Hazard Mitigation Plan

Waukesha County, Wisconsin

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Introduction and Background

The Waukesha County Hazard Mitigation Plan is intended to provide strategies for reducing susceptibility to future damage to public and private infrastructure in the county. The Waukesha County Emergency Management Office applied for and received a hazard mitigation planning grant in 2008. 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. The Federal Emergency Management Agency (FEMA) has rules in 44 CFR Part 206 Subpart M for implementing Section 409.

Section 409 states that the county is obligated to try to reduce 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 Waukesha 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 Waukesha 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 Waukesha County Hazard Mitigation Plan provides background information on Waukesha 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 Waukesha County Emergency Management Office has completed and regularly updates the Waukesha County Hazard Analysis. This Hazard Analysis identifies all likely natural and technological hazards that might or have occurred within the county. The Hazard Analysis does not generally include detailed mitigation strategies for the identified hazards. There have also been plans and ordinances completed by individual Waukesha County departments or municipalities, some of these were used as reference materials for this plan, including:

Waukesha County Code of Ordinances
http://www.waukeshacounty.gov/page.aspx?SetupMetaId=11982&id=11986

Chapter 14	Parks and Land Use
Chapter 15	Public Works
Appendix A	Basic Zoning Ordinance

Appendix B	Shoreland and Floodland Protection
Appendix D	Shoreland and Floodland Subdivision Control

City of Brookfield Municipal Code
http://www.codepublishing.com/wi/brookfield/

Title 15	Building and Construction
Title 16	Subdivisions
Title 17	Zoning

City of Brookfield Ordinances
http://www.ci.brookfield.wi.us/Archive.asp?AMID=83
2149-08: Temporary Moratorium on Land Divisions of Platted Residential Lots
Plus other ordinances with regard to specific lots.

City of Delafield Municipal Code
http://www.municode.com/Resources/gateway.asp?pid=12542&sid=49

Chapter 8	Public Works
Chapter 13	Municipal Utilities
Chapter 14	Building Code
Chapter 17	Zoning Code
Chapter 18	Subdivision Control Code
Chapter 20	Floodplain Zoning Code
Chapter 23	Construction Site Erosion Control and Storm Water Management

City of Muskego Municipal Code
http://www.ci.muskego.wi.us/Government/MunicipalCodes/tabid/391/Default.aspx

Chapter 14	Floodplain Zoning Ordinance
Chapter 17	Zoning Ordinance
Chapter 18	Land Division Ordinance
Chapter 19	Minimum Housing Code
Chapter 29	Erosion Control
Chapter 30	Building Code
Chapter 34	Storm Water Management
Chapter 38	Non Metallic Mining

City of New Berlin Municipal Code
http://www.ecode360.com/?custId=NE1873

Chapter 65	Water Resource Management
Chapter 80	Building Construction
Chapter 110	Erosion Control
Chapter 198	Property, Abandoned and Obsolete
Chapter 226	Storm Water Runoff
Chapter 235	Subdivision of Land
Chapter 275	Zoning

City of Oconomowoc Municipal Code
http://library6.municode.com/default-test/home.htm?infobase=19978&doc_action=whatsnew

City of Oconomowoc Zoning Code
http://www.ci.oconomowoc.wi.us/Zoningordinance/tableofcontents.htm

Sub-chapter 17-1	Establishment of Zoning Districts
Sub-chapter 17-2	Land Use Regulations
Sub-chapter 17-3	Density and Intensity Regulations
Sub-chapter 17-4	Bulk Regulations
Sub-chapter 17-5	Natural Resource Protection Regulations
Sub-chapter 17-6	Landscape and Buffer-Yard Regulations

City of Pewaukee Ordinances
http://www.cityofpewaukee.us/pewaukee_ordinances_02.php

Chapter 10	Land, Streets, Right of Ways
Chapter 14	Building Code
Chapter 16	Municipal Water and Wellhead Protection
Chapter 17	Zoning
Chapter 18	Land Division
Chapter 19	Storm Water/Erosion Control

City of Waukesha Code Book
http://www.ci.waukesha.wi.us/web/guest/codebook

Chapter 16	Building
Chapter 22	Zoning
Chapter 23	Subdivision and Platting
Chapter 24	Floodland Zoning
Chapter 32	Storm Water Management and Erosion Control

Village of Chenequa Code
http://www.chenequa.wi.us/village1.html

Chapter 3	Land
Chapter 5	Building Code
Chapter 6	Zoning Code

Village of Elm Grove Code of Ordinances
http://www.ecode360.com/?custId=EL1841

Chapter 106	Building Construction
Chapter 305	Land Division
Chapter 330	Floodplain Zoning
Chapter 335	Zoning

Village of Hartland Municipal Code
http://www.municode.com/resources/gateway.asp?sid=49&pid=13361

Chapter 18	Building and Building Regulations
Chapter 46	Land Development
Chapter 50	Land Subdivision
Chapter 76	Storm Water Management

Village of Menomonee Falls Code of Ordinances
http://www.municode.com/resources/gateway.asp?pid=13290&sid=49

Chapter 18	Building and Building Regulations
Chapter 38	Environment
Chapter 58	Manufactured Homes and Trailers
Chapter 59	Non-Metallic Mining Reclamation
Chapter 94	Subdivisions and Other Divisions of Land
Chapter 122	Zoning

Village of Mukwonago Municipal Code
http://www.villageofmukwonago.com/municipal_code.htm

Chapter 18	Buildings and Building Regulations
Chapter 45	Land Division
Chapter 50	Mobile Homes and Trailers
Chapter 62	Planning
Chapter 100	Zoning

Village of Nashotah Municipal Code
http://www.municode.com/resources/gateway.asp?pid=12609&sid=49

Chapter 14	Building Code
Chapter 16	Shoreland-Wetland Zoning
Chapter 17	Zoning Code
Chapter 18	Subdivision and Platting
Chapter 23	Storm Water Runoff

Village of North Prairie Municipal Code
http://www.northprairie.net/Municipal%20Codes,%20Ordinances%20and%20Polices.html

Chapter 14	Building and Building Regulations
Chapter 22	Manufactured Homes

Village of Oconomowoc Lake Zoning Code and Land Division Ordinances
http://www.oconlake.com/zonefile.html

Chapter 17	Zoning Code
Chapter 18	Subdivision and Platting

Village of Sussex Municipal Code and Newly Enacted Ordinances
http://www.village.sussex.wi.us/Ordinances.php

Chapter 14	Stormwater Runoff
Chapter 17	Zoning Code
Chapter 18	Land Development Code
Chapter 26	Non-metallic Mining Reclamation
Chapter 27	Environmental Enhancement and Protection
Chapter 30	Building Code
Ordinance No 711	Floodplain Management
Ordinance No 716	Land Suitability - Floodlands

Town of Brookfield Zoning Code
http://www.townofbrookfield.com/buildinginspection.html

Chapter 17	Zoning Code

Town of Delafield Municipal Code
http://www.townofdelafield.org/towninfo_codes.htm

Chapter 14	Building and Mechanical Code
Chapter 17	Zoning Code
Chapter 18	Land Division and Development Control

Town of Mukwonago Municipal Code
http://www.townofmukwonago.us/Town_Ordinances.htm

Chapter 14	Buildings and Building Regulations
Chapter 82	Zoning

Town of Ottawa Ordinances
http://www.townofottawa.com/ordinances.asp

Chapter 14	Building Code
Chapter 18	Land Division and Development

Town of Vernon Municipal Code
http://www.ecode360.com/?custId=VE2182

Chapter 125	Building Construction
Chapter 144	Commercial and Industrial Development
Chapter 200	Land Division and Development Control
Chapter 276	Storm Water Utility

Plan Preparation, Adoption and Maintenance

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

- William Stolte, Waukesha County Emergency Management
- Kathy Schwei, Waukesha County Emergency Management
- Steve Korthof, Waukesha County Environmental Health
- Pete Chladil, Waukesha County Highway Department
- Dale Shaver, Waukesha County Department of Parks and Land Use
- Heather McGuire, City of Delafield
- Mark Stigler, City of Waukesha
- Jessi Balcom, Village of Elm Grove
- Veronica Rudychev, Village of Elm Grove
- Jeffrey Leverenz, Waukesha County Technical College
- Lenora Borchardt, EPTEC, Inc. (Contractor)

It should be noted that the Village of Elm Grove had a completed and FEMA-approved pre-disaster mitigation plan that has neared its expiration date. The Village has decided to fold their plan into the overall county plan. Village representatives attended the county-wide workgroup meetings and provided input to the process. Appendix D lists the mitigation ideas that were in their previous plan and the status of those goals. The Village was able to complete some objectives, some were redefined as the details were discussed regarding the project ideas, others were dropped as they refined their goals for this plan and finally others were carried forward and integrated into this overall county plan.

An informational brochure was created and copies were distributed throughout the community. Meetings were held with chief elected officials from each municipality to explain and gather input regarding the program (e.g., previous occurrences, mitigation strategies.) The committee met several times, first to evaluate and incorporate input from local officials and then to review and provide input on the progress of the plan. Surveys were also distributed to the leadership committee of each municipality to gather information. An opportunity to review the plan was provided and announced via a legal public notice and a press release so that members of the

general public, local officials, academia and business and industry leaders could provide input. The plan was distributed to the County Emergency Management Directors from Milwaukee, Washington, Dodge, Jefferson and Racine counties. Comments received were reviewed and incorporated into the plan as appropriate. A copy of the mitigation brochure and a list of meeting dates and informational sessions to gather public and official input can be viewed in Appendix F.

The Waukesha 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 "high," "medium" or "low" by the workgroup.

The workgroup also, after reviewing the draft plan, selected the potential mitigation projects, which are listed in Appendix C (Summary of Mitigation Strategies) and discussed in more detail in each chapter's Hazard Mitigation Strategies section. The workgroup participants were given the *Mitigation Ideas: Possible Mitigation Measures by Hazard Type* (Mitigation Ideas, FEMA-R5, 9/02) booklet as an aid to generating ideas. All of the ideas generated during the workgroup meetings were incorporated into the plan and can be found in the Hazard Mitigation Strategies section of each chapter and are summarized in Appendix C. Based on the information collected, each of these projects was assigned a "high," "medium" or "low" priority based on the workgroup's 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 has been sent to Wisconsin Emergency Management (WEM) for review and tentative approval. Based on WEM's comments, a final draft plan has been completed and will be forwarded to FEMA for approval. Once approved by FEMA, a resolution adopting the plan will be put on publically-posted agendas for the county board and every participating city, village and town for review and adoption.

The resolution was passed by the Waukesha County Board, the Cities of Brookfield, Delafield, Muskego, New Berlin, Oconomowoc, Pewaukee, and Waukesha; the Villages of Big Bend, Butler, Chenequa, Dousman, Eagle, Elm Grove, Hartland, Lannon, Menomonee Falls, Merton, Nashotah, North Prairie,

Oconomowoc Lake, Pewaukee, Sussex, and Wales. Each of the towns was also given the opportunity to adopt the plan with the Towns of Delafield, Genesee, Merton, Mukwonago and Ottawa adopting it. Scanned copies of the adoption resolutions can be found in Appendix B.

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 Waukesha 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.

As information is received by the County Emergency Management Director between the five-year update periods (e.g., comprehensive or capital improvement plans) that might be included, it will be added to Appendix G: Inter-Revision Updates. Waukesha County Emergency Management maintains responsibility and is the point of contact for all issues regarding this plan. Municipalities can contact the County Emergency Management Director to add updated local information to Appendix G. Furthermore, the County Emergency Management Director will include in the Plan-of-Work program an annual letter that reaches out to the applicable county offices and municipalities. This letter will query if there are new elements for the mitigation plan as well as asking if there are any plans (new or updates) in which the mitigation plan can and/or will be used as a source plan.

The plan participants recognize this document as an important planning tool within the community and will use this plan as a reference as they complete other related planning such as storm water management and comprehensive plans. The Village of Elm Grove, which already has an approved hazard mitigation plan, referenced their existing plan within their Comprehensive Plan (page 3.)

Physical Characteristics of Waukesha County

General Community Introduction

A drive through Waukesha County uncovers evidence of the great glaciers that once covered the area. Lush rolling hills, abundant lakes and limestone quarries are just some of the natural wonders. Many of Waukesha County's parks feature the lakes and hills created by the glacier.

Waukesha County was home to prehistoric Native Americans, including the Effigy Mound Builders and Potawatomi people and was prized by fur traders in the 1700's. When settlers from the east arrived in the mid-1800's, they found four to six foot earthen mounds in the shape of birds and turtles, along with conical and linear mounds. Three conical mounds are visible today in front of the City of Waukesha Library. Increase Lapham, considered founder of the U.S. Weather Bureau, surveyed the mounds. The highest point in Waukesha County is named for him.

As far back as the 1700's, the native people told fur traders about the area's mineral springs. In 1868 Col. Richard Dunbar promoted what he believed were healing properties of Waukesha's water, which launched Waukesha County's “Springs Era”. Through 1910, people traveled cross-country to drink the water. Accounts tell us that up to 25 passenger trains arrived daily. Elaborate “springhouses” were built above the natural springs. Today's visitors can see the last of the original springhouses on the Moor Downs Golf Course, Frame Park and Springs Park.

In the late 1800's, many cities experienced devastating fires that destroyed early wood frame buildings. Waukesha County's quarries provided the stone for rebuilding, and railroads transported the stone to Chicago and other cities with fire damage.

Some of the famous people that called Waukesha County home include Les Paul, the inventor of the electric guitar and 1930's Broadway stars Alfred Lunt and Lynn Fontanne.

Once dubbed “Cow County USA”, Waukesha County has developed a diverse industrial base. Some of the world's leading manufacturers and businesses have corporate facilities located in the area.

(http://www.waukeshacounty.gov/page.aspx?SetupMetaId=40&id=11592)

Plan Area

Waukesha County covers approximately 580 square miles or 371,600 acres with rivers, streams and creeks accounting for about 25 square miles of the total. Waukesha County is home to approximately 379,333 people.

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

(http://www.wisconline.com)

Waukesha County is bordered on the east by Milwaukee, on the south by Walworth County and Racine County, on the west by Jefferson County and on the north by Dodge and Washington Counties.

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. Waukesha County contains the Cities of Brookfield, Delafield, Muskego, New Berlin, Oconomowoc, Pewaukee and Waukesha; the Villages of Big Bend, Butler, Chenequa, Dousman, Eagle, Elm Grove, Hartland, Lac La Belle, Lannon, Menomonee Falls, Merton, Mukwonago, Nashotah, North Prairie, Oconomowoc Lake, Pewaukee, Sussex and Wales and the Towns of Brookfield, Delafield, Eagle, Genesee, Lisbon, Merton, Mukwonago, Oconomowoc, Ottawa, Summit, Vernon and Waukesha. (See Appendix A for a map of Waukesha County.) The County and all municipalities except for the the Villages of Lac

La Belle and Mukwonago and the Towns of Brookfield, Eagle, Lisbon, Oconomowoc, Summit, Vernon and Waukesha have adopted the plan. It should be noted that the county's towns were given the opportunity to adopt the plan independently but, since they are unincorporated municipalities, all of the towns are covered by the county's adoption of the plan. (Copies of the adoptions can be found in Appendix B.)

Geology

The combined thickness of unconsolidated glacial deposits, alluvium, and marsh deposits overlying bedrock exceeds 100 feet throughout most of the county. Thicknesses are greatest where glacial materials fill the bedrock valleys and in areas of topographic highs formed by end moraines. The most substantial glacial deposits, from 300 to 500 feet thick, are located in the northwestern part of the County in the lakes area and in portions of the Towns of Mukwonago and Vernon. The thinnest glacial deposits, 20 feet thick or less, are found along an approximately six-mile-wide band traversing the county in a northeasterly direction from the Village of Eagle to the Villages of Lannon and Menomonee Falls.

Bedrock topography was shaped by preglacial and glacial erosion of the exposed bedrock. The consolidated bedrock underlying Waukesha County generally dips eastward at a rate of about 10 feet per mile. The bedrock surface ranges in elevation from about 900 feet above mean sea level, at Lapham Peak, to approximately 500 feet above mean sea level in the eastern portion of the County. The bedrock formations underlying the unconsolidated surficial deposits of Waukesha County consist of Precambrian crystalline rocks; Cambrian sandstone; Ordovician dolomite, sandstone, and shale; and Silurian dolomite. The uppermost bedrock unit throughout most of the County is Silurian dolomite, primarily Niagara dolomite, underlaid by a relatively impervious layer of Maquoketa shale, which acts as an aquitard – minimizing groundwater movement into the underlying materials. In some of the pre-Pleistocene valleys in the southwestern and central portions of the County, however, the Niagara dolomite is absent and the uppermost bedrock unit is the Maquoketa shale. (Waukesha Land and Water Resource Management Plan, 2006)

Topography

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

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

(http://www.uwex.edu/sco/state.html)

Topographic elevation in Waukesha County ranges from approximately 730 feet above mean sea level in the extreme eastern portions of the county along tributaries of the Menomonee River in Brookfield, Elm Grove and Menomonee Falls to 1,233 feet at Lapham Peak in the Town of Delafield, a variation of over 500 feet. Most of the high points in the county are located along the Kettle Moraine in three distinct areas: the southern half of the Town of Delafield near Lapham Peak, the southwestern quarter of the Town of Lisbon, and between State Highways 59 and 67 in the Towns of Genesee and Ottawa.

Four major stages of glaciation, the last of which was the Wisconsin stage, ending approximately 10,000 years ago in the state, have largely determined the physiography, topography, and soils of Waukesha County. The dominant physiographic and topographic feature in Waukesha County is the Kettle Moraine, an interlobate glacial deposit formed between the Green Bay and Lake Michigan lobes of the continental glacier that moved in a generally southerly direction from its origin in what is now Canada. The Kettle Moraine, which is oriented in a general northeast-southwest direction across western Washington, Waukesha, and Walworth Counties, is a complex system of kames, or crudely stratified conical hills; kettle holes formed by glacial ice blocks that became separated from the ice mass and melted to form depressions and small lakes as the meltwater deposited material around the ice blocks; and eskers, long, narrow ridges of drift deposited in abandoned drainageways. The remainder of the county is covered by a variety of glacial landforms and features, including various types of moraines, drumlins, kames, outwash plains, and lake basin deposits. (Waukesha Land and Water Resource Management Plan, 2006)

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^{o}F in the north to about 50^{o}F in the south with statewide extreme records of 114^{o}F (Wisconsin Dells, 7/13/1936) and minus 55^{o}F (Couderay, 2/2/1996 & 2/4/1996). During more than one-half of the winters, temperatures fall to minus 40^{o}F or lower and almost every winter temperatures of minus 30^{o}F or colder are reported from northern stations. Summer temperatures above 90^{o}F average two to four days in northern counties and about 14 days in southern districts, including Waukesha 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.

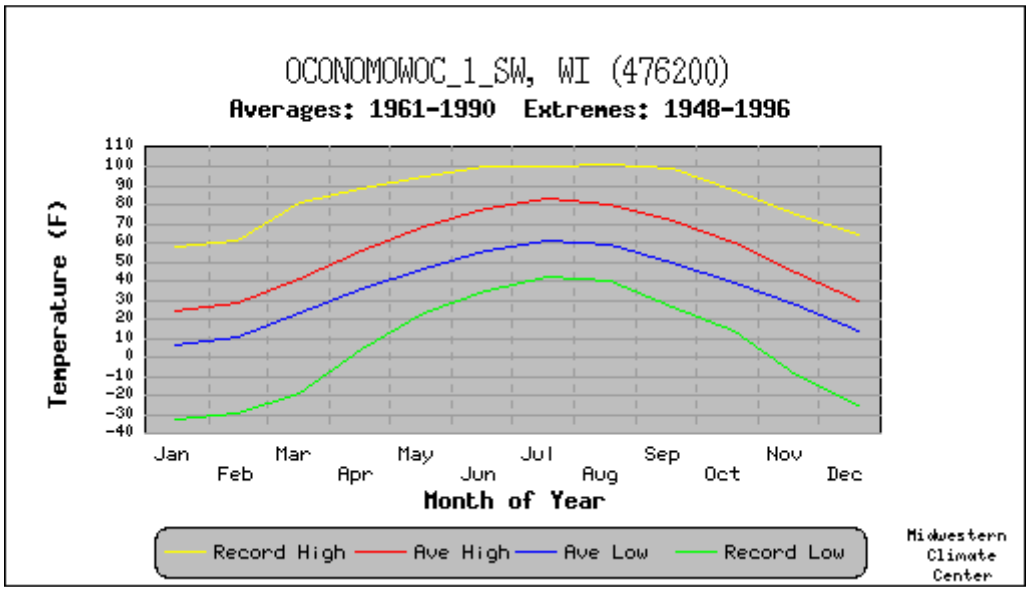
The long-term mean annual precipitation ranges from 30 to 34 inches over most of the Western Uplands and Northern Highlands, then diminishes to about 28 inches along most of the Wisconsin Central Plain and Lake Superior Coastal area. The higher average annual precipitation coincides generally with the 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 cover acts as protective insulation for grasses, autumn seeded grains, alfalfa and other vegetation.

The average growing season is defined as the number of days following the last 32^{o}F freeze in the spring through the beginning of fall. Waukesha County's growing season averages 158 days. Shallow lakes normally freeze in late November and remain frozen until late March or early April. (http://www.uwex.edu/sco/state.html)

Climate Normals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Ave Daily High (F°)	26.4	31.1	42.3	56.2	68.7	78.5	82.8	80.2	72.3	60.4	45.5	31.3
Ave Daily Low (F°)	10.8	15.0	25.5	36.3	46.6	56.2	61.8	59.9	52.0	41.2	30.2	16.8
Growing Degree Days	1	2	34	143	331	518	667	600	390	181	38	4
Heating Degree Days	1438	1173	964	564	265	47	6	18	110	448	816	1268
Cooling Degree Days	0	0	0	0	39	119	232	176	26	8	0	0
Ave Precipitation (")	1.34	1.09	2.36	3.35	2.99	3.47	3.33	4.10	3.68	2.48	2.40	1.96
Ave Snowfall (")	10.3	7.2	8.5	2.1	0.0	0.0	0.0	0.0	0.0	0.0	2.3	10.0

Data from the weather station at Waukesha, latitude 43°01' N, longitude 88°14' W, elevation 860 ft. Growing season data (including growing degree days and frost dates) are not available from the Waukesha station, and have been taken from Oconomowoc 1 SW.
http://www.wisconline.com/counties/Waukesha/climate.html



Midwestern Regional Climate Center

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.

(http://www.uwex.edu/sco/state.html)

Groundwater reservoirs are recharged by direct precipitation. Spring is a prime time for recharge because evapotranspiration is low and melting snow and rainfall infiltrate and percolate the water table on unfrozen ground. Fall is another prime time for high recharge. During the summer, groundwater levels drop because precipitation is lower causing losses to evaporation and transpiration to exceed precipitation. In addition, groundwater is lost to surface waters by discharge in the form of springs (DeVaul, 1967.) The winter period normally lacks infiltration because of frozen ground.

Groundwater is a vital natural resource of Waukesha County, which not only sustains lake levels and wetlands and provides the perennial base flow of the streams, but also is a major source of water supplies. In general, the county has an adequate supply of groundwater to support its growing population, agriculture,

commerce and a viable, diverse industry. However, overproduction and water shortages may occur in areas of concentrated development and intensive water demand, especially in the sandstone aquifer and in selected areas served by the shallow aquifers. The amount, recharge, movement and discharge of the groundwater is controlled by several factors, including precipitation, topography, drainage, land use, soil and the lithology and water-bearing properties of rock units ranging in age from Quaternary to Precambrian. In 2002, the Southeastern Wisconsin Regional Planning Commission (SEWRPC) published Technical Report 37 entitled, Groundwater Resources of Southeastern Wisconsin. The Report provided baseline information regarding groundwater availability and use in southeastern Wisconsin.

Groundwater occurs within three major aquifers that underlie the county. From the land's surface downward, they are: 1) the sand and gravel deposits in the glacial drift; 2) the shallow dolomite strata in the underlying bedrock and 3) the deeper sandstone, dolomite, siltstone and shale strata. Because of their proximity to the land's surface and hydraulic interconnection, the first two aquifers are commonly referred to collectively as the "shallow aquifer" while the latter is referred to as the deep aquifer. Within most of the county, the shallow and deep aquifers are separated by the Maquoketa shale, which forms a relatively impermeable barrier between the two aquifers. That shale layer is absent in the far western portion of the county.

Recharge to groundwater is derived almost entirely from precipitation. Much of the groundwater in shallow aquifers originates from precipitation that has fallen and infiltrated within a radius of about 20 or more miles from where it is found. The deeper sandstone aquifers are recharged by downward leakage of water through the Maquoketa Formation from the overlying aquifers or by infiltration of precipitation in western Waukesha County where the sandstone aquifer is not overlain by the Maquoketa Formation and is unconfined. On the average, precipitation annually brings about 32 inches of water to the surface area of the county. It is estimated that approximately 80 percent of that total is lost by evapotranspiration. Of the remaining water, part runs off in streams and part becomes groundwater. It is likely that the average annual groundwater recharge to shallow aquifers is 10 to 15 percent of annual precipitation.

Surface water resources constitute an extremely valuable part of the natural resource base of Waukesha County. Surface waters

are a focal point of water-related recreational activities and provide an attractive setting for properly planned residential development. Surface waters, particularly the major lakes, also provide substantial economic benefits. Expenditures by boaters and other recreational users of surface waters benefit the owners of restaurants, grocery and convenience stores, service stations and sporting goods stores in the county. Lakeshore properties, which generally have high-assessed valuations, also serve to enhance the property tax base of the county. In addition, when viewed in the context of open space areas, surface waters greatly enhance the aesthetic and scenic characteristics of the natural environment. Because surface water quality is highly susceptible to deterioration from pollutant runoff, both urban and rural land uses must be carefully managed to achieve a balance between level and extent of use and the maintenance of water quality.

Major inland lakes are defined as those with a surface area of 50 acres or larger, a size capable of supporting reasonable recreational use with minimal degradation of the resource. Waukesha County contains all or portions of 33 major lakes with a combined surface area of approximately 14,000 acres or 21.9 square miles, which is also about 3.8 percent of the total area of the county. This represents about 38 percent of the combined surface area of the 101 major lakes in the seven-county Southeastern Wisconsin Region, more than any other county in the Region. Thirty of the major lakes are located entirely within the county, while three major lakes (Lake Denoon, Golden Lake and Lake Five) are located only partly within the county. Seven lakes in the county have a surface area exceeding 640 acres or one square mile. In addition to the major lakes, there are 45 other water bodies with lake characteristics referenced in the DNR publication, “Wisconsin Lakes”, PUBL-FM-800 91.

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. Two of the major watersheds, the Menomonee River and Root River watersheds, lie east of the subcontinental divide and are part of the Great Lakes-St. Lawrence River drainage system. The other two watersheds, the Fox (Illinois) and Rock River watersheds, lie west of the sub-continental divide and are part of the Mississippi River drainage area. The watershed covering the largest area of Waukesha County is that of the Fox River, encompassing about 58 percent of the total area of the county. Major streams are perennial streams, which maintain, at a

minimum, a small contiguous flow throughout the year except under unusual drought conditions. Waukesha County contains approximately 268 miles of perennial streams. The longest major streams are the Fox (Illinois) and Bark Rivers, with 46.1 and 31.8 stream miles, respectively, in the county. (Draft Comprehensive Development Plan – Waukesha County)

Soil Types

Soils vary dramatically across the landscape. In Waukesha County nearly 150 different soil map units have been identified. Soils also vary in their individual susceptibility to erosion depending on a number of factors including: parent material, vegetative cover, and position on the landscape. (Waukesha Land and Water Resource Management Plan, 2006)

The soils in Waukesha County range from very poorly drained organic soils to excessively drained mineral soils. General grouping of these soils into soil associations is useful for comparing the suitability of relatively large areas of the county for various land uses. A soil association is defined as a landscape with a distinctive proportional pattern of soils, typically comprised of one or more major soil types and at least one minor soil type, as identified by the U. S. Department of Agriculture, Natural Resources Conservation Service, and named after the major soils. Nine soil associations are found in the county. (Draft Comprehensive Development Plan – Waukesha County)

Wetlands

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 can not be disturbed without a permit. Wetlands store flood waters and filter water from precipitation before it enters lakes and streams. Some wetlands also recharge local groundwater aquifers. By slowing water movement, wetlands reduce the likelihood that heavy rainfall or spring snowmelt will cause erosion and flooding. Wetlands retain eroded soil and hold nutrients that would otherwise promote excessive weed growth and algae blooms in lakes and streams.

These nutrients, when held in the wetlands, produce a heavy growth of vegetation that provides nesting sites, food and cover for waterfowl, small mammals and many other types of wildlife. Wetlands also provide recreational opportunities for humans (wildlife observation, hiking, hunting, etc).

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

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

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. (Draft Comprehensive Development Plan – Waukesha County)

According to the Wisconsin Department of Natural Resources, Waukesha County has approximately 54,913 acres of wetlands (approximately 15.4% of its total area). This is 1% of the total statewide acreage of wetlands.

http://dnr.wi.gov/wetlands/acreage.html

Land Use

The land in Waukesha County consists of farmland, shoreland and forests as well as commercial, residential and industrial land. The total land area is 556 square miles. The total water area is 25 square miles.

According to the Waukesha Land and Water Resource Management Plan, in 2000, land use was divided as follows:

- Urban
  - Residential - 75,221 acres
  - Commercial - 5,351 acres
  - Industrial – 5,525 acres
  - Transportation – 30,001 acres
  - Government – 4,887 acres
  - Recreational – 8,253 acres
  - Unused Urban – 7,806 acres
- Non-Urban
  - Surface Water – 16,891 acres
  - Wetlands – 52,661 acres
  - Woodlands – 98,483 acres
  - Agricultural – 112,611 acres
  - Unused Rural – 23,391 acres

A comprehensive inventory of natural areas within the county was conducted by the Southeastern Wisconsin Regional Planning Commission in 1994 as part of the natural areas and critical species habitat protection and management plan being prepared by the commission. The inventory systematically identified all remaining high quality natural areas and critical species habitat then existing within the region.

Natural areas were classified based upon the natural area classification system developed by the Wisconsin Department of Natural Resources. Three classification categories are used: NA-1, natural areas of statewide or greater significance, which contain nearly complete and relatively undisturbed plant and animal

communities which are believed to resemble closely those of presettlement times; NA-2, natural areas of countywide or regional significance, which contain native biotic communities judged to be of lower than NA-1 significance, either because of evidence of a limited amount of human disturbance or because of limited size; and NA-3, natural areas of local significance, which have been substantially altered by human activities but which provide refuge for native plant and animal species that no longer exist in the surrounding area because of land uses and associated activities. A total of 105 natural areas, encompassing about 13,710 acres, or about 4 percent of the county, were identified by the Regional Planning Commission in Waukesha County in 1994. Of the 105 identified sites, nine were classified as NA-1 sites and encompass about 1,775 acres, 30 were classified as NA-2 sites and encompass about 4,890 acres, and 66 were classified as NA-3 sites and encompass about 7,045 acres.

The inventory also identified a total of 77 critical species habitat sites within Waukesha County, including 22 critical bird habitat sites, one critical mammal habitat site, and 54 critical plant habitat sites. Of the total sites, 12 critical bird habitat sites, one critical mammal habitat site, and 23 critical plant habitat sites were located outside an identified natural area, for a total of 36 critical species habitat sites located outside natural areas. (Draft Comprehensive Development Plan – Waukesha County)

Waukesha County's state and county many natural areas include:

- Fox Brook Park, Located in the City of Brookfield, is an 173-acre park site consists of 128 acres of wetlands, which will be preserved and protected as a natural habitat and open space area. This habitat allows for many species of birds; gold finches and indigo buntings to name a few.
- Fox River Park is a 262-acre park and represents an outstanding area for providing a feeling of wilderness and solitude. The abundance of wildlife provides great opportunities for nature study and the exploration of the natural world. Many wildflowers and bird species can be viewed along the trails that wind through the park.
- Menomonee Park is located within the Villages of Menomonee Falls and Lannon. Menomonee Park totals 394 acres of rolling field, high quality maple woods, cattail marsh, wetlands, and a 16-acre quarry lake.
- Minooka Park is located approximately 2 miles southeast of the City of Waukesha at the corner of Racine Avenue and

Sunset Drive. This 580-acre park is the largest park in the Waukesha County Park System

- Mukwanago Park is a 222-acre park site that includes a high ridge formed during the last glacial period, which stretches nearly the length of the park. The oak opening ridge is covered with presettlement vegetation including Burr Oak, Shagbark Hickory and ground cover of prairie plants.
- Muskego Park - The State of Wisconsin Scientific Area Preservation Council named the 60 acres of hardwoods that inhabit the park a State Scientific Area. This area is to preserve valuable plant communities, teach conservation practices and study the area's natural history. Many trails wind through Muskego Park Hardwoods offering a tranquil atmosphere and home to abundant wildlife.
- Naga-Waukee Park and Golf Course are located north of I-94, spanning the lands between the shores of Nagawicka Lake and Pewaukee Lake. This 416-acre parcel consists of a regional park, a championship 18-hole golf course and 2 lake access sites. The diverse topographical features were created during the glacial age, which enhances the beauty of the site.
- Nashotah Park is located between the communities of Oconomowoc and Hartland, 1/2 mile north of U.S.H. 16 on the west side of C.T.H. C. This 443-acre park is nestled among rolling hills, woodlands, wetlands and grasslands, offering habitat for deer, waterfowl and a variety of songbirds.
- Old World Wisconsin in Eagle is one of the country's finest outdoor living history museums and offers 576 acres to explore with over 55 historic structures moved from around the state of Wisconsin, telling the history of Wisconsin's earliest settlers.
- Kettle Moraine State Forest – Southern Unit is more than 20,000 acres of glacial hills, kettles, lakes, prairie restoration sites, pine woods and hardwood forests making this a popular area for a wide variety of visitors. The 3,500-acre Scuppernong River Habitat Area is the largest wet prairie east of the Mississippi River.
- Kettle Moraine State Forest – Lapham Peak Unit. The Kettle Moraine and Lapham Peak were formed 10,000 years ago when a glacier covered much of Wisconsin. More than 1,000 acres of this hilly terrain are within the Lapham Peak boundaries. Lapham Peak has a variety of sights and activities to offer. (http://www.waukeshacountywi.com)

Vegetation

Sugar maple, basswood and elm dominate in the east and northwest portions of the county. In the central part of the county there is a large area of oak savanna. In the south part of the county there are a few areas of sugar maple.

(http://www.wisconline.com/counties/Waukesha/index.html)

Demographics

Human Settlement Patterns

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

Between 1670 and 1680, the first Europeans to visit this land were the French traders to establish trading and military posts in the name of France, and the Jesuits to bring Christianity to the native inhabitants. Because the French made no definite settlement of the territory they yielded their rights to the English in 1761, who claimed possession until after the Revolutionary War. By the Treaty of 1835, the Indian tribes gave up their homeland and were moved to the country west of the Mississippi.

Waukesha County was home to prehistoric Indians, including the Effigy Mound Builders and Potawatomi people and was prized by fur traders in the 1700's. When settlers from the east arrived in the mid-1800's, they found four to six foot earthen mounds in the shape of birds and turtles, along with conical and linear mounds. Three conical mounds are visible today in front of the City of Waukesha Library. Increase Lapham, considered founder of the U.S. Weather Bureau, surveyed the mounds. The highest point in Waukesha County is named for him. (www.waukeshacounty.gov)

In January of 1846, the Territorial Legislature voted to separate Waukesha County from Milwaukee. There was a strong popular desire for an Indian name. Waukt-shaw was suggested as being the Potawatomi form of fox, because the waters of the lower part of the county drain into Fox River of Illinois, which is named for the Fox tribe of Indians not for the animal.

(http://www.wisconsinhistory.org/dictionary/index.asp)

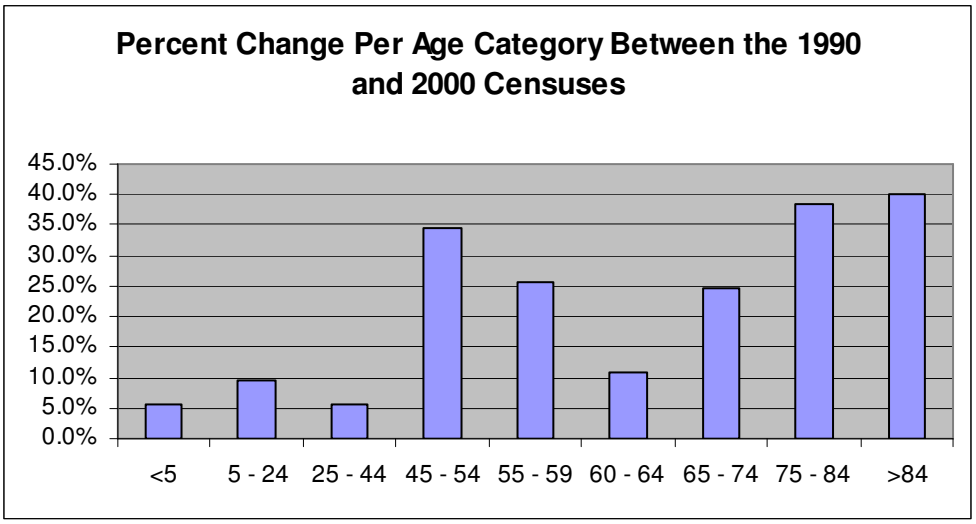
In April of 1846 Waukesha County was formed with sixteen townships. Supervisors representing each of the sixteen towns were elected to organize a county board, elect officers and to provide for and build necessary county buildings.

Population

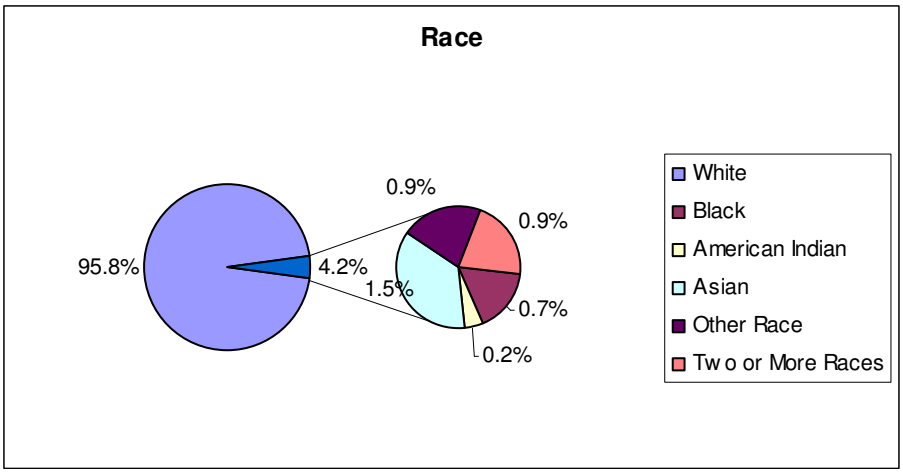
In recent decades, Waukesha County has experienced rapid development. The development has been accompanied by a population increase of 35% in 27 years. In 1980, the county was home to nearly 280,326 people; in 2001, there were 360,767 and according to the 2007 U.S. Census Bureau estimate, there are 379,333 people residing in Waukesha County.

According to the 2000 U.S. census report, there are 135,229 households in Waukesha County with an average of 2.63 people per household. This is an increase of 29,239 households over the 1990 census when 105,990 households were reported. The 1999 U.S. census numbers indicate that the median household income is $62,839 and that the per capita income is $29,164. Approximately 2.5% of the people live below the poverty line. The 2000 census also indicated that there are approximately 140,309 housing units within the county.

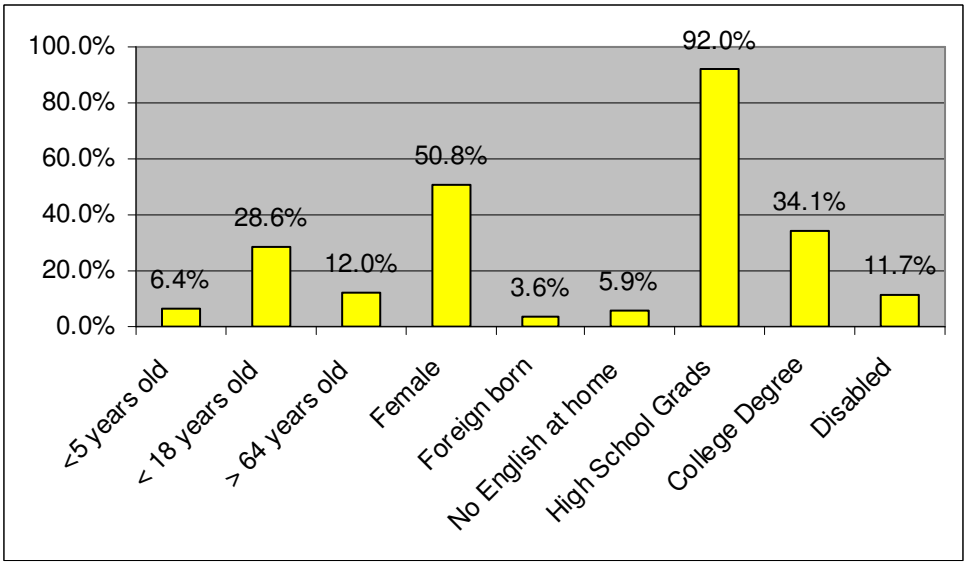
The population of Waukesha County rose from 304,715 to 360,767 between the 1990 and 2000 censuses. This is an increase of 56,052 people—a population growth rate of 18%.



According to the 2000 U.S. Census, the overwhelming majority of people in Waukesha County reported that they were white. People of Hispanic or Latino origin were counted as a subcategory of those reporting that they were white, as another race or as two or more races. These groups totaled 2.6% of those categories. There are no Native American tribal lands located within Waukesha County.



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



Waukesha County contains the Cities of Brookfield, Delafield, Muskego, New Berlin, Oconomowoc, Pewaukee and Waukesha; the Villages of Big Bend, Butler, Chenequa, Dousman, Eagle, Elm Grove, Hartland, Lac La Belle, Lannon, Menomonee Falls, Merton, Mukwonago, Nashotah, North Prairie, Oconomowoc Lake, Pewaukee, Sussex and Wales and the Townships of Brookfield, Delafield, Eagle, Genesee, Lisbon, Merton, Mukwonago, Oconomowoc, Ottawa, Summit, Vernon and Waukesha.

Transportation Network

Waukesha County has over 2,917 miles of federal, state, county and local roads within the county and over 373,000 registered automobiles, trucks, semi-trailers and motorcycles. Four freeways, Interstate Highway 43, Interstate Highway 94, State Highway 16 and U.S. Highway 41/45 serve Waukesha County. In addition, the county is served by State Highways 36, 59, 67, 74, 83, 100, 145, 164, 175 and 190. The County Trunk System includes over 391 miles of roads. Over 78 percent of road miles in Waukesha County are local village, town or city roads.

This street and highway system within the county serves several important functions; including providing movement of vehicular traffic; providing access for vehicular traffic to abutting land uses; providing for the movement of pedestrians and bicycles and serving as a location for utilities and storm water drainage facilities.

An arterial is a high-volume street that functions to conduct traffic between communities and activity centers and to connect communities to interstate highways. Arterial streets are defined by as streets and highways which are principally intended to provide a high degree of travel mobility, serving the through movement of traffic and providing transportation service between major sub-areas of an urban area or through an area. In a rural area, an arterial is a high-volume street that functions to conduct traffic between communities and activity centers and to connect communities to interstate highways. Together, arterial streets should form an integrated, area wide system. The most heavily traveled arterial streets and highways in the County are Interstate Highway 94, Bluemound (US Highway 18), Capitol Drive (State Trunk Highway 190), Moorland Road (County Trunk Highway O), Cleveland Avenue (County Highway D), Interstate Highway 43, State Highway 164, U.S. Highway 41/45, State Highway 16, State Highway 59, County Highway F, County J (Pewaukee Road) and State Highway 74.

In addition to their functional classification, arterial streets and highways are also classified by the unit of government that has the responsibility, or jurisdiction, over the facility. The Wisconsin Department of Transportation (WisDOT) has jurisdiction over the state trunk highway system, Waukesha County has jurisdiction over the county trunk highway system and each local government unit has jurisdiction over local arterial streets within their community. The state trunk highway system, which includes interstate

highways, U.S.–numbered highways and state highways, generally carry the highest traffic volumes, provide the highest traffic speeds, have the highest degree of access control and serve land uses of statewide or regional significance. State trunk highways serve the longest trips, principally carrying traffic traveling through Waukesha County and between Waukesha County and surrounding counties. County trunk highways should form an integrated system together with the state trunk highways and principally serve traffic between communities in the county and land uses of countywide importance. Local arterial streets and highways would serve the shortest trips, serve locally-oriented land uses, carry the lightest traffic volumes on the arterial system, carry traffic at lower speeds, have the least access control and predominately serve traffic within a community. (Draft Comprehensive Development Plan – Waukesha County)

Waukesha County has a good transportation network. Waukesha County has maintained these roads along with others to provide a safe and efficient transportation system. With continued maintenance, these roads will continue to serve the population effectively.

Land Use and Development Trends

Waukesha County is a mixed-use community. It is in the highly-populated southeastern corner of the state. Waukesha County has some natural areas that will not be developed and some rural farming areas. At the other extreme, its close proximity to Milwaukee County means that many people who work in the City and/or County of Milwaukee live in Waukesha County and commute. Some light manufacturing and other industrial businesses have chosen to locate in Waukesha County because of its well-developed transportation network and close proximity to the urban amenities offered in Milwaukee. There is also, of course, all of the retail and service industry that is required to provide goods, support and services required by the county's residents. The county was growing on pace with the rest of the southeastern corridor until the economic "Great Recession" that began in 2008, which has dampened growth. As of the time of this plan, it is expected that growth trends will mirror the recovery of the general national, state and regional economy, which is difficult to predict at this time.

Communities were surveyed regarding substantial development projects under discussion and/or scheduled in their communities; answers follow:

- City of Muskego
  - Development of Moorland Road corridor (between Janesville Road and College Avenue)
  - Improvement of Janesville Road from two to four lanes (between Moorland Road to Racine Avenue)
- City of New Berlin - Mill Valley Business Park (SW Corner of Racine Ave. & I-43)
- City of Oconomowoc
  - Fire Station #2 (SE port of the city by the intersection of STH 67/Oconomowoc Parkway)
  - Arrowood residential subdivision (SW part of the city)
  - Woodcreek missed use development (NE part of the city)
- Village of Elm Grove
  - Bluemound Road reconstruction
  - Watertown Plank Road reconstruction
  - Proposed municipal water system.
- Village of Hartland
  - Library addition
  - Village Center (immediately behind Village Hall at 210 Cottonwood Avenue)
  - Extension of Campus Drive (current terminus north ¾ mile to connection with County Trunk Highway K)
  - Future subdivisions (Gray Oaks and Murphy Farms in NE Quad of Village)
- Roads and Utility Buildings - Village of Lac la Belle
- Village of Lannon – The Cawley Property would first be mined (rock quarry) and then converted to a housing development. Discussions are in the early stages.
- Village of Menomonee Falls
  - Construct a new centralized public works garage and maintenance facility
  - Construct a sanitary sewer lift state including sanitary sewer and water main piping at N50W211 River Road
  - Construct a new municipal water supply well no.10 at N56W193 Silver Spring Dive
  - Redevelopment of the Richfield Way Corridor along the South Side of US 41/45 between Pilgrim Road and Water Street
  - Quail Haven Subdivision- East side of Marcy Road south of Walnut Way Drive

  - Fairway Village-Cul Du Sac at the East end of River Park Drive, South of Fond Du Lac Avenue
  - Christman Estates Subdivision- East Side of Maple Road North of Christman Road
  - Edgewood Preserve Subdivision – East Side of Town Hall Road North of Good Hope Road
- Village of Merton - Remodel old Baptist church on Main Street for community use
- Village of Mukwonago
  - Black Bear subdivision (condominiums) overlooking Vernon Marsh, east of STH 83, north of CTH NN. Conceptually approved, depending on economic conditions, requires further approvals
  - TID #3, south of I-43, east of STH 83 – vacant parcels, plus three additional phases (commercial, industrial, office and potential residential)
  - Fairwinds – north of CTH NN, west of STH 83, two additional phases
  - Minors Homestead, south of CTH NN, north of CTH NN, west of STH 83, one additional phase
  - Orchards of Mukwonago – between CTH ES and Honeywell Rd., one additional phase (in Waukesha County)
- Village of Oconomowoc Lake - East Wisconsin Avenue to McAdams for a mall and restaurants
- Village of Sussex
  - Glen at Seven Stones Subdivision
  - Glenwood Condo Development
  - Mammoth Springs Project
  - Engage Sports Building
  - a major outpatient medical facility
- Village of Wales - Retail offices/commercial project Tenby Harbor
- Village of Waukesha –
  - Dry Creek Subdivision - Milky Way Rd.
  - Hwy 164 Corridor - commercial/industrial planning and development.
  - Hwy 59 (Arcadian Ave.) Business corridor planning and development
- Town of Delafield
  - Northview Ridge Subdivision - Northview Rd.
  - Beach Park Circle – 2009 road reconstruction
  - Replacement of culvert on E. Glen Cove 2009
- Town of Genesee - None proposed for 2009. We had two new subdivisions approved in 2008 and road construction (1st lift of asphalt) just completed in the fall of 2008.

- Town of Merton - Library Addition
- Town of Mukwonago - Grey Hawk Meadows Subdivision near the corner of CTH NN and CTH E
- Town of Summit - Genesee Lake Road Park and municipal buildings located at the SW Corner of Genesee Lake Road and Dousman Road
- None - City of Brookfield; Villages of Big Bend, Butler, Chenequa, Dousman, Eagle, Nashotah, North Prairie and Pewaukee; Towns of Lisbon, Oconomowoc and Ottawa

Public Safety Support

Medical

The Waukesha 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. Waukesha County communities are served by a complete range of health facilities and health professionals.

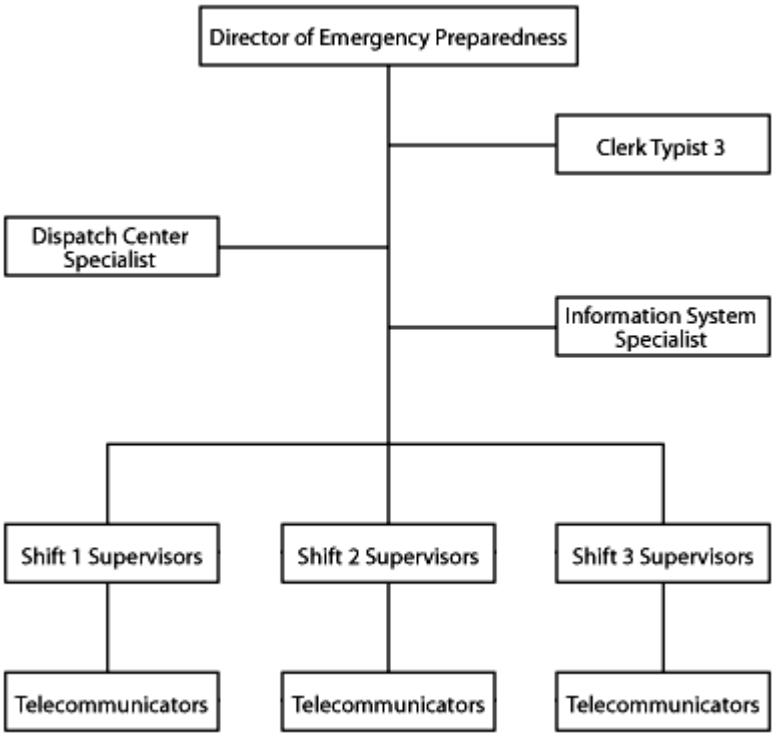
Waukesha County has five operating hospitals that provide care to county residents. In addition, over 600 physicians practicing in Waukesha County provide a variety of healthcare services for residents. Aurora Healthcare recently opened a new 110-bed hospital in the Town of Summit near Interstate I-94. The following hospitals are in Waukesha County:

- Waukesha Memorial Hospital Waukesha - 400 beds
- Community Memorial Hospital Menomonee Falls - 208 beds
- Elmbrook Memorial Hospital Brookfield – 166 beds
- Oconomowoc Memorial Hospital Oconomowoc - 130 beds
- Rogers Memorial Hospital Oconomowoc – 90 beds
- Aurora Summit Hospital – Summit – 110 beds

In addition, the 23 area hospitals and 12 immediate care centers of Milwaukee County are readily accessible to Waukesha County residents. These health care facilities will coordinate with responding agencies to ensure the best utilization of services and the least injury or loss of life from a disaster situation. It should also be noted that area hospitals have reciprocal verbal agreements for transferring critical patients during a disaster.

The Waukesha County Communications Center (WCC) is a 9-1-1 Public Safety Answering Point (PSAP) and Dispatch Center for 29 communities within Waukesha County and was the first PSAP to implement Wireless 9-1-1 with the new Phase I & II technologies.

The communications center is staffed with 40 telecommunicators who are divided into three different functions; call takers, police dispatchers and fire dispatchers. Each shift has two supervisors providing 24x7 coverage and four administrative personnel.



In 2004 the LACs dispatch center, the Sheriff's dispatch center and six agencies formally dispatched by another center moved over to WCC.

Other active PSAP's in Waukesha County include:

City of Muskego Police
City of New Berlin Police
City of Oconomowoc Public Safety
City of Waukesha Police
Village of Elm Grove
Village of Menomonee Falls Police
Village of Mukwonago

In 2005 the City of Brookfield and the Village of Butler joined the center completing the transition process that began the year before. The following communities and fire districts are dispatched by WCC:

- Big Bend
- City of Brookfield
- Town of Brookfield
- Butler
- Chenequa
- City of Delafield
- Town of Delafield
- Dousman
- Village of Eagle
- Town of Eagle
- Genesee
- Hartland
- Lac La Belle
- Lisbon
- Town of Merton
- Village of Merton
- Nashotah
- North Prairie
- Town of Oconomowoc
- Oconomowoc Lake
- Ottawa
- City of Pewaukee
- Town of Pewaukee
- Summit
- Sussex
- Vernon
- Wales
- Town of Waukesha
- County of Waukesha
- Big Bend/Vernon Fire Dist.
- Dousman Fire Dist.
- Eagle Fire Dist.
- Lake Country Merton Fire Dist.
- North Lake Fire Dist.
- Okauchee Fire Dist.
- Pewaukee Fire Dist.
- Stone Bank Fire Dist.
- Summit Fire Dist.
- Wales/Genesee Fire Dist.

(http://www.waukeshacounty.gov/)

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

Fire Service

Thirty-seven municipalities and an area of 556 sq. miles are served. Approximately 1,600 personnel, staff the 30 fire departments in Waukesha County. There are 51 fire stations (not including the Lisbon fire station), 90 fire engines, 20 ladder trucks and 64 ambulances with a $30 million per year operating budget. There are 24 municipal fire departments, 6 private corporations, 5 volunteer fire departments, 8 paid on call fire departments, 15 combination fire departments and 2 full-time fire departments. Paramedic services are provided for Big Bend/Vernon, the cities of Brookfield, Delafield and Waukesha, the Town of Brookfield, Elm Grove and Mukwonago. Of the 1,600 personnel, 215 are full time personnel, there are 11 full-time fire chiefs and 107 licensed paramedics in the County. A 2003 survey indicates there were 6,500 fire responses and 19,000 EMS calls. (See Waukesha County Fire Districts Map in Appendix A for district boundary details.)
(http://www.waukeshacounty.gov/posting/agenda/Committee/185/pdf/3924Minutes.pdf)

A-level hazardous materials (HazMat) response is sponsored by the State of Wisconsin and is provided by Milwaukee Regional Response Team #4. Some county departments also feature specialized skills such as water rescue/dive, hazardous materials and confined space entry.

Ambulance Service

The following departments in Waukesha County provide ambulance service:

- Big Bend-Vernon Fire Department
  License Level: EMT-Paramedic
- City of Brookfield Fire Department
  License Level: EMT-Paramedic

- Town of Brookfield Fire Department
  License Level: EMT-Paramedic
- Butler Volunteer Fire Department
  License Level: EMT-Basic
- City of Delafield Fire and Rescue
  License Level: EMT-Paramedic
- Town of Delafield Fire Department
  License Level: EMT-Intermediate
- Dousman Fire District
  License Level: EMT-Intermediate Technician
- Eagle Fire Department
  License Level: EMT-Intermediate Technician
- Elm Grove Emergency Medical Service
  License Level: EMT-Paramedic
- Hartland Fire Department Rescue
  License Level: EMT-Intermediate Technician
- Kettle Moraine EMS Inc
  License Level: EMT-Basic
- Lannon Fire Department
  License Level: EMT-Intermediate Technician
- Lisbon Fire Department
  License Level: EMT-Intermediate
- Village of Menomonee Falls Fire Department
  License Level: EMT-Intermediate Technician
- Merton Fire Department Inc
  License Level: EMT-Basic
- Mukwonago Fire Department
  License Level: EMT-Paramedic
- City of New Berlin Fire Department
  License Level: EMT-Intermediate Technician
- North Prairie Fire Department
  License Level: EMT-Basic
- Oconomowoc Fire Department
  License Level: EMT-Intermediate Technician
- Pewaukee Fire Department
  License Level: EMT-Intermediate Technician
- Stone Bank Volunteer Fire Department
  License Level: EMT-Intermediate Technician
- Sussex Fire Department
  License Level: EMT-Intermediate Technician
- Tess Corners Volunteer Fire Department
  License Level: EMT-Intermediate
- Wales - Genesee Fire Department
  License Level: EMT-Intermediate Technician

- City of Waukesha Fire Department
  License Level: EMT-Paramedic
- Town of Waukesha Fire Department
  License Level: EMT-Intermediate

http://dhs.wisconsin.gov/ems/EMSsection/Provider/WAUKESHA.HTM

Law Enforcement

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 Waukesha County. The Sheriff's Office provides law enforcement service to unincorporated areas of the county or to those jurisdictions that do not maintain full time police service. The department also provides security for the County Courthouse and the twelve Circuits Court branches and five Court Commissioners. The Department also staffs and maintains a 469-bed County Jail and a 330-bed Huber Law work-release facility. In addition, the department provides the following specialized services:

- Drug Enforcement
- Canine Support
- Identification
- Crime Prevention
- Tactical Enforcement
- Underwater Search and Rescue
- Computer Forensic/High Tech Crimes
- Polygragh
- Civil Process Service
- Accident Reconstruction
- Crime Scene Documentation
- Clerical Services

Today the department is comprised of more than 330 sworn and non-sworn personnel and provides direct police services to nearly 400,000 residents. (http://www.waukeshacounty.gov)

A large number of local law enforcement departments are also responsible for protecting and serving the citizens of the many municipalities within the county. Some are large, municipal departments with full-time officers, many with special trainings such as Dive, Investigations and Tactical/SWAT and functions such as bicycle units, school resource officers, neighborhood watch, gangs/special crimes, Drug Abuse Resistance Education (D.A.R.E.), Crime Stoppers, Neighborhood Watch etc. Other

departments are smaller and may have part-time staffing but all proudly serve as law enforcement professionals. Municipalities with departments are listed below:

- City of Brookfield www.cityofbrookfield.com
- City of Delafield www.cityofdelafield.com
- City of Muskego www.ci.muskego.wi.us
- City of New Berlin http://www.newberlin.org/
- City of Oconomowoc www.ci.oconomowoc.wi.us
- City of Pewaukee www.cityofpewaukee.us
- City of Waukesha www.ci.waukesha.wi.us
- Village of Big Bend www.villageofbigbend.com
- Village of Butler www.butlerpolice.org
- Village of Chenequa www.chenequa.wi.us
- Village of Dousman www.dousman.govoffice2.com
- Village of Eagle www.eaglepolicedepartment.com
- Village of Elm Grove www.elmgrovewi.org
- Village of Harland www.villageofhartland.com
- Village of Lac La Belle www.villageoflaclabelle.com
- Village of Lannon www.villageoflannon.com
- Village of Menomonee Falls www.menomonee-falls.org
- Village of Merton www.villageofmerton.com
- Village of Mukwonago www.villageofmukwonago.com
- Village of Nashotah www.nashotah-wi.gov
- Village of North Prairie www.northprairie.net

- Village of Oconomowoc Lake http://oconlake.com
- Town of Brookfield www.townofbrookfield.com
- Town of Mukwonago www.townofmukwonago.us
- Town of Oconomowoc www.topdonline.com
- Town of Summit www.summittown.org

See the Waukesha County Law Enforcement District Map in Appendix A for district boundary details.) Also, the Wisconsin State Patrol provides limited coverage from their district office in Waukesha. Additional details for some law enforcement agencies and their staffing are listed below:

Special Teams

Waukesha County began offering Community Emergency Response Team (CERT) training sessions in the last half of 2007. CERT training includes basic disaster preparedness and response skills to help people protect themselves, their families and their neighbors following an event when professional responders are not immediately available to help. Citizens and Organizations Active in Disasters (COAD) is a newly formed association of individuals and organizations in Waukesha County, Milwaukee County and Ozaukee County interested in disaster preparedness and response.

The Sheriff's Department's Underwater Search and Rescue (Dive Team) consists of a Captain and a Lieutenant (Both Certified Divers), seven Certified Divers and two surface operators. All divers are highly trained and have completed certification in Open Water diving, Rescue diving, Ice diving, Navigation and Deep Water diving. Several are also certified as Equipment Specialists and Master Divers.

The demand for this team is approximately 20 dives per year including training. The Dive Team has assisted other agencies with a variety of tasks including, search and recovery operations, helping to recover a drowning victim and assist in the recoveries of evidence. (www.waukeshacounty.gov)

Archaeological and Historical Resources

The Wisconsin Historical Society has a listing of archaeological sites that have been identified in Waukesha County; this list is available to governmental agencies upon request. The National Register of Historic Places also includes a listing of 168 locations in Waukesha County. 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
Andrews, Sewall, House	103 Main St.	Mukwonago
Arcadian Bottling Works	900 N. Hartwell Ave.	Waukesha
Arlington Apartments	309 Arlington St.	Waukesha
Baer, Albert R., House	W166 N8990 Grand Ave.	Menomonee Falls
Bailie, Ralph C., House	530 North Ave.	Hartland
Bank of Hartland	112 E. Capitol Dr.	Hartland
Barfoth-Blood Mound Group (47 WK 63)	Address Restricted	
Barnes, Andrew, House	N89 W16840 Appleton Ave.	Menomonee Falls
Barney House	W264 S3641 Saylesville Rd.	
Barrett, Everett P., House	120 S. Porter Ave.	Waukesha
Beaumont Hop House	Address Restricted	
Becker and Schafer Store Building	1002--1004 White Rock Ave.	Waukesha
Big Bend Mound Group No. 2	Address Restricted	
Bishopstead	153 W. Oakwood Dr.	Delafield
Blair, Sen. William, House	434 Madison St.	Waukesha
Block C Historic District	Roughly bounded by W. Main St., Gaspar St. and Broadway	Waukesha
Booth, J. C., House	About 1 mi. SW of Saylesville on Saylesville Rd.	
Buchner, John P., House	609 E. Broadway Ave.	Waukesha
Buckley, Patrick J., House	1101 Buckley St.	Waukesha
Burr Oak Tavern	315--317 E. Capitol Dr.	Hartland
Camp, Thomas, Farmhouse	W204 N8151 Lannon Rd.	Menomonee Falls
Caples' Park Historic District	Roughly bounded by E. Newhall Ave., S. Hartwell Ave., Windsor Dr. and Oxford Rd., and S. East Ave.	Waukesha
Carroll, William, House	142 W. Main St.	Waukesha

Castleman, Dr. Alfred L., House	975 S. Waterville Rd.	
Chandler, Walter S., House	151 W. College Ave.	Waukesha
Chandler--Blair House	1942 Madison St.	Waukesha
Chapel of St. Mary the Virgin	2 mi. SW of Nashotah on Nashotah House Rd.	
Chicago and Northwestern Railroad Passenger Depot	319 Williams St.	Waukesha
Clarke, George Lawrence Jr., House	12810 W. Hampton Ave.	Butler
Cobb, George N., House	S of Oconomowoc at 1505 N. Golden Lake Rd.	
College Avenue Historic District	Fountain St., S. East and College Aves.	Waukesha
Cook, Alexander, House	600 E. North St.	Waukesha
Cutler Mound Group	Cutler Park	Waukesha
Cutler, Morris, House	401 Central Ave.	Waukesha
Dansk Evangelical Lutheran Kirke	400 W. Capitol Dr.	Hartland
Davis, Cyrus, Farmstead	W204 N7776 Lannon Rd.	Menomonee Falls
Davis, Cyrus--Davis Brothers Farmhouse	W204 N7818 Lannon Rd.	Menomonee Falls
Delafield Fish Hatchery	Main St.	Delafield
Dewey Mound Group	Address Restricted	
Dousman Inn	15670 Blue Mound Rd.	Brookfield
Downtown Historic District	Roughly bounded by Broadway, Grand Ave., Clinton and South Sts.	Waukesha
Dwinnell, George, House	442 W. College Ave.	Waukesha
East Broadway Historic District	Roughly, Broadway from Fisk Ave. to Morningside Dr.	Waukesha
East Capitol Drive Historic District	337--702 E. Capitol Dr.	Hartland
Elliot, Dr. F. C., House	501Dunbar Ave.	Waukesha
Fabacker, Joseph, House	341 NW. Barstow St.	Waukesha
First Baptist Church	247 Wisconsin Ave.	Waukesha
First Congregational Church	214 E. Capitol Dr.	Hartland
First Congregational Church	100 E. Broadway	Waukesha
First German Reformed Church	413 Wisconsin Ave.	Waukesha
First Methodist Church	121 Wisconsin Ave.	Waukesha
Frame, Andrew, House	507 N. Grand Ave.	Waukesha
Freewill Baptist Church	W19750 W. National Ave.	New Berlin

Friederich Farmstead Historic District	N96 W15009 County Line Rd.	Menomonee Falls
Genesee Town Hall	Genesee St.	
Goodwin-McBean Site (47 WK 184)	Address Restricted	
Grace, Perry, House	307 N. West Ave.	Waukesha
Grand View Health Resort	500 Riverview Ave.	Waukesha
Gredler-Gramins House	20190 Davidson Rd.	Brookfield
Hadfield Company Lime Kilns	N of Waukesha	
Hadfield, Joseph Jackson, House	710--712 N. East Ave.	Waukesha
Hartland Railroad Depot	301 Pawling Ave.	Hartland
Haseltine Cobblestone House	N of Big Bend on Big Bend Dr.	
Hawks Inn	428 Wells St.	Delafield
Hemlock, David, J., House	234 Carroll St.	Waukesha
Henze, LeRoy A., House	N89 W15781 Main St.	Menomonee Falls
Hinkley, Ahira R., House	NE of Eagle off WI 59	Eagle
Hoeltz, Herbert, House	N87 W15714 Kenwood Blvd.	Menomonee Falls
Hoos, Elizabeth, House	W164 N9010 Water St.	Menomonee Falls
Hoos--Rowell House	W164 N8953 Water St.	Menomonee Falls
Hornburg, Harold, House	213 Warren Ave.	Hartland
Howitt, John, House	407 N. Grand Ave.	Waukesha
Jackson House	235 North Ave.	Hartland
James Store Building	129--131 W. Broadway	Waukesha
James, Samuel D., House	726 N. East Ave.	Waukesha
Johnston, William, Lime Kiln	E of Genesse Depot	
Jones, Robert O., House	501 W. College Ave.	Waukesha
Koehler, Frank, House and Office	N88 W16623 Appleton Ave.	Menomonee Falls
Koepsel House	Old World Wisconsin, off WI 59	
Laflin Avenue Historic District	W. Laflin and Garfield Aves.	Waukesha
Lain-Estburg House	229 Wisconsin Ave.	Waukesha
Lepper, M. F., House	N88 W16596 Main St.	Menomonee Falls
Lincoln High School	N88 W16913 Main St.	Menomonee Falls
Mace, Garwin A., House	W166 N8941 Grand Ave.	Menomonee Falls
Mace, Garwin, Lime Kilns	LimeKiln Park	Menomonee Falls
Madison Street Historic District	Jct. of Madison, Randall, and Third Sts.	Waukesha
Main Street Historic District	Main and Appleton Sts.	Menomonee Falls
Mann, William G., House	346 Maple Ave.	Waukesha

McCall Street Historic District	McCall and James Sts., and N. East and Hartwell Aves.	Waukesha
McCall Street Historic District (Boundary Increase)	Roughly, Charles and James Sts. from College Ave. to McCall St. and Hartwell Ave. from College to Grove St.	Waukesha
Menomonee Falls City Hall	N88 W16631 Appleton Ave.	Menomonee Falls
Menomonee Golf Club	N73 W13430 Appleton Ave.	Menomonee Falls
Merten, Charles, House	929 Rosemary St.	Waukesha
Miller-Davidson House	On County Line Rd., E of U.S. 41	Menomonee Falls
Moore, Dr. Volney L., House	307 E. Main St.	Waukesha
Moreland Boulevard Pump House and Reservoir	413 Moreland Blvd.	Waukesha
Morey--Andrews House	704 Westowne Ave.	Waukesha
Morey--Lewis House	1312 Pleasant View Ave.	Waukesha
Morey--Markham House	1017 Westowne Ave.	Waukesha
Morey--Seidens House	2020 Easy St.	Waukesha
Mukwonago High School	308 Washington Ave.	Mukwonago
National Guard Armory 127th Regiment Infantry Company G	103 E. Jefferson at Main St.	Oconomowoc
National Hotel	235 W. Main St.	Waukesha
Needham, Enoch Gardner and Mary Caroline Koch, House	12713 W. Greenfield Ave.	New Berlin
Nelson, Charles E., Sr., House	520 N. Grand Ave.	Waukesha
Newhall Avenue Pump House and Reservoir	445 W. Newhall Ave.	Waukesha
Nickell, William, A., House	511 Lake St.	Waukesha
Northwestern Hotel	322 Williams St.	Waukesha
Oconomowoc City Hall	174 E. Wisconsin Ave.	Oconomowoc
Oconomowoc Depot	115 Collins St.	Oconomowoc
Oconomowoc Public Library and Museum	212 N. Lake Rd.	Oconomowoc
Okauchee House	34880 Lake Dr.	
Old Waukesha County Courthouse	101 W. Main St.	Waukesha
Pabst, Gustave, Estate	36100 Genesee Lake Rd.	
Pearl and Grand Avenue Historic District	Pearl Avenue generally bounded by Grand Avenue and Franklin Street and portions of Pleasant and Divsion streets	Mukwonago
Peck, Clarence, Residence	430 and 434 N. Lake Rd.	Oconomowoc

Peck, Walter L., House	38928 Islandale Dr.	Oconomowoc
Peterson Site (47 WK 199)	Address Restricted	
Philadelphia Toboggan Company Carousel No. 15	Janesville Rd.	Muskego
Pix Theater	264 West Main Street	Waukesha
Pokrandt Blacksmith Shop	128 E. St. Paul Ave.	Waukesha
Pratt, Hannah, House	501 Barney St.	Waukesha
Pratt, John A., House	N88 W15634 Park Blvd.	Menomonee Falls
Putney Block	301 W. Main St., 816 and 802 Grand Ave.	Waukesha
Putney, Frank H., House	223 Wisconsin Ave.	Waukesha
Reformed Presbyterian Church of Vernon	W234 S7710 Big Bend Rd.	
Rest Haven Hotel	915 N. Hartwell Ave.	Waukesha
Saint Joan of Arc Catholic Church	N50 W34851 Wisconsin Ave., NW of jct. with US 16	Oconomowoc
Sanger, Casper M., House	507 E. College Ave.	Waukesha
Saylesville Historic District	Saylesville Road from west bank of Genesee Creek to S52 W28731 Saylesville Road	
Schuttler, Henry and Mary, House	371 E. Lisbon Rd.	Oconomowoc
Sign of the Willows	122 E. Capitol Dr.	Hartland
Silurian Mineral Springhouse	Post Office Circle	Waukesha
Sloan, William P., House	912 N. Barstow St.	Waukesha
Smith, Camillia, House	603 N. West Ave.	Waukesha
St. Anthony's Catholic Church and Cemetery	N74 W13604 Appleton Ave.	Menomonee Falls
St. James Catholic Church and Cemetery	W220 N6588 Town Line Rd.	Menomonee Falls
St. John Chrysostom Church	1111 Genesee St.	Delafield
St. John's Military Academy	Genessee St.	Delafield
St. Joseph's Catholic Church Complex	818 N. East Ave.	Waukesha
St. Mary's Catholic Church	N89 W16297 Cleveland Ave.	Menomonee Falls
St. Matthias Episcopal Church	111 E. Main St.	Waukesha
Statesan Historic District	Boys School Rd.	
Sussex Lime Kiln	E of SR 164	Sussex
Ten Chimneys	S42 W31610 Depot Rd.	
Third Street Bridge	Roosevelt Dr.	Menomonee Falls
Totten-Butterfield House	515 N. Grand Ave.	Waukesha
Trapp Filling Station	252--256 W. Capitol Dr.	Hartland

Turck, Christian, House	Off WI 59 in Old World Wisconsin	
United Unitarian and Universalist Church	216 Main St.	Mukwonago
Van Buren, Sarah Belle, House	128 Hill St.	Hartland
Village Park Bandstand	Village Park on Garfield Dr.	Menomonee Falls
Ward District No. 3 Schoolhouse	WI 67 and Betts Rd.	
Warren, Stephen, House	235 E. Capitol Dr.	Hartland
Waukesha County Airport Hangar	24151 W. Bluemound Rd.	Waukesha
Waukesha Post Office	235 W. Broadway Ave.	Waukesha
Waukesha Pure Food Company	550 Elizabeth St.	Waukesha
Welch, C. A., House	1616 White Rock Ave.	Waukesha
West, Deacon, Octagon House	370 High St.	Pewaukee
Weston's Antique Apple Orchard	19760 W. National Ave.	New Berlin
White Elm Nursery	621 W. Capitol Dr.	Hartland
White Rock Mineral Spring Company	1702 White Rock Ave.	Waukesha
Wick, Michael, Farmhouse and Barn	N72 W13449 Good Hope Rd.	Menomonee Falls
Wisconsin Avenue Historic District	Wisconsin	Waukesha
Wisconsin Industrial School for Boys	621 and 627 W. College Ave.	Waukesha
Yanke, Louis, Saloon	200 Madison Ave.	Waukesha
Zimmer, Johann, Farmhouse	W156 N9390 Pilgrim Rd.	Menomonee Falls
Zion Evangelical Lutheran Church	403 W. Capitol Dr.	Hartland

http://www.wisconsinhistory.org/hp/register/

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

Hazard Analysis and Previous Mitigation Projects

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

Wisconsin Emergency Management (WEM) completed and regularly updates the State Hazard Mitigation Plan, which was last revised in 2008. This plan describes the hazards that have occurred or are most likely to occur within the state and includes the frequency of occurrence, potential impacts and suggested actions to mitigate the hazard. This plan is the basis for the development of all emergency management plans and is distributed upon revision to county emergency government directors and other stakeholder agencies.

The Waukesha County Emergency Management Coordinator develops and annually updates a listing of all hazards that have occurred or could occur within the county. This listing includes the definition, frequency of occurrence and actions to mitigate the hazard. In general, the threat of most hazards is consistent throughout the county. The only hazard where there were differences identified within the county was for flooding and for that hazard, specific locations are identified.

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 Waukesha County Emergency Management Office is committed to working with municipalities and the private sector to

ensure that county mitigation information is shared and it is incorporated into their planning as appropriate.

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

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

Hazard Mitigation Grant Program

- City of Brookfield (1997, DR-1180) – Acquisition of one residential structure. $139, 203.
- Village of Menomonee Falls (1997, DR-1180) – Acquisition of 11 residential structures. $1,969,799.
- City of Brookfield (1998, DR-1236) – Acquisition of one residential structure. $140,060.
- Village of Elm Grove (1998, DR-1236) – Acquisition of one residential structure and one commercial structure. $921,601.
- Village of Menomonee Falls (1998, DR-1236) – Acquisition of two residential structures. This project was a continuation of the DR-1180 project for Menomonee Falls. $397,396.
- City of New Berlin (1998, DR-1236) – Acquisition of 1 residential structure. $93,947.
- Village of Elm Grove (2000, DR-1332) – Acquisition of two apartment buildings. $943,638.

- Village of Elm Grove (2002, DR-1429) – Acquisition of one commercial structure. $208,400.

Flood Mitigation Assistance Program

- City of Brookfield (1999) – Flood Mitigation Plan approved by FEMA on 1-14-02. $10,000

- City of Brookfield (2000) – Acquisition of one repetitive loss property (Supplemented FMA 2000 funds). $46,267.

- City of Brookfield (2001) - Acquisition of one repetitive loss property (Supplemented FMA 2000 funds). $140,219.

Pre-Disaster Program

- Village of Elm Grove (2002) – All-Hazards Mitigation Plan; was approved. $4,369.

- Waukesha County (2007C) - All-Hazards Mitigation Plan. $63,976.

Community Development Block Grant – Community Facilities

- Village of Menomonee Falls (FY99-0504). CDBG DRA grant to acquire two of ten floodplain properties (land and buildings). $171,261.

WI Department of Natural Resources – Municipal Flood Control

- Village of Elm Grove (3/1/02–8/31/04, MFC-67122-A-02) – Underwood Creek Flood Control Property Acquisition. $744,678.

- City of Brookfield (3/1/02–6/30/03, MFC-67206-A-02-UNDER) - Underwood Creek Flood Storage Property Acquisition. $257,004.

- City of New Berlin (1/1/06-12/31/07, MFC-67261-06) – U-314 Fullerton Avenue Property. $147,070.

- City of Brookfield (12/15/06-12/15/08, MFC-67206-06) – Calhoun Dam Removal and Channel Restoration. $207,922.50.

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 Waukesha 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 Waukesha County by identifying potential property damage risks and recommending appropriate mitigation strategies to minimize potential property damage.
- **Objective 3:** To promote countywide planning that avoids transferring the risk from one community to an adjacent community, where appropriate.
- **Objective 4:** To identify potential funding sources for mitigation projects and form the basis for FEMA project grant applications.

Vulnerability

Perhaps the largest risk that falls under the all-hazards banner is the continuing challenge of securing funding to keep up with the rapid technological changes and advances in the public safety communications infrastructure.

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 on the same band (i.e., 800 MHz) and are generally able to communicate with one another but many of the mutual aid departments that work with Waukesha County departments are still on the VHF band.

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

In general, most of the projects that can be done with current budgetary dollars are not capital improvement projects and are not very expensive. Projects that require significant capital outlays 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

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

Public Alert and Notification

Public alert and notification plans are vital in a time of crisis to reduce property damage and human casualties. An advance plan allows the appropriate authorities to perform their emergency duties

in an efficient manner. Waukesha County will maintain the following:

- Facilities, systems and procedures to activate warning and communication capabilities,
- Systems to support communications, including:
    - Sirens to warn the public. The municipalities plan to conduct a survey of the existing siren capability and ensure that maintenance, monitoring and usage policies/procedures reflect the current wishes of the fire chiefs. It should be noted that all sirens are municipally-owned; the county dispatch center can test/tone some of them but some can only be activated by the municipality.
    - Telephone and radio to notify public personnel
    - Local television, radio and newspaper connections to spread warning information
    - Local law enforcement, fire and rescue communications
    - An emergency communications center. Waukesha County Emergency Preparedness Department receives and distributes warning information to the public and emergency services agencies.

During an emergency, the general public receives information by sirens, NOAA weather radio, local broadcast or printed media, My State USA, 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. As a result, Waukesha County will continue to promote increased use of these radios among the public by sponsoring public information campaigns that point citizens to vendors. The county emergency management office will also support similar campaigns sponsored by the National Weather Service and the amateur radio club.

Waukesha County was a pilot program for the My State USA mass community notifications system and is now a paying customer. The

program's authorized users can select a pre-completed list of people for notification (e.g., EOC activation call list) or can select a polygon shape based on a community disaster area. The numbers within that shape will then be called and given a recorded disaster message. The County and City of Waukesha have been linking websites and working on seamless data merges.

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

Waukesha County should be capable of the following:

- Disseminate emergency warning and notification to the public though its county-wide warning systems,
- Support emergency management operations. To improve this capability:
    - Waukesha County used a $500,000 UASI grant to build a new Mobile Incident Command Post that can coordinate incident response anywhere in the county.
    - Waukesha County has acquired a fully-outfitted Mass Casualty Incident (MCI) Response Trailer. The trailer is housed at the Waukesha Fire Department, which has agreed to transport it to any MCI in the county
    - The City of Waukesha would like to upgrade their Incident Command Post to reconfigure the space and to add computers, a computer-aided dispatch (CAD) station and streaming video capabilities. In the EOC, they wish to upgrade wireless capabilities, add streaming video and improve data, phone and computer systems.
- Provide adequate warning and communication systems, and
- Plan for alternative means and resources in the event of a warning or communication system breakdown.

Waukesha County will prepare facilities, systems and procedures to activate warning and communication. During an emergency,

Waukesha County will deliver prompt and accurate warnings to businesses and residents.

Interoperable Communications

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

- The Waukesha County Emergency Operations Center (EOC), which also may serve as a host or alternate EOC for area municipalities, needs to evaluate services, contract terms and prices for a satellite phone to support EOC interoperability and sustained operations. This project may entail costs above those for the phone and service contract since the highway building blocks the line-of-sight to the EOC and required for the phone's operation.

- Waukesha County installed a VHF radio overlay system with four remote sites strategically placed across the county to provide interoperable communications for mutual aid agencies responding to Waukesha County. This system will also serve as a redundancy to the primary 800 mHz system that supports fire, law enforcement and county dispatch.

- Waukesha County and the City of Waukesha would like to improve their communications systems to include:

    - Purchase additional portable radios for law enforcement and fire service departments.

    - Equipment to patch VHF radios (primarily used by mutual aid departments) to the county's 800 mHz system.

Website

Geographic information system (GIS) mapping data is available from the Waukesha County website. The County Emergency Management Office also has a general webpage at http://www.waukeshacounty.gov and has, in past disasters, been

able to post links to disaster-specific information from FEMA, to volunteer, etc. In recognition of the importance of this communication tool, especially in pre-planning activities, county offices will review their web pages to ensure that important information and links for general preparedness topics are available from agencies such as the Department of Homeland Security/FEMA, the American Red Cross and Wisconsin Emergency Management. The county will also look for ways to publicize the website so that community members will know what valuable information is there.

Community Volunteer Organization

Waukesha County launched Citizens and Organizations Active in Disasters (COAD). This is a newly formed association of individuals and organizations in Waukesha County, Milwaukee County and Ozaukee County interested in disaster preparedness and response. COAD coordinates various citizen training programs that promote citizen and community awareness and preparedness.

Waukesha County is also very proud to have sponsored Community Emergency Response Team (CERT) training in cooperation with the local municipalities. The Community Emergency Response Team (CERT) Program educates people about disaster preparedness for hazards that may impact their area and trains them in basic disaster response skills, such as fire safety, light search and rescue, team organization and disaster medical operations. Using the training learned in the classroom and during exercises, CERT members can assist others in their neighborhood or workplace following an event when professional responders are not immediately available to help. CERT members also are encouraged to support emergency response agencies by taking a more active role in emergency preparedness projects in their community. The most active CERT chapter in Waukesha County is in the City of Waukesha, where the approximately 150 chapter members also serve as the police reserve unit. Waukesha County, through the Emergency Management Office, will continue to support the municipal chapters with the education and recruitment of volunteer disaster responders.

Community Preparedness (Planning, Training & Exercising)

Waukesha County has a comprehensive preparedness program and will work with its municipalities to complete the following preparedness programs that will also support mitigation goals:

- The county emergency management department will work with municipalities seeking the National Weather Service's (NWS) "StormReady" designation. According to the NWS, "Some 90% of all presidentially declared disasters are weather related, leading to around 500 deaths per year and nearly $14 billion in damage. StormReady, a program started in 1999 in Tulsa, OK, helps arm America's communities with the communication and safety skills needed to save lives and property–before and during the event. StormReady helps community leaders and emergency managers strengthen local safety programs." (http://www.stormready.noaa.gov/) Currently, the City of Dousman is Storm Ready and the Cities of Oconomowoc and Waukesha are working toward their designations.

- The City of Waukesha would like to complete a Continuity of Operations/Continuity of Government (COOP/COG) plan that would guide actions in the event a city building is lost.

Drought and Dust Storms

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

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

Physical Characteristics

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

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

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

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

SPI Values	
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

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

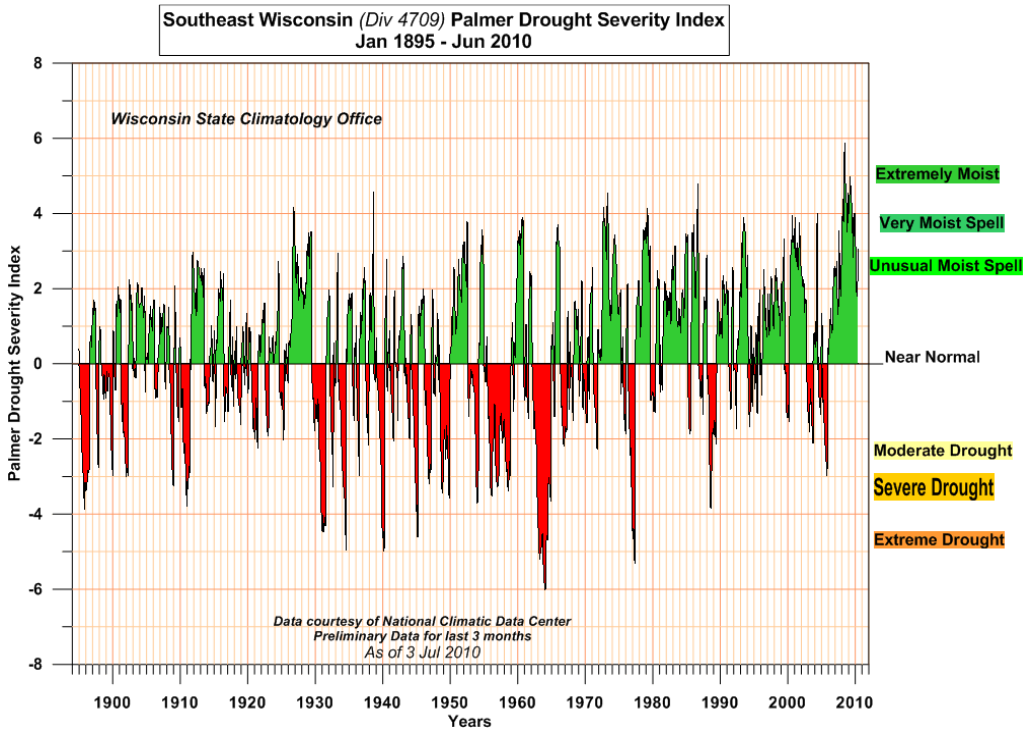
The Palmer Index is an older scale and is used more often by governmental organizations. It is effective in determining long-term drought (i.e., over several months) and is not as good with short-term forecasts (i.e., weeks.) It uses a zero as normal; drought is shown in terms of negative numbers and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

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

Frequency of Occurrence

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

The Palmer Index chart for the years between January 1895 and 5 January 2010 in Southeastern Wisconsin, which includes Waukesha County follows:



http://www.aos.wisc.edu/~sco/clim-watch/graphics/pdsi-ts-09-l.gif

On July 15, 2005, the Governor declared a drought emergency for the entire state of Wisconsin. This declaration, the first since August 2003, allowed farmers access to additional water for crop irrigation. The National Weather Service has 12 recorded drought

events for Waukesha County between 1 January 1950 and 30 April 2011:

Location or County	Date	Death	Injury	Property Damage	Crop Damage
Waukesha County	8/1/2002	0	0	0	4.4M
Waukesha County	8/1/2003	0	0	0	0
Waukesha County	9/1/2003	0	0	0	0
Waukesha County	10/1/2003	0	0	0	0
Waukesha County	11/1/2003	0	0	0	0
Waukesha County	12/1/2003	0	0	0	0
Waukesha County	7/1/2005	0	0	0	0
Waukesha County	8/1/2005	0	0	0	0
Waukesha County	9/1/2005	0	0	0	0
Waukesha County	10/1/2005	0	0	0	0
Waukesha County	11/1/2005	0	0	0	0
Waukesha County	7/1/2007	0	0	0K	50K
TOTALS:		0	0	0	4.480M

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

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. Drought is also a major risk factor for wildfire.

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

Prolonged drought can also impact the groundwater reserves. This can reduce the ability of the municipal water services and rural individuals on wells to draw adequate fresh water. This may especially impact rural homeowners who tend to have wells that are

not drilled as deeply as municipal wells. In Waukesha County, the population that lives outside of the cities and villages are generally on well water. There could also be a safety risk during dust storms if they are severe enough to reduce the visibility of the roadways for drivers.

Hazard Mitigation Strategies

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

Some Waukesha County communities have adopted water usage regulations during drought conditions but in general, mitigation strategies for periods of drought include preparing informational releases and plans for farmers and homeowners that can be used if needed.

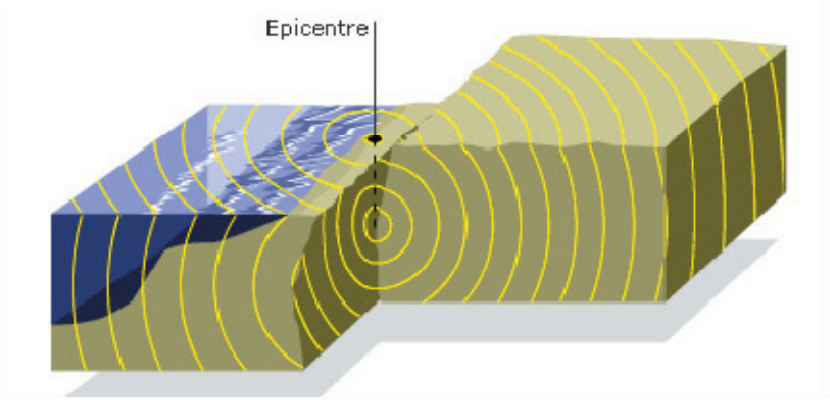
Waukesha County farmers can contact the University of Wisconsin – Waukesha County Extension Office and its federal partners from the U.S. Department of Agriculture for information and guidance related to drought. Various federal and state publications are available regarding ground water movement, the hydrologic cycle and irrigation methods. These agencies are also the lead agencies for obtaining emergency food and water supplies for agricultural use and for providing information regarding crop insurance.

Municipalities and the county will work together to ensure that drought considerations are included in emergency plans and will provide emergency information to non-farm concerns as needed. Additionally, the Village of Elm Grove would like to independently monitor severe weather advisories regarding extreme dry conditions.

The hazard mitigation strategies listed above primarily involve providing information on water conservation measures to farmers and the public. Water conservation will ensure that the resource is available for critical residential, business and agricultural uses (e.g., drinking, food irrigation, manufacturing, firefighting) and good farming practices may help prevent erosion of the rich topsoil found in Waukesha 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.)



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

Physical Characteristics

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

Earthquakes are measured by two principle methods: seismographs and human judgment. The seismograph measures the magnitude of an earthquake and interprets the amount of energy released on the Richter Scale, a logarithmic scale with no upper limit. For example, an earthquake measuring 6.0 on the Richter Scale is ten times more powerful than a 5.0 and 100 times more powerful than a 4.0. This is a measure of the absolute size or strength of an earthquake and does not consider the effect at any specific location. The Modified Mercalli Intensity (MMI) Scale

measures the strength of a shock at a particular location (i.e., intensity.)

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

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.

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.

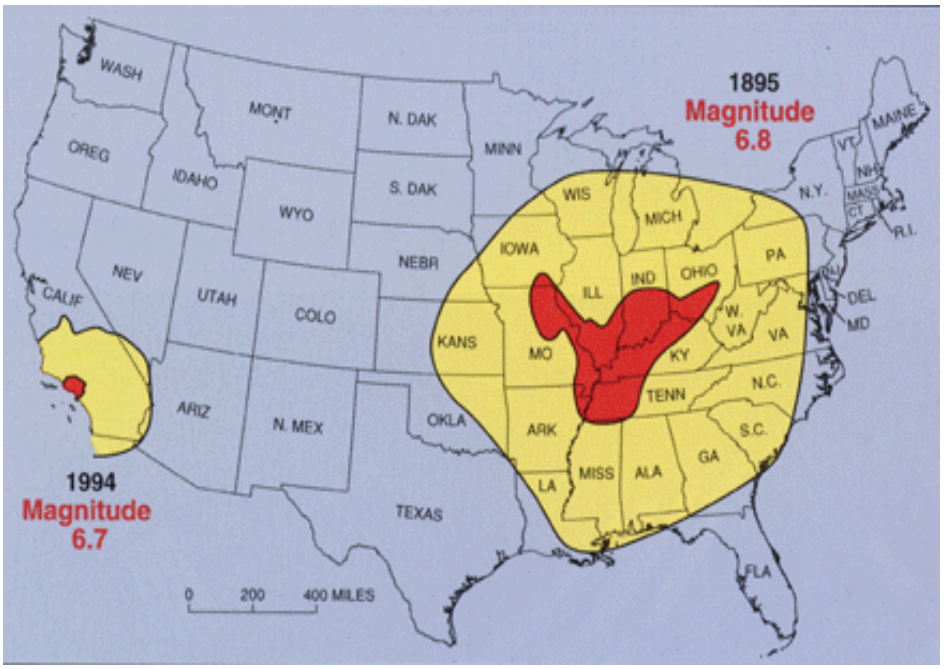
Frequency of Occurrence

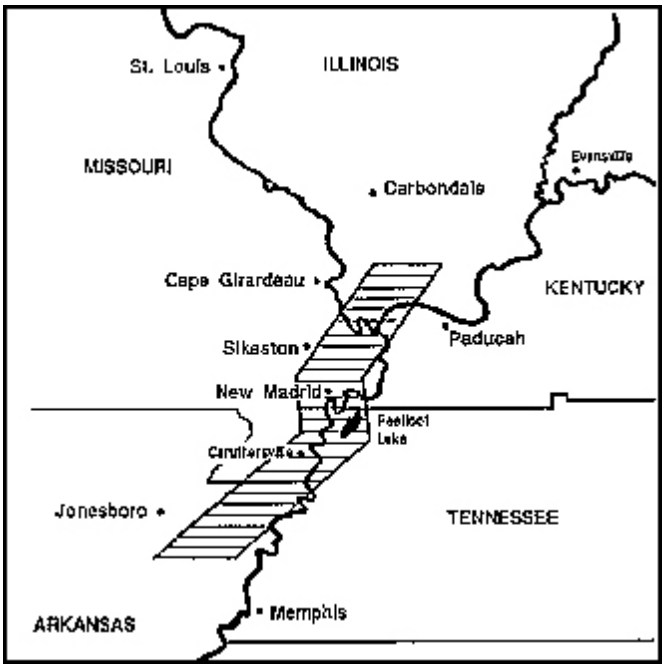
Earthquakes that have affected Wisconsin from 1899 to 1987 are listed in the table that follows. The most severe earthquake in Wisconsin was the record earthquake of 1811, centered along the New Madrid Fault. Most earthquakes that do occur in Wisconsin are very low in intensity and can hardly be felt. 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.

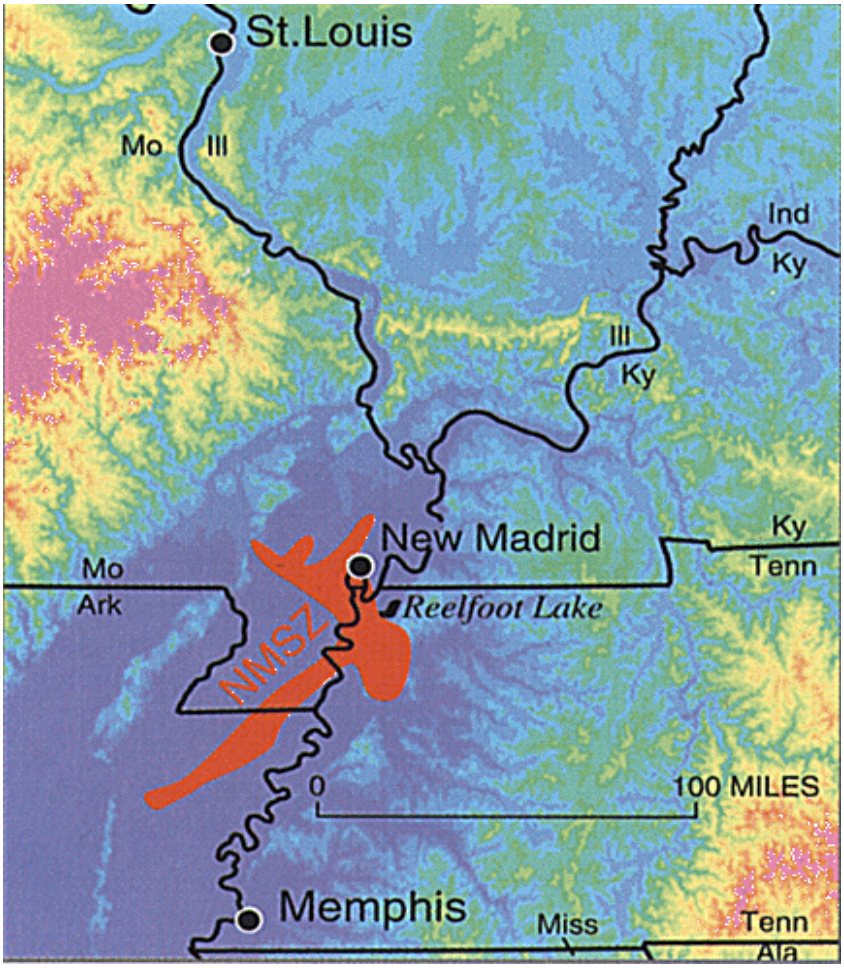
Date	Location	Latitude North	Longitude West	Maximum Intensity	Magnitude
10/12/1899	Kenosha	42° 34'	87° 50'	II	3.0
3/13/1905	Marinette	45° 08'	87° 40'	V	3.8
4/22/1906	Shorewood	43° 03'	87° 55'	II	3.0
4/24/1906	Milwaukee	43° 03'	87° 55'	III	--
1/10/1907	Marinette	45° 08'	87° 40'	III	--
5/26/1909	Beloit	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

The nearest major active fault is the New Madrid Fault, stretching along the central Mississippi River Valley in Missouri. In recent years, considerable attention has focused on seismic activity in the New Madrid seismic zone that lies within the central Mississippi Valley, extending from northeast Arkansas through southeast

Missouri, western Tennessee and western Kentucky to southern Illinois. Scientists at the Center for Earthquake Information have computed a set of probabilities that estimates the potential for different magnitude earthquakes to occur at the New Madrid Fault. Even an 8.3 magnitude earthquake at the New Madrid Fault, however, would cause only minor damage in the southeastern 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 Waukesha 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 very low.

Vulnerability

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

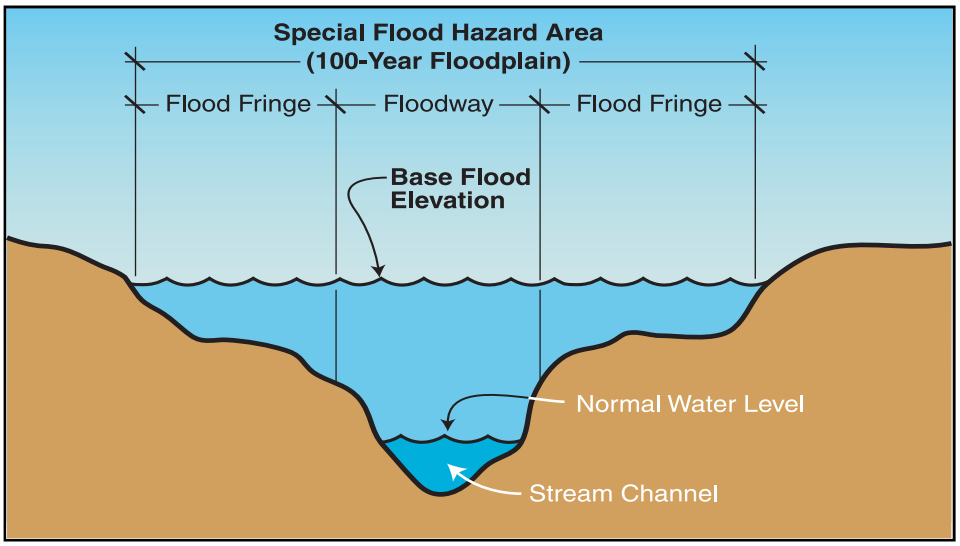
earthquake. The damage to critical infrastructure and buildings would be negligible.

Hazard Mitigation Strategies

Since Waukesha County is not likely to suffer directly from a severe earthquake, the community impacts are not considered significant and mitigation planning for this hazard is not necessary. If there is ever a need, obviously emergency resources will be mobilized but the goal for this section of the plan is therefore to educate on the low risks of earthquake damage in Waukesha 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.



FEMA, August 2001

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 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 the flood water level that can be expected to occur or to be exceeded in a given location once every 100 years. There is a one percent chance of a flood of such magnitude or greater occurring in any given year. The DNR, working with local zoning offices, has designated flood plain areas as those places where there is the greatest potential for flooding.

Flooding may also occur due to a dam breach or overflow. Dams are barriers built across a waterway to store, control or divert water; a dam failure is a failure of the dam that causes downstream flooding. Failures may be caused by technological events (e.g., materials failure) or by natural events (e.g., landslide, earthquake) with flooding being the most common result.

According to the Wisconsin Department of Natural Resources (WDNR) Dam Safety Program here 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.

Waukesha County has 79 small, uncontrolled agricultural dams included in the Wisconsin Department of Natural Resources (DNR) database:

Dam Official Name	Size	Latitude	Longitude	Owner Type	Waterway Name (Downstream City)
MONTEREY	LARGE	43.1720279	-88.4994749	PRIVATE	DRAINAGE DITCH-TR FOX R.
OKAUCHEE LAKE	LARGE	43.1085361	-88.4538685	TOWN	OCONOMOWOC
WATERVILLE	LARGE	43.02112	-88.43633	PRIVATE	SCUPPERNONG CREEK
BISCHEL	LARGE	42.9970597	-88.4781377	TOWN	UPPER SCUPPERNONG CR
WAMBOLD	LARGE	42.8559601	-88.4351349	LAKE ASSOCIATION	MUKWONAGO R
SAYLESVILLE ROLLER MILL	LARGE	42.948759	-88.3232668	PRIVATE	WHITE CREEK
MERTON ROLLING MILL	LARGE	43.1494041	-88.3066177	VILLAGE	BARK
MUKWONAGO	LARGE	42.85603	-88.33244	VILLAGE	MUKWONAGO
MONCHES	LARGE	43.1890942	-88.3417375	PRIVATE	OCONOMOWOC
PEWAUKEE	LARGE	43.0842232	-88.2646316	VILLAGE	PEWAUKEE
WILLOW SPRINGS LAKE	LARGE	42.9261265	-88.3664107	LAKE ASSOCIATION	SPRING CREEK
SARATOGA MILL	LARGE	43.01355	-88.22893	CITY	FOX
DELAFIELD FISH HATCHERY	LARGE	43.06304	-88.40215	CITY	BARK
LITTLE MUSKEGO	LARGE	42.9071	-88.1411	CITY	MUSKEGO CREEK
PEACOCK	LARGE	43.11724	-88.49899	CITY	OCONOMOWOC
UPPER NASHOTAH	LARGE	43.082284	-88.4324509	LAKE ASSOCIATION	OUTLET UPPER NASHOTAH LAKE
REISCHL	LARGE	42.8422122	-88.2430921	PRIVATE	TR-FOX RIVER
HIDDEN LAKES	LARGE	42.8817102	-88.3041344	PRIVATE	TR-FOX RIVER
SALOW LAKE	LARGE	43.0448541	-88.3315677	PRIVATE	ZION CREEK
VERNON MARSH-REF.FLOWAGE	LARGE	42.9280951	-88.2862511	DNR	DRAINAGE DITCH-TR FOX R.
VERNON MARSH-MID.FLOWAGE	LARGE	42.9204792	-88.2846198	DNR	MILL BROOK
VERNON MARSH-N.FLOWAGE	LARGE	42.9234789	-88.2842347	DNR	PEBBLE BROOK
LOWER LAKE NEMAHBIN	LARGE	43.0561637	-88.4421597	PRIVATE	BARK
SCHOOL SECTION LAKE	LARGE	42.98282	-88.50884	COUNTY	SCHOOL SECTION LAKE OUTLET
OCONOMOWOC LAKE	LARGE	43.10445	-88.46946	VILLAGE	OUTLET OCONOMOWOC LAKE
FUNKS	LARGE	43.1617749	-88.3551328	PRIVATE	OCONOMOWOC RIVER
SOUTHWEST FLOWAGE	LARGE	42.88708	-88.31844	DNR	NON-NAV DITCH TO FOX RIVER

Dam Official Name	Size	Latitude	Longitude	Owner Type	Waterway Name (Downstream City)
LEPPER	SMALL	43.1796589	-88.1144981	VILLAGE	MENOMONEE RIVER
FRASER	SMALL	42.8768781	-88.2064092	PRIVATE	TR FOX
MUSKEGO	SMALL	42.85222	-88.13085	CITY	MUSKEGO CREEK
BLOTT	LARGE	42.93033	-88.15086	LAKE ASSOCIATION	MUSKEGO CREEK
NEMAHBIN ROLLER MILL	LARGE	43.05926	-88.42266	PRIVATE	BARK
MOREY	SMALL	42.9562358	-88.3543353	PRIVATE	WHITE CREEK
BEAVER LAKE OUTLET	SMALL	43.1253972	-88.3686475	PRIVATE	OUTLET BEAVER LAKE
LAKE KEESUS	SMALL	43.1617789	-88.3274178	PRIVATE	OUTLET LAKE KEESUS
NORTH HILLS COUNTRY CLUB	SMALL	43.1586721	-88.0784026	PRIVATE	MENOMONEE
LAKE LABELLE	SMALL	43.1195256	-88.5165265	CITY	OCONOMOWOC
JENSEN	SMALL	42.9558529	-88.1995617	PRIVATE	MILL CREEK
AGNEW,DONALD P.	SMALL	43.1713657	-88.4584187	PRIVATE	TR-ASHTPPUN RIVER
CZERWINSKI,LEROY M.	SMALL	43.1778493	-88.2661951	PRIVATE	TR-BARK RIVER
GIRL SCOUTS CAMP CHINOOK	SMALL	42.9391359	-88.2496218	PRIVATE	NOT ON A STREAM
MINOOKA PARK	SMALL	42.9862514	-88.1990917	PRIVATE	TR-PEBBLE BROOK
REGAL MANORS III	SMALL	42.9683604	-88.0987427	PRIVATE	NOT ON A STREAM
SCUPPERNONG SPRINGS	SMALL	42.9344865	-88.4673018	DNR	SCUPPERNONG SPRINGS
ABENDROTH AND ASSOC. NO 1	SMALL	42.999272	-88.2551574	PRIVATE	TR-FOX RIVER
ABENDROTH AND ASSOC. NO 2	SMALL	42.9992941	-88.2551385	PRIVATE	TR-FOX RIVER
DUNLOP, DOUGLAS	SMALL	42.9212884	-88.3672788	PRIVATE	UNNAMED
HUBERTY, ROBERT L.	SMALL	42.8742883	-88.2101299	PRIVATE	TR-FOX RIVER
HASS,HOWARD	SMALL	42.981859	-88.2009633	PRIVATE	TR-PEBBLE CREEK
MCCLINTOCK SPRINGS	SMALL	42.9008751	-88.4758962	DNR	TR-SCUPPERNONG RIVER
PARADISE SPRINGS	SMALL	42.8863161	-88.4941086	DNR	TR-SCUPPERNONG RIVER
WEST ALLIS KENNEL CLUB	SMALL	42.9167323	-88.2335973	PRIVATE	MILL BROOK
GENESEE ROLLER MILL	SMALL	42.9623034	-88.3585139	PRIVATE	WHITE CREEK
DONNELLY	SMALL	42.8386733	-88.4558673	PRIV	NON-NAV
FOUNTAIN/SQUARE	SMALL	42.9905079	-88.0807048	CITY	TRIBUTARY TO ROOT RIVER
HOGAN'S DAMS		42.8582099	-88.4223737		
STONE BANK MILL DAM		43.1358619	-88.4082568		
BARK RIVER DAM		43.1001411	-88.3474471		
MANN DAM		43.1573792	-88.2928541		
WRIGHT'S DAM		42.9552245	-88.2229382		
COUNSEL DAM		43.179986	-88.4449451		
STEWART (JANES) DAM		42.9132236	-88.2427062		
R. ORMAND DAM		43.0663225	-88.1161648		

Dam Official Name	Size	Latitude	Longitude	Owner Type	Waterway Name (Downstream City)
S. BAKER DAM		43.1936754	-88.4426433		
KELLOG'S GRIST MILL DAM		42.9180871	-88.2661026		
VAN BUREN DAM		42.9187734	-88.2995717		
HUMPHREY DAM		43.0630391	-88.4021526		
PROCTOR DAM		42.9578289	-88.359203		TRIB TO WHITE CREEK
OLD OKAUCHEE DAM		43.1115481	-88.4474149		
SCHNEIDER DAM		43.159581	-88.3707366		
DEISSNER'S DAM		43.0438871	-88.2103001		OUTLET OF PEWAUKEE LAKE
WEBER BREWING COMPANY DAM		43.0085875	-88.2387524		
YOUMAN DAM		43.0080415	-88.2393451		TRIB TO FOX RIVER
WISCONSIN SUGAR COMPANY DAM		43.1844511	-88.1159401		
WAUKESHA STATE STREET DAM		43.0097038	-88.2374451		
SILVER LAKE		43.0729623	-88.5057114		
CALHOUN PARK	SMALL	42.9466063	-88.1281444	CITY	
HIGHWAY 67	SMALL	42.9249192	-88.4689061	DNR	TR SCUPPERNONG RIVER
E.S. KELLOG EST. DAM		42.8583795	-88.3714265		

Most of these dams are small, mill-type dams under the jurisdiction of the DNR and are also privately owned. None of these dams could handle the volume of water generated by a 100- or 500-year flood without overtopping. These dams are inspected by the Wisconsin Department of Natural Resources (DNR) and the largest are required to have an Emergency Action Plan (EAP) and failure analysis on them. There are no dams in other counties that pose a significant flooding risk to the citizens of Waukesha County.

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

Watersheds

Waukesha County has 10 watersheds. The maps in Attachment D show the watershed boundaries and 100-year floodplains for the

entire county. Waukesha County river systems drain to three major basins, the Rock River Basin on the western side of the county, the Fox River Basin in the center and the Lake Michigan Basin on the eastern part of the county. The Fox River Basin covers the largest area of the county, encompassing about 58 percent of the total surface area. The Rock River Basin encompasses approximately 34 percent and the Lake Michigan Basin accounts for the remaining eight percent of the county surface area. The Rock and Fox River Basins both lie west of the sub-continental divide and are part of the Mississippi River drainage area. Everything east of the sub-continental divide, including the Menomonee and Root River Watersheds, are part of the Great Lakes-St. Lawrence River drainage system. The sub-continental divide is critical to the water supply issue noted earlier and sanitary sewer planning. This is because water that is pumped from the Great Lakes system is generally required to be returned after use. For water resource planning purposes, each river basin is further divided into watersheds. There are 10 major watersheds in Waukesha County. The following sections provide additional detail on the watersheds within each basin. Most of the information presented has been compiled from DNR "State of the Basin" reports.

Rock River Basin

Ashippun River Watershed

The Ashippun River Watershed lies in Dodge, Washington and Waukesha Counties. It covers 69 square miles, of which approximately 16 square miles or 23 percent of the total watershed is located in northwestern Waukesha County. Agriculture is the primary land use and accounts for 66 percent of the land use in the Waukesha County portion of the watershed, according to the Year 2000 SEWRPC land use inventory. The water is stained light brown by tannic acid and the bottom is largely silt. The Ashippun River is classified as a warm water sport fishery.

Bark River Watershed

This 186-square mile watershed drains portions of Washington, Waukesha and Jefferson Counties and has many natural lakes, some of them large. About 47 percent of the area is in Waukesha County, 45 percent in Jefferson County and the remainder is in Washington County. Many of the watershed's lakes are experiencing heavy development pressure or have extensive development around them. While some wetlands have been

drained or filled, a significant amount of wetland remains. The greatest threat to the basin's wetlands is rapid development in Waukesha County. The watershed is about 44 percent agricultural but significant rural subdivision development occurs in the Waukesha County portion of the watershed. Of the agricultural lands, about seven percent have high soil erosion potential. Thus, agriculture use and rural development degrade local surface water quality.

Major streams in the Waukesha County portion of the Bark River watershed include the Bark River, Scuppernong Creek and Wales Creek. The Bark River is classified as a warm water sport fishery. There are currently two municipal sewage treatment plants that discharge to the Bark River within Waukesha County, the Village of Dousman and the Delafield-Hartland facility, which discharges just downstream from Nagawicka Lake.

Oconomowoc River Watershed

The Oconomowoc River Watershed drains approximately 128 square miles encompassing portions of Dodge, Jefferson, Washington and Waukesha Counties. The Waukesha County portion of the watershed is approximately 63 square miles in size representing 49 percent of the watershed. According to the Year 2000 SEWRPC land use inventory, nearly 35 percent of the Waukesha County portion of the watershed is agricultural. There is one sewage treatment plant discharge in the Oconomowoc River from the City of Oconomowoc, approximately 2 miles downstream of Lac Labelle.

Major lakes in the Waukesha County portion of the watershed include Beaver, Fowler, Lac LaBelle, Keesus, Moose, North, Oconomowoc, Okauchee, Pine and Silver Lakes. In addition to the Oconomowoc River, major streams in the Waukesha County portion of the watershed include Battle Creek, Little Oconomowoc River, Mason Creek and Rosenow Creek. Rosenow Creek is a designated trout stream and the location of a recent stream restoration project.

Scuppernong River Watershed

The Scuppernong River is a tributary of the Bark River in Jefferson County. The watershed is bordered on the southeast by the Kettle Moraine State Forest and lies with in portions of three counties: Jefferson, Walworth and Waukesha. The predominant land use is

agricultural though there is significant public ownership in the state forest and two state wildlife areas with large forested tracts and wetland areas. Other wetland areas have been drained for agriculture. Substantial low-density residential and industrial development is occurring throughout the watershed. According to the Year 2000 SEWRPC land use inventory, approximately 5,723 acres or 38 percent of the Waukesha County portion of the watershed is agricultural. Another 4,416 acres or 29 percent is considered wetland and 3,429 acres or 22 percent is classified as woodland.

Major streams found in the Waukesha County portion of the watershed include the Scuppernong River and Paradise Springs Creek. The Scuppernong River rises at the edge of the interlobate moraine in the Kettle Moraine State Forest.

Fox River Basin

Upper Fox River Watershed

The Upper Fox River Watershed is a 151 square mile drainage area located almost entirely in Waukesha County, with a very small portion (1%) located in Washington County. The Upper Fox River is the principal perennial stream in the watershed. Other significant perennial streams include Brandy Brook, Deer Creek, Pebble Creek, Pewaukee River, Poplar Creek and Sussex Creek.

According to the Year 2000 SEWRPC land use inventory, nearly 24 percent of the watershed is mapped as residential land use. Other land use categories include agricultural (23%), wetlands (13%) and transportation related (11%). Commercial and industrial land uses account for another six percent of the land area. There are many incorporated municipalities within the watershed including the Cities of Brookfield, Delafield, New Berlin, Pewaukee and Waukesha. Also included are the Villages of Hartland, Lannon, Menomonee Falls, Pewaukee, Sussex and Wales. There are three sewage treatment plants in the City of Brookfield and the City of Waukesha.

The Upper Fox River contains over 80 miles of perennial streams exhibiting a wide range of quality. At nearly 2500 acres, Pewaukee Lake is the only lake of significant size in the watershed with a maximum depth of 45 feet and an average depth of 15 feet. It is also one of the largest lakes in southeastern Wisconsin and recognized as one of the top musky lakes in the state. The lake level was naturally controlled until 1838 when a dam was

constructed at the lake outlet to power a mill. This resulted in lake levels rising about six feet and the surface area of the lake doubling. Present levels are artificially controlled by a dam at the outlet of the Lake to the Pewaukee River, which then flows about 4.4 miles to its confluence with the Fox River.

Mukwonago River Watershed

The Mukwonago River Watershed covers approximately 86 square miles in Jefferson, Waukesha and Walworth Counties. Approximately 52 square miles or 61 percent of the watershed area lies within Waukesha County. The Villages of Eagle, Mukwonago, North Prairie and Wales are found within the watershed boundary. The Village of Mukwonago has a wastewater treatment plant discharging into the Mukwonago River. Rural uses cover most of the land area in the watershed. Agriculture is dominant even in the Waukesha County portion where, according to the Year 2000 SEWRPC land use inventory, agriculture accounts for approximately 36 percent of the land use. Residential land use accounts for another 19 percent of the watershed area in Waukesha County followed by woodlands (15%) and wetlands (9%). There are nearly 50 miles of perennial streams in the watershed.

Middle Fox River Watershed

The Middle Fox River Watershed is the largest of the Fox River Basin watersheds (248 square miles), encompassing portions of Racine and Waukesha Counties, along with small portions of Milwaukee and Walworth Counties. The Waukesha County portion of the watershed covers 86,175 acres or approximately 134 square miles. In Waukesha County, portions of the Cities of Muskego, New Berlin and Waukesha lie within the watershed, along with the Villages of Big Bend, Mukwonago, North Prairie and Wales. Agriculture dominates the rural land use, accounting for over 40 percent of the area. Other rural uses include grasslands (18%), wetlands (14%), and forests (13%). Urban areas comprise nearly four percent of the land cover in the watershed.

There are about 40 miles of major perennial streams in this watershed within Waukesha County. Genesee Creek, Mill Brook, Spring Creek and White Creek are listed as cold-water communities.

Muskego/Wind Lakes Watershed

The Muskego/Wind Lakes Watershed is actually a small portion (41 square miles) of the Middle Fox River Watershed located in Waukesha, Racine and Milwaukee Counties. The Waukesha County portion of the watershed encompasses approximately 36 square miles and includes portions of the Cities of Muskego and New Berlin. Big Muskego Lake is the largest lake in this watershed covering 2,260 acres but averages only 2.5 feet deep. This lake is undergoing intensive management following the principles of "biomanipulation" to improve water quality not only within the lake but further downstream to Wind Lake and the Fox River.

Lake Michigan Basin

Menomonee River Watershed

The Menomonee River Watershed covers 136 square miles in portions of Washington, Waukesha and Milwaukee Counties. The Waukesha County portion of the watershed covers about 37 square miles and includes portions of the City of Brookfield as well as the Villages of Butler, Menomonee Falls, and Elm Grove. The Menomonee River originates in wetlands near the Village of Germantown in Washington County and runs southeasterly for 32 miles before meeting the Milwaukee and Kinnickinnic Rivers in the Milwaukee Harbor. Nearly all of the land area in the watershed is within incorporated municipalities. According to the Year 2000 SEWRPC land use inventory, nearly 42 percent of the Waukesha County portion of the watershed is residential. Other land uses in Waukesha County include: transportation-related (15%), wetlands (8%) and agriculture (7%). Commercial and industrial land uses each contribute another six percent of the total land uses respectively.

Ninety-six miles of streams are found within the watershed. Flooding continues to be a major concern in this watershed. Following the recent removal of the Falk Corporation Dam and concrete drop structure on the Menomonee River, seasonal runs of Lake Michigan trout and salmon create fishing opportunities in publicly-accessible areas

Root River Watershed

The Root River Watershed is located in portions of Waukesha, Milwaukee and Racine counties and encompasses 197 square

miles. Only about 13 square miles are within Waukesha County covering portions of the Cities of Muskego and New Berlin. According to the Year 2000 SEWRPC land use inventory, residential land use accounts for 46 percent of the land use in the Waukesha County portion of the watershed. Another 15 percent is agricultural and 14 percent is transportation related. Water quality of the 117 miles of rivers and streams in the Root River Watershed ranges from severely degraded to good.

Floodplain Regulations

Floodplain regulations have been in place in the cities, towns and villages of Waukesha 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, Waukesha County has adopted a zoning ordinance which gives a measure of protection to watersheds. The law protecting flood plains was created to meet the following objectives:

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

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

Frequency of Occurrence

Wisconsin has experienced several major floods during the last two decades. The 1973 and 1986 floods revealed that no flood plains or

urban areas in Wisconsin can be considered safe from damages. Mill-dams have developed leaks on occasion but have not caused any flooding problems.

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

- FEMA-912-DR-WI: On August 6, 1991, the President declared a major disaster as a result of high winds and severe storms that occurred July 7, 1991.
- FEMA-1180-DR-WI: On July 7, 1997, the President declared a Major Disaster as a result of flooding that occurred on June 21-23. The declaration was granted for both Public and Individual Assistance as well as Hazard Mitigation.
- FEMA 1526-DR-WI: On June 18, 2004, the President declared a major disaster as a result of severe storms and flooding that began on May 19th. Waukesha County was eligible for both Public and Individual Assistance as well as Hazard Mitigation.
- FEMA 1768-DR-WI: On June 14, 2008, the President declared a major disaster as a result of severe storms, tornadoes and flooding. Waukesha County was eligible for both Public and Individual Assistance as well as Hazard Mitigation.

Following is a table with the 45 flood events recorded by the National Weather Service between 1 January 1950 and 30 April 2011:

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
Pewaukee	2/21/1994	Flood	0	0	0	0
Oconomowoc	8/9/1995	Urban Flood	0	0	0	0
Waukesha County	8/16/1995	Flash Flood	0	0	0	0
Waukesha County	8/19/1995	Urban Flood	0	0	0	0
Waukesha County	6/17/1996	Flood	0	0	25K	1.0M
Brookfield	6/17/1996	Flash Flood	0	0	50K	0
Menomonee Falls	6/21/1997	Flash Flood	0	0	5.4M	1.2M
Big Bend	8/5/1998	Flash Flood	0	0	40K	0

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
Brookfield	8/6/1998	Flash Flood	2	1	17.3M	0
Hartland	2/11/1999	Urban/sml Stream Fld	0	0	1K	0
Elm Grove	4/23/1999	Urban/sml Stream Fld	0	0	0	0
Brookfield	5/16/1999	Urban/sml Stream Fld	0	0	0	0
Waukesha County	6/13/1999	Flood	0	0	900K	0
Waukesha	7/9/1999	Urban/sml Stream Fld	0	0	0	0
Pewaukee	7/20/1999	Flash Flood	0	0	10K	0
Waukesha County	5/11/2000	Urban/sml Stream Fld	0	0	0	0
Mapleton	5/17/2000	Flash Flood	0	0	50K	0
Mukwonago	7/2/2000	Urban/sml Stream Fld	0	0	0	0
Hartland	7/2/2000	Flash Flood	0	0	200K	0
Waukesha	7/14/2000	Urban/sml Stream Fld	0	0	0	0
Waukesha	9/11/2000	Flash Flood	0	0	50K	0
Waukesha County	2/9/2001	Flood	0	0	325K	0
Menomonee Falls	6/3/2002	Urban/sml Stream Fld	0	0	0	0
Waukesha	7/27/2002	Urban/sml Stream Fld	0	0	0	0
Waukesha	8/12/2002	Flash Flood	0	0	20K	0
Waukesha	8/13/2002	Urban/sml Stream Fld	0	0	0	0
Waukesha	8/21/2002	Urban/sml Stream Fld	0	0	0	0
Waukesha County	6/1/2004	Flood	0	0	35.6M	216.0M
Oconomowoc	8/3/2004	Flash Flood	0	0	50K	0
Mukwonago	9/25/2005	Flash Flood	0	0	50K	0
Sussex	11/5/2005	Flash Flood	0	0	10K	0
Brookfield	7/9/2006	Flash Flood	0	0	2K	0
Waukesha	7/27/2006	Flash Flood	0	0	3.0M	500K
Brookfield	9/12/2006	Flash Flood	0	0	100K	0
Mukwonago	8/19/2007	Flash Flood	0	0	100K	200K

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
Hartland	8/22/2007	Flash Flood	0	0	100K	200K
Big Bend	6/7/2008	Flash Flood	0	0	0K	10K
Oconomowoc	6/7/2008	Flash Flood	0	0	0K	10K
Waukesha Co Arpt	6/7/2008	Flash Flood	0	0	0K	10K
North Prairie	6/8/2008	Flash Flood	0	0	63.0M	1.0M
Wales	6/12/2008	Flash Flood	1	0	25K	0K
Downtown Waukesha	6/19/2009	Flash Flood	0	0	120K	0K
Downtown Waukesha	6/19/2009	Flash Flood	0	0	10K	0K
Elm Grove	7/15/2010	Flash Flood	0	0	5k	0K
Menomonee Falls	7/22/2010	Flash Flood	0	0	2.9M	50K
		TOTALS:	3	1	129.363M	220.190M

The following list summarizes damages attributed to flooding in Waukesha by the National Flood Insurance Program through 30 June 2008.

- 7 repetitive loss properties in Brookfield
- 2 repetitive loss properties in Butler
- 1 repetitive loss property in Delafield
- 2 repetitive loss properties in Elm Grove
- 1 repetitive loss property in Muskego
- 1 repetitive loss property in New Berlin
- 2 repetitive loss properties in Oconomowoc
- 1 repetitive loss property in Hartland
- 1 repetitive loss property in Waukesha

City of Brookfield

Site	Date of Loss	Building Claim ($)	Contents Claim ($)
W. North Ave.	08/06/98	3,739	0
	06/21/97	14,600	0
	04/04/82	4,797	0
W. Killarney Wy	08/01/1982	1,586	0
	04/11/79	5,469	0
Monterey Blvd	06/07/08	7,186	0
	08/06/98	10,800	125
Pomona Rd	08/06/98	21,464	3,543
	06/21/97	8,437	0
Santa Barbara Dr.	08/07/98	7,289	0
	06/21/97	7,772	0
Adelside Ln	08/06/98	32,573	0
	06/21/97	13,650	0
Oak Hill Lane	08/06/98	2,534	0
	06/21/97	16,919	0

Village of Butler

Site	Date of Loss	Building Claim ($)	Contents Claim ($)
N 124th St.	07/21/99	3,441	44,817
	08/06/98	24,528	34,037
	06/21/97	33,661	125,750
N 124th St.	08/16/83	0	16,606
	07/12/81	0	14,474
	08/04/80	0	16,813

City of Delafield

Site	Date of Loss	Building Claim ($)	Contents Claim ($)
Milwaukee Street	06/08/96	14,345	0
	10/01/93	2,943	0

Village of Elm Grove

Site	Date of Loss	Building Claim ($)	Contents Claim ($)
Legion Drive	08/06/98	24,540	0
	06/21/97	5,579	0
Legion Drive	08/06/98	64,576	21,800
	06/21/97	4,726	0

City of Muskego

Site	Date of Loss	Building Claim ($)	Contents Claim ($)
N. Shore Drive	06/11/20	125	2100
	06/12/99	2,028	331

City of New Berlin

Site	Date of Loss	Building Claim ($)	Contents Claim ($)
S. Canary Lane	08/06/98	39,837	6,800
	06/21/97	22,824	2,138

City of Oconomowoc

Site	Date of Loss	Building Claim ($)	Contents Claim ($)
Venice Beach Road	06/02/2000	1,142	0
	04/19/93	3,247	0
Venice Beach Road	06/21/97	7,287	0
	07/18/93	9,260	0

Village of Hartland

Site	Date of Loss	Building Claim ($)	Contents Claim ($)
N Lake Road	09/13/86	1,556	0
	03/25/79	5,773	553

City of Waukesha

Site	Date of Loss	Building Claim ($)	Contents Claim ($)
W St. Paul Avenue	07/27/06	1,556	0
	08/03/04	2,648	0

A careful review of the geography and history of flooding in Waukesha County leads to the conclusion that there is a very high probability of flooding in the future and a very high probability of damage and losses due to flooding. This flooding could occur due to urban stream flooding, flash flooding or, less likely, due to a dam failure.

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.

As noted in the demographics section, Waukesha County has experienced rapid development in recent decades. In 1980 the county population was nearly 280,326; in 2001 that number had risen to 360,767, which is an increase of almost 29% in 21 years. With this increase in population came an increase in physical structures (e.g., roadways, driveways, homes, parking lots, businesses), all of which increase the total area covered by impermeable surfaces. All of these impermeable surfaces have created a higher volume of run-off and a greater potential for flooding. That increased volume coupled with increased population and number of structures means that there are more lives and improved property at risk for flooding.

A recent example of Waukesha County's vulnerability to flood damages was seen after the 2008 Flooding incident. Waukesha

County was one of 34 Wisconsin communities that shared $39,220,410 in federal supplemental funds under the Community Development Block Grant (CDBG) Program to help them recover from the substantial damage sustained by county facilities, nine towns, twelve villages and seven cities. Of the $3,024,938.10 requested, $2,700,265.72 was approved by FEMA. The non-reimbursed figures range from a low of $55.57 to a high of $33,986.65 that the local units of government will have to bear. In addition, Waukesha County estimates that there are 438 low-to-middle income (LMI) households that needed additional assistance. With an average repair cost of $7,500, that translated to an unmet need for over $3,000,000 in housing assistance. In addition to $2,200,000 in residential rehabilitation the funding included:

Mukwonago Pump Station	$506,000
Pewaukee Springdale Road	$256,000
City of Waukesha A/D	$406,000
Oconomowoc Community Center	$506,000
Summit Lake Outlet Project	$506,000

Detailed information on flood-affected areas is provided in the appendices. Appendix A contains maps depicting areas that sustained damage in Waukesha County flooding events and a map of the areas identified by FEMA as areas with repetitive loss damage. These repetitive losses are identified through the NFIP record of claims. Also in Appendix E is a HAZUS-MH Flood Event Report for a Flood Study Case (100 year, 5 mi, 30 m) done for the county (rev. 12/08).

According to the Wisconsin Hazard Mitigation Plan, Waukesha County flood loss estimations for residential, commercial and government structures in Special Flood Hazard Areas [SFHA] for a two-foot flood are:

	Residential	Commercial	Government
Number of Structures	9331	154	5
Average Value	$199,922	$2,080,181	$1,033,592
Total Potential Loss	$373,076,383	$64,265,106	$1,033,592

This data was gathered with the use of Digital FIRMS or Q3 data, which is available for Waukesha County.

Another way to look at vulnerability is to look at the number of claims against the National Flood Insurance Program (NFIP) over the last thirty years. Waukesha County has had 158 claims (including 18 properties with repetitive losses) with $1,531,588 in building claims and $605,118 in contents claims for a total of $2,136,706. The Wisconsin Hazard Mitigation Plan lists Waukesha County 2nd (of 72 possible counties) when losses claimed were ranked according to claim amount. The county places 4th when ranked according to the number of claims submitted.

The Wisconsin Hazard Mitigation Plan also projects future risk for Waukesha County based on a 30-year horizon. The results show annual claims averaging $71,224 and future risk at $883,884. When ordered by projected future flood risk, Waukesha County ranks 2nd in Wisconsin.

It should be noted that several hazard mitigation projects have reduced the vulnerability to flooding in Waukesha County including:

- The Village of Elm Grove reduced the number from an initial 51 parcels to 40 parcels that exist in the 100-year floodplain. These 11 parcels were purchased and converted to greenspace with assistance from the Hazard Mitigation Grant Program (HMGP) and FEMA funding. Those properties include: the former Legion Post property (1195 Legion Drive – this property has been taken off the repetitive loss list), 1160 Legion Drive (a residential property) and the Villager Apartments (included six separate buildings). The Village also purchased 13555 Juneau Boulevard with HMGP funds. The Sleepy Hollow (hotel) site, which is included as part of the Village's final flood management plan, was purchased without any state/federal funding.

Hazard Mitigation Strategies

Waukesha County has a history of expensive damage to buildings and infrastructure due to floods. In addition to the strategies listed previously (i.e., in the All Hazards chapter) that deal with public information and planning, Waukesha County can make current and future buildings and infrastructure more disaster-resistant by:

- Using its maps and hydrology studies to ensure that properties at risk are identified and, as available, appropriate grants are sought and secured to mitigate losses. Good data also ensures that decision-makers can create and enforce

appropriate zoning and/or building regulations to make any new structures disaster-resistant.

- Targeting old structures for buy-out and convert the land to open, public lands. This also eliminates future damages by preventing building on this land.

- Pre-identifying infrastructure (roads, bridges, culverts, shoulders) prone to flooding and directing current and future budgetary dollars towards making the infrastructure disaster-resistant as it is scheduled for routine maintenance.

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 Waukesha 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 Waukesha 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, Waukesha 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 of proper floodplain zoning ordinances and land-use planning. There are several communities within the county engaged in a comprehensive planning process. The county is involved with these communities and their processes to ensure data sharing and consistency among the communities. The Waukesha County Department of Parks and Land Use will lead this effort and may apply for grants to assist with the additional costs.

Waukesha County is committed to remaining compliant with the requirements of the National Flood Insurance Program (NFIP) and all other state and federal laws. According to the NFIP, the following communities participate in the program:

- Waukesha County. Please note that the county participation covers the unincorporated municipal areas (i.e., the towns)

- Cities of Brookfield, Delafield, Muskego New Berlin, Oconomowoc, Pewaukee and Waukesha

- Villages of Big Bend, Butler, Chenequa, Dousman, Elm Grove, Hartland, Lannon, Menomonee Falls, Merton, Nashotah, Oconomowoc Lake, Pewaukee, Sussex and Wales

- The City of Pewaukee and the Villages of Chenequa, Merton, Nashotah, Oconomowoc Lake and Wales do not participate in the NFIP.

- The Villages of Eagle, Lac La Belle and North Prairie are listed as “N/A.”

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

- Incorporate mitigation activities into the local comprehensive planning process (including SMART growth plans) as applicable.

- Continue updating GIS mapping data on the planned five-year cycle

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

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

- Work to update the zoning ordinances to reflect the implementation recommendations in the February 2009 Comprehensive Development Plan.

- Completing the multi-jurisdictional Bark River flooding area study. This is a joint effort between Waukesha County, the SEWRPC and the municipalities along the Bark River. The study is nearly complete and will be submitted for review. There are still some negotiations regarding some of the findings of the study that may require adjusting the plan.

- Assist efforts to update the floodplain. The newly delineated floodplains for Keesus and Golden Lakes will be submitted to DNR and FEMA for a Letter of Map Revision (LOMR). The floodplain for the Genesee Lakes should be delineated as part of the proposed lake water level project. There are new, “yet-to-be-studied” areas that will likely be scheduled for evaluation. The county also just adopted the new floodplain in 2008. The county will be amending the floodplain provisions of its Shoreland and Floodland Protection Ordinance in 2010.

The Waukesha County Emergency Management Office disseminates public information materials related to flooding and the National Flood Insurance Program (NFIP) and will continue to have printed information as well as links to applicable sites on their webpage.

The Waukesha County Highway Department has identified some mitigation projects that would improve the disaster resistance of some of the roadways that have experience repetitive flooding.

Waukesha County Proposed Road Improvement Projects					
Location	**Municipality**	**Average Daily Traffic**	**Overtopping Frequency**	**Distance (ft)**	**Total**
CTH Y North of VV	Village of Menomonee Falls	4800	Seldom	2000	$991,801
CTH Y River Rd - Capital	City/Town of Brookfield	9000	Frequent	5400	$2,051,231
CTH M East of CTH Y	City of Brookfield	16000	Frequent	1600	$741,898
CTH Y South of CTH M	City of Brookfield	14000	Frequent	1600	$741,898
CTH Y Poplar Creek	City of Brookfield	17000	Seldom	1300	$453,227
CTH L West of Fox River	Village of Big Bend/Town of Vernon	3750	Unknown	1000	$348,636
CTH DE West of Brookhill	Town of Genesee	4000	Rare	800	$303,886
CTH D West of Brookhill	Town of Genesee	2000	Rare	1700	$645,758
CTH DR East of Bark River	Town of Summit	3180	Frequent	900	$313,773
CTH H North of CTH I	City of Waukesha	4600	Seldom	800	$303,886
CTH I South of CTH H	City/Town of Waukesha	4000	Seldom	4000	$1,519,431
CTH STH 164 to CTH F	City of Pewaukee	5300	Seldom	1300	$493,815
TOTAL					**$8,909,241**

Table Assumptions:

- Road Cost per Mile - $1,500,000
- Structure Cost per Square Foot - $100
- Right of Way Cost per Acre - $40,000

Flood Frequency Table Definitions:

- Frequent – Less than every 5 years
- Seldom – Approximately every 10 years
- Rare – Has been known to have happened
- Unknown – Not known to have happened before

In addition to Waukesha County projects, the municipalities and the Waukesha County Technical College (WCTC) have opportunities to lead their communities to become more disaster resistant. Possible projects include:

Look for an acceptable (environmentally, socially, cost-benefit, politically, etc.) solution (e.g., pumping) for removing water from flood-prone areas, especially those that are basin/bowl shaped. Some of the potential solutions may include acquisitions, demolitions, floodproofing or moving water to surface streams. Changes in development have caused increased storm runoff problems, which in turn has caused flooding in existing residential homes and streets in specific neighborhoods. Groundwater in parts of the county is rising and in one neighborhood, hard rock comes all the way to the surface not allowing water to soak in. Homes on the high sides of these areas are getting water in their basements and are pumping it out. This floods the homes in the lower areas and roads/ intersections, which is a safety hazard. There are homes pumping out water sending it into lower lying areas creating localized flooding and it should also be noted that existing storm sewers can not handle the large amount of water.

- City of Waukesha:
    - Several locations in the City of Waukesha experience significant flooding: W. College and Harvey, and Patrick and Sandra Lane, Harding and Anoka, Summit and North High and others. The City has filed four FY11 Intent to Submit forms with Wisconsin Emergency Management for the following projects:
        - Mitigate the recurring flooding of homes and roadways the Summit Ave., Anoka – Harding residential area through storm sewer reconstruction and other flood mitigation work including a retention pond.
        - Mitigate the recurring flooding of homes and roadways to a depth of four feet in the W. College/Harvey Ave. residential area through storm sewer reconstruction and other flood mitigation work including a retention pond.
        - Mitigate the recurring flooding of homes and roadways in the Sandra and Patrick Lane residential area through storm sewer reconstruction and other flood mitigation work including a retention pond.
        - Mitigate the recurring flooding of homes and roadways the Summit Ave., North High School, Michigan Ave. residential area through storm

sewer reconstruction and other flood mitigation work including a retention pond.

- A homeowner in the Fiddler's Creek subdivision has issues. The city is working with the homeowner's association to mitigate the problems.

- Town of Mukwonago:

  - Currently there are about 12 houses pumping and two to three at the bottom of the "bowl." The city has also had to pump water out to open the road to a key intersection. When this occurs, the water goes over a hill and into a surface stream causing a concern about pumping into a high-quality cold water stream and some easement issues. Once the acceptable solutions are found, the town will seek out funding sources (e.g., grants) to execute solutions.

- City of Waukesha:

  - Complete the Flood Mitigation Study and explore opportunities in the two areas deemed vulnerable (i.e., West College Ave., Maple Ave., Harvey Ave; Pine St., Bel Ayr Dr., Summit Ave., Michigan Ave., N. University Dr.)

  - The City of Waukesha would like to install a river monitoring camera system to safely/remotely monitor the NWS river level gauges because the area is a natural "chokepoint," which can cause water to rise very rapidly and it serves as a good predictor for flooding. The installation will be a three-phase project beginning in Aug. '09 and will end by Mar. '10. The system will have wireless cameras tied into a network that can be remotely monitored in the Incident Command Post (ICP) and Emergency Operations Center (EOC). The city has also applied for a Community Development Block Grant (CDBG) for four more cameras to make the system more robust.

- City of Delafield and Town of Mukwonago: Work with the Wisconsin Department of Natural Resources (DNR) on dam safety and flooding issues, including better communication and emergency plans. Recently, four dams were overtopped by flood waters and the water was affecting

bridges and roads. The affected municipalities were unaware that the DNR pulled the boards due to a failure in the communication protocols. The DNR is would also like to remove one dam and to create failure plans for the area.

- Village of Mukwonago:
  - The north bank of the Mukwonago River needs to be stabilized to control erosion from North Main (Hwy ES) to Highway 83. The goals of the project are to prevent erosion of the bank into the river, to establish a "no mow" area to filter water before it enters the river and to increase the aesthetic value of the land.
  - Raise the gate in the Mukwonago Dam, which is on the Mukwonago River, so that when it is opened the water has more room to pass out. Currently the gate does not go all of the way to the top of the dam, which restricts water flow. The new gate would also serve as a "relief valve" for the dam in major events. The Village received a grant from the Wisconsin Department of Natural Resources (WI DNR) for part of the work but is inadequate for the full extent of the project.

- Village of Menomonee Falls: Raise the road(s) and increase the flow capacity of the road(s) that service the Silver Meadows subdivision, which contains approximately 100 homes, on the west side of the village. There are only two access roads to the subdivision and the cross culverts are filled causing the roads to overtop by up to 1½ feet of water, which can close down the roads for over 24 hours. There is a child with special needs in the subdivision and all residents do not receive emergency services (fire, police, EMS) in floods. Residents have signed a petition to the village for assistance.

- Village of Merton: The Village has received and order from the Wisconsin Department of Natural Resources to complete a river berm upgrade to include tree removal and changing the slopes of the embankment around the Merton Dam (WI DNR 67.08). The WI DNR has also ordered that the village complete a dam failure analysis and a detailed Emergency Action Plan for the Merton Dam by 7/30/2011.

- Town, Village and City of Oconomowoc: Continue ongoing planning discussions regarding flooding issues caused by

dam management procedures in each municipality with the goal of creating agreements to reduce the flooding in downstream municipalities.

- City of New Berlin: Implement the mitigation measures in the City of New Berlin's Stormwater Management Plan a possible. The plan contains mitigation measures such as an extensive streambank stabilization project, creating retention ponds, waterway clearing and 13 homes that could be bought-out and converted to open space and/or retention ponds. The home buyouts were submitted for a mitigation grant but were denied except for one property (on Grange) that was bought-out.

- City of Pewaukee: Continue exploring the feasibility of creating a Storm Water Management District in the City of Pewaukee to fund mitigation projects. According to the Milwaukee Journal Sentinel,

> The City of Pewaukee may join a growing number of municipalities in the region and state that have created a public utility to charge property owners for the costs of storm-water control projects and meeting federal and state clean-water mandates. Squeezed by state levy limits, city officials are considering a storm-water utility to generate $1 million to $1.5 million per year for flood control and drainage projects, as well as meeting clean water requirements. In the past, the city has used revenue generated from the property tax levy and special assessments charged to property owners to finance various storm-water control projects. Under a storm-water utility, homeowners, businesses, churches and other property owners would pay a fee for the work. … Pewaukee Mayor Scott Klein said the city has a number of flood-control projects that need to be funded. If a public utility is not created, there is "no other way to do the work than to raise taxes." … Several areas of the city were flooded in June 2008 after heavy rains. Those areas are targeted for storm-control work. That flooding caused about $18.7 million in damage in the city.
> http://www.jsonline.com/news/waukesha/98213549.html

- City of Brookfield: Buyout one repetitive loss residential property that, because of its topography, is prone to flooding. Demolish the structure and create a retention pond. The home, which is on Parkhurst Drive, is the only one in the area and it sits in a "bowl" that floods. Most recently, the home flooded on July 22, 2010 with the basement totally filling and six inches of water standing on the first floor living area.

- City of Muskego: Evaluate hazard mitigation measures for properties that have a history of damage due to overland flooding. Exploring floodproofing, buy-outs, etc. to mitigate damages. There are 13 properties on Gaulke Dr., Saroyan Rd. (x 4), Catalina Dr., Cornell Dr., Racine Ave. (x2), Janesville (x2), Pioneer Dr. and Crowbar Dr.

- City of Brookfield:
    - Purchase and raze repetitive loss structures from flood-prone areas or where properties are subject to surface water drainage up to and into the house. The project would also include re-grading property to provide detention of runoff to reduce drainage issues elsewhere in the neighborhood. The residential homes in the Imperial Estates subdivision and along urbanized creeks are subject to surface water flooding, some of which may impact the first floor living space. Others are subject to repetitive losses from sewer backups, which are likely receiving water from other flooded houses in the area.
    - Floodproof repetitive loss structures adjacent to urbanized creeks or in or adjacent to low lying areas or floodplains. These residential properties have had flooding that may be "correctable" using floodproofing measures without purchasing the entire property or removing the house.
    - Repair the severely eroded streambank on Underwood Creek and replace driveway culverts over the creek upstream of this property with a bridge or box section. One property along this creek is experiencing significant property loss from erosion in this creek. Replacing the driveway culverts upstream of the property with a bridge or box section may reduce likelihood of repeated erosion.
    - Provide backwater valves to property owners subject to basement backups. They type of basement

backup valves that install in floor drains are very inexpensive but may reduce backups, which subject properties to thousands of dollars of damage.

- Village of Elm Grove:
  - Minor stormwater conveyance systems should be designed to provide protection from a ten-year recurrence interval event. Major stormwater conveyance systems should be designed to provide protection from a 100-year recurrence interval event. This will require regular maintenance by Department of Public Works. It should also be noted that Floodplain Mitigation Project was completed in July 2009 and was submitted to FEMA for FIRM remap in December 2007.
  - A comprehensive Stormwater Management Plan, including development and evaluation of alternative plans to abate problems caused by flooding, inadequate drainage, and nonpoint source pollution; development of a recommended plan; and establishment of procedures for plan implementation, should be adopted. To date, Chapter 235 in Village of Elm Grove Code of Ordinances was created in order to meet Chapter NR 216 Requirements and it has been sent to DNR for approval. It will be adopted following their approval of ordinance language.
  - Public and private drainage ways, both natural and man-made, should be kept free from obstructions. Easements should be obtained to protect drainage ways and allow access for maintenance. Ordinances should be adopted to enforce protection of and access to drainage ways. A maintenance schedule has been developed to keep the stormwater system functioning. This will require ongoing regular maintenance.
  - A comprehensive process should be put in place to review filling and grading of public and private parcels to assure that all stormwater management issues are addressed. Public education needs to create an awareness of the problems that can occur with improper filling and grading by homeowners. Engineering review, permitting, inspection and enforcement will be incorporated into the development and redevelopment of property. The municipal code was recently amended from 400 cubic

yards to 40 cubic yards requiring a permit (fill or excavation) and there will be on-going oversight by the Zoning Administrator/ Director of Public Works.

- As private wells provide a direct channel to the community's water resource, wells should be brought into compliance with current WDNR regulations. This would include well casings that terminate at least twelve inches (12") above the ground and twenty-four inches (24") above the base flood elevations in flood hazard zones. Well caps should be sealed. The village is studying municipal water opportunities to allow creation of municipal water utility.
- Floodplain zoning ordinances should be actively enforced. Policies should be established to address structures located in flood hazard zones. Policies could include elevation of structures, flood proofing, removal of structures, the provision of detention storage and modification of stream channels and/or bridges. If these alternatives are not feasible, the structures should be isolated from the municipal sanitary sewer system. Currently, the village checks floodplain status for all exterior building permits and reviews all exterior projects in the Village.

- Town of Mukwonago: Address flooding and roadway repairs associated with the Country Bliss subdivision. The preliminary solution is to install a force main and pumping station to take accumulated water out of a natural basin and pump it out. The accumulating water makes a few roads impassible and impacts a few properties. The flooding is primarily caused by elevated groundwater levels.

- Town of Summit: Seek an acceptable (environmentally, socially, cost-benefit, politically, etc.) solution for removing water from the Genesee Lake system and the Genesee Lake Farms subdivision. Seek out funding sources (i.e., grants) to execute solutions. The Town submitted a pre-application for 404 dollars from FEMA-1768-DR-WI, which was denied because they did not have a pre-disaster mitigation plan, which is a requirement for HMGP funding. It was awarded $506,000 from the Community Development Block Grant – Emergency Assistance Program (CDBG-

EAP) for the installation of an outlet pipe from Lower Genesee Lake to regulate the high water levels.

- Town of Lisbon: continue working on the acquisition and demolition project on Maple Aveneue. This is an ongoing project receiving HMGP grant funding. See Appendix A for maps with the details of the project's location.

- Waukesha County Technical College (WCTC)/City of Pewaukee – WCTC has a facility growth and modernization plan that reviews potential projects with an eye toward building mitigation measures in from the design. The planning committee also building environmental concerns into their projects, as can be seen by the following examples:

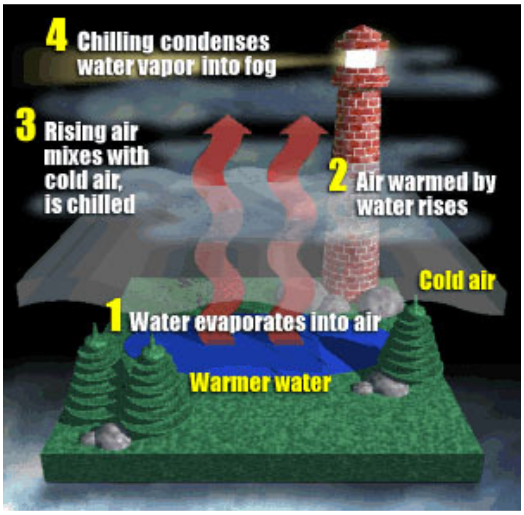
    - Work with the City of Brookfield's Fox River Water Pollution Control Center to monitor and maintain safe water discharge levels as part of the Slug Prevention Plan.
    - Work with the DNR to update the Air Pollution Control Registration Permit.
    - Working on an engineering study to see if a "green roof" can be installed on an existing building. The planned roof would be planted with approximately 6 inches of soil and native grasses.

  Mitigation projects proposed by the WCTC include continuing work on existing hazard mitigation activities such as:
    - Installing a water retention pond at the base of a hill that separates WCTC's property from the Pewaukee High School.
    - Meeting with local residents with concerns over walking trails eroded by rain in 2008-09 and described some planned repairs.
    - Adding five additional storm water retention basins as part of the Master Facilities Plan. See maps in Appendix A for proposed site locations.

Fog

Fog, at its basic definition, is a cloud based on the ground rather than in the atmosphere.

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



Physical Characteristics

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

- Radiation Fog is caused by cooling close to the earth's surface. The earth gives off long-wave radiation which on a clear night travels out into space. If the temperature drops to the dew point close to the ground, radiation fog can form.

Radiation fog is also known as ground fog. The fog normally disappears soon after sunrise as the sun's warmth evaporates it.

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

- Advection Fog results from the movement (advection) of warm, moist air from the south over a colder land mass. During the winter this is common when snow covers much of the Midwest. The snow cools the bottom portion of the moist airmass often resulting in condensation. The thickest advection fog usually forms during nights with light winds because humid air near the ground is not mixed with the drier air above. With light winds, the fog near the ground can become thick and reduce visibilities to zero; usually the fog burns off during the day but it can last many days if it is thick enough to block out the sun's light. This type of fog can occur almost anywhere in the United States, especially during winter warm-ups and early spring thaws. It can be widespread and very dangerous to commuters and aircraft travel.
- Evaporation Fog around Wisconsin is caused by cold air crossing over warmer bodies of water. The water evaporates its moisture into the colder air which immediately condenses it into clouds and fog. This is what looks like steam over Lake Michigan, inland lakes and rivers on a cold autumn or winter day. This rising fog can be found above thermal pools in Yellowstone National Park and is what you see when cool rain hits hot pavement. This may also be called "steam fog" or "sea smoke" when it forms over oceans. Sometimes this fog is lifted quickly and forms rotating whirls of fog known as *steam devils*.
- Upslope Fog is common near the Rockies, including the Denver area. If the winds are out of the east, the air flows up as it rises in elevation approaching the mountains. This

can cool the air to its dew point and result in widespread fog.

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

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

Frequency of Occurrence

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

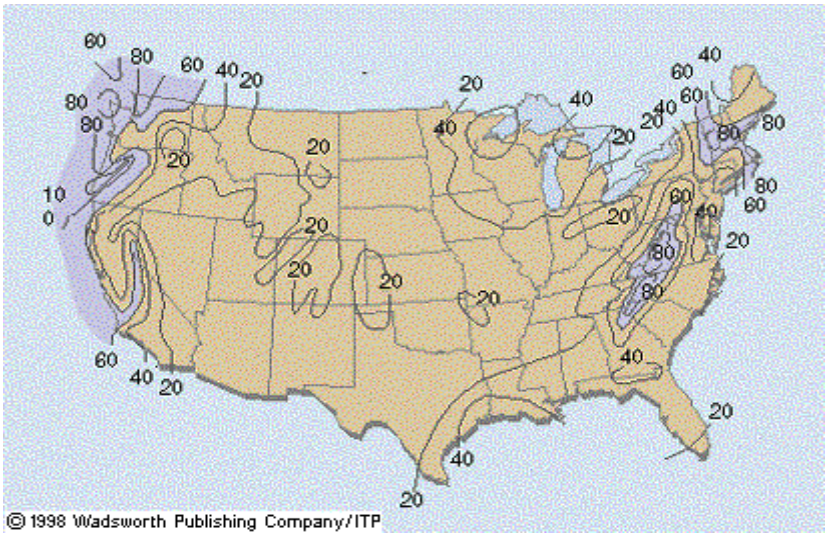
- San Francisco, California has an average of 18 days of heavy fog each year.
- Cape Disappointment, Washington is the foggiest place on the western U.S. coast with an average of 106 days of heavy fog per year.
- The foggiest area on the east coast of the United States is found along the rockbound coast of Maine. Moose Peak Lighthouse on Mistake Island, at an elevation of 72 feet, averages 1580 hours of heavy fog each year. Many other locations have problems with fog, such as Eastport, Maine with 65 days annually and Portland, with 55 days of heavy fog each year.
- Inland areas with regular heavy fog include parts of the Appalachian Mountains such as a peak area in West Virginia that averages over 100 days each year. Elkins, at

an elevation of 1948 feet has about 81 days annually with heavy fog.

- Milwaukee averages about 26 days with some heavy fog and this is comparable to the fog seen in Waukesha County.

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

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



The National Weather Service reports 53 fog events in the county between 1 January 1950 and 30 April 2011.

Location	Date	Death	Injury	Property Damage	Crop Damage
Waukesha County	11/13/1999	0	0	0	0
Waukesha County	12/3/1999	0	0	0	0
Waukesha County	12/13/1999	0	0	0	0
Waukesha County	1/9/2000	0	0	0	0
Waukesha County	2/25/2000	0	0	0	0
Waukesha County	3/21/2000	0	0	0	0
Waukesha County	8/23/2000	0	0	0	0
Waukesha County	8/24/2000	0	0	0	0
Waukesha County	10/24/2000	0	0	0	0
Waukesha County	10/24/2000	0	0	0	0
Waukesha County	1/14/2001	0	0	0	0
Waukesha County	2/24/2001	0	0	0	0
Waukesha County	3/22/2001	0	0	0	0
Waukesha County	4/7/2001	0	0	0	0
Waukesha County	5/24/2001	0	0	0	0
Waukesha County	7/19/2001	0	0	0	0

Location	Date	Death	Injury	Property Damage	Crop Damage
Waukesha County	7/30/2001	0	0	0	0
Waukesha County	8/3/2001	0	0	0	0
Waukesha County	8/22/2001	0	0	0	0
Waukesha County	9/30/2001	0	0	0	0
Waukesha County	10/22/2001	0	0	0	0
Waukesha County	11/15/2001	0	0	0	0
Waukesha County	12/2/2001	0	0	0	0
Waukesha County	2/20/2002	0	0	0	0
Waukesha County	4/13/2002	0	0	0	0
Waukesha County	9/6/2002	0	0	0	0
Waukesha County	3/20/2003	0	0	0	0
Waukesha County	2/26/2004	0	0	0	0
Waukesha County	10/12/2004	0	0	0	0
Waukesha County	12/6/2004	0	0	0	0
Waukesha County	12/9/2004	0	0	0	0
Waukesha County	12/29/2004	0	0	0	0
Waukesha County	1/11/2005	0	0	0	0
Waukesha County	11/27/2005	0	0	0	0
Waukesha County	12/27/2005	0	0	0	0
Waukesha County	1/3/2006	0	0	0	0
Waukesha County	3/9/2006	0	0	0	0
Waukesha County	3/29/2006	0	0	0	0
Waukesha County	9/14/2006	0	0	0	0
Waukesha County	9/15/2006	0	0	0	0
Waukesha County	3/9/2007	0	0	0	0
Waukesha County	6/1/2007	0	0	0	0
Waukesha County	9/20/2007	0	0	0	0
Waukesha County	10/1/2007	0	0	0	0
Waukesha County	12/21/2007	0	0	0	0
Waukesha County	9/21/2008	0	0	0	0
Waukesha County	4/30/2009	0	0	0	0
Waukesha County	9/10/2009	0	0	0	0
Waukesha County	9/12/2009	0	0	0	0
Waukesha County	3/7/2010	0	0	0	0
Waukesha County	3/10/2010	0	0	0	0
Waukesha County	5/21/2010	0	0	0	0
Waukesha County	12/30/2010	0	0	0	0
	TOTALS:	0	0	0	0

Considering its geographical location and history, Waukesha County has a high probability of fog occurrence in the future and the likelihood of damage (i.e., death and/or injury) due to fog is considered moderate.

Vulnerability

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

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

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

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

- On the morning of Friday, October 11, 2002, 50 vehicles were involved in a massive vehicle accident on Interstate 43 in Sheboygan County near Cedar Grove, Wisconsin just north of Waukesha County. This accident was the deadliest pile-up in Wisconsin history with ten individuals killed and over 40 people injured. Of the injured, seven were in critical condition and one was in serious condition at area hospitals immediately after the incident; 28 other people were treated and released for injuries ranging from burns to broken bones. The accident occurred as cars heading south collided into one another as some vehicles slowed down in a dense fog. This led to a chain reaction as numerous cars were unaware of the scene hidden behind a veil of fog. Chad

Kruse, a driver interviewed after the accident, described it by saying, “I entered the wall of fog, like someone took a blanket and threw it over the windshield.” At the same time but separate from this incident, four other accidents occurred nearby on the interstate; all the individuals involved with these accidents survived. http://www.stoutonia.uwstout.edu/2002-2003/stories/021024/ne_04.html

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

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

- In March 1990, three people were killed and 31 injured in a 52-vehicle pileup on the Tower Drive Bridge in Green Bay after dense fog and smoke from nearby paper mills created a "white wall" that reduced visibility to less than 10 feet. The accident was believed to be triggered when a tanker truck overturned and a ruptured gas tank ignited. Vehicles following too closely on the fog-shrouded bridge slammed into the tanker and were engulfed by a sheet of flames. http://www.jsonline.com/news/state/oct02/87083.asp

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

Hazard Mitigation Strategies

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

The Waukesha County Emergency Management Office will use current budget dollars to place a link on their website's preparedness page to explain safe driving procedures for driving in the fog.

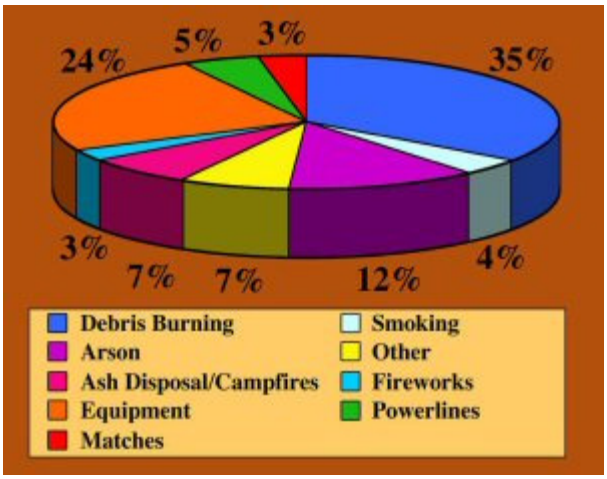
Forest and Wildfires

The forest fire and wildfire (fires on open or agricultural land) season in Waukesha 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 is responsible for forest fire protection on approximately 18 million acres of forest and wild land in Wisconsin. The U.S. Forest Service maintains forest fire protection on two million acres of this land while local fire departments retain responsibility for the remaining wooded acreage.

Physical Characteristics

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



Source: http://dnr.wi.gov/org/land/forestry/fire/fire-ps.htm

Fox Brook Park, Fox River Park, Menomonee Park, Minooka Park, Mukwanago Park, Muskego Park, Naga-Waukee Park, Nashotah Park, Old World Wisconsin, the Kettle Moraine State Forest–Southern Unit and the Kettle Moraine State Forest–Lapham Peak Unit are the natural areas in Waukesha County. Local fire departments are responsible for fire protection in these open acreage areas although state firefighting assets would provide mutual aid assistance in the state-owned lands.

Frequency of Occurrence

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

Vulnerability

Forest and wildfires can impact the ecology of the open lands. Waukesha County, which has two state forest areas and several county and municipal parks, 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.

Hazard Mitigation Strategies

Government at all levels is developing mitigation programs in fire control and firefighting tactics with the goal of protecting lives and property from loss due to forest and wildfire. Local fire departments attend regular trainings on firefighting tactics 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 about fire safety and other mitigation strategies to the public (e.g., protecting structures from wildfires), especially during Fire Safety Week in October of each year.

The Wisconsin Department of Natural Resources (DNR) has a service center in Waukesha and field stations in Delafield and Eagle. If there was a large wildfire for which local firefighters would request state assistance, the DNR may be able to provide limited assistance based upon their deployment level at that time. The DNR also conducts joint training activities with local departments, particularly Eagle and Dousman, to prepare for larger wildfires.

County Emergency Management will also partner with local fire departments to conduct outreach to stakeholders about preventing and managing wildfires caused by railroads.

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

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.

Heat Index and Disorders Table

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

FEMA, 1997; NWS, 1997

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.

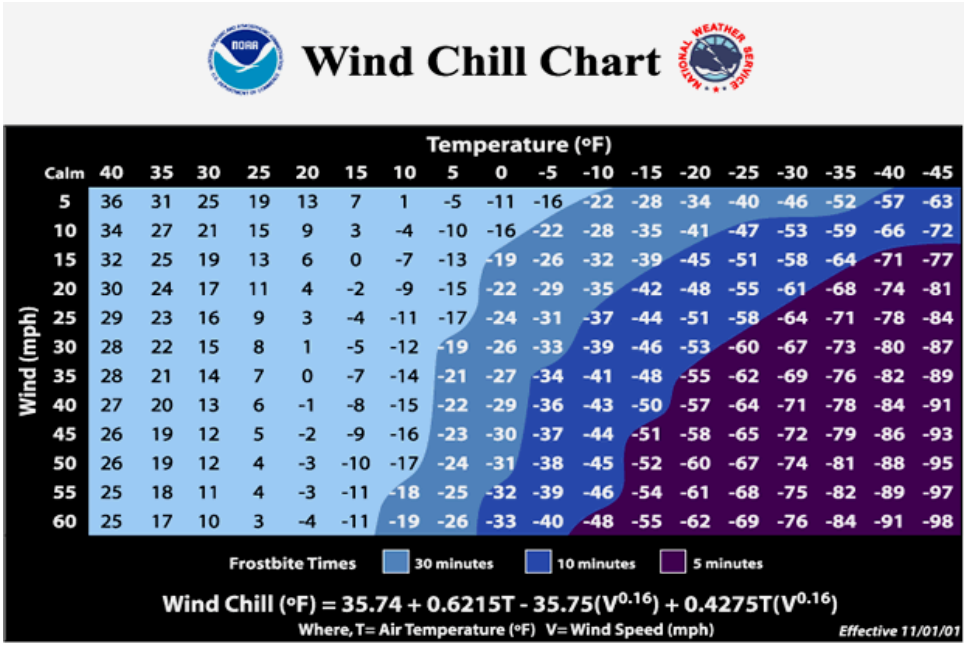
- Heat Syncope – a sudden “faint” or loss of consciousness usually brought on by exercising in warmer weather than one is accustomed to, usually no lasting effect.

- 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.



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

The major risks to people due to extreme cold are:

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

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

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

    - Superficial Frostbite – involves the skin and subcutaneous layers.

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

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

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

Frequency of Occurrence

Excessive heat events recorded by the National Weather Service between 1 January 1950 and 30 April 2011 are outlined below:

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
Statewide	6/14/1994	Heat Wave	0	0	0	0
Statewide	10/12/1995	Record Warmth	0	0	0	0
Waukesha County	10/3/1997	Record Heat	0	0	0	0
Waukesha County	9/13/1998	Excessive Heat	0	0	0	0
Waukesha County	9/27/1998	Excessive Heat	0	0	0	0
Waukesha County	11/23/1998	Excessive Heat	0	0	0	0
Waukesha County	12/1/1998	Excessive Heat	0	0	0	0
Waukesha County	7/4/1999	Excessive Heat	0	0	0	0
Waukesha County	7/29/1999	Excessive Heat	8	0	0	0
Waukesha County	7/21/2001	Excessive Heat	2	0	0	0
Waukesha County	7/31/2001	Excessive Heat	0	0	0	0
Waukesha County	8/6/2001	Excessive Heat	4	0	0	0
Waukesha County	4/15/2002	Excessive Heat	1	0	0	0
Waukesha County	6/20/2002	Excessive Heat	1	0	0	0
Waukesha County	6/22/2002	Excessive Heat	1	0	0	0
Waukesha County	6/30/2002	Excessive Heat	0	0	0	0
Waukesha County	7/1/2002	Excessive Heat	0	0	0	0
Waukesha County	7/8/2002	Excessive Heat	0	0	0	0
Waukesha County	7/21/2002	Excessive Heat	0	0	0	0
Waukesha County	7/24/2005	Excessive Heat	0	0	0	0
Waukesha County	7/16/2006	Heat	0	0	0	0
Waukesha County	7/30/2006	Heat	0	40	0	0
Waukesha County	8/1/2006	Heat	2	0	0	0

Following is a table that outlines severe cold events that have been recorded by the National Weather Service in Waukesha County between 1 January 1950 and 30 April 2011:

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
Statewide	1/13/1994	Cold	0	0	0	0
Waukesha County	12/9/1995	Cold	2	21	0	0
Waukesha County	1/30/1996	Extreme Windchill	2	0	0	0
Waukesha County	1/31/1996	Extreme Cold	0	10	0	0
Waukesha County	2/1/1996	Extreme Cold	4	18	0	0
Waukesha County	1/17/1997	Extreme Cold	0	3	20	0
Waukesha County	1/5/1999	Extreme Cold	0	0	0	0
Waukesha County	12/18/2005	Cold/Wind Chill	0	0	0	0
Waukesha County	2/17/2006	Cold/Wind Chill	0	0	0	0
Waukesha County	2/18/2006	Cold/Wind Chill	0	0	0	0
Waukesha County	2/3/2007	Cold/Wind Chill	0	0	0	0
Waukesha County	2/5/2007	Extreme Cold/Wind Chill	0	0	3	0

Waukesha County	2/5/2007	Cold/Wind Chill	0	0	0	0
Waukesha County	1/30/2008	Cold/Wind Chill	0	0	0	0
Waukesha County	12/15/2008	Cold/Wind Chill	0	0	0	0

Temperature extremes, both cold and hot, have a medium likelihood of occurrence in any given year. The loss of property due to temperature extremes is not likely but loss of life or injury to people has a medium likelihood of occurrence.

Vulnerability

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

The Waukesha 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

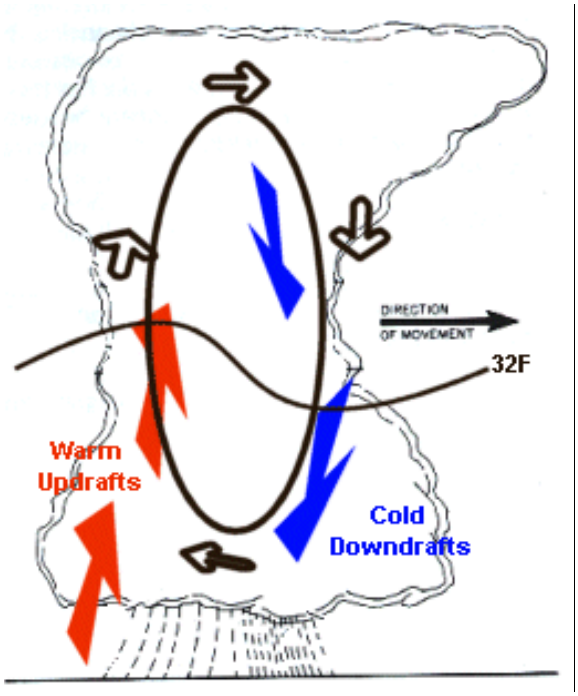
The goal of severe temperature mitigation activities is to reduce, in a cost effective manner, the loss of lives and property due to these events. Temperature extremes are difficult for a community to mitigate and the risks are to the health and safety of citizens, animals and crops. There are no strategies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

Waukesha 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. Emergency Management also has plans to support emergency sheltering operations and the Waukesha County Human Services Department has a protocol to open sheltering services for citizens in need during periods of severe temperatures. 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:



Source: NWS, January 10, 2003

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

Physical Characteristics

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

Hail Size Estimates	
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

NWS, January 10, 2003

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

Frequency of Occurrence

Hailstorms usually occur from May through August and Wisconsin averages two or three hail days per year. According to the Wisconsin State Hazard Mitigation Plan, from 1982 – 2003, Waukesha County reported 50 hail events but fortunately none have led to loss of life and one led to injury. Waukesha County, as can be seen in the map in Appendix A, has a high probability of hail occurrence in Wisconsin. The likelihood of damage due to hail is therefore considered high.

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. Following is a table that shows the 115 hail events recorded by the National Weather Service between 1 January 1950 and 30 April 2011.

Location	Date	Size	Death	Injury	Property Damage	Crop Damage
Waukesha County	5/14/1957	1.75 in.	0	0	0	0
Waukesha County	7/11/1969	1.75 in.	0	0	0	0
Waukesha County	6/23/1973	2.00 in.	0	0	0	0
Waukesha County	8/30/1973	0.75 in.	0	0	0	0
Waukesha County	7/3/1975	1.75 in.	0	0	0	0
Waukesha County	7/3/1975	1.75 in.	0	0	0	0
Waukesha County	4/2/1977	0.75 in.	0	0	0	0
Waukesha County	6/20/1979	1.75 in.	0	0	0	0
Waukesha County	6/20/1979	1.75 in.	0	0	0	0
Waukesha County	5/28/1980	1.00 in.	0	0	0	0
Waukesha County	5/30/1980	0.75 in.	0	0	0	0
Waukesha County	5/30/1980	1.00 in.	0	0	0	0
Waukesha County	6/5/1980	1.75 in.	0	0	0	0
Waukesha County	8/4/1980	0.75 in.	0	0	0	0
Waukesha County	6/26/1984	1.75 in.	0	0	0	0
Waukesha County	5/26/1985	0.75 in.	0	0	0	0
Waukesha County	5/21/1987	1.75 in.	0	0	0	0
Waukesha County	5/21/1987	1.75 in.	0	0	0	0
Waukesha County	5/21/1987	1.75 in.	0	0	0	0
Waukesha County	8/8/1988	1.00 in.	0	0	0	0
Waukesha County	7/27/1989	0.75 in.	0	0	0	0
Waukesha County	9/9/1991	0.75 in.	0	0	0	0
Oconomowoc	3/23/1994	1.00 in.	0	0	0	0
Brookfield	7/11/1994	1.00 in.	0	0	0	0
Waukesha	7/11/1994	0.75 in.	0	0	0	0
Hartland	4/18/1995	0.75 in.	0	0	0	0
Dousman	6/7/1995	0.75 in.	0	0	0	0
Hartland	8/28/1995	0.75 in.	0	0	0	0
Mukwonago	10/29/1996	2.00 in.	0	0	1.2M	0
New Berlin	10/29/1996	0.75 in.	0	0	0	0
Eagle	5/5/1997	0.75 in.	0	0	0	0
Dousman	6/21/1997	0.88 in.	0	0	0	0
Delafield	7/20/1998	100 kts.	0	0	6K	0
Dousman	8/24/1998	0.75 in.	0	0	0	0
Waukesha	9/1/1998	0.75 in.	0	0	0	0
Dousman	6/28/1999	0.75 in.	0	0	0	0
Waukesha	7/9/1999	0.75 in.	0	0	0	0
Muskego	8/10/1999	1.00 in.	0	0	0	0
Muskego	3/8/2000	0.75 in.	0	0	0	0
Eagle	3/8/2000	1.00 in.	0	0	0	0
Wales	3/8/2000	1.00 in.	0	0	0	0
Mukwonago	5/8/2000	1.00 in.	0	0	0	0
Mukwonago	5/18/2000	1.25 in.	0	0	0	0
Waukesha	5/18/2000	1.00 in.	0	0	0	0

Location	Date	Size	Death	Injury	Property Damage	Crop Damage
Menomonee Falls	5/18/2000	0.75 in.	0	0	0	0
Delafield	5/18/2000	1.25 in.	0	0	5K	0
Waukesha	5/18/2000	0.75 in.	0	0	0	0
Waukesha	5/18/2000	1.00 in.	0	0	0	0
Merton	5/18/2000	1.75 in.	0	0	0	0
Delafield	7/2/2000	0.88 in.	0	0	0	0
Eagle	5/14/2001	1.00 in.	0	0	0	0
Oconomowoc	5/14/2001	1.75 in.	0	0	0	0
North Prairie	5/14/2001	1.75 in.	0	0	0	0
New Berlin	5/14/2001	1.00 in.	0	0	0	0
Sussex	6/18/2001	1.00 in.	0	0	0	0
Stonebank	6/18/2001	0.88 in.	0	0	0	0
Eagle	7/31/2003	1.00 in.	0	0	0	0
Merton	8/1/2003	1.00 in.	0	0	0	25K
Oconomowoc	3/1/2004	1.00 in.	0	0	0	0
Waukesha	5/8/2004	0.75 in.	0	0	0	0
Delafield	5/23/2004	1.00 in.	0	0	0	0
Oconomowoc	5/23/2004	0.88 in.	0	0	0	0
Menomonee Falls	5/23/2004	1.00 in.	0	0	0	0
Oconomowoc	7/16/2004	0.75 in.	0	0	0	0
Delafield	7/16/2004	0.75 in.	0	0	0	0
Muskego	3/30/2005	1.00 in.	0	0	0	0
Oconomowoc	5/6/2005	0.75 in.	0	0	0	0
Dousman	5/6/2005	0.88 in.	0	0	0	0
North Prairie	5/6/2005	1.00 in.	0	0	0	0
Mukwonago	5/6/2005	0.88 in.	0	0	0	0
Mukwonago	11/5/2005	0.75 in.	0	0	0	0
Big Bend	11/5/2005	0.75 in.	0	0	0	0
Brookfield	11/5/2005	0.75 in.	0	0	0	0
Hartland	4/13/2006	1.75 in.	0	0	4.4M	0
Merton	4/13/2006	2.00 in.	0	0	4.4M	0
Sussex	4/13/2006	2.00 in.	0	0	4.4M	0
Sussex	4/13/2006	2.00 in.	0	0	4.4M	0
Menomonee Falls	4/13/2006	2.75 in.	0	0	4.4M	0
Waukesha	4/13/2006	0.88 in.	0	0	0	0
Hartland	5/17/2006	1.00 in.	0	0	0	0
Oconomowoc	6/28/2006	0.88 in.	0	0	0	0
Brookfield	7/9/2006	1.25 in.	0	0	0	0
Elm Grove	7/9/2006	0.75 in.	0	0	0	0
Brookfield	7/9/2006	0.75 in.	0	0	0	0
Brookfield	7/9/2006	0.75 in.	0	0	0	0
Brookfield	7/9/2006	1.00 in.	0	0	0	0
North Prairie	7/9/2006	0.75 in.	0	0	0	0
North Prairie	7/9/2006	1.75 in.	0	0	0	0
Big Bend	8/24/2006	1.00 in.	0	0	0	0

Location	Date	Size	Death	Injury	Property Damage	Crop Damage
Lannon	9/6/2006	1.00 in.	0	0	0	0
Delafield	9/8/2006	0.88 in.	0	0	0	0
Duplainville	9/8/2006	0.75 in.	0	0	0	0
Eagle	10/2/2006	0.75 in.	0	0	0	0
Oconomowoc	3/21/2007	0.75 in.	0	0	0	0
Pewaukee	3/21/2007	0.75 in.	0	0	0	0
Menomonee Falls	3/21/2007	0.75 in.	0	0	0	0
Hartland	3/22/2007	1.75 in.	0	0	0	0
Mukwonago	3/22/2007	0.88 in.	0	0	0	0
Hartland	7/9/2007	0.75 in.	0	0	0	0
Wales	9/27/2007	0.75 in.	0	0	0	0
Waukesha	4/25/2008	0.75 in.	0	0	0	0
Waukesha Co Arpt	6/7/2008	2.00 in.	0	0	0	0
Oconomowoc	6/7/2008	1.75 in.	0	0	0	0
Waukesha	6/7/2008	1.00 in.	0	0	0	0
Hartland	6/7/2008	3.00 in.	0	0	0	0
Dousman	6/28/2008	0.75 in.	0	0	0	0
Mukwonago	6/8/2009	1.50 in.	0	0	0	0
Downtown Waukesha	9/27/2009	1.00 in	0	0	0	0
Eagle	6/21/2010	1.50 in.	0	0	0	0
Lannon	6/23/2010	0.75 in.	0	0	0	0
Muskego	7/10/2010	0.75 in.	0	0	0	0
Oconomowoc	9/2/2010	0.88 in.	0	0	0	0
Oconomowoc	9/2/2010	0.88 in.	0	0	0	0
Downtown Waukesha	9/6/2010	1.75 in.	0	0	0	0
Downtown Waukesha	9/6/2010	0.75 in.	0	0	0	0
		TOTALS:	0	0	23.411M	25K

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.

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

The Waukesha 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 in display racks. Federal emergency assistance is available in the form of low-interest loans when a Presidential Disaster is declared or when the United States Department of Agriculture (USDA) declares that a county is eligible for aid. Damage from hailstorms alone is generally not extensive enough to invoke a disaster declaration.

Additionally, the Village of Elm Grove would like to independently monitor severe thunderstorm weather advisories, since hail tends to occur in conjunction with severe thunderstorms.

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.

Formation of Lightning

University Corporation for Atmospheric Research [UCAR]

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

Physical Characteristics

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

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

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. Waukesha County has a high probability of lightning occurrence; the likelihood of damage due to lightning is considered medium for the more rural areas of the county and low for the more urban areas of the county.

The following table shows the 59 lightning events recorded by the National Weather Service between 1 January 1950 and 30 April 2011.

Location	Date	Death	Injury	Property Damage	Crop Damage
Merton	7/4/1995	0	0	0	0
Delafield	7/25/1995	0	0	0	0
Dousman	8/9/1995	0	0	0	0
Dousman	8/9/1995	0	0	85K	0
Merton	8/9/1995	0	0	0	0
Brookfield	8/9/1995	0	0	12K	0
Mukwonago	8/9/1995	0	0	100K	0
Sussex	8/14/1995	0	0	0	0
Hartland	8/19/1995	1	0	0	0
Muskego	8/19/1995	0	1	0	0
Waukesha	8/19/1995	0	0	0	0
Merton	1/17/1996	0	0	15K	0
Elm Grove	6/2/1996	0	0	10K	0
Oconomowoc	6/2/1996	0	0	30K	0
Sussex	7/15/1996	0	1	0	0
New Berlin	8/5/1996	0	0	150K	0
Menomonee Falls	8/5/1996	0	0	25K	0
Chenequa	10/6/1996	0	1	10K	0
Hartland	6/20/1997	0	0	5K	0
Sussex	6/21/1997	0	1	0	0
Waukesha	6/24/1997	0	0	150K	0

Brookfield	7/2/1997	0	0	105K	0
Pewaukee	7/21/1997	0	0	12K	0
Muskego	9/16/1997	0	0	5K	0
Muskego	9/16/1997	0	0	1K	0
Muskego	9/16/1997	0	0	1K	0
Muskego	9/16/1997	0	0	1K	0
Sussex	5/12/1998	0	0	2K	0
Delafield	5/28/1998	0	0	20K	0
Delafield	5/31/1998	0	0	4K	0
Delafield	5/31/1998	0	0	10K	0
Pewaukee	5/31/1998	0	0	3K	0
Nashotah	6/18/1998	0	0	5K	0
Waukesha	6/24/1998	0	0	6K	0
Elm Grove	6/28/1998	0	0	10K	0
Oconomowoc	7/20/1998	0	0	4K	0
Oconomowoc	5/17/1999	0	0	2K	0
New Berlin	7/9/1999	0	0	2K	0
Pewaukee	8/26/2000	0	0	210K	0
Hartland	8/26/2000	0	0	10K	0
Brookfield	5/14/2001	0	0	3K	0
Elm Grove	8/12/2002	0	0	250K	0
Delafield	8/21/2002	0	0	3K	0
Hartland	8/21/2002	0	0	5K	0
Waukesha	8/3/2004	0	0	100K	0
Hartland	11/5/2005	0	0	1.1M	0
Brookfield	5/24/2006	0	0	1K	0
Waukesha	7/27/2006	0	1	0	0
Muskego	8/24/2006	0	1	0	0
Waterville	8/22/2007	0	0	200K	0
Waukesha	3/31/2008	0	0	25K	0
New Berlin	3/31/2008	0	0	10K	0
Oconomowoc	7/10/2008	0	0	50K	0
Oconomowoc	7/10/2008	0	0	100K	0
Mukwonago	8/4/2008	0	0	25K	0
North Prairie	8/4/2008	0	0	150K	0
New Berlin	8/9/2009	0	0	50K	0
Marcy	9/18/2010	0	0	100K	0
	TOTALS:	1	6	3.347M	0

Vulnerability

Lightning, which often occurs in conjunction with thunderstorms and hail, can damage many types of infrastructure, including electric lines/poles/transformers, telephone lines and radio communication equipment. These pieces of infrastructure are needed by both first

response agencies and the general community to ensure safe transport; warm, safe homes and good internal and external communications abilities.

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

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

Hazard Mitigation Strategies

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

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

Additionally, the Village of Elm Grove would like to independently monitor severe thunderstorm weather advisories, since lightning tends to occur in conjunction with severe thunderstorms.

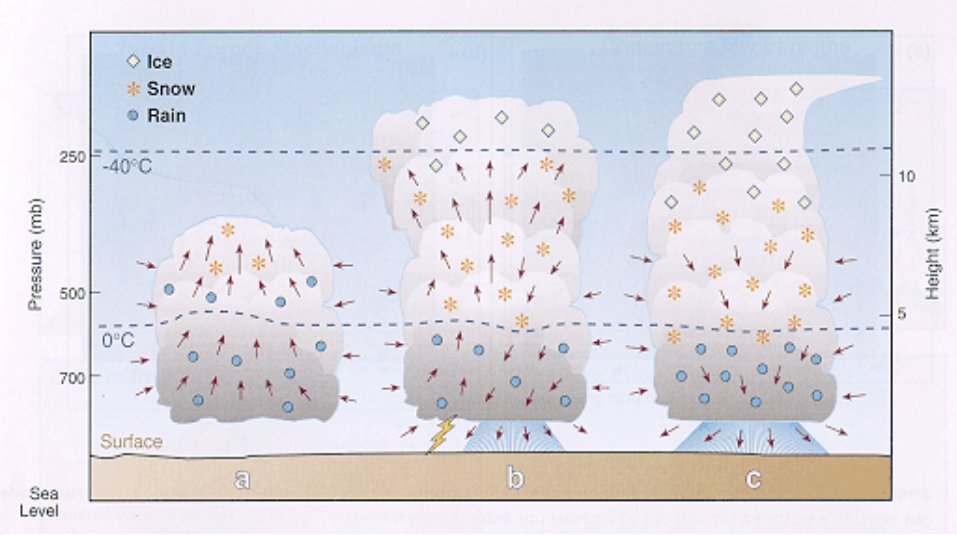
Storms: Thunderstorms

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

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

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

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



National Weather Service - Flagstaff

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

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

Frequency of Occurrence

Thunderstorm frequency is measured as the number of days per year with one or more incidents. There are approximately 100,000 thunderstorms in the United States every year and approximately 10% of those are considered severe (i.e., has at least ¾" hail, winds of at least 58 mph or a tornado). Most Wisconsin counties, including Waukesha County, average between 30 and 40 thunderstorm days per year although a portion of southwestern and south-central Wisconsin average 40 to 50 thunderstorm days per year. In Waukesha County there are typically several severe thunderstorms per year. In Wisconsin, Waukesha County has the highest incidence of hurricane-force thunderstorm winds, with 15 events documented between 1970 and 2001. Hurricane-force winds are greater than or equal to 75 miles per hour. 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 Waukesha County is high. 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 following table lists the 252 thunderstorms and high wind events that have been recorded in Waukesha County by the National Weather Service between 1 January 1950 and 30 April 2011.

Location	Date	Wind Speed	Death	Injury	Property Damage	Crop Damage
Waukesha County	7/31/1955	0 kts.	0	0	0	0
Waukesha County	6/17/1957	0 kts.	0	0	0	0
Waukesha County	10/8/1959	0 kts.	0	0	0	0
Waukesha County	6/10/1961	0 kts.	0	0	0	0
Waukesha County	6/29/1962	0 kts.	0	0	0	0
Waukesha County	4/11/1965	70 kts.	0	0	0	0
Waukesha County	6/20/1965	55 kts.	0	0	0	0
Waukesha County	9/9/1965	0 kts.	0	0	0	0
Waukesha County	7/10/1966	61 kts.	0	0	0	0

Location	Date	Wind Speed	Death	Injury	Property Damage	Crop Damage
Waukesha County	6/10/1968	0 kts.	0	0	0	0
Waukesha County	7/14/1972	65 kts.	0	0	0	0
Waukesha County	4/21/1973	60 kts.	0	0	0	0
Waukesha County	6/16/1973	0 kts.	0	0	0	0
Waukesha County	6/9/1974	0 kts.	0	0	0	0
Waukesha County	7/6/1977	50 kts.	0	0	0	0
Waukesha County	7/6/1977	0 kts.	0	0	0	0
Waukesha County	7/18/1978	0 kts.	0	0	0	0
Waukesha County	8/15/1978	0 kts.	0	0	0	0
Waukesha County	6/29/1979	0 kts.	0	0	0	0
Waukesha County	6/5/1980	56 kts.	0	0	0	0
Waukesha County	7/16/1980	52 kts.	0	0	0	0
Waukesha County	7/29/1980	61 kts.	0	0	0	0
Waukesha County	8/4/1980	0 kts.	0	0	0	0
Waukesha County	8/4/1980	75 kts.	0	0	0	0
Waukesha County	8/4/1980	65 kts.	0	0	0	0
Waukesha County	6/24/1981	0 kts.	0	0	0	0
Waukesha County	7/12/1981	0 kts.	0	0	0	0
Waukesha County	7/12/1981	0 kts.	0	0	0	0
Waukesha County	8/31/1981	0 kts.	0	0	0	0
Waukesha County	8/3/1982	0 kts.	0	0	0	0
Waukesha County	7/19/1983	0 kts.	0	0	0	0
Waukesha County	7/19/1983	0 kts.	0	0	0	0
Waukesha County	7/19/1983	0 kts.	0	0	0	0
Waukesha County	7/19/1983	0 kts.	0	0	0	0
Waukesha County	7/19/1983	0 kts.	0	0	0	0
Waukesha County	8/10/1983	0 kts.	0	0	0	0
Waukesha County	6/6/1984	0 kts.	0	0	0	0
Waukesha County	6/26/1984	0 kts.	0	0	0	0
Waukesha County	7/9/1984	69 kts.	0	0	0	0
Waukesha County	7/9/1984	69 kts.	0	0	0	0
Waukesha County	7/23/1984	57 kts.	0	0	0	0
Waukesha County	10/16/1984	0 kts.	0	0	0	0
Waukesha County	5/12/1985	0 kts.	0	0	0	0
Waukesha County	6/11/1986	60 kts.	0	0	0	0
Waukesha County	7/27/1986	0 kts.	0	0	0	0
Waukesha County	7/27/1986	0 kts.	0	0	0	0
Waukesha County	5/21/1987	0 kts.	0	0	0	0
Waukesha County	6/25/1987	0 kts.	0	0	0	0
Waukesha County	7/6/1987	0 kts.	0	0	0	0
Waukesha County	7/20/1987	0 kts.	0	0	0	0
Waukesha County	7/29/1987	65 kts.	0	0	0	0
Waukesha County	5/8/1988	0 kts.	0	0	0	0
Waukesha County	5/8/1988	55 kts.	0	0	0	0
Waukesha County	8/4/1988	0 kts.	0	0	0	0

Location	Date	Wind Speed	Death	Injury	Property Damage	Crop Damage
Waukesha County	8/8/1988	0 kts.	0	0	0	0
Waukesha County	8/8/1988	52 kts.	0	0	0	0
Waukesha County	11/16/1988	0 kts.	0	0	0	0
Waukesha County	5/24/1989	0 kts.	0	0	0	0
Waukesha County	7/27/1989	0 kts.	0	0	0	0
Waukesha County	7/27/1989	56 kts.	0	0	0	0
Waukesha County	8/4/1989	0 kts.	0	0	0	0
Waukesha County	8/4/1989	0 kts.	0	0	0	0
Waukesha County	8/4/1989	0 kts.	0	0	0	0
Waukesha County	8/18/1990	50 kts.	0	0	0	0
Waukesha County	3/27/1991	54 kts.	0	0	0	0
Waukesha County	4/29/1991	0 kts.	0	0	0	0
Waukesha County	7/1/1991	0 kts.	0	0	0	0
Waukesha County	7/7/1991	52 kts.	0	0	0	0
Waukesha County	7/7/1991	0 kts.	0	0	0	0
Waukesha County	7/7/1991	0 kts.	0	0	0	0
Waukesha County	7/7/1991	0 kts.	0	0	0	0
Waukesha County	5/11/1992	70 kts.	0	0	0	0
Waukesha County	6/17/1992	0 kts.	0	0	0	0
Waukesha County	6/17/1992	0 kts.	0	0	0	0
Oconomowoc	8/9/1993	0 kts.	0	0	5K	5K
Hartland	8/9/1993	0 kts.	0	0	50K	50K
Pewaukee	8/9/1993	0 kts.	0	0	50K	50K
Dousman	4/18/1994	52 kts.	0	0	0	0
Waukesha	4/18/1994	61 kts.	0	0	50K	0
Delafield	7/4/1994	50 kts.	0	0	0	0
Oconomowoc	7/4/1994	61 kts.	0	0	0	5K
Hartland	7/4/1994	0 kts.	0	0	5K	5K
Waukesha	7/11/1994	52 kts.	0	0	0	0
Eagle	8/9/1995	0 kts.	0	0	0	0
North Prairie	8/9/1995	52 kts.	0	0	0	0
Hartland	8/9/1995	0 kts.	0	0	0	0
Butler	8/28/1995	0 kts.	0	0	0	0
Mukwonago	8/28/1995	0 kts.	0	0	0	0
Waukesha County	1/30/1996	N/A	2	0	0	0
Oconomowoc	8/5/1996	0 kts.	0	0	15K	0
Brookfield	8/19/1996	0 kts.	0	0	10K	0
Wales	10/29/1996	0 kts.	0	0	20K	0
Waukesha County	10/30/1996	0 kts.	0	0	30K	0
Mukwonago	4/5/1997	0 kts.	0	0	12K	0
Waukesha County	4/6/1997	65 kts.	0	0	180K	0
Waukesha County	5/5/1997	0 kts.	0	0	29K	0
Chenequa	6/15/1997	0 kts.	0	1	3K	0
Hartland	6/21/1997	52 kts.	0	0	1K	0
Mukwonago	6/24/1997	54 kts.	0	0	1K	0

Location	Date	Wind Speed	Death	Injury	Property Damage	Crop Damage
Waukesha	6/24/1997	0 kts.	0	0	3K	0
Oconomowoc	7/26/1997	0 kts.	0	0	15K	0
Muskego	8/3/1997	0 kts.	0	0	200K	0
Brookfield	9/29/1997	0 kts.	0	0	0	0
Hartland	9/29/1997	0 kts.	0	0	0	0
Waukesha County	3/8/1998	0 kts.	0	0	215K	0
Eagle	5/15/1998	0 kts.	0	0	1K	0
Muskego	5/15/1998	0 kts.	0	0	1K	0
Dousman	5/28/1998	0 kts.	0	0	8K	0
Waukesha	5/28/1998	61 kts.	0	0	15K	0
Waukesha County	5/31/1998	70 kts.	0	0	6.7M	50K
Dousman	6/18/1998	0 kts.	0	0	30K	0
Delafield	7/20/1998	100 kts.	0	0	6K	0
Waukesha County	11/10/1998	0 kts.	4	14	10.4M	1.6M
Hartland	2/11/1999	55 kts.	0	0	3K	0
Waukesha County	3/17/1999	0 kts.	0	0	4K	0
Mukwonago	6/6/1999	70 kts.	0	0	40K	0
Brookfield	6/6/1999	0 kts.	0	0	15K	0
Oconomowoc	6/10/1999	0 kts.	0	0	1K	0
Waukesha	6/10/1999	0 kts.	0	0	1K	0
Waukesha	6/10/1999	0 kts.	0	0	1K	0
Brookfield	6/11/1999	51 kts.	0	0	0	0
Sussex	6/11/1999	56 kts.	0	0	0	0
Dousman	6/11/1999	0 kts.	0	0	1K	0
Delafield	5/8/2000	0 kts.	0	0	1K	0
Delafield	5/11/2000	52 kts.	0	0	1K	0
Hartland	5/11/2000	65 kts.	0	0	100K	0
Waukesha County	5/24/2000	0 kts.	0	0	3K	0
Genesee	6/1/2000	0 kts.	0	0	2K	0
Waukesha	7/2/2000	68 kts.	0	0	100K	0
Dousman	7/2/2000	61 kts.	0	0	150K	0
Brookfield	7/2/2000	0 kts.	0	0	200K	0
Waukesha	7/2/2000	0 kts.	0	0	2K	0
Wales	8/26/2000	0 kts.	0	0	2K	0
Waukesha	9/11/2000	0 kts.	0	0	3K	0
Waukesha County	4/7/2001	57 kts.	0	1	0	0
Waukesha County	4/11/2001	58 kts.	0	0	0	0
Waukesha County	6/11/2001	52 kts.	0	0	75K	0
Waukesha	8/9/2001	52 kts.	0	0	0	0
Dousman	9/3/2001	50 kts.	0	0	0	0
Big Bend	9/3/2001	56 kts.	0	0	0	0
Oconomowoc	9/7/2001	52 kts.	0	0	0	0
Waukesha County	9/19/2001	0 kts.	0	0	0	0
Waukesha County	10/24/2001	0 kts.	0	0	0	0

Location	Date	Wind Speed	Death	Injury	Property Damage	Crop Damage
Waukesha County	12/5/2001	0 kts.	0	0	105K	0
Waukesha County	3/9/2002	0 kts.	0	0	73K	0
Sussex	6/10/2002	56 kts.	0	0	0	0
Pewaukee	7/8/2002	52 kts.	0	0	0	0
Waukesha Co Arpt	8/21/2002	87 kts.	0	0	2.0M	0
Waukesha	8/21/2002	56 kts.	0	0	0	0
North Lake	9/2/2002	58 kts.	0	0	0	0
Eagle	10/4/2002	61 kts.	0	0	50K	0
Oconomowoc	10/4/2002	64 kts.	0	0	300K	0
Waukesha	7/4/2003	55 kts.	0	0	0	0
Eagle	7/4/2003	56 kts.	0	0	5K	0
Waukesha	7/6/2003	56 kts.	0	0	0	0
Oconomowoc	7/15/2003	61 kts.	0	0	0	0
Elm Grove	7/30/2003	54 kts.	0	0	0	0
Merton	8/1/2003	56 kts.	0	0	0	0
Waukesha County	11/12/2003	39 kts.	0	0	52K	0
Oconomowoc	3/1/2004	52 kts.	0	0	1K	0
Waukesha County	3/7/2004	34 kts.	0	0	33K	0
Waukesha County	3/14/2004	39 kts.	0	0	52K	0
Waukesha County	4/18/2004	43 kts.	0	0	280K	0
Oconomowoc	4/18/2004	57 kts.	0	0	50K	0
Pewaukee	5/21/2004	56 kts.	0	0	0	0
Eagle	6/23/2004	56 kts.	0	0	0	0
New Berlin	6/23/2004	56 kts.	0	0	0	0
Waukesha	8/3/2004	45 kts.	0	0	20K	0
Waukesha County	12/12/2004	40 kts.	0	0	34K	0
Merton	6/30/2005	56 kts.	0	0	0	0
Eagle	6/30/2005	56 kts.	0	0	0	0
Genesee	6/30/2005	52 kts.	0	0	0	0
Brookfield	6/30/2005	52 kts.	0	0	0	0
New Berlin	7/21/2005	59 kts.	0	0	5K	0
Waukesha	7/21/2005	61 kts.	0	0	10K	0
Hartland	7/23/2005	52 kts.	0	0	1K	0
Dousman	7/23/2005	52 kts.	0	0	1K	0
Mukwonago	7/23/2005	52 kts.	0	0	1K	0
North Prairie	7/25/2005	56 kts.	0	0	5K	0
Mukwonago	9/13/2005	58 kts.	0	0	0	0
Dousman	9/13/2005	56 kts.	0	0	0	0
Sussex	9/13/2005	61 kts.	0	0	0	0
Pewaukee	9/13/2005	61 kts.	0	0	0	0
Hartland	9/13/2005	56 kts.	0	0	0	0
Waukesha County	12/18/2005	N/A	0	0	0	0
Waukesha County	1/24/2006	39 kts.	0	0	100K	0
Waukesha County	2/17/2006	N/A	0	0	0	0
Waukesha County	2/18/2006	N/A	0	0	0	0

Location	Date	Wind Speed	Death	Injury	Property Damage	Crop Damage
Waukesha County	3/13/2006	39 kts.	0	0	65K	0
Waukesha County	3/31/2006	39 kts.	0	0	40K	0
Waukesha County	5/11/2006	36 kts.	0	0	20K	0
Delafield	5/24/2006	50 kts.	0	0	10K	0
Brookfield	6/21/2006	56 kts.	0	0	10K	0
Brookfield	6/21/2006	52 kts.	0	0	0	0
Delafield	6/28/2006	52 kts.	0	0	0	0
New Berlin	7/9/2006	57 kts.	0	0	0	0
Sussex	7/9/2006	56 kts.	0	0	75K	0
Dousman	7/20/2006	52 kts.	0	0	0	0
Brookfield	7/20/2006	52 kts.	0	0	10K	0
Eagle	7/27/2006	52 kts.	0	0	0	0
Pewaukee	7/27/2006	56 kts.	0	0	20K	0
Waukesha	7/27/2006	61 kts.	0	0	0	0
Big Bend	7/27/2006	52 kts.	0	0	5K	0
Muskego	8/2/2006	50 kts.	0	0	0	0
Downtown Waukesha	10/2/2006	56 kts.	0	0	0	0
New Berlin	10/2/2006	51 kts.	0	0	0	0
Hartland	10/4/2006	50 kts.	0	0	0	0
Waukesha County	2/3/2007	N/A	0	0	0	0
Waukesha County	2/5/2007	N/A	0	0	3K	0
Waukesha County	2/5/2007	N/A	0	0	0	0
Waukesha County	2/22/2007	39 kts.	0	0	2K	0
Waukesha County	4/4/2007	44 kts.	0	0	5K	0
Muskego	6/7/2007	52 kts.	0	0	0	0
Brookfield	6/18/2007	52 kts.	0	0	2K	0
Menomonee Falls	6/18/2007	52 kts.	0	0	2K	0
Oconomowoc	8/22/2007	52 kts.	0	0	25K	0
Sussex	8/22/2007	52 kts.	0	0	75K	0
Pewaukee	8/22/2007	56 kts.	0	0	25K	0
Waukesha County	8/27/2007	39 kts.	0	0	10K	0
Waukesha County	11/27/2007	43 kts.	0	0	3K	0
Waukesha County	12/23/2007	39 kts.	0	0	5K	0
Waukesha County	1/30/2008	N/A	0	0	0	0
Sussex	4/25/2008	52 kts.	0	0	1K	0
Dousman	4/25/2008	56 kts.	0	0	30K	0
Waukesha County	4/26/2008	43 kts.	0	0	5K	0
Eagle	6/6/2008	50 kts.	0	0	0	0
Lannon	6/6/2008	50 kts.	0	0	0	0
Lannon	6/6/2008	50 kts.	0	0	0	0
Waukesha Co Arpt	6/7/2008	61 kts.	0	0	0	0
Dousman	6/8/2008	50 kts.	0	0	0	0
Oconomowoc	6/28/2008	61 kts.	0	0	0	0
Downtown Waukesha	6/28/2008	50 kts.	0	0	0	0

Location	Date	Wind Speed	Death	Injury	Property Damage	Crop Damage
Hartland	7/2/2008	56 kts.	0	0	10K	0
Downtown Waukesha	7/7/2008	50 kts.	0	0	0	0
Downtown Waukesha	7/7/2008	56 kts.	0	0	15K	0
Eagle	7/10/2008	56 kts.	0	0	10K	0
Stonebank	7/16/2008	56 kts.	0	0	0	0
New Berlin	7/16/2008	65 kts.	0	0	15K	0
Waukesha County	10/26/2008	26 kts.	0	0	2K	0
Waukesha County	12/15/2008	N/A	0	0	0	0
Downtown Waukesha	6/18/2009	56 kts.	0	0	5K	0
Muskego	8/9/2009	61 kts.	0	0	10K	0
Eagle	8/9/2009	56 kts.	0	0	0	0
Downtown Waukesha	8/9/2009	52 kts.	0	0	0	0
Delafield	9/27/2009	56 kts.	0	0	0	0
Mukwonago	6/18/2010	66 kts.	0	0	0	0
Muskego	6/18/2010	65 kts.	0	0	0	0
Dousman	6/21/2010	60 kts.	0	0	0	0
Muskego	6/21/2010	65 kts.	0	0	0	0
Oconomowoc	6/23/2010	56 kts.	0	0	0	0
Lannon	7/14/2010	52 kts.	0	0	0	0
Downtown Waukesha	7/22/2010	59 kts.	0	0	0	0
Dousman	8/9/2010	56 kts.	0	0	0	0
Stonebank	8/20/2010	50 kts.	0	0	0	0
Pewaukee	8/20/2010	56 kts.	0	0	0	0
Nashotah	9/2/2010	70 kts.	0	0	0	0
Waukesha County	9/7/2010	39 kts	0	0	5K	0
Waukesha County	9/24/201	41 kts.	0	0	5K	0
Waukesha County	2/18/2011	26 kts.	0	0	2K	0
Muskego	4/10/2011	70 kts.	0	0	0	0
		TOTALS:	6	16	22.424M	1.745M

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. Waukesha 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. Waukesha County Emergency Management has developed severe weather safety information that it disseminates to the public in a display rack and online with the goal of protecting the lives and property of citizens. During Tornado 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.

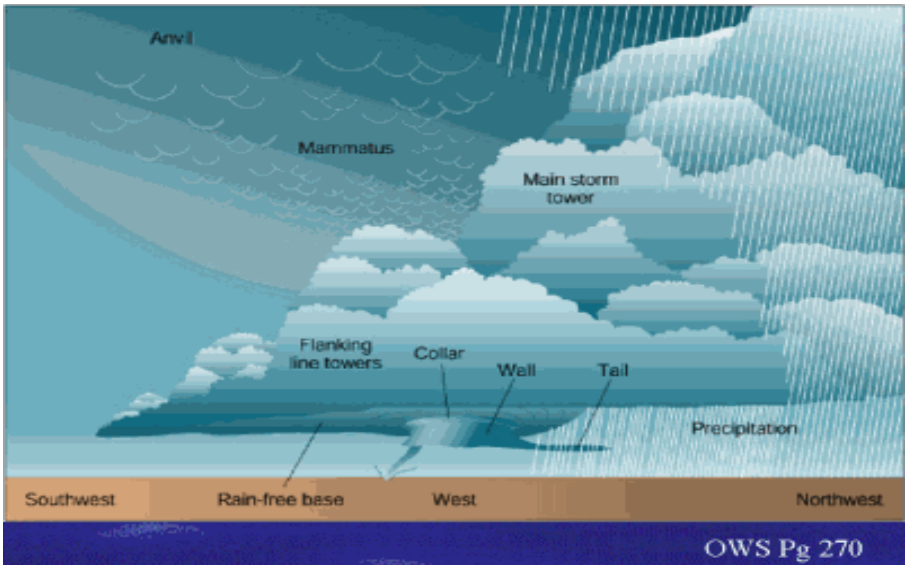
Waukesha County Emergency Management has also committed to working with local fair and festival boards, as they are requested, to help create emergency plans in the event of bad weather. Additionally, the Village of Elm Grove would like to monitor severe thunderstorm weather advisories.

The City of Brookfield is advocating for grant funding to complete a study to revise rainfall classifications from a recurrence interval standard to a simple scale similar to what is used for hurricanes, tornadoes and earthquakes with the goal of making it easier for the public to understand. Calling major rainstorms that have occurred multiple times in a short period of time “the 100-year storm” confuses the public and misleads them into thinking they need not protect themselves against such storms since they are “rare.” The City of Brookfield Department of Public Works (DPW) has developed a proposal, which has been presented at the Association of Flood Plain Manager’s national conference and at the National Weather Service Eastern Region Flash Flood Conference, for this project idea. The white paper proposal was most recently published in the August edition of the APWA Reporter and has received support from all over the country.

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

Storms: Tornadoes and High Winds

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



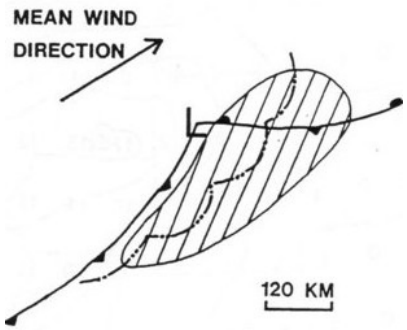
A derecho is a widespread, long-lived, violent, convectively-induced straight-line windstorm that is associated with a fast-moving band of severe thunderstorms usually taking the form of a bow echo. Derechos blow in the direction of movement of their associated storms; this is similar to a gust front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

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

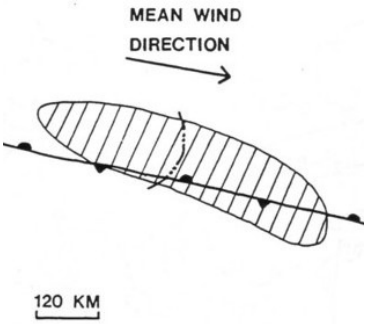
- Serial: Multiple bow echoes embedded in a massive squall line typically around 250 miles long. This type of derecho is usually associated with a very deep low. Also because of embedded supercells, tornadoes can easily spin out of these types of derechos.

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

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



Serial Derecho



Progressive Derecho

http://en.wikipedia.org/wiki/Derecho

Physical Characteristics

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

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

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		
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.

FEMA, 1997

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

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

Downburst Characteristics

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

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

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

Frequency of Occurrence

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

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

According to the National Weather Service, Waukesha County had 7 funnel clouds and 28 tornadoes between 1 January 1950 and 30 April 2011. The following table lists these events.

Location	Date	Type	Magnitude	Death	Injury	Property Damage	Crop Damage
Pewaukee	8/30/1993	Funnel Cloud	N/A	0	0	0	0
Pewaukee	7/11/1994	Funnel Cloud	N/A	0	0	0	0
Delafield	7/11/1994	Funnel Cloud	N/A	0	0	0	0
Hartland	7/2/1996	Funnel Cloud	N/A	0	0	0	0
Delafield	5/23/2004	Funnel Cloud	N/A	0	0	0	0
Menomonee Falls	5/23/2004	Funnel	N/A	0	0	0	0

Location	Date	Type	Magnitude	Death	Injury	Property Damage	Crop Damage
		Cloud					
Eagle	7/22/2010	Funnel Cloud	N/A	0	0	0	0
Waukesha County	4/7/1954	Tornado	F1	0	0	25K	0
Waukesha County	7/16/1956	Tornado	F0	0	0	3K	0
Waukesha County	6/11/1959	Tornado	F1	0	0	3K	0
Waukesha County	10/8/1959	Tornado	F2	0	0	25K	0
Waukesha County	5/8/1965	Tornado	F1	0	0	250K	0
Waukesha County	6/27/1965	Tornado	F1	0	0	25K	0
Waukesha County	7/10/1966	Tornado	F1	0	0	25K	0
Waukesha County	5/18/1967	Tornado	F2	0	0	25K	0
Waukesha County	6/29/1969	Tornado	F2	0	0	250K	0
Waukesha County	7/14/1972	Tornado	F1	0	0	250K	0
Waukesha County	8/30/1973	Tornado	F0	0	0	3K	0
Waukesha County	4/2/1977	Tornado	F2	0	2	2.5M	0
Waukesha County	6/5/1977	Tornado	F3	0	0	2.5M	0
Waukesha County	6/5/1980	Tornado	F3	0	0	250K	0
Waukesha County	7/29/1980	Tornado	F1	0	0	25K	0
Waukesha County	6/15/1981	Tornado	F2	0	0	250K	0
Waukesha County	5/15/1982	Tornado	F1	0	0	250K	0
Waukesha County	4/27/1984	Tornado	F4	1	14	2.5M	0
Waukesha County	8/17/1985	Tornado	F1	0	0	250K	0
Waukesha County	7/6/1987	Tornado	F1	0	0	2.5M	0
Waukesha County	8/16/1987	Tornado	F1	0	1	2.5M	0
Waukesha County	5/8/1988	Tornado	F0	0	0	0	0
Big Bend	6/6/1999	Tornado	F1	0	0	100K	0
Eagle	6/7/2008	Tornado	F0	0	0	0	0
Mukwonago	6/8/2009	Tornado	F0	0	0	0	0
Eagle	6/21/2010	Tornado	F2	0	15	20.6M	0
Big Bend	6/21/2010	Tornado	F1	0	0	430K	0
Big Bend	7/22/2010	Tornado	F2	0	0	0	0
			TOTALS:	1	32	35.538M	0

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; Waukesha County has several of each type of property. Both have high concentrations of people in a small area, generally have structures that provide less protection than standard construction homes generally do not provide storm shelters. Other places of concern during these types of events include critical emergency facilities such as hospitals and public works/highway

garages, police stations and fire departments, which contain equipment and services needed by the public after a tornado.

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

Community infrastructure such as power lines, telephone lines, radio towers and street signs are often vulnerable to damage from tornadoes and high winds and can be expensive to replace. The loss of radio towers that hold public safety communications repeaters can adversely impact the ability of first responders to mount an effective response; damage to towers that hold public media equipment may adversely impact the ability to distribute adequate public information.

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

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

The Wisconsin Hazard Mitigation Plan estimated tornado losses for Waukesha County. The table below shows the reported costs due to tornado damages plus the state's estimates of future risk. When sorted for total future risk, Waukesha County ranks 3rd (of 72 counties in Wisconsin.) When sorted for structural and contents damages Waukesha County ranks 2nd and when sorted for injury and mortality damages Waukesha County ranks 3rd.

	Manufactured Housing	Non-Engineered Wood Frame	Combined	Total Annual Damage
Injury and Mortality Damages	$535,433	$65,733,219	$66,268,652	$67,812,413

Structural and Contents Damage	$2,597	$1,541,165	$1,543,762	$67,812,413
Total Annual Damage	$538,030	$67,274,384	$67,812,413	$67,812,413
Total Future Risk	$6,676,950	$67,274,384	$841,552,050	$841,552,050

The Wisconsin Hazard Mitigation Plan also estimated losses for Waukesha County from straight-line winds. The table below shows the reported costs due to straight-line wind damage plus the state's estimates of future risk. When sorted for total future risk, Waukesha County ranks 2nd. When sorted for either structural and contents damages Waukesha County ranks 2nd and when sorted for injury and mortality damages, Waukesha County ranks 3rd.

	Manufactured Housing	Non-Engineered Wood Frame	Combined	Total Annual Damage
Injury and Mortality Damages	$124,975	$8,170,465	$8,295,440	$152,810,667
Structural and Contents Damage	$196,281	$144,318,945	$144,515,227	$152,810,667
Total Annual Damage	$321,257	$152,489,410	$152,810,667	$152,810,667
Total Future Risk	$3,986,794	$1,892,393,581	$1,896,380,375	$1,896,380,375

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. Waukesha County has a history of damage to buildings and infrastructure due to tornadoes and high winds. Some strategies below will deal with public information and alert and notification while others will enable the community to make current and future buildings and infrastructure more disaster-resistant by enacting more "bricks and mortar" solutions.

An effective warning system is the single most important resource for alerting the public to a tornado hazard, which is critical to the main goal of saving lives and reducing property losses.

Forecasting of tornadoes is difficult, however, because of the suddenness of their onset, their relatively short duration, the extreme variability of a tornado striking area, limited knowledge of tornado dynamics and the limitations of the weather observation system. Tornado sirens are municipally owned and maintained in Waukesha County although some are activated by the county, while others are activated by the local PSAP. Local PSAPs, including WCC and the seven other PSAPs in Waukesha County provide a critical link in relaying field observations of severe weather to the National Weather Service and the general public.

County Emergency Management promotes the use of NOAA weather radios for public alert and notification and also contracts with the My State USA mass notification telephone system to relay emergency messages to the citizenry. The department also continues to evaluate various technologies to determine if they can be effectively integrated into the county's alert and notification systems.

During the past several years, there has been a statewide Tornado Awareness Week in late March or April. Media information packets are distributed to reemphasize and alert the public to tornado warning procedures. Waukesha 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. Waukesha County also assists the National Weather Service with sponsoring tornado spotter training and in organizing local tornado spotter networks.

Across the county currently, maintenance buildings and lodges are used at campgrounds. Park rangers receive alerts from dispatch on their 800 mHz radios; they then go around and tell people of the alert. This system seems to work acceptably well in small parks. On community golf courses, people are alerted by an air horn blast. In mobile home parks the county is considering projects that would provide information to builders and owners of manufactured and mobile homes regarding the use of tie-downs with ground anchors. This relatively inexpensive strategy reduces the damage to these homes in lower F-scale tornadoes. As part of the tornado preparedness program, the county plans to work with the municipalities to construct tornado shelters in areas where deficient, especially in mobile home parks and campgrounds. The Villages of Butler and Lannon also have mobile home complexes and are interested in having shelters there. 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.

Finally, the county would like to explore the feasibility of increasing the wind resistance of the roofs of designated community storm shelters with a focus on buildings getting upgraded and new buildings that are likely candidates for being community shelters (e.g., schools, community centers, etc.)

Additionally, the Village of Elm Grove would like to:

- Monitor severe weather advisories if at risk for tornadoes.
- Continue active coordination with the Waukesha County Emergency Warning System. The village currently receives warnings from the National Weather Service but would like to receive notification from the county also.

Storms: Winter

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

Physical Characteristics

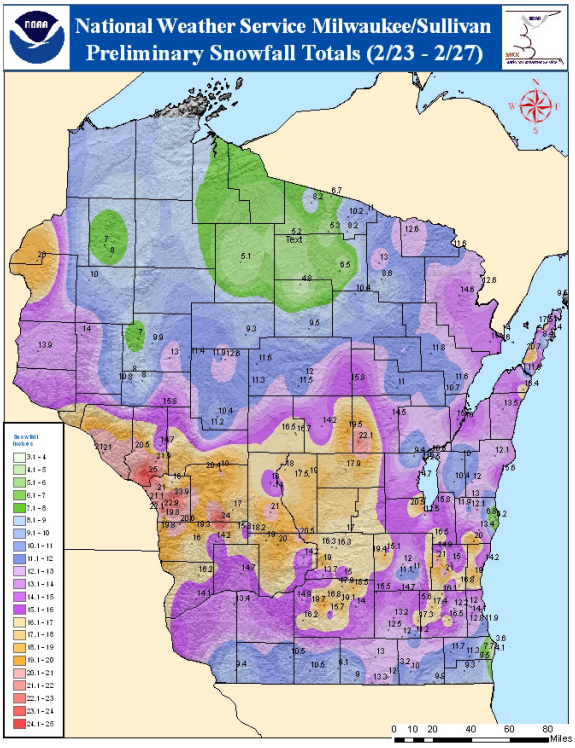
The National Weather Service descriptions of winter storm elements are:

- 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. Waukesha County averages approximately 38 inches of snow annually. Storm tracks originating in the southern Rockies or Plains states that move northeastward produce the heaviest precipitation, usually six to twelve inches. Low-pressure systems originating in the northwest (Alberta) tend to produce only light snowfalls of two to four inches. Snowfalls associated with Alberta lows occur more frequently with colder weather.

Although massive blizzards are rare in Wisconsin, blizzard-like conditions often exist during heavy snowstorms when gusty winds cause blowing and drifting of snow. Near blizzard conditions existed in Wisconsin in January 1979 when record snowfalls were recorded in many areas and wind speeds gusted to over thirty miles per hour.

Both ice and sleet storms can occur at any time throughout the winter season from November to April. Ice storms of disastrous proportions occurred in central Wisconsin in February 1922 and in southern Wisconsin in March 1976. A Presidential Disaster Declaration occurred as a result of the 1976 storm. Utility crews

from surrounding states were called in to restore power, which was off for up to ten days in some areas. Other storms of lesser magnitude caused power outages and treacherous highway conditions.

The probability that there will be severe winter storms in Waukesha County is medium and the likelihood that those storms will cause significant damage is also medium. The following table details Waukesha County's 63 winter storm statistics (i.e., snow and ice events) as reported by the National Weather Service including human loss and injury and property damage estimates from 1 January 1950 through 30 April 2011.

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
Statewide	1/13/1993	Heavy Snow	0	0	0	0
Central And Southern	1/5/1994	Heavy Snow	0	0	0	0
All But Far Northwest	1/26/1994	Heavy Snow/ice Storm	0	0	0	0
Southern And Eastern	2/7/1994	Heavy Snow	0	0	0	0
Southeast Wisconsin	2/12/1994	Heavy Snow	0	0	0	0
Southern Half Of Wisc	2/22/1994	Heavy Snow	0	0	0	0
Southern Half Of Wisc	2/25/1994	Heavy Snow	0	0	0	0
Southern Wisconsin	4/30/1994	Heavy Snow	0	0	0	0
Waukesha County	12/5/1994	Heavy Snow	0	0	0	0
Waukesha County	1/19/1995	Heavy Snow	0	0	0	0
Southeast Wisconsin	11/11/1995	Heavy Snow	0	0	0	0
Central And Southern	11/26/1995	Heavy Snow	0	1	0	0
Southern Wisconsin	12/13/1995	Glaze	0	0	0	0
Waukesha County	1/26/1996	Heavy Snow	0	0	0	0
Waukesha County	3/17/1997	Ice Storm	0	0	0	0
Waukesha County	4/11/1997	Winter Storm	0	0	0	0
Waukesha County	1/8/1998	Winter Storm	0	0	0	0
Waukesha County	3/9/1999	Winter Storm	0	0	0	0
Waukesha County	4/7/2000	Winter Storm	0	0	0	0
Waukesha County	12/11/2000	Heavy Snow	0	0	0	0
Waukesha County	12/18/2000	Heavy Snow	0	0	0	0
Waukesha County	3/2/2002	Heavy Snow	0	0	0	0
Waukesha County	2/3/2003	Winter Weather/mix	0	0	0	0
Waukesha County	2/11/2003	Winter Storm	0	0	0	0

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
Waukesha County	3/4/2003	Heavy Snow	0	0	0	0
Waukesha County	4/4/2003	Winter Weather/mix	0	0	0	0
Waukesha County	4/7/2003	Winter Weather/mix	0	0	0	0
Waukesha County	1/4/2004	Winter Weather/mix	0	0	0	0
Waukesha County	1/16/2004	Winter Weather/mix	0	0	0	0
Waukesha County	1/26/2004	Heavy Snow	0	0	0	0
Waukesha County	2/8/2004	Winter Weather/mix	0	0	0	0
Waukesha County	11/30/2004	Winter Weather/mix	0	0	0	0
Waukesha County	12/18/2004	Winter Weather/mix	0	0	0	0
Waukesha County	1/1/2005	Winter Weather/mix	0	0	0	0
Waukesha County	1/6/2005	Winter Storm	0	0	0	0
Waukesha County	1/22/2005	Winter Storm	0	0	0	0
Waukesha County	2/16/2006	Winter Storm	0	0	0	0
Waukesha County	12/1/2006	Winter Storm	0	0	0	0
Waukesha County	2/25/2007	Winter Storm	0	0	0	0
Waukesha County	12/11/2007	Ice Storm	0	0	0	0
Waukesha County	12/15/2007	Winter Weather	0	0	0	0
Waukesha County	1/21/2008	Heavy Snow	0	0	0	0
Waukesha County	1/29/2008	Winter Storm	0	0	0	0
Waukesha County	2/5/2008	Winter Storm	0	0	0	0
Waukesha County	2/17/2008	Ice Storm	0	0	20K	0
Waukesha County	11/30/2008	Winter Storm	0	0	0	0
Waukesha County	12/01/2008	Winter Storm	0	0	0	0
Waukesha County	12/08/2008	Winter Storm	0	0	0	0
Waukesha County	12/21/2008	Winter Storm	0	0	0	0
Waukesha County	12/27/2008	Winter Storm	0	0	0	0

Location	Date	Type	Death	Injury	Property Damage	Crop Damage
Waukesha County	01/03/2009	Winter Weather	0	0	0	0
Waukesha County	01/09/2009	Winter Weather	0	0	0	0
Waukesha County	01/13/2009	Winter Weather	0	0	0	0
Waukesha County	03/28/2009	Winter Weather	0	0	0	0
Waukesha County	12/23/2009	Winter Storm	0	0	0	0
Waukesha County	1/7/2010	Winter Storm	0	0	0	0
Waukesha County	2/9/2010	Winter Storm	0	0	0	0
Waukesha County	3/19/2010	Winter Weather	0	0	0	0
Waukesha County	12/9/2010	Winter Weather	0	0	0	0
Waukesha County	12/20/2010	Winter Weather	0	0	0	0
Waukesha County	2/6/2011	Winter Weather	0	0	0	0
Waukesha County	2/20/2011	Winter Storm	0	0	0	0
Waukesha County	3/9/2011	Winter Weather	0	0	0	0
		TOTALS:	0	1	20K	0

Vulnerability

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

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

Hazard Mitigation Strategies

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

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

The Waukesha County Highway Department is responsible for much of the response to and recovery from winter storm events. The department provided the following mitigation projects that would help them with their tasks:

- Create additional locations for road salt storage:
  - The county would like one additional large 15,000 lb salt dome for state and county usage and the purchase is slated for completion by Winter 2009.
  - The Village and Town of Mukwonago would like additional storage in smaller salt domes
- The County would like additional Road Weather Information System (RWIS) monitoring system stations. There is one station on I-94 but the weather/road conditions vary widely around the county. The stations report air and bridge/road deck temperature and wind speed and direction.
- The county would like to have AVL (automatic vehicle locator) and routing software for snowplows to increase efficiency and reduce waste.

Additionally, the Village of Elm Grove would like to:

- Monitor severe weather advisories if at risk for winter storms.
- Maintain the proper amount of resources (e.g., salt) to properly manage winter storms.

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 usually means an electrical power or natural gas outage or a fuel shortage caused by an oil embargo, power failure or natural disaster.

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. Waukesha County is provided with electric service by WE Energies. In addition, a municipal electric power utility is operated by the City of Oconomowoc. There are no electric power generating facilities located within the county. Natural gas service is provided by WE Energies and by the Wisconsin Gas Company.

Electrical substation

Thunderstorms with lightning are a possible cause of power failure. Fuel shortages can be caused by localized imbalances in supply. Labor strikes, severe cold weather or snowstorms also can cause a local shortage.

Frequency of Occurrence

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

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

Vulnerability

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

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. Waukesha County has worked directly with the utility companies and emergency management responders in formulating emergency management plans. During a fuel or power shortage, residents, schools, industry and businesses will be asked to take measures to conserve fuel. If the fuel shortage reaches a critical stage, all non-essential facilities will be closed and contingency plans will be activated.

In the event of a prolonged power outage, Waukesha County has generators available to provide power for radio communication and EOC operation. Evacuation and shelter arrangements have been prepared in case of a severe power outage. Currently countywide emergency shelters only have emergency back-up power (e.g., to exit lights), which is not adequate to fulfill the needs of evacuees. The county and its municipalities would like to enhance back-up power needs capabilities. To start this, in 2010 the county purchased two large (100KW) portable generators. The distribution equipment will be delivered in late summer/early fall and then staff will be trained on their usage. The units should be deployable in Fall 2010. The major goal of this project/equipment is to be capable of providing power at any mass clinic site but they can be used at shelters if not needed for a clinic. The county will need to evaluate if this is sufficient for sheltering operations.

It should be noted that schools are often top choices as community disaster shelters but few of the county's schools have back-up generators. Currently, the only place in the county with sufficient power to operate air handling units is the EOC. There is some emergency power to run boilers and minimal lighting in the pre-identified shelters but this would not be adequate for long-term operations. The Waukesha County Emergency Management Office would like to complete a feasibility study (including a cost-benefit analysis) to selectively upgrade shelter facilities for electricity needs. Emergency Management would also like to look at creating adequate shelters in each third of the county to ensure that residents had close access to an emergency shelter.

The City of Waukesha would also like to have a mobile generator to provide back-up power to critical municipal facilities. This was not funded by the UASI grant so in the short-term the city has allocated $7,000 for upgrading the police department building's electrical

wiring to take outside wiring and for an ongoing contingency contract with FABCO for a generator.

The county and its municipalities would also like to complete a survey to determine which railroad intersection safety systems do not have electrical power back-ups and then to seek funding sources to remedy deficiencies based on survey results.

Water service is generally provided by the incorporated municipalities and its continuation is a major concern for them. The Cities of Pewaukee and Waukesha would like to have truck-mounted water pumps to serve as back-ups to the stationary pumps in an electrical failure. In a power outage, water is available for 24 hours but water is still needed beyond that for regular community usage and firefighting. The Village of Mukwonago would also like to upgrade their old water utility pumps.

The City of Muskego would like to upgrade the sewage lift station's capacity to 5 million gallons per day. This goal of this project will be to help keep sewage from backing up into resident basements in floods.

Village of Pewaukee is interested in installing a back-up generator at Well #3 because the computer system panel that manages the whole water utility system is in that well house and the system would not be able to be monitored and controlled if power was lost at that location.

The Village of Sussex wishes to install a back-up generator in their public safety building. The County Sheriff's Office has a remote office location in the building for the deputies contracted to provide law enforcement coverage for the Village. The building also houses the Village's own EOC and fire department. The fire department has an undersized generator that will power their side but not the newly expanded other portions of the building.

The Village of Wales is removing old, diseased and/or damaged trees that are risks for damaging property in a severe wind, thunder or ice storm. The cost is about $10,000 over three years with the 2010 contract approximately $3,000. This work is being funded by the municipality.

The City of New Berlin wants to relocate, floodproof and elevate sewage lift stations that received damage in the 2008 flooding. The cost for this project is approximately $350,000 - $400,000. The

city applied for a mitigation grant but funding was not made available.

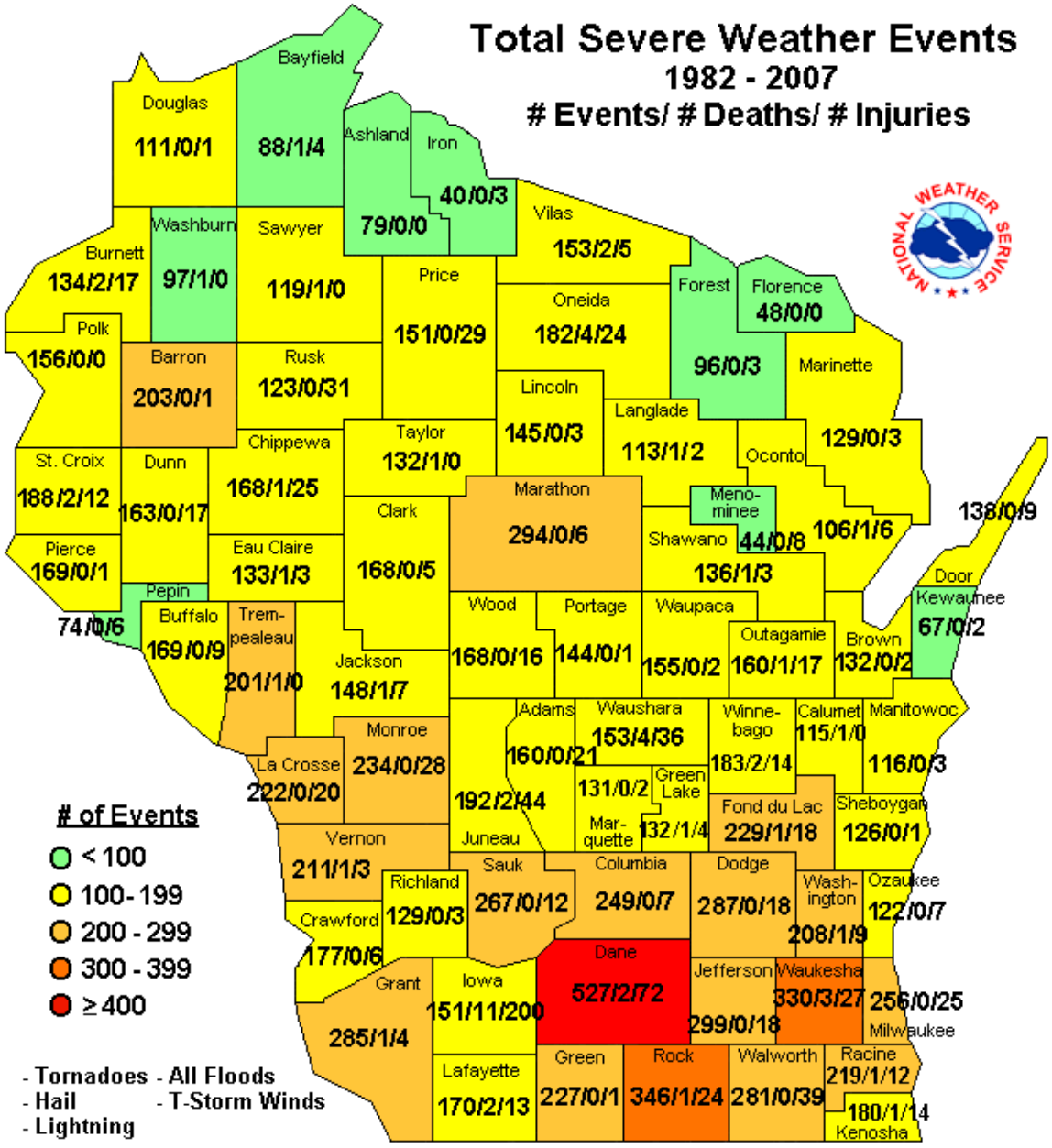
The Villages of Big Bend, Chenequa, Eagle, Hartland, Lac La Belle, North Prairie and Wales want to evaluate options for providing shelters, with back-up power generators (or panels to accept portable generators), within the municipalities. The Village of Chenequa has two state highways and a railroad through the village, which are concerns for hazardous materials spills. The Village has no pre-identified shelter and no facility with back-up power although the school district may be willing to host evacuees. The Village of Wales shelter is at the school but it does not have back-up power.

Volcano, Landslides, Hurricane and Tsunami

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

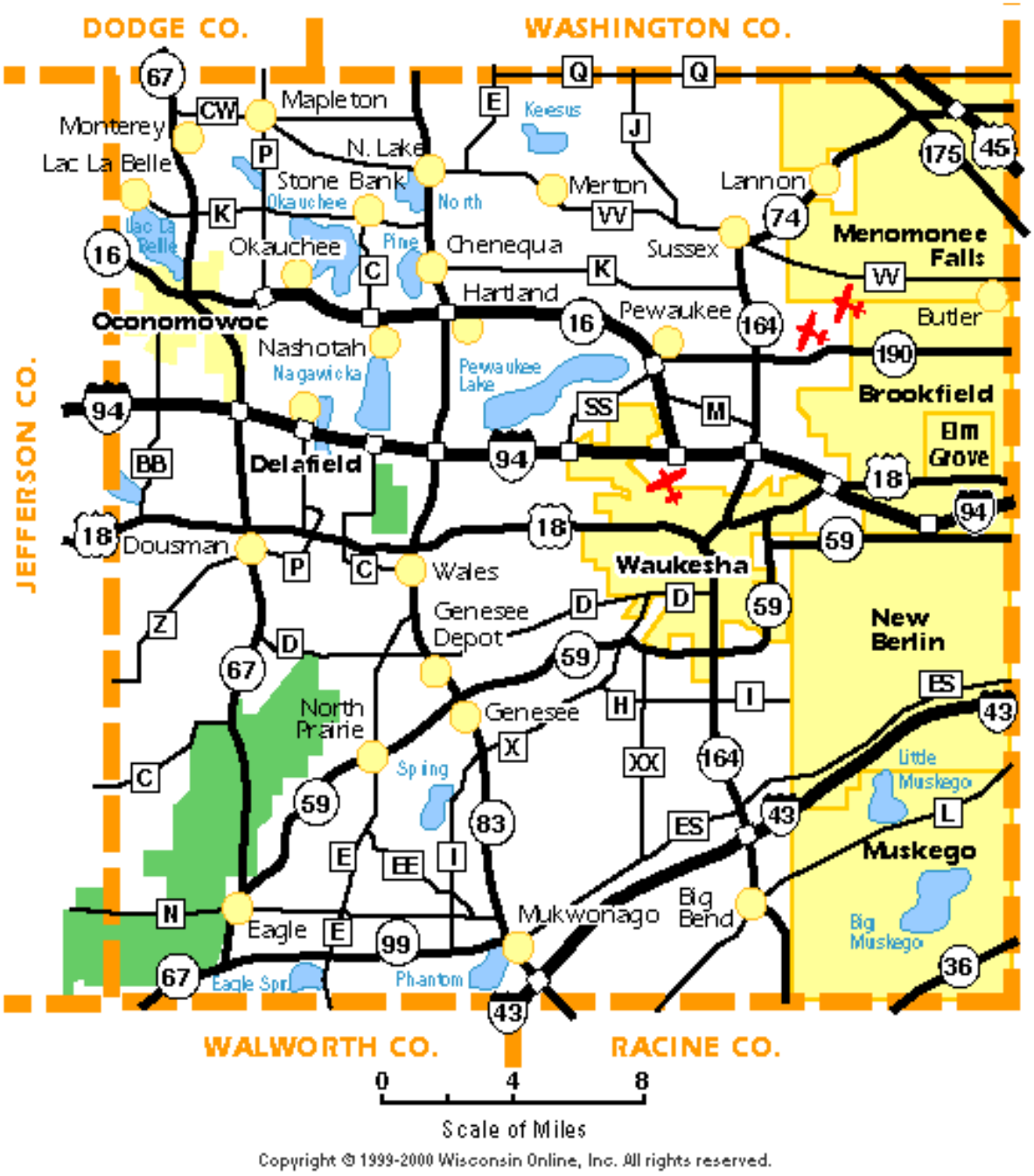
Appendix A: Maps

Wisconsin Total Severe Weather Events

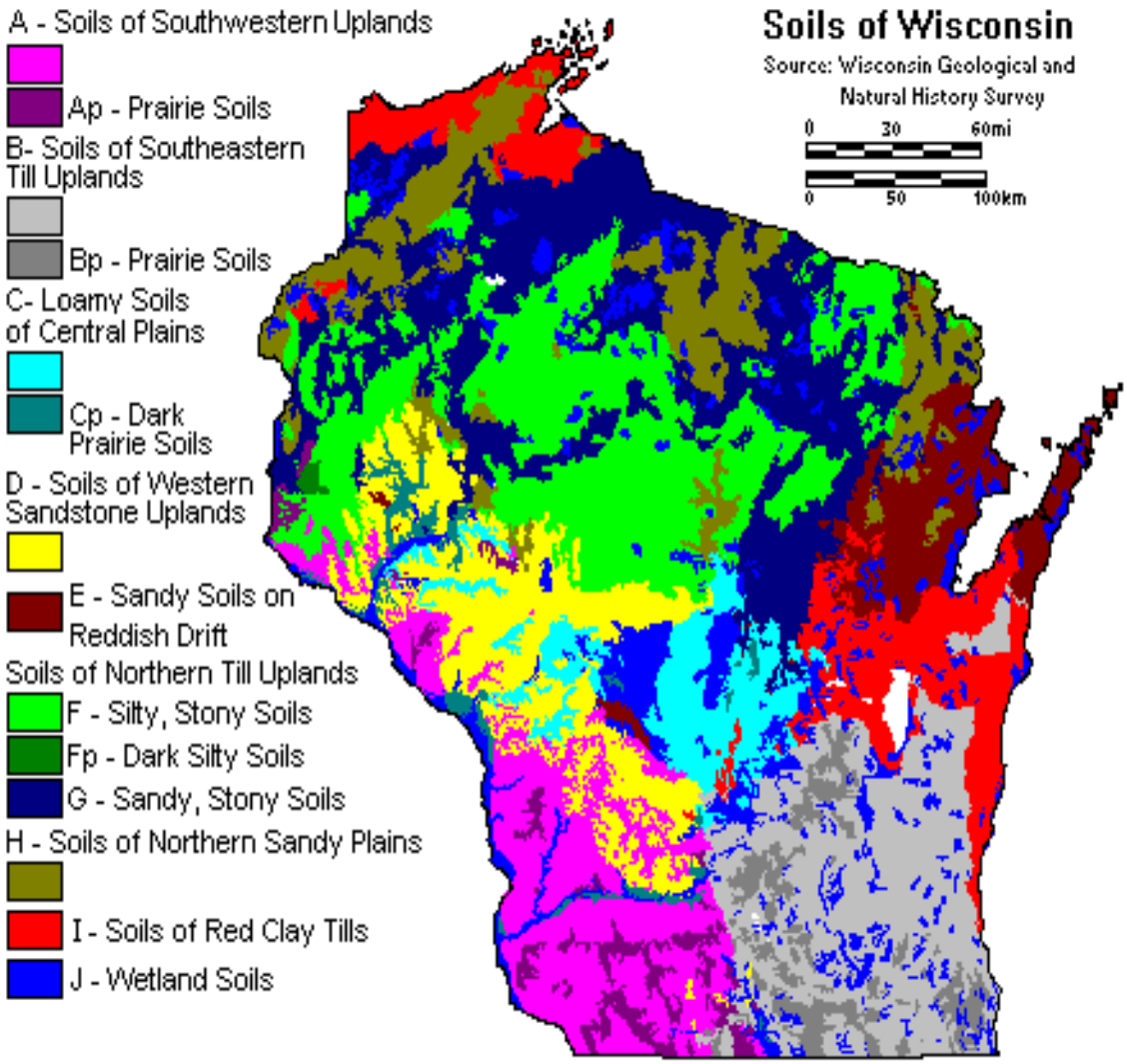


Wisconsin Emergency Management, http://emergencymanagement.wi.gov/docview.asp?docid=13595&locid=18

Waukesha County Base Map

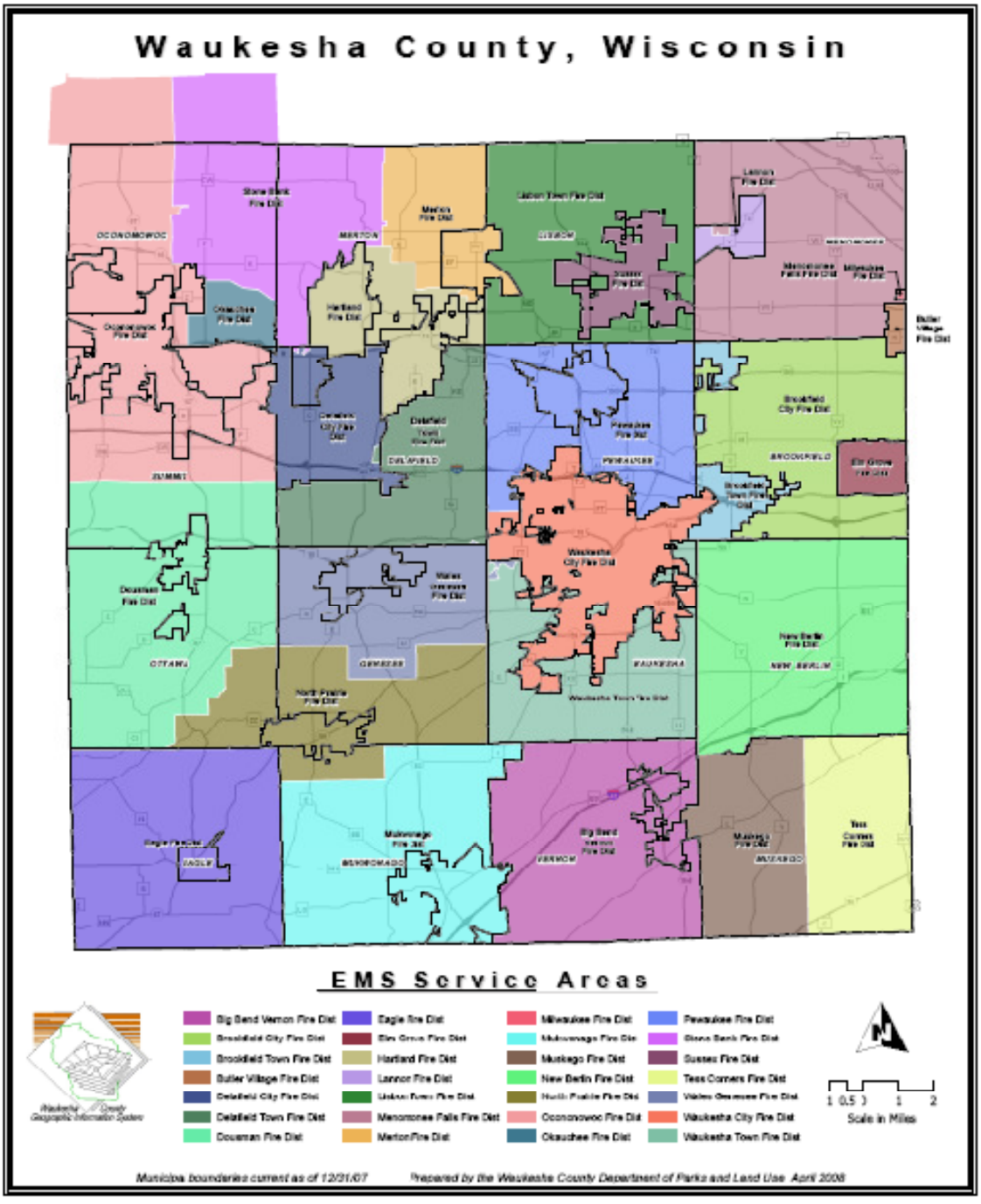


Soils Types

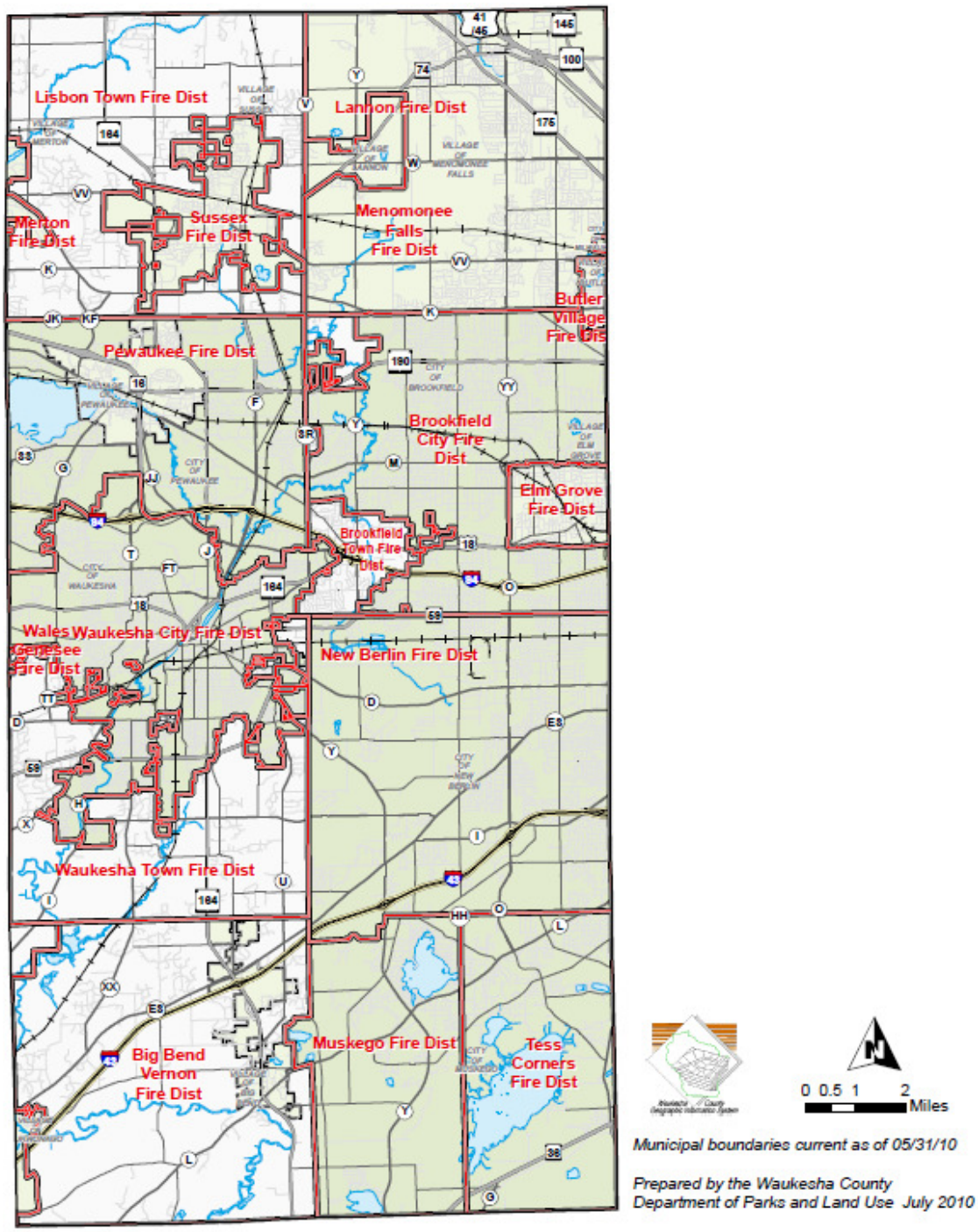


Source: *Soils of Wisconsin* compiled by F. D. Hole, 1973; Wisconsin Geological and Natural History Survey Map, scale (approx.) 1: 3,150,000.

Waukesha County EMS Service Areas



Waukesha County EMS Service Areas – East



Waukesha County EMS Service Areas – West

Waukesha County, Wisconsin

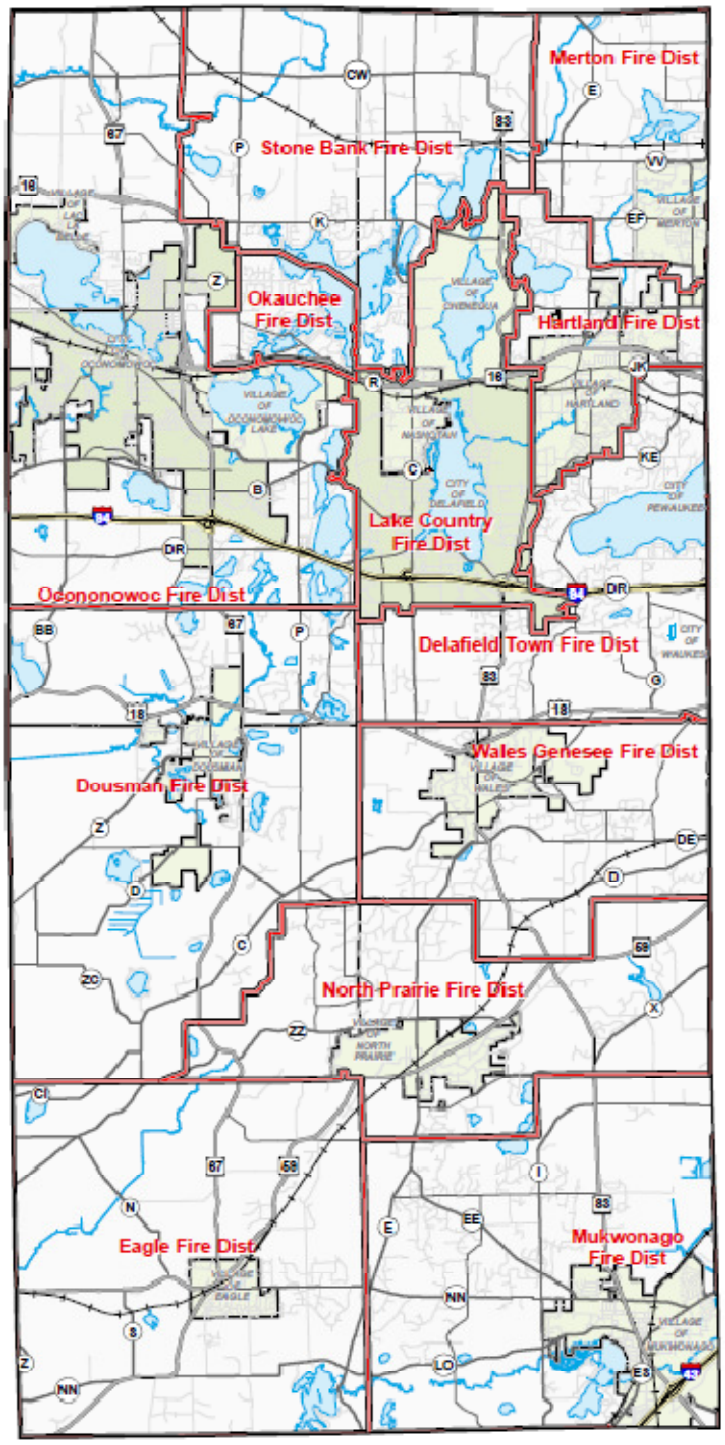
EMS Service Providers

Legend

- EMS Agency Boundary
- Railway
- Interstate
- US Highway
- State Highway
- County
- Local Major
- Local

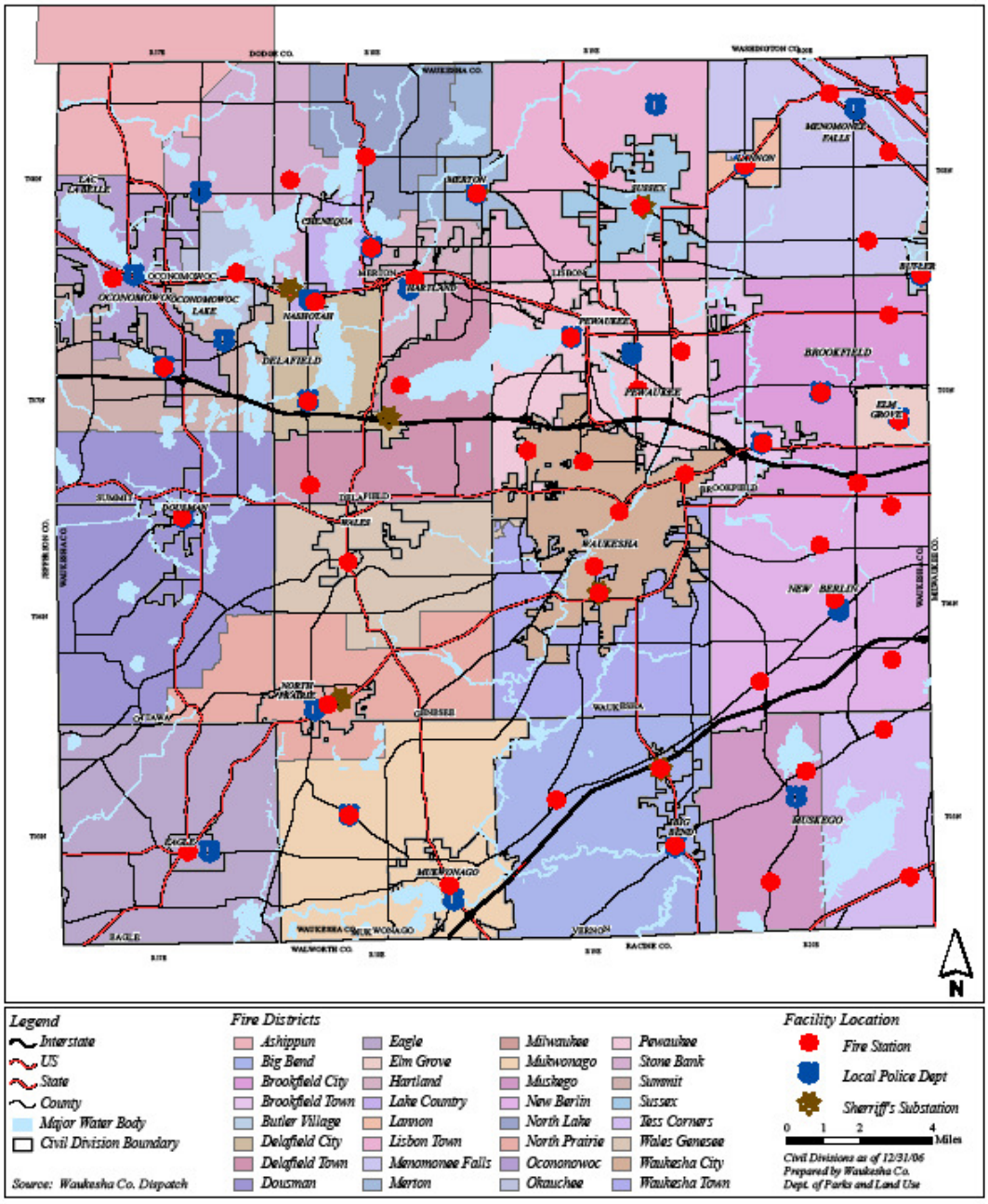
Civil Divisions

- City
- Village
- Town



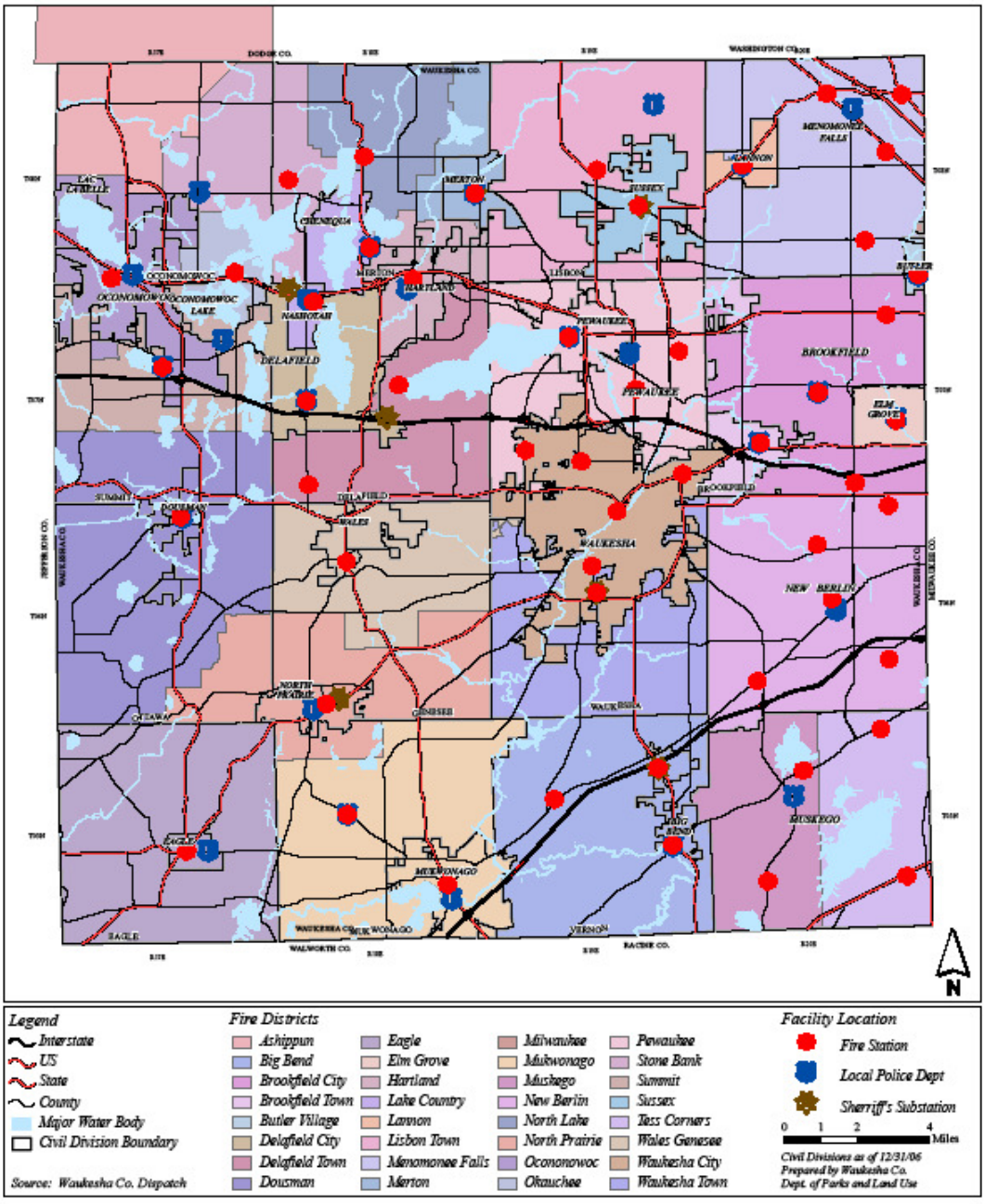
Waukesha County Fire Districts

Fire Stations, Local Police Departments & Sheriff Substations in Waukesha County: 2006



Waukesha County Law Enforcement Districts

Fire Stations, Local Police Departments & Sheriff Substations in Waukesha County: 2006



Legend
- *Interstate*
- *US*
- *State*
- *County*
- *Major Water Body*
- *Civil Division Boundary*

Source: Waukesha Co. Dispatch

Fire Districts
- *Ashippun*
- *Big Bend*
- *Brookfield City*
- *Brookfield Town*
- *Butler Village*
- *Delafield City*
- *Delafield Town*
- *Dousman*
- *Eagle*
- *Elm Grove*
- *Hartland*
- *Lake Country*
- *Lannon*
- *Lisbon Town*
- *Menomonee Falls*
- *Merton*
- *Milwaukee*
- *Mukwonago*
- *Mushego*
- *New Berlin*
- *North Lake*
- *North Prairie*
- *Oconomowoc*
- *Okauchee*
- *Pewaukee*
- *Stone Bank*
- *Summit*
- *Sussex*
- *Tess Corners*
- *Wales Genesee*
- *Waukesha City*
- *Waukesha Town*

Facility Location
- *Fire Station*
- *Local Police Dept*
- *Sherriff's Substation*

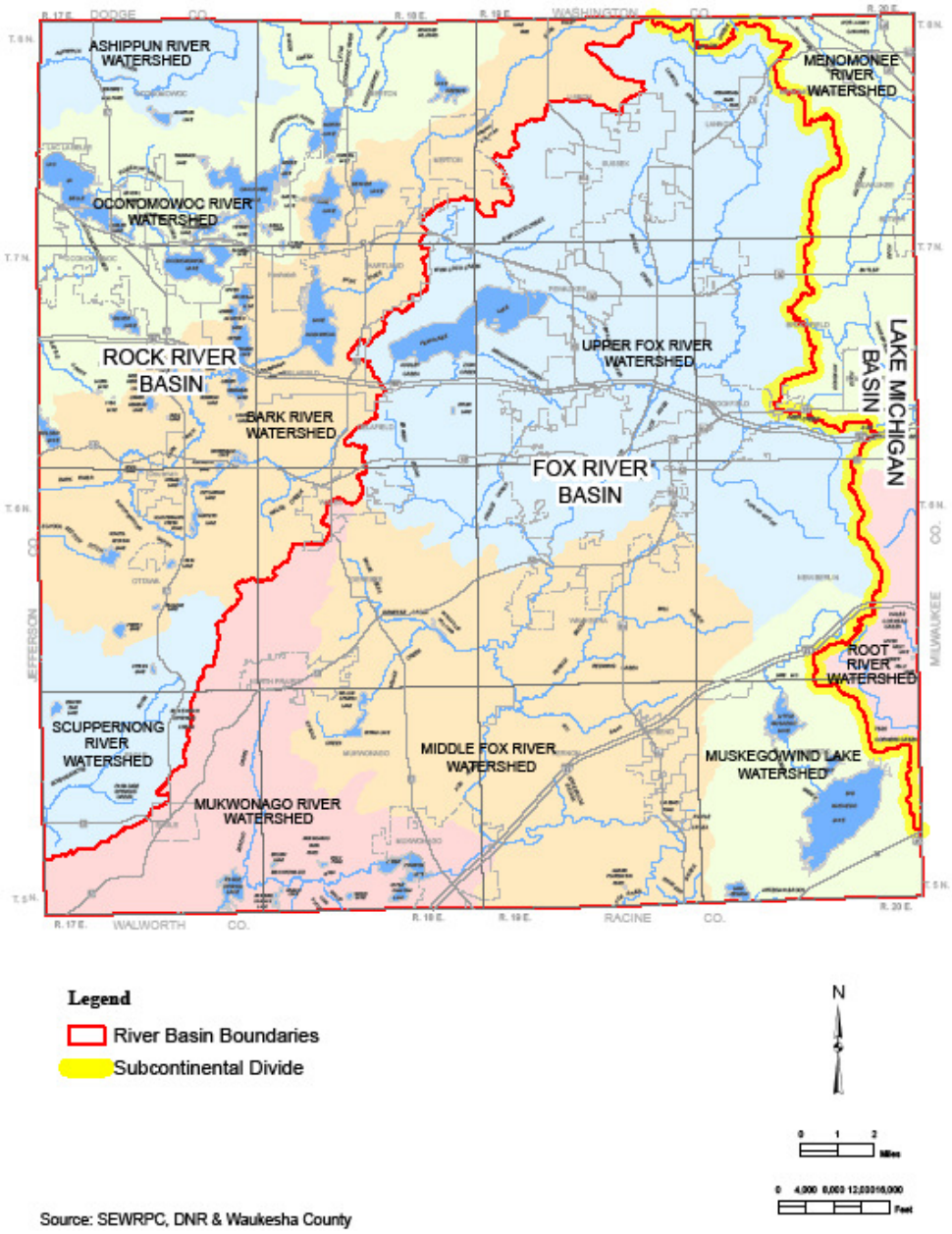
0 1 2 4 Miles

Civil Divisions as of 12/31/06
Prepared by Waukesha Co.
Dept. of Parks and Land Use

Waukesha County Watersheds

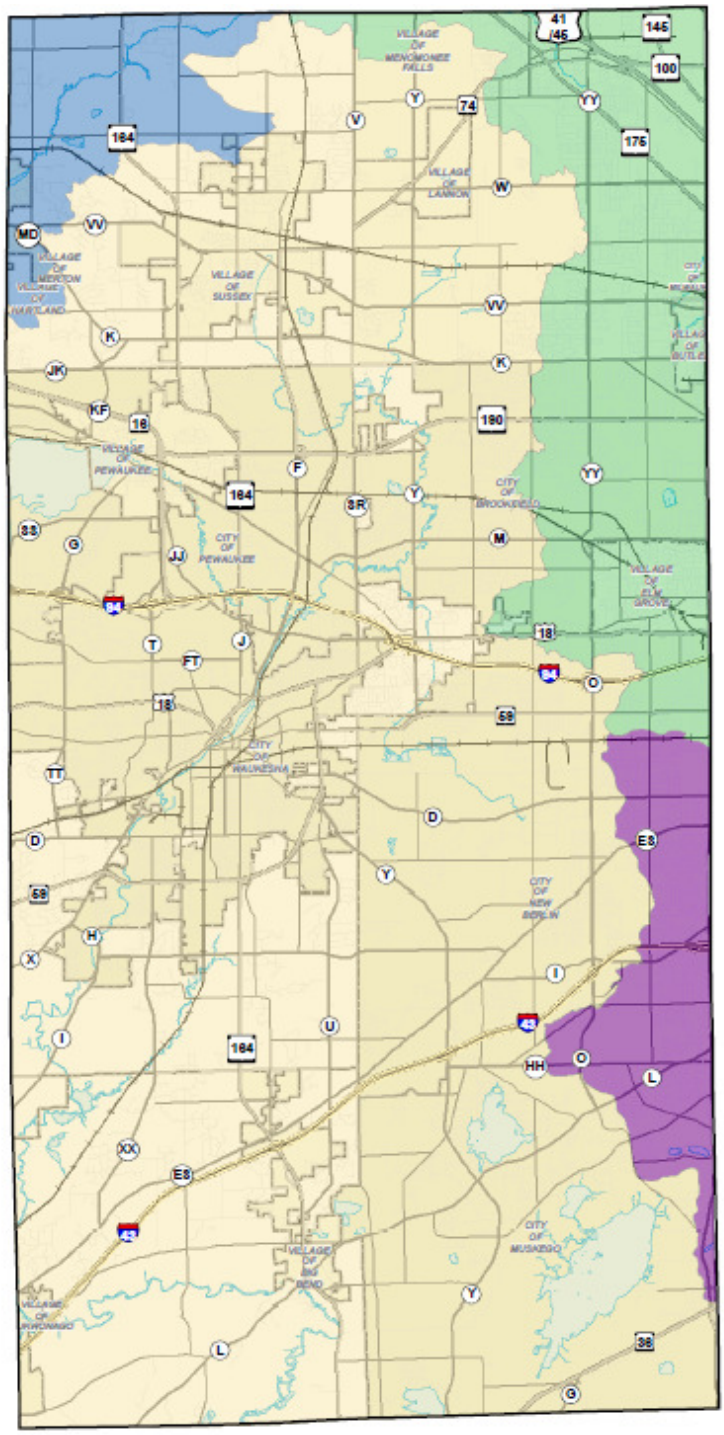
Appendix A: Maps

Watersheds of Waukesha County



Waukesha County Watersheds - East

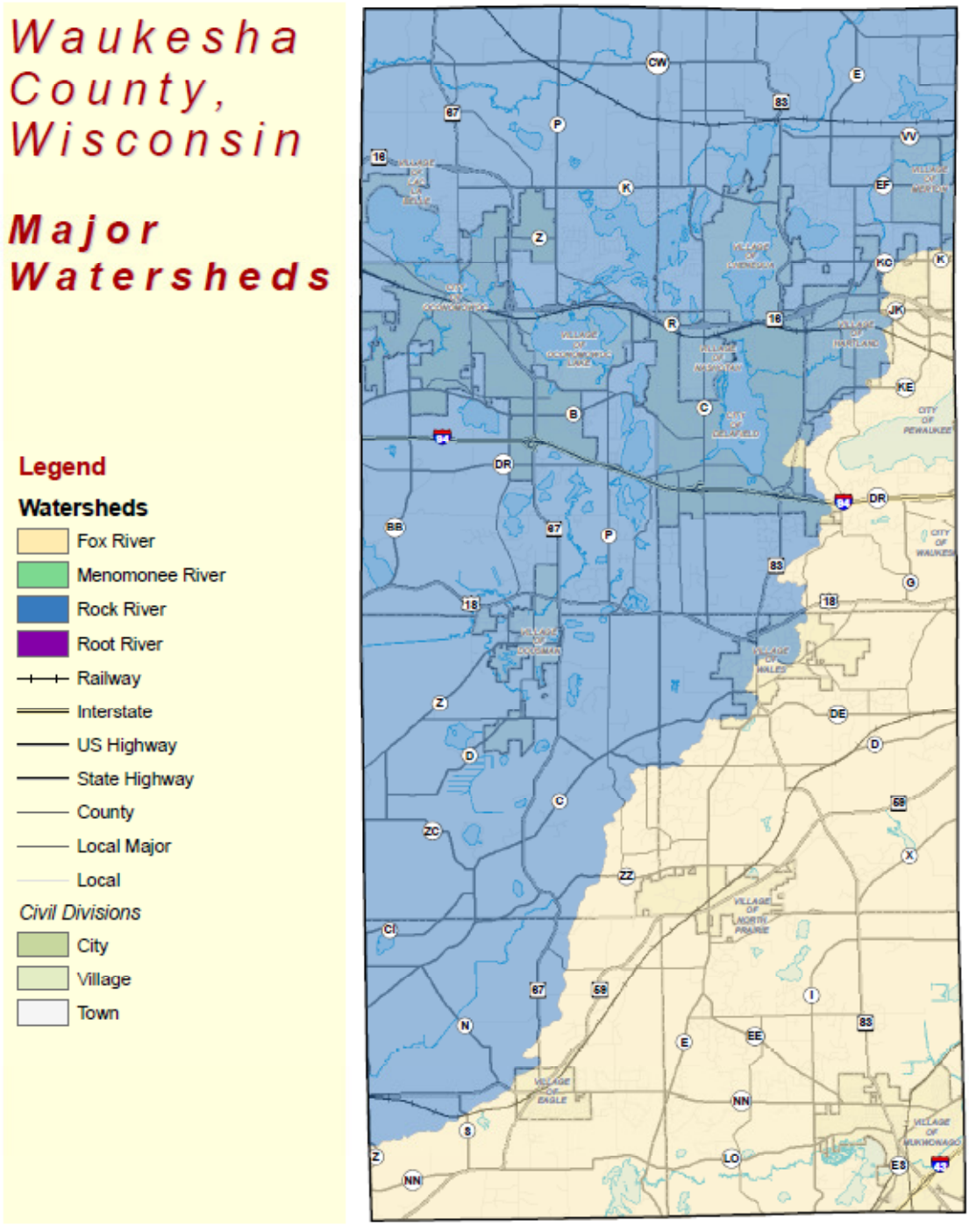
Appendix A: Maps



Municipal boundaries current as of 05/31/10

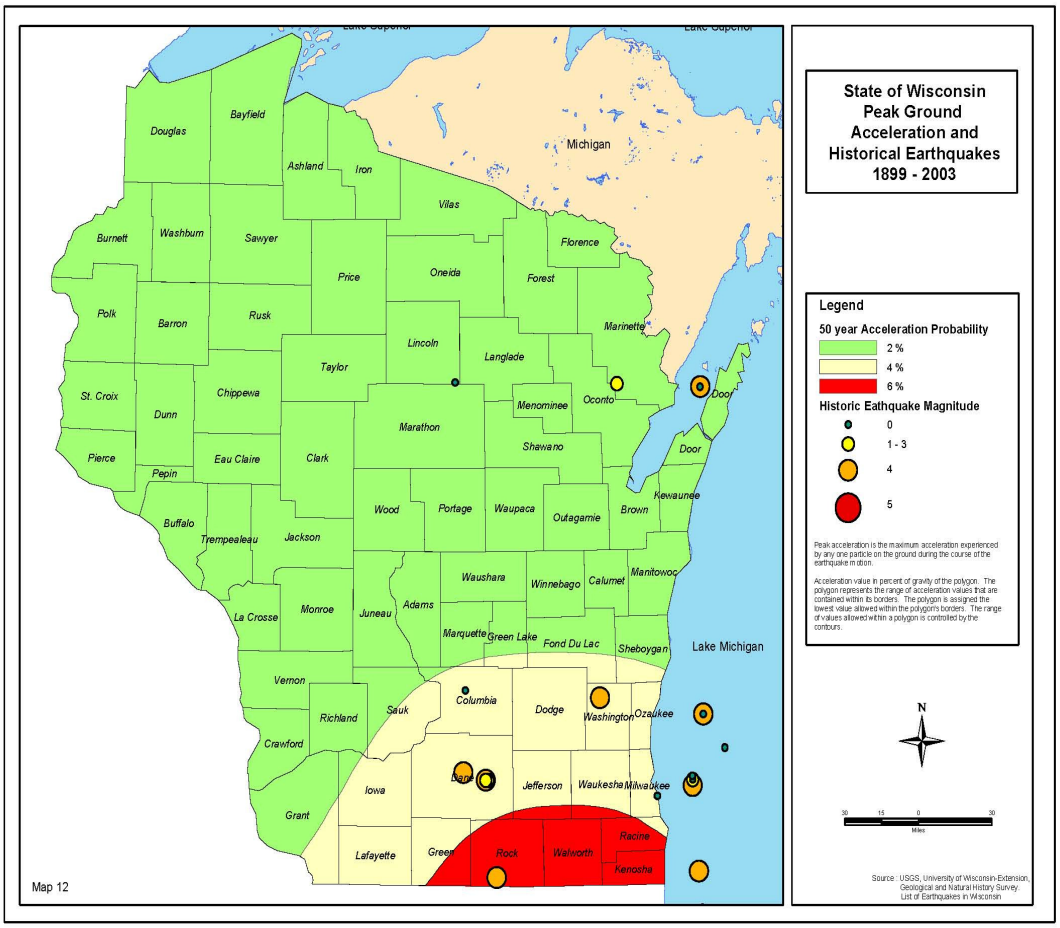
Prepared by the Waukesha County Department of Parks and Land Use July 2010

Waukesha County Watersheds – West

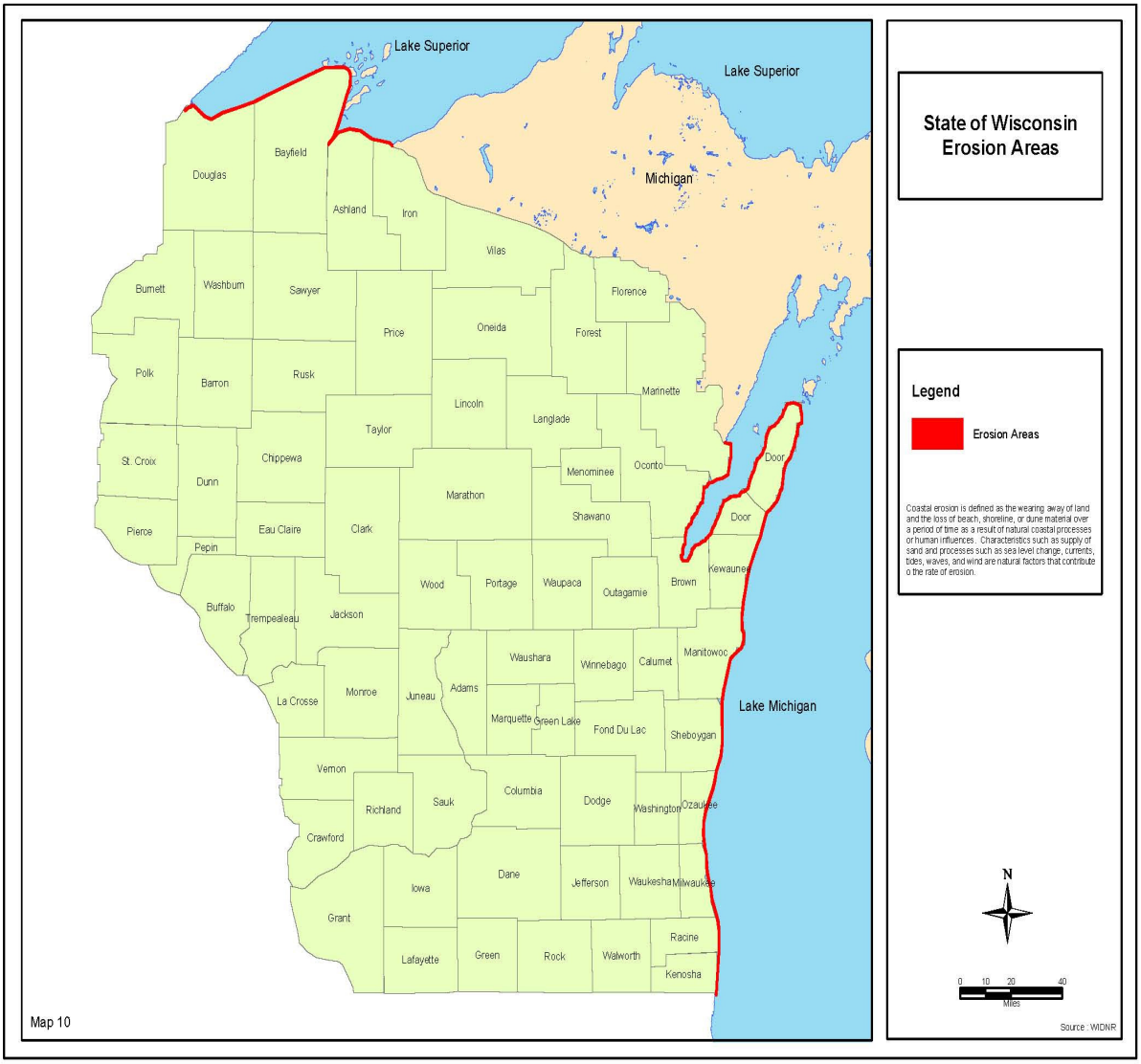


Earthquakes in Wisconsin

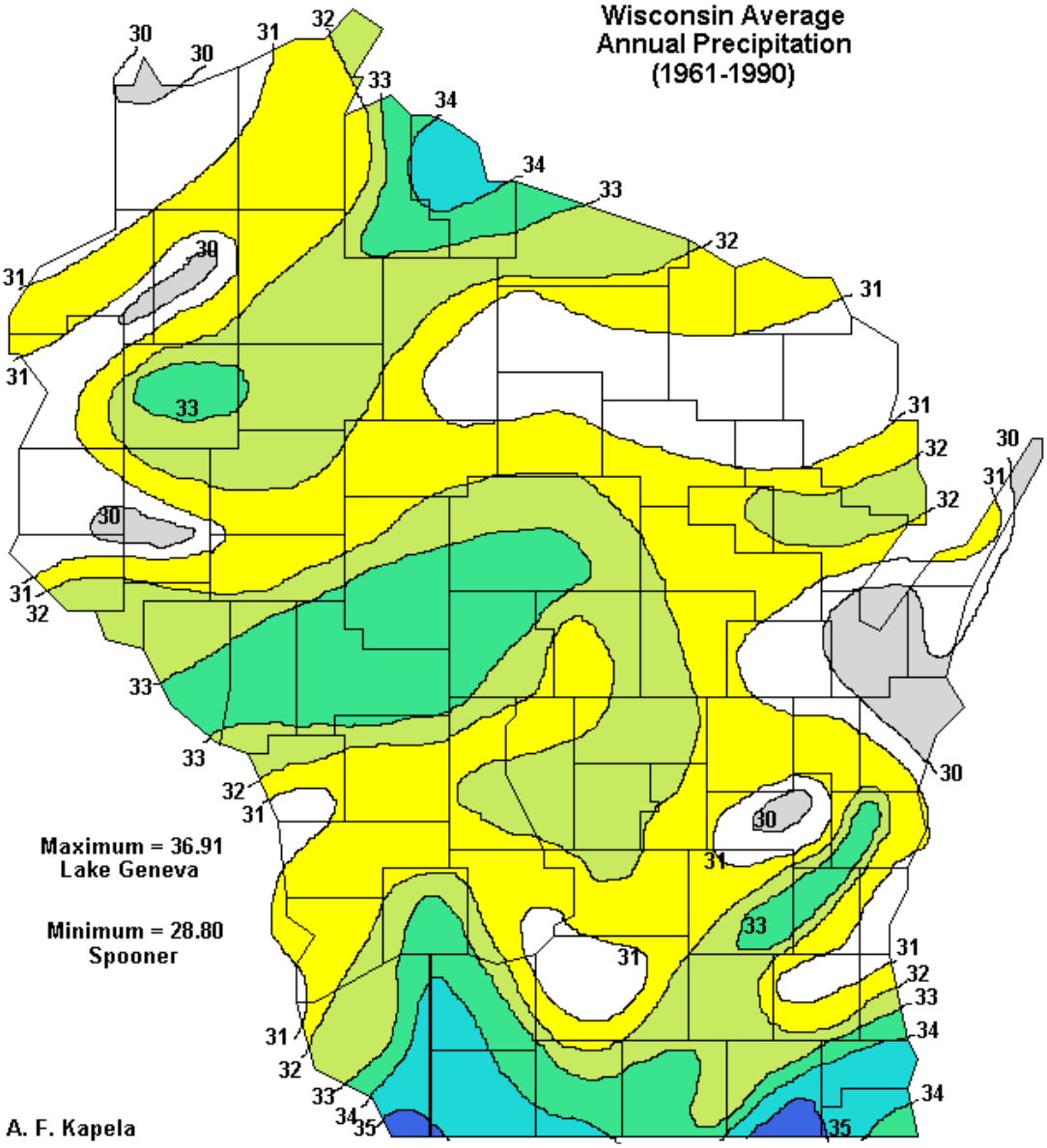
Peak Ground Acceleration Contours and Historical Earthquakes in Wisconsin



Erosion Areas in Wisconsin

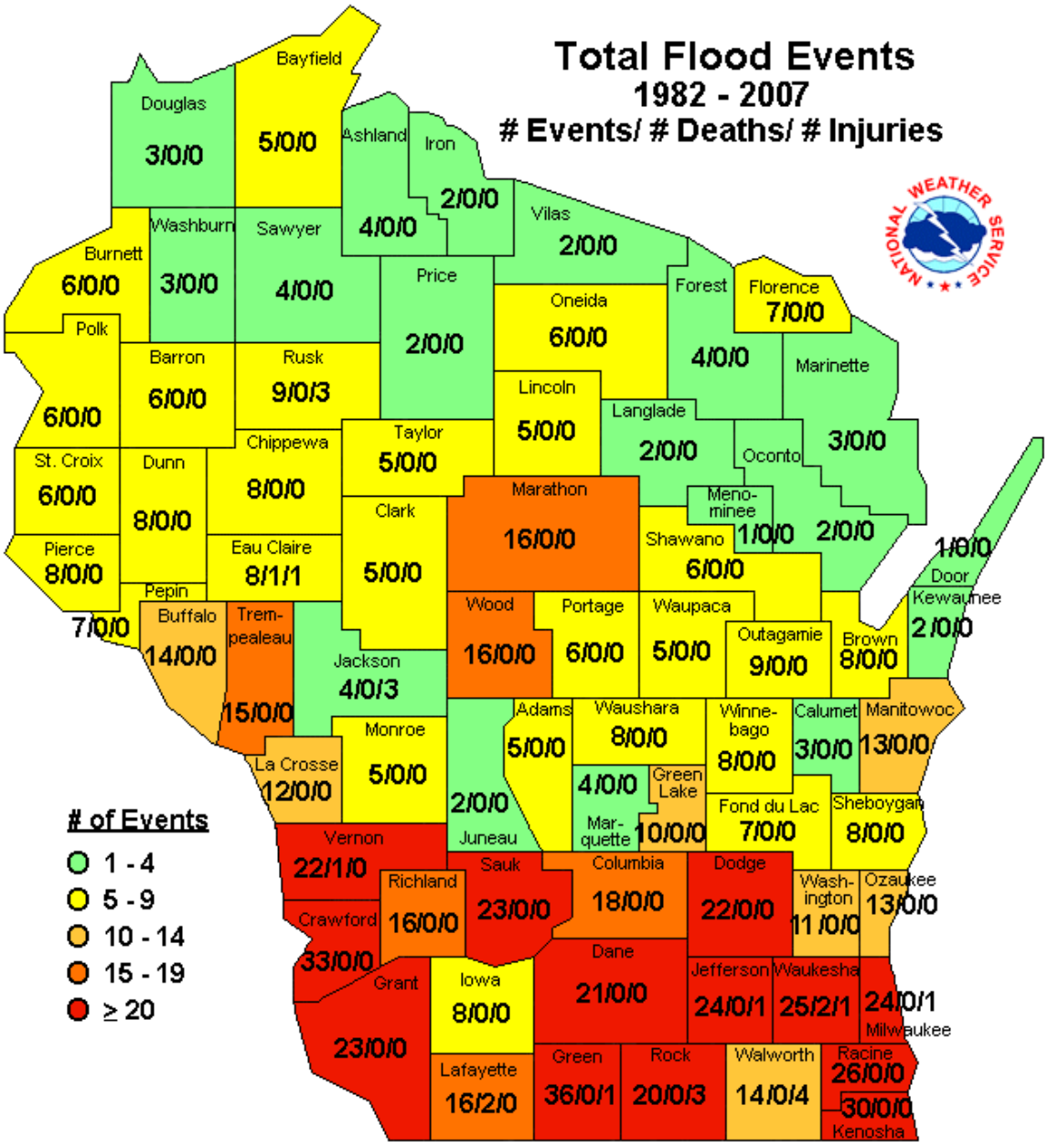


Wisconsin Annual Precipitation



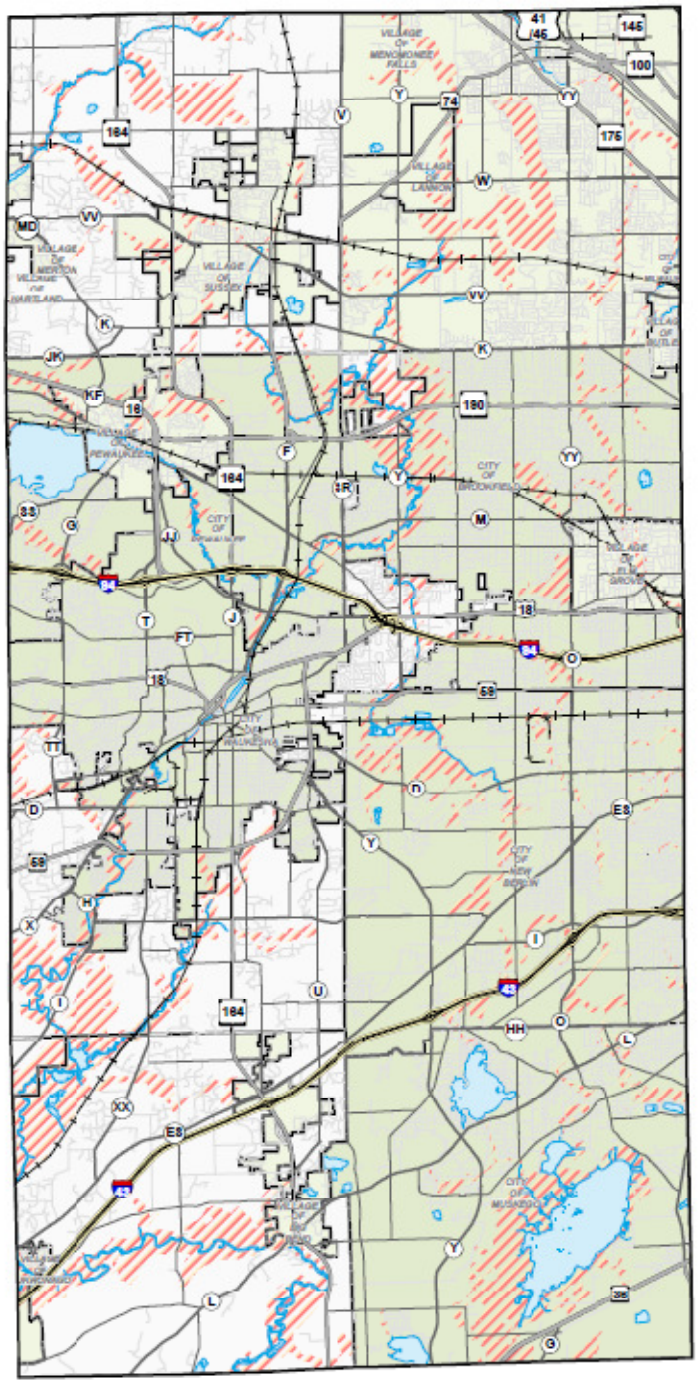
Source: http://www.uwex.edu/sco/state.html

Wisconsin Total Flood Events

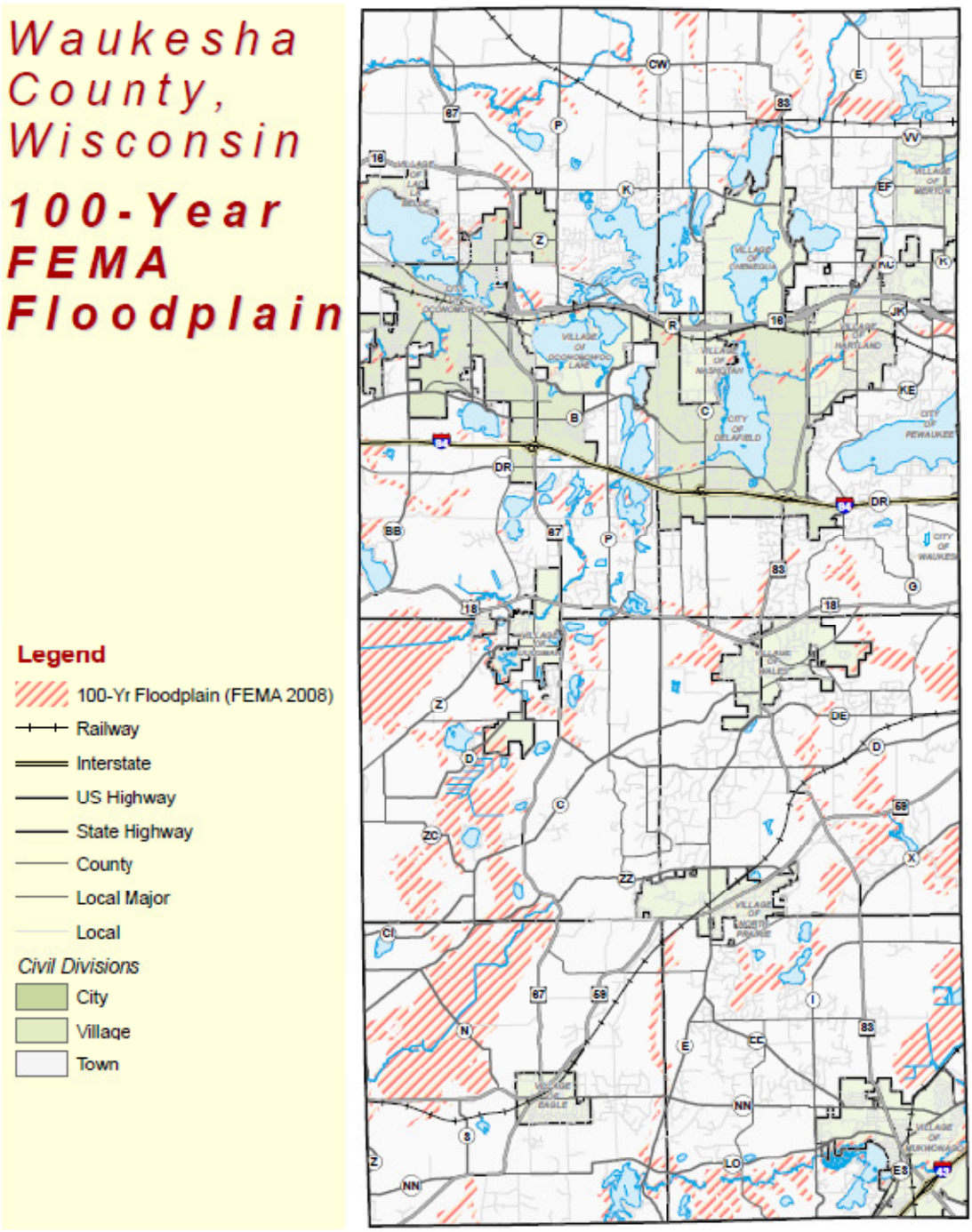


Wisconsin Emergency Management, http://emergencymanagement.wi.gov/docview.asp?docid=13591&locid=18

Waukesha County Floodplain - East

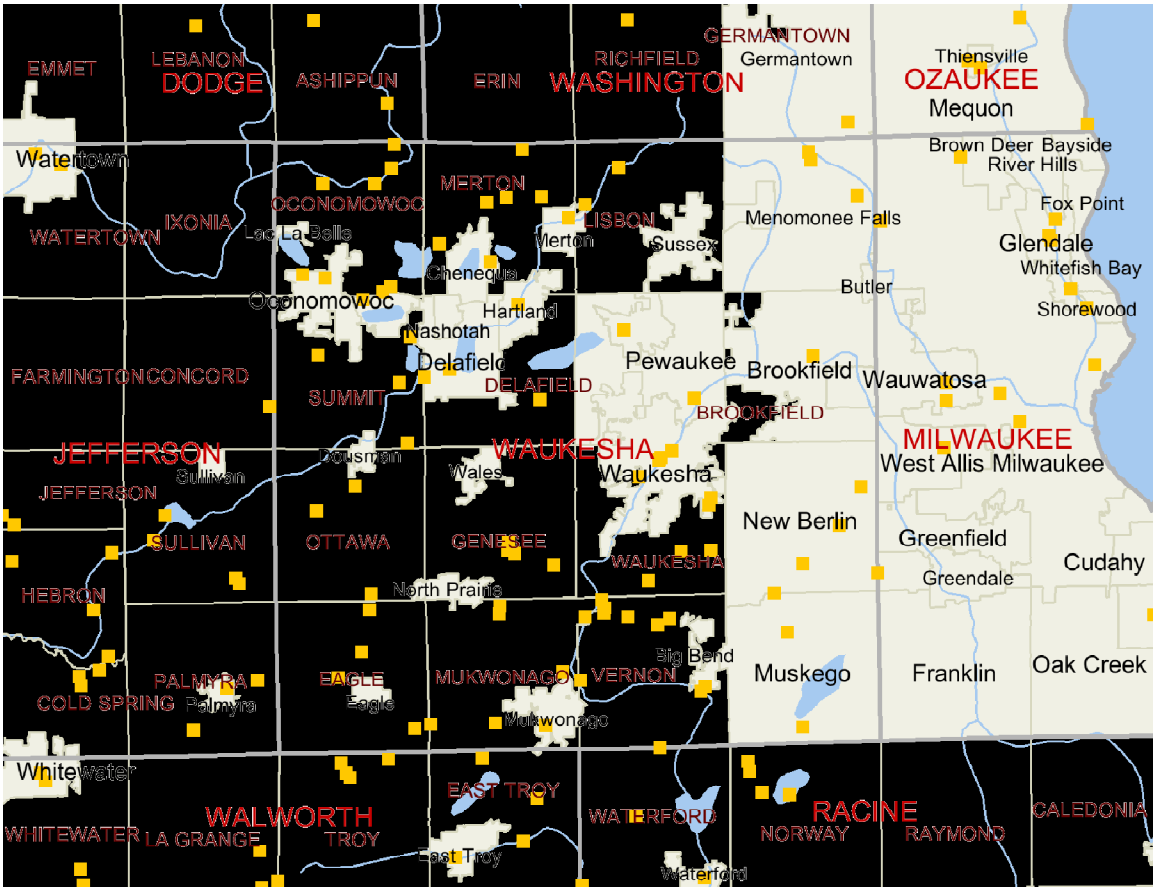


Waukesha County Floodplain – West



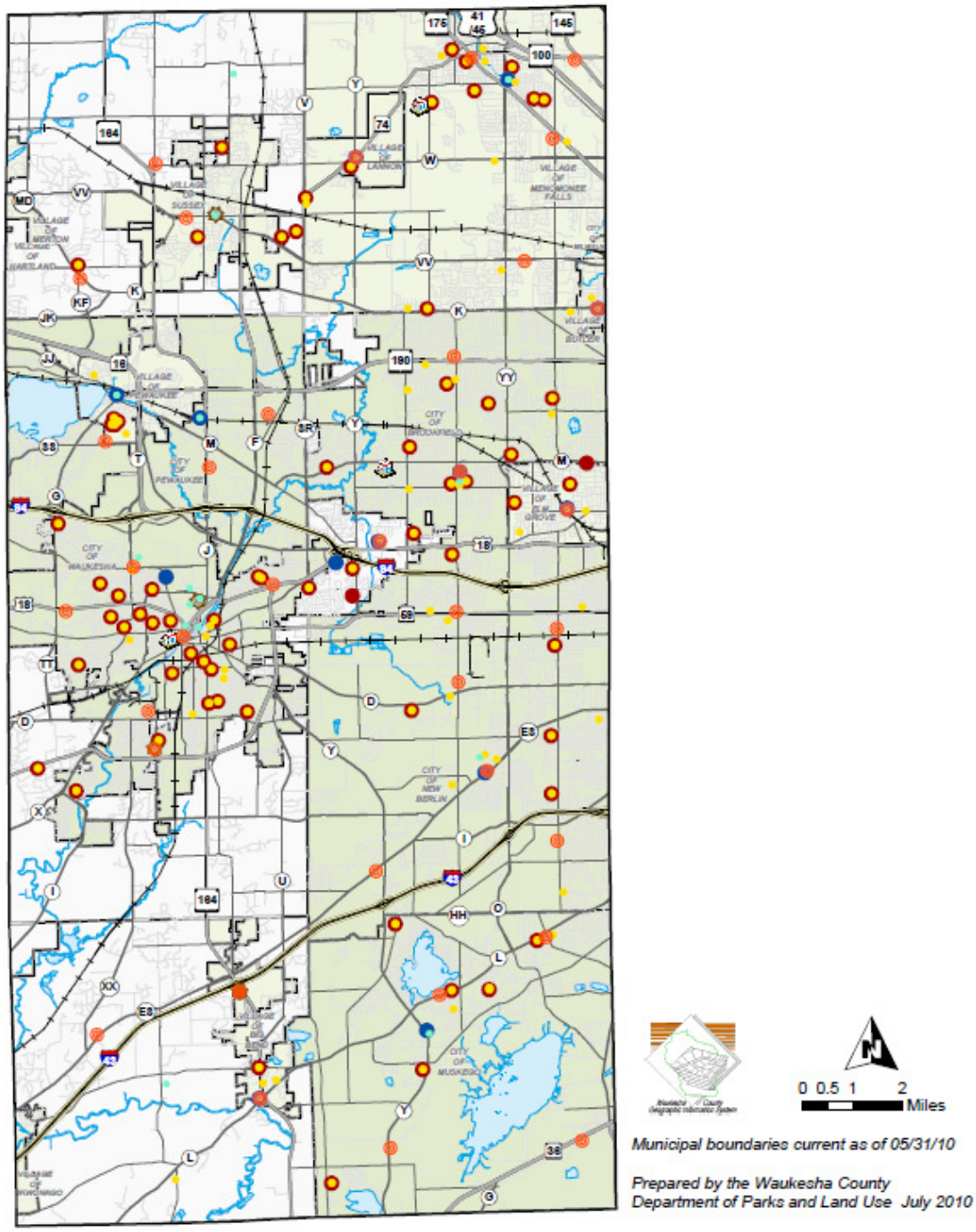
Appendix A: Maps

Waukesha County Dams

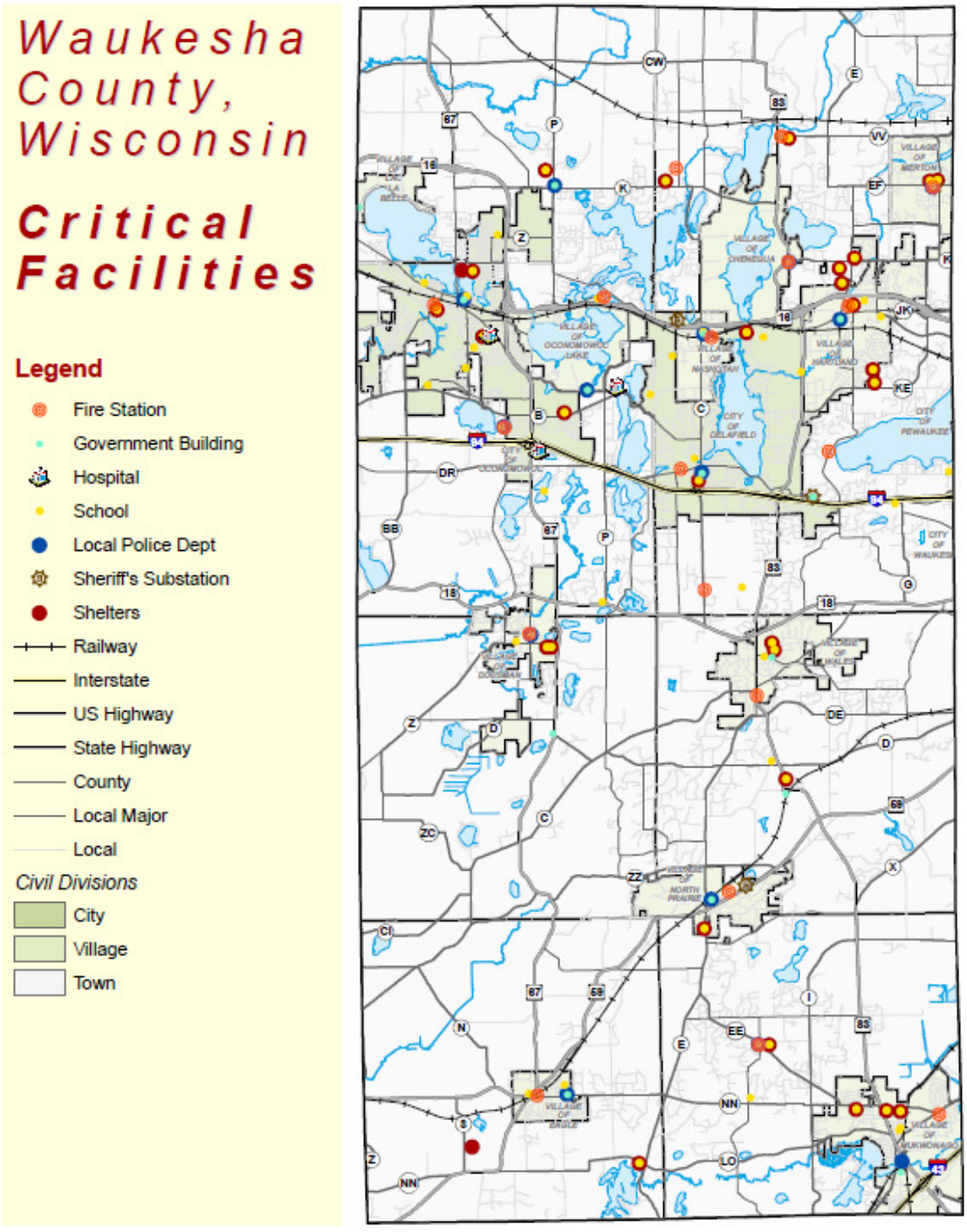


http://dnrmaps.wisconsin.gov/imf/imf.jsp?site=SurfaceWaterViewer

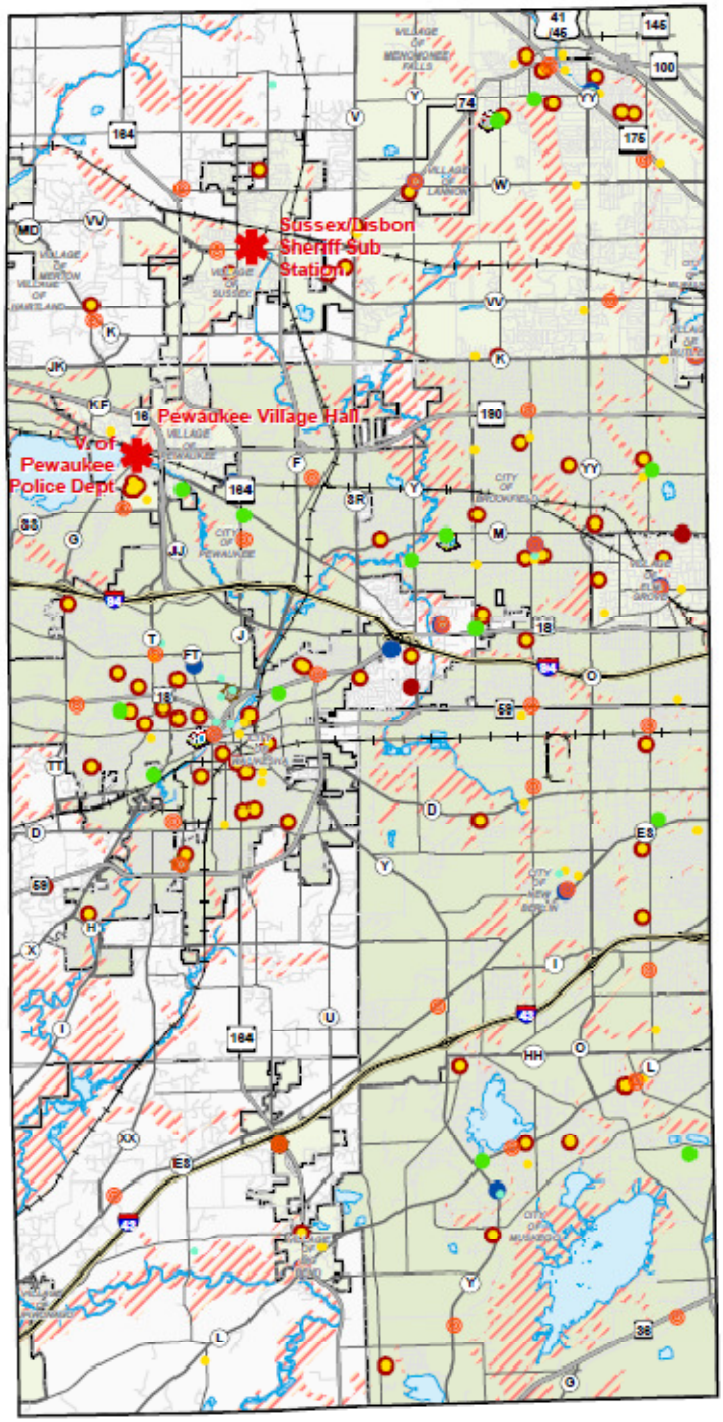
Waukesha County Critical Facilities - East



Waukesha County Critical Facilities - West



Waukesha County Critical Facilities in the Floodplain - East



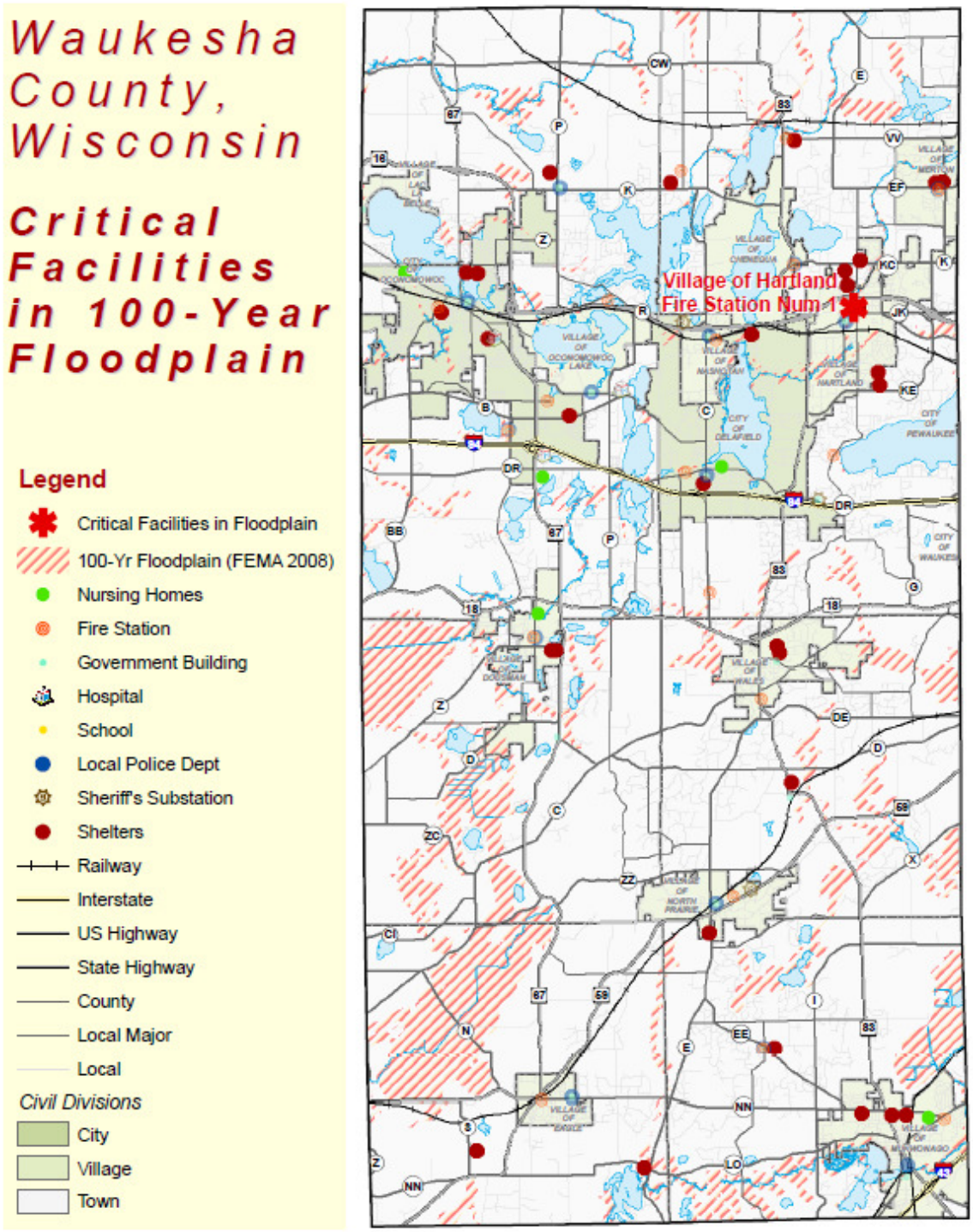
NOTE: Because Facilities are captured as point features, a 20 foot buffer was applied to the floodplain to capture places where only a portion of the building is in the floodplain.

0 0.5 1 2 Miles

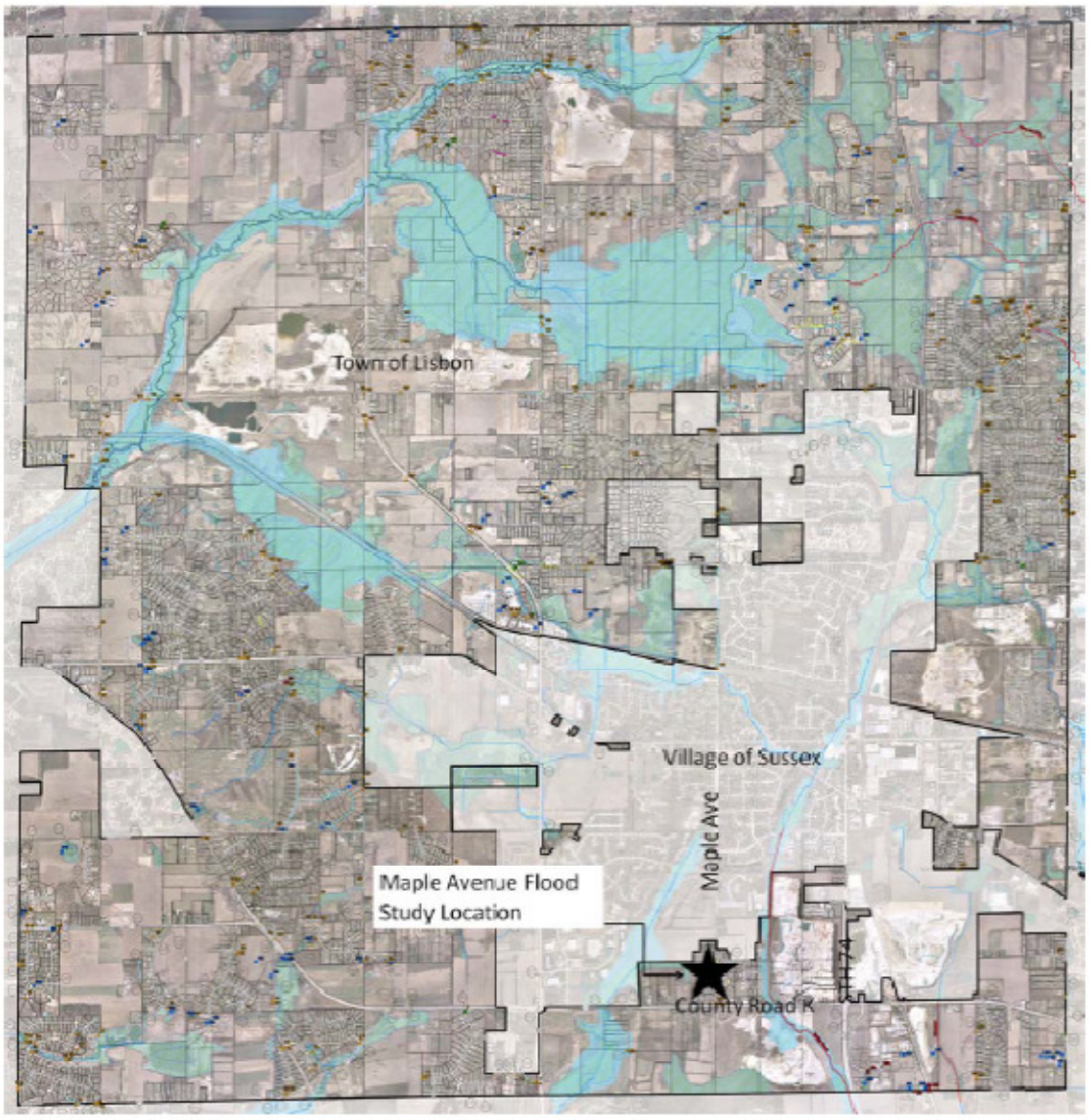
Municipal boundaries current as of 05/31/10

Prepared by the Waukesha County Department of Parks and Land Use July 2010

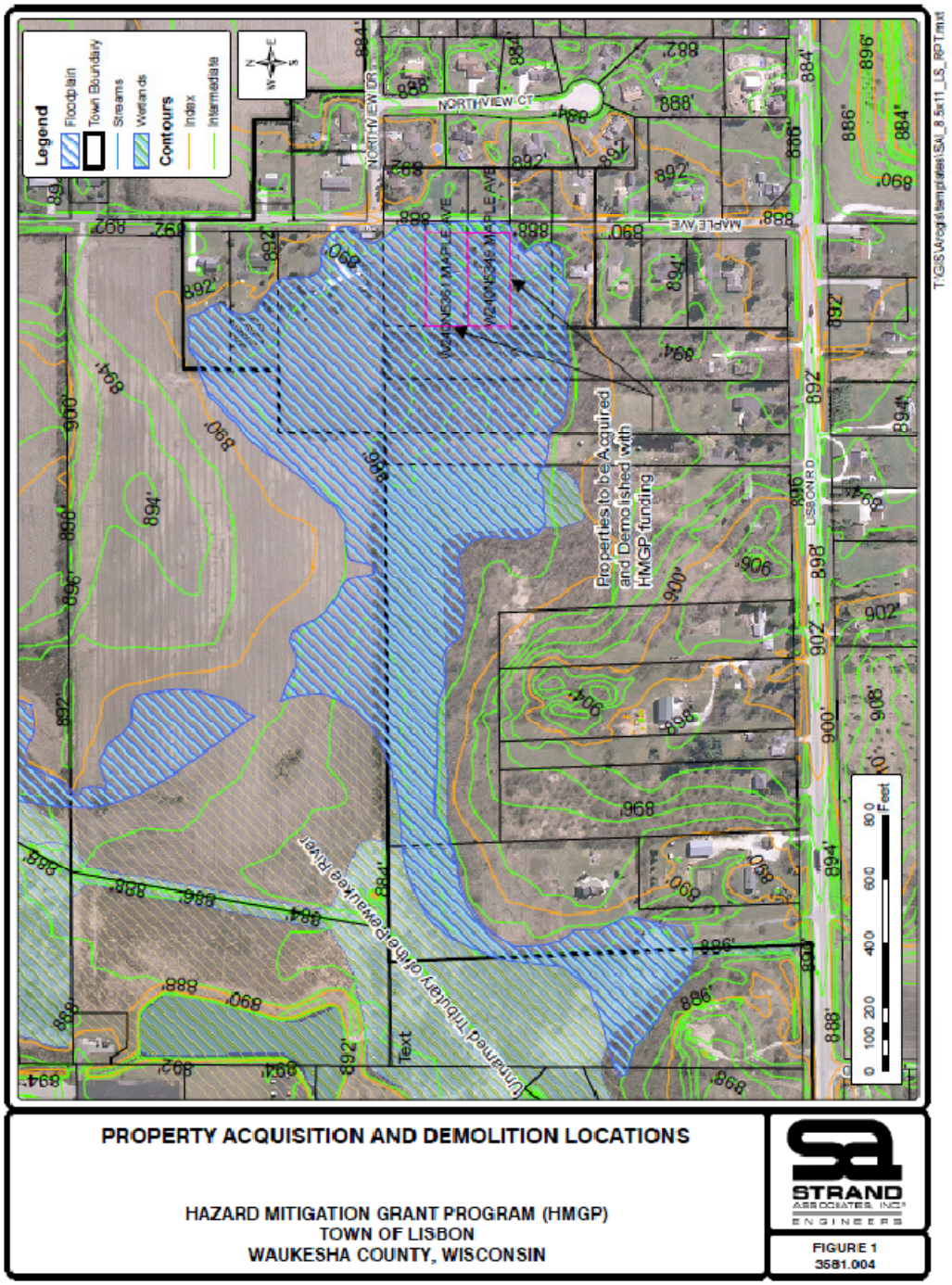
Waukesha County Critical Facilities in the Floodplain-West



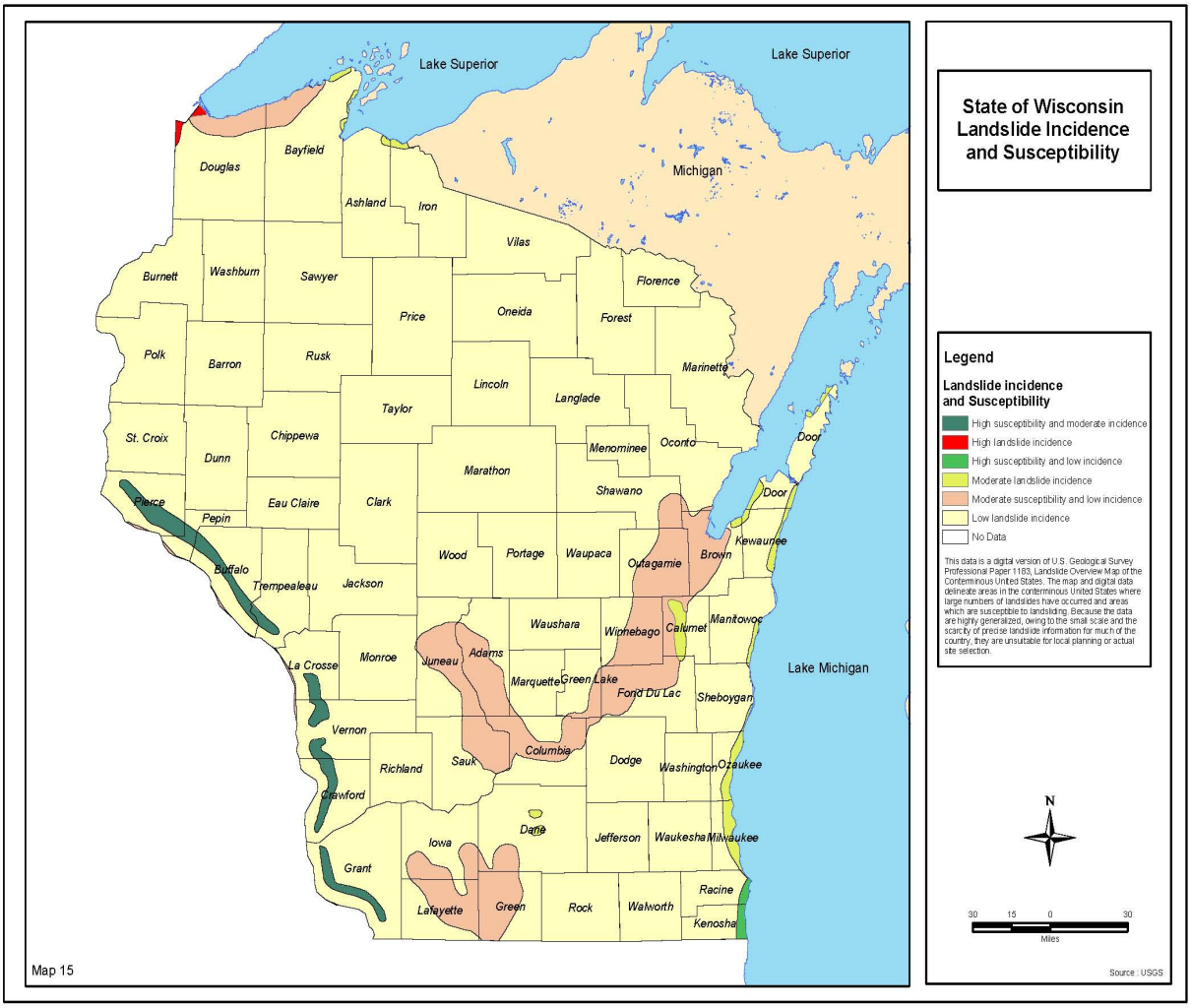
Town of Lisbon/Maple Avenue Flood Study Location



Town of Lisbon/Maple Avenue Property Acquisition & Demolition Locations

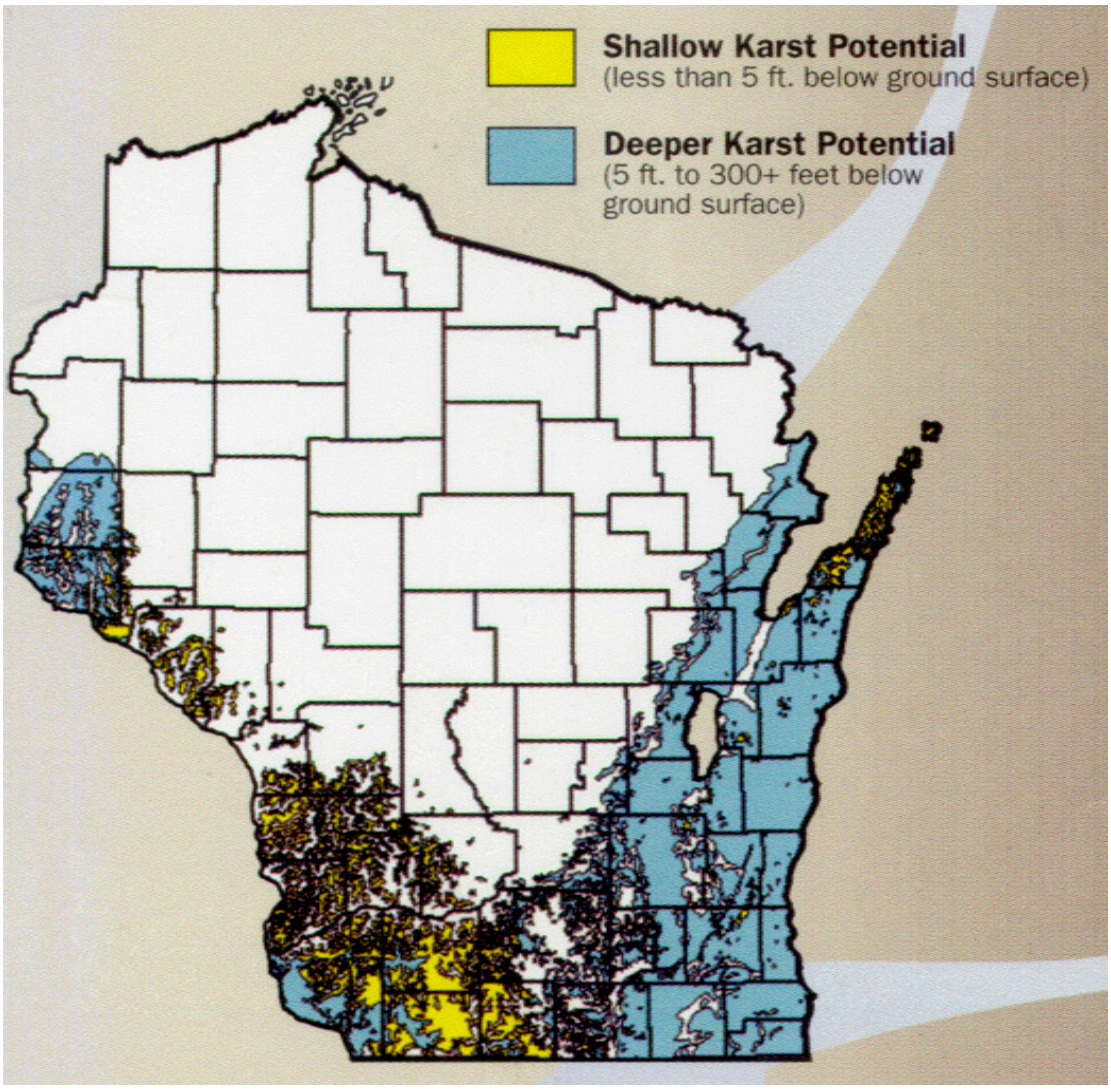


Landslide Incidence and Susceptibility



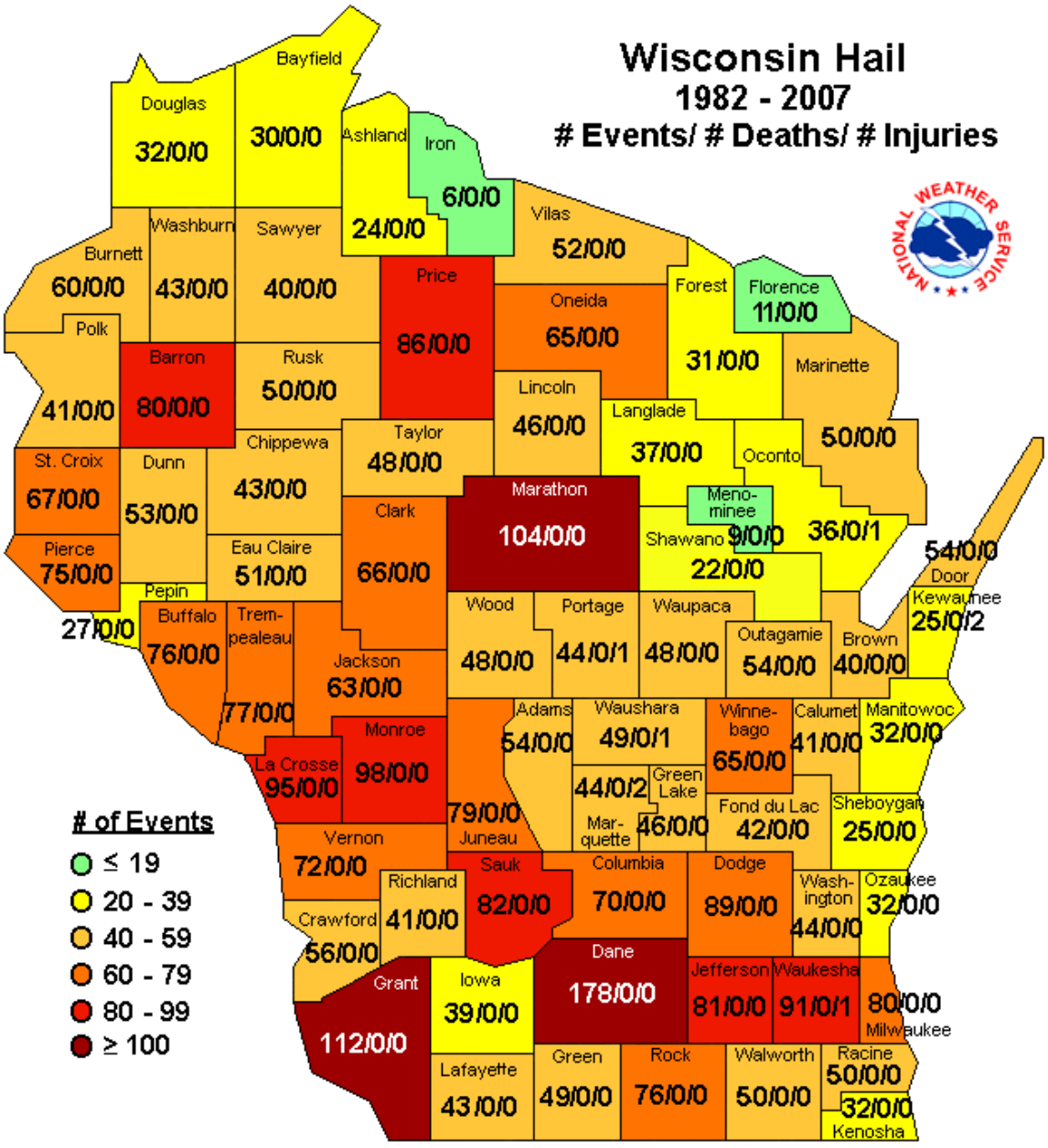
Wisconsin State Hazard Mitigation Plan, 2004, page 4-83

Karst Potential



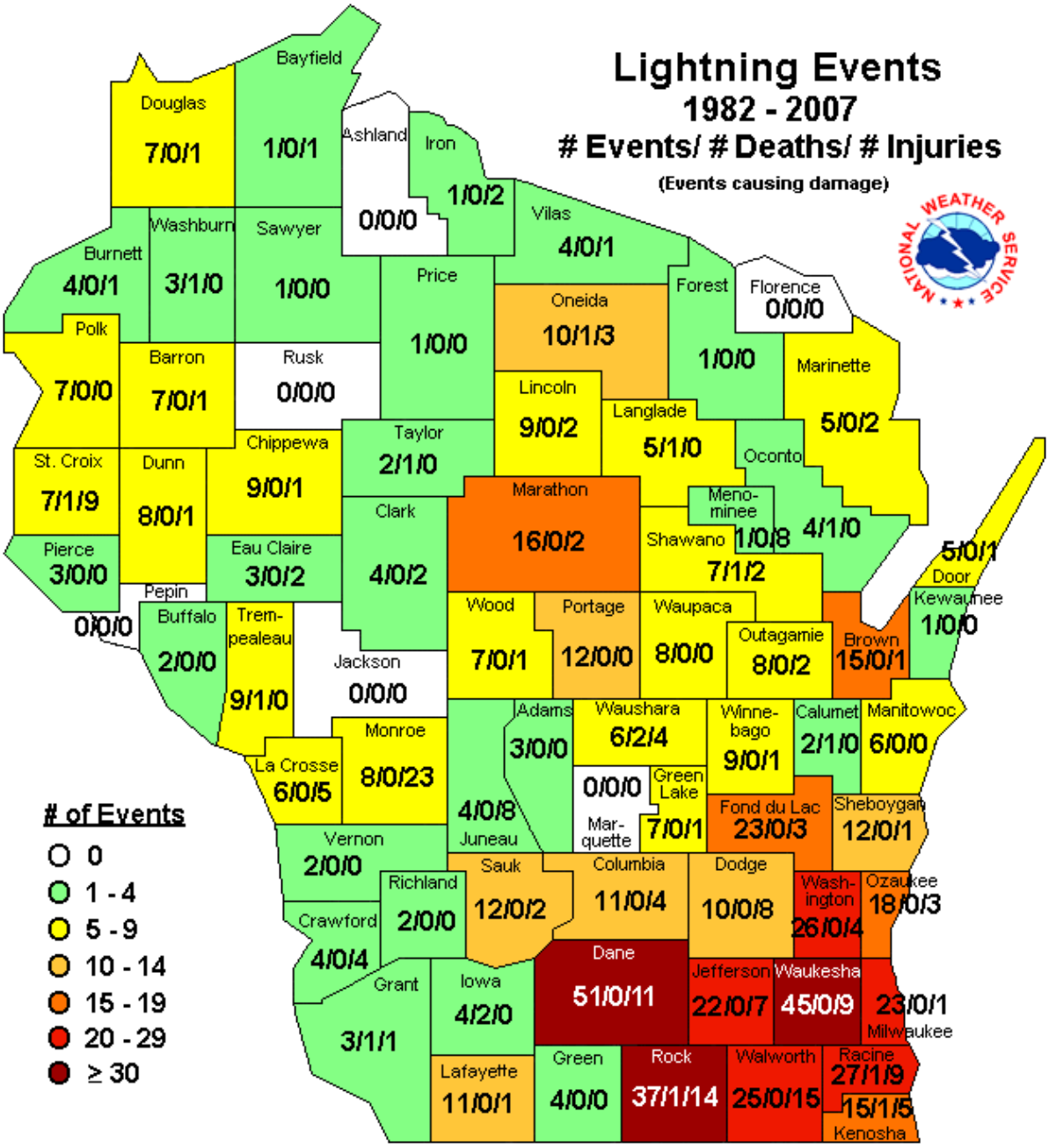
Wisconsin State Hazard Mitigation Plan, 2004, page 4-84

Wisconsin Hail



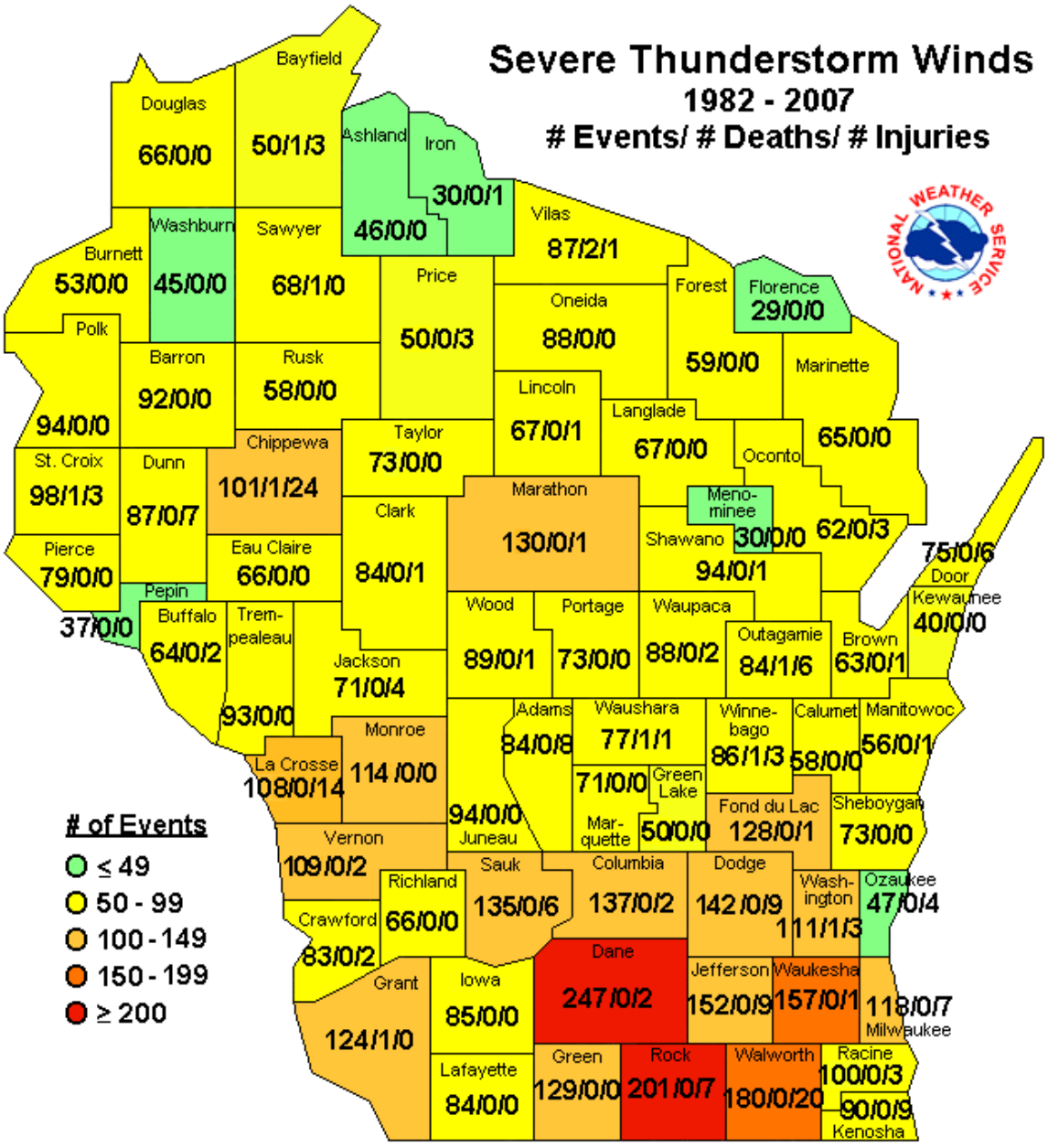
Wisconsin Emergency Management, http://emergencymanagement.wi.gov/docview.asp?docid=13592&locid=18

Wisconsin Lightning



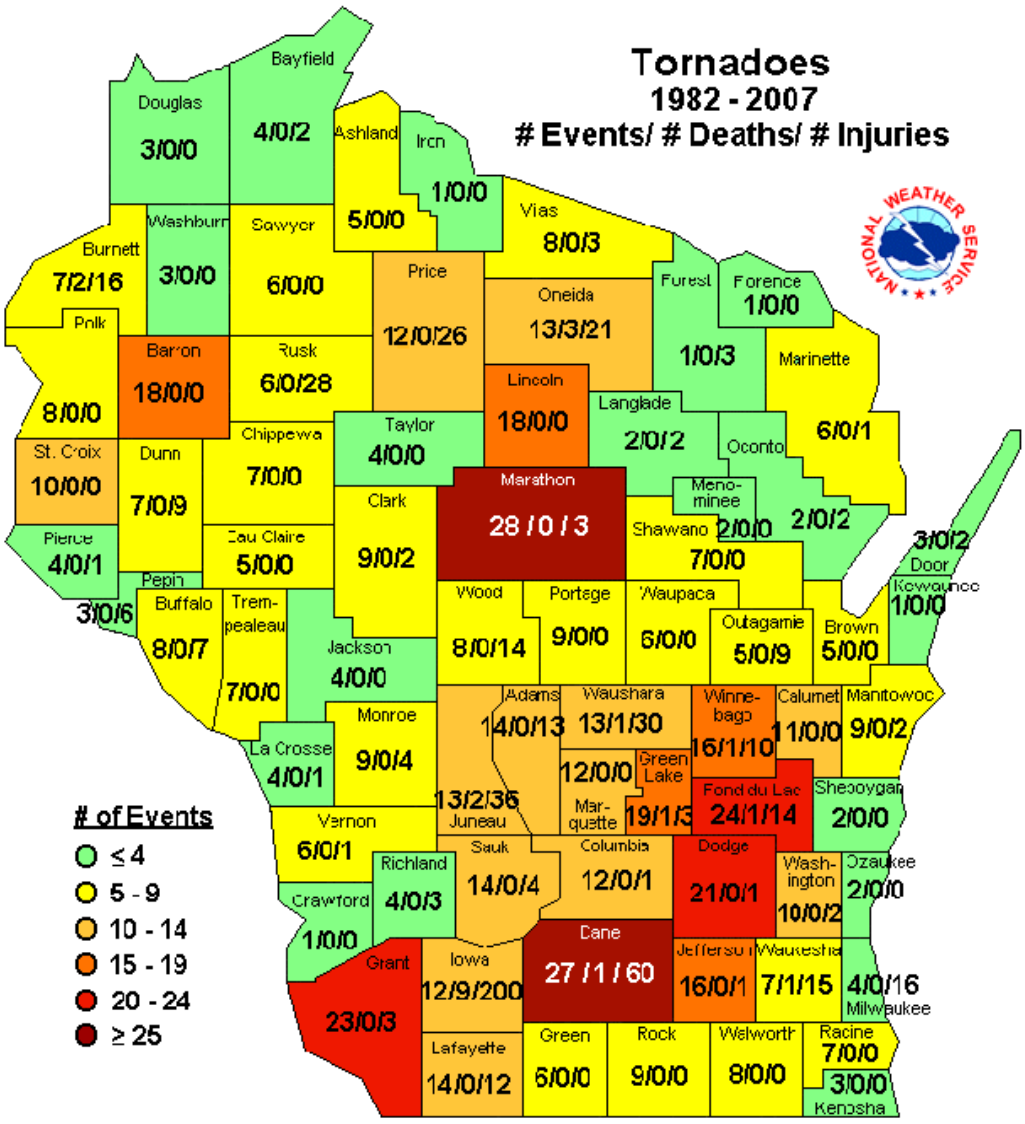
Wisconsin Emergency Management, http://emergencymanagement.wi.gov/docview.asp?docid=13593&locid=18

Wisconsin Severe Thunderstorm Winds



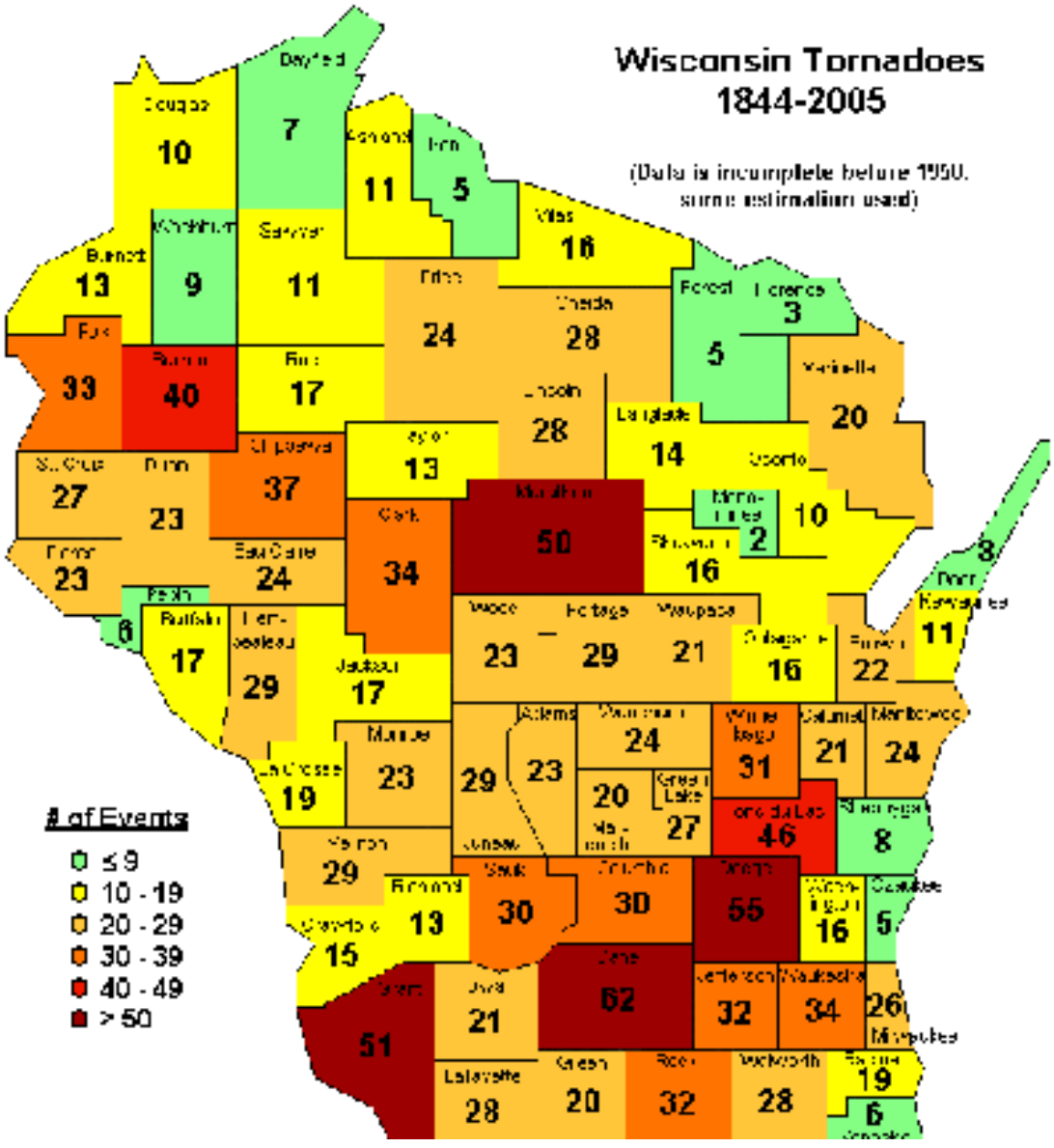
Wisconsin Emergency Management, http://emergencymanagement.wi.gov/docview.asp?docid=13596&locid=18

Wisconsin Tornadoes (1982-2007)



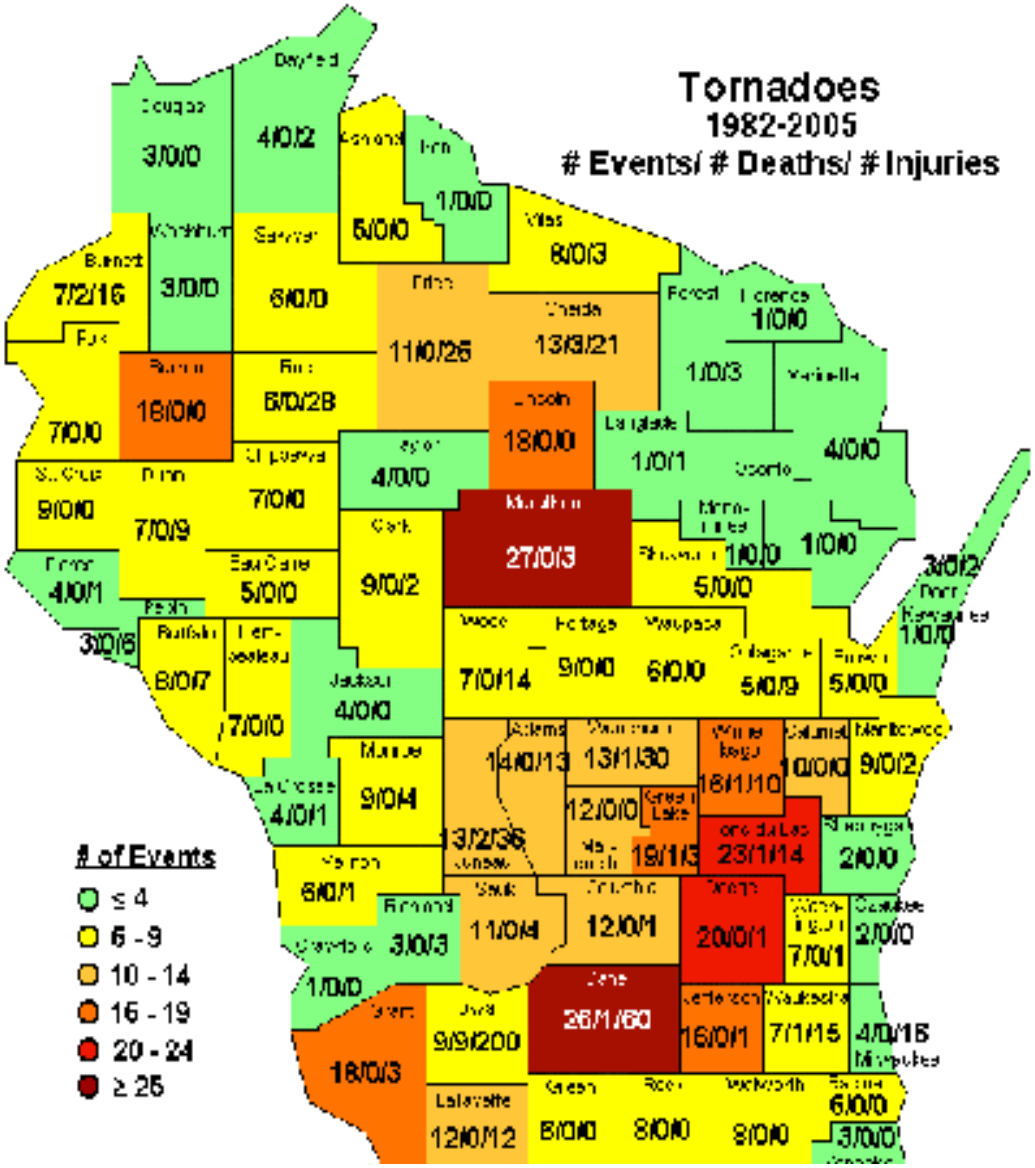
Wisconsin Emergency Management, http://emergencymanagement.wi.gov/docview.asp?docid=13594&locid=18

Wisconsin Tornadoes (1844-2005)



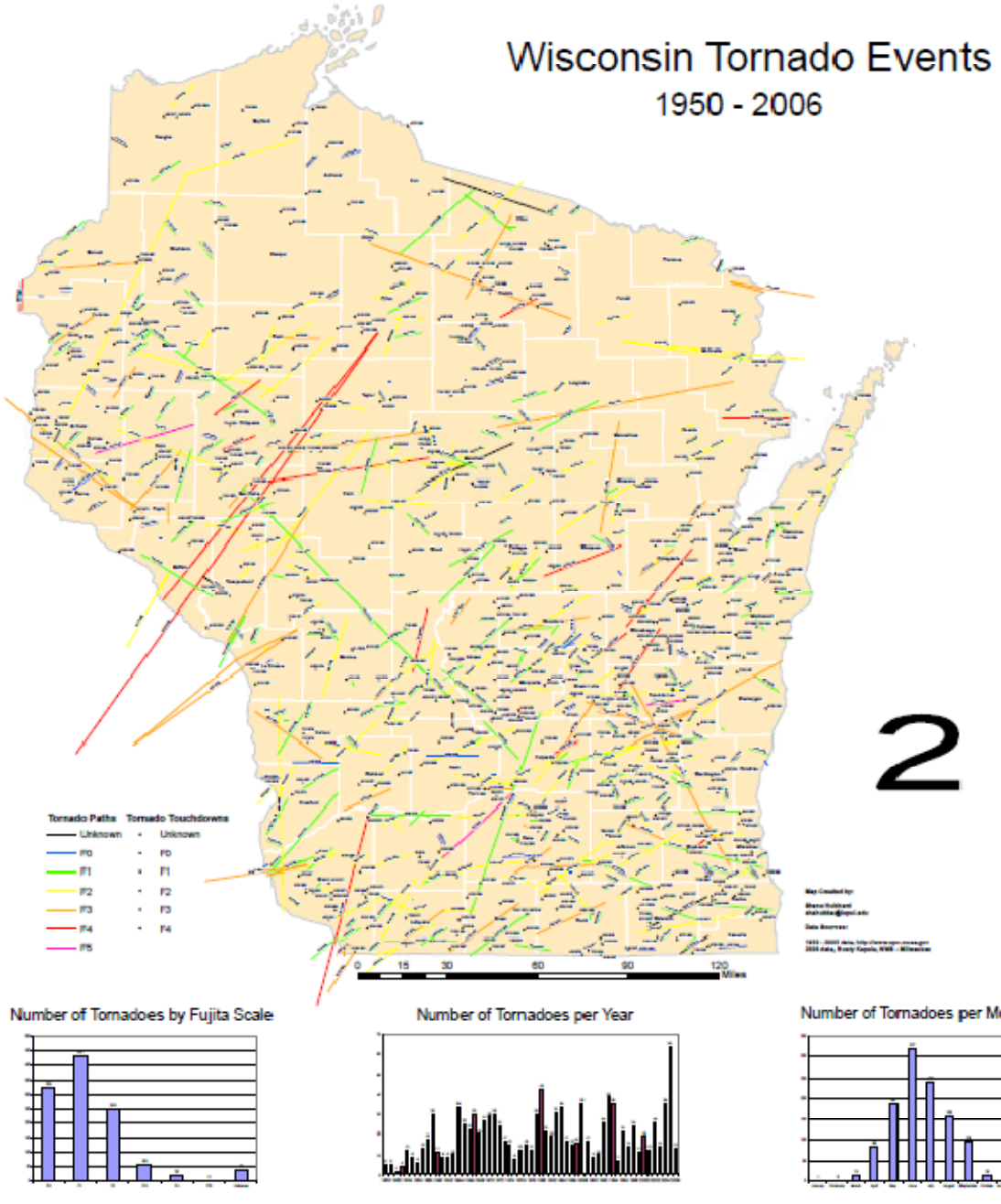
Wisconsin Emergency Management, http://emergencymanagement.wi.gov/docview.asp?docid=6707&locid=18

Wisconsin Tornado Events

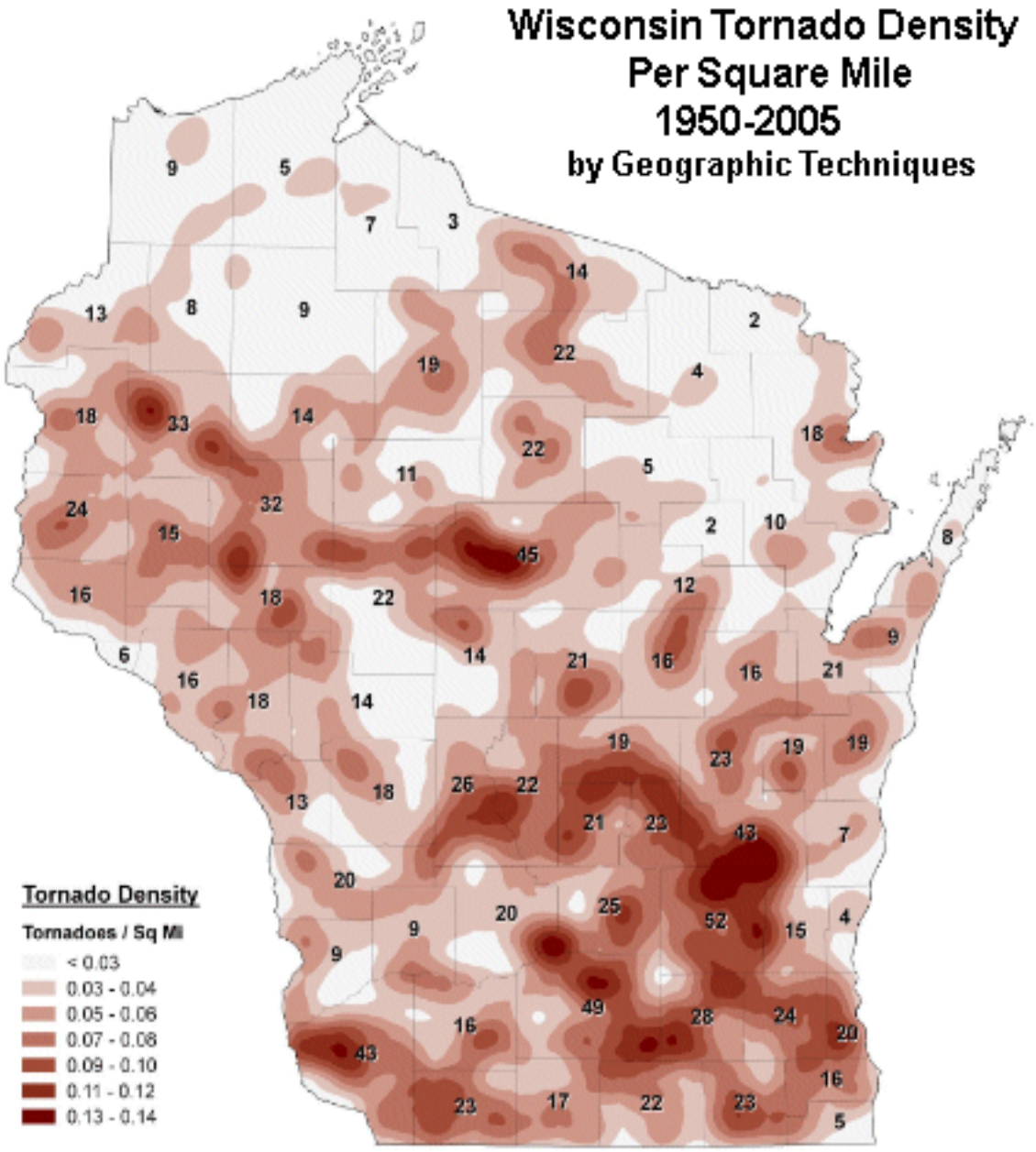


Wisconsin Emergency Management, http://emergencymanagement.wi.gov/docview.asp?docid=6710&locid=18

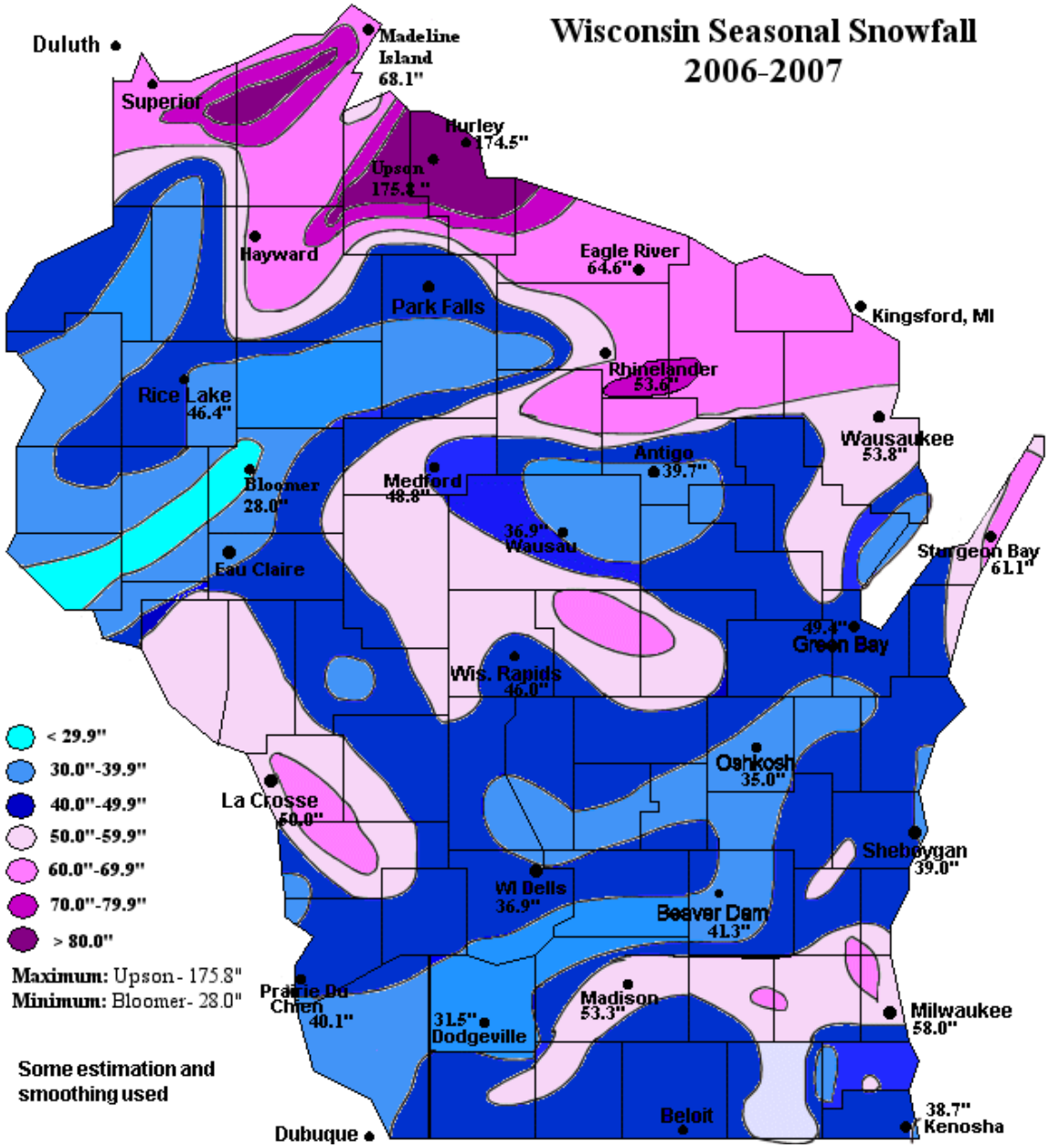
Wisconsin Tornado Events Paths 1950 – 2006



Wisconsin Tornado Density

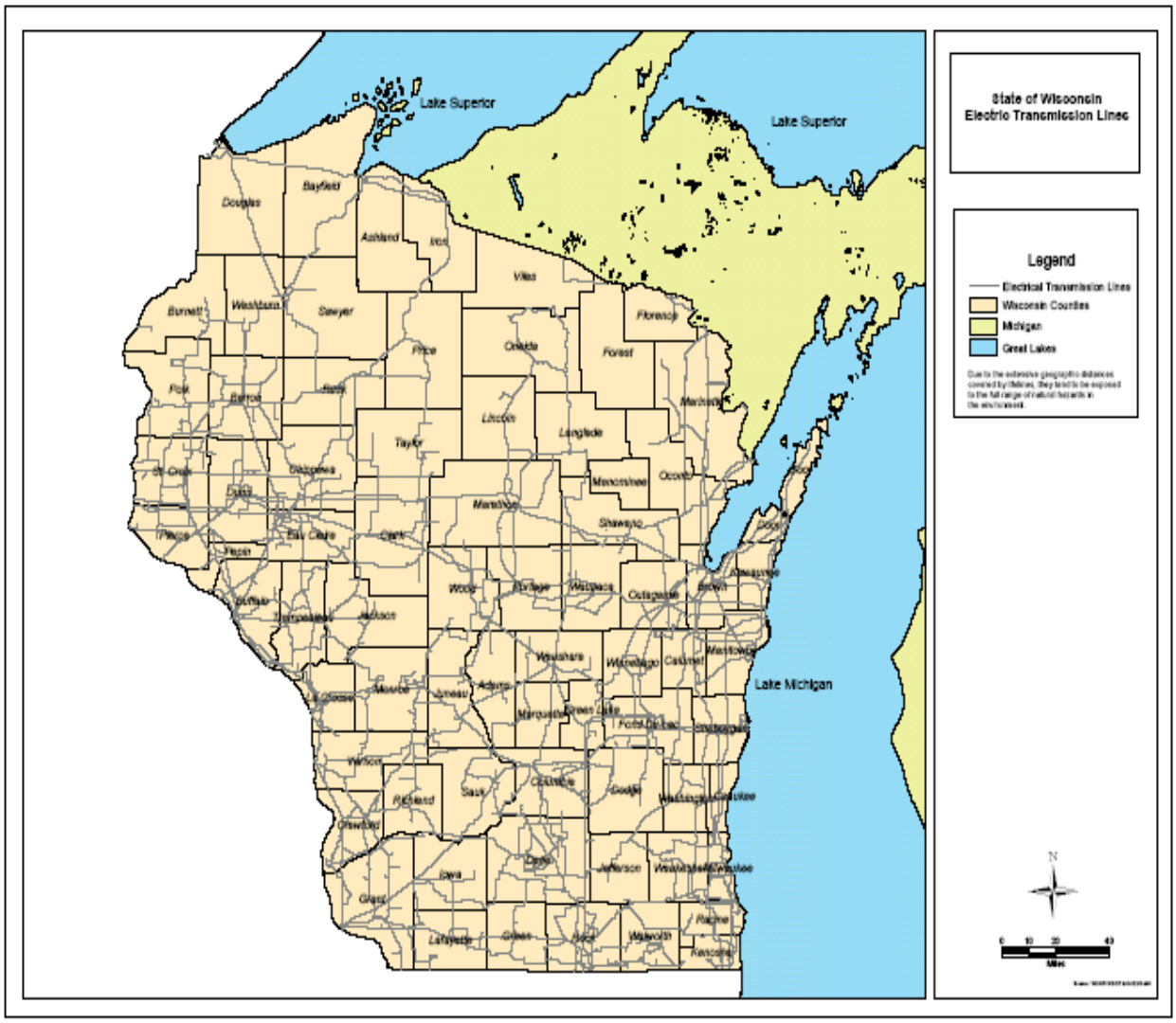


Wisconsin Seasonal Snowfall (2006-2007)



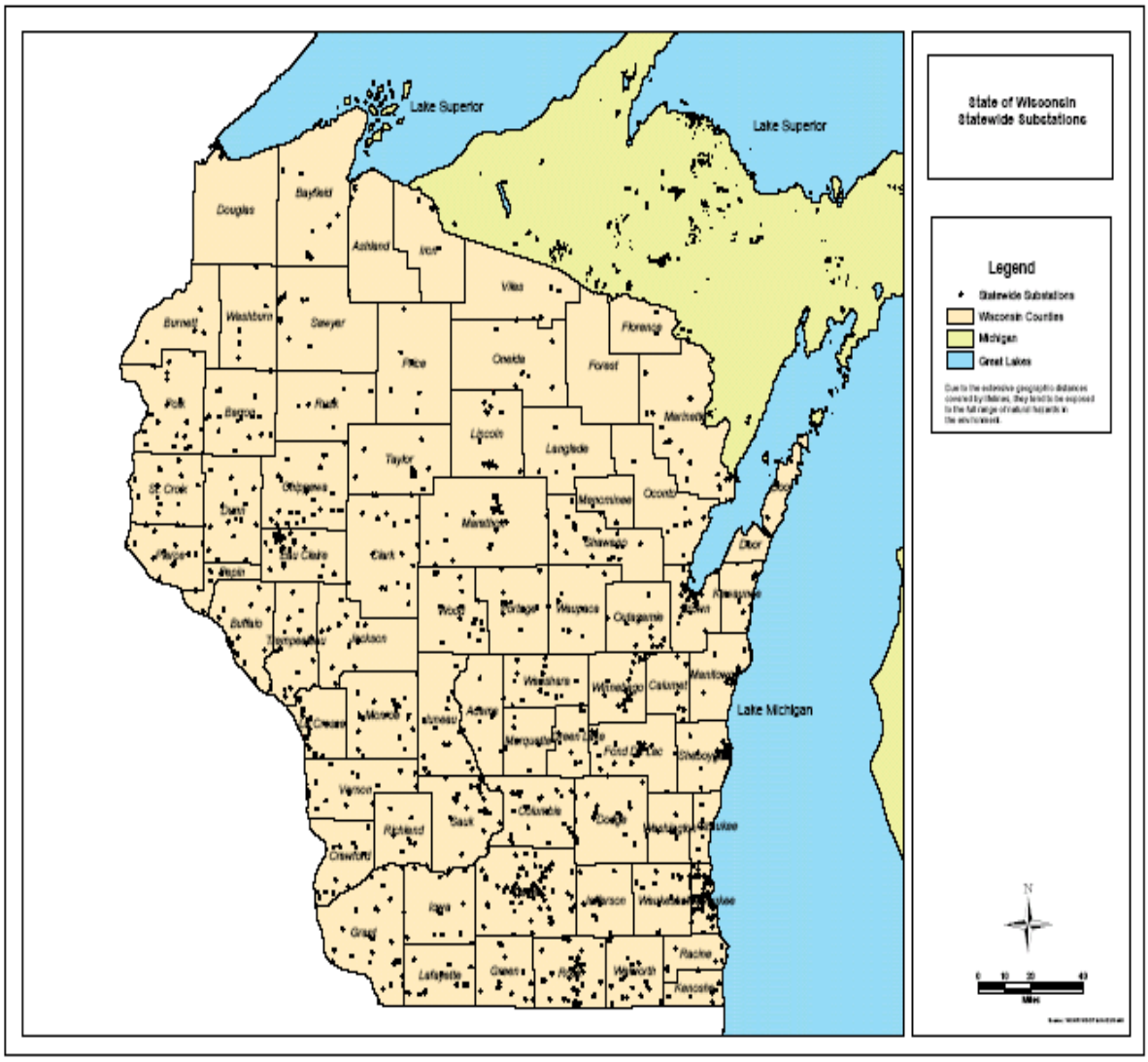
Wisconsin Emergency Management, http://emergencymanagement.wi.gov/docview.asp?docid=12366&locid=18

Electric Transmission Lines



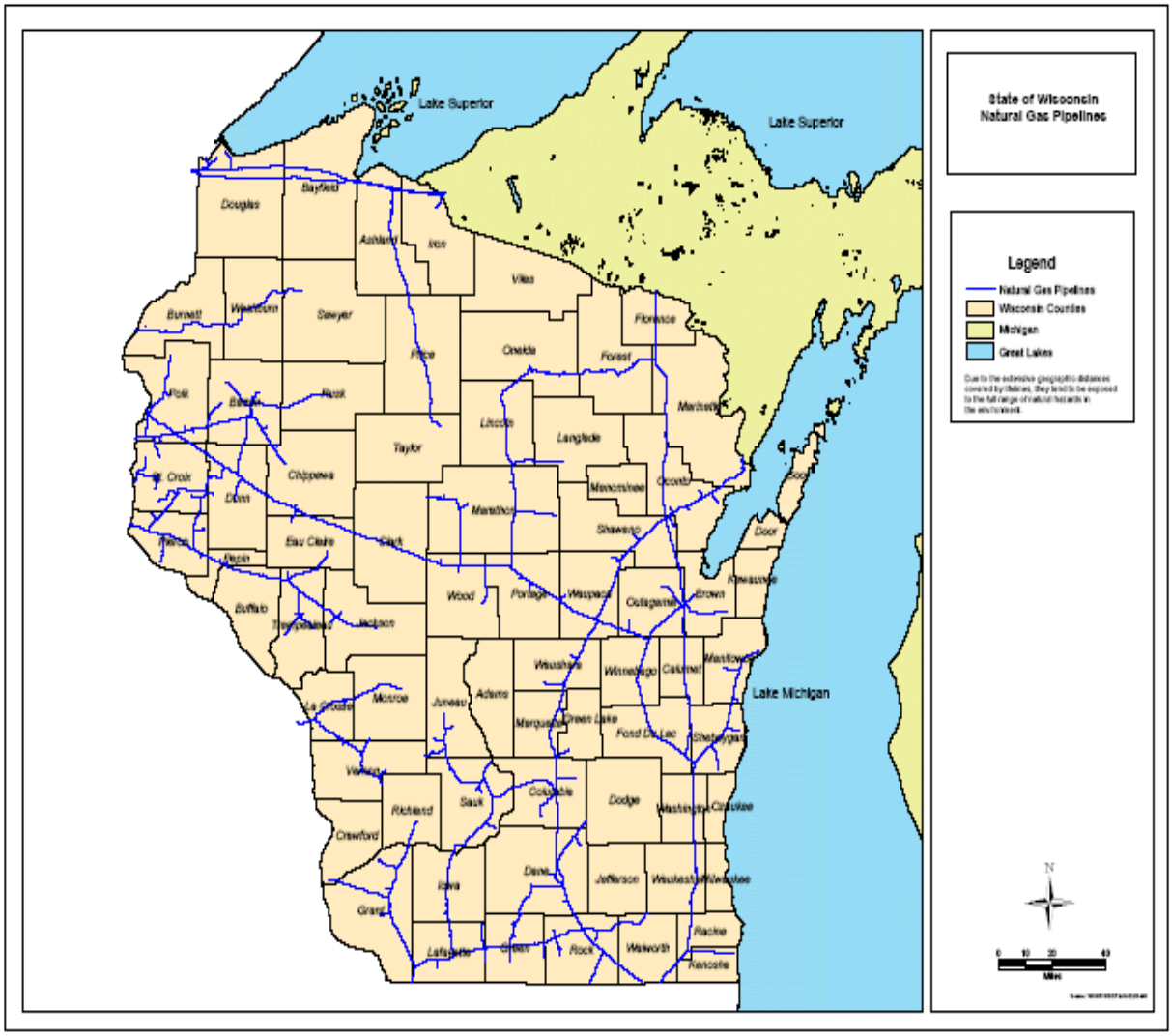
Wisconsin State Hazard Mitigation Plan, 2004, page 4-193

Electrical Substations



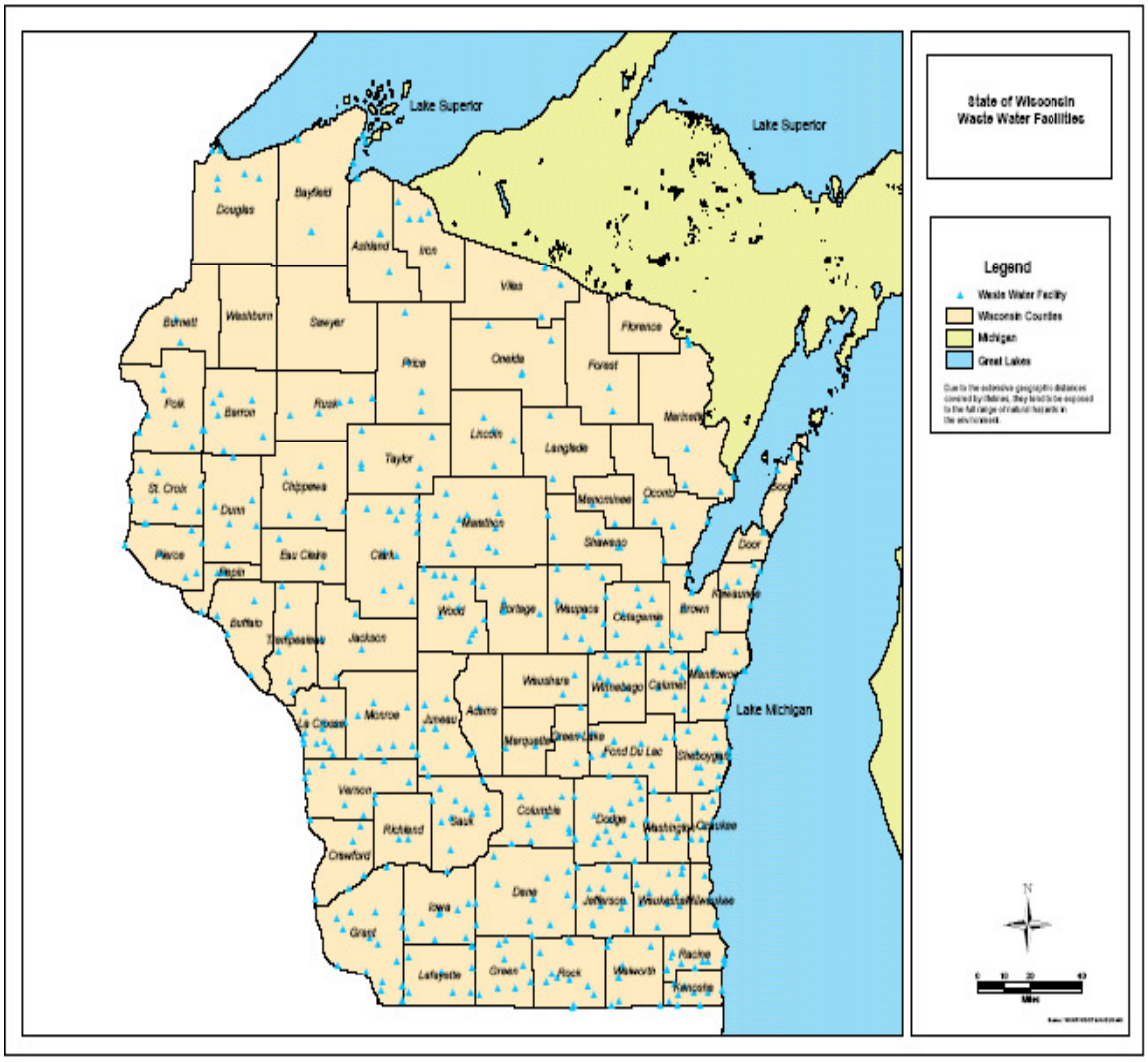
Wisconsin State Hazard Mitigation Plan, 2004, page 4-194

Natural Gas Pipelines



Wisconsin State Hazard Mitigation Plan, 2004, page 4-196

Wastewater Facilities



Wisconsin State Hazard Mitigation Plan, 2004, page 4-189

Appendix B: Plan Adoption

This plan has been adopted by Waukesha County and its major municipal bodies including Waukesha County; the Cities of Brookfield, Delafield, Muskego, New Berlin, Oconomowoc, Pewaukee and Waukesha; the Villages of Big Bend, Butler, Chenequa, Dousman, Eagle, Elm Grove, Hartland, Lannon, Menomonee Falls, Merton, Nashotah, North Prairie, Oconomowoc Lake, Pewaukee, Sussex and Wales and the Towns of Delafield, Genesee, Merton, Mukwonago and Ottawa. Scanned copies of those municipalities that adopted this plan follow.

U.S. Department of Homeland Security
Region V
536 South Clark Street, Floor 6
Chicago, IL 50605

FEMA

March 15, 2011

RECEIVED

MAR 22 2011

Name: _____

Ms. Roxanne Gray
State Hazard Mitigation Officer
Wisconsin Div. of Emergency Management
2400 Wright Street, P. O. Box 7865
Madison, WI 53707-7865

Dear Ms. Gray:

Thank you for submitting the adoption documentation for the Waukesha County All-Hazard Mitigation Plan. The plan was reviewed based on the local plan criteria contained in 44 CFR Part 201, as authorized by the Disaster Mitigation Act of 2000. We are pleased to inform you that the plan is now approved for Waukesha County, as well as the Cities of Brookfield, Muskego, New Berlin, Pewaukee, and Waukesha and the Villages of Chenequa, Dousman, Elm Grove, Harland, Lannon, Merton, Nashotah, North Prairie, Oconomowoc Lake, Pewaukee, Sussex and Wales. However, formal approval for the remaining jurisdictions is contingent upon their adoption of the plan.

The approval of this plan ensures continued availability of the full complement of Hazard Mitigation Assistance (HMA) Grants. All requests for funding, however, will be evaluated individually according to the specific eligibility and other requirements of the particular program under which the application is submitted.

Over the next five years, we encourage Waukesha County to follow the plan's schedule for monitoring and updating the plan, and continue their efforts to implement the mitigation measures. The plan must be reviewed, revised as appropriate, resubmitted, and approved within five years in order to continue project grant eligibility.

Please pass on our congratulations to the County for completing this significant action. If you or the County has any questions, please contact Lee Zachos at (312) 408-5227 or Tom Smith at (312) 408-5220.

Sincerely,

Christine Stack

Christine Stack, Director
Mitigation Division

STATE OF WISCONSIN
DEPARTMENT OF MILITARY AFFAIRS
DIVISION OF EMERGENCY MANAGEMENT

March 22, 2011

Bill Stolte
Emergency Management Director
Waukesha County
1621 Woodburn Rd.
Waukesha, WI 53188

Dear Bill:

It gives me great pleasure to advise that the *Waukesha County Hazard Mitigation Plan* has officially been approved by the Federal Emergency Management Agency. The plan complies with the requirements of the Disaster Mitigation Act of 2000. The County and participating jurisdictions are eligible to apply for funding through the Hazard Mitigation Grant Program, Pre-Disaster Mitigation Program, the Flood Mitigation Assistance Program, and the Repetitive Flood Claims Program through March 15, 2016, for projects identified in the Plan. Per the regulations, the Plan is required to be updated and resubmitted for approval every five years to remain eligible for mitigation funding.

With the FEMA Meets Requirements letter you received the Local Hazard Mitigation Plan Review Crosswalk includes recommended revisions for the five-year update.

Congratulations on the approval of the plan. I also want to commend the County for its commitment to mitigation and reducing future disaster losses, and I lock forward to working with you in the future.

If you have any questions, please feel free to call me at 608-242-3211.

Sincerely,

ROXANNE K. GRAY
State Hazard Mitigation Officer
Wisconsin Division of Emergency Management

Enclosure

cc Dan Dahlke, Regional Emergency Management Director

2400 Wright St. Madison, WI. 53707-7865 24 Hour Emergency Hotline 1-800-943-0003

COUNTY OF WAUKESHA

515 West Moreland Boulevard
Waukesha, Wisconsin 53188-2428

County Board Office
Courthouse - Room 170

Phone: (262) 548-7006
Fax: (262) 548-7005

COUNTY BOARD AGENDA

12th Meeting, 165th Year of the Waukesha County Board of Supervisors

Tuesday, February 22, 2011 – 7:00 p.m.

Waukesha County Courthouse – Room 350

CONVENE MEETING

Call to Order
Pledge of Allegiance
Silent Prayer
Roll Call
Public Comment
County Clerk Correspondence and Announcements
Announcements: County Board Chair and Supervisors
Approve Minutes of Previous Meeting(s)
Announce Votes Needed

STANDING COMMITTEE PRESENTATION OF ORDINANCES, RESOLUTIONS & MOTIONS

Land Use, Parks & Environment Committee

Resolution 165-R-006: Amend The Regional Water Quality Management Plan For The City Of New Berlin, Waukesha County, Wisconsin – ADOPTED 21-0

Ordinance 165-O-086: Amend The District Zoning Map Of The Town Of Lisbon Zoning Ordinance By Rezoning Certain Lands Located In Part Of The SW ¼ Of Section 28, T8N, R19E, Town Of Lisbon, Waukesha County, Wisconsin, From The A-5 Mini Farm District To The A-3 Agricultural/Residential Estate District (ZT-1711) – ADOPTED 21-1

Ordinance 165-O-087: Amend The District Zoning Map Of The Town Of Lisbon Zoning Ordinance By Rezoning Certain Lands Located In Part Of The NW ¼ Of The SW ¼ Of Section 29 And The NE ¼ Of The SE ¼ Of Section 30, T8N, R19E, Town Of Lisbon, Waukesha County, Wisconsin, From The A-10 Agricultural District To The A-5 Mini Farm District (ZT-1712) – ADOPTED 21-1

Ordinance 165-O-088: Approve The Rescission Of Previously Approved Land Use Permit Pertaining To The Lake Country Trail In Enrolled Ordinance 162-110 And The Approval Of Land Use Permit As Redrafted And Recorded – ADOPTED 22-0

Ordinance 165-O-093: Approve Wisconsin Energy Utility Easement For Nagawaukee Park Campground – ADOPTED 22-0

Public Works Committee

Ordinance 165-O-090: Laying Out, Relocation And Improvement Of CTH Y Woods Rd Intersection – City Of Muskego Project# I.D. 10-2779(16) – ADOPTED 21-1

Ordinance 165-O-091: Laying Out, Relocation And Improvement Of County Trunk Highway V, Waukesha County Project, Project I.D. 10-2776(14), Good Hope Road Intersection, Village Of Lannon, Town Of Lisbon, Waukesha County – ADOPTED 22-0

Ordinance 165-O-094: Laying Out, Relocation And Improvement Of County Trunk Highway L, Waukesha County Project, Project I.D. 06-2380(13) (B), Lannon Drive To Moorland Road, City Of Muskego, Waukesha County – ADOPTED 22-0

Ordinance 165-O-095: Modify The 2011 Department Of Public Works Budget For Traffic Mitigation Work Related To The I-94 E-W Freeway State Repaving Project (State Project I.D. 1060-32-90) – ADOPTED 22-0

Executive Committee

Resolution 165-R-007: Establish Size Of County Board To Facilitate County Supervisory District Plan – ADOPTED 18-4

Ordinance 165-O-096: Amend Waukesha County Code Of Ordinances Section 7-92 To Change Budgetary Controls For The Tarmann Parkland Acquisition Fund – ADOPTED 21-1

Judiciary & Law Enforcement Committee

Ordinance 165-O-092: Adopt Waukesha County All Hazards Mitigation Plan – ADOPTED 22-0

Ordinance 165-O-097: Accept Homeland Security Urban Area Initiative FY 2010 Program Funding And Modify The Sheriff's Department 2011 Budget To Appropriate Grant Revenues, Seized Fund Revenues, And Expenditures For An Armored Vehicle – ADOPTED 21-1

Ordinance 165-O-098: Amend 2011 Sheriff's Department Budget For The Expenditure Of Seized Funds To Participating Agencies In February 2011 – ADOPTED 22-0

Finance Committee

Ordinance 165-O-099: Transfer Carryover Funds From 2010 Unexpended Appropriations To 2011 Budgeted Appropriations – ADOPTED 21-1

ADJOURN MEETING

MOTION: To adjourn to Tuesday, March 22, 2011, at 7:00 p.m., or at the call of the County Board Chair.

RESOLUTION NO. 8876-10
By the Finance Committee

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

WHEREAS, the City of Brookfield recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the City of Brookfield participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Common Council of the City of Brookfield adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Waukesha County Emergency Management Department will submit, on behalf of the City, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

ADOPTED AND APPROVED ON December 21, 2010.

Kristine A. Schmidt, City Clerk

Steven V. Ponto, Mayor

RESOLUTION NO. 2011-04
ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

WHEREAS, the City of Delafield recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the City of Delafield participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the City Council of the City of Delafield adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the City, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

Adopted this 21st day of March, 2011.

CITY OF DELAFIELD

Ed McAleer, Mayor

ATTEST:

Gina C. Gresch, MMC/ WCPC
City of Delafield Clerk-Treasurer
Waukesha County

CITY OF DELAFIELD
CITY CLERK
WAUKESHA COUNTY, WISCONSIN

COMMON COUNCIL - CITY OF MUSKEGO
RESOLUTION #125-2010

ADOPTING THE WAUKESHA COUNTY
ALL HAZARDS MITIGATION PLAN

WHEREAS, the City of Muskego recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted All Hazards Mitigation Plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the City of Muskego participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a legal notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office.

NOW, THEREFORE, BE IT RESOLVED, that the Common Council of the City of Muskego does hereby adopt the Waukesha County All Hazards Mitigation Plan as an official plan.

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the City, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes made to the plan upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adoption of this resolution.

DATED THIS 14TH DAY OF DECEMBER 2010.

John R. Johnson, Mayor
City of Muskego

This is to certify that this is a true and accurate copy of Resolution #125-2010 which was adopted by the Common Council of the City of Muskego.

Sharon Mueller, Clerk-Treasurer

STATE OF WISCONSIN CITY OF NEW BERLIN WAUKESHA COUNTY

RESOLUTION NO. 10-43

WAUKESHA COUNTY HAZARD MITIGATION PLAN ADOPTION

WHEREAS, The City of New Berlin recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, The City of New Berlin participated jointly in the planning process with the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

WHEREAS, Formal approval of this plan is contingent upon adoption by the participating jurisdictions; and

WHEREAS, The City of New Berlin must adopt the Waukesha County Hazard Mitigation Plan in order to have a FEMA – approved hazard mitigation plan and be eligible for funding through the Hazard Mitigation Grant Program, Pre-disaster Mitigation Program, The Flood Mitigation assistance Program, and the Repetitive Flood Claims Program;

WHEREAS, The Waukesha County Office of Emergency Management Department will submit, on behalf of the participating municipalities, upon adoption by all such municipalities the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

NOW, THEREFORE, BE IT RESOLVED by the Common Council of the City of New Berlin, County of Waukesha, Wisconsin, that the City of New Berlin adopt the Waukesha County Hazard Mitigation Plan for purposes of hazard mitigation within the City of New Berlin.

Dated at New Berlin, Wisconsin this 9th day of November, 2010

APPROVED:

Jack F. Chiovatero, Mayor

Countersigned/Certified

Kari Morgan, City Clerk

RESOLUTION NO. 11-R2258

RESOLUTION ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

WHEREAS, the City of Oconomowoc recognizes the threat that natural hazards pose to persons and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to persons and property and save taxpayer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the City of Oconomowoc participated jointly in the planning process with Waukesha County and the other local units of government within the county to prepare an All Hazards Mitigation Plan; and

WHEREAS, the All Hazards Mitigation Plan has been made available for review by way of a legal notice, and a copy thereof will remain permanently on file in the Waukesha County Emergency Management Office.

NOW THEREFORE, BE IT HEREBY RESOLVED the Common Council of the City of Oconomowoc hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan.

BE IT FURTHER RESOLVED the Waukesha County Emergency Management Department will submit, on behalf of the City, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval.

BE IT FURTHER RESOLVED that minor changes to the Plan made upon advice from the Wisconsin Emergency Management and Federal Emergency Management Agency are hereby accepted without re-adoption of this resolution being necessary.

DATED: March 15, 2011

CITY OF OCONOMOWOC

By: _____
James Daley, Mayor

ATTEST:

_____
Diane Coenen, Clerk

STATE OF WISCONSIN CITY OF PEWAUKEE WAUKESHA COUNTY

RESOLUTION NO. 10-12-44

A RESOLUTION ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: NONE

WHEREAS, the City of Pewaukee recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the City of Pewaukee participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office.

NOW THEREFORE IT IS HEREBY RESOLVED that the City Council of the City of Pewaukee, adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Waukesha County Emergency Management Department will submit, on behalf of the City, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

Passed this 20th day of December 2010.

CITY OF PEWAUKEE

ATTEST: Scott Klein, Mayor

Kelly Parczewski, Clerk/Treasurer

RESOLUTION # R 78-10

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the City of Waukesha recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the City of Waukesha participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the City Council of the City of Waukesha, adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the City, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: 12/21/2010.

Certifying Official (Mayor)

Certifying Official (Clerk-Treasurer)

04/25/2011 13:57 Received: 2626620974 Apr 25 2011 02:43pm BIG BEND POLICE DEPT PAGE 02/02

Village of Big Bend

W230 S9185 Nevins Street • Big Bend, Wisconsin 53103
(262) 662-2747 • Fax: (262) 662-3751

James Soneberg, *Village President* Barbara Woppert, *Clerk* Gail Vogel, *Treasurer*

RESOLUTION 2011-01
ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Big Bend recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Big Bend participated jointly in the planning process with Waukesha County and other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice Management Office;

NOW, THERFORE, BE IT RESOLVED, that the Village Board of the Village of Big Bend, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

Passed and adopted this 7th day of April, 2011

President James S. Soneberg

ATTEST

Barbara Woppert

Barbara Woppert, Village Clerk

RESOLUTION 10-23

RESOLUTION TO ADOPT THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Butler recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Butler participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Butler, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FUTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED AND ADOPTED this 21st day of DECEMBER, 2010

THE VILLAGE OF BUTLER

By: _____
Richard A. Ensslin, President

ATTEST: _____
Timothy Rhode, Administrator/Clerk

Res.10-23

RESOLUTION # 2010-12-13-02

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Chenequa recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Chenequa participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Chenequa, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: 12-13-2010

Certifying Official

RESOLUTION # 02-11

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Dousman recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Dousman participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Dousman, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: 2/14/11

Certifying Official

Village of Eagle
Waukesha County

RESOLUTION # 2010-03

A RESOLUTION TO ADOPT THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Eagle recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Eagle participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Eagle, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

Dated and approved on this 9th day of December 2010.

Richard Spurrell, Village of Eagle President

Attest: Jeanne O'Brien
Jeanne O'Brien, Village of Eagle Clerk

STATE OF WISCONSIN **VILLAGE OF ELM GROVE** **WAUKESHA COUNTY**

RESOLUTION 122110
ADOPTING WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

WHEREAS, the Village of Elm Grove recognizes the threat that natural hazards post to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by the Federal Emergency Management Agency (FEMA) as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Elm Grove participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE BE IT RESOLVED, Village Board of Trustees of the Village of Elm Grove hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED that the Waukesha County Emergency Management Department will submit, on behalf of the Village, at no cost to the Village , the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

APPROVED THIS 21st day of December 2011

VILLAGE OF ELM GROVE

Neil H. Palmer, Village President

Mary S. Stredni, Village Clerk

RESOLUTION # 12/13/2010 - 02

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Hartland recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Hartland participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Hartland, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: 7-0

Certifying Official

Village Clerk

12/13/2010

VILLAGE OF HARTLAND INCORPORATED SEAL JANUARY 18, 1892 WISCONSIN

RESOLUTION # 2011–01

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Lannon recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Lannon participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Lannon, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: 2/14/11

D.H. Martin

Certifying Official VILLAGE PRESIDENT

Village of Menomonee Falls Resolution # 850-R-11

A RESOLUTION
ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

WHEREAS, the Village of Menomonee Falls recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Menomonee Falls participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office.

NOW, THEREFORE, BE IT RESOLVED by the Board of Trustees of the Village of Menomonee Falls that the Board of Trustees hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

Adopted by the Board of Trustees of the Village of Menomonee Falls on the 7 day of February, 2011.

VILLAGE OF MENOMONEE FALLS

Randall R. Newman, Village President

ATTEST:

Janice Moyer, Village Clerk

RESOLUTION # 2011-2

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Merton recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Merton participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Merton, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: 3-03-11

Patricia A. Weber
Certifying Official

Thomas A. Nelson
Clerk-
Village of Merton

VILLAGE OF MERTON CORPORATE SEAL WISCONSIN

WAUKESHA COUNTY STATE OF WISCONSIN

VILLAGE OF NASHOTAH

RESOLUTION # 2011-1-1

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Nashotah recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Nashotah participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Nashotah, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: _____

Certifying Official

STATE OF WISCONSIN VILLAGE OF NORTH PRAIRIE WAUKESHA COUNTY

RESOLUTION NO. 2010-05R

A RESOLUTION ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN
FISCAL IMPACT: NONE

WHEREAS, the Village of North Prairie recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars, and;

WHEREAS, an adopted all hazards mitigation plan is required by the Federal Emergency Management Agency (FEMA) as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of North Prairie participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE BE IT RESOLVED, that the Village of North Prairie Village Board hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes have been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

Adopted this 13th day of January, 2011.

VILLAGE BOARD, VILLAGE OF NORTH PRAIRIE
WAUKESHA COUNTY, WISCONSIN

BY: Joe Hoelkinger
Joe Hoelkinger, Village President

ATTEST:
Rhoda Bagley
Rhoda Bagley, Clerk/Treasurer

RESOLUTION # 146

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Oconomowoc Lake recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Oconomowoc Lake participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Oconomowoc Lake, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: 12/20/2010

Cindy J. Schluter, Clerk
Certifying Official

STATE OF WISCONSIN VILLAGE OF PEWAUKEE WAUKESHA COUNTY

RESOLUTION NO. 2010-21

A RESOLUTION ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

WHEREAS, the Village of Pewaukee recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Pewaukee participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office.

NOW, THEREFORE, BE IT RESOLVED that the Village Board of the Village of Pewaukee hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan;

BE IT FURTHER RESOLVED that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes have been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

Dated this 4th day of November, 2010.

APPROVED:

Jeff Knutson, Village of Pewaukee President

Countersigned:

Susan Atherton, Village of Pewaukee Clerk

RESOLUTION # 11-05

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Sussex recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Sussex participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Sussex, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: 2-8-2011

Certifying Official

RESOLUTION # 12-1-10

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Village of Wales recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Village of Wales participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Village Board of the Village of Wales, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Village, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: 12·20·10

Jeffery A. Haws

Certifying Official

RESOLUTION # 11-596

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Town of Delafield recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Town of Delafield participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Town Board of the Town of Delafield, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Town, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED 1/25/11

Certifying Official

STATE OF WISCONSIN TOWN OF GENESEE WAUKESHA COUNTY

RESOLUTION 10-7R

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Town of Genesee recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the Potential for harm to people and property and save tax payer dollars; and

WHEREAS, the Town of Genesee participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Town Board of the Town of Genesee, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Town, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes made upon advice from Wisconsin Emergency
Management and Federal Emergency Management Agency will not require re-adopting this resolution.

Adopted this 13th day of December, 2010

TOWN OF GENESEE

Sharon L. Leair

Sharon L. Leair, Chairman

Barbara A. Whitmore

Barbara A. Whitmore, Clerk

RESOLUTION NO. 121410

RESOLUTION ADOPTING THE WAUKESHA COUNTY
ALL HAZARDS MITIGATION PLAN

WHEREAS, the Town of Merton recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save taxpayer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Town of Merton participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW THEREFORE, BE IT RESOLVED that the Town Board of the Town of Merton, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan.

BE IT FURTHER RESOLVED that the Waukesha County Emergency Management Department will submit, on behalf of the Town, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes that may subsequently be made to this resolution upon advice from the Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

DATED: December 14, 2010

TOWN OF MERTON

By: Richard J. Morris

Richard Morris, Chairman

ATTEST:

Susan J. Oman

Susan J. Oman, Clerk

NOTE: The fiscal impact of this resolution is "none."

RESOLUTION # 2010-R-5

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Town of Mukwonago recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Town of Mukwonago participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Town Board of the Town of Mukwonago, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Town, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: December 15, 2010

Certifying Official

Town of Mukwonago Chairman

RESOLUTION # 12-10b

ADOPTING THE WAUKESHA COUNTY ALL HAZARDS MITIGATION PLAN

FISCAL IMPACT: None

WHEREAS, the Town of Ottawa recognizes the threat that natural hazards pose to people and property; and

WHEREAS, undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to people and property and save tax payer dollars; and

WHEREAS, an adopted all hazards mitigation plan is required by FEMA as a condition of future grant funding for mitigation projects; and

WHEREAS, the Town of Ottawa participated jointly in the planning process with Waukesha County and the other local units of government within the County to prepare an All Hazards Mitigation Plan, which was made available for review via a Legal Notice and a copy of which will reside permanently in the Waukesha County Emergency Management Office;

NOW, THEREFORE, BE IT RESOLVED, that the Town Board of the Town of Ottawa, hereby adopts the Waukesha County All Hazards Mitigation Plan as an official plan; and

BE IT FURTHER RESOLVED, that the Waukesha County Emergency Management Department will submit, on behalf of the Town, the adopted All Hazards Mitigation Plan to Wisconsin Emergency Management and Federal Emergency Management Agency officials for final review and approval. Minor changes been made upon advice from Wisconsin Emergency Management and Federal Emergency Management Agency will not require re-adopting this resolution.

PASSED: 12-13-2012

Richard Arrowood

Certifying Official

Appendix C: Summary of Mitigation Strategies

Summary of Mitigation Strategies							
Hazard Type	**Mitigation Measures**	**Costs of Project**	**Responsible Management**	**Project Timetable**	**Project Priority**	**Community(ies) Benefitting**	**Comments**
All Hazards	Continue to promote the increased use of National Oceanic and Atmospheric Administration (NOAA) weather radios	Covered by Dept annual budget	EM Dept	Ongoing	Medium	Countywide	This would be done by a public information campaign that points citizens to vendors. The amateur radio club and NWS also do campaigns in the area.
	Support communities working toward the National Weather Service "Storm Ready" designation	Covered by Dept annual budget	EM Dept	Ongoing	Low	Village of Dousman, Cities of Oconomowoc and Waukesha as well as munis seeking to be so designated	The Village of Dousman is StormReady. The Cities of Oconomowoc and Waukesha are working toward their designation
	Continue working with and supporting volunteer teams	Covered by Dept annual budget	EM Dept	Ongoing	Low	Countywide	The most active CERT chapter is in the City of Waukesha and also serves as the police reserve unit. They have trained about 150 people. The County is promoting citizen and community awareness and preparedness through the COAD.
	Integrate the usage of My State USA mass community notification system into emergency plans, procedures and practice in the county.	Covered by Dept annual budget	EM Dept/Sheriff's Dept	Ongoing	High	Countywide	Waukesha County was a pilot program and is now a paying customer. The program can do polygon warnings. The county and City of Waukesha have been linking websites and working on seamless data merges.

	Continue to add/update Emergency Management Department links on the existing county web site. Publicize the website to show the community what is there.	Covered by Dept annual budget	EM Dept	Ongoing	High	Countywide	• The county would like to include some pre-scripted public information messages, especially for high risk concerns (e.g., location of shelters). My State USA has a platform for this and also a place for citizens to register for notices on information updates. • The county is exploring the development of a self-reporting web-based disaster system.
	Evaluate services, contracts and prices for a fixed satellite telephone for the Emergency Operations Center.	$3000 – will seek funding opportunities	EM Dept	2008	High	Countywide	This may entail extra costs because the highway building blocks the line-of-sight to the primary EOC.
	Complete a survey of the county's siren capability and ensure that maintenance, monitoring and usage policies/procedures reflect current wishes of the fire chiefs.	Covered by Dept annual budget	Municipalities	Ongoing	Low	Countywide	All sirens are owned by their municipalities. Dispatch can test/tone some but others are muni-operated only.
	Waukesha County would like to build a new Incident Command Post (ICP). Waukesha County has acquired a fully-outfitted Mass Casualty Incident (MCI) Response Trailer.	$500,000 (UASI grant)	EM Dept and Sheriff's Office Waukesha Co, City of Waukesha	September 2009 Summer 2010	High	Countywide	The large, new Mobile Command Post was delivered and brought into service; it will provide support to incident response throughout the area. The trailer is housed at the Waukesha Fire Dept., which has agreed to transport it to any MCI in the county
	Waukesha County and the City of Waukesha would like to improve their communications systems to include: ○ Buy additional portable radios for law enforcement and fire ○ Equipment so that the	$615,000 (UASI grant)	EM Dept and City of Waukesha EM	2009	High	Countywide	The county completed (2009) a 4-tower VHF overlay system that provides redundancy to the 800 mHz system and will support interoperability with mutual aid responders.

	communications system can patch VHF radios (used by mutual aid departments) to the county's 800 mHz system						
	The City of Waukesha would like to have COOP-COG planning done that would plan for the loss of a city building.	$15,000	City of Waukesha EM	2014	Low	City of Waukesha	The plan should also consider alternate sites and the cost of relocation and operating from an alternate location (estimate $150,000). The plan should discuss potential funding options and contingency contracts as part of the plan.
	The City of Waukesha would like to upgrade its ICP/Emergency Operations Center (EOC) to include: o ICP - Upgrade the ICP (tear out walls, add computers, CAD station, streaming video) o EOC – upgrade wireless, streaming video, data capabilities, phone and computer	$9,000 (2009) $20,000 (2010) Unknown but would be in 2012-2014 if no grants available	City of Waukesha EM	2009-2010 2012-2014	High	City of Waukesha	
Drought and Dust Storms	County should be prepared to provide information to farmers (e.g., crop irrigation, crop insurance) during times of drought	Covered by annual budget	UW-Ext./FSA	As needed	Low	Countywide	
	Prepare/publicize water usage information for non-farm areas during drought	Covered by annual budget	Municipal Water Utilities	As needed	Low	Countywide	
	Monitor severe weather advisories regarding extreme dry conditions.	Covered by annual budget	Planners	Ongoing	Low	Village of Elm Grove	
Flooding and Dam Failure	Look for an acceptable (environmentally, socially, cost-benefit, politically, etc.) solution for removing water from flood-prone areas, especially those areas that are basin/bowl shaped. Seek out funding sources (grants) to execute solutions.	Covered by annual budget (Some grants received through CDBG-EAP.)	Municipal elected officials	Ongoing	High	Waukesha Co; Cities of Brookfield, Delafield, Muskego, New Berlin, Oconomowoc, Pewaukee, Waukesha;	Some of the potential solutions may include acquisitions, demolitions or floodproofing or moving water to surface streams. Changes in development have caused increased storm runoff problems, which in turn has caused flooding in existing

						Villages of Big Bend, Butler, Chenequa, Dousman, Eagle, Elm Grove, Hartland, Lac La Belle, Lannon, Menomonee Falls, Merton, Mukwonago, Nashotah, North Prairie, Oconomowoc Lake, Pewaukee, Sussex, Wales	residential homes and streets in specific neighborhoods. Groundwater in parts of the county is rising and in one neighborhood, hard rock comes all the way to the surface not allowing water to soak in. Homes on the high sides of these areas are getting water in their basements and are pumping it out. This floods the homes in the lower areas and roads/ intersections, which is a safety hazard. o There are homes pumping out water sending it into lower lying areas creating localized flooding. o Existing storm sewers can not handle the large amount of water.
						Town of Mukwonago	Town of Mukwonago: o There are about 12 houses pumping and 2-3 at the bottom receiving water. o The city has pumped water out to open the road to a key intersection. o The water goes over a hill and into a surface stream. o There is a concern about pumping into a high-quality cold water stream and some easement issues.

		Seeking Grants to fund these Capitol Improvement Projects. Approximately $5,000,000				City of Waukesha	○ Several locations in the City of Waukesha experience significant flooding: W. College and Harvey, and Patrick and Sandra Lane, Harding and Anoka, Summit and North High and others. ○ A homeowner in the Fiddler's Creek subdivision has issues. The city is working with the homeowner's association to mitigate the problem.
	Complete the Flood Mitigation Study and explore opportunities in the two areas deemed vulnerable: ○ W. College Ave., Maple Ave. and Harvey Ave. ○ Pine St., Bel Ayr Dr., Summit Ave., Michigan Ave., N. University Dr.	Covered by annual budget	City of Waukesha EM	Ongoing	Medium	City of Waukesha	
	Seek an acceptable (environmentally, socially, cost-benefit, politically, etc.) solution for removing water from the Genesee Lake system and the Genesee Lake Farms subdivision. Seek out funding sources (grants) to execute solutions.	Covered by annual budget	Municipal elected officials	2012	High	Town of Summit	○ The Town submitted a pre-application for 404 dollars from FEMA-1768-DR-WI, which was denied due to not having a mitigation plan. ○ The Town was awarded $506,000 from the Community Development Block Grant – Emergency Assistance Program for the installation of an outlet pipe from Lower Genesee Lake to regulate the high water levels.
	Address flooding and roadway repairs associated with the Country	$506,000 Community	Municipal elected	2011	High	Town of Mukwonago	○ The accumulating water makes a few roads

	Bliss subdivision. The preliminary solution is to install a force main and pumping station to take accumulated water out of a natural basin and pump it out.	Development Block Grant – Emergency Assistance Program	officials				impassible and impacts a few properties. The flooding is primarily caused by elevated groundwater levels.
	*Continue updating GIS mapping data on regular five-year cycle.	$200,000 - $250,000	Land Information Office	Ongoing (Sched 2010)	Medium	Countywide	○ The county creates a very detailed surface model (contours and elevations) maps. ○ Received a $600,000 credit from FEMA for this work.
	*Continue public outreach efforts for flood mitigation efforts.	Covered by Dept annual budget	Municipal and County Zoning Offices	Ongoing	Medium	Countywide	
	*Work to update the zoning ordinances to reflect the implementation recommendations in the Feb. 2009 Comprehensive Development Plan	Covered by Dept annual budget	Municipal and County Zoning Offices	2009-2010	High	Countywide	
	*Assist efforts, as requested, to update the floodplain: ○ Newly delineated floodplains for Keesus and Golden Lakes should be submitted to DNR and FEMA for LOMR ○ The floodplain for the Genesee Lakes should be delineated as part of the proposed lake water level project. ○ There are new, "yet-to-be-studied" areas that will likely be scheduled for evaluation.	Covered by Dept annual budget	Waukesha County Parks and Land Use Dept., SEWRPC and municipalities	2010 - 2011	Medium	Countywide	The county also just adopted the new floodplain in 2008. The county will be amending the floodplain provisions of its Shoreland and Floodland Protection Ordinance in 2010.
	Work with the DNR on dam safety and flooding issues, including better communication and emergency plans.	Covered by Dept annual budget	Municipalities	Ongoing	Medium	Town & Villages of Mukwonago, Lake Nagawicka (City of Delafield and Village of Nashotah), Saylesville Lake	○ Four dams were overtopped by flood waters and the water was affecting bridges and roads. The munis were unaware that the DNR pulled the boards.

						(TN Genesee)	○ DNR is looking to remove one dam and to create failure plans.
	Assist with completing the multi-jurisdictional Bark River flooding area study.	Covered by Dept annual budget	Waukesha County Parks and Land Use Dept., SEWRPC and municipalities	2009-2010	High	Municipalities participating in the floodplain study	The study is nearly complete and is about to be submitted for review. The munis disagreed with some of the findings and they may be adjusted.
	*Provide information to citizens about the purchase of flood insurance	Covered by Dept annual budget	EM Dept	Ongoing	Medium	Countywide	Link will be made available on the website
	The north bank of the Mukwonago River needs to be stabilized to control erosion from North Main (Hwy ES) to Highway 83.	$132,000	Municipal officials	2014	High to Very High	Village of Mukwonago	Goals of the project are to prevent erosion of the bank into the river, to establish a "no mow" area to filter water before it enters the river and to increase the aesthetic value of the land.
	Raise the gate in the Mukwonago Dam (on the Mukwonago River) so that when it is opened the water has more room to pass out.	$380,000 WI DNR grant received for part of the work but is inadequate for the full extent of the project.	Municipal officials	2015	High	Village of Mukwonago	Currently the gate does not go all of the way to the top of the dam, restricting flow. The new gate would also serve as a "relief valve" for the dam in major events.
	Raise the road(s) and increase the flow capacity of the road(s) that service the Silver Meadows subdivision (approximately 100 homes) on the west side of the village.	$6,000 for the engineering study (in progress) and unknown additional funding for the project (will be based on findings of the study)	Engineering Department	2015	Medium to High	Village of Menomonee Falls	There are only two access roads to the subdivision and the cross culverts are filled causing the roads to overtop by up to 1½' of water that can close down the roads for 24+ hours. There is a special needs child in the subdivision and all residents do not receive emergency services (fire, police, EMS) in floods.
	Complete tree removal and change the slopes of the embankment around the Merton Dam (67.08).	$30,000 - $50,000	Municipal officials and contracted	July 2011	High	Village of Merton	Under orders by the WI DNR to complete this by 7/30/2011.

	Complete a dam failure analysis and a detailed Emergency Action Plan for the Merton Dam.		engineers				
	Continue planning discussions regarding flooding issues caused by dam management procedures with the goal of creating agreements to reduce the flooding in downstream municipalities.	Covered by annual budget	WI DNR, Town, Village and City of Oconomowoc	Ongoing	Medium	Town, Village and City of Oconomowoc	
	Implement the mitigation measures in the City of New Berlin's Stormwater Management Plan a possible.	Costs vary by project selected	Stormwater Utility Dept. with City Emergency Management	Ongoing	Medium – High	City of New Berlin	The plan contains mitigation measures such as an extensive streambank stabilization project, creating retention ponds, waterway clearing and identifies 13 homes that could be bought-out and converted to open space and/or retention ponds. The home buyouts were submitted for a mitigation grant but were denied except for one property (on Grange) that was bought-out. The city submitted another mitigation grant application to acquire several of these properties in Sept. 2010.
	Continue exploring the feasibility of creating a Storm Water Management District in the City of Pewaukee to fund mitigation projects.	Covered by annual budget	Municipal officials	Ongoing	Medium	City of Pewaukee	
	Buyout one repetitive loss property (home) that, because of its topography, is prone to flooding. Demolish the structure and create a retention pond.	$400,000	Dept. of Public Works	As funding available	High	City of Brookfield	The home (Parkhurst Drive) is the only one in the area and it sits in a "bowl" that floods. Most recently, the home flooded on 7/22/10 with the basement totally filling and 6" of water standing on the first

							floor living area.
	Evaluate hazard mitigation measures for properties that have a history of damage due to overland flooding.	Costs will vary by mitigation measure selected	Municipal officials	As funding available	Medium to High	City of Muskego	Exploring floodproofing, buy-outs, etc. to mitigate damages. There are 13 properties on Gaulke Dr., Saroyan Rd. (x 4), Catalina Dr., Cornell Dr., Racine Ave. (x2), Janesville (x2), Pioneer Dr. and Crowbar Dr.
	Purchase and raze repetitive loss structures from flood prone areas or where properties are subject to surface water drainage up to and into the house. Project would also include regrading property to provide detention of runoff to reduce drainage issues elsewhere in the neighborhood.	Up to 10 houses @ $400,000 each in various locations. Could be completed individually or en masse.	City of Brookfield	2010-2014	High	City of Brookfield	These residential homes in the Imperial Estates subdivision and along urbanized creeks are subject to surface water flooding, some inclusive of the first floor. Others are subject to repetitive losses from sewer backups, likely contributed by the flooding of houses in the area.
	Floodproof repetitive loss structures adjacent to urbanized creeks or in or adjacent to low lying areas or floodplains.	Up to 15 houses @ $50,000 each in various locations. Could be completed individually or en masse.	City of Brookfield	2011-2014	High	City of Brookfield	These residential properties have had flooding that may be "correctable" using floodproofing measures without purchasing the entire property or removing the house.
	Repair severely eroded streambank on Underwood Creek and replace driveway culverts over the creek upstream of this property with a bridge or box section.	$75,000	City of Brookfield	2010	Medium	City of Brookfield	One property along this creek is experiencing significant property loss from erosion in this creek. Replacing the driveway culverts upstream of the property with a bridge or box section may reduce likelihood of repeated erosion.
	Provide backwater valves to property owners subject to basement backups.	$2,000	City of Brookfield	2010	Medium	City of Brookfield	Basement backup valves that install in floor drains are very inexpensive but may reduce backups, which subject

							properties to thousands of dollars of damage.
	Raise floodplain county roads that get overtopped by water out of the danger zone.	$8,909,241	County Highway	As funding available	Very Low to High	VI of Menomonee Falls, CI & TN of Brookfield, VI of Big Bend & TN of Vernon, TN of Genesee, TN of Summit, CI & TN of Waukesha, CI of Pewaukee	These projects are described more fully in the narrative.
	Minor stormwater conveyance systems should be designed to provide protection from a ten-year recurrence interval event. Major stormwater conveyance systems should be designed to provide protection from a 100-year recurrence interval event.	Unknown – TBD when grants available	Planning	As funding available	Medium	Village of Elm Grove	• Regular maintenance by Department of Public Works • Floodplain Mitigation Project - Completion Date: July 2009 Submitted to FEMA for FIRM remap: December 2007
	A comprehensive Stormwater Management Plan, including development and evaluation of alternative plans to abate problems caused by flooding, inadequate drainage, and nonpoint source pollution; development of a recommended plan; and establishment of procedures for plan implementation, should be adopted.	Covered by annual budget	Planning	Partially Completed	High	Village of Elm Grove	▪ Creation of Chapter 235 in Village of Elm Grove Code of Ordinances in order to meet Chapter NR 216 Requirements ▪ Has been sent to DNR for approval –will be adopted following their approval of ordinance language
	Public and private drainage ways, both natural and man-made, should be kept free from obstructions. Easements should be obtained to protect drainage ways and allow access for maintenance. Ordinances should be adopted to enforce protection of and access to drainage	Covered by annual budget	Planning and Public Works	Ongoing	High	Village of Elm Grove	▪ Regular maintenance

	ways. A maintenance schedule has been developed to keep the stormwater system functioning.						
	A comprehensive process should be put in place to review filling and grading of public and private parcels to assure that all stormwater management issues are addressed. Public education needs to create an awareness of the problems that can occur with improper filling and grading by homeowners. Engineering review, permitting, inspection and enforcement will be incorporated into the development and redevelopment of property.	Covered by annual budget	Planning and Public Works	Ongoing	Medium	Village of Elm Grove	▪ Amended code recently from 400 cubic yards to 40 cubic yards requiring a permit (fill or excavation) ▪ On-going oversight by the Zoning Administrator/ Director of Public Works
	As private wells provide a direct channel to the community's water resource, wells should be brought into compliance with current WDNR regulations. This would include well casings that terminate at least twelve inches (12") above the ground and twenty-four inches (24") above the base flood elevations in flood hazard zones. Well caps should be sealed.	Covered by annual budget	Planning and Public Works	Ongoing	Medium	Village of Elm Grove	▪ Studying municipal water opportunities and held referendum in April 2009 to allow creation of municipal water utility
	Floodplain zoning ordinances should be actively enforced. Policies should be established to address structures located in flood hazard zones. Policies could include elevation of structures, flood proofing, removal of structures, the provision of detention storage and modification of stream channels and/or bridges. If these alternatives are not feasible, the structures should be isolated from the municipal sanitary sewer system.	Covered by annual budget	Planning	Ongoing	Medium	Village of Elm Grove	▪ Check floodplain status for all exterior building permits ▪ Review all exterior projects in the Village
	The City of Waukesha would like to install a river monitoring camera	Stimulus grant: $20,000	City of Waukesha EM	2009-2010	High	City of Waukesha	The water can rise very quickly there and the area is a choke-

	system to safely/remotely monitor the NWS river level gauges. The installation will be a three-phase project beginning in Aug. '09 and will end by Mar. '10. The system will have wireless cameras tied into a network that can be remotely monitored in the ICP and EOC. The city applied for a CDBG for four more cameras.	CDBG grant: $56,000 $60,000					point for water and is a good predictor of flooding.
	Continue working on the acquisition and demolition project on Maple Aveneue in the Town of Lisbon	HMGP grant funding	Town of Lisbon	Ongoing	High	Town of Lisbon	Project underway
	Continue working on existing hazard mitigation activities at the Waukesha County Technical College (WCTC), including: o Installing a water retention pond at the base of a hill that separates WCTC's property from the Pewaukee High School. o Meeting with local residents with concerns over walking trails eroded by rain in 2008-09 and described some planned repairs.	Covered by Dept annual budget	WCTC Facilities Services	Ongoing	Medium to High	WCTC, City of Pewaukee	Also working on community and environmental projects such as: o Work with the City of Brookfield's Fox River Water Pollution Control Center to monitor and maintain safe water discharge levels as part of the Slug Prevention Plan. o Working with the DNR to update the Air Pollution Control Registration Permit.
	WCTC would like to add five additional storm water retention basins as part of the Master Facilities Plan.	$600,000	WCTC Facilities Services	2009-2017	Low to Medium	WCTC, City of Pewaukee	o Also working on an environmental project, which is an engineering study to see if a "green roof" can be installed on an existing building. The planned roof would be planted with approximately 6 inches of soil and native grasses.

							○ See maps in Appendix A for proposed site locations
Fog	Provide public information via website links or brochures regarding safe driving procedures in the fog	Covered by Dept annual budget	EM Dept, Sheriff's Office and Muni PDs	Ongoing	Low	Countywide	
Forest Fires and Wildfires	Continue to provide outreach efforts to homeowners on protecting homes and structures from wildfires and on obtaining the proper burn permits	Costs vary	Local Fire Departments	Ongoing	Low	Countywide	Done annually during the fire safety week in September or October
	Conduct outreach to stakeholders regarding wildfires caused by railroads	Covered by Dept annual budget	EM Dept, Local Fire Departments	Ongoing	Low	Countywide	
	Provide ample training for volunteer fire fighters for larger wildfires	Costs vary	Local Fire Departments, EM Dept.	Ongoing	Medium	Southern Kettle Moraine incl. Villages of Eagle and Dousman	Eagle and Dousman do some training
Severe Temperatures	Continue public informational campaigns about severe weather on the website and during Winter and Heat Awareness Weeks.	Covered by budget	EM Dept	Ongoing	Medium	Countywide	Done in an annual campaign in May or June.
	Continue to provide sheltering services to citizens in needs during severe temperatures.	Costs vary	Human Services with EM assistance	As needed	High	Countywide	A protocol exists and is used during severe temperature outbreaks to open community shelters.
Storms: Hail	Place hail storm safety materials in county display rack, on the website and during severe weather week.	Covered by Dept annual budget	EM Dept	Ongoing	Medium	Countywide	
	Monitor severe thunderstorm weather advisories, since hailstorms tend to occur in conjunction with severe thunderstorms.	Covered by annual budget	Emergency Response Agencies	Ongoing	Medium	Village of Elm Grove	
	Provide information regarding the purchase of crop insurance	Covered by Dept annual budget	UW Ext	Ongoing	Low	Countywide	
Storms: Lightning	Place lightning safety materials in county display rack, on the website and during severe weather week.	Covered by Dept annual budget	EM Dept	Ongoing	Medium	Countywide	
	Monitor severe thunderstorm weather advisories, since lightening tends to occur in conjunction with severe	Covered by annual budget	Emergency Response Agencies	Ongoing	Medium	Village of Elm Grove	

	thunderstorms.						
	Provide information regarding the use of fire-resistant materials and surge protectors.	Covered by Dept annual budget	EM Dept	Ongoing	Low	Countywide	
Storms: Thunderstorm	Place thunderstorm safety materials in county display rack, on the website and during severe weather week.	Covered by Dept annual budget	EM Dept	Ongoing	Medium	Countywide	
	Monitor severe thunderstorm weather advisories.	Covered by annual budget	Emergency Response Agencies	Ongoing	Medium	Village of Elm Grove	
	Work with local fair/festival boards, as requested, to create emergency plans in case of bad weather.	Covered by Dept annual budget	EM Dept	Ongoing	Medium	Countywide	EM regularly works with the county fair board and other large events, as outlined in the county contract provisions.
	Fund a study to revise rainfall classifications from a recurrence interval standard to a simple scale like those used for hurricanes, tornadoes and earthquakes with the goal of making it easier for the public to understand. Calling major rainstorms that have occurred multiple times in a short period of time the "100-year storm" confuses the public and misleads them into thinking they need not protect themselves against such storms since they are "rare."	$100,000?	Unknown at this time.	2011	Medium	Countywide	The City of Brookfield DPW has developed a proposal, which has been presented at the Association of Flood Plain Manager's national conference and at the National Weather Service Eastern Region Flash Flood Conference, for this. The white paper proposal was most recently published in the August edition of the APWA Reporter and received support from all over the country.
Storms: Tornadoes and High Winds	Explore the feasibility of constructing tornado shelters in areas where deficient especially in mobile home parks and campgrounds.	Costs vary	Waukesha County Parks, Land Use and Zoning Departments	Ongoing	Medium	Countywide	Maintenance buildings/lodges are used at campgrounds. Park rangers receive alerts from dispatch on their 800 mHz radios; they then go around and tell people of the alert. This works fine in small parks. On golf courses, people are alerted by an air

		Costs vary – grant dependent	Municipal Officials	As funding available	Medium	Villages of Butler and Lannon	horn blast. Each village has a mobile home complex.
	Monitor severe weather advisories if at risk for tornadoes.	Covered by annual budget	Emergency Response Agencies	Ongoing	Medium	Village of Elm Grove	
	Continue active coordination with the Waukesha County Emergency Warning System.	Covered by annual budget	Emergency Response Agencies	Ongoing	Medium	Village of Elm Grove	The village currently receives warnings from the National Weather Service but would like to receive notification from the county also.
	Encourage builders and owners of manufactured and mobile homes to use tie-downs with ground anchors	Covered by Dept annual budget	EM Dept	Ongoing	Medium	Countywide	Will provide information via website link
	Explore the feasibility of increasing the wind resistance of the roofs of community storm shelters.	Covered by Dept annual budget	Waukesha County Parks, Land Use and Zoning Departments	As grants available	Low	Countywide	Focus on buildings getting upgraded and new buildings that are likely candidates for being community shelters (e.g., schools, community centers, etc.)
	Promote tornado awareness, including safety measures.	Covered by Dept annual budget	EM Dept	Ongoing	Medium	Countywide	Done during tornado awareness week in April. Information will be included on the website for homes, schools and business safety measures.
Storms: Winter	Promote winter hazards awareness, including home and travel safety measures (including website.)	Covered by Dept annual budget	EM Dept	Ongoing	Medium	Countywide	Done during winter weather awareness week in November.
	Create additional locations for road salt storage: ○ The county would like one, large 15,000 lb salt dome for state and county usage. ○ Village and Town of Mukwonago would like additional storage in a smaller salt domes	$500,000 <$500,000	County Highway VL & TN of Mukwonago	As funding available As funding available	High High	State DOT, Waukesha County Highway VL & TN of Mukwonago	The county will have the dome by Winter '09

	Monitor severe weather advisories if at risk for winter storms.	Covered by budget	Emergency Response Agencies	Ongoing	High	Village of Elm Grove	
	Maintain the proper amount of resources (e.g., salt) to properly manage winter storms.	Varies	Public Works	Ongoing	High	Village of Elm Grove	
	The County would like additional Road Weather Information System (RWIS) monitoring system stations.	$40,000/site (WIDOT might also be interested in participating for additional stations.)	County Highway	As funding available	Low	Countywide	There is one station on I-94 but the weather/road conditions vary widely around the county. The stations report air and bridge/road deck temperature and wind speed and direction.
	The county would like to have AVL (automatic vehicle locator) and routing software for snowplows to increase efficiency and reduce waste.	>$85,000	County Highway	As funding available	Medium	Waukesha County Highway	AVL systems also report pavement temperatures.
Utility Failure	Complete a survey to determine which railroad intersection safety systems do not have electrical power back-ups. Seek funding sources based on survey results.	Covered by budget	County Highway and Municipalities	2011	Low	Countywide	
	Consider back-up power needs. The county purchased two large (100KW) portable generators with the major goal of providing power at any mass clinic site but can be used at shelters if not needed for a clinic. May need to evaluate if this is sufficient for sheltering operations.	Costs vary $135,000 UASI grant for purchased generator	EM Dept and Health and Human Services Dept	Ongoing	High	Countywide	Generators have been delivered and will be deployable in Fall 2010 Currently emergency shelters only have emergency back-up power (e.g., to exit lights), which is not adequate to fulfill the needs of evacuees.
	The City of Waukesha would like to have a mobile generator to provide back-up power to critical municipal facilities.	~$345,000 (UASI funding)	City of Waukesha EM	2010	Medium	City of Waukesha	This was not funded by the UASI grant so in the short-term the City has allocated $7,000 for upgrading the PD building's electrical wiring to take outside wiring and for an ongoing contingency contract with FABCO for a generator.

	The Cities of Pewaukee and Waukesha would like to have truck-mounted water pumps to serve as back-ups to the stationary pumps in an electrical failure.	~$335,000	Cities of Pewaukee and Waukesha Water Utilities	As funding available	Medium to High	Cities of Pewaukee and Waukesha	○ In a power outage, water is available for 24 hours. ○ Water is needed for regular community usage and firefighting.
	Upgrade the lift station to 5 million gallons per day.	$1,000,000 – municipally funded	Muskego Utilities	2011	High	City of Muskego	This project will help keep sewage from backing up into resident basements in floods.
	Install a back-up generator at Well #3 in the Village of Pewaukee.	$300,000	Municipal Water Department	As funding available	Medium – High	Village of Pewaukee	The computer system panel that manages the whole water utility system is in that well house and the system would not be able to be monitored and controlled if power was lost at that location.
	Install a back-up generator in the Village of Sussex public safety building.	$60,000 - $70,000	Engineering Department	As funding available	High	Village of Sussex	The County Sheriff has an office in the building as well as the village EOC and fire department. The fire department has an undersized generator that will power their side but not the newly expanded other portions of the building.
	Evaluation options for providing shelters, with back-up power generators (or panels to accept portable generators), within the municipalities.	Costs vary depending on options selected	Municipal officials	As funding available	Medium to High	Villages of Big Bend, Chenequa, Eagle, Hartland, Lac La Belle, North Prairie and Wales	The Village of Chenequa has 2 state highways and a railroad through the village. They have no shelter and no facility with back-up power. May use the school. The Village of Wales shelter is at the school but it does not have back-up power.
	Remove old, diseased or damaged trees that are a risk for damaging property in a severe storm.	~$10,000 over three years (municipally funded)	Municipal officials	Ongoing	Medium	Village of Wales	The 2010 contract is for $3,000
	Relocate, floodproof and elevate sewage lift stations that received	$350,000 - $400,000	Municipal Utility	As funding available	High	City of New Berlin	Applied for a mitigation grant but were denied.

	damage in the 2008 flooding.						
	The Village of Mukwonago would like to upgrade their old water utility pumps.	Costs vary	Mukwonago Water Utility	As funding available	Low	Village of Mukwonago	

EM Dept = Waukesha County Emergency Management Department
UW Ext = University of Wisconsin – Waukesha County University of Wisconsin Extension Office
* Designates an element that supports the NFIP.

Appendix D: Village of Elm Grove HazMit Objectives Report

1. FLOODING

The Village of Elm Grove's primary goal concerning flooding is to improve stormwater management and sanitary sewer performance and to mitigate the effects of the flooding within the Underwood Creek Basin. The Village has already been actively addressing this issue over the past several years, and will maintain this goal as a high priority. The following flood management objectives were established based on 1) citizen response to a resident goal setting survey from the Village of Elm Grove, 2) the mission of the Underwood Creek Task Force and 3) adoption of the Southeaster Wisconsin Regional Planning Commission's Recommendations for Stormwater and Floodland Management of the Dousman Ditch and the Underwood Creek Subwatersheds.

a. Objective 1 – Design Standards

Minor stormwater conveyance systems should be designed to provide protection from a ten-year recurrence interval event. Major stormwater conveyance systems should be designed to provide protection from a 100- year recurrence interval event. The ten-year and 100-year recurrence intervals equate to a ten percent (10%) and one percent (1%) recurrence probability in any one-year. Newly constructed and reconstructed stormwater conveyance systems, both major and minor, should be engineered in accordance with established design standards.

Status - Carry Forward

- Regular maintenance by Department of Public Works
- Floodplain Mitigation Project - Completion Date: July 2009 Submitted to FEMA for FIRM remap: December 2007

b. Objective 2 – Stormwater Management and Ordinances

A comprehensive Stormwater Management Plan, including development and evaluation of alternative plans to abate problems caused by flooding, inadequate drainage, and nonpoint source pollution; development of a recommended plan; and establishment of procedures for plan implementation, should be adopted. The water quality portion of such a plan should be required under the conditions of the Chapter NR 216 permit that will be issued by the Wisconsin Department of Natural Resources. Ordinances to provide protection during plan development and to implement the plan upon completion should also be developed. Natural Hazards Mitigation Plan Village of Elm Grove 40

Status - "Completed"/Carry Forward

- Creation of Chapter 235 in Village of Elm Grove Code of Ordinances in order to meet Chapter NR 216 Requirements
- Has been sent to DNR for approval –will be adopted following their approval of ordinance language

c. Objective 3 – Drainage Ways and Easements

Public and private drainage ways, both natural and man-made, should be kept free from obstructions. Easements should be obtained to protect drainage ways and allow access for maintenance. Ordinances should be adopted to enforce protection of and access to drainage ways. A maintenance schedule has been developed to keep the stormwater system functioning.

Status – Carry Forward

- Regular maintenance

d. Objective 4 – Filling and Grading

A comprehensive process should be put in place to review filling and grading of public and private parcels to assure that all stormwater management issues are addressed. Public education needs to create an awareness of the problems that can occur with improper filling and grading by homeowners. Engineering review, permitting, inspection and enforcement will be incorporated into the development and redevelopment of property.

Status - Carry Forward

- Amended code recently from 400 cubic yards to 40 cubic yards requiring a permit (fill or excavation)
- On-going oversight by the Zoning Administrator/Director of Public Works

e. Objective 5 – Private Wells

As private wells provide a direct channel to the community's water resource, wells should be brought into compliance with current WDNR regulations. This would include well casings that terminate at least twelve inches (12") above the ground and twenty-four inches (24") above the base flood elevations in flood hazard zones. Well caps should be sealed.

Status – Carry Forward

- Studying municipal water opportunities and held referendum in April 2009 to allow creation of municipal water utility

f. Objective 6 – Floodplain Issues

Floodplain zoning ordinances should be actively enforced. Policies should be established to address structures located in flood hazard zones. Policies could include elevation of structures, flood proofing, removal of structures, the provision of detention storage and modification of stream channels and/or bridges. If these alternatives are not feasible, the structures should be isolated from the municipal sanitary sewer system.

Status – Carry Forward

- Check floodplain status for all exterior building permits
- Review all exterior projects in the Village

2. THUNDERSTORMS

a. Objective 1 – Monitor

Monitor severe thunderstorm weather advisories.

Natural Hazards Mitigation Plan Village of Elm Grove 41

Status – Carry Forward

b. Objective 2 – Dissemination of Information

Rebroadcast weather bulletins over the Village of Elm Grove's local cable channel, Channel 25.

Status – Drop

- Not cost effective – information disseminated on local stations and weather stations

3. LIGHTNING

a. Objective 1 – Monitor

Monitor severe thunderstorm weather advisories, being as lightening tends to occur in conjunction with severe thunderstorms.

Status – Carry Forward

b. Objective 2 – Dissemination of Information

Rebroadcast weather bulletins over the Village of Elm Grove's local cable channel, Channel 25.

Status – Drop

- Not cost effective – information disseminated on local stations and weather stations

4. HAIL

a. Objective 1 – Monitor

Monitor severe thunderstorm weather advisories, being as hailstorms tend to occur in conjunction with severe thunderstorms.

Status – Carry Forward

b. Objective 2 – Dissemination of Information

Rebroadcast weather bulletins over the Village of Elm Grove's local cable channel, Channel 25.

Status – Drop

- Not cost effective – information disseminated on local stations and weather stations

5. DROUGHT

a. Objective 1 – Monitor

Monitor severe weather advisories regarding extreme dry conditions.

Status – Carry Forward

b. Objective 2 – Dissemination of Information

Rebroadcast weather bulletins over the Village of Elm Grove's local cable channel, Channel 25.

Status – Drop

- Not cost effective – information disseminated on local stations and weather stations

6. TORNADOES AND DOWNBURSTS

a. Objective 1 – Monitor

Monitor severe weather advisories regarding tornadoes.

Status – Carry Forward

b. Objective 2 – Dissemination of Information

Rebroadcast weather bulletins over the Village of Elm Grove's local cable channel, Channel 25.

Status – Drop

- Not cost effective – information disseminated on local stations and weather stations

c. Objective 3 - Coordinate

Continue active coordination with the Waukesha County Emergency Warning System.

Status – Carry Forward

- Although currently we receive notification of tornadoes through the national weather forecast, we wish to work with Waukesha County in order to receive notification from them

7. WINTER STORMS

a. Objective 1 – Education

Participate in Winter Awareness Week, a program sponsored by the National Weather Service and the Wisconsin Department of Emergency Management.

Status - Drop

- Not cost effective – information disseminated on local stations and weather stations

b. Objective 2 – Dissemination of Information

Rebroadcast weather bulletins over the Village of Elm Grove's local cable channel, Channel 25.

Status – Drop

- Not cost effective – information disseminated on local stations and weather stations

8. EARTHQUAKES

a. Objective 1 – Mobilize Resources

In the unlikely event of an earthquake, mobilize available emergency management resources.

Status – Carry Forward

Appendix E: HAZUS Vulnerability Assessment

Identify Hazards

Waukesha County is located in southeastern Wisconsin where its total land mass is approximately 554 square miles. Waukesha County's history signals a geography that may produce a flood at any time regardless of season. However the majority of the largest floods have occurred in the early spring, typically due to spring rains or snowmelt. The largest floods in the past have been to the Fox River, Bark River, Mukwonago River, and the Oconomowoc River. Since the installation of a gaging station on the Fox River in the City of Waukesha it has recorded major flood in 1965, 1973, 1974, and 1979.

Principle sources of flooding:

1. *Fox River* – The Fox River flows southwesterly, stretching 225 miles from its mouth at the Illinois River to the northeastern boundary of Waukesha County. The drainage area of the Fox River encompasses 2,658 square miles.
2. *Bark River* – The Bark River flows southwesterly through the cities of Merton, Hartland, and Oconomowoc East
3. *Mukwonago River* – The Mukwonago River flows easterly through the city of Mukwonago where it drains into the Fox River.
4. *Oconomowoc River* – The Oconomowoc River flows southwesterly through the cities of Merton and Oconomowoc. The river has flooded in the city of Oconomowoc during the years of 1943, 1959, and 1974; all of which were early spring floods.

This data was gathered from the Federal Emergency Management Agency's (FEMA) Flood Insurance Study. A study revision was completed on December 18, 1986.

HAZUS-MH Hazard Analysis

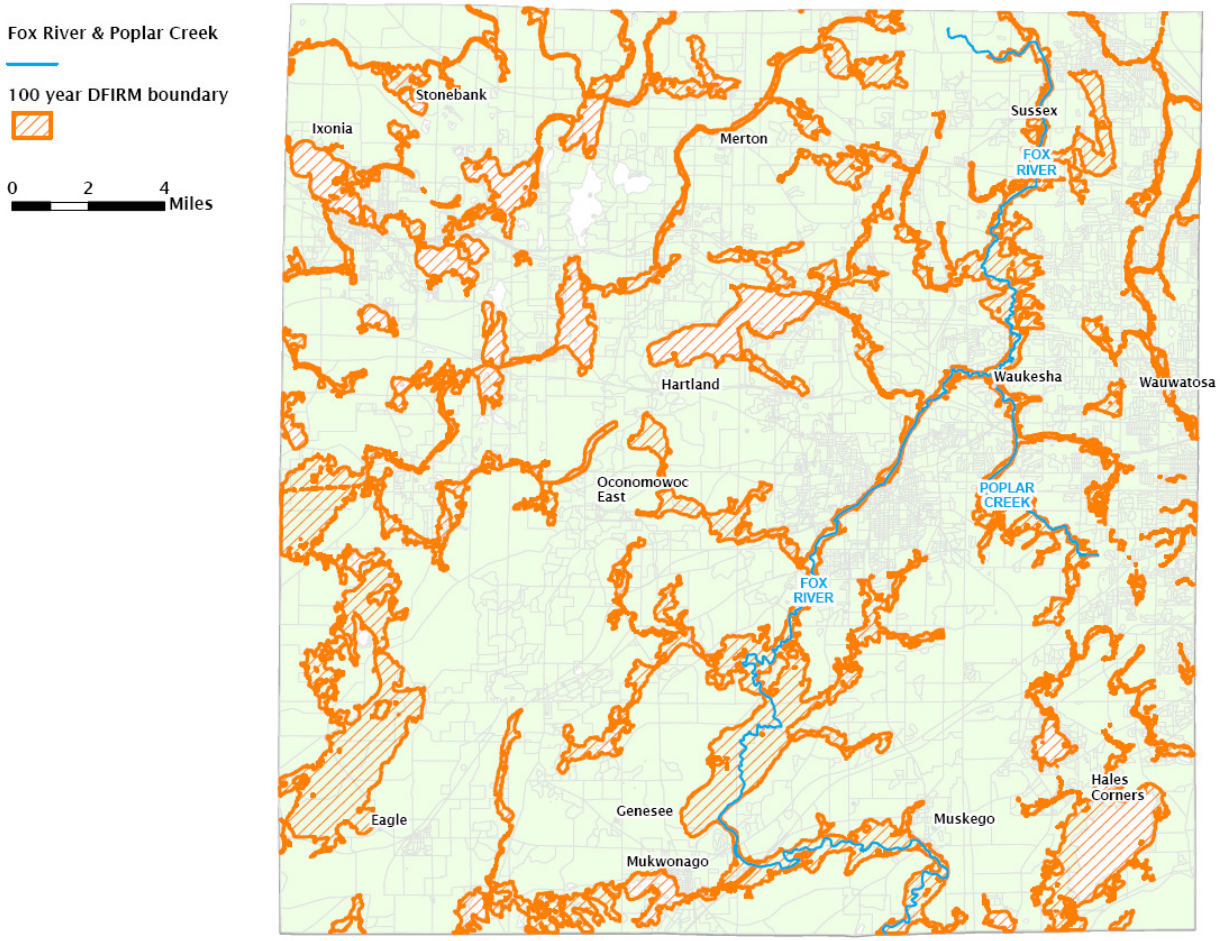
Flood analysis for Waukesha was performed using HAZUS-MH MR3 released in July 2007. The bundled aggregated general building stock was updated to Dun & Bradstreet 2006. Building valuations were updated to R.S. Means 2006. Building counts based on census housing unit counts are available for RES1 (single-family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

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

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

Figure 1 depicts the flood boundary from the HAZUS-MH analysis. Damages across Waukesha County are dispersed fairly evenly, with the largest amount occurring in the Town of Brookfield along Poplar Creek and the Fox River where 17 of the 189 Census Blocks exceeding $1 million in damage are located.

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



HAZUS-MH Aggregate Loss Analysis

HAZUS-MH was used to estimate the damages for a 100-year flood event in Waukesha County. An estimated 1,154 buildings will be damaged totaling in $292 million in building losses. The total estimated number of damaged buildings, total building losses, and estimated total economic losses are shown in Table 1.

HAZUS-MH estimates 189 census blocks with losses exceeding $1 million. The distribution of losses are shown in Figure 2.

HAZUS-MH aggregate loss analysis is area weighted. Census blocks of concern should be reviewed in more detail to determine the actual percentage of facilities that fall within the flood hazard areas. The area weighted analysis reported in this study may be overstated. Examples are provided in Figure 3.

Table 1: Waukesha Total Economic Loss - 100-Year Flood

General Occupancy	Estimated Total Buildings	Total Damaged Buildings	Total Building Exposure X 1000	Total Economic Loss X 1000	Building Loss X 1000
Agricultural	6	0	$122,348	$8,815	$2,041
Commercial	1,626	32	$6,217,785	$208,247	$52,069
Education	5	0	$428,274	$11,833	$1,681
Government	49	1	$146,690	$20,467	$2,255
Industrial	607	8	$3,108,256	$166,780	$44,960
Religious/Non-Profit	75	0	$506,240	$27,924	$3,765
Residential	111,984	1,113	$25,426,171	$295,712	$184,845
Total	**114,352**	**1,154**	**$35,955,764**	**$739,778**	**$291,616**

Figure 2: Waukesha Total Economic Loss - 100-Year Flood

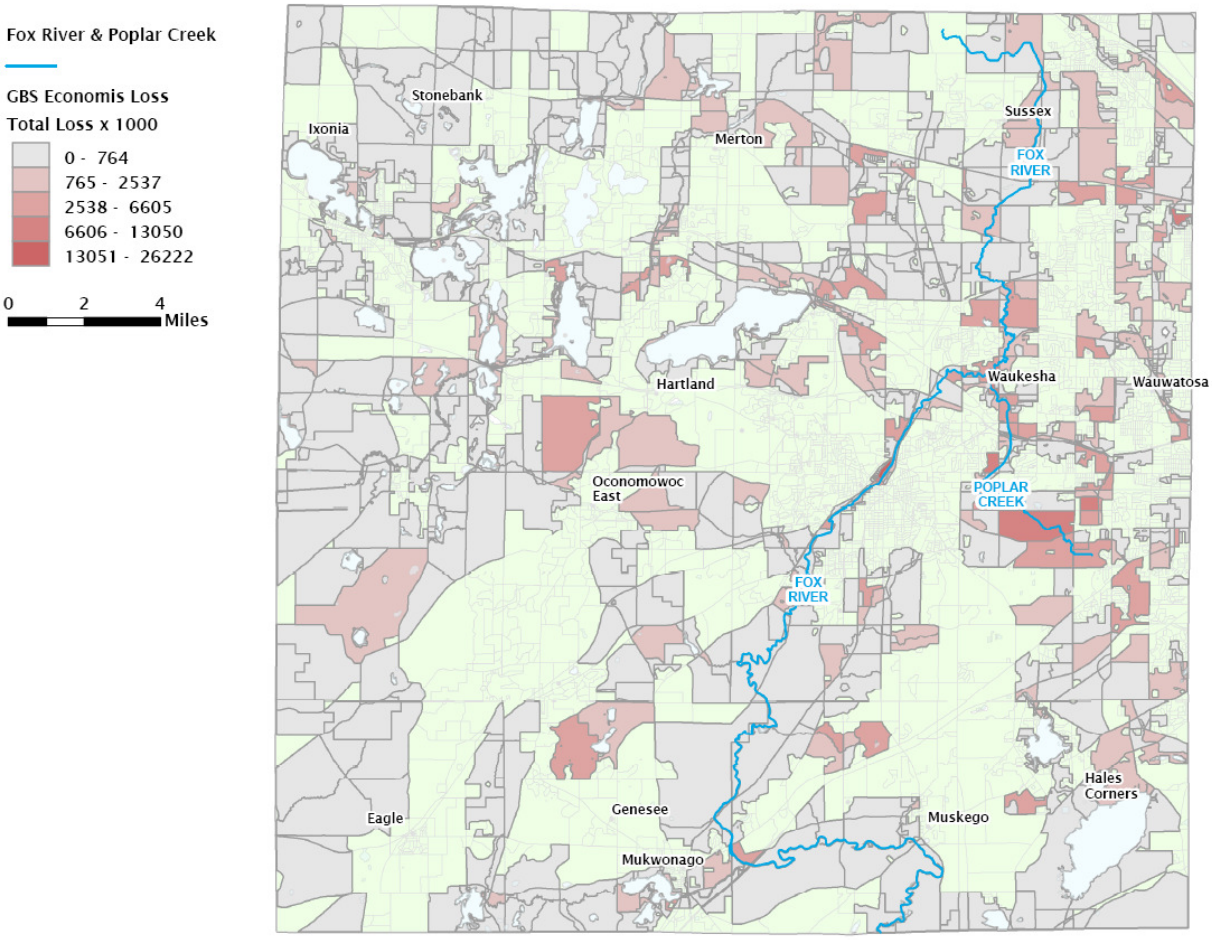


Figure 3a: Flood Damage Exposure north of Sussex

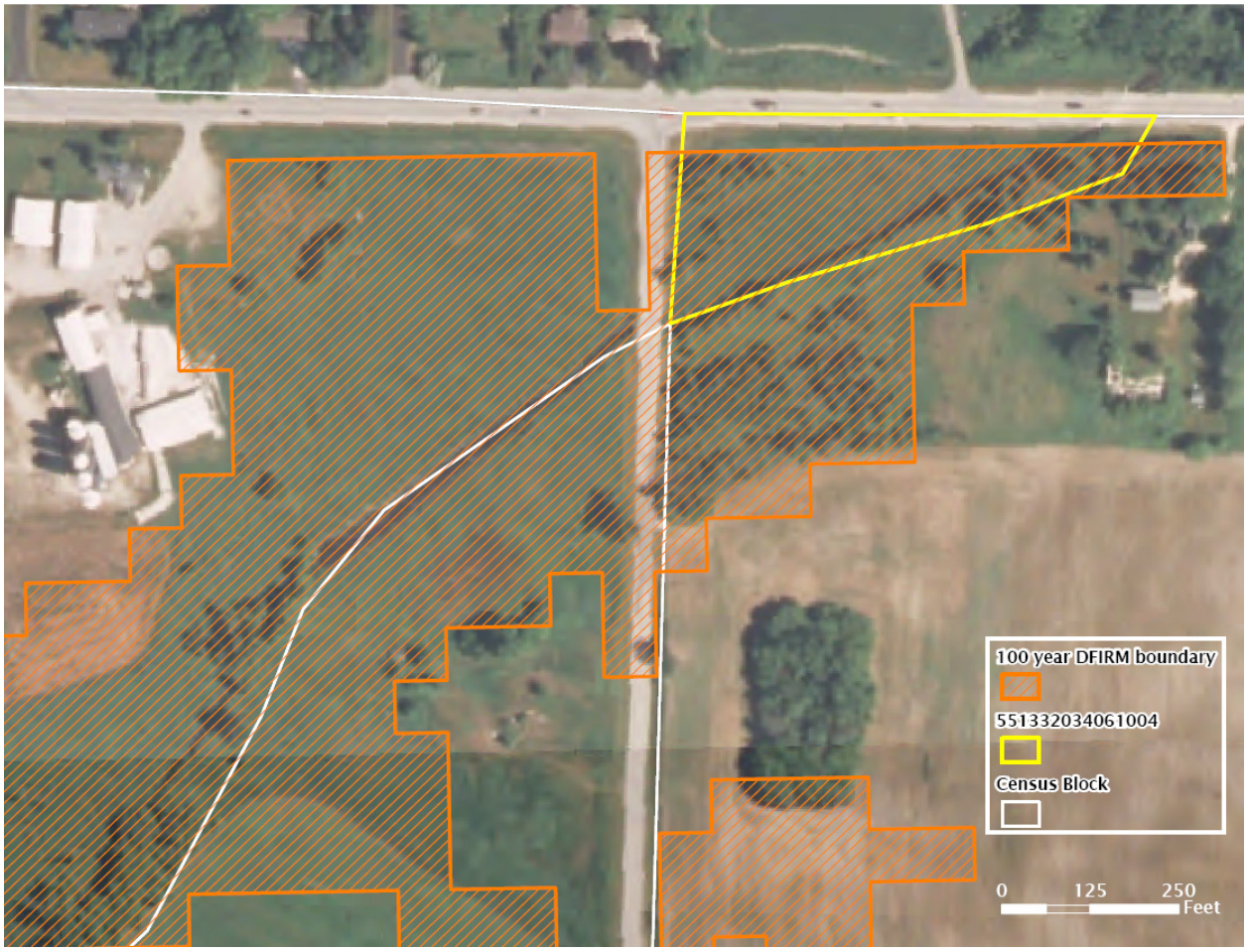


Figure 3a shows census blocks overlaid with the flood boundary and orthophoto north of Sussex on the Waukesha County boundary. Census block 551332034061004 has an estimated building loss of $5.4 million with a combined replacement cost of $22 million. According to the HAZUS-MH inventory this census block has a commercial replacement cost of $12.6 million and an industrial replacement cost of $13 million. However, the orthophoto shows this area to be an open field, with no buildings.

Figure 3b: Flood Damage Exposure in Muskego

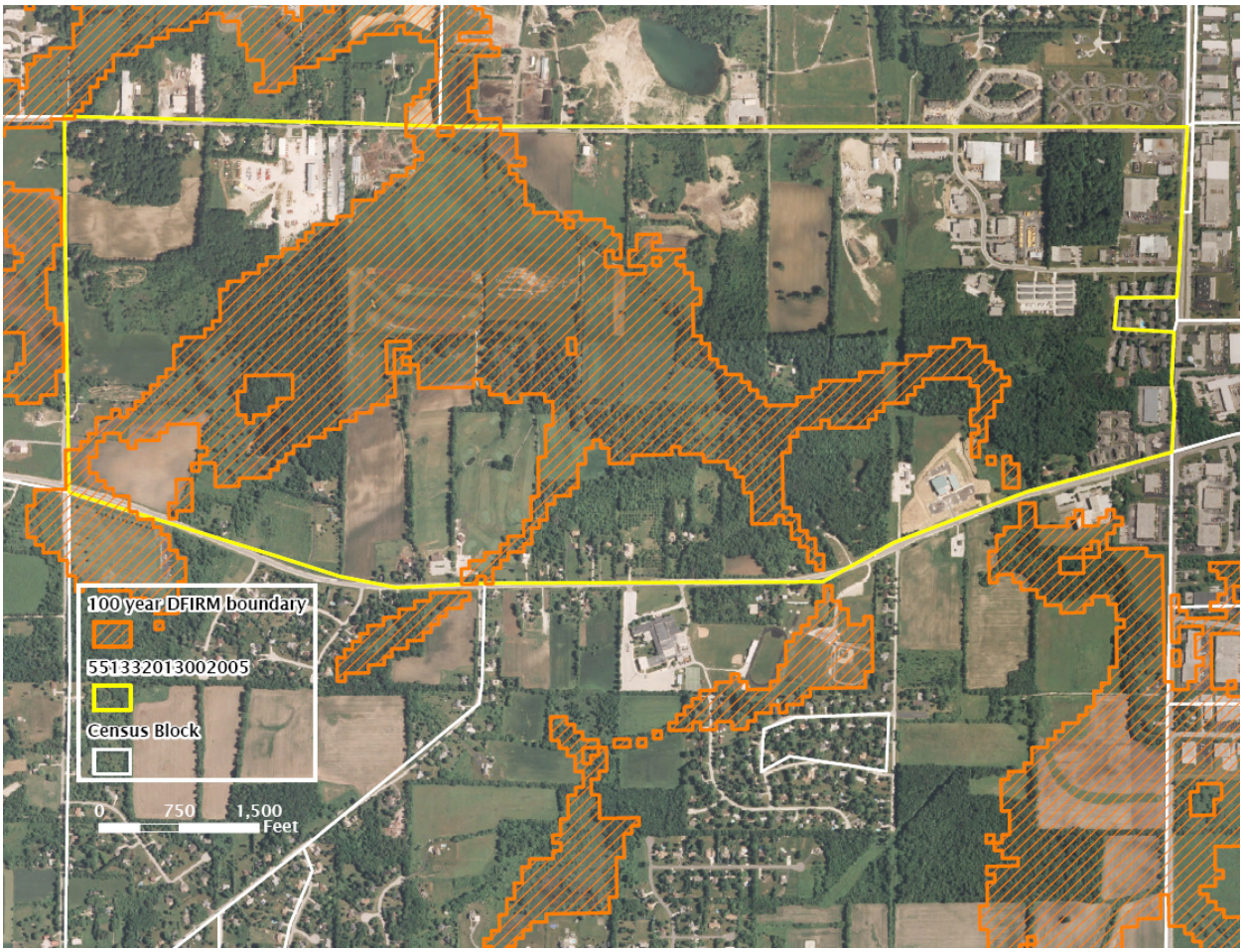


Figure 3b shows census blocks overlaid with the flood boundary and orthophoto of Muskego. Census block 551332013002005 has an estimated building loss of $3.3 million with a combined replacement cost of $13 million. According to the HAZUS-MH analysis 21 residential buildings are determined to be within the calculated flood boundary for this block. However, the orthophoto shows this area to be mainly forest and open fields, with few buildings actually within the flood boundary.

HAZUS-MH Essential Facility Loss Analysis

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

The HAZUS-MH analysis identified 6 schools, 4 fire stations, 3 police stations and 2 care facilities that may be subject to flooding. A list of the essential facilities within Waukesha County is included in Tables 2 and 3. A map of essential facilities potentially at risk to flooding is shown in Figure 4a.

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

Class	Building Count	At Least Moderate Damage	At Least Substantial Damage	Loss of Use
Fire Stations	41	4	0	0
Care Facilities	25	2	0	0
Police Stations	39	3	0	0
Schools	177	6	0	2
EOC	1	0	0	0
Total	**283**	**15**	**0**	**2**

Table 3: Waukesha Damaged Essential Facilities

Facility Name
Care-Age Of Brookfield
Lindengrove - New Berlin*
Hartland Volunteer Fire Department
Elm Grove Volunteer Fire Department
Tess Corners Volunteer Fire Department
Menomonee Falls Fire Department
Community Corrections-Easter
Elm Grove Police Department
Pewaukee Police Department
Saint Anthony Grade School*
Arrowhead High School*
Shady Lane Elementary School*
Queen Of Apostles School
Trinity Academy*
Waukesha County Tech College*

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

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

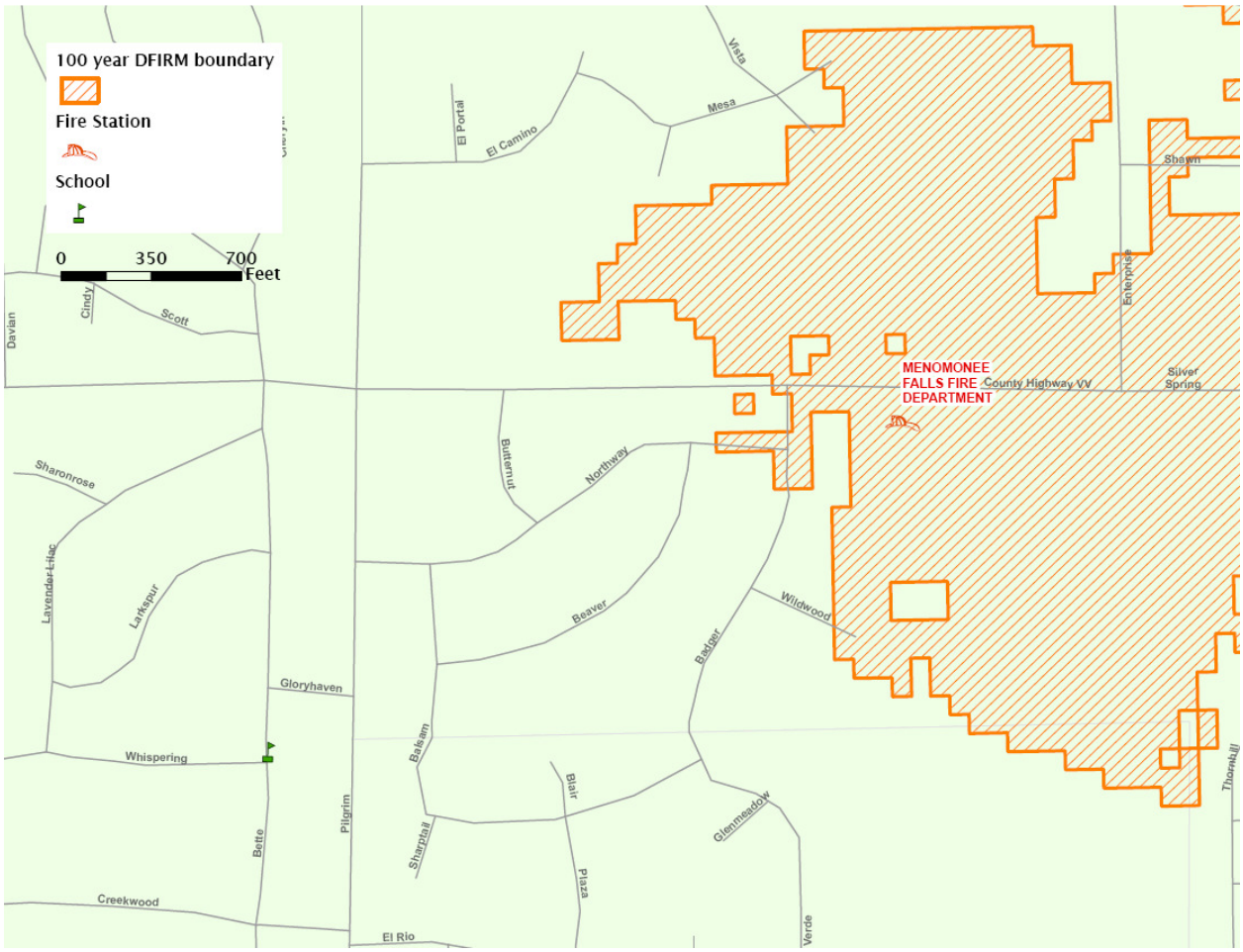
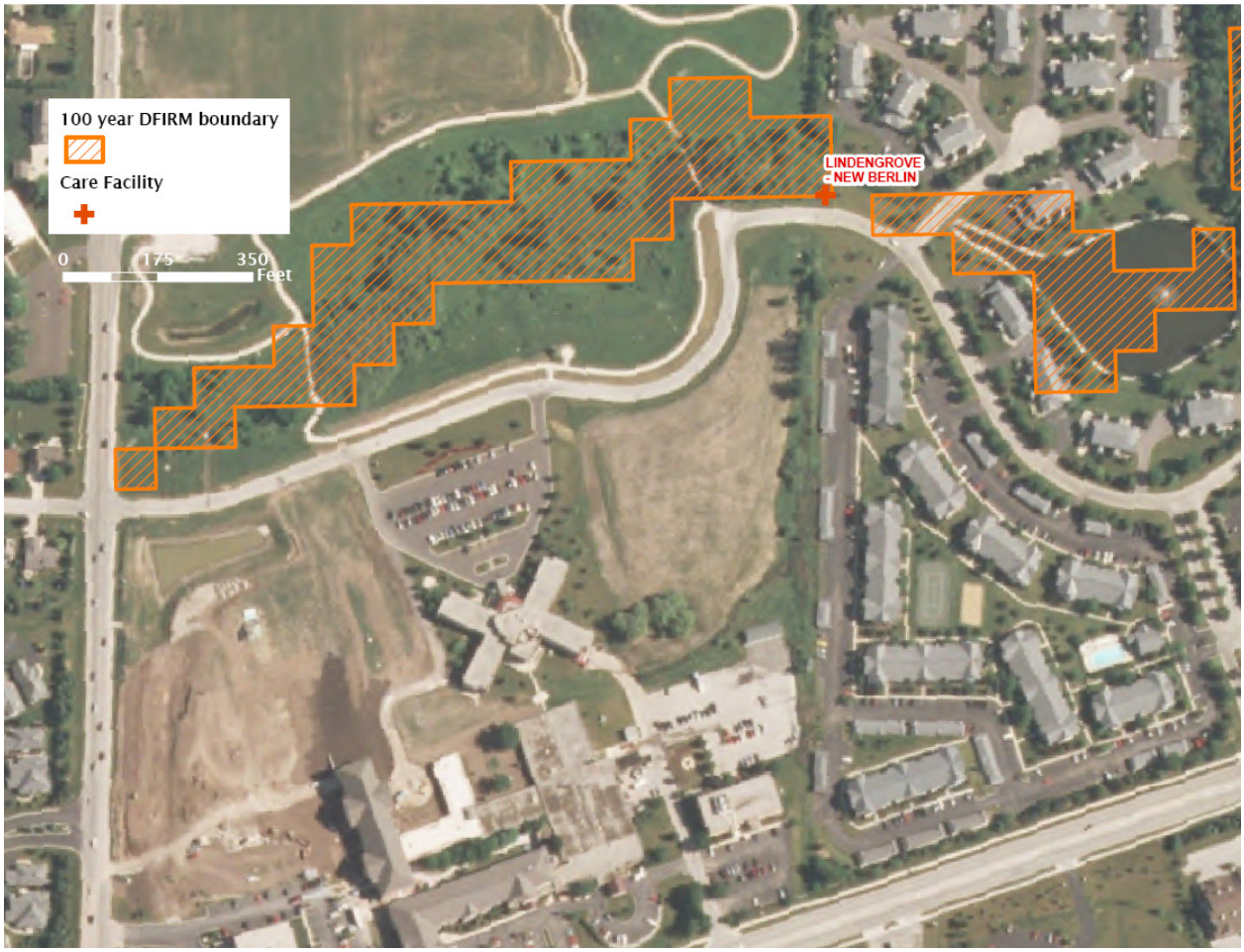


Figure 4b: 100-Year Flood Boundary Overlaid with Essential Facilities



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

HAZUS-MH Shelter Requirement Analysis

HAZUS-MH estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. HAZUS-MH also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 5,980 households will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these 13,042 people (out of a total population of 360,767) will seek temporary shelter in public shelters.

HAZUS-MH State Property Loss Analysis

The flood boundaries were overlaid with the State of Wisconsin property boundaries as provided by the Department of Natural Resources within Waukesha County. Table 4 provides a list of state properties with lands in the HAZUS flood boundary. Figures 5a and 5b show a couple examples of the inundated areas.

Table 4: Waukesha State Property Flood Inundation

State Property	Percent Inundated
Vernon Wildlife Area	76%
Big Muskego Lake Wildlife Area	72%
Unknown	36%
Lulu Lake Natural Area	34%
Kettle Moraine State Forest	32%
Glacial Drumlin State Trail	15%
Lapham Peak Unit	3%

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

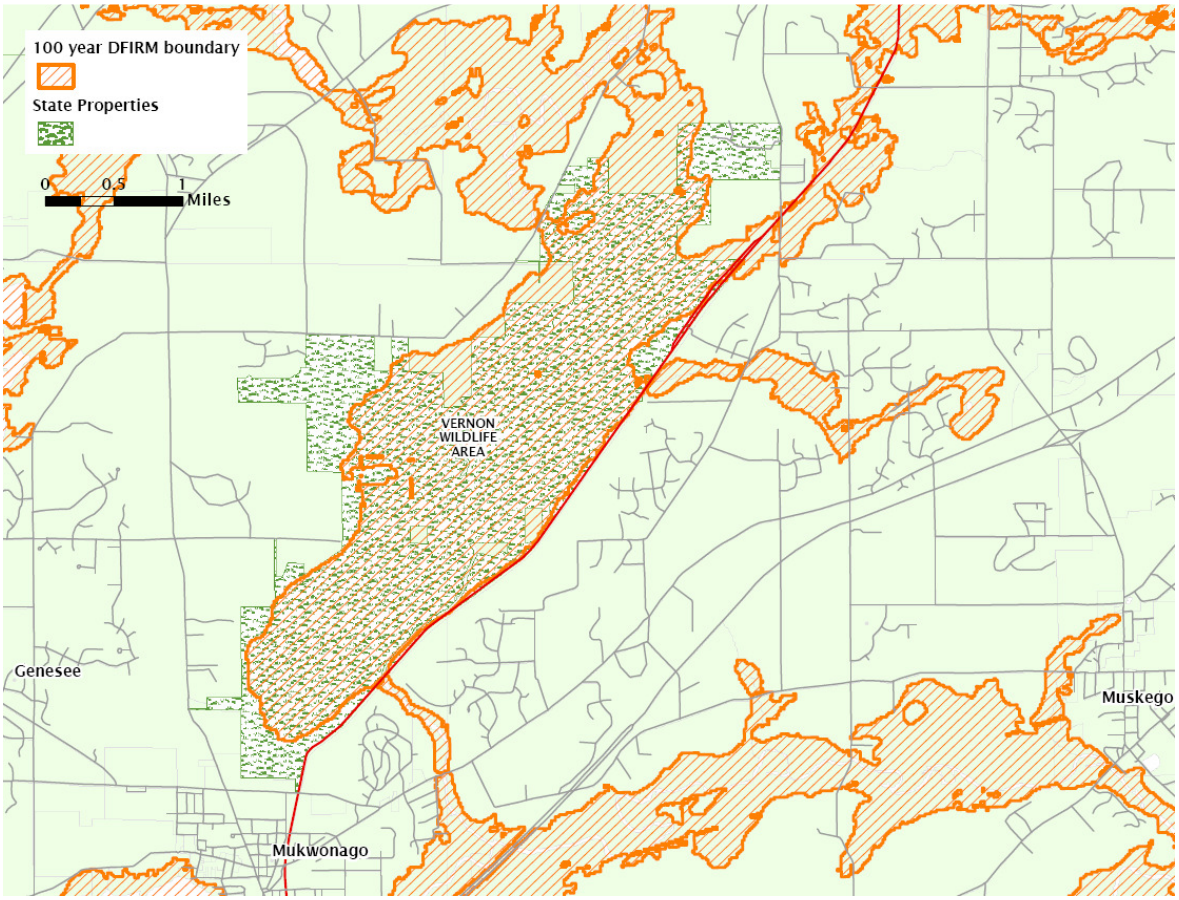
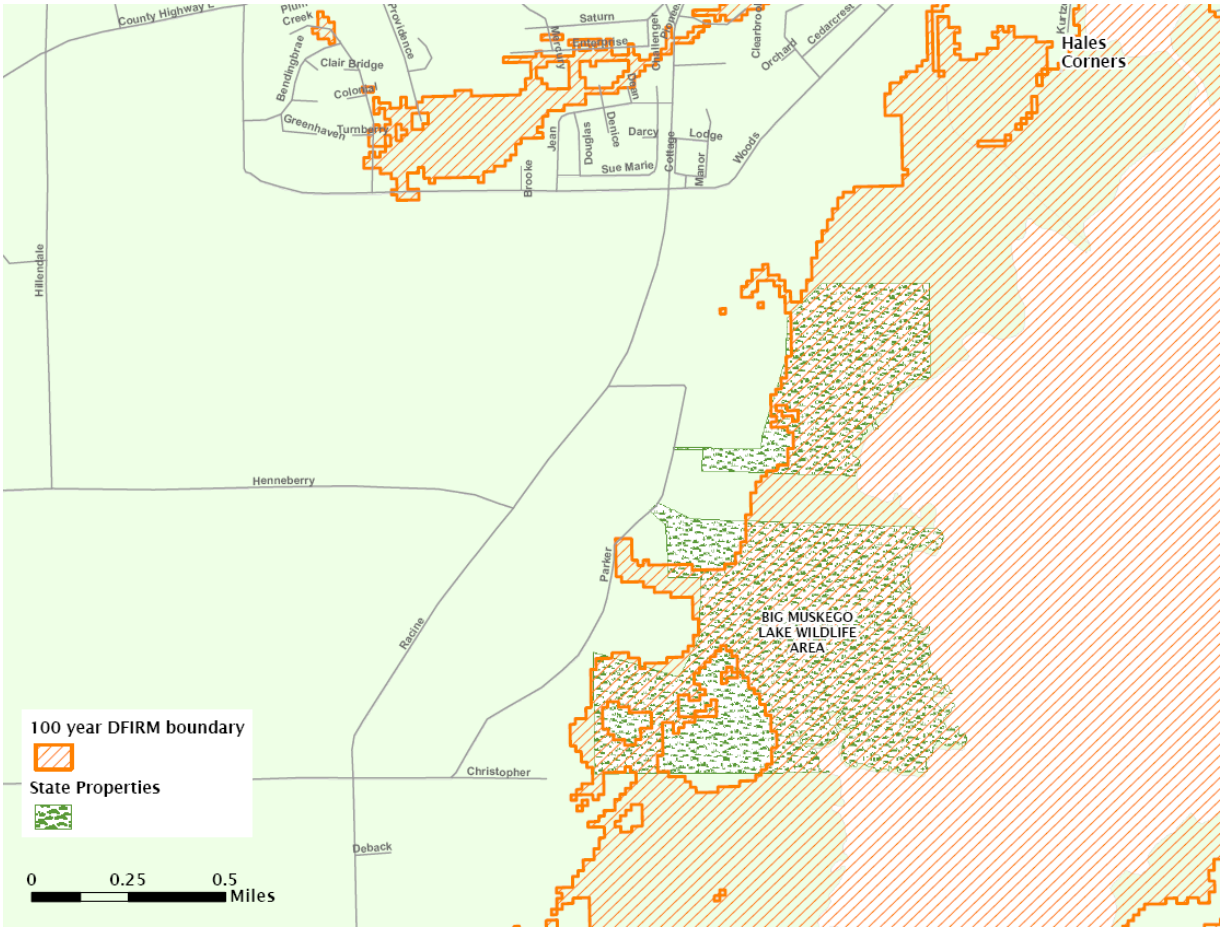


Figure 5b: Boundary of 100-Year Flood Overlaid with State of Wisconsin Properties



Appendix F: Community Input

Waukesha 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
10/7/08	The County Executive's Office released a message informing the community of the plan and soliciting members of the public, business and academia to join the workgroup. It was picked up and printed in several newspaper and online outlets (see below).
10/27/2008	The County EM Director and contractor presented information about the planning process and grant to elected officials from all of the cities, villages and towns in the county (as well as county officials) at the Waukesha County Coop Council. Again an open invitation was given to solicit officials (or their designees) to the workgroup.
Fall 2008	Every community in Waukesha County was given a survey to complete. Follow-up calls were made to solicit forms from those not received.
Fall 2008	Brochures describing the mitigation process were given to every municipality's officials with their surveys and others were put out in public places like town/village/city halls, libraries, etc.
5/26/2009	Hazmit workgroup meeting
7/21/2009	Hazmit workgroup meeting
July 2010	Press release and legal public notice regarding final draft of plan available for public comment.

On 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.

WAUKESHA COUNTY NATURAL HAZARDS PREPAREDNESS AND MITIGATION QUESTIONNAIRE

1. In the past five years, has your community experienced a natural disaster such as a severe windstorm, flood, wildfire, earthquake, etc.?
   - ⬭ No (If NO, skip to Question 2)
     - ○ City of Muskego (Police Dept.)
     - ○ Village of Dousman
     - ○ Village of Merton
     - ○ Village of Nashotah
     - ○ Town of Ottawa
     - ○ Town of Waukesha

   If YES, which of these natural disasters occurred? (Please check all that apply.)

Event	When event last occurred:				
	Within past year	**1-5 years ago**	**5-15 years ago**	**More than 15 years ago**	**Never**
Drought		Waukesha Co. V. of Hartland V. of Pewaukee	V. of LaclaBelle T. of Summit	T. of Delafield	C. of Oconomowoc V. of Eagle V. of Elm Grove V. of Lannon V. of N Prairie
Dust Storm				V. of LaclaBelle	Waukesha Co. C. of Oconomowoc V. of Eagle V. of Elm Grove V. of Hartland V. of Lannon V. of N Prairie V. of Pewaukee T. of Delafield T. of Summit
Earthquake		Waukesha Co. V. of Hartland V. of LaclaBelle			C. of Oconomowoc V. of Eagle V. of Elm Grove V. of Lannon V. of N Prairie V. of Pewaukee T. of Delafield T. of Summit
Flood	Waukesha Co. C. of Brookfield C. of New Berlin C. of Oconomowoc C. of Pewaukee V of Big Bend V. of Butler V. of Elm Grove V. of Hartland V. of LaclaBelle V. of Lannon V. of Menomonee Falls V. of Oconomowoc Lake V. of Pewaukee V. of Sussex V. of Wales T. of Brookfield	V. of Butler V. of Eagle V. of N Prairie	Waukesha Co. C. of New Berlin C. of Pewaukee V. of Hartland T. of Mukwonago T. of Summit	T. of Summit	

	T. of Delafield T. of Genesee T. of Lisbon DPW T. of Merton T. of Mukwonago T. of Oconomowoc T. of Summit				
Lakeshore/ River Shoreline Erosion	Waukesha Co. C. of Oconomowoc V. of Hartland V. of LaclaBelle V. of Mukwonago V. of Pewaukee T. of Summit	Waukesha Co. V. of Hartland V. of Mukwonago T. of Delafield T. of Summit	Waukesha Co. V. of Hartland V. of Mukwonago T. of Summit	Waukesha Co. V. of Hartland V. of Mukwonago	V. of Eagle V. of Elm Grove V. of Lannon V. of N Prairie
Landslide/ Debris Flow	V. of LaclaBelle T. of Delafield T. of Summit				Waukesha Co. C. of Oconomowoc V. of Eagle V. of Elm Grove V. of Hartland V. of Lannon V. of N Prairie V. of Pewaukee
Wildfire	V. of Lannon	V. of LaclaBelle V. of N Prairie		V. of Hartland	Waukesha Co. C. of Oconomowoc V. of Eagle V. of Elm Grove V. of Pewaukee T. of Delafield T. of Summit
Windstorm/ Tornado	V. of Eagle V. of Lannon V. of N Prairie T. of Merton	C. of Brookfield C. of New Berlin V. of Hartland V. of Menomonee Falls V. of LaclaBelle V. of Sussex T. of Merton	C. of Oconomowoc V. of Chenequa V. of Elm Grove (W) V. of Pewaukee T. of Delafield T. of Merton T. of Summit	Waukesha Co. V. of Elm Grove (T) V. of Mukwonago V. of Wales T. of Merton	
Severe Winter Storm	Waukesha Co. C. of New Berlin C. of Pewaukee V of Big Bend V. of Chenequa V. of Hartland V. of LaclaBelle T. of Brookfield T. of Delafield T. of Genesee T. of Lisbon DPW T. of Merton T. of Mukwonago T. of Oconomowoc	Waukesha Co. C. of Brookfield V. of Eagle V. of Hartland V. of Lannon V. of Mukwonago V. of Pewaukee V. of Sussex T. of Merton T. of Mukwonago T. of Summit	Waukesha Co. C. of Pewaukee V. of Hartland V. of Mukwonago T. of Merton	Waukesha Co. C. of Oconomowoc V. of Hartland V. of Mukwonago V. of N Prairie T. of Merton T. of Summit	
Other: Heat Wave			V. of Elm Grove		
Other: Hail Storm		V. of Elm Grove			
Other: Lightning Storm	T. of Brookfield		V. of Elm Grove		
Other: Sinkholes				V. of Lannon	
Other: Invasive Species – Gypsy Moth Emerald Ash Borer		V. of Menomonee Falls			

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

Event	Extremely Concerned	Very Concerned	Concerned	Somewhat Concerned	Not Concerned
Drought	V. of LaclaBelle		Waukesha Co. C. of New Berlin V. of Elm Grove V. of Hartland V. of Menomonee Falls T. of Waukesha	C. of Brookfield C. of Pewaukee V. of Dousman V. of Pewaukee T. of Genesee T. of Oconomowoc T. of Summit	C. of Oconomowoc V. of Big Bend V. of Eagle V. of Lannon V. of Merton V. of Nashotah V. of N Prairie V. of Sussex T. of Delafield T. of Lisbon DPW T. of Ottawa
Dust Storm				V. of Eagle T. of Genesee T. of Waukesha	Waukesha Co. C. of Brookfield C. of New Berlin C. of Oconomowoc C. of Pewaukee V. of Big Bend V. of Dousman V. of Elm Grove V. of Hartland V. of Lannon V. of Menomonee Falls V. of Merton V. of Nashotah V. of N Prairie V. of Pewaukee V. of Sussex T. of Delafield T. of Lisbon DPW T. of Oconomowoc T. of Ottawa T. of Summit
Earthquake	V. of LaclaBelle		C. of New Berlin C. of Pewaukee	V. of Dousman V. of Eagle	Waukesha Co. C. of Brookfield C. of Oconomowoc V. of Big Bend V. of Elm Grove V. of Hartland V. of Lannon V. of Menomonee Falls V. of Merton V. of Nashotah V. of N Prairie

					V. of Pewaukee V. of Sussex T. of Delafield T. of Genesee T. of Lisbon DPW T. of Oconomowoc T. of Ottawa T. of Summit T. of Waukesha
Flood	C. of New Berlin C. of Oconomowoc C. of Pewaukee V. of Butler V. of LaclaBelle T. of Genesee T. of Mukwonago T. of Oconomowoc T. of Summit T. of Waukesha	Waukesha Co. V. of Dousman V. of Eagle V. of Elm Grove V. of Hartland V. of Lannon V. of Oconomowoc Lake T. of Brookfield T. of Delafield T. of Lisbon DPW	C. of Brookfield C. of Muskego V. of Menomonee Falls V. of Mukwonago V. of N Prairie V. of Pewaukee V. of Sussex V. of Wales	V. of Big Bend T. of Merton T. of Ottawa	V. of Merton V. of Nashotah
Lakeshore/ River shoreline Erosion	C. of Oconomowoc C. of Pewaukee V. of LaclaBelle V. of Pewaukee T. of Delafield	Waukesha Co. V. of Hartland V. of Mukwonago V. of Oconomowoc Lake T. of Oconomowoc T. of Summit	T. of Genesee T. of Ottawa T. of Waukesha	C. of New Berlin V. of Elm Grove T. of Merton T. of Mukwonago	Waukesha Co. C. of Brookfield V. of Big Bend V. of Dousman V. of Eagle V. of Lannon V. of Merton V. of Nashotah V. of N Prairie V. of Sussex T. of Lisbon DPW
Landslide/ Debris Flow	V. of LaclaBelle	V. of Oconomowoc Lake T. of Summit	V. of Mukwonago T. of Waukesha	Waukesha Co. C. of New Berlin V. of Elm Grove V. of Hartland V. of Menomonee Falls T. of Delafield T. of Oconomowoc T. of Ottawa	C. of Brookfield C. of Oconomowoc C. of Pewaukee V. of Big Bend V. of Dousman V. of Eagle V. of Lannon V. of Merton V. of Nashotah V. of N Prairie V. of Pewaukee V. of Sussex T. of Genesee T. of Lisbon DPW
Wildfire	V. of LaclaBelle	T. of Genesee	V. of Eagle V. of Hartland V. of Mukwonago V. of Oconomowoc Lake	Waukesha Co. C. of Pewaukee V. of Dousman V. of Elm Grove V. of Lannon V. of Menomonee	C. of Brookfield C. of New Berlin C. of Oconomowoc V of Big Bend V. of Merton V. of Nashotah

			T. of Delafield T. of Waukesha T. of Summit	Falls V. of N Prairie T. of Lisbon DPW T. of Ottawa	V. of Pewaukee V. of Sussex T. of Oconomowoc
Windstorm/ Tornado	V. of Eagle V. of LaclaBelle T. of Genesee T. of Lisbon DPW-(Tornados)	C. of Brookfield C. of New Berlin V. of Elm Grove (W) V. of Mukwonago T. of Waukesha	Waukesha Co. C. of Oconomowoc C. of Pewaukee V. of Dousman V. of Elm Grove (T) V. of Hartland V. of Lannon V. of Menomonee Falls V. of Merton V. of N Prairie V. of Pewaukee V. of Sussex T. of Delafield T. of Oconomowoc T. of Summit	V. of Big Bend V. of Wales T. of Lisbon DPW T. of Merton T. of Ottawa	V. of Nashotah
Severe Winter Storm/ Ice Storm	C. of New Berlin C. of Pewaukee V. of Chenequa (I) V. of LaclaBelle T. of Genesee T. of Lisbon DPW	Waukesha Co. C. of Brookfield C. of Oconomowoc V. of Dousman V. of Eagle V. of Elm Grove V. of Hartland V. of Mukwonago T. of Brookfield T. of Delafield T. of Mukwonago T. of Oconomowoc T. of Waukesha	V. of Lannon V. of Menomonee Falls V. of Merton V. of N Prairie V. of Sussex T. of Ottawa	V. of Big Bend T. of Merton T. of Summit	V. of Nashotah V. of Pewaukee
Other: Heat Wave			V. of Elm Grove		
Other: Hail Storm		V. of Elm Grove			
Other: Lightning Storm		V. of Elm Grove			
Other: Sinkholes				V. of Lannon	
Other: Invasive Species – Gypsy Moth Emerald Ash Borer		V. of Menomonee Falls			

3. Has your community had damage to facilities or infrastructure (e.g., roads, public buildings, utilities?)

Waukesha County

- Yes, damaged roadway, storm sewer outfall erosion - Waukesha Co.

Cities

- Flood damage to public roads, waste water utilities, and minor public building damage - City of Brookfield
- No - City of Muskego
- Roads, culvert, lift stations (flooding) - City of New Berlin
- Spring '08 rains damaged small structure by the lake community center had to be protected by sandbags. May 10, 1990 show damaged overhead electrical facilities. - City of Oconomowoc
- Roof damage during recent flooding. Road sinkholes, culvert repairs, roads underwater. Sanitary sewer and private wells flooded. - City of Pewaukee

Villages

- No - Village of Big Bend
- Yes – Village Park, park building and fencing – Village of Butler
- No - Village of Chenequa
- No - Village of Dousman
- No – Village of Eagle
- Road washout (9/12/06); 9-1-1 system shut-down due to lightning strike (6/98); widespread power outages (7/9/96); sewer back-ups resulting from local flooding. - Village of Elm Grove
- Yes – damaged roadway, storm sewer and erosion – Village of Hartland
- Yes – Village of LaclaBelle
- None – some minor sinkholes – Village of Lannon
- Road pavement and right of ways washouts, damage to culvert pipes - Town of Lisbon DPW
- Yes, flooding in June of 97, August of 98, and June of 08 caused damage to roads, storm drainage systems, and Park buildings. The flooding also caused surcharging of sanitary sewer systems which necessitate bypass pumping by the Village to prevent basement flooding. Significant costs for excess sewage treatment (Sussex Facility) were absorbed by the Village Sewer Utility as a result of the flooding. The Village also experienced damage to public trees and landscaping as a result of the flooding event - Village of Menomonee Falls
- Hail storm - replace roofs. - Village of Merton
- None to date – Village of Mukwonago
- No - Village of Nashotah
- No – Village of North Prairie
- No - Village of Oconomowoc Lake

- Damage to roads and storm sewers from flooding in 2008; Lakefront erosion due to high waters on Pewaukee Lake in 2008- Village of Pewaukee
  The Village has had damage to roads, parking lots, fences due to flooding and wind damage - Village of Sussex
- No - Village of Wales

Towns

- No - Town of Brookfield
- Damage to shoulders of roads - Town of Delafield
- The severe flooding conditions in 2008 caused major road and bridge damage. - Town of Genesee
- Road Repairs-Flooding; Structures-Winds; No Utilities-All Well and Septic - Town of Merton
- Yes, Roads have been damaged due to flooding within past year and 16 years ago - Town of Mukwonago
- Road damage during the April/June 2008 flooding. We also had to bypass the Pondview Lift Station because of the amount of water entering the system. - Town of Oconomowoc
- No - Town of Ottawa
- Town roads were flooded in recent 2008 flooding at least two roads are water – covered annually. These areas are also served by sanitary sewer systems and municipal lift stations - Town of Summit
- No - Town of Waukesha

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

Waukesha County

- Electrical lines, parks, roadways, storm sewers, and sanitary sewers - Waukesha Co.

Cities

- The city facilitates are at no greater risk than all infrastructure within the jurisdiction. They do however, have a critical role for the citizens and are ritual to maintain or reinstate order and continuity during a disaster - City of Brookfield
- Electrical and water facilities - City of Oconomowoc
- Drinking water storage tanks (earthquake). Sewer/water pumping facilities (earthquake, floods).- City of Pewaukee

Villages

- The Village Park including roads and buildings located in it - Village of Big Bend
- Power/water tower – Village of Butler
- Electrical power due to weather-related incidents - Village of Chenequa

- Village Hall, Fire Department, Wastewater Treatment Plant - Village of Dousman
- Water tower (wind storm and power outage) and three wells (power outage)
- Gas and petroleum pipelines, railroad, Village Hall, electrical distribution systems, local roads, pool and pool building. - Village of Elm Grove
- Electrical lines, parks, roadways, storm sewers and sanitary sewers – Village of Hartland
- Roads – Village of LaclaBelle
- Village hall (houses fire and EMS) – Village of Lannon
- Electric Power Supply and Distribution Systems; Roadways, Bridges, and the Transportation Network, Communication Facilities, and Trees - Village of Menomonee Falls
- Village Hall, Firehouse - Village of Merton
- Severe windstorm – all public buildings, parks, electric utilities - Village of Mukwonago
- Not Applicable - Village of Nashotah
- Utility outages from downed trees and road washouts from flooding – Village of North Prairie
- Raildroad – Dam at Upper Oconomowoc Lake (Okauchee); Dam at River Raod- US Cell Tower – Village of Oconomowoc Lake
- Water Towers/ Standpipes- winds/tornado - Village of Pewaukee
- Low lying roads, Wastewater Treatment Facility, parks, and facilities - Village of Sussex

Towns

- Town offices sewer water utilities roads - Town of Brookfield
- Fire Station #1 - large trees around site - Town of Delafield
- Roads, bridges and parks - Town of Genesee
- Municipal buildings, emergency response equipment and proper trained staffing - Town of Lisbon DPW
- Utilities – Don't Own, but could shut us down; roads; all wells and septic systems - Town of Merton
- Roads - Town of Mukwonago
- Our bridges, roads and park sites - Town of Oconomowoc
- Roads, Parks and Park Structures; our roads are vulnerable to damage; I would suppose that Town Hall and the Recycle Center could sustain damage in a natural disaster as well - Town of Ottawa
- Roadways, lift stations, and electric power systems (overhead electric lines) - Town of Summit
- Roadways- Washout and Flood; Bridges in Glendale, Big Bend Rd., Hwy H, and Hwy I. Electric Utilities, especially over head, communication towers, Sunset Dr., Townline Rd. and Beehiem Rd, Fire Station, Rose Glen, and Waukesha Christian Academic schools, AT&T Facility -

Saylesville Rd., Townline Rd, Girl Scout Camp, (4) Churches, Hwy 59 & 164. Transportation corridors, Box Store-Strip Mall Sites, and Berkshire Apartments - Town of Waukesha

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	Waukesha Co. C. of New Berlin C. of Oconomowoc V of Big Bend V. of Dousman V. of Elm Grove V. of Hartland V. of LaclaBelle V. of Menomonee Falls V. of Mukwonago V. of Oconomowoc Lake V. of Wales T. of Brookfield T. of Genesee T. of Merton T. of Oconomowoc T. of Waukesha	V. of Butler V. of Chenequa V. of Eagle V. of Lannon V. of Pewaukee V. of Sussex T. of Mukwonago T. of Ottawa T. of Summit	C. of Muskego V. of N Prairie T. of Delafield T. of Lisbon DPW		V. of Nashotah
Protecting critical facilities (hospitals, fire stations, etc.)	Waukesha Co. C. of Brookfield C. of Muskego C. of New Berlin C. of Pewaukee V. of Big Bend V. of Butler V. of Chenequa V. of Dousman V. of Eagle V. of Elm Grove V. of Hartland V. of LaclaBelle V. of Menomonee Falls V. of Mukwonago V. of Pewaukee V. of Sussex V. of Wales T. of Brookfield T. of Delafield T. of Genesee T. of Lisbon DPW T. of Merton	C. of Oconomowoc V. of Lannon V. of Merton V. of N Prairie V. of Oconomowoc Lake			V. of Nashotah

	T. of Mukwonago T. of Oconomowoc T. of Ottawa T. of Summit T. of Waukesha				
Preventing development in hazard areas	Waukesha Co. C. of Brookfield C. of New Berlin C. of Pewaukee V. of Eagle V. of Elm Grove V. of Hartland V. of LaclaBelle V. of Menomonee Falls V. of Merton V. of Mukwonago V. of N Prairie V. of Pewaukee V. of Sussex T. of Brookfield T. of Genesee T. of Merton T. of Mukwonago T. of Oconomowoc T. of Ottawa T. of Waukesha	C. of Muskego C. of Oconomowoc V. of Butler V. of Chenequa V. of Dousman V. of Oconomowoc Lake V. of Wales T. of Lisbon DPW T. of Summit	V. of Big Bend V. of Lannon T. of Delafield		V. of Nashotah
Enhancing the function of natural features (streams, wetlands)	C. of Brookfield C. of New Berlin C. of Oconomowoc C. of Pewaukee V. of Elm Grove V. of LaclaBelle V. of Menomonee Falls V. of Merton V. of Mukwonago V. of N Prairie V. of Pewaukee V. of Sussex T. of Brookfield T. of Delafield T. of Genesee T. of Lisbon DPW T. of Merton T. of Oconomowoc T. of Waukesha	Waukesha Co. V. of Butler V. of Chenequa V. of Eagle V. of Hartland V. of Lannon V. of Oconomowoc Lake T. of Mukwonago T. of Ottawa	C. of Muskego V of Big Bend V. of Dousman V. of Wales T. of Summit		V. of Nashotah
Protecting historical and cultural landmarks	C. of New Berlin V. of Eagle V. of LaclaBelle V. of Mukwonago	Waukesha Co. C. of Pewaukee V. of Big Bend V. of Elm Grove V. of Hartland	C. of Brookfield C. of Muskego C. of Oconomowoc	T. of Mukwonago	V. of Butler V. of Chenequa V. of Nashotah

	V. of Oconomowoc Lake T. of Brookfield T. of Genesee T. of Lisbon DPW T. of Oconomowoc T. of Ottawa T. of Waukesha	V. of Lannon V. of Menomonee Falls V. of Merton V. of N Prairie V. of Pewaukee V. of Sussex V. of Wales	V. of Dousman T. of Delafield T. of Summit		
Promoting cooperation among public agencies, citizens, non-profit organizations and businesses	C. of Brookfield C. of New Berlin C. of Oconomowoc V of Big Bend V. of Chenequa V. of Dousman V. of Eagle V. of LaclaBelle V. of Menomonee Falls V. of Merton V. of Mukwonago V. of N Prairie V. of Sussex V. of Wales T. of Brookfield T. of Genesee T. of Lisbon DPW T. of Merton T. of Oconomowoc T. of Ottawa T. of Waukesha	Waukesha Co. C. of Muskego C. of Pewaukee V. of Butler V. of Elm Grove V. of Hartland V. of Lannon V. of Pewaukee V. of Oconomowoc Lake T. of Mukwonago T. of Summit	T. of Delafield		V. of Nashotah
Protecting and reducing damage to utilities	Waukesha Co. C. of Brookfield C. of Muskego C. of New Berlin C. of Oconomowoc V of Big Bend V. of Butler V. of Chenequa V. of Dousman V. of Eagle V. of Hartland V. of LaclaBelle V. of Menomonee Falls V. of Mukwonago V. of Pewaukee V. of Sussex T. of Brookfield T. of Genesee T. of Mukwonago V. of N Prairie T. of Oconomowoc	C. of Pewaukee V. of Elm Grove V. of Lannon V. of Merton V. of Oconomowoc Lake V. of Wales T. of Lisbon DPW T. of Ottawa	T. of Delafield		V. of Nashotah

	T. of Summit T. of Waukesha				
Strengthening emergency services	C. of Brookfield C. of Muskego C. of New Berlin C. of Oconomowoc C. of Pewaukee V. of Big Bend V. of Chenequa V. of Dousman V. of Eagle V. of Elm Grove V. of LaclaBelle V. of Menomonee Falls V. of Merton V. of Mukwonago V. of N Prairie V. of Oconomowoc Lake V. of Sussex V. of Wales T. of Brookfield T. of Delafield T. of Genesee T. of Oconomowoc T. of Ottawa T. of Summit T. of Waukesha	Waukesha Co. V. of Butler V. of Hartland V. of Lannon V. of Pewaukee T. of Mukwonago	T. of Lisbon DPW		V. of Nashotah

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

Waukesha County

- Participation in NIMS education and preparations and enforcement of floodplain regulations - Waukesha Co.

Cities

- Flood plane- Wetlands preservation through zoning; NIMS training; Response Plans; Education, Practice, and Training - City of Brookfield
- Multiple access points to all developments. Convert overhead electrical facilities to underground. Ground reservoir water storage. - City of Oconomowoc

Villages

- Generators, common dispatch center for every community – Village of Butler
- Building partnerships with neighboring communities in the areas of police, fire EMS, public works and administration. We have also adopted an ordinance that requires the burying of utilities for all new construction. - Village of Chenequa
- We have an EOP and we have an EOC location.- Village of Dousman

- Back-up power for critical facilities and have a strong disaster team in place – Village of Eagle
- Municipal water system would provide fire protection and reduce the likelihood of hydrologic drought - Village of Elm Grove
- Participation in NIMS education and preparations. Enforcement of floodplain regulations. – Town of Hartland
- Storm Water Run Off; Improved Tension Ponds - Village of LaclaBelle
- Create a storm shelter in the mobile home park – Village of Lannon
- Have a plan. Do not develop in hazard areas. - Village of Merton
- Purchase/raze and/or flood proof buildings susceptible to repeated flood damage. Bury utility distribution facilities wherever practical. Construct shoreline stabilization projects along rivers, streams, and channels prone to erosion during heavy storm events. Expand tree trimming and removal operations to maintain healthy trees within the community – Village of Menomonee Falls
- Maintain wetland and shoreline buffers to protect surface waters, improve Mukwonago Dam and build relief floodway/spillway to protect dam structure, use zoning and storm water regulations/standards to protect surface and ground waters, eliminate storm water infiltration into sanitary sewer mains through replacement and lining where appropriate, plant and maintain more trees, increase no-mow zones, educate public about environment, decrease use of chemical fertilizers, daylight farm drainage tiles, re-establish waterway meanders. – Village of Mukwonago
- Upgrade village hall to take a portable generator – Village of North Prairie
- Participate in preparedness planning with county and local municipalities - Village of Oconomowoc Lake
- Exploring property acquisition for flood control- Village of Pewaukee
- Work with private landowners to fix some private culvert crossings that may be damaged, which during flooding conditions can cause Sussex Creek to back up into the roadways in one neighborhood. Work on additional upstream storm water detention projects. We are currently constructing a new public safety building that will be a primary emergency government operations center allowing our current EOC to be a back up facility - Village of Sussex
- None at this time – Village of Wales
- Education in public and private arenas. Up-To-Date Emergency Response Plans, emergency communication center & CAD. Cooperation & integrated services, county or regional emergency; Public works and Administration. Better integrated and cooperative planning between municipalities for land use and development and services. Better and wiser use over control of open space and

agricultural land preservation and protection. Better control over development and site restoration, and higher quality building construction and over site - Village of Waukesha

Towns

- Plans need to be updated. This is currently being investigated - Village of Big Bend
- The Town Chairman is drafting a flood plan policy - Town of Delafield
- None at this time. - Town of Genesee
- Reviewing the counties and surrounding neighbor's emergency plans of operations and on yearly bases provide all parties involved with any updated information on staffing, infrastructure improvements (equipment or new facilities, new training tactics) that are under planning in the near future and update of key staffing changes contacts information - Town of Lisbon DPW
- We have in place a highway inter-governmental agreement for equipment and costs - Town of Merton
- Our community has drafted a flood mitigation plan, but lacks funding for it - Town of Mukwonago
- None - Town of Oconomowoc
- We have discussed road grade changes; drain system for lower Genesee Lake; a new hospital facility; new town hall and police station; and storm water planning - Town of Summit

7. Do you have any community building projects (e.g., subdivisions, office/industrial parks, roads) slated to be built in the near future? If so, what is the project called and what is its location?

Waukesha County

- Library addition; Village Center (immediately behind Village Hall at 210 Cottonwood Avenue); Extension of Campus Drive (current terminus north ¾ mile to connection with County Trunk Highway K); and future subdivisions (Gray Oaks and Murphy Farms in NE Quad of Village) - Waukesha Co.

Cities

- None within critical environmental corridors- City of Brookfield
- Development of Moorland Road corridor (between Janesville Road and College Avenue), Improvement of Janesville Road from two to four lanes (between Moorland Road to Racine Avenue) - City of Muskego
- Mill Valley Business Park (SW Corner of Racine Ave. & I-43) - City of New Berlin
- Fire Station #2 (SE port of the city by the intersection of STH67/Oconomowoc Parkway), Arrowood residential subdivision (SW part of the city), Woodcreek missed use development (NE part of the city) - City of Oconomowoc

Villages

- None - Village of Big Bend
- None – Village of Butler
- No - Village of Chenequa
- None planned - Village of Dousman
- Nothing concrete – Village of Eagle
- Bluemound Road reconstruction. Watertown Plank Road recontruction. Proposed municipal water system. - Village of Elm Grove
- Library addition. Village Center (immediately behind Village Hall at 210 Cottonwood Avenue). Extension of Campus Drive (current terminus north ¾ mile to connection with County Trunk Highway K). Future subdivisions (Gray Oaks and Murphy Farms in NE Quad of Village). – Village of Hartland
- Roads and Utility Buildings - Village of LaclaBelle
- The Cawley Property would first be mined (rock quarry) and then converted to a housing development. Discussions are in the early stages. – Village of Lannon
- Construct a new centralized public works garage and maintenance facility at N72W15920 Good Hope Road, Menomonee Falls; Construct a sanitary sewer lift state including sanitary sewer and water main piping at N50W211 River Road, Menomonee Falls; Construct a new municipal water supply well no.10 at N56W193 Silver Spring Dive, Menomonee Falls; Redevelopment of the Richland Way Corridor along the South Side of US 41/45 between Pilgrim Road and Water Street; Quail Have Subdivision- East side of Marcy Road south of Walunt Way Drive; Fairway Village-Cul Du Sac at the East end of River Park Drive, South of Fond Du Lac Avenue; Christmand Estates Subdivision- East Side of Maple Road North of Christman Road; and Edgewood Preserve Subdivision – East Side of Town Hall Road North of Good Hope Road – Village of Menomonee Falls
- Remodel old Baptist church on Main Street for community use.- Village of Merton
- Yes – near future: Black Bear subdivision (condominiums) overlooking Vernon Marsh, east of STH 83, north of CTH NN. Conceptually approved, depending on economic conditions, requires further approvals: TID #3, south of I-43, east of STH 83 – vacant parcels, plus three additional phases (commercial, industrial, office and potential residential); Fairwinds – north of CTH NN, west of STH 83, two additional phases; Minors Homestead, south of CTH NN, north of CTH NN, west of STH 83, one additional phase; Orchards of Mukwonago – between CTH ES and Honeywell Rd., one additional phase (in Waukesha County) – Village of Mukwonago

- No – Village of Nashotah
- No – Village of North Prairie
- East Wisconsin Avenue – McAdams for a mall and restaurants - Village of Oconomowoc Lake
- No- Village of Pewaukee
- Yes, we have lots of developments on the horizon, the most current would be Glen at Seven Stones Subdivision, Glenwood Condo Development, Mammoth Springs Project, Engage Sports Building, and a Major Outpatient Medical Facility - Village of Sussex
- Retail offices/ commercial project Tenby Harbor Hwys 18 and 18 – Village of Wales
- Dry Creek Subdivision- Milky Way Rd. Hwy 164 Corridor - commercial/ industrial planning and development. Hwy 59 (Arcadian Ave.) Business corridor planning and development - Village of Waukesha

Towns

- Northview Ridge Subdivision - Northview Rd.; Beach Park Circle – 2009 road reconstruction; and Replacement of culvert on E Glen Cove - 2009 project - Town of Delafield
- None proposed for 2009. We had two new subdivisions approved in 2008 and road construction (1st lift of asphalt) just completed in the fall of 2008. - Town of Genesee
- Not at this time - Town of Lisbon DPWI
- Library Addition- Ongoing - Town of Merton
- Grey Hawk Meadows Subdivision near the corner of CTH NN and CTH E - Town of Mukwonago
- Currently we have no community building projects. - Town of Oconomowoc
- Not Applicable - Town of Ottawa
- Yes- Genesee Lake Road Park and municipal buildings located at the SW Corner of Genesee Lake Road and Dousman Road - Town of Summit

Daniel P. Vrakas
County Executive

Waukesha
COUNTY
DEPARTMENT OF COUNTY EXECUTIVE

FOR IMMEDIATE RELEASE

Date: Tuesday, October 7, 2008
Contact: William Stolte – Emergency Management Coordinator, (262) 548-7580

County Starts Hazard Mitigation Plan with Municipalities

Waukesha, WIS. – Waukesha County Executive Dan Vrakas announces the launch of a new hazard mitigation planning process in cooperation with its 37 municipalities to make Waukesha County safer and more resistant to disasters.

Vrakas says, "Hazard mitigation is designed to break the cycle of damage and repair and minimizes recovery efforts when disasters occur. In partnership with each of our municipalities, our comprehensive planning process will identify policies, activities and tools that can be implemented prior to, during or after an incident to ensure that our residents are safe."

Mitigation actions that are undertaken as part of the plan reduce or eliminate the long term risk to human life and property from hazards. These actions can be as simple as elevating a furnace in a basement that is prone to having water on the floor, or actions can be more extensive in nature, such as relocating buildings out of the floodplain or strengthening critical facilities to prevent wind damage and provide stronger shelter.

Wisconsin incurred disaster related damages totaling nearly $3 billion in the last three decades, of which almost half of these tragedies occurred in the 1990's. Like the rest of the state, Waukesha County is vulnerable to a variety of disasters. In an effort to better prepare and manage its vulnerability to them, the County applied for and received a Pre-Disaster Mitigation planning grant from the Federal Emergency Management Agency totaling nearly $64,000. The goal of the grant is to complete a plan for FEMA's approval that will serve as a roadmap outlining potential cost-effective hazard mitigation activities, some of which may be eligible for future grant funding.

County and municipal elected officials and staff will join with members of the public in a multi-disciplinary workgroup to examine disaster related risks and vulnerabilities within the county, while developing mitigation strategies to reduce future losses.

"The workgroup's review of initial background information about the county and its assistance in identifying mitigation strategies will be of great value to the county, municipalities, businesses and residents," announces Emergency Management Coordinator William Stolte. "We are deeply appreciative to receive FEMA's grant funding for this important process."

If you would like more information about the process or have interest in providing your input, please contact Waukesha County's Emergency Management Coordinator William Stolte at (262) 548-7580.

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The press release above was published in several county and statewide newspaper and online media outlets (links below):

wispolitics.com
http://74.125.95.132/search?q=cache:kkJLtNMPIC0J:www.wispolitics.com/index.iml%3FArticle%3D138222+%22Hazard+Mitigation+Plan%22+%22waukesha+county%22&hl=en&ct=clnk&cd=4&gl=us
Direct URL: *www.wispolitics.com/index.iml?Article=138222*
File name (jpeg): WisPolitics.com_1227013233143

Waukesha County's website
http://www.waukeshacounty.gov/uploadedFiles/Home_Page/In_The_News/2008/Co_Muni_HazMitigation_Planning.pdf
File name (PDF): Co_Muni_HazMitigation_Planning

From waukeshanow.com -
http://www.waukeshanow.com/story/index.aspx?id=803858
File name (jpeg): WaukeshaNOW.com- County Starts Hazard Mitigation Plan with Municipalities_1227013082517

The Wheeler Report -
http://www.thewheelerreport.com/releases/Oct08/oct7/1007vrakashazardmit.pdf
File name (PDF): 1007vrakashazardmit

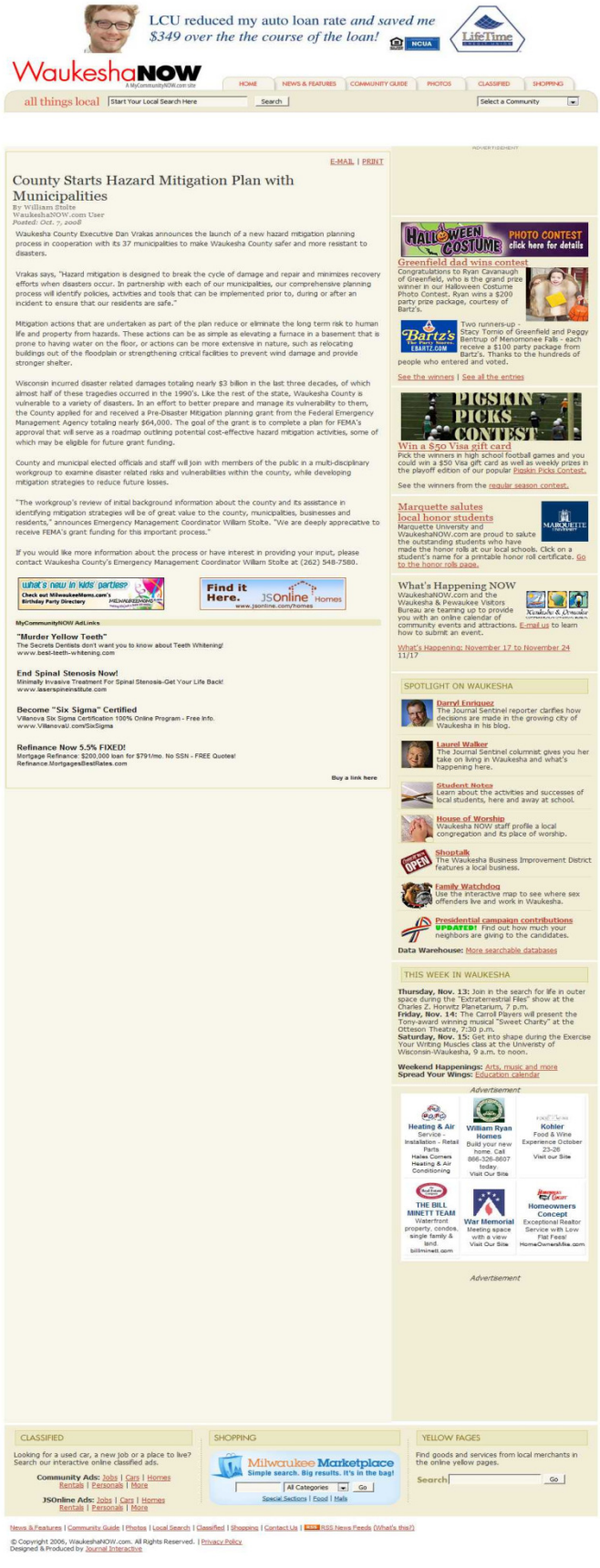
It did appear in the Freeman (gmtoday.com)....b
http://nl.newsbank.com/nl-search/we/Archives?p_product=CNLB&p_multi=WFMB&p_theme=cnlb&p_action=search&p_maxdocs=200&p_topdoc=1&p_text_direct-0=103675DDB57AE172&p_field_direct-0=document_id&p_perpage=10&p_sort=YMD_date:D&s_trackval=GooglePM

-----Original Message-----
From: Sprager, Meghan [mailto:MSprager@waukeshacounty.gov]
Sent: Monday, November 10, 2008 12:45 PM
To: Stolte, William; 'LenoraB@EPTECinc.com'
Subject: RE: revised press release

Please find the release attached. The Freeman initially expressed interest in the story. Locally, it was posted on the County's website, the 6 CommunityNow.com websites, and Wispolitics.com. I also believe that the Mukwonago Chief and Lake Country Reporter ran stories.

Meg

Appendix F: Community Input



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PRESS RELEASES

Waukesha Co. Exec. Vrakas: County starts hazard mitigation plan with municipalities
10/7/2008

Contact: William Stolte – Emergency Management Coordinator, (262) 548-7580

Waukesha, WIS. – Waukesha County Executive Dan Vrakas announces the launch of a new hazard mitigation planning process in cooperation with its 37 municipalities to make Waukesha County safer and more resistant to disasters.

Vrakas says, "Hazard mitigation is designed to break the cycle of damage and repair and minimizes recovery efforts when disasters occur. In partnership with each of our municipalities, our comprehensive planning process will identify policies, activities and tools that can be implemented prior to, during or after an incident to ensure that our residents are safe."

Mitigation actions that are undertaken as part of the plan reduce or eliminate the long term risk to human life and property from hazards. These actions can be as simple as elevating a furnace in a basement that is prone to having water on the floor, or actions can be more extensive in nature, such as relocating buildings out of the floodplain or strengthening critical facilities to prevent wind damage and provide stronger shelter.

Wisconsin incurred disaster related damages totaling nearly $3 billion in the last three decades, of which almost half of these tragedies occurred in the 1990's. Like the rest of the state, Waukesha County is vulnerable to a variety of disasters. In an effort to better prepare and manage its vulnerability to them, the County applied for and received a Pre-Disaster Mitigation planning grant from the Federal Emergency Management Agency totaling nearly $64,000. The goal of the grant is to complete a plan for FEMA's approval that will serve as a roadmap outlining potential cost-effective hazard mitigation activities, some of which may be eligible for future grant funding.

County and municipal elected officials and staff will join with members of the public in a multi-disciplinary workgroup to examine disaster related risks and vulnerabilities within the county, while developing mitigation strategies to reduce future losses.

"The workgroup's review of initial background information about the county and its assistance in identifying mitigation strategies will be of great value to the county, municipalities, businesses and residents," announces Emergency Management Coordinator William Stolte. "We are deeply appreciative to receive FEMA's grant funding for this important process."

If you would like more information about the process or have interest in providing your input, please contact Waukesha County's Emergency Management Coordinator William Stolte at (262) 548-7580.

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WAUKESHA COUNTY COOPERATION COUNCIL
Monday, October 27, 2008
7:00 p.m.
Courthouse, County Boardroom, Room #350
Waukesha

AGENDA

1. Approve Minutes from July 28 Meeting

2. County-wide Mutual Aid Agreement
   - William Stolte, Emergency Management

3. County-wide Pre-Disaster Mitigation Plan Development
   – Lenora Borchardt, EPTEC

4. Regional Water Study – Robert Biebel, SEWRPC

5. Next meeting date –January 26, 2009 at 7:00 p.m.

6. Adjourn

MEETING OF THE
WAUKESHA COUNTY COOPERATION COUNCIL

Minutes
October 27, 2008

Present:

Waukesha County

Dan Vrakas

Cities

Maury Sullivan
Oconomowoc

Jack Chiovatero
New Berlin

Larry Nelson
Waukesha

Scott Klein
Pewaukee

Villages

Joe Whitmore
North Prairie

Neil Palmer
Elm Grove

Greg Jezak
Wales

Bob Weber
Merton

Bob Douglas
Chenequa

Towns

Keith Henderson
Brookfield

Michael Reed
Lisbon

Brian Paff
Vernon

Bob Tallinger
Waukesha

Others

Bob Biebel, SEWRPC; Lenora Borchardt, EPTEC, Inc.; Mark Mader, Bill Stolte, Dale Shaver, Dick Mace, and Steve Korthof, Waukesha County.

WCCC MEMBERS NOT PRESENT: Cities of Brookfield, Delafield, and Muskego; Villages of Big Bend, Butler, Dousman, Eagle, Hartland, Lac La Belle, Lannon, Menomonee Falls, Mukwonago, Nashotah, Oconomowoc Lake, Pewaukee, and Sussex; and Towns of Delafield, Genesee, Lisbon, Merton, Mukwonago, Oconomowoc, Ottawa, and Summit.

The meeting was called to order at 7:00 p.m. by Chairman Palmer.

Minutes from July 28, 2008 Meeting –

A motion was made by Jack Chiovatero, seconded by Larry Nelson, to approve the minutes of July 28, 2008. Motion carried.

Countywide Mutual Aid Agreement - Bill Stolte, Waukesha County Emergency Management Coordinator, handed out a draft mutual aid agreement (See handout for those not present.) An electronic copy will be e-mailed to all municipalities. Waukesha County Corporation Counsel and the City of Waukesha Attorney had input into the development of the document. If there is a major incident within any of our Waukesha communities, this document will help to get aid as quickly as possible to the community while still allowing flexibility in dealing with the situation. Please take the document to your community for review and have any comments on the document back by the end of November to Bill Stolte, (262) 548-7580 or wstolte@wakeshacounty.gov.

Countywide Pre-Disaster Mitigation Plan Development – Lenora Borchardt, EPTEC, Inc., handed out a Natural Hazards Preparedness and Mitigation Questionnaire along with a pamphlet on mitigation planning. (See handouts for those not present.) 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. A grant was applied for and received by Waukesha County for hazard mitigation planning. There is no cost for a municipality to be included, but if your community doesn't adopt a plan, future mitigation FEMA grant dollars are not available to you. If you wish to participate, each community is asked to fill out the questionnaire and return to Bill Stolte, Emergency Management Coordinator, 1621 Woodburn Road, Waukesha, WI, 53188. If local municipalities have already prepared a plan, they may submit for inclusion in the overall county plan. If you wish to have a community representative serve on the committee that will be drafting the plan, please contact Bill Stolte at (262) 548-7580. Once the plan is completed, communities will be asked to adopt the final plan.

Regional Water Study - Robert Biebel, Southeastern Wisconsin Regional Planning Commission, SEWRPC, gave a power point presentation explaining SEWRPC's recommended water supply plan with the focus on Waukesha County. (See handout for those not present.) An important part of this project is water conservation, and the conservation plan needs to be community and utility specific. They considered four basic alternatives. They chose Regional Water Supply Plan Subalternative 2, which includes return flow pipelines to Lake Michigan, and/or Underwood Creek, and/or Root River. In this plan, the city of Waukesha water utility is converted to a Lake Michigan supply with a return flow component. (See pages 10 and 11 in handout.) The preferred plan relies on the use of a Lake Michigan supply to serve portions of two communities west of the divide, New Berlin and Muskego, along with the City of Waukesha, and converts Elm Grove, Brookfield-east, Germantown and Yorkville to Lake Michigan supply with existing return flow. Other communities would continue to rely on groundwater supplies. This plan is being proposed because of its benefits in the recovery of the deep aquifer, minimizing loss of baseflow in surface water, and reducing chloride discharges to surface waters.

Public information meetings are being planned through December 2008 with a recommended plan, implementation, and summary to be finished by March 2009.

Set Next Meeting Date – The next regular meeting of the WCCC will take place on Monday, January 26, at 7:00 p.m. in the County Boardroom, Room 350, third floor, of the Waukesha County Courthouse. Due to security improvements, please remember to use the Courthouse entrance facing 515 W. Moreland Blvd. when attending the WCCC meetings or doing business at the Courthouse or Administration Center.

Adjourn – Keith Henderson moved, seconded by Larry Nelson, to adjourn the meeting. Motion carried.

Minutes 5-26-09 Workgroup Meeting

Introductions – See Sign-in sheet for attendance roster.

Lenora explained planning process and progress to date. Also discussed the project grant process. Conducted Survey's of municipalities and summarized responses.

Dams and Levee's generally not funded, Fed's prefer buyouts and other strategies. Two primary FEMA funding streams available: FEMA annual grants and Disaster Declaration Hazard Mitigation allocation. Submission of Pre-Application leads the way in the review process. Grants typically open late August or September annually for project grants in HMGP and FMGP.

Handout from FEMA Region V Mitigation Ideas.

Plan generally good for 5 years, but can put interim projects in a Reserve Chapter. Add items and send out email or letter to Planning Group. Allow 2 weeks for comment then consider adopted by default. Every municipality and County Board must adopt the plan. Local decision whether to formally adopt every year's update process. We also must document what projects are done during the interim years.

Spillways may be eligible, but probably dependent upon amount of money available. Work with Roxanne Gray for Pre-Apps review process. Any funding for equipment – such as CERT volunteers. Not really. Some things like sandbagging machines may get funded as small projects with left over funding or turn back money.

City of Waukesha and Delafield both need to submit surveys.

Timeline: Another meeting in July, and then entire draft to work group by fall for edits. Then to Municipalities for edits. Incorporate all edits and submit for approvals, then to WEM for review, then FEMA. FEMA is usually 3 months turn around time.

Village of Elm Grove's plan is due to expire in 5-2010, but will be incorporated into this plan.

This plan is more infrastructure rather than PH disease mitigation, due to funding guidelines. Project must meet Cost-Benefit Analysis criteria. Also, remember that all these grants require a local match. Most are 75-25% Annual. Post disaster is 75-12.5-12.5% split.

Strategies - Categories:

All-Hazards:
Drought – Info supplied to farmers etc. Crop insurance etc. Water use regulations. Crop irrigation system impact on water tables. Smart water usage ideas. Use general boiler plate format to speed process along. Work Group will review and concur or revise.

Fire Concerns: Wildfires and occasional cause by Railroads. Some FD's work with WDNR for wildfire suppression training. Burning Permit process and burning restrictions.

Severe Temperatures:
County Heat and Cold Protocol. Established shelter sites.

Hail and Lightning: Public Education – EM Plans for County Fair and other large events exist and reviewed annually.

Electrical: Public Education

Utility Failures: Water utility needs electrical generation capacity. Waukesha City wells can run for 24 hours, then no water. City of Pewaukee's system also ties to Waukesha City's system. Medium to High priority for City of Waukesha. Mark Stigler has grant proposal from last year with engineering and cost analysis information. Mark will forward to Lenora.

Mukwonago purchased some water utility equipment used many years ago, but is now reaching to exceeding normal usable life. An individual item may not be fundable, but could be included as a match with another related project. Portable generators are generally preferred, but remember that the receiving facility must have appropriate engineering in place to allow connection to a portable generator. Most FD's and some PD's have back-up power. Providing for "double-duty" applications improves the cost-benefit analysis. Almost any community could use a large portable generator.

Most shelters in Waukesha either have no generator or only very limited capacity. Certain intersections and railroad crossings could use back up power capacity. Pete will get a list.

Get a list of shelters to Lenora with designated primary sites. Bill will work with ARC to review shelter list.

Long term power failure is probably the most critical unmet need in Waukesha County from City's perspective.

Do we consider local companies with power generation capacity? Identified in Resource Book.

Erosion issues:
Several roads under water last year. There are several County and State highways that could be elevated to alleviate the flooding and road closures. Try to keep these areas together in a project application. Both Barker and North Avenues were closed. Pete will try to get a description of critical areas.

Tornados and High Winds: Trailer parks and camp grounds (5 or less) generally do not have any tornado shelter capability. Don Dittmar did a plot of mobile home parks sometime ago. He will find that information. County Parks direct people into Maintenance Buildings or lodges. Any NOAA radios? Park Rangers use the 800 radios to receive severe weather information and they notify campers appropriately. Gold Courses use an air horn blast to clear course. There are some grants available through HUD and CDBG grants for tornado shelters.

Consider tie downs and roof supports for shelter facility remodeling or new construction. Not likely to generate a special project.

Siren issues: Many communities don't have any or insufficient to reach entire populations. WCC activates some, local PSAP's do others. County does not own any sirens. There are siren upgrade projects available. WCC may have a map of sirens by community. WkOEM recommends NOAA radios. Can we get a list of communities with outdoor sirens? We can get list from WCC. Menomonee Falls also has sirens.

NOAA radios: Promotion activities to support purchase.

Get list of Storm Ready Communities to add to plan.

Get a count of CERT trained people in Waukesha County.

EOC upgrades, Satellite phones and MyStateUSA. Municipal upgrades – Mark will send information. Citizen reporting system under consideration/development.

Surveillance camera system for City of Waukesha. Monitor river levels also. NWS river gauge system remotely access. Can you pair the cameras and river gauge? Consider partnering with NWS to add another station downtown Waukesha.

Have a central website in the "can" to put information out to public. Interactive mapping system for shelter locations – etc. Should we have the capability to provide critical information? MyStateUSA also provides a public side.

Flooding:
Roxanne sent Town of Summit pre-application. Town of Mukwonago issues. Create a storm water management district or special water movement process for Country Bliss. County Development Plan covers and restricts construction in certain soil types. Word strategy section loosely so as to allow on-going research into solutions.

May be another pre-app for West Shore Town of Oconomowoc.

New Flood Plain maps recently adopted. Previously unmapped lakes are understudy at this time. Continued studies of unmapped areas.

Dam potential failure issues from 2008. 4 dams affected. Notification process for dam openings should be required and implemented.

Concerns about traffic routing issues from I-94 closure.

GIS mapping updates every 5 years at a cost of $200,000 to $250,000. Will be updated in 2010.

Project along Bark River, several muni's and County shared in cost of evaluating flood map revisions. This looks like it will be changed to remove structures from flood plain. Village of Elm Grove is doing a restudy – hopefully done next year.

Snow issues: Increased salt storage capacity needed. 15,000 tons add'l capacity needed – one large facility. State DOT wants this. They want 150% of "normal" need. Cost would be $500,000. Town and Village of Mukwonago also need a smaller poly-structure. Current recommendation is that communities join together to purchase salt. This is a high priority from County and Mukwonago perspective. State DOT won't help with cost.

Road weather information systems needed: pavement temperature sensors, wind direction and speed, bridge deck temp sensors. Only one in Waukesha County right now, so we need sensors North and South as well. Low to medium priority. Pete will get costs.

AVL systems for snow plows, also provide pavement temp information. Routing software for snow plow efficiencies. Pete will get costs. City of Waukesha has AVL for PD, FD, and DPW. SO advises that this doesn't function, although equipment is in place – not a priority for SO at this time in view of the budget constraints.

Next Meeting: July 21st 9am. Location either WCC or Highway. EM and Lenora to send out meeting notices again.

~~COURSE~~ SIGN-IN

POM Mtg ~~Class~~ Haz Mit Steering Date: 21 JULY 09 Location: Waukesha

Name (Please Print)	Social ~~Security~~ No.	Department / Email
LENORA BORCHARDT		EPTEC LENORA B@EPTECinc.com
Jessi Balcom		Village of Elm Grove jbalcom@elmgrovewi.org
Veronica Ruaychev		Village of Elm Grove vrudychev@elmgrovewi.org
JEFF LEVERENZ		Waukesha County Tech College
STEVE KORTHOF		Waukesha County Env. Health
HEATHER McGUIRE		City of Delafield heatherm@yaggy.com
Kathy Schwei		Waukesha County Emergency Mgmt
MARK G. STIGNER		WAUKESHA POLICE DEPT.
WILLIAM STOLTE		WAUKESHA Co. EMERG. MGMT wstolte@waukeshacounty.gov

21 July 2009 Planning Workgroup Meeting

Public Notice

Waukesha County completed the draft of a Hazard Mitigation Plan. The plan was completed in accordance with the Disaster Mitigation Act of 2000 (Public Law 106-390; DMA2K). The plan is available for review and public comment until July 30, 2010, Mondays through Fridays between the hours of 8:30 a.m. and 4:00 p.m. at the Waukesha County Emergency Management Office at 1621 Woodburn Road Waukesha, WI 53188.

(put on letterhead)

July 2010

For More Information, Contact William Stolte (262-548-7580)
For Immediate Release

Waukesha 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. 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 by reducing or eliminating 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 take 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 Waukesha County to manage its vulnerability to disaster, William Stolte, Waukesha County Emergency Management Director, applied for, received and has now completed a Pre-Disaster Mitigation (PDM) planning grant. This plan 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 disaster and highlights mitigation strategies that might reduce future losses. The completed hazard mitigation plan is available for review and public comment until July 30, 2010, weekdays between the hours of 8:30 a.m. and 4:30 p.m. at the Waukesha County Emergency Management Office at 1621 Woodburn Road, Waukesha, WI 53188.

###

GOVERNMENTAL & PUBLIC INPUT

Successful community mitigation begins with a commitment from government officials throughout the county. Community groups then provide vital information to insure that the plan is workable within the framework of the community's priorities.

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

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.

MITIGATION PLANNING PAYS OFF

1. FEMA has long recognized the critical importance of hazard mitigation and considers reducing vulnerability to natural disasters through mitigation planning a cornerstone of a national emergency management plan.
2. In the same way, **mitigation should be the cornerstone of local community planning** – a necessary means of making our community a safer place in which to live, work and play and to leave a more viable and sustainable environment for generations to come.

Keep in mind – experience shows that for every dollar spent on mitigation; two to three dollars is saved in potential future damages.

NOTES:_____

_____

_____

_____

For further information please contact:

1621 Woodburn Road
Waukesha, WI 53188
(262) 548-7580

MITIGATION PLANNING

Creating Safe,

Sustainable

Communities

Prepared by:
Waukesha County Emergency Management
1621 Woodburn Road
Waukesha, WI 53188

HISTORY

3. 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**.
4. 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.

WHAT IS HAZARD MITIGATION PLANNING?

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.

WHY DO IT?

- To preserve the life, health and safety of residents in your community
- To protect your community's economic health
- To preserve the unique character of your community
- To reduce your community's vulnerability to disaster
- To speed your community's recovery after a disaster
- To save valuable tax dollars in your community and beyond

THE DISASTER MITIGATION ACT OF 2000 (DMA2K)

The impetus for states and local governments to undertake natural hazard mitigation planning occurred on October 30, 2000 when the President signed the Disaster Mitigation Act of 2000 (Public Law 106-390, DMA2K). The law encourages and rewards local and state pre-disaster planning, promotes sustainability as a strategy for disaster resistance and is intended to integrate state and local planning with the aim of strengthening statewide mitigation planning. This new approach facilitates cooperation between state and local authorities, prompting them to work together. The resulting enhanced planning network enables local and state governments to articulate accurate and specific needs for mitigation, resulting in faster allocation of funding and more effective risk-reduction projects.

HAZARD MITIGATION PLANNING PROCESS

5.

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.

6.

2. Assess Risks- Next, communities need to identify the characteristics and potential consequences of natural hazards. It is important to understand how much of the community can be affected by specific hazards and what the likely impacts would be for important community assets.

3. Develop a Mitigation Plan- Armed with an understanding of the risks posed by natural hazards, communities need to determine what their priorities should be and then look at possible ways to avoid or minimize the undesired effects. The result is a natural hazard mitigation plan and strategy for implementation.

4. Implement the Plan & Monitor Progress- Communities can bring the plan to life in a variety of ways ranging from implementing specific mitigation projects to changes in the day-to-day operation of the local government. To ensure the success of an on-going program, it is critical that the plan remains effective. Thus, it is important to conduct periodic evaluations and make revisions as needed.

Appendix G: Inter-Revision Updates

This plan will undergo major revisions every five years per the FEMA requirements. Waukesha 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