

**RESOLUTION NO. 8864****A RESOLUTION ADOPTING THE FOND DU LAC COUNTY, WISCONSIN  
HAZARD MITIGATION PLAN 2019-2024**

**WHEREAS**, the United States Congress passed the Disaster Mitigation Act of 2000, which requires that a local unit of government must have an approved all hazard mitigation plan before it can receive federal grant monies for pre-disaster mitigation projects; and

**WHEREAS**, the City of Fond du Lac worked with Fond du Lac County Emergency Management to update the countywide mitigation plan that was first adopted in 2004; and

**WHEREAS**, the City Council makes the following findings:

1. Natural disasters pose a tangible threat to residents and property.
2. Undertaking hazard mitigation actions before disasters occur will reduce the potential for harm to residents and property and save taxpayers dollars.
3. Preparation of this plan is in the public interest.
4. This plan is intended to serve as a general strategy and may be amended from time to time.
5. Nothing in this plan obligates the city to undertake any of the recommended activities and/or projects.
6. Adoption of this plan is needed to apply for federal funding for mitigation projects.

**NOW THEREFORE, BE IT RESOLVED**, the plan entitled "Fond du Lac County, Wisconsin 2019-2024 Hazard Mitigation Plan is adopted; and

**BE IT FURTHER RESOLVED**, the City Clerk is directed to send a signed copy of this resolution to Fond du Lac County; and

**BE IT FURTHER RESOLVED**, the City Council authorizes the City Clerk to make nonsubstantive revisions to the plan as may be required to comply with the requirements of Wisconsin Emergency Management or the

Federal Emergency Management Agency. Should the clerk make such authorized change, she shall notify the City Council of such change.

**ADOPTED:**

MARCH 11, 2020



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Brian Kolstad, President  
Fond du Lac City Council

Attest:



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Margaret Hefter, City Clerk

City Attorney:

Reviewed 



# Fond du Lac County, Wisconsin 2019-2024 Hazard Mitigation Plan

December 17, 2019



*Fond du Lac  
County*



# FOND DU LAC COUNTY, WISCONSIN HAZARD MITIGATION PLAN 2019-2024

**ADOPTED:  
DECEMBER 17, 2019**

## **Emergency Management Contact**

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## **Steering Committee**

<b>Name</b>	<b>Organization</b>
BJ DeMaa	City of Waupun
Bobbi Hicken	Fond du Lac County EM
Ed Costello	Village of Eden
Jim Sutton	Mercury Marine
Josh Thomas	Fond du Lac County GIS
Lance Thomas	Village of Oakfield
Lori Rich	City of Ripon
Nick Leonard	Village of North Fond du Lac
Robert Steeb	Alliance Laundry Systems
Shelley Brown-Giebel	Fond du Lac County EM
Terry Dietzel	Fond du Lac County Land Information
Tom Janke	Fond du Lac County Highway Department
Mike Ehrenberg	City of Ripon Public Works
William Tadych	Fond du Lac County Sheriff's Office

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## FOREWORD

### PLAN UPDATE SUMMARY

The following is a summary of the changes made to each chapter of the previous version of the *Fond du Lac County, Wisconsin Hazard Mitigation Plan*.

- Chapter 1: Introduction and Planning Process: Updated recent disasters, planning process participants, and public review information. The steering committee updated the prioritized order of the hazards to be addressed. The Plan Coordination section was moved from Chapter 5 to Chapter 1.
- Chapter 2: Community Profile: Updated land use information.
- Chapter 3: Risk Assessment: Hazard risk rankings were updated based on previous hazard occurrences and steering committee consensus. Table A below shows the changes that were made in the ranking. All hazard profiles, occurrences, and probabilities were updated. In addition, the risk assessments were updated. Hazard occurrences were updated to include all from January 1, 2000 to August 28, 2018. Hazard probabilities were updated based on updated occurrences. Critical facilities were updated and a County-maintained GIS database was created.
- Chapter 4: Mitigation Strategy: Updated the mitigation strategies to account for completed projects, updated timetables, new project additions, and some revisions. Table B below lists the updates made to the identified mitigation strategies.
- Chapter 5: Plan Adoption and Maintenance: Updated plan maintenance process and plan update schedule. The Plan Coordination section was moved from Chapter 5 to Chapter 1.

**Table A: Risk Assessment Rankings, 2015 compared to 2019**

Natural Hazards	2019 Rank	2015 Rank
Tornado and strong wind	1	2
Winter storm	2	1
Flooding	3	3
Excessive heat	4	5
Extreme cold	5	6
Drought	6	4
Hail	7	7
Lightning	8	8
Wildland fire	9	10
Dense fog	10	9

**Table B: Mitigation Strategy Updates from Previous Plan**

Mitigation Strategy	Changes
<b>All Hazards</b>	
Maintain partnerships with local emergency management.	Addition
Create and maintain public relation displays on Hazard Mitigation for special events and meetings.	Removed, redundant
Get NOAA weather radios in every school library and senior center.	Completed
Maintain StormReady Community status.	Addition
Maintain and upgrade generators.	Addition from 2018 addendum
Promote CoderED (for chemical spills & safety).	Addition
<b>Tornado and Strong Wind</b>	
Provide area specific tornado warnings to decrease desensitization to inapplicable alerts.	Addition
<b>Flooding</b>	
Evaluate the support for and the feasibility of becoming part of the Community Rating System (CRS) to lower flood insurance premiums for property owners.	Decreased priority
Revise local floodplain regulations to ensure they comply with the most recent model floodplain regulations developed by the Wisconsin DNR.	Complete
Study problem areas to determine feasible and cost-effective solutions to minimize flooding along the local waterways.	Change in responsible party
Design and construct stormwater management facilities consistent with adopted stormwater management plans that have been or will be prepared/amended.	Change in responsible party and decreased priority
Identify and analyze feasible mitigation options for those properties which are designated as a repetitive loss property.	RP change
Floodproofing, as needed (including increasing culvert sizing and stream widening)	Addition from 2018 addendum
Acquire LiDAR (1-foot) and hydro layer.	Addition
<b>Excessive Heat</b>	
Review severe temperatures plan to identify procedures to implement.	Addition
Amend the Fond du Lac County's emergency operations plan to address extreme heat.	Removed, no longer applicable
<b>Extreme Cold</b>	
Review severe temperatures plan to identify procedures to implement.	Addition
Promote informational campaigns about severe weather.	Addition
Amend the Fond du Lac County's emergency operations plan to address extreme cold.	Removed, no longer applicable
<b>Drought</b>	
Adopt local regulations to control the use of water during significant drought conditions.	Decreased priority
<b>Hail</b>	
Continue to educate producers on risk management strategies that minimize the economic impact of extreme weather events for crops.	Decreased priority
<b>Lightning</b>	
Provide public information about lightning safety.	Change in responsible party and decreased priority
<b>Wildland Fires</b>	
Develop and maintain ordinances to ensure that those parties conducting controlled burns are present and have the wherewithal to control and extinguish the fire if required.	Decreased priority
<b>Dense Fog</b>	
Dissemination of fog advisories.	Decreased priority

## CHAPTER 1 - INTRODUCTION

### **PURPOSE OF THE PLAN**

The *Fond du Lac County, Wisconsin Hazard Mitigation Plan 2019-2024* was developed to evaluate the county's potential exposure to hazards and to identify mitigation strategies aimed at reducing the impact of hazards. The plan conforms to Federal Emergency Management Agency (FEMA) requirements for local hazards mitigation planning consistent with the Code of Federal Regulations (44 CFR Part 201.6) and provides information on risk areas, risk magnitude, and strategies to reduce hazard impacts. In this plan, the county addressed issues related to the protection of lives and property from hazards, the protection of critical facilities, and the reduction costs associated with disaster relief and rescue efforts. Completion and approval of this plan maintains Fond du Lac County's eligibility to apply for future FEMA disaster relief and mitigation project funds, helping to implement mitigation strategies in the county.

### **DISASTER MITIGATION ACT OF 2000**

Local hazard mitigation planning is conducted in accordance with the Disaster Mitigation Act of 2000 (DMA2K). DMA2K was signed into law in October 2000 to attempt to stem the losses from disasters, reduce future public and private expenditures, and speed up response and recovery from disasters. DMA 2000 encourages hazard mitigation planning to make communities more proactive with addressing hazards to avoid and reduce the negative impacts.

DMA2K requires that a community have an approved hazard mitigation plan in order to be eligible to apply for grant funding from the Pre-Disaster Mitigation (PDM) Program or the Hazard Mitigation Grant Program (HMGP). If a disaster strikes and a community does not have an approved plan, it must agree to prepare a plan within one year in order to receive funding through HMGP.

### **PLAN DEVELOPMENT TIMEFRAME**

The *Fond du Lac County, Wisconsin Hazard Mitigation Plan 2019-2024* was developed over an 14-month time period beginning in October 2018. Plan development concluded with the adoption of the plan by the County Board on December 17, 2019.

### **HAZARD MITIGATION PLAN STEERING COMMITTEE**

Fond du Lac County established a steering committee to guide the development of the hazard mitigation plan (Table 1.1). The steering committee, comprised of county and local representatives and businesses, provided value input to the plan throughout the planning process.

The steering committee held four meetings to update the plan. Additional plan review occurred outside of these meetings via e-mail. Copies of the sign-in sheets are included in Appendix C.

**Table 1.1: Fond du Lac County Hazard Mitigation Plan Steering Committee**

<b>Name</b>	<b>Organization</b>
BJ DeMaa	City of Waupun
Bobbi Hicken	Fond du Lac County EM
Ed Costello	Village of Eden
Jim Sutton	Mercury Marine
Josh Thomas	Fond du Lac County GIS
Lance Thomas	Village of Oakfield
Lori Rich	City of Ripon
Nick Leonard	Village of North Fond du Lac
Robert Steeb	Alliance Laundry Systems
Shelley Brown-Giebel	Fond du Lac County EM
Terry Dietzel	Fond du Lac County Land Information
Tom Janke	Fond du Lac County Highway Department
Mike Ehrenberg	City of Ripon Public Works
William Tadych	Fond du Lac County Sheriff's Office

## **PLAN COORDINATION**

To maximize coordination with other related plans for Fond du Lac County, mitigation strategies recommended in this plan have been and should continue to be considered when developing capital improvement plans, stormwater management plans, or flood mitigation plans.

A number of plans, reports, and technical data were referenced and incorporated into the Fond du Lac County Hazard Mitigation Plan. The following is a comprehensive list of the data and reports that were utilized in plan development:

- Population, housing, and employment data from the Bureau of the Census (2000 and 2010);
- Land use inventory data (2010, East Central Wisconsin Regional Planning Commission);
- the county's previous local Hazard Mitigation Plan Review Crosswalk was used to complete the updated Crosswalk;
- *State of Wisconsin Hazard Mitigation Enhanced Plan (2016)* was used to develop hazard descriptions for the risk assessment;
- *FEMA Local Mitigation Plan Review Guide (2011)* was used to ensure the plan contained all required information;
- Past hazard occurrences were obtained from National Oceanic and Atmospheric Administration (NOAA) – National Climatic Data Center – severe weather event data (January 2000 – August 2018);
- FEMA Flood Insurance Studies and FEMA Flood Insurance Rate Maps (FIRMs) were used to map floodplain areas;

- Parcel data from Fond du Lac County was used to determine impacts of hazards with defined areas;
- Assessed valuation data from Fond du Lac County was used to derive estimates of potential dollar losses;

The identified mitigation strategies (provided in Chapter 4) are tied to related plans and policies. As the county and jurisdictions in the planning area develop or update their comprehensive plans, incorporation of this hazard mitigation plan is highly recommended. Fond du Lac County Emergency Management will ensure that all municipalities have a copy of the hazard mitigation plan and are encouraged to incorporate the mitigation strategy into their planning mechanisms. The previous hazard mitigation plan was not specifically incorporated into local comprehensive plans. Fond du Lac County Emergency Management will encourage and support better incorporation with upcoming ten-year updates.

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## **MULTI-JURISDICTIONAL COOPERATION**

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As a way to ensure accurate data and multi-jurisdictional cooperation in the update of the county's hazard mitigation plan, all municipalities in the county were engaged in a multi-jurisdictional cooperation exercise to review and provide input on plan materials.

Each municipality in Fond du Lac County was provided the following for their review and comment: a list of the critical facilities in their jurisdiction, the county identified mitigation strategies, the mitigation strategy identified for their municipality in the previous plan, and draft of the county hazard mitigation plan. Confirmation was secured from each incorporated community that they had reviewed the materials and provided updates.

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## **PUBLIC PARTICIPATION**

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The public was encouraged to participate throughout the development of the plan by attending steering committee meetings. All meetings were open to the public and meeting notices were posted at the Fond du Lac City/County Government Center.

Additionally, a public open house was held on April 4, 2019 to provide an opportunity for the public to review and comment on the draft plan and maps. No comments were received from the public at this meeting. Appendix F contains the public notice.

The Fond du Lac County Board meeting, where the plan was adopted, was also open to the public with time allotted for public comment.

## **NEIGHBORING JURISDICTION PARTICIPATION**

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A draft of the *Fond du Lac County, Wisconsin Hazard Mitigation Plan 2019-2024* was provided to emergency management directors in the adjacent counties for their review and comment. Adjacent counties include Winnebago County (north), Calumet County (northeast), Sheboygan County (east), Washington County (southeast), Dodge County (southwest), Green Lake County (west).

## CHAPTER 2 - PLANNING AREA PROFILE

The planning area for the *Fond du Lac County, Wisconsin Hazard Mitigation Plan 2019-2024* covers all of Fond du Lac County including the three cities (Fond du Lac, Ripon, and Waupun), nine villages (Brandon, Campbellsport, Eden, Fairwater, Mount Calvary, North Fond du Lac, Oakfield, Rosendale, and St. Cloud), and 21 towns (Alto, Ashford, Auburn, Byron, Calumet, Eden, Eldorado, Empire, Fond du Lac, Forest, Friendship, Lamartine, Marshfield, Metomen, Oakfield, Osceola, Ripon, Rosendale, Springvale, Taycheedah, and Waupun).

### GENERAL COUNTY INFORMATION

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Fond du Lac County, located in east central Wisconsin, has a total land area of 725 square miles. The county has 34 municipalities comprised of 13 incorporated communities. Map 2.1 illustrates the location of Fond du Lac County and municipalities in the county.

Fond du Lac County was incorporated on April 1, 1839. Fond du Lac County currently has a population of approximately 101,984 persons. For 2013, the total property valuation was \$6,652,706,000.<sup>1</sup>

### CURRENT LAND USE

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Table 2.1 and Map 2.1 provides a tabulated summary of the land use data, based on a land use inventory assessment of the county, which was conducted in 2010 by the East Central Wisconsin Regional Planning Commission. The data shows that 89 percent of the county is classified as undeveloped, primarily agricultural lands, while existing development covers 11 percent of the county. The vast majority of the county, nearly 58 percent, is comprised of agricultural lands with nearly 270,000 acres.

Developed land is comprised of residential, transportation, commercial, industrial, public/institutional, and recreation/open space land uses. Transportation and residential land uses make up most of the developed land in the county, comprising 38 percent and 44 percent of the developed area, respectively.

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<sup>1</sup> Fond du Lac County, Wisconsin website. <http://www.fdlco.wi.gov/about-the-county/county-facts>. Retrieved 12/2018; and Fond du Lac County Land Information Department, 09/2014.

**Table 2.1: Land Use, 2010, Fond du Lac County**

<b>Land Use Type</b>	<b>Acres</b>
<b>DEVELOPED</b>	
Transportation	18,824
Residential	21,931
<i>Single Family Residential</i>	20,982
<i>Multi-Family Residential</i>	473
<i>Mobile Homes</i>	476
Industrial	2,044
Recreation/Open Space	3,296
Commercial	1,939
Public/Institutional	1,927
<b>Total Developed</b>	<b>49,961</b>
<b>UNDEVELOPED</b>	
Agricultural	269,914
Open Space/Undeveloped	78,675
Woodlands	60,047
Water	7,214
<b>Total Undeveloped</b>	<b>415,850</b>
<b>Total Area</b>	<b>465,811</b>

Source: East Central Wisconsin RPC, 2010; and Fond du Lac County Land Information, 2019.

## POPULATION TRENDS

In order to plan for hazards that may occur within Fond du Lac County, it is important to gain an understanding of the current and projected future population and housing characteristics for each community within the county. U.S. Census of Population and projections provided by the Wisconsin Department of Administration (WDOA) provide an indication of anticipated population increases for the county. Increases in population will drive the need for new homes (single and multi-family) and the services required to meet the needs of those new residents. The following information summarizes population and housing data for Fond du Lac County.

During the past 110 years, Fond du Lac County's population has steadily grown over the decades, with an overall increase of 114 percent or 54,044 persons.

Fond du Lac County's population is projected to continue growing steadily from 2010 to 2040 with a slight dip in population from 2030 to 2040. Overall the county is projected to have a population of 110,250 by 2040, according to the WDOA projection calculations. This represents an increase of 8,617 persons, or 8.5 percent, from the 2010 Census count of 101,633 persons (Table 2.2).



**Table 2.2: Population and Projections, Fond du Lac County and State of Wisconsin, 2010-2040**

Geographic Location	Census 2010	Population Projections			% Change 2010-2040
		2020	2030	2040	
Fond du Lac Co.	101,633	105,755	110,590	110,250	8.5
Wisconsin	5,686,986	6,005,080	6,375,910	6,491,635	14.1

Source: U.S. Census Bureau, 2010 Census; WDOA, Population Projections, 2013.

## HOUSING TRENDS

Fond du Lac County has experienced steady housing growth over the last 40 years. From 1970 to 2010, the county gained 18,029 housing units (69.7 percent) (Table 2.3).

**Table 2.3: Housing Units, Fond du Lac County, 1970-2010**

Geographic Location	Year				
	1970	1980	1990	2000	2010
Fond du Lac County	25,881	31,739	34,548	39,271	43,910
Wisconsin	1,472,466	1,863,897	2,055,774	2,321,144	5,686,986

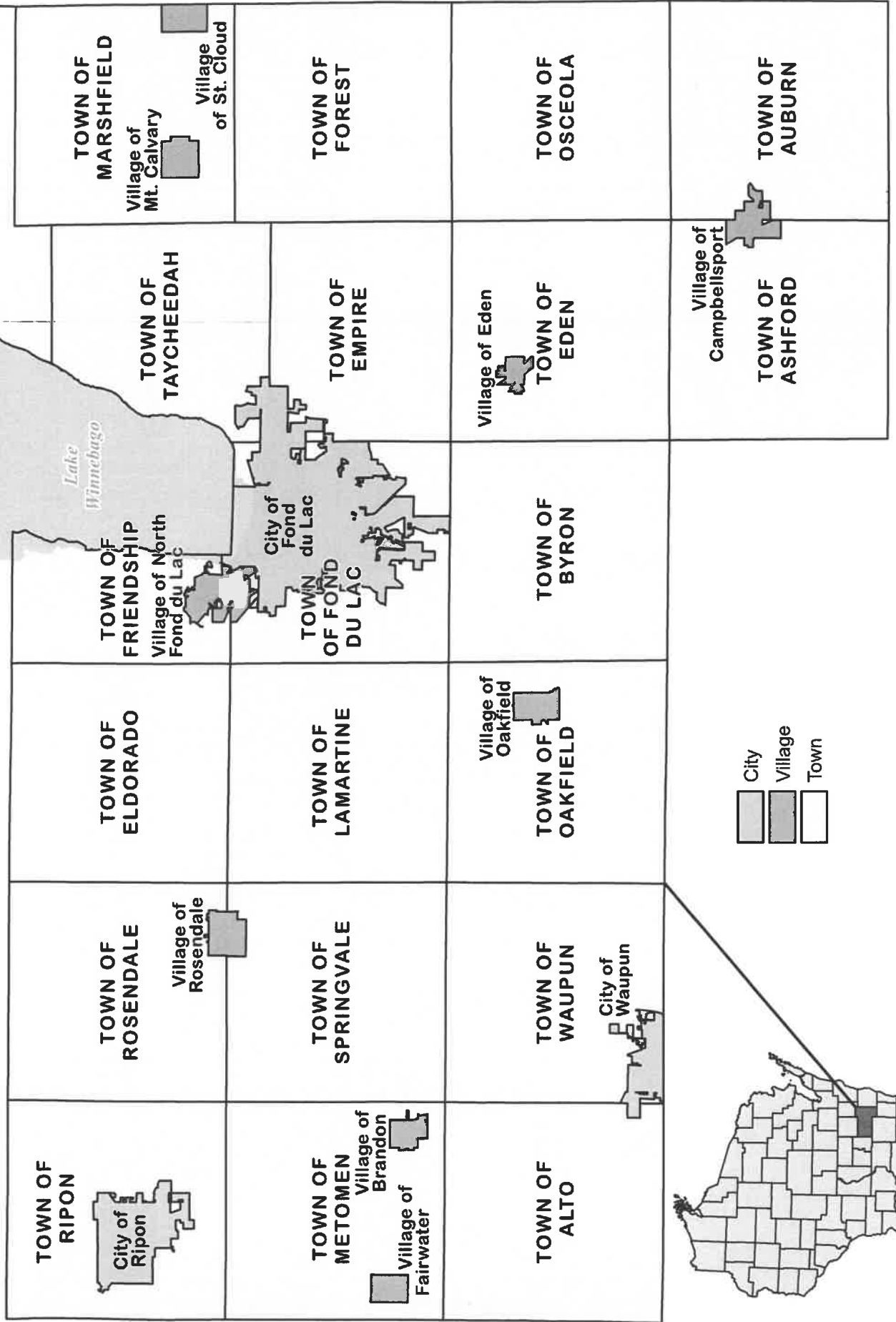
Source: U.S. Census Bureau, 1970 - 2010 Censuses.

## EMPLOYMENT TRENDS

Over the last decade, Fond du Lac County has employed a labor force of approximately 54,000 to 56,000 civilian persons over the age of 16 years old. The average unemployment rate over the last decade has been 5.7.

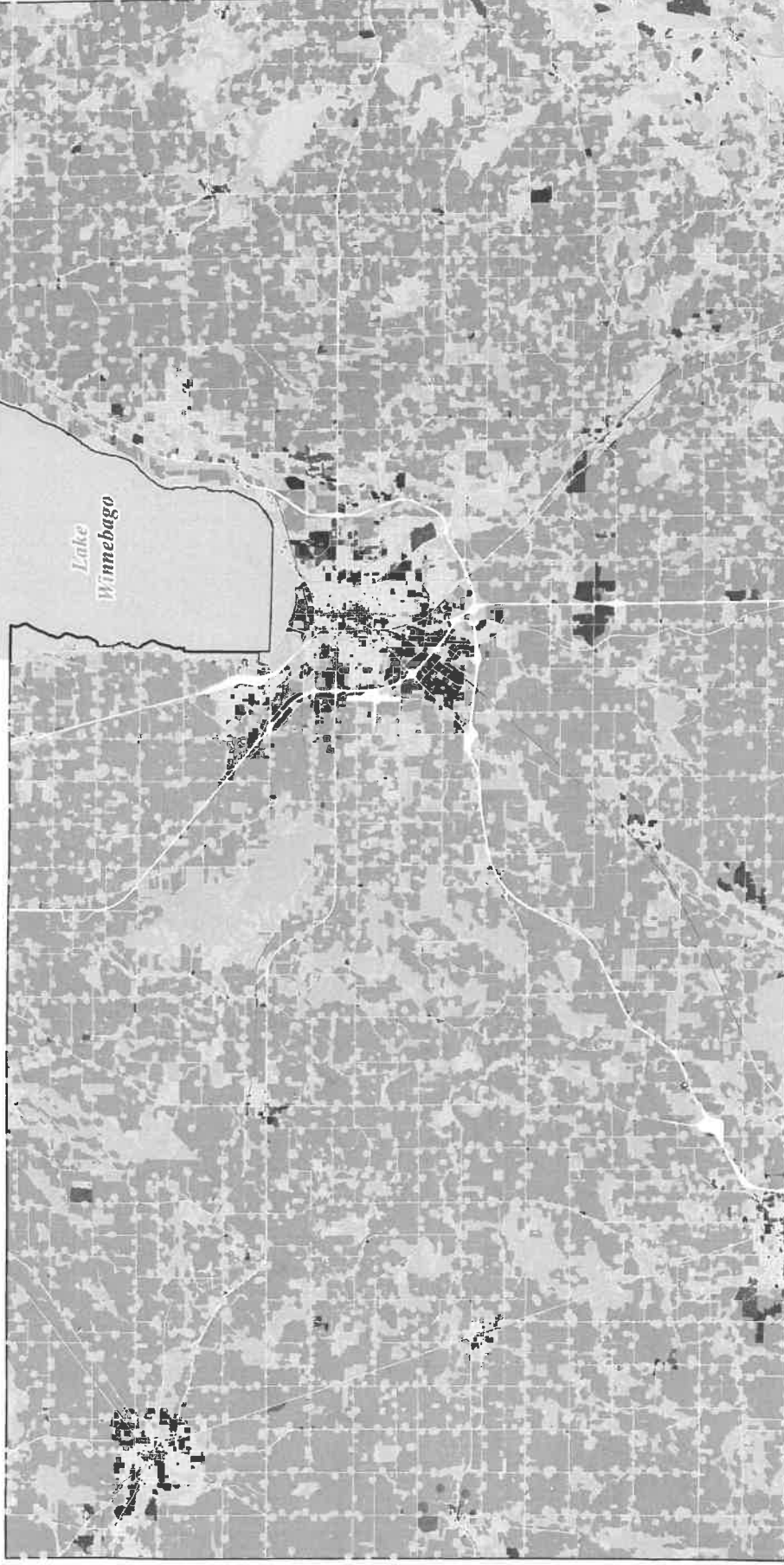


# Map 2.1: Fond du Lac County, Wisconsin





# Map 2.2: Land Use Fond du Lac County, WI



- |                           |                          |
|---------------------------|--------------------------|
| Single Family Residential | Utilities/Communications |
| Farmsteads                | Non-Irrigated Cropland   |
| Multi-Family              | Irrigated Cropland       |
| Mobile Home Parks         | Water Features           |
| Commercial                | Recreational Facilities  |
| Industrial                | Planted Woodlands        |
| Quarries                  | General Woodlands        |
| Institutional Facilities  | Open Other Land          |
| Transportation            | Municipal Boundaries     |

Source: East Central Wisconsin Regional Planning Commission  
Existing Land Use 2010



## CHAPTER 3 - RISK ASSESSMENT

To provide a means to effectively evaluate potential hazard mitigation measures, a risk assessment has been developed for Fond du Lac County, Wisconsin. The risk assessment helps the county in developing strategies to mitigate the identified hazards. The risk assessment identifies the natural hazards that impact the county, profiles the extent and severity of past hazard occurrences in the county, and assesses the county's vulnerability to each hazard.

### HAZARD IDENTIFICATION

The hazards addressed in this plan were based on the hazards addressed in the previous hazard mitigation plan and the findings from a query of the online database of historical hazard occurrences for the county from the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center (NCDC).

### HAZARD PRIORITIZATION

Using a consensus-based prioritization exercise, the steering committee ranked the risk of each identified hazard. The steering committee made their determination on the ranking based on the number and frequency of hazard occurrences, the number of recorded injuries and deaths, and the estimated damage costs reported to the NCDC database. Table 3.1 shows the hazard risk assessment ranking for the plan.

Although earthquakes were identified and addressed in the State of Wisconsin hazard mitigation plan, they have a minimal likelihood of occurring in Fond du Lac County. Therefore, a full risk assessment for earthquakes has not been included.

**Table 3.1: Hazard Risk Ranking**

Natural Hazard	Ranking
Tornado and strong wind	1
Winter storm	2
Flooding	3
Excessive heat	4
Extreme cold	5
Drought	6
Hail	7
Lightning	8
Wildland fire	9
Dense fog	10

Source: Fond du Lac County Hazard Mitigation Plan Steering Committee, 2019.

## HISTORY OF NATURAL HAZARD OCCURRENCES

The NCDC publishes National Weather Service (NWS) data of occurrences of past hazardous weather and the resulting deaths, injuries, and damages associated with each of these events. Event occurrence information is available at a local, county, or regional level, depending on the area covered by the hazard event. A query of historical hazard events from January 1, 2000 through August 28, 2018 resulted in 497 events (Table 3.2).

The data from the NCDC shows that of the 497 events, the hazards occurring most frequently in Fond du Lac County from 2000 to 2018 include: tornado and strong wind (157 events), winter storm (130 events), hail (60 events), and dense fog (53 events).

Some of the recorded hazard events may not have been specific to Fond du Lac County, as they may have been recorded for a larger regional area, or statewide. Additionally, some of the common hazard events, such as lightning or dense fog may only get reported to the NCDC if they are extreme events that cause property damage, injury, or death.

There has been one death and 60 injuries in the last 18 years as a result of natural hazards in Fond du Lac County. The one death resulted from an extreme cold event in December 2017. The 60 injuries were not specific to Fond du Lac County, but occurred across the region during one winter storm event in January 2009 from freezing rain, which caused hazardous driving conditions.

By far, the most costly hazard event in the county in terms of property damage (includes crop damage) since 2000 has been flooding (\$98,257,850). The single most costly flooding event occurred in June 2004 and caused \$67.4 million in damages. However, the damage totals included a zone extending beyond the county.

**Table 3.2: Natural Hazard Occurrences Data, Fond du Lac County 2000-2018**

Natural Hazard (Listed in Ranked Order)	# of Events <sup>1</sup>	Average #/Year	Deaths	Injuries	Reported Crop Damage	Reported Property Damage <sup>2</sup>	Risk <sup>3</sup>
Tornado and strong wind	157	8	0	0	\$8,827,000	\$10,409,500	Very High
Winter storm	130	7	0	60	\$0	\$10,000	Very High
Flooding	19	1	0	0	\$89,000,000	\$9,257,850	Moderate
Excessive heat	23	1	0	0	\$0	\$0	Moderate
Extreme cold	21	1	1	0	\$0	\$2,000	Moderate
Drought	19	1	0	0	\$200,000	\$0	Moderate
Hail	60	3	0	0	\$0	\$54,000	High
Lightning	15	1	0	0	\$3,000	\$598,000	Moderate
Wildland fire	ND	ND	ND	ND	ND	ND	Low
Dense fog	53	3	0	0	\$0	\$0	High
<b>Total Events</b>	<b>497</b>	<b>--</b>	<b>1</b>	<b>60</b>	<b>\$98,030,000</b>	<b>\$20,331,350</b>	<b>--</b>

1. January 1, 2000 to August 28, 2018 (18.6 years)

2. Does not factor in private losses for most occurrences.

3. Risk based on occurrences per year: Very High >5; High 3-4; Moderate 1-2; and Low <1

Source: NOAA NCDC Storms Database, 2000-2018.



## **DISASTER DECLARATION HISTORY**

There have been 20 declarations issued for Wisconsin since 2000. Fond du Lac County was included in three major disaster declarations. The major disaster declarations that included Fond du Lac County occurred in 2004 (FEMA-1526-DR), 2008 (FEMA-1768-DR), and 2018 (FEMA-4402-DR) for severe storms, flooding, straight-line winds, and tornadoes.

## **VULNERABILITY ASSESSMENT**

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The vulnerability assessment described the frequency, severity, and probability of future occurrence of natural hazards that could impact the planning area. The following hazard profiles describe the characteristics of each hazard and how it has affected the planning area, and the potential future risk to people and property.

### **CRITICAL FACILITIES**

The steering committee, local representatives, and the Fond du Lac County Land Information Department gathered data and evaluated facilities in the county to identify those to be considered as critical facilities for the purpose of this plan. A critical facility includes a facility that provides a public service and may serve a particular need to respond to a natural hazard, a facility that may contribute to, or worsen, the impact of a natural hazard, or a facility that houses vulnerable populations such as children or the elderly. Critical facilities are necessary to preserve the health, welfare, and quality of life in the county, and fulfill important public safety, emergency response, and/or disaster recovery functions, or they house vulnerable populations (such as schools, childcare, and manufactured housing communities).

There are 630 critical facilities in Fond du Lac County. Table 3.3 lists the types and number of critical facilities within the county. The critical facilities list is not comprehensive, but a combination of statewide and county databases, along with additions from local representatives. Critical facilities in the planning area are illustrated in Map 3.3, and Appendix D lists the critical facilities by community.

**Table 3.3: Number of Critical Facilities by Type, Fond du Lac County**

Critical Facility Type	Total
Bridge	262
Utilities	103
School	63
Health care facility	60
Municipal facility	39
Pump Station	22
Fire department	19
Manufactured Housing Community	13
Law Enforcement	12
Communication Tower/Center	9
Dam	9
Lift Station	9
Railroads and Yards	5
Temporary Labor Camp	4
Airport	1
<b>Total</b>	<b>630</b>

Source: Steering Committee; Fond du Lac County; and local representatives; 2019.

## **HAZARD PROFILES**

Each natural hazard that has been identified as impacting Fond du Lac County has been profiled in this section. The hazard profile describes the characteristics of past natural hazards, and their impacts, frequency, and probability of future hazards that could impact the county.

Hazard risk probabilities are represented as very high, high, moderate, and low. Very high risk probability hazards are defined as hazards that occur an average of more than five times per year; high risk probability hazards are those that occur an average of three to four times per year; moderate risk probability hazards are those that occur an average of one to two times per year; and low risk probability hazards occur less frequently than one time per year.

### **TORNADO AND STRONG WIND**

#### **Profile**

Tornadoes are violently rotating columns of air that extend from a thunderstorm to the ground. They look like funnels and can occur any time, bring intense wind, and can happen anywhere. Most tornadoes have wind speeds less than 110 miles per hour, are about 250 feet across, and travel a few miles before dissipating. Tornadoes can destroy buildings, flip cars, and create deadly flying debris. Table 3.4 shows the Enhanced Fujita

Scale (EF Scale), which is recognized as the acceptable tornado magnitude measurement rating.

The United States is divided geographically into four zones for the occurrence and strength of extreme wind. Wisconsin lies along the northern edge of Zone IV, the nation's maximum frequency zone for tornadoes (commonly known as "tornado alley"), which extends northeastward from Oklahoma into Iowa and then across to Michigan and Ohio. Zone IV includes most of the southern two-thirds of Wisconsin and has experienced the strongest tornado activity that has affected the entire U.S., with wind speeds of up to 250 miles per hour being recorded. This zone includes Fond du Lac County.

Wisconsin's tornado season runs from the beginning of April through September, but tornadoes have occurred in Wisconsin in every month except February. The most severe tornadoes statewide typically occur during the months of April, May, and June.

**Table 3.4: Tornado Magnitude Measurement, EF Scale**

Enhanced Fujita Scale damage and windspeed estimates						
Damage	Little Damage	Minor Damage	Roof Gone	Walls Collapse	Blown Down	Blown Away
EF5	X	X	X	X	X	X
EF4	X	X	X	X	X	
EF3	X	X	X	X		
EF2	X	X	X			
EF1	X	X				
EF0	X					
Estimated windspeed (mph)	65-85	86-110	111-135	136-165	166-200	200+

Source: U.S. Air Force graphic/Senior Airman Thomas Trower.

Strong winds, including downburst winds, strong/high winds, and thunderstorms can often be just as damaging as a tornado. Downburst winds are strong, concentrated, straight-line winds created by falling rain and sinking air that can reach speeds of 125 miles per hour. Strong or high winds are high speeds winds that can be as damaging as a tornado, but remain nearly straight line and are not the rotating column of air that is characteristic of a tornado. A severe thunderstorm has winds that exceed 58 miles per hour, produces a tornado, or drops surface hail at least 0.75 inch in diameter.

**Past Occurrences**

According to the NCDC, Fond du Lac County has experienced 157 significant tornado and strong wind events (including thunderstorm wind, high wind, and funnel clouds) in the last 18.5 years from January 1, 2000 to August 28, 2018.

Several tornado events have been particularly damaging for the county.

- An F1 tornado that occurred in Eden on September 2, 2002 caused \$750,000 in damages.
- An F3 tornado that occurred from Alto to Waupun on June 23, 2004 caused \$8.6 million in damages.
- A potent line of severe thunderstorms moved through central Wisconsin on August 28th, 2018. Nineteen tornadoes were confirmed, stretching from Marquette County, east through Sheboygan County. Eleven of the tornadoes were confirmed in Fond du Lac County, including one EF2 tornado, seven EF1 tornadoes, and three EF0 tornadoes. The amount of damage to trees and agriculture was staggering.



Tornado damage west of Brownsville, Fond du Lac County, August 28, 2018. Source: National Weather Service, Milwaukee/Sullivan, WI Weather Forecast

Based on previous hazard occurrences as reported by the NCDC, Fond du Lac County experiences approximately eight significant tornado and strong wind events per year.

### Vulnerability

Based on the hazard frequency, Fond du Lac County is considered to have a **very high** probability of experiencing a tornado or strong wind event in any given year.

Tornadoes have no specific defined hazard area within the county. Past events have been relatively uniform across the planning area; however, manufactured home residents are often most vulnerable to death, injury, and property damage from tornadoes as these homes often lack foundations, tie-downs, and/or basements. Therefore, manufactured housing communities in the county are the areas of greatest risk from this hazard.

### Impacts

#### Death and Injury

No deaths or injuries have been reported from tornado and strong wind events for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018, according to NCDC data.

#### Critical Facilities

Hospitals can see increases in patient load following tornadoes. Schools can sustain damage, and if they do not sustain damage, they often function as temporary shelters in the aftermath of tornadoes. Police and fire departments often see an increased workload during and after tornadoes. Power lines and communication towers are at risk of being blown down.

Any critical facility in the planning area may be impacted by a tornado; however, schools and manufactured home communities are of particular concern during tornadoes. Schools are a primary concern during tornadoes for three reasons: (1) they have large numbers of people present, either during school or as a storm shelter; (2) they have large span areas, such as gyms and theaters; and (3) they house a vulnerable population during the day time for most of the year.

The National Weather Service has found that unanchored manufactured homes start to fail due to wind speed and wind stress at a lower wind gust or wind speeds than permanent homes. Therefore, manufactured home communities are a primary concern during tornadoes. The use of anchoring systems and foundations can help reduce damage to manufactured homes caused by tornadoes and strong winds.

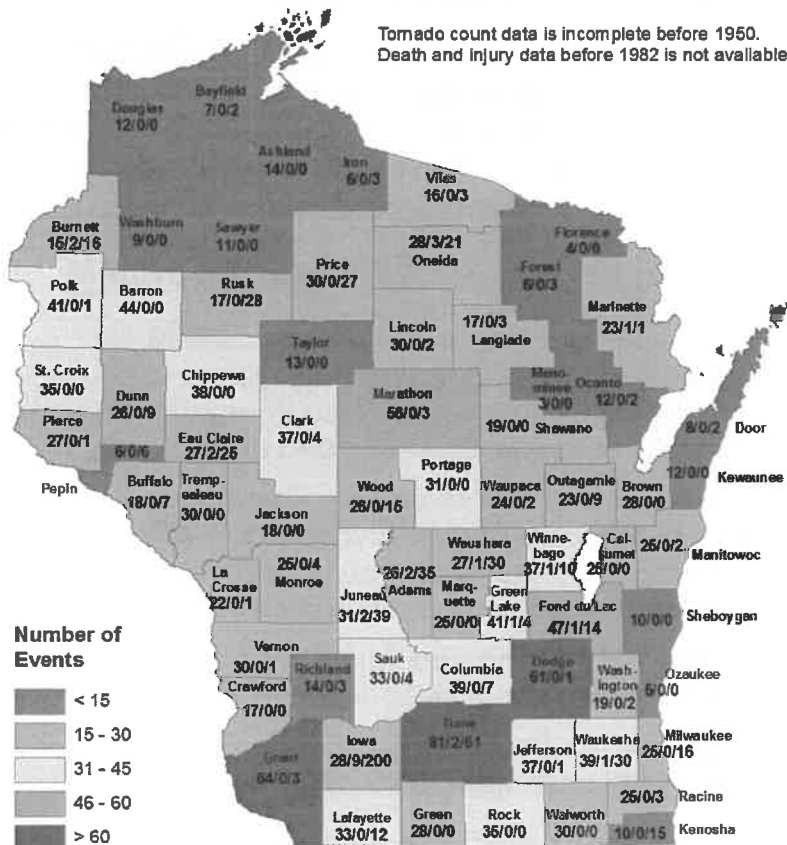


## Wisconsin Tornado Events 1844 - 2014

# Events / # Deaths / # Injuries



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



### Economic Impacts

A tornado can have a significant economic impact to a local economy due to irrecoverable businesses and infrastructure damages. A heavily damaged business often never reopens after the event.

Infrastructure damage is usually limited to above ground utilities, such as power lines. Damage to utility lines can usually be repaired or replaced relatively quickly. Damage to roads and to railroads is also localized; if these facilities cannot be repaired promptly, alternate transportation routes must be established.

Public expenditures include search and rescue, shelters, and emergency protection measures. The greatest public expenditures for a community result from repairs to public facilities, and cleanup and disposal of debris. Cleanup and disposal can be an issue, especially if there is limited landfill capacity near the damage site.

Since manufactured homes are especially vulnerable to tornadoes, a "worst case scenario" for this hazard would involve the total destruction of all manufactured homes

in the county. In such a "worst case scenario," the total destruction of all homes in the 17 manufactured home communities in the county would result in estimated dollar losses of approximately \$12.8 million plus an additional estimated value of building contents of \$6.4 million (calculated as 50 percent of the building value), for total estimate of potential dollar losses of \$19.2 million.

### Property Damage

Reported property damage from significant tornadoes and strong winds for Fond du Lac County has totaled approximately \$11.6 million in public property and crop damages over the last 18.5 years from January 1, 2000 to August 28, 2018 according to the NCDC.

## **WINTER STORM**

### **Profile**

Winter storms can vary in size and strength, and can include heavy snowstorms, blizzards, freezing rain, sleet, and ice storms. The aftermath of a winter storm can impact a community or region for weeks, and even months.

Winter storms can occur as a single event or they can occur in combination, which can make an event more severe. A variety of weather phenomena and conditions can occur during winter storms. For purposes of classification, the following are National Weather Service descriptions of winter storm elements:

Heavy Snowfall – the accumulation of six or more inches of snow in a 12-hour period, or eight or more inches in a 24-hour period.

Winter Storm – the occurrence of heavy snowfall accompanied by significant blowing snow, low wind chills, sleet or freezing rain.

Blizzard – the occurrence of sustained wind speeds in excess of 35 miles per hour accompanied by heavy snowfall or large amounts of blowing or drifting snow.

Ice Storm – an occurrence where rain falls 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 – the effect of drizzle or rain freezing upon impact on objects that have 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.

Much of the snowfall in Wisconsin occurs in small amounts of between one and three inches per occurrence. Heavy snowfalls (producing at least eight to ten inches of accumulation) happen on the average about five times per season. True blizzards are rare in Wisconsin, and are more likely to occur in northwestern Wisconsin than in southern portions of the state, even though heavy snowfalls are more frequent in southeastern Wisconsin. However, blizzard-like conditions often exist during heavy snowstorms when gusty winds cause severe blowing and drifting of snow.

## Past Occurrences

According to the NCDC, Fond du Lac County has experienced 130 significant winter storm events in the last 18.5 years from January 1, 2000 to August 28, 2018 (including blizzards, winter weather, heavy snow, and ice storms). Many of these hazard events may not have been specific to Fond du Lac County, and may have been recorded for a larger regional area.

Based on previous hazard occurrences as reported by the NCDC, Fond du Lac County experiences approximately seven significant winter storm events per year.

## Vulnerability

Based on the hazard frequency, Fond du Lac County is considered to have a **very high** probability of experiencing a winter storm event in any given year.

Winter storms tend to be a regional phenomenon in that they affect much of east central Wisconsin on nearly all of the occasions in which they affect Fond du Lac County.

Winter storms have no defined hazard area within the planning area. Past events have been relatively uniform across the planning area or the larger regional area.

## Impacts

### Death and Injury

No deaths, but 60 injuries have been reported from significant winter storm events for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018 according to NCDC data.

The 60 injuries were not specific to Fond du Lac County, but occurred across the region during one winter storm event in January 2009 from freezing rain, which caused hazardous driving conditions.

### Critical Facilities

Critical facilities are not greatly impacted by winter storms; however, personnel associated with the critical facilities face greater workload burdens. Street and road crews have an increased burden of snow removal (and salting in the case of ice storms) during and after winter storms. In some cases, winter storms can be so severe that these crews have to be called off the road for a period of time.

Hospitals and clinics may see increased patient loads for frostbite, pedestrian and vehicular accident injuries, and heart conditions resulting from the shoveling of heavy snow during and following winter storms. Sometimes, hospitals and clinics have difficulty getting their own staff to report to work because of the storm, which increases the workload for present staff (double shifts, etc.).

Police personnel respond to more accidents during winter storms. Utility and telephone companies respond to downed electrical and telephone lines, especially in the case of ice storms. Rescue services can receive more calls because of accidents or health related circumstances. Schools may need to have early dismissal or cancel classes altogether. Shelters may take in additional persons during winter storms. Airports face flight delays.

## Economic Impacts

Loss of power often means that businesses and manufacturing facilities must close down. Loss of access due to snow or ice covered roads can have a similar effect, especially when trucks cannot travel on major thoroughfares to make “just in time” deliveries to business and industry in the planning area. The effects are particularly difficult when the storm is widespread.

An estimate of potential dollar losses cannot be calculated for winter storm events, since no vulnerable structures have been identified. Based on previous damages reported by the NCDC, property damages from winter storms has been minimal over the past 18.5 years.

## Property Damage

The NCDC reports \$10,000 in reported property damages from winter storm events for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018 according to NCDC data.

# **FLOODING**

## **Profile**

A flood is a rising and overflowing of a body of water especially onto normally dry land. FEMA defines a flood as a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from overflow of inland or tidal waters, unusual and rapid accumulation or runoff of surface waters from any source, or mudflow.

The type of flooding that can impact Fond du Lac County includes riverine, stormwater, and dam failure flooding.

## Riverine Flooding

Riverine flooding occurs when water draining from a watershed, whether from rainfall or melting snow, exceeds the capacity of the river or stream channel to hold it. Water overflows onto the nearby low-lying lands (floodplains). In hilly and mountainous areas flooding is likely to be rapid, deep, and dangerous. In relatively flat floodplains, land may stay covered with shallow, slow moving water for days or even weeks.

## Stormwater Flooding

Flooding often occurs in urban areas due to stormwater management issues. Stormwater drainage systems have been designed to manage most storms. However, larger storms that occur in a short time period are of such intensity that the drains cannot handle all the stormwater and flooding results. Localized stormwater flooding can also occur if storm drains in the area are blocked. It is important to keep the drainage system clear of litter and debris.

Newly built property developments incorporate stormwater management measures such as stormwater detention and retention basins that provide greater flood protection. Detention basins slow the flow of stormwater being carried in the drainage system by storing it for a time, while retention basins (i.e. ponds) hold water during most of the year. Detention basins often double as parks and playing fields.



## Dam Failure Flooding

Flooding can result from a dam failure. A dam is an artificial barrier, together with its appurtenant works, constructed in or across a waterway for the primary purpose of impounding or diverting water. Dam failure can occur for a number of reasons, including overtopping caused by floods that exceed the capacity of the dam, deliberate acts of sabotage, structural failure of materials used in dam construction, movement and/or failure of the foundation supporting the dam, settlement and cracking of concrete or embankment dams, piping and internal erosion of soil in embankment dams, or inadequate maintenance and upkeep. In extreme cases, dam failure can occur with little warning and can result in the loss of life and significant property damage in areas downstream of the dam. Other failures and breaches can take much longer to occur.

As identified by the Wisconsin Department of Natural Resources (WDNR), there are a total of 63 dams in Fond du Lac County. Of these, nine are classified as large dams. A large dam has a structural height of over six 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. The rest of the dams located in the county are regarded as small dams.<sup>2</sup> Map 3.5 displays the large dams in the county.

The WDNR assigns hazard ratings to large dams within the state based on existing land use and land use controls (zoning) downstream of the dam. The hazard rating is not based on the physical attributes, quality, or strength of the dam itself, but rather the potential for loss of life or property damage should the dam fail. A high hazard rating indicates that a failure would put lives at risk. A significant hazard rating indicates that a failure could result in significant property damage. A low hazard rating is given when a failure would result in only minimal property damage and loss of life is unlikely.

Of the nine large dams in Fond du Lac County, three of them have a significant hazard risk rating including the Ripon Gothic Mill Pond dam, the Dundee Long Lake dam, and Schley's Ledgeview Acres dam; and six of them have a low hazard risk rating including Schrauths Mill/Lake Bernice dam, Fairwater dam, Mullet Creek dam, Mischos Pond dam, Eldorado Marsh dam, and Radtke Pool dam.

The areas of greatest risk from dam failure are those areas within the hydraulic shadow of the dam of the four significant hazard risk rated dams. The hydraulic shadow of the dam is the area of land downstream from a dam that would be inundated by water upon failure of the dam during the regional flood (100-year flood).

### Past Occurrences

According to the NCCDC, Fond du Lac County has experienced 19 significant flooding events (including flood, flash flood, heavy rain, dam failure flooding, and stormwater flooding) in the last 18.5 years from January 1, 2000 to August 28, 2018. Some of these reported occurrences may not have been specific to Fond du Lac County, and may have been recorded for a larger regional area.

In June 2008, Wisconsin and other Midwest states saw an unprecedented amount of rainfall across the region. A series of storms from June 5<sup>th</sup> through the 12<sup>th</sup> caused

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<sup>2</sup> Wisconsin Department of Natural Resources; <https://dnr.wi.gov/topic/dams>; Retrieved 2018.

widespread flooding that resulted in damage to thousands of homes, businesses, and public infrastructure. Many local climate records were broken with up to 17 inches of rain in some parts of Wisconsin. Thirty counties declared a "state of emergency." Governor Doyle requested and received a "Presidential Declaration."

Appendix E provides maps of the extent of flooding throughout Fond du Lac County and the City of Fond du Lac in 2008.

Based on previous hazard occurrences as reported by the NCEM, Fond du Lac County experiences approximately one significant flooding event every year.

### Vulnerability

FEMA uses the "base" flood as the basis for its regulatory requirements and flood insurance ratings. The hazards mitigation plan also uses the base flood for planning purposes. The base flood is the one percent chance flood, or the flood that has a one percent (one out of 100) chance of occurring in any given year. The one percent chance flood is commonly referred to as the "100-year flood."

Based on the hazard frequency, Fond du Lac County is considered to have a **moderate** probability of sustaining a 100-year flood in any given year.

The areas at greatest risk from flooding include the "100-year floodplain" areas of Fond du Lac County. FEMA Flood Insurance Rate Maps also call this the Special Flood Hazard Area, or "A Zone." The base floodplains for the planning area are shown in Map 3.1. Properties that potentially lie within the floodplain and would be affected by the 100-year flood are shown in Map 3.2.

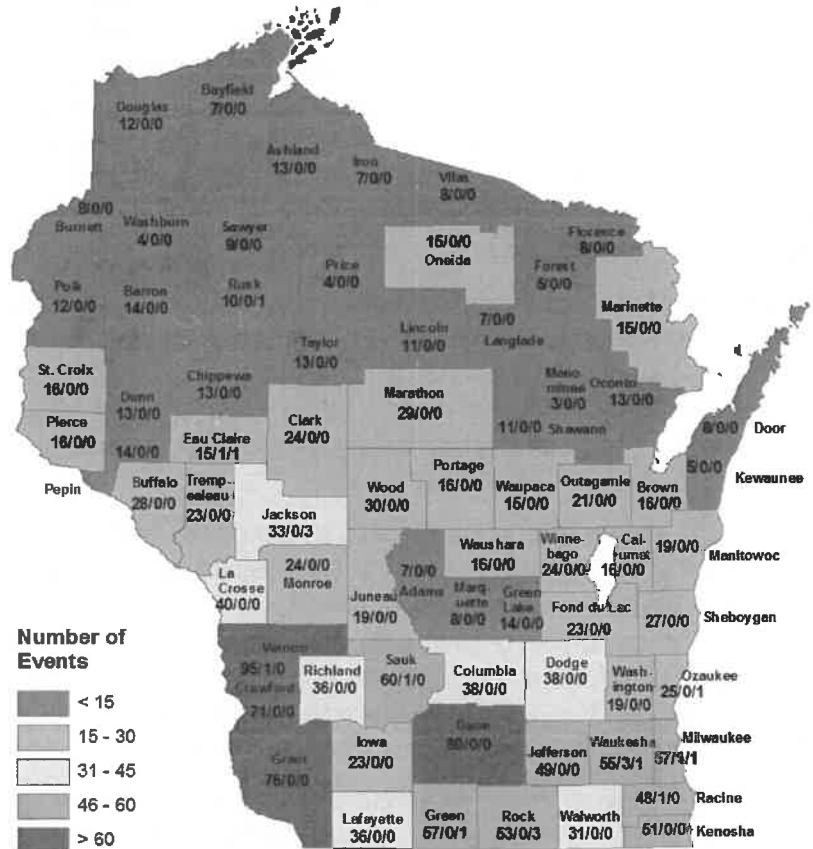
### Structures at Risk

Analysis of the data used to produce Map 3.2 indicates that 5,960 structures could potentially be impacted by the base flood in the planning area. There was a significant decrease in the number of structures at risk since the previous hazard mitigation plan



## Wisconsin Flood Events 1844 - 2014

# Events / # Deaths / # Injuries



was completed in 2015 (5,670 less structures at risk). However, this large of a change is due to different methods being used in GIS to make the calculations. In 2015, a parcel was considered at-risk if floodplains touched any part of the parcel. The current calculation only counted a structure as at-risk if it was within the floodplain.

A review of FEMA flood insurance claims from January 1, 1978 through September 30, 2018, indicates that there were 320 paid claims in Fond du Lac County in the amount of \$45.6 million.<sup>3</sup>

### Repetitive Loss Properties

Repetitive loss structure is a term that is usually associated with the National Flood Insurance Program (NFIP) to describe a structure, covered by a contract of flood insurance under the NFIP, that has suffered flood damage on two or more occasions over a 10-year period ending on the date when a second claim is made, in which the cost to repair the flood damage, on average, equals or exceeds 25 percent of the market-value of the structure at the time of each flood loss event. For the Community Rating System (CRS) of the NFIP, a repetitive loss property is any property, which the NFIP has paid two or more flood claims of \$1,000 or more in any given 10-year period since 1978. A repetitive loss structure is important to the NFIP, since structures that flood frequently put a strain on the flood insurance fund. It should also be important to a community because residents' lives are disrupted and may be threatened by the continual flooding.

According to FEMA, there are eight repetitive loss properties in Fond du Lac County. All eight are residential structures.

### Impacts

#### Death and Injury

No deaths or injuries from flooding have been reported for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018, according to the NCDC.

#### Critical Facilities

There are 241 critical facilities in Fond du Lac County that are located within 100-year floodplains in Fond du Lac County. However, 155 of them are critical facilities that are justifiably near water such as bridges and dams. However, 86 critical facilities may be unnecessarily located in the floodplain. Table 3.5 lists the types of facilities potentially within the 100-year floodplains.

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<sup>3</sup> FEMA NFIP Flood Loss Statistics (WR2C1040); <http://bsa.nfipstat.fema.gov/reports/1040.htm>; 2019.

**Table 3.5: Critical Facility Types within the 100-Year Floodplains**

Critical Facilities Type	Total
Bridge	147
Utilities	33
School	19
Health care facility	12
Pump Station	11
Dam (large)	8
Municipal facility	7
Railroads and yards	5
Fire department	4
Manufactured Housing Community	4
Lift Station	2
Airport	1
Communication Tower/Center	1
Law Enforcement	1
<b>Total</b>	<b>255</b>

Source: Fond du Lac County GIS, 2019.

### Economic Impacts

Flooding can have significant economic impact to a local economy from businesses and infrastructure damages. During floods, property and belongings may be destroyed and people may become homeless. Public expenditures will include police, fire, and emergency management personnel and shelters, and may also include search and rescue. Great public expenditures result from repairs to public facilities and cleanup. It often takes years for affected communities and businesses to rebuild and return to normalcy.

Vulnerable structures are structures located in the 100-year flood hazard area identified in Map 3.1. Since there is no building height data for buildings in these flood hazard areas, a "worst case scenario" of total structural damage for buildings in all of the flood zones of the planning area was assumed in estimating potential dollar losses to vulnerable structures.

It is estimated that over \$903 million in losses would occur with the 100-year flood in zones projected to be impacted by the 100-year flood in a "worst case scenario" of total structural damage for all buildings in the county flood zones.

This information was obtained from a Fond du Lac County database on assessed values of real property. This only involves damage to structures themselves, and may not account for damage to personal property inside or adjacent to vulnerable structures. In addition, there may be areas outside the 100-year flood zones that will flood during an event of that magnitude (or even of lesser magnitude).

Through zoning, development in floodplains, wetlands, and environmentally sensitive areas is kept to a minimum. Fond du Lac County has shoreland and floodplain zoning.

This ordinance is a useful tool in keeping inappropriate development out of flood hazard zones in the county.

### **Property Damage**

Reported property and crop damage from flooding in Fond du Lac County has totaled \$98.3 million over the last 18.5 years from January 1, 2000 to August 28, 2018 according to NCDC data.

Most of the damage occurred from the following three flooding events.

- A flooding event occurring from June 9-12, 2004 was caused by heavy rain across east central and southeast Wisconsin. Fond du Lac County had at least 3,869 houses report basement flooding, minor damage occurred to 1,040 homes, and major damage to 31 homes (\$4.2 million in private property damage); minor damage occurred to eight businesses, and major damage to one business (\$231,000 in business property damage); damage occurred to public infrastructure (\$363,000 in damages); and crop losses were estimated at \$63 million.
- A flooding event occurring from June 7-9, 2008 caused by heavy rain across east central and southeast Wisconsin. A number of areas across Fond du Lac County were affected; however, only the City of Ripon had reported damages including \$4.6 million in property damage and \$9 million in crop damage.
- A flash flooding event occurred on June 12, 2008 caused by heavy rain across east central and southeast Wisconsin. Much of western Fond du Lac County was impacted. Water depths on road surfaces reached three feet or more and there were gravel washouts. Manhole covers pushed up in Ripon. Some farm fields remained flooded into early July. The breakdown for private property damages included 1,000 minimally affected homes, 500 homes with minor damage, 25 homes with major damage, and five homes destroyed (\$1 million in private property damages). 15 businesses sustained minor damage (\$50,000 in business property damage). Crop losses were estimated at \$17 million. Public sector damage was about \$1.3 million from several roads and bridges that sustained damage.

Loss of road access is a major flood impact that affects all residents and businesses, not just those who own property in the floodplain. Sometimes, the loss is temporary, such as during a flood. However, on some occasions, the loss of transportation lasts well after the disaster. When a flood washes out roads, bridges, or railroads, it can be weeks or months before they are repaired and reusable. A key evacuation and safety concern is when roads and bridges go under water. Generally, the larger the road, the more likely it will not flood, but this is not always the case.

Analysis of the GIS data indicates that there are 147 bridges that could potentially be underwater during a base flood. There may be a number of additional bridges in areas that are not included in the mapped 100-year flood zones, such as areas located along small tributary streams.

### **NFIP Participation**

Fond du Lac County has participated in the FEMA National Floodplain Insurance Program (NFIP) since July 1982 by adopting and enforcing floodplain management ordinances to reduce future flood damage. In exchange, the NFIP makes federally

backed flood insurance available to homeowners, renters, and business owners in the county.

Additionally, all incorporated communities in the county participate in the NFIP. The following provides the date that each incorporated community joined the NFIP:

- City of Fond du Lac since January 1979
- City of Ripon since August 1980
- City of Waupun since August 1984
- Village of Brandon since September 1988
- Village of Campbellsport since May 1978
- Village of Eden since August 2012
- Village of Fairwater since September 1985
- Village of Mount Calvary since September 1976
- Village of North Fond Du Lac since December 1979
- Village of Oakfield since September 1988
- Village of Rosendale since September 1989
- Village of St. Cloud since July 1987

## **EXCESSIVE HEAT**

### **Profile**

A combination of high heat and humidity can lead to heat related illness, including heat cramps, heat exhaustion, and heat stroke. Heat-related illness can occur when the ability of the body to cool itself is challenged, or when there are insufficient levels of fluid or salt in the body due to sweating or dehydration. Heat-related illnesses increase as the combination of temperature and relative humidity increase, but there are other factors involved as well. The elderly, disabled, and other vulnerable populations are especially susceptible to excessive heat. A heat wave occurs during a period of abnormally and uncomfortably hot and unusually humid weather. Typically a heat wave lasts two or more days.

### **Past Occurrences**

According to the NCDC, Fond du Lac County has experienced 23 significant excessive heat events in the last 18.5 years from January 1, 2000 to August 28, 2018.

Based on previous hazard occurrences as reported by the NCDC, Fond du Lac County experiences approximately one significant excessive heat event every year.

### **Vulnerability**

Based on the hazard frequency, Fond du Lac County is considered to have a **moderate** probability of experiencing an excessive heat event in any given year.

Excessive heat events have no defined hazard area within the planning area. Past events have been relatively uniform across the planning area.

## **Impacts from Hazard**

### **Death and Injury**

No deaths or injuries have been reported from significant excessive heat events for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018 according to NCDC data.

### **Critical Facilities**

Utilities may see peak demand for electricity during excessive heat event. Hospitals and clinics will likely experience an increased demand due to heat related illnesses during an excessive heat event. In some cases, rescue services will experience an increased demand due to these same heat related illnesses. If school is in session during the excessive heat event, area school districts may dismiss classes early in the day, at least in older schools without air conditioning. Emergency shelters will experience higher demand during the excessive heat, with some emergency shelters being set up specifically in response.

### **Economic Impacts**

Economic impacts of an excessive heat event may include higher electrical consumption and increased demands for medical treatment. Local governments may need to incur expenses when repairing streets and highways in the planning area that have been damaged due to buckling. Excessive heat can also negatively impact agriculture in the surrounding area when combined with drought.

An estimate of potential dollar losses cannot be calculated for excessive heat events, since no vulnerable structures have been identified. Based on previous damages reported by the NCDC, there have been no property damages from excessive heat over the past 18.5 years.

### **Property Damage**

No significant public property damages have been reported from excessive heat events for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018 according to NCDC data.

## **EXTREME COLD**

### **Profile**

Exposure to extreme cold can cause frostbite or hypothermia and become life threatening. What constitutes extreme cold varies in different parts of the country. In Wisconsin, extreme cold means temperatures well below zero with wind chill. Wind chill is the term used to describe the rate of heat loss on the human body resulting from the combined effect of low temperature and wind. As winds increase, heat is carried away from the body at a faster rate, driving down both the skin temperature and eventually the internal body temperature.

Extreme cold is a dangerous situation that can cause health emergencies for susceptible people, such as children, the elderly, those without shelter, those who are stranded outdoors or in a disabled car, or those who live in a home that is poorly insulated or without heat.

## Past Occurrences

According to the NCDC, Fond du Lac County has experienced 21 significant extreme cold events in the last 18.5 years from January 1, 2000 to August 28, 2018.

Based on previous hazard occurrences as reported by the NCDC, Fond du Lac County experiences approximately one significant extreme cold event every year.

## Vulnerability

Based on the hazard frequency, Fond du Lac County is considered to have a **moderate** probability of experiencing an extreme cold event in any given year.

Extreme cold events have no defined hazard area within the planning area. Past events have been relatively uniform across the planning area.

## Impacts from Hazard

### Death and Injury

One death was reported from a significant extreme cold event for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018 according to NCDC data.

The death occurred during an extreme cold event that brought bitterly cold air and wind chill temperatures prevailing over southern Wisconsin from Christmas Day through January 6, 2018. Wind chill temperatures of 20 below to 34 below zero occurred at times with low temperatures below zero for most nights. Fond du Lac County authorities confirmed one death of a 27-year-old female due to hypothermia.

### Critical Facilities

All heated facilities will have greater heating expenses during an extreme cold event, and increased demand will affect electric and natural gas utilities. Hospitals and clinics may have an increase in patients exposed to the extreme cold conditions. Emergency shelters may take in additional individuals during the extreme cold event. Area schools may cancel classes or call for early dismissal in extreme cold events. Local fire departments and rescue services may also deal with direct or indirect consequences of the extreme cold event.

### Economic Impacts

Municipalities and water utilities may need to repair damaged water mains caused by the extreme cold. If area school districts need to call off school early on extremely cold days, there may be expenses involved with early busing and with paying staff for a full day while only having the benefit of a partial day of instruction.

An estimate of potential dollar losses cannot be calculated for extreme cold events, since no vulnerable structures have been identified. Based on previous damages reported by the NCDC, property damages from extreme cold has been minimal over the past 18.5 years.

### Property Damage

Reported property damage from significant extreme cold events for Fond du Lac County has totaled approximately \$2,000 in public property and crop damages over the last 18.5 years from January 1, 2000 to August 28, 2018 according to the NCDC.



In addition to the property damages information from the NCDC, the Fond du Lac County Emergency Management Department has recorded \$460,885 in damages (plus \$14,467 in protective measures) as a result of failures in public sector water mains for municipalities throughout Fond du Lac County from extreme cold causing frost levels to exceed system depths during the winter of 2013/2014.

## **DROUGHT**

### **Profile**

A drought is an extended period of below-average precipitation in a given region resulting in prolonged shortages in the water supply (including surface or groundwater). A drought can last for months or years.

Droughts in Wisconsin often have the greatest impact on agriculture by reducing crop growth and yields. More substantial drought occurrences can devastate crops resulting in a total loss. Droughts can also cause dry conditions increasing the risk of wildland fires.

### **Past Occurrences**

According to the NCDC, Fond du Lac County has experienced 19 significant drought events in the last 18.5 years from January 1, 2000 to August 28, 2018.

Based on previous hazard occurrences as reported by the NCDC, Fond du Lac County experiences approximately one significant drought every year.

### **Vulnerability**

The future incidence of drought is highly unpredictable, as its occurrence is based on weather patterns, making it difficult to determine probability with any accuracy. Based on the hazard frequency, Fond du Lac County is considered to have a **moderate** probability of experiencing a drought event in any given year.

Droughts have no defined hazard area within the planning area. Past events have been relatively uniform across the planning area, as they tend to be a regional phenomenon. However, agricultural croplands are most vulnerable to losses from drought events. According to the 2012 USDA Census of Agriculture (updated every ten years), Fond du Lac County contains 315,553 acres of agricultural lands.

### **Impacts from Hazard**

#### **Death and Injury**

No deaths or injuries have been reported from significant drought events for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018, according to NCDC data.

#### **Critical Facilities**

In extreme, prolonged drought conditions, water shortages may occur and affect the amount of water available for human consumption, and hospitals could see an increase in individuals suffering from dehydration. Parks that provide recreational water facilities are likely to experience increased usage during times of drought as well.

## Economic Impacts

Drought can significantly reduce crop growth and yields, which adversely affects farm income. Substantial drought events can lead to complete crop loss. Livestock may also be adversely affected by droughts.

As agricultural croplands are most vulnerable to losses from drought events, a "worst case scenario" would involve the total destruction of all 315,553 acres of agricultural lands in Fond du Lac County resulting in a loss of over \$1.6 billion. This calculation is based on data from the USDA Census of Agriculture that lists the average value of agricultural land in Fond du Lac County at \$5,001 per acre (USDA, 2014). The USDA Census of Agriculture is conducted every five years and the valuation data is based on a sample of farms to estimate the market value of agricultural land and buildings.

## Property Damage

Reported property damage from significant drought events for Fond du Lac County has totaled approximately \$200,000 in crop damages over the last 18.5 years from January 1, 2000 to August 28, 2018 according to the NCDC.

## HAIL

### Profile

Hail is a form of precipitation that occurs when updrafts in thunderstorms carry raindrops upward into extremely cold areas of the atmosphere where they freeze into balls of ice. Hailstone size is a direct function of the severity and size of the storm. Hail can be deadly to livestock and people, and can damage homes, cars, and aircraft.

### Past Occurrences

According to the NCDC, Fond du Lac County has experienced 60 significant hail events in the last 18.5 years from January 1, 2000 to August 28, 2018.

Based on previous hazard occurrences, the county experiences approximately three significant hail events per year.



## Vulnerability

Based on the hazard frequency, Fond du Lac County is considered to have a **high** probability of experiencing a significant hail event in any given year.

Hailstorms have no defined hazard area within the planning area. Past events have been relatively uniform across the planning area or the larger regional area.

## Impacts from Hazard

### Death and Injury

No death or injuries have been reported from hail events in Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018, according to NCDC data.

### Critical Facilities

Hail can inflict severe damage to roofs, windows, and siding of critical facilities, depending on hailstone size and winds.

### Economic Impacts

Hail can damage or destroy crops, and cause costly damage to roofs, windows, siding, trees, and vehicles.

An estimate of potential dollar losses cannot be calculated for hail events, since a specific hazard area cannot be defined.

### Property Damage

Reported property damage from significant hail events for Fond du Lac County has totaled \$54,000 in public property and crop damages over the last 18.5 years from January 1, 2000 to August 28, 2018 according to NCDC data.



## LIGHTNING

### Profile

Lightning is a sudden electrostatic discharge that occurs usually during a thunderstorm and can strike anywhere. The air in the channel of a lightning strike reaches temperatures higher than 50,000 degrees Fahrenheit.

## **Past Occurrences**

According to the NCDC, Fond du Lac County has experienced 15 significant lightning events in the last 18.5 years from January 1, 2000 to August 28, 2018.

Based on previous hazard occurrences as reported by the NCDC, Fond du Lac County experiences approximately one significant lightning event every year.

## **Vulnerability**

Based on the hazard frequency, Fond du Lac County is considered to have a **moderate** probability of experiencing a lightning storm and/or thunderstorm event in any given year.

Based on review of the historic patterns of lightning event occurrences, there are no specific areas that are a higher than average risk. The events are relatively uniform throughout Fond du Lac County.

## **Impacts from Hazard**

### **Death and Injury**

No deaths or injuries from lightning storms or thunderstorms have been reported for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018, according to NCDC data.

### **Critical Facilities**

Hospitals can see increases in patient load with sufficiently severe lightning events. Schools can sustain damage. Lightning can strike radio and cellular antennas disrupting emergency communications.

### **Economic Impacts**

An estimate of potential dollar losses cannot be calculated for lightning events, since no hazard area has been identified. Based on previous damages reported by the NCDC, property damages from lightning has been minimal over the past 18.5 years.

### **Property Damage**

Reported property damage from significant lightning for Fond du Lac County has totaled \$601,000 over the last 18.5 years from January 1, 2000 to August 28, 2018 according to NCDC data.

The most costly lightning event occurred on October 2, 2006 in Ladoga in the amount of \$200,000. The resultant fire burned the shed to the ground, and the contents were a total loss.

## **WILDLAND FIRE**

### **Profile**

A wildland fire is an unintentional burning in brush, marshes, grasslands, or open lands, typically caused by lightning, human carelessness, or arson. According to the current land use for the county (Table 2.1), 13 percent of the county is woodlands, which are potentially susceptible to wildland fires. Generally, fires are more likely when vegetation is dry.

## Past Occurrences

There have been no significant wildland fires on record for Fond du Lac County, so the hazard frequency cannot be determined.

## Vulnerability

According to the U.S. Forest Service Wildland Fire Assessment System, Fond du Lac County regularly falls within a low to moderate fire danger class. A low rating indicates that fuels do not ignite readily from small firebrands, while a moderate rating means that fires will likely start from most accidental causes.

Fond du Lac County contains approximately 60,047 acres of woodlands (based on current land use data). Of these, few contain timbers that are very susceptible to burning. The Kettle Moraine State Forest, in the southeastern corner of the county, is the largest area of contiguous woodlands in the county and likely poses the greatest risk for wildland fire.

As Fond du Lac County is not extensively forested and does not contain the hazards and risks necessary to warrant intensive or extensive fire protection, the Wisconsin DNR designates the county a "Cooperative Fire Protection Area." Therefore, no DNR ranger stations or suppression resources are located within the county.

The likelihood that any wildland fire in Fond du Lac County would be catastrophic is **low** as most susceptible areas lack enough acreage to allow for continuous burning.

## Impacts from Hazard

### Death and Injury

No data on deaths or injuries is available for significant wildland fire events for Fond du Lac County.

### Critical Facilities

All critical facilities located in the path of a wildland fire can be affected structurally and functionally if evacuation is deemed necessary. Fire, emergency response, and police personnel are most affected by wildland fires due to the dangers of helping to save people and extinguish fires, and the increased workloads during and after occurrences. Hospitals can see increases in patient load resulting from burn related injuries and individuals suffering from the effects of smoke inhalation.

### Economic Impacts

Fires can have an impact on the economy of an affected area by causing property damages. Major direct costs associated with wildland fires are incurred to extinguish the fire, to salvage and remove damaged debris, restore the burned area, and reconstruction. Wildland fires can also have a significant impact on local agriculture..

An estimate of potential dollar losses from wildland fire cannot be calculated as specific vulnerable structures or geographic areas have not been identified.

### Property Damage

No property damage data is available for wildland fire events for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018.

## **DENSE FOG**

### **Profile**

Fog is a collection of liquid water droplets or ice crystals suspended in the air at or near the ground. Fog can be considered a type of low-lying cloud, usually resembling stratus, and is heavily influenced by nearby bodies of water, topography, and wind conditions. Dense fog creates a hazardous situation mainly because of reduced visibility. To alert travelers to potentially dangerous conditions, the National Weather Service forecasts fog and issues dense fog advisories when visibility is decreased to less than one quarter of a mile.

### **Past Occurrences**

According to the NCDC, Fond du Lac County has experienced 53 significant dense fog events in the last 18.5 years from January 1, 2000 to August 28, 2018.

Based on previous hazard occurrences as reported by the NCDC, Fond du Lac County experiences approximately three significant dense fog events every year.

### **Vulnerability**

Based on the hazard frequency, Fond du Lac County is considered to have a **high** probability of experiencing a significant dense fog event in any given year.

Low lying areas along waterways and wetlands are at greatest risk for developing dense fog under certain meteorological conditions. However, no portion of the planning area is free of the possibility of experiencing fog events.

### **Impacts from Hazard**

#### **Death and Injury**

No deaths or injuries have been reported from significant fog events for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018, according to NCDC data.

#### **Critical Facilities**

Law enforcement and rescue services may need to respond to an increased number of accidents during dense fog events. Airports can experience flight delays and cancellations during certain fog events.

#### **Economic Impacts**

Vehicular accidents from dense fog events can result in property damage. Airline delays due to fog have economic impacts for travelers and airlines.

An estimate of potential dollar losses cannot be calculated for dense fog events since no vulnerable structures have been identified.

#### **Property Damage**

According to NCDC data, no significant public property damages have been reported from dense fog events for Fond du Lac County over the last 18.5 years from January 1, 2000 to August 28, 2018.

## IMPACTS OF A CHANGING CLIMATE ON NATURAL HAZARDS

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The evaluation and assessment of natural hazards in this plan and the determination of Fond du Lac County's vulnerability to natural hazards is based on the occurrence of past natural hazards. However, climate change may make past trends an unreliable resource for predicting future impacts, frequency, and vulnerabilities. According to a climate change report by Wisconsin scientists (*Wisconsin Initiative on Climate Change Impacts (WICCI)*, 2011), climate change has and will continue to impact average annual temperatures causing increased frequency in heat waves; increased frequency and intensity of severe rainstorms; shorter, warmer winters with decreased lake ice cover; increased drought frequency, and other impacts. Based on the WICCI report, Fond du Lac County, along with most of Wisconsin, will continue to become warmer and drier, especially in the summer. When it does rain, rainfall amounts will be greater and increase in intensity. It is projected that over the next 25-45 years, Fond du Lac's climate will resemble that of current Toledo, Ohio.<sup>4</sup>

The WICCI workgroups identified the following potential impacts from climate change.

- Stormwater engineers design infrastructure using standards based on rainfall data from the latter half of the 20th century making Fond du Lac County vulnerable to the potential impacts from more intense rainfall events, causing impoundments and stormwater detention ponds to fail more frequently and conveyance systems to be filled beyond capacity leading to flooded homes and urban streets.
- Roadways and bridges could be washed-out or become impassable.
- Rising groundwater levels could flood property and cropland.
- Rural residential wellheads may more often become contaminated by floodwaters and high groundwater.
- Raingardens and other biofiltration best management practices (BMPs) may fail more frequently due to saturated soil conditions.
- Runoff of manure from fields may occur more frequently.
- Warmer nighttime temperatures might lead to more excessive heat waves, increasing the risk for heat stroke in some populations.
- Heavy rains and flooding can lead to a rise in water pollution and the risk of waterborne diseases such as cryptosporidium and giardia.
- Changes in temperatures and precipitation could result in an increase in disease-carrying insects, including ticks and mosquitoes. This means people may be at a greater risk for contracting vector-borne diseases, such as Lyme disease and West Nile encephalitis.
- Changes in temperature and precipitation could affect growing seasons, crop yields, weed and pest infestations, and dairy productivity.

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<sup>4</sup> Wisconsin Initiative on Climate Change Impacts, Interactive Mapping Tool, <http://www.wicci.wisc.edu/climate-map.php>.

## **MITIGATION AND ADAPTABILITY STRATEGIES**

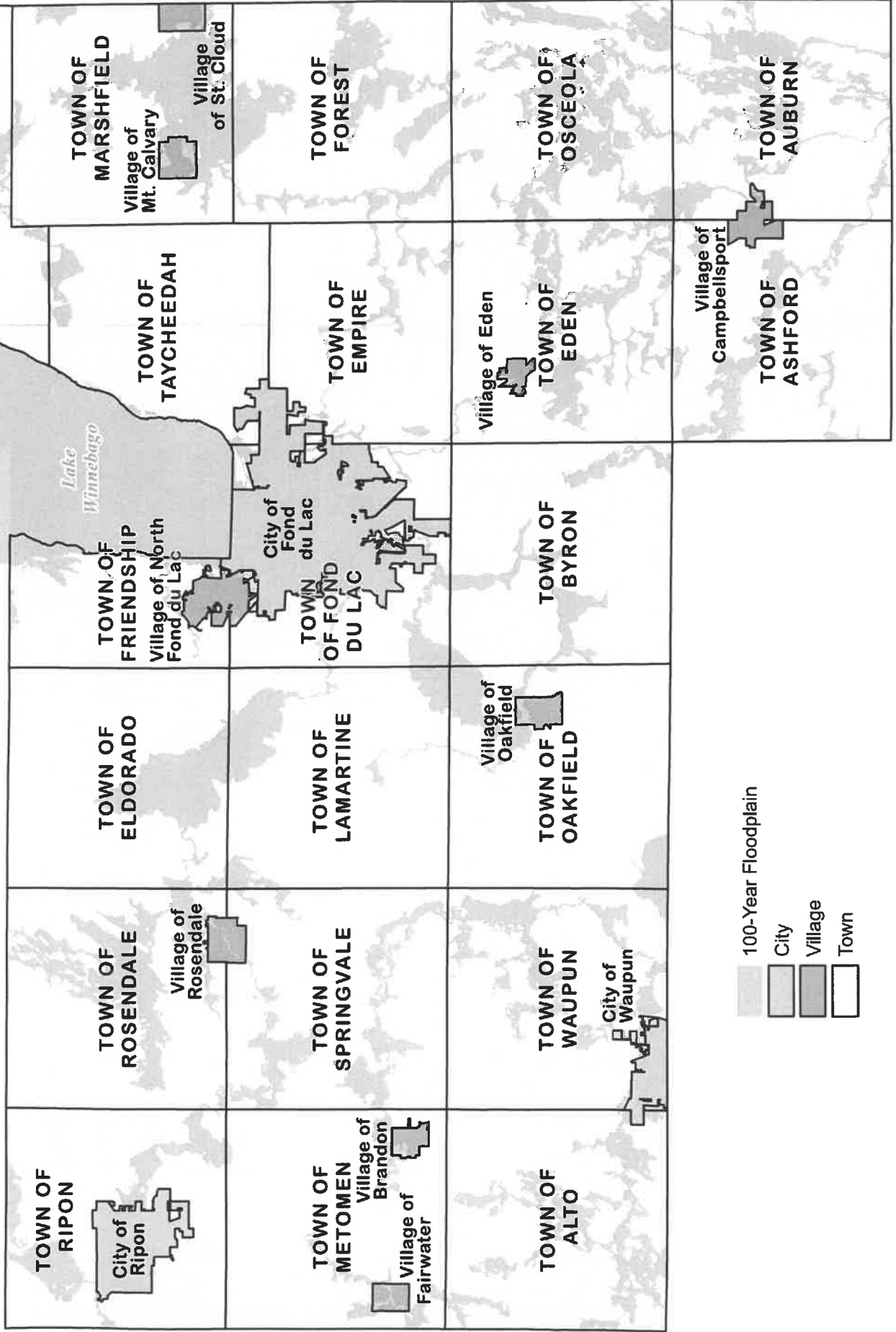
Impacts from a changing climate are already being seen in Wisconsin, and it is likely too late to reverse some of these changes. However, there are actions that Fond du Lac County policymakers, business leaders, and residents can take to contribute to slowing climate change, and to help the county adapt to the impacts from climate change.

Actions such as implementing cost-effective clean energy policies and programs, and reducing carbon emissions will contribute to slowing climate change while also lowering energy costs, and improving air quality and public health. Additionally, the following mitigation and adaptation strategies, developed by the WICCI working groups, could be employed in Fond du Lac County.

- Strengthen public health response and warning systems.
- Increase energy efficiency.
- Switch to renewable energy sources such as wind, solar, geothermal, and biomass.
- Increase vehicle fuel economy.
- Invest in clean transportation choices.
- Encourage bicycle and pedestrian transportation and expand availability options.
- Protect floodplains, wetlands, and other natural "green infrastructure" features that can hold floodwaters and enable water infiltration.
- Implement development setbacks based on defensible scientific data.
- Relocate structures that are threatened by flooding or erosion.
- Provide education for developers, bankers, and insurance agents.
- Ongoing comprehensive planning and improved implementation of existing plans.
- Use best management practices for site design to control stormwater runoff.

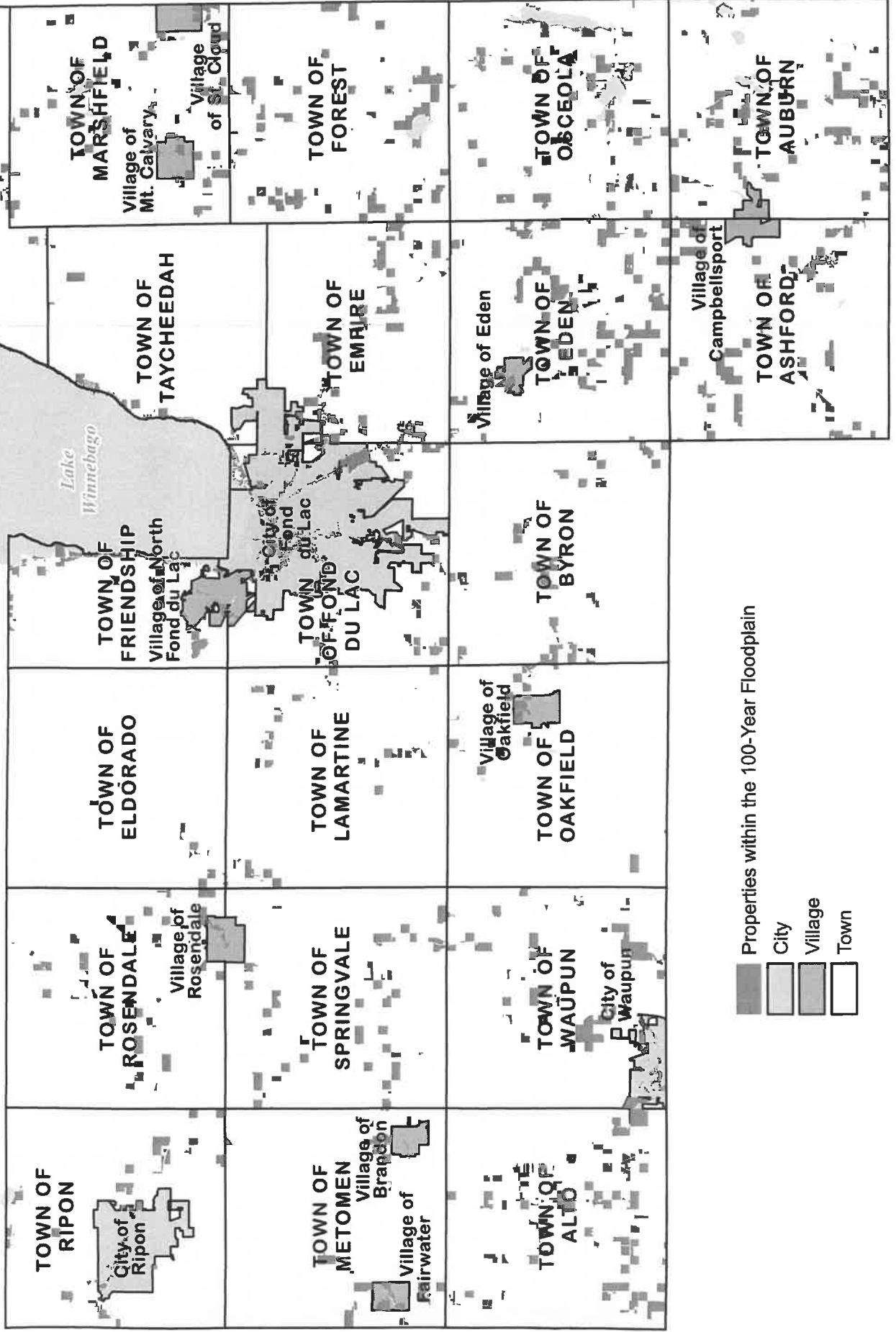


# Map 3.1: 100-Year Floodplains Fond du Lac County, WI



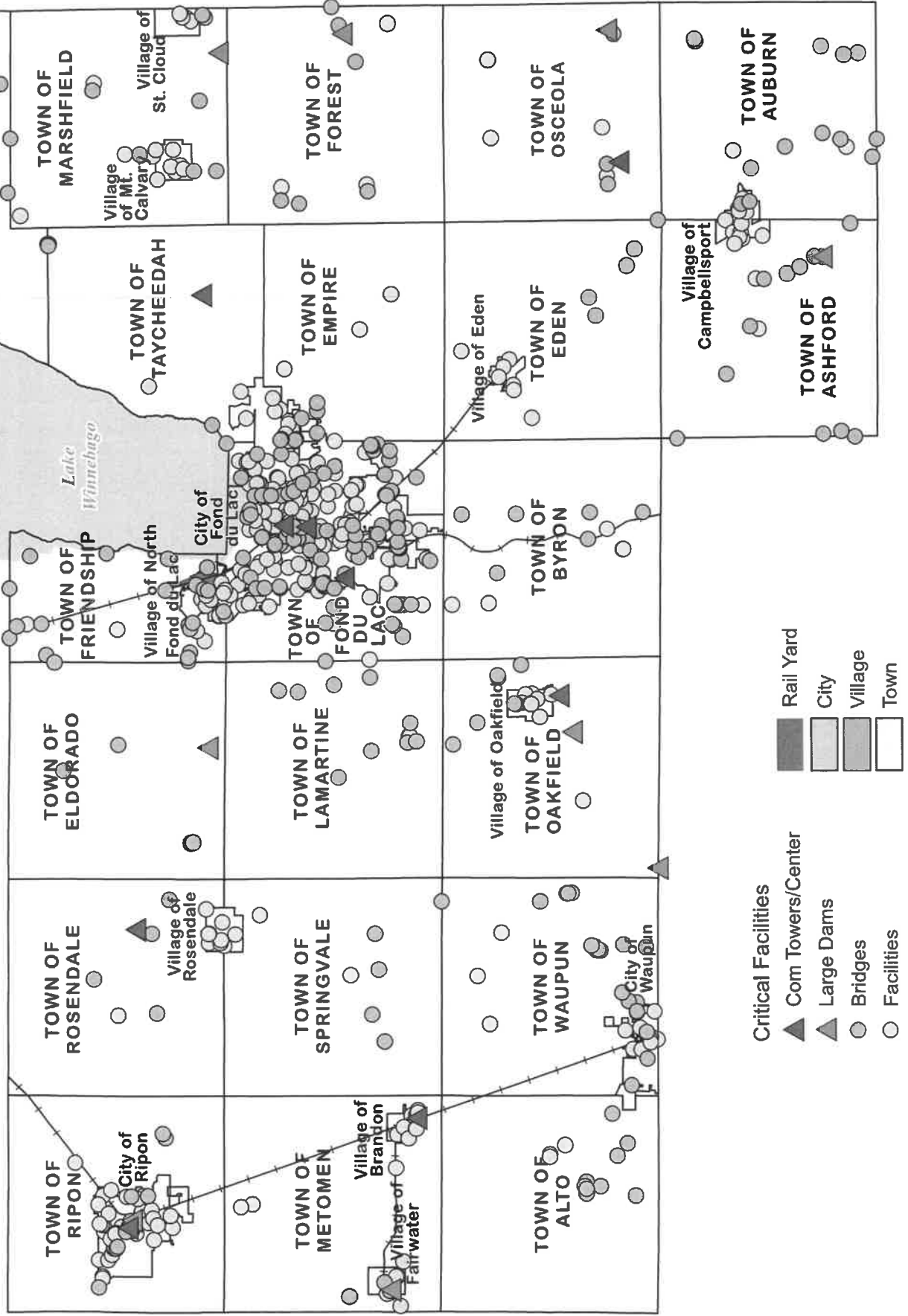


# Map 3.2: Properties within the 100-Year Floodplains Fond du Lac County, WI





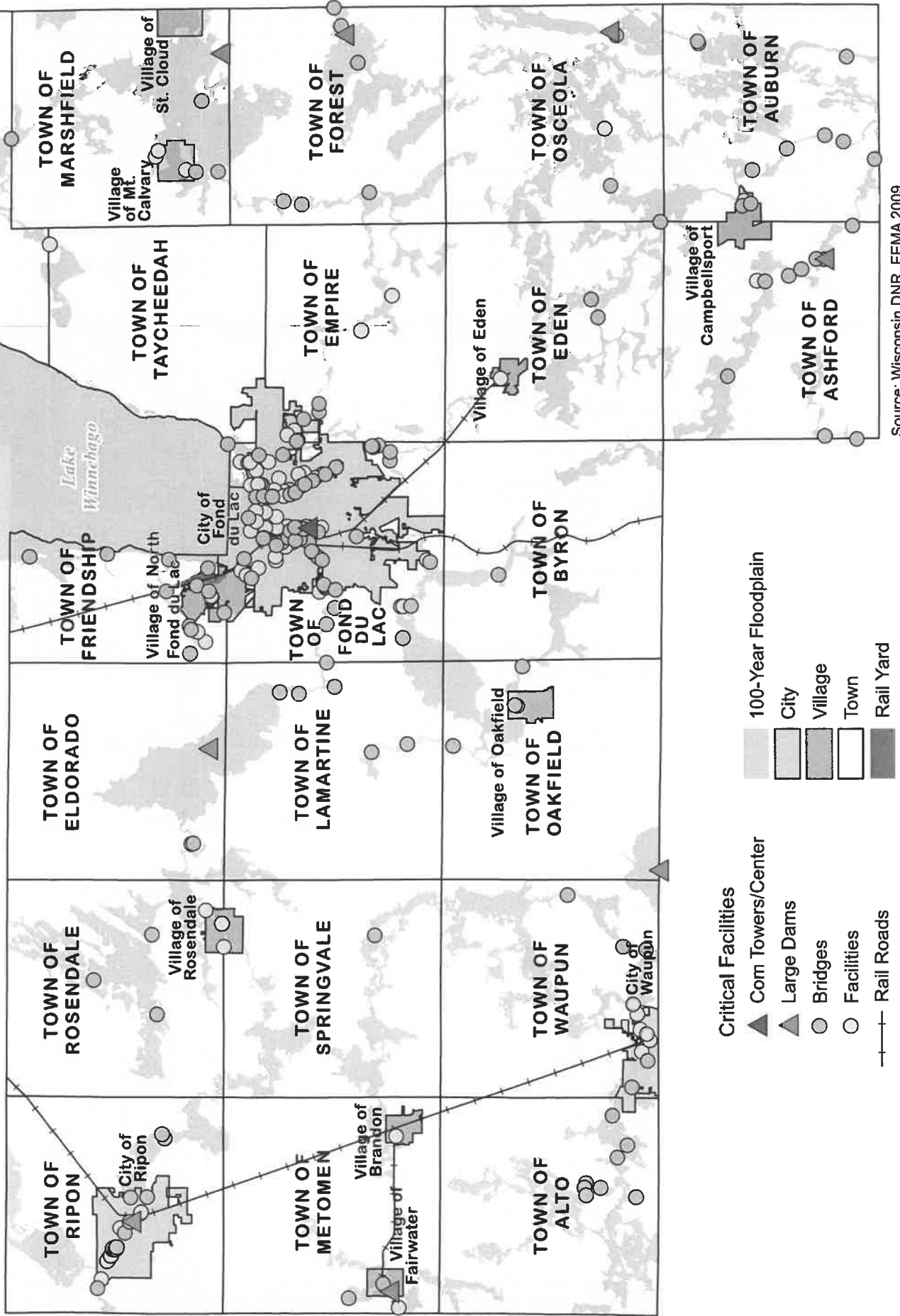
# Map 3.3: Critical Facilities Fond du Lac County, WI



Source: Wisconsin DNR



# Map 3.4: Critical Facilities within the 100-Year Floodplain Fond du Lac County, WI

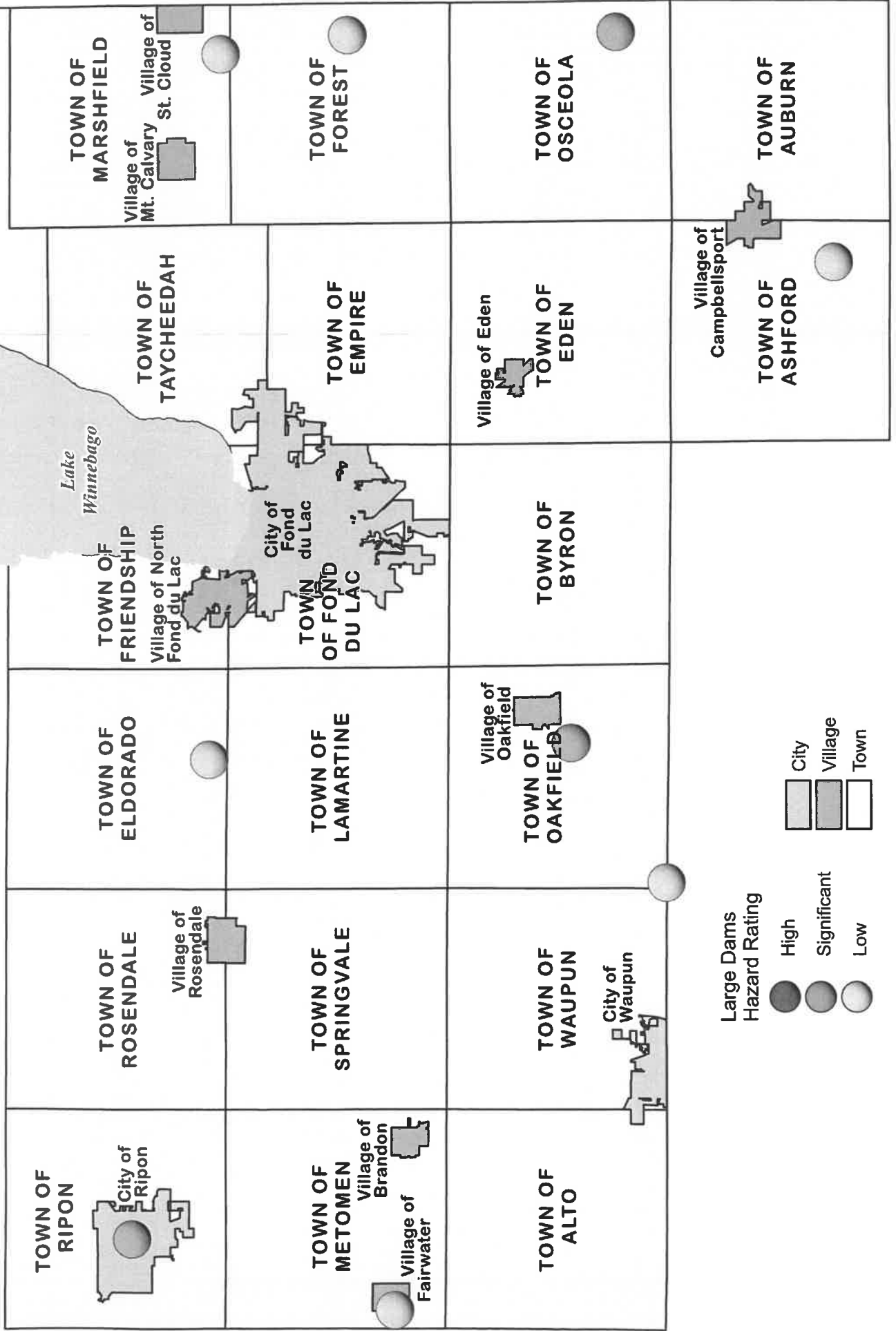


Source: Wisconsin DNR, FEMA 2009





# Map 3.5: Dams Fond du Lac County, WI



Source: Wisconsin DNR



## CHAPTER 4 - MITIGATION STRATEGY

A county mitigation strategy identifies the steps a county can take to reduce the risk from hazards. The mitigation strategy is made up of the mitigation goals, mitigation actions, and an action plan for implementation. These components provide a framework to identify, prioritize, and implement actions to reduce risk to people and property from hazards.

This chapter also identifies the mitigation strategies that have been completed for the county and resources available for mitigation.

### PLAN GOALS

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The following mitigation goals have been developed for the Fond du Lac County hazard mitigation plan. They offer general guidelines aimed at mitigating natural hazards in the county.

Goal 1: Protect the public health, safety, and welfare of people, property, and the environment during hazard events.

Goal 2: Lessen the impact of storm events to the extent feasible and speed recovery following an event.

Goal 3: Provide the public with the information they need to adequately prepare for and respond to hazards.

Goal 4: Utilize an early warning system to provide the affected public with as much advance warning as possible.

### COMPLETED MITIGATION STRATEGIES

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Two mitigation actions have been completed since the preparation of the previous hazard mitigation plan for Fond du Lac County, including acquiring NOAA weather radios for every school library and senior center, and revising local floodplain regulations to ensure that they comply with the most recent model floodplain regulations developed by the Wisconsin DNR.

### COUNTY MITIGATION RESOURCES

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Fond du Lac County has a number of authorities that enforce policies, execute programs, and provide resources that support the mitigation action plan for reducing potential losses identified in the risk assessment. These authorities have been identified under the responsible parties in the mitigation strategy tables.

Additionally, each municipality has identified an emergency manager for their jurisdiction. The local emergency manager will work with county emergency management and other identified responders during a hazard event impacting the municipality.

## **FUNDING MITIGATION**

Hazard mitigation programs and projects can be funded in a variety of ways and funding sources can come from both public and private programs, including local budgets, grants, or loan. Table 4.3 provides a list of a number of potential grant programs available to Fond du Lac County (or other entities seeking to carry out hazard mitigation actions) for funding future mitigation actions identified in this plan.

**Table 4.1: Potential Fund Programs for Mitigation**

<b>Federal</b>
EDA Public Works and Development Facilities
FEMA Assistance to Firefighters Grant
FEMA Flood Mitigation Assistance Program
FEMA Hazard Mitigation Grant Program
FEMA Pre-Disaster Mitigation Program
Pipeline and Hazardous Materials Safety Administration, Hazardous Materials Emergency Preparedness
U.S. Department of Education School Emergency Response and Crisis Management Plan Discretionary Grant Program
<b>State</b>
WDOA, Division of Housing and Intergovernmental Relations, Emergency Housing Grant Program
WDNR Volunteer Fire Assistance Grant
WDNR River Planning Grant Program
WDNR Municipal Flood Control Grant Program
WDNR Lake Planning Grant Program

## **HAZARD MITIGATION STRATEGIES**

Table 4.2-4.12 list the mitigation strategies developed for Fond du Lac County. Each table lists mitigation strategies for a specific natural hazard, the estimated costs of each project (where known), project priorities, the project timetable, and responsible parties.

The County Emergency Management Department will monitor the implementation of mitigation actions throughout the county. Completed or revised projects will be documented in future five-year updates of the county hazard mitigation plan.

A cost-benefit analysis was not prepared for any identified mitigation strategy, but will be undertaken as needed when the project is pursued.

### **STRATEGY PRIORITIZATION**

As part of the mitigation strategy, each project was prioritized by the steering committee. By consensus, the steering committee assigning a prioritization rank of “high,” “medium” or “low” to each strategy based on need, potential funding, and anticipated support for the project.

**Table 4.2: All Hazards Mitigation Strategies**

Mitigation Actions/Strategies	Cost Estimate	Priority	Timeline	Responsible Entities
<b>ALL HAZARDS</b>				
Maintain and upgrade generators	Covered within budgets and grants	High	2019-2024	Local government
Host severe weather classes for spotters and maintain a network of spotters in the county.	Existing budgets	High	On-going	County Emergency Management
Maintain partnerships with local emergency management.	Existing budgets	High	On-going	County and local Emergency Management
Update and maintain the database of critical facilities.	Existing budgets	Medium	2019-2024	County Emergency Management
Identify and pursue funding opportunities to develop and implement local and county mitigation activities.	Grants and/or existing budgets	Medium	2019-2024	County Emergency Management, and local government
Communicate with public and private schools within the county to promote hazard mitigation awareness and to develop hazard mitigation plans.	Existing budgets	Medium	On-going	County Emergency Management
Promote informational and preparedness campaigns for all hazards.	Existing budgets	Medium	On-going	County Emergency Management
Make hazard-related information and materials available to non-English speaking, and visual and hearing impaired persons.	Existing budgets	Medium	On-going	County Emergency Management
Maintain a list of shelters and update shelter evaluation assessments.	Existing budgets	Medium	On-going	American Red Cross
Promote CodeRED (for chemical spills & safety).	Existing budgets	Medium	On-going	County Emergency Management
Maintain StormReady Community status.	Existing budgets	Medium	On-going every 3 years	County Emergency Management and NWS
Post and maintain current hazard mitigation plan on the county website.	Existing budgets	Low	On-going	County Emergency Management

**Table 4.3: Tornado and Strong Wind Mitigation Strategies**

Mitigation Actions/Strategies	Cost Estimate	Priority	Timeline	Responsible Entities
<b>TORNADO AND STRONG WIND</b>				
Provide area specific tornado warnings to decrease desensitivity to inapplicable alerts.	Grants and/or existing budgets	High	2019-2024	County Emergency Management
Install storm shelters near or in existing manufactured housing communities and high occupancy campgrounds.	Grants or park owners	Medium	2019-2024	Manufactured housing communities and campground managers

**Table 4.4: Winter Storm Mitigation Strategies**

Mitigation Actions/Strategies	Cost Estimate	Priority	Timeline	Responsible Entities
<b>WINTER STORM</b>				
Provide public safety announcements.	Existing budgets	Medium	On-going	County Sheriff's Office, county and local Emergency Management, and NWS

**Table 4.5: Flooding Mitigation Strategies**

Mitigation Actions/Strategies	Cost Estimate	Priority	Timeline	Responsible Entities
<b>FLOODING</b>				
Floodproofing, as needed (including increasing culvert sizing and stream widening)	\$915,000	High	2019-2024	Local government and County Highway
Study problem areas to determine feasible and cost-effective solutions to minimize flooding along the local waterways.	Existing budgets	High	On-going	County Land Information, County Land Conservation, and local government
Acquire LiDAR (1-foot) and hydro layer.	Grants and/or existing budgets	Medium	2019-2024	County Land Information
Design and construct stormwater management facilities consistent with adopted stormwater management plans that have been or will be prepared/amended.	Existing budgets	Medium	On-going	County Land Information, County Land Conservation, and local government
Identify and analyze feasible mitigation options for those properties which are designated as a repetitive loss property.	Grants and/or existing budgets	Medium	On-going	County Land Information, County Land Conservation, and local government
Apply for funding through the federal Hazard Mitigation Grant program, Flood Mitigation Assistance Program, and the Pre-Disaster Mitigation Program as well as any other resources that may be available to help floodproof repetitive loss sites or remove them through voluntary acquisition with demolition or relocation.	Existing budgets	Medium	On-going	County Emergency Management, and local government
Maintain the database of bridges/culverts.	Existing budgets	Medium	On-going	County Highway, County Land Information, local government; and WisDOT
Identify those culverts and bridges that are undersized or are otherwise unable to handle expected flood flows.	Existing budgets	Medium	On-going	County Highway, local government, and WisDOT
Evaluate the support for and the feasibility of becoming part of the Community Rating System (CRS) to lower flood insurance premiums for property owners.	Existing budgets	Low	2019-2024	County Planning and Development Department, and local government
Address stormwater improvements for public roadways that are susceptible to flooding.	Existing budgets	Medium	On-going	County Highway and local government
Re-evaluate and update the stormwater and erosion control ordinances as may be required.	Existing budgets	Medium	On-going	County Land Conservation and local governments
Monitor National Flood Insurance Program outreach information and distribute outreach materials as available.	Existing budgets	Medium	On-going	County Emergency Management, County Land Information, and local government
Work with the owners in manufactured housing communities that are located in the 100-year floodplain to reduce the density of units and to ensure the remaining units are tied down.	Existing budgets	Medium	On-going	Local government and private owners
Initiate a study to update hydrology data of problem areas.	Grants and/or existing budgets	Low	On-going	County Planning and Development Department

**Table 4.6: Excessive Heat and Extreme Cold Mitigation Strategies**

Mitigation Actions/Strategies	Cost Estimate	Priority	Timeline	Responsible Entities
<b>EXCESSIVE HEAT AND EXTREME COLD</b>				
Review severe temperatures plan to identify procedures to implement.	Existing budgets	Medium	Annually	County Emergency Management and County Health Department
Promote informational campaigns about severe weather.	Existing budgets	Medium	On-going	County Emergency Management, County Health Department, and local media

**Table 4.7: Drought Mitigation Strategies**

Mitigation Actions/Strategies	Cost Estimate	Priority	Timeline	Responsible Entities
<b>DROUGHT</b>				
As needed, develop procedures for water distribution to those in need (during significant drought conditions).	Existing budgets	Medium	2019-2024	County Emergency Management and local government
Adopt local regulations to control the use of water during significant drought conditions.	Existing budgets	Low	2019-2024	Local government and water utilities

**Table 4.8: Hail Mitigation Strategies**

Mitigation Actions/Strategies	Cost Estimate	Priority	Timeline	Responsible Entities
<b>HAIL</b>				
Continue to educate producers on risk management strategies that minimize the economic impact of extreme weather events for crops.	Existing budgets	Low	On-going	County UW-Extension

**Table 4.9: Lightning Mitigation Strategies**

Mitigation Actions/Strategies	Cost Estimate	Priority	Timeline	Responsible Entities
<b>LIGHTNING</b>				
Provide public information about lightning safety.	Existing budgets	Low	On-going	Local media and County Emergency Management

**Table 4.10: Wildland Fire Mitigation Strategies**

Mitigation Actions/Strategies	Cost Estimate	Priority	Timeline	Responsible Entities
<b>WILDLAND FIRE</b>				
Develop and maintain ordinances to ensure that those parties conducting controlled burns are present and have the wherewithal to control and extinguish the fire, if required.	Existing budgets	Medium	2019-2024	Local government
Apply for federal and state grants to enhance the capability of local fire departments.	Existing budgets	Medium	On-going	Local fire departments

**Table 4.11: Dense Fog Mitigation Strategies**

Mitigation Actions/Strategies	Cost Estimate	Priority	Timeline	Responsible Entities
<b>DENSE FOG</b>				
Dissemination of fog advisories.	Existing budgets	Low	On-going	National Weather Service and local media

**Table 4.12: Incorporated Communities Mitigation Strategies**

Hazard Type	Mitigation Measures	Costs of Project	Responsible Parties	Project Timetable	Priority
<b>City of Fond du Lac</b>					
All Hazards	Replace all police department portable radios.	\$414,000	City	2019-2024	High
<b>City of Ripon</b>					
Flooding	Evaluation lining vs replacement of sanitary sewers to prevent sewer backups and WWTP flooding (I&I)	TBD	City	2019-2024	Medium
Flooding	Acquire two non-clogging pumps at WWTP to prevent clogged raw pumps at WWTP	\$100,000	City	2019-2024	Medium
Flooding	Acquire backup generators at four critical lift stations to prevent sewer backups	TBD	City	2019-2024	Medium
All Hazards	Acquire backup generators at Wells 5, 6 and 9 for water reliability and fire fighting	TBD	City	2019-2024	Medium
<b>City of Waupun</b>					
Flooding	Elevation projects/ floodproofing along Harris Creek.	TBD	City	2019-2024	High
<b>Village of Brandon</b>					
All Hazards	New backup generator for water plant.	\$20,000-\$25,000	Village Sewer and Water Utility	2020-2021	High
All Hazards	Acquire portable emergency backup generator to set up emergency shelter.	\$15,000	Village Emergency Management and Brandon Fairwater Fire Department	2020-2021	Medium



**Table 4-12: Incorporated Communities Mitigation Strategies (cont'd)**

Hazard Type	Mitigation Measures	Costs of Project	Responsible Parties	Project Timetable	Priority
<b>Village of Campbellsport</b>					
All Hazards	Purchase generator for Municipal Center.	\$30,000	Village	2019	High
Winter Storm	Purchase new snowplows.	\$225,000	Village Public Works Department	2021	Medium
<b>Village of Eden</b>					
All Hazards	Provide public awareness regarding chemical storage at Helena Chemical Co. for the community and the fire department.	Covered by existing budgets	Village and Fire Department	2019-2024	Low
<b>Village of Fairwater</b>					
Tornado and Strong Wind	Place NOAA radios in all homes and businesses to warn of tornadoes in the event of siren failures.	\$3,000 (for 100 units)	Village Board and Emergency Government	2019-2024	Medium
<b>Village of Mount Calvary</b>					
Winter Storm	Acquire a tractor with front end loader for moving snow from hydrants.	TBD	Village	2019-2024	Medium
<b>Village of North Fond du Lac</b>					
All Hazards	Evaluate risk and relocation of Village police, fire, EMS, administration offices, and the DPW garage associated with an incident involving the chemicals carried on the railroad.	\$30,000	Village	2019-2024	High
<b>Village of Oakfield</b>					
All Hazards	Enhance the capability of the village fire department.	Federal and State Grants	Fire Department	On-going	Medium
<b>Village of Rosendale</b>					
Flooding	Remove fallen trees in creek bed (Hill Road to Mascoutin Valley State Trail) to reduce debris during flooding conditions.	\$4,000	Village	2019-2024	Medium
<b>Village of St. Cloud</b>					
All Hazards	Acquire portable emergency backup generator.	\$40,000	Village and Fire Department	2020-2022	Medium



## CHAPTER 5 - PLAN ADOPTION AND MAINTENANCE

The Fond du Lac County hazard mitigation plan was adopted in accordance with DMA2K and follows the FEMA guidelines for local hazard mitigation plans with respect to maintaining the plan.

### PLAN ADOPTION

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The *Fond du Lac County, Wisconsin Hazard Mitigation Plan 2019-2024* was adopted by resolution by the Fond du Lac County Board on December 17, 2019. Both WEM and FEMA reviewed a final draft of the county's hazard mitigation plan prior to adoption by the Fond du Lac County Board. Comments received from WEM and FEMA were reviewed by Emergency Management and necessary revisions were made. The resolution adopting the plan can be found in the appendices. After the Fond du Lac County Board adopted the plan, it was approved by WEM and FEMA. An approval letter from FEMA/WEM can be found in the appendices.

### PLAN MAINTENANCE

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The *Fond du Lac County, Wisconsin Hazard Mitigation Plan 2019-2024* will be evaluated and updated at least every five years. The five-year plan maintenance schedule meets the requirements of DMA2K and maintains the county's eligibility for disaster assistance. All data in the plan will be updated along with the development of new mitigation strategies and an implementation plan, and will incorporate opportunities for public involvement to meet the requirements of 44 CFR Part 201.6 and/or any applicable requirements or regulations developed over the next five years. The Fond du Lac County Emergency Management Director will coordinate the five-year plan update with all municipalities, and the County Board will adopt the plan.

The plan will also be evaluated and monitored by the County Emergency Management Director on an annual basis or after a significant event (as deemed by the County Emergency Management Director). At this time, the County Emergency Management Director will track the implementation of mitigation actions and assess the effectiveness of the hazard mitigation plan at achieving goals and objectives.

A special post-disaster review may involve County Emergency Management, law enforcement, fire departments, disaster response personnel, Wisconsin Emergency Management staff, FEMA staff, affected citizens, and any other pertinent entities. Public meetings will be included with the special post-disaster review.



## APPENDIX A - COUNTY RESOLUTION OF ADOPTION

RESOLUTION NO. 72-19

### RESOLUTION ADOPTING THE FOND DU LAC COUNTY HAZARD MITIGATION PLAN: 2019-2024

**WHEREAS**, Fond du Lac County towns, villages, and cities were invited to participate in the preparation of a multijurisdictional natural hazard mitigation plan, and

**WHEREAS**, pursuant to 42 U.S.C. § 5165(b), a mitigation plan developed by a local government shall describe actions to mitigate hazards, risks, and vulnerabilities identified under the plan and establish a strategy to implement those actions, and

**WHEREAS**, along with a consultant, Fond du Lac County Emergency Management worked in partnership with the participating municipalities to prepare a final natural hazard mitigation plan in conformance with the state and federal guidelines, and

**WHEREAS**, the plan was submitted for final review and approval by the Federal Emergency Management Agency and was conditionally approved on November 1, 2019, pursuant to 44 CFR § 201.6(a)(4), which also requires each participating incorporated jurisdiction to officially adopt the plan, and

**WHEREAS**, the Public Safety Committee has reviewed the plan and recommends its adoption by the Fond du Lac County Board of Supervisors.

**NOW, THEREFORE, BE IT RESOLVED** that the Fond du Lac County Board of Supervisors hereby adopts the Fond du Lac County Hazard Mitigation Plan: 2019-2024 and authorizes the Emergency Management director to submit the plan to the appropriate local, state, and federal offices, consistent with 44 CFR § 201.6(c)(5).

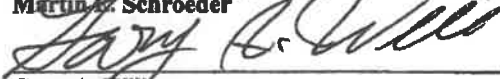
**BE IT FURTHER RESOLVED** that the Fond du Lac County Board of Supervisors authorizes the Fond du Lac County Emergency Management director to make any nonsubstantive revisions to the adopted plan that may be required.

**BE IT FURTHER RESOLVED** that the Fond du Lac County Board of Supervisors understands that, pursuant to 44 CFR § 201.6(d)(3), the plan must be reviewed and revised to reflect changes in development, progress in local mitigation efforts, and changes in priorities and must be resubmitted for approval within five years in order to continue to be eligible for mitigation project grant funding.

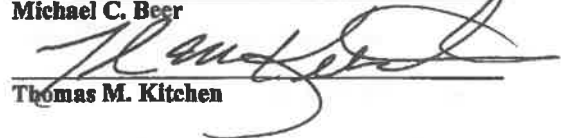
Dated December 17, 2019

**SUBMITTED BY:  
PUBLIC SAFETY COMMITTEE**

  
Martin E. Schroeder

  
Gary A. Will

  
Michael C. Beer

  
Thomas M. Kitchen

Robert J. Simon

**FISCAL NOTE:** This resolution does not require an appropriation from the county general fund.

**APPROVED BY:**

  
Allen J. Buechel  
COUNTY EXECUTIVE

**APPROVED BY:**


  
Meggin E. McNamara  
CORPORATION COUNSEL

**CERTIFICATION:** I hereby certify this to be a true and exact copy of Resolution No. 72-19.

Ayes 25 Nays 0 Abstained      Excused      Absent     

Approved and adopted this 17th day of December 2019.

Denied this      day of     .

  
Lisa Freiberg  
COUNTY CLERK

**APPENDIX B - FEMA/WEM APPROVAL LETTER**





## APPENDIX C - STEERING COMMITTEE SIGN-IN SHEETS

In order to assist in plan development, Fond du Lac County established a Hazard Mitigation Plan Steering Committee. A table listing all members of the Committee can be found in Chapter 1 - Introduction. This appendix contains the sign-in sheets from the steering committee meetings in order to verify attendance and participation by steering committee members.

November 29, 2018

Name	Business	email
Lance Thomas	Village of Oakfield	Lctofdl911@gmail.com
NICK LEONARD	Village of NFDL	nleonard@nfdl.org
Angela Kambach-Hick	CAP, LLC	
Bobbi Hickman	Fond du Lac Co Em	bobbi.hickman@fdlco.wi.gov
Jim Sutton	Mercury	jim.f.sutton@mercurymaine.com
Mike Ehrenberg	Ripon	MEhrenberg@CityofRipon.com
Lori Rich	City of Ripon	lrich@cityofripon.com
TOM JANKE	FOL CO HIGHWAY	TOM.JANKE@FDLCO.WI.GOV
ED COSTELLO	Village of EDEN	edenwvtp@gmail.com
ROBERT STEEB	ALLIANCE LAUNDRY SYSTEMS	robert.steeb@alliances.com
B.J. DeMaa	City of Waupun	bjedeman@waupunpd.org
Josh Thomas	FDL County Lead Info	josthomas@fdlco.wi.gov
William Tadych	Fond du Lac Sheriff's Office	william.tadych@fdlco.wi.gov
TERRY DEBEL	LAND INFORMATION DEPT	terry.debel@fdlco.wi.gov
Valley Dr. - (Cristal)	FOL City Em	Valley.Dr@fdlco.wi.gov



Fond du Lac County Hazard Mitigation Plan  
Steering Committee Sign-In

DATE: 10/20/18

Name	Affiliation
Bobbi Nickon	FdL Co EM
ED Costello	VILLAGE of EDEN
William Tadych	FDL CO SO
BJ DeMaa	City of Waupun EM
Shelley Brown Grubel	FdL Co EM
Lori RICH	City of Ripon
Josh Thomas	FDL Land Records
TERRY DETTEL	LAND INFORMATION
JIM SUTTON	Mercury Marine
Robert Steeb	Alliant Laundry Systems



Fond du Lac County Hazard Mitigation Plan  
Steering Committee Sign-In

DATE: FEB. 21, 2019

Name	Affiliation
Josh Thomas	Fond du Lac County GIS/Land Info
JIM SUTTON	Mercury Marine
NICK LEONARD	NORTH FOND DU LAC
THOMAS JANKE	FDL CO HIGHWAY
ED COSTELLO	VILLAGE of EDEN
Bill Tadych	FDSO
BJ DeMaa	Waupun E.M.
Bobbi Hicken	Fdl Co em
Shelley Brown-Grubel	Fdl Co EM

## APPENDIX D - CRITICAL FACILITIES BY MUNICIPALITY

The Fond du Lac County Hazard Mitigation Plan Steering Committee and municipal representatives identified critical infrastructure assets for all the communities in the county. Table C-1 below summarizes the critical facilities by municipality for Fond du Lac County. The critical facilities list is not comprehensive, but a combination of statewide and county databases, along with additions from local representatives.

**Table D.1: Critical Facilities by Municipality, Fond du Lac County**

<b>Critical Facilities by Municipality</b>	<b>Total</b>	<b>Critical Facilities by Municipality</b>	<b>Total</b>
<b>City of Fond du Lac</b>	<b>189</b>	<b>Town of Oakfield</b>	<b>8</b>
Bridge	47	Bridge	4
Communication Tower/Center	3	Dam	2
Fire department	3	Municipal facility	1
Health care facility	32	Utilities	1
Law Enforcement	4	<b>Town of Osceola</b>	<b>9</b>
Lift Station	9	Bridge	4
Manufactured Housing Community	3	Dam	1
Municipal facility	9	Municipal facility	1
Pump Station	22	School	2
School	32	Utilities	1
Utilities	25	<b>Town of Ripon</b>	<b>6</b>
<b>City of Ripon</b>	<b>42</b>	Bridge	4
Bridge	5	Law Enforcement	1
Communication Tower/Center	1	Temporary Labor Camp	1
Dam	1	<b>Town of Rosendale</b>	<b>5</b>
Fire department	1	Bridge	4
Health care facility	12	Municipal facility	1
Law Enforcement	1	<b>Town of Springvale</b>	<b>7</b>
Manufactured Housing Community	1	Bridge	5
Municipal facility	1	Municipal facility	1
School	7	Utilities	1
Temporary Labor Camp	1	<b>Town of Taycheedah</b>	<b>5</b>
Utilities	11	Bridge	3
<b>City of Waupun</b>	<b>16</b>	Municipal facility	1
Bridge	2	School	1
Health care facility	1	<b>Town of Waupun</b>	<b>22</b>
Law Enforcement	1	Bridge	18
Municipal facility	1	Municipal facility	1
School	1	School	1
Utilities	10	Utilities	2
Railroads and Yards	5	<b>Village of Brandon</b>	<b>13</b>
<b>Town of Alto</b>	<b>12</b>	Communication Tower/Center	1
Bridge	9	Fire department	1
Fire department	1	Health care facility	4
Municipal facility	1	Law Enforcement	1
Utilities	1	Municipal facility	1
<b>Town of Ashford</b>	<b>15</b>	School	1
Bridge	12	Utilities	4
Dam	1		
Manufactured Housing Community	1		
Municipal facility	1		

**Table D.1: Critical Facilities by Municipality, Fond du Lac County (cont'd)**

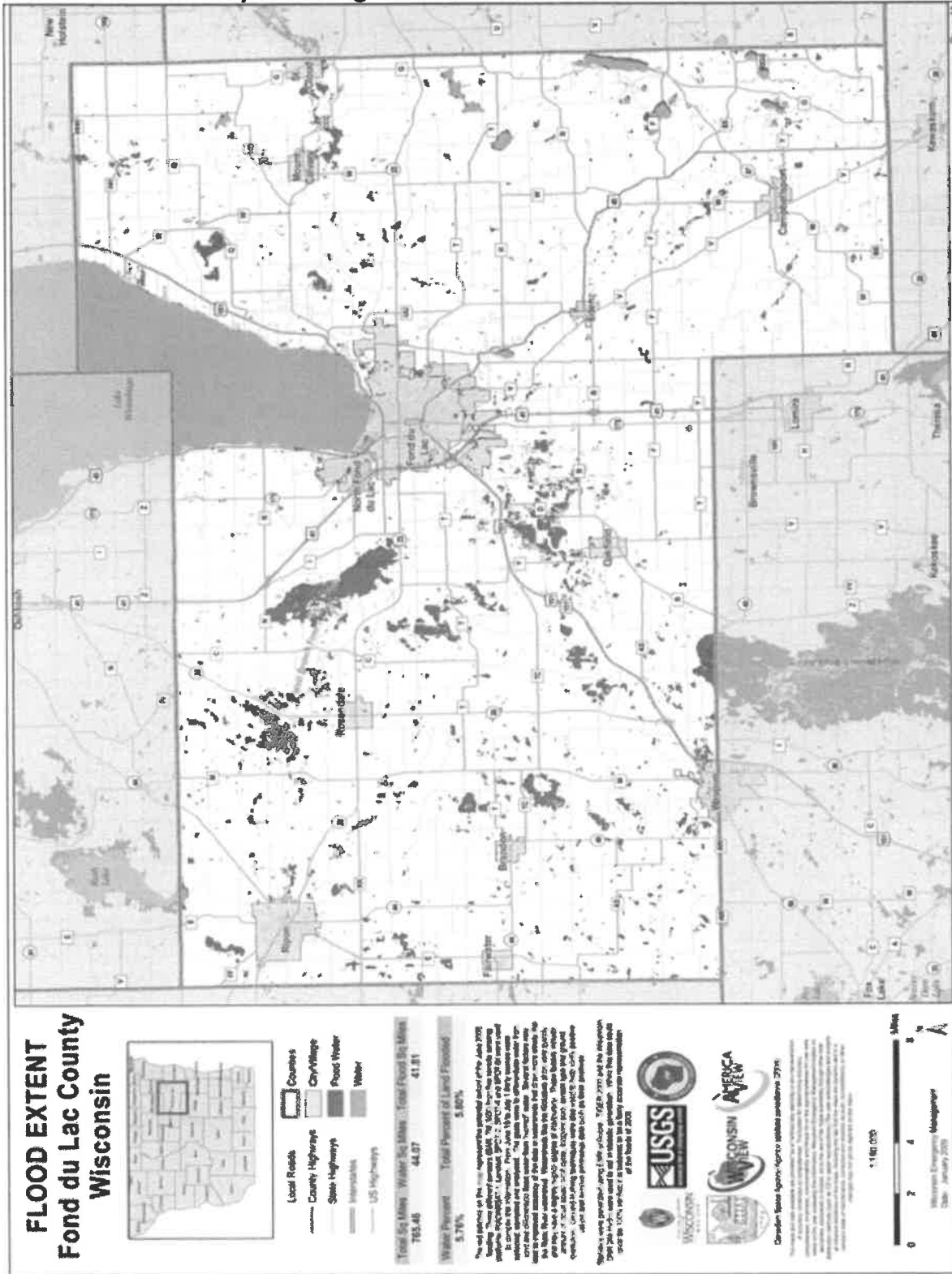
Critical Facilities by Municipality	Total	Critical Facilities by Municipality	Total
<b>Town of Auburn</b>	<b>14</b>	<b>Village of Campbellsport</b>	<b>15</b>
Bridge	12	Bridge	1
Municipal facility	1	Communication Tower/Center	1
Utilities	1	Fire department	1
<b>Town of Byron</b>	<b>12</b>	Health care facility	1
Bridge	7	Law Enforcement	1
Municipal facility	1	Manufactured Housing Community	2
Utilities	4	Municipal facility	2
<b>Town of Calumet</b>	<b>11</b>	School	3
Bridge	8	Utilities	3
Fire department	1	<b>Village of Eden</b>	<b>4</b>
Municipal facility	1	Fire department	1
Utilities	1	Manufactured Housing Community	1
<b>Town of Eden</b>	<b>8</b>	School	1
Bridge	5	Utilities	1
Health care facility	1	<b>Village of Fairwater</b>	<b>7</b>
Utilities	2	Bridge	2
<b>Town of Eldorado</b>	<b>9</b>	Dam	1
Bridge	5	Fire department	1
Communication Tower/Center	1	Utilities	3
Dam	1	<b>Village of Mt Calvary</b>	<b>8</b>
Fire department	1	Communication Tower/Center	1
Municipal facility	1	Fire department	1
<b>Town of Empire</b>	<b>7</b>	Health care facility	1
Bridge	3	Municipal facility	1
Municipal facility	1	School	1
Utilities	3	Utilities	3
<b>Town of Fond du Lac</b>	<b>63</b>	<b>Village of North Fond du Lac</b>	<b>20</b>
Airport	1	Bridge	4
Bridge	46	Health care facility	3
Fire department	2	Law Enforcement	1
Health care facility	1	Manufactured Housing Community	2
Manufactured Housing Community	1	Municipal facility	1
Municipal facility	1	School	4
School	1	Utilities	5
Utilities	10	<b>Village of Oakfield</b>	<b>12</b>
<b>Town of Forest</b>	<b>13</b>	Bridge	1
Bridge	9	Communication Tower/Center	1
Dam	1	Fire department	1
Municipal facility	1	Law Enforcement	1
School	1	Municipal facility	2
Utilities	1	School	3
		Temporary Labor Camp	1
		Utilities	2

**Table D.1: Critical Facilities by Municipality, Fond du Lac County (cont'd)**

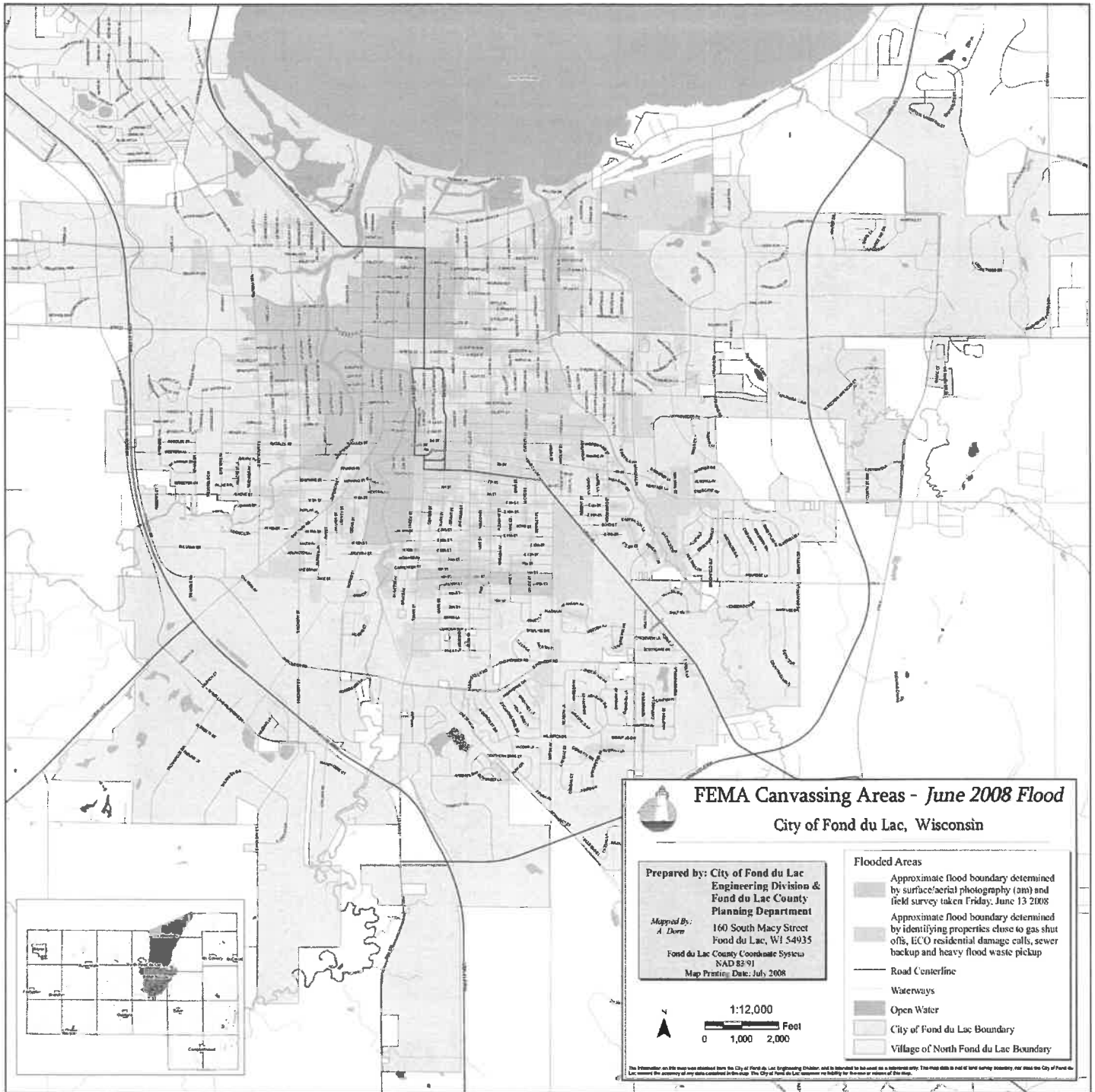
Critical Facilities by Municipality	Total	Critical Facilities by Municipality	Total
<b>Town of Friendship</b>	<b>26</b>	<b>Village of Rosendale</b>	<b>9</b>
Bridge	22	Fire department	1
Fire department	1	Health care facility	1
Manufactured Housing Community	2	Law Enforcement	1
Municipal facility	1	Municipal facility	1
Town of Lamartine	13	School	3
Bridge	11	Utilities	2
Fire department	1	<b>Village of St. Cloud</b>	<b>5</b>
Municipal facility	1	Fire department	1
<b>Town of Marshfield</b>	<b>15</b>	Municipal facility	1
Bridge	8	School	1
Dam	1	Utilities	2
Health care facility	3	Bridge	3
Municipal facility	1	Communication Tower/Center	1
Utilities	2	Municipal facility	1
Bridge	9	School	1
Fire department	1	<b>Town of Waupun</b>	<b>22</b>
Municipal facility	1	Bridge	18
School	1	Municipal facility	1
Utilities	1	School	1
<b>Town of Metomen</b>	<b>5</b>	Utilities	2
Bridge	1		
Municipal facility	1		
Temporary Labor Camp	1		
Utilities	2		

# APPENDIX E - JUNE 2008 FLOODING EXTENT

## Fond du Lac County Flooding Extent



# City of Fond du Lac Flooding Extent



Source: Dorn, A.; City of Fond du Lac Engineering Division & Fond du Lac County Planning Department; June 2008.



## APPENDIX F - PUBLIC MEETING NOTICE

### NOTICE OF PUBLIC OPEN HOUSE

*Contact:* Bobbi Hicken, Tel: (920) 929-7647

***For Immediate Release***

February 27, 2019

**Fond du Lac County Undertaking Hazard Mitigation Planning – Public Open House  
Scheduled and Draft Plan Available for Public Review**

Emergency management, response, and planning personnel from the private and public sectors in Fond du Lac County have been working together to update the county's hazard mitigation plan. The plan is being developed with funding assistance from the Federal Emergency Management Agency (FEMA).

With this plan, the county has identified mitigation actions aimed at minimizing or eliminating long-term risk to people and property from natural hazards. With the rising costs associated with hazard recovery activities, it is much more cost effective to address hazards before they occur. Additionally, a current plan qualifies the county to apply for FEMA funding to undertake pre-disaster mitigation activities.

Public input is requested on the draft plan. A public open house to present the draft plan, maps, and materials will be held **Thursday, April 4, 2019 from 6:00-7:00 PM** at the Fond du Lac City/County Government Center on the first floor in Meeting Room H at 160 South Macy Street in Fond du Lac.

# # #



**APPENDIX G - ADOPTION RESOLUTIONS FROM INCORPORATED  
COMMUNITIES**

