climate change varies by season, with winter experiencing the greatest warming and most likely increase in precipitation.” The site’s information shows that Waushara County is likely to experience warmer weather and an increase in precipitation for all four seasons of the year, with the greatest increases in winter and summer. This will likely reduce the impact of drought in the future.

As noted earlier in this plan, the National Risk Index (NRI) tool ⁸⁸ has been made available by the Federal Emergency Management

⁸⁶ State of Wisconsin Hazard Mitigation Plan

⁸⁷ [Trends and Projections | Wisconsin Initiative on Climate Change Impacts \(WICCI\)](#)

⁸⁸ <https://hazards.fema.gov/nri/map>

Agency (FEMA). It calculates a baseline relative risk measurement for 18 natural hazards based on expected annual loss, social vulnerability and community resilience. Below is data relevant to the hazard discussed in this chapter. It should be noted that the NRI information may not necessarily match the hazard ratings reached by the county and is only being included for reference.

Number of Events	0
Annualized Frequency	0.00
Expo. - Agricultural Value (\$)	0
Expo. - Total (\$)	0
HLR – Agriculture (\$)	1.54 per 100K
HLR - Overall Rating	No Rating
EAL - Agricultural Value (\$)	0
EAL - Total (\$)	0
EAL Score	0.00
EAL Rating	No Expected Annual Losses
Risk Score	0.00
Risk Rating	No Rating

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

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 Waushara County economy and that the losses could be considerable:

- Average size of farms: 269 acres

- Average value of agricultural products sold per farm: \$119,776
- Average value of crops sold per acre for harvested cropland: \$573.06
- The value of livestock, poultry, and their products as a percentage of the total market value of agricultural products sold: 22.22%
- Harvested cropland as a percentage of land in farms: 60.53%
- Average number of cattle and calves per 100 acres of all land in farms: 8.32
- Corn for grain: 25,073 harvested acres
- All wheat for grain: 1,158 harvested acres
- Soybeans for beans: 13,356 harvested acres
- Vegetables: 29,987 harvested acres
- Land in orchards: 20 acres⁸⁹

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 Waushara County, the population that lives outside of the cities and villages is 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.

Waushara County farmers can contact the Waushara County University of Wisconsin – Madison Division of Extension and its

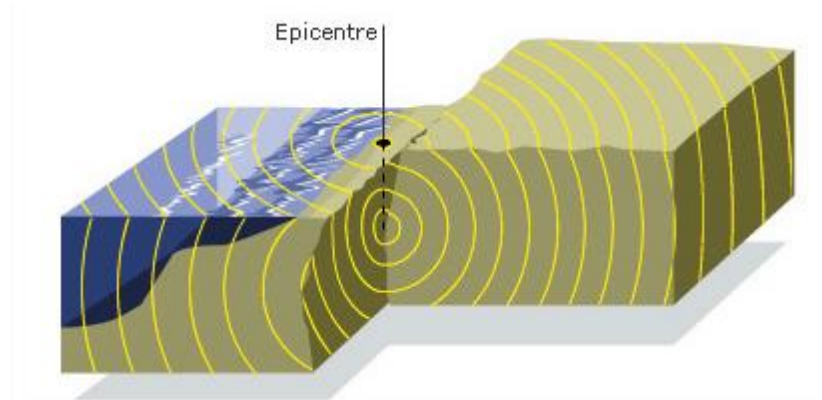
⁸⁹ http://www.city-data.com/county/Waushara_County-WI.html

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.

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 topsoil found in Waushara 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.)⁹⁰



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

⁹⁰ 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: ⁹¹

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.

⁹¹ Wald, Quitoriano, Heaton and Kanamori, 1999

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

Frequency of Occurrence

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

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

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 Waushara County citizens:⁹²

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.

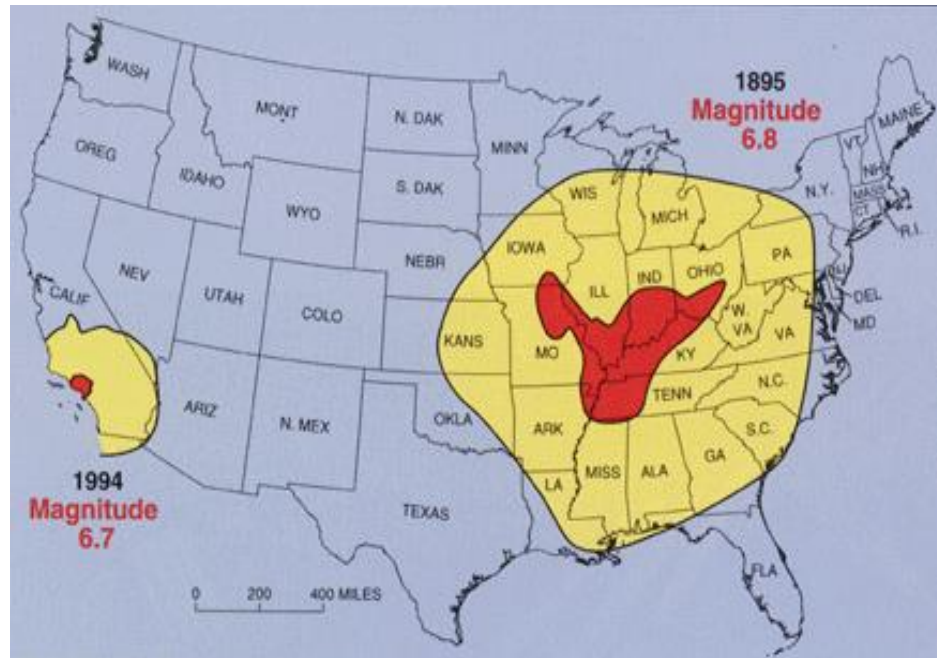
There is no known geologic fault beneath central Wisconsin so the postglacial rebounding is the only thing stretching the bedrock crust in the state, Hart said.

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 different

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

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 Waushara County is considered 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 low.

As noted earlier in this plan, the National Risk Index (NRI) tool ⁹³ has been made available by the Federal Emergency Management Agency (FEMA). It calculates a baseline relative risk measurement for 18 natural hazards based on expected annual loss, social vulnerability, and community resilience. Below is data relevant to the hazard discussed in this chapter. It should be noted that the NRI information may not necessarily match the hazard ratings reached by the county and is only being included for reference.

Number of Events	N/A
Annualized Frequency	0.00
Expo. - Building Value (\$)	3,184,594,000
Expo. - Population	24,496
Expo. - Population Equiv. (\$)	186,169,600,000
Expo. - Total (\$)	189,354,194,000
HLR – Buildings (\$)	1.68 per 100
HLR - Population (\$)	1.40 per 10K
HLR – Agriculture (\$)	N/A
HLR - Overall Rating	Very Low
EAL - Building Value (\$)	3,477
EAL - Population	0
EAL - Population Equiv. (\$)	179
EAL - Total (\$)	3,647
EAL Score	1.12
EAL Rating	Very Low
Risk Score	0.88
Risk Rating	Very Low

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

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

⁹³ <https://hazards.fema.gov/nri/map>

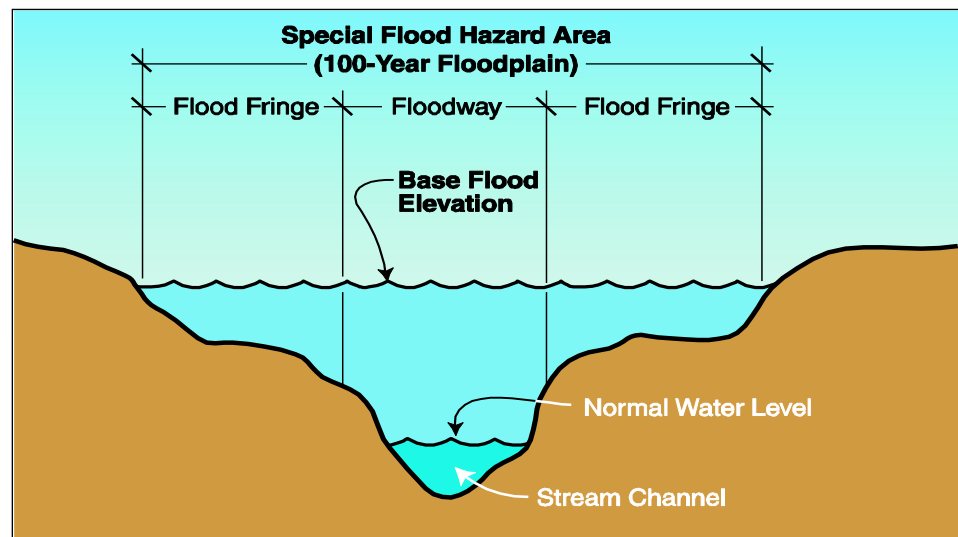
unlikely losses to the electrical grid, transportation routes/goods shipments and pipelines.

Hazard Mitigation Strategies

Since Waushara 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 very low risks of earthquake damage in Waushara 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.⁹⁴



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

⁹⁴ 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 Table⁹⁵

Flood Recurrence Intervals	Percent Chance of Occurrence Annually
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

⁹⁵ State of Wisconsin Hazard Mitigation Plan

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 19th 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 Waushara County⁹⁶

Dam Official Name	Size	Latitude	Longitude	Owner	Waterway Name (Downstream City)
Lower White River	Large	44.02073	-89.2479	Eagle Creek Renewable Energy	WHITE
Alpine Lake	Large	44.06227	-89.1889	Waushara County	BRUCE (THORSTAD) CREEK
Mount Morris	Large	44.11269	-89.1925	MORRIS LAKE MGMT. DIST.	RATTLESNAKE CREEK
Wautoma	Large	44.07564	-89.2912	City Of Wautoma	WHITE RIVER
Kristine Lake	Large	44.18124	-89.1123	LAKE OWNERS' ASSOC.	POPPLE CR.
Poy Sippi	Large	44.13617	-88.9974	Poy Sippi Betterment Assoc.	PINE
Wild Rose	Large	44.18314	-89.2479	Village Of Wild Rose	LOWER PINE

⁹⁶ <https://dnr.wisconsin.gov/topic/dams/damSearch.html>

Flooding and Dam Failure

Dam Official Name	Size	Latitude	Longitude	Owner	Waterway Name (Downstream City)
Upper White River	Large	44.088	-89.3655	White River Lake District	WEST BRANCH WHITE
Auroraville	Large	44.05397	-88.9918	Olsen Brothers	WILLOW CREEK
CLARK'S MILL	Large	44.23018	-89.0071	Sleepy Hollow Sawmill	MAGDANZ CREEK
Alan Wilcox	Large	43.99781	-89.262	The Flowage, LLC	LITTLE LUNCH CREEK
Alan Wilcox	Large	43.99781	-89.262	Alan D and Jane V Wilcox Revocable Trust	LITTLE LUNCH CREEK
Fish Lake	Small	44.06072	-89.2369	WI DOT	OUTLET FISH LAKE
Everett Wilcox	Large	44.00324	-89.2818	Wisconsin Department of Natural Resources	LITTLE LUNCH CREEK
Pine River	Large	44.15089	-89.0774	TOWN OF LEON	PINE RIVER
Saxeville	Small	44.17483	-89.113	Renew Hydro Power, LLC	PINE RIVER
Waushara Co.No.1	Small	44.23292	-89.1837	Waushara County	DITCH 1 TRIB PINE RIVER
Waushara Co.No.2	Small	44.24201	-89.1791	Waushara County	DITCH 1 TRIB PINE RIVER
Waushara Co.No.3	Small	44.24042	-89.1791	Waushara County	DITCH 1 TRIB PINE RIVER
Waushara County No. 4	Small	44.24319	-89.1857	Waushara County	DITCH 1 TRIB PINE RIVER
Waushara County No.5	Small	44.24096	-89.1791	Waushara County	DITCH 2 TRIB PINE RIVER
Leola 25	Small	44.21094	-89.5782	LEOLA DRAINAGE DISTRICT	DITCH 3
Leola 26	Small	44.22297	-89.5882	LEOLA DRAINAGE DISTRICT	DITCH 3
Wilson Lake	Small	44.1783	-89.1709	Kusel, Wilson, Round Lakes Rehabilitation &	OUTLET WILSON LAKE TR-PINE R.

Flooding and Dam Failure

Dam Official Name	Size	Latitude	Longitude	Owner	Waterway Name (Downstream City)
				Preservation District	
Johns Lake	Small	44.07712	-89.2106		OUTLET JOHNS LAKE TR- BRUCE CR
Idlewild	Small	44.20659	-89.2077		PINE RIVER
Behm, Alfred #1	Small	44.21482	-88.9706		ALDER CREEK
Behm, Alfred #2	Small	44.21422	-88.9703		ALDER CREEK
Behm, Alfred #3	Small	44.21545	-88.9708		ALDER CREEK
Davies #1	Small	44.21784	-89.2086		TR-HUMPHREY CREEK
Davies #2	Small	44.21702	-89.2083		TR-HUMPHREY CREEK
Davies #3	Small	44.21574	-89.2064		TR-HUMPHREY CREEK
Lower Upper White River	Small	44.08738	-89.3642		WEST BRANCH WHITE
Clark, John K.		44.18382	-89.1702		WILSON LAKE OUTLET
Steuck		44.03181	-89.269	U.S. Departme nt of the Interior	UNNAMED
Richford		44.02551	-89.4359		MECAN RIVER
Mecan		44.01324	-89.4062		MECAN RIVER
Wollert		44.1703	-89.5822		BIG ROCHE A CRI CREEK
Hancock Fish Lake		44.22299	-89.29		FISH LAKE
Willow Creek Aquaculture	Small	44.10414	-88.9738		
Dumke	Small	44.14464	-88.9526	Dumke & Associates, LLC	UNNAMED TRIB. TO PINE RIVER
Spangler 1	Small	43.98797	-88.9819		TRIBUTARY TO BARNES CREEK
Spangler 2	Small	43.98795	-88.9818		TRIBUTARY TO BARNES CREEK
Cummings Road Sed Pond	Small	44.07483	-89.3009	WAUTOM A	TRIBUTARY TO BOWERS CREEK
Nitzke	Small	44.19514	-88.9204		UN-NAMED TRIB TO LAKE POYGAN
River Valley One		44.00014	-88.9109	River Valley One, LLC	
Lake Irogami				Silver Lake Sanitary District	

Many 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 Waushara County.

Flooding and dam failure in 1995 resulted in about \$45,000 of property damage. The Mount Morris Dam failed due to unusually heavy rainfall. Failure of the dam resulted in the flooding of Little Rattlesnake and Willow Creeks. Portions of State Highway 152 were undermined, a bridge was washed out, and a 40-ton crane and air compressor fell into the flood waters. In addition, part of the foundation of a nearby home was damaged. The ensuing flood waters forced the temporary closure of several county roads.

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 Waushara County, the Poy Sippi, Saxeville, Auoraville and Clark's Mills dams have a high hazard rating. The Lower White River and Wild Rose dams have a significant hazard rating. The other dams in Waushara 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

The majority of the land in the county is part of the Wolf and Upper Fox River Basins draining into the Lake Michigan Basin. The western

third of the county from the Almond-Arnott Moraine drains to the Central Wisconsin River Basin. Four main watersheds make up the Wisconsin River Basin in Waushara County: Seven and Ten Mile Creek, Fourteen Mile Creek, Big Roche A Cri, and the Little Roche A Cri. The Almond-Arnott Terminal Moraine in western Waushara County forms the drainage divide between the Wisconsin, Upper Fox and Wolf River Basins. Three watersheds make up the Upper Fox Basin in Waushara County: Mecan, White and the Fox (Berlin) River. The Pine and Willow Rivers make up the majority of the Wolf River basin in Waushara County.

Within the watersheds, there are 68 interior streams covering 222 linear miles and 646 surface acres. These streams are generally on the small side, in fact 25 (of 40) named streams and 17 (of 28) unnamed streams (a total of 41 percent of the total stream frontage) have average widths of less than 10 feet making them relatively undesirable for development. However, all the streams are important in the hydrological and ecological regime and should be protected by shoreland zoning and physical protective measures. Following is a brief description of each watershed:

Central Wisconsin River Basin

Big Roche-A-Cri Creek ⁹⁷

Big Roche-A-Cri Creek Watershed is located in Adams and Waushara counties covering 113,277 acres. The Big Roche-A-Cri Creek Watershed is known for pivot irrigation and vegetable crop production consisting primarily of corn and potatoes. Most of the surface waters have been altered by ditching, especially on the eastern edge where agricultural land use predominates. Most lakes are artificial impoundments, however some small kettle lakes and wetlands are found in the pitted outwash areas in the central to eastern portions of the watershed. The watershed includes the towns of Leola and Colburn. The Adams County soil erosion plan ranks these towns first and fifth priority out of 17 for needing conservation work to control wind and water erosion, respectively. The Golden Sands Resource Conservation and Development Planning Agency studied the impact of wind erosion on water quality. The DNR partially funded this program. The study concluded that properly irrigated corn crops reduce the most erosion compared to the dominant potato farming. Adverse water quality impacts were detected on all the ditches throughout the Big Roche-A-Cri watershed through biotic index sampling and review of water quality data.

⁹⁷ <https://dnr.wi.gov/water/watershedDetail.aspx?code=CW06>

Fourteenmile Creek ⁹⁸

The Fourteen-mile Watershed is located in Adams, Wood, Portage and Waushara counties. A large portion of this area is referred to as the Leola Marsh. This area at one time was an extensive wetland that was ditched and drained for agricultural activities. There are several cranberry farms located in the watershed that utilize water for their operation. Water drawn from ditches reduces stream flow, decreases adult fish cover, reduces spawning areas for trout and likely exposes fish redds, and may result in an increase of water temperatures. Discharges from cranberry marshes can adversely affect water temperatures, deposit sediment, and release nutrients to the ditches. Periodic impounding of the ditches to flood marshes may prevent fish migration, increase water temperatures and de-water downstream reaches. This watershed was ranked using the Nonpoint Source Priority Selection Criteria. Based on surface and ground water data, the overall ranking is medium. This overall ranking establishes the watershed as a medium priority for future grant eligibility through the Nonpoint Source Program. The Adams County Soil Erosion Control plan identified the town of Leola as highest priority for conservation work to control wind erosion. This town is in the upper Fourteenmile Creek Watershed. Intense irrigation farming also occurs in the watershed leading to stream impacts from pesticides/herbicides and nutrients (Schultz). Many of the creeks have also been ditched for wetland drainage (Schultz).

Little Roche-A-Cri Creek ⁹⁹

The Little Roche-A-Cri Watershed , a 196 mi² watershed, is situated in the southern part of the Central Wisconsin Basin in Adams, Waushara and Marquette Counties. The Central Wisconsin River Basin contains numerous rock outcroppings and beautiful flowages. The basin is characterized by agricultural activities throughout the basin with intensive row cropping taking place in the central sands region. The last glaciers to flatten Wisconsin only stretched through part of the basin, consequently affecting the Little Roche-A-Cri Watershed topography. The glaciers created a network of warm and cold water streams fed by surface and groundwater sources that all connect to the Wisconsin River. The Central Wisconsin River Basin has one of the largest and most diverse arrays of surface water systems in the state.

⁹⁸ <https://dnr.wi.gov/water/watershedDetail.aspx?code=CW07>

⁹⁹ <https://dnr.wi.gov/water/watershedDetail.aspx?code=CW01>

Sevenmile & Tenmile Creeks ¹⁰⁰

The Sevenmile and Tenmile Creek Watershed is located in the counties of Adams, Portage, Wood and Waushara. This watershed is a maze of ditches and laterals that were created to drain lowland areas for agricultural activities. There are large sections of land that have been purchased by the state that are being maintained for grassland ecosystems. Both grazing and pivot irrigation are two land uses that impact the water quality of Sevenmile and Tenmile Creeks Watershed.

Upper Fox River Basin

Fox River/Berlin ¹⁰¹

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.

Mecan River ¹⁰²

The Mecan River Watershed is located in Waushara and Marquette counties, with a tiny area in Green Lake County. The watershed is 94,917 acres in size and contains 166 miles of streams and rivers, 1,837 acres of lakes, and 18,622 acres of wetlands. The watershed is dominated by forest (33%), agriculture (22%), grassland (22%) and wetlands (19%) and is ranked high for nonpoint sources affecting groundwater.

White River ¹⁰³

The White River Watershed is located primarily in Waushara County but extends south to Green Lake and Marquette counties. The watershed is 95,879 acres in size and contains 156 miles of streams and rivers, 1,017 acres of lakes and 18,495 acres of wetlands. The watershed is dominated by forest (29%), grassland (27%), agriculture (21%) and wetlands (19%), and is ranked high for nonpoint source issues affecting groundwater.

¹⁰⁰ <https://dnr.wi.gov/water/watershedDetail.aspx?code=CW09>

¹⁰¹ <https://dnr.wi.gov/water/watershedDetail.aspx?code=UF06>

¹⁰² <https://dnr.wi.gov/water/watershedDetail.aspx?code=UF09>

¹⁰³ <https://dnr.wi.gov/water/watershedDetail.aspx?code=UF08>

Wolf River Basin

Little River and Alder Creek (Walla Walla) ¹⁰⁴

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 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 River and Willow Creek ¹⁰⁵

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).

Waupaca River ¹⁰⁶

The Waupaca River watershed is 292 square miles and lies almost entirely in Portage and Waupaca counties. A small part of its southwestern portion is in Waushara County. The river's name changes as it flows from Portage County to Waupaca County. In Portage County it is called the Tomorrow River. In Waupaca County, it is the Waupaca River, which in its entirety runs approximately 63 miles. The Waupaca River's major tributary, the Crystal River, ties

¹⁰⁴ <https://dnr.wi.gov/water/watershedDetail.aspx?code=WR03>

¹⁰⁵ <https://dnr.wi.gov/water/watershedDetail.aspx?code=WR02>

¹⁰⁶ <https://dnr.wi.gov/water/watershedDetail.aspx?code=WR05>

into the system from the south and is included within the planning area and is classified as Class II trout waters. The Crystal River is the outlet to the Chain O' Lakes (Long Lake) which is a very prominent recreational and residential area consisting of 22 interconnected lakes. These lakes comprise approximately 725 acres and is considered as part of the Tomorrow/Waupaca River Priority Watershed Project. Recent changes to the Waupaca County Shoreland Ordinance should improve this resource, from a development standpoint, in the future. The Waupaca River Watershed was selected as a priority watershed project in 1993 and will expire at the end of the year 2007. A priority watershed plan was prepared cooperatively by WDNR, DATCP, NRCS, University of Wisconsin Extension, Portage County Land Conservation Department, Waupaca County Land and Water Conservation Department, and Waushara County Land Conservation Department. The soils, geology and other physical resources of the western 95 percent of this watershed indicate that this area is highly susceptible to groundwater contamination due to poor land use practices (WDNR and WGNHS, 1987). A data search revealed groundwater samples with contamination, mainly pesticides, in this area.

Floodplain Regulations

Floodplain regulations have been in place in the cities, villages and towns of Waushara 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, Waushara 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. No flood events have occurred since the last update of this plan which required substantial improvement or substantial damage provisions of the flood management regulations.

To regulate and permit development in Special Flood Hazard Areas (SFHAs), Waushara County requires that a land use permit shall be obtained before any new developments are started within the floodplain. Inspections are conducted to assure compliance with the permits.

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.

Waushara County does have a history of flooding problems and has been included in six Presidential Disaster Declarations requests for flooding, which are detailed below: ¹⁰⁷

- DR-376-WI: On April 27, 1973, the President declared a major disaster as a result of severe storms and flooding that began on April 27. Waushara County was eligible for Individual and Public Assistance.
- DR-959-WI: On September 2, 1992, the President declared a major disaster as a result of severe storms and tornadoes that began on August 29. Waushara County was eligible for Individual and Public Assistance.
- DR-994-WI: On July 2, 1993, the President declared a major disaster as a result of flooding, severe storms and tornadoes

¹⁰⁷ <https://www.fema.gov/disasters>

that began on June 7. Waushara County was eligible for Individual and Public Assistance.

- DR-1369-WI: On May 11, 2001, the President declared a major disaster as a result of flooding that began on April 10. Waushara County was eligible for Public Assistance.
- DR-1429-WI: On July 19, 2001, the President declared a major disaster as a result of flooding that began on June 21. Waushara County was eligible for Public Assistance.
- DR-1526-WI: On June 18, 2004, the President declared a major disaster as a result of severe storms and flooding that began on May 7. Waushara County was eligible for Individual Assistance.

There are no repetitive loss properties (RLPs) listed for Waushara County. The following list summarizes damages attributed to flooding in Waushara County by the National Flood Insurance Program through September, 2022:

Jurisdiction	Total Number of Claims over \$1,000.00
City of Berlin	3

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 Waushara County leads to the conclusion that there is a medium to high probability of flooding in the future and a medium 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 medium probability of a dam break in the county and a low probability of damage and losses due to a dam break.

The University of Wisconsin-Madison, Nelson Institute for Environmental Studies/ Wisconsin DNR's Wisconsin Initiative on Climate Change Impacts¹⁰⁸ shows a scientific consensus that, "Wisconsin is likely to become a much warmer state over the next few decades...and...our state is also likely to become somewhat

¹⁰⁸ [Trends and Projections | Wisconsin Initiative on Climate Change Impacts \(WICCI\)](#)

wetter, with a modest increase in total precipitation and in the number of intense rainfall events. The amount of climate change varies by season, with winter experiencing the greatest warming and most likely increase in precipitation.” The site’s information shows that Waushara County is likely to experience warmer weather and an increase in precipitation for all four seasons of the year, with the greatest increases in winter and summer. Additionally, the increased number of intense rainfall events is likely to increase the number and intensity of flooding incidents.

As noted earlier in this plan, the National Risk Index (NRI) tool ¹⁰⁹ has been made available by the Federal Emergency Management Agency (FEMA). It calculates a baseline relative risk measurement for 18 natural hazards based on expected annual loss, social vulnerability and community resilience. Below is data relevant to the hazard discussed in this chapter. It should be noted that the NRI information may not necessarily match the hazard ratings reached by the county and is only being included for reference.

Number of Events	11
Annualized Frequency	0.5
Expo. - Building Value (\$)	104,024,230
Expo. - Population	677.29
Expo. - Population Equiv. (\$)	5,147,374,147
Expo. - Agricultural Value (\$)	2,076,027
Expo. - Total (\$)	5,253,474,404
HLR – Buildings (\$)	1.07 per 1K
HLR - Population (\$)	9.14 per iM
HLR - Agriculture (\$)	2.22 per 100
HLR - Overall Rating	Very Low
EAL - Building Value (\$)	50,836
EAL - Population	0
EAL - Population Equiv. (\$)	21,563
EAL - Agricultural Value (\$)	21,163
EAL - Total (\$)	93,562
EAL Score	5.72
EAL Rating	Very Low

¹⁰⁹ <https://hazards.fema.gov/nri/map>

Risk Score	5.23
Risk Rating	Very Low

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

Vulnerability

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

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

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

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

Appendix A contains maps depicting the floodplain in Waushara County. Appendix F contains excerpts from the Waushara 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

Waushara County is committed to remaining compliant with the requirements of the National Flood Insurance Program (NFIP) and all other state and federal laws. They have participated in the NFIP since April 12, 2005. According to the NFIP, the following communities participate in the program.¹¹⁰

- County of Waushara
- City of Berlin (*mostly in Green Lake County*)
- City of Wautoma
- Village of Wild Rose

Additional Information Regarding Municipal NFIP Implementation ¹¹¹	
City of Berlin	
Date joined NFIP	Unavailable
Initial Flood Hazard Boundary Map (FHBM) Identified	1/16/1974
Initial Flood Insurance Rate Map (FIRM) Identified	9/30/1977
Current Effective Map Date	6/18/2013
Regular Program Entry Date	9/30/1977
How implemented	Unavailable
City of Wautoma	
Date joined NFIP	Unavailable
Initial Flood Hazard Boundary Map (FHBM) Identified	5/17/1974
Initial Flood Insurance Rate Map (FIRM) Identified	6/18/2013
Current Effective Map Date	6/18/2013

¹¹⁰ <https://www.fema.gov/cis/WI.pdf>

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

Regular Program Entry Date	6/18/2013
How implemented	Continued reviewing and updating the projects identified in our All-Hazards Mitigation Plan.
Village of Wild Rose	
Date joined NFIP	1/9/2008
Initial Flood Hazard Boundary Map (FHBM) Identified	5/13/1974
Initial Flood Insurance Rate Map (FIRM) Identified	9/30/1988
Current Effective Map Date	6/18/2013
Regular Program Entry Date	9/30/1988
How implemented	Continued reviewing and updating the projects identified in our All-Hazards Mitigation Plan.

The county's planning and zoning department serves as the flood administrator for the municipalities.

The following communities in Waushara County have had special flood areas identified by FEMA but are not in the NFIP program. Each community has chosen not to participate because, after a review of their topography and risk, they do not believe that there is an adequate risk of flooding to warrant the costs of NFIP participation.

- Village of Hancock
- Village of Lohrville
- Village of Red Granite

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 Waushara 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 Waushara 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, Waushara 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.

There is a need for ongoing review and updating of some of the flood-related data, information and projects related to mapping. A LIDAR flyover was completed in 2020. The flights are coordinated between FEMA and WDNR. Various developers will update their flood maps from time to time after studies have been done. Current maps should be adequate over the lifespan of this plan but if additional maps are needed, it will be done as budgets allow.

For more information and to access mapping products, please visit <https://msc.fema.gov/portal/search?AddressQuery=Waushara%20County#searchresultsanchor>

The Waushara 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.

Waushara County has a history of 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:

- Encouraging every jurisdiction to participate in the National Flood Insurance Program (NFIP).
- Performing a cost-analysis of removing homes within the floodplaining and floodway; and consider the range of flood mitigation measure (e.g., buy-outs, flood-proofing, elevations).
- Encourage the use of Low-Impact Development techniques.
- Encourage a zero discharge policy for stormwater subdivision design.
- Encourage townships to adopt a stormwater drainage system (open ditch and culverts) maintenance program such as sediment and debris clearance; as well as detection and prevention of discharges into stormwater and sewer systems from home footing drains, downspouts or sewer pumps.
- Encourage the use of check valves, sump pumps and backflow prevention devices in homes and buildings.
- Gather status information on all dams in the county and evaluate the downstream threat in areas prone to flooding events.
- Evaluate municipal stormwater plans.

The county and its municipalities will continue to pre-identify infrastructure (roads, bridges, culverts, shoulders) prone to flooding; and will direct current and future budgetary dollars towards making the infrastructure disaster-resistant as it is scheduled for routine maintenance. Strategies and projects include the following:

- City of Wautoma

- Develop a plan to replace old water mains near downtown Wautoma (Waupaca St.) supplying fire suppression. Applying for a CDGB grant to completely reconstruct both the road and the infrastructure underneath Waupaca Street that they believe they are going to get. That project will happen at the end of 2022, potentially going into 2023. They did a lot of improvements on Mount Morris 3 years ago. When the city ran their water utilities down there, there was a full replacement of several roads downtown. Project is dependent on grant funding - \$1M grant. If they do not get the grant, it will be up to the Council to consider borrowing the additional money or consider doing the part of Waupaca that has not been touched. Will be carried forward and changed to a medium-high priority. Move to All Hazards.
- Village of Lohrville
 - Trim and cut trees to avoid potential road blockage. Continually trim back and cut down trees away from the roadway as needed.
 - Monitor drainage ditches for blockage and flow. They have installed new ditches on some problem areas. Some areas have resolved themselves.
- Town of Mount Morris
 - Beechnut Ave W of 22nd Ave - Install culvert. Floods every spring and after heavy rain
 - 22nd Ave N of Beechnut Ave - Install culvert. Floods every spring and after heavy rain.
 - Bighorn Ave W of G - Clean and repair culvert. Floods in high water.
 - Bighorn Ln at 20th Dr - Install culvert. Floods both roads.
 - Beechnut Ave at 24th Ave - Raise road 4 feet. Floods.
 - Chicago Ave E of 20th Dr - Clean culvert. Floods yards.
 - Dye Rd at Badger Ln 0 Install larger culvert. Lake floods in high water.
- Town of Richford

Flooding and Dam Failure

- Czech Rd. by greenhouse – raise 2 feet. Frequent flooding; closed 2 months in 2020 and caused hardship.
- Cty Rd JJ, Intersection of Cty Rd B - Culvert and fill. Frequent flooding of cemetery.
- Culvert at Cty Rd B Intersection of Cumberland Rd. Homeowner suffering frequent flooding and loss due to damaged culvert from Cty Rd B work.

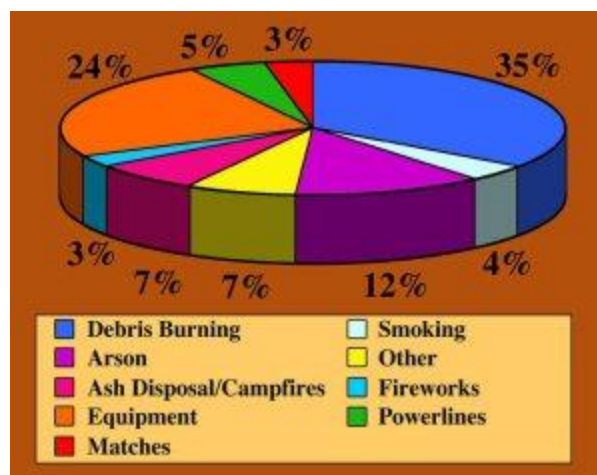
Fires (Grassfires and Wildfires)

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

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 Division of Forestry has recorded fire occurrences throughout Waushara County since 1975. Over the last forty years, Waushara County has experienced 2,220 fires at an average size of 2.28 acres. No events have escalated to a level of declaration. In 2005, the Cottonville Fire in neighboring Adams County burnt a total of 3,410 acres, destroying over 100 buildings and threatened approximately 300 more.

According to the Wisconsin DNR Fire Management Dashboard,¹¹² since 2012 Waushara County has experienced 368 separate instances of wildfires burning a total of 427.21 acres. As such, the overall probability for a wildfire in Waushara County is medium. The probability of damage from wildfire is considered also medium.

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).

The University of Wisconsin-Madison, Nelson Institute for Environmental Studies/ Wisconsin DNR's Wisconsin Initiative on Climate Change Impacts¹¹³ shows a scientific consensus that, "Wisconsin is likely to become a much warmer state over the next few decades...and...our state is also likely to become somewhat wetter, with a modest increase in total precipitation and in the number of intense rainfall events. The amount of climate change varies by season, with winter experiencing the greatest warming and most likely increase in precipitation." The site's information shows that Waushara County is likely to experience warmer weather and an increase in precipitation for all four seasons of the year. This is likely to increase the growth rate of vegetation, but the additional rainfall is likely to reduce the number of fires.

¹¹² [Fire Management Dashboards \(wi.gov\)](#)

¹¹³ [Trends and Projections | Wisconsin Initiative on Climate Change Impacts \(WICCI\)](#)

As noted earlier in this plan, the National Risk Index (NRI) tool ¹¹⁴ has been made available by the Federal Emergency Management Agency (FEMA). It calculates a baseline relative risk measurement for 18 natural hazards based on expected annual loss, social vulnerability and community resilience. Below is data relevant to the hazard discussed in this chapter. It should be noted that the NRI information may not necessarily match the hazard ratings reached by the county and is only being included for reference.

Number of Events	N/A
Annualized Frequency	0.00
Expo. - Building Value (\$)	594,443,245
Expo. - Population	4426.61
Expo. - Agricultural Value (\$)	14,218,565
Expo. - Population Equiv. (\$)	33,642,260,266
Expo. - Total (\$)	34,250,922,076
HLR – Buildings (\$)	4.00 per 10
HLR - Population (\$)	6.89 per 10K
HLR - Agriculture (\$)	3.56 per 100K
HLR - Overall Rating	Very Low
EAL - Building Value (\$)	48,584
EAL - Population	0
EAL - Population Equiv. (\$)	5,002
EAL - Total (\$)	53,587
EAL Score	6.97
EAL Rating	Relatively Low
Risk Score	6.37
Risk Rating	Relatively Low

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

Vulnerability

Grassfires and wildfires can impact the ecology of the open lands. Waushara County has seven state natural areas: Bass Lake Fen, Bohn Lake, Karner Blue Meadow, Lunch Creek Wetlands, Mecan

¹¹⁴ <https://hazards.fema.gov/nri/map>

Springs, Plainfield Tunnel Channel Lakes and Upper Fox Headwaters.¹¹⁵ The county has two state wildlife areas: Greenwood and Poygan Marsh.¹¹⁶ Within the county there are also other local and county parks. All would be impacted by a wildfire since a disruption from fire could erase the usability of this habitat for wildlife and/or recreational purposes for many years.

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

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

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

- Historic Fire Occurrence
- Hazard
- Values Protected
- Capabilities

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

- Hazard – the relative likelihood that an ignited wildfire will achieve sufficient intensity to threaten life or property based on land cover type and historic fire regime.
- WUI (Values at Risk) – the relative vulnerability of each 2000 census block to wildfire damage based on housing density and spatial relationship with undeveloped vegetation based on housing density and proximity to vegetation (Wisconsin’s Wildland-Urban Interface). Wisconsin’s WUI was layered with

¹¹⁵ <https://dnr.wisconsin.gov/topic/Lands/NaturalAreas/county.html#Waushara>

¹¹⁶ <https://dnr.wisconsin.gov/topic/Lands/WildlifeAreas/alpha.html>

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.¹¹⁷

Waushara County has five Communities-of-Concern; nine communities rated as Very High Communities-at-Risk; and seven communities rated as High Communities-at-Risk.¹¹⁸

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

¹¹⁷ Wisconsin State Hazard Mitigation Plan

¹¹⁸ <https://dnr.wisconsin.gov/sites/default/files/topic/ForestFire/communitiesAtRiskWildfire.pdf>

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 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. Other strategies include:

- Map wildfire hazard areas to facilitate analysis and planning decisions through comparison with zoning, development and infrastructure, etc. Updates are done by WDNR and maps are used for comprehensive planning purposes.
- Coordinate with utility companies to create defensible zones around power lines, oil and gas lines, and other infrastructure systems. The county and its municipalities support the reduction of fuel loads by infrastructure owners around their property by making access available in rights-of-way and on public roadways for maintenance
- Coordinate with the WDNR to manage public lands to reduce fuel loads (prescribed burning, clearing dead vegetation, selective logging, etc.). The county's fire departments work with the WDNR as requested to support prescribed burns.

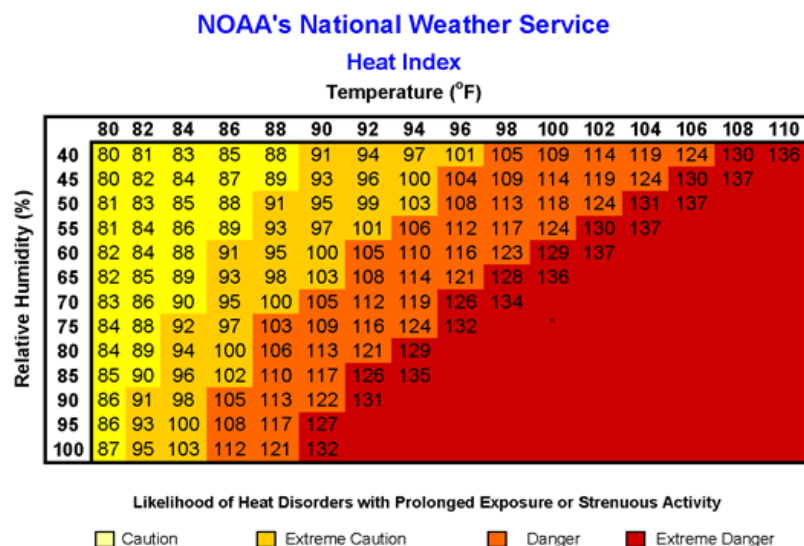
Severe Temperatures

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. ¹¹⁹

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

¹¹⁹ FEMA, 1997; NWS, 1997

Severe Temperatures

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:

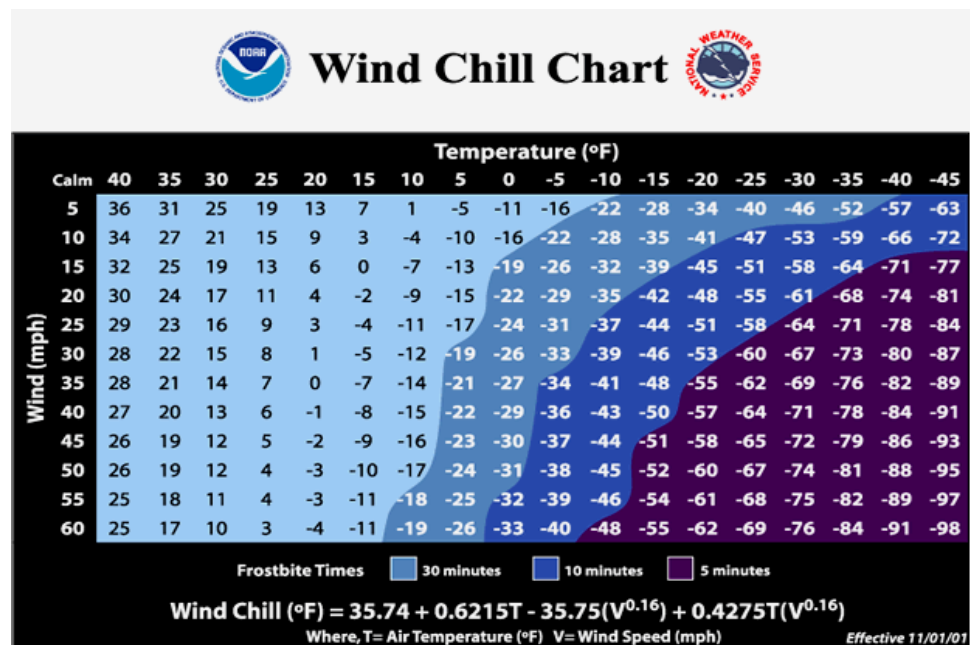
- Heatstroke – a potentially lethal medical emergency where the ability of a person to thermo-regulate is compromised resulting in the rise of the body's core temperature to above 105°F (Fahrenheit).
- Heat Exhaustion – a less threatening medical condition where the victim complains of dizziness, weakness 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.¹²⁰

¹²⁰ <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

- 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.

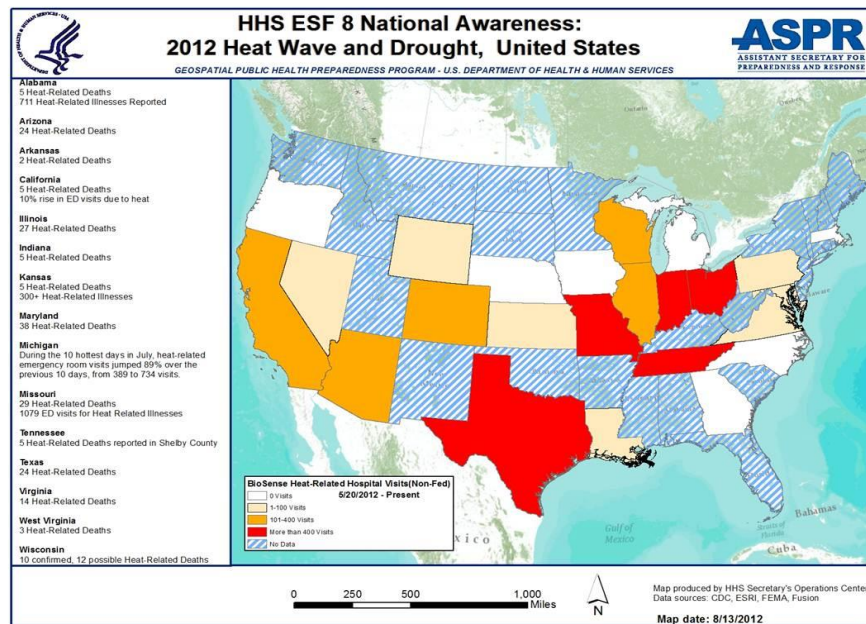
Tables showing the excessive heat and heat events recorded by the National Weather Service in Waushara County ¹²¹ can be found in Appendix B.

It should be noted that during the summer of 2012 much of the country, including Waushara 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.¹²²

¹²¹ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

¹²² 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, Waushara 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 high 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).

The University of Wisconsin-Madison, Nelson Institute for Environmental Studies/ Wisconsin DNR's Wisconsin Initiative on Climate Change Impacts¹²³ shows a scientific consensus that, "Wisconsin is likely to become a much warmer state over the next few decades...and...our state is also likely to become somewhat wetter, with a modest increase in total precipitation and in the number of intense rainfall events. The amount of climate change varies by season, with winter experiencing the greatest warming and most likely increase in precipitation." The site's information shows that Waushara County is likely to experience warmer weather and an

¹²³ [Trends and Projections | Wisconsin Initiative on Climate Change Impacts \(WICCI\)](#)

Severe Temperatures

increase in precipitation which means that the likelihood of additional severe heat days will increase. This could be even more concerning because of the additional atmospheric moisture, which will make it harder for people and animals to evaporatively cool.

As noted earlier in this plan, the National Risk Index (NRI) tool ¹²⁴ has been made available by the Federal Emergency Management Agency (FEMA). It calculates a baseline relative risk measurement for 18 natural hazards based on expected annual loss, social vulnerability and community resilience. Below is data relevant to the hazard discussed in this chapter. It should be noted that the NRI information may not necessarily match the hazard ratings reached by the county and is only being included for reference.

Number of Events	6
Annualized Frequency	0.5
Expo. - Building Value (\$)	3,184,583,934
Expo. - Population	24,496
Expo. - Population Equiv. (\$)	186,169,697,536
Expo. - Agricultural Value (\$)	126,702,000
Expo. - Total (\$)	189,480,893,470
HLR – Buildings (\$)	1.37 per 10M
HLR - Population (\$)	1.07 per 1M
HLR - Agriculture (\$)	5.52 per 100K
HLR - Overall Rating	Very Low
EAL - Building Value (\$)	216
EAL - Population	0.01
EAL - Population Equiv. (\$)	98,590
EAL - Total (\$)	102,264
EAL Score	11.34
EAL Rating	Relatively Low
Risk Score	9.34
Risk Rating	Relatively Low

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

¹²⁴ <https://hazards.fema.gov/nri/map>

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 Weather Service in Waushara County¹²⁵ can be found in Appendix B.

After examining this data, the workgroup believed that cold and/or extreme cold has a high 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.

The Wisconsin Initiative on Climate Change Impacts¹²⁶ study also means that Waushara County is likely to fewer extreme cold weather incidents

As noted earlier in this plan, the National Risk Index (NRI) tool ¹²⁷ has been made available by the Federal Emergency Management Agency (FEMA). It calculates a baseline relative risk measurement for 18 natural hazards based on expected annual loss, social vulnerability and community resilience. Below is data relevant to the hazard discussed in this chapter. It should be noted that the NRI information may not necessarily match the hazard ratings reached by the county and is only being included for reference.

Number of Events	9
Annualized Frequency	0.7
Expo. - Building Value (\$)	3,184,593,934
Expo. - Population	24,496
Expo. - Population Equiv. (\$)	186,169,597,536

^{49 & 125} <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

¹²⁶ [Trends and Projections | Wisconsin Initiative on Climate Change Impacts \(WICCI\)](#)

¹²⁷ <https://hazards.fema.gov/nri/map>

Severe Temperatures

Expo. - Agricultural Value (\$)	126,702,000
Expo. - Total (\$)	189,480,893,470
HLR – Buildings (\$)	3.66 per 100M
HLR - Population (\$)	1.05 per 1M
HLR - Agriculture (\$)	3.76 per 10K
HLR - Overall Rating	Very Low
EAL - Building Value (\$)	86
EAL - Population	0.02
EAL - Population Equiv. (\$)	145,414
EAL - Agricultural Value (\$)	35,283
EAL - Total (\$)	180,783
EAL Score	30.29
EAL Rating	Relatively Moderate
Risk Score	26.52
Risk Rating	Relatively Moderate

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

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.

The Waushara 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

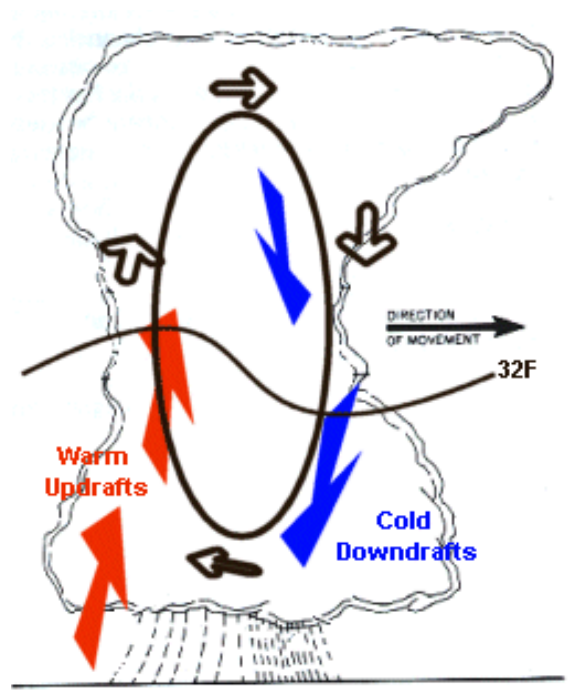
The goal of severe temperature mitigation activities is to reduce, in a cost-effective manner, the loss of lives and property due to these events. Temperature extremes are difficult for a community to mitigate and the risks are to the health and safety of citizens, animals and crops. There are no strategies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

Waushara 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. They will also use the mass notification system to assist local utilities to inform homeowners to let faucets drip during extreme cold weather.

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:¹²⁸



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

¹²⁸ Source: NWS, January 10, 2003

Physical Characteristics

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

Hail Size Estimates¹²⁹	
Size	Inches in Diameter
Pea	1/4 inch
Marble/mothball	1/2 inch
Dime/Penny	3/4 inch
Nickel	7/8 inch
Quarter	1 inch
Ping-Pong Ball	1 1/2 inch
Golf Ball	1 3/4 inches
Tennis Ball	2 1/2 inches
Baseball	2 3/4 inches
Tea cup	3 inches
Grapefruit	4 inches
Softball	4 1/2 inches

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

Frequency of Occurrence

Hailstorms usually occur from May through August and Wisconsin averages two or three hail days per year. Waushara County has a high 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 60 times for an average of just over 2 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

¹²⁹ NWS, January 10, 2003

hail events recorded by the National Weather Service in Waushara County¹³⁰ 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.

The University of Wisconsin-Madison, Nelson Institute for Environmental Studies/ Wisconsin DNR's Wisconsin Initiative on Climate Change Impacts¹³¹ shows a scientific consensus that, "Wisconsin is likely to become a much warmer state over the next few decades...and...our state is also likely to become somewhat wetter, with a modest increase in total precipitation and in the number of intense rainfall events. The amount of climate change varies by season, with winter experiencing the greatest warming and most likely increase in precipitation." The site's information shows that Waushara County is likely to experience warmer weather and an increase in precipitation for all four seasons of the year, with the greatest increases in winter and summer. This shows an increased likelihood of severe thunderstorms in spring, summer, and fall in Waushara County. These thunderstorms generate hailstorms, which should also increase in frequency.

As noted earlier in this plan, the National Risk Index (NRI) tool¹³² has been made available by the Federal Emergency Management Agency (FEMA). It calculates a baseline relative risk measurement for 18 natural hazards based on expected annual loss, social vulnerability and community resilience. Below is data relevant to the hazard discussed in this chapter. It should be noted that the NRI information may not necessarily match the hazard ratings reached by the county and is only being included for reference.

Number of Events	105
Annualized Frequency	3.3
Expo. - Building Value (\$)	3,184,594,000

¹³⁰ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

¹³¹ [Trends and Projections | Wisconsin Initiative on Climate Change Impacts \(WICCI\)](#)

¹³² <https://hazards.fema.gov/nri/map>

Expo. - Population	24,496
Expo. - Population Equiv. (\$)	186,169,600,000
Expo. - Agricultural Value (\$)	126,702,000
Expo. - Total (\$)	189,480,896,000
HLR – Buildings (\$)	5.88 per 100K
HLR - Population (\$)	4.75 per 100M
HLR - Agriculture (\$)	1.69 per 1M
HLR - Overall Rating	Relatively Low
EAL - Building Value (\$)	620,092
EAL - Population	0
EAL - Population Equiv. (\$)	29,463
EAL - Agricultural Value (\$)	698
EAL - Total (\$)	650,253
EAL Score	21.33
EAL Rating	Relatively Moderate
Risk Score	17.92
Risk Rating	Relatively Moderate

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

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.

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 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, mass notification system). 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 Waushara 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.

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.¹³³

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 strike 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 strike, 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.

¹³³ University Corporation for Atmospheric Research [UCAR]

Lightning

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. Waushara County has a very 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 Waushara County¹³⁴ 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.

The University of Wisconsin-Madison, Nelson Institute for Environmental Studies/ Wisconsin DNR's Wisconsin Initiative on Climate Change Impacts¹³⁵ shows a scientific consensus that, "Wisconsin is likely to become a much warmer state over the next few decades...and...our state is also likely to become somewhat wetter, with a modest increase in total precipitation and in the number of intense rainfall events. The amount of climate change varies by season, with winter experiencing the greatest warming and most likely increase in precipitation." The site's information shows that Waushara County is likely to experience warmer weather and an increase in precipitation for all four seasons of the year, with the greatest increases in winter and summer. This shows an increased likelihood of severe thunderstorms in spring, summer, and fall in

¹³⁴ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

¹³⁵ [Trends and Projections | Wisconsin Initiative on Climate Change Impacts \(WICCI\)](#)

Waushara County. Thunderstorms generate lightning, which should also increase in frequency.

As noted earlier in this plan, the National Risk Index (NRI) tool ¹³⁶ has been made available by the Federal Emergency Management Agency (FEMA). It calculates a baseline relative risk measurement for 18 natural hazards based on expected annual loss, social vulnerability and community resilience. Below is data relevant to the hazard discussed in this chapter. It should be noted that the NRI information may not necessarily match the hazard ratings reached by the county and is only being included for reference.

Number of Events	734
Annualized Frequency	33.3
Expo. - Building Value (\$)	3,184,594,000
Expo. - Population	24,496
Expo. - Population Equiv. (\$)	186,169,600,000
Expo. - Total (\$)	189,354,194,000
HLR – Buildings (\$)	5.24 per 100M
HLR - Population (\$)	5.06 per 1B
HLR - Overall Rating	Very Low
EAL - Building Value (\$)	5,597
EAL - Population	0
EAL - Population Equiv. (\$)	31,740
EAL - Total (\$)	37,336
EAL Score	14.90
EAL Rating	Relatively Low
Risk Score	9.10
Risk Rating	Very Low

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

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

¹³⁶ <https://hazards.fema.gov/nri/map>

Lightning

equipment. These pieces of infrastructure are needed by both first response agencies and the general community to ensure safe transport; warm, safe homes and good internal and external communications abilities.

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

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

Hazard Mitigation Strategies

The goal of lightning mitigation activities is to reduce, in a cost-effective manner, the loss of lives and property due to these events. The two primary ways to effectively reduce lightning losses are modifying human behavior and protecting structures (e.g., using fire resistant materials in building construction).

The Waushara 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.

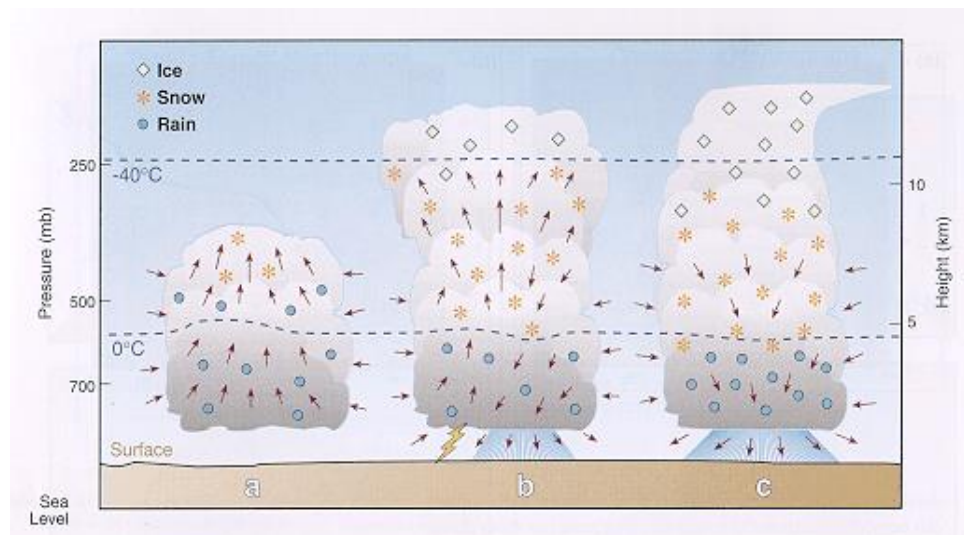
Storms: Thunderstorms

There are three distinct stages of development for thunderstorms (birth, growth, maturity) each of which can be seen in the following schematic. ¹³⁷

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

¹³⁷ 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 Waushara 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 Waushara County is very high as these storms usually occur one or more times each year during the summer in Wisconsin and Waushara County. The probability of damage due to a thunderstorm is considered to be high and the likelihood of injury/death to people is also considered to be high. 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.

The University of Wisconsin-Madison, Nelson Institute for Environmental Studies/ Wisconsin DNR's Wisconsin Initiative on Climate Change Impacts¹³⁸ shows a scientific consensus that, "Wisconsin is likely to become a much warmer state over the next few decades...and...our state is also likely to become somewhat wetter, with a modest increase in total precipitation and in the number of intense rainfall events. The amount of climate change varies by season, with winter experiencing the greatest warming and most likely increase in precipitation." The site's information shows that Waushara County is likely to experience warmer weather and an increase in precipitation for all four seasons of the year, with the greatest increases in winter and summer. This shows an increased likelihood of severe thunderstorms in spring, summer, and fall in Waushara County. Thunderstorms can generate lightning, hail,

¹³⁸ [Trends and Projections | Wisconsin Initiative on Climate Change Impacts \(WICCI\)](#)

tornadoes, and strong winds, which should also increase in frequency.

Tables showing the thunderstorm events that have been recorded by the National Weather Service in Waushara County can be found in Appendix B.¹³⁹

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

Hazard Mitigation Strategies

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

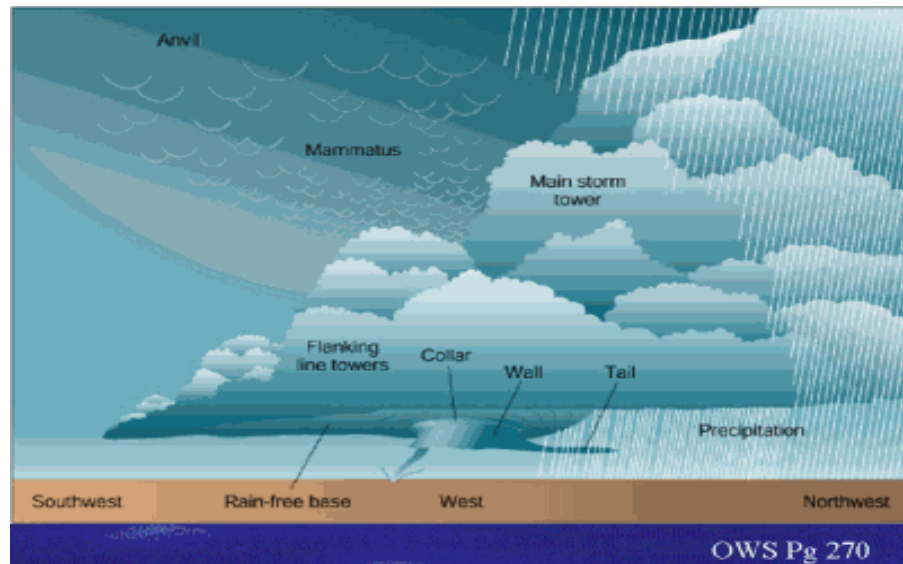
Waushara County Emergency Management has developed severe weather safety and alert and notification information that it disseminates to the public online via their website and on social media, with the goal of protecting the lives and property of citizens. During Tornado Awareness Week, there is extensive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

¹³⁹ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

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.

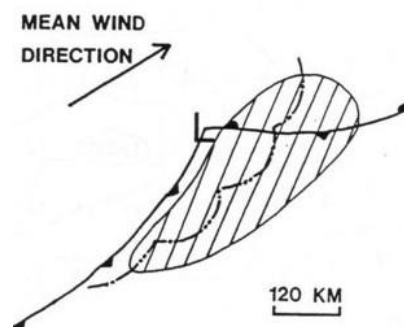


A derecho is a widespread, long-lived, violent, convectively-induced straight-line windstorm that is associated with a fast-moving band of severe thunderstorms usually taking the form of a bow echo. Derechos blow in the direction of movement of their associated storms; this is similar to a gust front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

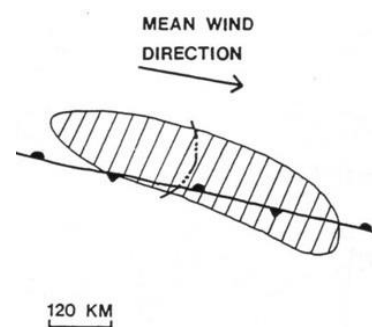
The traditional criteria that distinguish a derecho from a severe thunderstorm are *sustained* winds of 58 mph during the storm as opposed to gusts, high and/or rapidly increasing forward speed and geographic extent (typically 250 nautical miles in length). In addition, they have a distinctive appearance 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.¹⁴⁰

- **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

¹⁴⁰ <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 ¹⁴¹		
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 $\frac{1}{4}$ 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

¹⁴¹ FEMA, 1997

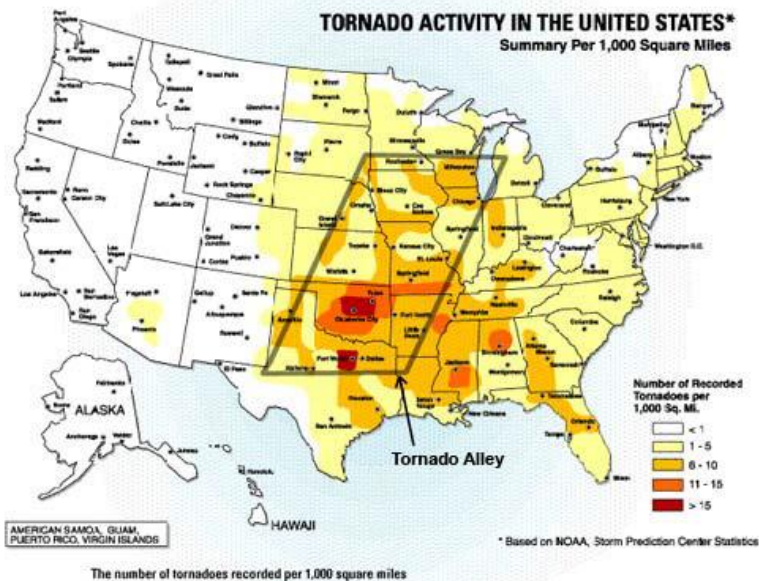
Downburst Characteristics

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.¹⁴² There have been four funnel clouds reported for the county. The probability of Waushara County being struck by a tornado in the future is medium and the likelihood of damage from future incidents is high. The probability of high wind (derecho) and downburst is medium and the likelihood of damages is high. All parts of Waushara County are equally susceptible to tornadoes and high winds.

The University of Wisconsin-Madison, Nelson Institute for Environmental Studies/ Wisconsin DNR's Wisconsin Initiative on Climate Change Impacts¹⁴³ shows a scientific consensus that, "Wisconsin is likely to become a much warmer state over the next few decades...and...our state is also likely to become somewhat wetter, with a modest increase in total precipitation and in the number of intense rainfall events. The amount of climate change varies by season, with winter experiencing the greatest warming and most likely increase in precipitation." The site's information shows that Waushara County is likely to experience warmer weather and an increase in precipitation for all four seasons of the year, with the greatest increases in winter and summer. This shows an increased likelihood of severe thunderstorms in spring, summer, and fall in Waushara County. Extra atmospheric energy can increase the frequency and intensity of the severe thunderstorms that generate tornadoes and strong winds.

As noted earlier in this plan, the National Risk Index (NRI) tool¹⁴⁴ has been made available by the Federal Emergency Management Agency (FEMA). It calculates a baseline relative risk measurement for 18 natural hazards based on expected annual loss, social vulnerability and community resilience. Below is data relevant to the hazard discussed in this chapter. It should be noted that the NRI

¹⁴² <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

¹⁴³ [Trends and Projections | Wisconsin Initiative on Climate Change Impacts \(WICCI\)](#)

¹⁴⁴ <https://hazards.fema.gov/nri/map>

Storms: Tornadoes and High Winds

information may not necessarily match the hazard ratings reached by the county and is only being included for reference.

(Tornadoes)

Number of Events	20
Annualized Frequency	0.4
Expo. - Building Value (\$)	3,184,594,000
Expo. - Population	24,496
Expo. - Agricultural Value (\$)	126,702,000
Expo. - Population Equiv. (\$)	186,169,600,000
Expo. - Total (\$)	189,480,896,000
HLR – Buildings (\$)	2.11 per 10K
HLR - Population (\$)	3.78 per 1M
HLR - Agriculture (\$)	6.30 per 100K
HLR - Overall Rating	Very Low
EAL - Building Value (\$)	250,614
EAL - Population	0.03
EAL - Agricultural Value (\$)	2,976
EAL - Population Equiv. (\$)	262,239
EAL - Total (\$)	515,829
EAL Score	15.39
EAL Rating	Relatively Low
Risk Score	14.07
Risk Rating	Relatively Low

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

(Strong Winds)

Number of Events	108
Annualized Frequency	3.3
Expo. - Building Value (\$)	3,184,594,000
Expo. - Population	24,496
Expo. - Population Equiv. (\$)	186,169,600,000
Expo. - Agricultural Value (\$)	126,702,000
Expo. - Total (\$)	189,480,896,000
HLR – Buildings (\$)	1.72 per 100K

HLR - Population (\$)	2.81 per 10M
HLR - Agriculture (\$)	1.19 per 10K
HLR - Overall Rating	Relatively Low
EAL - Building Value (\$)	185,654
EAL - Population	0.02
EAL - Population Equiv. (\$)	177,791
EAL - Agricultural Value (\$)	50,228
EAL - Total (\$)	413,674
EAL Score	28.46
EAL Rating	Relatively Moderate
Risk Score	15.09
Risk Rating	Relatively Moderate

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

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; Waushara 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, and usually 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.

Mobile Home Parks ^{145 146}	
Park Name	Location
WIVR Redgranite MHP, LLC	Redgranite
Dakota Capital MHC	Wautoma
Lake of the Woods Trailer Park	Wautoma

¹⁴⁵ <https://www.mobilehome.net/mobile-home-park-directory/wisconsin/county/Waushara-county>

¹⁴⁶ <https://www.mhville.com/Communities/MobileHomeParks.php?State=WI&County=Waushara>

Storms: Tornadoes and High Winds

Rosetown Mobile Home Park	Wild Rose
Lakeside Mobile Home Park	Wild Rose
Maple Grove Mobile Home Park	Wild Rose
Evergreen Park	Wild Rose
Pineland Mobile Home Park	Wild Rose
Redgranite Mobile Home Park	Redgranite
Park Meadows	Wautoma

Campgrounds ¹⁴⁷	
Campground Name	Location
Danny's Campers RV Park & Campground	Coloma
Enchanted Forest Campground	Wild Rose
Evergreen Campsites	Wild Rose
Flanagan's Pearl Lake Campground	Redgranite
Hancock KOA Campgrounds	Hancock
Hancock Village Campgrounds	Hancock
Camp Lakotah	Wautoma
Lake Lucerne Camp and Retreat Center	Neshkoro ¹⁴⁸
Luwisomo Outdoor Ministry & Retreat Center	Wild Rose
Luwisomo Campgrounds	Wild Rose
Maywood Wilderness Boy Scouts	Hancock

¹⁴⁷ http://www.hikercentral.com/campcounty/Wisconsin_Waushara.html

¹⁴⁸ In Marquette County but draws some emergency services from Waushara County.

Camp Moshava	Wild Rose
Mount Morris Camp & Conference Center	Wautoma
Napowan Scout Camp	Wild Rose
Oakwood Campsite Bar & Grill	Wild Rose
Patzer's Last Resort	Wild Rose
Camp Phillips	Wautoma
Pine Lake Lutheran Camp	Waupaca ¹⁴⁹
Pineland Park Mobile Home Court and Campsite	Wild Rose
Camp Shin-Go-Beek	Waupaca ¹⁵⁰
Little Silver Lake Resort	Wild Rose
Tomorrow Wood Campground	Hancock
White River Campground	Wautoma

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

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

¹⁴⁹ In Waupaca County but draws some emergency services from Waushara County.

¹⁵⁰ In Waupaca County but draws some emergency services from Waushara County.

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. Waushara 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 Waushara County by individual municipalities. Some jurisdictions noted strategies related to sirens:

- Village of Coloma: If the siren goes down and cannot be repaired, it will not be replaced. Encouraging residents to use the mass notification system. Will remain a strategy until siren is no longer in the Village.
- Village of Redgranite: The siren is currently out of service. No plans in the near future to repair.
- Town of PoySippi: Have one active siren, maintaining and upgrading as needed. Located next to fire station. Firm believer in the mass notification system.

County Emergency Management and the municipalities promote the mass 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. Waushara 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. Waushara 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. Projects include:

- City of Wautoma: Will continue to discuss and research options for a shelter at the fairgrounds to accommodate people at the location, as well as campgrounds and mobile home parks within a 10-mile radius.
- Village of Redgranite: Will monitor progress of potential shelter(s) at Red Granite Mobile Home Park. Inform public of shelters and schools in area and the evacuation routes, including use of social media. The Village finished building a new Village Hall which will be used of ran emergency shelter. Also will be installing a generator shortly.
- Town of Springwater: Will monitor progress of potential shelters identified at Wilson Lake Campground and Rose's Campground.

Other strategies related to this hazard include:

- Apply for funding to build Community Safe Rooms. Require new construction of safe rooms in new schools, daycares, and nursing homes, and public facilities. Ensure that school officials are aware of the best area of refuge in school buildings and participate in annual Sever Weather Awareness

week. The county has sought opportunities to create safe rooms, especially in areas with high-hazard concerns such as schools, campgrounds and mobile home parks. WI DPI requires schools to plan and train through drills, the school community on where their safe rooms are and EM provides information and support to them upon request. EM works with students during Severe Weather Awareness week in Spring. Schools all have tornado plans.

- The Village of Hancock will inform residents and campers from the Village Campground of the shelter location at the Hancock Community Center and create an evacuation route.

Storms: Winter

Due to its position along the northern edge of the United States, Wisconsin, including Waushara 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.

- 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.¹⁵¹ 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 no recorded blizzard events for the county.

The probability that there will be severe winter storms in Waushara County is high and the likelihood that those storms will cause significant damage is medium (snow) and high (ice).

The University of Wisconsin-Madison, Nelson Institute for Environmental Studies/ Wisconsin DNR's Wisconsin Initiative on Climate Change Impacts¹⁵² shows a scientific consensus that, "Wisconsin is likely to become a much warmer state over the next few decades...and...our state is also likely to become somewhat wetter, with a modest increase in total precipitation and in the number of intense rainfall events. The amount of climate change varies by season, with winter experiencing the greatest warming and most likely increase in precipitation." The site's information shows that Waushara County is likely to experience warmer weather and an increase in precipitation for all four seasons of the year, with the greatest increases in winter and summer. This shows an decreased likelihood of severe winter storms in Waushara County. It should be noted that this change does not mean that Waushara County is unlikely to have freezing weather. Instead, it is more likely that the additional atmospheric moisture forecasted will fall as freezing rain, sleet, and ice instead of as snow.

As noted earlier in this plan, the National Risk Index (NRI) tool¹⁵³ has been made available by the Federal Emergency Management Agency (FEMA). It calculates a baseline relative risk measurement

¹⁵¹ <http://www.ncdc.noaa.gov/stormevents/choosedates.jsp?statefips=55%2CWISCONSIN>

¹⁵² [Trends and Projections | Wisconsin Initiative on Climate Change Impacts \(WICCI\)](#)

¹⁵³ <https://hazards.fema.gov/nri/map>

Storms: Winter

for 18 natural hazards based on expected annual loss, social vulnerability and community resilience. Below is data relevant to the hazard discussed in this chapter. It should be noted that the NRI information may not necessarily match the hazard ratings reached by the county and is only being included for reference.

(Winter Weather)

Number of Events	51
Annualized Frequency	4.2
Expo. - Building Value (\$)	3,184,593,934
Expo. - Population	24,496
Expo. - Agricultural Value (\$)	126,702,000
Expo. - Population Equiv. (\$)	186,169,597,536
Expo. - Total (\$)	189,480,893,470
HLR – Buildings (\$)	1.43 per 10M
HLR - Population (\$)	4.26 per 100M
HLR - Agriculture (\$)	1.16 per iM
HLR - Overall Rating	Very Low
EAL - Building Value (\$)	1,907
EAL - Population	0
EAL - Agricultural Value (\$)	616
EAL - Population Equiv. (\$)	33,300
EAL - Total (\$)	35,823
EAL Score	17.72
EAL Rating	Relatively Low
Risk Score	13.01
Risk Rating	Relatively Low

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

(Ice Storms)

Number of Events	10
Annualized Frequency	0.1
Expo. - Building Value (\$)	3,163,538,070
Expo. - Population	24,309.65

Expo. - Population Equiv. (\$)	184,753,377,544
Expo. - Total (\$)	187,916,915,613
HLR – Buildings (\$)	2.48 per 1M
HLR - Population (\$)	5.12 per 10M
HLR - Overall Rating	Very Low
EAL - Building Value (\$)	1,105
EAL - Population	0
EAL - Population Equiv. (\$)	12,852
EAL - Total (\$)	13,957
EAL Score	10.83
EAL Rating	Very Low
Risk Score	7.65
Risk Rating	Very Low

"Expo." = Exposure / "HLR" = Historic Loss Ratio / "EAL" = Expected Annual Loss

Vulnerability

Winter storms present a serious threat to the health and safety of affected citizens and can result in significant damage to property. Heavy snow or accumulated ice can cause the structural collapse of homes, commercial buildings and agricultural structures; down power lines or isolate people from assistance or services by impeding transportation by the general public, emergency responders and public transportation resources.

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

Hazard Mitigation Strategies

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

Communities prepare for severe winter weather by ensuring that plowing and sanding equipment is operational and available to handle potential emergencies. Funding is budgeted for the overtime

hours of extra personnel but in a large emergency this may not be adequate. Redundant communication modes (e.g., radio, telephone) exist between government, police, fire, EMS, hospitals and highway departments.

Winter safety information is prepared and distributed to the media and the public by Waushara 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 information includes home and travel safety measures. Other projects include:

- Coordinating with local fire departments to develop a smoke and carbon monoxide detector purchasing program.
- Encouraging existing homeowners and require new construction for all dwellings that are heated by fuel-burning equipment to install carbon monoxide monitors and alarms.

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.

Utility systems are important in hazard mitigation planning because of the dependency on water, wastewater treatment, gas service, electricity and communications. Because of this reliance and vulnerability to hazards, utility systems must be identified for this plan.

The City of Wautoma and the Villages of Plainfield, Hancock, Coloma, and Redgranite provide municipal water supplies for domestic and commercial use.

There are a total of eight wastewater treatment facilities in Waushara County. A municipal wastewater treatment facility that serves the Wautoma area is located to the southwest off of State Highway 73. The other seven locations are in the City of Berlin, the Town of Poy Sippi, and the Villages of Plainfield, Hancock, Coloma, Wild Rose, Poygan Sanitary District and Redgranite.

Utility Failure

The Wisconsin Gas Company provides natural gas to the majority of the county. The Town of Aurora is serviced by Alliant/Wisconsin Power and Light. The Towns of Deerfield and Bloomfield do not have natural gas services available.

Alliant-Wisconsin Power and Light, Adam-Columbia Electric Cooperative, WE Energies and Pioneer Power and Light Company provide Waushara County with electric service throughout the county. As of 2001, the American Transmission Company (ATC) owns maintains and operates the major transmission facilities located in the State of Wisconsin, including Waushara County.

Four providers in the county – Union, SBC, Century-Midwest Wisconsin, Century- Kendall, and CenturyTel supply telephone service.



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

Waushara County typically has a couple of short power outages happen each summer, usually from wind damage 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 Waushara County has a between a medium to high likelihood of utility failures with a medium to 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 Waushara 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 Waushara 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.

Waushara 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 may be asked to take measures to

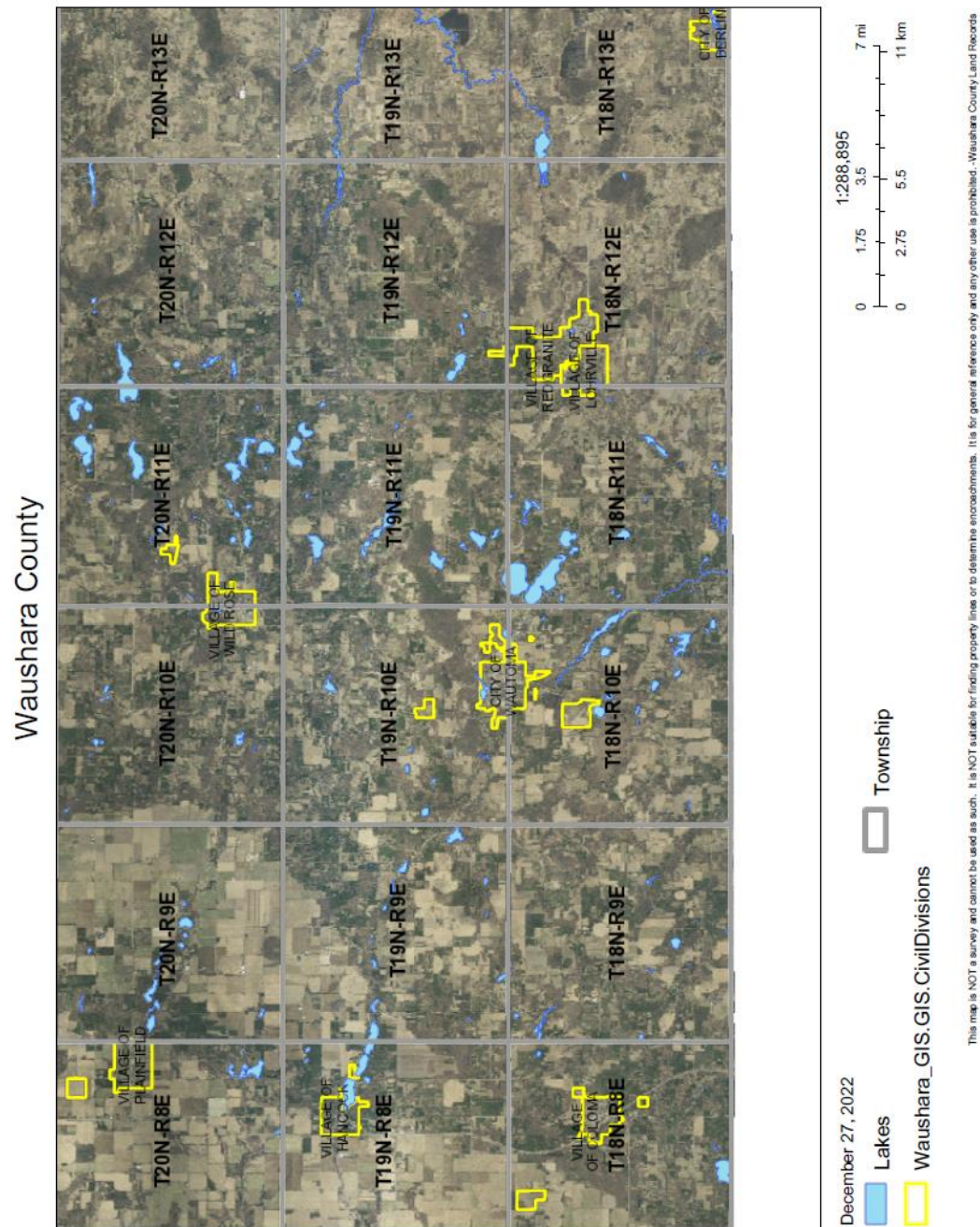
conserve fuel. If the fuel shortage reaches a critical stage, all non-essential facilities will be closed and contingency plans will be activated. Waushara County plans to continue to actively evaluate the utility systems' preparedness in cases of disaster to create mitigation strategies for likely scenarios.

In the event of a prolonged power outage, Waushara County has generators available to provide power for radio communication and some critical infrastructure. Some 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:

- Village of Coloma: Power sewer system in time of electric outages. Main lift station wired for backup generator. This will be evaluated for completion in the upcoming plan cycle.
- City of Wautoma: Backup generator and power sewer system for electrical outages- evaluate back-up options for the sanitary sewer system and implementation of recommendations. Have been using money from the American Rescue Plan Act that would qualify to replace things at the lift stations and work has been done. This was not completed during the previous plan cycle due to lack of funding.
- Town of Poy Sippi: Maintain and check portable generator for the municipal sanitary system.

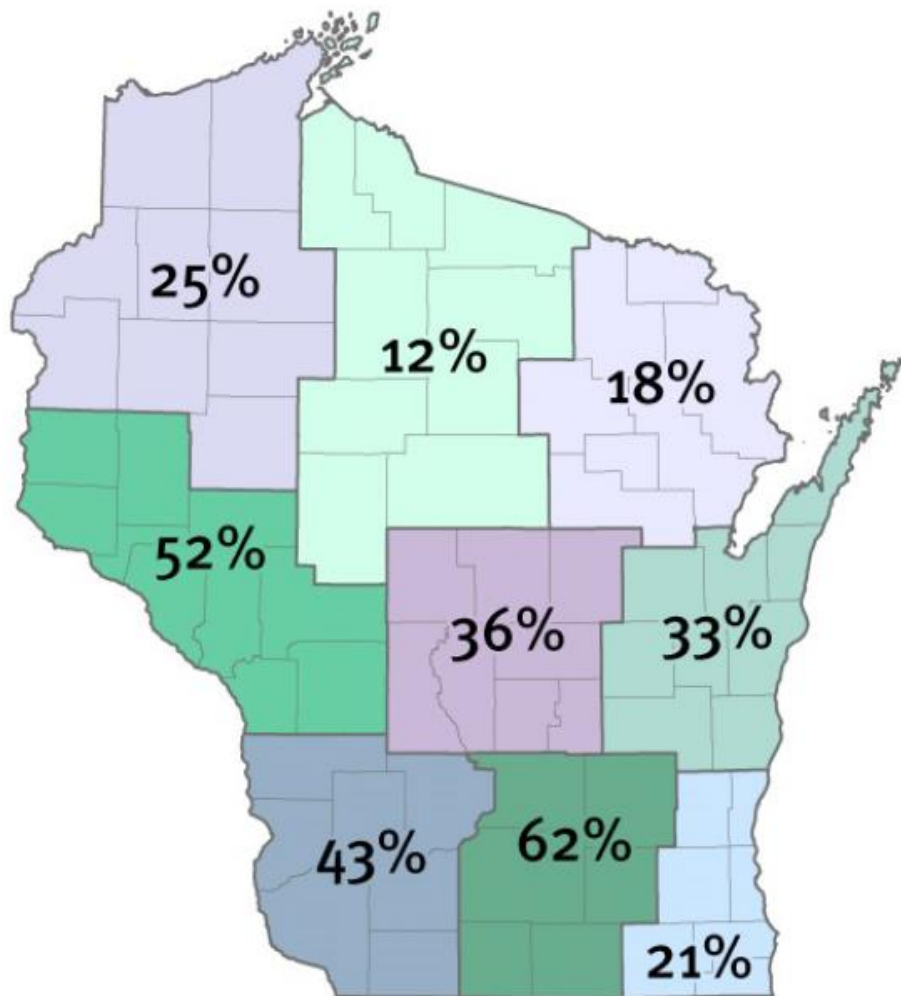
Appendix A: Maps

Waushara County Base Map¹⁵⁴



¹⁵⁴ [Waushara County, WI](#)

Percentage of Private Wells with Detectable Herbicides or Herbicide Metabolites (2001)¹⁵⁵

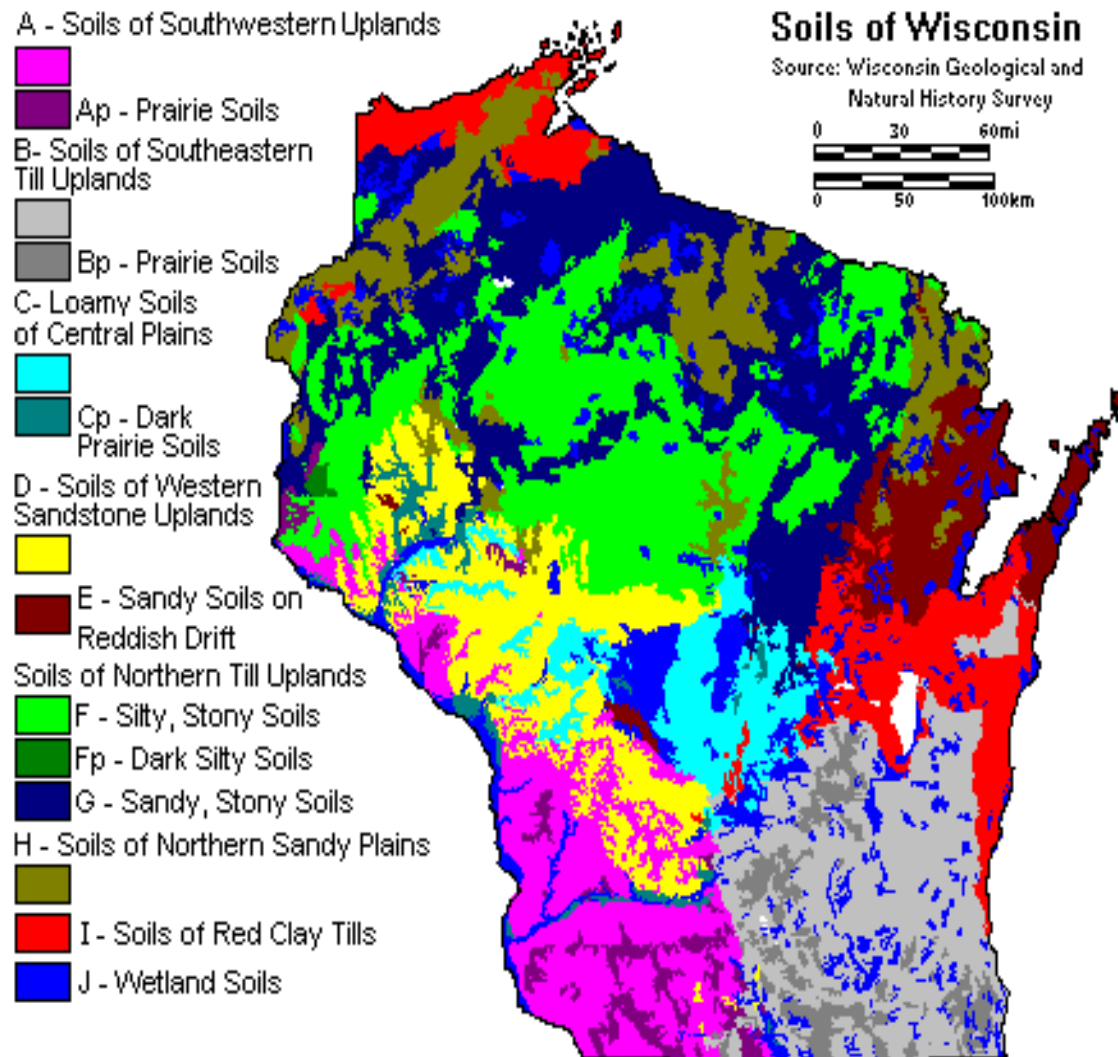


Herbicide data: Wisconsin Department of Agriculture, Trade and Consumer Protection, 2002, Agricultural chemicals in Wisconsin groundwater: final report, http://www.datcp.state.wi.us/arm/agriculture/land-water/enviro_n_quality/pdf/arm-pub-98.pdf

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

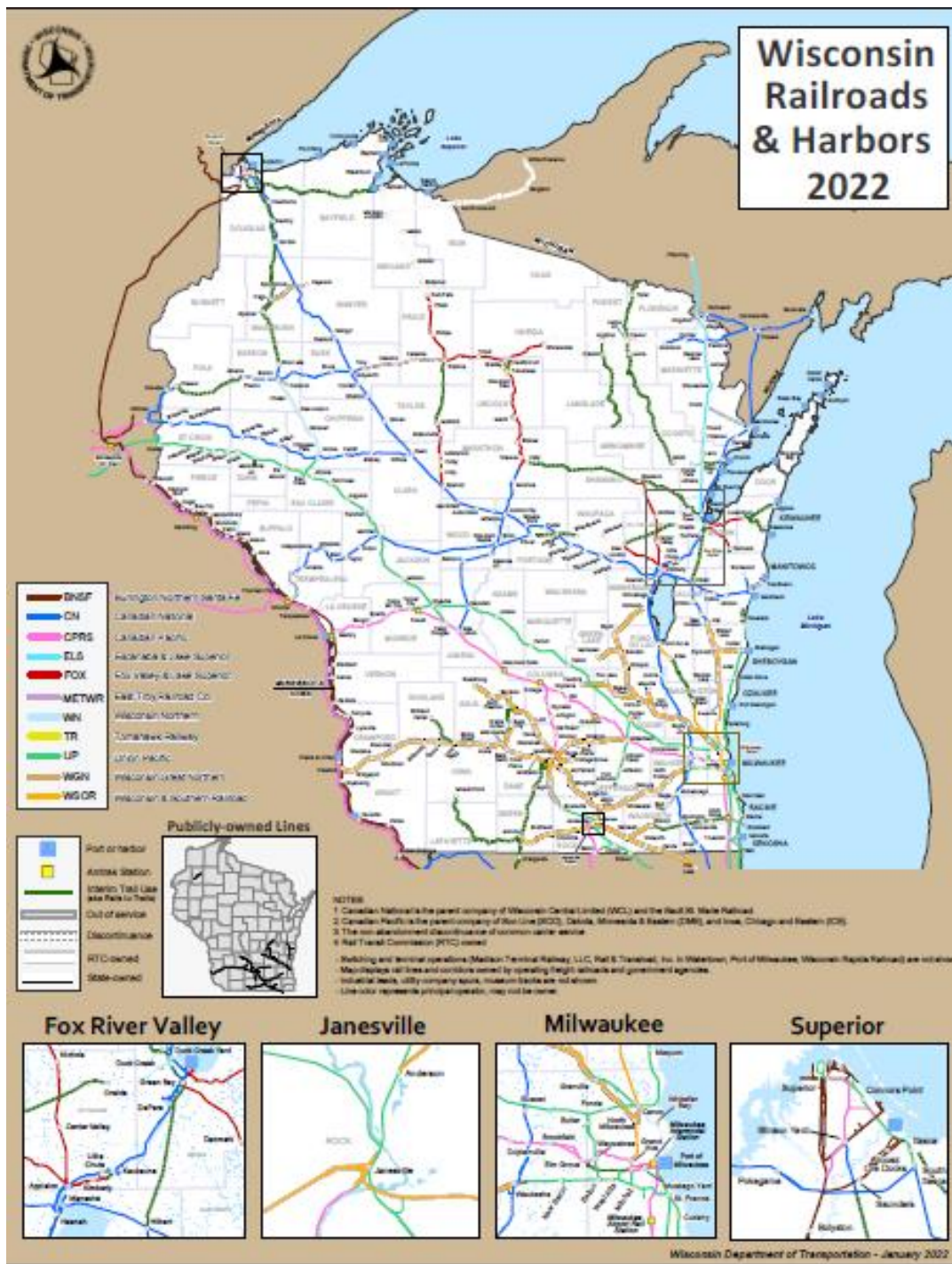
¹⁵⁵ <https://wi.water.usgs.gov/gwcomp/find/waushara/pesticidestate.html>

Soils Types¹⁵⁶



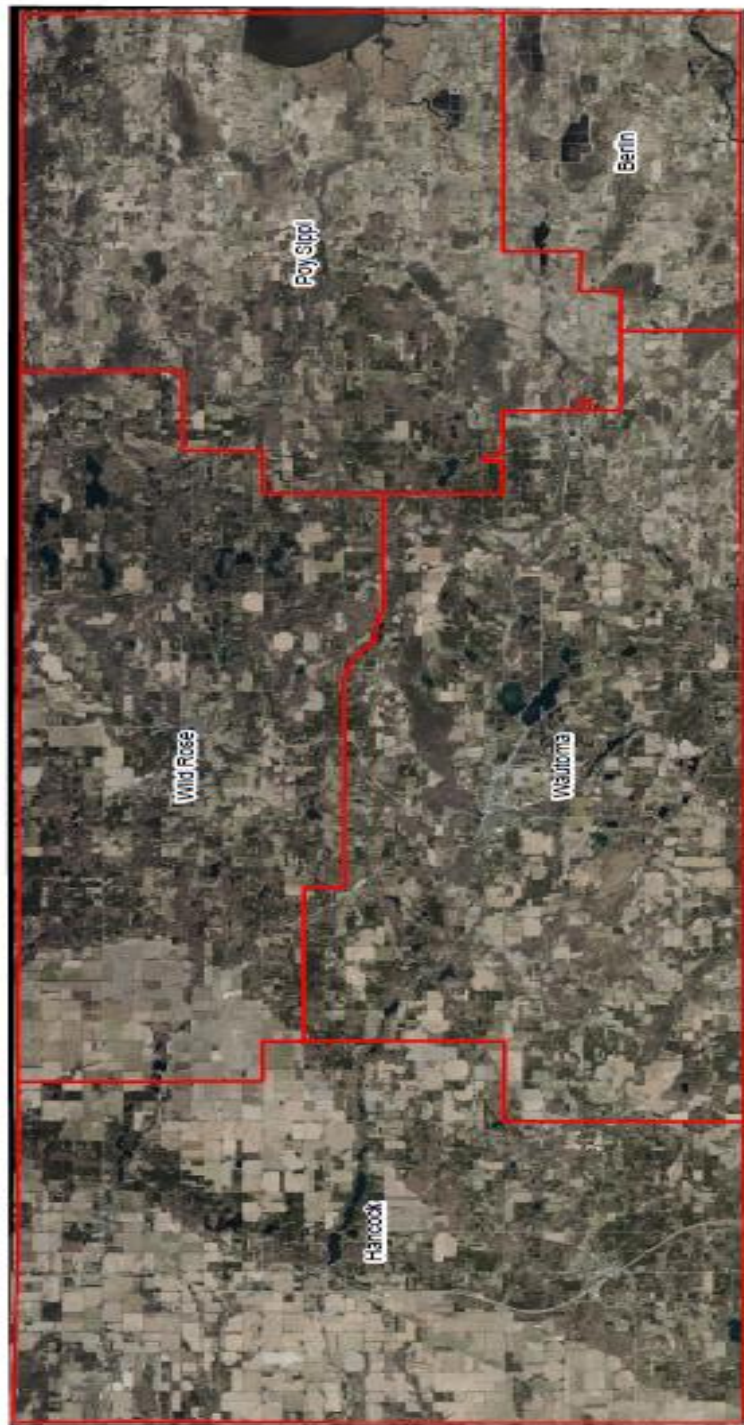
¹⁵⁶ Source: *Soils of Wisconsin* compiled by F. D. Hole, 1973; Wisconsin Geological and Natural History Survey Map, scale (approx.) 1: 3,150,000.

Wisconsin Railroads and Harbors ¹⁵⁸



¹⁵⁸ <https://wisconsindot.gov/Documents/travel/rail/railmap.pdf>

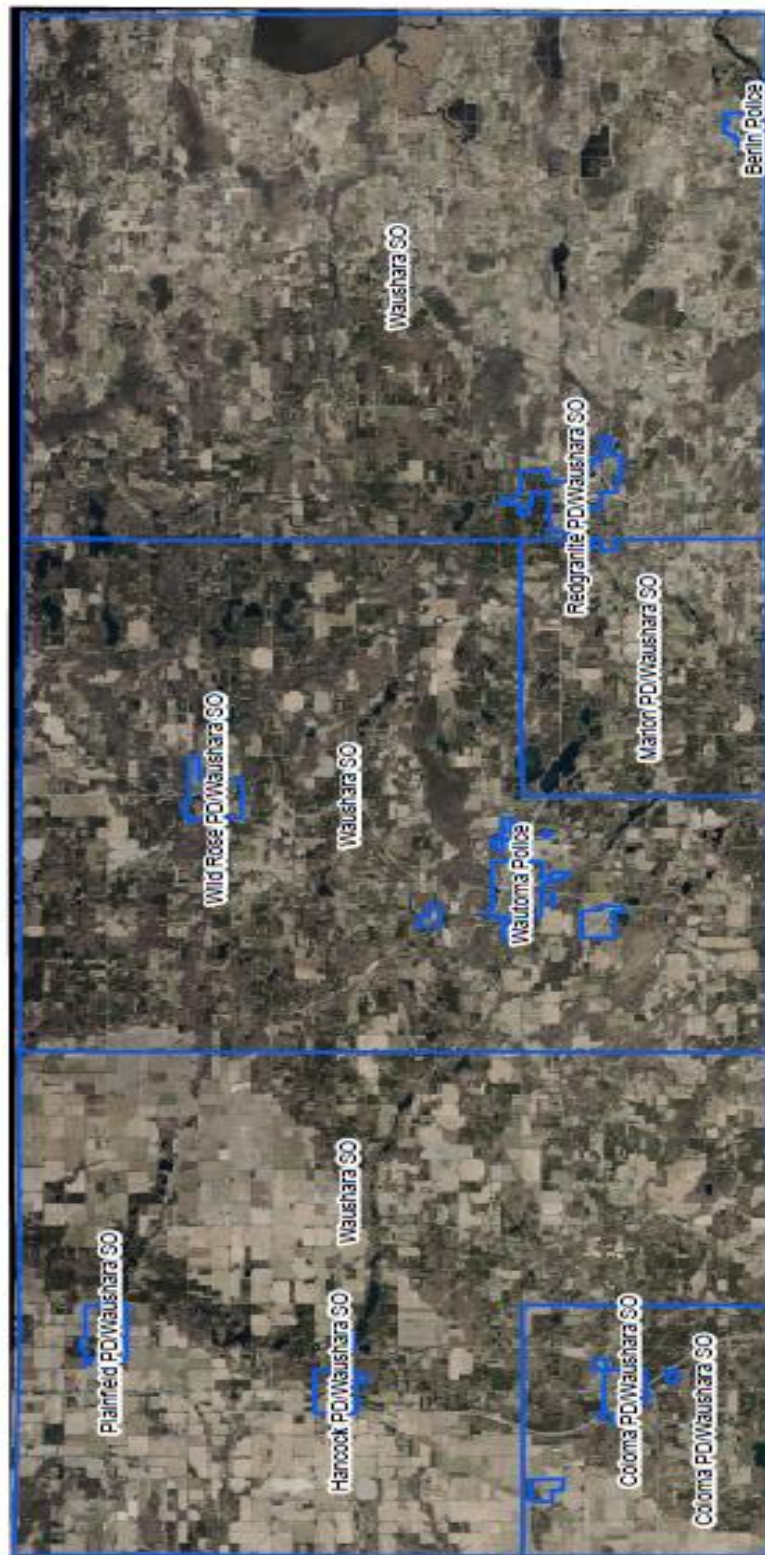
Waushara County EMS Service Areas



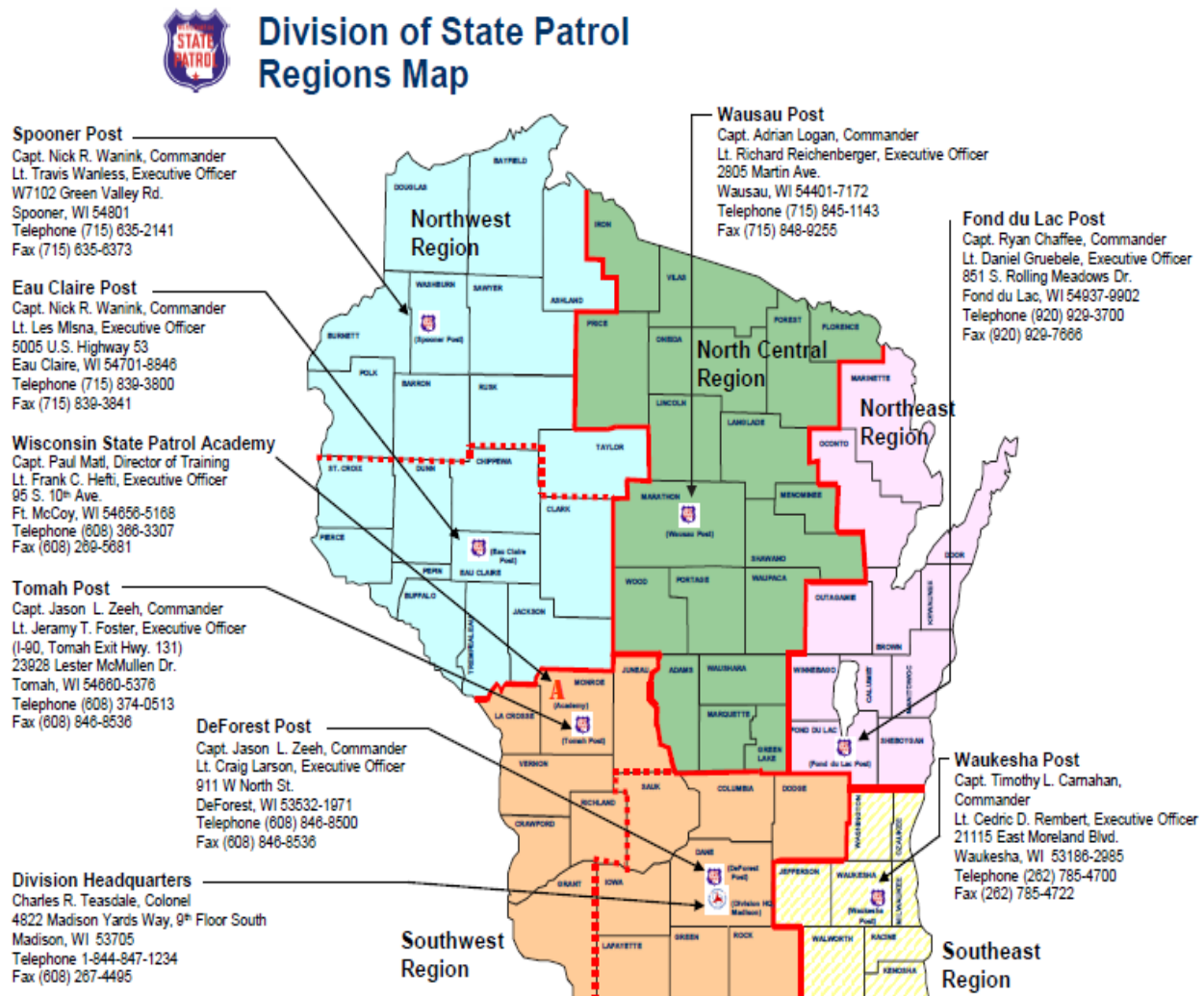
Waushara County Fire Service Areas



Waushara County Law Enforcement Districts

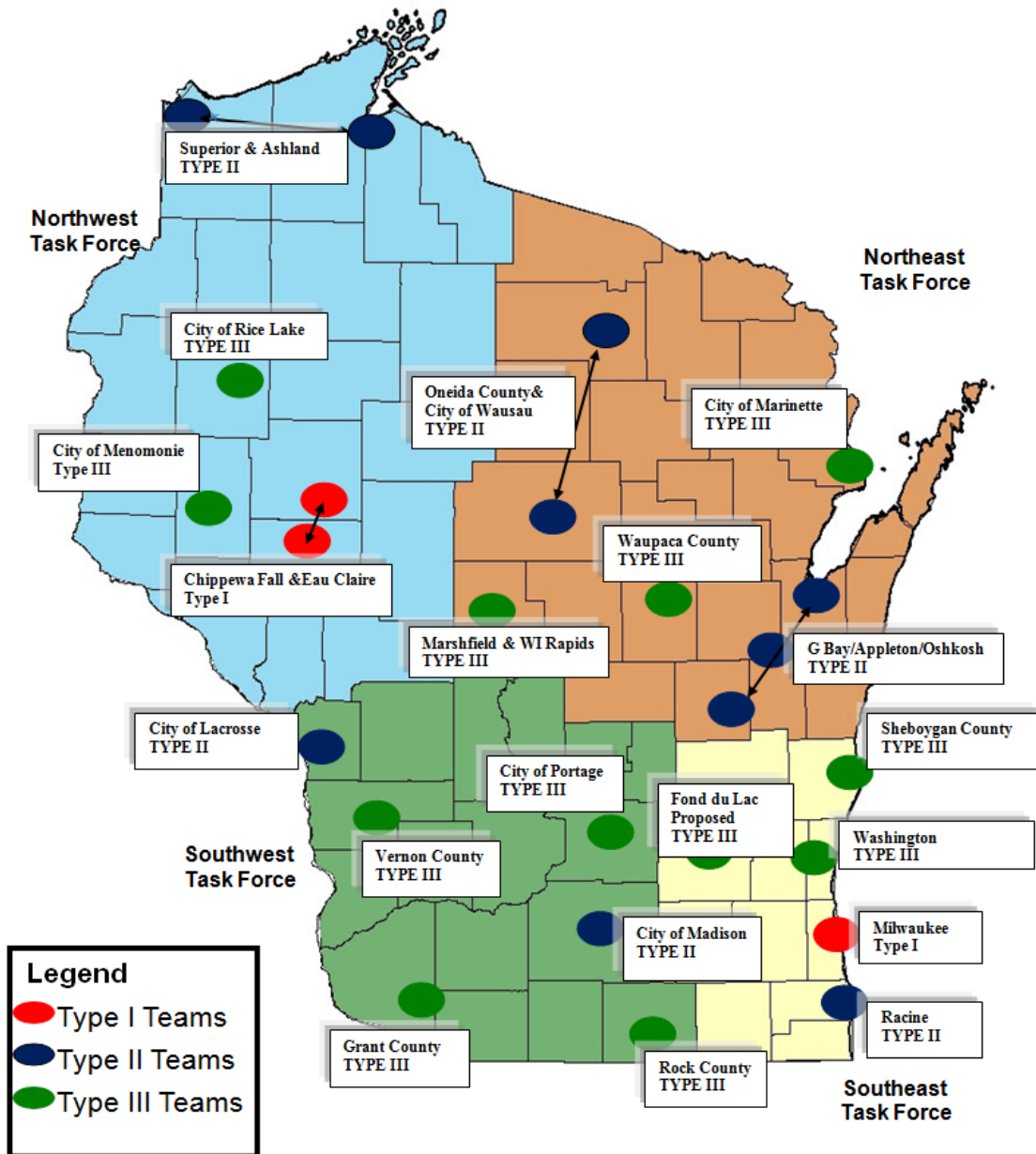


Wisconsin State Patrol Regions



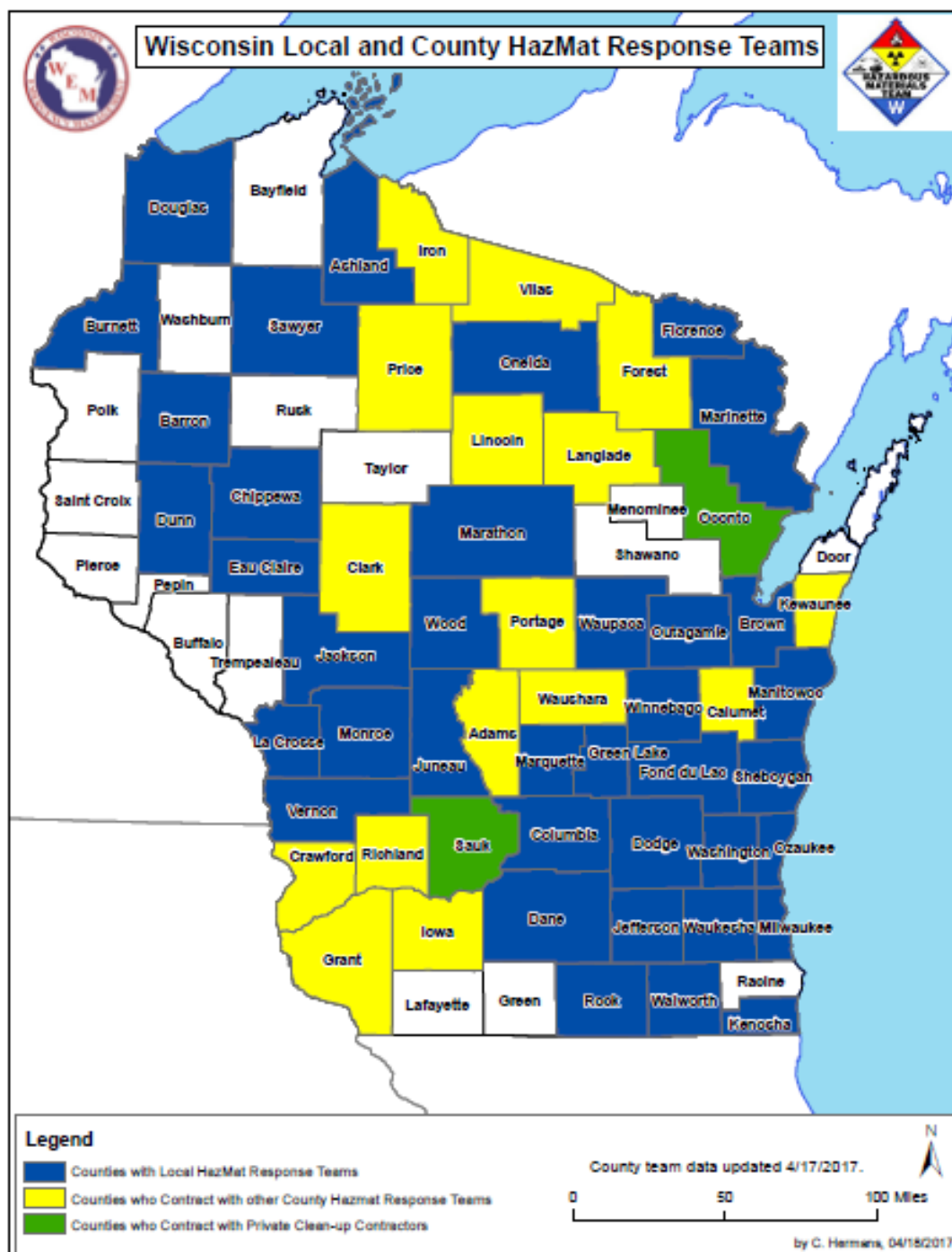
Rev. 10/24/18

Wisconsin's Regional & County/Local HazMat Response Teams¹⁵⁹



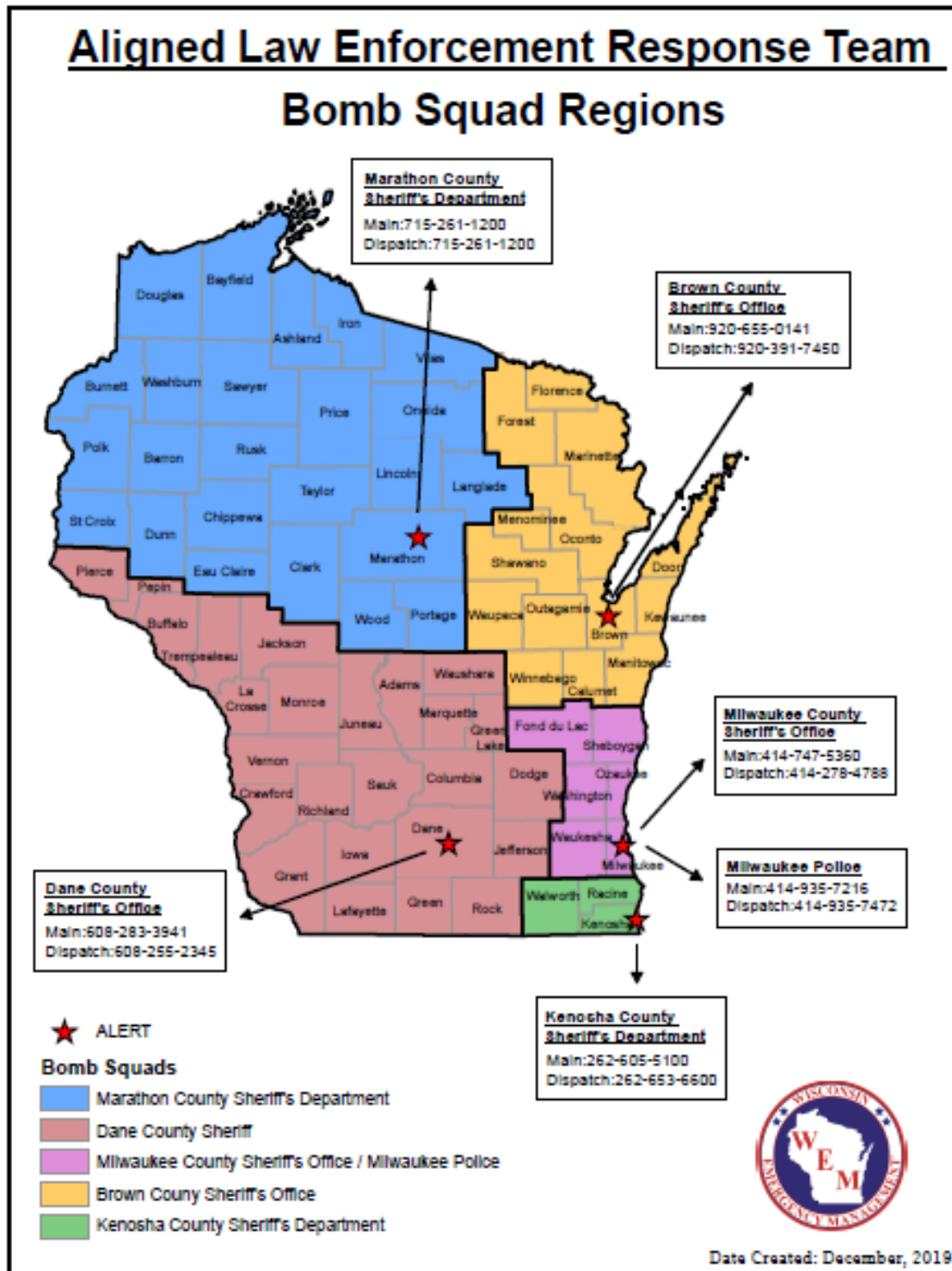
¹⁵⁹ <http://www.wsfca.com/files/cache/c1e510bdc2d15a686a3e1793a4418804.jpg>

Wisconsin Hazardous Materials Response Teams¹⁶⁰

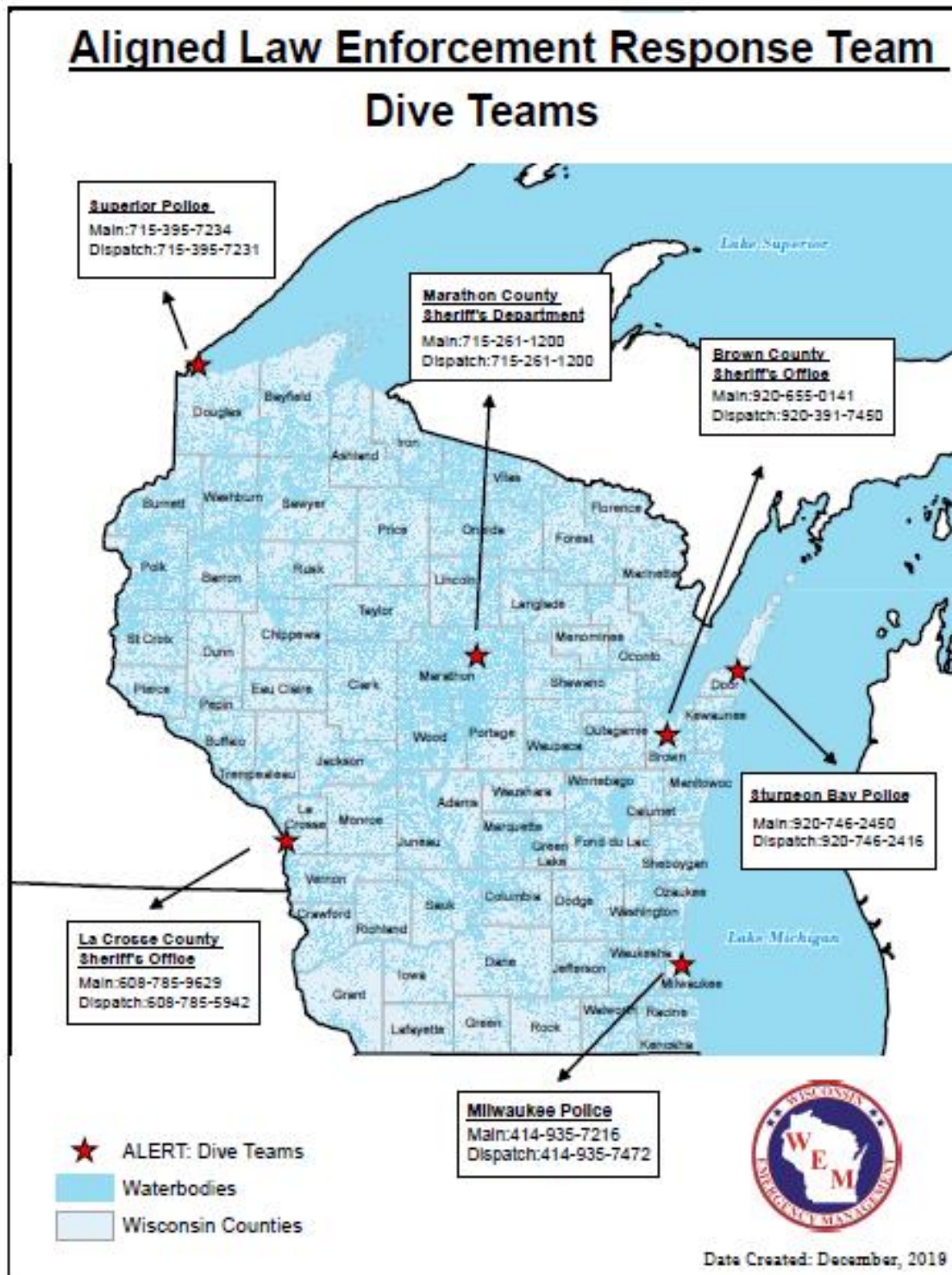


¹⁶⁰ https://dma.wi.gov/DMA/divisions/wem/response/images/HazMat_County_Teams.pdf

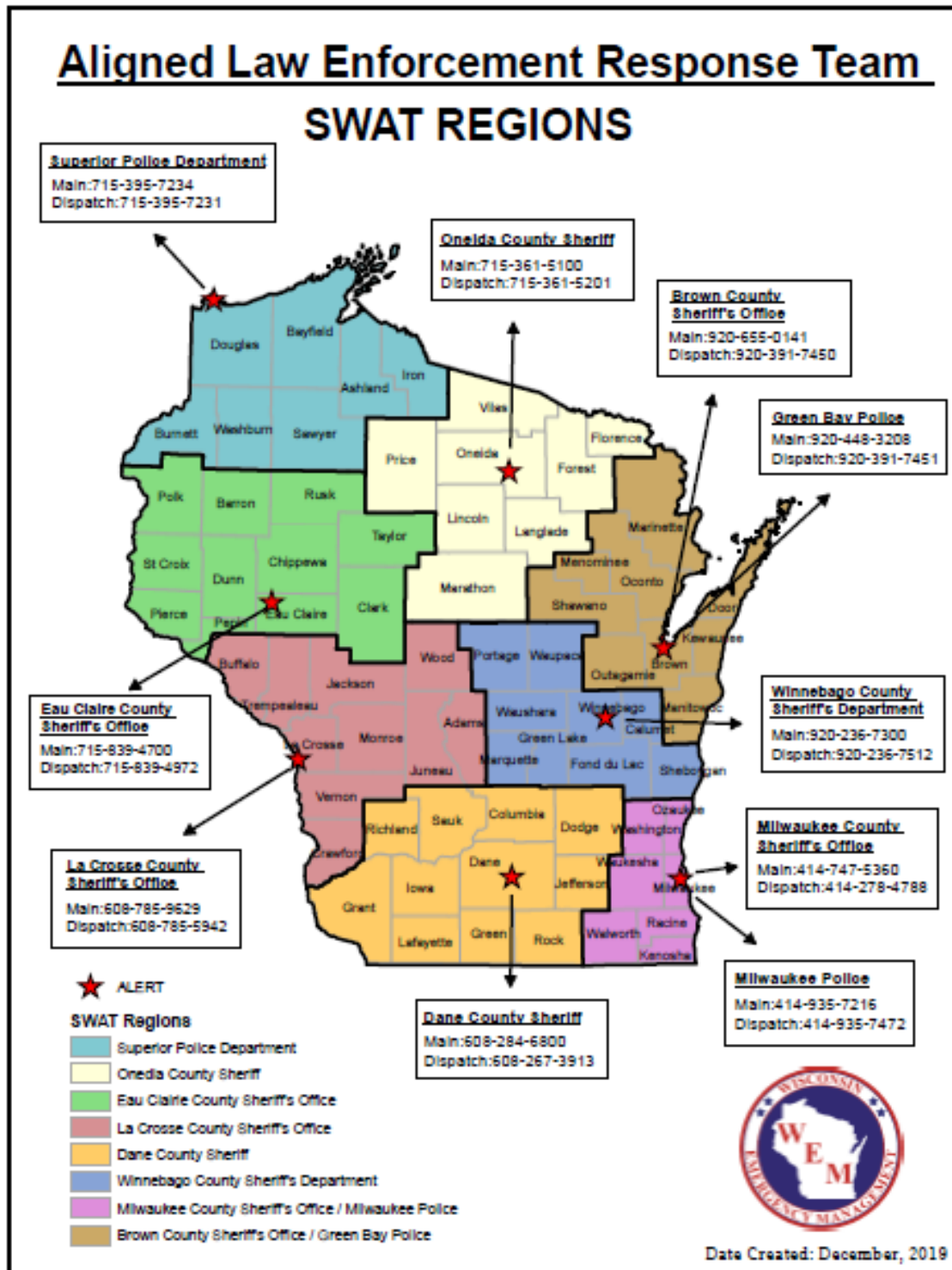
Wisconsin Bomb Squad Regions



Wisconsin Dive Teams

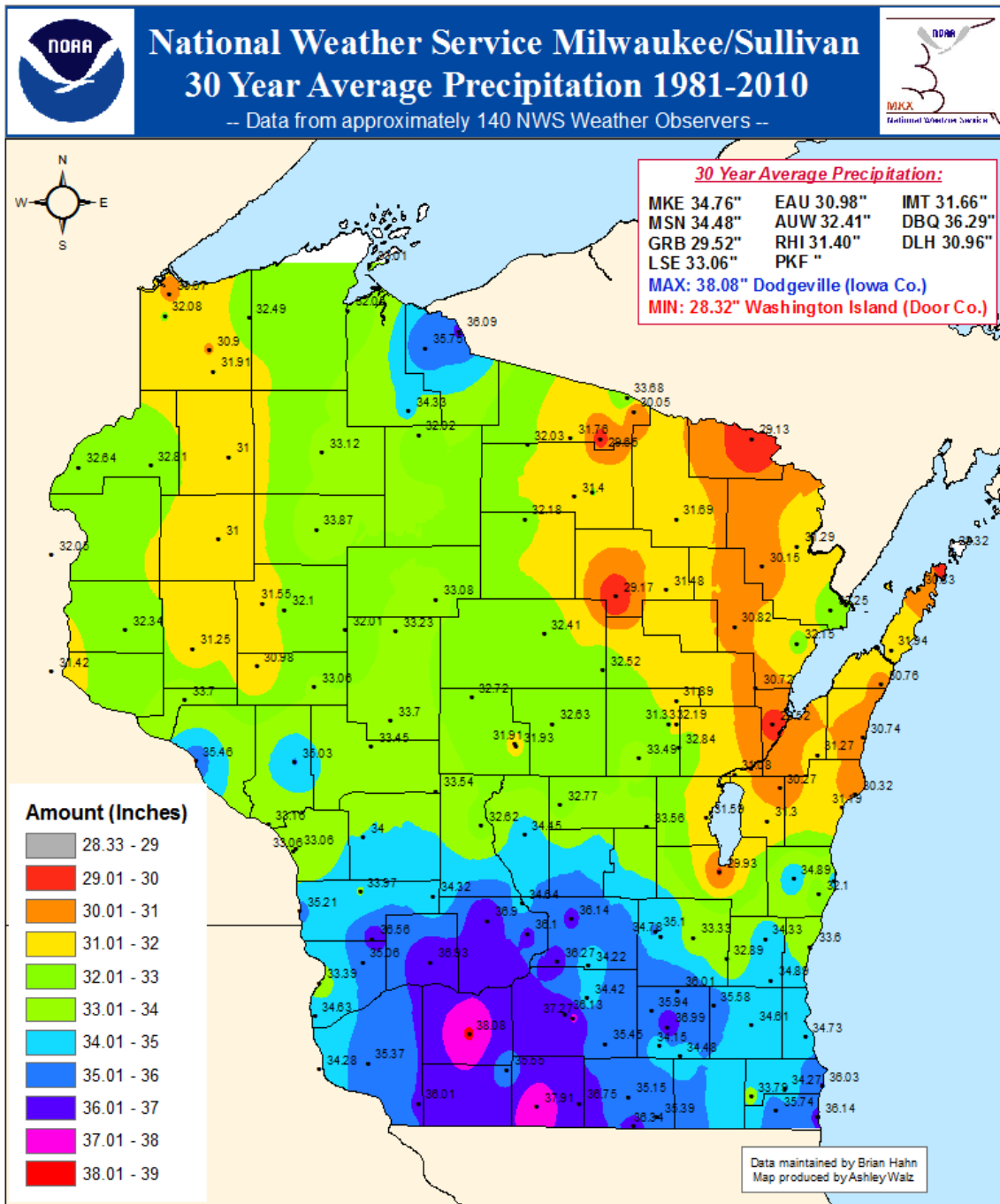


Wisconsin SWAT Regions



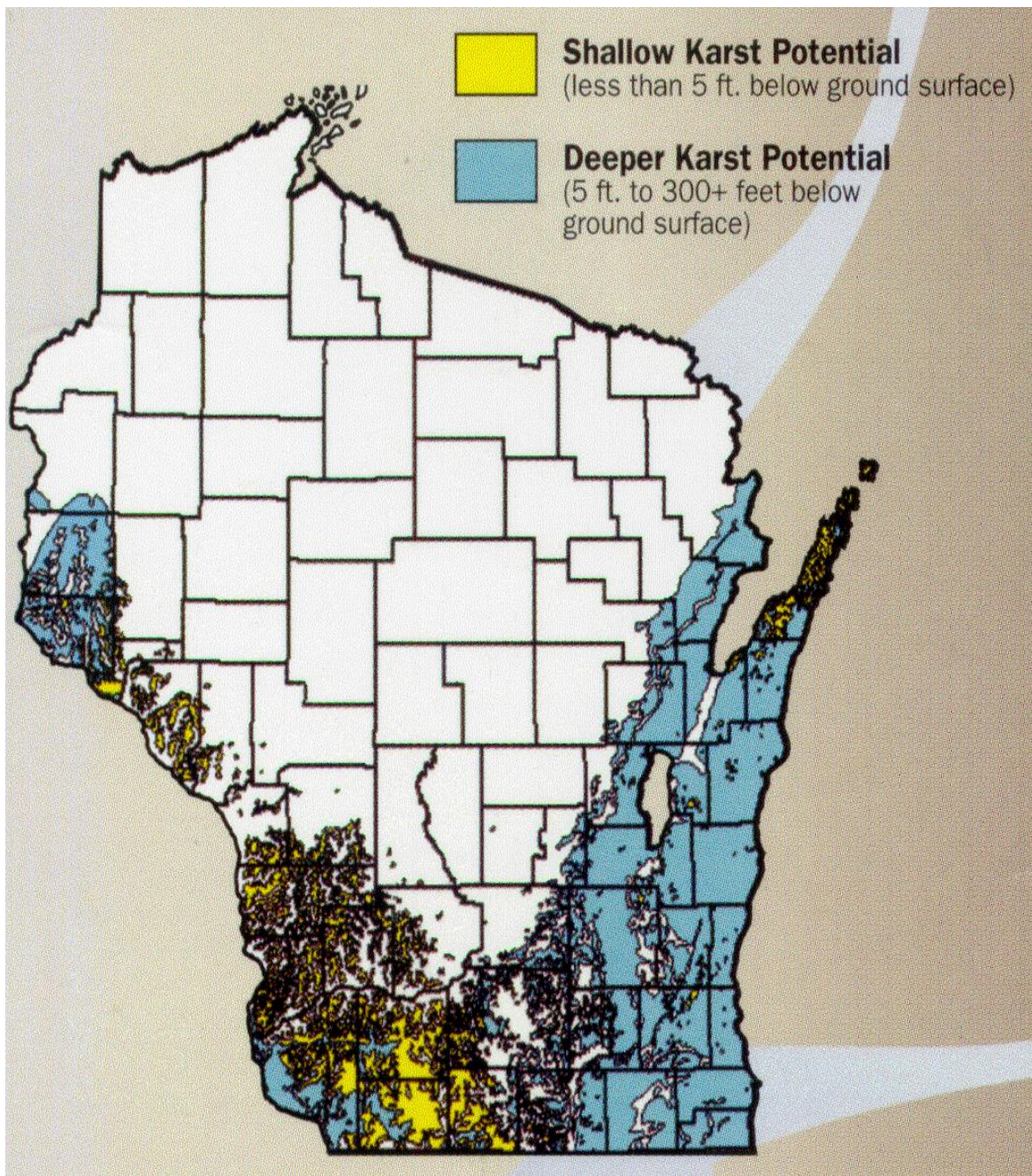
161

Wisconsin 30-Year Average Precipitation ¹⁶²



¹⁶² http://www.crh.noaa.gov/images/mkx/climate/avg_30_year_precip.png

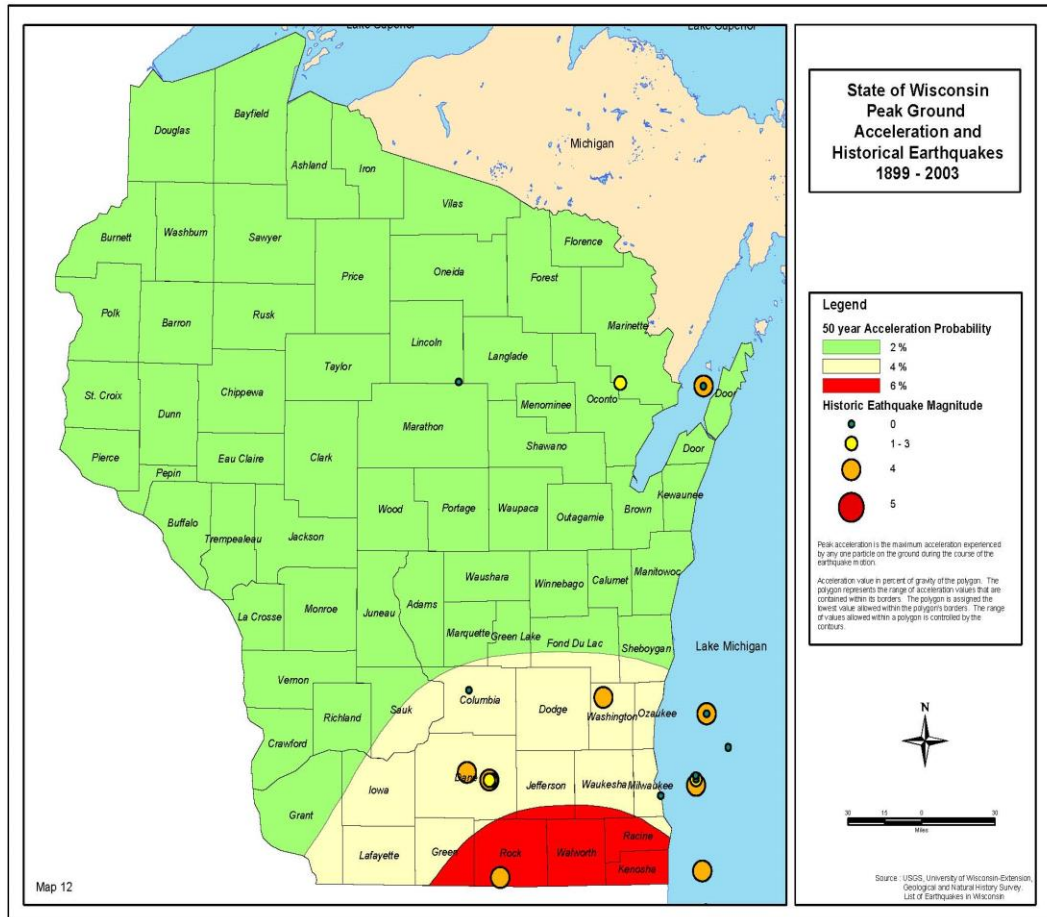
Karst Potential ¹⁶³



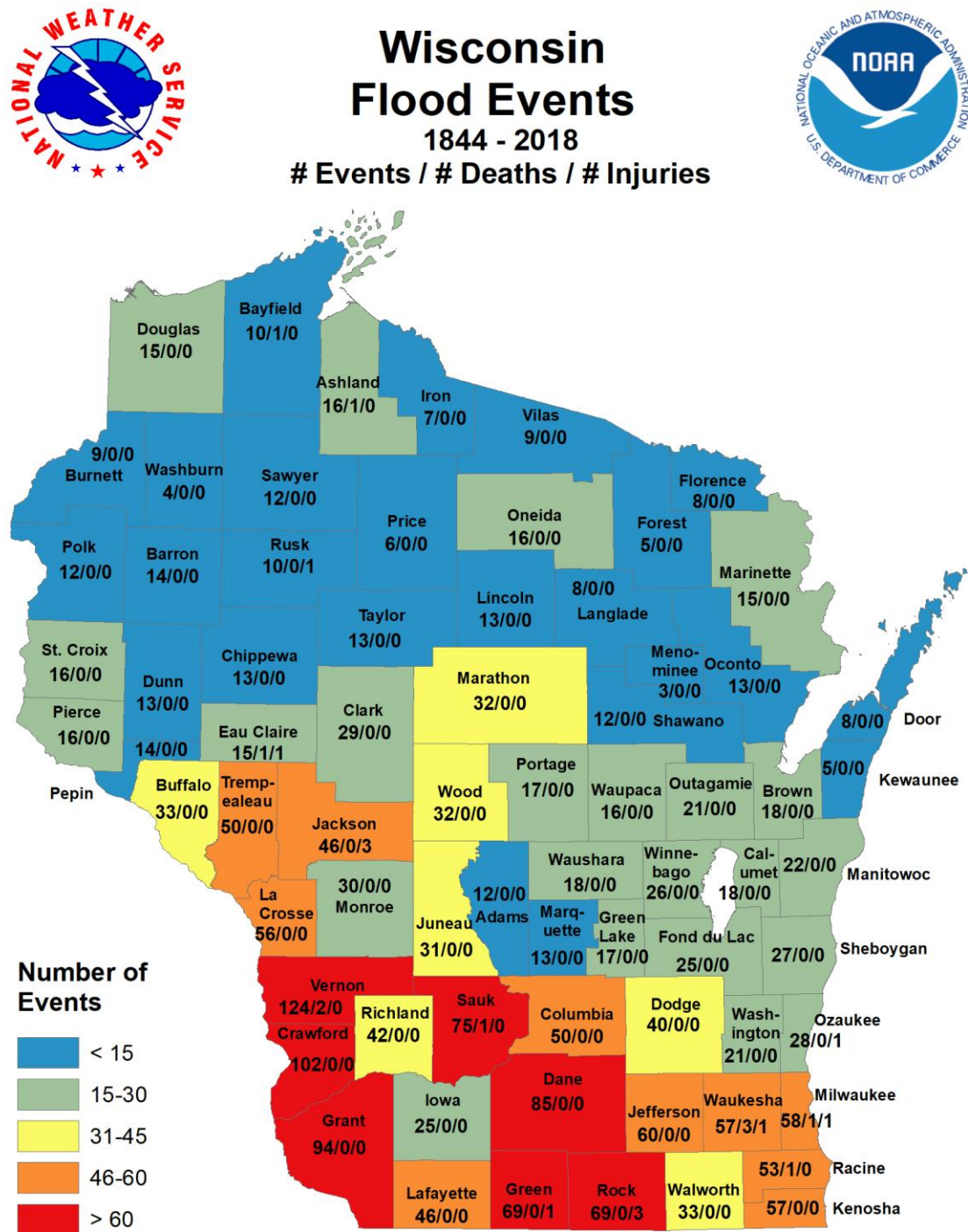
¹⁶³ Wisconsin State Hazard Mitigation Plan

Earthquakes in Wisconsin 164

Peak Ground Acceleration Contours and Historical Earthquakes in Wisconsin



Wisconsin Total Flood Events



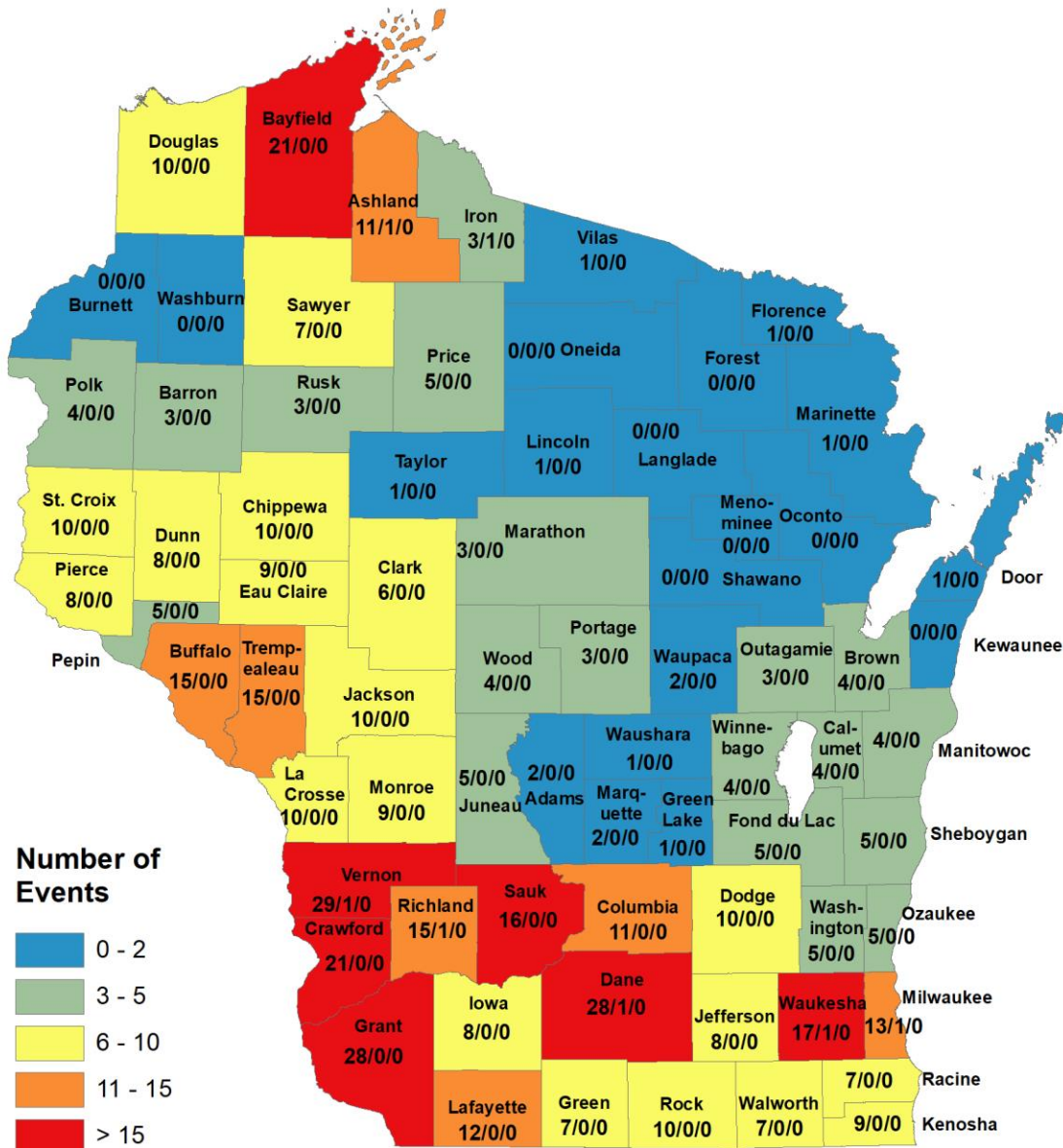
Wisconsin Flash Flood Events



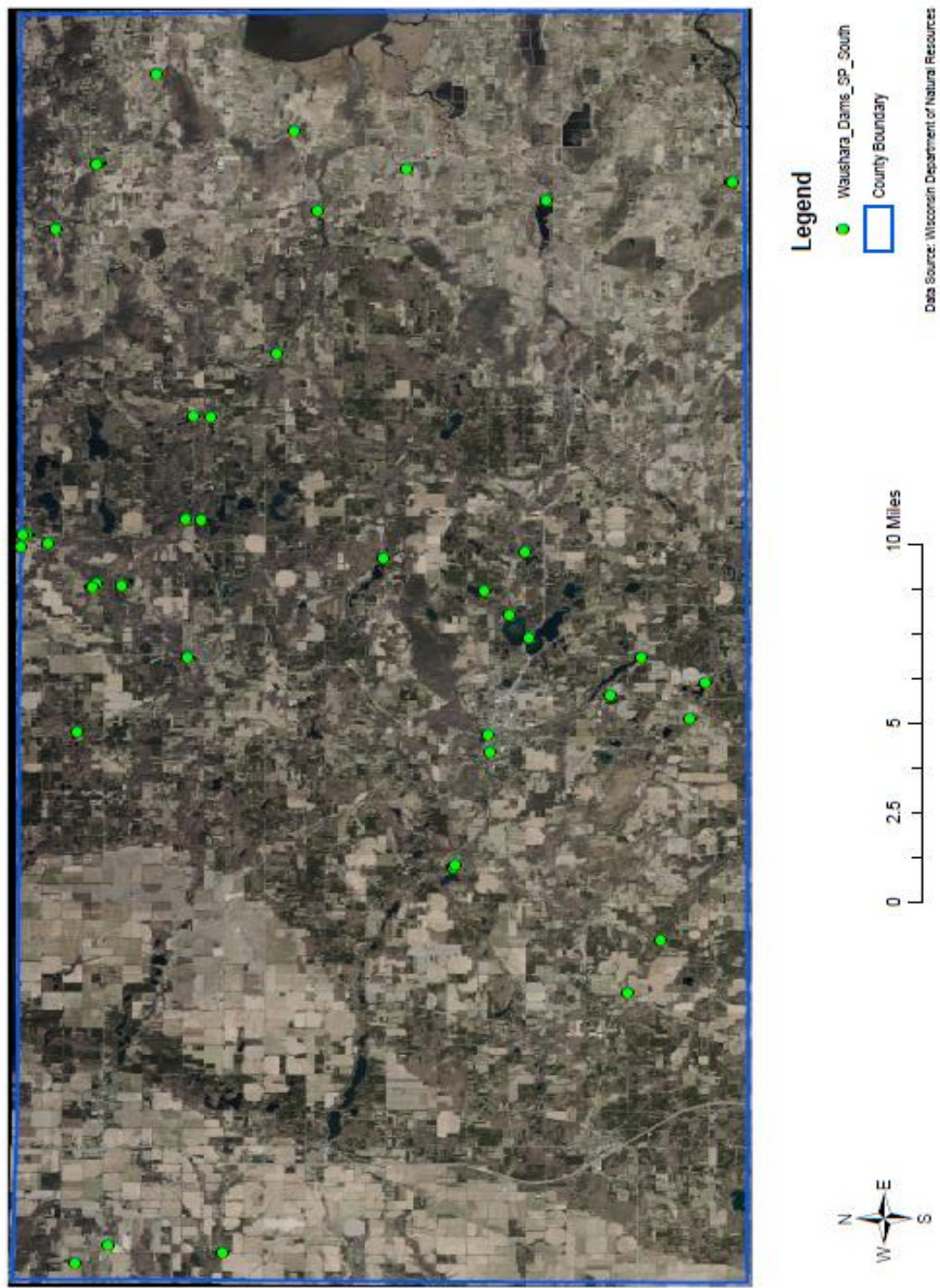
Wisconsin Flash Flood Events

2006 - 2018

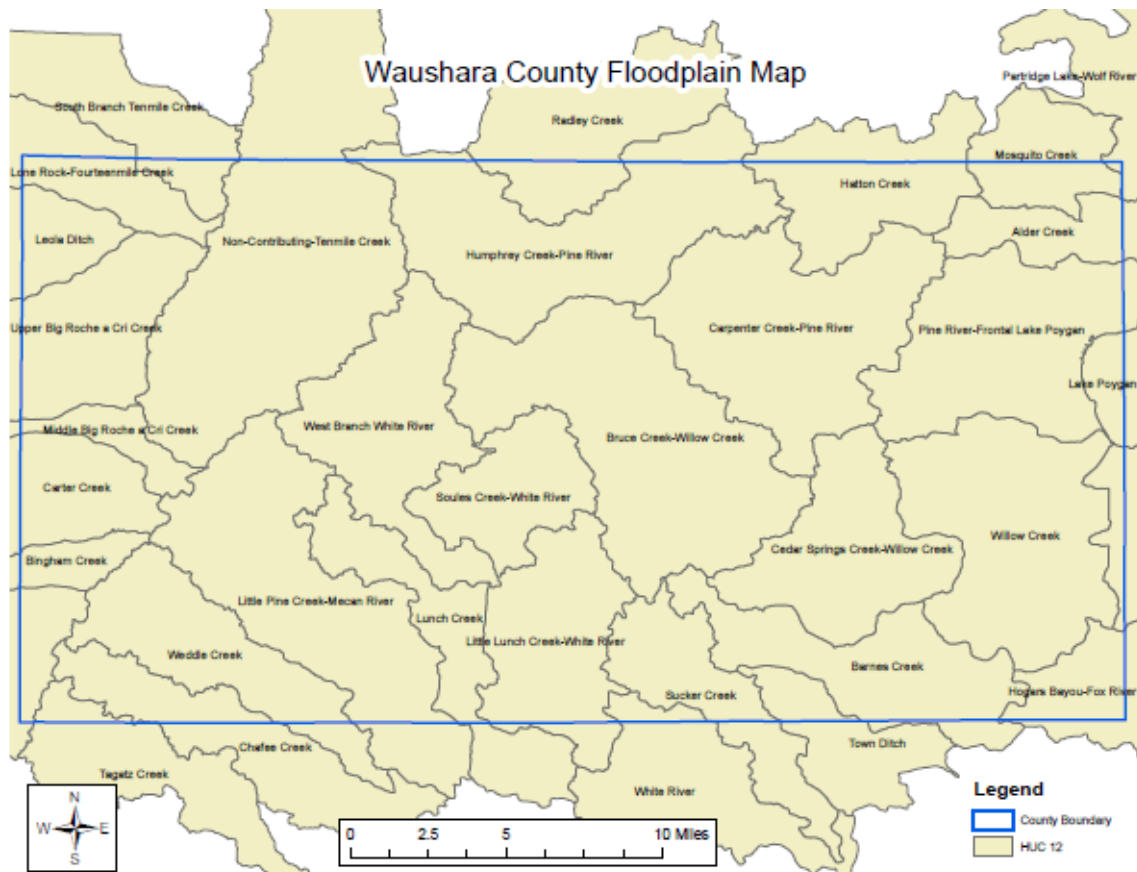
Events / # Deaths / # Injuries



Waushara County Dams

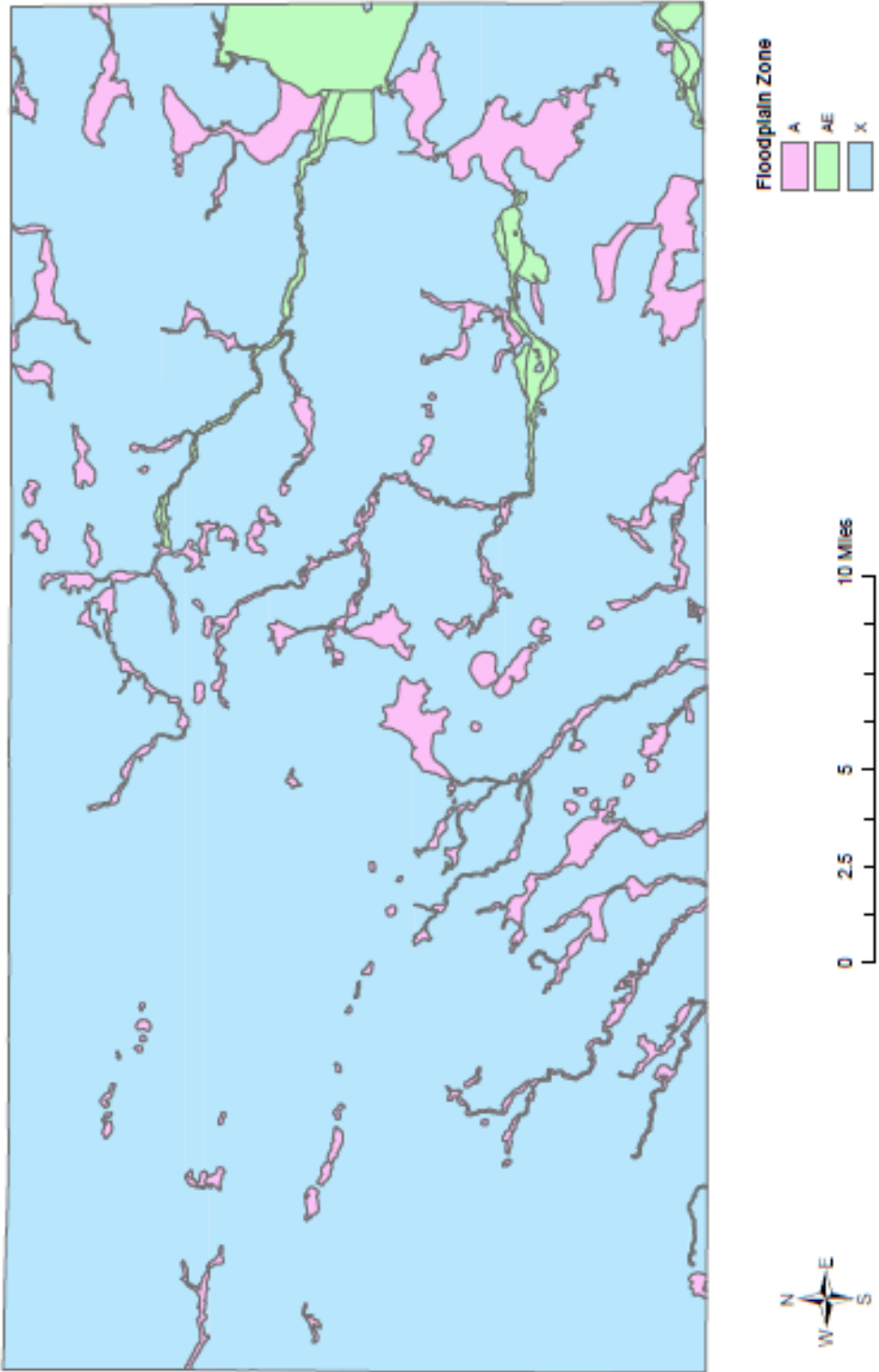


Waushara County Watersheds

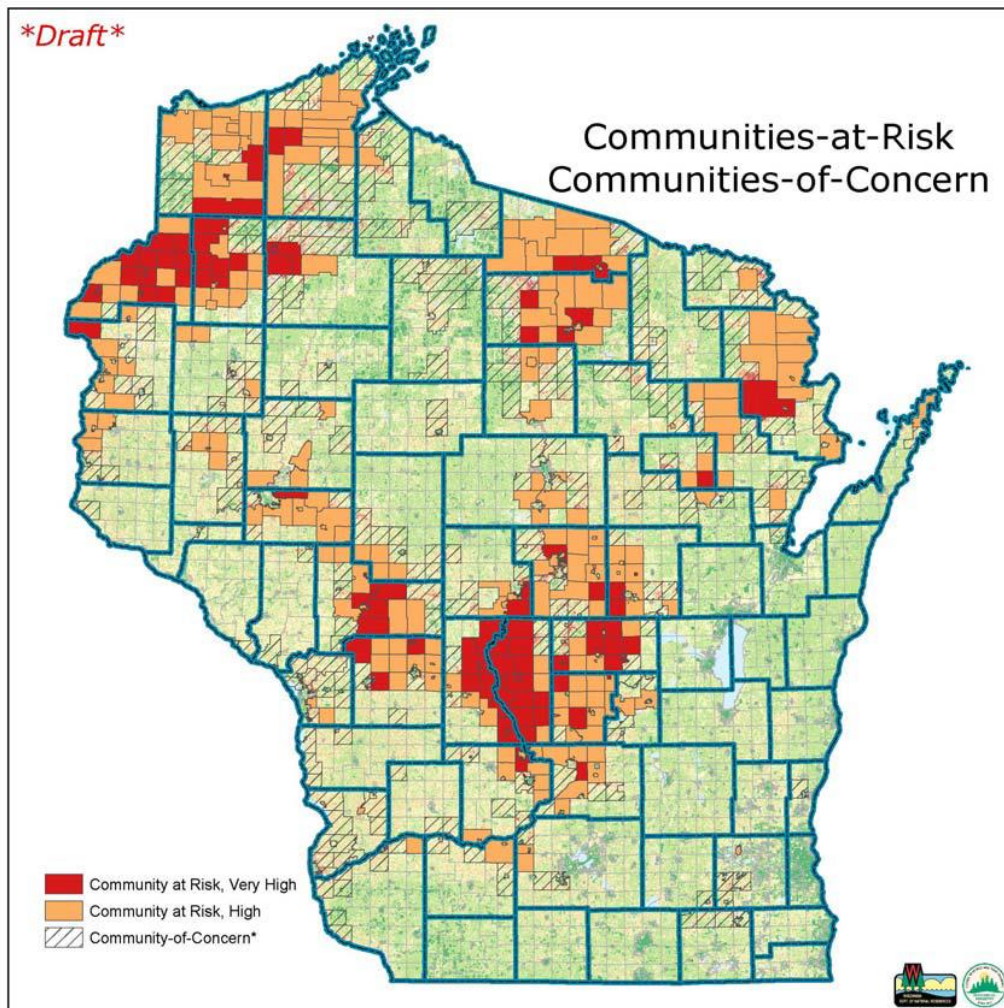


Waushara County Floodplain Map

Waushara County Floodplain Map



Wildfire Communities at Risk ¹⁶⁵



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

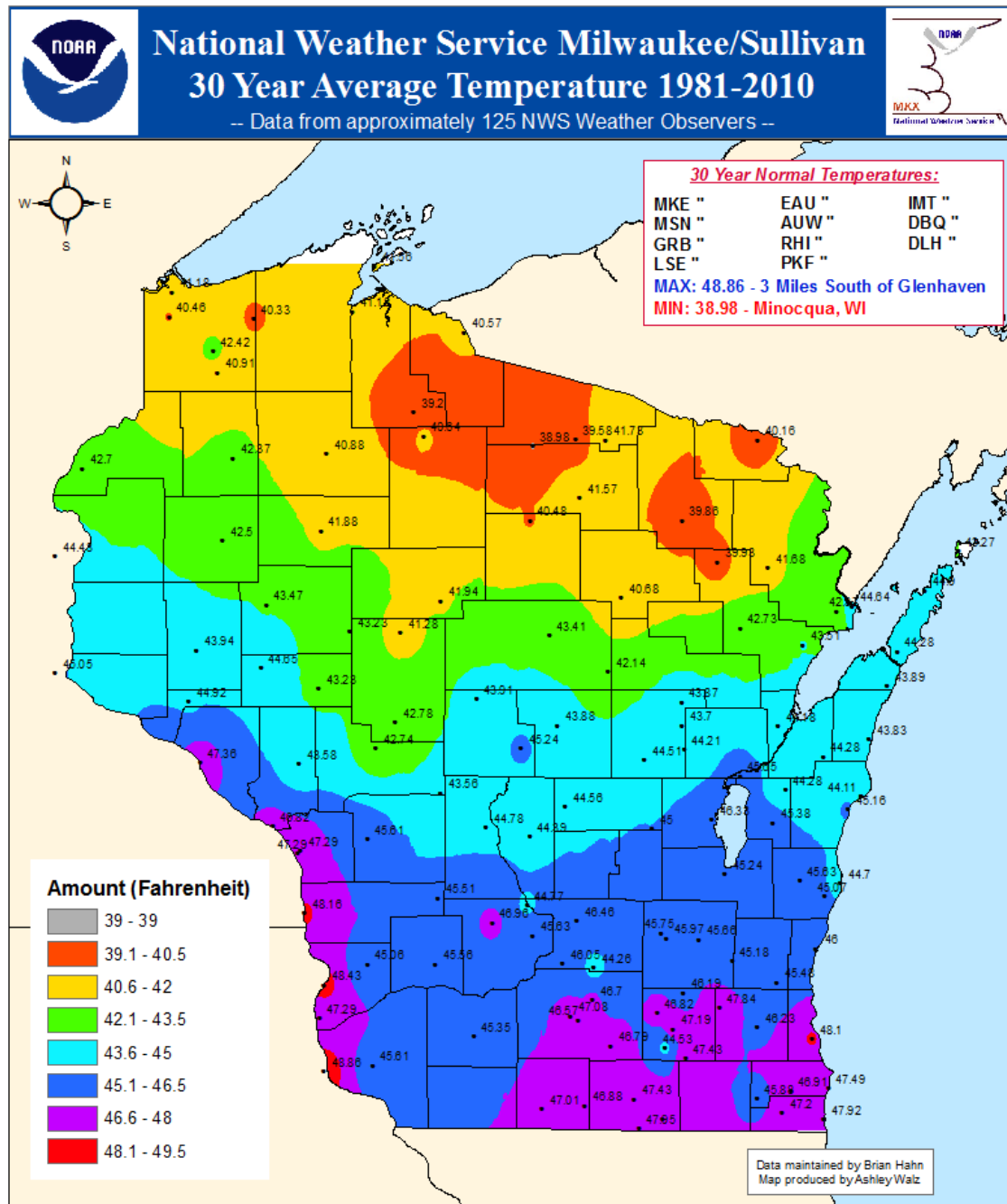


For Wisconsin, Communities-at-Risk are reported at the MCD (municipal civil division) level*. MCD was chosen due to its identifiable legal boundaries, ease in reporting, and usage in the development of Community Wildfire Protection Plans.

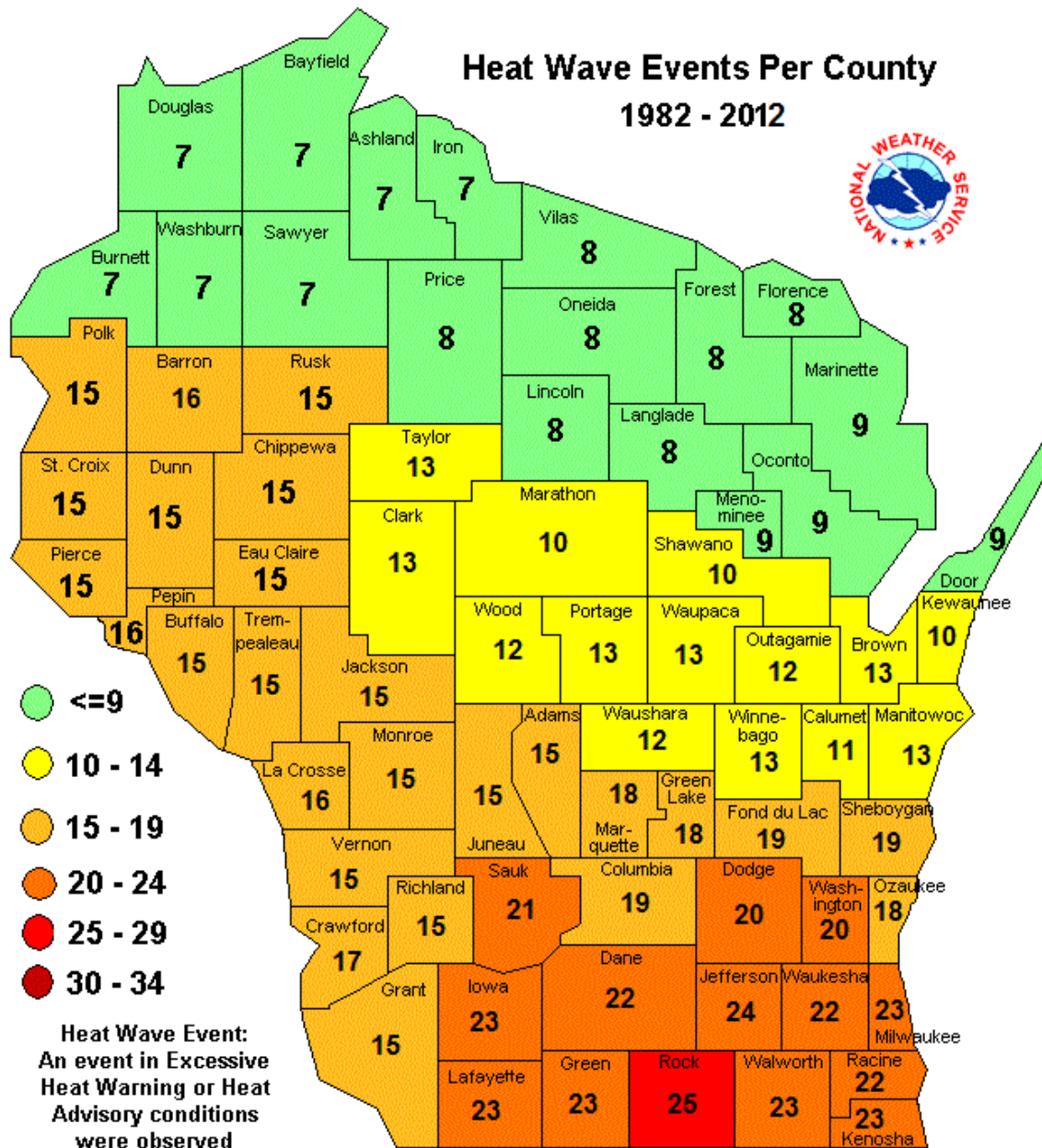
* Menominee County is an exception due to its lack of MCD's (civil townships). Therefore, Menominee county is reported by legal township.

10/5/07

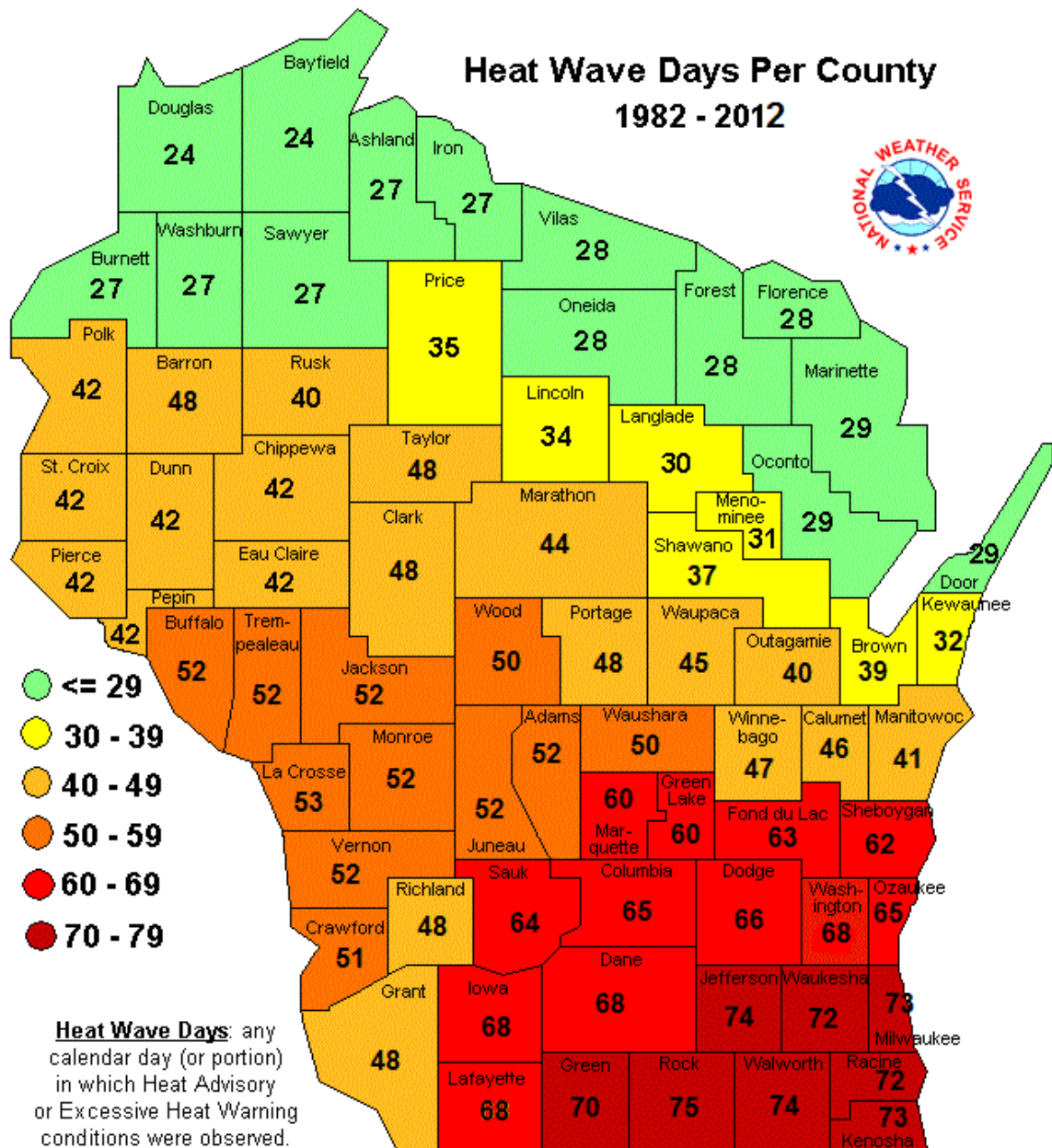
Wisconsin 30 Year Average Temperature



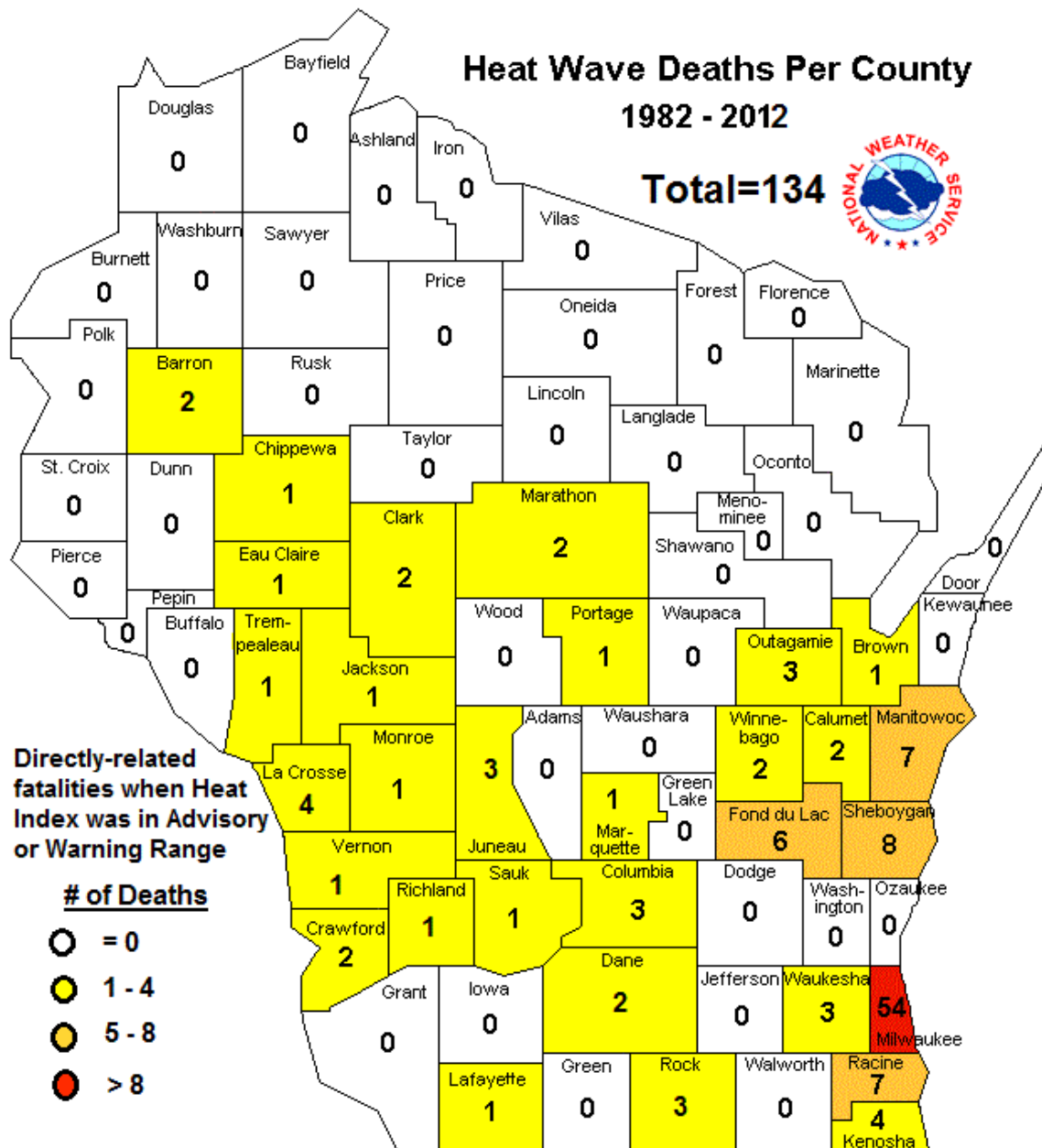
Wisconsin Heat Wave Events



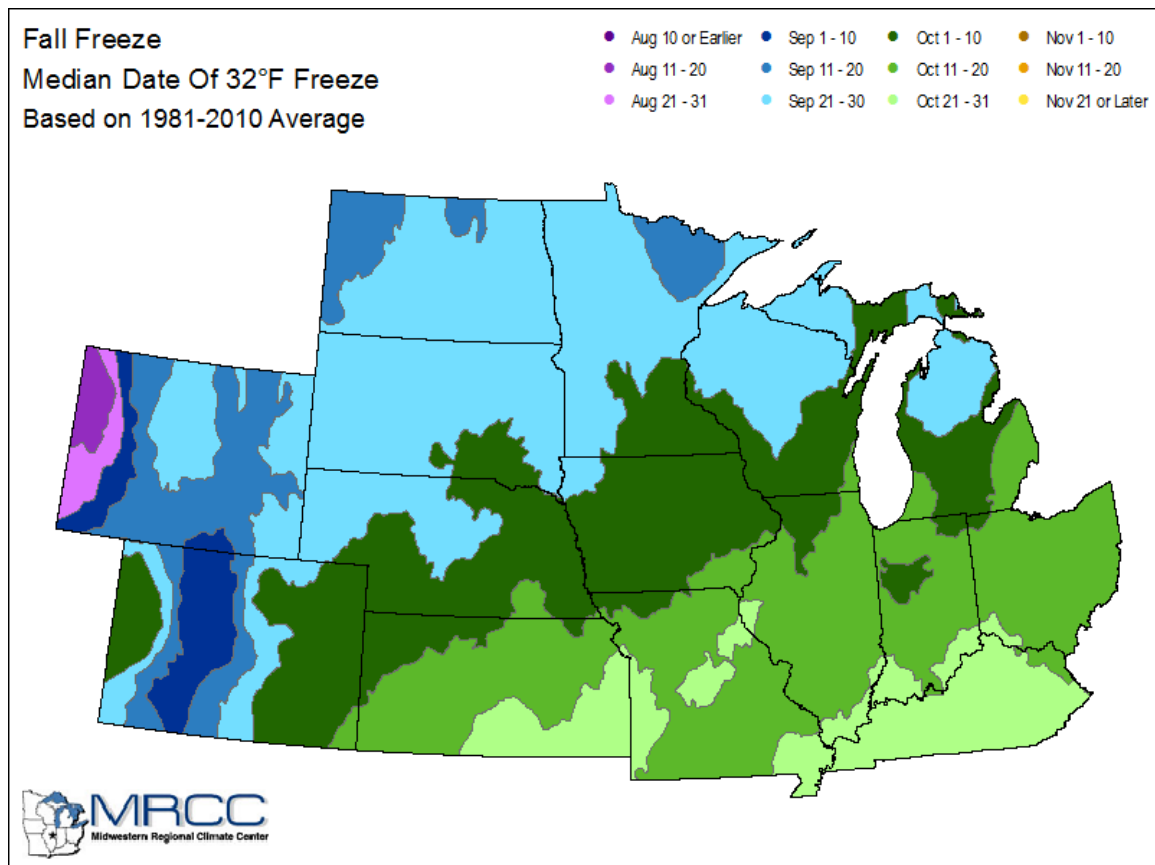
Wisconsin Heat Wave Days



Wisconsin Heat Wave Deaths

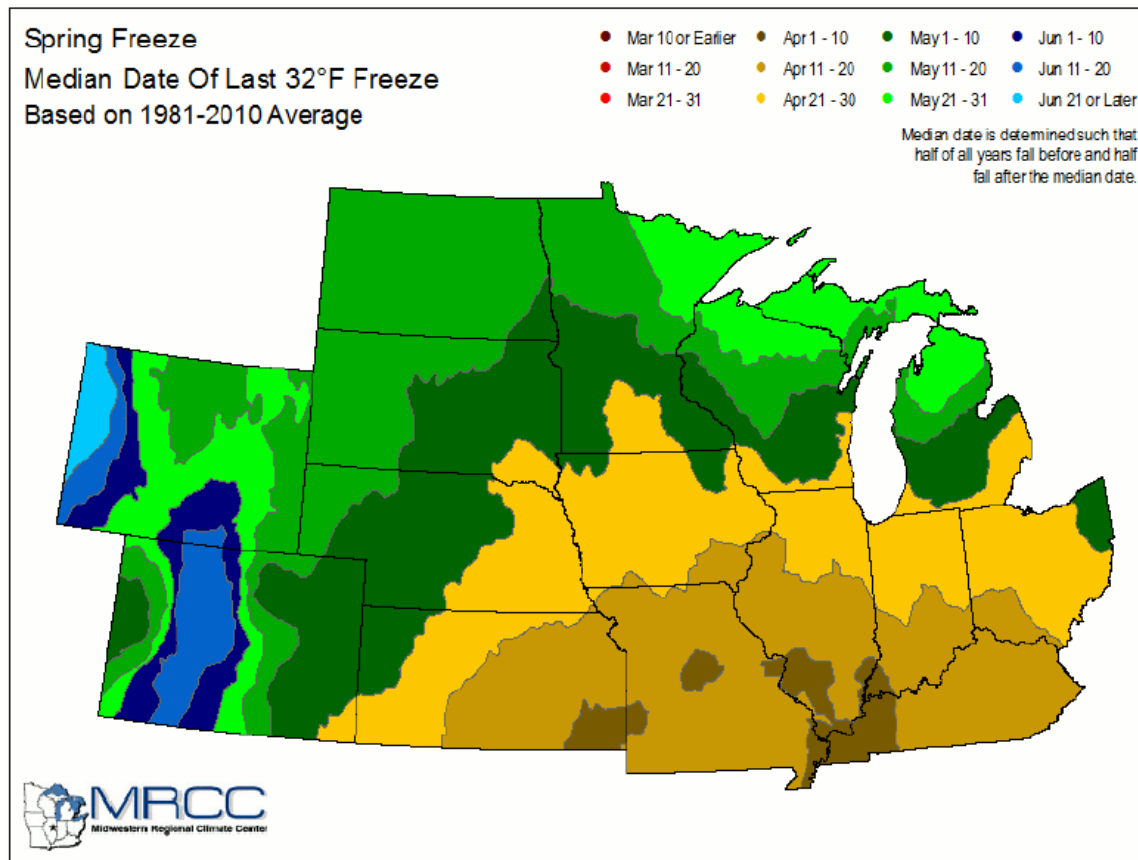


Median Date of First Freeze¹⁶⁶



¹⁶⁶ <http://www.crh.noaa.gov/images/mkx/climate/FallFirstFreeze.png>

Median Date of Last Freeze¹⁶⁷



¹⁶⁷ <http://www.crh.noaa.gov/images/mkx/climate/springlastfreeze.png>

Wisconsin Hail Events



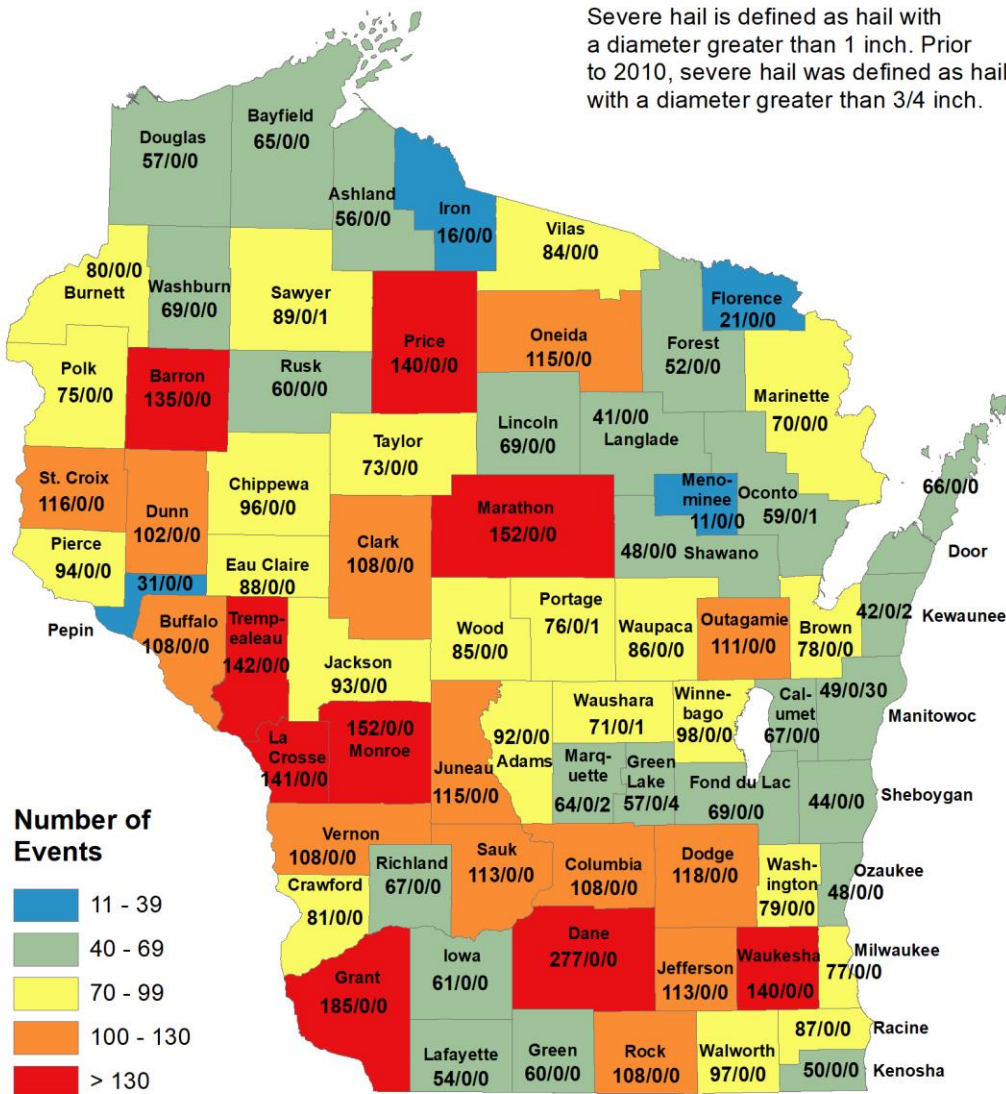
Wisconsin Severe Hail Events

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



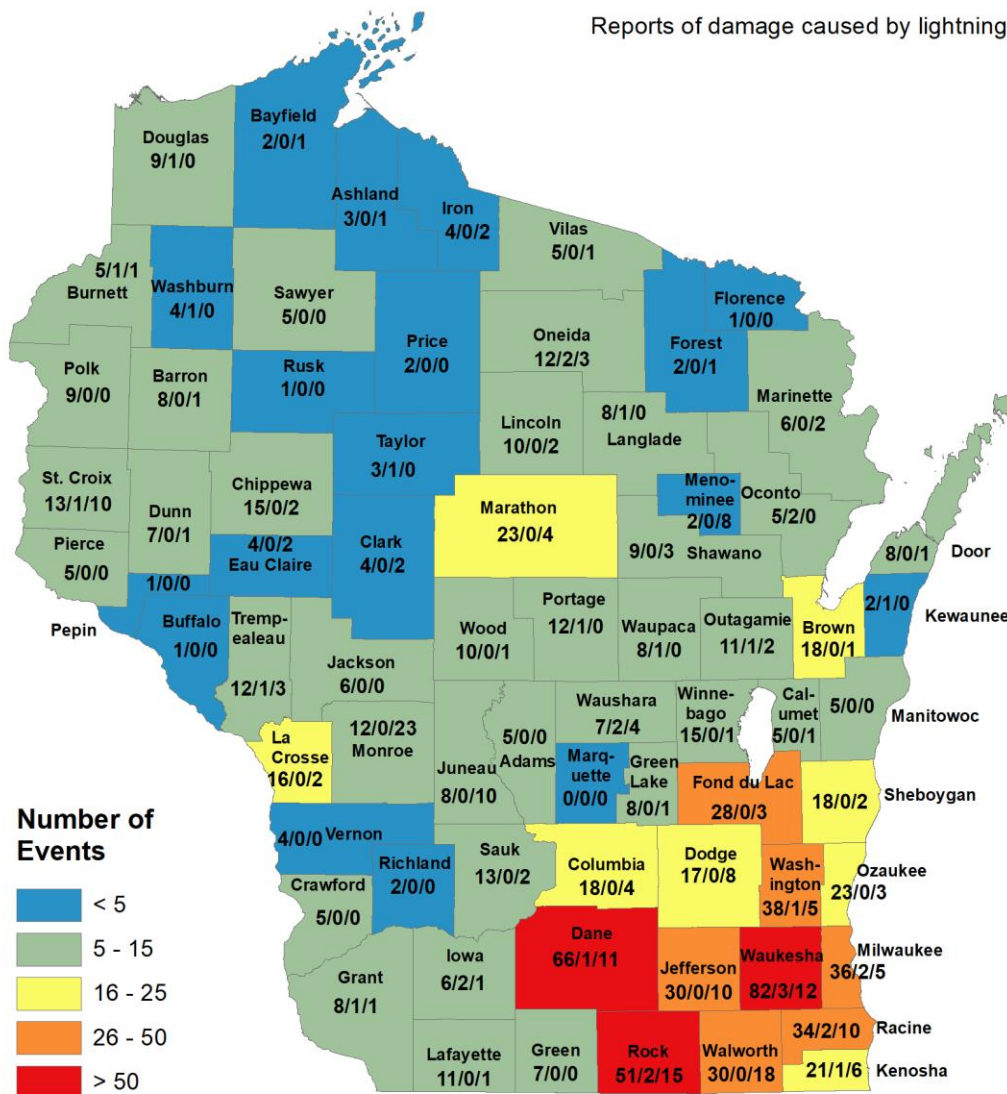
Wisconsin Lightning Events

1982 - 2018

Events / # Deaths / # Injuries



Reports of damage caused by lightning.



Wisconsin Severe Thunderstorm Winds

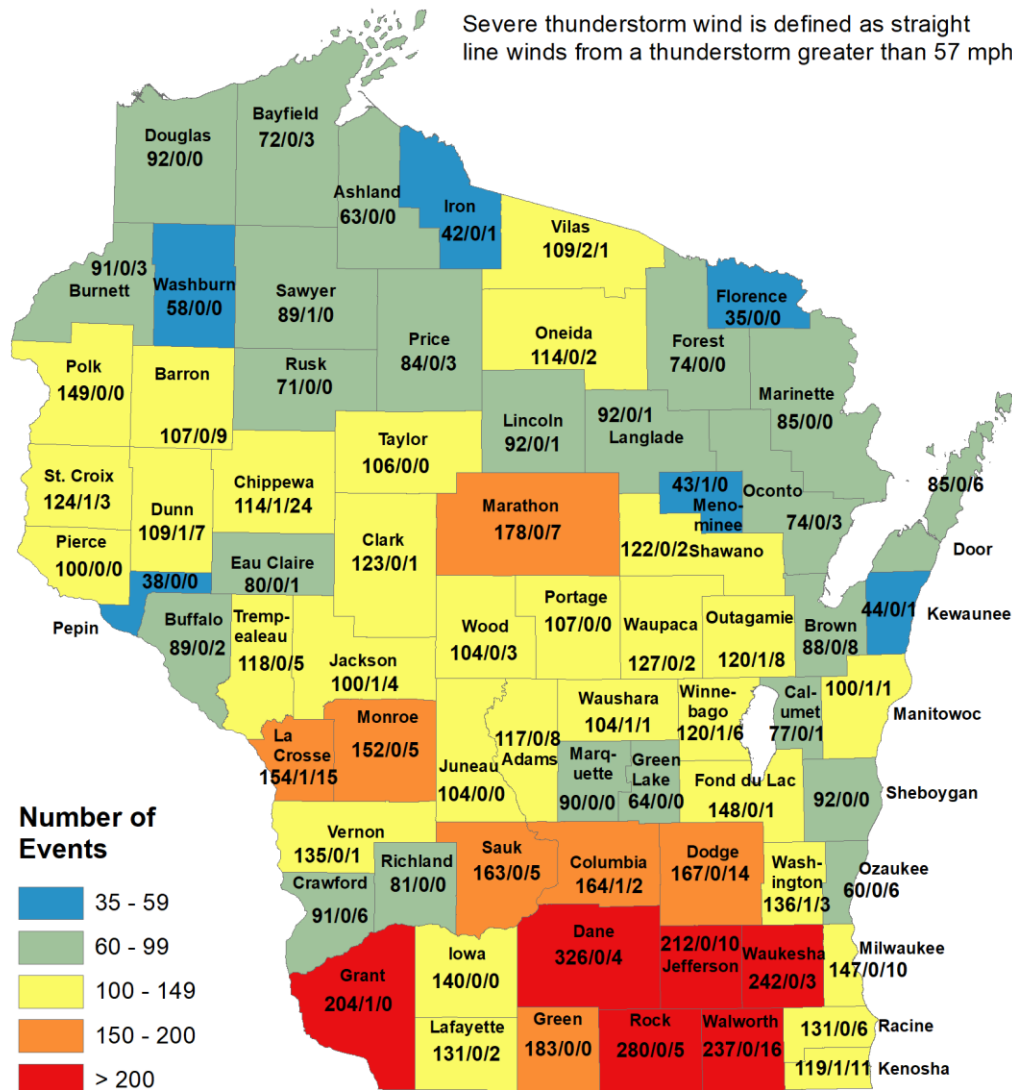


Wisconsin Severe Thunderstorm Wind Events

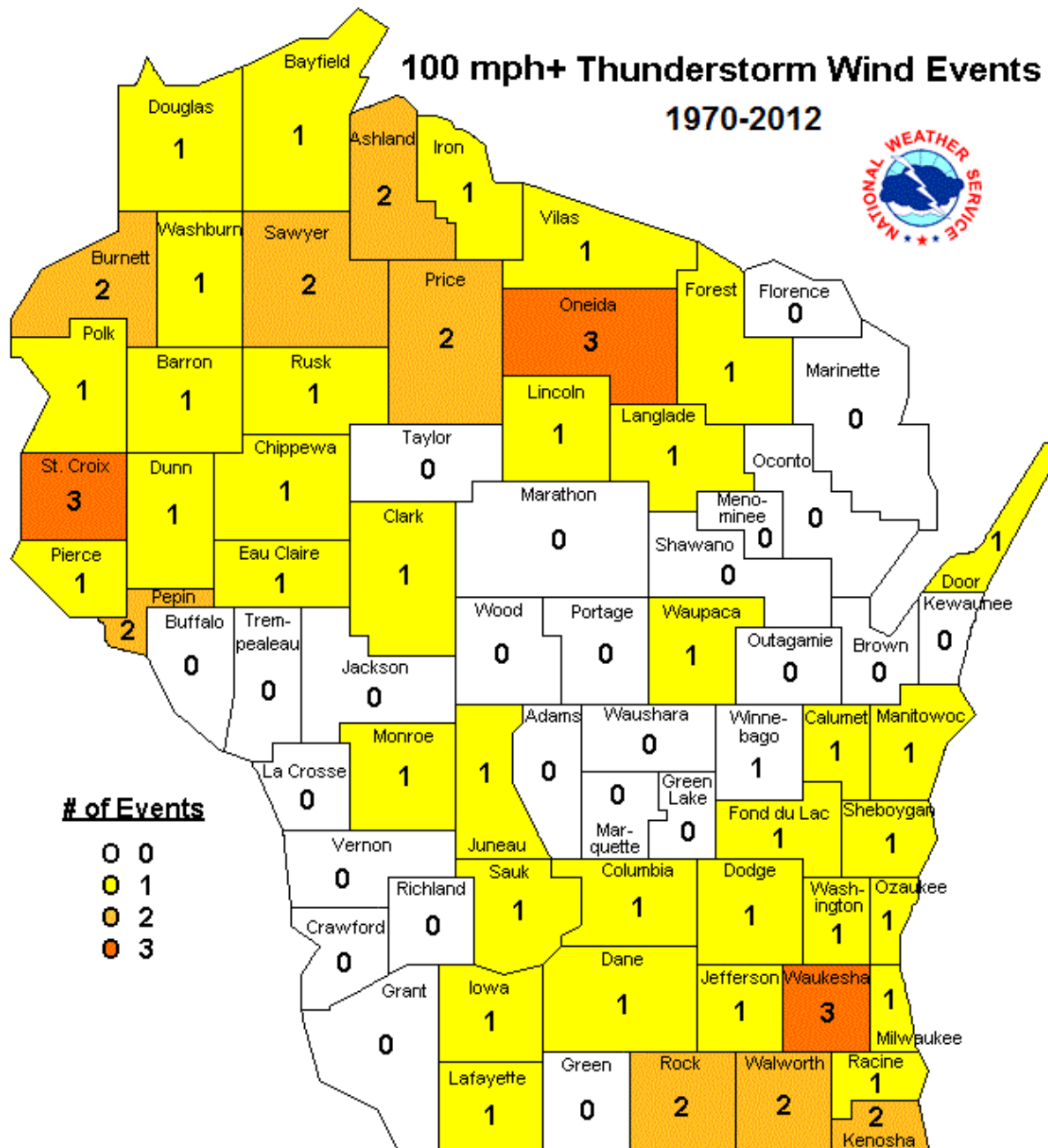
1844 - 2018

Events / # Deaths / # Injuries

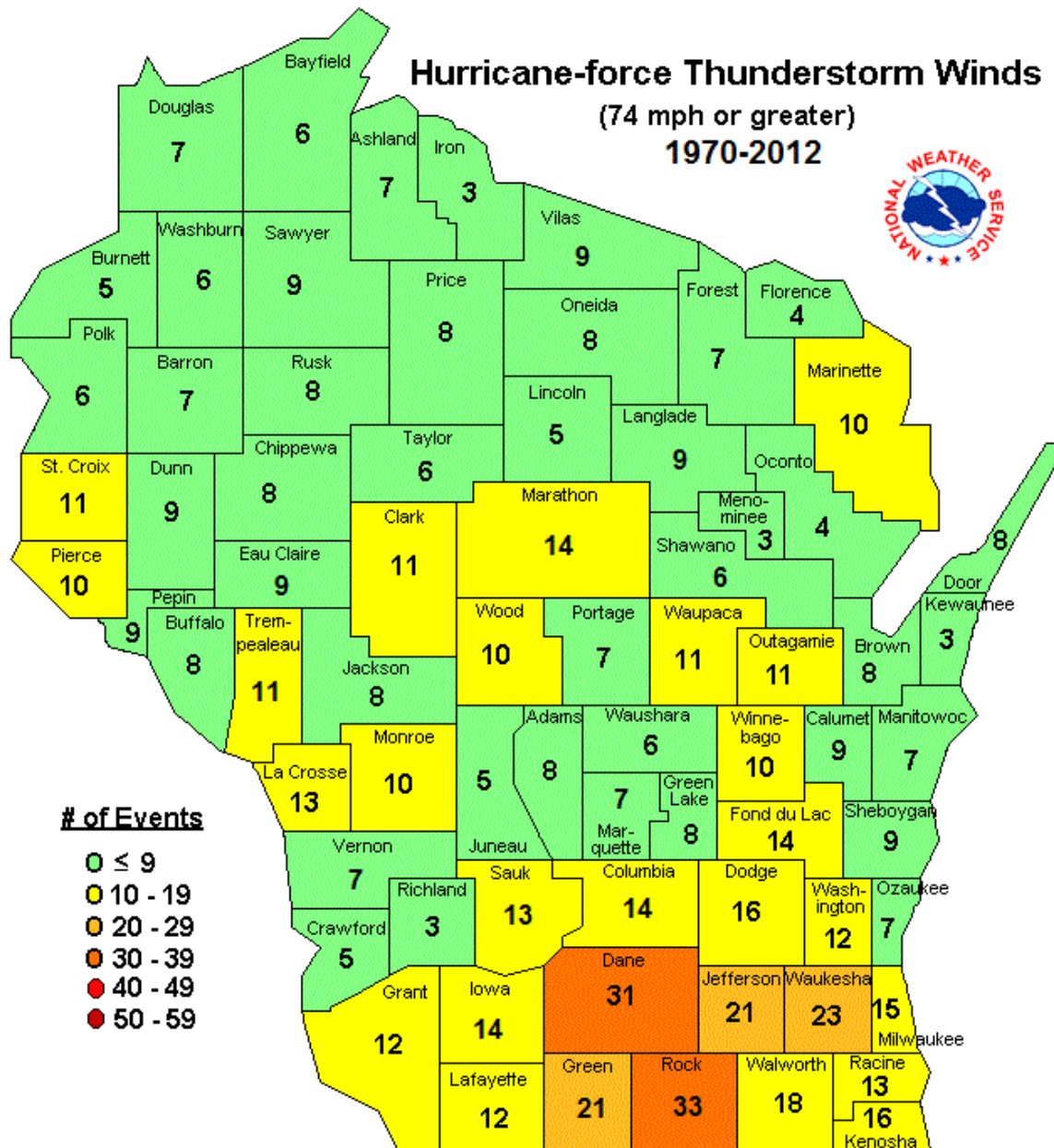
Severe thunderstorm wind is defined as straight line winds from a thunderstorm greater than 57 mph.



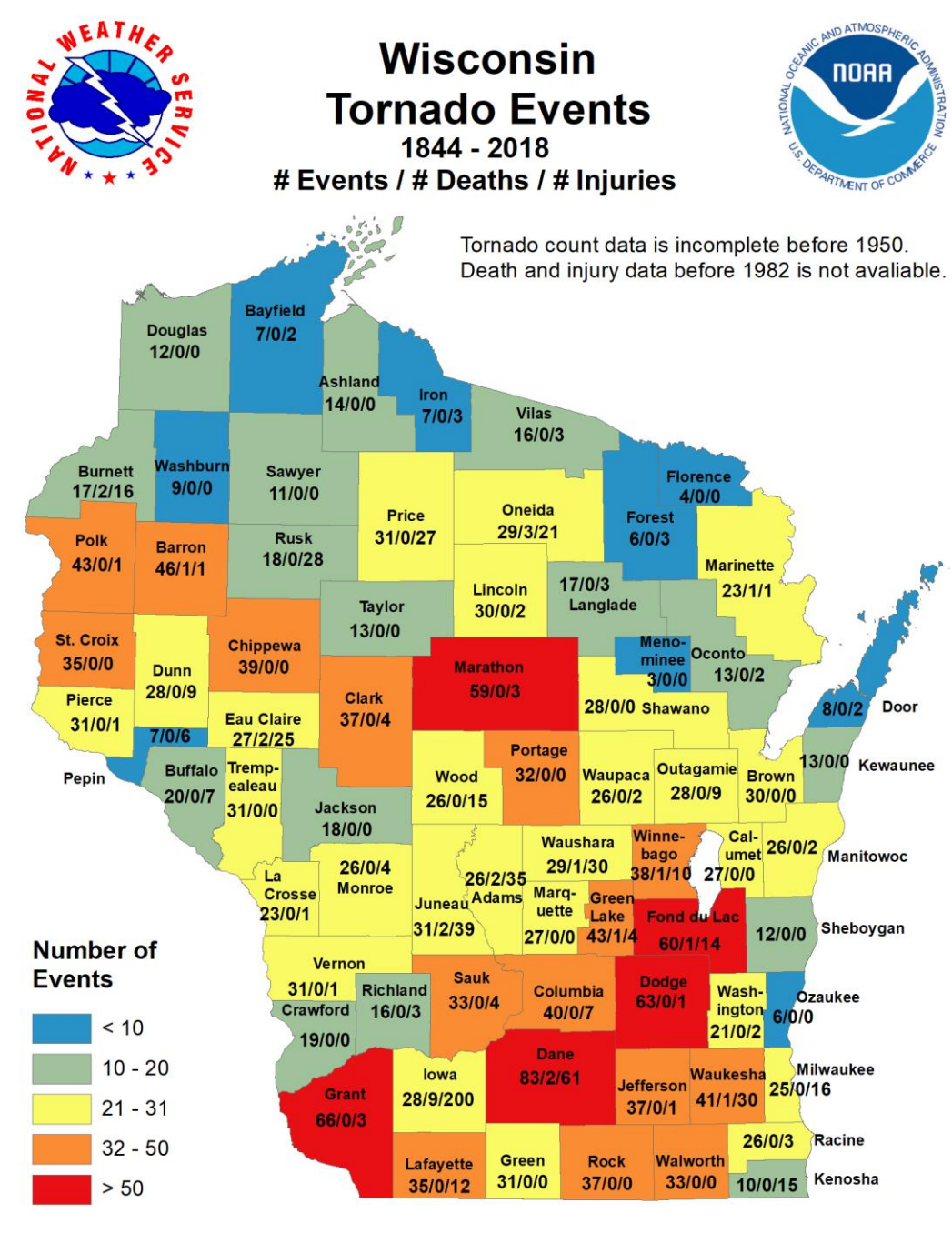
Wisconsin 100+ mph Thunderstorm Wind Events



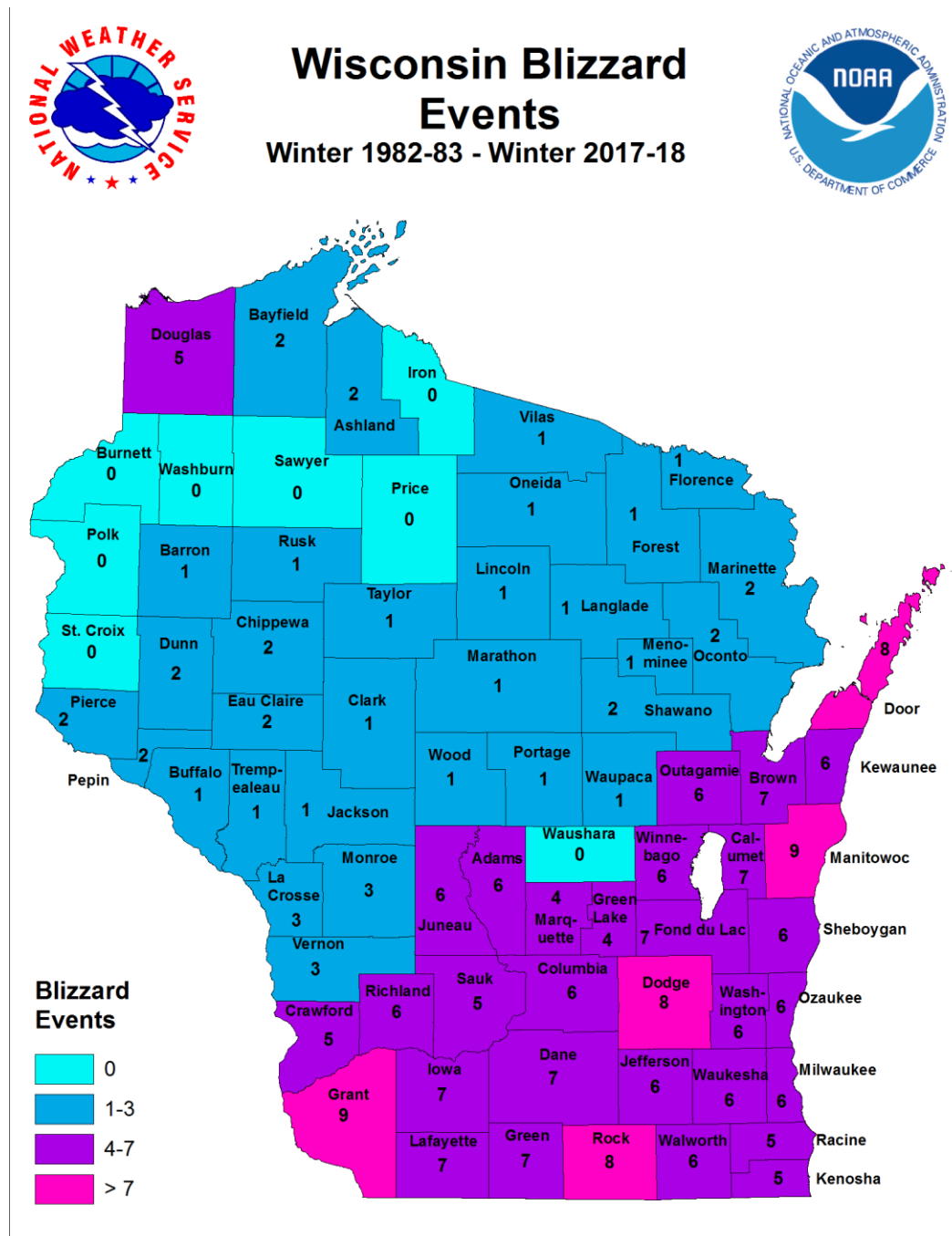
Wisconsin Hurricane-force (74+ mph) Thunderstorm Winds



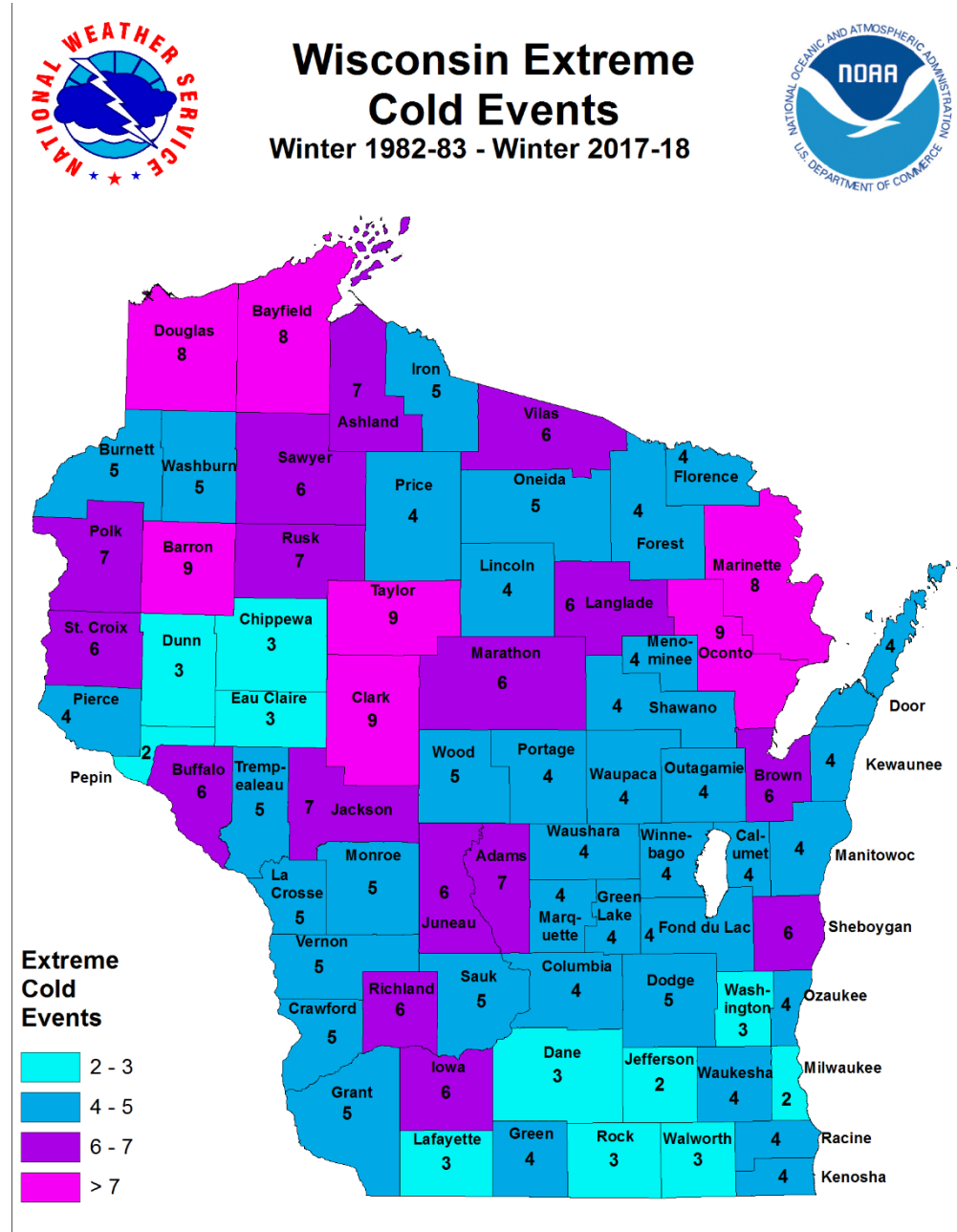
Wisconsin Tornado Events



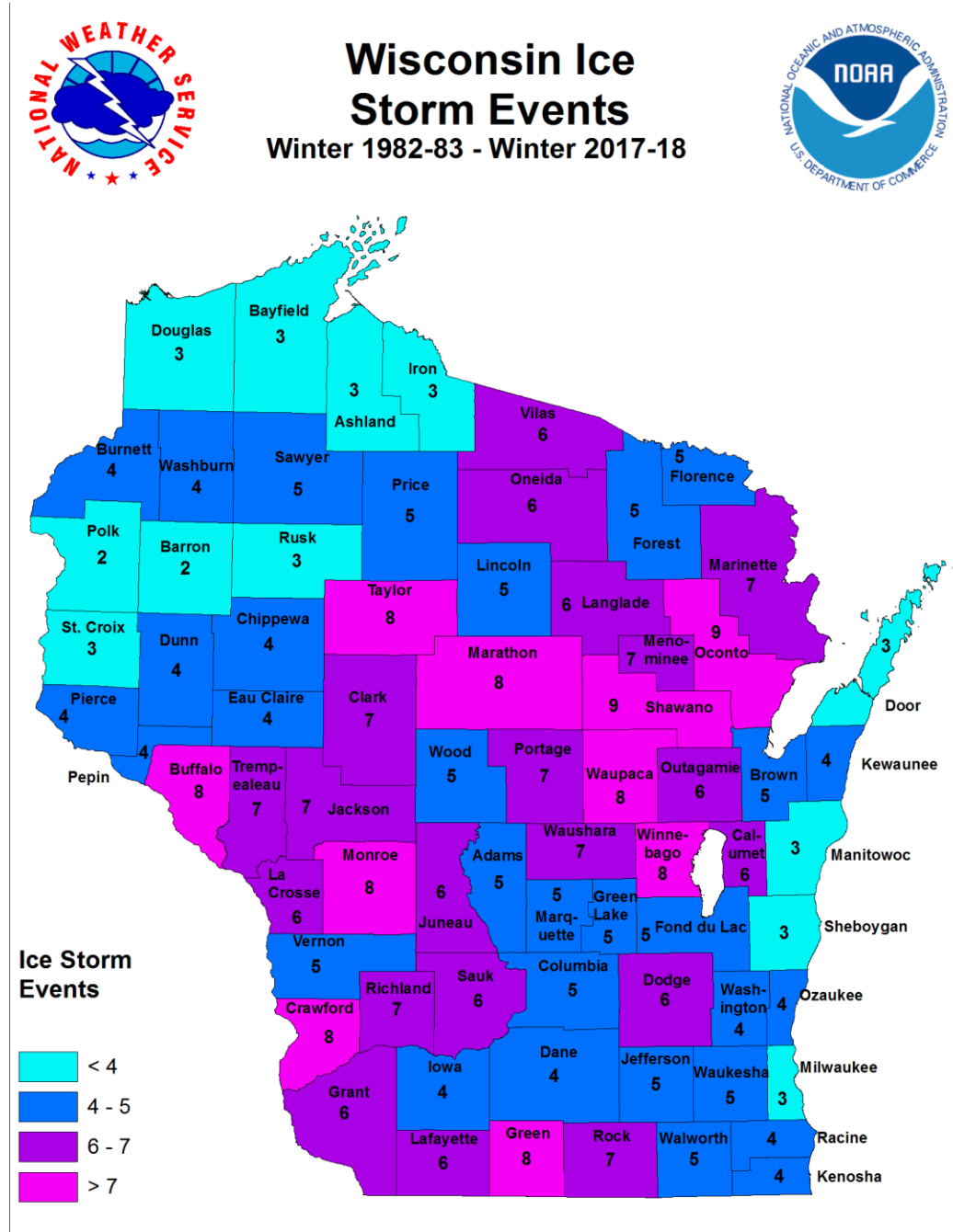
Wisconsin Blizzard Events



Wisconsin Extreme Cold Events

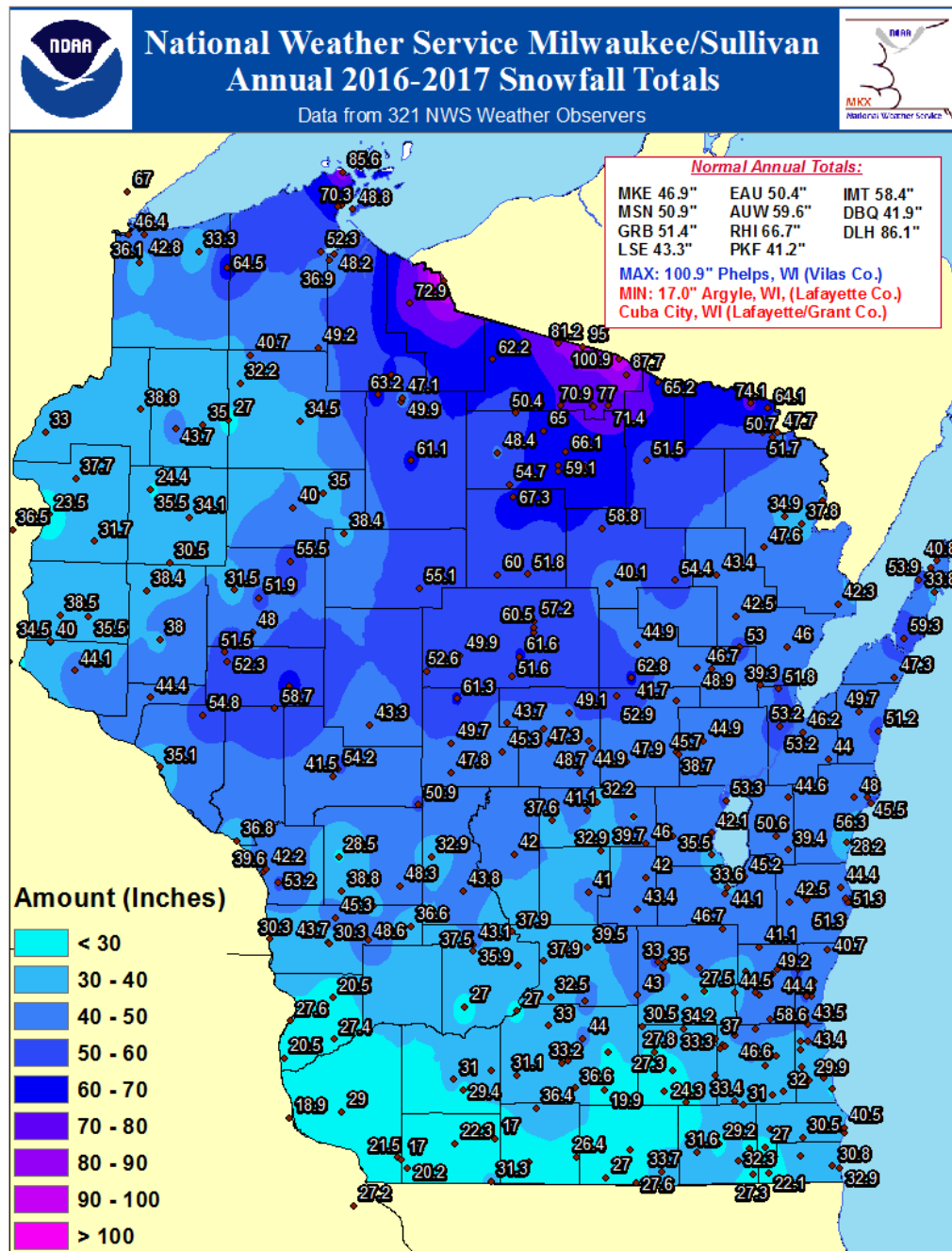


Wisconsin Ice Storm Events





Wisconsin Annual 2016-2017 Snowfall Totals



Wisconsin Total Severe Weather Events

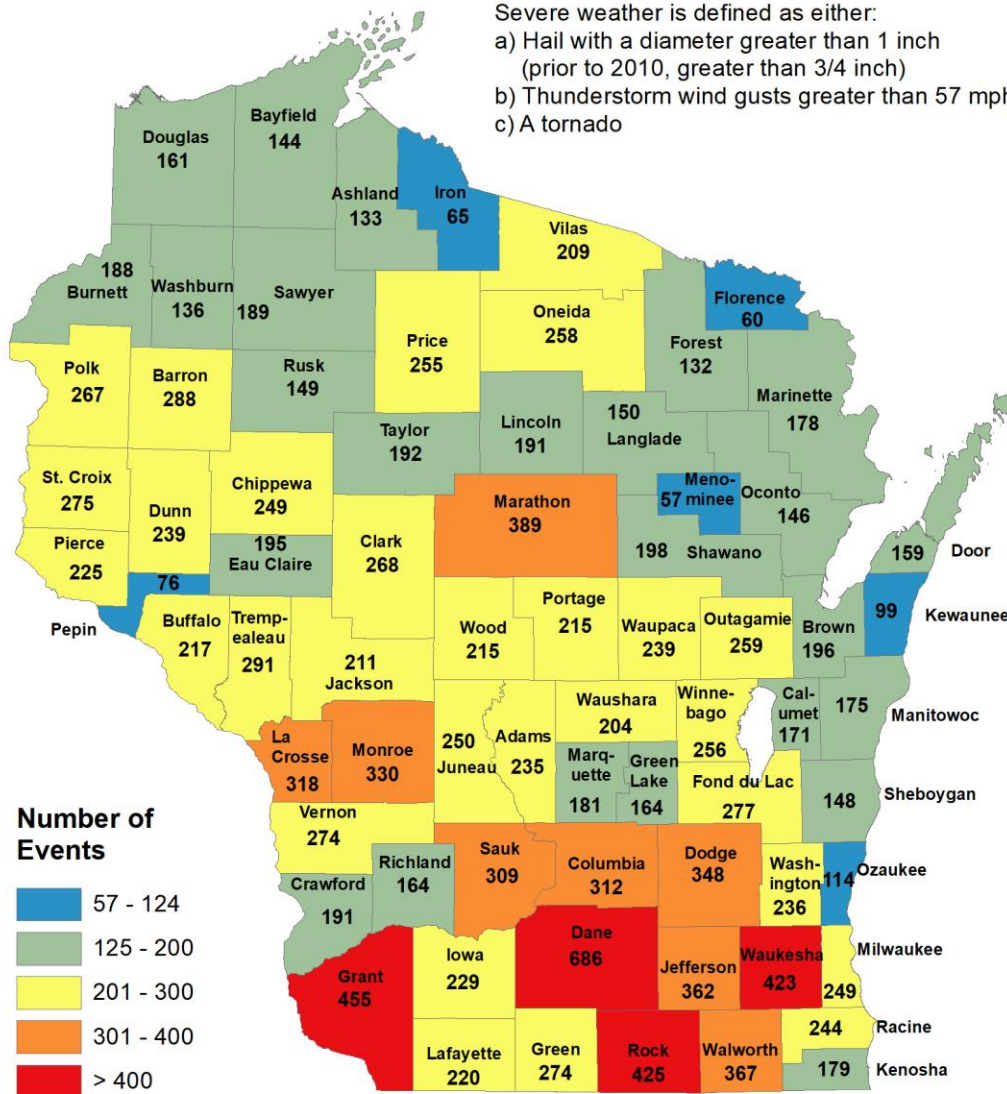


Wisconsin Total Severe Weather Events 1844 - 2018

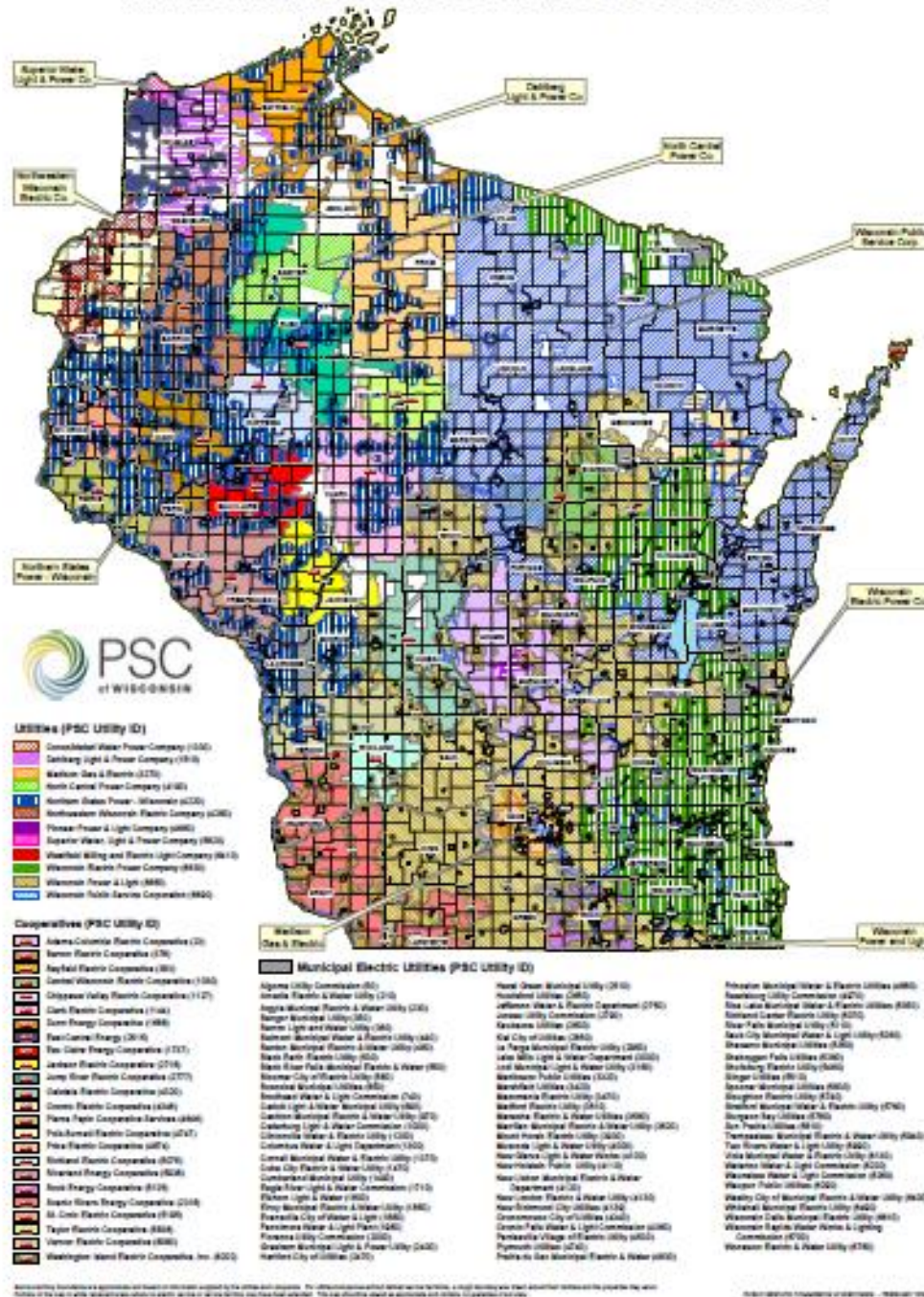


Severe weather is defined as either:

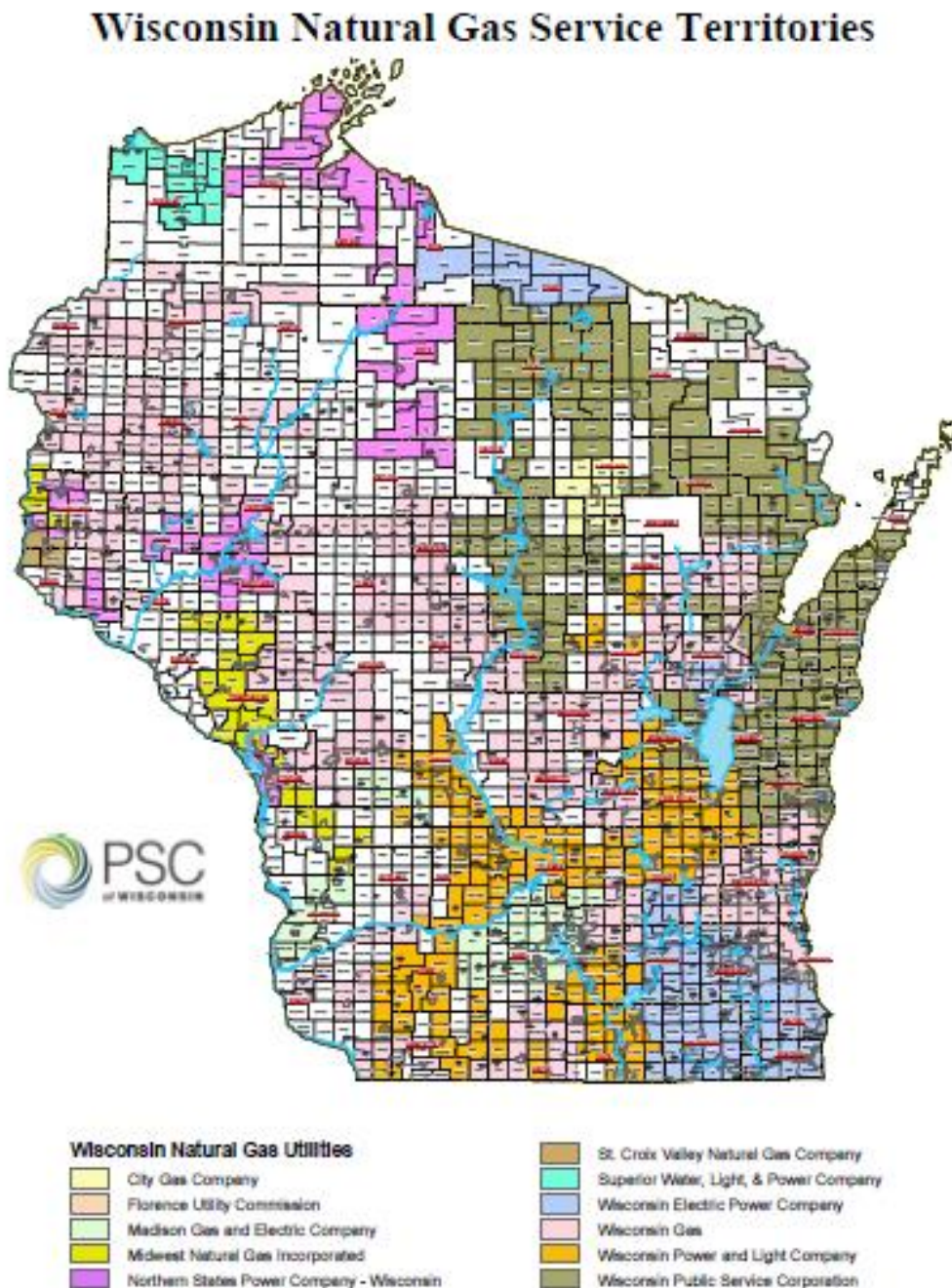
- a) Hail with a diameter greater than 1 inch
(prior to 2010, greater than 3/4 inch)
- b) Thunderstorm wind gusts greater than 57 mph
- c) A tornado



100

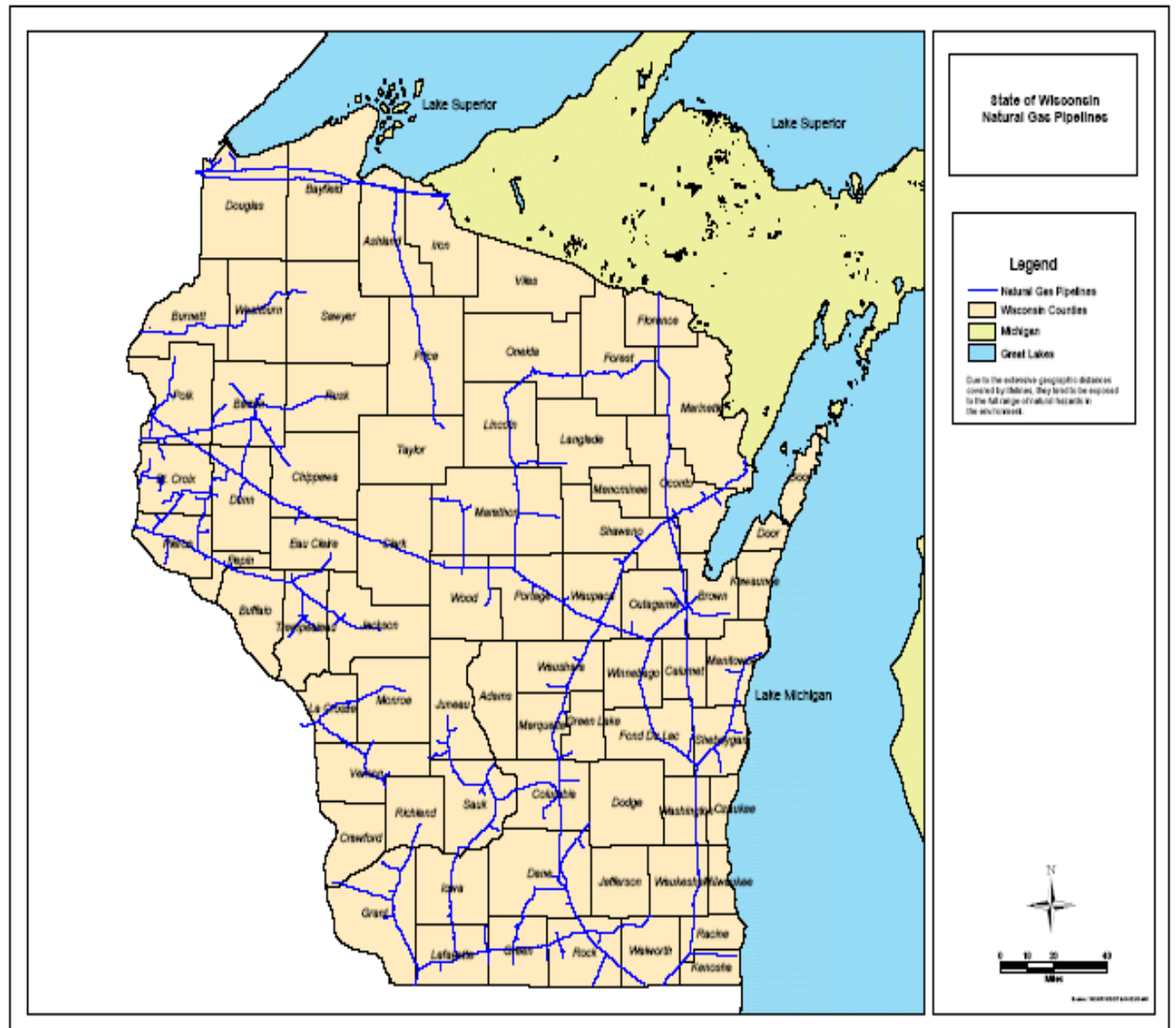


Natural Gas Service Territories ¹⁶⁹

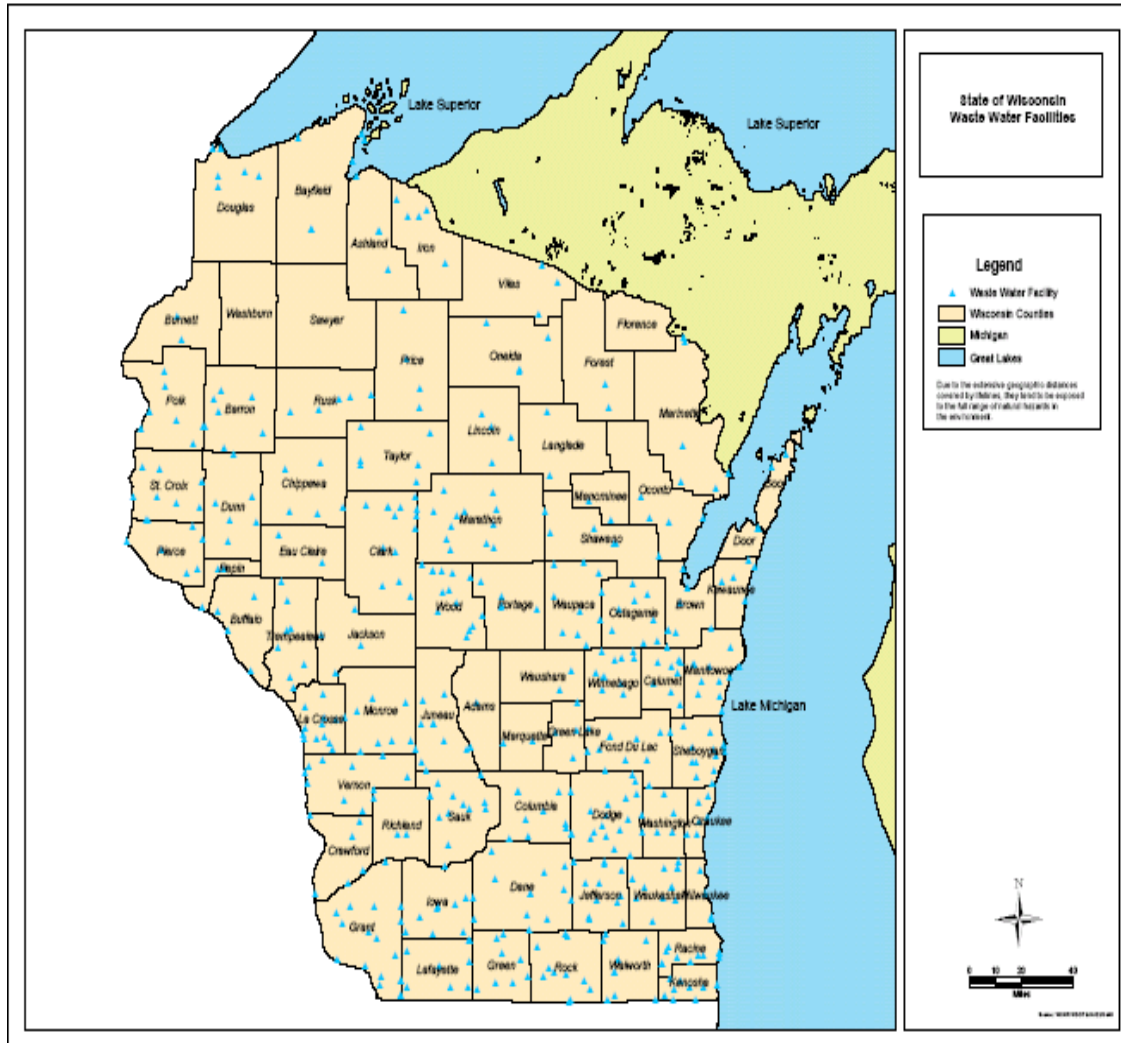


¹⁶⁹ https://psc.wi.gov/SiteAssets/Maps/Natural_Gas_30x42_PUBLIC.pdf

Natural Gas Pipelines



Wastewater Facilities ¹⁷⁰



¹⁷⁰ Wisconsin State Hazard Mitigation Plan

Appendix B: Frequency of Occurrence ¹⁷¹

As noted earlier in this plan, the Waushara 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 April 1997 through 30 April 2022) and is noted below with each hazard.

DROUGHT					
<i>There were 6 events reported over the 25-year period from 4/1/1997 – 4/30/2022.</i>					
<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	03/10/1999	0	0	0	0
WAUSHARA COUNTY	07/19/2005	0	0	0	0
WAUSHARA COUNTY	07/24/2012	0	0	0	0
WAUSHARA COUNTY	08/01/2012	0	0	0	0
WAUSHARA COUNTY	09/01/2012	0	0	0	0
WAUSHARA COUNTY	10/01/2012	0	0	0	0

¹⁷¹ <https://www.ncdc.noaa.gov/stormevents/>

Appendix B: Frequency of Occurrence

FLASH FLOOD

There were 4 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
HANCOCK	07/16/1997	0	0	\$50,000	0
WAUSHARA COUNTY	06/21/2002	0	0	0	0
WAUSHARA COUNTY	06/22/2002	0	0	\$975,000	\$35M
WAUTOMA	07/26/2007	0	0	0	0

FLOOD

There were 6 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUTOMA	06/10/1999	0	0	0	0
PLAINFIELD	07/18/1999	0	0	0	0
WAUSHARA COUNTY	06/11/2004	0	0	0	\$20M
HANCOCK	09/21/2016	0	0	\$20,000	0
WAUTOMA	06/12/2017	0	0	\$1,000	0
BERLIN	03/15/2019	0	0	\$13,000	0

HEAVY RAIN

There were 4 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	07/25/2005	0	0	0	0
WAUTOMA	07/26/2007	0	0	0	0
WAUTOMA	03/31/2008	0	0	0	0
MT. MORRIS	07/13/2010	0	0	0	0

EXCESSIVE HEAT

There was 1 event reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	07/03/2012	0	0	0	0

Appendix B: Frequency of Occurrence

HEAT

There were 3 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	02/11/1999	0	0	0	0
WAUSHARA COUNTY	07/23/1999	0	0	0	0
WAUSHARA COUNTY	07/16/2012	0	0	0	0

EXTREME COLD/WIND CHILL

There were 4 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

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

COLD/WIND CHILL

There were 4 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	02/17/2006	0	0	0	0
WAUSHARA COUNTY	01/02/2018	0	0	0	0
WAUSHARA COUNTY	01/29/2019	0	0	0	0
WAUSHARA COUNTY	02/07/2021	0	0	0	0

HAIL

There were 60 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Diameter (inch)</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
PLAINFIELD	07/16/1997	0.75	0	0	0	0
WAUTOMA	07/16/1997	0.75	0	0	0	0
REDGRANITE	07/16/1997	0.75	0	0	0	0
WEST BLOOMFIELD	07/16/1997	1	0	0	0	0

Appendix B: Frequency of Occurrence

REDGRANITE	08/03/1997	1	0	0	0	0
PLAINFIELD	03/29/1998	0.75	0	0	0	0
WILD ROSE	03/29/1998	1.75	0	0	0	0
WAUTOMA	03/29/1998	0.75	0	0	0	0
WILD ROSE	03/29/1998	1.75	0	1	0	0
WEST BLOOMFIELD	03/29/1998	1.75	0	0	0	0
WAUTOMA	05/28/1998	0.75	0	0	0	0
REDGRANITE	05/28/1998	1	0	0	0	0
WAUTOMA	06/16/1998	1	0	0	0	0
WAUTOMA	07/20/1998	1	0	0	0	0
AURORAVILLE	03/08/2000	0.75	0	0	0	0
COLOMA	05/12/2000	2.75	0	0	\$20M	0
WAUTOMA	05/14/2001	0.75	0	0	0	0
WEST BLOOMFIELD	05/06/2002	0.88	0	0	0	0
REDGRANITE	09/2/2002	0.75	0	0	0	0
PLAINFIELD	04/16/2003	0.75	0	0	0	0
REDGRANITE	06/04/2005	1.75	0	0	0	0
PLAINFIELD	08/09/2005	0.75	0	0	0	0
HANCOCK	09/07/2005	0.75	0	0	0	0
COLOMA	09/07/2005	0.88	0	0	0	0
REDGRANITE	07/01/2006	0.75	0	0	0	0
POY SIPPI	07/17/2006	2	0	0	0	0
WILD ROSE	07/30/2006	0.88	0	0	0	0
POY SIPPI	06/07/2007	1	0	0	0	0
BANNERMAN	06/28/2008	0.75	0	0	0	0
PINE RIVER	07/10/2008	1	0	0	0	0
WILD ROSE	07/10/2010	1	0	0	0	0
HANCOCK	04/10/2011	1	0	0	0	0
WILD ROSE	04/10/2011	1.75	0	0	0	0
WAUTOMA	04/10/2011	1.75	0	0	0	0
WILD ROSE	04/10/2011	0.75	0	0	0	0
WILD ROSE	04/10/2011	1.75	0	0	0	0
PINE RIVER	04/10/2011	1	0	0	0	0
WAUTOMA ARPT	05/22/2011	1	0	0	0	0
REDGRANITE	05/22/2011	4.25	0	0	\$5,000	0
POY SIPPI	05/22/2011	2	0	0	0	0
BORTH	05/22/2011	1.5	0	0	0	0
POY SIPPI	05/22/2011	0.88	0	0	0	0
WAUTOMA ARPT	06/06/2011	1.75	0	0	0	0
WAUTOMA	06/06/2011	1.75	0	0	0	0

Appendix B: Frequency of Occurrence

WAUTOMA	06/06/2011	1.25	0	0	0	0
HANCOCK	05/03/2012	0.88	0	0	0	0
POY SIPPI	08/02/2015	1.38	0	0	0	0
AURORAVILLE	08/02/2015	1.75	0	0	0	0
WEST BLOOMFIELD	06/06/2016	1	0	0	0	\$6,000
COLOMA	06/15/2016	1.75	0	0	0	0
MT MORRIS	06/12/2017	1	0	0	0	0
HANCOCK	07/06/2017	1.5	0	0	0	0
AURORAVILLE	10/09/2018	1	0	0	0	0
BORTH	10/09/2018	1.5	0	0	0	0
PLAINFIELD	06/02/2020	0.88	0	0	0	0
WAUTOMA	06/02/2020	1.5	0	0	0	0
POY SIPPI	06/02/2020	1.25	0	0	0	0
WAUTOMA	06/02/2020	1	0	0	0	0
POY SIPPI	08/24/2021	1.75	0	0	0	0
BERLIN	09/07/2021	1	0	0	0	0

LIGHTNING

There were 3 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
REDGRANTE	09/26/1998	0	0	0	0
WAUTOMA	04/10/1999	0	0	\$3,000	0
WAUTOMA	04/10/1999	0	0	\$75,000	0

THUNDER-STORM WIND

There were 97 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>KTS</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
HANCOCK	4/5/1997		0	0	\$2,000	0
WAUTOMA	6/24/1997		0	0	\$1,000	0
WILD ROSE	6/24/1997		0	0	\$1,000	0
WAUTOMA	7/14/1997		0	0	\$1,000	0
WAUTOMA	7/16/1997		0	0	\$25,000	0
COLOMA	9/1/1997		0	0	\$500	0
WAUTOMA	9/16/1997		0	0	\$2,000	0

Appendix B: Frequency of Occurrence

COLOMA	5/31/1998	55	0	0	0	0
HANCOCK	5/31/1998	50	0	0	0	0
MT MORRIS	5/31/1998	55	0	0	0	0
WAUTOMA	6/18/1998	50	0	0	0	0
WAUTOMA	6/6/1999		0	0	\$10,000	0
WAUTOMA	6/10/1999	50	0	0	0	0
COLOMA	7/3/1999	52	0	0	0	0
WAUTOMA	7/3/1999	50	0	0	0	0
REDGRANITE	7/8/1999	50	0	0	0	0
WILD ROSE	7/30/1999	50	0	0	0	0
REDGRANITE	7/30/1999	50	0	0	0	0
HANCOCK	4/12/2001	50	0	0	0	0
POY SIPPI	4/12/2001	50	0	0	0	0
PLAINFIELD	6/11/2001	50	0	0	\$5M	0
REDGRANITE	9/7/2001	55	0	0	0	0
COLOMA	7/30/2002	50	0	0	0	0
WAUTOMA	7/30/2002	55	1	1	0	0
SAXEVILLE	7/30/2002	52	0	0	0	0
REDGRANITE	8/20/2003	50	0	0	0	0
PLAINFIELD	8/20/2003	50	0	0	0	0
SAXEVILLE	6/23/2004	50	0	0	0	0
WILD ROSE	7/13/2004	50	0	0	0	0
WILD ROSE	8/26/2004	50	0	0	0	0
POY SIPPI	6/4/2005	50	0	0	0	0
RICHFORD	6/5/2005	50	0	0	0	0
REDGRANITE	6/5/2005	50	0	0	0	0
WILD ROSE	6/5/2005	50	0	0	0	0
REDGRANITE	6/10/2005	50	0	0	0	0
WAUTOMA	7/23/2005	50	0	0	0	0
WAUTOMA	7/23/2005	50	0	0	0	0
REDGRANITE	7/25/2005	50	0	0	0	0
PLAINFIELD	9/13/2005	50	0	0	0	0
WILD ROSE	7/30/2006	50	0	0	0	0
PLAINFIELD	7/30/2006	56	0	0	0	0
POY SIPPI	7/30/2006	50	0	0	0	0
WILD ROSE	5/24/2007	52	0	0	0	0
LOHRVILLE	6/7/2007	52	0	0	0	0
WAUTOMA	7/3/2007	52	0	0	0	0
WAUTOMA	7/26/2007	52	0	0	0	0
HANCOCK	8/11/2007	52	0	0	0	0

Appendix B: Frequency of Occurrence

COLOMA	9/21/2007	52	0	0	0	0
COLOMA	7/10/2008	50	0	0	0	0
COLOMA	7/10/2008	50	0	0	0	0
PINE RIVER	7/10/2008	50	0	0	0	0
WILD ROSE	7/16/2008	50	0	0	0	0
WILD ROSE	7/14/2010	52	0	0	0	0
WAUTOMA	4/10/2011	78	0	0	0	0
WAUTOMA	4/10/2011	78	0	0	0	0
WAUTOMA	4/10/2011	70	0	0	0	0
WILD ROSE	4/10/2011	52	0	0	0	0
WILD ROSE	7/17/2011	52	0	0	0	0
COLOMA	9/2/2011	52	0	0	0	0
WAUTOMA	9/2/2011	61	0	0	\$500,000	0
WILD ROSE	8/6/2013	65	0	0	\$25,000	0
WILD ROSE	6/18/2014	52	0	0	0	0
HANCOCK	7/13/2015	61	0	0	0	0
MT MORRIS	7/13/2015	65	0	0	0	0
WAUTOMA	7/13/2015	52	0	0	0	0
WAUTOMA ARPT	7/13/2015	52	0	0	0	0
WILD ROSE	8/2/2015	52	0	0	\$2,000	0
COLOMA	5/25/2016	52	0	0	0	0
WAUTOMA	5/25/2016	56	0	0	0	0
COLOMA	6/15/2016	56	0	0	0	0
PLAINFIELD	7/13/2016	52	0	0	0	0
COLOMA	7/21/2016	52	0	0	0	0
WAUTOMA	7/21/2016	52	0	0	0	0
MT MORRIS	7/21/2016	52	0	0	0	0
BANNERMAN	7/21/2016	52	0	0	\$2,500	0
COLOMA	9/6/2016	52	0	0	0	0
BORTH	3/6/2017	61	0	0	\$10,000	0
WAUTOMA	5/17/2017	52	0	0	0	0
WAUTOMA	6/12/2017	52	0	0	0	0
SAXEVILLE	6/12/2017	52	0	0	0	0
RICHFORD	6/14/2017	56	0	0	\$30,000	0
WAUTOMA ARPT	6/14/2017	51	0	0	0	0
MT MORRIS	6/14/2017	56	0	0	0	0
WILD ROSE	6/14/2017	56	0	0	0	0
WAUTOMA ARPT	6/16/2018	52	0	0	0	0
WAUTOMA	8/27/2018	52	0	0	0	0

Appendix B: Frequency of Occurrence

WAUTOMA ARPT	8/28/2018	52	0	0	0	0
WAUTOMA	6/27/2019	53	0	0	0	0
MT MORRIS	6/27/2019	52	0	0	0	0
WAUTOMA	7/19/2019	52	0	0	0	0
PLAINFIELD	7/20/2019	52	0	0	0	0
WILD ROSE	7/20/2019	52	0	0	0	0
PLAINFIELD	8/10/2020	52	0	0	0	0
WILD ROSE	8/10/2020	52	0	0	0	0
BORTH	7/28/2021	56	0	0	0	0
COLOMA	8/8/2021	52	0	0	0	0
PLAINFIELD	12/15/2021	56	0	0	0	0

HIGH WIND

There were 6 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>KTS</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	04/06/1997		0	0	\$1,000	0
WAUSHARA COUNTY	06/28/1998		0	0	\$1,000	0
WAUSHARA COUNTY	06/28/1998		0	0	\$200,000	0
WAUSHARA COUNTY	11/10/1998	50	0	0	0	0
WAUSHARA COUNTY	02/25/2001	50	0	0	0	0
WAUSHARA COUNTY	03/08/2017	51	0	0	0	0

STRONG WIND

There were 15 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>KTS</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	03/09/1998		0	0	0	0
WAUSHARA COUNTY	04/12/1998		0	0	0	0
WAUSHARA COUNTY	05/18/1998		0	0	0	0
WAUSHARA COUNTY	03/17/1999		0	0	0	0
WAUSHARA COUNTY	12/25/1999		0	0	0	0
WAUSHARA COUNTY	03/25/2000		0	0	0	0
WAUSHARA COUNTY	04/05/2000		0	0	0	0
WAUSHARA COUNTY	06/21/2000		0	0	0	0
WAUSHARA COUNTY	10/25/2001		0	0	0	0
WAUSHARA COUNTY	12/05/2001		0	0	0	0
WAUSHARA COUNTY	02/11/2002		0	0	0	0

Appendix B: Frequency of Occurrence

WAUSHARA COUNTY	03/09/2002		0	0	0	0
WAUSHARA COUNTY	05/09/2002		0	0	0	0
WAUSHARA COUNTY	12/23/2015	40	0	0	\$1,000	0
WAUSHARA COUNTY	07/19/2017	39	0	0	\$1,500	0

TORNADO

There were 13 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Strength</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
HANCOCK	07/16/1997	F0	0	0	0	0
COLOMA	06/16/1998	F0	0	0	0	0
AURORAVILLE	06/04/2005	F0	0	0	0	0
BORTH	06/04/2005	F0	0	0	0	0
WAUTOMA	08/18/2005	F0	0	0	\$5,000	0
COLOMA MUNI	04/10/2011	EF1	0	0	\$175,000	0
SAXEVILLE	04/10/2011	EF1	0	0	0	0
POY SIPPI	04/10/2011	EF1	0	0	\$100,000	0
WILD ROSE	06/14/2017	EF1	0	0	\$100,000	0
SILVER LAKE	07/20/2018	EF0	0	0	0	0
HANCOCK	07/16/2019	EF0	0	0	0	0
BORTH	07/28/2021	EF0	0	0	0	0
COLOMA	08/08/2021	EF1	0	0	0	0

FUNNEL CLOUD

There were 4 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUTOMA	07/25/2005	0	0	0	0
HANCOCK	06/06/2006	0	0	0	0
HANCOCK	07/04/2009	0	0	0	0
POY SIPPI	07/09/2013	0	0	0	0

Appendix B: Frequency of Occurrence

WINTER WEATHER					
<i>There were 3 events reported over the 25-year period from 4/1/1997 – 4/30/2022.</i>					
<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	01/14/1998	0	0	0	0
WAUSHARA COUNTY	01/22/1999	0	0	0	0
WAUSHARA COUNTY	04/28/2008	0	0	0	0

WINTER STORM					
<i>There were 38 events reported over the 25-year period from 4/1/1997 – 4/30/2022.</i>					
<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	01/08/1998	0	0	0	0
WAUSHARA COUNTY	03/08/1998	0	0	0	0
WAUSHARA COUNTY	01/02/1999	0	0	0	0
WAUSHARA COUNTY	03/08/1999	0	0	0	0
WAUSHARA COUNTY	02/08/2001	0	0	0	0
WAUSHARA COUNTY	03/02/2002	0	0	0	0
WAUSHARA COUNTY	12/09/2003	0	0	0	0
WAUSHARA COUNTY	12/20/2004	0	0	0	0
WAUSHARA COUNTY	01/21/2005	0	0	0	0
WAUSHARA COUNTY	02/16/2006	0	0	0	0
WAUSHARA COUNTY	02/24/2007	0	0	0	0
WAUSHARA COUNTY	03/01/2007	0	0	0	0
WAUSHARA COUNTY	04/11/2007	0	0	0	0
WAUSHARA COUNTY	12/01/2007	0	0	0	0
WAUSHARA COUNTY	12/23/2007	0	0	0	0
WAUSHARA COUNTY	01/17/2008	0	0	0	0
WAUSHARA COUNTY	01/29/2008	0	0	0	0
WAUSHARA COUNTY	02/17/2008	0	0	0	0
WAUSHARA COUNTY	02/26/2009	0	0	0	0
WAUSHARA COUNTY	03/08/2009	0	0	0	0
WAUSHARA COUNTY	12/08/2009	0	0	0	0
WAUSHARA COUNTY	12/24/2009	0	0	0	0
WAUSHARA COUNTY	12/11/2010	0	0	0	0
WAUSHARA COUNTY	02/20/2011	0	0	0	0
WAUSHARA COUNTY	12/20/2012	0	0	0	0

Appendix B: Frequency of Occurrence

WAUSHARA COUNTY	01/30/2013	0	0	0	0
WAUSHARA COUNTY	12/22/2013	0	0	0	0
WAUSHARA COUNTY	01/14/2014	0	0	0	0
WAUSHARA COUNTY	11/24/2014	0	0	0	0
WAUSHARA COUNTY	12/28/2015	0	0	0	0
WAUSHARA COUNTY	02/02/2016	0	0	0	0
WAUSHARA COUNTY	03/23/2016	0	0	0	0
WAUSHARA COUNTY	01/16/2017	0	0	0	0
WAUSHARA COUNTY	04/03/2018	0	0	0	0
WAUSHARA COUNTY	04/13/2018	0	0	0	0
WAUSHARA COUNTY	01/28/2019	0	0	0	0
WAUSHARA COUNTY	02/23/2019	0	0	0	0
WAUSHARA COUNTY	02/04/2021	0	0	0	0

HEAVY SNOW

There were 24 events reported over the 25-year period from 4/1/1997 – 4/30/2022.

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	01/14/1998	0	0	0	0
WAUSHARA COUNTY	12/20/1998	0	0	0	0
WAUSHARA COUNTY	01/12/2000	0	0	0	0
WAUSHARA COUNTY	01/31/2002	0	0	0	0
WAUSHARA COUNTY	02/01/2002	0	0	0	0
WAUSHARA COUNTY	01/31/2003	0	0	0	0
WAUSHARA COUNTY	04/07/2003	0	0	0	0
WAUSHARA COUNTY	02/05/2004	0	0	0	0
WAUSHARA COUNTY	01/05/2005	0	0	0	0
WAUSHARA COUNTY	02/20/2005	0	0	0	0
WAUSHARA COUNTY	03/18/2005	0	0	0	0
WAUSHARA COUNTY	12/14/2005	0	0	0	0
WAUSHARA COUNTY	02/23/2007	0	0	0	0
WAUSHARA COUNTY	02/14/2008	0	0	0	0
WAUSHARA COUNTY	03/21/2008	0	0	0	0
WAUSHARA COUNTY	12/08/2008	0	0	0	0
WAUSHARA COUNTY	12/19/2008	0	0	0	0
WAUSHARA COUNTY	03/09/2011	0	0	0	0

Appendix B: Frequency of Occurrence

WAUSHARA COUNTY	04/19/2011	0	0	0	0
WAUSHARA COUNTY	11/09/2011	0	0	0	0
WAUSHARA COUNTY	02/17/2014	0	0	0	0
WAUSHARA COUNTY	12/16/2016	0	0	0	0
WAUSHARA COUNTY	02/12/2019	0	0	0	0
WAUSHARA COUNTY	02/09/2020	0	0	0	0

BLIZZARD

*There were **no** events reported over the 25-year period from 4/1/1997 – 4/30/2022.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
NO EVENTS					

ICE STORM

*There were **2** events reported over the 25-year period from 4/1/1997 – 4/30/2022.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	01/01/2005	0	0	0	0
WAUSHARA COUNTY	04/09/2013	0	0	0	0

DENSE FOG¹⁷²

*There were **4** events reported over the 25-year period from 4/1/1997 – 4/30/2022.*

<i>Location</i>	<i>Date</i>	<i>Deaths</i>	<i>Injuries</i>	<i>Property Damage</i>	<i>Crop Damage</i>
WAUSHARA COUNTY	02/11/1999	0	0	0	0
WAUSHARA COUNTY	12/13/1999	0	0	0	0
WAUSHARA COUNTY	01/09/2000	0	0	0	0
WAUSHARA COUNTY	02/24/2000	0	0	0	0

¹⁷² 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 Waushara County and its major municipal bodies including the Waushara 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.

(Insert FEMA Approval / WEM Approval / Municipal Adoptions
(County, City, Village, Town))

Appendix D: Report on Previous Mitigation Strategies

All Hazards						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
1.1	Develop a National Oceanic and Atmospheric Administration (NOAA) weather radio purchasing program. NOAA Weather radios sold at cost. Available to the public and local business owners.	High	Covered by department annual budget	Emergency Management Department	Ongoing	<i>Program has been developed by county EM for purchasing NOAA weather radios. In lieu of charging for the radios, EM set a priority to give them out at no cost to vulnerable populations. Senior citizens were advised to contact the Department of Aging to obtain a radio. Over the last 1-2 years, the county has given out approximately 400 radios.</i> <i>Will carry forward as an ongoing strategy at a high priority and with EM budgeting \$4K annually for this program.</i>
1.2	The County should continue to add and update information on the Sheriff's Department website regarding Emergency Management Information. The web site should contain information describing the types of natural and manmade hazardous disasters in the County and how to respond when a hazard threatens. The site should also contain information on ordinances pertaining to hazards and links to such sites	High	Covered by department annual budget	Emergency Management Department, IT	Ongoing	<i>EM is no longer underneath the Sheriff's Department and will be sharing information on an independent website, which has already been created. Over the last 3.5 years, EM has utilized social media to provide information.</i> <i>Will carry forward as a high priority and expand to include the use of social media and other methods of</i>

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	as burning and weather conditions.					disseminating information.
1.3	Promote campgrounds, camp, and mobile home parks to consider providing protective shelters.	High	Covered department budget	by annual Emergency Management Department	Ongoing	<i>Fiscal restraints have prevented shelters from being built. EM has been working with the Zoning Dept to identify locations and obtain funding to build shelters.</i> <i>TN Springwater: Evergreen Campground has put in 2 shelters; the new Wilson Lake Campground will be putting in 1 shelter; and Rose's Campground has discussed putting in 1 shelter.</i> <i>VI Red Granite: Red Granite Mobile Home Park recently sold and is being redeveloped; the new owners should be notified of this strategy. They will be putting in some new homes and removing others; as well as updating sewer and water connections.</i> <i>CI Wautoma: Have talked about putting a shelter at the fairgrounds. This would be a central location that could accommodate the people living, working and visiting at the fairgrounds during the fair and other special events who would otherwise have no place to go for shelter. It would also be advantageous for those in campgrounds and mobile home parks within a 10-mile radius.</i> <i>Will carry forward as a high priority. EM will continue to work with Zoning to see if there is interest and</i>

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						<i>look at applying for grant funding for those locations that express an interest. Similar strategies noted elsewhere in this table will be consolidated into this strategy moving forward.</i>
1.4	Develop a Plan Implementation Steering Committee to monitor progress on mitigation strategies (including a mix of County staff, civic group members, local business owners, and citizens).	Medium	Covered by department annual budget	Emergency Management Department	2015-2020	<i>The EM Director has been coordinating hazard mitigation information and strategies from municipalities, members of the community, and other interested parties as needed. This strategy will continue going forward and the EM director will use the final appendix of the revised plan to collect that information for action (should opportunities arise) or for inclusion in the next plan update.</i>
1.5	Promote Siren Program	Medium	Approximately \$16,000 for each siren	Emergency Management Department	Ongoing	<i>Municipalities are responsible for the upkeep and replacement of sirens. This is expensive and some have decided to remove sirens for this reason. Sirens are also effective only when people are outside or near enough to hear them. Instead, the county purchased and has handed out weather radios to people who have the need or are not served by the use of cellular phones. Advancements in technology provide a higher cost/benefit ratio.</i> <i>The Town of Coloma voted to not fix the siren in their town. EM has handed out several weather radios in this area.</i>

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						<i>Will carry forward, noting that municipalities may be moving away from the use of sirens and that other options for warning are available to county residents.</i>
1.6	Incorporate recommendations of the All-Hazards Mitigation Plan into the County Comprehensive plan.	Medium	County annual budget	Emergency Management Department. Land Conservation and Zoning Department, UW-Ext.	Ongoing	<i>The county's Stormwater, Floodplain and Wetlands plans all cross-reference this mitigation plan. The Comprehensive Plan was being updated but that person left; the county is looking to hire a new consultant. The plan is updated annually and bi-annually from the townships. All cities, towns and villages have their own Comprehensive Plans and will ensure that they cross-reference this mitigation plan as a source plan.</i> <i>Will be carried forward with the county and municipalities reviewing their individual Comprehensive Plans and adding a cross-reference if not already included.</i>
1.7	Coordinate with County business owner groups to help encourage business continuity planning.	Medium	Covered by department annual budget	Emergency Management Department	2015-2020	<i>EM completed a Do-1-Thing campaign in 2019 with 13 articles covering both homes/families and businesses in an effort to promote developing a plan to prepare for emergencies. The campaign spanned 12 months and the end goal was for participants to have a comprehensive plan.</i> <i>CI Wautoma: Tries to use social media to disseminate information</i>

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						<i>as the newspaper only comes out once per week. They also utilize their website and link to the county website.</i> <i>This strategy will be carried forward with at least one event occurring over the 5-year span of this plan with at least one target group. EM will lead the effort with municipalities amplifying the county's information (i.e., posting at town halls, reposting/sharing on social media, reading announcements at Board meetings, promoting weather radios, etc.). Upon request, EM will provide the articles that were done in 2019 to the municipalities to share with their residents; and any future information beneficial to individuals and businesses.</i>
1.8	Analyze County and municipal fire and police stations to make sure they are hazard resistant.	Medium	Covered by department annual budget	Emergency Management Department	Ongoing	<i>Stations are always being reviewed, especially as they age. A lot of the fire stations are newer and up-to-date.</i> <i>Will carry forward.</i>
1.9	Establish a hazard awareness week and host an annual public hazards workshop that engages and informs the County's citizens (can be part of the Waushara County Fair).	Medium	Covered by department annual budget	Emergency Management Department, LEPC, WIN groups, Chamber of Commerce	2015-2020	<i>This is done annually in April in conjunction with spring's Severe Weather Week; and during November's Winter Weather Awareness Week through social media and other outreach opportunities. Most municipal fire departments provide education during Fire Awareness month in the Fall.</i>

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						<i>Will be carried forward as ongoing but strategy will be changed to "Continue providing community disaster education presentations to citizens, public agencies, private property owners, businesses, and schools during the Spring Severe Weather Week, the Fall/Winter Weather Awareness campaign and during Fire Awareness campaigns. Share electronically as well as doing interviews and presentations."</i>
1.10	Local emergency Management training for municipal political officials and <u>collect property values for structures that are considered to have a high risk to identified hazards.</u>	Medium	Covered by department annual budget	Emergency Management Department, participating jurisdictions and towns	Ongoing	<i>Has been done as a part of disaster planning to get average property values for estimating loss of property. Surveys 1, 2, 3 have been populated. New damage assessment plan has been developed over the last four years. Local leaders have been invited for damage assessment and planning training. Zoning and Land Conservation are leading damage assessment in the county in a more formal way. Current plans have been validated as useful, as they were used after a tornado in August.</i> <i>Will carry forward, changing the strategy to ongoing maintenance and updating of plans as needed and with a Low-Medium priority.</i>
1.11	Continue to mobilize weather spotters.	Low	Covered by department annual budget	Emergency Management Department	Ongoing	<i>EM monitors the weather, calls out spotters and coordinates the training, which occurs every other year. EM is purchasing some</i>

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						equipment (vehicle-mounted wind meters). Will carry forward, offering regular training and evaluating other opportunities to support with training and equipment as needed.
1.12	Continually update County-wide maps (aerial photos, parcels, building footprints, critical facility locations, etc.).	Low	Covered by department budget annual	Emergency Management Department, Land Conservation and Zoning Department, GIS staff	Ongoing	GIS has used LIDAR and ortho photo data, maps, etc. as updated and available. Will be carried forward.
1.13	Enforce shoreline, wetland, steep slope, setbacks.	Low	Covered by department budget annual	Land Conservation Department, WDNR	Ongoing	Enforcement actions were completed as needed by the departments as part of their regular departmental activities and budgets. Will carry forward and continue with these activities, moving the priority to Medium.
1.14	Incorporate hazard mitigation principals into all aspects of public-funded buildings.	Low	Covered by department budget annual	Emergency Management Department, Land Conservation and Zoning Department	Ongoing	Hazard mitigation is built into the codes and into the regular process of the communities as they look at siting public buildings. This strategy does not contain anything actionable; this plan formalizes hazard mitigation planning and looks at strategies. Will be removed.
1.15	Install/Maintain quick-connect emergency generator hook-ups for critical facilities.	Low	Covered by department budget annual	Emergency Management Department	Ongoing	Use funding to purchase a new generator that will also power the kitchen if there is a delay in Red Cross response. All other facilities that need to have back-up generators have them.

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						<i>Will be carried forward for the kitchen generator. As opportunities arise, this project will be taken into account, as budget allows.</i>
1.16	Encourage the installation of NOAA Weather Radios in all schools and government buildings.	Low	Covered by department annual budget	Emergency Management Department	Ongoing	<i>Completed. Weather radios have been provided to all schools and government buildings, including outlying dining centers, offices across all county buildings and to the schools. EM also programmed the radios. Will be removed.</i>
1.17	Coordinate with local businesses to develop mutual-aid agreements (use of heavy equipment, generators, pumps, etc.).	Low	Covered by department annual budget	Emergency Management Department, Chamber of Commerce, WIN groups, local civic groups	2015-2020	<i>EM has been working with a key single-point source at the engineering school on an agreement, as they have many of the necessary items that would be needed. Negotiations and agreements are continuing to be sought. Will be carried forward.</i>
1.18	Identify specific at-risk populations that may be exceptionally vulnerable in the event of long-term power outages or impassible transportation routes.	Low	Covered by department annual budget	Emergency Management Department, Health Department, Health and Human Services Department, Cooperative Care, Department of Aging	Ongoing	<i>This has been completed. EM has worked with the service agencies and created a plan to get the most recent information when needed. Other agencies have provided locations of these populations. The identification and planning phase has been completed and will be maintained as part of regular operations moving forward. Will be removed.</i>

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Tornados/High Winds						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
2.1	Promote the use of County-wide mass notification system participation.	High	Covered by department annual budget	Emergency Management Department	Ongoing	<i>Residents can sign up and get alerts through the county Sheriff's Office. There are currently 14K phone numbers registered, which is about 60% of the county's population. If registering online, alerts will only come from Waushara County. If downloading the app, alerts will come from any county that a person is traveling through. The county currently pays about \$12K for its annual contract. Information and a download link are on the county's website and is promoted at least once a year, primarily prior to the Spring storm season. It can be used for more than just weather alerts; and has been used to provide pandemic-related information.</i> <i>Will carry forward as a high priority, consolidating similar strategies in this table into a single strategy.</i>
2.2	Coordinate with the campground and mobile home park owners to promote their participation in the County's mass notification system and develop campground warning systems and procedures.	High	Covered by department annual budget	Emergency Management Department, WIN	Ongoing	<i>This has been completed as noted above and will be consolidated into that strategy moving forward.</i> <i>Will be removed.</i>

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2.3	Study the feasibility and work toward the development of safety shelters for campgrounds and mobile home parks.	High	FEMA Grant or CDBG	Emergency Management Department, UW-Extension	Ongoing	<i>Activities have been conducted as noted under the "Promote campgrounds, camp, and mobile home parks to consider providing protective shelters" in the All Hazards section of this table.</i> <i>This item will be removed and consolidated with similar strategies in this table.</i>
2.4	Apply for funding to build Community Safe Rooms.	High	WI Emergency Management	Emergency Management Department, WEM, local campground and mobile home park owners	2016-2020	<i>Have sought opportunities to create safe rooms, especially in areas with high-hazard concerns such as schools, campgrounds and mobile home parks.</i> <i>Will be carried forward and other similar strategies will be combined with this one.</i>
2.5	Recommend stronger building codes for mobile homes and trailers.	Medium	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning Department	Ongoing	<i>County has discussed at length and this is cost-prohibitive. County already requires them to be tied down and weather-resistant. County and municipalities will stick to the UDC and manufacturer recommendations and are not looking to have their codes extended at this point.</i> <i>Will be removed.</i>
2.6	Expand early warning system to a greater percentage of the County.	Medium	Covered by department annual budget	Emergency Management Department	Ongoing	<i>Residents can sign up and get alerts through the county Sheriff's Office. There are currently 14K phone numbers registered, which is about 60% of the county's population. If registering online,</i>

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						<i>alerts will only come from Waushara County. If downloading the app, alerts will come from any county that a person is traveling through. The county currently pays about \$12K for its annual contract. Information and a download link are on the county's website and is promoted at least once a year, primarily prior to the Spring storm season. It can be used for more than just weather alerts; and has been used to provide pandemic-related information.</i> <i>This item will be removed and consolidated with similar strategies in this table.</i>
2.7	Take a county-wide inventory of mobile home standards.	Low	Covered by department annual budget	Emergency Management Department	Ongoing	<i>Not feasible to do or maintain an inventory; EM knows where the parks are and it is the owners' responsibility to know who is in their parks.</i> <i>Will be removed.</i>
2.8	Inform residents of shelter locations and evacuation routes.	Low	Covered by department annual budget	Emergency Management Department	Ongoing	<i>Evacuation plan was developed for the fairgrounds; identified the basement of the Sheriff's Dept. and county buildings to be used as shelters until a shelter can be built at the fairgrounds.</i> <i>If there is a request by businesses or a mobile home park, EM would work with them individually.</i> <i>Will be removed.</i>

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2.9	Require new construction of safe rooms in new schools, daycares, and nursing homes, and public facilities.	Low	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning Department	Ongoing	<i>Have sought opportunities to create safe rooms, especially in areas with high-hazard concerns such as schools, campgrounds and mobile home parks.</i> <i>Will be carried forward and similar strategies will be consolidated into this one.</i>
2.10	Ensure that school officials are aware of the best area of refuge in school buildings and participate in annual Severe Weather Awareness week activities.	Low	Covered by department annual budget	Emergency Management Department	Ongoing	<i>WI DPI requires schools to plan and train through drills, the school community on where their safe rooms are and EM provides information and support to them upon request. EM works with students during Severe Weather Awareness week in Spring. Schools all have tornado plans</i> <i>Will be removed and incorporated into item 2.3 going forward.</i>
2.11	Support the development of a county-wide ordinance requiring mobile home tie downs.	Low	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning Department.	Ongoing	<i>County has discussed at length and this is cost-prohibitive. County already requires them to be tied down and weather-resistant. County and municipalities will stick to the UDC and manufacturer recommendations and are not looking to have their codes extended at this point.</i> <i>Will be removed.</i>

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Severe Thunderstorms & Lightning Storms (Hail)						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
3.1	Promote public awareness and personal preparedness.	High	Covered by department annual budget	Emergency Management Department	Ongoing	<i>This is done annually in April in conjunction with spring's Severe Weather Week; and during November's Winter Weather Awareness Week through social media and other outreach opportunities.</i> <i>Will be carried forward.</i>
3.2	Install and maintain surge protection on critical electronic equipment on listed critical facilities.	Low	Covered by County annual budget and local MCD budgets	Emergency Management Department	Ongoing	<i>County does have surge protection, including a back-up server. Municipalities will check with their vendors to see if anything is needed.</i> <i>This will be removed going forward.</i>

Forest Fires and Wildfires						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
4.1	Continue mutual aid.	High	Covered by department annual budget	Emergency Management Department	Ongoing	<i>Mutual aid agreements exist for first response agencies within the county. This is also a response issue. As such, it will be removed going forward.</i>
4.2	Promote public awareness on fire protection and fire safety.	Medium	Covered by department annual budget	WDNR, Emergency Management Department, Local Fire Departments	Ongoing	<i>Fire departments routinely participate in outreach activities as needed and as they are available.</i> <i>Will be carried forward.</i>

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4.3	Provide educational outreach to citizens on wildfire prevention and evacuation (Restore fire warden program).	Medium	Covered by department annual budget	WDNR, Local Fire Departments, Emergency Management Department	Ongoing	<i>The WDNR does still have this program and joins the local FDs during fire prevention week to get the materials to parents.</i> <i>TN Springwater - goes through WDNR to get permit; then have to call that day to ensure it is okay to burn. Permit valid from Jan to May and you have to call in every time you are going to burn.</i> <i>Will be removed.</i>
4.4	Map wildfire hazard areas to facilitate analysis and planning decisions through comparison with zoning, development and infrastructure, etc.	Low	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning Department	Ongoing	<i>Updates are done by WDNR and maps are used for comprehensive planning purposes.</i> <i>Will be carried forward with the strategy being changed to note the above comments.</i>
4.5	Include wildfire hazards considerations in land use, public safety, and other elements of the County comprehensive plan.	Low	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning Department	Ongoing	<i>Wildfires are considered as part of the planning process each time the comprehensive plan is updated.</i> <i>Will be removed.</i>
4.6	Coordinate with utility companies to create defensible zones around power lines, oil and gas lines, and other infrastructure systems.	Low	Covered by department annual budget	Emergency Management Department, utility companies	Ongoing	<i>The county and its municipalities support the reduction of fuel loads by infrastructure owners around their property by making access available in rights-of-way and on public roadways for maintenance.</i> <i>Will be carried forward.</i>
4.7	Coordinate with the WDNR to manage public lands to reduce fuel loads (prescribed burning, clearing dead	Low	Covered by department annual budget	Emergency Management Department, WDNR	Ongoing	<i>The county's fire departments work with the WDNR as requested to support prescribed burns.</i>

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	vegetation, selective logging, etc.).					<i>Will be carried forward.</i>
4.8	Coordinate with local fire departments to establish proper evacuation procedures and provide educational outreach.	Low	Covered by department annual budget	Emergency Management Department, Local Fire Departments	Ongoing	<i>Fire departments routinely participate in outreach activities as needed and as they are available.</i> <i>Will be removed as a separate strategy and consolidated with item 4.2 above.</i>

Winter Storms						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
5.1	Promote public awareness and personal preparedness.	Medium	Covered by department annual budget	Emergency Management Department	Ongoing	<i>EM completed a Do-1-Thing campaign in 2019 with 13 articles covering both homes/families and businesses in an effort to promote developing a plan to prepare for emergencies. The campaign spanned 12 months and the end goal was for participants to have a comprehensive plan.</i> <i>This strategy will be carried forward.</i>
5.2	Enhance communication with local power companies	Medium	Covered by department annual budget	Emergency Management Department, All participating jurisdictions, Health and Human Services	Ongoing	<i>The county EM department coordinates with the local power companies in the preparedness and response phase, as necessary.</i> <i>This is not a concrete action and the strategy will be rolled into other strategies (and therefore</i>

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						<i>dropped) going forward.</i>
5.3	Coordinate with local fire departments to develop a smoke and carbon monoxide detector purchasing program.	Medium	Covered by department annual budget	Emergency Management Department and Local Fire Departments	Ongoing	<i>EM gathers information for those interested in dual smoke/carbon monoxide detectors and provides that information to the American Red Cross; Red Cross then goes into the homes and installs the detectors.</i> <i>Outreach has been provided during the county fair at the EM booth, where residents can sign up for the program.</i> <i>Will carry forward as an ongoing strategy, removing the local fire departments and adding the Red Cross.</i>
5.4	Coordinate with utility companies to assure that tree pruning around lines meet accepted standards and determine utility infrastructure critical transportation routes.	Low	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning Department, utility companies	Ongoing	<i>There are no standards for "acceptable standards" for pruning and neither the county nor the municipalities have any mechanism to force compliance. The aforementioned strategies of providing access reflects the reality of the county's abilities. As such, this strategy will be removed.</i>
5.5	Encourage existing homeowners and require new construction for all dwellings that are heated by fuel-burning equipment to install carbon monoxide monitors and alarms.	Low	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning Department	Ongoing	<i>This is regularly done in the annual (November) public information campaigns associated with Winter Preparedness.</i> <i>Will be carried forward.</i>
5.6	Ensure new construction meets building codes for roof snowloads.	Low	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning	Ongoing	<i>This is done by the Planning and Zoning Department during engineering plan reviews as a</i>

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				Department		<i>required part of the process. Will be dropped.</i>
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Extreme Heat/Cold						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
6.1	Promote public awareness and personal preparedness.	Medium	Covered by department annual budget	Emergency Management Department	Ongoing	<i>EM completed a Do-1-Thing campaign in 2019 with 13 articles covering both homes/families and businesses in an effort to promote developing a plan to prepare for emergencies. The campaign spanned 12 months and the end goal was for participants to have a comprehensive plan. This strategy will be carried forward.</i>
6.2	Utilize The mass notification system to assist local utilities to inform homeowners to let faucets drip during extreme cold weather.	Medium	Covered by department annual budget	Local water utilities, Emergency Management Department, County Health and Human Services	Ongoing	Residents can sign up and get alerts through the county Sheriff's Office. There are currently 14K phone numbers registered, which is about 60% of the county's population. If registering online, alerts will only come from Waushara County. If downloading the app, alerts will come from any county that a person is traveling through. The county currently pays about \$12K for its annual contract. Information and a

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						download link are on the county's website and is promoted at least once a year, primarily prior to the Spring storm season. It can be used for more than just weather alerts; and has been used to provide pandemic-related information. <i>This item will be removed as a stand-alone item and consolidated with similar strategies in this table.</i>
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Flash, Riverine and Stormwater Flooding						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
7.1	Work with FEMA and WDNR to re-designate floodplain maps through updating hydrological data and continue compliance with the Federal NFIP.	High	FEMA Grant	Land Conservation and Zoning Department	Ongoing	<i>LIDAR flyover was completed in 2020 and the maps are currently being revised. The flights are coordinated between FEMA and WDNR, not done by the county or municipalities. Various developers will update their flood maps from time to time after studies have been done.</i> <i>Maps for two lakes are currently being reviewed. After discussion between EM and Land/Zoning, this item is not being pursued as it was determined to be an isolated flood and not a chronic flooding area. This specific item will not be carried forward.</i> <i>These maps should be adequate over the lifespan of this plan but if</i>

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						<i>additional maps are needed, it will be done as budget allows. This strategy will be carried forward with a low priority.</i>
7.2	Encourage every Jurisdiction to participate in the NFIP.	High	Covered by department annual budget	Emergency Management	Ongoing	<i>Initial and/or continued participation in the NFIP will be encouraged. Carry forward. Emergency Management will put together brochures and give to local jurisdictions.</i>
7.3	Evaluate municipal stormwater management plans.	Low	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	<i>VI Red Granite updating stormwater management plan (3 to 5 sections per year). Some done in-house and by consultants. Spend about \$10K per year. Ongoing. Will carry forward.</i>
7.4	Perform cost analysis of removing homes within the floodplain and floodway.	Low	FEMA Grant, Detailed Benefit/Cost Analysis at time of project development	Emergency Management Department	Ongoing	<i>No requests for specific assistance occurred in the previous plan period. This strategy will be expanded to include the range of flood mitigation measures (e.g., buy-outs, flood-proofing, elevations) and carried forward to support those that request assistance.</i>
7.5	Enforce local and county building setback codes that restrict development within the mapped floodplain.	Low	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	<i>This is accomplished as part of the regular review that occurs with the building permitting and inspection process. Will be dropped going forward.</i>
7.6	Enforce (or create) a stream buffer ordinance to protect water resources	Low	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	<i>This item was discussed and will not be explored further as existing</i>

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	and limit flood impacts.		budget			<i>ordinances meet the required standards.</i> <i>Will be dropped going forward.</i>
7.7	Prohibit any filling of floodplains or wetlands.	Low	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	<i>The WDNR determines whether these projects will be approved. The county and its municipalities will abide by their direction.</i> <i>Will be dropped going forward.</i>
7.8	Develop engineering guidelines for drainage from new development.	Low	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	<i>This item was discussed and will not be explored further as existing ordinances meet the required standards.</i> <i>Will be dropped going forward.</i>
7.9	Encourage the use of Low-Impact Development techniques.	Low	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	<i>Information regarding low-impact development techniques is available at the Planning and Zoning office and will continue to be available.</i> <i>Carry forward.</i>
7.10	Encourage a zero discharge policy for stormwater in subdivision design.	Low	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	<i>Information regarding reducing the impact of stormwater is available at the Planning and Zoning office and will continue to be available.</i> <i>The WDNR controls properties over 1 acre. The County does not employ an Engineer so the county will support the WDNR as requested.</i> <i>Carry forward.</i>
7.11	Encourage Townships to adopt a stormwater drainage system (open ditch and culverts) maintenance program	Low	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	<i>The county continues to work with the municipalities on stormwater management issues and will</i>

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	such as sediment and debris clearance as well as detection and prevention of discharges into stormwater and sewer systems from home footing drains, downspouts, or sewer pumps.					<i>continue to support their development over the next planning period.</i> <i>Carry forward.</i>
7.12	Encourage the use of check valves, sump pumps, and backflow prevention devices in homes and buildings.	Low	Covered by department annual budget	Land Conservation and Zoning	Ongoing	<i>Information regarding the installation of flood management devices/systems within homes is available at the Planning and Zoning office and will continue to be available.</i> <i>Carry forward.</i>
	Blackhawk Rd W of 24 th Rd - Install larger culvert	Very High	\$7,000	TN Mount Morris	2018	<i>Completed. Washed out. Will be removed.</i>
	21 st Ln S of Buttercup - Install culvert and raise road 4 feet	Very High	\$18,300	TN Mount Morris	2020	<i>Completed. Constant road flooding. Will be removed.</i>
	Beechnut Ave W of Bighorn Ave - Clear trees	High	\$37,500	TN Mount Morris	2019	<i>Completed. Too close to road, always falling on road. Will be removed.</i>
	Buttercup Dr E of 24 th - Clear trees	High	\$18,700	TN Mount Morris	2018	<i>Completed. Too close to road, blocking road after storms. Will be removed.</i>
	22 nd Ave S of Cty Rd S - Clear trees	High	\$74,900	TN Mount Morris	2020	<i>Completed. Too close to road, blocking after storms. Will be removed.</i>

Dam Failure

#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
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8.1	Gather status information on all dams in the county and evaluate the downstream threat in areas prone to flooding events.	Low	Costs of project would vary by dam	Emergency Management Department, WDNR, Dam owners	Ongoing	<i>The county EM office maintains information on high-hazard dams, as provided by the WDNR. Dam emergency plans are provided to the EM office for those dams required to produce them. The EM office also participated in dam exercises as invited.</i> <i>Carry forward. Move to Flooding.</i>
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Structural Fires

#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
9.1	Promote public awareness and personal preparedness.	Medium	Covered by department annual budget	Emergency Management Department, Local fire Departments	Ongoing	<i>Outside the scope of this plan and will be removed.</i>
9.2	Coordinate mutual aid agreements and coordinated training events with local fire departments.	Medium		Local Fire Districts, MABAS		<i>Outside the scope of this plan and will be removed.</i>

Hazardous Materials Incidents

#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
10.1	Promote state enforcement of federal requirements for transporting hazardous materials.	High	Covered by department annual budget	Emergency Management Department, All participating jurisdictions, WI State Patrol	Ongoing	<i>Outside the scope of this plan and will be removed.</i>
10.2	Enforce compliance with Title III EPCRA requirements.	High	Covered by department annual budget	Emergency Management Department	Ongoing	<i>Outside the scope of this plan and will be removed.</i>

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10.3	Reference Pipeline Plans.	Medium	Covered by department annual budget	Emergency Management Department	Ongoing	<i>Outside the scope of this plan and will be removed.</i>
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Communicable Diseases						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
11.1	Promote public awareness and personal preparedness.	Medium	Covered by department annual budget	Waushara County Public Health Dept., Emergency Management Department	Ongoing	<i>Outside the scope of this plan and will be removed.</i>

City of Berlin						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
1	Encourage city residents to participate in the County's mass notification system.	High	None	Emergency Services	Ongoing	<i>Community members received information at public events as well as during the annual (April) severe weather week. Carry forward and move to All Hazards.</i>

City of Wautoma						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
1	Develop a plan to replace old water mains near Downtown Wautoma (Mt. Morris & Waupaca) supplying fire protection.	High	CDBG, Rural and Development General Fund	MSA Engineering/City Council	Ongoing	<i>Waupaca - applying for a CDGB grant to completely reconstruct both the road and the infrastructure underneath Waupaca Street that they believe</i>

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						<i>they are going to get. That project will happen at the end of 2022, potentially going into 2023. They did a lot of improvements on Mount Morris 3 years ago. When the city ran their water utilities down there, there was a full replacement of several roads downtown.</i> <i>Mount Morris project will be removed.</i> <i>Waupaca project is dependent on grant funding - \$1M grant. If they don't get the grant, it will be up to the Council to consider borrowing the additional money or consider doing the part of Waupaca that has not been touched. Will be carried forward and changed to a medium-high priority. Move to All Hazards.</i>
2	Backup generator and power sewer system for electrical outages.	High	Purchased with Rural Development Funds	Public Works	Completed	Have been using money from the American Rescue Plan Act that would qualify to replace things at the lift stations and work has been done. Will be carried forward, evaluating back-up options for the sanitary sewer system and implementation of recommendations. <i>Will be carried forward and changed to a medium-high priority. Move to All Hazards.</i>
3	Backup generator and power water system for electrical outages.	High	Purchased with Rural Development Funds	Public Works	Completed	<i>This was not completed due to lack of funding.</i>

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						Will be carried forward and changed to a medium-high priority. Move to All Hazards.
Village of Coloma						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
1	Develop an emergency shelter site at Anna Follett Memorial Community Center with emergency power and wired for an emergency generator. The facility shall be furnished as an emergency shelter.	High	Generator purchased with Rural Development Funding. Community Center budget and future CC budgeting	Village Safety Department Village Board	Ongoing	Generator was purchased and have a connection to the building. Will be removed.
2	Develop the Coloma Volunteer Fire Department station as an emergency shelter site, wired for emergency generator use and furnished for emergency shelter.	High	Village and town shared funding (to furnish). Generator is owned by the Fire Department.	Village Safety Department Village Board Town Board	Ongoing	Generator is owned by the fire department. Will be removed.
3	Power sewer system in time of electric outages. Main lift station wired for backup generator.	High	Sewer lift station replacement included controls and wired for backup generator. Local financial institution bonding	Sewer Utility Village Board	Completed Payments Ongoing	– This will be evaluated for completion in the upcoming plan cycle. Carry forward and move to Flooding.
4	Replace emergency siren.	High	Safety Department funding in budget and Siren Program	Safety Department Village Board	Completed	If the siren goes down and cannot be repaired, it will not be replaced. Encouraging residents to use the mass notification system. Will carry forward until the siren is no longer in

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						<i>the Village. Move to All Hazards.</i>
5	Continue funding for Volunteer Fire Department and continuation of mobilizing weather spotters.	High	Continued Fire Department budgeting	Village BoardTown Board	Ongoing	<i>Will continue to fund the fire department for their weather spotters. Carry forward and move to All Hazards.</i>
Village of Hancock						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
1	Promote the use of Waushara County's mass notification system.	High	Tax Bills	Village Clerk	Ongoing	<i>Participated with the county during Spring/Winter and Fire Awareness weeks. Carry forward and move to All Hazards.</i>
2	Utilize the mass notification system and the village website to inform residents to run water to prevent freezing.	Medium	Village Website	Village Clerk	Ongoing	<i>Participated with the county during Spring/Winter and Fire Awareness weeks. Carry forward and move to All Hazards.</i>
3	Inform residents and campers from the Village Campground of the shelter location at the Hancock Community Center and create an evacuation route.	Low	Website / Posters at Campground	Village Board	Ongoing	<i>Participated with the county during Spring/Winter and Fire Awareness weeks. Carry forward and move to All Hazards.</i>

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Village of Lohrville						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
1	Inform village residents about the Waushara County mass notification system.	High	Letter sent in tax bills	Village Board	On-going	<i>Mass notification system is promoted through flyers. Carry forward and move to All Hazards.</i>
2	Trim and cut trees to avoid potential road blockage.	Medium	Village Volunteers	Village Board	On-going	<i>They continually trim back and cut down trees away from the roadway as needed. Carry forward and move to Flooding.</i>
3	Monitor drainage ditches for blockage and flow.	Low	Village Volunteers	Village Board	On-going	<i>They have installed new ditches on some problem areas. Some areas have resolved themselves.</i>
Village of Plainfield						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
1	Continued funding of Volunteer Fire Department upgrades of equipment.	High	Village Board	Fire Dept. & Village Staff	Ongoing	<i>The FD is funded through the Village – they continue to update equipment as needed. Carry forward and move to All Hazards.</i>
2	Alert residents of the mass notification system information available by registering phone	High	Village – utilizing water and sewer bills and newsletter	Village	Ongoing	<i>EM emailed a flyer for the mass notification system that the Village will</i>

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	numbers with Sheriff's Department.					<i>include in the next water bill. They also will post on the Village website. Carry forward and move to All Hazards.</i>
3	Contact local business with availability of equipment the Village could get for help with storm damage.	High	Village Staff and Owner Contacts	Village	Ongoing	<i>The Village has an ERP that list the contractors they would use in an emergency. Carry forward and move to All Hazards.</i>
Village of Red Granite						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
1	Update emergency siren, early warning system on a regular basis.	High	V. Redgranite & County	Village & County staff	Ongoing	<i>The siren is currently out of service. No plans in the near future to repair. Carry forward and move to All Hazards.</i>
2	Develop an emergency shelter with emergency power or generator.	High	V. Redgranite	Village staff & County Safety Dept.	Ongoing	<i>The Village finished building a new Village Hall which will be used of an emergency shelter. Also will be installing a generator shortly. Carry forward and move to All Hazards.</i>
3	Keep an updated list and coordinate with mutual aid groups and private contractors in area.	High	V. Redgranite	Age Police Dept.	Ongoing	<i>Police Dept. will update the list they have. Carry forward and move to All Hazards.</i>
4	Inform public of shelters and schools in area and the evacuation routes.	High	V. Redgranite	Village staff (utilizing social media)	Ongoing	<i>This is kept by the County and ARC. Will be dropped.</i>

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5	Promote the use of the County's mass notification system for tornados, wind, and cold weather (for freezing pipes).	High	County Safety Dept.	Village staff & County Sherriff's Depts.	Ongoing	<i>EM emailed a digital informational mass notification system flyer to the Village. They will include this in the next water bill. Also they will post a flyer on the main board in Village Hall. Carry forward and move to All Hazards.</i>
Village of Wild Rose						
#	Mitigation Actions	Action Priority	Costs of Project & Funding Source	Responsible Department / Partners	Project Timetable	Comments / Implementation Obstacles
1	Continue to pursue dam grant and rebuilding.	Medium	Village / State	Village Board	Ongoing	<i>Dam was rebuilt and completed. Will be removed.</i>
2	Work with the County on all hazards plan updates.	Low	Village	Village Board	Ongoing	<i>EM and Village President are working on this and making progress. Carry forward and move to All Hazards.</i>

* Designates an element that supports the NFIP.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
All Hazards	Develop a National Oceanic and Atmospheric Administration (NOAA) weather radio purchasing program. NOAA Weather radios sold at cost. Available to the public and local business owners.	Covered by department annual budget of \$4K.	Emergency Management Department	Ongoing	High	Waushara County and all communities within	Continue this program and promote the use of weather radios more than sirens, as the use of sirens has become cost-prohibitive for municipalities. The county is purchasing more weather radios. County residents can also utilize weather alerts on cell phones and sign up for the mass notification system via the county's website or by downloading the phone application. It was suggested that consideration be made to place a weather radio in each of the municipal halls; this may be prohibitive as the town halls, etc. are not always occupied. Getting the radios into individual homes may be more effective. Individual municipalities are not currently running their own programs.
	Keep the County's website up-to-date and continue to provide hazard related information that is easily accessible. Also utilize social media.	Covered by department annual budget of \$4K.	Emergency Management Department	Ongoing	High	Waushara County and all communities within	

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Contact local business with availability of equipment the Village could get for help with storm damage.	Village staff and owner contacts	Village Officials	Ongoing	High	VI Plainfield	The Village has an ERP that list the contractors they would use in an emergency.
	Provide information and guidance to increase community awareness of and resilience to climate change impacts, to include educating residents about the causes and effects of climate change, how it affects the residents, and what they could be doing to help improve the situation.	Covered by annual budget	Emergency Management Department	Ongoing	Low	Waushara County and all communities within	
	Encourage residents and businesses to conserve energy whenever possible.	Covered by annual budget	Emergency Management Department	Ongoing	Low	Waushara County and all communities within	
	Promote the use of Waushara County's mass notification system and encourage residents to participate by registering phone numbers.	\$12K annual contract	Emergency Management Department	Ongoing	High	Waushara County and all communities within	Residents can sign up and get alerts through the county Sheriff's Office. There are currently 14K phone numbers registered, which is about 60% of the county's population. If registering online, alerts will only come from Waushara County. If downloading the app, alerts will come from any county that a person is traveling through. Information and a download link are on the county's website and is promoted at least once a year, primarily prior to the Spring storm season. It can be used for more than just weather alerts; and has been used to provide

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							pandemic-related information.
		Covered by annual budget	Village Board	Ongoing	High	CI Berlin	
		Covered by annual budget	Village Clerk	Ongoing	High	VI Hancock	Mass notification system is promoted via a letter sent in tax bills and the Village website.
		Covered by annual budget	Village Board	Ongoing	High	VI Plainfield	Mass notification system is promoted via a letter sent in water and sewer bills; and a newsletter.
		Covered by annual budget	Village Board	Ongoing	High	VI Redgranite	Mass notification system is promoted via digital informational flyer and in water bills. The Village will also post a flyer on the main board in Village hall.
		Covered by annual budget	Village Board	Ongoing	High	VI Lohrville	Mass notification system is promoted via a letter sent in tax bills.
		Covered by annual budget	Town Board	Ongoing	High	TN Leon	Currently have 3 sirens but have talked about terminating the maintenance agreements as it is getting expensive. Agreeable to the county's programs for using the Mass notification system and the weather radios.
	The County should continue to add and update information on the Sheriff's Department website regarding Emergency Management	Covered by department	Emergency Management Department, IT	Ongoing	High	Waushara County and all communities within	EM has created a stand-alone website to share EM-related information. EM will ensure that information is current. Municipalities

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Information. The web site should contain information describing the types of natural and manmade hazardous disasters in the County and how to respond when a hazard threatens. The site should also contain information on ordinances pertaining to hazards and links to such sites as burning and weather conditions.	annual budget	Department, Municipal officials				will be linking to the county EM website and sharing/reposting information; and EM sending a message to all municipalities to link to the new EM site.
		Covered by annual budget	Village Board	Ongoing	High	VI Redgranite	Will talk with the Board to see if they will approve.
		Covered by annual budget	City Council	Ongoing	High	CI Wautoma	Will promote EM-related information via website and social media.
	Develop a Plan Implementation Steering Committee to monitor progress on mitigation strategies (including a mix of County staff, civic group members, local business owners, and citizens).	Covered by department annual budget	Emergency Management Department	2020-2025	Medium	Waushara County and all communities within	EM director will use the final appendix of this revised plan to collect that information for action (should opportunities arise) or for inclusion in the next plan update.
	Promote Siren Program	Unknown at this time	Emergency Management Department & Municipal officials	Ongoing	Medium	Waushara County and all communities within	Municipalities are responsible for the upkeep and replacement of sirens. This is expensive and some have decided to remove sirens for this reason. Sirens are also effective only when people are outside or near enough to hear them. Instead, the county purchased and has handed out weather radios to people who have the need or are not served by the use of cellular phones. Advancements in technology provide a higher cost/benefit ratio.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							Municipalities may be moving away from the use of sirens and that other options for warning are available to county residents.
	Incorporate recommendations of the All-Hazards Mitigation Plan into the County Comprehensive plan.	Unknown at this time	Emergency Management Department. Land Conservation and Zoning Department, UW-Ext.; Municipal officials	Ongoing	High	Waushara County and all communities within	The county and municipalities will review their individual Comprehensive Plans and adding a cross-reference if not already included.
		Covered by annual budget	City Council	2020-2025	High	CI Wautoma	Their Comprehensive Plan is in need of updating and they will ensure there is a cross-reference to this mitigation plan.
	Coordinate with County business owner groups to help encourage business continuity planning.	Covered by department annual budget	Emergency Management Department	2020-2025	Medium	Waushara County and all communities within	This strategy will be carried forward with at least one Do-1-Thing event occurring over the 5-year span of this plan with at least one target group. EM will lead the effort with municipalities amplifying the county's information (i.e., posting at town halls, reposting/sharing on social media, reading announcements at Board meetings, promoting weather radios, etc.). Upon request, EM will provide the articles that were done in 2019 to

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							the municipalities to share with their residents; and any future information beneficial to individuals and businesses.
		Covered by annual budget	City Officials	Ongoing	Medium	CI Wautoma	They try to use social media to disseminate information as the newspaper only comes out once per week. They also utilize their website and link to the county website.
	Analyze County and municipal fire and police stations to make sure they are hazard resistant.	Covered by department annual budget	Emergency Management Department	Ongoing	Medium	Waushara County and all communities within	As needs come up in the future, EM will be available to make recommendations for mitigating and making more resistant.
	Continue providing community disaster education presentations to citizens, public agencies, private property owners, businesses, and schools during the Spring Severe Weather Week, the Fall/Winter Weather Awareness campaign and during Fire Awareness campaigns. Share electronically as well as doing interviews and presentations.	Covered by department annual budget	Emergency Management Department. LEPC, WIN groups, Chamber of Commerce, Municipal agencies and officials	Ongoing	Medium	Waushara County and all communities within	This is done annually in April in conjunction with spring's Severe Weather Week; and during November's Winter Weather Awareness Week through social media and other outreach opportunities. Most municipal fire departments provide education during Fire Awareness month in the Fall.
	Ongoing maintenance and updating of disaster plans and property values as needed.	Covered by department annual budget	Emergency Management Department, participating jurisdictions and towns	Ongoing	Low-Medium	Waushara County and all communities within	New damage assessment plan has been developed previously. Local leaders have been invited for damage assessment and planning training. Zoning and Land Conservation are leading damage assessment in the county in a more formal way. Current plans have

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
							been validated as useful, as they were used after a previous tornado.
	Continue to mobilize weather spotters.	Covered by department annual budget	Emergency Management Department	Ongoing	Low	Waushara County and all communities within	EM monitors the weather, calls out spotters and coordinates the training, which occurs every other year. EM is purchasing some equipment (vehicle-mounted wind meters). EM will offer regular training and evaluating other opportunities to support with training and equipment as needed.
	Continually update County-wide maps (aerial photos, parcels, building footprints, critical facility locations, etc.).	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning Department, GIS staff	Ongoing	Low	Waushara County and all communities within	GIS uses LIDAR and ortho photo data, maps, etc. as updated and available.
	Enforce shoreline, wetland, steep slope, setbacks.	Covered by department annual budget	Land Conservation Department, WDNR	Ongoing	Medium	Waushara County and all communities within	Will complete as needed.
	Install/Maintain quick-connect emergency generator hook-ups for critical facilities.	As budget allows	Emergency Management Department	Ongoing	Low	Waushara County and all communities within	Use funding to purchase a new generator that will also power the kitchen if there is a delay in Red Cross response. All other facilities that need to have back-up generators have them.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	Coordinate with local businesses to develop mutual-aid agreements (use of heavy equipment, generators, pumps, etc.).	Covered by department annual budget	Emergency Management Department, Chamber of Commerce, WIN groups, local civic groups	2020-2025	Low	Waushara County and all communities within	EM will continue with these actions and explore other options for mutual aid agreements, particularly public works-type equipment.
	Continue funding for Volunteer Fire Department and continuation of mobilizing weather spotters.	Continued Fire Department budgeting	Village Board Town Board	Ongoing	High	VI Coloma	Will continue to fund the fire department for their weather spotters.
	Continued funding of Volunteer Fire Department upgrades of equipment.	To be determined	Fire Dept. & Village Staff	Ongoing	High	VI Plainfield	The FD is funded through the Village – they continue to update equipment as needed.
	Work with the County on all hazards plan updates.	Covered by annual budget	Village Board	Ongoing	Low	VI Wild Rose	EM and Village President are working on this and making progress.
	Keep an updated list and coordinate with mutual aid groups and private contractors in area	Covered by annual budget	Village Police Dept.	Ongoing	High	VI Redgranite	Police Dept. will update the list they have.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
Drought and Dust Storms	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	Waushara Co. and all municipalities within	The county and its municipalities should be prepared to provide information to farmers and citizens (e.g., crop irrigation, crop insurance) during times of drought.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
Flooding and Dam Failure	LIDAR flyover was completed in 2020. The flights are coordinated between FEMA and WDNR, not done by the county or municipalities. Various developers will update their flood maps from time to time after studies have been done.	FEMA Grant	Land Conservation and Zoning Department	Ongoing	Low	Waushara Co. and all municipalities within	These maps should be adequate over the lifespan of this plan but if additional maps are needed, it will be done as budget allows.
	Encourage every Jurisdiction to participate in the NFIP.	Covered by department annual budget	Emergency Management	Ongoing	High	Waushara Co. and all municipalities within	Initial and/or continued participation in the NFIP will be encouraged. EM will put together brochures and provide to local jurisdictions.
	*Distribute National Flood Insurance Program information	Covered by department annual budget	EM, Planning/ Zoning, GIS	Ongoing	High	Waushara Co. 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
	Provide information and offer education to make people aware of natural floodplain resources and functions and how they can protect them.	Covered by department annual budget	EM	Ongoing	Low	Waushara Co. and all municipalities within	
	Perform cost analysis of removing homes within the floodplain and floodway. Consider the range of flood mitigation measures (e.g., buy-outs, flood-proofing, elevations).	FEMA Grant, Detailed Benefit/Cost Analysis at time of project development	Emergency Management Department	Ongoing / As needed to support those that request assistance	Low	Waushara Co. and all municipalities within	
	Encourage the use of Low-Impact Development techniques.	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	Low	Waushara Co. and all municipalities within	Information regarding low-impact development techniques is available at the Planning and Zoning office and will continue to be available.
	Encourage a zero discharge policy for stormwater insubdivision design.	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	Low	Waushara Co. and all municipalities within	Information regarding reducing the impact of stormwater is available at the Planning and Zoning office and will continue to be available. The WDNR controls properties over 1 acre. The County does not employ an Engineer so the county will support the WDNR as requested.
	Encourage Townships to adopt a stormwater drainage system (open ditch and culverts) maintenance program such as sediment and debris clearance as well as detection and prevention of discharges into stormwater and sewer systems from	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	Low	Waushara Co. and all municipalities within	The county works with the municipalities on stormwater management issues and will continue to support their development over the next planning period.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	home footing drains, downspouts, or sewer pumps.						
	Encourage the use of check valves, sump pumps, and backflow prevention devices in homes and buildings.	Covered by department annual budget	Land Conservation and Zoning	Ongoing	Low	Waushara Co. and all municipalities within	Information regarding the installation of flood management devices/systems within homes is available at the Planning and Zoning office and will continue to be available.
	Gather status information on all dams in the county and evaluate the downstream threat in areas prone to flooding events.	Costs of project would vary by dam	Emergency Management Department, WDNR, Dam owners	Ongoing	Low	Waushara Co. and all municipalities within	The county EM office maintains information on high-hazard dams, as provided by the WDNR. Dam emergency plans are provided to the EM office for those dams required to produce them. The EM office will also participate in dam exercises as invited.
	Evaluate municipal stormwater management plans.	Covered by department annual budget	Land Conservation and Zoning Department	Ongoing	Low	Waushara Co. and all municipalities within	
		\$10K per year	Village Board	Ongoing	Low	VI Redgranite	Updating stormwater management plan (3 to 5 sections per year). Some done in-house and some by consultants.
	Identify those culverts and bridges that are undersized or are otherwise unable to handle expected flood flows; and prioritize road	Village Volunteers	Village Board	Ongoing	Medium	VI Lohrville	Trim and cut trees to avoid potential road blockage. Continually trim back and cut down trees away from the roadway as needed.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
	improvements for public roadways that are susceptible to flooding.	Village Volunteers	Village Board	Ongoing	Low	VI Lohrville	Monitor drainage ditches for blockage and flow. They have installed new ditches on some problem areas. Some areas have resolved themselves.
		\$30K (.25/mile)	Town Board	2024	Medium	TN Richford	Czech Rd. by greenhouse – raise 2 feet. Frequent flooding; closed 2 months in 2020 and caused hardship.
		\$20K	Town Board	2025	Medium	TN Richford	Cty Rd JJ, Intersection of Cty Rd B - Culvert and fill. Frequent flooding of cemetery.
		\$5K	Town Board	2025	High	TN Richford	Culvert at Cty Rd B Intersection of Cumberland Rd. Homeowner suffering frequent flooding and loss due to damaged culvert from Cty Rd B work.
		\$6K	Town Board	2025	Medium	TN Mount Morris	Beechnut Ave W of 22 nd Ave - Install culvert. Floods every spring and after heavy rain.
		\$6K	Town Board	2025	Medium	TN Mount Morris	22 nd Ave N of Beechnut Ave - Install culvert. Floods every spring and after heavy rain.
		\$3K	Town Board	2025	Low	TN Mount Morris	Bighorn Ave W of G - Clean and repair culvert. Floods in high water.

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Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
		\$6K	Town Board	2025	High	TN Mount Morris	Bighorn Ln at 20th Dr - Install culvert. Floods both roads.
		\$25K	Town Board	2025	High	TN Mount Morris	Beechnut Ave at 24 th Ave - Raise road 4 feet. Floods.
		\$3K	Town Board	2025	Low	TN Mount Morris	Chicago Ave E of 20 th Dr - Clean culvert. Floods yards.
		\$10K	Town Board	2025	Low	TN Mount Morris	Dye Rd at Badger Ln - Install larger culvert. Lake floods in high water.
	Develop a plan to replace old water mains near Downtown Wautoma (Waupaca St.) supplying fire protection.	CDBG, Rural Development and General Fund	MSA Engineering/City Council	Ongoing	Medium-High	CI Wautoma	Applying for a CDGB grant to completely reconstruct both the road and the infrastructure underneath Waupaca Street that they believe they are going to get. That project will happen at the end of 2022, potentially going into 2023. They did a lot of improvements on Mount Morris 3 years ago. When the city ran their water utilities down there, there was a full replacement of several roads downtown. Project is dependent on grant funding - \$1M grant. If they do not get the grant, it will be up to the Council to consider borrowing the additional money or consider doing the part of Waupaca that has not been touched. Will be carried forward and changed to a medium-high priority. Move to All Hazards.

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
Fires	Promote public awareness on fire protection and fire safety; and coordinate with local fire departments to establish proper evacuation procedures and provide.	Covered by department annual budget	WDNR, Emergency Management Department, Local Fire Departments	Ongoing	Medium	Waushara Co. and all municipalities within	Fire departments routinely participate in outreach activities as needed and as they are available.
	Map wildfire hazard areas to facilitate analysis and planning decisions through comparison with zoning, development and infrastructure, etc.	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning Department	Ongoing	Low	Waushara Co. and all municipalities within	Updates are done by WDNR and maps are used for comprehensive planning purposes.
	Coordinate with utility companies to create defensible zones around power lines, oil and gas lines, and other infrastructures.	Covered by department annual budget	Emergency Management Department, utility companies	Ongoing	Low	Waushara Co. and all municipalities within	The county and its municipalities support the reduction of fuel loads by infrastructure owners around their property by making access available in rights-of-way and on public roadways for maintenance.
	Coordinate with the WDNR to manage public lands to reduce fuel loads (prescribed burning, clearing dead vegetation, selective logging, etc.).	Covered by department annual budget	Emergency Management Department, WDNR	Ongoing	Low	Waushara Co. and all municipalities within	The county's fire departments work with the WDNR as requested to support prescribed burns.
	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	Waushara Co. 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
Severe Temperatures	Promote public awareness and personal preparedness.	Covered by department annual budget	Emergency Management Department	Ongoing	Medium	Waushara Co. and all municipalities within	
	Utilize the mass notification system to assist local utilities to inform homeowners to let faucets drip during extreme cold weather.	Covered by department annual budget	Local water utilities, Emergency Management Department, County Health and Human Services	Ongoing	Medium	Waushara Co. 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
Storms: Hail	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	Waushara Co. 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.

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
Storms: Lightning	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	Waushara Co. 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.

Summary of Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
Storms: Thunderstorms	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	Waushara Co. 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.

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
Storms: Tornadoes and High Winds	Promote the use of County-wide mass notification participation and expand early warning system to a greater percentage of the County.	Covered by department annual budget; \$12K annual contract for the mass notification system	Emergency Management Department	Ongoing	High	Waushara County and all communities within	Residents can sign up and get alerts through the county Sheriff's Office. There are currently 14K phone numbers registered, which is about 60% of the county's population. If registering online, alerts will only come from Waushara County. If downloading the app, alerts will come from any county that a person is traveling through. Information and a download link are on the county's website and is promoted at least once a year, primarily prior to the Spring storm season. It can be used for more than just weather alerts; and has been used to provide pandemic-related information.
		Covered by annual budget	Town board	Ongoing	High	TN Leon	Focusing on moving away from sirens and moving to mass notification system for communicating/warning.
	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	Waushara Co. 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.

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
	Evaluate the need for constructing tornado shelters to serve vulnerable residents and construct facilities where needed, including campgrounds and mobile home parks.	Covered by department annual budget, FEMA grant, CDBG	Emergency Management Department & Municipal officials, UW-Extension, Zoning	2023 and Ongoing	High	Waushara County and all communities within	EM will continue to work with municipalities and other departments to see if there is interest and look at applying for grant funding for those locations that express an interest.
		Covered by annual budget	City Council	2023 and Ongoing	High	CI Wautoma	Will continue to discuss and research options for a shelter at the fairgrounds to accommodate people at the location, as well as campgrounds and mobile home parks within a 10-mile radius.
		Covered by annual budget	Village Board	Ongoing	High	VI Redgranite	Will monitor progress of potential shelter(s) at Red Granite Mobile Home Park. Inform public of shelters and schools in area and the evacuation routes, including use of social media. The Village finished building a new Village Hall which will be used of ran emergency shelter. Also will be installing a generator shortly.
		Covered by annual budget	Town Board	2023 and Ongoing	High	TN Springwater	Will monitor progress of potential shelters identified at Wilson Lake Campground and Rose's Campground.

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
	Inform residents and campers from the Village Campground of the shelter location at the Hancock Community Center and create an evacuation route.	Website / Posters at Campground	Village Board	Ongoing	Low	VI Hancock	
	Apply for funding to build Community Safe Rooms. Require new construction of safe rooms in new schools, daycares, and nursing homes, and public facilities. Ensure that school officials are aware of the best area of refuge in school buildings and participate in annual Sever Weather Awareness week activities.	WI Emergency Management	Emergency Management Department, WEM, local campground and mobile home park owners, Land Conservation and Zoning	Ongoing	Low	Waushara County and all communities within	Have sought opportunities to create safe rooms, especially in areas with high-hazard concerns such as schools, campgrounds and mobile home parks. WI DPI requires schools to plan and train through drills, the school community on where their safe rooms are and EM provides information and support to them upon request. EM works with students during Severe Weather Awareness week in Spring. Schools all have tornado plans.
	Update and/or replace emergency sirens and early warning systems as needed.	Safety Department funding in budget and siren program	Safety Department, Village Board	Ongoing	High	VI Coloma	If the siren goes down and cannot be repaired, it will not be replaced. Encouraging residents to use the mass notification system. Will remain a strategy until siren is no longer in the Village

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
		Covered by annual budget	Town Board	Ongoing	High	TN PoySippi	Have one active siren, maintaining and upgrading as needed. Located next to fire station. Firm believer in the mass notification system.
		Covered by annual budget	Village & County staff	Ongoing	High	VI Redgranite	The siren is currently out of service. No plans in the near future to repair.

Summary of Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
Storms: Winter	Produce and distribute emergency preparedness information related to thunderstorms, snow storms, hailstorms, lightning, and windstorm hazard.	Covered by annual budget	EM, ARC, municipalities	Ongoing	Medium	Waushara Co. 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. Will also enhance communication with local power companies.
	Coordinate with local fire departments to develop a smoke and carbon monoxide detector purchasing program.	Covered by department annual budget	Emergency Management Department and American Red Cross	Ongoing	Medium	Waushara Co. and all municipalities within	EM gathers information for those interested in dual smoke/carbon monoxide detectors and provides that information to the American Red Cross; Red Cross then goes into the homes and installs the detectors. Outreach is provided during the county fair at the EM booth, where

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
							residents can sign up for the program.
	Encourage existing homeowners and require new construction for all dwellings that are heated by fuel-burning equipment to install carbon monoxide monitors and alarms.	Covered by department annual budget	Emergency Management Department, Land Conservation and Zoning Department	Ongoing	Low	Waushara Co. and all municipalities within	This is regularly done in the annual (November) public information campaigns associated with Winter Preparedness.

Summary of Mitigation Strategies							
Hazard Type	Mitigation Measures	Costs of Project	Responsible Management	Project Timetable	Project Priority	Community(ies) Benefitting	Comments
Utility Failure	Power sewer system in time of electric outages. Main liftstation wired for backup generator.	Local financial institution bonding	Sewer Utility Village Board	Ongoing	High	VI Coloma	This will be evaluated for completion in the upcoming plan cycle.
	Backup generator and power sewer system for electrical outages-evaluate back-up options for the sanitary sewer system and implementation of recommendations.	Rural Development Funds	Public Works	2026	Medium-High	CI of Wautoma	Have been using money from the American Rescue Plan Act that would qualify to replace things at the lift stations and work has been done. This was not completed during the previous plan cycle due to lack of funding.
	Maintain and check portable generator for the municipal sanitary system	Unknown	Sanitary System Staff	Ongoing	High	TN PoySippi	

Appendix E: Summary of Mitigation Strategies

* Designates an element that supports the NFIP

Appendix F: HAZUS Vulnerability Assessment

Waushara County, Wisconsin

Flood Risk Assessment



Executive Summary

Disasters impacting the State of Wisconsin have increased over recent years with multiple presidential disaster declarations being issued. Several of these disasters involved flooding and its impacts. 2018 was the second wettest year for the State of Wisconsin and is a part of a trend that has shown record precipitation over the past 5 years and is the wettest 5 years on record for the State (2017 (9th wettest), 2016 (3rd wettest), 2015 (22nd wettest), 2014 (10th wettest). As a result, communities must consider mitigation actions that can build community resilience for future flood risks. To identify the most effective mitigation actions, local and State groups must first understand what is vulnerable and at risk. To achieve this, Wisconsin's Division of Emergency Management (WDEM) elected to conduct an analysis of the flood related risks and vulnerabilities to communities throughout Wisconsin.

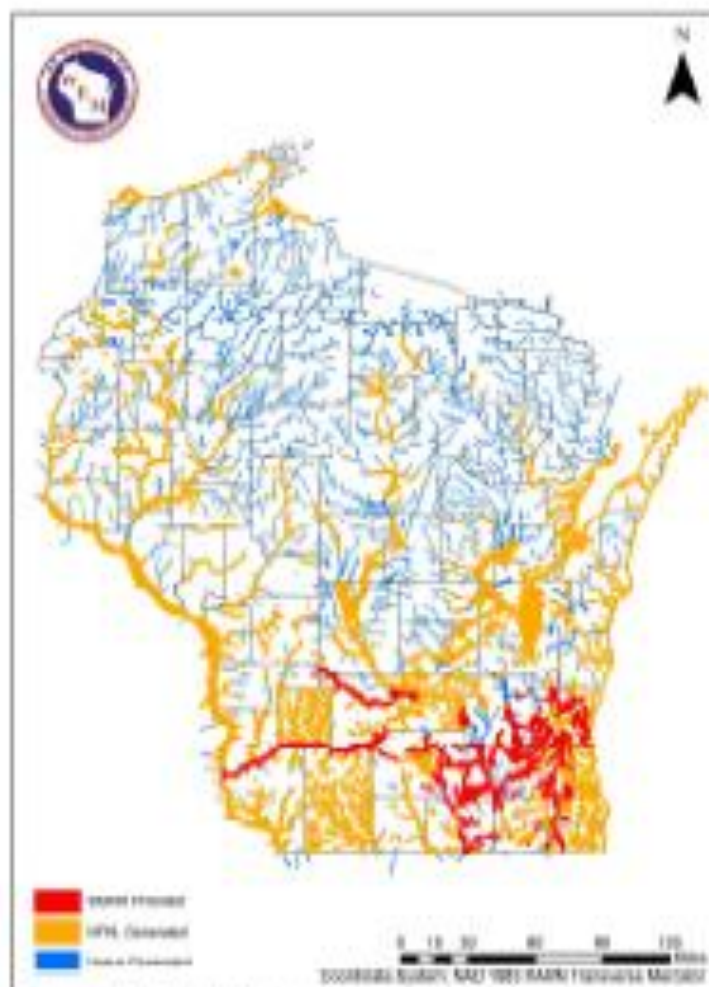
This project was completed by the Space Science and Engineering Center at the University of Wisconsin (SSEC) in collaboration with The Polis Center at IUPUI. The project team leveraged Hazus-MH Release 4.2.3, a powerful flood damage and loss modeling software developed by the Federal Emergency Management Agency (FEMA). They also leveraged existing geospatial flood hazard datasets that have been developed throughout the State.

Flood Hazard Data

For each county in the study, the team either developed new data or leveraged existing flood depth grid geospatial data representing the extent and depth of water for the 1% annual chance flood. Where possible, the team leveraged flood depth grids created by the Wisconsin Department of Natural Resources or generated by the University of Wisconsin from digital flood insurance rate map products. Where these data were unavailable, the team generated new 1% annual chance flood depth grids using FEMA's Hazus-MH version 4.2.3.

Waushara County's 1% annual chance flood hazard data in this study included datasets from the Wisconsin Department of Natural Resources and FEMA's National Flood Hazard Layer.

Figure 1 shows the distribution of 1% annual chance flood hazard data source providers across the State of Wisconsin.



Sources: FEMA, 2007; FEMA Map Service Center, 2007; Wisconsin Emergency Management, 2007; Wisconsin Department of Natural Resources (DNR)

Figure 1: Sources for the 1% annual chance flood.

Loss Estimates

The following information summarizes the modeled impacts of the 1% annual return period flood.

Building Damage, Content, and Inventory Losses

Estimated counts of damaged buildings, building losses, building content losses, and building inventory losses are reported for Waushara County in Table 1 and for the State of Wisconsin in Table 2.

Waushara County				
Occupancy	Number of Damaged Buildings	Building Loss (\$)	Content Loss (\$)	Inventory Loss (\$)
Residential	38	\$2,814,000	\$1,176,000	0
Commercial	0	\$187,000	\$740,000	\$12,000
Industrial	0	\$80,000	\$164,000	\$30,000
Agricultural	0	\$98,000	\$156,000	\$60,000
Education	0	\$26,000	\$171,000	0
Government	0	\$65,000	\$124,000	0
Religion	0	\$14,000	\$158,000	0
Total	38	\$3,289,000	\$2,889,000	\$94,000

Table 1: Potential building, content, and inventory damages for Waushara County resulting from a 1% annual chance flood.

State of Wisconsin				
Occupancy	Number of Damaged Buildings	Building Loss (\$)	Content Loss (\$)	Inventory Loss (\$)
Residential	14,740	\$1,974,371,000	\$678,198,000	0
Commercial	174	\$407,406,000	\$1,215,884,000	\$29,606,000
Industrial	74	\$246,242,000	\$620,732,000	\$100,396,000
Agricultural	2	\$21,618,000	\$62,166,000	\$7,216,000
Education	4	\$18,473,000	\$111,599,000	0
Government	10	\$17,060,000	\$70,842,000	0
Religion	1	\$21,679,000	\$149,489,000	0
Total	15,005	\$2,792,848,000	\$3,228,009,000	\$137,218,000

Table 2: Potential building, content and inventory damages for the State of Wisconsin resulting from a 1% annual chance flood.

Loss estimates were calculated using the aggregated building inventory provided with Hazus-MH 4.2.3. This inventory is reported by Hazus-MH provided 2010 census blocks that have been modified to remove unpopulated areas such as vacant land, forests, and lakes. Hazus-MH assumes buildings are evenly distributed across each census block. For example, if 10% of a census block area is covered by floodwaters, it is assumed that 10% of the inventory in the census block is within the flooded area.

Economic losses consider the cost of materials and labor required to rebuild. Additionally, the Hazus-MH inventory reflects variations in foundation types, first floor elevations and other factors that may mitigate potential flood damages.

Figure 2 illustrates the modeled distribution of total potential building losses that may result from the 1% annual chance flood. Losses represented in Figure 2 are restricted to building losses and do not consider the costs of contents or inventory.

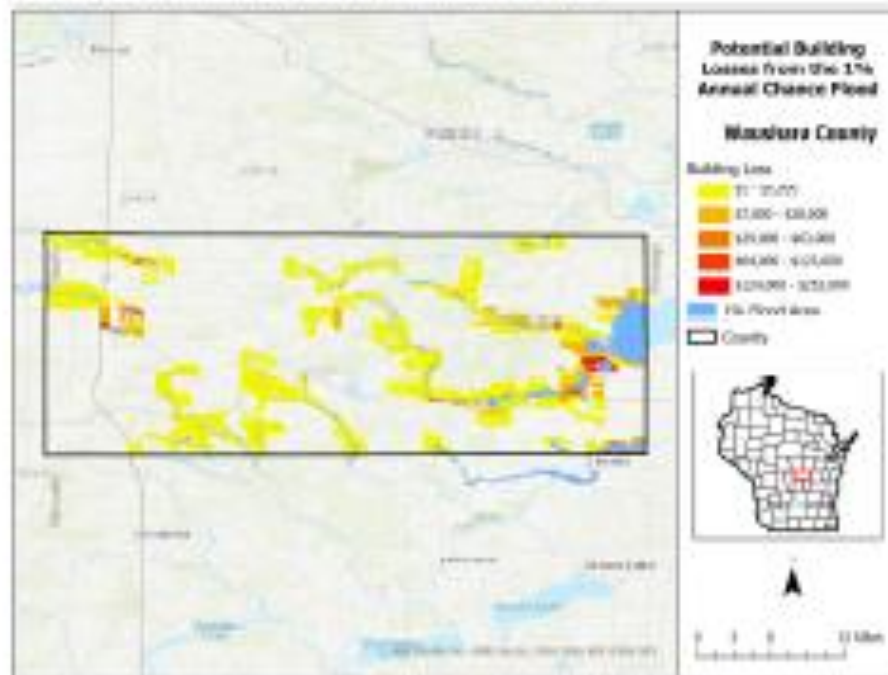


Figure 2: Potential building losses in Waukegan County resulting from the 1% annual chance flood.

Displaced Population

A total of 124,777 persons are at risk of being displaced from a 1% annual chance flood in the State of Wisconsin. In Waukegan County, 380 people are expected to be displaced in from the 1% flood. This estimate was derived from the same modified census block inventory used to estimate building damages. Population is assumed to be evenly distributed across each census block.

Essential Facilities

Essential facilities in Hazus-MH 4.2.3 are defined as fire stations, police stations, care facilities such as hospitals and clinics, K-12 schools and universities and emergency operation centers. This study evaluated essential facilities expected to sustain slight, moderate, or severe damage. For purposes of this study, facilities with less than 10% damage to the building were considered slightly damaged, facilities with over 10% but less than 50% damage to the building were considered moderately damaged and facilities with over 50% damage to the building were

considered severely damaged. Damages to building contents and inventory were not considered as part of this study.

There are no essential facilities expected to sustain damage from a 1% annual return period flood in Waushara County.

Table 3 reports the distribution of the 60 essential facilities that might receive slight or moderate damage resulting from a 1% annual chance flood in the State of Wisconsin. No essential facilities in Wisconsin were found to be susceptible to severe building damage from the 1% annual chance flood.

State of Wisconsin		
Facility Type	Total facilities at least slightly damaged	Total facilities at least moderately damaged
Fire Stations	14	0
Police Stations	3	6
Care Facilities	0	1
Schools	20	1
Emergency Operation Centers	0	1

Table 3: Potential essential facility damage in the State of Wisconsin resulting from the 1% annual chance flood.

Appendix G: Community Input

Waushara 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
2/3/21	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.
2/24/21	Press release given to all media in Waushara County. The releases invited public participation in the planning process but none participated.
Feb. – Mar. 2021	Waushara Co. PDM informational brochure (attached) was distributed throughout the community at public locations. The brochure was distributed at the community libraries and municipal buildings.
3/5/21	First workgroup meeting to review/rank the vulnerabilities, review the planning process, the previous plan and to discuss the plan update, including new hazard strategies.
2/21/22	Second workgroup meeting to review/rank the vulnerabilities, review the planning process, the previous plan and to discuss the plan update, including new hazard strategies.
4/5/23	Plan sent to the county emergency management directors from contiguous counties requesting review, comments and edits.
2/7/24	Request a review, input, and comments for the draft plan from the business community, through the Chamber of Commerce organization.
2/7/24	Request a review, input, and comments for the draft plan from the school districts in Waushara County (i.e., Wautoma and Wild Rose.)

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

Some of our outreach efforts were hampered during this planning process due to the COVID-19 restrictions on meetings. These restrictions forced the meetings online and impacted some of the attendance by participants and whole community partners.

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 sent to municipalities with survey 1/21/21

**WAUSHARA COUNTY
EMERGENCY MANAGEMENT**

Norman Duesterhoeft, Director
e-mail: norman.duesterhoeft@co.waushara.wi.us

P.O. Box 300
209 South Saint Marie Street
Wautoma, WI 54982-0300

Phone: (920) 787-0468
Fax: (920) 787-0425

Date: 21 January 2021
To: Town, Village or City Leader
County Department Manager
From: Norman Duesterhoeft, EM Director
Re: Hazard Mitigation Plan Update

Waushara 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, \$2 to \$3 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 Waushara County to manage its vulnerability to disaster Waushara 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 28, 2021**.

After receiving your surveys, the information will be incorporated into the draft plan, which is being guided by a workgroup of interested agencies and public members. I would like to extend an offer for anyone from your leadership council, your municipal staff or your general community to contact me if they would like to join the workgroup.

Finally, after the workgroup has a final draft, we will be sending copies of the plan to each of you for final review and adoption. It is important to note two things:

- Adoption of this plan will not cost your community anything. You will not be committing to completing any of the projects listed; instead it is a list of triaged ideas that can be accomplished should the funding and 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) 787-0468 or by email at Norman.Duesterhoeft@co.waushara.wi.us

Norman Duesterhoeft

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WAUSHARA 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
Drought		TN Deerfield		CI Wautoma TN Oasis	TN Bloomfield TN Leon TN Poy Sippi TN Saxeville
Dust Storm	TN Oasis	TN Deerfield TN Oasis	TN Oasis	TN Oasis	TN Bloomfield TN Leon TN Poy Sippi TN Saxeville
Earthquake					TN Bloomfield TN Deerfield TN Leon TN Oasis TN Poy Sippi TN Saxeville
Flood	VI Plainfield	CI Wautoma TN Aurora TN Leon TN Saxeville	TN Deerfield		TN Bloomfield TN Oasis TN Poy Sippi
Lakeshore Erosion	TN Deerfield	TN Hancock TN Leon TN Oasis TN Saxeville TN Springwater			TN Bloomfield TN Poy Sippi
Landslide/ Debris Flow					TN Bloomfield TN Deerfield TN Leon TN Oasis TN Poy Sippi TN Saxeville
Wildfire		TN Saxeville		TN Deerfield	TN Bloomfield TN Leon TN Oasis TN Poy Sippi
Windstorm/ Tornado	VI Coloma TN Oasis	CI Wautoma VI Wild Rose TN Leon TN Mount Morris TN Oasis TN Saxeville TN Springwater	VI Plainfield TN Bloomfield TN Deerfield TN Oasis TN Poy Sippi TN Saxeville	VI Redgranite TN Oasis	
Severe Winter Storm	TN Oasis	CI Wautoma VI Redgranite TN Aurora TN Leon TN Oasis TN Poy Sippi TN Rose TN Saxeville	VI Plainfield TN Deerfield TN Oasis TN Saxeville	TN Oasis TN Saxeville	TN Bloomfield

2. For which of the following natural disasters do you think your community is at risk? (Check the appropriate box for each hazard.)

Event	Extremely Concerned	Very Concerned	Concerned	Somewhat Concerned	Not Concerned
Drought			CI Wautoma TN Deerfield TN Mount Morris	VI Plainfield TN Aurora TN Bloomfield	VI Lohrville VI Wild Rose TN Hancock TN Leon TN Oasis TN Poy Sippi TN Saxeville
Dust Storm				TN Aurora TN Deerfield TN Hancock	CI Wautoma VI Lohrville VI Plainfield VI Wild Rose TN Bloomfield TN Leon TN Mount Morris TN Oasis TN Poy Sippi TN Saxeville
Earthquake					CI Wautoma VI Lohrville VI Plainfield VI Wild Rose TN Aurora TN Bloomfield TN Deerfield TN Hancock TN Leon TN Mount Morris TN Oasis TN Poy Sippi TN Saxeville
Flood	CI Berlin	VI Plainfield TN Aurora	CI Wautoma VI Wild Rose TN Hancock TN Leon TN Mount Morris	VI Lohrville VI Redgranite TN Deerfield TN Saxeville	TN Bloomfield TN Oasis TN Poy Sippi
Erosion		TN Deerfield TN Hancock	TN Leon TN Mount Morris TN Springwater	VI Lohrville VI Wild Rose TN Aurora	CI Wautoma VI Plainfield TN Bloomfield TN Oasis TN Poy Sippi TN Saxeville
Landslide/ Debris Flow				VI Lohrville TN Deerfield	CI Wautoma VI Plainfield TN Aurora TN Bloomfield TN Hancock TN Leon TN Mount Morris TN Oasis TN Poy Sippi TN Saxeville

Wildfire		TN Deerfield TN Hancock	VI Lohrville VI Plainfield VI Wild Rose TN Mount Morris TN Poy Sippi TN Saxeville	TN Leon	CI Wautoma TN Aurora TN Bloomfield TN Oasis
Windstorm/ Tornado	CI Berlin VI Coloma VI Plainfield VI Wild Rose	CI Wautoma TN Deerfield TN Hancock TN Leon TN Mount Morris TN Saxeville	VI Lohrville VI Redgranite TN Aurora TN Oasis TN Poy Sippi	TN Bloomfield TN Marion	
Severe Winter Storm/ Ice Storm	CI Berlin VI Wild Rose	CI Wautoma VI Plainfield VI Redgranite TN Hancock TN Mount Morris TN Saxeville	VI Coloma VI Lohrville TN Deerfield TN Leon TN Oasis TN Poy Sippi	TN Aurora TN Bloomfield	

3. Has your community had damage to facilities or infrastructure? If yes, please describe the damage.

(e.g., roads, public buildings, utilities)

- CI Wautoma: Wind storm – damage to city structures (roof, signage); flooding – Highways 21 and 73 flood during heavy rain.
- VI Plainfield: Water main breaks due to frost in the ground breaking the pipes.
- TN Bloomfield: Nearly had bridge wash out.
- TN Deerfield: Road washed out.
- TN Hancock: Minor roadside erosion.
- TN Leon: Some flooding of portions of roadway; trees uprooted or blown down onto roadway.
- TN Marion: Yes, we have had damage to power lines and trees, causing power outages in our township.
- TN Oasis: Utilities.
- TN Saxeville: Road washout at 30th Road/31st Avenue; culvert washouts at 30th Road; downed power lines; flooding at Archer Avenue; clay boil at 29th Drive; all town bridges on 29th Drive, Pine Hill Road and Akron Court.
- TN Springwater: Had to install a pipe under the road to alleviate the high water on Gilbert Lake.

4. What facilities or infrastructure in your community do you think are especially vulnerable to damage during a natural disaster?

- CI Wautoma: Specifically, flooding on Highways 21 and 73 would cause this area to be vulnerable.
- VI Coloma: Water tower, well houses, lift station, fire department.
- VI Lohrville: Power lines.
- VI Plainfield: I think all of the facilities in our community are secure but I think water and sewer in a community are the most important to protect.
- VI Plainfield: Water tower, well pumps, lift stations, sewer treatment plan, fire department building, maintenance building.

Appendix G: Community Input

- VI Redgranite: Sewer, water, loss of power, tree damage, Public Works building.
- VI Wild Rose: The aging facilities in the Village would be at a higher risk than the newer facilities. For example, the Red Mill, the Hotel Bar and the Mercantile buildings.
- TN Deerfield: Roads, power.
- TN Leon: Roadways; possible damage to town hall as it is an old schoolhouse.
- TN Marion: Trailer homes, power lines and trees are especially vulnerable during a natural disaster.
- TN Mount Morris: The structures in our town include Mountain View Community Center, town garage and park pavilion.
- TN Oasis: Utilities.
- TN Saxeville: Town hall; all town bridges on 29th Drive, Pine Hill Road and Akron Court.
- TN Springwater: The lakes bring in a lot of tourism to the Town of Springwater, so the lake levels due to excessive rain or lack of rain (drought) affect the shoreline. We have had to implement slow/no wake restrictions to protect shorelines.

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
Protecting private property	CI Berlin VI Lohrville VI Redgranite TN Hancock	CI Wautoma VI Coloma VI Plainfield TN Aurora TN Deerfield TN Saxeville	VI Wild Rose TN Bloomfield TN Leon TN Mount Morris TN Poy Sippi TN Springwater		TN Oasis
Protecting critical facilities (hospitals, fire stations, etc.)	CI Berlin CI Wautoma VI Coloma VI Lohrville VI Plainfield VI Redgranite VI Wild Rose TN Aurora TN Deerfield TN Hancock TN Leon TN Rose TN Saxeville	TN Springwater	TN Bloomfield TN Mount Morris TN Poy Sippi		TN Oasis
Preventing development in hazard areas	CI Berlin VI Plainfield VI Wild Rose TN Hancock	VI Coloma VI Lohrville TN Aurora TN Leon TN Springwater	CI Wautoma VI Redgranite TN Bloomfield TN Deerfield TN Mount Morris TN Poy Sippi		TN Oasis TN Saxeville
Enhancing the function of natural features (streams, wetlands)	CI Berlin TN Aurora	CI Wautoma VI Coloma VI Lohrville VI Plainfield VI Wild Rose TN Deerfield TN Hancock TN Leon TN Saxeville TN Springwater	TN Bloomfield TN Mount Morris TN Poy Sippi	VI Redgranite	TN Oasis

Protecting historical and cultural landmarks	CI Berlin VI Lohrville	CI Wautoma VI Coloma VI Wild Rose TN Deerfield TN Hancock TN Leon TN Saxeville TN Springwater	VI Plainfield TN Aurora TN Bloomfield TN Mount Morris TN Poy Sippi	VI Redgranite	TN Oasis
Promoting cooperation among public agencies, citizens, non-profit organizations and businesses	CI Berlin VI Lohrville VI Plainfield VI Redgranite TN Aurora TN Deerfield TN Leon TN Rose TN Saxeville	CI Wautoma VI Coloma VI Wild Rose TN Hancock TN Springwater	TN Bloomfield TN Mount Morris TN Poy Sippi		TN Oasis
Protecting and reducing damage to utilities	CI Berlin CI Wautoma VI Coloma VI Lohrville VI Plainfield VI Redgranite VI Wild Rose TN Aurora TN Deerfield TN Hancock TN Leon TN Rose TN Saxeville	TN Springwater	TN Bloomfield TN Mount Morris TN Oasis TN Poy Sippi		
Strengthening emergency services	CI Berlin CI Wautoma VI Coloma VI Lohrville VI Plainfield TN Hancock TN Leon TN Marion TN Rose TN Saxeville	VI Redgranite TN Aurora TN Deerfield TN Springwater	VI Wild Rose TN Bloomfield TN Mount Morris TN Oasis TN Poy Sippi		

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 Wautoma: Potential development in Lake Ridge Subdivision and/or Century Drive by this area.
- VI Plainfield: DOT Project ID: 6310-00.30 Wis 73 Wis 21 to County BB – resurfacing between 5th Ave and Wis 21 (May-October 2021).
- VI Plainfield: Three new sidewalks (walkways) replaced in Waterman Park (Spring 2021).
- TN Marion: We currently do not have any community building projects slated to be built in the near future; however, we maintain our roads on a regular basis.
- TN Saxeville: Replacement of the following bridges on these town roads: 29th Drive, Pine Hill Road, Akron Court.
- TN Saxeville: Replacement of culvert on 28th Road.

7. What ideas do you have for your community to mitigate natural disasters?

Appendix G: Community Input

- CI Wautoma: The infrastructure on Highways 21 and 73 could be enhanced to help alleviate flooding.
- CI Wautoma: Coordination with emergency personnel of all areas and designating places to provide shelter and services to both EMS and residents.
- CI Wautoma: Continuing to make infrastructure enhancements that make our community more durable and alleviate or reduce impact of disasters like flooding.
- VI Coloma: Portable generators, lift station (permanent), fire department (upgrade existing).
- VI Plainfield: Good leadership on Village Boards. Good police and fire protection locally.
- VI Redgranite: Have adequate equipment to clean up if one occurs.
- VI Wild Rose: Planning, training and reviewing areas of concern to the people that live in the Village. For example, building a community shelter for people to go that live in the mobile home park.
- TN Aurora: Warning systems.
- TN Deerfield: Cooperation.
- TN Leon: Try to keep trees trimmed as much as possible. Waterways cleared.
- TN Marion: We continue to cut dead trees and clear power lines to help keep roads open and clear.
- TN Marion: Utilization of a Waushara County command center vehicle would help facilitate clearer communication to all involved in any natural disaster within the county.
- TN Mount Morris: We continually manage tree and plant growth on town roads to reduce damage and clean up from storms.
- TN Saxeville: Replace all failing bridges; enhance tree-trimming maintenance; maintain high quality town roads.

Please return to Waushara County Emergency Management by email to Norm Duesterhoeft at Norm.Duesterhoeft@co.waushara.wi.us or by mail to:

**Waushara County Emergency Management
PO Box 300
Wautoma, WI 54982**

Invitation sent 2/2/21 for first workgroup meeting

**WAUSHARA COUNTY
EMERGENCY MANAGEMENT**

Norman Duesterhoeft, Director
e-mail: norman.duesterhoeft@co.waushara.wi.us

P.O. Box 300
209 South Saint Marie Street
Wautoma, WI 54982-0300

Phone: (920) 787-0468
Fax: (920) 787-0425

Date: February 2, 2021
To: Town, Village or City Leader
County Department Manager
From: Norman Duesterhoeft, EM Director
Re: Hazard Mitigation Plan Workgroup

The Waushara County Emergency Management Office has received a grant from the Federal Emergency Management Agency (FEMA) and Wisconsin Emergency Management to complete an update of the Hazard Mitigation Plan for Waushara County because as with any plan, it needs to be evaluated and updated on a regular basis to outline progress and to set a roadmap for future mitigation efforts.

The plan reviews the risks for various natural disasters within Waushara County and creates a plan for addressing these risks in a cost-effective way. As I am sure you are aware, Waushara County has received several federal disaster declarations in recent history and we are at continued risk for future events such as flooding, high winds and tornados; this planning is intended to help reduce potential future losses. Also, the federal government requires that communities have a current hazard mitigation plan as one criterion for eligibility for some types of grants so it is critical that this plan is completed and kept updated on schedule.

This requires significant input from stakeholder agencies and the public during the planning process. In order for you agency to be eligible for future FEMA mitigation funding you agency must participate in these planning sessions. I have contracted with Lenora Borchardt, EPTEC, INC., to assist me with completing this update. In order to be eligible for FEMA mitigation funding your municipality must send at least one representative to be a member of our planning team. Team members will be asked to be available to assist the contractor answering questions needed to complete the plan and to attend these occasional meetings.

Our first workgroup meeting is scheduled for (3/5/2021) from (10:00 – 12:00) at (zoom <https://us02web.zoom.us/j/83276035264?pwd=d1RlTmRnYy9rIS0xRRHdlcUz4UHFZlUT09> Dial in 312 626 6799, Meeting ID 852 7603 5264 Passcode: 350287). I look forward to your municipality's participation in this process so that we may keep your community eligible for future hazard mitigation grant funding. Please feel free to contact me with any questions at (920) 787-0427.

Sincerely,

Norman Duesterhoeft
Norman Duesterhoeft, Director
Waushara County Emergency Management

PDM Meeting #1 – Attendance

- City of Wautoma
- Town of Mt. Morris
- Town of Saxville
- Waushara County Emergency Management
- Waushara County GIS
- Waushara County Highway Department
- EPTEC, Inc.

PDM press release 2/24/21

Waushara County receives a hazard mitigation planning update grant

Waushara 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, \$4 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 Waushara County to manage its vulnerability to disaster, Norman Duesterhoeft, Waushara County Emergency Management Director, 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, Duesterhoeft is assembling a workgroup to review

and guide the planning activities. The workgroup is reviewing initial background information about Waushara County and has begun identifying strategies that might help.

Duesterhoeft stated, "I am very excited about this part of the planning process. The input from the workgroup can have long-lasting impacts, making Waushara County safer and more disaster resistant."

FEMA has recognized the importance of having members of the community involved in the process and Duesterhoeft 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 or would like to provide input into the plan, please contact Norman Duesterhoeft at 920- 787-0468.

Invitation sent 2/7/22 for second workgroup meeting

**WAUSHARA COUNTY
EMERGENCY MANAGEMENT**

Norman Duesterhoeft, Director
e-mail: norman.duesterhoeft@co.waushara.wi.us

P.O. Box 300
209 South Saint Marie Street
Wautoma, WI 54982-0300

Phone: (920) 787-0468
Fax: (920) 787-0425

Date: 7 February 2022
To: Town, Village, or City Leader
County Department Manager
From: Norman Duesterhoeft, EM Director
Re: Hazard Mitigation Plan Workgroup – Second Meeting

As you know, the Waushara County Emergency Management Office has received a grant from the Federal Emergency Management Agency (FEMA) and Wisconsin Emergency Management to complete an update of the Hazard Mitigation Plan for Waushara County.

The plan reviews the risks for various natural disasters within Waushara County and creates a plan for addressing these risks in a cost-effective way. In order to be eligible for FEMA mitigation funding your municipality must send at least one representative to be a member of our planning team.

The second workgroup meeting is scheduled for Monday, February 21, 2022 from 1:00PM until 3:00PM on Zoom and can be accessed using the information below:

Join Zoom Meeting

<https://us02web.zoom.us/j/85875104039?pwd=U5Gdk5dVU6czBHMdRZlWlWVWtU09>

Meeting ID: 858 7510 4039

Passcode: 147321

One tap mobile

+13126266799,,85875104039#,,,,*147321# US (Chicago)

+19292056099,,85875104039#,,,,*147321# US (New York)

Dial by your location

+1 312 626 6799 US (Chicago)

+1 929 205 6099 US (New York)

+1 301 715 8592 US (Washington DC)

+1 346 248 7799 US (Houston)

+1 889 900 8833 US (San Jose)

+1 253 215 8782 US (Tacoma)

Meeting ID: 858 7510 4039

Passcode: 147321

Find your local number: <https://us02web.zoom.us/j/85875104039>

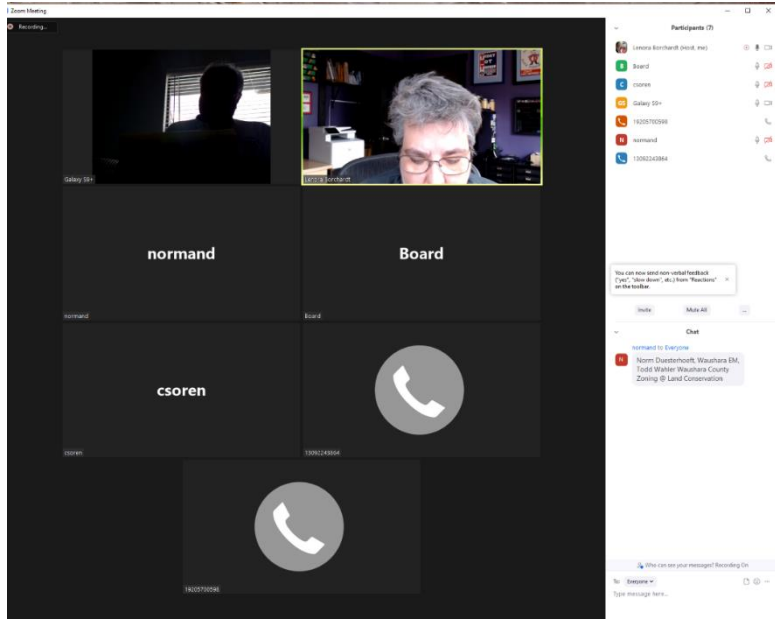
I look forward to your municipality's participation in this process so that we may keep your community eligible for future hazard mitigation grant funding. Please feel free to contact me with any questions at (920) 787-0427.

Sincerely,

Norman Duesterhoeft

Norman Duesterhoeft, Director
Waushara County Emergency Management

Meeting #2 Zoom Screenshot



Meeting #2 Attendance

- Norman Duesterhoeft, Waushara County Emergency Management
- Todd Wahler, Waushara County Zoning and Land Conservation
- Tommy Bohler, City of Wautoma
- Brenda Walker, Village of Coloma
- Ellen Caswell, Village of Red Granite
- Chris Sorenson, Town of Leon
- Larry Albright, Town of Poy Sippi
- Paul Zimmer, Town of Springwater

Request for Review by Contiguous Counties

Waushara Co PDM

Lenora Borchardt <LenoraBorchardt@hotmail.com >

Wed 4/5/2023 3:01 PM

To: emmgmt@co.adams.wi.us <emmgmt@co.adams.wi.us>; weinertr@co.portage.wi.gov
<weinertr@co.portage.wi.gov>; Andrew Carlin <andrew.carlin@co.waupaca.wi.us>; Eric Rasmussen
<erasmussen@winnebago.wi.gov>; Gary V. Podoll <gpodoll@cityofberlin.net>; Aaron Williams
<awilliams@co.marquette.wi.us>

Cc: Allen Luchini <allen.luchini@co.waushara.wi.us>

Hello! Please find attached a link to the draft Waushara County PDM plan. Please return any comments to me (or Al Luchini) by 19 April 2023. Thanks, and have a great day! Lenora

<https://www.dropbox.com/scl/fi/v409yebbkmqkaOxfiw6x2/Waushara-Co-HazMit-Plan-2022-v3.docx?dl=O&rlkey=ck98si7zcOh1f28nbpykwmwig5>

6 April 2023

Dear Town, Village, City, and County Community Leader:

The State of Wisconsin has endured billions of dollars in damages over the past three decades because of various disasters including severe weather and flooding events, major snowstorms, and powerful tornadoes. While the costs of each disaster may vary greatly, the impact is always the hardest at the local level, impacting our communities the most.

Hazard mitigation breaks the cycle of damage and repair by reducing or eliminating the long-term risk to human life and property caused by potential hazards. In fact, for every dollar spent on mitigation activities, approximately \$6.00 in future damages is avoided. These preventative actions may be as simple as elevating a furnace in a basement in an effort to prevent flood damage. Mitigation efforts may also take a more comprehensive approach such as relocating buildings out of the floodplain or strengthening critical facilities to prevent wind damage and provide stronger shelter.

To better mitigate Waushara County's vulnerability to disaster, Waushara County Emergency Management applied for, received, and updated the Waushara County Hazard Mitigation Plan through a Pre-Disaster Mitigation (PDM) planning grant. The updated plan serves as a roadmap that outlines potential cost-effective hazard mitigation activities, some of which might be available for future grant funding. The plan highlights the risks and vulnerabilities that Waushara County faces from natural disasters and highlights mitigation strategies selected by a local workgroup that may reduce future losses.

As this project nears completion, we are sending copies of the final updated plan and a draft resolution template for you to use for the re-adoption of the Waushara County Hazard Mitigation Plan. Please note:

1. **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 could be accomplished should the funding and will to complete them become available.
2. **If you do not adopt this plan, your community will not be eligible to apply for and receive mitigation project funding in the future.**

Please include the adoption of this resolution on your next meeting agenda and provide a copy of the final resolution, as soon as it is passed, to me at the email address below. If you have any questions or comments regarding this plan update, please feel free to contact me at (920) 787-0427 or by email at allen.luchini@co.waushara.wi.us

Thank you for your assistance with completing the Waushara County Hazard Mitigation Plan. This small investment of your time will help make our community a safer, healthier, and more disaster-resistant community for years to come.

Respectfully,

Allen Luchini, Director
Waushara County Emergency Management

Public Notice

Waushara County has completed the draft of a Hazard Mitigation Plan Update, prepared in accordance with the Disaster Mitigation Act of 2000 (Public Law 106-390; DMA2K). The draft is available for public review and comment during business hours at the Waushara County Clerk's Office, 209 S. St. Marie Street, Wautoma until 30 June 2023

If you have questions related to this notice or its application in Waushara County, call the Waushara County Emergency Management office at (920) 787-0427.

6 April 2023

For More Information, Contact Allen Luchini, (920) 787-0427

For Immediate Release

**WAUSHARA COUNTY DRAFT HAZARD MITIGATION PLAN UPDATE
AVAILABLE FOR REVIEW**

(Wautoma, WI) Waushara County, like the rest of the State of Wisconsin, is vulnerable to a variety of disasters. Wisconsin has incurred disaster-related damages totaling \$3 billion in the last three decades but future losses can be reduced through mitigation activities. A recent study by the Multi-hazard Mitigation Council shows that each average dollar spent on mitigation saves society in excess of six dollars. Since 1993 more than 400 disasters have occurred in the United States, affecting communities in all 50 states, costing the country over \$500 million dollars per week, and killing over 24,000 people.

Mitigation actions reduce or eliminate the long-term risk to human life and property from hazards. These preventative actions can be as simple as elevating a furnace in a basement that sometimes has water on the floor. Mitigation can also have a comprehensive approach such as relocating buildings out of the floodplain or strengthening critical facilities to prevent wind damage and provide stronger shelter.

To better prepare Waushara County to manage its vulnerability to disasters, Waushara County Emergency Management applied for, received, and has completed a Pre-Disaster Mitigation (PDM) update planning grant. This plan update will serve as a roadmap that outlines potential cost-effective hazard mitigation activities, some of which might be available for future grant funding. The updated plan outlines the risks and vulnerabilities that the county faces from natural disasters and highlights mitigation strategies that might reduce future losses. The completed draft hazard mitigation plan update is available during business hours (8:00 am – 4:00 pm) at the Waushara County Clerk's Office at 209 S. St. Marie Street, Wautoma, for review and public comment until 30 June 2023.

Appendix G: Community Input

All Hazard Mitigation Plan - Waushara County

Allen Luchini <allen.luchini@co.waushara.wi.us>

Wed 2/7/2024 8:08 AM

To: WausharaChamber@gmail.com <WausharaChamber@gmail.com>

📎 1 attachments (75 KB)

EM Letterhead asking for Input.docx;

Good morning,

Please see the attached letter asking for any input the community may have in regards to the All Hazard Mitigation Plan.

Also, could you please share with your members?

Thank you for all you do!

 [Waushara Co HazMit Plan 2022 v3.docx](#)

Allen Luchini

Emergency Management Director

NEMBA, WPCEM



T: (920)787-0468

M: (920)240-9555

E: allen.luchini@co.waushara.wi.us

A: Waushara County, 54982 United States



The content of this email is confidential and intended for the recipient specified in message only. It is strictly forbidden to share any part of this message with any third party, without a written consent of the sender. If you received this message by mistake, please reply to this message and follow with its deletion, so that we can ensure such a mistake does not occur in the future.

Waushara County All Hazard Mitigation Plan

Allen Luchini <allen.luchini@co.waushara.wi.us>

Wed 2/7/2024 8:10 AM

To: School District Clerks <SchoolDistrictClerks@wausharacounty1.onmicrosoft.com>; mucklina@wautoma.k12.wi.us
<mucklina@wautoma.k12.wi.us>; Craig Hayes <hayesc@wildroseschools.org>; Jamie Delikowski
<jamiedelikowski@tcpenguin.net>

 [Waushara Co HazMit Plan 2022 v3 1.docx](#)

Good morning,

Please see the attached letter asking for any input the community may have in regards to the All Hazard Mitigation Plan.

Please share as you see fit.

Thank you all for what you do for our children and our communities!

Allen Luchini

Emergency Management Director

NEMBA, WPCEM



T: (920)787-0468

M: (920)240-9555

E: allen.luchini@co.waushara.wi.us

A: Waushara County, 54982 United States



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Office of Emergency Management, Waushara County

To: Whole Community Planning Partner

From: Allen Luchini, EM Director

Re: Hazard Mitigation Plan Update

Date: February 7, 2024

To: Whole Community Planning Partner

From: Allen Luchini, EM Director

Re: Hazard Mitigation Plan Update

Waushara 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, up to \$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.

To better prepare our community to manage its vulnerability to disaster, Waushara County Emergency Management applied for and received a FEMA 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 outlines the risks and vulnerabilities that the county faces from natural disasters and highlights mitigation strategies that might reduce future losses. As part of this planning process, we are asking you if you have any concerns (i.e., risks or vulnerabilities) and/or hazard mitigation projects that you would like included in the plan.

We recognize the importance of having members of the community involved in the process and 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 or would like to provide input into the plan, please contact Allen Luchini at 920-787-0468 or by email at allen.luchini@co.waushara.wi.us before February 27, 2024. Thank you!



Office of Emergency Management, Waushara County

To: Whole Community Planning Partner

From: Allen Luchini, EM Director

Re: Hazard Mitigation Plan Update

Fecha: 7 de febrero de 2024

Para: Socio de Planificación de Toda la Comunidad

De: Allen Luchini, Director de EM

Re: Actualización del Plan de Mitigación de Riesgos

El Condado de Waushara, como el resto del Estado de Wisconsin, es vulnerable a una variedad de desastres. Wisconsin ha sufrido daños relacionados con catástrofes por un total de casi 3.000 millones de dólares en las últimas tres décadas, casi la mitad de los cuales se produjeron sólo en la década de 1990. Estas pérdidas pueden reducirse mediante actividades de mitigación. Se calcula que por cada dólar gastado en mitigación pueden evitarse hasta 6 dólares en daños futuros. La mitigación de riesgos rompe el ciclo de daños y reparaciones.

Las acciones de mitigación reducen o eliminan el riesgo a largo plazo de los peligros para la vida humana y la propiedad. Estas acciones preventivas pueden ser sencillas, como elevar un horno en un sótano que a veces tiene agua en el suelo. La mitigación también puede tener un enfoque integral, como la reubicación de edificios fuera de la llanura aluvial o el refuerzo de instalaciones críticas para evitar daños por viento y proporcionar un refugio más sólido.

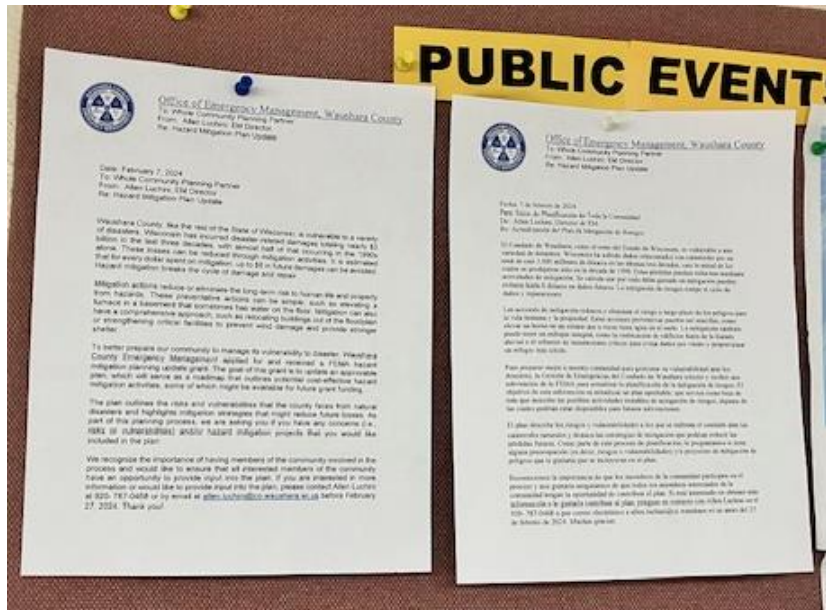
Para preparar mejor a nuestra comunidad para gestionar su vulnerabilidad ante los desastres, la Gestión de Emergencias del Condado de Waushara solicitó y recibió una subvención de la FEMA para actualizar la planificación de la mitigación de riesgos. El objetivo de esta subvención es actualizar un plan aprobable, que servirá como hoja de ruta que describa las posibles actividades rentables de mitigación de riesgos, algunas de las cuales podrían estar disponibles para futuras subvenciones.

El plan describe los riesgos y vulnerabilidades a los que se enfrenta el condado ante las catástrofes naturales y destaca las estrategias de mitigación que podrían reducir las pérdidas futuras. Como parte de este proceso de planificación, le preguntamos si tiene alguna preocupación (es decir, riesgos o vulnerabilidades) y/o proyectos de mitigación de peligros que le gustaría que se incluyeran en el plan.

Reconocemos la importancia de que los miembros de la comunidad participen en el proceso y nos gustaría asegurarnos de que todos los miembros interesados de la comunidad tengan la oportunidad de contribuir al plan. Si está interesado en obtener más información o le gustaría contribuir al plan, póngase en contacto con Allen Luchini en el 920- 787-0468 o por correo electrónico a allen.luchini@co.waushara.wi.us antes del 27 de febrero de 2024. Muchas gracias.

Appendix G: Community Input

Posting of the above letters to planning partners dated February 7, 2024
(Spanish and English versions)



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 2019 study has shown that mitigation saves society an average of \$6 for every \$1 spent through federal mitigation grant programs.

► Rigorous building standards in communities across the country are saving \$11 per \$1 spent simply by adopting model codes. Other building measures save \$4 per \$1 spent.

► 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, cumulative costs for weather and climate disasters in the United States during 2017 were \$306.2 billion - making it the costliest year ever.

NOTES: _____

For further information please contact:

**Waushara County
Emergency Management**
P.O. Box 300
Wautoma, WI 54982
(920) 787-0427

Pre-Disaster Mitigation Planning

*Creating Safe,
Sustainable
Communities*



Prepared by:
Waushara County Emergency Management
P.O. Box 300
Wautoma, WI 54982
(920) 787-0427

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. Waushara County has recognized that there may be information that should be added to the plan between the five-year updates but that the costs of continuous updates, printing and distribution can be excessive. This section is designed to hold that information that is gathered between the five-year updates. It is felt that only having to reproduce and distribute one section between updates will lessen the costs to the county.

Potential Areas of Concern Identified:

- No additional concerns have been identified to date