State of Wisconsin
Hazard Mitigation Plan

Breaking the Cycle...

...Mitigating for the Future

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EXECUTIVE SUMMARY

Millions of dollars are spent each year for disaster response and recovery. By undertaking hazard mitigation – activities which will reduce the impact of future disasters – state and local governments can reduce these costs and minimize the impact of potentially disastrous events. Hazard mitigation can also be considered disaster prevention and encourages the development of disaster resistant communities. Wisconsin Emergency Management (WEM) is the lead agency for the hazard mitigation program in Wisconsin, a key component of which is the State Hazard Mitigation Plan. The purpose of the Plan is to identify Wisconsin's major hazards, assess the vulnerability to those hazards and take steps to reduce that vulnerability using the technical and program resources of Wisconsin State agencies. The Plan strives to help protect the health, safety, property, environment and economy of Wisconsin from the effects of natural hazards. Moreover, the Federal Emergency Management Agency (FEMA) requires states to submit a hazard mitigation plan as a condition for receiving disaster assistance.

Over the past year, the State Hazard Mitigation Team with representatives from key state agencies has been meeting to develop this Plan. Team members served as points of contact for the agencies they represented. When necessary, they distributed Plan elements to key personnel in their respective agencies. Thus, the level of state involvement went beyond the members of the Team.

This version of the State Hazard Mitigation Plan is a natural hazard mitigation plan. It is the first substantive step in a long-term planning process. The Plan will continue to evolve. The State Hazard Mitigation Team will continue to meet to review, evaluate and revise the Plan. Future versions of the Plan will address technological hazards. In addition, plan elements will be updated as needed to incorporate new information about hazards that threaten Wisconsin as well as changes to agency programs that address hazards.

The Mitigation Objectives are outlined in Section 1 and were developed by the State Hazard Mitigation Team. They serve as the foundation for organizing the Agency Recommendations. The Mitigation Objectives are as follows:

<u>Mitigation Objectives</u>

1. To minimize human, economic and environmental disruption from natural hazards;
2. To enhance public education about disaster resistance and expand public awareness of natural hazards;
3. To encourage hazard mitigation planning;
4. To support intergovernmental coordination and cooperation among federal, state and local authorities regarding hazard mitigation activities; and
5. To improve the disaster resistance of buildings and structures whether new construction, expansion or renovation.

The Natural Hazard Risk and Vulnerability Assessment, Section 2, ranks the hazards that Wisconsin experiences and assesses key areas of vulnerability. Top hazards are floods, tornadoes, thunderstorms/wind and hail. Section 3 describes how Wisconsin's primary mitigation programs have been implemented. The Capability Assessment, Section 4, is a summary of state grant programs, public information programs, regulatory authorities, training programs and technical assistance that support hazard mitigation. The Capability Assessment was created using a survey instrument distributed to state agencies by the State Hazard Mitigation Team. The survey forms and a summary of the results are located in Appendix D.

The State Mitigation Recommendations, Section 5, are specific actions that state agencies will initiate in the year 2001. For example, Wisconsin Emergency Management will promote local hazard mitigation planning and raise the profile of mitigation on its Internet web page. In addition, the Department of Commerce is working to update the Wisconsin building code with a standardized code that would offer improved disaster resistance for new structures, a difficult task that is supported by the State Hazard Mitigation Team.

Section 6 details how the Plan's implementation will be monitored and reviewed as the State Hazard Mitigation Team continues to meet on a quarterly basis. Section 7 describes how the Plan will be evaluated and revised. Updates of the Plan will have new agency recommendations to further enhance state mitigation programs and refine Wisconsin's long term mitigation strategy. Other Plan elements that will be updated as necessary include the disaster history, the hazard analysis and the vulnerability assessment. The Plan updates will reflect changing conditions in Wisconsin.

The conclusion of the Plan, Section 8, acknowledges the adequacy of state hazard mitigation programs, which were tested and matured during a succession of disasters during the 1990's, especially the Great Midwest Flood of 1993. Flood mitigation programs have substantially reduced the number of flood damaged and repetitive loss properties. At the same time, many challenges remain. Basement and stormwater flooding remain common, flood insurance is widely misunderstood, and many communities' floodplain maps are out of date. A very important task will be to effectively promote local mitigation planning as disaster prevention. Community planning and development professionals should evaluate local hazards in their plans and embrace the goal of making disaster resistance a Wisconsin way of life.

Section 9 contains the signature pages for agency concurrence with the Plan. The Plan appendices contain documentation regarding Wisconsin's hazard history, mitigation programs, state and federal authorities for the Plan and other reference materials.

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PREFACE

Natural disasters threaten communities and citizens throughout the United States, with many communities vulnerable to multiple hazards such as tornadoes, floods, earthquakes and hurricanes. In the last 25 years, $140 billion has been spent in responding to disasters, with flood damages averaging $4 billion a year. Tornadoes, hurricanes, blizzards, earthquakes, drought and especially flooding have caused an increase in property damage, and interruption of business and government services during the 1990's. Natural disasters have a tremendous economic and emotional impact on government, businesses and individuals. It is estimated that after a natural disaster, 20 to 40% of the businesses impacted do not reopen and many more close within the first two years.

Wisconsin is not immune to disasters. The state has incurred disaster-related damages totaling nearly $3 billion in the last three decades, with almost half of that occurring in the '90's alone.[1] As a result, the state has received $750 million in disaster relief for local governments and individuals. The state was granted twelve Presidential Disaster Declarations in the 90's compared to only six in the 80's. The 1993 Midwest Flood was the largest and most expensive natural disaster for the state. Flood damages were estimated at $747 million with 47 of the 72 counties declared a federal disaster area. $300 million in disaster relief funds were provided to local governments and flood victims. That meant that nearly $450 million in damages was not covered by disaster assistance. Wisconsin ranks number ten in the country for the states with the most total flood damage[2] and for the amount of land annually disturbed by tornadoes[3]. It is clear that the state is vulnerable to natural disasters. Every time a natural disaster occurs it costs the state and its taxpayers money, directly and indirectly. Many disasters in the state do not warrant a federal disaster designation, which then means that the local governments, businesses and citizens must bear the total costs.

It is clear that the state cannot leave so many people vulnerable to such hazards and neither can the government or the insurance industry continue to pay such staggering costs. In recovering from disasters, not only do communities, businesses and individuals need to repair the damages; but we also need to take the necessary steps to reduce the impact of natural disasters before the next event occurs.

In order to reduce the impact of natural disasters, the state must find ways to minimize disaster losses through the implementation of mitigation programs and activities. Hazard mitigation activities are actions taken to eliminate or reduce the long-term risk to human life and property from natural hazards. Hazard mitigation is one of the four phases of emergency management along with preparedness, response and recovery. Mitigation can occur during any phase of emergency management – before, during or after a disaster. However, hazard mitigation is the one phase of emergency management that can break the repeated cycle of damage and repair. It is now estimated that for every dollar spent on mitigation, $2 to $3 can be saved in future damages. The primary purpose of hazard mitigation is to help communities become

more disaster resistant, significantly reducing the loss of lives, property damage and economic disruption.

Mitigation begins at the local level. Local governments are responsible for the actual implementation of mitigation measures within their jurisdictions. The state also recognizes that it has the responsibility to provide the necessary tools and resources to assist communities to help them succeed in their mitigation efforts. To this end the State of Wisconsin has determined that developing a State Hazard Mitigation Plan is the foundation for implementing a viable mitigation program statewide.

Wisconsin Emergency Management (WEM) with assistance from the Wisconsin State Hazard Mitigation Team presents the ***State of Wisconsin Hazard Mitigation Plan***. With the attention, cooperation, dedication and support from federal, state and local officials as well as individuals, it is hoped that this plan will be successfully implemented and will reduce the impacts of future disasters.

[1]Annual Natural Disaster Report, Wisconsin Emergency Management, dated April 3, 2000.
[2]Article dated March 20, 2000, in the Duluth News.
[3]Article dated April 10, 2000, in the Wisconsin State Journal.

SECTION 1

PURPOSE AND SCOPE

PURPOSE

The purpose of the Plan is to identify Wisconsin's major hazards, assess the vulnerability to those hazards, and take steps to reduce that vulnerability using the technical and program resources of Wisconsin State agencies. The Plan strives to help protect the health, safety, property, environment, and economy of Wisconsin from the effects of natural hazards. Moreover, FEMA requires states to submit a hazard mitigation plan as a condition for receiving disaster assistance.

SCOPE OF THE STATE HAZARD MITIGATION PLAN

The State Hazard Mitigation Plan is a natural hazard mitigation plan. Technological hazards are not assessed in this first version of the Plan. However, technological hazards are an important part of emergency management and may be addressed in future updates of the Plan. The Plan assesses hazard risk, reviews current state level hazard mitigation capabilities, develops mitigation strategies and identifies state agency actions to address mitigation needs. The Plan does not attempt to develop local mitigation projects. As a home rule state, the state respects the right of communities to implement specific mitigation actions that best serve them. The Plan identifies existing resources to assist local governments in their mitigation efforts and develops new tools to further mitigation at the local level. This is accomplished by establishing statewide mitigation policies, providing technical resources through state agency staff expertise and support, providing financial assistance through various programs, training and education and other agency initiatives. The Plan includes a list of potential local mitigation projects in Appendix F. This list was developed based on previous mitigation applications submitted to the state. These projects have not been implemented because they lacked sufficient funding, they were not cost effective, or because the projects did not meet the state's mitigation priorities at the time they were submitted.

The State Hazard Mitigation Team recognizes that its first objective is to protect public health and safety by helping to prevent future disaster losses. At the state level, this can be accomplished through agency actions that improve existing hazard mitigation programs, encourage state and local hazard mitigation planning, enhance the public's hazard awareness, support intergovernmental coordination and promote strong, disaster resistant buildings. These are the methods of action available to state agencies to reduce future disaster losses and they form the objectives of the Plan.

<u>Mitigation Plan Objectives</u>

1. To minimize human, economic and environmental disruption from natural hazards;
2. To enhance public education about disaster resistance and expand public awareness of natural hazards;
3. To encourage hazard mitigation planning;
4. To support intergovernmental coordination and cooperation among federal, state and local authorities regarding hazard mitigation activities; and

5. To improve the disaster resistance of buildings and structures whether new construction, expansion or renovation.

OVERVIEW OF THE PLANNING PROCESS

The State Hazard Mitigation Plan is a multi-agency effort with the Department of Military Affairs, Wisconsin Emergency Management (WEM) serving as the lead agency for the planning process. Key state agencies were invited by WEM to appoint one or more persons to serve as members of the State Hazard Mitigation Team (SHMT) and as the point of contact liaison for other program personnel in their agency. The members of the SHMT met and corresponded regularly to discuss and prepare elements of the Plan. In addition, all elements of the Plan were reviewed and, where appropriate, approved by team members.

THE STATE HAZARD MITIGATION TEAM

The State Hazard Mitigation Team is comprised of representatives from the following Wisconsin State agencies:

- Department of Administration
- Department of Agriculture, Trade and Consumer Protection
- Department of Commerce
- Department of Health and Family Services
- Department of Military Affairs
- Department of Natural Resources
- Department of Transportation
- Office of the Commissioner of Insurance
- Public Service Commission of Wisconsin
- State Historical Society
- University of Wisconsin-Cooperative Extension
- Wisconsin Emergency Management

The State Mitigation Recommendations in this Plan were based on the experience of SHMT members and were developed through discussions during Team meetings. Each year the State Hazard Mitigation Team will identify additional actions that their respective agencies can undertake to support hazard mitigation in Wisconsin and that will support the five mitigation objectives listed above. Section 2 ranks Wisconsin's natural hazards by risk and assesses where and how Wisconsin is vulnerable to natural hazards.

SECTION 2

NATURAL HAZARD RISK AND VULNERABILITY ASSESSMENT

This section summarizes the natural hazards that face Wisconsin and tries to identify where the state is most vulnerable. The natural hazards are compared and ranked by risk. Hazard vulnerabilities are assessed and summarized based on disaster history and state emergency management experience. Additional description of Wisconsin hazards can be found in the Annual Disaster Report in Appendix A, the Wisconsin Hazard Analysis in Appendix B and the History of Wisconsin's Federal Disaster Declarations in Appendix C.

COSTS OF DISASTERS IN WISCONSIN

Between 1971 and the end of 2000 Wisconsin has had 24 presidential disaster declarations, 4 federally declared emergencies, and 15 major incidents where federal disaster assistance was requested and denied. The total estimated damages of these 43 events were $2,903,630,039. However, it must be noted this amount significantly underestimates the sum of all losses in Wisconsin from natural hazards. Almost every year there are significant weather events causing millions of dollars of damage for which no federal disaster assistance was requested. Thus, losses from hazards in Wisconsin are significantly greater than this $2.9 billion estimate.

If disaster damages exceed the capabilities of local communities and state agencies, federal assistance will be requested. Federal disaster assistance may be offered through a variety of programs. Assistance may be directed to agricultural producers, individuals and families, businesses or local governments. The following table provides a summary of estimated damages and public assistance by decade from disasters and emergencies in Wisconsin, both Presidential declarations and non-declared, from 1971 through 2000.

Summary of Estimated Disaster Damages and Assistance in Wisconsin 1971-2000

Decade	Estimated Damages			State and Federal Assistance		
	Public Damages (1,000)	Private Damages (1,000)	Total Damages (1,000)	Public Assistance (1,000)	Individual Assistance (1,000)	Total Assistance (1,000)
1971-1979	$62,921	$1,133,463	$1,196,384	$25,703	$269,748	$295,451
1980-1989	$26,733	$243,060	$269,793	$10,771	$26,247	$37,017
1990-1999	$135,089	$1,236,665	$1,371,754	$77,181	$344,950	$422,131
2000	$38,656	$27,042	$65,698	$10,740	$12,319	$23,059
Total	**$263,399**	**$2,640,230**	**$2,903,630**	**$124,395**	**$653,264**	**$777,658**

Source: Wisconsin Emergency Management.

It is worth noting that the $777,658,000 in state and federal assistance that was provided to Wisconsin communities, businesses, individuals and farmers during this period is only 26.8% of the total estimated damages of $2,903,630,039. However, an undetermined amount of damages may have been covered by insurance. It is also worth noting that the amount of estimated losses from major events has been

increasing rapidly in the public sector. There were over $135 million in hazard-related damages and expenses to Wisconsin local and state governments in the 1990's alone. This is 150% more than the previous two decades combined. The severity of the 1993 Midwest flood disaster is the largest single reason for this increase; although it is also true that the decade of the 1990's was an unusually active one for natural disasters in Wisconsin. Another possible reason for the increase in damage estimates may be improvements in how local community and county officials report damages to state emergency management. However, there is no doubt Wisconsin is experiencing high rates of loss due to natural hazards. In the third quarter of 2000 Wisconsin had the second highest amount of insured losses ($50 million) of any state in the country due to thunderstorm-related events in early July (*Emergency Preparedness News* , November 7, 2000, p. 206).

WHAT ARE TYPICAL WISCONSIN DISASTERS?

In Wisconsin Emergency Management's disaster records there are 43 major events for which federal disaster assistance was requested. The causes of each of these disaster events are listed in the Annual Disaster Report in Appendix A of this Plan. Many disaster events are compound in nature and not the result of a single event. The following is a list of hazards and the number of times they have been mentioned as a contributing cause for a disaster:

Disaster History

Hazard	Number of times mentioned as a cause for disaster
Flooding	19 times
Tornadoes	14 times
Severe Storms	14 times
High Winds	5 times
Hail	3 times
Drought	2 times
Heavy Rains	2 times
Forest Fires	2 times
Winter Storms (snow and ice)	2 times
Frost	1 time
Insect Infestation (Farms)	1 time

Source: Wisconsin Emergency Management, Annual Disaster Report, 2000.

The causes of disasters of the past will likely be the best predictor of future disasters. However, general weather hazard data can also be instructive. The National Weather Service (NWS) is a good source for Wisconsin weather data. The NWS has identified the following additional weather-related hazards as potential threats to Wisconsin: Temperature extremes, lightning, hail, coastal storms and erosion, fog and dust storms. While none of these additional hazards has, by themselves, caused a disaster, each of these hazards can be a threat to public safety or cause property damage.

Major indicators of hazard severity are the deaths, injuries and economic losses resulting from natural hazards and disasters. The National Oceanic and Atmospheric

Administration's (NOAA) National Climatic Data Center (NCDC) publishes NWS data describing recorded weather events and resulting deaths, injuries and damages. Since 1993, Wisconsin has experienced the following:

Wisconsin Weather Hazards 01/01/1993 to 06/30/2000 (Sorted by number of events)

Weather Hazard	Events	Deaths	Injuries	Property Damage (1,000)	Crop Damage (1,000)
Thunderstorm & High Wind	2261	14	170	138,002	17,477
Flood	396	4	15	315,931	227,499
Lightning	318	6	65	11,649	115
Tornado	298	1	69	85,657	11,193
Snow & Ice	253	2	47	771	0
Extreme Heat	70	97	86	30	0
Fog	35	0	0	0	0
Hail	31	0	38	122,394	6,453
Precipitation	14	0	0	82	0
Wildfire or Forest Fire	3	0	0	125	0
Coastal Storms	2	0	0	0	0
Drought	1	0	0	0	0
Dust Storm	0	0	0	0	0

Source: National Oceanic and Atmospheric Administration's National Climatic Data Center http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms.

The NWS data shows that thunderstorms are the most frequent weather hazard, floods are the most damaging weather hazard and extreme heat is the most deadly weather hazard over the last seven years. It is noteworthy that hail is the third most damaging weather hazard after floods and thunderstorms in the data set. In addition, it should be acknowledged that weather events are often complex and damages may occur from multiple hazards, such as when hail, rain, wind and tornadoes strike during a single storm.

Another source of data regarding natural hazards in Wisconsin is historical records of major or catastrophic events. The above data for the NCDC has a time frame of only seven years. However, some types of severe weather hazards are occasional to rare. Over the history of the State of Wisconsin there have been a number of deadly and disastrous events. The table on the following page describes the compiled chronological history of natural disasters resulting in high mortality (more than 5 deaths).

Deadliest Wisconsin Disasters

Location – Event	Year	Lives Lost
Viroqua Tornado*	1865	22
Pestigo Fire #	1871	800
Grant County Tornado~	1876	9
Iowa, Dane, Milwaukee, Waukesha County Tornado~	1878	19
Buffalo County Tornado~	1881	12
Racine County Tornado~	1883	25
Eau Claire, Clark, Marathon, Lincoln, Langlade County Tornado~	1898	17
New Richmond Tornado*	1899	117
Clark, Jackson, and Juneau County Tornado~	1907	26
Rock County Tornado*	1911	9
Lone Rock Tornado*	1918	8
Barron, Rusk, Bayfield, Sawyer, Ashland County Tornado~	1924	10
Pierce and Iron County Tornado~	1929	12
Berlin Tornado*	1956	7
Dunn County (Colfax) and Chippewa County Tornadoes*	1958	28
Barneveld (Iowa County) Tornado*	1984	9
Summer 1995 Heat Waves**	1995	88
Summer 1999 Heat Waves**	1999	11

Sources:
* http://members.nbci.com/_XOOM/jbiehl/peshtigo/peshtigo.html
\# http://www.wx-fx.com/tornado.htm
~ http://www.crh.noaa.gov/mkx/tordeaths.htm
** http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms (Data describing mortality due to temperature extremes has only recently been collected).

What is striking about this data in the absence of high mortality for wildfires in the 20th century compared to the catastrophic Peshtigo Fire in 1871, the gradual decline of high mortality for tornadoes, and the sudden appearance of temperature extremes as a cause for mortality. The adoption of fire codes and development of fire fighting organizations are probably responsible for the decrease in wildfire mortality (house fires, however, still claim an average of 6.8 lives a year in Wisconsin (United States Fire Administration, http://www.usfa.fema.gov/nfdc/profiles.htm). Improved weather forecasting and warning systems as well as stronger building codes help explain why tornado mortality has decreased over time, although tornadoes remain a very serious threat to human life. The sudden emergence of temperature extremes as a cause for mortality is most likely due to a combination of improved record keeping by health organizations and the longer life expectancy of individuals. Mortality from heat waves affects the elderly disproportionately. During the 1995 heat wave 73% of those who died nationwide were 60 years of age or older.

RANKING SEVERITY OF NATURAL HAZARDS

There are several ways the severity of weather hazards can be ranked. Earlier in this section the historical causes of federally declared disasters were listed. While these natural hazards are likely to be the cause of future disasters, the method of analysis is

not very informative. Therefore, natural hazards were also examined with respect to their frequency, the amount of damage and death and injuries they caused. For ranking purposes property damage and mortality will be examined in more detail. Using the data supplied by NOAA's National Climatic Data Center for Wisconsin from January 1, 1993, to July 1, 2000, and ranking natural hazards by the amount of property damage they caused, the following table would result:

Ranking Scenario 1
Wisconsin Weather Hazards Ranked by Property Damage 1/1/1993 - 6/30/2000

Weather Hazard	Rank	Property Damage (1,000)	Crop Damage (1,000)	Events	
Flood	1	315,931	227,499	396	
Thunderstorm & High Wind	2	138,002	17,477	2261	
Tornado	3	85,657	11,193	298	
Hail	4	48,820	5,625	31	
Lightning	5	11,649	115	318	
Snow & Ice	6	771	0	253	
Wildfire or Forest Fire	7	125	0	3	
Precipitation	8	82	0	14	
Temperature Extremes	9	30	0	70	
Fog	10	0	0	37	
Coastal Storms	11	0	0	2	
Drought	**12**	**0**	**0**	**1**	⇐ Ranked too low?
Dust Storm	13	0	0	0	

Source: National Oceanic and Atmospheric Administration's National Climatic Data Center
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms

Due to the importance of agriculture to the Wisconsin economy and the potential for large crop losses because of drought, drought should be ranked higher. Wisconsin Emergency Management's Annual Disaster Report, located in Appendix A of this plan, shows that the 1976 drought resulted in crop and property losses estimated at $624 million. This is nearly the highest amount of estimated damages in Wisconsin's disaster history, second only to the 1993 flood disaster. Severe droughts may only happen on average every 25 or 50 years, so a ranking system that looks at only seven years of data will skew the results in favor of more frequent, lower intensity events and de-emphasize less frequent, higher intensity events. The 1976 drought proves that while severe droughts are rare, they are devastating to agriculture and very damaging to the state's economy.

Another way to assess the vulnerability of Wisconsin to natural hazards is to examine the loss of life they cause. Again, using the data supplied by NOAA's National Climatic Data Center for Wisconsin from January 1, 1993, to July 1, 2000, and ranking natural hazards by the number of deaths they caused, the following table would result:

Ranking Scenario 2

Wisconsin Weather Hazards Ranked by Mortality 1/1/1993 - 6/30/2000

Weather Hazard	Rank	Deaths	Injuries	Events	
Excessive Heat	1	97	86	70	
Thunderstorm & High Wind	2	14	170	2261	
Lightning	3	6	65	318	
Flood	4	4	15	396	
Snow & Ice	5	2	47	253	
Tornado	**6**	**1**	**69**	**298**	⇐ Ranked too low?
Hail	7	0	34	31	
Precipitation	9	0	0	12	
Wildfire or Forest Fire	8	0	0	3	
Fog	10	0	0	37	
Coastal Storms	11	0	0	2	
Drought	12	0	0	1	
Dust Storm	13	0	0	0	

Source: National Oceanic and Atmospheric Administration's National Climatic Data Center
http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms

The problem with this ranking scenario is the short time frame from which the data is drawn. When compared to the long-term history of deadly disasters in Wisconsin described in the previous table, this ranking scenario simply does not rank tornadoes high enough. Even as recently as 1984 the Barneveld tornado resulted in 9 deaths, 200 injuries, $40 million in damages and left 500 homeless in a town of only 607 people. Due to the high probability that a similar storm will occur in the future, possibly in a more populated area, should place tornadoes near the top of the hazard rankings in terms of mortality. It is arguable that tornadoes are on a par with thunderstorms and high wind in terms of life and safety risk. Tornadoes are similar in effect to thunderstorms and high wind, only tornadoes are more powerful but also more compact and less frequent.

Another potential issue is whether the hazard ranking reflects public health concerns for which mitigation is possible. For example, the vulnerability to hazards such as extreme heat and lightning are very much a matter of personal exposure. Mitigation in the traditional sense (strengthening a structure or moving a structure away from the hazard) is of little use for these hazards. Neither are extreme heat and lightning an emergency management issue in terms of operations. Reducing the risk of mortality from lightning or temperature extremes requires public health information and hazard awareness so that individuals take precautions to limit their exposure to the hazard. While hazard awareness and public safety information are important for any type of hazard, it is especially important for hazards such as temperature extremes, lightning, fog, and dust storms.

RANKING SUMMARY

Clearly, hazard severity can be assessed and ranked in a variety of ways. The purpose of ranking hazards is to help set priorities and direct more resources to address those hazards of the greatest severity. However, the kinds of mitigation actions that will be

needed and warranted depend on the type of vulnerability to be addressed. Some hazards, such as excessive heat and lightning are unlikely to cause a disaster, but they can be fatal and therefore are serious hazards. Vulnerability to such hazards can best be addressed by preventative measures such as public information to encourage hazard awareness and personal protection. Other hazards such as flooding are pervasive and devastating, and may require a variety of tools – mapping, building codes, zoning laws, insurance, elevation or acquisition of flood prone structures and public awareness – to effectively reduce the risk of disaster. However, flooding might not result in more fatalities than a heat wave. In general, ranking hazards by the number of deaths that they cause shifts the focus away from major and largely avoidable disasters such as floods. Weather hazards that have caused past Wisconsin disasters, are probably the hazards that will cause future disasters. However, the types of natural hazards that result in fatalities remain a public health and safety concern.

VULNERABILITY ASSESSMENT

In the preceding pages natural hazards have been ranked by severity both in terms of risk to life and in terms of risk to property. Additional background information on hazards in Wisconsin is available in the State of Wisconsin Hazard Analysis in Appendix B of this document. In this vulnerability assessment the focus will be on what is most vulnerable to these hazards and where these vulnerabilities exist, thereby pointing to mitigation strategies that address these vulnerabilities.

Vulnerability, however, is not easy to quantify. Some hazards are extremely variable in how and where they strike. In an ideal world hazard information would have been collected in great detail for many years, put into a digital format, and geo-referenced to allow for easy access and thorough analysis. Unfortunately, this is not the case and even if it were, most specific mitigation needs (this repetitively damaged house, this vulnerable bridge) would have to be addressed at the local level. However, the State of Wisconsin remains charged with the responsibility of presenting a clear summary of how and where the state is vulnerable to its hazards and articulating a strategy to mitigate the most serious of these hazards. Wisconsin's hazard history is discussed in greater detail in the Hazard Analysis in Appendix B and in the Disaster Declaration History in Appendix C. Therefore, this section will examine vulnerabilities and weaknesses in how Wisconsin addresses risks for each major natural hazard, and suggest strategies for mitigation of these hazards.

VULNERABILITIES AND STRATEGIES FOR THE TOP FIVE HAZARDS CAUSING PROPERTY DAMAGE

Wisconsin's five most disruptive and costly natural hazards are flooding, tornadoes, thunderstorms with high winds, hail, and heavy rain. The following pages describe where major Wisconsin hazards tend to occur, what human activities can increase the hazard risk, and what reasonable strategies for addressing each hazard may be.

Priorities, Vulnerabilities and Strategies for Hazards that Result in Disasters

1. Flooding: Wisconsin can experience flooding in any county and in any city. One great misunderstanding is the belief that floods only happen in the floodplain. With sufficient rain almost any area will experience at least pockets of surface flooding or overland flooding. In addition, heavy rain in urbanized areas with extensive paved and impervious surfaces can easily overwhelm stormwater facilities resulting in localized flooding, basement flooding and sewer back up. Overland flooding in rural areas can result in erosion, washouts, road damage and loss of crops. Basements are especially vulnerable to flooding and subject to intense hydrologic pressure when the surrounding soil is saturated. A great deal of flood damage in Wisconsin is a result of basement flooding.

Areas of Special Vulnerability – Riverine Flooding: Riverine flooding is the most common and can be the most powerful of flood events. Every river, stream and creek can potentially flood. The maps on the following pages 10 and 11 delineate major rivers and major river basins or watersheds in Wisconsin. Metropolitan areas are highlighted in gray on both maps. A third map on page 12 shows the distribution of flood-related emergencies and disasters by county.

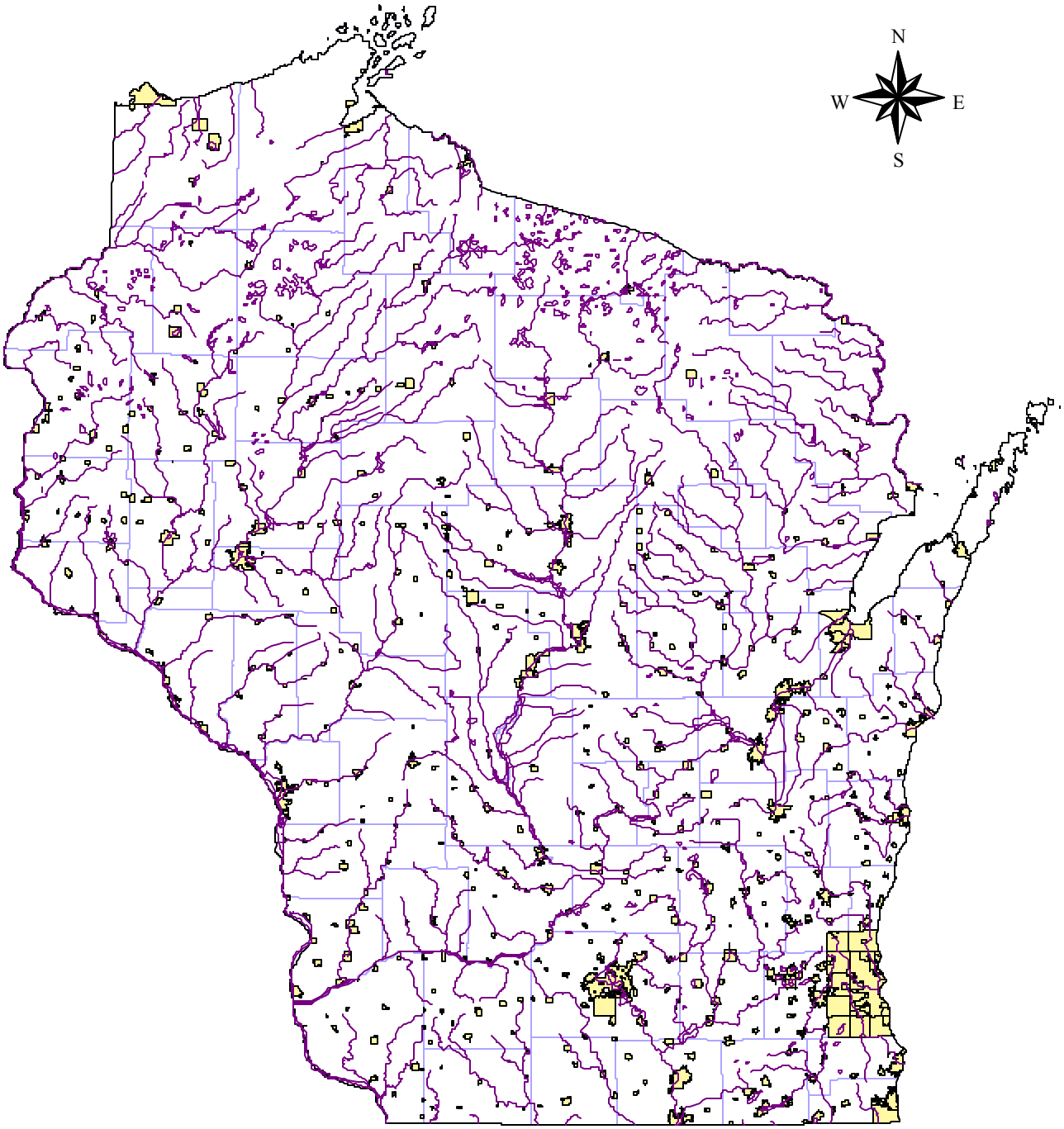
Stormwater and Overland Flooding: Stormwater flooding is a growing problem in every urban area. If 6" of rain falls on just 2,000 square feet of roof and concrete, about the size of a typical urban roof, driveway and garage, 1,000 square feet of stormwater will run off from that single home. Development not only creates more impervious surfaces; but it also changes natural drainage by altering natural contours by grading and filling, sometimes creating unexpected stormwater flooding during heavy rains.

Areas of Special Vulnerability-Stormwater Flooding: Almost any settled area can have a stormwater problem; but given that the intensity of development tends to increase stormwater flooding, it is not surprising that large and developed metropolitan areas have the most serious stormwater problems. In addition to causing erosion and flood damage, stormwater contributes to water pollution by carrying silt, oil, fertilizers, pesticides and waste into streams, rivers and lakes. In a few older urban areas stormwater and sanitary sewers are combined, resulting in additional water pollution when extreme rain events lead to diluted releases of sewage into waterways.

Strategies for Reducing Flood Vulnerability:

- Encourage flood mitigation: Acquire and demolish structures repetitively damaged by floods or, if possible, flood-proof vulnerable or critical structures;
- Promote floodplain management including strong enforcement of zoning and development ordinances;
- Promote the mapping of floodplains and other flood problem areas such as stormwater problem areas;
- Encourage community participation in the NFIP and the Community Rating System;
- Promote concepts of building a disaster resistant community;
- Promote flood insurance for homes and businesses including sewer back-up riders available for homeowners' insurance policies;
- Reduce stormwater inputs into city sanitary sewer systems;
- Maintain stormwater facilities and keep storm creeks clear of debris;
- Promote low cost measures to reduce basement flooding such as back-flow valves; and
- Encourage the use of green space around creeks, streams, marshes, drainage areas, and known floodplains to minimize local flood damage and reduce the downstream impact of local flooding.

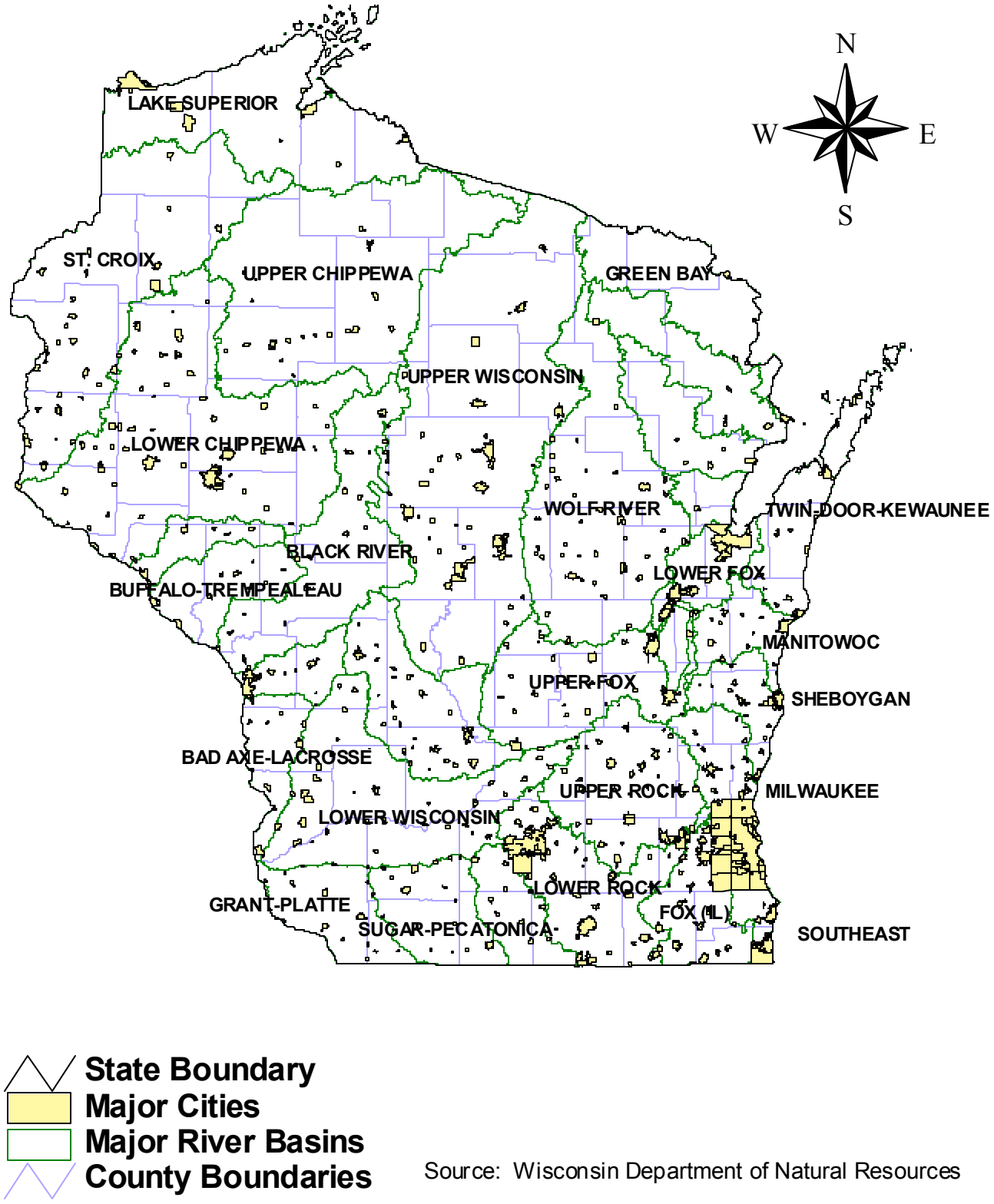
Major Rivers in Wisconsin



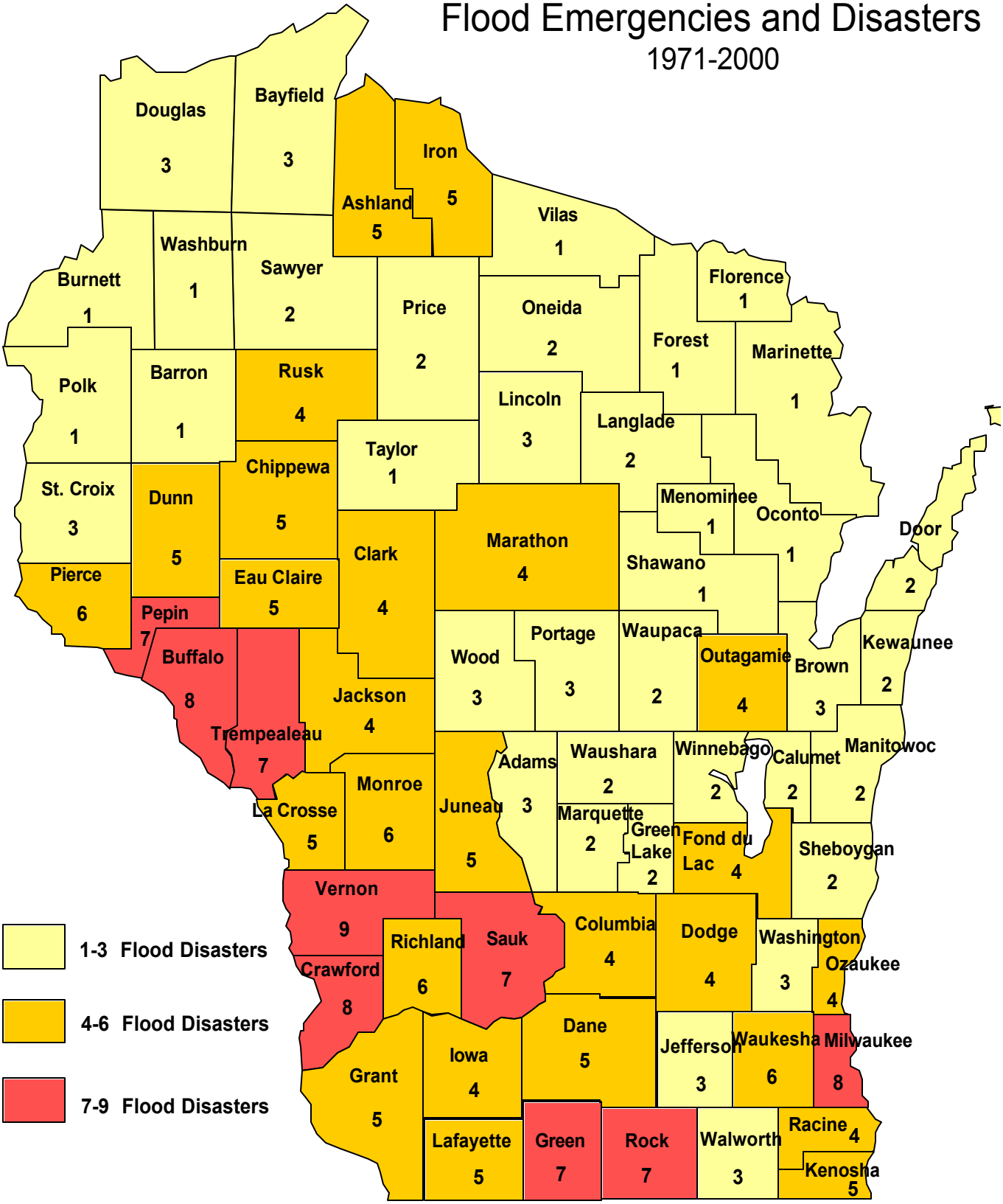
Hydrology (Major Rivers)
State Boundary
Major Cities
County Boundaries

Source: Wisconsin Department of Natural Resources

Major River Basins in Wisconsin



Source: Wisconsin Department of Natural Resources



Source: Wisconsin Emergency Management

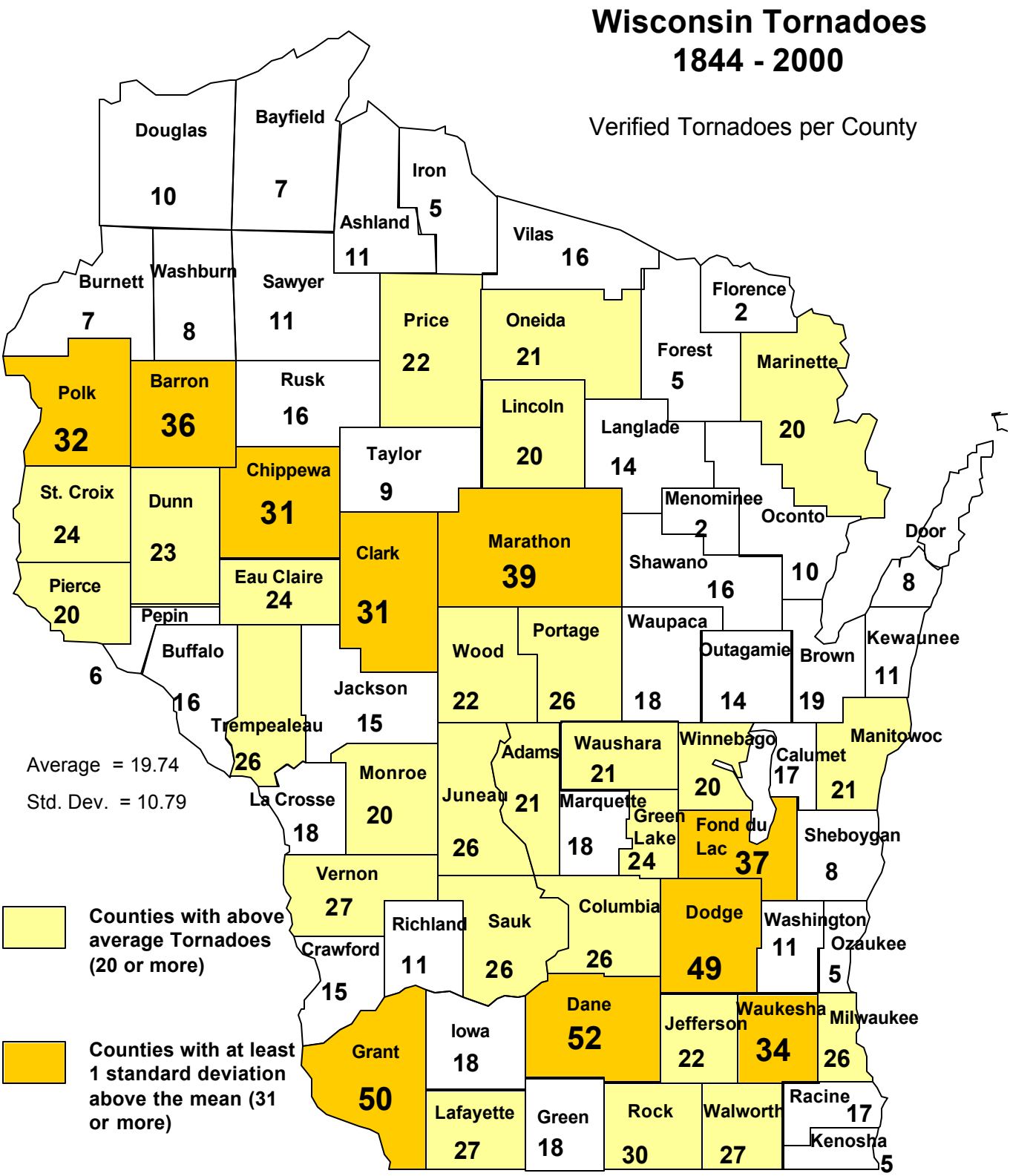
2. Tornadoes: A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. In Wisconsin, tornadoes usually accompany thunderstorms that form as eastward-moving cold fronts strike warm moist air streaming up from the south. Occasionally, multiple outbreaks of tornadoes occur with this type of weather pattern, affecting large areas of the state at one time.

It is possible to predict that a line of thunderstorms is likely to produce tornadoes, but it is not possible to predict well in advance exactly where a tornado will form, where a tornado will touch down or how powerful it may be. Tornadoes may come with very little warning and so any warning should be heeded and any threat acted upon immediately. The first consideration is personal safety. Even an F-1 category tornado that accounts for 40% of all tornadoes nationally is powerful enough to overturn cars, uproot trees and demolish garages. An F-2 tornado, 24% of all tornadoes nationally, can blow the roofs off homes and overturn mobile homes.

Areas of Special Vulnerability: Tornadoes can occur anywhere in Wisconsin and on average there are about 21 tornadoes in the state each year. The map on page 14 displays the distribution of verified tornadoes from 1844 – 1999. This map shows every county has had at least two verified tornadoes and as many as 52. The three counties with the most verified tornadoes are Dane, Grant and Dodge Counties in Southern Wisconsin. In addition, Polk, Barron, Chippewa, Clark and Marathon Counties form a band of counties extending from the Mississippi River into the north-central part of Wisconsin that also have had occurrences of tornadoes significantly above average. However, it should be noted that some of the most devastating tornadoes in Wisconsin's history have occurred in Iowa (Barneveld) and Green Lake (City of Berlin) Counties, which have had slightly below average numbers of tornadoes historically.

Strategies for Reducing Tornado Vulnerability: Taking shelter is the most immediate concern during a tornado. Therefore, warning systems and adequate shelter are very important. For personal safety, the best shelter is a specifically designed tornado shelter or safe room. Lacking such a shelter, taking refuge in a basement near supporting walls or pillars and away from windows is the next best option. If there is no basement, a smaller interior windowless room such as a hallway or closet can offer some protection. Cars, mobile homes, garages and outbuildings are not safe shelter from tornadoes. Strategies for reducing tornado vulnerability include:

- Promote use of NOAA weather radios to help provide timely tornado warnings;
- Ensure building code compliance through building inspections;
- Assess the ability of essential facilities to provide adequate shelter from tornadoes;
- Promote retrofits in essential facilities that are found to offer inadequate protection;
- Securely anchor mobile and manufactured housing;
- Adopt a standardized building code with improved wind resistance;
- Install laminated glass in essential facilities to avoid wind blown projectiles from entering the building; and
- Encourage safe rooms and shelters in new construction.



Source: Rusty Kapela, National Weather Service

3. Thunderstorms and High Winds: Thunderstorms are the most common of severe weather events and can produce tornadoes, severe wind, hail, lightning and flooding rain. High-velocity, straight-line winds produced by thunderstorms are the third most destructive natural hazard in Wisconsin. Distinct from tornadoes, straight-line winds produced by thunderstorms can be very powerful and are fairly common. According to the National Climatic Data Center from 1/1/1993 to 12/31/2000 there have been 87 areas of the state that experienced events with winds over 70 knots (80.5 mph) (http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms). The high winds produced by thunderstorms can cause damage similar to a tornado. Most vulnerable are crops, trees, utility lines, roofs, garages, garage doors, mobile homes, sheds and other outbuildings. Boats and airplanes are also extremely vulnerable to damage from high winds. In addition, blown down timber can block roads, knock down power and telephone utility lines and become a long-term fire hazard.

Areas of Vulnerability to High Winds: Every county in Wisconsin is subject to high winds from thunderstorms. The damage caused by these winds can be severe and affect large areas of the state at a time.

Strategies for Reducing Vulnerability to High Winds:
High wind events associated with thunderstorms are very similar to tornadoes, except they are more common and usually less powerful than tornadoes. Thus, the strategies for tornadoes would also apply to thunderstorms and high winds. In addition to those strategies the following strategies are suggested:

- Maintain public awareness of the potential severity of thunderstorms;
- Promote strong construction methods that employ cross bracing, anchoring of walls to foundation and anchoring roof rafters to walls (also mitigates tornado risk);
- Promote wind protection and retrofits for vulnerable features such as windows, garage doors, patio doors, double-wide entry doors, siding and bracing for walls and rafters (also mitigates tornado risk);
- Trim and maintain the health of trees near vulnerable infrastructure such as utility lines, essential facilities and roads, as well as near homes and businesses; and
- Promote planting wind breaks for farm crops;

4. Hail: Hailstorms are also associated with thunderstorms and are the fourth most destructive type of weather hazard in Wisconsin. Especially vulnerable are farm crops, the roofs, siding and windows of buildings, and the bodies and windows of automobiles. In addition to impact damage, thick hail combined with heavy rain can clog storm sewers and aggravate stormwater flooding. Hail sufficiently thick to cover a road will pose a traffic hazard. From 1993 to 2000, sixteen major hailstorms occurred in Wisconsin that resulted in significant crop and property damage. Well over $124 million in property damages and $11 million in crop damages have resulted from hailstorms between 1/1/1993 and 12/31/2000 (Reported hail damage data maintained by the National Climatic Data Center, http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms). Most of these damages, $121 million, occurred as a result of a single storm on May 12, 2000, which struck east central Wisconsin. This was the costliest hailstorm in Wisconsin history.

Strategies for Reducing Vulnerability to Hailstorms: During a hail storm personal safety is the first priority. Persons should seek shelter and stop driving to avoid accidents. The largest amount of personal property damage is to cars and roofs. It is possible to reduce or eliminate damage to roofs by installing impact resistant roofing materials. The Underwriter's Laboratory grades roofing materials by Standard UL 2218, which rates materials from Class 1 (least protection) to Class 4 (most protection). Class 4 roofing materials will not crack when struck in the same place twice by 2-inch steel ball. Class 1 signifies resistance to a 1.25-inch steel ball. Few building codes require impact resistant roofing and many materials are not rated. Note that metal roof materials will not easily crack but will dimple from hailstones. Strategies for reducing hail damage include:

- Encourage local building codes to require roofing materials that are rated by Standard UL 2218;
- Choose impact resistant roofing materials when installing a new roof; and
- When hiring a roofing contractor, carefully review product warranty and workmanship guarantees. Do not assume roof materials will be impact resistant.

5. Heavy Rains-Precipitation: Heavy rains usually accompany thunderstorms and are a common hazard that is the fifth most destructive hazard in Wisconsin. It can be difficult to discriminate between the damages caused by rain and those caused by flooding. Many weather events can produce multiple hazards that cause similar damages. Many of the damages caused by heavy rain are the same as was described under the stormwater and overland flooding heading in the top Wisconsin hazard, flooding. However, heavy rain by itself can also damage crops, flood basements, lead to traffic accidents, infiltrate sewer lines and erode soil. Every county in Wisconsin is subject to heavy rain.

Strategies for Reducing Vulnerability to Heavy Rains:

- Acquire and demolish homes that are repetitively and seriously damaged by stormwater flooding;

- Install back flow prevention valves in basements susceptible to basement flooding due to stormwater infiltration into home sewer drains;
- Use detention ponds and contour land to reduce the rate and amount of runoff;
- Promote proper landscaping and the use of drainage techniques by homeowners that will discourage water from entering basements;
- Reserve green space in urban areas for absorbing stormwater and reducing runoff;
- Promote the use of soil conservation techniques to minimize erosion;
- Reinforce critical infrastructure vulnerable to erosion such as bridges; and
- Encourage sewer system maintenance to minimize rainwater inflow and infiltration.

OTHER NATURAL HAZARDS THAT AFFECT WISCONSIN - UNRANKED

Wildfire and Forest Fire: Forest fires and wildfires are capable of causing significant injury, death and damage to property. A recent inventory showed that 46 percent of the state, 16 million acres, is covered with forests. From 1990 to 1998, an average of 3,200 acres burned each year. The potential for property damage caused by fire increases each year as more recreational properties are developed on wooded land and increased numbers of people use these areas. Fires can extensively impact the economy of an affected area, particularly the logging, recreation and tourism industries, upon which many northern counties depend. Major costs associated with any forest fire or wildfire are the salvage and removal of downed timber and debris, and the restoration of the burned area. If burned-out woodlands and grasslands are not replanted quickly to prevent widespread soil erosion, landslides, mudflows and floods could result, compounding the damage.

Strategies for Reducing Vulnerability to Wildfires and Forest Fires: The beauty of the woods leads many people to increase their fire hazard risk by building homes within the forest or too close to flammable trees and shrubs. This is especially true of vacation homes and cabins. Keeping a defensible space around a structure where there are no flammable trees or shrubs will reduce the risk of property loss from fire. Constructing the home of non-flammable materials can further reduce fire risk. Forest management practices such as prescribed or controlled burns can also reduce fire risk by reducing standing fuel loads in the forest that, if left intact, could create fires that cannot be controlled. Finally, it is important to emphasize awareness of forest fire hazards to promote safe practices and minimize accidental fires during drought or other dangerous conditions. Many fires are the result of human activities. In summary, strategies for reducing vulnerability to forest fires include:

- Promote awareness of forest and wildfire hazards especially when the risk is great;
- Encourage defensible space around a home where there are no flammable shrubs or trees;
- Encourage the use of non-flammable building materials in forested or fire-prone areas; and
- Use good forest management practices to minimize fuel loads in forests.

Snow & Ice (Winter Storms): Snow and ice are common winter hazards associated with winter storms and are the eighth most destructive natural hazard in Wisconsin. Snow and ice can cause traffic accidents, bring down telephone and power lines, damage trees, impede transportation, burst water pipes and during heavy storms can tax the public's capabilities for snow removal. A major winter storm can have a serious impact on a community. Loss of heat and mobility are key complications that contribute to winter storm fatalities.

All areas of the state are subject to winter storms. The average seasonal snowfall varies from about 30 inches at Beloit to well over 100 inches in northern Iron County. The mean dates of first snowfall of consequence, an inch or more, vary from early November in northern localities to early December in southern Wisconsin counties. Average annual duration of snow cover ranges from 85 days in southernmost Wisconsin to more than 140 days along Lake Superior. The greatest daily snowfall, 26.0 inches, occurred in Neillsville, in Clark County, on December 27, 1904. The greatest amount of snowfall from a single storm, 31 inches, occurred in Superior, Douglas County, from Oct. 31-Nov. 2, 1991. The City of Hurley in Iron County holds the state record for total seasonal snowfall at 277 inches.

Ice storms and freezing rain are less common than snow but produce road conditions that can make travel hazardous. Even fog or mist on cold roads can produce a glaze of ice that makes travel slippery and dangerous. In addition, accumulating ice can bring down trees and power lines, causing property damage and loss of power.

Strategies for Reducing Vulnerability to Winter Storms: The Wisconsin Building Code specifies design requirements to minimize vulnerability to winter storms by setting the load capacity of roofs by region based on likely maximum snowfall. Community strategies include plowing, salting and sanding roads, maintaining the health of urban trees to minimize damage from ice storms and promoting good home insulation. Older homes can be vulnerable to heat loss and any home is vulnerable to power loss. Personal safety strategies have been discussed previously in the hazard awareness vulnerability assessment, but it is worth noting that safe alternative sources of heat or power can help to maintain a comfortable temperature if power is lost. According to the National Weather Service, however, 70% of winter storm fatalities occur in automobiles, thus listening to weather advisories and avoiding travel during winter storms would help prevent many fatalities (http://www.nws.noaa.gov/om/wntrstm.htm). A summary of strategies to minimize vulnerability to winter storms include:

- Promote winter hazard awareness, including home and travel safety measures such as avoiding travel during winter storms or having a shovel, sand, warm clothing, food and water if travel cannot be avoided, and installing a back-up heating system in at least one room in the home;
- Promote the use of NOAA weather radios;
- Maintain high standards for building codes and inspection. Review the energy efficiency and winter readiness of critical facilities and housing in the community;
- Trim and maintain trees, especially around utility lines; and

- Consider burying utilities at critical and vulnerable junctions to avoid power loss due to downed lines.

Drought: Although rare in Wisconsin, when very serious droughts have occurred staggering agricultural losses have resulted. Wisconsin has about 16,400,000 acres of farmland on 78,000 farms and was ranked 10th in the country in overall farm receipts in 1998 (Wisconsin Agricultural Statistics Service). Even small droughts of limited duration can significantly reduce crop growth and yields, adversely affecting farm income. More substantial events can decimate croplands and result in total loss, hurting the local economy. Droughts also greatly increase the risk of forest fires and wildfires because of the extreme dryness. In addition, the loss of vegetation in the absence of sufficient water can result in flooding, even from average rainfall, following drought conditions.

Each region of the state has significant farm production, however, the southwest, west-central, central and east-central regions have the highest agricultural production. Thus, these areas tend to suffer the greatest economic impact when drought restricts production. According to the 1997 Census of Agriculture, Wisconsin has 9 of the top 100 counties in the nation of farms with revenues of $100,000 or more (Grant, Dane, Marathon, Dodge, Clark, Fond du Lac, Green, Lafayette and Outagamie). Drought also increases the likelihood of wildfires and forest fires, which can have a significant impact on tourism and timber receipts in the heavily forested northern tier of Wisconsin counties.

Strategies for Reducing Vulnerability to Drought: The ample supply of fresh water available in the Great Lakes and the Mississippi River basins help to minimize water supply problems for human consumption in Wisconsin. However, during a severe drought some wells, mainly private wells, will go dry. It is agriculture that is most vulnerable to drought, as many farms in Wisconsin do not irrigate. Although nothing can prevent a drought, existing agricultural programs can promote soil health, preserve soil moisture and help to minimize loss of crops and topsoil during drought conditions. If a drought reaches emergency proportions, the State of Wisconsin assembles a Drought Monitoring Task Force composed of state and federal agency representatives to direct assistance to those areas of the state that request help. Farm drought management strategies include monitoring soil moisture levels and planting crops that will tolerate low moisture levels as well as using alternative sources of fodder and bedding. In summary, drought management strategies include:

- Promote soil conservation practices;
- Monitor soil moisture; and
- Convene Drought Monitoring Task Force as needed.

Coastal Storms and Erosion: Douglas, Bayfield, Ashland, Iron, Marinette, Oconto, Brown, Door, Kewaunee, Manitowoc, Sheboygan, Ozaukee, Milwaukee, Racine and Kenosha counties are the 15 coastal counties in Wisconsin. Each of these counties

experiences some coastal erosion. The pounding of storm surf along the shore of the Great Lakes is the principle cause of erosion and damage to coastal structures. In 1985 and 1986 record high lake levels contributed to extensive erosion related property damage triggered by a series of coastal storms in Wisconsin's 15 coastal counties. Damage assessments submitted to Wisconsin Emergency Management (WEM) from those 15 counties totaled a conservative $16 million in damages. However, FEMA advised that the damages would not be eligible for a disaster declaration due to the extended time period in which the damages occurred.

Since 1994, the Wisconsin Coastal Management Program has been updating information related to coastal erosion. A Coastal Hazards Work Group has been formed with representatives of state agencies, UW Sea Grant Institute and the State Cartographer's Office. Another study underway since October 1996 is the U.S. Army Corps of Engineers' Lake Michigan Potential Damages Study. This study is intending to issue recommendations on strategies to deal with coastal erosion in 2001.

Strategies for Reducing Vulnerability to Coastal Storms Erosion: Almost everywhere along the Great Lakes in Wisconsin is under development pressure. However, local governments have difficulty establishing defensible restrictions on coastal development beyond the minimum setback required by the state, due to concerns about unfairly limiting local property rights. Local governments need guidance to produce development ordinances that fairly balance public safety concerns with property rights protection. Specific strategies to help reduce vulnerability to coastal storms and shoreline erosion include:

- Create a model zoning ordinance that local governments can use to promote sustainable coastal development;
- Support the distribution of data that is being developed by the Lake Michigan Potential Damages Study;
- Support the Wisconsin Coastal Management Program's coastal hazard awareness initiatives; and
- Look for mitigation opportunities for repetitively damaged coastal structures.

Lightning: Lightning can cause damage to electronic equipment, start fires and injure or kill both people and livestock. Lightning is a major cause of damage and loss on farms. The National Board of Fire Underwriters reports that lightning is the number one cause of farm fires. Lightning is also responsible for more than 80% of all livestock losses due to accidents and millions of dollars in damage to farm buildings and equipment annually. Although any part of the state can be subject to lightning, according to the National Weather Service office in Milwaukee, from 1982-1996 Waukesha County had 38 lightning events, twice as many as the next highest total of 19 in Rock County. Most other counties with a high number of events are in or near the southeast region of Wisconsin: Dane County had 15 lightning events, while Washington, Milwaukee and Jefferson Counties each had 13 events. Washburn County in the northwest portion of Wisconsin also had 13 lightning events.

Strategies for Reducing Vulnerability to Lightning: Personal protection is paramount for lightning safety and these strategies have been discussed previously. Protection of electric and electronic equipment is easily accomplished with surge protectors, many of which offer additional insurance for equipment damaged by power surges resulting from lightning strikes. It is important to install lightning grade surge protection for critical electronic components used by government, public service and public safety facilities, such as warning systems, control systems, communications and computers. A farm lightning protection system can help protect family, livestock and farm property from lightning strikes (see http://www.wisconsinpublicservice.com/farm/lightning.asp for more information). Specific strategies to help reduce lightning vulnerability include:

- Promote lightning hazard awareness;
- Encourage use of surge protections for public service and critical facilities; and
- Encourage use of lightning protection systems for barns, silos and other vulnerable farm structures.

Hazard Awareness Priorities for Addressing Fatalities

Earlier in this section natural hazards were ranked as a cause of mortality. The top five hazards that cause loss of life are excessive heat, thunderstorms and high winds, tornadoes, lightning and flooding. As suggested previously, hazards that present mortal risks should focus on public information programs that promote hazard awareness and encourage people to reduce their risk exposure. Strategies for addressing these natural hazards are suggested below.

Excessive Heat: The elderly, especially in large urban areas in southern Wisconsin, are most vulnerable to excessive heat. Fatalities are usually related to age because excessive heat is stressful and can overwhelm those who are weak because of age or illness. Strategies for addressing fatalities involve hazard awareness and community involvement. Public Service Announcements about avoiding heat stress help to minimize exposure. It is also important to encourage concern for and awareness of elderly neighbors. Currently these measures are implemented by the National Weather Service, national, state and local health organizations and the media preceding and during excessively hot weather.

Thunderstorm & High Wind: People who are caught outside in a boat or in substandard shelter are most vulnerable during a thunderstorm and high winds. Strategies for addressing fatalities include promoting the use of portable NOAA weather radios for outdoor activities. Public information about personal protection measures to avoid injury is also an important component of reducing hazard risk. Currently these measures are implemented during tornado and severe weather awareness week, and by the National Weather Service, national, state and local health organizations and the media during storm season.

Tornado: Most of Wisconsin is at risk from tornadoes. If a tornado is powerful, the only safe place is in a reinforced room, preferably below ground. NOAA weather radios are crucial in providing timely warning. Warning sirens are also an option for urban areas.

Hazard awareness is important to encourage people to heed tornado warnings and know how to take immediate shelter. Public hazard information is provided during tornado and severe weather awareness week. Safe rooms offer excellent protection and should be considered by those who do not have a basement.

Lightning: Most of Wisconsin is at risk from lightning. People who are outdoors during a lightning storm such as golfers and boaters are especially vulnerable. Hazard awareness and implementing personal protection measures are vital to minimizing the risk of being struck by lightning. Public hazard information is provided during tornado and severe weather awareness week and seasonally by public health officials, weather services and the media.

Flood: Most of Wisconsin is at risk from flooding. Drowning is the chief danger due to rapidly flowing water. Children are especially vulnerable, as are people that drive their cars through flowing water. Strategies include warning signs in known flood-ways and seasonal hazard awareness measures. Currently there is a flood awareness week that coincides with the release of the spring flood outlook to help promote flood hazard awareness just prior to the spring flood season.

SECTION 3

MITIGATION IN WISCONSIN

For years, Wisconsin Emergency Management and Wisconsin communities have focused on doing a good job in responding to disasters. However, the disaster events of the past 10 years have increased the need to address disaster prevention and hazard mitigation. This section describes the history of Wisconsin's mitigation programs and how they have matured through the 1990's. As we begin the new millennium, the state continues to emphasize mitigation and the importance of its role in emergency management. Now is the time to place equal emphasis on being proactive and on making communities disaster resistant.

The **Section 404-Hazard Mitigation Grant Program (HMGP)** is a critical component of the state's mitigation efforts. The program was created in November 1988 as a result of the Robert T. Stafford Disaster Relief and Emergency Assistance Act that amended PL 93-288, the Federal Disaster Relief Act of 1974. The HMGP is administered by Wisconsin Emergency Management and makes grants available to state and local governments as well as eligible private, non-profit organizations and Indian tribes to implement long-term mitigation measures following a major disaster declaration. Eligible projects must be environmentally sound, cost-effective, solve a problem and prevent future disaster damages. In order to receive HMGP funds, a community must be participating and in good standing with the National Flood Insurance Program (NFIP).

Under the terms of the original program a proposed project had to be in the designated disaster area or have a direct positive impact on the area. The amount of HMGP funds were allocated based on 10% of the federal share of the Public Assistance funds approved for the declaration. The grants were 50% federally funded and required a 50% match. In Wisconsin, the state split the local match and paid for 25% of total project costs. Based on this funding allocation, there were very limited funds available for mitigation activities. Wisconsin Emergency Management received four federal disaster declarations from 1988 until 1993 with only $915,000 ($475,500 federal share) in HMGP funds available for all four declarations. It was very difficult to identify and develop viable projects and to administer the program with these limited funds.

A turning point for the HMGP was in 1993 during the Great Midwest Flood. Due to the magnitude of the flooding in the nine Midwest states, the President signed the **Hazard Mitigation and Relocation Assistance Act** that amended Section 404 of the Stafford Act on December 3, 1993. This amendment significantly increased the amount of funding available in the HMGP in two ways. First, it increased the federal share of grant funds from 50% to 75%. Second, the proportion of federal funds allotted to the HMGP was increased to 15% of the federal funds spent on the Individual and Public Assistance Programs for each disaster, whereas before it was based on 10% of the federal funds spent in the Public Assistance Program only. The change of the funding formula raised

the amount of HMGP funds available in the state for the 1993 Midwest Flood from $2 million to $14 million.

In addition, on August 6, 1993, Congress approved HR 2667 that provided $5.3 billion in supplemental disaster appropriations to federal agencies to assist state and local governments recover from the widespread flooding. Eleven federal agencies received supplemental funds including FEMA, the Department of Housing and Urban Development and the Economic Development Administration. These programs played an important role in the state's recovery from the devastating floods. These additional funds helped to rebuild homes, infrastructure, and businesses, as well as support implementation of community mitigation projects.

Another important and significant outcome of the 1993 federal declaration was the formation of the **Wisconsin Interagency Disaster Recovery Group** (IDRG). As a result of the additional funding that was made available through HR 2667, there was a need to form a group of federal and state agencies to develop a mitigation strategy and coordinate long-term recovery efforts. This group, consisting of individuals from a core group of agencies, met on a weekly basis to act as a clearinghouse for communities proposing long-term recovery projects. The IDRG initially consisted of FEMA, WEM, the Economic Development Administration, the Department of Administration, the Department of Commerce (formerly Development), the Department of Natural Resources and the State Historical Society. The Farmers Home Administration, Natural Resources Conservation Service, and the State Departments of Workforce Development (formerly Industry, Labor and Human Relations) and Transportation would also join the group. In addition, there was an individual representing the Regional Planning Commissions. The IDRG's mission was: "To develop a cooperative federal and state disaster recovery effort that can assist communities and regional agencies in utilizing all available funding sources to recover from and mitigate the future effects associated with the damages from natural hazards."

The objectives of the IDRG to achieve the mission are to:

- Serve as a clearinghouse for tracking and status reporting of disaster recovery project applications;
- Encourage and assist funding submissions from communities for recovery and hazard mitigation projects;
- Assure full utilization of all available and applicable funding sources for recovery and mitigation projects;
- Encourage the enhancement of recovery projects with hazard mitigation measures; and
- Assist in the avoidance of funding duplication for recovery and mitigation efforts.

In addition to the IDRG, the Wisconsin Interagency Hazard Mitigation Recovery Office (WIHRO) was established by FEMA. This office was set up in WEM headquarters and was staffed with a full-time FEMA staff person who worked closely with WEM staff and supported the efforts of the core group of state and federal agencies. The WIHRO staff

person monitored the status on all projects submitted to the agencies. The WIHRO staff grew to two in the following years and played a vital role in implementing mitigation projects within the state until 1996.

FEMA established the policy to fund projects that reduced future disaster losses through acquisition and relocation of properties that were most prone to flood damages. Although many other types of projects were funded through the various agencies, the IDRG also established priority funding for projects consisting of acquisition, demolition, relocation and/or floodproofing of floodprone properties.

In keeping with the objectives of the IDRG, the agencies worked together to identify and fund as many mitigation projects as possible. In many instances, several agencies provided funding on the same project to ensure that the project would be completed. The IDRG worked to “package” funding for communities so that even local match requirements would be funded. In addition to addressing funding issues, agencies on the IDRG often provided technical assistance in implementing projects. This included technical assistance in areas involving relocation assistance, floodplain management community compliance, environmental contamination, historical consultation, reviewing and expediting building review and permits and the Americans with Disabilities Act.

The success of the IDRG demonstrated the need to continue the group. Therefore, the IDRG continued to function after each disaster declaration to coordinate long-term recovery efforts.

Another significant outcome of the 1993 declaration, was the recognition of the need to hire a full-time State Hazard Mitigation Officer (SHMO) at WEM. The SHMO was hired in August 1994 and in 1998 a full-time Assistant SHMO was added.

Another positive change to the HMGP occurred in April 1997 when the regulations were changed to allow the use of HMGP funds statewide instead of limiting them to be used in the designated disaster area.

In October 2000, Wisconsin Emergency Management became a HMGP Managing State. FEMA has recognized the State as having certain capabilities in the area of performing benefit-cost analyses and environmental reviews for proposed projects. Based on a Memorandum of Understanding signed between FEMA and WEM, the State prepares a project summary sheet for all HMGP applications submitted to FEMA. Instead of reviewing the entire application package, FEMA reviews the project summary sheet and approves the project and environmental documents. This greatly streamlines the approval process.

On October 30, 2000, the **Disaster Mitigation Act of 2000**, was enacted and amended the Stafford Act. The purpose of the Act was to establish a national program for pre-disaster mitigation, streamline administration of disaster relief and control federal costs of disaster assistance. Section 322 of the act will have a great impact on the HMGP. This section increases HMGP funding from 15% to 20% for those states that have an

approved State Hazard Mitigation Plan. In addition, it established a requirement for local and tribal mitigation plans and authorized 7% of the HMGP funds to be available to states to be used in developing such plans. Regulations and planning criteria for mitigation plans have not yet been published.

The HMGP is primarily a post-disaster assistance program. On September 23, 1994, the National Flood Insurance Reform Act (NFIRA) was signed into law. The purpose of the NFIRA is to improve the financial condition of the National Flood Insurance Program (NFIP) and reduce the federal expenditures for federal disaster assistance to flood damaged properties. One of the things that the NFIRA did was create a pre-disaster mitigation program called the **Flood Mitigation Assistance** (FMA) program. FMA is state-administered through WEM and is a cost-share program (75 % federal, 25% local match) through which states and communities can receive grants for flood mitigation planning, technical assistance and mitigation projects.

The overall goal of the FMA is to fund cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other NFIP-insured structures. Other goals are: Reduce the number of repetitively or substantially damaged structures and the associated claims on the NFIP; encourage long-term, comprehensive mitigation planning; respond to the needs of communities participating in the NFIP; and complement other federal and state mitigation programs with similar goals.

Twenty million dollars is transferred each year into the FMA, which is then distributed to the states. Each state receives an allocation based on the number of flood insurance policies in force and the number of repetitive loss structures in the state. Repetitive loss structures are those structures that have had two or more flood insurance claims of at least $1,000 each in the last ten years. The minimum amount any state receives is $10,000 for mitigation planning grants and $100,000 for project grants to implement mitigation activities identified in approved mitigation plans. In addition, up to 10% of the project funds are allowed for the state to use for technical assistance. Thus far, the state has not utilized the technical assistance funds and has applied those funds to implement projects. Based on this formula, the state has received the following FMA funding:

Flood Mitigation Assistance Funding

FFY	PLANNING	PROJECT	TOTAL
1996/1997	$11,700	$117,100	$ 128,800
1998	$11,900	$119,810	$ 131,710
1998 Supplemental Funds*	$24,420	$281,600	$ 306,020
1999	$12,000	$125,100	$ 137,100
2000	$14,400	$153,700	$ 168,100
2001	$14,100	$149,900	$ 164,000
TOTAL	$88,520	$947,210	$1,035,730

* Due to unspent funds of other states, Wisconsin was able to receive additional funds.

As with the HMGP, to receive FMA grant funds, the community must be participating and in good standing with the NFIP. Eligible projects and criteria are basically the same as for the HMGP. The biggest difference is that the projects must reduce the risk of flood damage to structures insured under the NFIP.

The FMA program is difficult to administer in the state due to the following: The small amount of funds received, funds can only be used to protect structures insured through the NFIP and a community must have a FEMA approved flood mitigation plan in order to receive FMA Project Grant funds with the project identified in the plan. Based on the experience WEM has gained in administering the FMA program, only one plan can be completed each year with the amount of Planning Grant funds provided. This severely limits the state on where it can provide Project Grant funds. To date, the majority of Project Grant funds have been provided to the City of Darlington who until just recently had the only officially approved flood mitigation plan in the state. However, Eau Claire County's mitigation plan was recently approved. There are presently another six plans under development using FMA Planning Grant funds. In addition, within the HMGP the state requires HMGP subgrantees to develop and complete a hazard mitigation plan. Therefore, there are another eleven plans under development. Once these plans are completed and approved, there should be more eligible projects identified for the Project Grant funds. Project Grant funds have been awarded to Jefferson and Kenosha Counties on the basis that they received Planning Grant funds and have a draft plan completed. The plans should be finalized and approved in the near future. Project Grant funds are based on the condition that the plans are completed and approved.

In addition to the above requirements, in December 1999 FEMA issued guidance that stated emphasis should be given to addressing the target repetitive loss properties identified in the FEMA's Repetitive Loss Strategy. Target properties were defined as structures with four or more losses and structures with two to three losses where cumulative payments exceeded the property value. According to these criteria, there are twelve such properties in the state located within nine communities. Eight are residential structures valued at $1,042,700 and four are commercial valued at $2.8 million. One of the residential properties has been included in a mitigation project underway in the City of Wauwatosa, which will bring the number down to eleven properties.

Although there are only twelve properties that meet the strict criteria of a target repetitive loss property, there are 362 properties that have been identified in 54 communities that meet the general repetitive loss definition. This number has been reduced to 316 through the efforts of mitigation programs. Another 12 repetitive loss properties are in the process of being mitigated. Most of the communities with repetitive loss properties have only one or two properties. The City of Milwaukee has the most with 205 repetitive loss properties remaining after 6 of 211 repetitive loss properties have received flood mitigation. A summary of Wisconsin's Repetitive Loss Report is presented in Appendix G. The state makes every attempt to mitigate repetitive loss properties through the HMGP and FMA programs. However, the state has had difficulty

obtaining correct and timely data from FEMA/NFIP. Repetitive loss data is continuously changing after every event as additional claims are filed.

As stated previously, the IDRG has continued to meet to address long-term recovery issues after each disaster declaration. Since 1993, WEM and the IDRG have established the priority of acquisition, demolition, relocation, and/or floodproofing of floodprone properties, and have approved projects for these activities. In administering the HMGP and FMA programs, WEM has established the following priorities based on funding availability and provided the projects meet all of the program criteria:

- Acquisition and demolition of properties substantially damaged;
- Acquisition and demolition of repetitive loss properties;
- Acquisition and demolition of damaged properties in the floodplain;
- Acquisition and demolition of floodplain properties;
- Acquisition of flood damage properties not in the floodplain;
- Floodproofing or retrofitting flood damaged structures in the floodplain;
- Floodproofing or retrofitting flood damaged structures not in the floodplain; and
- Other hazard reduction projects (such as detention ponds, storm sewer improvements, protection of utilities, drainage, etc.).

In addition, educational or public awareness projects are funded under the 5% HMGP set-aside when it is felt there will be a positive outcome from the project.

The Wisconsin Department of Natural Resource's (DNR) **Floodplain Management Program** plays an important role in state mitigation. Program staff assist communities in administering their local floodplain management programs, make substantial damage determinations after a flood and ensure that communities are in compliance with their local ordinances. In addition, they work to provide assistance to non-participating communities that wish to enter the NFIP and provide technical assistance to participating communities interested in enrolling in the Community Rating System (CRS). Floodplain Management staff provides technical assistance to the IDRG as well as WEM mitigation staff in administering the HMGP and FMA programs and developing a repetitive loss strategy for the state. Floodplain Management staff provides training to local government and emergency management officials on floodplain management and mitigation planning.

There are 570 communities including all 72 Wisconsin counties that have identified flood hazard areas. There are presently 499 communities participating in the NFIP (479 in regular program and 20 in the emergency program). There are another 50 communities with a special flood hazard area identified, but are not participating in the program. Ten communities have been suspended from the regular program. Floodplain Management staff have the following communities and counties as top priorities for joining the NFIP: Balsam Lake, Fontana, Genoa City, City of Marquette, Merton, North Bay, Potosi, Prairie du Sac, Rockdale, Shell Lake, Sturtevant, Village of Superior, Taylor County, Vilas County and Williams Bay. Fitchburg and Forest County are in the process of joining. Contact is made with these communities after a disaster declaration

to provide them with information and technical assistance and encourage them to join the program. There are serious consequences when a community is not participating in the program. Flood insurance is not available to individuals and businesses. In turn, lending institutions cannot approve mortgages for properties located in an identified special flood hazard area without the purchase of flood insurance. In addition, certain disaster assistance will not be available to individuals and businesses as well as local governments. For instance, the communities are not eligible for the HMGP and FMA programs.

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. The National Flood Insurance Reform Act of 1994 codified the Community Rating System in the NFIP. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS: (1) reduce flood losses; (2) facilitate accurate insurance rating; and (3) promote the awareness of flood insurance.

There are ten CRS classes: class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction. The CRS recognizes 18 creditable activities, organized under four categories: Public Information, Mapping and Regulations, Flood Damage Reduction and Flood Preparedness.

The table below describes the credit points earned, classification awarded and premium reductions given for Wisconsin communities in the National Flood Insurance Program Community Rating System.

Wisconsin Communities in the NFIP Community Rating System in 2000

Community Number	Community Name	CRS Entry Date	Current Effective Date	Current Class	Credit For SFHA	Credit For Non- SFHA
550001	Adams County	10/1/91	10/1/91	9	5	5
550612	Allouez, Village of	10/1/92	10/1/94	8	10	5
550128	Eau Claire, City of	10/1/91	10/1/91	9	5	5
550022	Green Bay, City of	10/1/91	10/1/93	8	10	5
555562	La Crosse, City of	10/1/91	10/1/91	9	5	5
550085	Mazomanie, Village of	10/1/91	10/1/91	9	5	5
550310	Ozaukee County	10/1/91	10/1/91	9	5	5
550107	Watertown, City of	10/1/91	10/1/91	9	5	5
550108	Waupun, City of	10/1/91	10/1/91	9	5	5
550537	Winnebago County	10/1/91	10/1/91	9	5	5

Source: http://www.fema.gov/nfip/wisconsin.htm

Mitigation can also be implemented through FEMA's **Public Assistance Program** after a disaster declaration through Section 406. Public Assistance funds allow an existing damaged facility to incorporate mitigation measures during repairs, if the measures are cost-effective or are required by code. This provision has been in the regulations, however, has been very much underutilized. Typically, funds through the Public

Assistance Program were to provide funds to repair the facility to its pre-disaster condition not giving any thought to mitigation opportunities. In administering the 1996 declaration, FEMA-1131-DR-WI, a greater effort was made to fund Section 406 through the Public Assistance Program. Federal mitigation staff was assigned to be a liaison with Public Assistance staff and to provide technical assistance. To further emphasize mitigation opportunities, a Memorandum of Understanding (MOU) was developed for FEMA-1180-DR-WI for implementing Section 406 mitigation opportunities. The MOU was signed by the Federal and State Hazard Mitigation and Public Assistance Officers as well as the State and Federal Coordinating Officers (FCO) and the Deputy FCO for Mitigation. This tool has been implemented in all subsequent federal disaster declarations. In fact, in implementing FEMA-1332-DR declared in July 2000, the FCO's goal was to incorporate Section 406 mitigation in 20% of all project worksheets. The goal was exceeded with mitigation incorporated on 40% of the projects.

In 1998, the Federal Emergency Management Agency (FEMA) created the **Project Impact** initiative. Project Impact is community based with public and private partners working together to improve a community's disaster resistance. Each year for the last four years one Wisconsin community has been selected to become a Project Impact community and has received funding to initiate activities that will assist the community in becoming disaster resistant. Although the official contract period for Project Impact is two years (each community signs a two-year contract with FEMA), the purpose of becoming a Project Impact community is to permanently embrace disaster resistance as a community-wide effort. Another goal of Project Impact is for the designated communities to share their experiences and successes and mentor with other communities so they can implement similar programs.

The City of Wauwatosa became the first Project Impact community in November 1998. Project Impact activities include hazard planning, mitigation projects and public awareness initiatives. In conjunction with the Milwaukee Metropolitan Sewer District the city will continue their acquisition program and plans on acquiring and demolishing another 43 properties along the Menomonee River. With Americorps and Milwaukee County as partners, the city completed a riverside clean up. In addition, the city has completed the installation of a stationary sewer by-pass pump that will reduce future damages to properties. Other proposed projects include building a stormwater detention pond in Timmerman Airfield, developing a hazard mitigation plan for the city, ongoing public awareness and information program, foundation drain and sump pump inspection program for properties, and other projects that will reduce future disaster damages.

Racine County was selected as the second Project Impact community in 1999. Some of the activities undertaken in Racine County through Project Impact include completing a tornado shelter assessment of the public and non-public schools within the county. As a result of the assessment, school officials will be able to develop or revise emergency procedures and plans, and initiate educational programs. In addition, recommendations will be made for possible retrofitting. The county is active in the community promoting Project Impact and mitigation through such events as safety fairs

and workshops at Home Depot. The county has produced a Project Impact coloring book to teach children how to stay safe during a natural hazard event and has promoted Project Impact through local broadcast weather reports. Working with the county Housing Authority, the county will be building a "safe room" in a home that is being constructed. The county is working with the local technical college in conducting a survey of selected county residents to determine resident's opinions, attitude and preparedness in the event of a disaster within the county. The information gathered from the survey will help to develop public awareness campaigns, etc. Other activities underway include developing a hazard mitigation plan, and integrating emergency management planning with the county geographic information system (GIS) system.

The 2000 Project Impact community selected was the City of Waukesha. The City of Waukesha has experienced flooding in the past during major rain events and has had its share of severe weather. However, the city's major hazards include numerous highway and railroad corridors that transect the city and pose technological hazards from accidental spills of industrial chemicals.

The city will be conducting a hazard assessment using the information to complete a hazard mitigation plan. Other activities include a tornado shelter assessment of all schools and public buildings in the city (similar to Racine County's project), community outreach and education projects, GIS mapping resources for hazard planning and supporting a tornado safe room demonstration project.

The most recent community to be selected for Project Impact is the City of Eau Claire, designated for 2001. The City of Eau Claire has had a history of river flooding and severe weather. It incurred flood damages in 1971, 1973, 1980, 1992, 1993 and most recently in September 2000. Thunderstorms and tornadoes have also affected the city and surrounding areas. The city is currently in the process of developing its Plan of Work for Project Impact.

Section 203 of the Disaster Mitigation Act of 2000 authorized the **National Predisaster Mitigation Program** or as we know it, Project Impact. By October 1 of each year the Governor may recommend to the President not fewer than five local governments to receive assistance under this section. It is not clear yet how much funding will be available per state or per community. Section 203 outlines criteria for eligible communities, one being that the community has submitted a mitigation plan. The authority for Section 203 will terminate in December 31, 2003.

One of the challenges for WEM has been educating citizens as well as emergency management and local officials of the importance and the need for mitigation. Since the Midwest Flood of 1993, officials within the state have become more aware of the need for mitigation. However, there is still a long way to go. WEM includes information on mitigation measures and activities in its annual winter weather, tornado and severe weather and flood awareness campaigns. In addition, information is included on WEM's web site as well as the bi-monthly newsletter. A newsletter distributed by the Department of Natural Resources also includes information on mitigation. Mitigation

elements are included in all Damage Assessment Workshops held at the county level as well as in the Introduction to Emergency Management Course, Disaster Response and Recovery Course, and the New Directors Orientation conducted each year by WEM.

The biggest challenge for the state has been helping local governments recognize the need to do **mitigation planning**. Both FEMA and the state agree that in order to truly be effective in the area of mitigation at the local level there needs to be a mitigation planning process. The problem has been how to get communities at risk from natural hazards to complete the mitigation planning process. In 1995 the Department of Natural Resources developed the "Wisconsin Community Flood Mitigation Planning Guidebook." The guidebook was provided to assist local governments in developing local mitigation plans and focused on a planning process.

As an accompanying tool, the Department of Natural Resources with some financial assistance from FEMA/WEM developed the video "Mitigation Revitalizes a Flood Community: The Darlington Story." The video focused on the city and how repeated flooding forced them to look at implementing mitigation measures. The city used a mitigation planning process similar to the one described in the guidebook to find solutions to reduce the flooding and attack the underlying economic problems associated with it. The video discussed how the city brought civic leaders, business owners and citizens together through the planning process to identify solutions to the problems. The efforts of the city have been recognized in videos produced by FEMA and the Association of State Floodplain Managers (ASFPM). WEM and the Department of Natural Resources have sponsored and conducted mitigation planning workshops using both of the above as training tools.

To this point in time, the only funds available for mitigation planning have been through the FMA program and thus have been limited to addressing only flood hazards in a community, not an all-hazards approach. In addition, the funds allocated to the state are only enough to provide Planning Grant funds to one or two communities each year at the most. For communities that receive HMGP funds, WEM has required as a grant condition that the community complete a hazard mitigation plan. WEM reviews mitigation plans that are submitted to them and provides comments and suggestions to the community for changes, additions or improvements to the plan. If the community wants FEMA approval, they are required to meet all of the FMA planning elements. This proves to be a very difficult task for local governments particularly small communities with very limited or no staff. WEM has developed additional planning guidance to meet the FMA planning requirements. Most of the communities developing mitigation plans have requested the assistance of their local Regional Planning Commission or hired a private consultant.

Through the planning process, the community must have public participation, coordinate with other agencies and organizations, assess the hazards, identify the problems, establish mitigation goals, review possible mitigation actions and draft an action plan to implement the mitigation actions identified. WEM needs to identify a way to make it

easier for local governments to develop mitigation plans that are realistic, practical and can actually be implemented. In the area of mitigation planning, much will depend upon the criteria established for implementing Section 203 and 322 of the Disaster Mitigation Act of 2000.

Risk assessment and vulnerability analysis is the most difficult task for local governments to complete in developing a mitigation plan. FEMA has developed a system referred to as **HAZUS** that may assist local governments in this effort. HAZUS is a software program that utilizes GIS software to calculate, map and display potential damage loss data for various hazards. HAZUS is basically a "loss estimation methodology." This methodology may assist local governments in developing mitigation plans and policies, developing and improving emergency operations plans, assist in generating scenarios for exercises and training purposes and for quickly estimating losses after a disaster and what resources will be required for response and recovery. However, the methodology has only been developed for earthquakes at this time. FEMA is working on developing methodology for flooding and wind hazards, but they will not be released for several years. HAZUS provides some default data based on census information. It is then up to the local government to verify the data and import their own hazard data. The GIS capability of local governments will determine how successful they are in utilizing HAZUS.

To promote mitigation, WEM has outlined a five-year strategy to improve mitigation capabilities at the local level. Each year builds off of the previous year's activities. Some of the activities include providing information on available mitigation resources, guidance on how to develop public and private partners at the local level, promoting the concept of disaster resistance, developing a mitigation curriculum and guidance for developing a comprehensive hazard analysis and hazard mitigation plan. A final outcome would be to incorporate a mitigation component into local government exercises.

Another effort that is underway in the state that could support mitigation planning is through Wisconsin's **Comprehensive Planning and Smart Growth Legislation**. The legislation requires all local governments to develop and adopt a comprehensive land-use plan by 2010. One of the required elements involves the agricultural, natural and cultural resources element and will describe goals, policies and programs to conserve and manage these resources. Some of the resources to be considered under this element include groundwater, forests, environmentally sensitive areas, stream corridors, surface waters, floodplains and wetlands. Mitigation could be addressed through this planning element. There will be grant funds available through the Department of Administration (DOA) for completing these comprehensive land use plans. The DOA is represented on the State Hazard Mitigation Team.

An important component of mitigation is to celebrate our successes. Since 1991, $28,753,958 in HMGP funds have been administered. The HMGP funds available for FEMA-1332-DR-WI declared in July 2000 are $4,424,019. This brings the total HMGP

funds to $33,177,897 for the history of the program. The table on the following page summarizes the funding history of the Hazard Mitigation Grant Program:

Hazard Mitigation Grant Program Funding History 1991 – 2000

HAZARD MITIGATION GRANT PROGRAM FUNDING				
DISASTER	**FEDERAL SHARE**	**STATE SHARE**	**LOCAL SHARE**	**TOTAL**
912-DR-WI	$54,342	$27,171	$27,171	$108,684
959-DR-WI	$19,434	$9,717	$9,717	$38,868
963-DR-WI	$188,187	$94,093	$94,093	$376,374
964-DR-WI	$195,537	$97,768	$97,768	$391,074
994-DR-WI	$10,503,363	$1,750,560	$1,750,560	$14,004,483
1131-DR-WI	$258,395	$43,066	$43,066	$344,527
1180-DR-WI	$4,698,752	$783,125	$783,125	$6,265,003
1236-DR-WI	$1,471,849	$245,308	$245,308	$1,962,465
1238-DR-WI	$3,337,816	$556,302	$556,302	$4,450,421
1284-DR-WI	$609,044	$101,529	$101,529	$812,059
1332-DR-WI	$3,318,014	$553,003	$553,003	$4,424,019
TOTAL	**$24,654,732**	**$4,261,603**	**$4,261,603**	**$33,177,897**
AVERAGE	**$2,241,339**	**$387,418**	**$387,418**	**$3,016,172**

The table below identifies the number of grants awarded for the different type of projects. In addition to the HMGP, FMA funds in the amount of $822,630 have been administered for seven Planning Grants (City of Brookfield, Crawford County, Eau Claire County, Jefferson County, Kenosha County, City of Milwaukee and Ozaukee County) and six Project Grants (City of Darlington, Jefferson and Kenosha Counties).

HMGP Grants by Type

PROJECT TYPE	GRANTS AWARDED
Acquisition/Demolition	24
Floodproofing	5
Wind Retrofit	1
Education	1
Structural	10
Other	3
Total	**42**

Between HMGP and FMA, a total of $29,576,508 in funds has been provided to communities for mitigation. With the additional funds under 1332-DR and FFY 2000 and 2001 FMA funds that total will be $34,213,627. As stated previously, the IDRG and WEM's priorities for mitigation are acquisition and demolition, relocation and floodproofing of hazard prone structures. The following table identifies the number of structures that have been mitigated through HMGP and FMA. It is worth noting that the majority of the commercial structures that have been floodproofed were within the

historic district in the City of Darlington and required special consideration as historic structures within a floodplain.

Structures Mitigated through HMGP/FMA

TYPE	NUMBER OF RESIDENTIAL STRUCTURES	NUMBER OF COMMERCIAL STRUCTURES	TOTAL NUMBER OF STRUCTURES
Acquisition	256	16	272
Floodproofed	22*	24	45
Relocated	1	0	1
Total	**278**	**40**	**318**

*There are 14 additional structures scheduled for floodproofing in the City of Milwaukee by July 2001.

The totals in the table above do not reflect the mitigation efforts undertaken through other agencies and by local governments. The Department of Administration through Community Development Block Grant (CDBG) funds has provided assistance to several communities to further their mitigation efforts by acquiring and demolishing floodplain properties (see Appendix E). Since 1995, Kenosha County has purchased 33 properties along the Fox River in the Towns of Salem and Wheatland and in the Village of Silver Lake. These acquisitions were made using CDBG funds as well as HMGP and FMA funds. Their goal is to purchase up to 160 properties, as funds become available. Another example is Blackhawk Island in Jefferson County, which is bordered by the Rock River on one side and Lake Koshkonong on the other. The island has been flooded repeatedly over the years and the entire island lies within the floodway. In addition to CDBG, HMGP and FMA funds, the county received Urban Rivers Grant Program funds through the Department of Natural Resources. These funds have enabled the county to purchase 30 properties. The county would like to purchase up to 85 properties on the island. Both counties continue to apply for funding to reach their mitigation goals.

There are also mitigation projects occurring in Wisconsin through local initiative and mostly local funding. The Milwaukee Metropolitan Sewerage District (MMSD) has been implementing a stormwater management strategy for over ten years that has involved acquiring structures that their flood hazard models show are vulnerable to a 1% probability storm. Using a variety of funding sources including HMGP and MMSD funds, 123 flood vulnerable structures have been acquired or are in the process of being acquired. The Cities of Wauwatosa and Greenfield are the two locations that have had the largest acquisition projects. Along the Root River in Greenfield 43 structures have been acquired. In Wauwatosa, 46 structures are in the process of being acquired along the lower Wauwatosa River. There may be other unheralded communities that have purchased floodprone properties and turned those sites into open space preventing future disaster damages.

In addition to acquisitions and floodproofing, other types of mitigation projects have been implemented in Wisconsin. In response to the flooding in 1997 and 1998, Milwaukee County received a grant for the development of a flood mitigation video and

accompanying brochure. The video and brochure are targeted towards property owners and what they can do to protect themselves from flooding. The video was distributed to all the public libraries within the county and over 10,000 brochures have been printed and distributed. These items were developed for Milwaukee County, however, the information is valid for all Wisconsin residents.

Another unique project involved the wind retrofit of a school. In 1996, the Oakfield Middle School was destroyed as a result of a tornado. The school district utilized HMGP funds to incorporate wind resistant construction techniques when rebuilding the school. The extra expense to incorporate the measures were relatively minor compared to the overall construction costs and will provide protection to the faculty, students and other individuals living in the vicinity of the school.

Most communities that have implemented mitigation measures through HMGP and FMA have not had the chance to test those measures. However, in the spring and summer of 2000 several communities had flood conditions severe enough to test the benefits of mitigation.

In May, heavy rains in the Milwaukee area caused the Menomonee River to reach floodstage. The City of Wauwatosa, through HMGP and Community Development Block Grant (CDBG) funds, had acquired and demolished 23 structures in the Valley Park area along the river. If the river had risen much higher and mitigation had not been undertaken, damages would have once again occurred to the structures. At the same time, floodwaters rose in the Village of Brown Deer along Southbranch Creek. In 1998, ten homes were substantially damaged adjacent to the creek and were acquired and demolished by the village again utilizing HMGP and CDBG funds. MMSD constructed a detention basin at the site to alleviate future flooding to neighboring and down stream properties. The detention basin worked as designed alleviating flood damages to structures.

The Fox River in Kenosha County is subject to frequent flooding. To some extent flooding occurs at least annually and sometimes two and three times a year. Since 1993 the county has been implementing a buyout program along the river utilizing HMGP and CDBG funds. The county issued a flood emergency in May and residents were urged to evacuate when the river rose to two feet above floodstage. Again, damages were averted where mitigation measures had been undertaken. Flooding once again occurred in June making it necessary to declare another flood emergency.

In June heavy rains impacted much of the southern half of the state. The City of Sun Prairie and the Village of Deforest in Dane County had previously implemented mitigation measures to alleviate stormwater flooding. Both communities advised that due to the mitigation projects damages were averted.

On June 1, the rising Pecatonica River shut down the Darlington schools and closed off cross-town travel, but the city's first flood emergency since it floodproofed its downtown proceeded smoothly. Floodgates were standing by ready to be installed if needed. It

was the first time the gates were used since the downtown area raised their floor levels after the severe floods of 1990 and 1993. Several businesses closest to the river actually installed the floodgates to prevent damages. All waited in anticipation to see how high the water would get. Fortunately, the river began to recede negating the need to install the remaining floodgates. In addition to floodproofing downtown businesses within the historic district, the City of Darlington also acquired and demolished several commercial structures in the floodway closest to the river opening up the area for recreational uses. Due to the extensive mitigation efforts implemented in the city, flood damages were minimal and were mostly related to costs for emergency response and minor road damages.

It is estimated that for every $1 spent on mitigation, $2 to $3 will be saved in future disaster losses. In future events, one of our activities will be to demonstrate this by documenting the success and economic benefits of the mitigation measures implemented through HMGP and FMA and other mitigation programs.

SECTION 4

STATE AGENCY CAPABILITY ASSESSMENT

A capability assessment survey was developed to collect information about what grant programs, regulation authorities, public information programs, agency initiatives, training and technical assistance are provided by state agencies that address hazard mitigation. A copy of the survey form is located in Appendix D. Also in Appendix D is a table of the survey results organized by state agency that includes details on program authorities, program contacts and program eligibility requirements.

In this section, state agency activities that support hazard mitigation are briefly noted and assessed. The capability assessments are organized by their intended functions.

ALL-HAZARD MITIGATION

The programs below are flexible enough to provide mitigation for any kind of disaster. However, as a practical measure, flood mitigation is the top priority of the Hazard Mitigation Grant Program (HMGP) Administrative Plan (2000) because floods result in the highest uninsured losses. Project Impact is the newest of these general mitigation programs and could be considered a pre-disaster mitigation and disaster prevention program because it does not require a disaster to release funds. Encouraging communities to think about disaster prevention is a significant innovation that benefits every phase of emergency management.

GENERAL HAZARD MITIGATION PROGRAMS

Program or Statute	Key Elements/Issue Addressed
WEM, Hazard Mitigation Section	Administers the mitigation portion of Ch. 44 CFR for Wisconsin including the HMGP and FMA programs. Promotes hazard mitigation concepts. Coordinates with other state agencies on mitigation issues with IDRG and SHMT. Provides technical assistance for hazard mitigation planning and projects.
WEM, Hazard Mitigation Grant Program	HMGP provides grants after a federal disaster declaration to fund long-term permanent solutions to reduce disaster costs.
WEM, Public Assistance	Provides immediate mitigation through upgrade of public infrastructure during recovery if cost-effective.
WEM, Project Impact	A community-based, hazard mitigation and disaster prevention program. The program stresses community involvement, hazard awareness, and a long-term commitment to disaster prevention.

Many other programs are or can be involved in disaster mitigation but address specific hazards such as floods or specific strategies such as housing, economic recovery and healthcare. These will be assessed individually in this section. More detailed information on completed hazard mitigation projects in Wisconsin can be found in Appendix E.

FLOOD HAZARD MITIGATION

Flooding is addressed extensively by state law and state agency programs. There are programs and technical support for floodplain zoning and mapping, flood mitigation projects, flood mitigation planning, soil conservation, riparian preservation and restoration, dam safety, sustainable coastal development, wetland preservation, nonpoint source pollution and stormwater facility development.

The Department of Natural Resources (DNR) has remained active in pre-disaster mitigation. There are two Wisconsin communities in the process of joining the National Flood Insurance Program, the City of Fitchburg and Forest County. In addition, there is a new DNR program, the Municipal Flood Control and Riparian Restoration Program that is designed to provide additional funding for local communities to mitigate flooding and protect water resources.

Unmet needs include funding for floodplain mapping and flood studies for some communities. In addition, communities that experience development pressure can face a steep learning curve for managing floodplains, shorelands and stormwater. These local challenges are difficult for state agencies to address completely because they are local responsibilities and require local expenditures of effort and money. However, state agencies continue to offer support to local communities with technical and program assistance. One current DNR initiative is to provide technical support for computer based mapping of floodplains and wetlands as a low cost alternative for local communities that lack floodplain maps.

FLOOD HAZARD MITIGATION PROGRAMS

Program or Statute	Key Elements/Issue Addressed
DNR, Floodplain and Shoreland Management Section	This section enforces state laws governing floodplain and shoreland development. The section also administers the National Flood Insurance Program and the Community Rating System. Provides zoning and mapping assistance, community assessments, and training, to help local communities with floodplain or shoreland areas. Technical assistance includes GIS assistance for creating low cost local flood maps.
DNR, NR 115	Establishes minimum shoreland protection rules.
DNR, NR 116	Requires local floodplain mapping and zoning in compliance with state floodplain standards (2' above BFE and no development in floodway).
DNR, NR 117	Requires local adoption of state wetland maps and zoning in compliance with state wetland setback and preservation standards.

FLOOD HAZARD MITIGATION PROGRAMS, continued

Program or Statute	Key Elements/Issue Addressed
DNR, Wisconsin Waters Initiative	Wisconsin Waters Initiative is creating electronic access to water information to aid in planning for development. It also provides professional assistance for waterfront landowners, realtors, developers, local governments, anglers and others.
DNR, Municipal Flood Control and Riparian Restoration Program	New program still under development designed to partially fund (70/30) local flood mitigation and riparian restoration projects that will improve water quality, primarily through acquisition.
DNR, Dam Safety Section	Provides technical assistance, conducts dam inspections, administers dam repair and removal grants and reviews engineering plans for all communities with dams per Chapter 31 Wisconsin Statutes.
NR 335	Provides for the administration of the Municipal Dam Repair and Removal Grant Program.
NR 333	Provides design and construction standards for large dams and requires all large dams to have Emergency Action Plans (EAP). EAPs identify potential emergency conditions at a high hazard dam and prescribe procedures to be followed to eliminate the loss of life and minimize property damage.
Executive Order 67	Requires all state actions affecting construction of any structure or facility to obey state statutes regulating floodplains, wetlands, erosion and shoreland management.
Executive Order 73	Requires flood mitigation for state owned or leased property. It also prohibits state government buildings being built in a 100-year floodplain for most facilities, or the 500-year floodplain for critical facilities.
WEM, Flood Mitigation Assistance	Provides grants to communities to assist them in mitigating repetitive flood losses to NFIP insured structures. Planning Grants are available for the development of comprehensive flood mitigation plans. Project Grants are available to communities with approved Flood Mitigation Plans to implement mitigation measures identified within the plan
DOA, Wisconsin Coastal Management Program	Awards grants to communities for the protection of Wisconsin coastal resources through the Coastal Grant Program. In addition the Coastal Management Program formulates strategies, goals and policies for managing coastal hazards through the Interagency Coastal Hazards Workgroup.
DATCP, Agricultural Resource Management, Conservation Management Section	Agency Authorities include regulation of agricultural activities relating to soil and water conservation, shoreland management ordinances, farmland preservation and drainage districts.

FLOOD HAZARD MITIGATION PROGRAMS, continued

Program or Statute	Key Elements/Issue Addressed
DATCP Programs	Conservation Reserve Enhancement Program is a new program for Wisconsin that is designed to help remove sensitive riparian areas from crop or pasture production and install filter strips, grassed waterways, grass habitat and wetland restorations.
DATCP Programs	Nonpoint Source Grants are provided to counties for cost sharing with landowners and land users for installing practices that can reduce environmental damage due to flooding.

WIND HAZARDS

There are no programs devoted specifically to wind hazard mitigation. However, wind hazard mitigation can be addressed through general hazard mitigation programs. A recent HMGP project, for example, involves burying strategically important electric lines in a rural area vulnerable to damage from tree fall. In addition, a recent CDBG Public Facilities grant partially funded a tornado resistant shelter in a Wisconsin town where many houses did not have basements or other adequate tornado shelter.

Wisconsin's building code programs are listed below because strong building codes and code enforcement are a large part of preventing severe damage from tornadoes or thunderstorm winds. The Department of Commerce (DOC) is the state agency with the responsibility to establish and enforce state building codes. In 2000, DOC was also given the responsibility of regulating state codes for manufactured housing.

PROGRAMS AND POLICIES THAT ADDRESS WIND HAZARDS

Program	Key Elements/Issue Addressed
DOC, Division of Safety and Buildings	Building Codes Authority: Promulgates and enforces building code regulations to ensure the safe construction and maintenance of buildings and facilities.
DOC, Division of Safety and Buildings	Building Codes Training: Annual continuing education classes for building codes used for design, construction or building inspection.
DOC, Division of Safety and Buildings	Manufactured Housing Regulation: Regulates titling of manufactured homes and licensing for manufactured housing dealers. DOC also reviews complaints against dealers or products to ensure compliance with federal (HUD) regulations.
DOC, Community Development Block Grant, Public Facilities	CDBG Public Facilities grants can help fund projects such as tornado shelters, and shelter retrofits to mitigate against wind and tornado damage.
DOA, Community Development Block Grant, Housing	CDBG Housing grants can help fund rehabilitation of housing to meet current building codes and therefore help prevent vulnerability to moderately high wind events.
WEM, HMGP	The Hazard Mitigation Grant Program can address wind hazards.

WILDFIRE HAZARDS

The Department of Natural Resources, Division of Forestry is the lead agency for forestry management and forest fire control in Wisconsin. The programs listed below can help reduce the potential for a severe forest fire both in urban and rural settings. Additional support for wildfire hazards comes from local fire departments and the US Forestry Service.

PROGRAMS AND POLICIES THAT ADDRESS WILDFIRE HAZARDS

Program or Statute	Key Elements/Issue Addressed
DNR, Division of Forestry, Technical Assistance	Manages state forests and provides forestry management assistance to private forests statewide.
DNR, Division of Forestry, Programs	Urban Forestry Technical Assistance and Grants: Provide matching grant funds for urban forestry projects.
DNR, Division of Forestry, Programs	Fire Suppression Technical Assistance, Grant program and Regulation: Protection of forestlands and providing grant programs addressing fire suppression.

HAZARD AWARENESS

Wisconsin Emergency Management has three annual hazard awareness campaigns, one for floods, one for tornadoes and severe weather and one for winter weather. The tornado and severe weather campaign includes press releases and mass mailings to schools. There is also a tornado drill every year that occurs in cooperation with much of the state's media. The University of Wisconsin Cooperative Extension belongs to the Extension Disaster Education Network and promotes disaster awareness through its Local Government Center. Numerous state agencies provide hazard awareness content on the Internet. In addition, the National Weather Service and most electronic media participate in transmitting information on weather hazards including weather advisories, watches and warnings. The table below describes major state hazard awareness programs.

HAZARD AWARENESS PROGRAMS

Program or Statute	Key Elements/Issue Addressed
UW-Cooperative Extension	Provides community education and public information programs promoting hazard awareness and mitigation concepts.
WEM, Public Information and Education Initiatives	WEM promotes hazard awareness with a Spring Flood Report, a Tornado and Severe Weather Awareness Week and a Winter Weather Awareness Week. WEM publishes a newsletter every 2 months, which provides information on current emergency management operations. WEM also maintains a web site on the Internet with hazard information, links to other information sources and emergency management program information. WEM has a Public Information Officer for distributing press releases and coordinating relations with the media.

HAZARD AWARENESS PROGRAMS, continued

Web Sites – Most Agencies	Most state agencies provide some content on the Internet that help inform Wisconsin citizens about potential hazards and methods or agency programs to avoid or minimize their impact. See Appendix I for a list of Wisconsin agency web sites with hazard information.

DISASTER-RELATED ECONOMIC ASSISTANCE

The Department of Commerce is the lead agency for promoting economic development in Wisconsin. Most state economic programs are not disaster-related. However, a disaster or severe emergency can strain local resources and damage a local economy, especially if the community is small and the economy is not well diversified. There are two economic programs available for emergency assistance, one for communities and one for businesses. In addition, after a disaster additional post-disaster economic support often is made available from the Small Business Administration and the US Department of Agriculture.

DISASTER-RELATED ECONOMIC ASSISTANCE PROGRAMS

Program	Key Elements/Issue Addressed
WDOC, Division of Community Development Programs	The CBDG – Emergency Grant Program provides emergency assistance of up to $500,000 to local governments that experience a natural disaster or other catastrophe to fund up to 75% of local projects to repair damage.
WDOC Division of Community Development Programs	The Rapid Response Fund provides financial assistance to businesses or local governments to prepare sites for businesses to locate or expand in communities that are at risk for plant closings or layoffs as a result of natural disasters or economic downturn.

TRANSPORTATION AND PUBLIC UTILITIES

The Wisconsin Department of Transportation has two programs for highway transportation that can incorporate hazard mitigation and these are described below. In addition, through an interagency agreement WisDOT provides technical assistance to communities performing damage assessments to infrastructure after a disaster. The Public Service Commission of Wisconsin (PSCW) incorporates disaster resistance into the regulation of gas, electric, water and telecommunication utilities.

TRANSPORTATION AND UTILITIES PROGRAMS

Program or Statute	Key Elements/Issue Addressed
WisDOT	Flood Damage Aid partially funds replacement and improvement costs for major flood damage to any road or road structure under their jurisdiction. Can help pay for improvements that will make local roads more disaster resistant.

TRANSPORTATION AND UTILITIES PROGRAMS, continued

Program or Statute	Key Elements/Issue Addressed
WisDOT State statutes 86.34	Local Bridge Improvement Assistance Program works to rehabilitate and replace existing bridges on Wisconsin's local highway and road system. *Can fund improvements to better than replacement standards.* A) On claims over $15,000, an applicant may receive 75% of replacement costs, PLUS 50% of improvement costs. B) On claims of less than $15,000, the applicant has the option of accepting payment equal to 75% of the total amount of the Department's estimate OR submitting final costs and receiving payment as described above for claims larger than $15,000.
PSCW, Telecommunications Division	Authorities – Telecommunications: PSCW regulates development, land-use practices and environmental impact of utilities to minimize the risk to people, property and natural resources, including consideration of natural hazard mitigation.
PSCW, Division of Water, Compliance and Consumer Affairs	Authorities – Water: Wis. Stats. Ch. 196 and Wis. Admin Code Ch. 185. PSC regulates development, land use practices, and environmental impact of utilities to minimize the risk to people, property and natural resources, including consideration of natural hazard mitigation.
PSCW, Electric Division and Gas Division	Authorities – Electric: The purpose is the practical safeguarding of persons during the installation, operation or maintenance of Electric and Telephone supply and communication lines and their associated equipment. Gas: All gas transmission, distribution and utilization equipment and facilities must be constructed, installed, operated and maintained in a reasonably adequate and safe manner.

PUBLIC HEALTH PROGRAMS

The Wisconsin Department of Health and Family Services (DHFS) has programs to address infectious diseases, chemical exposure, radiological exposure, special needs populations and licensing of health care and other public facilities. The DHFS responds and coordinates with Wisconsin Emergency Management during emergency events. In addition, the DHFS participates in exercises simulating radiological and chemical emergencies. Additional capabilities are being developed to address emergency public health issues associated with weapons of mass destruction. Although not generally organized around natural hazards, public health programs include prevention as a focus. The DHFS web site includes natural hazard safety tips. A long-term concern is improving the disaster resistance of health care facilities.

STATE PROGRAMS ADDRESSING PUBLIC HEALTH ISSUES

Program	Key Elements/Issue Addressed
DHFS, Division of Supportive Living and Division of Children and Family Services	Special Needs Technical Assistance: Personnel with expertise in human service and/or special population needs are available to assist if actual or potential problems are present. Technical assistance can determine if an actual or potential human service and/or special population threat is present.
DHFS, Division of Public Health, Bureau of Environmental Health	Chemical Contamination Technical Assistance Personnel with expertise in environmental health issues are available to provide information specific to local concerns. Technical assistance can determine if an actual or potential public health threat is present and if hazard mitigation is warranted or desirable.
DHFS, Division of Public Health, Bureau of Communicable Disease	Communicable or Infectious Disease Technical Assistance Personnel with expertise in communicable/infectious disease are available to provide information specific to state or local concerns. Technical assistance can determine if an actual or potential public health threat is present.
DHFS, Certification, Licensing & Registration	Licensing of health care facilities, which includes hospitals, nursing homes, community based residential facilities (CBRFs). Other Licensing: The Department of Health and Family Services licenses or certifies a variety of enterprises for health and safety purposes including lead abatement and asbestos abatement services, tattoo parlors, child care facilities, mental health facilities, food service, lodging, campgrounds and public pools.

STATE HOUSING ASSISTANCE PROGRAMS

Housing programs are primarily designed to facilitate the fair provision of adequate shelter. After a disaster there is an opportunity to correct long-standing problems with houses that are in harm's way, especially houses that have been repetitively damaged by flooding. Wisconsin Emergency Management's Hazard Mitigation Grant Program and the Department of Administration's Community Development Block Grant programs have often worked together to achieve hazard mitigation goals and remove vulnerable houses from areas that flood. Other housing programs also help promote disaster resistance through rehabilitation and weatherization of substandard housing.

STATE HOUSING ASSISTANCE PROGRAMS

Program	Key Elements/Issue Addressed
DOA, Division of Housing and Intergovernmental Programs	The Community Development Block Grant – Housing can provide funds to buy out or flood proof homes in floodplains and can augment HMGP and FMA buy-out programs.
DOA, Division of Housing and Intergovernmental Programs	The Community Development Block Grant - Emergency Assistance Program provides funds to enable low-income residents repair and in some cases replace disaster-damaged homes.

STATE HOUSING ASSISTANCE PROGRAMS, continued.

DOA, Division of Housing and Intergovernmental Programs	The Home Investment Partnerships Program provides funds to support rental rehabilitation, weatherization related repairs, accessibility improvements and rental housing development.

LAND USE PLANNING PROGRAMS

The Department of Administration's Office of Land Information Services (OLIS) administers the Wisconsin Land Information Program in conjunction with the Wisconsin Land Information Board. Each county in Wisconsin has a land information officer to help local officials to manage land use. The GIS Services section is dedicated to promoting the efficient use of geographic information systems to facilitate informed local land use decisions. OLIS also houses Plat Review and Municipal Boundary Review, both of which have statutory authority for approval of specific land use related requests.

OLIS is administering the Smart Growth planning initiative passed by the Wisconsin legislature in 2000. The Smart Growth legislation will require a community to set forth a local growth plan by 2010 if the community wishes to make any significant changes in land use in the future. Although the focus of the planning process is transportation and residential development, Smart Growth requires that environmental issues be addressed. This presents the opportunity for communities to examine hazards such as flood with respect to development patterns.

LAND USE PLANNING PROGRAMS

Program	Key Elements/Issue Addressed
DOA, Office of Land Information Services	Wisconsin's *Smart Growth Initiative* provides planning grants including the Comprehensive Planning Grant and the Transportation Planning Grant to help communities adopt land use plans that address issues of urban sprawl and transportation infrastructure.
DOA, Office of Land Information Services	The Smart Growth Dividend Aid Program (available 2005) provides financial incentives for compact development and preservation of natural resources.
DOA, Office of Land Information Services	Municipal Boundary Review reviews and approves or denies municipal annexations through the program.

SECTION 5

STATE MITIGATION RECOMMENDATIONS

MITIGATION OBJECTIVES AND AGENCY ACTIONS

This section describes the mitigation actions recommended by the members of the State Hazard Mitigation Team (SHMT) for their state agencies to begin in 2001. The recommendations establish reasonable goals that are possible to do and are important to Wisconsin. A significant number of potential actions were proposed and reviewed by the SHMT. Some of these proposed actions were tabled for future discussion and may be included in the future when the Plan is updated. The actions presented below represent the focus of the SHMT for the next year or two. The actions are arranged according to the five mitigation objectives outlined in Section 1. Background information on the actions and the timeframe for their implementation are also provided.

1. To minimize human, economic and environmental disruption from natural hazards.

1.1 Action: Wisconsin Emergency Management will continue to administer the Hazard Mitigation Grant Program and the Flood Mitigation Assistance Program to eliminate or reduce future disaster damages by providing grants for long-term, permanent and cost-effective mitigation measures as well as mitigation planning.

Supporting Agencies: Those belonging to the IDRG and the SHMT.
Implementation: Current and ongoing.
Background: WEM has administered nearly $30 million in HMGP/FMA funds for projects that eliminate or reduce disaster damages and protect lives and property. With the assistance of the IDRG, WEM will continue to encourage communities to apply for mitigation grant funds and look to fund cost-effective projects and projects that make the biggest impact in reducing disaster costs. In addition, WEM will coordinate with other agencies through the IDRG to identify potential funding sources for projects and "package" funding to ensure implementation of projects at the local level.

1.2 Action: The Public Service Commission of Wisconsin (PSCW) will encourage telecommunication utilities to use lightning protection and grounding systems to avoid service disruption and loss of life by sending a general letter to telephone companies to remind them of service issues and requirements.

Lead Agency: PSCW.
Implementation: In 2001.
Background: Lightning is a major source of damage to telephone communication systems, systems that are critical for emergency response and coordination. Urging enhanced protection systems for these critical systems will help reduce their vulnerability to lightning.

1.3 Action: The Public Service Commission of Wisconsin (PSCW) will encourage telecommunication utilities to interconnect their switching networks and central offices with diverse routes so that service disruptions are minimized and 911 service trunks are operative at all times by sending a general letter to telephone companies to remind them of service issues and requirements.

Lead Agency: PSCW.

Implementation: In 2001.
Background: Modern communications are interconnected and become more reliable with some redundancy built into the network. Urging improved redundancy for these critical systems will help reduce their vulnerability to a variety of natural and technological hazards.

1.4 Action: The Department of Agriculture, Trade and Consumer Protection will encourage community participation in the Conservation Reserve Enhancement Program (CREP) to reduce crop losses.
Lead Agency: DATCP.
Implementation: In 2001. Sign up period ends in 2002.
Background: The CREP is a federal and state program that will focus on improving water quality by reducing nonpoint pollutant runoff from agricultural lands through the reduction of sediment, nutrient and pesticide runoff by installing riparian buffers, filter strips, grassed waterways, wetland restorations and restoring prairie grasses. The project goals are to establish 100,000 acres into the CREP. While primarily a water quality program, secondary benefits could be realized by removal of flood prone cropland from production.

2. To enhance public education about disaster resistance and expand public awareness of natural hazards.

2.1 Action: The Department of Administration's Division of Housing and Intergovernmental Relations will distribute hazard mitigation administration materials at housing workshops, training and orientation sessions.
Supporting Agencies: WEM.
Implementation: DOA-DHIR will begin to distribute hazard mitigation materials at its workshops in March 2001.
Background: The Division of Housing and Intergovernmental Relations will acquire hazard mitigation materials from WEM and distribute them at CDBG and HOME workshop and training sessions.

2.2 Action: The Wisconsin Coastal Management Program (WCMP) will continue to raise awareness of coastal hazards through activities such as Coastal Awareness Month, GIS training and workshops for government officials, and include concepts of disaster resistant communities to promote hazard mitigation.
Supporting Agencies: DOA-OLIS, WEM and DNR.
Implementation: The WCMP will pursue at least one workshop in coordination with UW-Extension on coastal hazards during 2001.
Background: The WCMP has a primary responsibility to promote responsible use of coastal resources through public workshops, grant programs and agency partnerships.

2.3 Action: The Department of Health and Family Services will move Disaster Health and Safety Tips web page to a more prominent location on DHFS' web site. Add links to and from WEM web site.
Supporting Agencies: WEM.
Implementation: This web page was moved up two levels to the Programs and Services page on DHFS' web site in 2000. Links to the WEM web site will be created in 2001.
Background: Information, designed to prevent or minimize adverse health impacts, and associated with different types of disasters or emergencies, should be provided and readily available to a wide range of persons and agencies. DHFS will move this information from its

current location (www.dhfs.state.wi.us/DPH_EMSIP/InjuryPrevention/Disaster/Disasterindex.htm) so that it is more visible and accessible.

2.4 Action: The Department of Health and Family Services will survey healthcare facilities to find out whether they have NOAA weather alert radios and whether they have a severe weather response plan for the facility. Provide information about NOAA radios and seek sources of funding to obtain NOAA radios for those facilities that lack them.

Supporting Agencies: WEM.

Implementation: DHFS will begin to survey healthcare facilities in 2001 that it licenses, certifies, operates or otherwise regulates. Program staff from the Divisions of Supportive Living (DSL), Children and Family Services (DCFS) and Care and Treatment Facilities (DCTF) will survey their respective facilities on the radios and plans; and provide such information, including potential sources of funding, for facilities that lack them.

Background: NOAA weather alert radios are a very cost-effective means of alerting local residents of impending, or existing, dangerous weather conditions. DHFS, through the Divisions of Supportive Living, Children and Family Services and Care and Treatment Facilities, will survey health care facilities licensed and regulated by this agency to determine the use and/or potential use of weather alert radios and whether facilities have included all types of severe weather (tornadoes, wind, heat and cold) in their disaster plans. DHFS will explore ways to provide radios that are not currently used in health care facilities.

2.5 Action: The Department of Natural Resources will provide workshops and distribute informational materials to improve understanding and enforcement of floodplain, shoreline and wetland regulations at the county level, including mitigation techniques.

Supporting Agencies: WCMP, UW-Sea Grant institute, WEM.

Implementation: Current and ongoing. Will coordinate with WCMP to improve coastal hazard awareness and coastal hazard mitigation. Three workshops on performance of groins and solid piers including comments on coastal hazard mitigation are scheduled for spring 2001 with Coastal funding.

Background: Making the public aware of flood hazards is one of the first duties and greatest challenges of any flood management program, especially for flood mitigation and prevention. The Coastal Management Program also actively promotes shoreline issues.

2.6 Action: The Public Service Commission of Wisconsin (PSCW) will continue to educate the public about safety issues related to natural hazards at electric and natural gas utilities.

Implementation: Current and ongoing.

Background: The PSCW prepares a wide variety of public information brochures. Authors for new brochures or revision of existing brochures will be advised to consider hazard mitigation when preparing future brochures.

2.7 Action: Wisconsin Emergency Management will promote mitigation on the WEM web site and link to other agencies as appropriate.

Supporting Agencies: WCMP, DOA-OLIS, OCI, DNR, DHFS, DATCP and DOC.

Implementation: WEM will update its web site, badger.state.wi.us/agencies/dma/wem/index.htm, by June 2001 and add links to other state agencies' web sites by October 2001. The WCMP will post reports on its activities related to coastal erosion on the WCMP web site in spring 2001. The OCI will add links to the WEM mitigation Internet site during 2001 and will add references to WEM mitigation information to OCI insurance brochures as they are updated.

Background: There is a lack of awareness of mitigation actions that people and communities can undertake to protect themselves from disasters and damages. This action will utilize WEM's web

page to the fullest extent to further educate and make persons aware of the benefits of mitigation. Some of the items to be included (but not limited to) are the State Hazard Analysis, the State Hazard Mitigation Plan, information on Project Impact including the activities of the designated communities and HMGP information. Projects to develop could include providing insurance and property protection options a homeowner could use to minimize risk from sewer back-up and basement flooding; identifying mitigation success stories in the state; and providing information regarding mitigation actions that can be taken to prevent disaster damages such as FEMA'S Building Performance Assessment Report (FEMA 342) on the Midwest Tornadoes. Establish links between agencies to areas of expertise.

2.8 Action: Wisconsin Emergency Management will participate in conferences and make presentations to local interest groups and associations to promote mitigation and disaster resistance. Such groups could include but are not limited to Wisconsin Land Information Associations (WLIA), Wisconsin Chapter of the American Planning Association (WAPA), the League of Wisconsin Municipalities, Wisconsin Counties Association, Wisconsin Emergency Management Association and the Wisconsin Manufactured Housing Association.

Supporting Agencies: DNR, UW-Extension, WCMP.
Implementation: WEM will make no less than 2 presentations in 2001 on the importance of hazard mitigation to organizations in Wisconsin.
Background: Although the awareness and the importance of mitigation has improved in recent years, it is acknowledged that much more can be done in this area. Recognizing that actual implementation of mitigation activities occurs at the local level, by attending and participating in conferences sponsored by various organizations WEM will be able to reach those at the local level, thus furthering mitigation in the state.

3. To encourage hazard mitigation planning.

3.1 Action: The Department of Administration's Office of Land Information Systems will incorporate hazard planning elements in the state guide to developing the Natural Resources element of a comprehensive plan.

Supporting Agencies: WEM, DNR and UW-Sea Grant Institute.
Implementation: This project will be initiated this summer and completed before the end of the year 2001.
Background: Comprehensive planning ("Smart Growth") legislation was created in 1999 to address the planning needs of Wisconsin communities. Many communities had outdated plans, inconsistent plans or no plans at all. This legislation requires communities that make land use decisions to have a comprehensive plan in place by January 1, 2010. Within the comprehensive plan, communities must address nine elements. One element of particular interest to hazard mitigation planning is the "natural and cultural resources" element. With guidance from WEM and the Department of Natural Resources (DNR), OLIS could incorporate natural hazard mitigation in the comprehensive planning guide. This could be accomplished by listing hazard mitigation as one of the goals within the comprehensive planning goals.

3.2 Action: The Wisconsin Coastal Management Program will update the current model ordinance to address Great Lakes coastal hazard areas.

Supporting Agencies: WEM, DNR, UW-Sea Grant Institute, State Cartographers Office.
Implementation: The model ordinance will be updated in the spring of 2001 and piloted in at least two counties on Lake Michigan in 2001.
Background: The WCMP in DOA has been working since 1995 on an update of the methodologies and technical information regarding coastal erosion in the Great Lakes shoreline.

This information is intended to help devise mitigation activities, update current model ordinances and raise the awareness of stakeholders in the coastal zone regarding risks posed by coastal erosion.

3.3 Action: The Department of Health and Family Services will schedule a conference on emergency management for healthcare facilities that includes hazard mitigation elements every 3 to 5 years based on local community needs.

Supporting Agencies: WEM.

Implementation: DHFS piloted an initial conference in October of 1999. DHFS will begin in 2001 to plan for a follow-up conference to be held in October of 2002. Staff from the Divisions of Supportive Living (DSL), Children and Family Services (DCFS) and Public Health (DPH) will coordinate the location, topics and presentation of the conference. WEM staff will be asked to participate in the planning process and conference presentations.

Background: Healthcare facilities (hospitals, nursing homes, community-based residential facilities, etc.) house residents who are at increased risk due to their individual needs. These facilities must be identified and integrated into the local community's emergency planning, response, recovery and mitigation activities. Special consideration should be given to the care and protection of both residents and their caregivers when local emergencies arise. DHFS piloted a "Local Emergency Management for Health Care Facilities" conference in October of 1999 to discuss case studies of Wisconsin health care facilities that experienced a variety of local emergencies. DHFS, through the Divisions of Supportive Living and Public Health, in the next year, will begin the process of establishing similar conferences that could be held periodically and rotated in different regional areas at least every 3 to 5 years. These conferences will be based upon local community needs and will include hazard mitigation elements.

3.4 Action: The State Historical Society (SHS) will use GIS to identify and map locations of known historical and archeological sites in floodplains.

Supporting Agencies: DOA-OLIS and DNR.

Implementation: The SHS is currently digitizing both historical and archeological site locations. This should be completed by mid summer/early fall of 2001. Once that is completed we can create the floodplain level information.

Background: Section 106 of the National Historic Preservation Act requires federal agencies, and the programs that they fund, to avoid the alteration, damage or destruction of significant historical and archeological sites. Knowing that an area contains significant historical or archeological sites should be taken into consideration in determining appropriate treatment of these resources before, during and after a disaster. Creating a statewide Geographic Information System (GIS) database containing the locations of significant historical and archeological sites will make information on these resources more widely available and facilitate mitigation planning that protects these resources. The State Historical Society will provide WEM and Wisconsin counties with data (lists/maps) for all properties listed in the National Register of Historic Places as it becomes available and will develop agreements on access to data and how this information will be used.

3.5 Action: University of Wisconsin Cooperative Extension will integrate hazard mitigation concepts into current Extension programs for community development, lake and watershed management, farm management and housing.

Supporting Agencies: WEM, WCMP, DOA-OLIS and DNR.

Implementation: Obtain and integrate hazard mitigation materials into curricula in the areas mentioned over a two-year period beginning on July 1, 2001. Once this is done, it will be an ongoing task, with updates and additions to the information as appropriate. The WCMP will pursue at least one workshop in coordination with UW-Extension on coastal hazards during 2001.

Background: UW-Extension provides, and continues to develop, educational programming for community, agricultural, family, youth, business, non-profit organization and local government audiences statewide. Some important programming areas covered by UW-Extension are relevant

to the implementation of hazard mitigation practices, including community, natural resource and economic development; lake and watershed management; farm management; and housing. Extension educational programs are delivered via face-to-face presentations, distance learning, printed material and the media. When appropriate, Extension educators integrate material on major state initiatives into educational programs. Examples have included energy conservation, farmland preservation and growth management. Under this action UW-Extension will prepare and adapt materials and update educational programs to include education and information on hazard mitigation.

3.6 Action: Wisconsin Emergency Management will encourage the development of local mitigation plans and strive to identify a process that would simplify the development and review of such plans and still meet federal criteria for plan approval.

Implementation: April 1, 2001 and ongoing.
Background: Presently only two flood mitigation plans have been officially approved by FEMA. Nine communities have completed a draft plan with another six communities still developing plans. Communities find it difficult to prepare the plans to include all of the criteria required for FEMA approval particularly the risk assessment and vulnerability analysis. There is a need to make the planning process simpler so that communities can develop the plans required by FEMA. The process should be able to meet the planning requirements of the HMGP, FMA and the CRS programs. Presently FEMA is developing mitigation planning criteria that would meet the requirements for all three plans.

4. To support intergovernmental coordination and cooperation among federal, state and local authorities regarding hazard mitigation activities.

4.1 Action: The Department of Administration's Division of Housing and Intergovernmental Relations will include hazard mitigation as a topic at selected conferences and workshops attended by CDBG and HOME grantees. The Division will invite WEM staff to speak at selected workshops.

Supporting Agencies: WEM.
Implementation: March 2001.
Background: Hazard mitigation and disaster resistance concepts will be discussed in conferences and workshops for CDBG and HOME grantees. WEM and DOA-DHIR can work together to provide mitigation information to DOA-DHIR grantees involved in housing and community development rehabilitation.

4.2 Action: The Wisconsin Coastal Management Program (WCMP) will continue to coordinate the Coastal Hazards Workgroup and look to expand hazard mitigation activities.

Supporting Agencies: WEM
Implementation: The WCMP will continue to meet as needed during 2001. WCMP will try to hold one meeting jointly with the State Hazard Mitigation Team in 2001.
Background: The WCMP works with its partners in an ad-hoc Coastal Hazards Work Group and maintains contact with the regional planning commissions and local governments in the coastal zone. This action will be carried out in the next three years as part of the WCMP Needs Assessment and Strategy.

4.3 Action: The Department of Natural Resources will (continue to) provide technical assistance to non-National Flood Insurance Program (NFIP) communities that have had flood damage and encourage them to join the NFIP.

Supporting Agency: WEM.

Implementation: Current and ongoing.
Background: Although most communities that are not in the NFIP are not high-risk communities for flooding, many of these communities do have some flood risk and need to establish a community flood mitigation program to clearly identify and mitigate flood risk.

4.4 Action: The Department of Natural Resources and the Wisconsin Coastal Management Program will work with local communities to encourage local mapping of floodplains and coastal areas. DNR will help identify flood hazard and coastal erosion areas, especially in those communities where mapping of hazard areas is most needed. DNR will try to have at least one priority community a year map its flood hazard areas.

Lead Agencies: DNR and WCMP.
Supporting Agency: WEM.
Implementation: Current and ongoing. Each year DNR will try to have at least one priority community map its flood hazard areas. Will coordinate with WCMP on identifying areas of coastal erosion. Coastal mapping activities will continue in 2001, starting with a pilot project to update coastal erosion information for Bayfield County on Lake Superior.
Background: Many developing areas of Wisconsin have flood and erosion risk but are poorly mapped for these risks or not mapped at all. Promoting hazard mapping is key to empowering local communities and individuals to manage and reduce their risks.

4.5 Action: The Wisconsin Department of Transportation will coordinate with WEM to sponsor a workshop for WisDOT engineers, technicians and other staff for post-disaster damage mitigation and programs.

Supporting Agency: WEM.
Implementation: WisDOT will begin planning the post-disaster damage mitigation workshop in 2001 and hold the workshop in the fall of 2001 or the spring of 2002. WEM will provide support to the workshop with presentations and materials.
Background: The Wisconsin DOT provides engineers and technicians to assist local government with post-disaster damage assessment of roads, bridges and public works.

4.6 Action: The Office of the Commissioner of Insurance will provide ongoing support and coordination with IDRG and SHMT in developing, establishing and implementing permanent and viable statewide mitigation programs.

Implementation: OCI's support of IDRG and SHMT is ongoing. OCI's insurance regulatory responsibilities are also ongoing. Those responsibilities include regulating insurance companies and agents and educating consumers about insurance products. During 2001and subsequent years, OCI will continue to publicize information on insurance and oversee the activities of insurance agents and companies.
Background: As the regulatory agency for insurance and insurance carriers, OCI serves as an expert in the field of insurance. As such it will cooperate fully with other agencies to encourage loss prevention, enhance consumer protection through the licensing and education of insurance agents and carriers and keep the businesses and individuals informed on insurance matters. OCI requires continuing education for agents and credit can be obtained through flood insurance courses provided by the NFIP.

4.7 Action: The State Historical Society will provide ongoing support and coordination with the IDRG and SHMT in developing, establishing and implementing permanent and viable statewide mitigation programs while protecting historical and cultural resources.

Implementation: Current and ongoing.
Background: Section 106 of the National Historic Preservation Act requires federal agencies, and the programs that they fund, to avoid the alteration, damage or destruction of significant historical and archeological sites. Coordination with WEM on hazard mitigation activities will help fulfill this mission.

4.8 Action: Wisconsin Emergency Management will continue to be the lead agency for and coordinate the Wisconsin Interagency Disaster Recovery Group (IDRG) and the State Hazard Mitigation Team in establishing a long-term, permanent and viable statewide mitigation program.

Implementation: Current and ongoing.
Background: The Wisconsin Interagency Disaster Recovery Group was organized in response to the 1993 Midwest Flood to coordinate relief and recovery efforts and to prevent duplication of efforts. As a result of the success of the group, the IDRG continues to meet and coordinate disaster relief and recovery among the agencies after disaster events, including both declared and non-declared. The success of the group has been demonstrated by the various mitigation projects completed in the state sometimes with multi-agency funding as well as technical assistance provided by many agencies. However, the IDRG is primarily a "reactive" group that is activated after a disaster. The success of the IDRG made clear the need to formalize a group and designate a State Hazard Mitigation Team (SHMT) that would be an expansion of the IDRG with policy-making authority. The SHMT is responsible for the development of a statewide mitigation strategy through the development of the State Hazard Mitigation Plan. Both groups play a vital role in furthering mitigation efforts in the state. Under this action, WEM will further define the roles and responsibilities of each group and the relationship between the two; continue the development and implementation of the State Hazard Mitigation Plan; continue to establish a viable ongoing mitigation program in the state; educate state, federal and local agencies regarding mitigation; and provide support to the IDRG and SHMT.

4.9 Action: Wisconsin Emergency Management will invite a representative from the Regional Planning Commission to participate on the State Hazard Mitigation Team and the Interagency Disaster Recovery Group.

Implementation: Extend invitation by July 1, 2001.
Background: Regional Planning Commissions conduct research and analysis, provide planning services, assist in grant writing as well as provide advise to local governments. Thus, they can be a valuable resource to not only the local governments, but also to the State Hazard Mitigation Team and Interagency Disaster Recovery Group. The State Hazard Mitigation Team membership invitation will be extended to a liaison to represent all nine Regional Planning Commissions. Those Regional Planning Commissions whose region has been affected by a recent disaster will be invited to participate on the Interagency Disaster Recovery Group.

5. To improve the disaster resistance of buildings and structures whether new construction, expansion or renovation.

5.1 Action: The Department of Administration's Division of Housing and Intergovernmental Relations will incorporate mitigation practices into its housing rehabilitation programs.

Lead Agency: DOA-DHIR.
Supporting Agencies: WEM.
Implementation: DOA-DHIR will begin to incorporate mitigation practices into its housing rehabilitation programs beginning in June 2001.

Background: Within certain general parameters, DOA-DHIR is able to identify eligible improvements using CDBG funds. "Safe Rooms" could be listed as eligible activities for grantees that are able to identify a need for such an activity. The change to the "eligible activities list" can be made for the next round of applications (due September 2001). Floodproofing is not only an eligible expense, but required in certain rehabilitation projects. Retrofitting for greater wind resistance can be added to the list of eligible CDBG activities where other property conditions require the replacement of the roof or siding.

5.2 Action: Support the adoption by Wisconsin of a current model building code as part of a suite of coordinated construction and maintenance codes in cooperation with FEMA's efforts for a disaster resistant standard building code.

Lead Agency: DOC-Division of Buildings and Safety.
Supporting Agencies: All agencies support building code improvements.
Implementation: 2001-2002.
Background: The State of Wisconsin is one of the last two states that has developed its own statewide code rather than use a national model code. Through the last decade there has been a nationwide drive to develop an international model building code (For more information see www.fema.gov/impact/pi913.htm). Regional and state building codes are usually limited in scope and application, responding predominately to local requirements. The development of nationwide or international codes will increase the level of safety and result in buildings that will be more resistant to the effects of all environments. Over the past three years the Department of Commerce has shifted resources to move away from developing or modifying state codes and towards the review and adoption process of an international model building code along with the coordinated construction and maintenance codes.

5.3 Action: The Department of Commerce-Division of Buildings and Safety will address the disaster resistance of manufactured homes by reviewing tie-down standards, installation standards and inspection standards. Encourage the installation of storm shelters for manufactured housing parks.

Lead Agency: DOC-Division of Buildings and Safety.
Supporting Agencies: WEM.
Implementation: Ongoing.
Background: The Department of Commerce has recently consolidated the responsibilities to permit and inspect manufactured housing parks. Commerce will review current requirements and work towards improving resistance to environmental events.

5.4 Action: The Department of Commerce-Division of Community Facilities will not approve grants or loans to communities to construct critical facilities in floodplains or do not address local hazards.

Lead Agency: DOC-Division of Community Facilities.
Supporting Agencies: DNR.
Implementation: Ongoing.
Background: Community development programs within the Department of Commerce, such as the CDBG Community Facilities program, help disadvantaged communities finance the construction of community facilities and infrastructure. These are key components of the community and need to be disaster resistant. The Department of Commerce will follow federal and state standards for flood risk mitigation and address other natural hazards as applicable when funding the construction of community facilities.

5.5 Action: The Public Service Commission of Wisconsin (PSCW) will encourage telecommunication utilities to obtain information about floodplains in advance of construction and to take reasonable precautions to avoid construction in these areas:

however, if construction in flood plains is unavoidable, the utilities should be encouraged to use alternative methods or technologies for such plant additions. The utilities should also be encouraged to be familiar with and to adhere to proper construction practices in general to avoid or minimize loss of service.

Lead Agency: PSCW.
Implementation: In 2001.
Background: The Public Service Commission of Wisconsin (PSCW) is an independent regulatory agency responsible for the regulation of Wisconsin public utilities. The above action will be accomplished through a general letter to telecommunications utilities to address these construction issues.

5.6 Action: The Public Service Commission of Wisconsin (PSCW) will continue to educate electric and natural gas utility personnel about utility safety issues and mitigation issues related to natural hazards during review of utility construction applications.

Lead Agency: PSCW.
Implementation: Current and ongoing.
Background: Hazard and public safety issues are discussed during each review of utility construction applications. All reviews include an evaluation of proximity to existing floodplains.

5.7 Action: Wisconsin Emergency Management will continue to administer the Hazard Mitigation Grant Program and the Flood Mitigation Assistance Program to strengthen buildings against disaster by providing grants for long-term, permanent and cost-effective mitigation measures.

Supporting Agencies: Those belonging to the IDRG and the SHMT.
Implementation: Current and ongoing.
Background: WEM has administered nearly $30 million in HMGP/FMA funds for projects that eliminate or reduce disaster damages and protect lives and property. With the assistance of the IDRG, WEM will continue to encourage communities to apply for mitigation grant funds and look to fund cost-effective projects and projects that make the biggest impact in reducing disaster costs. In addition, WEM will coordinate with other agencies through the IDRG to identify potential funding sources for projects and “package” funding to ensure implementation of projects at the local level.

SECTION 6

PLAN IMPLEMENTATION AND MONITORING

Plan Implementation

The State Hazard Mitigation Officer (SHMO), with the support and advice of the State Hazard Mitigation Team (SHMT), will coordinate the implementation of the State Hazard Mitigation Plan.

The State of Wisconsin Administrative Plan for the Hazard Mitigation Grant Program details the management of the Hazard Mitigation Grant Program and implementation of the Wisconsin State Hazard Mitigation (409) Plan in accordance with 44 CFR Section 206. Continued implementation of the State Hazard Mitigation Plan is the responsibility of the Governor's Authorized Representative (GAR) and the State Hazard Mitigation Officer (SHMO) as outlined in the HMGP Administrative Plan. The State Hazard Mitigation Team (SHMT) members are responsible for implementing the recommendations identified for their agencies in support of the Plan.

Monitoring, Evaluation and Plan Maintenance

Wisconsin Emergency Management is responsible for monitoring and evaluating implementation of the State Hazard Mitigation Plan.

The SHMO will convene regular SHMT meetings to monitor and evaluate progress on achieving hazard mitigation program goals and objectives as identified in the Plan. In addition, the SHMT will continue to discuss, research, and develop mitigation recommendations in support of the Plan's goals and objectives. These recommendations will then be added to the Plan during the annual Plan update.

Hazard Mitigation Team Members will complete semi-annual progress reports (forms are in this section) and submit the report to the State Hazard Mitigation Officer. Reports will be for 6-month periods October 1st to March 31st and April 1st to September 30th. Reports will be due April 30th and October 31st, one month after the end of the reporting period. The reports will identify the agency and contact person, the recommendation and its number as identified in the Plan and the schedule for implementation consistent with the recommendations in Section 5. It will include a brief summary of the actions completed to date, the actions remaining, the problems encountered and the type of assistance needed to resolve any problems or to complete the recommendation. It will include a summary on the status of the recommendations (on-schedule, delayed, suspended, and/or completed). The SHMT will discuss progress of mitigation recommendations at their regular meetings. The status of plan recommendations will be incorporated into the annual Plan update.

State Hazard Mitigation Plan

Semi-Annual Progress Report on Recommended Actions

Summary of progress for the period: 10/01 _____ to 03/31 _____
04/01 _____ to 09/30 _____

Agency:
Contact:
Action Item Subject Title:
Action Item Number:
Schedule for Implementation:
Actions Completed To Date (Be Specific)
Actions Remaining (Be Specific):
Assistance Needed:
Summary of Action Item Status: _____(A) Recommended actions on-schedule. _____(B) Recommended actions delayed. _____(C) Recommended actions suspended. _____(D) Recommended actions completed.
Comments:
Signature: Date:

SCHEDULE FOR IMPLEMENTATION OF RECOMMENDATIONS BY RECOMMENDATION

ACTION NUMBER	LEAD AGENCY	SUPPORT AGENCY	SCHEDULE FOR IMPLEMENTATION
1.1	WEM		Current and ongoing.
1.2	PSCW		In 2001.
1.3	PSCW		In 2001.
1.4	DATCP		In 2001. Sign up period ends in 2002.
2.1	DOA-DHIR	WEM	March 2001
2.2	DOA-WCMP	DOA-OLIS WEM DNR	The WCMP will pursue at least one workshop in coordination with UW-Extension on coastal hazards during 2001.
2.3	DHFS	WEM	This web page was moved to a more prominent location on DHFS' web site in 2000. Links to the WEM web site will be created in 2001.
2.4	DHFS	WEM	DHFS will begin to survey healthcare facilities in 2001 that it licenses, certifies, operates or otherwise regulates. Program staff from the Divisions of Supportive Living (DSL), Children and Family Services (DCFS) and Care and Treatment Facilities (DCTF) will survey their respective facilities on the radios and plans and provide such information, including potential sources of funding, for facilities that lack them.
2.5	DNR	WCMP UW-Sea Grant institute WEM	Current and ongoing. Will coordinate with WCMP to improve coastal hazard awareness and coastal hazard mitigation.
2.6	PSCW		Current and ongoing.
2.7	WEM	DOA-WCMP OCI DNR DHFS DATCP DOC	The WCMP will post reports on its activities related to coastal erosion on the WCMP web site in spring 2001. OCI will add links to the WEM mitigation Internet site during 2001 and will add references to WEM mitigation information to OCI insurance brochures as they are updated.

SCHEDULE FOR IMPLEMENTATION OF RECOMMENDATIONS BY RECOMMENDATION, continued

ACTION NUMBER	LEAD AGENCY	SUPPORT AGENCY	SCHEDULE FOR IMPLEMENTATION
2.8	WEM	DNR UW-Extension DOA-WCMP	WEM will make no less than two presentations in 2001 on the importance of hazard mitigation to organizations in Wisconsin.
3.1	DOA-OLIS	WEM DNR UW-Sea Grant Institute	This project will be initiated this summer and completed before the end of the year 2001.
3.2	DOA-WCMP	WEM DNR UW-Sea Grant Institute State Cartographers Office	The model ordinance will be updated in the spring of 2001 and piloted in at least two counties on Lake Michigan in 2001.
3.3	DHFS	WEM	DHFS piloted an initial conference in October of 1999. DHFS will begin in 2001 to plan for a follow-up conference to be held in October of 2002. Staff from the Divisions of Supportive Living (DSL), Children and Family Services (DCFS), and Public Health (DPH) will coordinate the location, topics and presentation of the conference. WEM staff will be asked to participate in the planning process and conference presentations.
3.4	State Historical Society	DOA-OLIS DNR	The SHS is currently digitizing both historical and archeological site locations. This should be completed by mid summer/early fall of 2001. Once that is completed we can create the floodplain level information.
3.5	UW-Cooperative Extension	WEM WCMP	Obtain and integrate hazard mitigation materials into curricula in the areas mentioned over a two-year period beginning on July 1, 2001. Once this is done, it will be an ongoing task, with updates and additions to the information as appropriate.
3.6	WEM		April 1, 2001 and ongoing.
4.1	DOA-DHIR	WEM	March 2001.
4.2	DOA-WCMP	WEM	The WCMP will continue to meet as needed during 2001. WCMP will try to hold one meeting jointly with the State Hazard Mitigation Team in 2001.

SCHEDULE FOR IMPLEMENTATION OF RECOMMENDATIONS BY RECOMMENDATION, continued

ACTION NUMBER	LEAD AGENCY	SUPPORT AGENCY	SCHEDULE FOR IMPLEMENTATION
4.3	DNR	WEM	Current and ongoing.
4.4	DNR DOA-WCMP	WEM	Current and ongoing. Each year DNR will try to have at least one priority community map its flood hazard areas. Will coordinate with WCMP on identifying areas of coastal erosion.
4.5	WisDOT	WEM	WisDOT will begin planning the post-disaster damage mitigation workshop in 2001 and hold the workshop in the fall of 2001 or the spring of 2002. WEM will provide support to the workshop with presentations and materials.
4.6	OCI		OCI's support of IDRG and SHMT is ongoing. OCI's insurance regulatory responsibilities are also ongoing. During 2001 and subsequent years, OCI will continue to publicize information on insurance, and oversee the activities of insurance agents and companies.
4.7	State Historical Society		Current and ongoing.
4.8	WEM		Current and ongoing.
4.9	WEM		Extend invitation by July 1, 2001
5.1	DOA-DHIR	WEM	June 2001.
5.2	DOC-Division of Buildings and Safety	All agencies	Changes to building codes take time and discussions regarding improvements are ongoing. If an improved building code is implemented it will be in 2001 or 2002.
5.3	DOC-Division of Buildings and Safety	WEM	Ongoing.
5.4	DOC-Division of Community Facilities	DNR	Ongoing.
5.5	PSCW		In 2001.
5.6	PSCW		Current and ongoing.
5.7	WEM		Current and ongoing.

SCHEDULE FOR IMPLEMENTATION OF RECOMMENDATIONS BY AGENCY

AGENCY	ACTION NUMBER	LEAD RESPONSIBILITY IMPLEMENTATION SCHEDULE	SUPPORT RESPONSIBILITY IMPLEMENTATION SCHEDULE
DOA-DHIR	2.1	March 2001.	
DOA-DHIR	4.1	March 2001.	
DOA-DHIR	5.1	June 2001.	
DOA-OLIS	3.1	This project will be initiated this summer and completed before the end of the year 2001.	
DOA-WCMP	2.2	The WCMP will pursue at least one workshop in coordination with UW-Extension on coastal hazards during 2001. Also see Action 4.5.	
DOA-WCMP	3.2	The model ordinance will be updated in the spring of 2001 and piloted in at least two counties on Lake Michigan in 2001.	
DOA-WCMP	4.2	The WCMP will continue to meet as needed during 2001. WCMP will try to hold one meeting jointly with the State Hazard Mitigation Team in 2001.	
DATCP	1.4	In 2001. Sign up period ends in 2002.	
DOC-DBS	5.2	2001-2002.	OCI offers its support for building codes improvements.
DOC-DBS	5.3	Ongoing.	
DOC-DCF	5.4	Ongoing.	
DHFS	2.3	This web page was moved to a more prominent location on DHFS' web site in 2000. Links to the WEM web site will be created in 2001.	
DHFS	2.4	DHFS will begin to survey healthcare facilities in 2001 that it licenses, certifies, operates or otherwise regulates. Program staff from the Divisions of Supportive Living (DSL), Children and Family Services (DCFS) and Care and Treatment Facilities (DCTF) will survey their respective facilities on the radios and plans and provide such information, including potential sources of funding, for facilities that lack them.	

SCHEDULE FOR IMPLEMENTATION OF RECOMMENDATIONS BY AGENCY, continued

AGENCY	ACTION NUMBER	LEAD RESPONSIBILITY IMPLEMENTATION SCHEDULE	SUPPORT RESPONSIBILITY IMPLEMENTATION SCHEDULE
DHFS	3.3	DHFS piloted an initial conference in October of 1999. DHFS will begin in 2001 to plan for a follow-up conference to be held in October of 2002. Staff from the Divisions of Supportive Living (DSL), Children and Family Services (DCFS) and Public Health (DPH) will coordinate the location, topics and presentation of the conference. WEM staff will be asked to participate in the planning process and conference presentations.	
DNR	2.5	Current and ongoing. Will coordinate with WCMP to improve coastal hazard awareness and coastal hazard mitigation.	Three WCMP funded workshops on performance of groins and solid piers including comments on coastal hazard mitigation are scheduled for spring 2001.
DNR	4.3	Current and ongoing.	
DNR DOA-WCMP	4.4	Current and ongoing. Each year DNR will try to have at least one priority community map its flood hazard areas. Will coordinate with WCMP on identifying areas of coastal erosion.	WCMP coastal mapping activities will continue in 2001, starting with a pilot project to update coastal erosion information for Bayfield County on Lake Superior.
DOT	4.5	WisDOT will begin planning the post-disaster damage mitigation workshop in 2001 and hold the workshop in the fall of 2001 or the spring of 2002.	WEM will provide support to the workshop with presentations and materials
OCI	4.6	OCI's support of IDRG and SHMT is ongoing. OCI's insurance regulatory responsibilities are also ongoing. Those responsibilities include regulating insurance companies and agents, and educating consumers about insurance products. During 2001 and subsequent years, OCI will continue to publicize information on insurance, and oversee the activities of insurance agents and companies.	
PSCW	1.2	In 2001.	
PSCW	1.3	In 2001.	
PSCW	2.6	Current and ongoing.	
PSCW	5.5	In 2001.	
PSCW	5.6	Current and ongoing.	

SCHEDULE FOR IMPLEMENTATION OF RECOMMENDATIONS BY AGENCY, continued

AGENCY	ACTION NUMBER	LEAD RESPONSIBILITY IMPLEMENTATION SCHEDULE	SUPPORT RESPONSIBILITY IMPLEMENTATION SCHEDULE
SHS	3.4	The SHS is currently digitizing both historical and archeological site locations. This should be completed by mid summer/early fall of 2001. Once that is completed SHS can create the floodplain level information.	
SHS	4.7	Current and ongoing.	
UW-Cooperative Extension	3.5	Obtain and integrate hazard mitigation materials into curricula in the areas mentioned over a two-year period beginning on July 1, 2001. Once this is done, it will be an ongoing task, with updates and additions to the information as appropriate.	The WCMP will pursue at least one workshop in coordination with UW-Extension on coastal hazards during 2001. Also see Action 4.5.
WEM	1.1	Current and ongoing.	
WEM	2.7	WEM will update its web site by June 2001 and add links to other state agencies' web sites by October 2001.	The WCMP will post reports on its activities related to coastal erosion on the WCMP web site in spring 2001. OCI will add links to the WEM mitigation Internet site during 2001 and will add references to WEM mitigation information to OCI insurance brochures as they are updated.
WEM	2.8	WEM will make no less than 2 presentations in 2001 on the importance of hazard mitigation to organizations in Wisconsin.	
WEM	3.6	April 1, 2001 and ongoing.	
WEM	4.8	Current and ongoing.	
WEM	4.9	Extend invitation by July 1, 2001	
WEM	5.7	Current and ongoing.	

SECTION 7

PLAN REVIEW AND REVISION

The State Hazard Mitigation Plan will be reviewed and evaluated semi-annually and updated each year by December 31st to ensure that program implementation is on schedule. The update will not only include progress on recommendations as stated in the Plan, but also will contain a review of the effectiveness of current programs and recommend additional mitigation activities for the future. The State Hazard Mitigation Officer (SHMO) will be responsible for the evaluation with participation from the State Hazard Mitigation Team (SHMT).

The primary intent of the update is to document and measure mitigation successes, and to incorporate the lessons learned from recent and past disasters to improve the state's ability to minimize the effects of future disasters. A secondary purpose of the update is to support and promote coordination among federal, state and local units of government as well as the private sector.

In the event of a presidential disaster declaration, the State Hazard Mitigation Officer (SHMO) will take the lead and coordinate with the State Hazard Mitigation Team (SHMT) in updating or amending the Plan to take into account special needs identified for the declaration. The SHMO and the SHMT will review the existing State Hazard Mitigation Plan to determine if existing policies, programs and/or capabilities are adequate and to address the issues generated by that disaster.

The SHMO, the Federal Hazard Mitigation Officer, Region V National Flood Insurance Program (NFIP) Specialist and the State Department of Natural Resources floodplain management staff will develop the Hazard Mitigation Implementation Strategy Report at the Disaster Field Office. This strategy report will identify mitigation opportunities and issues that need to be addressed based on the event and identify the specific activities that each will accomplish in administering mitigation programs for the declaration. This report will become an integral part of the Plan update. This Plan update will be due to FEMA within 180 days after the declaration is granted.

At a minimum, the annual Plan update will contain the following:

- A description and evaluation of the natural hazards in the state and in the designated disaster area (Natural Hazard Risk and Vulnerability Assessment, Section 2; Mitigation in Wisconsin, Section 3; and the Wisconsin Hazard Analysis, Appendix B);
- A description and analysis of state and local hazard management policies, programs and capabilities already in place or available to mitigate the hazards (State Agency Capability Assessment, Section 4);
- Hazard mitigation objectives and proposed actions to reduce or avoid long-term vulnerability to hazards. (State Mitigation Recommendations, Section 5); and

- A method of implementing, monitoring, evaluating and updating the Plan (Plan Implementation and Monitoring, Section 6 and Plan Review and Revision, Section 7).

The State Hazard Mitigation Plan update will also include:

- Reviewing goals and objectives of the Plan;
- Developing new hazard mitigation issues and recommendations;
- Reprioritizing existing mitigation issues and recommendations;
- Expanding the Plan to address additional hazards, risks, vulnerability, damages, capability assessments and/or criteria; and
- Proposed projects listed in Appendix F (Unfunded Mitigation Projects) will be reviewed and updated.

Revisions to the project listings are not considered Plan updates. However, changes in policy, such as in the priorities for implementing measures, or revisions to assessment information supporting policy development, are considered formal Plan updates.

The SHMT will review and concur with the Plan update before transmittal to FEMA. WEM will request signed state agency concurrence from those agencies represented on the SHMT. Agency concurrence will be incorporated into the Plan update as adoption of the update.

In the event that there is not a disaster declaration, the SHMO will coordinate with the SHMT to develop the annual Plan update. This update will be coordinated with the development of the annual Emergency Management Performance Grant process with FEMA, whenever possible.

Implementation of the Wisconsin State Hazard Mitigation Plan is in part delineated in the State of Wisconsin Administrative Plan for the Hazard Mitigation Grant Program in accordance with 44 CFR Section 206. Continued implementation and reporting on the Plan is the responsibility of the GAR, SHMO and SHMT.

ROLES AND RESPONSIBILITIES

Section V of the State of Wisconsin Administrative Plan for the Hazard Mitigation Grant Program contains detailed responsibilities of the GAR, SHMO, SHMT and the State Interagency Disaster Recovery Group (IDRG.) The general responsibilities in support of the HMGP Administrative Plan and the State Hazard Mitigation Plan update follow.

The Governor's Authorized Representative (GAR)/State Coordinating Officer (SCO):

- Ensures that Section 409 requirements, including development or updating of the State Hazard Mitigation Plan are met and closely tied to the administration of the HMGP; and

- Ensures that appropriate state agencies are on the IDRG and SHMT, and assist in the development or updating of the State Hazard Mitigation Plan.

State Hazard Mitigation Officer (SHMO):

- Leads the SHMT and IDRG in the development or update of the State Hazard Mitigation Plan to meet the Section 409 requirements; and
- Serves as liaison to the federal, state and local governments impacted by the Plan.

The Interagency Disaster Recovery Group (IDRG):

- Identifies immediate mitigation opportunities and issues that need to be addressed following a presidential disaster declaration; and
- Assists the SHMO in implementing the HMGP and in fulfilling the hazard mitigation planning requirements.

State Hazard Mitigation Team (SHMT):

- Identifies immediate mitigation opportunities and issues that need to be addressed following a presidential disaster declaration;
- Supports and advises the SHMO in the implementation of the State Hazard Mitigation Plan to meet the Section 409 requirements; and
- Members serve as liaisons to their designated agencies.

The “Lead” Agencies:

- Have foremost responsibility for the implementation of specific hazard mitigation recommendations.

The “Support” Agencies:

- Assist the agencies that have primary responsibility for a specific recommendation.

STATE HAZARD MITIGATION PLAN DISTRIBUTION

When the Plan update is developed, the SHMO will circulate the draft to members of the SHMT for review, comment and concurrence. The SHMO will revise the Plan as appropriate and circulate the final update of the Plan. The SHMO will submit the final update of the Plan to FEMA for approval by December 31st each year or within 180 days after a disaster declaration. The SHMO will distribute copies of the approved Plan to federal, state and local agencies as appropriate.

STATE HAZARD MITIGATION PLAN UPDATE
SCHEDULE OF ACTIVITIES

**ACTIVITY	TARGET DATE
Hold the first State Hazard Mitigation Team meeting to discuss development of the update and the agencies' roles and the responsibilities of the Team. (WEM)	/01
Review the Hazard Mitigation Implementation Strategy Report for the newly declared disaster to identify new issues generated by that disaster. (WEM, All)	/01
Review the State Hazard Analysis to identify new and existing hazards in the state that require action. (WEM)	/01
Identify and describe the state's existing resources that are available for reducing the state's risk and vulnerability to natural hazards. Review the State Agency Capability Assessment. (All)	/01
Identify completed mitigation projects and those currently in progress from the release of the Plan to the present. (WEM)	/01
Review the data base of unfunded mitigation projects based on past applications submitted for mitigation funding covering the time period of 1990 to the present. (WEM)	/01
Based on state hazard mitigation goals and objectives, begin to formulate agency specific mitigation recommendations for the update along with implementation schedule. (All)	/01
Finalize agency specific mitigation recommendations and implementation schedule. (All)	/01
Assemble draft State Hazard Mitigation Plan update. (WEM)	/01
Copy and distribute the draft State Hazard Mitigation Plan update requesting agency review and comments. (WEM, All)	/01
Incorporate changes into final draft of the State Hazard Mitigation Plan update. (WEM)	/01
Distribute State Hazard Mitigation Plan update for final review and concurrence. (WEM, All)	/01
Submit State Hazard Mitigation Plan update to the Federal Emergency Management Agency for review and approval. (WEM)	/01
Distribute approved State Hazard Mitigation Plan update to state and federal agencies, as appropriate.	/01

****Triggered by disaster declaration or annual review of the State Hazard Mitigation Plan.**

SECTION 8

CONCLUSION

Hazard mitigation is a tool to reduce the vulnerability of the citizens of the State of Wisconsin to natural hazards. The state has made a commitment to hazard mitigation, targeting floods as its top priority. Floods are the most costly natural hazard in the state. Acquisition of flood prone structures is an effective way to prevent flood damage and to minimize human suffering associated with flood damage. Since 1990 Wisconsin has acquired and removed over 270 residential and commercial structures from flood prone areas and has floodproofed 58 more. Of the structures that have been acquired, 39 are repetitive loss properties, structures that have had at least 2 flood insurance losses of more than $1,000 each. By the end of 2001, 58 of 362 repetitive loss properties will have been acquired or floodproofed. There has been a variety of other flood mitigation projects in the last 10 years as well. Communities, using state, federal and local hazard mitigation program funds, have also conducted flood awareness programs, repaired dams and levees and constructed storm sewers and detention ponds to reduce the likelihood of future damage.

Many state agencies support flood mitigation efforts. For example, the Department of Natural Resources (DNR), Floodplain and Shorelands Management Section has been active in flood prevention activities in fulfillment of Wisconsin's aggressive floodplain regulations such as floodplain zoning, promoting the National Flood Insurance Program and providing technical support for local floodplain and wetland mapping. In addition, the Wisconsin Coastal Management Program and the University of Wisconsin are working with DNR to better understand coastal hazards, map Wisconsin's Great Lakes coastline, and help local communities address coastal development. The Community Development Block Grant programs in the Department of Administration (housing) and the Department of Commerce (public facilities) have helped to fund a number of mitigation projects for flooding and other hazards. The Office of the Commissioner of Insurance arranges for flood insurance training for insurance agents.

New state agency programs will further reduce the future impact of flood hazards. The Department of Agriculture, Trade and Consumer Protection's Conservation Reserve Enhancement Program will provide technical assistance and funding for farmers with flooding and erosion problems to protect vulnerable farmland and convert it into wetland habitat reserves. The Department of Natural Resources' new Municipal Flood Control and Riparian Restoration Program will provide additional resources to communities to reduce flood vulnerability and also help protect the water quality of Wisconsin's rivers.

Wisconsin, however, is subject to other hazards besides floods. Tornadoes, high winds, hail, thunderstorms and temperature extremes are natural hazards that have caused significant loss of life and property. While not as many Wisconsin agency programs are focused on these hazards as compared to floods, the resources are significant. For

many of these other hazards, prevention is the biggest part of mitigation. Through strong building codes, inspection and code enforcement, severe damage and loss of life as a result of building failure is minimized. Likewise, weather warning systems, hazard awareness programs, insurance and public health advisories can reduce loss of life and property by giving the public access to information that can help them take protective measures. Finally, careful consideration of potential hazards when building facilities for utilities, health care and public use ensures that government and public facilities are truly long-term investments. Together with the many flood mitigation programs, these are Wisconsin's core strengths for reducing the public's vulnerability to natural hazards.

State agency programs that address hazards through mitigation have matured under the trying circumstances of the Great Midwest Flood of 1993 and the very busy decade for natural disasters, the 1990's. Many challenges have been met, yet many challenges remain. With respect to flooding, many people in Wisconsin are subject to basement flooding and sewer back up. Too few people have flood insurance or understand it. Many communities have yet to embrace flood mitigation planning as a tool to help make the community disaster resistant. Many communities need updated flood maps. Stormwater flooding is common and becoming more common. With respect to tornadoes and windstorms, many communities would benefit from performing a shelter assessment, especially for facilities such as schools and health care facilities, to evaluate their suitability as shelter during high winds.

Although the top priority for mitigation will remain the acquisition and demolition of flood vulnerable structures, these other mitigation and hazard awareness issues need to be addressed. The long-term challenge for public planning, development, public safety and emergency management professionals at every level of government is making disaster resistance a Wisconsin way of life.

This Plan demonstrates that state agencies are willing to take a leadership role to promote hazard mitigation, disaster prevention and hazard resistant communities. However, ultimately all mitigation is local. Participation in state and federal mitigation programs is at the discretion of each community and its citizens. Therefore, it makes sense to encourage local mitigation planning so local problems will have local solutions.

Wisconsin Emergency Management and our state agency partners have created this State Hazard Mitigation Plan, as a state disaster prevention planning tool, to help the state and all its citizens understand and combat natural disasters. This Plan is also designed to fulfill the requirements outlined by the Federal Emergency Management Agency. The Plan shows a solid history of hazard mitigation in Wisconsin, an appraisal of concerns and the commitment of state agencies to adopt policies and take actions that will address these concerns.

APPENDIX A:

2001 ANNUAL NATURAL DISASTER REPORT

The year 2001 began with Wisconsin's first snow emergency declaration in more than 20 years. Snow Emergency EM-3163 was declared in January for excessive snowfall during 2 periods in December 2000. Columbia, Ozaukee, Dane, Racine, Door, Rock, Green, Sheboygan, Kenosha, Walworth, Kewaunee, Waukesha, Manitowoc and Milwaukee counties were declared. Under the snow emergency 440 applicants in these 14 counties were eligible for federal funding to recover part of the cost for snow removal. A total of $5,483,097 in assistance was distributed as a result of this emergency declaration.

The heavy December snowfall contributed to spring flooding. In mid-April, rain and rapid snowmelt caused the Mississippi River and many of its tributaries to flood. Floodwaters along the Mississippi River from Alma to Prairie du Chien rose to the highest levels since 1965. Severe storms also struck northern Wisconsin in late April. Heavy rains mixed with freezing rain, snow and severe winds caused widespread flooding and wind damage. As a result of the record flooding and storm damage Wisconsin received a Presidential Disaster Declaration for 17 Wisconsin counties, DR-1369.

The scope of the disaster expanded when severe storms hit the west-central and east-central areas of Wisconsin on June 11 with hurricane-force winds. More than 30 counties reported damage totaling millions of dollars from these storms alone. One week later an F3 tornado hit Burnett and Washburn Counties. This tornado touched down near Grantsburg and continued traveling east for over 25 miles to an area just outside Spooner. There was extensive damage and destruction along the tornado's path. Damage was most concentrated in a six-block wide area of Siren, where numerous homes and businesses were completely leveled, 3 people killed and 16 people injured.

The cumulative result of these storms, tornadoes and flooding was that 32 counties were eligible to receive federal and state disaster assistance for DR-1369. This is the greatest number of declared counties in one summer since 1993 when 47 counties received federal disaster aid. Eighteen of these counties were approved for both Public Assistance for local governments and Individual Assistance. More than 3,000 individuals registered for federal disaster assistance under DR-1369. Under the Disaster Housing Program the Federal Emergency Management Agency distributed $1.6 million in housing assistance to almost 1,500 individuals. A total of $707,028 was distributed to 250 applicants under the Individual and Family Grant Program (IFG). WEM received 502 applications from local governments under DR-1369 for Public Assistance and distributed over $17 million through the program. The Small Business Administration provided more than $20 million of disaster assistance in the form of low-interest home repair loans, business damage loans and business economic injury loans. The Hazard Mitigation Grant Program will make $3,690,072 available in state and federal dollars for projects to reduce vulnerability to hazards. One notable project is making NOAA weather radios widely available in Burnett County, the site of last summer's devastating tornado.

Disaster DR-1369 is the 24th Presidential Declaration in Wisconsin and the 14th such disaster since 1990. The state has had multiple declarations in 1990, 1992 and 1998 and at least one

Presidential Declaration every year for the last 6 years in a row. In these last 12 years, 66 of the State's 72 counties were directly affected by disaster declarations. Additionally, in the 12 years since 1990, 6 requests for declarations were denied. The unprecedented frequency and severity of natural disasters established in the last decade has continued into the present one. Damage estimates for the last 14 disasters totaled in excess of $1.47 billion. As a result of these declarations more than $515 million in disaster relief was made available to the Wisconsin citizens and governments that were affected.

Wisconsin Emergency Management also responded to non-weather events in 2001. On September 11, the State Emergency Operations Center was activated. Staff coordinated with state and federal agencies in case the terrorist attacks in New York and Washington D.C. were to grow in scope. The public information section issued news releases and situation reports, coordinating and sharing information with the Governor's Office and Wisconsin's Congressional delegation. WEM contacted all 72 counties and received regular reports from the county emergency management directors that greatly facilitated the flow of information.

The year 2000 was similarly eventful. The State Emergency Operations Center was activated New Year's Eve and New Year's Day for the widely anticipated and somewhat overrated turning of the calendar from 1999 to 2000. There was a Presidential Disaster Declaration in 2000, DR-1332, for damages resulting from severe storms and tornadoes. On June 13, the state made its initial request for a disaster declaration for sixteen counties. By the end of the incident period, July 19, thirty counties were included in declaration DR-1332. The collective impact of this disaster was tremendous, especially to infrastructure. Multiple severe storms damaged many roads repeatedly and severely, and utility lines were down across broad areas of the state.

Overall, 10,461 individuals registered for disaster assistance under DR-1332. Under the Disaster Housing Program, 4,139 individuals were eligible for assistance and more than $6 million was disbursed. In the Individual and Family Grant Program, 4,004 applications were approved for the program with $4.4 million issued to disaster victims, making it the second largest IFG program in history in terms of dollars for the state. In addition, over 700 loans were approved through the Small Business Administration for nearly $8 million to assist individuals and businesses. The Public Assistance Program received 444 applications for disaster assistance totaling to date $13,969,024 making it the third largest Public Assistance program in the state outside of the 1993 Midwest Floods and the 2001 flooding storms and tornadoes. The Hazard Mitigation Grant Program made $3.3 million federal and state dollars available statewide to help get Wisconsin citizens out of harm's way.

There were two other weather events in 2000 severe enough to receive a Small Business Administration disaster designation. The first of these events occurred on May 12, 2000 when a major storm produced baseball size hail and winds in excess of 60 mph in Waushara, Winnebago, Calumet and Manitowoc Counties. The communities of Chilton and St. Nazianz were particularly hard-hit by hail and straight-line winds over 100 mph as well as a brief F1 tornado. The second event occurred on September 11 and 12 in Eau Claire and Chippewa Counties as a result of severe storms and flooding. Basement and first floor flooding occurred in more than 300 homes, some of which sustained major structural damage. Approximately a dozen businesses were similarly impacted.

Looking forward into 2002 and beyond, there are many tasks ahead. FEMA has a new program called Pre-Disaster Mitigation that makes federal funding available statewide to communities, counties and tribes for local hazard mitigation planning and prevention on an annual basis. This program provides opportunities for communities to avoid severe impacts from natural hazards before they happen.

NATURAL DISASTER DAMAGE IN WISCONSIN
1971 – 2001

YEAR	EVENT	NUMBER OF COUNTIES		STATE AND FEDERAL MONEY RECEIVED (For Public or Gov't Assist.)		STATE AND FEDERAL MONEY RECEIVED (For Private or Indiv. Assist.)		ESTIMATED DAMAGE PUBLIC (Gov't. Prop. & Facilities)	PRIVATE (Indiv. Prop., Crops, & Facilities)	TOTAL
2001**	Flooding/Storms/Tornado	32	1	21,247,565		22,375,528		47,725,550	56,158,600	103,884,150
2001****	Snow Emergency	14		5,483,097		_		N/A	N/A	N/A
2000***	Heavy Rains, Storms, Flooding	2	2	_		1,547,000		1,626,500	1,845,850	3,472,350
2000**	Heavy Rains, Storms Flooding	30	3	18,114,937		18,742,906		37,556,388	25,242,248	62,798,636
2000***	Severe Storms, Hail and Tornado	4	4	_		7,251,900		2,056,228	120,562,423	122,618,651
1999**	Heavy Rains, Severe Storms, Flooding	10	5	5,916,859		_		6,500,000	1,500,000	8,000,000
1998*	Tornadoes, Severe Storms	1	6	_		_		15,500	6,509,030	6,524,530
1998**	Severe Storms and Flooding	5	7	11,023,053		26,518,256		10,687,346	44,025,738	54,713,084
1998**	High Winds and Severe Storms	14	8	10,481,638		_		11,115,989	36,806,899	47,922,888
1998*	High Winds and Severe Storms	16	9	_		_		5,832,845	47,892,964	53,725,809
1997**	Flooding, Heavy Rains	4	10	17,160,019		37,620,733		17,064,946	70,667,000	87,731,946
1996**	Flooding, Tornadoes	2	11	2,450,546		_		11,366,650	49,748,000	61,114,650
1996*	Flooding	15	12	_		_		4,689,700	194,336,539	199,026,239
1994*	Tornadoes, Severe Storms	2	13	_		_		1,195,750	8,508,290	9,704,040
1993**	Flooding, Storms, Tornadoes, Heavy Rain	47	14	26,683,822	15	271,761,899	16	47,000,000	700,000,000	747,000,000
1992**	Flooding	10		3,143,715		126,402	17	1,917,000	15,838,286	17,755,286
1992**	Tornadoes	1		945,138		391,881	18	1,800,000	8,301,900	10,101,900
1992**	Tornadoes	1		3,054,759		0	19	5,362,500	9,020,000	14,382,500
1991**	Severe Storms, High Winds	5		3,850,598		0	20	3,696,000	23,001,283	26,697,283
1990**	Flooding	1		0		1,369,602	21	2,245,206	3,984,532	6,229,738
1990**	Flooding/Tornadoes	17		6,471,321		7,340,689	22	4,600,000	16,524,222	21,124,222

(See Notes on following pages)

* Presidential Disaster Declaration Applied for; Denied by Federal Government
** Presidential Disaster Declaration Approved for State
*** USDA-SBA Disaster Declarations Approved Upon Governor's Request
**** Presidential Emergency Declaration Approved Upon Governor's Request

YEAR	EVENT	NUMBER OF COUNTIES	STATE AND FEDERAL MONEY RECEIVED (For Public or Gov't Assist.)		STATE AND FEDERAL MONEY RECEIVED (For Private or Indiv. Assist.)		ESTIMATED DAMAGE PUBLIC (Gov't. Prop. & Facilities)	PRIVATE (Indiv. Prop., Crops, & Facilities)	TOTAL
1986**	Flooding	8	0		3,148,856	23	267,000	5,628,125	5,895,125
1986**	Flooding	2	2,071,063		7,037,267	24	4,262,500	15,737,500	20,000,000
1985*	Flash Flooding, Heavy Rain	3	0		0		1,327,000	1,339,000	2,666,000
1985*	Tornadoes, High Winds, Hail, Lightning	2	0		0		1,018,200	8,928,380	9,946,580
1984**	Tornadoes	2	775,394	25	11,168,220	26	880,890	20,569,000	21,449,890
1984****	Tornadoes	3	531,523		0		2,135,500	26,423,222	28,558,722
1980*	Flooding	6	0		0		2,803,000	3,052,217	5,855,217
1980**	High Winds, Tornadoes, Heavy Rains	4	2,367,824	27	4,119,380		6,468,000	153,243,650	159,711,650
1980*	High Winds, Heavy Rains	11	0		63,600		3,570,933	86,904,000	10,474,933
1980****	Forest Fires	2	25,010		709,300		4,000,000	1,235,000	5,235,000
1979****	Snow	3	962,000		0		N/A	N/A	N/A
1978**	Flooding and Tornadoes	16	5,000,000		20,745,150	28	11,662,450	39,710,820	51,373,270
1977****	High Winds and Hail	13	610,957		704,440	29	34,488,900	26,278,287	60,767,187
1977*	Tornado	5	0		0	30	222,000	6,036,500	6,258,500
1976****	Drought	64	8,858,250		119,576,674	31	1,000,000	623,000,000	624,000,000
1976**	Ice Storm	22	6,000,000		125,000	32	8,450,674	42,028,665	50,479,339
1975	Army Worm Infestation	29	0		0	33	0	8,100,000	8,100,000
1975**	Flood and High Wind	4	591,922		200,000	34	1,451,200	3,791,000	5,242,200
1975*	Flood	8					633,500	1,800,000	2,433,500
1974***	Rain, Hail, Frost, Drought	68			106,296,850	35		350,000,000	350,000,000
1974**	Tornadoes	5	100,000		500,000		412,135	8,507,040	8,919,175
1973**	Floods	35	3,000,000		10-12,000,000 9,200,000	36 37	4,000,000	20,000,000	24,000,000

(See Notes on following pages)

* Presidential Disaster Declaration Applied for; Denied by Federal Government

** Presidential Disaster Declaration Approved for State

*** USDA-SBA Disaster Declarations Approved Upon Governor's Request

**** Presidential Emergency Declaration Approved Upon Governor's Request

YEAR	EVENTS	NUMBER OF COUNTIES	STATE AND FEDERAL MONEY RECEIVED (For Public or Gov't Assist.)	STATE AND FEDERAL MONEY RECEIVED (For Private or Indiv. Assist.)		ESTIMATED DAMAGE PUBLIC (Gov't. Prop. & Facilities)	ESTIMATED DAMAGE PRIVATE (Indiv. Prop., Crops, & Facilities)	TOTAL
1972**	Floods	4	450,000	1,400,000	38	600,000	2,000,000	2,600,000
1971*	Tornadoes	7	130,000			0	2,211,000	2,211,000
1971*	Floods	24				N/A	N/A	N/A
TOTALS	**46**	**584**	**$ 167,501,010**	**$ 691,041,533**		**$ 313,251,752**	**$ 2,896,434,787**	**$ 3,129,686,539**

Presidential Disaster Declarations Awarded	24
Presidential Disaster Declarations Denied	14
SBA Disaster Declarations Awarded	4
Emergency Declarations Awarded	5

* Presidential Disaster Declaration Applied for; Denied by Federal Government
** Presidential Disaster Declaration Approved for State
*** USDA-SBA Disaster Declarations Approved Upon Governor's Request
**** Presidential Emergency Declaration Approved Upon Governor's Request

NOTES FOR THE NATURAL DISASTER DAMAGE TABLE

1 The sum of disaster assistance to governments includes $17,557,494 from the Public Assistance (PA) program and $3,690,072 from the Hazard Mitigation Grant Program (HMGP). The sum of disaster assistance to private individuals includes $1.6 million under the Disaster Housing Program, $707,028 under the Individual and Family Grant Program (IFG), and $20,068,500 in Small Business Administration (SBA) disaster assistance loans. The SBA loans included $9,999,700 in Home Loans, $8,382,700 in Business Damage Loans, and $1,686,100 in business economic injury loans.

2 Private sector disaster assistance was entirely from the SBA and represents 41 home loans made to individuals totaling $679,100, 4 loans to businesses for physical damages totaling $475,500 and 3 loans to businesses for economic injury related to the storm totaling $392,400.

3 The $18,742,906 in private sector assistance includes $6,267,491 in federal Disaster Housing Program funds and $4,504,015 in the Individual and Family Grant Program. The remainder is from the Small Business Administration and represents 661 home loans made to individuals totaling $7,234,200, 40 loans to businesses for physical damages totaling $554,800 and 28 loans to businesses for economic injury related to the storm totaling 182,400. The public sector assistance includes $13,695,918 in total Public Assistance ($10,271,939 federal share) and $4,424,019) in Hazard Mitigation Grant Program funds ($3,313,014 federal share).

4 Private sector disaster assistance was entirely from the SBA in the form of low-interest loans. The largest portion, $5,756,000, was for Home Loans. In addition, the SBA provided $963,400 for Business Damage Loans and $532,500 for Business Economic Injury Loans. The May 12 storm was the costliest hailstorm in Wisconsin's history (the National Weather Service estimated $121.6 million in damage) although most of the damages were covered by insurance. County estimates for damages to public infrastructure and costs for debris removal totaled $2,056,228 of which $1,018,651 was for debris removal and emergency protection measures. Most of these expenses were not covered by insurance. The damage to public sector structures, $1,037,577, was subtracted from the gross damage estimate of $121.6 million to create an estimate of private sector damages (mostly homes and crops).

5 The $5,916,859 in public sector assistance represents $5,116,859 in monies obligated for the Public Assistance Program and $800,000 for the Hazard Mitigation Grant Program. Approximately $3,352,710 in Public Assistance had already been paid out as of the date of this publication. Individual assistance was not requested from the federal government as part of this declaration.

6 Request for Presidential Declaration was denied on the basis that most of the losses were covered by insurance and that the remaining costs were within the capabilities of the state and local governments. A subsequent appeal by the Governor was also denied.

7 The $7,561,053 in public sector funding represents monies obligated and includes $3,110,632 for the Public Assistance Program and $4,450,421 for the Hazard Mitigation Grant Program. The private sector figure represents the total of loans from the Small Business Administration ($12,479,500), Disaster Housing Grants ($8,824,255), Individual and Family Grants ($5,147,127), the Disaster Unemployment Assistance Program ($3,253) and the Crisis Counseling Program ($64,121). The declared counties also received a special HUD CDBG grant award in the amount of $3,462,000.

8 The Presidential Declaration included only Public Assistance and Hazard Mitigation, even though Individual Assistance was also requested. This exclusion was appealed, however the appeal was also denied on the basis that most of the private sector losses were covered by insurance. The $10,481,638 in public sector funding represents monies obligated and includes more than $$8,519,173 for the Public Assistance Program and $1,962,465 for the Hazard Mitigation Grant Program.

9 Request for Presidential Declaration was denied on the basis that most of the losses were covered by insurance and that the remaining costs were within the capabilities of the state and local governments. A subsequent appeal by the Governor was also denied.

10 Damage figures are based on original estimates received from county emergency management directors. More than 14,000 individuals applied for assistance from the Disaster Housing, Small Business Administration and Individual and Family Grant Programs. This represents the largest Individual Assistance Program ever administered in the state. Public Assistance and Hazard Mitigation Programs are still being administered. When completed, it is estimated that $6,795,016 will be paid out in the Public Assistance Program and that $6,265,003 will go toward Hazard Mitigation Grants. The declared counties also received a special HUD CDBG grant award in the amount of $4.1 million.

11 A Presidential Disaster Declaration was declared on August 2 for Public Assistance only. An appeal to have Individual Assistance added to the declaration was denied. Green County was declared eligible for low-interest loans from the Small Business Administration.

12 Both the original request for a Presidential Major Disaster Declaration and a subsequent appeal were denied. The private damage figure reflects an estimated $180 million in crop losses.

13 Low-interest loans were made available by the Small Business Administration. Information is not available as to the number of loans approved and the amount.

14 Funds disbursed include aid to the agricultural community totaling $230,742,262; loans through SBA for individual and businesses totaling $10,394,929; 840 Individual and Family Grants totaling $1,492,267; and Disaster Housing Grants for $3,944,158. Close to 4,500 people applied for disaster assistance through the FEMA programs.

15 Funds disbursed to date include $5,008,911 in Community Development Block Grants, $1,525,000 in Community Services Block Grants, $1,019,309 in Federal Highway Administration Emergency Relief Funds, among other programs. Over 600 state and local governments have received almost $20 million in grants through the Public Assistance Program. The cost share for this declaration under the Public Assistance Program was increased from 75% to 90% federal (FEMA) funds with the state splitting the remaining 10% with the applicant.

16 Forty counties declared for both Individual and Public Assistance programs, and another seven for Individual Assistance. Incident period for the declaration was June 7 - August 25, 1993.

17 This figure represents the amount of assistance provided by the Individual and Family Grant Program. It does not include the amount of assistance provided by the Disaster Housing Program and the Small Business Administration.

18 This figure represents the amount of assistance provided by the Individual and Family Grant Program and Crisis Counseling Grant. It does not include the amount of assistance provided by the Disaster Housing Program and the Small Business Administration.

19 This request for a Presidential Disaster Declaration for Public Assistance was originally denied. An appeal of the denial was made on July 27 and the result of the appeal was that a declaration was granted.

20 This declaration was made by the President on August 6, 1991, for public assistance only, as most of the losses to the private sector were covered by insurance. The Farmers Home Administration Emergency Loan Program was also made available.

21 Both individual and public assistance were requested, however, only individual assistance was granted in this declaration. A subsequent appeal for the public assistance program was also denied. The bulk of public damage was to the Lake Tomah Dam and the Tomah Wastewater Treatment Facility.

22 This was the first declaration received by the state subsequent to the passage of the amended disaster law, Public Law 100-707, The Robert T. Stafford Disaster Relief and Emergency Assistance Act. The law expanded eligibility under the public assistance program and also made a new Hazard Mitigation Grant Program available under Section 404.

23 As a result of FEMA-775-DR, the Small Business Administration has approved 237 loan applications totaling $2,562,600. The Individual and Family Grant Program approved 519 grants totaling $586,256.

24 As a result of FEMA-770-DR, the Small Business Administration has approved 649 loan applications totaling $5,568,000. The Individual and Family Grant Program approved 1,154 grants totaling $1,468,667.

25 As a result of FEMA-710-DR, the Small Business Administration approved 63 project loan applications totaling $3,683,600. The Individual and Family Grant Program approved 64 grants totaling $171,967. The Farmers Home Administration approved 484 loans for $11,168,220.

26 The Public Assistance Program included 4 projects (Iowa County, Town of Brigham, Wisconsin Conservation Corps and the Village of Barneveld). Final payment was made to the Village of Barneveld on April 10, 1987.

27 This disaster marked the first time that the Federal Emergency Management Agency implemented cost-sharing for the public assistance program and mandated that the state and local governments pay for 25 percent of eligible costs. The Governor's Office, WEM and local officials worked diligently to overturn FEMA's policy, maintaining that it was contrary to the intent of Congress in passing Public Law 93-288, the Disaster Relief Act of 1974. Moreover, FEMA chose to implement the new policy without prior formal notification to the states and in an arbitrary manner. This is evidenced by the fact that various states were able to negotiate different rates of cost sharing, such as the 90/10 agreement obtained by the State of Arizona. The Governor eventually signed, under protest, the federal-state agreement putting the program into effect.

28 This figure includes over $800,000 in home loans and $2,000,000 in business loans made through the Small Business Administration; approximately $750,000 given in outright grants through the Individual and Family Grant Program; and more than $15,800,000 in loans through the Farmers Home Administration. It also includes $244,529 paid out through the Emergency Conservation Measures Program and $981,051 through the Set Aside Disaster Program.

29 The statistics listed refer to severe weather that occurred on July 4, July 30, and August 31. A Presidential Disaster Declaration was requested for the July 4 incident with a subsequent amendment to that request being filed to include the July 30 damages. The declaration request and amendment were denied in spite of the fact that the public and private damage figures for both incidents totaled $57,267,187. The resulting burden placed on state and local governments and individual citizens and farmers was overwhelming. An emergency declaration, #3048-EM, was granted for the 10 counties suffering damage during the July 4 incident. This declaration only provided for removal of downed timber on publicly owned lands to avert fire hazards. A total of 92 project applications were approved, with a total of $542,160 being disbursed. Requests were made to SBA and FmHA for disaster designations for all 12 counties involved in July 4 and July 30 incidents, and for the August 31 incident that involved Marathon County. Approved applications for all three occurrences totaled $704,440. This assistance allowed citizens and farmers to obtain long-term, low-interest loans (1 percent for the first $10,000 - 3 percent for the next $30,000) for real and personal property losses sustained as a result of the storms. Business loans were also made available.

30 A Presidential Disaster Declaration was requested for this particular incident and denied. Subsequent requests for disaster designations were made to SBA and FmHA and approved by both. Despite such assistance, more than $222,000 in public damages had to be absorbed by the state and local governments. Also, most of the $5,766,500 in private damages and $270,000 in private utility damages had to be absorbed by the citizens and private utility companies respectively.

31 Losses include fire damage to local government forests and state and local government fire fighting costs. The great majority of losses were to farmers in lost production and income due to reduction in crop yields. The Hay Transportation Assistance Program paid out a total of $7,757,515 to farmers. Through the payments from the Emergency Livestock Feed Program farmers received a total of $9,039,450. The Farmers Home Administration approved 2,957 Emergency Disaster Loans for a total of $78,264,990. FmHA also approved Emergency Livestock loans totaling $2,584,300. The Small Business Administration approved applications for Physical Damage Loans for wells in the amount of $164,700. In terms of public assistance, $7,792,800 was paid out under the Community Emergency Drought Relief Programs. HUD provided a total of $625,000 in the form of Community Development Grants. When all Drought Programs are combined, total federal monies paid out are $119,434,924. This figure represents 19 percent of the $624,000,000 in losses attributed to the drought.

32 The public assistance for governments was responsive. The $125,000 is a combination of monies received by individuals for unemployment compensation, for Individual and Family Grants and for SBA and FmHA loans.

33 Loan assistance was requested from USDA-FmHA. Denied by FmHA who stated this was a cyclical phenomenon and not eligible under their regulations.

34 In private sector, includes grants for individuals and Small Business Administration and Farmers Home Administration loans. In addition, the USDA-SCS expended in excess of $1,000,000 in soil conservation measures activities.

35 FmHA made over 6,700 loans (5 percent) to farmers, totaling over $106,000,000 in obligated funds.

36 SBA loans with approximately half of the amount being forgiven.

37 FmHA made loans on the 1973 flood retroactively. Loans were made for 10 to 12 million dollars, with approximately 4 to 6 million dollars being outright grants or loan forgiveness.

38 Federal Government agencies (Small Business Administration and Farmers Home Administration) provided low-cost loans with forgiveness features (part of principal canceled) to private home owners, businessmen and farmers.

ACRONYMS

USCE = UNITED STATES CORPS OF ENGINEERS
USDA = UNITED STATES DEPARTMENT OF AGRICULTURE
FSA = FARM SERVICES AGENCY
SBA = SMALL BUSINESS ADMINISTRATION
HUD = HOUSING AND URBAN DEVELOPMENT
FEMA = FEDERAL EMERGENCY MANAGEMENT AGENCY

NATURAL DISASTER ACTIVITY BY COUNTY

(1971-2001)

KEY CHART

A	1971 Tornado*
B	1971 Flood*
C	1972 Flood**
D	1973 Flood**
E	1974 Tornado**
F	1975 Flood*
G	1975 Floods and High Winds**
H	1975 Army Work Infestation
I	1976 Ice Storm**
J	1976 Drought***
K	1977 Tornado*
L	1977 High Winds and Hail***
M	1978 Flooding and Tornadoes**
N	1979 Snow***
O	1980 Floods, Tornadoes, High Winds*
P	1980 High winds, Severe Thunderstorms, Tornadoes**
Q	1980 Floods*
R	1980 Fire***
S	1984 Tornadoes***
T	1984 Tornadoes**
U	1985 Tornadoes, High Winds, Lightning, Hail*
V	1985 Flash Flooding and Heavy Rains*
W	1986 Flooding**
X	1986 Flooding**
Y	1990 Flooding, Tornadoes**
Z	1990 Flooding**
A1	1991 Severe Storms**
A2	1992 Tornadoes**
A3	1992 Tornado**
A4	1992 Flooding**
A5	1993 Flooding**
A6	1994 Tornadoes/Severe Storms*
A7	1996 Flooding/Severe Storms*
A8	1996 Flooding/Tornadoes**
A9	1997 Flooding/Severe Storms**
A10	1998 High Winds/Severe Storms*
A11	1998 High Winds/Severe Storms**
A12	1998 Severe Storms/Flooding**
A13	1998 Tornadoes/Severe Storms*
A14	1999 Heavy Rain/Severe Storms/Flooding**
A15	2000 Hail, Severe Storms, Tornado*
A16	2000 Heavy Rain/Severe Storms/Flooding**
A17	2000 Heavy Rain/Severe Storms/Flooding*
A18	2001 Snow Emergency***
A19	2001 Flooding, Severe Storms, Tornado, Heavy Rains**

* Signifies Request for Presidential Disaster Declaration Denied

** Signifies Request for Presidential Disaster Declaration Approved

*** Signifies Request for Presidential Emergency Declaration Approved

APPENDIX B

HAZARD ANALYSIS

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INTRODUCTION

Wisconsin is vulnerable to a wide range of hazards, both natural and technological. Natural hazards such as floods, tornadoes, winter storms and excessive heat have caused injuries, loss of life, disruption of essential services, significant property damage and crop damage. Advancements in technology have resulted in a range of radiological, biological and chemical hazards, many unknown 20 or 30 years ago. Religious and political extremists have attacked government, military and civilian targets both in the United States and abroad. Managing these diverse threats and protecting lives and property is the challenge faced by emergency management officials at all levels of government. Effective emergency management must attain the capability to plan and prepare for, respond to, recover from and mitigate all types of hazards. To do this an awareness and understanding of the probability and impact of disasters resulting from these hazards must be developed. The first step in this process is the preparation of a hazard analysis. This not only increases awareness, understanding and the ability to determine probability of occurrence within a specific area and actual vulnerability; it enables decision-makers to set goals and priorities for planning, training, preparedness activities and allocate resources on a day-to-day and disaster basis.

The scope of this document is statewide. It details the hazards that have caused or are likely to cause disasters in Wisconsin. This report also discusses hazards that threaten public health and safety, but may not be likely to cause a disaster. The descriptions of disasters, hazards and threats include information on frequency of occurrence, significant occurrences, potential and actual impacts and related programs. Wherever possible, maps, charts and supplemental materials have been included to illustrate or emphasize areas of particular vulnerability, provide historical data and impart statistical information. This report may be utilized as a reference document and resource for the preparation of county, local and municipal hazard analyses.

It is Wisconsin Emergency Management's (WEM) policy to update the State Hazard Analysis document on a biennial basis. Copies are distributed to each county emergency management director and appropriate state agencies. County emergency management directors are encouraged to use the information in this document to complete the required update of their respective county hazard analyses.

WEM would like to acknowledge the assistance and contributions of information from federal, state and local agencies in the preparation of this document. Of special merit are the contributions from the National Weather Service; the Federal Emergency Management Agency (FEMA); the Wisconsin Departments of Natural Resources, Transportation, Corrections and Agriculture, Trade and Consumer Protection; the State Climatologist; and the Wisconsin Agricultural Statistics Service.

AIR TRANSPORTATION INCIDENTS

Hazard Description: Air transportation incidents include accidental and intentional crashes or collisions involving any type of aircraft. Serious air transportation accidents involve primarily large commercial passenger airlines.

Hazard Assessment: Air transportation incidents can result from a number of causes including human error, mechanical failure, poor weather conditions, hijacking, sabotage and deliberate use of the airplane as a weapon. The overwhelming majority of most airplane incidents are accidental in nature. The risk of an accidental airplane crash is usually greatest during landing and take-off operations. As a result, the areas adjacent to airports and in airport approach and departure paths are most vulnerable to this hazard and flight plans are usually designed to minimize risk should an accident occur. During times of heightened security due to terrorist threat, flight plans may be changed to maintain greater distance between airline flight paths and vulnerable targets. Weather is often a factor in airline accidents, particularly high winds and ice storms, and may impede rescue efforts. When an air transportation incident results in a crash, emergency response personnel may have to confront secondary effects like fires and hazardous material spills. Responder actions may need to include search and rescue efforts for survivors, establishing field medical or mortuary facilities for victims and crash site security for crowd and traffic control. Local law enforcement agencies will need to provide crash security and may initially investigate the incident if they have the capability. It must be stressed that when a commercial passenger airplane accident occurs or any type of aircraft crashes into a densely populated area, area response teams and emergency facilities must be prepared to find, rescue, transport and medically treat mass casualties. Any response operation may evolve quickly and give rise to difficulties with communicating and coordinating efforts among multiple responders. The more responders involved, the more difficult it is to keep the operation well coordinated. However, commercial airline accidents involving large capacity aircraft are rare in Wisconsin. Most Wisconsin air transportation incidents are accidents involving small privately owned airplanes or small commercial air taxis.

There are 726 aircraft landing areas in Wisconsin as of the end of calendar year 2001. The number of both private use and privately owned airports operating in Wisconsin increased slightly in 2000 and remained virtually steady in 2001, decreasing by just 1. The table below summarizes the type and number of landing facilities from 1996 to 2001.

Wisconsin Landing Facilities on Record

Type of Facility	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Airports open to the public	133	133	132	131	136	136
Publicly owned	95	95	97	97	98	98
Privately owned	38	38	35	34	38	38
Private use airports	408	395	403	419	426	430
Heliport	108	111	115	120	131	126
Seaplane bases	28	26	26	27	27	27
Military/Police fields & helipads	7	7	7	7	7	7
Total	**684**	**673**	**683**	**704**	**727**	**726**

Source: Wisconsin Department of Transportation, Bureau of Aeronautics, 2002.
http://www.dot.state.wi.us/dtid/boa/01activity.htm

There are 11 airports in Wisconsin that provide regularly scheduled commercial flights. The table below illustrates airport operation trends for Wisconsin's airports with scheduled carrier service. Total operations for 2001 decreased by 0.83% or 8,358 operations. Only four of these airports reported increases in 2001. Total aviation operations decreased in 2001 for the second year in a row. Operations are defined as any take off or landing by any type of aircraft, including freight, charter, or helicopter whether it is commercial, private, government or military.

Wisconsin Airports with Scheduled Air Carrier Service
Total Annual Operations 1998 - 2001

Location/Airport	Tower Hours	1998	1999	2000	2001	% Change (00-01)
Milwaukee-General Mitchell International	24 hours	219,087	221,866	221,855	211,512	-4.8
Madison-Dane County Regional	6AM – 11PM	144,712	153,200	134,692	128,555	-4.8
Oshkosh - Wittman Regional	6AM – 10PM	88,809	115,500	104,393	103,399	-1.0
Waukesha - Crites Field	6AM – 9PM	89,662	96,160	90,472	96,032	6.1
Kenosha - Kenosha Regional	7AM – 9PM	78,826	87,545	89,221	99,093	11.0
Janesville - Rock County	6AM – 9PM	72,128	82,675	76,671	80,740	5.3
Milwaukee - Timmerman	7AM – 9PM	82,195	79,815	76,437	76,867	.5
Green Bay - Austin Straubel International	5:30AM – 11:30PM	67,835	74,389	65,480	63,405	-3.3
Appleton - Outagamie County Regional	5:30AM – 11PM	62,383	61,822	63,858	56,805	-12.4
LaCrosse - LaCrosse Municipal	6AM – 9PM	45,613	45,716	44,064	42,490	-3.7
Mosinee - Central Wisconsin	6AM – 10PM	37,775	38,397	38,455	38,342	0
Total		**989,025**	**1,057,085**	**1,005,598**	**997,240**	**-0.83**

Source: Wisconsin Department of Transportation, Bureau of Aeronautics, 2002.
http://www.dot.state.wi.us/dtid/boa/01activity.htm

Each public and private airport facility that services Wisconsin is listed on the following page. The graph on page 4 indicates the total number of passenger enplanements from 1992 through 2001. This graph shows that the number of airline passengers has been increasing every year except 2001.

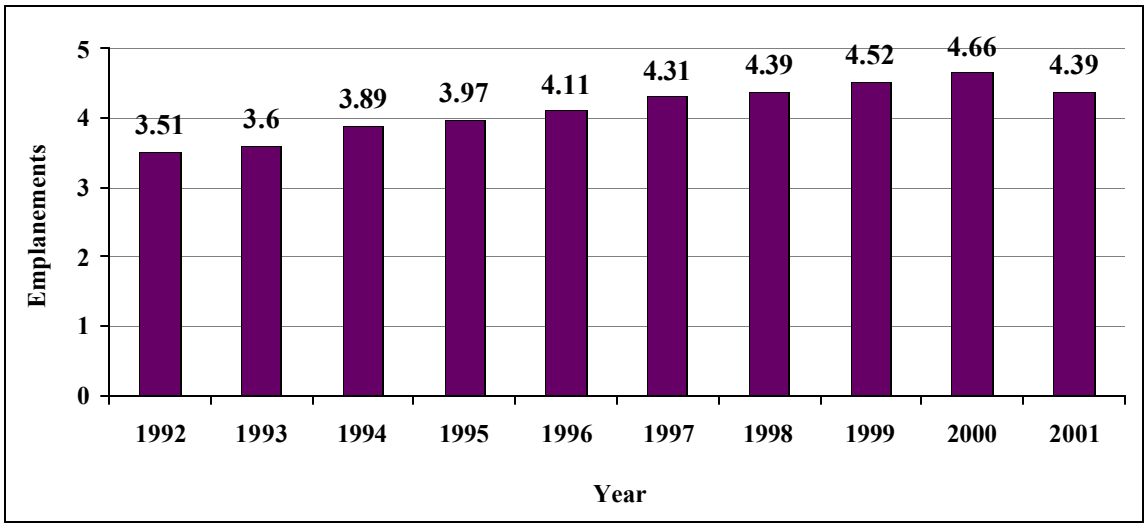
Public and Private Airports Listed by Location

Amery
Antigo
Appleton
Ashland
Baraboo-Wisconsin Dells
Barron
Beloit *
Black River Falls
Blair
Boscobel
Boulder Junction
Boyceville
Brodhead *
Brookfield *
Brule-Bayfield Co. *
Burlington
Cable
Camp Douglas
Camp Lake *
Cassville
Chetek
Clintonville
Cornell
Crandon
Crivitz
Cumberland
Delavan *
Eagle River
East Troy
Eau Claire
Edgerton *
Ephraim-Fish Creek (Sister Bay)
Fond du Lac
Fort Atkinson
Franksville
Friendship/Adams
Genoa City
Grantsburg
Green Bay-Austin Straubel
Hartford
Hayward
Hillsboro
Iola
Iron Mountain, Michigan #
Iron River-Bay Co.
Ironwood, Michigan #
Janesville
Juneau
Kenosha
La Crosse
La Pointe
Ladysmith
Lake Geneva *
Lakewood *
Lancaster
Land O'Lakes
Lone Rock
Madison-Cottage Grove*
Madison-Dane Co.
Manawa-Central Co. *
Manitowish Waters
Manitowoc
Marshfield
Medford
Menominee, Michigan #
Menomonie
Menomonie Falls
Merrill
Middleton-Morey
Milwaukee-Mitchell
Milwaukee-Timmerman
Mineral Point-Iowa Co.
Minocqua
Monroe
Mosinee
Necedah
Neenah *
Neillsville
New Holstein
New Lisbon
New Richmond
Oconto
Osceola
Oshkosh
Palmyra
Park Falls
Phillips
Platteville-Grant Co.
Portage
Prairie du Chien
Prairie du Sac
Prentice
Pulaski *
Racine *
Red Wing, Minnesota #
Reedsburg
Rhinelander
Rice Lake
Richland Center
Rio *
Rio Creek
River Falls
Rochester *
Shawano
Sheboygan Falls
Shell Lake
Shiocton *
Siren
Solon Springs
Sparta-Fort McCoy
Stevens Point
Sturgeon Bay
Sturtevant *
Superior
Suring-Piso*
Three Lakes
Tomah
Tomahawk
Verona *
Viroqua
Walworth *
Washington Island
Watertown
Waukesha
Waunakee *
Waupaca
Wausau
Wautoma
West Bend
Wild Rose
Wilmot *
Wisconsin Rapids
Wonewoc

* Denotes private airport
\# Denotes out-of state airports used by people in some areas of Wisconsin

SOURCE: Wisconsin Department of Transportation, Bureau of Aeronautics.
http://www.dot.state.wi.us/dtid/boa/airportdirectory.htm, January 2001.

Wisconsin Air Carrier Enplanements (Millions)



Source: Wisconsin Department of Transportation, 2002. http://www.dot.state.wi.us/dtid/boa/01activity.htm

Programs: The Federal Aviation Administration (FAA) regulates all private and commercial aircraft in the U.S., promulgating standards and conducting compliance audits for aircraft, aircrews, maintenance personnel and airport facilities. In addition the Aviation and Transportation Security Act authorizes the federal Department of Transportation to enact airport security measures designed to prevent acts of such as sabotage, hijacking, or terrorism. The Wisconsin Department of Transportation's Bureau of Aeronautics works closely with federal, state and local governments and with aviation industry associations. The Bureau has state permit authority for airport site approval and tall structures construction. The Bureau provides safety and technical education programs to assist pilots, flight instructors and mechanics in meeting FAA regulatory requirements. Counties and municipalities with major airports routinely conduct exercises to test their response capabilities, particularly those of fire, emergency medical, mortuary and law enforcement agencies.

Significant Incidents: Since 1970 there have been two airplane hijackings originating in Wisconsin. On January 22, 1971 a single individual hijacked a Northwest flight from Milwaukee to Detroit and redirected the flight to Cuba. None of the 60 passengers on board was seriously injured. On November 23, 1978, a single hijacker unsuccessfully tried to take control of a flight from Madison to Milwaukee. The flight's passengers overpowered this individual (Source: http://aviation-safety.net/database/hijackings/index.html).

Wisconsin's worst air crash killed 31 people at Milwaukee's Mitchell Field on September 6, 1985. A Midwest Express Airline DC-9 jet aircraft went into a roll shortly after takeoff, crashed and burst into flames, killing all passengers and crewmembers. The worst previous crash occurred on June 29, 1972, when two commuter turboprop planes collided in mid-air above Lake Winnebago, killing all 13 people on board the two aircraft.

From January 1,1996 through December 31, 2001 the National Transportation Safety Board, Aviation Safety Database reported 243 air traffic accidents in Wisconsin. Of these 243 accidents, 47 resulted in at least one fatality with a total of 82 fatalities during this period. All but two of these accidents involved private aircraft. The two commercial flights that had an accident were chartered air taxi flights. None of the accidents involved regularly scheduled commercial passenger airlines. The table on the next page summarizes fatal aircraft accidents by aircraft type and location.

Fatal Air Traffic Accidents from January 1, 1996 to December 31, 2001

Date	Location	Make / Model	Fatalities	Name or Type of Carrier
1/17/96	Milwaukee, WI	Piper PA-32	1	Private
5/4/96	Lancaster, WI	Mustang M-II	1	Private
6/29/96	Racine, WI	Piper J3C-90	1	Private
8/8/96	Fond du Lac, WI	Lancair 320	1	Private
9/4/96	Tomahawk, WI	Beech 23	1	Private
3/15/97	Newton, WI	Douglas DC-3C/BT-67R	4	Private
3/15/97	Newton, WI	Beech A36	4	Private
8/2/97	Superior, WI	Briegleb BG-12A	1	Private
8/4/97	New Richmond, WI	Beech 76	2	Private
8/4/97	Poygen, WI	Peck Osprey 2	2	Private
8/5/97	Fond Du Lac, WI	Adventurer 333	1	Private
12/13/97	Sturtevant, WI	Piper PA-28-140	1	Private
4/15/98	Ashland, WI	Cessna 180J	1	Private
5/15/98	Lagrange, WI	Commander 114-B	4	Private
7/31/98	Coloma, WI	Navion A	1	Private
8/2/98	Oshkosh, WI	Hispano Aviacion A10B-37	1	Private
8/4/98	Phillips, WI	Cessna A185F	2	Private
8/28/98	Beaver Dam, WI	Piper PA-22-150	2	Private
8/31/98	Seymour Twp, WI	Cessna 310R	2	Heartland Aviation
8/31/98	Seymour Twp., WI	Cessna 185B	2	Private
9/16/98	Oakdale, WI	Beech 58	3	Private
10/9/98	Superior, WI	Bellanca 8KCAB	1	Private
11/29/98	Coleman, WI	Cessna 172F	2	Private
4/14/99	Superior, WI	Cessna 152	2	Private
5/29/99	Comstock, WI	Champion 7ECA	1	Private
7/9/99	Menominee Falls, WI	Cessna 182E	1	Private
8/14/99	Campbellsport, WI	Johannes-Robert Acrosport RJ-2	1	Private
8/27/99	Janesville, WI	Walker Breezy	1	Private
1/6/00	Dunbar, WI	Beech D-95A	1	Private
7/28/00	Sauk City, WI	Cessna 182A	4	Private
8/15/00	Watertown, WI	Piper PA-28-161	3	Private
8/18/00	Watertown, WI	Bell OH-58C	2	Private
9/1/00	Manitowish Wtrs., WI	Beech K35	2	Private
12/3/00	Milltown, WI	Beech 95 - B55	2	Private
2/10/01	Horicon, WI	Cessna 152	1	Private
2/14/01	Webb Lake, WI	Piper PA-28R-201	4	Private
4/2/01	Ashwaubenon, WI	Cessna 501	1	Private
4/17/01	Oshkosh, WI	Beech F35	1	Private
5/16/01	Green Bay, WI	Brault Glasair SH2F	1	Private
6/16/01	La Crosse, WI	Fouga CM 170	2	Private
7/17/01	Oak Creek, WI	Cessna 310R	1	Air Taxi & Commuter
7/24/01	Oshkosh, WI	Payne Giles G-202	1	Private
7/26/01	Oshkosh, WI	Schuchart Stoddard Hamilton SH3	1	Private
7/26/01	Wheeler, WI	Bell 47G-2	1	Private
8/30/01	Stevens Point, WI	Beech A23	3	Private
9/29/01	Marshfield, WI	Cessna 414	3	Private
12/12/01	Waukesha, WI	Robinson R44	1	Private
47 Air Traffic Accidents.			**82 Fatalities**	

National Transportation Safety Board, Aviation Accident Database. http://www.ntsb.gov/NTSB/Query.htm

COASTAL HAZARDS

Hazard Description: There are three major types of natural hazards affecting the state's Great Lakes shoreline along Lake Superior and Lake Michigan. These are:

- Erosion of coastal bluffs, banks, beaches and near shore lake beds;
- Flooding from upland runoff, high lake levels and storm-induced surge (temporary water level changes); and
- Damage to shoreline structures from storm waves (WCMP 1992, p. 85).

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

Coastal property owners are acutely aware of hazards during periods of high water levels and especially right after a damaging storm or a bluff failure, but this awareness can fade over time if low lake levels slow the erosion rate. Lake levels were above long-term averages from 1996 to 1998. The last period of significantly higher lake levels was during 1985-86, resulting in $16 million of documented damage to public facilities alone (WCMP 1992, p. 85).

Vulnerability to Bluff Erosion in Wisconsin: Many areas of the Wisconsin Great Lakes coast are vulnerable to bluff erosion. In general, the erodible sections of the Lake Michigan shore are found between the Illinois state line to the Sturgeon Bay Canal in Door County and in the northeastern part of Brown County on Green Bay. Along the remainder of the Lake Michigan shore, bluff erosion is limited to smaller segments of bays and clay banks. On the Lake Superior shore, bluff erosion is more localized. Vulnerability is highest along the high clay bluffs running from Bark Point in Bayfield County to Wisconsin Point in Douglas County and from Iron County to the White River in Ashland County (Springman and Born 1979, pp. 6-11).

Vulnerability to Coastal Flooding in Wisconsin: All 15 coastal counties in Wisconsin can experience some coastal flooding. However, coastal flooding is a serious issue along two low-lying sections of the Lake Michigan shore: southern Kenosha County and the western shore of Green Bay from the City of Green Bay to the Michigan state line (WCMP 1992, Addendum). Although the risk of coastal flooding is reduced when lake levels are low, lake levels are only one factor contributing to coastal flooding. Other factors include wind set-up and wave run-up. Wind set-up increases the level of the lake against which a steady wind is blowing and which causes a corresponding decrease in lake level on the opposite side of the lake. Wave run-up is also caused by wind but is also dependent on the shore profile. Waves will form more readily where there is a shallow beach profile. In these areas strong winds can cause or exacerbate coastal flooding.

Variable Lake Levels: Water levels in the Great Lakes fluctuate on both a seasonal and long-term basis. On a seasonal basis, the lakes are at their lowest levels during the winter when much

of the precipitation is held on land as snow and ice. The highest seasonal levels are during the summer when snowmelt from the spring thaw and summer rains contribute to the water supply. Long-term variation of lake levels depends on precipitation and evaporation trends in the Great Lakes watershed. Lake levels rise when net water supply exceeds outflow and above average lake levels can persist for extended periods even after the conditions that caused them have ended. The water volume of the Great Lakes is large and outflow from natural outlets is limited. Flow regulation structures exist in Lakes Ontario, Michigan and Superior, but their influence is limited by their size. Controlled releases strive to simulate long-term averages in order to serve multiple interests. The source of about 40 percent of Lake Superior's annual water supply is from the snow pack around its shores. Lakes Michigan and Huron get up to 30 percent of their yearly supply from Superior's snowmelt when it flows into the lower lakes (Detroit Free Press, March 18, 2000).

Record snowfall in northern Wisconsin in 1996 was followed by near record high water levels in 1997. However, unusually mild weather and light snowfall in the winters of 1998-1999 and 1999-2000 has brought lake levels to below long-term averages. According to the Army Corps of Engineers Monthly Bulletin of Lake Levels for the Great Lakes, lake levels in Lake Superior are nearly a foot below normal and more than a foot below normal in Lake Michigan. Water levels on Lake Superior and Lake Michigan recovered somewhat in 2001 but remained below normal. Heavy above average rainfall in April 2002 (133% of average) has helped improve low lake levels by as much as 8 inches in the summer of 2002. The Army Corps of Engineers has begun a comprehensive study of damages caused by fluctuating lake levels in Lake Michigan. Documents describing the progress and findings of this study may be found on the Internet at http://huron.lre.usace.army.mil/coastal/LMPDS/documents.htm.

Economic Impacts of Low Lake Levels

The water level of the Great Lakes significantly affects the revenues of the shipping industry. Commercial carriers receive less revenue when water levels are low. This is because shipping is dependent on the amount of draft available in shipping channels. When the draft is reduced, the amount of revenue-generating cargo must be reduced. A 1,000-foot long vessel forfeits 270 tons of cargo for each one-inch reduction in draft. The drop in lake levels in 1999 resulted in a one-foot reduction in available draft. The loss of one foot of water means a typical 1,000-foot iron ore carrier would lose 3,240 tons of cargo. The ship would have to make 2.5 extra trips to make up the difference over the season, costing the shipping company an estimated $121,000 per ship per season (Lake Carrier's Association/Army Corps of Engineers, 1999). Economic losses also arise from restricted marina and launch traffic for charter boats, pleasure boats, commercial fishing and sport fishing when lake levels are low. Although dredging can improve access to the lakes, it is often damaging to the aquatic environment and many cases not cost effective.

Population Trends in Coastal Counties

According to the 2000 Census, a total of 1,992,393 people, 37.1 percent of the population of Wisconsin lives in Wisconsin's 15 coastal counties, 84,612 more people than in 1990. The 1990-2000 population growth rate of Wisconsin's coastal counties was 4.4 percent compared to 13 percent for inland counties. This difference is largely attributable to the drop in population in Milwaukee County. If Milwaukee County is not included in the summary statistics, the population of coastal counties in Wisconsin has grown at an average of 10.9 % from 1990 to 2000. It is notable that Brown, Iron, Kenosha, and Oconto Counties all experienced double digit population growth in

excess of the state average. Population growth is a good indicator of development pressure in coastal zones.

Population Trends in Wisconsin's Coastal Counties

COASTAL COUNTY	1990 CENSUS	2000 CENSUS	1990-2000 DIFFERENCE	1990-2000 % CHANGE
ASHLAND	16,307	16,866	559	3.4
BAYFIELD	14,008	15,013	1,005	7.2
BROWN	194,594	226,778	32,184	16.5
DOOR	25,690	27,961	2,271	8.8
DOUGLAS	41,758	43,287	1,529	3.7
IRON	6,153	6,861	708	11.5
KENOSHA	128,181	149,577	21,396	16.7
KEWAUNEE	18,878	20,187	1,309	6.9
MANITOWOC	80,421	82,887	2,466	3.1
MARINETTE	40,548	43,384	2,836	7
MILWAUKEE	959,275	940,164	-19,111	-2
OCONTO	30,226	35,634	5,408	17.9
OZAUKEE	72,831	82,317	9,486	13
RACINE	175,034	188,831	13,797	7.9
SHEBOYGAN	103,877	112,646	8,769	8.4
COASTAL TOTAL	**1,907,781**	**1,992,393**	**84,612**	**4.4**

Wisconsin Coastal and Inland Population Trends Compared

COUNTY AREA	1990 POPULATION	1990 PERCENT	2000 POPULATION	2000 PERCENT	1990-2000 DIFFERENCE	1990-2000 PERCENT	1990-2000 PERCENT CHANGE
Coastal	1,907,781	39.0%	1,992,393	37.1%	84,612	17.9%	4.4%
Inland	2,983,988	61.0%	3,371,282	62.9%	387,294	82.1%	13.0%
Total	4,891,769	100.0%	5,363,675	100.0%	471,906	100.0%	9.6%

Coastal Barrier Resources

Coastal barriers are landscape features that shield the mainland from the full force of wind, wave, and tidal energies. They can take on a variety of forms including islands, spits, or mangrove trees. Established in 1982, the Coastal Barrier Resources Act (CBRA) is a federal law that eliminates federal subsidies for development on fragile, high-risk coastal barriers that have been identified by congressional committee under the advice of the US Fish and Wildlife Service. The System currently includes 585 units, about 1,200 shoreline miles. There are also 274 "Otherwise Protected Areas", a category added by the 1990 Act for coastal barriers within lands reserved for conservation purposes.

CBRA does not regulate how landowners can develop their land; rather, it transfers the full cost of at-risk development from federal taxpayers to individuals. Federal subsidies and other programs, especially the National Flood Insurance program, which are central to the economic viability of

high-risk coastal areas, cannot be accessed for development within an area designated by CBRA as a coastal barrier resource unit. CBRA seeks to conserve coastal habitat, minimize potential for loss of human life from storm surge, and reduce "wasteful" federal spending to develop – and rebuild again and again – places where storms and chronic erosion are common. Federal monies can be spent within the System for certain exempted activities, after consultation with the U.S. Fish and Wildlife Service. Examples of such activities include emergency assistance, military activities for national defense, and maintenance of existing federal navigational channels. However, since structures within a CBRA unit are not allowed to participate in the NFIP, federal money for flood hazard mitigation projects is not available.

CBRA is a map-driven law. The maps, which are approved by Congress and the Administration, cover over 1.3 million acres of privately owned, undeveloped coastal barriers along the Atlantic, Gulf, Great Lakes, and Caribbean coasts. The Act was amended in 1990, designating an additional 1.8 million acres of "otherwise protected areas," or coastal barriers protected for conservation purposes by government or non-government groups. To protect these, federal flood insurance is prohibited in "otherwise protected areas." The US Fish and Wildlife Service (the Service) administers the Act and is responsible for a number of related activities, including:

- Maintaining the official system and "otherwise protected area" maps;
- Modifying System maps every five years to reflect changes from natural processes;
- Consulting with federal agencies that propose spending funds in the system;
- Ensuring the Flood Insurance Rate Maps developed by the National Flood Insurance program accurately depict CBRA boundaries; and
- Working with private partners, state and local governments to accurately depict CBRA boundaries on local mapping systems.

All of Wisconsin's CBRA units were added in 1990 when the Act was amended. The following table describes the CBRA units in Wisconsin by county and FIRM map panel number.

Coastal Barrier Resource Systems In Wisconsin

Community	CID	FIPS Code	County	FIRM Panel Number	Map Suffix	FIRM Date	CBRS Units on FIRM Panel	Earliest CBRS Date on Map
Bayfield County (Uninc. Areas)	550539	55007	Bayfield	3	C	11/4/1992	WI-06, WI-07	11/16/1990
Bayfield County (Uninc. Areas)	550539	55007	Bayfield	4	C	11/4/1992	WI-05	11/16/1990
Bayfield County (Uninc. Areas)	550539	55007	Bayfield	8	C	11/4/1992	WI-07	11/16/1990
Brown County (Uninc. Areas)	550020	55009	Brown	100	C	11/4/1992	WI-02	11/16/1990
Manitowoc Co. (Uninc. Areas)	550236	55071	Manitowoc	10	B	11/4/1992	WI-01	11/16/1990
Marinette Co. (Uninc. Areas)	550259	55075	Marinette	950	C	11/4/1992	WI-03, WI-04	11/16/1990

Source: FEMA

Over the last two years, the US Fish and Wildlife Service has worked closely with partners to create precise, digital maps for a few CBRA areas that can be easily integrated into local tax appraiser databases and GIS planning systems. These maps increase government efficiency and allow customers to quickly find information on their properties. Using competitive sourcing of funds to government and industry experts, the Service is merging electronic government principles with the five-year review of the system.

Congress has adopted a number of these high-quality products and directed the Service to continue on this course. The Coastal Barrier Resources Reauthorization Act of 2000 directs the Service to complete a pilot study on digitizing all CBRA areas. Due in two years, the pilot study will digitally map between 50 and 75 areas affected by the law, determine the availability of digital data in all related states, and estimate the total cost of modernizing all CBRA maps.
(Sources : http://budget.fws.gov/FY%202003%20GB/03.34%20coastal.pdf and http://www.fws.gov/cep/cbrfact.html)

Programs: The Wisconsin Department of Natural Resources' Shoreland Program is a partnership between state and local government that requires the adoption of county shoreland zoning ordinances to regulate development near navigable lakes and streams, in compliance with statewide minimum standards. These minimum statewide standards, found in Chapter NR115, Wisconsin Administrative Code, seek to create a balance between private rights and public responsibilities of landowners. In brief, the four major aspects of NR115 aim to:

1) Control the density of development;
2) Create a protective buffer of vegetation along public waterways;
3) Minimize disturbances to water resources; and
4) Protect wetlands which are located near lakes and streams by prohibiting most filling or draining and by placing limits on what can be done in those special areas.

The Wisconsin Coastal Management Program oversees management of the state's coastal resources and strives to maintain a balance between preservation and economic needs. Established in 1978 under the Federal Coastal Zone Management Act, the Wisconsin Coastal Management Program works to preserve, protect and wisely use the resources of the Lake Michigan and Lake Superior coastlines for this and future generations. The Wisconsin Coastal Management Program (WCMP) provides grants to encourage the management and protection of Wisconsin's coastal resources and to increase public access to the Great Lakes. For the year 2000, the four types of matching grants available were focused on wetland protection, reducing cumulative and secondary impacts to coastal resources and coastal resource protection through land use and management planning.

A long-term project to assess the economic impact of the water levels in the Great Lakes is being coordinated by the Army Corps of Engineers, Detroit District. In cooperation with the University of Wisconsin, the Wisconsin Department of Natural Resources, several private consultants and agencies from the State of Michigan, the Corps has organized the Lake Michigan Potential Damages Study (LMPDS). The objective of this research project is “to create a modeling procedure and engineering-management tool for estimating economic effects of lake level changes and related social, environmental and cultural impacts. The LMPDS modeling approaches are expected to be the framework for economic assessments for each of the other

Great Lakes. The LMPDS is also intended to be a forum for concerted information system development between international, federal, state, county, township and municipal governance about the resource base that is commonly shared (The LMPDS Internet web site has detailed information about the study – http://huron.lre.usace.army.mil/coastal/LMPDS/documents.htm)."

Several state and local benefits should result from the LMPDS project, including better tools to predict lakeshore erosion and greater availability of erosion data. However, nature has the greatest role in determining lake levels while the Corps' ability to affect water levels on the Great Lakes through the use of water controls such as locks and dams is very limited. The key to reducing economic and environmental losses from variable lake levels must involve improving local land use planning to minimize erosion risks to lakeshore development. Development patterns and coastal geography largely determine local vulnerability to coastal storms and bluff erosion. County and municipal zoning officials and emergency management officials should be aware of local coastal conditions and take steps to protect public safety.

Additional Resources for Local Coastal Hazard Analysis:
The Wisconsin Coastal GIS Applications Project is a joint effort of the University of Wisconsin Sea Grant Institute and Land Information and Computer Graphics Facility. The Project makes coastal geography information and analysis available to coastal communities and researchers both on-line and through the University of Wisconsin at http://coastal.lic.wisc.edu/. The information available on this site includes coastal maps of Wisconsin and a document entitled, "A Resource Guide for Great Lakes Coastal Hazards in Wisconsin." Likewise, the University of Wisconsin Sea Grant web site is a useful source of information about coastal issues in Wisconsin. Access Sea Grant at http://www.seagrant.wisc.edu/index.asp.

DAM FAILURES

Hazard Description: A dam failure involves the uncontrolled release of stored water due to the breaching of a water control structure, resulting in rapid downstream flooding. A dam can fail because of excessive rainfall or melted snow, poor construction or maintenance, flood damage, earthquake activity, weakening caused by burrowing animals or vegetation, surface erosion, vandalism or a combination of these factors. Dam failures can result in the loss of life and significant property damage in an extensive area downstream of the dam.

Hazard Assessment: There are approximately 3,700 dams in Wisconsin, many of which were constructed before 1900. Some dams originally used for logging or milling operations are no longer used for their original purpose. An additional 700 dams were built but have subsequently washed out and no longer exist. Approximately 100 dams have been removed since 1967. Dams serve many purposes, including agricultural uses, providing recreation areas, electrical power generation, erosion control, water level control and flood control. The federal government has jurisdiction over large dams that produce hydroelectricity – approximately 5% of the dams in Wisconsin. Private individuals own approximately 50% of the dams in Wisconsin. The State of Wisconsin owns 19%, municipalities such as townships or county governments own 16%, and 15% are owned by various other groups. A dam with a structural height of over 6 feet and impounding 50 acre-feet or more, or having a structural height of 25 feet or more and impounding more than 15 acre-feet is classified as a large dam. There are approximately 1,200 large dams in the State of Wisconsin. The Wisconsin Department of Natural Resources regulates all dams on waterways to some degree. However, the majority of dams overall in Wisconsin are small and are not stringently regulated for safety purposes.

Among these 3,700 dams there is a wide variance in the potential to cause damage in the event of failure. Very few dams in Wisconsin were built primarily to protect people and property from floods. Most of the dams that provide a flood control benefit are large hydroelectric dams on major rivers where flood control is a secondary benefit or they are PL 566 dams built through the Watershed Protection and Flood Prevention Act of 1954. There are about 83 PL 566 dams in Wisconsin located mainly in the western part of the state. This type of dam often holds little or no water in their reservoirs under normal conditions. Since these dams only hold significant amounts of water during floods, they present a special hazard as everyday water related problems such as seepage cannot be readily seen and corrected. When floodwater does arrive, the dam is used to its maximum capacity. For this reason, flood control structures should be monitored continuously during flood events, have a trained operator, be inspected annually as well as after every flood and have regularly performed maintenance.

For emergency planning purposes, dam failures are categorized as either *rainy day* or *sunny day failures*. *Rainy day failures* involve periods of excessive precipitation leading to an unusually high runoff. This high runoff increases the reservoir of the dam and if not controlled, the overtopping of the dam or excessive water pressure can lead to dam failure. Normal storm events can also lead to rainy day failures if water outlets are plugged with debris or otherwise made inoperable. *Sunny day failures* occur due to poor dam maintenance, damage/obstruction of outlet systems or vandalism. This type is the worst case of failure and can be catastrophic because the breach is unexpected and there may not be sufficient time to properly warn downstream residents.

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

minimal property damage and loss of life is unlikely. All dams perceived as posing a threat to downstream development should have a dam failure analysis performed in order to identify the hydraulic shadow (that area of land downstream from a dam that would be inundated by water upon failure of the dam during a regional flood). This information can be used to develop an Emergency Action Plan (EAP) for the dam. This EAP includes provisions for notifying emergency authorities for assistance and warning affected downstream residents if the potential for failure exists. The EAPs that exist are kept on file at the State Emergency Operations Center (Wisconsin Emergency Management, Department of Military Affairs) and in the local city or county emergency management office. Of the 966 dams Wisconsin regulates, 33 High Hazard dams and 10 Significant Hazards dams have EAPs. According to DNR's on-line database of dams in Wisconsin, there are 262 dams with a high hazard potential, 252 dams with a significant hazard potential, and 1,386 dams with a low hazard potential.

Historical Frequency: Most recently, the Radigan Dam in Douglas County sustained serious damage from the flooding associated with Disaster 1369 during May 2001. The amount of damage exceeded $300,000; much more than the Town of Dairyland, owner of the dam, could afford. Fortunately, the dam did not completely fail. Between 1990 and 1995, over 75 dam failures were documented in the state. Many of these dam failures were associated with the Great Midwest Flood of 1993. Fortunately, none of these failures resulted in loss of life. During several of these incidents, however, injuries and extensive property damage did occur.

In September 1994, heavy rainfall in Price County caused concern over the potential failure of the Musser, Jobe and Weimer Dams. The Musser Dam was the most seriously threatened and the county emergency management office set up a command post above the dam to monitor it and coordinate the sandbagging efforts of local crews augmented by the Wisconsin Conservation Corps. Wisconsin Emergency Management and Department of Natural Resources Dam Safety personnel were dispatched to the command post. An evacuation of low-lying areas below the dam was ordered as construction crews attempted to open the inoperable floodgates. Their efforts were successful and this allowed maximum release of water behind the dam, averting a near catastrophic situation. The Ladysmith Dam in Rusk County did overtop during this event and fail at the left abutment. City, County and State emergency personnel responded.

In March 1993, the Briggsville Dam in Marquette County failed and washed out the embankment. Fortunately, severe property damage was averted, but a recreational lake was totally drained. This failure was just one of many which occurred in 1993, a record year for precipitation and flooding. One of the more publicized incidents was that involving the Hatfield Dam in Jackson County. Due to the flooding a power canal dike at the dam failed. Initial reports from the area indicated that the main dam had failed, but this proved to be incorrect. A summary of dam washouts, overtopping or damages that were associated with the 1993 precipitation and flooding follows on page 16.

In June 1990 heavy rains stressed the Hillsboro Dam in Vernon County and it threatened to breach. The Village of Union Center was evacuated and other villages below the dam were alerted to prepare for evacuation. Quick response by emergency workers prevented the dam from failing and resultant loss of life and property.

Excessive precipitation (nine inches of rain in four hours) in August 1990 greatly stressed the 50-year old Lake Tomah Dam and imperiled the lives of some 2,000 residents of the City of Tomah who were evacuated from their homes. Municipal workers, volunteers and Wisconsin National Guard personnel averted a breach by using more than 20,000 sand bags to reinforce the structure. A large crane was used to open the floodgates and the level of the lake dropped eight inches in an

hour. The excess water emptied into the Lemonweir River, which overtopped its banks and rose approximately two inches per minute until it stabilized.

Heavy rainfall created a breach in the Orienta Dam in 1985, causing major damage to the powerhouse. Approximately two-thirds of all dam failures are caused by floods. Northern States Power Company Report (as reported by Wisconsin Department of Natural Resources, 1999).

On the night of September 1, 1985, a vicious flood nearly overtopped the 66-foot tall Orienta Falls electrical power-generating dam on the Iron River in Bayfield County. The events were chronicled the next morning in photographs taken by employees of Northern States Power (NSP), who circled helplessly in a helicopter, watching as the raging waters overwhelmed the earth embankment and bulldozed away the dam's powerhouse walls. It wasn't just the dam that was destroyed, according to The Evening Telegram, a local newspaper. At least three bridges came down as well, including the one at the mouth of the Iron River on Highway 13, where it joins Lake Superior. Telephone service was cut, many roads and culverts were washed away and though no one died, two families downstream were evacuated for fear the whole dam would go. The flood brought down the Orienta Dam, but changing times prevented its repair. NSP couldn't justify spending half a million dollars to rebuild a dam that generated only meager profits. The river was returned to its natural state and as a result improved trout fishing. However, some residents long for the scenic beauty of the flowage or small lake the dam had provided (Katherine Esposito, Wisconsin Natural Resources Magazine, April 1999).

Programs: Chapter 31 of the Wisconsin State Statutes regulates dam safety activities. By virtue of this statute, the Department of Natural Resources (DNR) has the authority over the operation and maintenance, construction, modification, change of ownership and flow control of dams not under federal jurisdiction in the state. About 119 dams used to produce hydroelectric power in the state are under federal regulation by the Federal Energy Regulatory Agency (FERC). FERC maintains specific flow operation requirements, regular inspections and an EAP as part of their licensing process.

About 1,100 of the 3,700 dams in Wisconsin are classified as large dams. The DNR is required to inspect all large dams at least once every ten years. Following the inspection, DNR sends a report to the dam owner outlining needed repairs and a schedule for completing the repairs. The owner is responsible for all costs of completing the repairs. The DNR has programs that can provide partial funding for costs associated with the repair or removal of municipally owned dams.

DNR Administrative Code NR 333 requires any new large dam constructed to have an EAP. This code also states that for any large dam to be considered safe it should have an EAP. Non-FERC licensed dams are not legally required to have EAPs unless they were a recipient under the DNR grant fund program or have been otherwise directed by the DNR to prepare one. EAP development is highly encouraged for all dams, whether or not they have development directly downstream.

The DNR board has revised Wisconsin Administrative Code Chapters NR 116.08 and NR 333 that govern dam design and construction standards and zoning downstream of dams. The revised code was effective August 1, 2001 and makes the following changes:

- Revises standards for dam design and construction by adding definitions for development, land use controls and open space use. The proposed rule eliminates the unnecessary term "preliminary dam hazard rating" in favor of "dam hazard rating" and allows for the assignment of a dam hazard rating for existing dams after a directive in a dam safety inspection report is issued and clarifies that the necessary dam failure analysis is to be provided by the owner.
- Provides more detail on the minimum contents of the required engineering consultant's report on the hydraulic, hydrologic and stability analyses and eliminates suggested dam breach parameters since they are in the DAMBRK and FLDWAV computer model user documentation.
- Greatly simplifies language on dam hazard rating determinations and adds language that considers the potential or probable loss of human life in the hazard rating definitions.
- Eliminates the unnecessary distinction between minor and major dams.
- Specifies minimum standards for an adequate emergency action plan in the event of a dam failure.
- Extends required time limits for Department approvals or actions.
- Eliminates the existing paradox that a dam owner could face by trying to comply with NR 333 requirements to secure a low hazard rating for the dam and the associated less costly lower spillway capacity requirements. Once the dam has met the low hazard requirements of NR 333 it can be considered a "safe" dam under the current NR 116.08 standards. This would then allow a community to adopt floodplain zoning downstream of a "safe" dam that could allow development to occur below the dam. This new development would then change the dam hazard rating to significant or high and would require the dam owner to undertake significant and potentially costly modifications to increase the dam's spillway capacity to the higher requirements of NR 333 for significant or high hazard dams. Without this concurrent revision to NR 116 it could be very difficult to convince a dam owner of the advantages, cost savings, reduced liability and greater protection of life, health, and property gained by securing a low hazard rating for the dam.

Resources: The Wisconsin Department of Natural Resources has an Internet-based map application for viewing and searching for information about significant dams in Wisconsin. This mapping application can be accessed at http://gomapout.dnr.state.wi.us/website/wwi/dams/viewer.htm. The database has about 1,900 dams on record. For more information about DNR's dam safety program, contact Meg Galloway, (608) 266-7014 or John Coke, (608) 266-7037.

Summary of Dam Failures/Damages Associated with the 1993 Floods

During winter, the following dam washed out:

Partridge Lake Dam, Juneau County

In spring, the following dams washed out or were damaged by high water:

Wright Dam, Iowa County
Lake Emily Dam, Dodge County
Gooseville Dam, Sheboygan County
Cox Hollow Dam, Governor Dodge State Park, Iowa County
Briggsville Dam, Marquette County
Waterford Dam, Racine County
Lowell Dam, Dodge County

The following dams overtopped:

Upper Watertown Dam, Jefferson County
Hebron Dam, Jefferson County

Due to the flooding period in June the following dams washed out:

Rock Dam, Lake Dam, Eau Claire County - washed out embankment and road
Hatfield Dam power canal dike, Jackson County
ASP Cranberry, Jackson County - 2 dikes
Roberts Cranberry, Jackson County - 4 dikes
Cambria Dam, Columbia County
Bass Lake Dam, Waupaca County

Several other dams were damaged during this period in June:

Jordan Dam, Columbia County - emergency repairs to prevent embankment failure
Humbird Dam, Clark County - completely washed out the embankments around the cutoff walls
Fairchild Dam, Eau Claire County - dike overtopped and road washed out
Lake Eau Claire Dam, Eau Claire County - deep sluice gate broken in attempt to open
Blair Dam, Trempeleau County - Slow gate operation caused downstream road embankment to erode
Dells Dam, Augusta, Eau Claire County - damage to waterwheel
Packers Bay Dam, Marquette County - embankment overtopped
Shopier Dam, Rock County - emergency repairs were required to fill embankment breach
Reservoir/Dummy Dams , Oconto County - failure to fully operate gates caused lake to bypass through low area causing road damage
Upper Appleton, Outagamie County - high head caused grout patch to fail resulting in severe seepage through a rock rubble wall
Auld & Rohrer, Waupaca County - contractor breached embankment to prevent spillway construction from failing
Fox Lake Dam, Dodge County - embankment problems related to seepage at old tree roots

Other results of the flooding include:

Construction on dams was halted at Dairyland and Ladysmith due to high water
The necessity for increased numbers of inspections

Source: Wisconsin Department of Natural Resources, 1993.

DROUGHT

Hazard Description: A drought is an extended period of unusually dry weather, which may be accompanied by extreme heat (temperatures which are 10 or more degrees above the normal high temperature for the period). There are basically two types of drought in Wisconsin: agricultural and hydrologic. Agricultural drought is a dry period of sufficient length and intensity that markedly reduces crop yields. Hydrologic drought is a dry period of sufficient length and intensity to affect lake and stream levels and the height of the groundwater table. These two types of drought may, but do not necessarily, occur at the same time.

Hazard Assessment: Wisconsin is most vulnerable to agricultural drought. Wisconsin has about 16,400,000 acres of farmland on 78,000 farms and was ranked 10th in the country in overall farm receipts in 1998 (Wisconsin Agricultural Statistics Service). Even small droughts of limited duration can significantly reduce crop growth and yields, adversely affecting farm income. More substantial events can decimate croplands and result in total loss, hurting the local economy. Droughts also greatly increase the risk of forest fires and wildfires because of the extreme dryness. In addition, the loss of vegetation in the absence of sufficient water can result in flooding, even from average rainfall, following drought conditions.

Historical Frequency and Significant Incidents: Droughts, both agricultural and hydrologic, are relatively common in the state. Small droughts of shortened duration have occurred at an interval of about every ten years since the 1930's. Extended, widespread droughts have been infrequent in Wisconsin. The five most significant droughts, in terms of severity and duration, are: 1987-1988, 1976-1977, 1955-1959, 1948-1950 and 1929-1934.

Some believe the drought of 1987-1988 was the most severe ever experienced in Wisconsin and much of the Midwest. It was characterized not only by below normal precipitation, but also by persistent dry air and above normal temperatures. Stream flow measuring stations indicated a recurrence interval of between 75 and 100 years. Its effects were most severe in north-central and northeastern Wisconsin. The drought occurred early in the growing season and resulted in a 30-60% crop loss, with agricultural losses set at $1.3 billion. Fifty-two percent of the state's 81,000 farms were estimated to have crop losses of 50% or more, with 14% estimated having losses of 70% or more. A combination of state and federal drought assistance programs helped the state's farmers recover a portion of their losses. All Wisconsin counties were designated eligible for this drought assistance.

The effect of this drought on municipal and private water supplies was not as severe, with only a few reports of individual wells drying up. A number of municipal water utilities experienced maximum use of their water delivery systems. Many water utilities imposed some type of water-use reduction rules or restrictions, usually involving the limitation of lawn sprinkling and yard watering.

The drought of 1976-1977 was most severe in a wide band stretching from north to south across the state. Stream flow measuring stations recorded recurrence intervals from 10 to 30 years. Agricultural losses during this drought were set at $624 million. Sixty-four counties were declared federal drought areas and deemed eligible for assistance under the Disaster Relief Act. Additionally, numerous private and municipal wells went dry. Federal assistance was used to help communities drill new wells and obtain new water supplies.

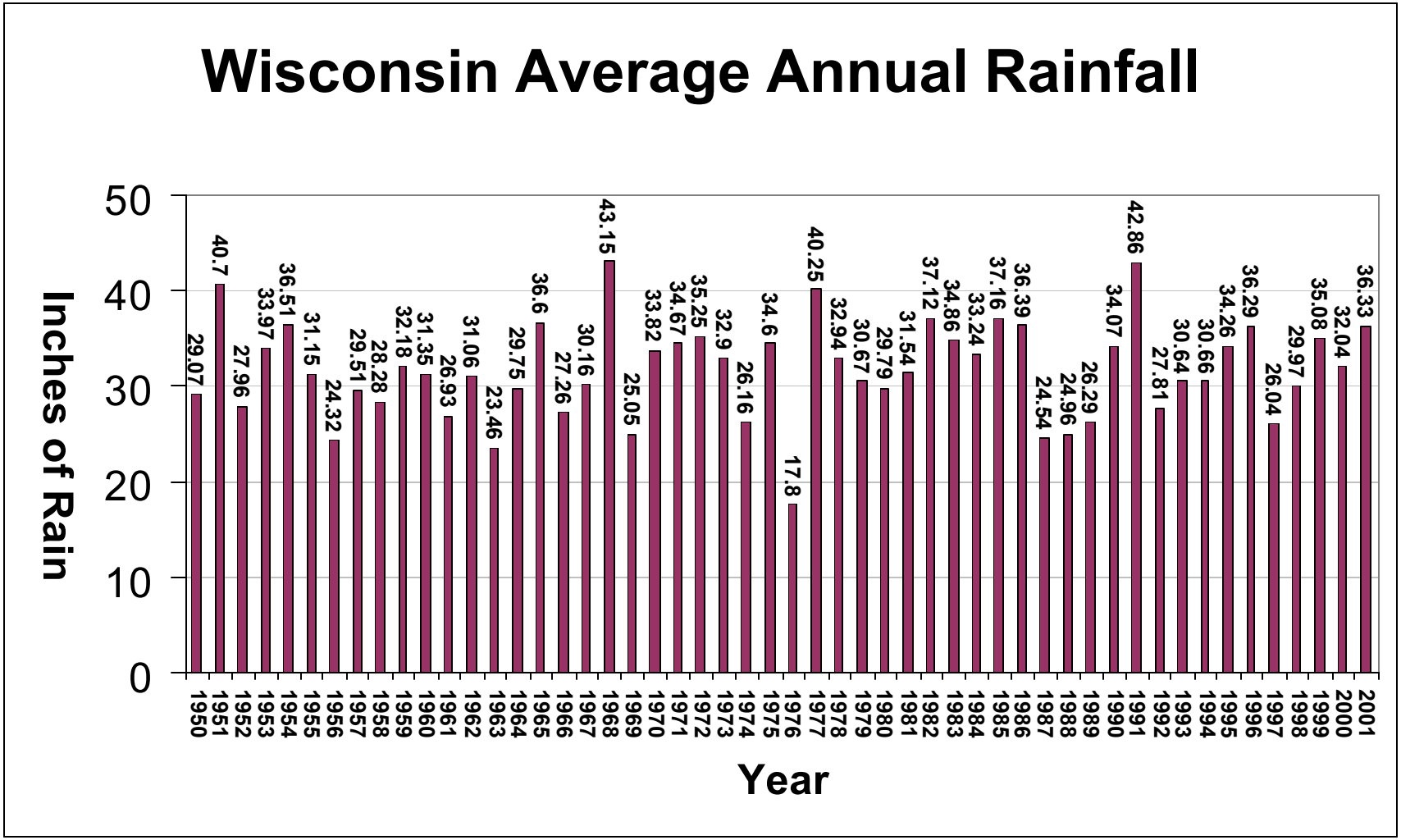
The drought of 1955-1959 had a recurrence interval of between 30 and 70 years in all but the northwestern corner of Wisconsin. The drought that occurred during 1948-1950 was most significant in the northern part of the state. In the most severely affected areas, the drought had a recurrence interval of greater than 70 years. The 1929-1934 drought probably was the most

significant in Wisconsin history, considering its duration as well as its severity. This drought had at least a 75-year recurrence interval in most of the state and over 100-year recurrence interval in certain areas. The austere economic aspects of the Depression compounded its effects. The drought continued with somewhat decreased effect until the early 1940s in some parts of the state.

Programs: When confronted with drought conditions, the state's usual course of action has been to organize an Interagency Drought Task Force, with federal, state and private sector agencies involved. The original Task Force was organized in 1976 in response to a critical drought statewide. It was reconstituted in 1988-89, once again to respond to drought conditions that prevailed throughout the state. At that time it was co-chaired by Wisconsin Emergency Management and the Wisconsin Department of Agriculture, Trade and Consumer Protection. The Task Force brought together the resources and technical expertise of the various agencies, including the University of Wisconsin Extension, to address all aspects of the drought. Examples of key activities included the operation of a Hay Hotline that matched those in need of hay or feed with potential suppliers from locations throughout the nation and the Farmers Assistance Line operated by the Department of Agriculture. The Assistance Line provided information and referrals for family farmers on a wide variety of legal, financial, employment and personal health issues.

Resources:
The University of Wisconsin Cooperative Extension has a drought disaster handbook located on the Internet at http://www.uwex.edu/ces/news/info/drought.pdf. National drought conditions can be monitored at http://enso.unl.edu/ndmc/dm/. Monthly precipitation statistics for areas of Wisconsin (as delineated by National Weather Service Weather Forecast Offices in the Midwest) are available at http://www.crh.noaa.gov/ci_climatology.html. For Wisconsin the NWS Weather Forecast Offices are located in Milwaukee, Madison, La Crosse, Green Bay, the Twin Cities (MN) and Duluth (MN). The Wisconsin State Climatology Office (http://www.aos.wisc.edu/~sco/) is a good source for general information about the climate of Wisconsin.

The chart on the following page describes the average annual rainfall for Wisconsin from 1950 through 2001.



Source: The Wisconsin State Climatology Office.

The 50-year rainfall average is 31.68 inches per year for all of Wisconsin. Rainfall will vary by region within the state.

EARTHQUAKES

Hazard Description: An earthquake is a shaking or sometimes violent trembling of the earth that results from the sudden shifting of rock beneath the earth's crust. This sudden shifting releases energy in the form of seismic waves or wave-like movement of the earth's surface. Earthquakes can strike without warning and may range in intensity from slight tremors to great shocks. They can last from a few seconds to over five minutes and they may also occur as a series of tremors over a period of several days. The actual movement of the ground in an earthquake is seldom the direct cause of injury or death. Casualties may result from falling objects and debris, because the shocks shake, damage or demolish buildings and other structures. Disruption of communications, electrical power supplies and gas, sewer and water lines should be expected. Earthquakes may trigger fires, dam failures, landslides or releases of hazardous material, compounding their disastrous effects.

Earthquakes are measured by two principal methods: seismographs and human judgment. The seismograph measures the magnitude of an earthquake and interprets the amount of energy released on the ***Richter scale***, a logarithmic scale with no upper limit. This amount is expressed in Arabic numbers and each unit of increase represents a ten-fold increase in magnitude. An earthquake measuring 6.0 on the Richter scale is ten times more powerful than a 5.0 and one hundred times more powerful than an earthquake measuring 4.0. This is a measure of the absolute size or strength of an earthquake and does not consider the effect at any specific location. The ***Modified Mercalli Intensity Scale*** is an intensity scale expressed in Roman numerals, which reports the amount of shaking and effects at a specific location based on expert judgment. The scale has twelve classes and ranges from I (not felt) to XII (total destruction). No occurrence of earthquakes in Wisconsin has been severe. The most serious recorded earthquake registered 5.1 on the Richter scale and had a maximum intensity on the Mercalli Scale of VII. Below is a comparison for scales of magnitude and intensity.

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

Source: United States Geological Survey National Earthquake Information Center.

Earthquake History of Wisconsin: Moderate shaking was reported at many places in Wisconsin from the strong earthquake centered near Charleston, South Carolina, on August 31, 1886. The intensity at Beloit, Janesville and Milwaukee was estimated to have been V on the Modified Mercalli Intensity Scale (MM). A May 26, 1909, earthquake damaged many chimneys at Aurora, Illinois, and caused MM VII effects over a considerable area from Bloomington, Illinois, to Platteville, Wisconsin. Two more moderate shocks affected the same area on January 2, 1912. The first tremor was MM VI at Aurora, Freeport, Morris and Yorkville, Illinois, and was followed by a lighter shock. People noticed the tremor as far away as Madison and Milwaukee.

An earthquake centered in eastern Missouri on April 9, 1919, affected a broad area from Wisconsin to Mississippi and from Kansas to Ohio, approximately 320,000 square kilometers. In the epicenter region between St. Louis and New Madrid, windows were broken and plaster cracked. Two shocks of short duration were reportedly felt in Madison (MM II).

Scattered felt reports in Wisconsin were noted from a major earthquake in the St. Lawrence River region near La Malbaie, Quebec, Canada, on February 28, 1925. The magnitude 7.0 (Richter scale) encompassed an area of approximately 5,000,000 square kilometers. Intensity at La Crosse and Milwaukee was estimated at MM-III. Another strong Canadian earthquake (magnitude 6.25, Richter Scale) affected a large area of the northeastern and north-central United States on November 1, 1935. The area in which the quake was felt was over 2,500,000 square kilometers and included most of eastern Wisconsin (MM I - III) and scattered points elsewhere in the state.

Two strong earthquakes near Anna, Ohio, on March 2 and 8, 1937, caused damage to buildings near the epicenter and were reported to have been felt over a six-state region. The second shock was perhaps slightly stronger and more widespread than that of March 2. Both earthquakes were felt at Milwaukee; the latter tremor was also reported felt at Madison.

On November 23, 1939, a shock in southern Illinois having maximum intensity just short of damage (MM V) caused slight disturbances over an unusually large area (390,000 square kilometers). The intensity at Janesville, Wisconsin, was I - III. People in Medford, Milwaukee and Racine felt minor vibrations from a moderate earthquake in south central Michigan on August 9, 1947. Broken windows and considerable plaster and chimney damage were observed over a 30-kilometer radius from the epicenter, located near Coldwater, Michigan. The range of the earthquake covered about 130,000 square kilometers and included portions of Illinois, Indiana and Ohio.

A short but moderately strong earthquake apparently centered just south of Milwaukee caused only minor damage on May 6, 1947. There were no reports of injuries. The 4:25 a.m. CDT tremor shook buildings and rattled windows in many communities in a 7,770 square kilometer area of southeastern Wisconsin. There were a few reports of broken windows at Kenosha (MM-V) and residents of other communities reported that dishes and glasses had fallen from shelves. Some frightened Milwaukee residents ran into the streets in the belief there had been a serious explosion. The shock encompassed a 160-kilometer wide strip from Sheboygan to the Wisconsin - Illinois border and extended from the lakeshore to Waukesha, 40 kilometers inland. This

earthquake lasted only about a half a second and could have caused some serious damage if it had continued for as long as a typical major earthquake (30 or more seconds).

The strongest earthquake in the central United States in 74 years occurred on November 9, 1968, in south central Illinois. The shock was felt over an area of approximately 1,500,000 square kilometers, including all or portions of 23 states and southern Ontario, Canada. Measured at magnitude of 5.3, maximum intensity reached VII in Illinois, Indiana, Kentucky and Missouri. MM V was reported from Jefferson and Kenosha, Wisconsin and MM I - IV, at Baraboo, La Crosse, Milwaukee, Port Washington, Portage, Prairie du Chien and Sheboygan. Press reports indicated that the shock was also felt at Beloit, Janesville and Madison.

Another earthquake in Illinois, about 500 kilometers north of the 1968 epicenter, caused slight damage at several places in Illinois, Indiana, Iowa and Wisconsin. The September 14, 1972, tremor (M = 3.7) was felt over 650,000 square kilometers, including Michigan, Minnesota, Missouri, Ohio and the four states mentioned above. Cracked plaster (MM V) was noted at Kewaskum, Milton, Nashotah and Zenda, Wisconsin. A report from Browntown, Green County, said that water pipes leaked after the shock.

Reports were received from Kansasville, Mount Hope and Trevor, Wisconsin, following a magnitude 4 earthquake on April 3, 1974, centered near the 1968 epicenter in southern Illinois. Within 1 hour or so, a number of tornadoes passed through the area affected by the earthquake. It is possible some of the reports confused the effects caused by the earthquake and those caused by the tornadoes (Abridged from Earthquake Information Bulletin, Volume 10, Number 3, May - June 1978, by Carl A. Von Hake).

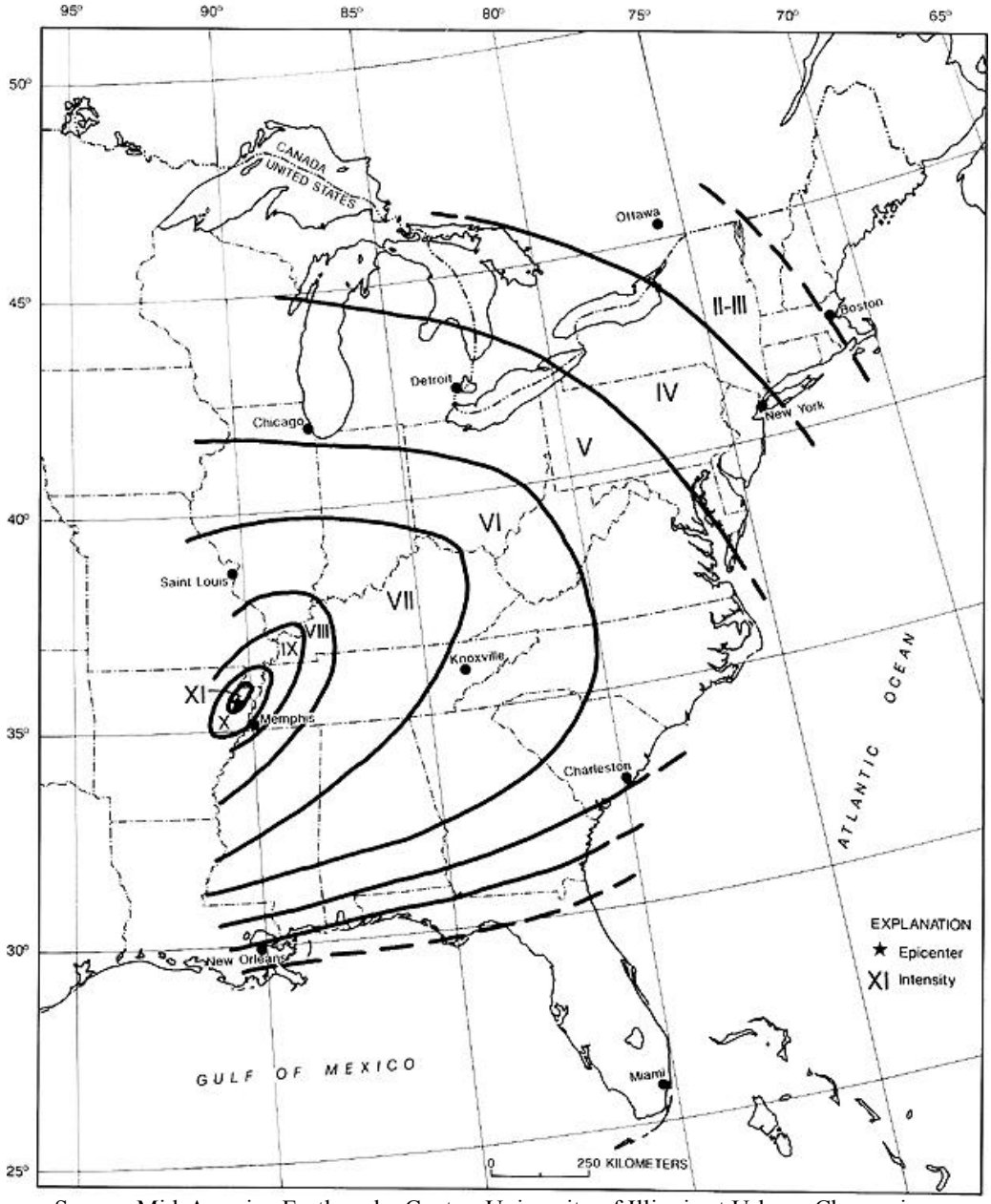
Hazard Assessment: The earthquake threat to the state is considered low. Minor damages such as plaster cracking have occurred but most often the results have been only windows rattling and ground shaking. There is little risk except to structures that are badly constructed. Most of the earthquakes that could be felt have been centered in Wisconsin and in adjacent states. The table on page 26 lists the locations and dates of the 24 recorded earthquakes that have occurred in Wisconsin since the turn of the century, with none causing significant damage. The causes of these local quakes are poorly understood and are thought to be the result of the continuing rebound of the earth's crust after the retreat of the last glacial ice.

The nearest major active fault is the New Madrid Fault, which stretches along the central Mississippi River Valley in Missouri. Considerable attention has focused in recent years on seismic activity in the New Madrid seismic zone, which lies within the central Mississippi Valley, extending from northeast Arkansas, through southeast Missouri, western Tennessee and western Kentucky to southern Illinois. Between 1811 and 1812, four catastrophic earthquakes with magnitude estimates greater than 7.0 occurred over a 3-month period. The largest earthquakes to have occurred since then were on January 4, 1843, and October 31, 1895, with magnitude estimates of 6.0 and 6.2 respectively. Instruments were installed in and around this area in 1974 to closely monitor seismic activity. Since then, more than 4000 earthquakes have been detected, most of which were too small to be felt. On average one earthquake per year will be large enough to be felt in the area.

If an 1811 size earthquake occurred, having an epicenter anywhere along the New Madrid Seismic Zone, the following counties could experience at maximum an earthquake of Mercalli Scale intensity V to VII: Milwaukee, Waukesha, Walworth, Racine, Kenosha and Rock. However, this level of intensity would not occur everywhere in these counties. Another potential impact of a major New Madrid Fault earthquake to Wisconsin could be damage to natural gas and petroleum supply pipelines that pass through or near the New Madrid Fault zone. A depiction of the regional intensity that could result from a major earthquake at the New Madrid Fault is displayed in the map below.

Regional Intensity Map

General Intensity from an 1811-Type Earthquake with an Epicenter along the New Madrid Fault



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

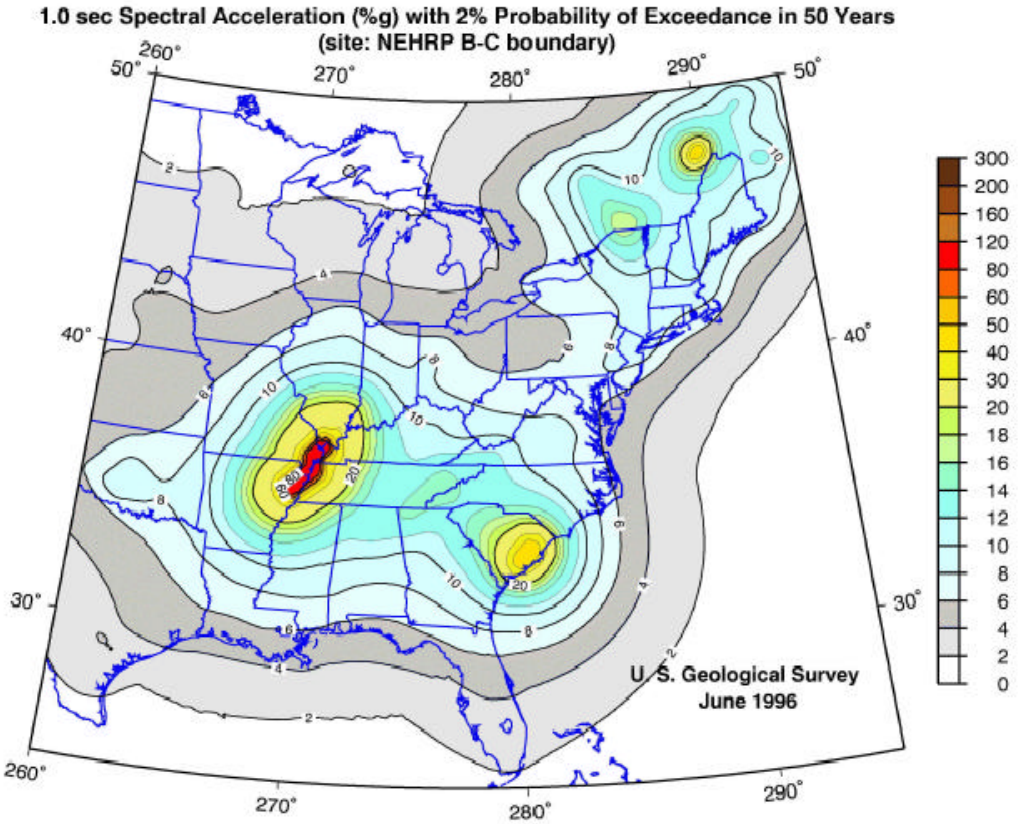
Another way of measuring the potential damage of an earthquake is the peak ground acceleration (PGA). The PGA is measured as a percentage and refers to the maximum percentage of acceleration of the movement of the ground. A higher PGA means a more rapid movement of the ground and a higher probability of structural damage. The table below provides a comparison between the Modified Mercalli Intensity scale and peak ground acceleration.

Modified Mercalli Intensity Scale and Peak Ground Acceleration Comparison

MMI	Acceleration (%g) PGA	Perceived Shaking	Potential Damage
I	< 0.17	Not Felt	None
II - III	0.17 – 1.4	Weak	None
IV	1.4 – 3.9	Light	None
V	3.9 – 9.2	Moderate	Very Light
VI	9.2 – 18	Strong	Light
VII	18 –34	Very Strong	Moderate
VIII	34 –65	Severe	Moderate to Heavy
IX	65 – 124	Violent	Heavy
X - XII	>124	Extreme	Very Heavy

Source: USGS (Excerpted from FEMA Publication 386-2, "Understanding Your Risks." August 2001

The map below describes the peak ground acceleration from a low probability, high intensity earthquake on the New Madrid Fault. It confirms that Wisconsin has a low earthquake risk.



Source: USGS, http://geohazards.cr.usgs.gov/eq/

Historical Frequency: Earthquakes that have affected Wisconsin from 1899 to 1987 are listed on the table on page 26. The most severe earthquake that affected Wisconsin was the record earthquake of 1811, which was centered along the New Madrid Fault. Most earthquakes that do occur in Wisconsin are very low in intensity and can hardly be felt. These very minor earthquakes are fairly common, occurring every few years.

Future Probability of Major Earthquakes at the New Madrid Fault:
The New Madrid Fault system is active, averaging more than 200 earthquakes per year. Of these, eight to ten are large enough to be felt. Each year there are approximately forty-six earthquakes in the magnitude 2.0 range, and seven in the magnitude 3.0 range. Scientists at the Center for Earthquake Information have computed a set of probabilities that estimates the potential for different magnitude earthquakes to occur at the New Madrid Fault. At this time it is not possible to predict the exact date, duration or magnitude of an earthquake. However, even an 8.3 magnitude earthquake at the New Madrid Fault would cause only minor damage in the southeastern corner of Wisconsin (Source: The University of Memphis Center for Earthquake Information http://www.ceri.memphis.edu/index.shtml).

New Madrid Fault Probabilities

Magnitude	Expected Rate (yr)
4.0	14 months
5.0	10-12 yr
6.0	70-90 yr
7.0	254-500 yr
8.0	550-1200 yr

Programs: Wisconsin is not likely to suffer direct physical damage from a severe earthquake. A more likely concern to Wisconsin is indirect effects such as the disruption in the provision of essential goods and services from the direct-impact area of a major earthquake. The Central United States Earthquake Preparedness Program Project (CUSEPP), under FEMA, is engaged in an on-going effort to reduce the hazards associated with earthquakes. Although Wisconsin is not one of the states directly involved in this program, WEM and the state indirectly benefit from its planning and actions. The program's hazard reduction efforts focus on:

- Determining the potential consequences of major earthquake events in the New Madrid seismic zone;
- Reducing or managing negative consequences through the use of zoning or building codes;
- Increasing enforcement of local mitigation codes or regulations; and
- Significantly increasing public awareness of earthquake consequences and actions that can be taken to minimize adverse effects.

Resources: Perhaps the best source of general earthquake hazard information in the United States Geological Society (USGS) at http://geohazards.cr.usgs.gov/earthquake.html. For more information about the New Madrid fault, visit the University of Memphis Center for Earthquake Information at http://www.ceri.memphis.edu/index.shtml.

Earthquake History in Wisconsin

Location	Year	Month	Day	Time C.S.T. H	M	S	Latitude North	Longitude West	Felt Area Square km	Maximum Intensity	Magnitude	
1. Kenosha	1899	Oct	12	--			42° 34'	87° 50'	--	II	3.0	
2. Marinette	1905	Mar	13	22	30		45° 08'	87° 40'	--	V	3.8	
3. Shorewood	1906	Apr	22	--			43° 03'	87° 55'	--	II	3.0	
4. Milwaukee	1906	Apr	24	--			43° 03'	87° 55'	--	III	--	
5. Marinette	1907	Jan	10	--			45° 08'	87° 40'	--	III	--	
6. Beloit	1909	May	26	8	42		42° 30'	89° 00'	800,000	VII	5.1	⇐ Maximum
7. Madison	1914	Oct	07	15	0		43° 05'	89° 23'	--	IV	3.8	
8. Madison	1916	May	31	16	45		43° 05'	89° 21'	--	II	3.0	
9. Fond du Lac	1922	Jul	07	--			43° 47'	88° 29'	--	V	3.6	
10. Madison	1931	Oct	18	15	12		43° 05'	89° 23'	--	III	3.4	
11. Stoughton	1933	Dec	06	23	55		42° 54'	89° 15'	1,200	IV	3.5	
12. Dubuque	1938	Nov	07	23	30		42° 30'	90° 43'	--	II	3.0	
"	"	"	08	1	15		"	"	--	"	"	
"	"	"	"	3	30		"	"	--	"	"	
13. Thunder Mountain	1943	Feb	09	17	21		45° 11'	88° 10'	--	III	3.2	
14. Milwaukee	1947	May	06	15	27		43° 00'	87° 55'	8,000	V	4.0	
15. Lake Mendota	1948	Jan	15	11	40		43° 09'	89° 41'	--	IV	3.8	
16. Oostburg	1956	Jul	18	15	30		43° 37'	87° 45'	--	IV	3.8	
"	"	"	0	17	0		"	"	--	"	"	
17. South Milwaukee	1956	Oct	13	--			42° 55'	87° 52'	--	IV	3.8	
18. Beaver Dam	1957	Jan	08	10	0		42° 32'	98° 48'	--	IV	3.6	
19. Bill Cross Rapids	1979	Feb	28	12	4	55	45° 13'	89° 46'	Instrumental	--	<1.0 MoLg	
20. Madison	1981	Jan	09	9	15		43° 05'	87° 55'	Local	II	--	
21. Madison	1981	Mar	13	a.m.			43° 05'	87° 55'	Local	II	--	
22. Oxford	1981	Jun	12	10	30		43° 52'	89° 39'	Local	IV-V	--	
23. Milwaukee	1987	Feb	12	13	12		42° 95'	87° 84'	Local	IV-V	--	
24. Milwaukee	1987	Feb	12	13	16		43° 19'	87° 28'	Local	IV-V	--	

Source: University of Wisconsin-Extension, Geological and Natural History Survey. *List of Earthquakes in Wisconsin*, M.G. Mudrey, Jr., Open File Report 84-1, 12/11/84. Ron Friedel, Department of Geological and Geophysical Sciences, U.W. Milwaukee, 1987

FLOODS AND FLASH FLOODS

Hazard Description: Flooding occurs when a river, stream, lake or other body of water overflows its banks onto normally dry land or there is an excessive pooling of surface water. These events can be slow to develop or happen very quickly. Flash floods are usually the result of excessive precipitation or rapid snowmelt and can occur suddenly with awesome power.

Hazard Assessment: Flood related hazards in Wisconsin arise from a complex set of hydrologic and hydraulic interactions, including excessive precipitation, rapid snowmelt, ice or debris jams in waterway channels and dam or levee failures. These result in river flooding, stream flooding, coastal flooding and erosion, bank slumping, inland lake flooding, flash flooding, flooding from levee and dam failure and storm water runoff and ponding.

The effects of flooding can be devastating and cause extensive property damage. Although the probability of serious injury and loss of life is usually low, flooding increases the likelihood of long-term health hazards from water-borne diseases, mold, mildew, insect infestation and contaminated drinking water. Long-term damage to the environment may also result from flooding of sites containing hazardous materials or waste.

Major floods in Wisconsin tend to occur either in the spring when melting snow adds to runoff from rain or in summer and early fall after intense rainfalls. Flooding which occurs in the spring due to snowmelt and/or a prolonged period of heavy rain is characterized by a slow build-up of flow and velocity in rivers and streams over a period of days. This build-up continues until the river or stream overflows its banks, for as long as a week or two. The water then slowly recedes inch by inch to its original level. The expected occurrence and location of this type of flooding is fairly predictable and normally there is sufficient time for the orderly evacuation of people and property.

Flash flooding, which usually results from surface runoff after intense rains or the failure of water control structures, also poses a threat to all areas of Wisconsin. This is an extremely dangerous form of flooding because it is not very predictable. It can occur very quickly, precluding evacuation to higher ground to prevent loss of life. Small and normally calm rivers and streams will rise very rapidly when surrounding soil and terrain are unable to accommodate intense precipitation. Raging torrents of water can rip through waterways, surging well beyond normal banks and sweeping away everything in their path. Houses, structures, bridges and boulders can be tossed and rolled by a flash flood. The strength of the water current, carrying debris and surging through an area, can cause serious injuries and death. It can also interrupt power, disable fuel sources, make roads impassable, hamper response efforts and strand people in their homes awaiting rescue.

Those counties that border the Mississippi and the Wisconsin Rivers, the largest rivers in the state, are prone to flooding in low-lying areas. In addition, the Chippewa River in Eau Claire and Dunn Counties, the Kickapoo River in Crawford and Vernon Counties, the Pecatonica River and its tributaries in Green and Lafayette Counties, the Bad River in Ashland County, the Wolf River in Waupaca and Menominee Counties and the Milwaukee River have flooded periodically.

Agricultural losses from floods can be as high or higher than other forms of property damage. Agricultural losses can be in the form of crop loss, soil erosion or property damage to farm

structures and equipment. As development moves into agricultural areas flooding is likely to increase on farms and pastures near population centers due to increased stormwater run-off. For example, people have reported that agricultural areas in Waukesha County, a rapidly developing county, have flooded more often as development has increased.

Another development issue related to flooding is the demand for housing along Wisconsin's waterfronts. For example, the number of homes along all sizes of northern Wisconsin lakes has increased an average of 216 percent since the 1960s. According to the Wisconsin Department of Natural Resources, lakes that are 500 to 1,000 acres in size now have nine times as many homes as in the 1960s. In addition, some developing rural areas lack stormwater planning, flood insurance studies and flood maps.

Historical Frequency and Significant Incidents: Flooding has been a principle cause of damage in 16 out of 24 Presidential Disaster Declarations in Wisconsin from 1971 through 2001. Two costly floods occurred in 1973 and 1978 with private and public damage losses set at $24 million and $51 million respectively. The 1973 flood affected thirty-five counties. Included were counties along the Mississippi and Wisconsin Rivers, counties bordering the Great Lakes and some interior counties as well. The 1978 flood affected sixteen counties in southern and southwestern Wisconsin. The area most severely affected was that of the Kickapoo River Valley where homes were destroyed and families forced to relocate.

During the 1980s there were several significant flood events. In June and September 1980, flash flooding occurred in six northwestern and west central counties causing approximately $6 million in damage. Vernon County suffered over $1 million in flood-related losses in July 1984. Ashland, Bayfield and Douglas Counties suffered almost $3 million in public and private damages as a result of flooding that occurred during the month of September 1985. Two Presidential Disaster Declarations were received for flash flooding which occurred in August 1986 in Milwaukee and Waukesha Counties and again in September 1986 in Milwaukee, Waukesha, Ozaukee, Sheboygan, Manitowoc, Dodge, Kenosha and Washington Counties. That August, record rainfalls in the Milwaukee area and resultant flooding caused two deaths and an estimated $20 million in property damage. In September, torrential rains once again fell and associated flooding caused damage estimated at $6 million. Some of this flooding was associated with streams overtopping their banks, but overland flooding also occurred when storm and sanitary sewers were unable to handle the increased water resulting from intense precipitation.

The decade of the 1990s had eight Presidential Disaster Declarations for floods. In 1990, intense rainfall caused flash flooding severe enough to result in two Presidential Disaster Declarations. The first declaration covered late June when, on two successive weekends, record rainfalls occurred in east central and southwestern counties causing more than $20 million in losses. Federal assistance was requested and obtained for the following 17 counties: Brown, Kewaunee, Calumet, Manitowoc, Outagamie, Winnebago, Dane, Green, Rock, Grant, Iowa, Lafayette, Crawford, Richland, Sauk, Juneau and Vernon. The City of Green Bay in Brown County and the City of Darlington in Lafayette County were most severely impacted. Storm and sanitary sewer back up caused significant problems for Green Bay residents. In Darlington, the Pecatonica River once again flooded (approximately 7 feet above flood stage) and forced the evacuation of the downtown

business district. On the weekend of August 17-19, 1990, the City of Tomah and surrounding areas of Monroe County experienced a record nine inches of rain in a 24-hour period. The heavy storm runoff filled the Lake Tomah reservoir to capacity and the dam nearly failed. A portion of the city was evacuated before the dam gates were opened and a breach averted. Damage in Monroe County totaled over $3 million and a Presidential Disaster Declaration was obtained for individual assistance only.

During the period of September 14-24, 1992, severe thunderstorms with heavy rain ripped through southwestern Wisconsin, leaving in their wake extensive damage in a ten-county area. The high winds, extensive rainfall and resultant flooding caused property and agricultural losses that exceeded $17 million. A Presidential Disaster Declaration was granted on September 30, 1992, for the following ten- counties: Buffalo, Crawford, Jackson, Juneau, Pepin, Pierce, Richland, Sauk, Trempealeau and Vernon.

During the summer of 1993, the state received its worst flooding in over twenty years. Widespread rainfall and associated severe storms occurred from June 7 to August 25, 1993, resulting in a Presidential Major Disaster Declaration for 47 counties. The total associated damage exceeded $740 million. Forty of the counties were declared for both public and private assistance, with the other seven declared for Individual Assistance only. Recovery from this disaster is still continuing today. In comparison to other states in the Midwest, Wisconsin was fortunate in that our state was not as severely impacted as others; but the '93 floods are, by far, the state's worst disaster in terms not only of damages, but also in funds received through disaster relief programs. The total amount of disaster relief funds received from all declarations prior to this was $352 million. Approximately $300 million in disaster relief was received for the 1993 Presidential Disaster Declaration alone.

Heavy rains during the period of June 17-19, 1993, caused extensive flooding on the Black River. Late Sunday morning, June 20, a portion of the embankment on the power canal between Hatfield and Black River Falls failed. At approximately 2:00 p.m. the levee protecting the Grove subdivision of the City of Black River Falls began to fail due to overtopping. Approximately 90 structures were damaged in the Grove area, some having flood waters reaching the ceiling on the first floor. There were 500-700 residents estimated to have evacuated from their homes. Municipal water pumps and sewage treatment operations were shut down. Gas service to over 180 homes and businesses was also shut off. As a result streets, storm sewers, sanitary sewers, water mains, utilities and well water sources also suffered extensive damage. High water marks in Black River Falls indicated that the floodwaters reached two and a half feet above the 100-Year flood level.

Significant flooding also occurred in Darlington, Wisconsin, on the upper west branch of the Pecatonica River. Record-breaking heavy rains in early July added to previous minor flood conditions and raised levels on the Pecatonica River to a crest of 18.6 feet, 7.6 feet over floodstage. The river completely covered the Main Street bridge, effectively dividing the town. Several blocks of the downtown area had to be evacuated. The fire station was flooded, as were several businesses located downtown. An oil company with large stores of petroleum and gas in the floodplain on the northwest side and the sewage plant on the southeast side were environmental concerns because of the high water. Because of the frequent and predictable flooding that occurred in the City of Darlington, a flood warning and evacuation plan had been developed and was used. Without it, considerably more property damage and endangerment of life would have resulted. This flood

event provided the incentive and the needed funding for the community to embark on a major hazard mitigation project. Darlington was able to implement its flood mitigation and economic development plan, which entailed the floodproofing and/or acquisition and relocation of numerous downtown buildings. The project has become a model for communities interested in dealing with the effects of repetitive flooding.

Agriculture was severely impacted by the heavy rains and flooding which occurred in 1993. Thousands of acres of crops were damaged or destroyed and countless acres of rich farm soil were washed away. These losses compounded those already incurred by crop producers as a result of the lack of soil moisture in 1992 and winterkill in the first three months of 1993.

In 1996, Green County was declared for widespread flooding that took place July 17 and 18. During a 5-hour period 11 inches of rain that fell and as a result many roads were damaged and closed and seven bridges or approaches were washed-out. Basement flooding and sewer back up was prevalent throughout the county and especially in the City of Monroe and the Village of Monticello. Hundreds of homes and several businesses had flooded basements with extensive damage to furnaces, water heaters, water softeners, washers and dryers. Although Fond du Lac was also declared at the same time, the main source of damage was an F5 tornado in the Village of Oakfield, which will be discussed in more detail in the tornado section of this doucment.

On June 20 and 21, 1997, the worst rainstorm in more than a decade dumped more than 7 inches of rain in a 30-hour period in Milwaukee and the surrounding counties. The intense rainfall overwhelmed creeks and rivers as well as storm and sanitary sewers. Severe impacts from the storm were felt in Milwaukee, Ozaukee, Washington and Waukesha Counties. Hundreds of local roads and highways were filled with water, as much as 23 feet in some areas. Thousands of homes were damaged many of which had 6-7 feet of water in the basement. Hundreds more had first floor flooding with major structural damage and a dozen more houses were destroyed. The flood also damaged hundreds of businesses, many of which were forced to close temporarily or in some cases, permanently. Some of the damaged businesses that provide critical services included Bayshore Clinical Labs, St. Michael's Hospital Health Center, St. Luke's South Shore Hospital and the dialysis center in the City of Brown Deer. Damage assessments made by county emergency directors estimated disaster-related costs of $87,700,000.

From August 5 through 7, 1998, slow-moving thunderstorms dumped anywhere from five to ten inches of rain in a three to five hour period and resulted in flash flooding or urban/small stream flooding in Southeastern Wisconsin. Thousands of homes were damaged and hundreds had water above the first floor. Many sustained structural damage, with basement walls bowing or collapsing. The flooding also affected a number of businesses, some of which were temporarily or permanently forced out of operation. Tragically, two young boys lost their lives as a result of the flooding.

When all initial damage figures were compiled for the public and private sectors, they amounted to almost $55 million in losses. Most of the $44 million in private sector losses were uninsured, as flood related losses are not covered by the standard homeowner's insurance policy. The severity of the storm and significance of the uninsured losses prompted a request for a

Presidential Disaster Declaration for four Wisconsin counties. The declaration was granted for both the public and private sectors. A fifth county was added later for public assistance only.

In 1999, 10 counties were declared because of damages from flash flooding and downed trees that resulted from a series of wind and rainstorms that took place from July 4 to July 30. The declared counties were Ashland, Bayfield, Douglas, Florence, Iron, Oneida, Price, Rusk, Sawyer and Vilas Counties. Many of the communities affected by the flooding and debris were small rural communities. The flash flooding washed out roads, culverts and bridges, which cut off communities from each other. Just getting the main roads passable was difficult as many of the towns had just one or two person road crews. Often roads were damaged a second or third time by the multiple storms. The floodwater also damaged homes and private wells. Many residents were isolated because they could not use roads submerged by standing water.

Flooding and flood disasters continued into the next decade. A series of severe storms from May 26 to July 19, 2000 followed the wettest month of May in southern Wisconsin since 1870. The subsequent flooding resulted in disaster declaration 1332-WI. The initial declaration occurred on June 23 and was for 12 counties in southern Wisconsin. Several storms with straight-line winds and heavy rains caused extensive damage to public infrastructure and flooded private homes. Additional storms and flood damage resulted in declarations for 10 more counties in the southern third of Wisconsin and 8 counties in the northwest part of Wisconsin. By the end of the incident period (July 19), thirty counties were included in the declaration. Thirteen counties received both Public and Individual Assistance (Columbia, Crawford, Dane, Grant, Iowa, Juneau, Kenosha, Lafayette, Milwaukee, Richland, Sauk, Vernon and Walworth). Fourteen counties received Public Assistance only (Adams, Ashland, Barron, Burnett, Forest, Green, Iron, Jackson, Monroe, Oneida, Polk, Rusk, Sawyer and Washburn). Three received Individual Assistance only (Dodge, Racine and Waukesha). The Hazard Mitigation Grant Program was made eligible statewide.

In 2001, flooding was the principle reason Wisconsin initially received Presidential Disaster Declaration, DR-1369, although tornadoes and severe storms became a major factor as the disaster progressed. Heavy winter snowfall combined with spring rain led to spring flooding. In mid-April, rain and rapid snowmelt caused the Mississippi River and many of its tributaries to flood. Floodwaters along the Mississippi River from Alma to Prairie du Chien rose to their highest levels since 1965. In addition, severe storms also struck northern Wisconsin in late April. Heavy rains mixed with freezing rain, snow and severe winds caused widespread flooding as well as wind damage. The initial flooding affected 17 counties. Eventually 32 counties were declared for DR-1369 for a variety of storm-related damage including tornadoes.

Programs: As a result of the 1993 Midwest floods, Congress authorized a special appropriation to aid flood victims and assist communities in recovering from the widespread devastation. To coordinate the distribution of these federal funds, FEMA and WEM formed an Interagency Disaster Recovery Group (IDRG), which included representatives from a variety of state and federal agencies. The group acted as a clearinghouse for communities interested in hazard mitigation or long-term recovery projects, matching proposals with grant programs and funding projects from a variety of sources. Over 100 potential hazard mitigation projects were identified.

In December 1993, as an outgrowth of the IDRG, the FEMA/WEM Hazard Mitigation Recovery Office was established for Wisconsin and located at the WEM central office. It was staffed by

FEMA personnel who worked closely with the WEM State Hazard Mitigation Officer, other state agencies and local governments concerning hazard mitigation and long-term recovery issues. Priorities in the recovery from the 1993 flooding have been the elevation of flood prone structures, the public acquisition of flooded property for open space use and the relocation of affected homes and businesses to areas outside identified flood hazard areas. The **Hazard Mitigation Grant Program** (HMGP) and HUD Community Development Block Grants (CDBG) have been used for floodproofing and elevation or acquisition of structures in flood hazard areas.

Wisconsin Emergency Management (WEM) has continued to administer the Hazard Mitigation Grant Program (HMGP) for every disaster since 1993. Since most disasters are flood related, the priorities for the HMGP continue to be reducing flood-related disaster losses. Another program available through WEM is the **Flood Mitigation Assistance Program**, which provides limited annual funds for flood mitigation planning and cost-effective flood mitigation projects. New as of 2001, the **Pre-Disaster Mitigation Program** (PDM) makes annual funds available to counties, municipalities and tribes regardless of whether or not a disaster has taken place. PDM funds may be used to produce a comprehensive all-hazards mitigation plan or for hazard mitigation projects. The Disaster Mitigation Act of 2000, which authorized the Pre-Disaster Mitigation Program, made mitigation planning a priority. Any county, municipality or tribe that wants to receive PDM project funds will need to have an approved comprehensive all-hazards mitigation plan in place. In addition, a successful applicant for HMGP funds will need to have an all-hazards mitigation plan in place or complete a plan within one year of receiving HMGP funding. More about WEM's mitigation programs may be found at http://badger.state.wi.us/agencies/dma/wem/mit_home.htm.

One of the prerequisites for access to federally funded hazard mitigation programs is participation by the county or municipality in the **National Flood Insurance Program** (NFIP). Communities that participate in the NFIP must adopt and enforce a floodplain ordinance to restrict development in the floodplain and protect against loss of life or property due to floods. In return for participation in the NFIP, people within the county or community are able to insure their homes, community buildings and businesses against flood losses. The Wisconsin Department of Natural Resources (DNR) is the state agency that coordinates the NFIP in Wisconsin. The DNR, working with local governments, is identifying special flood hazard areas in the state. Local government bodies are responsible for enacting floodplain zoning ordinances, which comply with state and federal regulations. State floodplain management regulations are found in Chapters 30.27, 59.971, 61.351, 62.231, 87.30 and 144.26, Wisconsin Statutes and Chapters NR 115, 116, 117 and 118 of the Wisconsin Administrative Code. Federal requirements for floodplain management are set forth in the National Flood Insurance Act as amended, EO 11988 and EO 11990.

NFIP Flood Insurance Statistics for Wisconsin as of 12/31/2001

Policies In-force	Coverage In-force	Premiums In-force	Total Losses	Total Payments
12,714	1,261,727,100	6,161,851	4,267	26,032,054

Source: http://www.fema.gov/nfip/datadef.htm (Note: Community level data also available here).

The DNR has also established a Municipal Flood Control Grant Program. This program offers an assistance package to cities, villages, towns and metropolitan sewerage districts concerned with municipal flood control management. Assistance is provided in two ways: (1) Local Assistance

Grants that support municipal flood control administrative activities, and (2) Acquisition and Development Grants to acquire and remove floodplain structures, elevate floodplain structures, restore riparian areas, acquire land and easements for flood storage, construct flood control structures, and fund flood mapping projects. Information and application forms are available from DNR's web site at http://www.dnr.state.wi.us/org/caer/cfa/ef/flood/grants.html.

The National Weather Service provides timely warning information concerning floods and other weather-related hazards. When severe weather conditions occur that might result in flooding or flash flooding, *flash flood watch*, *flash flood warning* or *urban and small stream flood advisory* weather bulletins are broadcast by the National Weather Service. These bulletins are disseminated over a number of telecommunication channels, including NOAA Weather Radio, the NOAA Weather Wire and the state law enforcement's TIME system. Local media routinely monitor these sources and rebroadcast the weather bulletins over public and private television and radio stations. NOAA Weather Radio is available to any individual with a weather alert radio.

Wisconsin Emergency Management, in conjunction with the National Weather Service, other state agencies and local emergency government organizations provides both flood awareness and preparedness information to the citizens of Wisconsin. Just before spring the National Weather Service provides a spring flood outlook that predicts the likelihood of spring flooding in Wisconsin rivers. In the May-June timeframe, the Wisconsin Emergency Management has a Flood and Flash Flood Awareness campaign to highlight the dangers of floods and flash floods and increase public awareness of these hazards. This information is provided annually.

Current information about flood potential by river is available on the National Weather Service's Advanced Hydrologic Prediction Services web site at http://www.crh.noaa.gov/ahps/index.html. For general climatology and local weather information such as local flood warnings and flood watches, the National Weather Service's Forecast Offices for Wisconsin are excellent sources. The NWS Forecast Offices serving Wisconsin are:

Duluth, MN http://www.crh.noaa.gov/dlh/cwa.htm
Serving Douglas, Bayfield, Ashland, Bayfield, Iron, Burnett, Washburn, Sawyer and Price Counties.

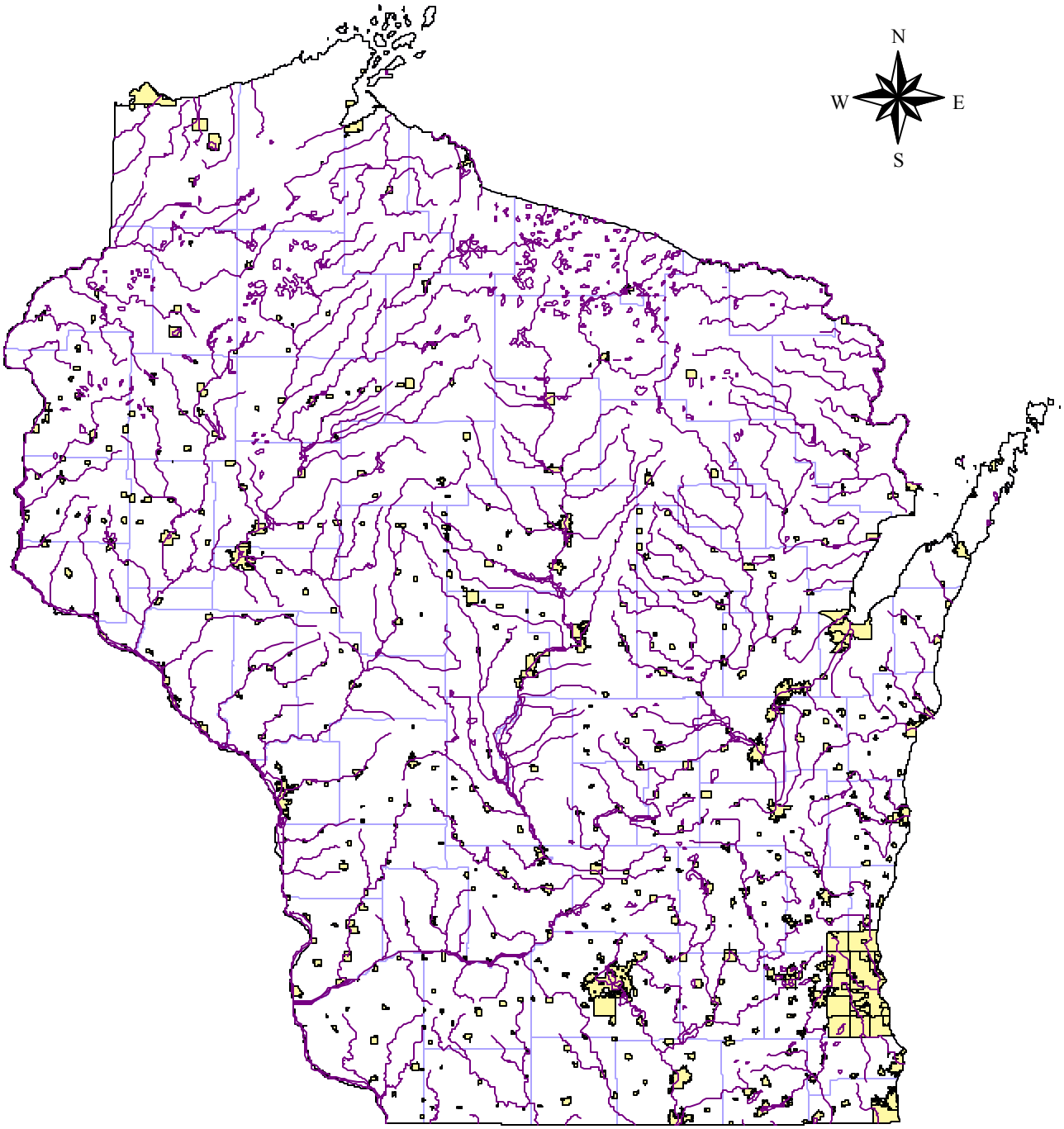
Green Bay, WI http://www.crh.noaa.gov/grb/warn.html
Serving Vilas, Forest, Florence, Marinette, Oneida, Lincoln, Langlade, Marathon, Shawano, Menominee, Oconto, Portage, Door, Kewaunee, Waushara, Winnebago, Calumet and Manitowoc Counties.

Milwaukee, WI http://www.crh.noaa.gov/mkx/
Serving Marquette, Green Lake, Fond du Lac, Sheboygan, Sauk, Dodge, Columbia, Washington, Ozaukee, Iowa, Dane, Jefferson, Waukesha, Milwaukee, Lafayette, Green, Rock, Walworth, Racine and Kenosha Counties.

La Crosse, WI http://www.crh.noaa.gov/arx/
Serving Taylor, Jackson, Trempealeau, Buffalo, La Crosse, Monroe, Juneau, Adams, Vernon, Crawford, Richland and Grant Counties.

Minneapolis, MN http://www.crh.noaa.gov/mpx/index.html
Serving Polk, Barron, Rock, St. Croix, Dunn, Chippewa, Pepin and Eau Claire Counties.

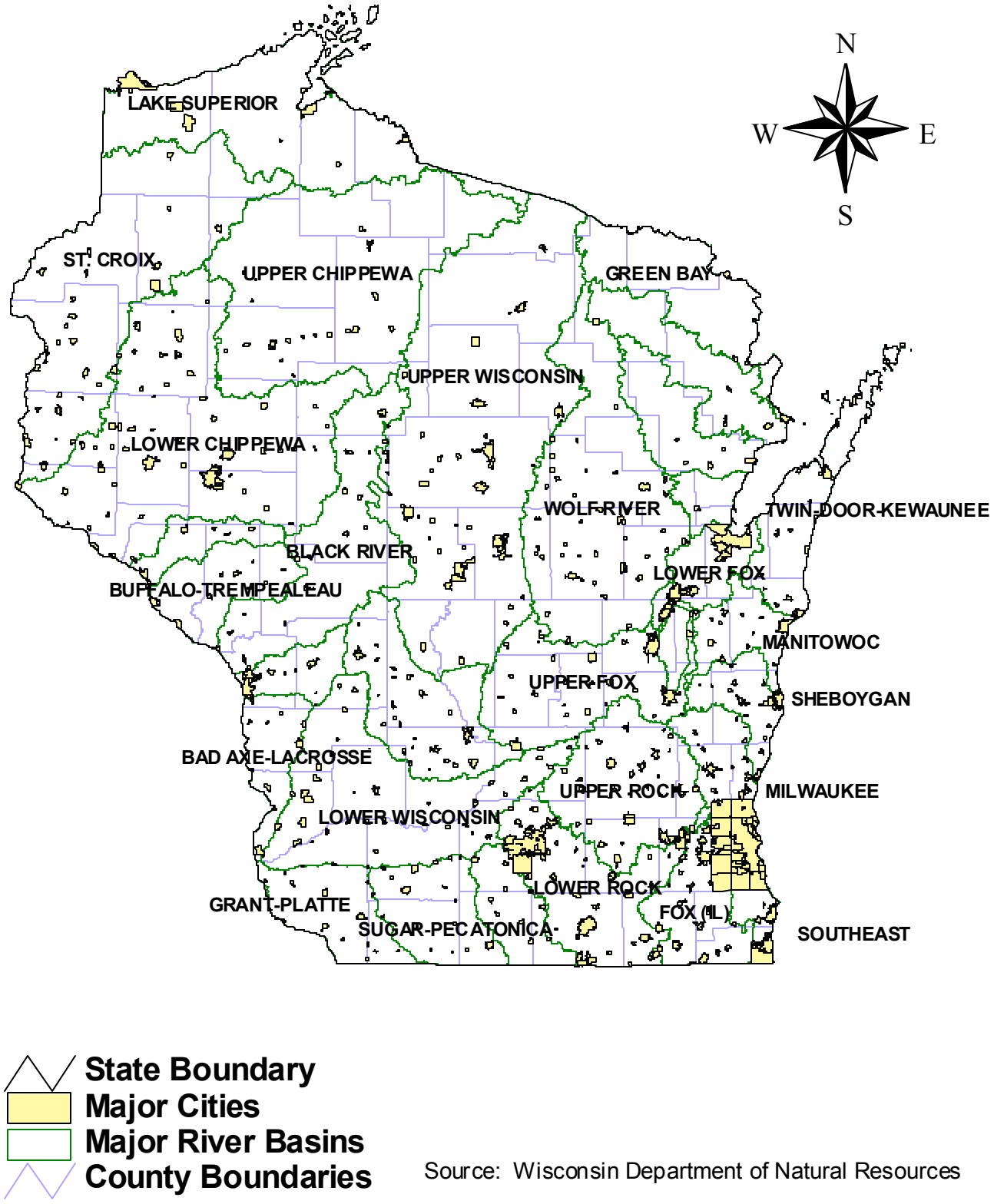
Major Rivers in Wisconsin



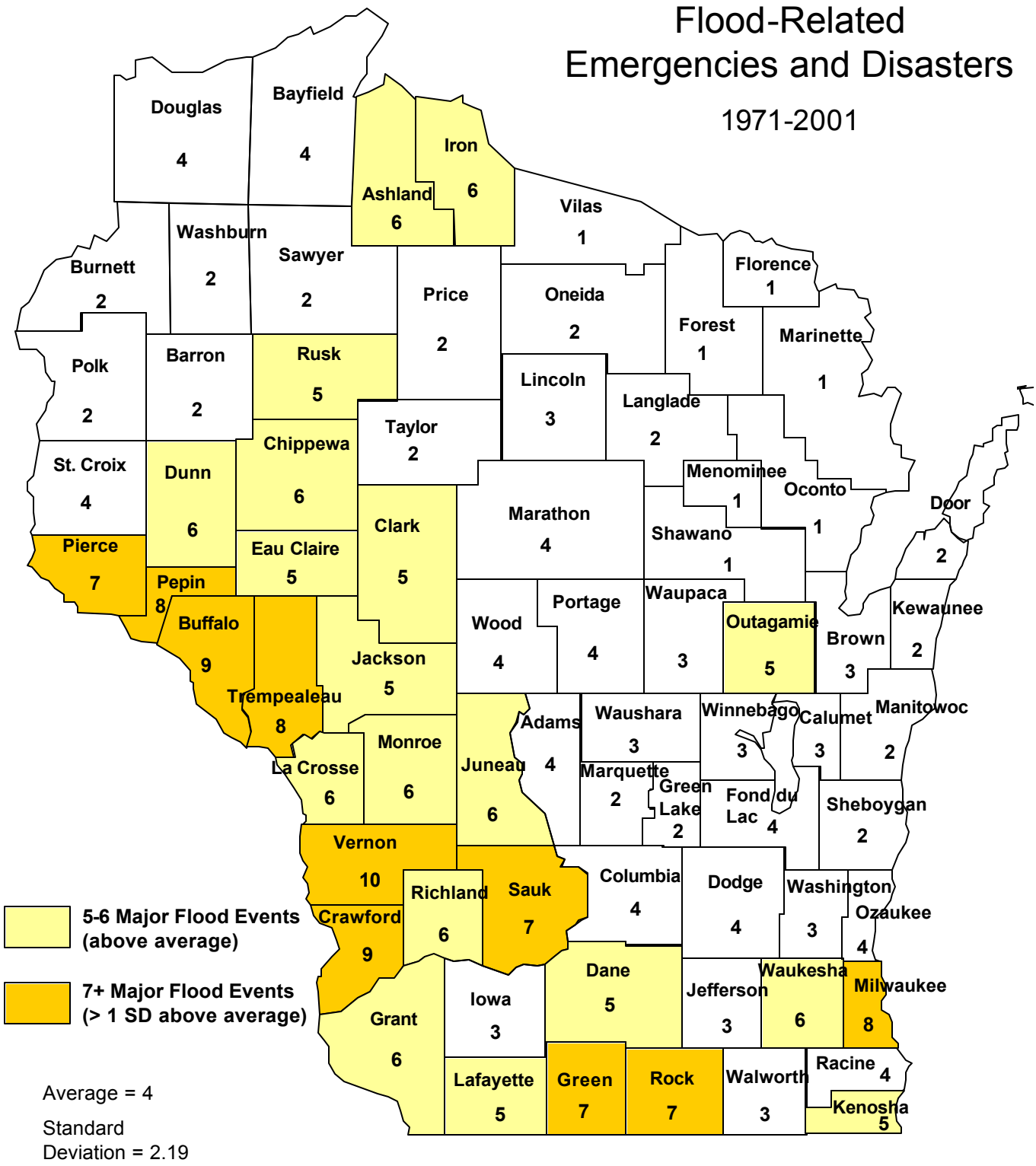
Hydrology (Major Rivers)
State Boundary
Major Cities
County Boundaries

Source: Wisconsin Department of Natural Resources

Major River Basins in Wisconsin



Source: Wisconsin Department of Natural Resources



Source: Wisconsin Emergency Management

FOREST FIRES AND WILDFIRES

Hazard Description: A forest fire is an uncontrolled fire occurring in a forest or in woodlands outside the limits of incorporated villages or cities. A wildfire is any instance of uncontrolled burning in brush, marshes, grasslands or field lands. For the purpose of this analysis, both of these kinds of fires are being considered together. The causes of these fires include lightning, human carelessness and arson.

Hazard Assessment: Forest fires and wildfires can occur at any time of day and during any month of the year, but the peak fire season in Wisconsin is normally from March through November. The season length and peak months may vary appreciably from year to year. Land use, vegetation, amount of combustible materials present and weather conditions such as wind, low humidity and lack of precipitation are the chief factors determining the number of fires and acreage burned. Generally, fires are more likely when vegetation is dry from a winter with little snow and/or a spring and summer with sparse rainfall.

Forest fires and wildfires are capable of causing significant injury, death and damage to property. A recent inventory showed that 46 percent of the state, 16 million acres, is covered with forests. The potential for property damage from fire increases each year as more recreational properties are developed on wooded land and increased numbers of people use these areas. Fires can extensively impact the economy of an affected area, especially the logging, recreation and tourism industries, upon which many northern counties depend. Major direct costs associated with forest fires or wildfires are the salvage and removal of downed timber and debris and the restoration of the burned area. If burned-out woodlands and grasslands are not replanted quickly to prevent widespread soil erosion, then landslides, mudflows and floods could result, compounding the damage.

Historical Frequency and Significant Incidents: The most disastrous fire in the state's history, the Peshtigo fire, occurred on October 8, 1871, when over 1,200,000 acres of forest burned in northeastern Wisconsin, mainly in Oconto, Marinette, Shawano, Brown, Kewaunee, Door and Manitowoc counties. It was estimated that 3,000 people were made homeless by this fire. With 1,152 people killed and another 350 missing, this represents the greatest single loss of human life by fire in American history. However, the Great Chicago Fire occurred at the same time and received much more publicity than this historic Wisconsin fire.

The 1976 drought created the most severe fire danger conditions in Wisconsin forests and grasslands since the 1930s. During 1976 a total of 4,144 fires occurred, the greatest number in any one-year since 1971, when detailed record keeping began. Likewise, the fire season of 1988 is also remembered as one of the driest on record. A total of 3,242 fires occurred that year, but just 9,740 acres burned, an extraordinarily low number considering the severity of the threat.

Programs: The Wisconsin Department of Natural Resources (DNR) is responsible for forest fire protection on approximately 18 million acres of forest and wild lands in the state. The U.S. Forest Service maintains fire protection responsibility for designated national forests within the state, an area of about 2 million acres. Local fire departments carry out this responsibility on the remaining wildland and forest acreage.

Both the DNR and the US Forest Service have grave concerns about the potential for severe forest fires during the fire season in 2000 and beyond. The thousands of acres of timber blown down in the downburst in late July 1999 in the northern tier of Wisconsin counties have created a potential hazard. Downed timber impedes the mobility of fire-fighting vehicles and equipment and provides large reserves of fuel if a fire should break out. The US Forest Service and the Department of Natural Resources are working together in advance of the fire season to plan strategies to reduce the risk of a severe forest fire.

The DNR Bureau of Forestry is the lead state agency in this area. It maintains a command center in Madison and monitors fire conditions throughout the state. It maintains and conducts an active fire management program for the state. To perform this function, personnel from this bureau develop two types of plans – fire program plans and fire program action plans. Fire program plans include fire prevention education and awareness campaigns, fire education conducted in schools, fire-fighting training to be conducted and other non-emergency program actions planned for the year. Fire program action plans are also developed and are used in time of emergency. They contain listings of hazard areas, maps, response actions, notification guidance, points of contact for additional assistance and mutual support, etc. Both of these types of plans are done on an annual basis and by county. The Bureau works through its six district offices to conduct local training, educational classes, coordination, response actions and assistance.

There are three major programs being conducted by the DNR to improve fire hazard response. The first is an upgrade of their 22 manual weather stations strategically located in fire hazard areas in the northern two thirds of the state. In the last year and a half eleven of these stations have been upgraded with state funds and seven others with federal funds. The upgrade enables these stations to be fully automated and provide real-time information. They constantly monitor local conditions that are converted using the National Fire Danger Program to provide current fire hazard conditions or levels.

Another relatively new program is the use of single engine air tanker (SEAT) aircraft to fight fires. This program has been used for one year and will continue to be evaluated for another two years. These airplanes operate out of the Adams-Friendship area and are used to apply environmentally safe foam that can extinguish fires and also treat potential fuel (houses, timber, etc.) to make it more fire resistant. Finally, a major training program is being evaluated for statewide use in the Lake Michigan district or northeast area. Its purpose is to prepare local fire departments in northeast Wisconsin to help out more with forest fires. This consists of 8-10 hours of concentrated forest fire training and providing personal protective equipment such as flame-resistant coveralls for the firefighters.

Future Outlook: There is potential for forest fires ahead. Unusually strong winds in northwestern Wisconsin during the month of July 1999 damaged thousands of acres of trees. The US Forest Service estimates that approximately 12,000 acres of trees were downed within a 92,000-acre area in the Washburn District (Straddling Douglas and Bayfield Counties). Another 30,000 acres were moderately damaged with less than 40% of the trees mortally damaged. The balance of the area contains scattered patches of broken and uprooted trees. The vast majority of the blow-down area has not been treated for fire or timber activities in 50 years. Under normal weather conditions the amount of downed timber

has created a fuel load of 12 to 18 tons per acre, 3 to 6 times greater than would normally be available. If drought conditions were to occur, larger fuels would actively burn and increase the available fuel load to 20 to 30 tons per acre. Under such conditions, a fire could burn so intensely that it would create wind gusts and cause a firestorm. These events would create an exceptionally dangerous environment for firefighters. Tests sponsored by the DNR confirmed that the traditional approach of attacking the fire directly using bulldozers would not be effective. In areas heavily affected by the blow-down, even the heaviest bulldozer would be ineffective. The strategy for fighting fires in this area will require support from aerial fire suppression resources (US Forest Service memo, March 2000).

Example of wind damage to trees on Lake Minocqua July 30, 1999.

As of March 2000, the US Forest Service has identified 309 structures within the Chequamegon and Nicolet National Forests in the Washburn District that are under moderate to very high risk of loss from fire. Additionally, 180 structures have been identified as falling into a category of low to moderate wildland fire risk. This level of risk is unprecedented for the urban-wildland interface in this area. Unfortunately, the fire hazard created by the downed timber will persist for many years to come until the wood is removed, burned or decomposes. Some of the fire hazard will be reduced by timber salvage operations currently being organized. Other preparations include clearing debris around forest service roads that could allow a fire to jump the firebreak the road would normally provide. Other key strategies include:

> **Prevention**: Enhanced hazard awareness for landowners and visitors; and emergency restrictions on the use of fireworks, grills, open burning and campfires.

Planning: Enhancing fire detection ability; training and exercising for local and regional firefighters; and mapping hazard areas and vulnerable structures with aerial photos and computer software.

Preparation: Acquiring additional fire suppression equipment, especially aircraft, hose trailers and large bulldozers.

These strategies may need to be implemented with a heightened sense of awareness for wildfire potential until the downed timber is removed or no longer a threat. The summer of 2000 was fairly wet and unusually cool. This helped reduce the threat of fire, although the number of acres burned, 4,582, was above average. Only 1,338 acres were burned in 2001, fewer than any year in the last 12 years. However, tornadoes and powerful straight-line winds brought even more timber down in northwest Wisconsin in 2001, especially in Burnett County. Even though the efforts to reduce the standing fuel load will continue, the potential remains for a large and difficult to manage forest fire.

Acreage Burned by Wildfires, 1990 to 2001

Year	Acres
1990	7,287
1991	1,765
1992	2,413
1993	1,365
1994	4,317
1995	2,334
1996	2,859
1997	2,488
1998	3,964
1999	5,561
2000	4,582
2001	1,338

Source: DNR - Bureau of Forestry, 2000-2002.

Wildfires in 2001

Cause	Number	Cost	Acres
Campfires	46	18,541	99.39
Debris Burn	314	129,813	578.41
Equipment	190	43,370	146.65
Incendiary	120	25,933	145.16
Lightning	22	64	6.3
Miscellaneous	262	91,257	243.52
Railroad	28	7,189	49.55
Smoking	24	12,906	68.97
Totals	1,006	$329,073	1,337.95

Source: DNR - Bureau of Forestry, 2002.

Causes of Forest Fires, Acreage Burned and Cost from 1990 to 2000

Cause	Number	Percent	Acres	Cost
Burning of brush, debris and other working fires	6,372	36.6%	14,224.9	$1,722,120
Vehicles, engines, motors and equipment	3,533	20.3%	6,782.0	$792,501
Miscellaneous (dumps, power lines, ash disposal)	2,840	16.3%	4,912.6	$694,562
Arson, all kinds	1,926	11.1%	7,741.9	$430,435
Recreational fires (campfires, fireworks)	1,517	8.7%	3,016.4	$445,405
Smoking	576	3.3%	1,410.3	$169,958
Train Related	386	2.2%	348.1	$95,238
Lightning	263	1.5%	513.1	$90,089
Total	17,413	100%	38,949.2	$4,440,306

Source: DNR- Bureau of Forestry, 2001.

Forest Fires and Wildfires Over 500 Acres in Wisconsin 1976-2001

County	Acres	Date	Section	Town	Range	Descript.	Name/Area
Juneau	3,177	May 9, 1976	28	20	4E	NWSW	New Miner I
Juneau	1,507	August 28, 1976	27	18	3E	NWSE	Necedah
Portage	1,318	September 1, 1976	27	25	8E	NENW	Dewey Marsh
Portage	2,776	October 2, 1976	7	25	8E	NWSE	Range Line
Wood	1,210	November 2, 1976	29	21	6W	SESE	Shamrock
Jackson	17,590	April 27, 1977	32	21	3W	NWNW	Brockway
Jackson	6,159	April 27, 1977	9	20	3W	NWNE	Saratoga
Jackson	3,037	April 30, 1977	9	20	4W	SWSE	Airport
Washburn	13,375	April 30, 1977	6	41	13W	SWSW	Five Mile Tower
Juneau	1,551	May 8, 1977	15	20	4E	NWNW	New Miner III
Burnett	4,654	April 21, 1980	36	40	16W	SWSW	Ekdall Church
Washburn	11,418	April 22, 1980	15	39	11W	SESE	Oak Lake
Monroe	1,028	April 22, 1980	27	18	1W	SESE	Lyndon Station
Barron	565	April 9, 1987	6	34	14W	NWNW	
Iowa	967	April 17, 1988	2	8	01E	NESE	
Douglas	863	May 2, 1988	21	45	10W	SESW	Deer Print
Juneau	911	June 25, 1988	10	14	5E	NWNE	Lyndon Station III
Dodge	1553	October 15, 1988	19	12	16E	NESE	
Green Lake	4261	November 20, 1989	16	17	12E	NESW	White River
Iowa	1897	April 22, 1990	7	8	02E	NENE	
Eau Claire	553	April 23, 1994	16	26	05W	NWSE	
Fond du Lac	630	October 24, 1998	6	14	15E	SENW	
Rock	583	March 30, 1999	10	3	10E	NWNE	
Iowa	1350	April 1, 1999	5	8	02E	NWSW	

Source: DNR- Bureau of Forestry, 2000-2002.

HAILSTORMS

Hazard Description: A hailstorm is a weather condition where atmospheric water particles form into rounded or irregular masses of ice that fall to earth. Hail is a product of strong thunderstorms that frequently move across the state. Hail normally falls near the center of the moving storm along with the heaviest rain; however, the strong winds at high altitudes can blow the hailstones away from the storm center, causing unexpected hazards at places that otherwise might not appear threatened.

Hazard Assessment: Hailstones normally range from the size of a pea to that of a golf ball, but sizes larger than baseballs have occurred with the most severe storms. They form when sub-freezing temperatures cause water in thunderstorm clouds to accumulate in layers around an icy core. When strong underlying winds no longer can support their weight, the hailstones fall earthward. Hail tends to fall in swaths that may be 20-115 miles long and 5-30 miles wide. The swath is not normally a large, continuous bombardment of hail, but generally consists of a series of hail strikes that are produced by individual thunderstorm clouds traversing the same general area. Hail strikes are typically one-half mile wide and five miles long. They may partially overlap, but often leave completely undamaged gaps between them.

Hailstorms are considered formidable among the weather and climatic hazards to property and crops of the interior plains of the U.S. because they dent vehicles and structures, break windows, damage roofs and batter crops to the point that significant agricultural losses result. Serious injury and loss of human life, however, are rarely associated with hailstorms.

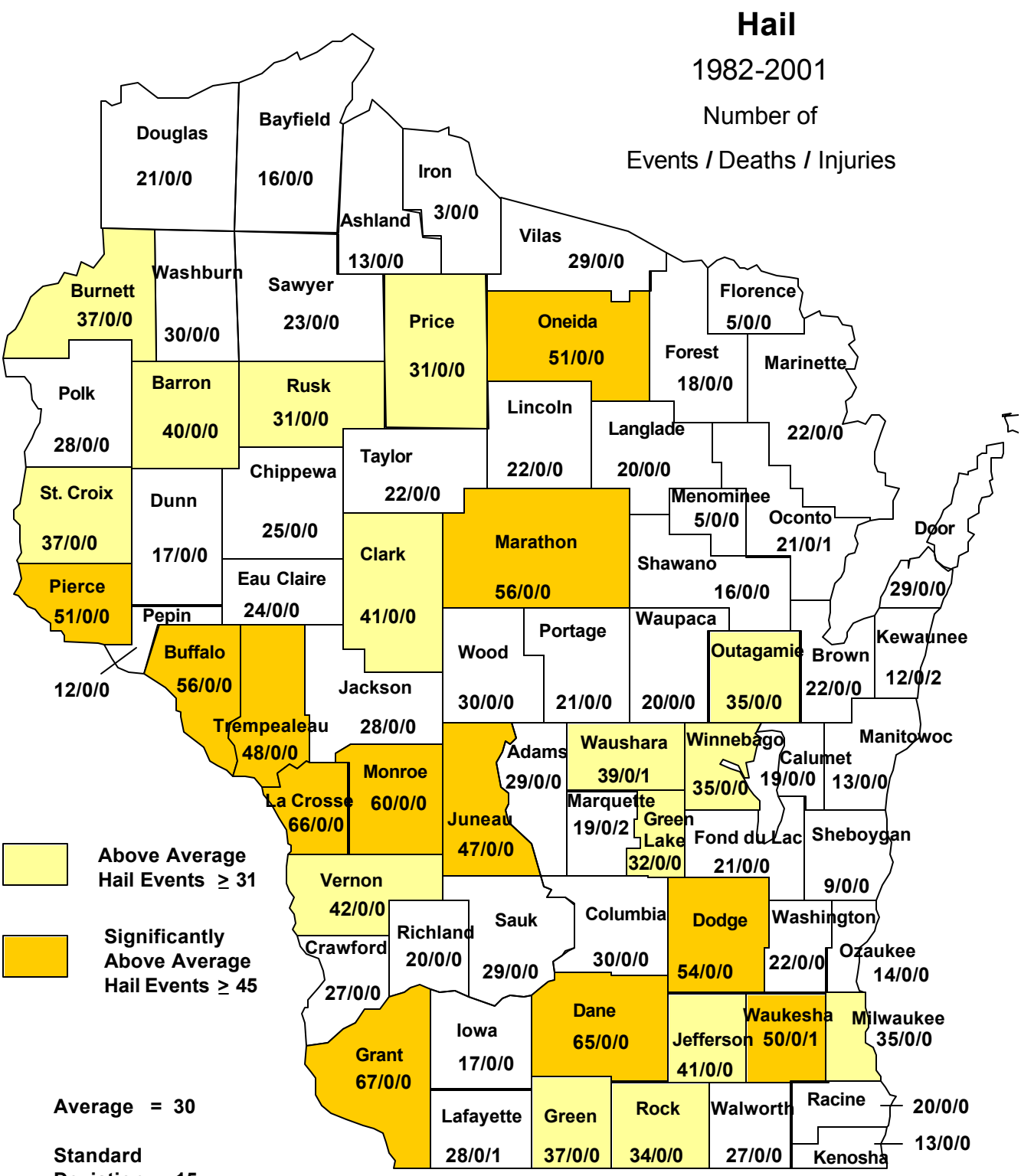
Historical Frequency and Significant Incidents: Wisconsin averages between two to three *hail days* per year as recorded by National Weather Service stations, although this may not be indicative of the number of hailstorms which occur within a county or larger area during any given hail season. The months of maximum hailstorm frequency are May through September with approximately 85% of hailstorms occurring during this period. Unfortunately, hailstorms are most frequent during the four months of the growing and harvesting seasons for most crops in the state.

According to the National Weather Service, about 20% of all severe weather events in Wisconsin are hail events in which hailstones are at least ¾ inch in diameter. Serious hailstorms with hailstones 1.5 inch or larger in diameter are not common. However, when a serious hailstorm does strike serious damage can result. Wisconsin's worst and most costly hailstorm took place on May 12, 2000 in a band of storms south of La Crosse through the Lake Winnebago area to Lake Michigan. Ten counties were pounded with hailstones 1-3 inches in diameter during the morning hours. Thirty-six people were injured and the estimated property damaged totaled $121 million.

Another very costly storm in which hail was a factor took place on July 15, 1980, when strong winds, hail and isolated tornadoes occurred across much of west central Wisconsin, causing combined agricultural and property damages of about $240 million. A Presidential Disaster Declaration was requested and issued for this incident. On July 4, 1985, storms with extensive hail traveled across Buffalo, Trempealeau, Jackson and Columbia Counties, damaging over 230,000 acres of crops and causing more than $5 million in damages. More recently, two prolific thunderstorms produced baseball and grapefruit-sized hail over a 14 county area in central and east

central Wisconsin on March 29, 1998. Over $10 million dollars in damage occurred in Waushara, Winnebago, Outagamie, Brown and Calumet Counties alone. A map showing the distribution of hail events in Wisconsin from 1982 to 2001 follows on page 44.

Resources: Hailstorms tend to occur in conjunction with severe thunderstorms, therefore severe thunderstorm weather advisories are good indicators of large or damaging hail. The Storm Prediction Center (formerly known as the National Severe Storms Forecast Center) in Kansas City, Missouri, issues severe thunderstorm watches, frequently with accompanying hail warnings, for the Midwest. Local National Weather Service offices issue watches, warnings and information statements about severe weather and localized storms, including the possibility and presence of hail. This advance warning allows some actions to reduce hail damage to vehicles and other equipment that can be garaged or similarly sheltered. Little can be done to protect structures or crops in the field. Paying attention to media weather advisories and keeping a NOAA weather radio on hand are the best ways to stay informed of potentially damaging storms including hailstorms. Information on recent local hailstorms and damages can be accessed through the National Climatic Data Center at http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms.



Source: Rusty Kapela, National Weather Service

HAZARDOUS MATERIALS INCIDENTS - FIXED FACILITIES

Hazard Description: This type of hazard occurs with the uncontrolled release or threatened release of hazardous materials from a fixed site that may impact public health and safety and/or the environment.

Under the Emergency Planning and Community Right To Know Act (EPCRA), a hazardous material is defined as any chemical that is a physical hazard or health hazard [defined at 29 CFR 1910.1200(c)] for which the Occupational Safety and Health Administration (OSHA) requires a facility to maintain a Material Safety Data Sheet (MSDS). Under EPCRA there is no specific list of hazardous materials. An extremely hazardous substance (EHS) is defined as one of 356 substances on the United States Environmental Protection Agency list of extremely hazardous substances, identified at 40 CFR Part 355.

Hazard Assessment: Over the past several decades, the use of chemicals has increased in nearly every sector of the economy. As a result, hazardous materials are present in quantities of concern in business and industry, agriculture, universities, hospitals, utilities and other facilities in the state. There are no areas of the state that are exempt from a possible hazardous material incident. Despite extensive precautions taken to ensure careful handling during manufacture, transport, storage, use and disposal, accidents and inadvertent releases are bound to occur. The potential impacts of such releases include short and/or long-term health hazards to those exposed, explosions, fires and environmental contamination. An incident may also necessitate short or long-term evacuation, which disrupts the social and economic aspects of the affected area.

As of June 17, 2002, 6,778 facilities had submitted documentation to the State Emergency Response Commission indicating that they currently met the requirements of the Emergency Planning and Community Right To Know Act. Of these facilities, 3,112 submitted planning notification indicating that they had the threshold amount of at least one extremely hazardous substance.

Planning Threshold — Facility has an *extremely hazardous substance* present at any one time in an amount equal to or exceeding the chemical-specific *threshold planning quantity* (TPQ).

Reporting Threshold — Facility has 10,000 pounds of a hazardous substance or either 500 pounds or the threshold planning quantity of an extremely hazardous substance present at any one time and is not exempt from reporting requirements.

EPCRA Facilities as of June 17, 2002

Type of Facility	Number of Facilities
Planning Only	1,192
Reporting Only	3,666
Both Planning & Reporting	1,920
Total Facilities	6,778

Source: Wisconsin Emergency Management, EPCRA Section.

Significant Incidents: Wisconsin has had several significant fixed site hazardous material incidents. These include: a 250,000 gallon crude oil spill at a pumping station in Jefferson County in 1973; a 95,000 gallon gasoline spill in 1981 at a pumping station in Superior; a 1982 explosion at a chemical plant in the Duluth-Superior area that necessitated the evacuation of part of Superior; and an Oregon pool supply company fire in Dane County in December 1985 that required evacuation of part of the village. On January 6, 1996, in Lena, Oconto County, a fire in the cheese storage area of Stella Foods burned out of control. The blaze spread to the processing section of the plant and caused an ammonia release. Prior to the actual ammonia release the entire village of 590 residents was evacuated. On April 1998, hundreds of residents were evacuated in Arcadia, Trempealeau County, after a worker accidentally unloaded a tanker of cleaning acid into a storage tank containing another type of acid at the Dairy Farmers of America plant. The mixture of acids caused a chemical reaction and released a gaseous yellow cloud. Another incident occurred on January 7, 1999, when the Fox River Paper Company accidentally spilled 2000-3000 gallons of #6 fuel oil into the Fox River.

Programs: Deadly and tragic chemical releases in the United States and around the world have demonstrated the need to develop plans to handle chemical emergencies at the local level. Under the Emergency Planning and Community Right to Know Act, facilities that have quantities of hazardous materials that meet or exceed reporting thresholds are required to submit chemical inventory reports to the State Emergency Response Commission, the Local Emergency Planning committee and the local fire department.

In accordance with The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 and Wisconsin Statute Chapter 166, Local Emergency Planning Committees (LEPCs) have been established in Wisconsin. Wisconsin Emergency Management has been charged with the duties of the State Emergency Response Commission and is the organization that oversees the EPCRA grant program, the emergency response system and establishing training standards for the state and the LEPCs. In this state, the federally mandated local planning districts are counties and the LEPCs develop emergency response plans and prepare for hazardous material emergencies within their individual counties. Each LEPC is required to coordinate its planning activities with local response agencies and local industries that handle extremely hazardous substances (EHS) above threshold planning quantities (TPQs), and to develop emergency response plans for the transportation of hazardous materials through their communities. Additionally, facilities are required to make emergency release notification to the National Response Center, the State EPCRA program and LEPC whenever there is a release of an "extremely hazardous substance" or other hazardous substances listed under the Comprehensive Environmental Resources and Conservation Liability Act (CERCLA).

For emergency response purposes within the state, hazardous material spill incidents are categorized as Level A or Level B releases. A *Level A release* involves the most hazardous types of materials and requires the highest degree of protection for the emergency responders, including both respiratory and skin protection. A *Level B release* requires respiratory protection with minimum skin protection. The State of Wisconsin has contracted with eight regional Level A Response Teams, to provide Level A release response capability for the state. Level B response capability is a county responsibility and there are presently 35 counties with designated Level B response teams, with remaining county teams expected to achieve designation in the near term.

HAZARDOUS MATERIALS INCIDENTS - TRANSPORTATION

Hazard Description: This hazard consists of an uncontrolled release or threatened release of hazardous materials or substances during transport that may adversely affect the public's health and safety/environment. The list of hazardous materials is extensive. However, the bulk of products being transported are petroleum products (gasoline, diesel fuel, jet fuel, fuel oil, asphalt, creosote and propane), chemicals used for industrial or manufacturing processes (anhydrous ammonia, sulfuric acid and chlorine) and waste products (industrial waste, food waste, medical waste and animal waste). There are numerous other hazardous materials routinely transported in smaller quantities such as pesticides, herbicides and specialized industrial chemicals. The majority of releases are the result of transportation accidents. However, many minor releases are the result of illegal dumping of waste materials or unwanted materials to avoid the expense of proper disposal. Transport of nuclear materials in Wisconsin does occur on occasion and will increase as the state's nuclear power plants begin shipping spent fuel to interim, private fuel storage facilities and/or to the permanent repository at Yucca Mountain, Nevada that was approved by Congress in July, 2002. Shipping to private fuel storage facilities in other states may begin in early 2004. If the Yucca Mountain plan continues on schedule, the transportation of spent nuclear fuel and high-level radioactive waste from the 131 temporary storage sites located in 39 states, including Wisconsin, will begin in 2010.

Hazard Assessment: Demand for established and new chemical substances in all walks of life result in extensive hazardous materials shipments within and through Wisconsin communities daily. The major overland modes of transportation are highways, railroads and pipelines. These modes of transport are complementary. It is common for materials to be transported by multiple modes such as pipeline to tanker truck.

Highway: Trucks are the most common way of transporting hazardous materials, accounting for as much as 94% of all hazardous materials shipments nationwide according to the USDOT. Various fuels are the most common cargo that is classified as hazardous. Every roadway in Wisconsin is a potential route for hazardous material transport. Interstate Highways 90 and 94 span Wisconsin between the densely populated Milwaukee-Chicago corridor in the southeast corner of the state and the interstate connection in north central Illinois and the west-central region along the Mississippi River. Large tankers conducting inter and intra-state transportation of hazardous materials and substances use these highways extensively. Interstate Highway 43 also provides a route for hazardous material transportation from Beloit to Milwaukee and north along Lake Michigan to the Green Bay area. Interstate 39 now provides a main transportation route of mostly petroleum products from Rockford Illinois north to Rhinelander, WI.

Rail: There are fifteen railroad companies that operate in Wisconsin, actively utilizing about 4,165 miles of track. Although trucks transport most of the hazardous materials in Wisconsin and the United States, rail can carry significantly larger and various loads. Thus, responding to rail incidents involving hazardous materials can be very dangerous due to the large quantities of materials and possible interaction among chemicals from several freight or tanker cars. Rail transport routes pass through every county in Wisconsin except Bayfield, Burnett, Door, Lafayette, Vilas and Waushara Counties.

Pipeline: There are ten major pipeline companies that operate in Wisconsin and move liquid, natural gas and oil. These pipelines are present in over 90% of the counties in the state. Most pipeline incidents involve a leak or rupture in the pipeline. These incidents are relatively limited in scope because the pipeline failure is usually partial and restricted to a single area.

Water: Wisconsin accesses world markets through 15 commercial ports located along Lake Superior, Lake Michigan and the Mississippi River. These ports transport over 40 million metric tons of cargo annually with a value of over $7 billion. There are 4 principle ports on the Great Lakes: Superior, Milwaukee, Marinette and Green Bay. Of these, the busiest port is Milwaukee, which received 807,315.2 metric tons of imported cargo and exported 396,351.6 metric tons in the year 2000 (US Dept. of Transportation, Maritime Administration statistics (www.marad.dot.gov/). However, shipments of all goods by water account for only 0.2 percent of all shipments into and out of Wisconsin and of that amount, only a portion consists of hazardous materials.

Barge traffic on the Upper Mississippi River carries freight near riverside cities and towns. Much of the barge freight is agricultural inputs such as fuel, fertilizers and other chemicals or outputs such as grain. No serious accidents or incidents have occurred involving barges or large tankers transporting hazardous materials on the Mississippi River or the Great Lakes in Wisconsin. In fact waterborne transportation is the safest and most environmentally friendly way of transporting cargo. However, the possibility for a large-scale release remains, which could have long-term environmental consequences as well as emergency public health effects.

An incident involving any one of the above modes of hazardous material transport could result in a local emergency with the potential to affect large numbers of people. The potential effects of a hazardous materials incident include health hazards to those exposed to explosions, fire, toxic gases and environmental contamination. An incident may necessitate short or long-term evacuation that would disrupt the affected area. Accidents on major transport arteries can also disrupt or stop traffic for extended periods of time.

If a hazardous materials incident occurs, public safety is always the first concern. Securing and, if necessary, evacuating the affected area is step one once it has been determined that there is a public health risk. For emergency response purposes within the state, hazardous material spill incidents are categorized as requiring either a Level A or Level B response. A *Level A response* is for the most hazardous types of materials and requires the highest degree of protection for the emergency responders, including both respiratory and skin protection. A *Level B response* requires respiratory protection with minimum skin protection. The State of Wisconsin has contracted with eight regional Level A Response Teams to provide Level A response capability for the state. There are presently 35 counties who have earned a designation of Level B Response teams. There are an additional 18 counties that have contracted with these counties to provide Level B Response services. The remaining county teams are expected to achieve designation in the near term.

There are several factors that should be considered when attempting to identify the scope, magnitude and vulnerability for incidents within different areas of the state. One factor is the density of traffic carrying hazardous materials over a specific route or through certain pipeline sections, as certain major highways, rail lines or pipelines may handle more hazardous material traffic than others. The condition of the transport routes and seasonal weather effects should also be

considered. Types and quantities of hazardous materials being transported within particular modes are of concern. However, the biggest concern is public safety and local, state and federal agencies are excellent resources for gathering commodity flow data such as the number of transportation-related incidents recorded during given time periods in given areas of the state, the type of chemical involved, the response necessary to deal with the incident, the mode of transportation involvement, etc. Developing communication between planning agencies and owner/operators can be beneficial in determining the possible risks associated with transporting hazardous materials into or through a particular community.

Significant Incidents: On March 4, 1996, Wisconsin Central Train No. 22, an 81-car train, derailed in Weyauwega. Five of the 14 cars carrying propane gas caught fire and touched off a blaze that forced the evacuation of the city and part of the surrounding area. About 2,300 people were kept out of their homes for 18 days as experts allowed the fuel to burn off safely. According to the Beloit Daily News, the train wreck cost Wisconsin Central and its insurance companies $26.1 million, including all expenses related to the evacuation and cleanup as well as settlement of legal claims (http://www.beloitdailynews.com/897/3wis9.htm). Recent transportation related hazardous material spills are summarized in the table below. The higher than average annual damages in 1996 are due to the Weyauwega incident, but do not reflect indirect costs such as evacuation and legal claims that were a financial factor in the incident. Although Weyauwega the largest incident involving an accidental release of hazardous materials, the great majority of transportation-related hazardous materials incidents take place on Wisconsin's highways.

Wisconsin Hazmat Transportation Spills

Year	Incidents					Injuries		Deaths	Damages
	Air	Hwy	Rail	Water	All	Major	Minor		
1995	1	125	2	0	128	0	2	0	$84,791
1996	4	122	2	0	128	0	2	0	$2,053,146
1997	6	129	2	0	137	0	1	0	$183,065
1998	8	178	6	0	192	0	1	0	$278,110
1999	10	233	4	0	247	1	0	0	$365,825
2000	6	235	12	0	253	0	1	1	$438,345
2001	2	290	3	0	295	0	4	4	$332,991

Source: Department of Transportation, 2002 (http://hazmat.dot.gov/files/hazmat/2001/2001frm.htm).

Programs: As mentioned previously, the State of Wisconsin has contracted with eight regional Level A Response Teams to provide Level A response capability for the state. There are presently 35 counties who have earned a designation of Level B Response teams. There are an additional 18 counties that have contracted with these counties to provide Level B Response services. The remaining county teams are expected to achieve designation in the near term. Wisconsin Emergency Management (WEM) develops policies and administers the programs that support regional emergency response teams and countywide Level B teams.

In accordance with the state and federal law, Local Emergency Planning Committees (LEPCs) coordinate planning activities with local response agencies and local industries that handle Extremely Hazardous Substances (EHSs) above Threshold Planning Quantities (TPQs). LEPCs develop off-site emergency response plans and prepare for off-site hazardous material emergencies with their counties. Planning activities include determining transportation routes to and from fixed facilities and planning for off-site consequences of transporting EHSs.

Resources: The United States Department of Transportation's (USDOT) Research and Special Programs Administration (RSPA) administers the Department's national regulatory program to assure the safe transportation of natural gas, petroleum, and other hazardous materials by pipeline. USDOT develops regulations and other approaches to risk management to assure safety in design, construction, testing, operation, maintenance, and emergency response of pipeline facilities. Since 1986, a user fee collected by USDOT funds the entire pipeline safety program. The fee is assessed on a per-mile basis on each pipeline operator USDOT regulates.

The USDOT's Office of Pipeline Safety (OPS) collects data describing pipeline safety, which is published on the OPS web site. More information about the OPS may be found at http://ops.dot.gov/index.html. The following two tables briefly summarize incidents involving natural gas transmission accidents. The data was obtained from OPS and the original data sets contain additional detail such as the time of day the incident occurred and the cause of the incident, if known. The first table describes transmission incidents in Wisconsin where there was a failure in a transmission pipeline. The second table describes incidents in Wisconsin where there was an accidental release from a local distributor of natural gas. The full data sets may be downloaded from the OPS web site at http://ops.dot.gov/IA98.htm.

Natural Gas Pipeline Transmission Incidents in Wisconsin 1984 - 2001

City	County	Date	Type	Fatalities	Injuries	Property Damage	Company
Baraboo	Sauk	21-Aug-84	Rupture	0	1	$0	Northern Natural Gas Co
Mellen	Ashland	20-Dec-93	Rupture	0	0	$750,000	Northern Natural Gas Co (Enron)
Viola	Lacrosse	17-Sep-96	Rupture	0	0	$0	Northern Natural Gas Co (Enron)
Black River Falls	Jackson	13-Oct-96	Rupture	0	0	$0	Northern Natural Gas Co (Enron)
Mauston	Juneau	29-Nov-96	Rupture	0	0	$53,750	Northern Natural Gas Co (Enron)
No data	Green	12-May-99	Rupture	0	0	$50,000	Northern Natural Gas Co (Enron)
Lena	Oconto	2-Aug-00	Rupture	0	0	$50,000	ANR Pipeline Co
Poynette	Columbia	14-Jun-01	Leak	0	0	$42,000	Northern Natural Gas Co (Enron)
Totals				0	1	$945,750	

Source: Federal Department of Transportation, Office of Pipeline Safety. 2002, (http://ops.dot.gov/IA98.htm).

Natural Gas Distribution Incident Data - 1984 to 2000

City	County	Date	Fatalities	Injuries	Property Damage
Racine	Racine	6-Sep-84	0	0	$0
Milwaukee	Milwaukee	9-Aug-84	0	2	$100,000
Delavan	Walworth	30-Oct-84	0	2	$60,000
Twin Lakes	Kenosha	6-Feb-85	0	0	$1,000,000
Green Bay	Brown	28-May-85	0	1	$40,000
Wild Rose	Waushara	10-Aug-85	1	0	$0
New Berlin	Waukesha	25-Dec-85	0	0	$0
Brodhead	Green	19-Feb-86	0	2	$0
Racine	Racine	28-Feb-86	0	0	$0
Kenosha	Kenosha	20-Jul-86	1	0	$70,000
La Crosse	La Crosse	6-Aug-86	0	2	$10,000
Wausau	Marathon	16-Oct-86	1	1	$50,000
Horicon	Dodge	13-Feb-88	0	0	$76,000
Cedar Park	Racine	26-Feb-88	0	1	$50,000
Delavan	Walworth	1-Aug-88	1	0	$0
Milwaukee	Milwaukee	24-Apr-88	0	12	$1,500,000
Nekoosa	Wood	22-Mar-89	1	2	$75,000
Menomonee Falls	Waukesha	1-Aug-89	0	1	$0
Two Rivers	Manitowoc	27-Dec-89	0	3	$100,000
Green Bay	Brown	25-Aug-90	1	0	$0
Cedarburg	Ozaukee	12-Oct-90	0	0	$80,000
Milwaukee	Milwaukee	15-Oct-90	0	0	$100,000
Summit	Waukesha	24-Jan-91	0	0	$65,000
Greendale	Milwaukee	5-Feb-91	3	6	$200,000
Eau Claire	Eau Claire	20-Feb-92	0	4	$20,000
Milwaukee	Milwaukee	9-Jul-92	0	0	$51,000
Oak Creek	Milwaukee	14-Sep-92	0	1	$0
Phillips	Price	2-Feb-93	0	1	$50,000
South Milwaukee	Milwaukee	12-Jun-93	0	0	$1,000,000
Village of Sharon	Walworth	27-Oct-93	0	1	$0
Harrison	Calumet	23-Jan-96	0	0	$150,000
Wisconsin Rapids	Wood	1-Apr-96	0	0	$70,000
Wausau	Marathon	24-Jul-96	0	0	$100,000
Madison	Dane	25-Feb-00	0	0	$200,000
Madison	Dane	16-Dec-00	0	0	$100,000
Ellington	Outagamie	3-Feb-01	1	1	$185,000
		Total	**10**	**43**	**$5.502.000**

Source: Federal Department of Transportation, Office of Pipeline Safety. 2002, (http://ops.dot.gov/IA98.htm).

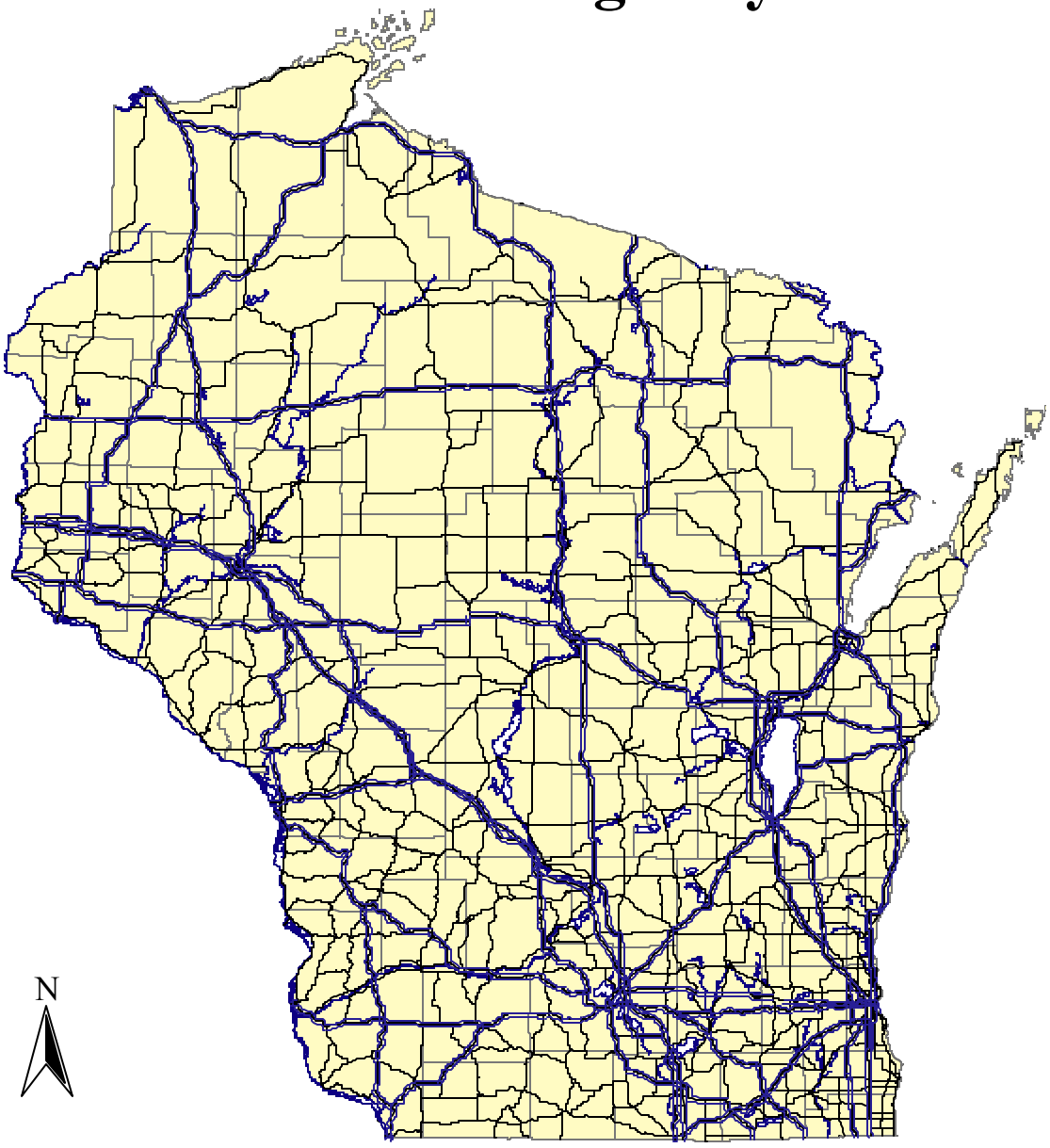
The table on the following page describes pipeline incidents involving liquids classified as hazardous, although these liquids are almost entirely various types of fuel such as gasoline, fuel oil and liquid propane gas (LPG).

Hazardous Liquid Pipeline Accident Data 1986-2001

Date	City	County	Commodity	Fatalities	Injuries	Property Damage
18-Apr-86	Green Bay	Brown	Gasoline	0	0	$0
26-Sep-86		Clark	Gasoline	0	0	$1,000
12-Mar-87	Stoughton	Dane	Fuel Oil	0	0	$60,000
27-May-87		Columbia	Crude Oil	0	0	$345,000
11-Jan-88	Superior	Douglas	Crude Oil	0	0	$5,000
04-Jun-88	Wauwatosa	Milwaukee	Fuel Oil	0	0	$0
13-Aug-90		Portage	Gasoline	0	0	$0
09-Aug-90		Racine	Gasoline	0	0	$0
15-Feb-91	Milwaukee	Milwaukee	Fuel Oil	0	0	$34,153
29-Jun-91	Unknown	Portage	Gasoline	0	0	$200,000
17-Jul-92	Superior	Douglas	Crude Oil	0	0	$50,000
24-Aug-92	Superior	Douglas	Fuel Oil	0	0	$72,000
11-Dec-92	Pleasant Valley	Eau Claire	L. P. G.	0	1	$0
22-Jun-93		Wood	Gasoline	0	0	$120,000
27-Aug-93	Milwaukee	Milwaukee	Not Given	0	0	$10,000
15-Aug-93		Clark	Fuel Oil	0	0	$100,000
15-Feb-94		Eau Claire	L. P. G.	1	1	$0
14-Mar-94		Rusk	Crude Oil	0	0	$86,000
01-Apr-94	Superior	Douglas	Crude Oil	0	0	$25,000
18-Apr-94		Lafayette	L. P. G.	0	0	$5,500
18-Dec-94	Superior	Douglas	Diesel Fuel	0	0	$3,000
02-Dec-94		Portage	Gasoline	0	0	$200,000
05-Mar-95		Eau Claire	Gasoline	0	0	$250,000
30-Aug-95		Dodge	Fuel Oil	0	0	$50,000
14-Sep-95		Dodge	Fuel Oil	0	0	$50,000
20-Sep-95		Dane	Fuel Oil	0	0	$50,000
11-Sep-95		Chippewa	Crude Oil	0	0	$75,000
11-Jun-96		Rock	L. P. G.	0	0	$95
10-Nov-96	McFarland	Dane	Gasoline	0	0	$125,000
15-Apr-97		La Fayette	Butane	0	0	$73,650
10-May-98	McFarland	Dane	Oil and Gasoline	0	0	$0
16-Jan-99	Superior	Douglas	Liq. Natural Gas	0	0	$365,000
23-Jan-99	Germantown	Washington	Gasoline	0	0	$400,000
15-Nov-99		Taylor	Oil and Gasoline	0	0	$63,800
27-Jul-00		Douglas	Crude Oil	0	0	$200,000
Totals				**1**	**2**	**$3,019,198**

Source: Federal Department of Transportation, Office of Pipeline Safety, 2001, (http://ops.dot.gov/IA98.htm).

Wisconsin Highways

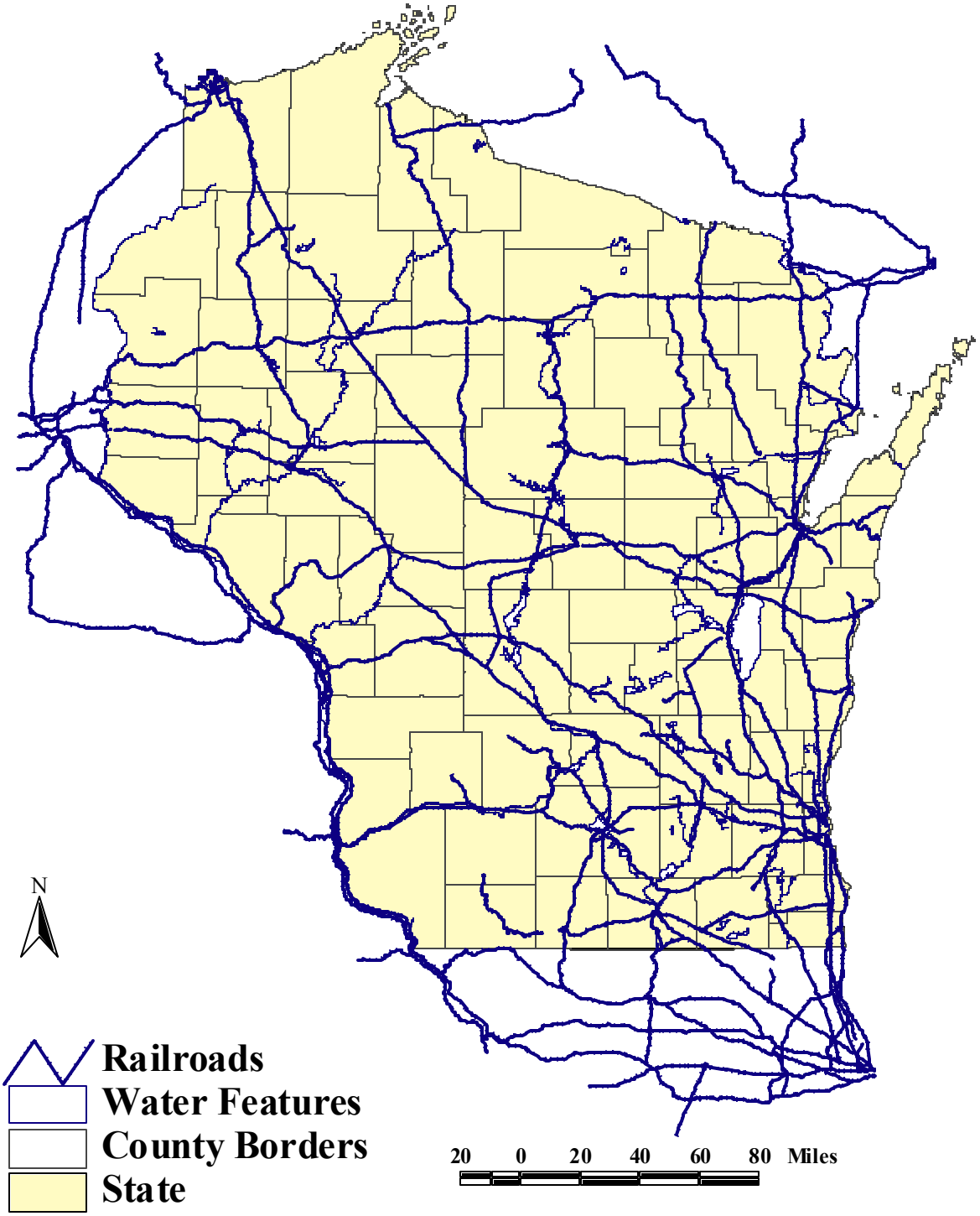


Federal Highways
Wisconsin Highways
Water Features
County Borders
State

20 0 20 40 60 80

Source: Department of Administration, Office of Land Information Services.

Wisconsin Railroads



Source: Department of Administration, Office of Land Information Services.

Major Commercial Wisconsin Pipelines

1. Badger Pipeline Company	(888) 625-7310
2. Minnesota-Wood River & Koch	(800) 666-9047
3. Lakehead Pipeline Company	(800) 858-5253
4. West Shore Pipeline Company	(800) 806-2449
5. Williams Pipeline Company	(918) 588-3200
6. Mid-Americ Propane Pipeline	(918) 584-4471

Ports of Wisconsin

Source: Department of Administration, Office of Land Information Services.

HEAT WAVES

Hazard Description: A heat wave is primarily a public health concern. During extended periods of very high temperatures or high temperatures with high humidity, individuals can suffer a variety of ailments including heat exhaustion and heat stroke. Heat stroke in particular is a life-threatening condition that requires immediate medical attention. In addition to posing a public health hazard, periods of excessive heat usually result in high electrical consumption for air conditioning, which can cause power outages and brown outs.

Hazard Assessment: Excessive heat has become the most deadly hazard in Wisconsin in recent times. According to the National Weather Service Milwaukee/Sullivan Office, 109 people have died in Wisconsin directly as a result of heat waves during the 20 years from 1982-2001. This rate of mortality during this 20-year period is more than 4 times greater than the next most deadly hazards - tornadoes (25 deaths) and cold waves (24). The majority of deaths during a heat wave are the result of heat stroke. The elderly, disabled and debilitated are especially susceptible to heat stroke. Large and highly urbanized cities can create an island of heat that can raise the area temperature 3 to 5 degrees F. Therefore, urban communities with substantial populations of elderly, disabled and debilitated people could face a significant medical emergency during an extended period of excessive heat.

Preparedness: During the summer there are public service announcements about the health risks of heat and how to recognize the symptoms of heat stroke and heat exhaustion. Public safety workers and community volunteer organizations should be aware of elderly and shut-in populations that are at greatest risk. Emergency medical workers need to be prepared for treating heat stroke victims.

Historical Frequency: Several heat waves from mid-July through early August 2001 claimed 15 fatalities (10 direct and 5 indirect) across Wisconsin. Perhaps 300 people or more were treated at hospitals for heat exhaustion. Temperatures topped out in the mid to upper 90s. However on August 7th the temperature topped out at 102 at Mt. Mary College in Milwaukee and 101 in Buffalo and Trempealeau counties.

Another heat wave struck Wisconsin during the last two weeks of July 1999 and peaked during the 4 days of July 28-31. During these four days, high humidity and temperatures in the 90s and 100s produced heat index values of 110 to as high as 125 degrees. The heat wave resulted in 12 direct and 8 indirect deaths (National Weather Service). During this time, there was record peak demand for electric power in the Milwaukee area and for that summer there was a record set for the Midwest region for electrical demand.

During the summer of 1995, Wisconsin experienced 2 periods of prolonged heat. From June 17-27, high temperatures were well in the 90s with heat index values of 98 to 104. During this period, 9 people died directly from the heat. The second heat wave, July 12-15, resulted in the greatest number of weather-related deaths in Wisconsin history. During this heat wave, 141 people died directly or indirectly from the heat. High temperatures were between 100 and 108 with heat index values of 120 to 130. All time record high temperatures were set in La Crosse (108) on July 13, 1995, and Sheboygan (108) on July 14, 1995.

Heat Related Deaths in Wisconsin

Year	Direct Deaths	Indirect Deaths
1986	1	0
1988	1	0
1993	2	0
1995	82	72
1997	1	0
1999	12	8
2001	10	5
Totals	**109**	**85**

Source: National Weather Service, Milwaukee/Sullivan Office, 2002.

The table below displays the number of fatalities nationwide directly resulting from the heat wave of 1995 broken down by age and gender. It is worth noting that over 71% of the fatalities occurred were people aged 60 years and older. Most of the all-time maximum daily temperatures were recorded during the Dust Bowl years between 1934 and 1936. The highest temperature ever recorded in Wisconsin was 114 degrees, which occurred on July 13, 1936, at Wisconsin Dells. The second table below lists the Wisconsin cities that set all-time records for high temperatures during the Dust Bowl years:

1995 Nation-Wide Heat Related Fatalities By Age and Gender

Age Group	Female	Male	Total	Percent
0 to 9	6	6	12	1
10 to 19	0	2	2	0
20 to 29	2	3	5	0
30 to 39	7	27	34	3
40 to 49	15	64	79	8
50 to 59	22	73	95	9
60 to 69	50	129	179	18
70 to 79	131	122	253	25
80 to 89	145	96	241	24
90 and Above	51	10	61	6
Unknown	6	54	60	6
Total	435	586	1,021	100

Source: National Weather Service, http://www.nws.noaa.gov/om/95heat.htm.

All-Time High Temperatures Set During the Dust Bowl Years

City	Record High Temperature	Date
Oshkosh	107 degrees	July 13, 1936
Appleton	107 degrees	July 14, 1936
Madison	107 degrees	July 14, 1936
Milwaukee	105 degrees	July 24, 1934
Green Bay	104 degrees	July 13, 1936
Wisconsin Dells	114 degrees	July 13, 1936

Source: National Weather Service, Rusty Kapela, Milwaukee/Sullivan Office.

Programs: The National Weather Service (NWS) issues advisory statements to media, emergency management and public health officials in advance of and during conditions of excessive heat. Heat waves cannot be prevented, therefore, it is important to provide notice of adverse conditions so that the public can anticipate and avoid health-threatening situations.

Summary of National Weather Service's Alert Procedures: The NWS will initiate alert procedures (advisories or warnings) when the Heat Index (HI) is expected to have a significant impact on public safety. The expected severity of the heat wave determines whether advisories or warnings are issued. A common guideline for the issuance of excessive heat alerts is when the maximum daytime Heat Index is expected to equal or exceed 105°F and a nighttime minimum Heat Index of 80°F or above for two or more consecutive days. Some regions and municipalities are more sensitive to excessive heat than others. As a result, alert thresholds may vary from these guidelines. Excessive heat alert thresholds are being tailored at major metropolitan centers based on research results that link unusual amounts of heat-related deaths to city-specific meteorological conditions. The alert procedures are:

? Include Heat Index values in zone and city forecasts;

? Issue Special Weather Statements and/or Public Information Statements presenting a detailed discussion of (1) the extent of the hazard including Heat Index values, (2) who is most at risk, (3) safety rules for reducing the risk;

? Assist state and local health officials in preparing civil emergency messages in severe heat waves. Meteorological information from Special Weather Statements will be included as well as medical information, advice, and names and telephone numbers of health officials; and

? Release to the media and over NOAA's own Weather Radio all of the above information.

Heat Index Chart

Temp (F)	Relative Humidity (%)								
	90	**80**	**70**	**60**	**50**	**40**	**30**	**20**	**10**
65	65.6	64.7	63.8	62.8	61.9	60.9	60	59.1	58.1
70	71.6	70.7	69.8	68.8	67.9	66.9	66	65.1	64.1
75	79.7	76.7	75.8	74.8	73.9	72.9	72	71.1	70.1
80	88.2	85.9	84.2	82.8	81.6	80.4	79	77.4	76.1
85	101.4	97	93.3	90.3	87.7	85.5	83.5	81.6	79.6
90	119.3	112	105.8	100.5	96.1	92.3	89.2	86.5	84.2
95	141.8	131.1	121.7	113.6	106.7	100.9	96.1	92.2	89.2
100	168.7	154	140.9	129.5	119.6	111.2	104.2	98.7	94.4
105	200	180.7	163.4	148.1	134.7	123.2	113.6	105.8	100
110	235.6	211.2	189.1	169.4	151.9	136.8	124.1	113.7	105.8
115	275.3	245.4	218	193.3	171.3	152.1	135.8	122.3	111.9
120	319.1	283.1	250	219.9	192.9	169.1	148.7	131.6	118.2

Any value less than 80 is considered comfortable. Any value greater than 90 is considered extreme.
Any value greater than 100 is considered hazardous. Any value greater than 110 is considered dangerous.
Source: National Weather Service - http://www.crh.noaa.gov/grb/educate.html.

The Milwaukee-Sullivan office of the National Weather Service offers the following 3 types of alerts for excessive heat conditions in its 30-county service area:

? **Outlook** – A narrative statement issued 2 to 4 days prior to the first day that excessive heat conditions are anticipated to notify that the potential exists for a heat wave;

? **Excessive Heat Watch** – A narrative statement issued 24 to 48 hours in advance of the first day of anticipated heat wave conditions; and

? **Excessive Heat Warning** – A warning issued within 25 hours of the first day that heat wave conditions are expected. Warning threshold values are: any 24-hour period in which daytime heat indices are expected to reach or exceed 105 for 3 hours or more, while night time heat indices are 80 or higher. Warning is issued when heat indices have reached or will reach a level where heatstroke, sunstroke, or heat exhaustion is highly likely. Elderly, sick, socially disadvantaged and medicated individuals are at a higher risk and may die, especially if they live in poorly ventilated or inner-city locations without air conditioning.

Heat Wave Safety Tips: The following safety tips can minimize the possibility of getting a heat related disorder.

Slow down: Strenuous activities should be reduced, eliminated, or rescheduled to the coolest time of the day. Individuals at risk should stay in the coolest available place, not necessarily indoors.

Dress for summer: Lightweight, light-colored clothing reflects heat and sunlight, and helps your body maintain normal temperatures.

Put less fuel on your inner fires: Foods (like proteins) that increase metabolic heat production also increase water loss.

Drink plenty of water or other nonalcoholic fluids: Your body needs water to keep cool. Drink plenty of fluids even if you don't feel thirsty. Persons who (1) have epilepsy or heart, kidney, or liver disease, (2) are on fluid restrictive diets, or (3) have a problem with fluid retention should consult a physician before increasing their consumption of fluids.

Do not drink alcoholic beverages.

Do not take salt tablets unless specified by a physician: Persons on salt restrictive diets should consult a physician before increasing their salt intake.

Spend more time in air-conditioned places: Air conditioning in homes and other buildings markedly reduces danger from the heat. If you cannot afford an air conditioner, spending some time each day (during hot weather) in an air-conditioned environment affords some protection.

Don't get too much sun: Sunburn makes the job of heat dissipation that much more difficult.

Treating Heat Related Disorders

Heat Disorder	Symptoms	First Aid
Sunburn	Redness and pain. In severe cases, swelling of skin, blisters, fever, and headaches.	Ointment for mild cases if blisters appear. If breaking occurs, apply dry sterile dressing. Serious, extensive cases should be seen by a physician.
Heat Cramps	Painful spasms usually in muscles of legs and abdomen possible. Heavy sweating.	Firm pressure on cramping muscles, or gentle massage to relieve spasm. Give sips of water. If nausea occurs, discontinue use.
Heat Exhaustion	Heavy sweating, weakness, skin cold, pale and clammy. Pulse thready. Normal temperature possible. Fainting and vomiting.	Get victim out of sun. Lie down and loosen clothing. Apply cool wet cloths. Fan or move victim to air-conditioned room. Sips of water. If nausea occurs, discontinue use. If vomiting continues, seek immediate medical attention.
Heat Stroke (or sunstroke)	High body temperature (106°F, or higher). Hot dry skin. Rapid and strong pulse. Possible unconsciousness.	Heat stroke is a severe medical emergency. Summon medical assistance or get the victim to a hospital immediately. Delay can be fatal. Move the victim to a cooler environment. Reduce body temperature with cold bath or sponging. Use extreme caution. Remove clothing, use fans and air conditioners. If temperature rises again, repeat process. Do not give fluids.

Source: http://www.crh.noaa.gov/grb/educate.html

Wisconsin Heat Wave Days

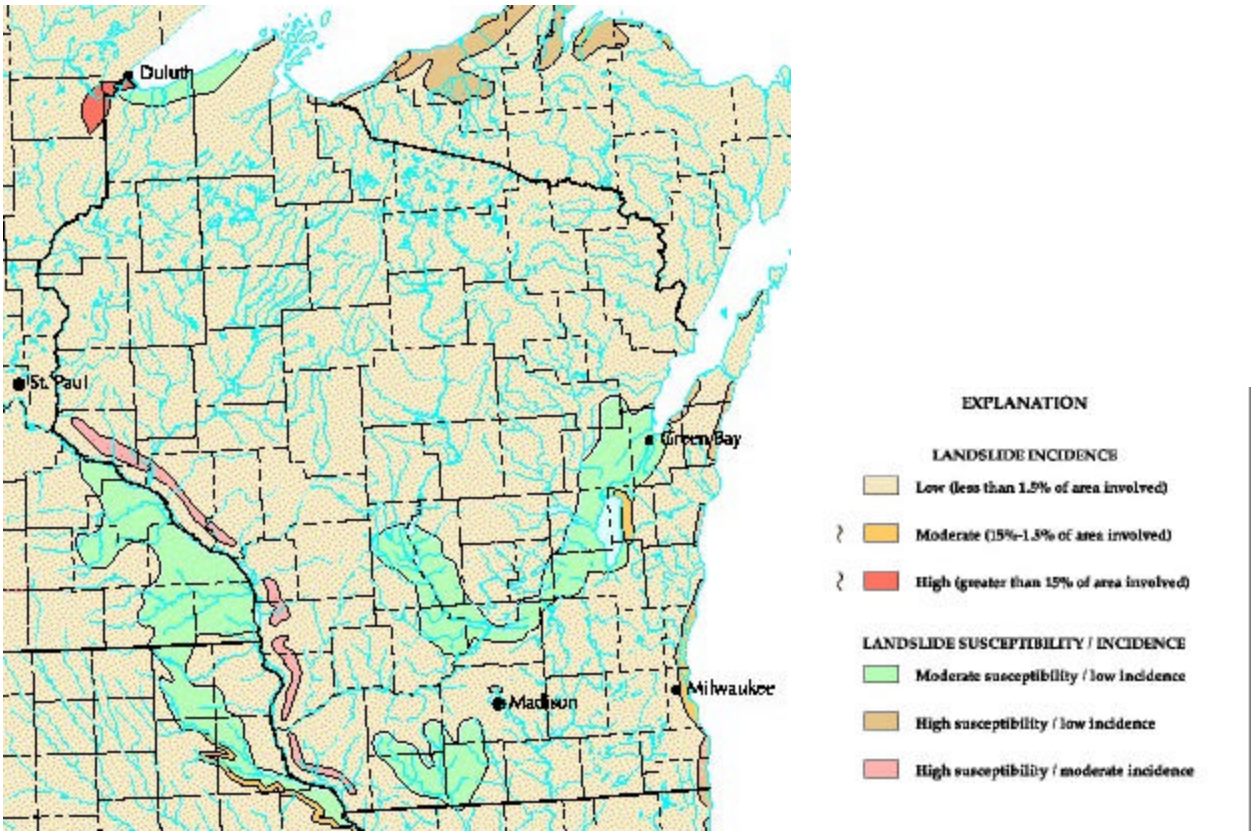
1982-2001

Source: National Weather Service, Milwaukee Office, 2002.

LANDSLIDES AND SINKHOLES

Hazard Description: Landslides and sinkholes are geological phenomena that can pose a hazard to structures and people. Although neither landslides nor sinkholes are likely to be the cause of a major natural disaster, both present risks to citizens of Wisconsin. A landslide is a relatively sudden movement of soil and bedrock downhill in response to gravity. The movement of the soil can cause damage to structures by removing the support for the foundation of a building or by falling dirt and debris colliding with or covering a structure. Landslides can be triggered by heavy rain, bank or bluff erosion, or other natural causes. A sinkhole is a depression in the ground caused by an evacuation of support from below the soil. Sinkholes can form naturally in areas with karst geology – areas that have limestone or other bedrock that can be dissolved by water.

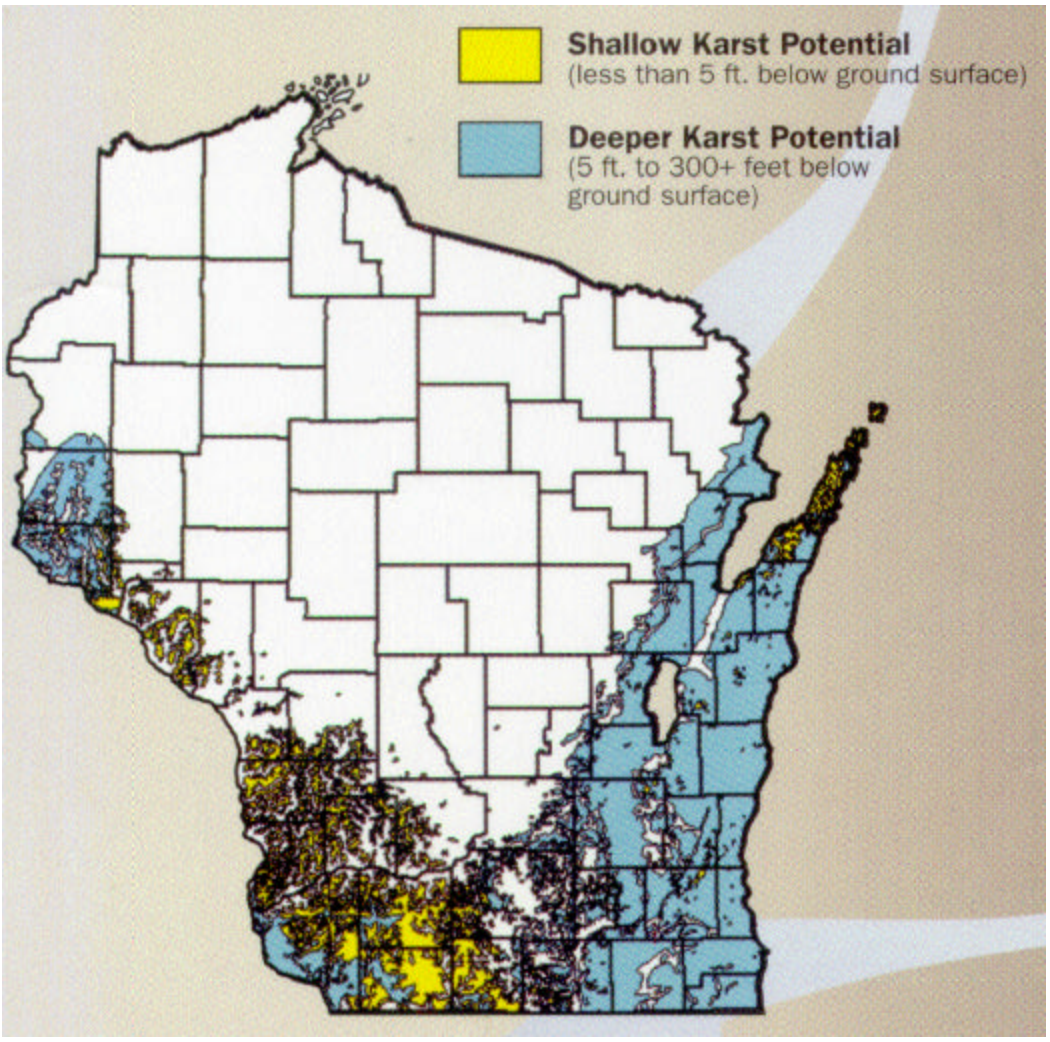
Hazard Assessment: In Wisconsin landslides generally are not dramatic. However, there have been instances of bluff slumping along the shore of Lake Michigan, rock fall along the bluffs of the Mississippi River and the collapsing of hillsides during heavy rainfall. Areas of landslide incidence are indicated in the map below.



(Source: USGS http://landslides.usgs.government/html_files/landslides/nationalmap/national.html).
Note: Susceptibility not indicated where same or lower than incidence. Susceptibility to landslides was defined as the probable degree of response of rocks and soils to natural or artificial cutting or loading of slopes, or to high precipitation. High, moderate, and low susceptibility are delimited by the same percentages used in classifying the incidence of landsliding. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated.

Sinkholes can form naturally in areas with karst geology – areas that have limestone or other bedrock that can be dissolved by water. As the limestone rock under the soil dissolves over time

from rainfall or flowing groundwater, a hollow area may form underground, into which surface soil can sink. Sinkholes also can be caused by human activity. Some parts of southern and western Wisconsin have experienced sinkholes from abandoned underground mines that have collapsed. Identifying areas with karst conditions is important, and not just for public safety and the protection of structures. Karst features provide direct conduits to groundwater. Areas with karst conditions can be subject to groundwater contaminants from pollutants entering a sinkhole, fissure or other karst features. Areas with karst potential are indicated in the map below.



Source: Wisconsin Geological and Natural History Survey.

Hazard History: Landslides in the form of streambank erosion and hillside slumping have been a factor in several Wisconsin disasters. In 2001, a home in the City of Superior was endangered as the entire yard starting slipping downhill toward the Namdji River. Although the house was not in the floodplain and 100 yards from the river, streambank erosion from the spring floods had caused the ground within 15 feet of the house to slide downhill. The City of Superior applied for and received a Hazard Mitigation Grant under Disaster 1369 to buy the threatened structure from the landowner and demolish it to protect public safety. In 2000 during disaster 1332, one home in Grant County was damaged when its foundation partially collapsed as the hillside slumped from heavy rainfall. Falling rock is also a common problem along the bluffs of the Mississippi River.

In several areas where railroad tracks run along the river, fences have been erected with sensors to detect rockfalls that could otherwise damage or derail a train (Ron Hennings, Wisconsin Geological and Natural History Survey, 2002). According to a Wisconsin State Journal article a 400,000-pound boulder rolled down a bluff in Fountain City in July 2002, leveling trees but otherwise causing little damage. The rock was the second to fall from the bluff in the last seven years. In 1995, a 55-ton boulder crashed into a Fountain City house, causing serious damage but fortunately no injuries (WSJ July 12, 2002).

Sinkholes have not been a factor in any natural disaster. However, karst features should be identified and considered in a community especially for land use planning, stormwater management and hazardous materials planning to avoid possible damage to structures or contamination of ground water. Even a well 100 feet deep can be contaminated from surface pollutants entering a sinkhole.

Programs: There are no state laws or programs that directly regulate or manage the hazards associated with landslides or steep terrain. Local regulation for steep slopes may be needed for some of the following public purposes: protection from natural hazards such as landslides; protection of natural resources such as water quality; and protection of environmental features like bluffs, native vegetation, and wildlife habitat. Regulations should be designed to meet local conditions and characteristics such as geology, available building space, watershed characteristics, and habitat concerns. The Village of Bayside in Milwaukee County has long had an ordinance regulating building on ravines and Lake Michigan bluffs. The Village of Cross Plains in Dane County also has an ordinance regulating building on the hills surrounding the village. Pepin County has adopted a Mississippi River Bluffland Ordinance. Copies are available from the Pepin County Zoning Administrator at (715) 672–8897. The Wisconsin Coastal Management Program encourages all coastal counties to adopt a coastal ordinance to address safety concerns such as bluff erosion as well as other coastal hazards such as flooding. For more information see the Wisconsin Coastal Management Program web site at http://www.doa.state.wi.us/dhir/boir/coastal/index.asp.

The Wisconsin Department of Natural Resources' Stewardship Program provides grants to local communities for the acquisition of land for parks or natural resource areas. Although this program does not specifically address landslide or sinkhole hazards, the Stewardship Program can be used for acquisition of land for bluff protection in areas with landslide potential or for groundwater protection in areas with karst features. For more information about WDNR's Stewardship Program see: http://www.dnr.state.wi.us/org/caer/cfa/lr/stewardship/stewardship.html#local.

Resources: The Wisconsin Geological and Natural History Survey (WGNHS) is a part of the University of Wisconsin-Extension. It is an interdisciplinary organization that conducts natural resources surveys and research to produce information used for decision-making, problem solving, planning, management, development, and education. The WGNHS has produced a map of areas of karst conditions as well as other maps describing geologic features in Wisconsin. For more information contact Ronald Hennings, Assistant Director at (608) 263-7395 or by email at rghennin@facstaff.wisc.edu or visit the website at http://www.uwex.edu/wgnhs/.

The US Geological Survey has a web page at http://geohazards.cr.usgs.gov/ devoted to geologic hazards that includes links to the landslide program as well as other geological hazard programs.

LIGHTNING

Hazard Description: Lightning is a sudden and violent discharge of electricity from within a thunderstorm due to a difference in electrical charges and represents a flow of electrical current from cloud-to-cloud or cloud-to-ground. Nationally, lightning causes extensive damage to buildings and structures, kills or injures people and livestock, starts untold numbers of forest fires and wildfires and disrupts electromagnetic transmissions.

Hazard Assessment: To the general public lightning is often perceived as a minor hazard. However, lightning-caused damage, injuries and deaths establish lightning as a significant hazard associated with any thunderstorm in any part of the state. Damage from lightning occurs four ways:

(1) Electrocution/severe shock of humans and animals;
(2) Vaporization of materials along the path of the lightning strike;
(3) Fire caused by the high temperatures associated with lightning (10,000-60,000° F); and
(4) The sudden power surge that can damage electrical/electronic equipment.

Large outdoor gatherings (sporting events, concerts, campgrounds, etc.) are particularly vulnerable to lightning strikes that could result in injuries and deaths. This vulnerability underscores the importance of developing site-specific emergency procedures for these types of events, with particular emphasis on adequate early warning. Early warning of lightning hazards, combined with prudent protective actions, can greatly reduce the likelihood of lightning-related injuries and deaths.

> "Previous studies have identified patterns associated with lightning fatalities. For example, approximately 30% of persons struck by lightning die and 74% of lightning strike survivors have permanent disabilities. In addition, persons with cranial burns or leg burns from lightning are at higher risk for death than others struck by lightning. Sixty-three percent of lightning-associated deaths occur within 1 hour of injury, 92% occur during May-September and 73% occur during the afternoon and early evening. Of persons who died from lightning strikes, 52% were engaged in outdoor recreational activities and 25% were engaged in work activities. Most lightning injuries and deaths can be prevented by taking precautions (Center for Disease Control, 1998)."

Preventing Deaths and Injuries from Lightning Strikes

- When participating in outdoor activities, be aware of weather forecasts during the thunderstorm season (generally May through September).
- Because lightning often precedes rain, preparations to avoid potential lightning strikes should begin before the rain begins.
- When thunder is heard, seek shelter inside the nearest building or an enclosed vehicle (e.g., a car or truck). If shelter is not available, avoid trees or tall objects because electricity may be conducted from that object to other nearby objects or persons.
- Avoid high ground, water, open spaces and metal objects (golf clubs, umbrellas, fences and tools).
- When indoors, turn off appliances and electronic devices and remain inside until the storm passes.

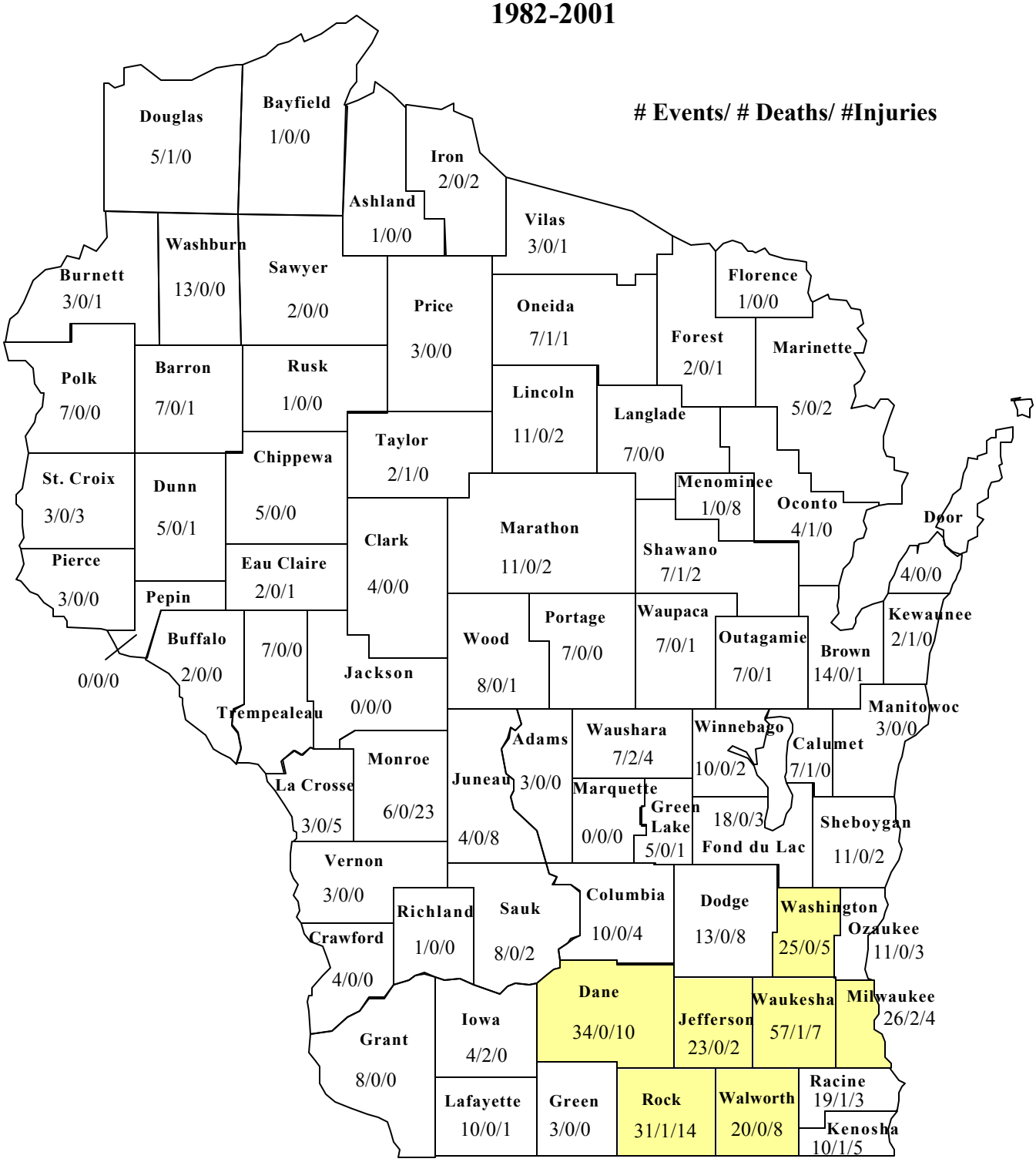
Source: Center for Disease Control, 1998.

Historical Frequency: Wisconsin has a high frequency of property losses due to lightning. Insurance statistics show that two out of every 100 farms are struck by lightning or have a fire that may have been lightning-caused each year. It is estimated that in northern Wisconsin there are between two and five lightning-caused fires per million acres of forested lands every year. In Wisconsin from 1982 to 1999 there were 18 fatalities directly caused by lightning (Rusty Kapela, NWS 2000).

Programs: The National Weather Service issues severe thunderstorm watches and warnings when there is a threat of severe weather conditions, including lightning. The National Weather Service also has an extensive public information program to educate people about the dangers of lightning and assist in preventing related deaths and injuries. Numerous other organizations provide public safety information regarding lightning, most notably the American Red Cross.

Wisconsin Lightning Events

1982-2001



Source: National Weather Service, Milwaukee Office, 2002.

NUCLEAR POWER PLANT INCIDENTS

Hazard Description: These are events that involve the uncontrolled release of potentially dangerous radioactive materials into the environment from a commercial nuclear power plant.

Hazard Assessment: Nuclear energy provides approximately 25 percent of Wisconsin's electricity, which is produced by 2 nuclear power plants (3 reactors) located in the state. There are also 2 nuclear power plants, each with 2 reactors, located in close proximity to Wisconsin, which produce electrical power for Illinois and Minnesota. (These power plants are listed in the following chart). The Nuclear Regulatory Commission (NRC) closely monitors the construction and operation of nuclear power plants, but an incident is possible. This could allow radioactive materials to contaminate the environment around a plant, which might affect the health and safety of the public living near the plant. The degree and area of environmental contamination could vary greatly depending on the type and amount of radioactivity and the existing weather conditions. An incident requires specialized emergency response personnel who have special equipment to detect and monitor radiation and have been highly trained to handle and dispose of radioactive materials safely.

Radioactive materials emit different types of radiation, each of which presents its own danger to the human body. Some types can penetrate the skin and pass through the body and others must be taken inside the body (inhalation or ingestion) to affect a person. Radiation cannot be seen, tasted, smelled or felt. The danger not only depends upon the type of radiation, but also the total amount of exposure, because radiation effects are cumulative. Greater total exposure to radiation will result in higher risk of damage to cells of the body. With nuclear power plant incidents, three dominant exposure modes to people have been identified: whole body (bone marrow) exposure from external gamma radiation, internal thyroid exposure from inhalation or ingestion of radio-iodine and internal exposure from ingestion of other radioactive materials.

Some people believe that a far greater threat posed by the plants involves the transportation of radioactive fuel and wastes to and from the plant. The interim and terminal storage of these wastes is an issue which federal, state and local officials are working to resolve.

Historical Frequency: No commercial nuclear power plant incidents have occurred that have affected the state.

Programs: Since the Three Mile Island incident in 1979, officials from federal, State of Wisconsin and local governments in nearby areas have developed detailed radiological incident response plans for each nuclear power plant. The nuclear power plants, local and state emergency management officials exercise these plans on a biennial basis and are reviewed by the Federal Emergency Management Agency (FEMA).

Response to a nuclear power plant incident in Wisconsin is a shared responsibility of the plant owner (licensee) and local, state and federal governments. Plant employees take immediate actions to control or minimize the incident, as well as required follow-up actions. State and local government agencies implement protective actions and other preparedness, response and recovery activities. The following map shows the location of each nuclear power plant affecting Wisconsin,

as well as its associated 10-mile Primary Emergency Planning Zone (EPZ) radius and 50-mile Secondary Emergency Planning Zone (EPZ) radius. These are the areas that potentially could suffer the greatest consequences of an incident at a nuclear plant and where the state focuses its Radiological Emergency Response Planning and Exercising Program (REP).

Within the primary (plume exposure pathway) EPZ, plans are developed to consider what actions are required to protect the nearby public, such as in-place sheltering and evacuation. This 10-mile distance and area could vary somewhat based on local radiological and meteorological characteristics. Falling all or partially within these zones of potential risk are Kewaunee, Manitowoc and Pierce Counties. Host counties are counties that adjoin one of the risk counties and have agreed to "host" a share of the risk county's population if a nuclear plant incident requires evacuation of the public. Wisconsin's host counties are Racine and Walworth, which support Kenosha County. Within the 50-mile secondary (ingestion exposure pathway) EPZ, planning and actions are taken to prevent the introduction of radioactive contamination into the food chain or protect the public from ingestion of contaminated materials. There are 22 Wisconsin ingestion counties, all or part of which lie within each power plant's 50-mile ingestion EPZs (see the following map and table). Risk and host counties are also considered to be ingestion counties.

When an incident occurs at a nuclear power plant, a pre-determined system is used to identify and classify the gravity of the situation. This system consists of four Emergency Classification Levels (ECLs), which are consistent with NRC and FEMA requirements and are recognized and used by the power plants and federal, state and local response organizations throughout the country. The following is a description of each of the emergency classification levels (ECLs):

Notification of Unusual Event - The first and lowest classification, which covers events that are in progress or have occurred which indicate a potential degradation of the safety level of the plant. No release is expected unless further degradation occurs.

Alert - Denotes events that are in progress or have occurred which involve an actual or potential substantial degradation in the level of plant safety. Any releases expected are limited to extremely small exposure levels.

Site Area Emergency - Reflects events that involve actual or likely major failure of plant functions needed for protection of the public. Any release resulting from an event should not exceed guideline exposure levels except near the site boundary.

General Emergency - Highest classification which denotes events that are in progress or have occurred which involve actual or imminent substantial core degradation or melting with the potential for loss of containment and release of radioactive material from the plant. Releases can be reasonably expected to exceed the guideline exposure levels offsite for more than the immediate site level.

The purpose of the first two classifications is to provide early and prompt notification of minor events, with a gradation provided to assure greater response preparations and actions for more serious indicators. The next two classification levels prompt various actions and activities that are

taken to minimize any possible effects on people, property and the environment; and provide for recovery.

The Wisconsin Radiological Incident Response Plan (WRIRP) serves as a guide for off-site response by state and local government and recovery operations. It guides the activities of eleven state agencies and other private organizations, such as the American Red Cross. Wisconsin Emergency Management has been designated by the Governor as the lead agency in coordinating the response to an incident at a nuclear power plant.

Nuclear Reactors In or Near Wisconsin

Nuclear Power Plant Name	Location	Type	Capacity-Kilowatts	Startup
Point Beach Unit 1	Two Creeks, WI	Pressurized Water	495,000	1970
Point Beach Unit 2	Two Creeks, WI	Pressurized Water	495,000	1972
Kewaunee Nuclear Power Plant	Carlton, WI	Pressurized Water	540,000	1973
Prairie Island Nuclear, Unit 1	Red Wing, MN	Pressurized Water	520,000	1973
Prairie Island Nuclear, Unit 2	Red Wing, MN	Pressurized Water	520,000	1974
Byron Unit 1	Byron, IL	Pressurized Water	1,120,000	1985
Byron Unit 2	Byron, IL	Pressurized Water	1,120,000	1986
Zion Nuclear Power Plant 1 & 2	Zion, IL	Shut down 1998		

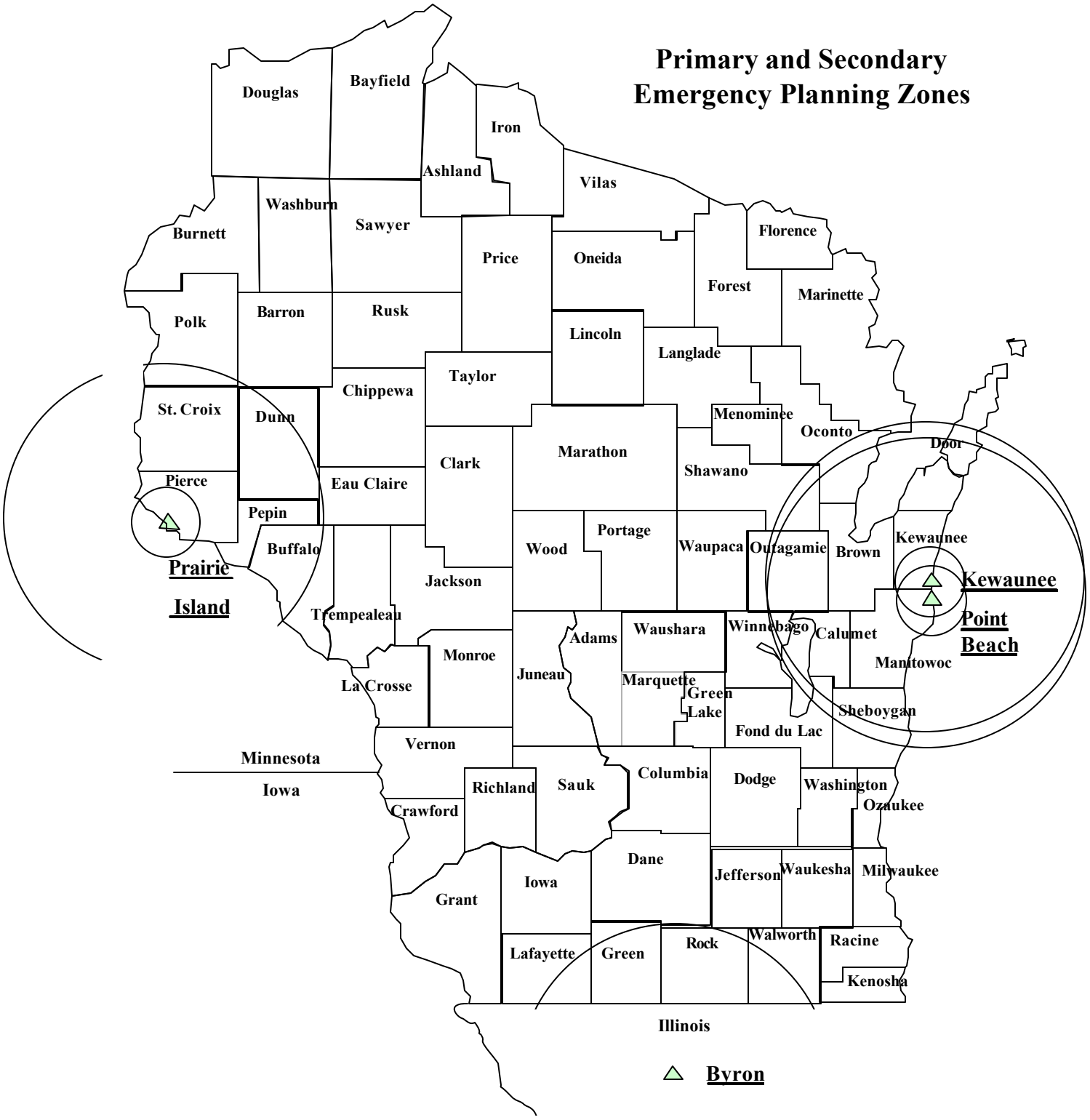
Wisconsin Counties within Possible Ingestion Pathway from a Nuclear Power Plant Incident

(Secondary Emergency Planning Zone)

County	Nuclear Plant
Brown	Kewaunee/Point Beach
Buffalo	Prairie Island
Calumet	**Kewaunee/Point Beach**
Door	Kewaunee/Point Beach
Dunn	Prairie Island
Fond du Lac	Kewaunee/Point Beach
Green	Byron
Kewaunee	Kewaunee/Point Beach
Lafayette	Byron
Manitowoc	Kewaunee/Point Beach
Marinette	Kewaunee/Point Beach
Oconto	Kewaunee/Point Beach
Outagamie	Kewaunee/Point Beach
Pepin	Prairie Island
Pierce	Prairie Island
Polk	Prairie Island
Rock	Byron
Shawano	Kewaunee/Point Beach
Sheboygan	Kewaunee/Point Beach
St. Croix	Prairie Island
Walworth	Byron
Winnebago	Kewaunee/Point Beach

Source: State of Wisconsin Radiological Incident Response Plan, Volume 1.

Nuclear Power Plants Affecting Wisconsin



Source: Wisconsin Emergency Management.
Note: Map is a generalized depiction of emergency planning zones created for presentation only.

PRISON/CORRECTIONAL FACILITY DISTURBANCES

Hazard Description: Prison disturbances are events that occur at correctional centers and institutions that affect the facility's security and might include any of the following inmate actions: protests, hunger strikes, rioting, widespread damage or destruction of institutional property and/or the taking of hostages. The worst-case scenarios include a "takeover" of areas of the facility by inmates or the escape of dangerous inmates into the surrounding area, with subsequent criminal acts against local citizens.

Hazard Assessment: The State of Wisconsin operates 40 correctional institutions, juvenile correctional schools and secure mental health facilities. All of the facilities, including those for juveniles, are under the auspices of the Department of Corrections and are classified as maximum, medium or minimum security. In addition to these Wisconsin facilities, there is a medium security federal correctional institution located near Oxford, in Marquette County. The names and location of these facilities are displayed on page 75.

Most prison disturbances are minor and handled by the institution's own security forces, aided by local police and county sheriff departments if requested. Each facility has a plan for calling in mutual aid if required. If the size or magnitude of the disturbance necessitates, law enforcement officials from neighboring jurisdictions and the State Patrol may be requested. National Guard personnel could also be activated and utilized, but only in correctional facility work stoppage situations.

Prison disturbances may occur for a variety of reasons such as overcrowding, perceived poor treatment, inadequate staffing, unpopular staff actions, racial strife and prisoner unrest. Disturbances are extremely dangerous from an internal perspective when hostages are taken or widespread damage or destruction of institutional property occurs. Incidents where nearby civilian populations and property are in direct danger are rare, but this is a possibility if escapes occur. Indirectly, citizens may also be impacted if emergency response personnel and resources are dedicated to the disturbance and responses to routine emergency calls are delayed.

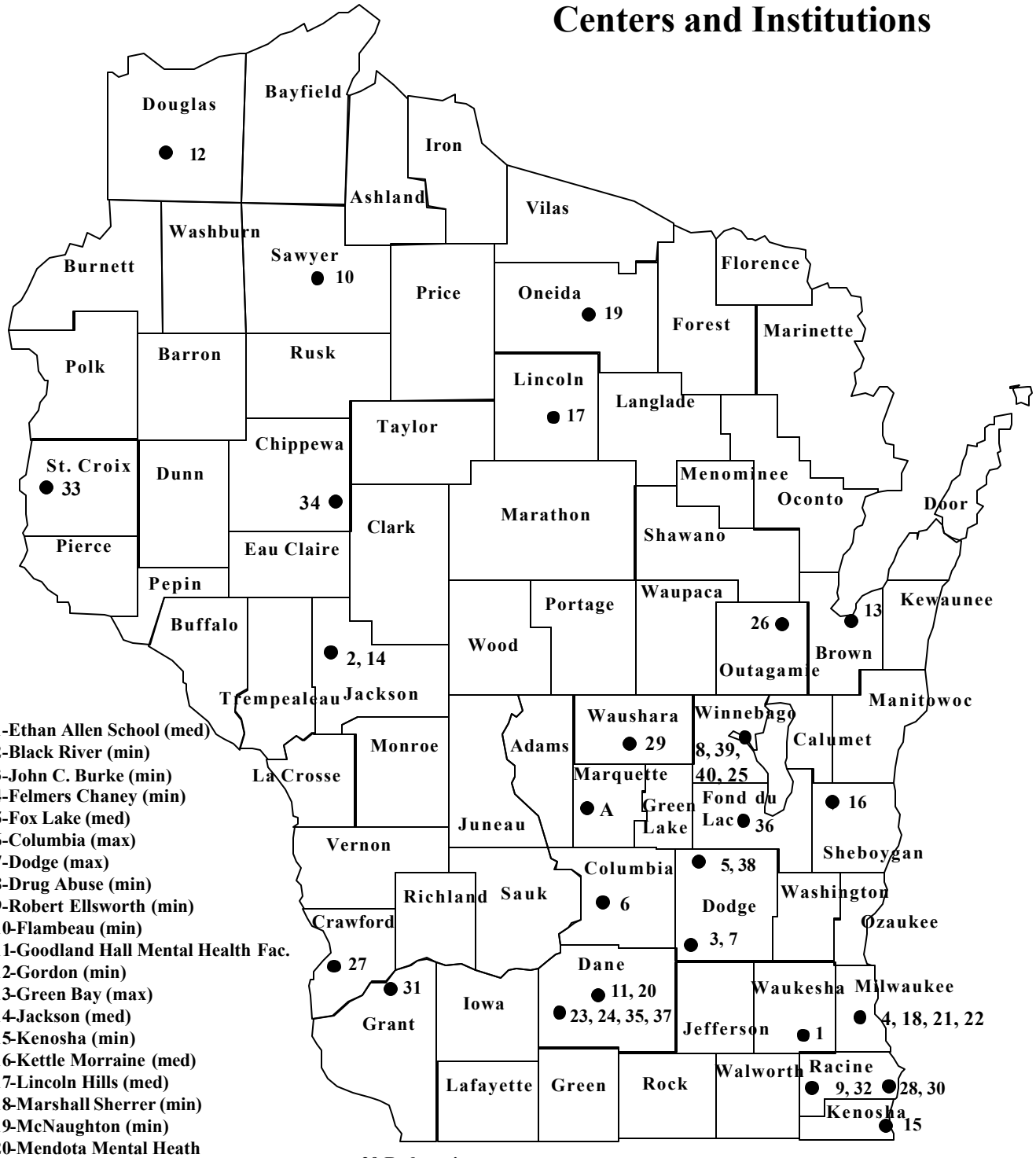
Significant Incidents: Three serious disturbances have occurred at Wisconsin correctional institutions since 1976. On July 21, 1976, 87 inmates in the Waupun facility took control of the industry building and held 14 staff personnel hostage. In addition to institution personnel, local and county authorities, the State Patrol, Emergency Management and mutual aid personnel responded quickly. Because the inmates were armed and the building was heavily fortified, this incident was settled by negotiation, with the inmates being granted amnesty. No serious injuries occurred to inmates or staff.

A second incident occurred on June 13, 1977, at the Fox Lake Correctional Institution. Inmates took 32 staff members hostage during this situation and an estimated $135,000 in damage was done to the food service, maintenance and hospital buildings. Two officers were slightly injured, but all hostages were released unharmed and the incident was resolved. In addition to facility staff, approximately sixty State Patrol, Emergency Management, Dodge County and mutual aid personnel responded, in addition to the University Hospital Trauma Unit.

The most recent serious disturbance occurred at the Waupun Correctional Institution on January 31, 1983. Fifteen members of the staff were taken hostage in two separate buildings. The emergency plan was implemented and the incident was resolved with no physical injuries to staff or inmates. However, property damage in excess of $50,000 to the facility resulted from this disturbance.

Programs: The Department of Corrections requires each facility to maintain current and up-to-date emergency plans and mutual aid agreements for use in case of disturbances or incidents. These emergency plans are reviewed and updated annually and this process includes the Department of Corrections, Emergency Police Services of the Wisconsin Emergency Management Agency, the State Patrol and local government and law enforcement agencies, in addition to officials from the facility or institution. Mutual aid agreements are also reviewed and updated on an as required basis. These plans and agreements provide for proper and rapid response in emergency situations resulting from disturbances.

Wisconsin Correctional Centers and Institutions



1-Ethan Allen School (med)
2-Black River (min)
3-John C. Burke (min)
4-Felmers Chaney (min)
5-Fox Lake (med)
6-Columbia (max)
7-Dodge (max)
8-Drug Abuse (min)
9-Robert Ellsworth (min)
10-Flambeau (min)
11-Goodland Hall Mental Health Fac.
12-Gordon (min)
13-Green Bay (max)
14-Jackson (med)
15-Kenosha (min)
16-Kettle Morraine (med)
17-Lincoln Hills (med)
18-Marshall Sherrer (min)
19-McNaughton (min)
20-Mendota Mental Heath
21-Milw. Secure Detention
22-Milw. Women's (min)
23-Oak Hill (min)
24-Oregon (min)
25-Oshkosh (med)
26-Sanger B. Powers (min)
27-Prairie du Chien (med)
28-Racine (med)
29-Redgranite
30-RYOC (med)
31-Super Max (max)
32-Southern Oaks (med)
33-St. Croix (min)
34-Stanley Correctional (med)
35-Thompson (min)
36-Taycheedah (max)
37-UW Hospital & Clinic
38-Waupun (max)
39-Winnebago (min)
40-WI Resource Ctr. (med)
A-Oxford (Federal/med)

Source: Wisconsin Emergency Management

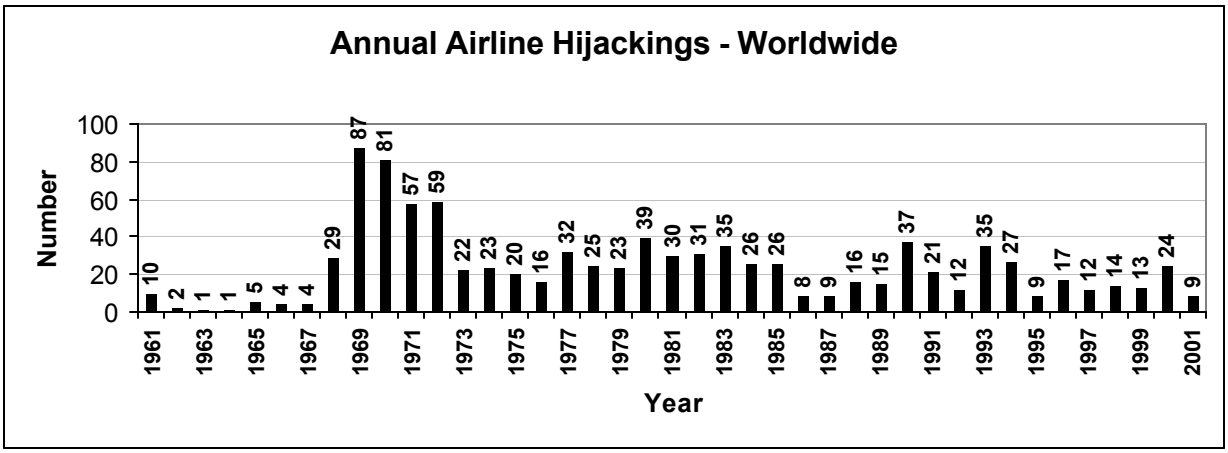
TERRORISM

Hazard Description: Terrorism can be defined as the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population or any segment of either, in the furthering of political or social objectives. The Federal Bureau of Investigation categorizes two types of terrorism in the United States: *domestic terrorism* which involves groups or individuals whose activities are directed at elements of our government or population without foreign direction; and *international terrorism* which involves groups or individuals who are foreign based and/or directed by countries or groups outside the U.S. or whose activities transcend national boundaries. Additionally, some acts conducted by gangs, people involved in civil unrest, radical splinter groups or activists and people involved in illegal drug trade could also be described as terrorism.

Hazard Assessment: An act of terrorism can take several forms, depending on the technological means available to the terrorist, the nature of the political issue motivating the act and the points of weakness of the terrorism target. Among the terrorist action possibilities are:

Bombing: Most terrorist incidents in the U.S. have involved bombs or incendiary devices, including detonated and undetonated explosive devices, tear gas, pipe and fire bombs and rocket attacks. Often the aim of the attack is to inflict large-scale damage and/or mass casualties. An example of this would be the bombing of the Murrah Federal Building in Oklahoma City in August 1995. The type of materials and method of delivery utilized in the bombing of the Murrah Federal Building are readily accessible to potential terrorists. Because of the availability of such materials, it is anticipated that various types of explosive weapons have a high potential for use in the U.S.

Airline Attack: Since September 11, 2001, there is an acute awareness of the potential use of a passenger airliner as a weapon of destruction and terror. In the past passenger airplanes often have been targets of hijacking as indicated in the graph below. There also have been instances in which airplanes have been sabotaged with bombs such as the Pan Am flight 103 that crashed in Lockerbee, Scotland in December 1988, killing 259 passengers and 11 more people on the ground.



Aviation Safety Network, 2002: http://aviation-safety.net/database/hijackings/index.html.

Other potential airplane incidents include, airport bombings or shootings or the tampering with air navigation and control systems, resulting in plane crashes or collisions.

Chemical/Biological/Nuclear Attack: Terrorists can use chemical and biological agents or weapons to either extort or deliberately try to kill in order to further political goals. An example would be the use of the toxic gas, sarin, in the attack on the Tokyo subway system that occurred in March 1995. Toxins or even some radiological materials, such as water-soluble plutonium chloride, could become a credible threat to municipal water supplies. Chemical, biological and nuclear materials weapons along with highly explosive devices are often referred to as Weapons of Mass Destruction (WMD).

Hostage Taking: The taking of hostages can provide terrorist groups publicity for their political or social objectives, allow negotiation for furtherance of their aims or result in events which are designed to invoke sympathy for their causes. The main goal of response agencies is to end the incident, with the absolute minimum loss of innocent lives. The common belief that most response agencies are willing to agree to any demand to prevent endangering the safety of hostages is not a true statement in all cases.

Infrastructure Attack: An individual or group of terrorists could coordinate an attack against utilities and other public services such as the water supply, electric power generation and transmission or telephone service. Another form of infrastructure attack is against computer resources such as databanks, communications and software by infiltrating computer networks and altering, stealing or destroying programs and data. As society becomes more dependent on computers, this form of cyber-attack is a legitimate concern. Attacks in the form of viruses, Trojan horses and worms through email or hacking have become routine for the information technology departments of many government agencies and corporations. There is evidence that cyber-attacks have been coordinated with physical attacks by terrorists in Pakistan and India (Vatis, 2001). It is likely that similar coordinated attacks will be attempted in the United States. The Federal Bureau of Investigation (FBI) has instituted a National Infrastructure Protection Center (NIPC) to investigate computer-based attacks and has made an incident report form available at http://www.nipc.gov/incident/incident.htm.

The emergency management community in the United States must accept that national security and intelligence organizations will not always be successful in preventing terrorist incidents. State and local emergency management personnel and services need to respond when attacks occur. The ramifications of responding to a terrorist incident may not be the same as traditional large-scale emergencies. The safety of emergency service providers must be an early and major consideration because a terrorist incident may present risks to responders from unknown elements or secondary attacks. In addition, the media will take an active interest in this type of incident from start to finish. The public has high expectations for emergency managers and service providers in a terrorist situation and extraordinary efforts are demanded. Federal and state government agencies depend directly on local managers and emergency response personnel and their initial and follow-up actions during any terrorist incident.

When dealing with terrorist incidents, the traditional command structure may need to be adjusted due to the inclusion of additional federal and state agencies. These additional required personnel

should be identified prior to the situation arising. The security and safety of emergency response personnel are also special concerns during terrorist incidents. The conventional procedure of treating the injured at the scene may threaten the life of the patient and emergency personnel, thus requiring the rapid evacuation of the injured from the scene before treatment begins. In addition, mass decontamination may be needed for chemical, biological or nuclear attacks.

Currently, no international terrorist groups are believed to be operating in Wisconsin, but a number of political activist, domestic terrorist and/or organized hate groups may be operating in or around the state. Potential terrorist targets include government facilities, utilities, commercial/industrial facilities, transportation centers, recreational facilities, institutions and various miscellaneous type facilities and special events. It is safe to assume that any type of facility for which an attack could generate desired publicity or further terrorism objectives could be classified as a potential target for terrorist activity.

Frequency and Significant Incidents: Wisconsin has been the target of several violent acts in the last thirty years that could be classified as terrorism or potential terrorism. On August 24, 1970, Sterling Hall at the University of Wisconsin-Madison was damaged by a bomb blast, resulting in one fatality and injuring four people. This act was conducted to protest mathematical research being conducted in the building that was funded by the US Army and thought to support the Vietnam War. On January 1, 1975, armed members of the Menominee Warriors Society took possession of the Alexian Brothers Novitiate near Gresham, holding two people hostage and demanding legal title of the property for the nearby reservation. The hostages were soon released, but the situation turned into a 35-day standoff between the Society and local law enforcement and the National Guard before resolution. During this entire standoff period, the local sheriff retained control of the response structure and activities. In November of 1997, an individual in Rock County was arrested for making the deadly toxins ricin and nicotine sulfate in his home (Milwaukee Journal Sentinel, 5/21/99). In March of 2000, activists broke into a warehouse in Vernon County that stores food for mink farms. Incendiary devices with timers were placed on a propane tank with the intent to burn the warehouse down. The devices malfunctioned and damage to the warehouse was limited to the break-in. A group calling itself the Animal Liberation Front claimed credit for the incident. (Milwaukee Journal Sentinel, 3/23/00).

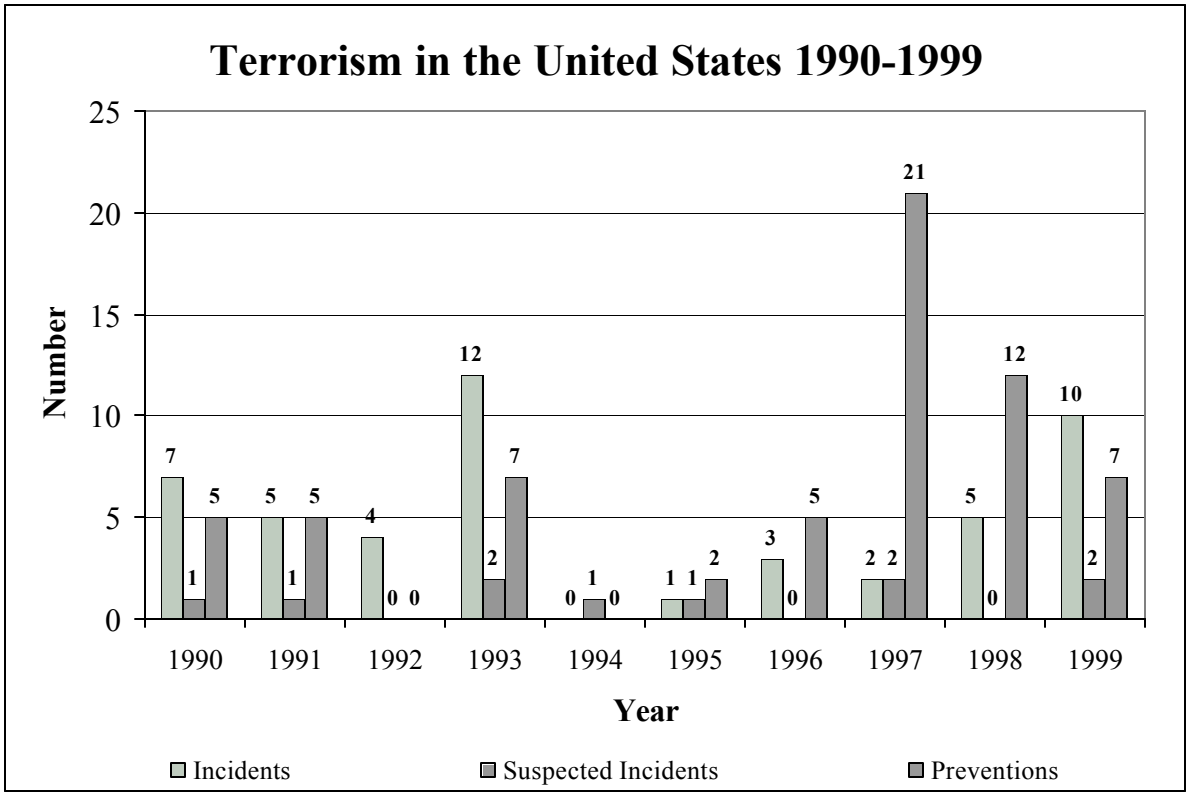
Hoaxes: A growing concern in Wisconsin is the increase in hoaxes or false alarms involving threats to public safety. For example, in January of 2000, an anthrax threat was received by a family planning clinic in Milwaukee. A day later, envelopes filled with a powdery substance were mailed to a middle school and a children's agency in Kenosha County as well as another abortion clinic on Milwaukee's east side. About 800 students at the school were evacuated and eventually sent home while 30 people, firefighters, students and staff members who were exposed to the powdery substance, which the letters claimed was anthrax, were taken to area hospitals (Milwaukee Journal Sentinel, 1/13/2000). Overall, a total of 17 letters, supposedly containing anthrax, were mailed to Milwaukee area health care clinics, planned parenthood centers, and counseling services in the month of January 2000. Although these threats and letters proved to be a hoax, responders cannot afford to treat these types of cases lightly.

Law enforcement and emergency first responders are trained to approach every threat as if it is real and potentially dangerous. For this reason, hoaxes involving threatened use of chemical,

biological and radiological substances represent a difficult challenge to public safety agencies. Although the use of Weapons of Mass Destruction (WMDs) is not common in Wisconsin, the potential loss of life from even small-scale exposure to chemical, biological or radiological substances requires caution and prudence when responding to threats involving WMD devices.

The FBI divides terrorist-related activity into three categories:

1. A *terrorist incident* is a violent act or an act dangerous to human life in violation of the criminal laws of the United States or of any state, to intimidate or coerce a government, the civilian population or any segment thereof.
2. A *suspected terrorist incident* is a potential act of terrorism to which responsibility cannot be attributed at the time to a known or suspected terrorist group or individual.
3. *Terrorism prevention* is a documented instance in which a violent act by a known or suspected terrorist group or individual with the means and a proven propensity for violence is successfully interdicted through investigative activity.



Source: Federal Bureau of Investigation, "Terrorism in the United States 1999."

During the period of 1990 through 1999, the FBI identified a total of 49 terrorist incidents, 10 suspected terrorist incidents and 64 terrorist incidents prevented in the United States. Major incidents of the 1990's include the Oklahoma City bombing on April 19, 1995, in which 168 people lost their lives. The Centennial Park bombing at the Atlanta Summer Olympics occurred

on July 27, 1996, injuring 112 people. The bombing of an Atlanta nightclub on February 21, 1997, added another element for emergency managers to consider: a secondary bomb, apparently intended for emergency responders, was discovered and disarmed at the sight of the explosion. A massive explosion occurred at the World Trade Center (WTC) complex in New York City on February 26, 1993. The blast killed six people and injured over 1,000. Property damage amounted to over half a billion dollars (Federal Bureau of Investigation, "Terrorism in the United States 1999." The most current version of this publication available is published on the Internet at www.fbi.gov/publications/terror/terroris.htm).

WMD Programs: Wisconsin anti-terrorism efforts are coordinated by the Wisconsin Emergency Management (WEM) Division within the Department of Military Affairs in cooperation with various other federal, state and local agencies. In 1997, the Governor initiated a Wisconsin Interagency Working Group on Terrorism, which includes numerous state agencies and advisory members from federal agencies. This group has been working with WEM on WMD/terrorism related issues.

Assessment and Planning: The response to terrorism is initially local, with response assistance from federal and state agencies. Therefore counties have been requested to add an Anti-Terrorism Response Appendix to their existing Emergency Operations Plan (EOP). Initially in 1999, thirteen of the largest counties in Wisconsin; Brown, Dane, Kenosha, La Crosse, Marathon, Outagamie, Racine, Rock, Sheboygan, Washington, Waukesha and Winnebago were the focus of additional training, assessment and planning efforts specifically including the development of a county WMD plan and exercises to test the plans. These counties make up 61% of the population of Wisconsin.

During FY 2000, all counties were offered the opportunity to obtain funding to conduct WMD assessments and develop county plans. The availability of funding allowed approximately 50 Wisconsin counties to receive training and begin the conduct of Weapons of Mass Destruction (WMD) assessments as part of the Department of Justice's assessment program. These assessments have continued into FY 2001 and now all 72 counties are participating. These assessments include the identification of potential targets, as well as threat and risk potentials within each county. The assessments also include determinations of the current and needed capabilities of local response agencies with regard to WMD incidents, including a review of equipment, training and exercise needs. These local evaluations and similar assessments being conducted at the state level provided the information necessary for the statewide WMD strategy, which was approved October 31, 2001.

WMD Equipment: The approval of the statewide WMD strategy means almost $3 million has been made available for local responders to purchase equipment for personal protection, detection, monitoring and decontamination, and communications to enhance response to potential WMD incidents. The U.S. Department of Justice under its Domestic Preparedness Equipment Grant Program provides equipment funding for states with which WMD response equipment can be purchased to enhance state and local response capabilities. The WMD Strategic Plan addresses WMD risks and threats and identifies a plan for purchasing and placing certain specific equipment statewide to most effectively utilize the equipment funding that is available. The WMD strategy will be updated in 2002 to enable the state to receive funding for

additional types of critical equipment such as explosive device mitigation and remediation equipment, WMD technical rescue equipment, interoperable communications equipment, medical supplies and limited types of pharmaceuticals, and general support equipment. The 2002 funding is approximately $5.9 million.

WMD Training: Since the late 1990's, the Wisconsin Technical College System through the National Fire Academy has provided WMD training. The Wisconsin Technical College System receives a Federal Emergency Management Agency funding grant to provide Weapons of Mass Destruction training to first responders. This grant provides funding for the *Emergency Response to Terrorism* series of courses developed by the National Fire Academy. Wisconsin Emergency Management in partnership with the Wisconsin Technical College System coordinates the delivery of these courses and the delivery of train-the-trainer courses to develop a cadre of instructors in the state.

In addition, Wisconsin Emergency Management has been involved in terrorism consequence management training with funding provided by the Federal Emergency Management Agency and the Department of Justice. Counties that have completed their Terrorism Consequence Management Planning Assistance (TCMPA) assessments will be eligible for training in the area of terrorism consequence management.

WMD Exercising: As counties develop their WMD plans, many are conducting local exercises to test these plans. Limited funding has been available to counties for conducting these exercises. During FY 2001-02, WEM will also be coordinating the development and conduct of WMD tabletop and functional exercises to test and further refine the state WMD plan.

Other WMD Related Activities: The U.S. Congress has passed a number of initiatives to combat terrorism, including the Nunn-Luger-Domenici Act of 1996, which funded the anti-terrorism effort. Eventually the U.S. Department of Justice was designated as the lead agency to carry out the precepts of the legislation, with assistance from many additional federal agencies.

In 1999, the Wisconsin Department of Health and Family Services received a 3-year grant for Bio-Terrorism Preparedness and Response from the U.S. Center for Disease Control and Prevention with funding for the first year of the grant set at $1.12 million. This grant provides for health alert network training, increased capability in disease surveillance and epidemiology and increased laboratory capacity for biological agents. The Department of Health and Family Services is engaged in a number of other projects relating to improving Wisconsin's ability to respond to bio-terrorism or mass-casualty events. For more information on these endeavors visit http://www.dhfs.state.wi.us/dph_bcd/Bioterrorism/BT_Partners.htm.

Resources: Wisconsin Emergency Management has some information available on its web site at http://badger.state.wi.us/agencies/dma/wem/terrorism.html for citizens who would like more information about Wisconsin's domestic preparedness.

Federal sources of information on the national response to terrorism include the following sites:

- The White House - http://www.whitehouse.gov/response/
- The Federal Bureau of Investigation - http://www.fbi.gov/terrorinfo/terrorism.htm

THUNDERSTORMS

Hazard Description: Thunderstorms are severe and violent forms of convection produced when warm moist air is overrun by dry cool air. As the warm air rises *thunderheads* (cumulo-nimbus clouds) form and cause the strong winds, lightning, thunder, hail and rain associated with these storms. The National Weather Service definition of a *severe thunderstorm* is a thunderstorm event that produces any of the following: downbursts with winds of 58 miles per hour or greater (often with gusts of 74 miles per hour or greater), hail 3/4 of an inch in diameter or greater or a tornado.

Hazard Analysis: The thunderheads formed may be a towering mass six miles or more across and 40,000 to 50,000 feet high. It may contain as much as 1.5 million tons of water and enormous amounts of energy that often are released in the form of high winds, excessive rains and three violently destructive natural elements: lightning, tornadoes and hail. This chapter will focus on the hazard of straight-line winds associated with thunderstorms since lightning, hail, tornadoes and flooding have each been covered separately elsewhere in this document.

On the ground directly beneath the storm system, the mature thunderstorm is initially felt as rain, which is soon joined by a strong downdraft. The downdraft spreads out from the cloud in gusting divergent winds and brings a marked drop in temperature. Even where the rain has not reached the ground, this cold air stream flowing over the earth's surface is a warning that the storm's most violent phase is about to mature.

A thunderstorm often lasts no more than 30 minutes in a given location because an individual thunderstorm cell frequently moves between 30 and 50 miles per hour. However, strong frontal systems may spawn more than one squall line composed of many individual thunderstorm cells. Thunderstorms may occur individually, in clusters or as a portion of a large line of storms that may stretch across the entire state. Thus, it is possible that several thunderstorms may affect an area in the course of a few hours.

Severe thunderstorms can cause injury or death and can also result in substantial property damage. They may cause power outages, disrupt telephone service and severely affect radio communications and surface/air transportation, which may seriously impair the emergency management capabilities of the affected jurisdictions.

Historical Frequency: At any given time, there are nearly 2,000 thunderstorms in progress over the earth's surface. There are at least 100,000 thunderstorms annually across the United States. In Wisconsin, thunderstorms and their associated high winds can occur throughout the state during any month of the year with little or no notice, but their highest frequency is during the period May through September. They also occur most often between the hours of noon and 10:00 p.m.

Thunderstorm frequency is measured in terms of incidence of *thunderstorm days* or days on which thunderstorms are observed. Wisconsin averages between 30 and 50 thunderstorm days per year depending on location, with the southwestern area of the state normally having more thunderstorms than the rest of the state. A given county may experience ten or more thunderstorm days per year.

According to the National Weather Service Publication, *Storm Data*, in the past 30 years, Wisconsin has experienced hurricane force winds of 75 mph or higher on 120 days or about 4 days per year on average. Within the same time period there have been 17 days when winds at or above 100 mph have been documented. This means that winds similar to a Category 2 Hurricane are experienced about one day every two years on average in Wisconsin. Thunderstorm winds can be fatal. During the period from 1982 to 2001, 20 fatalities have been attributed to wind from severe thunderstorms.

Recent Incidents: On June 11, 2001 a line of thunderstorms with many of the same characteristics as a tropical storm ripped through east-central and west central Wisconsin. The thunderstorm complex produced hurricane-strength wind gusts and hail, resulting in thousands of downed trees and damage to structures. Nearly $20 million in damage was reported in central and east-central Wisconsin. Much of the wind damage was concentrated in Wood, Portage, Waushara, Waupaca, Winnebago, Outagamie, and Calumet Counties and the cities of Appleton and Oshkosh. Overall, this event affected 30 counties, which were added to disaster declaration 1369.

Fallen trees in Oshkosh from June 11 storm 2001. Photo: Shu-Ling Zhou, Oshkosh Northwestern.

Throughout the month of July 1999, the northwestern portion of Wisconsin received an unusual amount of thunderstorm activity. The cumulative damage from these events led to a disaster declaration for 10 counties. Most of the wind damage was to the forests in Douglas and Bayfield Counties. The United States Forest Service stated that downbursts and wind affected an estimated 92,000-acre area of forest during this month long period. Within this affected area approximately 12,000 acres of trees were nearly 100% down and another 30,000 acres were moderately affected with up to 40% of the trees mortally damaged. This damage has serious consequences for a number of reasons. The downed trees created an immediate debris problem on area roads as well as a severe long-term fire hazard. Other long-term effects include the spread of tree diseases that could affect the value of timber as an economic resource. Other economic losses include lost tourism, increased expenses for clearing debris and increased expense for fire fighting activities.

During the early morning hours of Sunday, May 31, 1998, south central and southeast Wisconsin experienced an unprecedented, widespread downburst wind event known as a "derecho." Incredibly powerful, hurricane-force straight-line winds, with peak gusts of 100 to 128 mph tore through 12 counties, while another 8 counties had peak gusts of 60 to 80 mph. Whereas all 20 counties in south central and southeast Wisconsin reported scattered to widespread wind damage, there were 5 main corridors or swaths of concentrated damage: 1) central Sauk County through northern Dane County through northern Jefferson County and southern Dodge County through Waukesha County and into Milwaukee County; 2) east-central Columbia County across northern Dodge County through southeast Fond du Lac County and through southern Sheboygan County; 3) West Bend area of central Washington County east to the Port Washington area of Ozaukee County; 4) southeast Iowa County into northwest Green County; and 5) northwest to central part of Lafayette County.

Utility companies and Emergency Managers stated that this was the most damaging, widespread, straight-line thunderstorm wind event to affect southern Wisconsin in the past 100 years. Estimated monetary damage for all 20 counties were $55.85 million for residential or mobile homes, businesses, utilities buildings, agriculture buildings, signs, street lights, billboards, campers and boats. There was an additional $1.48 million in crop and livestock losses. As a sign of the wind power, many concrete silos had their tops blown off and many barns flattened. Many homes and other structures had their roofs peeled off. Thousands of large trees were either uprooted or broken/twisted by the winds. Hundreds of power poles were snapped or pushed over by the winds or falling trees/branches. At one time, about 60,000 customers were without electricity in south central Wisconsin and about 170,000 in southeast Wisconsin. Some residences or businesses were without power for as much as 5 or 6 days due to a deluge of utility repairs and shortage of replacement power poles. Hundreds of motor vehicles were either damaged or totaled by falling trees/branches or collapsed garages. The monetary damage to motor vehicles is not included in the totals given above. In addition, numerous vehicle accidents resulted from inoperative stop/go streetlights, as roads quickly became logjams (Source: NOAA at http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~ShowEvent~146585)."

Programs: Wisconsin Emergency Management, in conjunction with the National Weather Service and state and local government agencies provides both preparedness information and severe weather information to the citizens of Wisconsin. Preparedness information is provided during three severe weather awareness campaigns conducted during the year, each focusing on the prevalent weather hazard at that time. Each April, Tornado Awareness Week is conducted in cooperation with the Department of Public Instruction educating schools and the public on tornado hazards and safety actions. During this time extensive information is also distributed on related weather events such as severe thunderstorms.

In the event of severe weather, weather bulletins are posted. A *severe thunderstorm watch* announces that conditions are favorable for storms in and close to the watch area and implies that people should be alert for these severe storms and have a plan of action if they threaten. These watches are issued by the Storm Prediction Center in Kansas City for the Midwest. A *severe thunderstorm warning* is given when a severe storm or tornado has been detected by radar or observed by trained spotters, the storm has winds of 58 miles per hour or greater and/or produces

hail 3/4 inch or larger and people in the path of the storm should take actions to protect life and property. The National Weather Service issues these warnings.

These severe thunderstorm watch and warning bulletins and advisories are disseminated over a number of telecommunication channels, including NOAA Weather Radio, the NOAA Weather Wire and the State Law Enforcement TIME System. NOAA Weather Radio is available to any individual with a weather alert radio. This system and the other sources are routinely monitored by local media, which rebroadcast the weather bulletins over public and private television and radio stations.

Wisconsin Thunderstorm Facts:

- Wisconsin averages over 30 days each year with thunderstorms.
- One of the country's worst thunderstorm windstorms occurred on July 4, 1977, in northern Wisconsin. Winds reached more than 115 mph in a swath over 150 miles long, flattening hundreds of thousands of acres of forest.
- In 1998, thunderstorm winds were responsible for 1 death and 59 injuries in Wisconsin, mostly due to the widespread thunderstorm wind event on May 30th and 31st across southern and central parts of the state. Maximum wind gusts ranged from 80 to 128 mph!!!
- In 1999, thunderstorm winds resulted in 2 deaths, and 4 injuries in Wisconsin.

What You Can Do:

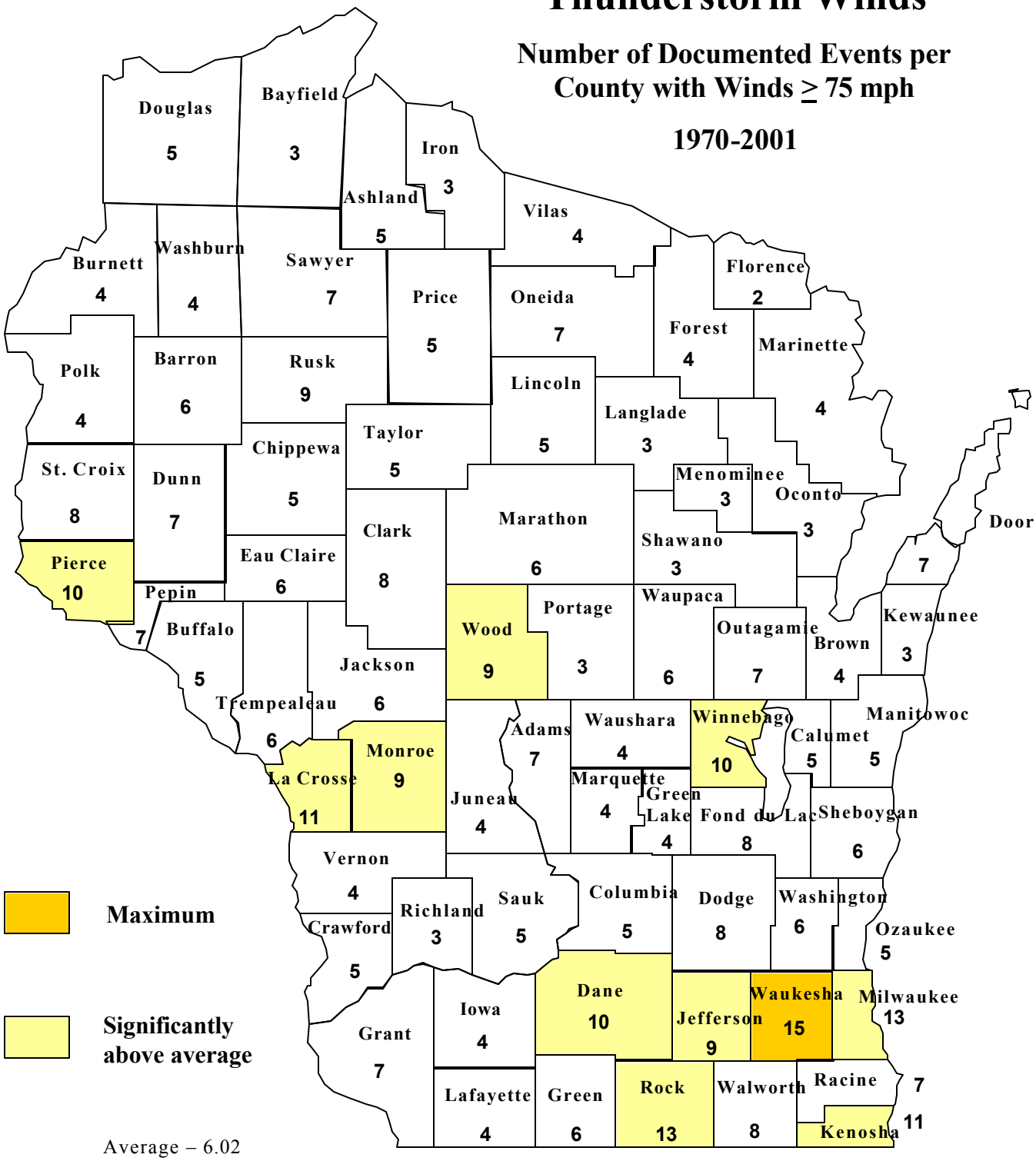
- Keep track of what county you are in. Severe weather warnings are issued on a county basis.
- Check the weather forecast before leaving for extended periods outdoors.
- If a storm is approaching, seek a sturdy shelter and keep a NOAA Weather Radio with you.
- Postpone outdoor activities if thunderstorms are imminent.
- Stay off the water if a thunderstorm approaches.
- Don't take Severe Thunderstorm Warnings lightly!

Source: National Weather Service, Milwaukee, URL: http://www.crh.noaa.gov/mkx/flyers/flyerstm.htm

Hurricane-Force Thunderstorm Winds

Number of Documented Events per County with Winds ≥ 75 mph

1970-2001



Average – 6.02

Std. Deviation – 2.67

Source: Rusty Kapela, National Weather Service, Milwaukee/Sullivan Forecast Office, 2002.

TORNADOES

Hazard Description: A tornado is a relatively short-lived storm composed of an intense rotating column of air, extending from a thunderstorm cloud system. It is nearly always visible as a funnel, although its lower end does not necessarily touch the ground. Average winds in a tornado, although never accurately measured, are between 100 and 200 miles per hour, but some may have winds exceeding 300 miles per hour. For standardization, the following are National Weather Service definitions of a tornado and associated terms:

- *Tornado* - A violently rotating column of air that is touching the ground.
- *Funnel cloud* - A rapidly rotating column of air that does not touch the ground.
- *Downburst* - A strong downdraft, initiated by a thunderstorm, which induces an outburst of straight-line winds on or near the ground. They may last anywhere from a few minutes in small-scale microbursts to periods of up to 20 minutes in larger, longer macro-bursts. Wind speeds in downbursts can reach 150 mph, in the range of a tornado.

Hazard Assessment: A tornado path averages four miles, but may reach up to 300 miles in length. Widths average 300-400 yards, but severe tornadoes have cut swaths a mile or more in width, or have formed groups of two or three funnels traveling together. On the average, tornadoes move between 25 and 45 miles per hour, but speeds over land of up to 70 mph have been reported. Tornadoes rarely last more than a couple of minutes over a spot or more than 15-20 minutes in a ten-mile area, but their short periods of existence do not limit their devastation of an area.

The destructive power of the tornado results primarily from its high wind velocities and sudden changes in pressure. Wind and pressure differentials probably account for 90 percent of tornado-caused damage. Since tornadoes are generally associated with severe storm systems, they are usually accompanied by hail, torrential rain and intense lightning. Depending on their intensity, tornadoes can uproot trees, down power lines and destroy buildings. Flying debris can cause serious injury and death.

Downbursts are characterized by straight-line winds. Downburst damage is often highly localized and resembles that of tornadoes. There are significant interactions between tornadoes and downbursts and a tornado's path can also be affected by downbursts. Because of this, the path of a tornado can be very unpredictable, including veering right and left or even a U-turn.

Wisconsin lies along the northern edge of the nation's maximum frequency belt for tornadoes, called "tornado alley" by some, which extends northeastward from Oklahoma into Iowa and then across to Michigan and Ohio. Broadly speaking, the southern and the western portions of Wisconsin have a higher frequency of tornadoes, however, every county in Wisconsin has had tornadoes and is susceptible to a tornado disaster.

Historical Frequency and Significant Incidents: While all Wisconsin counties have recorded at least two tornadoes in the period from 1844-2001, several counties, Barron, Clark, Chippewa, Dane, Dodge, Fond du Lac, Grant, Marathon, Polk, Rock and Waukesha, have each recorded 30 or more

tornadoes. Dane, Dodge and Grant Counties have had the most with 52, 51 and 50 respectively. The map on page 92 displays the total number of tornado occurrences by county for this period.

Wisconsin currently averages 20 reported tornadoes per year. For the past few years, Wisconsin has ranked about fifteenth in the nation insofar as number of annually reported tornadoes. The state ranked fourth nationally in 1980 when 43 tornadoes touched down. During 1999, there were only eleven "confirmed" tornadoes in Wisconsin, a small number compared to an average year. These occurred in Jefferson, Waukesha, Wood, Lincoln, Buffalo, St. Croix, Polk, Barron, Washburn and Rusk Counties. A more typical year would be 2000 in which there were 18 tornadoes or 1998 when there were 24 reported tornadoes. In 2001 there were 12 tornadoes. The locations, intensities and paths of the tornadoes for the past two years are shown on maps on pages 93 and 94.

Tornadoes most frequently occur in the late afternoon and early evening, but can occur at any time. As many as 75 percent of all Wisconsin tornadoes happen between the hours of 3:00 p.m. and 7:00 p.m. Tornadoes also display a strong local seasonal variation. In Wisconsin, they have occurred in every month except February, with most activity occurring between April and September. The month of June has the highest tornado frequency. The most severe tornadoes tend to occur during April, May and June with tornadoes during the remainder of the year as a rule being smaller and with shorter tracks. Winter, spring and fall tornadoes historically are more likely to occur in southern Wisconsin than in the central or northern parts of the state.

Some of Wisconsin's more noteworthy tornadoes and associated downbursts occurred as long as 100 years ago. In 1899 half of the City of New Richmond in St. Croix County was destroyed and 112 people were killed by a powerful tornado. In September 1924, 26 people were killed as a tornado ripped a path from Eau Claire County through to Oneida County.

The Berlin Tornado: On April 3, 1956, a tornado struck the southeast sector of the City of Berlin, Green Lake County at approximately 1:40 p.m. after damaging at least three farms south and west of the city. It came within a few yards of the high school where four hundred students were in class. The terrified students watched the tornado churn towards the high school, but the funnel veered to the right, barely missing the school. Witnesses saw cars and buildings lifted and carried through the air. The tornado killed 7 people and injured 50. Damage was estimated at over $1,000,000.

On June 4, 1958, 20 people died, 110 were injured and 60 buildings were destroyed in the City of Colfax in Dunn County by a tornado estimated to be F4 intensity. The same storm system produced three other tornadoes in Chippewa and Clark counties that same day. On April 21, 1974, a tornado estimated to be a F4 intensity hit the City of Oshkosh in Winnebago County. Despite a lack of no warning in advance of the storm no one was killed, although seventeen people were reported injured. Eleven commercial structures were damaged and property damage reached 4 million dollars. The hardest hit area was the section on the south by Witzel Avenue and the east close to Titan Stadium. About the time the tornado began ripping through Oshkosh in Winnebago County, a series of tornadoes touched down in Dodge County in the Lomira/Brownsville area. They left in their wake a trail of broken homes and barns and destroyed a large lumberyard. Two deaths and numerous injuries were attributed to the storms. In 1980, tornadoes and downbursts occurred in Chippewa, Dunn, Eau Claire and Pierce Counties and caused more than $150 million in property damage.

In 1984, the year of the "killer tornado", twelve Wisconsin people lost their lives as a result of severe weather. On April 27-28, 1984, three people were killed and several dozen injured when tornadoes struck Oneida, Vilas and Menominee Counties. Nine persons were killed on June 8, 1984, when tornadoes occurred in Dane and Iowa Counties and literally destroyed the Village of Barneveld. Property damage for both incidents totaled more than $50 million. Because of its intensity, the National Weather Service has studied the June 8 tornado extensively.

On August 29, 1992, severe thunderstorms developed across Wisconsin and spawned tornadoes, high winds, heavy rains, frequent lightning strikes and hail. The storms traveled eastward in Waushara County and funnel clouds set down in and around the Wautoma area just after 8:00 p.m. One death was attributed directly to the tornadoes and a second occurred as a result of a heart attack. Over thirty were transported to area hospitals with injuries (four in critical condition). Additional people, estimated in the hundreds, were also injured but they did not require professional medical treatment. A search was conducted throughout the evening by law enforcement, fire and emergency medical personnel to ensure that all victims had been found. The large number of downed trees and power lines made search and rescue efforts difficult. Over 40 homes were destroyed, with 95 more suffering major damage and almost another 400 being affected or having minor damage. A total of 28 businesses were damaged as well as numerous farm buildings. A migrant worker camp was severely damaged and a senior citizen center was demolished. Thousands of mature trees in the area were leveled and the high winds and tornadoes flattened many acres of corn and sweet corn. Some of the most devastating losses were the many stands of timber, which were severely damaged or completely destroyed.

On July 18, 1996, a line of thunderstorms caused the National Weather Service to issue a tornado watch for the eastern two-thirds of the state. As the line moved east the storms became more severe in counties such as Marathon and Portage. By the time the storms reached Fond du Lac County they had become very dangerous. At approximately 7:08 p.m. warning sirens sounded in the Village of Oakfield (population 1,005) in Fond du Lac County. At 7:13 p.m. a tornado of F5 intensity tore through the community and neighboring areas. The tornado left a path of destruction 15 miles long and a quarter to a half-mile wide. More than 19 people were injured and over 150 homes and businesses were damaged or destroyed.

It was a miracle that no one was killed by the Oakfield tornado. Homes were lifted from their foundations and deposited in adjacent yards or across the street. The community's middle school was destroyed as were two churches and a church school. One of the village's largest employers, the Friday Canning Company, had its warehouses literally shredded and its contents, cans of corn, strewn for miles around. The farming community was hit very hard. Many farmers lost their homes, farm buildings and crops. Hundreds of acres of corn waiting to be picked and packed at the canning plant were destroyed. Thousands of trees were down and created a serious debris removal problem. Power poles were snapped and most of the community lost power, some for as long as two weeks.

More recently, an F3 tornado struck a rural section of central Door County in northeast Wisconsin during the evening of August 23, 1998. The multiple-vortex tornado was on the ground for nearly 14 minutes and carved a path of damage 5.1 miles long and 1/4 to over 1/2 mile wide at times. Damage was estimated at nearly $7 million. Fortunately, only 2 people were injured and no one was killed.

There were several tornadoes that struck Wisconsin in 2000. A very early tornado touched down near General Mitchell Airport in Milwaukee on March 8. The National Weather Service classified the tornado as a Category F1. Tornadoes of this category are considered moderate, with 73-112 mph winds. In just a few minutes the tornado caused $381,000 worth of damage to about 75 homes and $3.8 million in damage to commercial real estate. On May 12, 2000, a major storm or supercell developed in west central Wisconsin. Chilton and St. Nazianz in Manitowoc County were particularly hard-hit by hail and wet microbursts that produced straight line winds over 100 mph and a brief F0 to F1 tornado. In addition, three tornadoes were documented on June 1, in Dodge, Juneau and Monroe Counties. The one in Dodge County, an F2, occurred just after 6:00 p.m. and was on the ground for more than 16 miles. The tornado destroyed or did major damage to several dozen homes in Iron Ridge, a small community of 800.

On June 18, 2001, a fierce F3 tornado hit Burnett and Washburn Counties. This tornado touched down near Grantsburg and continued traveling east for over 25 miles to an area just outside Spooner. Some witnesses said the tornado split into 3 funnel clouds in some areas. There was extensive damage and destruction along the tornado's path. Damage was most concentrated in a six-block wide area of the Village of Siren, where numerous homes and businesses were completely leveled and tragically, 3 people were killed and 16 people injured.

Programs: Each April, Wisconsin Emergency Management, in conjunction with the National Weather Service, the Department of Public Instruction and local emergency government agencies conducts the annual Tornado Awareness Week and tornado drill. This campaign focuses on schools, educating students on tornado safety and increasing their awareness of this significant weather hazard. A statewide tornado drill is conducted with the National Weather Service commencing this exercise by broadcasting simulated weather bulletins. Many schools actually go to shelters as part of the exercise.

As part of these awareness efforts, state and local emergency managers are emphasizing the importance of hazard mitigation in reducing the impacts of these devastating storms. Local officials are urged to adopt and enforce building codes that make structures more resistant to wind damage. Special efforts are made to reach out to those who live in mobile homes or manufactured housing. Such structures are particularly vulnerable to damage in storms that have wind speeds in excess of 80 mph, even when the structures are properly anchored. Residents of such structures are advised to leave them immediately and seek protection in a suitable shelter. Mobile home park owners are also urged to provide residents with tornado shelters or make arrangements with a nearby facility for use as a shelter.

In the event of a tornado threat, the National Weather Service posts weather bulletins. These consist of issuing tornado watches and tornado warnings for areas of the state. These bulletins are disseminated over a number of telecommunication channels including: NOAA Weather Radio, the NOAA Weather Wire and the state law enforcement TIME system. These communications systems are routinely monitored by local media, which rebroadcast the weather bulletins over public and private television and radio stations.

Tornado Damage Scale

Scale	Wind Speeds	Damage	Frequency
F0	40 to 72 MPH	Some damage to chimneys, TV antennas, roof shingles, trees and windows.	29%
F1	73 to 112 MPH	Automobiles overturned, carports destroyed, trees uprooted	40%
F2	113 to 157 MPH	Roofs blown off homes, sheds and outbuildings demolished, mobile homes overturned.	24%
F3	158 to 206 MPH	Exterior walls and roofs blown off homes. Metal buildings collapsed or are severely damaged. Forests and farmland flattened.	6%
F4	207 to 260 MPH	Few walls, if any, standing in well-built homes. Large steel and concrete missiles thrown far distances.	2%
F5	261 to 318 MPH	Homes leveled with all debris removed. Schools, motels and other larger structures have considerable damage with exterior walls and roofs gone. Top stories demolished.	less than 1%

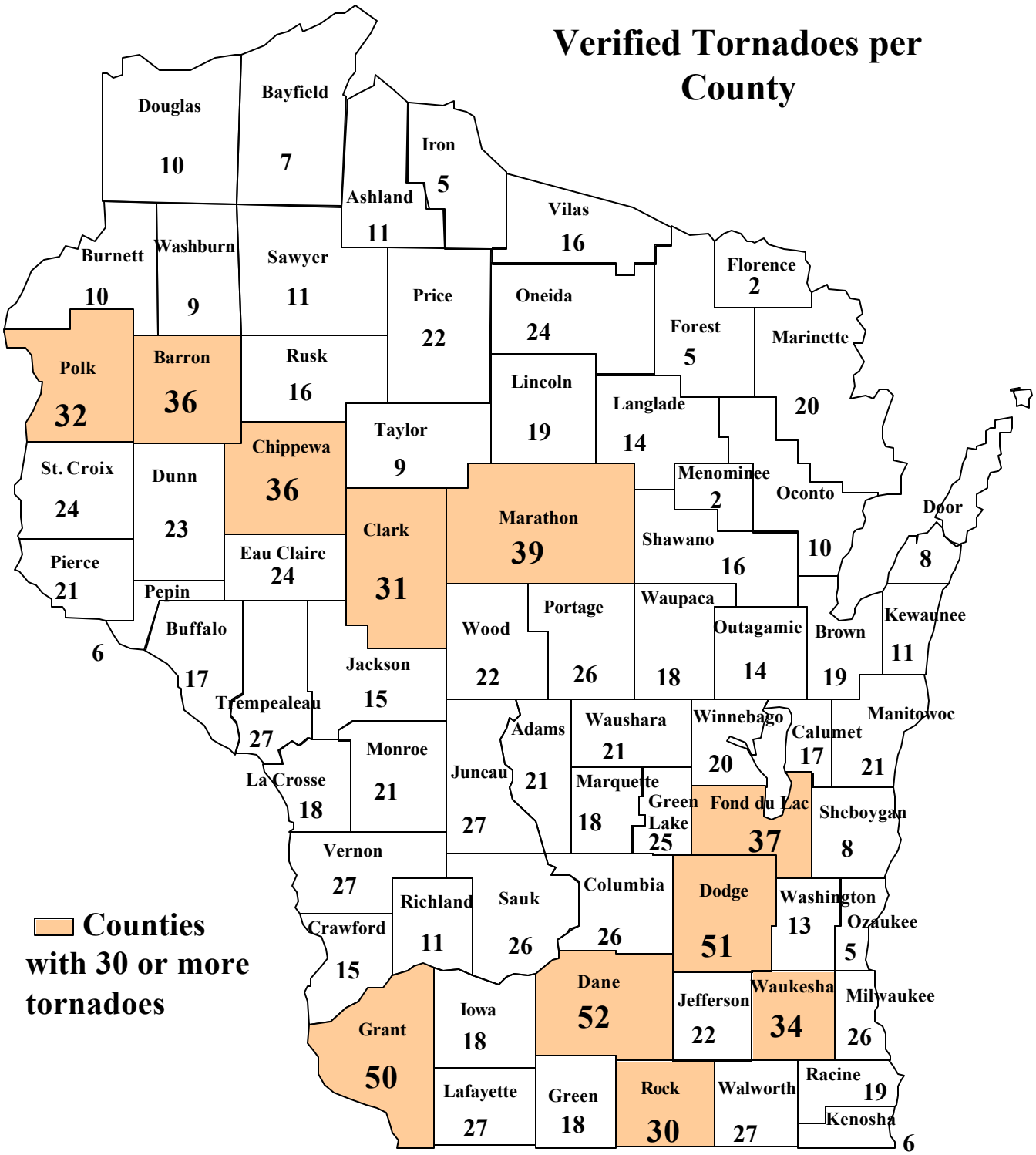
Source: National Weather Service: http://www.nws.noaa.gov/er/cae/svrwx/tornado/tornado.htm

United States Tornado Deaths by Location/Circumstance 1985-1998

Year	Mobile Home	Permanent Home	Vehicle	Business	School or Church	Outdoors	Unknown	Total
1999	39	35	6	8	0	6	1	94
1998	65	40	15	7	0	3	0	130
1997	30	23	3	3	0	7	1	67
1996	14	8	2	0	0	0	1	25
1995	8	15	4	0	0	3	0	30
1994	26	14	3	0	20	6	0	69
1993	13	6	7	3	1	3	0	33
1992	20	18	0	0	0	1	0	39
1991	20	3	4	0	0	12	0	39
1990	7	11	14	15	5	1	0	53
1989	12	8	16	4	9	0	1	50
1988	21	6	3	2	0	0	0	32
1987	24	7	3	0	22	3	0	59
1986	7	3	3	0	0	0	2	15
1985	28	40	4	0	0	0	22	94
Total	**334**	**237**	**87**	**42**	**57**	**45**	**28**	**829**
Percent	**40.3%**	**28.6%**	**10.5%**	**5.1%**	**6.9%**	**5.4%**	**3.4%**	**100%**

Source: National Weather Service: http://www.spc.noaa.gov/climo/torn/locations.html.

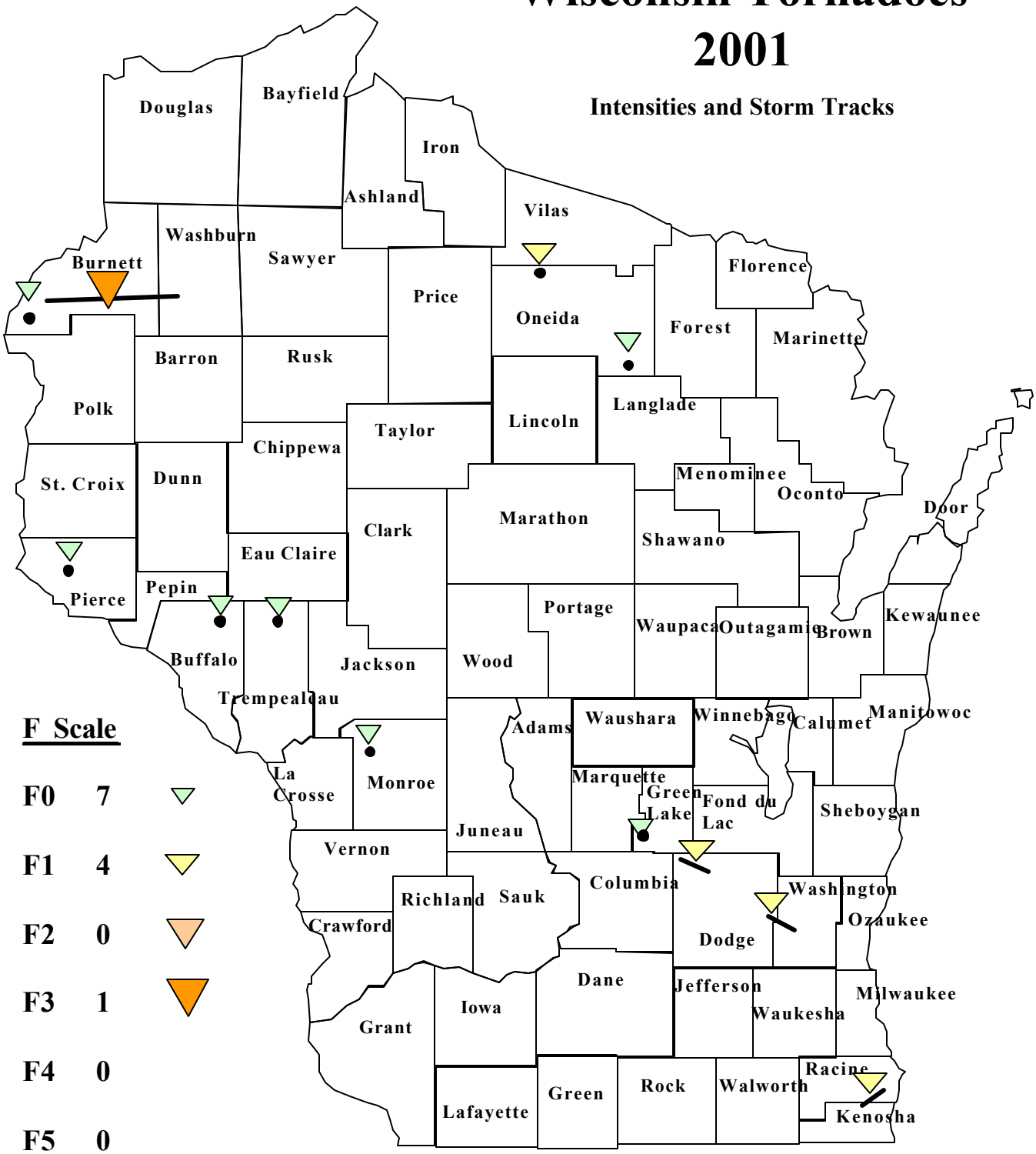
Wisconsin Tornadoes 1844 - 2001



Source: Rusty Kapela, National Weather Service, Milwaukee

Wisconsin Tornadoes 2001

Intensities and Storm Tracks



F Scale

F0	7	▽
F1	4	▽
F2	0	▽
F3	1	▽
F4	0	
F5	0	

Total = 12 **Average = 20**

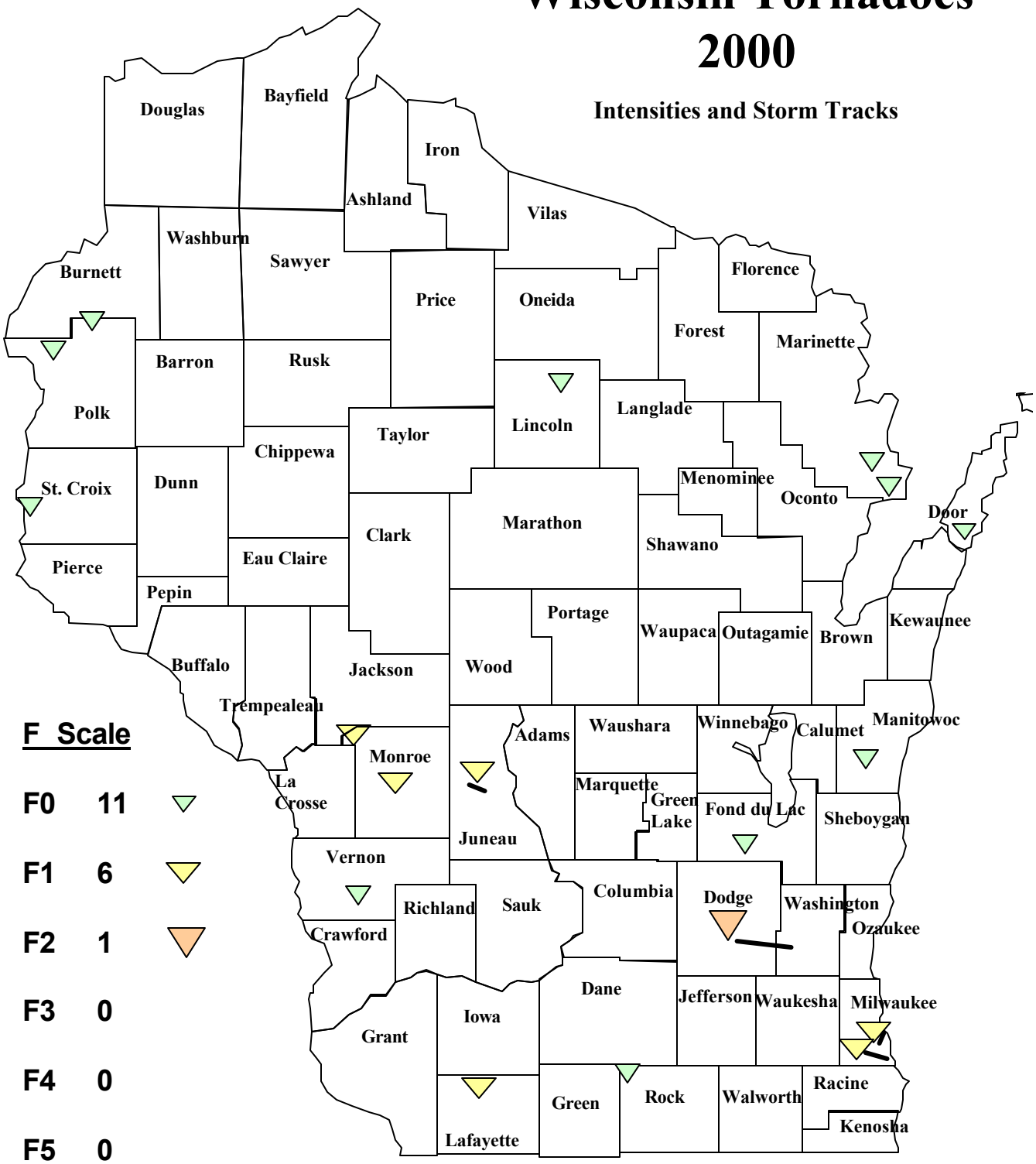
Tornado Path —

Brief Tornado •

Source: Rusty Kapela, National Weather Service

Wisconsin Tornadoes 2000

Intensities and Storm Tracks



Total = 18 **Average = 20**

Source: Rusty Kapela, National Weather Service

WINTER STORMS

Hazard Description: Winter storms can vary in size and strength and include heavy snowstorms, blizzards, freezing rain, sleet, ice storms and blowing and drifting snow conditions. Extremely cold temperatures accompanied by strong winds can result in wind chills that cause bodily injury such as frostbite and death.

Hazard Assessment: A variety of weather phenomena and conditions can occur during winter storms. For clarification, the following are National Weather Service approved 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.

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.

Wind chill - an apparent temperature that describes the combined effect of wind and low air temperatures on exposed skin.

Much of the snowfall in Wisconsin occurs in small amounts of between one and three inches per occurrence. Heavy snowfalls that produce at least eight to ten inches accumulation happen on the average only five times per season. The northwestern portion of Wisconsin receives most of its snow during early and late season storms, while southwestern and southeastern counties receive heavy snows more often in mid-winter. Snowfall in Wisconsin varies between the seasonal average of approximately 30 inches in the south central area of the state to over 100 inches a year in the extreme northwestern counties.

True blizzards are rare in Wisconsin. They are more likely to occur in northwestern Wisconsin than in southern portions of the state, even though heavy snowfalls are more frequent in the southeast. However, blizzard-like conditions often exist during heavy snowstorms when gusty winds cause the severe blowing and drifting of snow.

Both ice and sleet storms can occur at anytime throughout the winter season from October into April. Early and late season ice and sleet storms are generally restricted to northern Wisconsin, such as the November 7-8, 1943, and April 16-17, 1939, storms. Otherwise, the majority of these storms occur in southern Wisconsin. In a typical winter season there are 3-5 freezing rain events

and a major ice storm occurs on a frequency of about once every other year. If a half-inch of rain freezes on trees and utility wires, extensive damage can occur, especially if accompanied by high winds that compound the effects of the added weight of the ice. There are also between three and five instances of glazing (less than 1/4 inch of ice) throughout the state during a normal winter.

Winter storms present a serious threat to the health and safety of affected citizens and can result in significant damage to property. Heavy snow or accumulated ice can cause the structural collapse of buildings, down power lines or isolate people from assistance or services.

Historical Frequency and Significant Incidents: Generally, the winter storm season in Wisconsin runs from October through March. Severe winter weather has occurred, however, as early as September and as late as the latter half of April and into May in some locations in the state.

The first significant winter event of 2001 was an ice storm that left a ¼ inch of ice over large portions of Oneida and Forest Counties. In addition, several heavy snowfalls were recorded in northern Wisconsin in 2001. The first heavy snow of the year occurred February 24-25, covering Douglas County with 20 inches of snow. A November 26-28 storm left 12 to 20 inches in a band from Burnett to Vilas County. A series of lake-effect snowfalls from Lake Superior left accumulations of 1 to 4 feet from Douglas to Vilas County. However, southern Wisconsin and much of the state received far less than average snowfall during 2001 and winter temperatures were generally quite mild.

December 2000, in contrast, was one of the 10 coldest Decembers on record for most of the state. In addition to the low temperatures, record or near record snow depths of 15-34" occurred in much of southern Wisconsin during December. As a result of record snowfalls, thirteen counties received a Presidential Emergency Declaration and were eligible to receive federal funds for extraordinary expenses associated with clearing roads and emergency response efforts. The counties declared in the snow emergency were Columbia, Dane, Door, Green, Kenosha, Kewaunee, Manitowoc, Milwaukee, Racine, Rock, Sheboygan, Walworth and Waukesha Counties.

The winter of 1998-1999 was quite mild. However, a heavy snowfall occurred January 1-3, 1999. More than 10 inches fell in most southern counties with parts of Kenosha, Milwaukee, Ozaukee, Walworth, Washington and Waukesha Counties receiving more than 18 inches. The record for seasonal snowfall belongs to Hurley, WI. In the winter of 1996-97 over an 8-month period a total of 277.7 inches fell in Hurley. As that winter progressed, it became difficult to clear the streets of Hurley because there was no place to put the snow.

Other notably heavy snowfalls occurred in 1994 and 1991. In February 1994, 15 or more inches of snow were deposited in areas of Vernon, Juneau, Dane, Dodge and Columbia counties. In late November 1991, a snowstorm struck northwestern Wisconsin and left accumulations of 18-20 inches in Sawyer County and over ten inches of snow in Bayfield, Douglas, Burnett, Polk, St. Croix, Barron, Washburn, Ashland and Iron Counties. A heavy snowstorm the previous week dumped ten or more inches of snow in a diagonal band from Vernon, La Crosse and Buffalo Counties in the south to the northern counties of Iron, Vilas and Forest. Another storm during the period October 31-November 2, 1991, left large amounts of snow in northwest Wisconsin, with 35

inches in areas of Douglas County and over 30 inches of snow in Bayfield, Polk, St. Croix and Pierce Counties.

A statewide blizzard occurred December 2-4, 1990, depositing ten or more inches of snow across the central and southern portions of the state. Snowfalls of 22 inches were recorded in Juneau and Adams Counties, 20 inches in Marquette County, 19 inches in Dodge and Washington Counties and 17-18 inches in Columbia and Dane Counties. This excessive snowfall throughout such a large area of the state severely taxed capabilities to clear and remove snow.

Blizzard-like conditions occurred during the winter of 1981-82 when extremely cold temperatures were accompanied by wind speeds gusting to 50 mph. Wind chill factors reached 100 degrees below zero and severely affected the health and safety of those who ventured outdoors. Near blizzard conditions also existed in January 1979 when record snowfalls were recorded in many areas of the state and winds gusted to over 30 mph. Many persons were isolated from assistance and services as roads drifted shut and highway crews were unable to keep them open. Conditions were extremely hazardous in the City of Milwaukee and Racine County where a Presidential Emergency Declaration was obtained to assist in snow removal operations.

In March 1976 an ice storm of disastrous proportions occurred in the southern portion of the state. This storm was of such magnitude and caused so significant an amount of damage that a Presidential Disaster Declaration was obtained. This storm affected 22 counties, resulted in extensive power outages and caused over $50 million in damage.

Programs: Wisconsin Emergency Management, in conjunction with the National Weather Service, other state agencies and local emergency management organizations, provides awareness and preparedness information to the citizens of Wisconsin. This information is provided in three severe weather awareness campaigns conducted annually, each focusing on the prevalent weather hazard at that time. In November each year, Winter Awareness Week focuses on informing and educating people concerning the hazards presented by severe winter weather and information on preparedness for extreme weather conditions during winter.

In the event of severe winter weather, the National Weather Service posts winter weather bulletins. These bulletins consist of advisories, watches and warnings that are issued concerning expected winter weather conditions. Some are used to alert the public of situations such as *snow, winter weather, freezing rain or freezing drizzle* and *blowing snow advisories*. Others are used to warn the public of more serious weather situations which could pose a threat to life and property: *winter storm watch* and *winter storm, heavy snow, blizzard, ice storm* and *sleet warnings*. There are also bulletins that are not associated with precipitation, but are used to alert and warn like *freeze, wind* and *wind chill advisories* and *wind chill warnings*. These bulletins are disseminated over a number of telecommunication channels including the NOAA Weather Radio, the NOAA Weather Wire and the state law enforcement TIME system. These weather information sources are routinely monitored by local media, which rebroadcast the weather bulletins over public and private television and radio stations.

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APPENDIX C

HISTORY OF THE STATE'S FEDERAL DISASTER DECLARATIONS

This appendix will present a discussion of how Wisconsin's Hazard Mitigation Grant Program evolved in the course of the state's declared disaster history from 1991 to 2000.

FEMA-912-DR-WI

On August 6, 1991, the President declared a major disaster for the counties of Dane, Jefferson, Ozaukee, Washington and Waukesha as a result of high winds and severe storms that occurred July 7, 1991.

Severe storms in south central and southeastern Wisconsin on July 7 ranged from 60 to 80 miles per hour and hail as large as one inch in diameter fell in northeastern Dane County. Wind and hail caused crop damage and damage to farm buildings. In urban areas, trees were split and uprooted, damaging property and blocking streets as well as causing significant damages to private and public utility power lines. High winds also caused damage to 400 homes. A state owned hanger at the Dane County Regional Airport was completely destroyed damaging two state airplanes.

Total estimated damages for the disaster were $26.7 million. The costs incurred by government were estimated to be $3.7 million with individual property and agricultural losses at $23 million. The declaration was granted for Public Assistance only as the majority of the private sector damages were covered by insurance. The Public Assistance Program provided $3,283,562 to 79 community and county applicants. The Farmers Home Administration Emergency Loan Program also was made available to farmers who were affected by the storm.

The Hazard Mitigation Team Report prepared for FEMA-912-DR-WI identified mitigation opportunities in the following areas: 1) Use of local forestry program standards in the removal of damaged and hazardous trees and branches; 2) Identification and utilization of wind resistant building construction and repair standards, and the incorporation of mitigation provisions in local inspectors' training and certification programs; and 3) Provision of warning sirens. The issues raised remain concerns today and are being addressed by the State Hazard Mitigation Team through the planning process. Some require additional research and will require legislative action. Others will have opposition to implementation from various parties.

As a result of the declaration, the five counties were also eligible for the Section 404-Hazard Mitigation Grant Program (HMGP). HMGP funds available totaled $108,684 with the federal share representing 50% or $54,342, state share 25% or $27,171 with a local match of 25% or $27,171. Due to the small amount of funds available, the state had a difficult time in identifying an eligible project that would meet all of FEMA's program criteria and the funds remained unobligated for some time.

After the Midwest Flood in 1993, the state received a HMGP application from Jefferson County for acquisition and demolition of structures in the floodway on Blackhawk Island located in the Towns of Sumner and Koshkonong. Major floods occurred on the island in 1929, 1959, 1979 and 1993 with 1929 the worst recorded flood. Lesser flooding occurs almost annually, affecting many of the island's low to moderate-income level families and secondary residences. In 1993, the water came up to less than 10 inches from the all-time high and nearly every resident was evacuated for more than seven weeks. The repeated flooding caused structures on the island to show signs of disrepair. Septic systems and holding tanks were poor to substandard quality and presented an environment threat. In addition to the damages that occurred to the structures, there were continued expenses for the towns and county in emergency response and road repairs on the island.

As a result of the flooding in 1993, the county received grants from the Department of Administration (Community Development Block Grant in the amount of $500,000) and the Department of Natural Resources (Urban Rivers Grant Program in the amount of $611,000) for acquisition and demolition. To further the county's efforts, the state requested and FEMA approved a HMGP grant under 912-DR in the amount of $108,684 for Jefferson County. The funds were applied to the acquisition and demolition of three properties located on Blackhawk Island. The county received additional HMGP funds under declaration FEMA-994-DR-WI as well as the Flood Mitigation Assistance Program (FMA) to further their efforts of acquisition and demolition on Blackhawk Island. To date the county has acquired and demolished 30 structures utilizing the various funding sources. In addition, the county received a FMA Planning Grant to develop a comprehensive flood mitigation plan. There are about 60 structures remaining on the island. The acquisition and demolition of structures on Blackhawk Island remains a high priority with the county.

FEMA-959-DR-WI

On September 2, 1992, the President declared a major disaster for Waushara County for severe storms and tornadoes that occurred on August 29. During the evening of August 29, two tornadoes occurred. The first, an F1, occurred in Adams County and was on the ground for 4.5 miles. No injuries were reported and there was only minor damage. The second tornado ripped through Waushara County killing two individuals (one from a heart attack) and injuring 30 others. The tornado, rated F3 (158-206 mph) was on the ground for approximately 30 miles. The City of Wautoma sustained the heaviest damage with debris being a major concern.

The storms destroyed mobile homes, severely damaged a migrant worker camp and decimated thousands of trees. Forty-eight homes were destroyed, 95 received major damage, 289 received minor damage and 100 were affected to a lesser degree. Twenty-eight businesses were also damaged as well as many farm buildings. Two private, non-profit organizations were destroyed: One employed handicapped individuals and the other was a senior citizen center. On alternate weekends the senior citizen center hosted a Bingo Night. Fortunately, it was empty the night of the tornado

or there could have been up to 200 people in the center at the time the tornado struck. The number of deaths and injuries could have been much higher.

Debris was widespread in both urban and rural areas. There were massive tracts of downed timber posing a serious problem on both public and private lands. About 953 acres of commercial and state forested lands were critically affected. Waushara County is known as the Christmas tree capitol of the world. Christmas tree farms were severely impacted by this event. Metal debris from destroyed mobile homes was also a problem and was scattered throughout forests and agricultural fields.

The costs incurred by government were estimated to be $1.8 million with individual property and agricultural losses at $8.3 million. The estimated damages totaled $10.1 million. Disaster assistance through the Public Assistance Program was provided to 18 applicants and totaled $807,648. Assistance through the Individual and Family Grant program and through Crisis Counseling totaled $391,881. In addition, Disaster Housing Grants, Small Business Administration low-interest loans and unemployment assistance were provided. Waushara County and the contiguous counties of Adams, Green Lake, Marquette, Portage, Waupaca and Winnebago were eligible for physical and production loss loans through the Farmers Home Administration.

The Hazard Mitigation Team Report prepared for FEMA-959-DR-WI identified 12 mitigation recommendations in the following areas: Alert and Warning (3), Severe Weather Protection Shelters (1), Training and Education (3), Building Codes and Standards (4) and Economic Development (1). Several of the recommendations remain concerns today and are being addressed by the State Hazard Mitigation Team through the planning process for this document. Some require additional research and will require legislative action.

As a result of the declaration, the communities within the county were eligible for Section 404-Hazard Mitigation Grant Program funds. HMGP funds available totaled $38,868 with the federal share representing 50% or $19,434, a state share of 25% or $9,717 with a local match of 25% or $9,717. Waushara County applied for an HMGP grant for a weather information system that would create a forecasting system for all hazards that would greatly enhance the ability of local responders to preplan their responses based on past, current and predictable future weather conditions. This application was related to mitigation recommendation 3 of the Hazard Mitigation Team Report.

FEMA denied the application stating that the proposal was considered an enhancement to the county's preparedness capability and was not mitigation. They further referred to FEMA's policy dated February 7, 1992, regarding the funding of warning systems and other similar equipment. The policy states that HMGP cannot fund the purchase of warning systems, enhanced computer hardware and similar equipment. However, 44 CFR Section 206.434, states that "development or improvement of warning systems" are eligible under HMGP. The state submitted a formal appeal to the decision on behalf of the county and was denied. Working with FEMA and this office, the county submitted

another application for the development and implementation of a geographic information system (GIS) application that received approval. The project consisted of verifying digitized floodplain maps, using a global positioning system (GPS) to identify the location of structures in the 100-year floodplain of the Pine River, determine the lowest adjacent and first floor elevations and incorporate the information into the county's GIS system. The information would be used in emergency situations and for mitigation planning efforts. The project covered 12.7 miles of the Pine River and involved investigation of 124 structures. In addition to the HMGP awarded to the county, a basement was constructed in the rebuilding of the senior center to be used as a community shelter utilizing Section 406 funds.

FEMA-963-DR-WI

On September 18, 1992, the President declared a major disaster for Dane County as a result of severe storms and tornadoes that occurred on June 17. The Governor had requested a disaster declaration for Dane County on June 22, but was denied on the basis that the majority of damage occurred to insured structures. An appeal submitted on July 27 cited the tremendous burden already placed on the state by the numerous natural disasters that had already taken place during the year. Subsequently the President granted a disaster declaration for Public Assistance and Hazard Mitigation.

On June 17, 1992, a tornado touched down in southern Dane County just ten miles south of Madison. The F3 tornado touched down in the City of Fitchburg at the State of Wisconsin Oakhill Correctional Institute causing heavy to total destruction of the various buildings and equipment. More than 12 buildings at the prison farm were totally destroyed and two others sustained a 50% loss. Total damages, including inventory, livestock and machinery/equipment were set at more than $5.2 million. The tornado continued to travel northeast, destroying businesses and residences in its path. The storm damaged almost 200 homes, including 48 that were totally destroyed. The majority of homes destroyed and damaged were located in the Waubesa Heights subdivision within the Town of Dunn. Other private sector damages included damages to barns, outbuildings and sheds. Debris removal was also a concern.

Between 20 and 30 persons were injured, but fortunately there were no deaths. Contemplating the magnitude of the storm, it is significant that there were few injuries and no deaths. This was attributed to the fact that the storm occurred during the day and that there was adequate warning.

The costs incurred by government were estimated at $5.4 million with damages to individual property and agricultural losses at $9 million for total estimated damages of $14.4 million. Disaster assistance through the Public Assistance Program was provided to 12 applicants and totaled $2,600,142.

The Hazard Mitigation Survey Team Report prepared for FEMA-963-DR-WI identified 4 recommendations. Again, one of the recommendations dealt with building codes and standards similar to those identified in the previous report for FEMA-959-DR-WI. Several of the recommendations remain concerns today and are being addressed by

the State Hazard Mitigation Team through the planning process for this document. Some require additional research and will require legislative action. Others have opposition from various parties to implementation.

As a result of the declaration, the communities within the county were eligible for Section 404-Hazard Mitigation Grant Program funds. HMGP funds available totaled $376,374 with the federal share representing 50% or $188,187, a state share of 25% or $94,093.50 with a local match of 25% or $94,093.50. The state received 12 pre-applications from six communities totaling $836,405. Grants were awarded to the City of Sun Prairie and the Villages of Cross Plains and Deforest. The City of Sun Prairie received HMGP funds in the amount of $137,340. Fifty percent or $68,670 represented the federal share with the state providing 25% or $34,335. The city provided the remaining 25% plus additional funds in the amount of $91,021. The City of Sun Prairie received an initial grant for the development of a stormwater management plan. A subsequent award was then granted to implement one of the recommendations identified in the stormwater management plan. The Village of Cross Plains received a grant in the amount of $37,000 ($18,500 federal share, $9,250 state and local shares) for a clearwater infiltration abatement project. Finally, the Village of Deforest received a grant in the amount of $202,034 ($101,017 federal share, $50,508.50 state and local shares) for the development of a detention basin. In addition to HMGP, funds for construction of the basin were provided through a Community Development Block Grant in the amount of $200,049. Both the City of Sun Prairie and the Village of Deforest reported that these projects reduced damages during the flooding that occurred in May-June 2000. It is also worth mentioning that the City of Sun Prairie completed an all-hazards mitigation plan subsequent to receiving mitigation funds.

FEMA-964-DR-WI

On September 30, 1992, the President declared a major disaster for severe storms and flooding that occurred between September 14-24. This was the third federal disaster declaration granted for the state in less than two months. The declaration made Buffalo, Crawford, Jackson, Juneau, Pepin, Pierce, Richland, Sauk, Trempealeau and Vernon Counties eligible for Public and Individual Assistance as well as the Hazard Mitigation Grant Program.

The majority of the rain fell between September 14 and 18 with the heaviest rainfall occurring on the 16th. Precipitation reports showed a wide area across the central portion of the state received rainfall greater than 4 inches. Two areas recorded rainfall greater than 7 inches, one located in upper Buffalo and Trempealeau Counties and the other near Hillsboro just east of the Kickapoo Valley. Within these areas, there were isolated reports of 9 to 13 inches. A few farmers in the LaValle-Hillsboro region reported three-day amounts of 14-17 inches. Four rivers, the Pine River in Richland County, the Trempealeau River in Trempealeau County, the Baraboo River in Sauk County and the Kickapoo River in Crawford and Vernon Counties rose quickly. Many of the rivers crested at record levels, and some equaled or exceeded the 100-year flood elevation. Arcadia, Richland Center, Rock Springs, Viola and Gays Mills were evacuated as flood waters inundated or surrounded residences. The flooding forced

early closure of Farm Progress Days, which was a serious blow to the economy of the region.

Dozens of state, county and local roads were closed when swollen rivers and run-off flooded them. Numerous bridges were damaged or destroyed. A levee in Arcadia was greatly stressed and in danger of breaching. The Wisconsin National Guard assisted emergency officials and volunteers with sandbagging efforts. There was considerable damage in the City of Richland Center. Approximately 120 buildings were flooded. Due to previous mitigation, 50 to 70 residences were protected and suffered no damage. Damage assessment indicated that 19 homes received major damage, 174 minor and 132 were affected to a lesser degree.

The damages to and costs incurred by government were estimated at $1.9 million with damages to individual property and agricultural losses at almost $16 million for total estimated damages of $17.9 million. Disaster assistance through the Public Assistance Program was provided to 145 applicants in the amount of $2,821,355. Individual assistance was provided through the Individual and Family Grant Program in the amount of $126,402. In addition, Disaster Housing Grants and Small Business Administration low-interest loans provided assistance.

The Interagency Hazard Mitigation Team Report for FEMA-964-DR-WI identified 9 mitigation recommendations in the following areas: Flood Planning (2), Stream Maintenance (1) and Alert and Warning (6) as well as 19 site specific recommendations.

As a result of the declaration, the communities within the ten counties were eligible for Section 404-Hazard Mitigation Grant Program funds. HMGP funds available totaled $391,074 with the federal share representing 50% or $195,537, state share 25% or $97,768 with a local match of 25% or $97,768. The state received 25 pre-applications totaling $1,732,163. Based on a review of the submitted pre-applications, 8 applicants were asked to participate in the formal application process. Grants were awarded to the Cities of Blair (Trempealeau County) and Black River Falls (Jackson County). The City of Blair was approved for a HMGP grant in the amount of $109,144 for a dam improvement project on Lake Henry. Fifty percent or $54,572 represented the federal share, with the state and city providing 25% each in the amount of $27,286. In addition, the city received a Community Development Block Grant in the amount of $109,173, and a grant from the Department of Natural Resources in the amount of $43,460 for this project. The City of Black River Falls was awarded a grant in the amount of $281,930 for constructing storm sewers to alleviate flooding problems. The federal share represented 50% or $140,965 with the state and local shares of 25% or $70,482 each. In addition, the city also received a Community Development Block Grant in the amount of $43,971 to complete this project.

FEMA-994-DR-WI

Wisconsin experienced above normal precipitation across much of Wisconsin during April and May of 1993. Initially this began with prolonged periods of rain and heavy late

season snowfalls, then as showers and thunderstorms. In early June, a weather pattern developed that was characterized by a strong low-pressure system over the western United States and a large high-pressure system in the southeast. The jetstream dipped south in the western states and flowed northeasterly across the upper Midwest. The southeastern high blocked the eastward movement of storms, thus creating a convergence zone between the warm, moist flow from the Gulf of Mexico and the much cooler and drier air from Canada, which resulted in thunderstorms. As a result, the upper Midwest within this zone was deluged with rain through most of June and July. The persistence of this weather pattern caused unusually large amounts of rain to fall over the upper Midwest. These large accumulations and the wetter-than-usual spring produced flooding throughout the upper Mississippi River basin. Cumulative totals of 20-40 inches for the first seven months of the year were typical; putting totals 150-200% above normal.

This event would become known as the Great Midwest Flood, with nine states including Wisconsin declared a federal disaster area. The magnitude of the Great Midwest Flood to people, property, business, agriculture, tourism, and the environment, was unmatched by any other flood in the history of the country. Damages exceeded $12 billion with $747 million in Wisconsin. The Mississippi and Missouri Rivers would be closed to shipping and millions of acres of farmland were severely impacted.

The state incurred $800 million in agricultural-related damages. Cool, wet weather in 1992 combined with over $125 million in winterkill losses and a very wet spring made this one of the most disastrous periods in the state agricultural history. It was estimated that 804,800 acres of farmland suffered severe erosion due to the flooding. It would cost $11 million to implement all the land treatment practices needed to correct erosion damage. At least 4,700 homes were damaged and 2,500 people evacuated. Private business losses exceeded $31 million, most of it related to business shutdowns and damages to goods and supplies. Public damages reached $43.6 million. The state lost millions in tourism revenue and incurred costs for additional staff for public health services, unemployment claims for displaced workers and extensive use of National Guard and Conservation Corps services.

In Wisconsin, the disaster started with one of its wettest and most stormy months of June in memory. The first bout of severe weather occurred on June 7 and 8 when heavy rains and severe thunderstorms developed in the southern two-thirds of the state. The most damaging weather occurred in east central Wisconsin where tornadoes ripped through Green Lake and surrounding communities. Statewide the rains continued and were followed by an outbreak of tornadoes that occurred on June 17. That storm affected a band of counties extending from Grant County northeastward to central and east central counties. In addition to the damages caused by the high winds and tornadoes, rainfall of two to seven inches throughout the southern and western part of the state caused even greater problems on rivers and streams that were bank-full and soils that were still saturated from spring snowmelt and record precipitation during the month of May. Flooding occurred along the following rivers and tributaries: Black, Buffalo, Chippewa, Eau Claire, Fox, Kickapoo, Trempealeau, Wolf, Wisconsin and

Mississippi. The National Weather Service issued flood watches and warnings almost continuously. Several dams and levees failed, hundreds were evacuated and hundreds of millions of dollars in damages resulted.

Evacuations occurred in Jackson, Columbia, Trempealeau, Adams and several other counties as rivers made islands of residential and business areas. Both individual and municipal water supplies were contaminated along with collapsed mound and/or septic systems.

Significant structural damage to residences occurred in the Grove subdivision in the City of Black River Falls when the levee along the Black River failed. Approximately 90 structures were substantially damaged. The municipal sewer and water systems were also severely damaged. The city with a population of 3,500 received $45 million in damages. Damages to utilities were estimated at $6.5 million.

Over 250 members of the Wisconsin National Guard were on duty in the City of Black River Falls beginning on June 20. They assisted with flood fighting efforts, security and evacuation. On June 28 another 25 Guard members were activated to assist in sandbagging operations in the City of Prairie du Chien in Crawford County. Guard members and/or equipment such as water buffaloes and tankers were also used in numerous other communities. Guard helicopters assisted with overflights in assessing the severity of the situation throughout the area. Hundreds of volunteers also assisted in sandbagging efforts in the most critical areas around the state.

Literally hundreds of state, county and town roads were closed when swollen rivers and runoff flooded them. Local police, fire, public works and emergency management officials worked around the clock for more than a week monitoring dams and levees and taking emergency protective actions.

The preliminary damage assessment identified almost 1,600 homes that were affected by the flooding. In addition, emergency protective measures and damage to roads and bridges were confirmed at nearly $5 million.

On June 29 the Governor requested federal disaster assistance for 30 counties. Initial damage assessment figures compiled by the county emergency management offices indicated that disaster-related costs were $30 million in private damage, $20 million in public damages and $124 million in agricultural losses for a total in excess of $174 million.

On July 2,1993, the President declared a major disaster for 17 of the 30 counties as a result of flash flooding, heavy rains, severe storms and tornadoes that began on June 7. The counties included in the declaration included Calumet, Clark, Eau Claire, Green Lake, Jackson, Marquette and Trempealeau for both Public and Individual Assistance, and the Counties of Columbia, Dunn, Fond du Lac, Outagamie, Portage, Sauk, Waupaca, Waushara, Winnebago and Wood for Individual Assistance only.

Subsequent rainfalls in late June and July again caused serious damages this time in the basins of the Pecatonica and Yahara Rivers. An extreme example of localized flooding occurred on July 17-18 as a flash flood at the Baraboo River and Devils Lake. Over 12 inches of rain fell in a three-hour time period and exceeded the 100-year precipitation event by 3.6 inches. The flash flood washed away cars, roads, bridges and buildings, and resulted in the death of a twelve-year old when the car he was riding in was overturned and he was carried downstream. The Baraboo River rose ten feet in five hours, 6.75 feet above flood stage. Three of the City of Baraboo's wells were disabled, numerous highways closed and more than 2,300 campers evacuated. There was three to five feet of standing water throughout Baraboo. Damage to a major industry in the city was estimated at $1.5 million. Devils Lake State Park incurred significant damages and was closed for the first time in its history.

Working together, the Wisconsin National Guard, Wisconsin Conservation Corps and the Department of Corrections provided over 1,110 personnel for 4,340 man-days along with 125 vehicles and heavy equipment for over 10,770 hours in assisting on 62 projects in 14 counties.

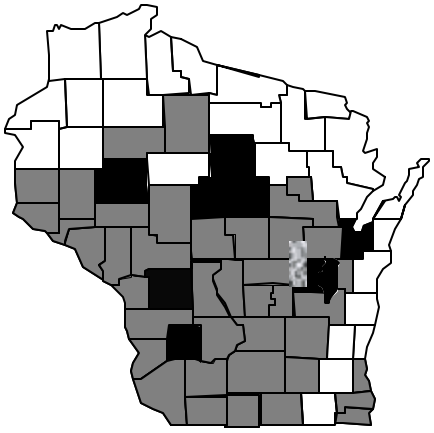
By August, the stalled weather pattern began to revert to more normal conditions. Finally, floodwaters receded around the state with the exception of the lower Rock River (Some of the above information was provided from the report on "The Floods of 1993: The Wisconsin Experience," prepared by the Wisconsin Department of Natural Resources).

On July 30, the Governor requested that FEMA waive the 25% state and local match for the Public Assistance Program, the 50% state and local match for the Hazard Mitigation Grant Program and the 25% state match for the Individual and Family Grant Program because of the duration, magnitude and severity of the 1993 flood disaster. Damages had been estimated at $175 million in total disaster-related costs in the Governor's initial request for disaster assistance June 29. Disaster losses were now estimated at $47 million in public and $700 million in private losses for a total of $747 million, with that amount increasing with each passing day. It would take the state years to recover. This disaster was unlike any the state had ever experienced. The request to waive the match requirements for the HMGP and IFGP were denied as the cost sharing requirements for both programs are set by law, therefore, they could not be adjusted. However, eventually FEMA increased the federal cost share for the Public Assistance Program for the nine states impacted by the Midwest Floods to 90% requiring only a 10% state and local match. This not only increased the amount of federal funding for eligible applicants of the Public Assistance Program, but also increased the amount of HMGP funds that would be available since the funding allocation was based on 10% of the amount of federal funds approved in the Public Assistance Program.

By the end of summer, 47 counties would be included in the declaration and made eligible for federal disaster assistance. Forty counties were declared for both Public and Individual Assistance, while another seven were eligible for Individual Assistance only.

All 47 counties were eligible for the Hazard Mitigation Grant Program. The incident period extended from June 7 to August 25.

Disaster Declaration
FEMA DR 994



Individual & Public Assistance
Adams, Buffalo, Calumet, Clark, Columbia, Crawford, Dane, Dodge, Dunn, Eau Claire, Fond du Lac, Grant, Green, Green Lake, Iowa, Jackson, Jefferson, Juneau, Kenosha, La Crosse, Lafayette, Marquette, Menominee, Milwaukee, Outagamie, Pepin, Pierce, Portage, Price, Racine, Rock, Rusk, Sauk, Shawano, St. Croix, Trempealeau, Vernon, Waupaca, Waushara, and Wood.

Individual Assistance Only
Brown, Chippewa, Lincoln, Marathon, Monroe, Richland, and Winnebago.

The Interagency Hazard Mitigation Team Report for FEMA-994-DR-WI dated July 23, 1993, identified 36 mitigation recommendations for 42 of the 47 counties in the following categories: Alerts and Warning (3), Education (7), Flood Planning (2), River/Stream Maintenance (1), site specific recommendations (21) and Technical Assistance (2).

Due to the magnitude of the Great Midwest Flood, on August 6, Congress approved HR 2667, a bill to provide $5.3 billion in supplemental disaster appropriations to federal agencies to assist state and local governments respond and recover from the widespread flooding. Eleven federal agencies would receive supplemental funds from this bill. FEMA received $2 billion. In addition, $200 million was awarded to the Department of Housing and Urban Development for Community Development Block Grants and $200 million to the Economic Development Administration for economic recovery and public works grants. These programs in particular would play an important role in the state's recovery from the devastating floods.

To ensure that the flood recovery would be rapid and well coordinated among the various agencies responsible for implementing recovery programs, a meeting was held with federal and state agencies on August 18 in conjunction with the Annual Governor's Conference on Emergency Management. Eighteen federal and state agencies were represented at the meeting. State agencies were required to provide weekly updates to WEM regarding status of the various recovery activities. Reports were consolidated and forwarded to the Governor's Office. WEM was the primary coordinating agency with FEMA.

On August 26 and 27, the Midwest Flood Disaster Workshop was held in Des Moines, Iowa to provide a forum for federal, state and local officials to discuss the short and long term needs and to begin to develop flood recovery plans. Representatives from WEM and the Department of Administration attended this workshop. The goals of the session were to:

- Devise a relief system to deliver the highest level of assistance and service to the maximum number of victims;
- Provide a quick response to the questions and technical needs of the providers of housing relief services; and
- Assess federal programs in light of the current situation.

To coordinate recovery efforts at the state level, FEMA and WEM conducted a meeting with various federal and state agencies and Regional Planning Commissions on September 19 to discuss a strategy for dealing with mitigation and long-term recovery. At the meeting it was determined that a core group of agencies would meet on a weekly basis to act as a clearinghouse for communities proposing long-term recovery projects. Other agencies were brought into the process as needed. The core group consisted of FEMA, WEM, the Economic Development Administration, the Department of Natural Resources, the Department of Administration, the Department of Development (Commerce) and the State Historical Society. The Farmers Home Administration, Natural Resources Conservation Service and the State Departments of Transportation and Industry, Labor and Human Relations (Workforce Development) would later join the group. The group would become known as the Wisconsin Interagency Disaster Recovery Group (IDRG) which continues to meet today in response to disaster declarations. The IDRG identified as its mission: "To develop a cooperative federal and state disaster recovery effort that can assist communities and regional agencies in utilizing all available funding sources to recovery from and mitigate the future effects associated with the damages from natural hazards." The objectives of the IDRG to achieve the mission were to:

- Serve as a clearing house for tracking and status reporting of disaster recovery project applications;
- Encourage and assist funding submissions from communities for recovery and hazard mitigation projects;
- Assure full utilization of all available and applicable funding sources for recovery and mitigation projects;
- Encourage the enhancement of recovery projects with hazard mitigation measures; and
- Assist in the avoidance of funding duplication for recovery and mitigation efforts.

Significant to the state's recovery was FEMA's establishment of the Wisconsin Interagency Hazard Mitigation Recovery Office (WIHRO). This office was set up in WEM headquarters and was staffed with a full-time FEMA staff person who worked closely with WEM staff and supported the efforts of the core group. Projects submitted to the core group were entered into a database developed and maintained by the WIHRO. The database acted as a central source of information and provided the status on all projects submitted to the agencies. The WIHRO staff grew to two and continued to be staffed until 1996. It played a vital role in implementing mitigation projects within the state.

The Regional Planning Commissions (RPCs) in Wisconsin played an integral part in the recovery process. The Economic Development Administration funded Flood Recovery Coordinators in the RPCs to assist communities in developing grant applications for the various funding sources available, and to prepare Regional Flood Recovery Plans. In addition, FEMA provided technical assistance funds to supplement EDA's efforts with the RPCs. The RPCs worked with communities and agencies to clarify and/or obtain additional information on specific projects.

FEMA's priority was to fund projects that reduced future disaster losses through acquisition or relocation of properties most prone to flood damages. Although many other types of projects were funded through the various agencies on the IDRG, the group's priority also became acquisition, demolition, relocation and floodproofing of flood damaged property.

The Great Midwest Flood was a turning point for mitigation and in particular the Hazard Mitigation Grant Program. On December 3, 1993, the President signed the Hazard Mitigation and Relocation Assistance Act. This significantly increased funding in the HMGP in two ways. First, it increased the amount of funding for grants from 50% federal share to 75%. Second, allocation funding was increased from 10% of the federal share of the funds spent in the Public Assistance Program to 15% of the total estimated federal grant assistance provided under the Stafford Act (i.e., Individual and Public Assistance Programs). This would raise the amount of HMGP funds available in this declaration from an estimate of $2 million to over $14 million.

The database developed by WIHRO included 136 projects totaling $70 million that were reviewed by the IDRG. WEM received over 90 pre-applications for HMGP totaling $30 million. To assist the communities in their recovery efforts, the IDRG packaged several funding sources so that the community did not have to fund the required local match. The required local match was provided with CDBG funds through the Departments of Development (Commerce) and Administration. Following the priorities of the IDRG, HMGP grants were awarded to the following communities:

HMGP Participants for FEMA 994-DR

APPLICANT	COUNTY	AMOUNT
Darlington, City of	Lafayette	$4,175,790
Eau Claire, City of	Eau Claire	$2,152,831
Eau Claire County	Eau Claire	$1,217,227
Jefferson County	Jefferson	$ 458,635
Pierce County	Pierce	$6,000,000
TOTAL		**$14,004,483**

This was the first declaration that acquisition/demolition and floodproofing projects were implemented utilizing HMGP funds, and it was not an easy task. The WEM had no prior experience with these types of projects, therefore, policies and procedures had to be established. In addition, several of the projects particularly in the City of Darlington had significant issues that had to be resolved prior to funding and implementation. This

included issues involving relocation assistance per state law, environmental contamination, floodplain management compliance, historical and ADA (Americans with Disabilities Act) requirements. With the persistence, patience and coordination of the agencies involved and the applicants, these "roadblocks" were eventually overcome and the projects proceeded. As a result, 179 properties were mitigated; 156 properties (12 commercial) acquired and demolished and another 23 properties (21 commercial most of which were historic) floodproofed. Additional properties were mitigated utilizing CDBG funds provided through the Department of Administration. Through the Department of Commerce, CDBG funds were provided to many communities to implement mitigation measures to repair and reconstruct public facilities.

As stated previously, on June 20 an earthen levee that protected a portion of the City of Black River Falls referred to as the Grove subdivision failed. Floodwaters reached the ceiling of the first floor of many structures causing significant damage. As a result of the levee failure, the city received funds to reconstruct the levee to current standards for adequate protection in future events. Funds in the amount of $2,014,625 were provided in Section 406 mitigation funding through the Public Assistance Program to reconstruct the levee south of Highway 54 in the residential area referred to as the Grove. Additional funds from the Economic Development Administration and the State Department of Commerce (CDBG) provided for the construction of the levee north of Highway 54 protecting the downtown business area. The excellent cooperation and coordination among the state and federal agencies made this project possible.

The City of Darlington's mitigation program is a prime example of what can be achieved by long-term planning and cooperation of city officials, local business owners and concerned citizens as well as federal and state agencies. In the last 50 years, four major flood events occurred on the Pecatonica River causing substantial damage to homes and businesses, most recently in 1990 and 1993. After the 1990 flood, attention focused on alternatives to prevent future damage such as relocation, floodproofing and elevating structures. The city had developed a Master Plan in 1984. After the 1990 flood, the city updated the Master Plan to include flood mitigation strategies. The city completed a comprehensive flood mitigation plan with a grant provided by FEMA through WEM. Goals of both plans were to implement an extensive flood mitigation effort that would include historic preservation, economic development, downtown revitalization, recreation and tourism. The revised Darlington Master Plan was barely a year old and the Darlington Flood Mitigation Plan was in draft when the 1993 flood hit the city. The flood provided the impetus and a sense of urgency to finalize the flood mitigation plan.

Repeated flooding over time led to deterioration of many of the downtown buildings. City officials, citizens and business owners determined that they could no longer sit by and let nature decide the future of their community. The city finalized the Flood Mitigation Plan that included not only floodproofing residential properties and acquisition and demolition of commercial floodplain properties (some with contamination), but also a downtown rehabilitation and mitigation project. Instead of moving the downtown businesses, the project included in-place floodproofing and rehabilitation of buildings.

The city was the first community in the state to have a FEMA-approved mitigation plan. The first step was to inventory and collect survey data for structures in the floodplain. The Corps of Engineers, Natural Resources Conservation Service and WDNR all worked together to provide the flood data needed to estimate flood damages for the economic analysis. Next, the State Historical Society nominated Darlington's historic Main Street Central Business District to the National Register of Historic Places. The District includes 51 buildings within a six-block area. Next, a study was completed to identify flood mitigation measures for 41 buildings.

The approach taken in Darlington is characterized as innovative and unique. The approach in Darlington was to find a way for the government agencies, building and business owners and the city to arrive at a consensus on how to accomplish four major objectives: 1) preserve the historic downtown business district; 2) restore the downtown economic base; 3) develop an urban river open space park and recreation area; and 4) eliminate or substantially reduce flood damage in the future. With the assistance of many federal and state agencies the following mitigation measures were implemented:

- 12 commercial buildings were acquired and demolished adjacent to the river and the land used for riverfront park and recreation area. A 33-acre parcel on higher ground was developed as a business park for the relocated businesses;
- 52 residential structures were mitigated with some structures elevated and others had floodwalls constructed where raising the structure was not possible;
- 6 downtown businesses that could not be floodproofed or elevated were afforded as much flood protection as possible by raising or floodproofing building mechanics, electrical and plumbing;
- 13 historic downtown buildings were refurbished and floodproofed while maintaining their historic character; and
- A new wastewater treatment plant was constructed outside of the floodplain.

Benefits resulting from implementation of the mitigation recommendations are the significant reduction of future flood damages, quicker recovery following floods, capital improvements, economic development and revitalization of the downtown business community.

The city worked continuously and aggressively to implement their mitigation program. The city applied for and received over $10 million in various state and federal grants and loans to accomplish their goals. As a result of their efforts, the city has reduced the number of repetitive loss properties in the city from 11 to 2 (one rejected a mitigation offer). The city was honored with a State Historical Society of Wisconsin Historic Preservation Achievement Award on May 9, 1998, and the architectural and engineering firm hired for the downtown floodproofing project received a state award for special categories through the Association of Building Contractors. The city continues to pursue funding to further their mitigation efforts. They have received additional grants to acquire and demolish a repetitive loss property and would like to relocate the fire department outside of the floodplain. The City of Darlington is an example of what a small community can do with long-term planning and determination.

Another significant result of the declaration was that mitigation would take a more important role in emergency management. WEM created a position and hired a full-time hazard mitigation officer in August of 1994.

As a result of the declaration, almost $300 million in disaster relief was provided through the various state and federal programs. More than 4,500 individuals received disaster assistance through the FEMA programs making it the largest Individual Assistance Program in the state up to that point in time. More than 600 state and local governments and non-profits received disaster assistance through the Public Assistance Program. To date, this disaster generated the most funding for the state's Public Assistance and Hazard Mitigation Grant Programs.

Sources of Federal Assistance for FEMA 994-DR

PROGRAM	AMOUNT
Agricultural Programs	$230,742,262
SBA Disaster Loan Program (individuals and businesses)	$ 10,394,929
Disaster Housing Grants	$ 3,944,158
Individual and Family Grant	$ 1,492,267
Public Assistance Program	$ 22,297,456
Hazard Mitigation Grant Program	$ 14,427,340
Community Development Block Grants	$ 5,008,911
Community Services Grants	$ 1,525,000
Federal Highway Administration	$ 1,019,309

FEMA-1131-DR-WI

On August 2, 1996, the President declared a major disaster for Fond du Lac and Green Counties as a result of tornadoes and flooding that occurred on July 17 and 18. The Governor requested both Public and Individual Assistance. However, the declaration was granted for Public Assistance only, as the majority of private sector damages were covered by insurance. Hazard Mitigation was also granted as part of the declaration. The Governor appealed the decision for Individual Assistance that again was denied. However, Green County was declared eligible for low-interest loans from the Small Business Administration.

In 1996 following a wet spring, a weather front stalled over southern Wisconsin and northern Illinois. This front produced torrential record rains along the state border on the evening of July 17 with Green County receiving eleven inches of rain in five hours. The heavy rain caused riverine flooding, flash flooding and sewer backup. Dozens of roads were damaged with many bridges destroyed.

The stalled weather system also generated a line of severe thunderstorms that moved through east central Wisconsin during the late afternoon and evening on July 18. Shortly after 7 p.m., a tornado touched down in the Village of Oakfield and the Towns of Oakfield and Byron in Fond du Lac County. The twister was classified as an F5 storm and left a path of destruction about one quarter mile wide and 15 miles long. There

were nineteen injuries and more than 360 homes and businesses damaged or destroyed. Destroyed were two churches, a private school, a middle school and a major business. Thousands of trees were uprooted as well.

The costs and losses incurred by government were estimated to be $11.4 million with damages to individual property and agricultural losses at $49.7 million for a total estimated damages of $61.1 million. Disaster assistance through the Public Assistance Program was provided to 33 communities and totaled $2,140,156.

The Hazard Mitigation Early Implementation Strategy Report dated August 14, 1996 outlined a four-phase approach for identifying and implementing appropriate mitigation strategies. The first phase was to reconvene the Wisconsin Interagency Disaster Recovery Group (IDRG) to assist the local governments during the recovery phase. This was done to provide technical assistance when possible; prevent duplication of efforts and funding; identify and prioritize mitigation measures and projects; and identify funding options for implementing mitigation measures whether through the individual agencies or by "packaging" various funding programs. Phase II included conducting briefings/meetings with local officials. This was done to discuss mitigation and various options available, introduce local officials to mitigation planning, and make them aware of potential funding programs. Phase III was to solicit pre-applications for the Hazard Mitigation Grant Program. Phase IV entailed a thorough review of the pre-applications submitted and selecting those projects for the HMGP formal application process.

In administering the declaration, greater effort was made to fund Section 406 mitigation opportunities through the Public Assistance Program. To further this effort, a federal mitigation staff person was assigned to be a liaison with Public Assistance (Infrastructure) staff and provide technical support. This liaison reviewed Damage Survey Reports (DSRs) for mitigation opportunities and provided the required benefit-cost analysis for the 406 mitigation projects.

A Recovery Information Center opened for one day in the Village of Oakfield and two Construction Information Workshops were held designed to inform local homeowners and building professionals of wind resistant construction practices. A document, Building to Resist Strong Winds, was developed by the mitigation staff and distributed at the workshops. In addition, a display demonstrating connectors along with catalogs and installation guides were provided. It was estimated that 35 to 40 homeowners and 10 building professionals attended the workshops.

As a result of the declaration, the communities within Fond du Lac and Green Counties were eligible for the Section 404-Hazard Mitigation Grant Program funds. HMGP funds available totaled $344,527 with the federal share representing 75% or $258,395, a state share of 12.5% or $43,066 with a local match of the same amount. The state received eight pre-applications (three from Fond du Lac County and five from Green County) totaling $1,070,729. Grants were awarded to the City of Monroe and the Village of Oakfield. The City of Monroe received HMGP funds in the amount of $142,311 ($106,733 federal, $17,789 state and local shares) for the construction of a detention

pond. Another grant was awarded to the Oakfield School District in the amount of $202,216 ($151,662 federal and $25,277 state share).

The Oakfield Middle School was destroyed in the tornado that struck the community on July 18. If school had been in session at the time of the tornado, there may have been many injuries and possibly deaths. The School District had the foresight to apply for HMGP funds to harden the new facility by strengthening and reinforcing the walls. Funds were provided to construct the interior and exterior bearing walls with reinforced masonry; construct the roof system with precast flat slabs on the low room areas; upper roof over the gymnasium/stage area was precast double trees; with the complete roof system tied into the masonry bearing walls with reinforcing steel and welded plate inserts. The hardened facility will not only reduce future damages, but will also provide protection to the students, faculty and others in the community during severe weather. The increased cost of construction over the original design was $233,000. The cost for the added protection was relatively small compared to the benefits that cannot be measured. This was the first time the state funded this type of project with HMGP funds.

FEMA-1180-DR-WI

On July 7, 1997, the President declared a Major Disaster for Milwaukee, Ozaukee, Washington and Waukesha Counties as a result of flooding that occurred on June 21-23. The declaration was granted for both Public and Individual Assistance as well as Hazard Mitigation.

During the night of June 20 and the morning of June 21, 1997, a storm system passed through the southeastern portion of Wisconsin in the area of Ozaukee, Milwaukee, Washington and Waukesha Counties. This storm system generated torrential rains throughout this four-county area with rainfall ranging from five to nearly ten inches in a thirty-hour period beginning at 6:00 AM on Friday, June 20 and ending on June 21 at noon. Information from the “Rainfall Frequency Atlas of the Midwest” indicated that this was greater than a 100-year rainfall for this area. The most intense rainfall was centered in northern Milwaukee County and covered a 13 mile-wide, 18 mile-long band which included the extreme southern portion of Ozaukee County, southeastern Washington County and northeastern Waukesha County.

Between 3:00 and 11:00 AM on June 21, Flash Flood and Flood Warnings were issued for portions of the four counties. The Milwaukee County EOC set up a flood information hotline which received over 900 calls between Saturday morning and the following Monday (June 23).

The flooding was made worse by existing high-moisture conditions. Prior to the flooding rains, moderate rainfall amounts of from 1.5 to 2.0 inches were reported across the region in a 24-hour period on June 15-16. This earlier rain saturated the area soils. When the intense rainfalls of June 20-21 occurred, the ability of the soil to absorb rainfall was reduced and the amount of runoff was increased.

The torrential rain coupled with heavy urban runoff caused the drainage ditches, sewer systems, creeks and rivers to rise rapidly. Most of the larger rivers in the area reached and surpassed flood stage by midmorning on June 21. The Milwaukee, Menomonee, Fox and Sheboygan Rivers and Lincoln and Oak Creeks reported flooding levels during the morning. With the storm sewer system overloaded, sanitary sewers began to back up into residences throughout the area. Areas with significant damage included Mequon and Thiensville in Ozaukee County, Germantown in Washington County, New Berlin, Brookfield, Menomonee Falls and Sussex in Waukesha County and Brown Deer, Glendale and Wauwatosa in Milwaukee County. The Piggsville and Lincoln Creek areas in the City of Milwaukee were among the hardest hit. Milwaukee County received extensive damages to its parks and golf courses.

Thousands of homes were damaged due to overland flooding, stormwater drainage problems and sanitary sewer backups. Water was filling basements and in some cases reaching the first floor of the house. Hundreds of businesses along waterways and drainage creeks sustained damages and had to close for some time. Several roads were closed and electricity was lost as the storms passed through the area.

Initial damage assessments reported $71 million in damage to private property and $17 million to public property for a total of $87 million. As a result of the declaration, $6,506,485 was provided through the Public Assistance Program to 58 communities, state agencies and eligible private non-profit organizations. More than 14,000 individuals applied for Individual Assistance totaling over $37 million. This represents the largest Individual Assistance Program ever administered in the state. In addition, the declared counties received a special HUD (Housing and Urban Development) CDBG award in the amount of $4.1 million for unmet needs.

As in the previous disaster, greater effort was made to fund eligible mitigation measures through the Individual and Public Assistance Programs. For the first time, a Memorandum of Understanding (MOU) was developed for the declaration for implementing Section 406 mitigation opportunities. The MOU outlined the process and procedures that would be implemented in the declaration to ensure that all eligible mitigation opportunities were explored and funded through the program. The MOU was signed by Federal and State Hazard Mitigation and Public Assistance Officers as well as the State and Federal Coordinating Officers and the Deputy FCO for Mitigation.

For the first time, Hazard Mitigation Grant Program funds were eligible statewide. Available HMGP funds for the declaration totaled $6,265,003 with the federal share representing 75% or $4,698,752, a state share of 12.5% or $783,125 with a local match of the same amount. The state received over 60 pre-applications totaling $60 million. After discussion with the Wisconsin IDRG, the decision was made that projects consisting of acquisition and floodproofing would receive the highest priority for further funding consideration. Each pre-application was reviewed, scored and ranked based on the state's priorities. Nine communities were requested to participate in the formal application process, along with Milwaukee County for an educational project. After

review of the formal applications, benefit-cost analyses and environmental review, the following applications were submitted to FEMA for approval:

HMGP Applicants for FEMA 1180-DR

APPLICANT	COUNTY	AMOUNT
Brookfield, City of	Waukesha	$ 222,075
Menomonee Falls, Village of	Waukesha	$1,886,927
Milwaukee, City of	Milwaukee	$1,613,000
Milwaukee County	Milwaukee	$ 40,000
Wauwatosa, City of	Milwaukee	$2,388,661
West Allis, City of	Milwaukee	$ 114,340
TOTAL		$6,265,003

All of the projects involved acquisition of flood damaged properties with the following exceptions. The City of Milwaukee's grant included some floodproofing in the Menomonee Valley area, and Milwaukee County's project was for the production of a mitigation video and brochure targeted at homeowners.

In August 1998, the applications were at FEMA Region V awaiting approval and obligation of funds when Milwaukee and Waukesha Counties again incurred significant damages from flooding. Many of the same structures damaged in the previous flood were flooded again, making some of them uninhabitable and substantially damaged. Subsequent to this second flood the above applicants received grant approval.

FEMA-1236-DR-WI

On July 24, 1998, the President declared a major disaster for Buffalo, Clark, Crawford, Dunn, Grant, Jackson, LaCrosse, Monroe, Pepin, Pierce, Richland, St. Croix, Trempealeau and Vernon Counties as a result of high winds and severe storms that occurred on June 18-30. The Governor's request added Chippewa, Eau Claire and Rock Counties and included both Public and Individual Assistance. However, the declaration was granted only for Public Assistance for the above fourteen counties (initially Richland County was denied, but after appeal was included). Individual Assistance was denied on the basis that most of the private sector losses were covered by insurance. The Governor appealed the decision that denied Public Assistance for Chippewa, Eau Claire, Richland and Rock Counties, and Individual Assistance for all seventeen counties. The Governor also requested that Juneau, Sauk and Wood Counties be added for Public Assistance. The only request that was successful was the addition of Richland County for Public Assistance. All other requests were denied.

The disaster was the result of an extraordinary siege of severe weather during the period of June 18 through 30. Warmer than normal temperatures and high humidity levels, combined with a strong, relatively stationary jet stream, resulted in downburst winds, tornadoes, heavy rain and flash flooding. The Severe Storms Prediction Center issued 17 severe weather watches (12 for thunderstorms and 5 for tornadoes) during this time period. The average number of watches issued annually in the state is 38. In addition, the Wisconsin National Weather Service offices issued an equally significant

number of severe thunderstorm and tornado warnings and flash flood watches and warnings, with that number equaling 60% of those issued annually in the state. The state was still reeling from the damages suffered in storms that occurred May 31. Thus, the severity of these later weather events amplified the difficulty of the situation and slowed recovery even more.

Hundreds of homes and farm structures sustained damage. Thousands of acres of trees on both public and private lands were blown down, creating a serious problem with debris. Power outages were as widespread as those experienced subsequent to the 1976 ice storm, with some areas without power for four to five days. Local utility crews from other states helped to restore service. Particularly hard hit were the numerous private non-profit rural electric cooperatives that serve the west central area of the state. They sustained millions of dollars of damage and needed many months to fully restore service to its pre-disaster status.

Heavy rainfall caused many streams and rivers to reach or exceed flood stage and forced the closure of numerous roads. A few rivers even exceeded the levels they rose to in the record 1993 floods. Many farm fields were flooded and some crops, such as corn and soybeans were damaged in crucial stages of development. The basements of dozens of homes were flooded resulting in damage to furnaces and water heaters, and in some cases structural damage.

Initial damage assessments estimated there were $37 million in private and agricultural losses and $11 million to public property for a total of $48 million in damages. Public Assistance grants totaling $8,740,461 were awarded to 214 communities and private non-profit organizations.

The Mitigation Strategy Report, dated August 7, 1998, focused on coordination with other disaster assistance programs, mitigation project development and promotion of the NFIP's mitigation opportunities.

Hazard Mitigation (HMGP) funds available for this declaration were $1,962,465 with the federal share representing 75% or $1,471,849, a state share of 12.5% or $245,308 with the local match the same. The state received 24 pre-applications totaling $1.4 million. Each pre-application was reviewed, scored and ranked based on the state's priorities. The state convened the IDRG to discuss the pre-applications and establish priorities for HMGP funding.

As federal and state staff were administering the disaster assistance programs out of the Disaster Field Office located in La Crosse, significant flooding was occurring in the east central and southeast part of the state. As a result of those events, the state received a second Major Disaster Declaration in August for Milwaukee, Racine, Rock, Sheboygan and Waukesha Counties. A decision was made to pool the HMGP funds available from both declarations to be used to fund projects submitted under either declaration that met the state's priority (i.e., acquisition of flood damaged properties with those determined to be substantially damaged receiving the highest priority). None of

the pre-applications submitted under declaration 1236-DR met the criteria. Therefore, pre-applications submitted under the second declaration that met this criteria received further consideration. Ten communities were asked to participate in the formal application process with eight of the ten returning applications. After review of the formal applications, benefit-cost analyses and environmental review, the following applications were submitted to FEMA and subsequently approved:

HMGP Applicants for FEMA 1236-DR

APPLICANT	COUNTY	AMOUNT
Brookfield, City of	Waukesha	$ 180,725
Elm Grove, Village of	Waukesha	$ 869,048
Menomonee Falls, Village of	Waukesha	$ 502,782
Milwaukee, City of	Milwaukee	$ 170,000
New Berlin, City of	Waukesha	$ 136,325
State Management Costs	WEM	$ 103,585
TOTAL		$1,962,465

All of the projects involved the acquisition of substantially damaged properties except for the Village of Menomonee Falls. The village identified sixteen properties for acquisition and had received an approved HMGP grant as a result of the previous year's declaration, however, there were not enough funds awarded to purchase all the properties. Therefore, the funds awarded under declaration 1236-DR were to supplement the previous grant award.

FEMA-1238-DR-WI

On August 12, 1998, the President declared a Major Disaster for Milwaukee, Rock, Sheboygan and Waukesha Counties for both Public and Individual Assistance as a result of severe storms and flooding that occurred August 5-7. Racine County was later added for Individual Assistance but was denied Public Assistance. In addition, the Hazard Mitigation Grant Program was made eligible statewide.

The disaster was the result of an extremely active severe weather pattern during the period of August 4 through 7 in the southern part of the state. The storms caused flash flooding and urban/small stream flooding, the majority of which occurred on August 5 and 6. A series of slow-moving thunderstorms affected the area over several days and dumped from five to ten inches of rain in a three to five hour period. The most severely impacted areas were the Cities of Sheboygan and Kohler in Sheboygan County, the eastern portion of Waukesha County, the northwest half of Milwaukee County, much of Rock County and the Town of Waterford in Racine County. Observed rainfall amounts in the City of Sheboygan were at least 10.7 inches, anywhere from 6 to 10 inches in Waukesha and Milwaukee Counties and 6 to 9 inches in Rock County.

The state was still in the recovery phase as a result of damages suffered in a May 31 severe weather (request for federal disaster assistance denied) and the June 18-30 storms. The severity of this event just amplified the situation making the recovery even slower.

The rain came so rapidly and intensely that sandbagging and pumping were ineffective. Creeks and rivers rose rapidly. Storm and sanitary sewers were overwhelmed by the intense rainfall. Tragically, two boys lost their lives in the Village of Elm Grove in Waukesha County as they were swept into a culvert and drowned in the drainage system. Another youngster in Rock County was pulled from a river and was in critical condition. Dozens of others were injured in the clean-up effort. Emergency response personnel were busy rescuing persons from stranded vehicles and evacuating homes and institutions.

Thousands of homes were damaged to one extent or another, hundreds of which had water above the first floor. Many of those sustained structural damage with basement walls bowing or collapsing. In the City of Sheboygan, which was particularly hard hit, an apartment complex was structurally damaged causing the long-term displacement of more than 100 residents. The flooding also affected hundreds of businesses, many of which sustained major damage and several of which permanently went out of business. Some of the same areas that had been hard hit the previous summer were again damaged in this event, making many structures substantially damaged.

Initial damage assessment figures reported $44 million in private losses and $11 million in public damages for a total of $55 million in disaster damages. $3,570,456 was awarded to 55 applicants for Public Assistance. A total of $26,518,526 was made available as Individual Assistance from the following sources: Loans from the Small Business Administration ($12,479,500); Disaster Housing Grants ($8,824,255); Individual and Family Grants ($5,147,127); the Disaster Unemployment Assistance Program ($3,253); and the Crisis Counseling Program ($64,121). The declared counties also received a Community Development Block Grant for $3,462,000 to address serious unmet needs.

The Mitigation Strategy Report dated August 21, 1998, identified activities to be implemented in the following areas: Community mitigation education and outreach; Coordination with other disaster assistance programs; Mitigation project development; and NFIP mitigation opportunities and promotion.

Hazard mitigation (HMGP) funds available for the declaration amounted to $4,450,421 with $3,337,816 representing the 75% federal share with the state and local match of $556,302 each. Recognizing that some of the hardest hit areas within Waukesha and Milwaukee Counties were the same areas affected by flooding the previous summer, mitigation staff knew there would be structures that would meet the criteria of substantially damaged under local floodplain zoning. Therefore, federal and state staff including DNR worked with local officials to make substantial damage determinations. This included having FEMA provide a training session for local officials, state WEM and DNR staff meeting with communities and DNR sending letters to each of communities requesting them to identify the substantially damaged structures. This information became the basis for project development for the HMGP.

The state received 45 pre-applications totaling over $50 million. Each pre-application was reviewed, scored and ranked. The IDRG reconvened and discussed the pre-applications and established HMGP funding priorities. FEMA and WEM staff was now faced with administering two declarations at the same time. The IDRG sought to fund those projects that included acquisition of flood damaged properties, with acquisitions of property determined to be substantially damaged under local floodplain zoning given the highest priority. In addition, the decision was made to pool the HMGP funds available from both declarations (1236 and 1238) to be used to fund projects that met the state's priority. None of the pre-applications submitted under 1236-DR met the criteria. Of the pre-applications submitted under 1238-DR, 16 were for acquisition and totaled $35 million. Ten communities were asked to participate in the formal application process with eight of the ten returning applications. After review of the formal applications, benefit-cost analyses and environmental review, the following applications were submitted to FEMA and subsequently approved.

HMGP Applicants for FEMA 1238-DR

APPLICANT	COUNTY	AMOUNT
Brown Deer, Village of	Milwaukee	$1,304,650
Darlington, City of	Lafayette	$ 196,841
Kenosha County	Kenosha	$ 885,000
Menomonee Falls, Village of	Waukesha	$ 117,705
Sheboygan, City of	Sheboygan	$1,850,000
State Management Costs	WEM	$ 117,705
TOTAL		$4,450,421

The grants in the Village of Brown Deer and the City of Sheboygan involved the acquisition of substantially damaged properties. Again, the grant for the Village of Menomonee Falls was awarded to supplement previous grants to enable the Village to complete the acquisition of sixteen properties. The City of Darlington's grant was also awarded to supplement a previous grant so that they could complete the extensive mitigation project underway in that community since 1993. Since the 1993 flood, Kenosha County has aggressively pursued funding for mitigation efforts along the Fox River. As a result, the county was awarded a grant for acquisition and demolition of structures along the Fox River that have repeatedly received flood damages.

It is a goal of WEM to never return HMGP funds to FEMA if at all possible. To that end, as the grants under 1180-DR, 1236-DR and 1236-DR were completed, any unspent funds were obligated to other projects incurring funding shortfalls, as well as to new projects identified in subsequent events. Appendix E identifies the projects and actual amounts awarded to date for the three declarations.

As a result of the extensive damages that have occurred in the Milwaukee area from flooding in the '90's particularly in 1997 and 1998, the Milwaukee Metropolitan Sewage District (MMSD) has planned and undertaken a number of projects to address flood control, stormwater management and water quality issues. About 1,600 homes lay within the floodplain of Lincoln Creek in the City of Milwaukee. MMSD is implementing a $70 million flood-control project to be completed in 2002. The project involves

massive detention ponds, removal of concrete portions of the creek bed and deepening and widening the creek to create more storage space for floodwaters.

Another $96 million will be spent over the next five years to reduce flood damages along the Menomonee River. MMSD is planning the acquisition and demolition of more than 100 homes and two dozen commercial buildings, construction of an earthen levee and million gallon underground tank at Valley Park and other improvements. In addition, they are considering flood control projects along Little Menomonee River, Lilly Creek, Honey Creek and Grantosa Creek.

After the acquisition and demolition of ten properties in the Village of Brown Deer (nine funded through HMGP), MMDS constructed a detention pond to alleviate future flooding in the area and downstream.

FEMA-1284-DR-WI

On August 16, 1999, the President declared a major disaster for Ashland, Bayfield, Douglas, Florence, Iron, Oneida, Price, Rusk, Sawyer and Vilas Counties as a result of severe storms, straight-line winds and flooding that occurred July 4-31 for Public Assistance. The Hazard Mitigation Grant Program was made eligible statewide.

On July 4 and 5 a strong thunderstorm accompanied by high winds dumped torrential rains and caused flash flooding in Bayfield County. More than four inches of rain fell in a very short time in various parts of the county, seriously impairing road systems. Another incident occurred on July 8 when strong thunderstorms dumped more than two inches of rain in Rusk County. The next major episode affected Florence County. Several parts of the county received over seven inches of rain over a six-hour period on July 15 and an additional two inches on July 16. The combined rains and resulting flash flooding had a devastating impact on the affected townships and residents.

On July 23, Rusk and Sawyer Counties were struck by strong early morning thunderstorms. Significant rainfall occurred and straight-line winds caused power outages. A combination of weather systems on July 25 led to continually redeveloping storms for several hours, which affected an even larger area of the state. Heavy rains and high winds occurred once again in Rusk, Sawyer and Bayfield Counties, but with an even more severe effect on Douglas County. Reports of four and five inches of rain were common and the resulting flash floods washed out roads, bridges and culverts. Several small communities such as Solon Springs in Douglas County waited nervously for the storms and rain to subside as homes and businesses were put at risk by the sudden downpour.

The final episode was on July 30. Thunderstorms produced strong wind gusts of more than 75 miles per hour and rainfall averaging one to two inches over a widespread area. Many of the areas hit were the same counties that were ravaged by the previous episodes of severe weather. In Rusk, Douglas and Sawyer Counties downed trees and power lines and washed out roads were once again very common. The storms' intensity persisted as they traveled eastward and wrecked further havoc in Oneida,

Vilas and Florence Counties. Tragically, this storm killed three people and inflicted dozens of injuries as trees fell on people and homes.

The collective impact of the series of storms was tremendous especially to the infrastructure of the very sparsely populated, poor, rural communities in these counties. Roads were severely damaged with washouts, scouring, culverts washed away and bridges destroyed. Getting the main roads passable was a tremendous burden on towns that often had a one or two person road crew. Because of the multiple storms, some roads or sections of road were repeatedly damaged, with crews just completing repairs only to have them washed out again several days later. Many persons were forced to take alternate routes of travel driving literally hundreds of miles out of their way to get to their destinations.

High winds and tornadoes also blocked roads with debris. In Oneida and Vilas Counties especially, debris was just shoved to the side of the major roads so as to provide emergency access. It was many weeks before the debris along the right of way was totally removed. Even after cleanup of the roads and right of ways, there remained hundreds of acres of downed timber on private land and local, county, state and national forests. This downed timber created a danger for forest fires that continued into 2000. In light of the fact that it was prime camping season, the state was very fortunate that more campers and park users were not killed or injured. The high winds also took their toll on rural electric cooperatives. There were many downed power lines and utility lines.

Dozens of homes were also affected by the severe weather. In some counties such as Douglas and Florence many residents reported basement flooding. Others experienced water in living areas. In Solon Springs in Douglas County, the St. Croix Lake was so high that homes were surrounded by water. Another problem was contamination of water supply wells due to flooding. Falling trees and high winds damaged dozens of homes and farm buildings. Thousands of residents and businesses were affected by the widespread power outages. Initial damage assessment figures reported $1.5 million in losses to private property and $6.5 million on public damages for a total of $8 million. A total of $5,387,447 in Public Assistance grants were awarded to 162 applicants.

The Mitigation Strategy Report dated August 24 identified activities to be implemented in the following areas: Community mitigation education and outreach; Coordination with other disaster assistance programs; Mitigation project development; and NFIP mitigation opportunities and promotion.

HMGP funds available for the declaration amounted to $812,059 with $609,044 representing the 75% federal share and a state and local match of $101,529 each. The state received twenty pre-applications totaling $4,438,999. Each pre-application was reviewed, scored and ranked. The IDRG reconvened and discussed the pre-applications and established HMGP funding priorities. After discussion with the IDRG, a decision was made to ask eight applicants (thirteen applications) to participate in the

formal application process. Two applicants withdrew. After review of the applications and benefit-cost analyses, the recommendation was made to fund projects as follows:

HMGP Applicants for FEMA 1284-DR

APPLICANT	COUNTY	AMOUNT
Florence, Town of	Florence	$250,240
Head of the Lakes Electric Coop.	Douglas	$235,760
Superior, City of	Douglas	$320,000
State Management Costs	WEM	$ 6,059
TOTAL		$812,059

Based on the funding available and project costs, the applicants are providing greater than the required 12.5% local match. In addition, two of the applications (Village of North Fond du Lac in Fond du Lac County and Village of Thiensville in Ozaukee County) are being funded under a previous disaster with unspent funds from another project.

FEMA-1332-DR-WI

On June 23, 2000, the President declared a major disaster for 12 counties as a result of severe storms, straight-line winds and flooding that began on May 26. By the end of the incident period (July 19), thirty counties had been included in the declaration: Thirteen counties for both Public and Individual Assistance (Columbia, Crawford, Dane, Grant, Iowa, Juneau, Kenosha, Lafayette, Milwaukee, Richland, Sauk, Vernon and Walworth); Fourteen for Public Assistance only (Adams, Ashland, Barron, Burnett, Forest, Green, Iron, Jackson, Monroe, Oneida, Polk, Rusk, Sawyer and Wasburn); and another three (Dodge, Racine and Waukesha) for Individual Assistance. The Hazard Mitigation Grant Program was made eligible statewide.

The disaster started after a very wet month of May. The National Weather Service indicated that it was the wettest month ever for most locations in southern Wisconsin going back through the weather books to 1870. Generally, 8 to 11 inches were measured, with some locations in eastern Iowa and Dane Counties unofficially receiving between 16 and 18 inches. The wet, rainy weather culminated in a series of severe thunderstorms and heavy rains that began May 26 and continued into early June.

The storms produced record rainfalls, tornadoes and hurricane force winds. From 9:00 p.m. on May 29 through 8:00 p.m. on June 2, between 8 and 10 inches of rain fell along a line from southern Vernon County through northern Richland County to central Sauk County, over northwest Iowa County into northwest Dane County and over northern Lafayette County. Because soils were already saturated, the heavy rains pushed most mainstream rivers over flood stage and caused severe and widespread flooding.

Three tornadoes were documented on June 1, in Dodge, Juneau and Monroe Counties. The one in Dodge County, an F2, occurred just after 6:00 p.m. and was on the ground for more than 16 miles. The tornado destroyed or did major damage to several dozen homes in Iron Ridge, a small community of 800 in Dodge County. Elsewhere, there

were notable downbursts or wind gusts in the 75 to 100 mph range, accompanied by hail as large as golf balls. Rains reappeared on June 3-4 and added another one to two inches to already saturated soils.

The collective impact of these series of storms was tremendous, especially to the infrastructure of the counties. For many of the communities, roads were severely damaged with washouts, scouring, culverts washed away and bridges destroyed. Just getting the main roads passable was a tremendous burden on the towns, which sometime have a one or two person road crew. Because of multiple storms, some roads or sections of road were damaged repeatedly, with crews just effecting repairs, only to have them washed out again several days later.

High winds and tornadoes also blocked roads with debris and downed power and utility lines. In Juneau and Monroe Counties especially, debris was just shoved to the side of the major roads so as to provide access for emergency vehicles and power crews. It was weeks before debris along the right-of-way was totally removed. This was of great concern to local officials and residents, as many of the roads were nothing more than narrow fire lanes, and the debris made the roadways even narrower. Even after the cleanup, there remained acres of downed timber and debris on private land and in local, county and state forests.

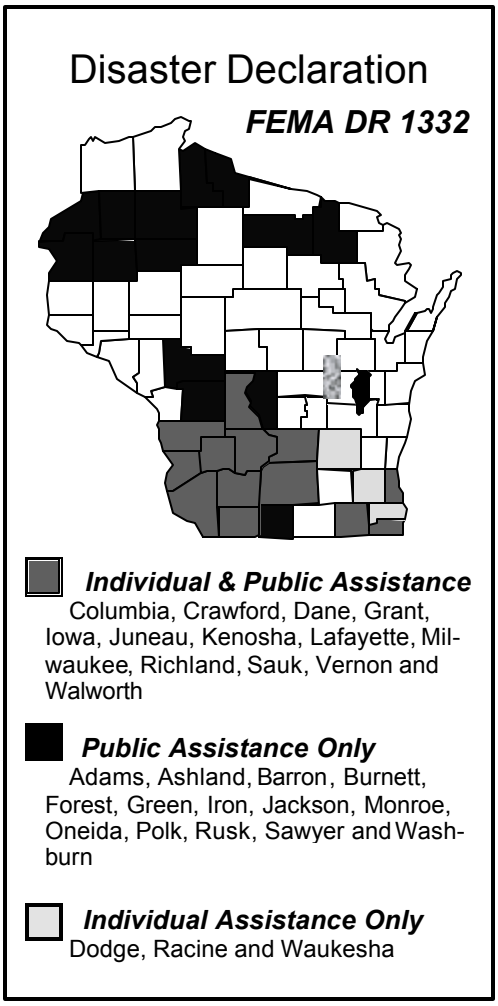
The high winds and flooding also impaired electrical service and took their toll on the rural electric cooperatives. Power crews did a commendable job of restoring service, considering the multiple events, the widespread area of impact and the condition of the roadways. Phone service was also affected, mostly by the rain, and it took at least 2 weeks to have all service fully restored.

Dozens of homes were also affected by the flooding and severe winds. In the majority of the counties, basement flooding was common, jeopardizing furnaces and water heaters. Grant County reported a dozen or more homes that had major damage or were destroyed. Several communities reported sewer back up in residences. Still others had access problems, as roads were either blocked with debris, inundated with water or had bridges washed away. Private well contamination and septic tank problems were reported. Thousands of residences and businesses were affected by the widespread power outages and even those citizens whose structures sustained no physical damage, had to deal with spoiled food or commodities. Shelters were opened, as necessary, in the affected areas to accommodate those displaced from their homes or to serve as relief stations for those involved with the cleanup.

Initial damages assessment figures reported $11.4 million in private property and $17.3 million in public damages for a total of $28.7 million. A preliminary damage assessment was completed for sixteen counties. On June 13, the state requested that Public Assistance be made available to sixteen counties and Individual Assistance for ten of the counties plus contiguous counties.

Another major storm system moved across southeastern corner of the state on June 12 and 13. Kenosha and Walworth Counties received 3 to 5 inches of rain on already heavily saturated soils. Since the Governor's original request, rains continued to fall across southern Wisconsin. In Kenosha, damages were countywide and the County Executive declared a State of Emergency. At one point, more than 100 roads were closed due to high water with 41 county roads remaining closed for several days. Property owners reported losses due to basement flooding, sewer backup and backed up wells. A boating unit assisted with evacuations of a mobile home park in Pleasant Prairie and homes in the Town of Somers. Several communities in Walworth County were also impacted. One village evacuated 100 residences bordering a rapidly rising retention pond. The request included Public Assistance for all three counties, and Individual Assistance for Kenosha and Walworth. The Governor amended his request on June 14 to include the Counties of Jackson, Kenosha, and Walworth.

On June 23, the President declared twelve counties from the Governor's original request eligible for Public Assistance only. On June 28, FEMA advised that Individual Assistance was not granted, as it was determined that the impacts to individuals were not beyond state and local capabilities.



The Governor appealed the above decision on June 30, as additional damages were uncovered in several counties, including Dane, Grant, and Kenosha. The appeal requested that FEMA re-evaluate the information and make Individual Assistance available to the twelve counties and all contiguous counties.

On June 30, the disaster declaration was amended to add Columbia, Kenosha, Jackson, and Walworth Counties for Public Assistance only. Subsequent to the Governor's appeal, on July 11 Crawford, Dane, Grant, Kenosha, Milwaukee, Vernon and Walworth Counties were all declared eligible for Individual Assistance.

On July 2, storms roared through southeastern Wisconsin. Strong winds and heavy rains (4 to 6.5 inches) with the subsequent loss of power caused water and sewage to backup in nearly 7,000 homes. That storm also spawned a F1 tornado that affected the City of Oak Creek and portions of northern Racine County. On July 10, the WEM Division Administrator on behalf of the Governor asked that both Public and Individual Assistance be extended to Milwaukee County, and Public Assistance in Racine County. In addition, he requested that the incident period be extended to July 5. Ironically, the incident period was closed effective July 5.

However, on July 8 and 9 the state once again experienced another 4 to 10 inches of rain that resulted in flash flooding in many of the same areas already included in the declaration. In Sauk, Vernon and Crawford Counties, roads affected in the earlier storms were once again damaged, in some cases more severely. With soils saturated and rivers and lakes at or near flood stage, most of the southern half of the state remained at risk with damages occurring with each storm event. More damages were reported in Barron, Burnett, Forest, Oneida, Polk, Rusk, Sawyer and Washburn. On July 12 the Governor requested that the incident period be reopened.

On July 13, Public Assistance was extended to Milwaukee County. This would be the third presidential disaster declaration in four years for the county. On July 13, the WEM Division Administrator requested that in addition to Public Assistance, that Individual Assistance also be granted to Racine County. Effective July 18, Racine County was made eligible for Individual Assistance, but denied Public Assistance. In addition, the Counties of Richland and Sauk were also made eligible for Individual Assistance as a result of the Division Administrator's request the day before.

As a result of the storms that occurred over the weekend of the 10th, ten sparsely populated counties in the northern half of the state were seriously impacted, sustaining almost $2 million in Public Assistance costs with almost $1 million in road damages. Therefore, on July 17, the Division Administrator requested that Ashland, Barron, Burnett, Forest, Iron, Oneida, Polk, Rusk, Sawyer and Washburn Counties be included in the declaration for Public Assistance. On July 18 the request was granted and the incident period was closed effective July 19.

Based on calls received on the FEMA teleregistration number, on July 21 the State Coordinating Officer requested that Individual Assistance be granted to Columbia, Iowa, Juneau and Waukesha Counties, and on August 8 for Juneau County. The requests were granted on July 26 and August 9. As a result of the severe weather extending from May 26 through July 19, the final count was 30 counties included in the federal declaration. Thirteen counties were declared for both Public and Individual Assistance, fourteen for Public Assistance only, and three counties for Individual Assistance only.

As of November 22, 2000, 10,461 individuals had registered for disaster assistance. Under the Disaster Housing Program, 4,139 individuals were eligible for assistance with more than $6 million disbursed. In the Individual and Family Grant Program, 4,004 applications have been approved for the program with $4.4 million issued to disaster victims making it the second largest IFG program in terms of dollars for the state. The Public Assistance Program received 444 applications for disaster assistance totaling to date $13,969,024 making it the second largest Public Assistance Program in the state outside of the 1993 Midwest Floods. In addition, over 700 loans have been approved through the Small Business Administration totaling nearly $8 million to assist individuals and businesses.

The Mitigation Strategy Report dated July 17, 2000, identified activities to be implemented in the following areas: Community mitigation education and outreach,

coordination with other disaster assistance programs, mitigation project development and National Flood Insurance Program mitigation opportunities and promotion.

Hazard Mitigation (HMGP) funds available for the declaration are $4,424,019 with $3,318,014 representing the 75% federal share with the state and local match of $553,002.50 each. Pre-applications for the program were mailed to potential applicants on September 5 with a due date of October 9. The state received 89 pre-applications totaling $29.8 million. The pre-applications were categorized as follows:

HMGP Pre-Applications for #1332 by Category

NUMBER OF PRE-APPS	CATEGORY	AMOUNT
13	Acquisition	$14,225,523
17	Detention	8,327,638
7	Sewer	1,658,966
7	Drainage	2,310,000
32	Road Related	1,244,790
12	Miscellaneous	2,014,120
1	Ineligible	1,800
89 Total		**$29,782,837**

Each pre-application was reviewed, scored and ranked. Based on the funding priorities previously established by the Interagency Disaster Recovery Group, those communities that applied for acquisition were requested to participate in the formal application process. Formal applications have been forwarded to 9 additional communities with proposed projects that were feasible and addressed state mitigation priorities. A total of 22 formal applications were forwarded to 19 communities. The following communities returned the formal application.

HMGP Applicants for FEMA 1332-DR

APPLICANT	COUNTY	AMOUNT REQUESTED
Baraboo, City of	Sauk	$ 200,000
Brookfield, City of	Waukesha	842,355
Crandon, City of	Forest	110,000
Cumberland, City Municipal	Barron	380,520
Dane Co. Emergency Mgmt.	Dane	33,000
DeForest School District	Dane	496,000
Eau Claire County	Eau Claire	200,000
Eau Claire, City of	Eau Claire	3,619,710
Elm Grove, Village of	Waukesha	2,472,235
Jefferson County	Jefferson	975,000
Kenosha County	Kenosha	1,710,150
Milwaukee Co. Emergency Mgmt.	Milwaukee	15,000
Milwaukee, City of	Milwaukee	147,200
Pleasant Prairie, Village of	Kenosha	7,000
Shell Lake, City of	Washburn	672,156
Sun Prairie, City of	Dane	30,000
TOTAL		**$11,910,326**

APPENDIX D

STATE HAZARD MITIGATION TEAM
STATE AGENCY CAPABILITY ASSESSMENT FOR MITIGATION

SURVEY FORM

The purpose of this assessment is to determine and describe the existing resources that are available within the state for reducing the state's vulnerability to natural hazards. This includes those activities and functions that take place agency-wide that support hazard mitigation activities directly or indirectly in reducing exposure or losses from natural hazards such as floods, tornadoes and windstorms, hail and lightning, snow and ice storms, extreme heat, drought, etc. This would include ongoing programs and activities in the following areas:

Financial Assistance or Grant Programs: Funding mechanisms that support hazard mitigation directly or indirectly at the state and/or local level. Examples include but are not limited to:

1. Community Development Block Grant programs that help to improve infrastructure and housing in low to moderate-income communities;

2. Land preservation programs such as the Stewardship Programs that conserve wetlands, coastal resources or erosion prone areas, all of which are hazardous areas for development; and

3. The Department of Transportation's Flood Damage Aids Program that can include funding for mitigation activities in making road repairs.

Policies, Authorities, Regulations: Include policies, authorities or regulations relating to development, land-use practices, environmental, etc., that minimizes the risk of natural hazards to people, property or the environment. This would include those that pertain to just within your agency as well as those that your agency is responsible for implementing at the state and local level. This would include, but is not limited to:

1. Regulation of development activities that prevent unwise and unsafe construction or development practices such as building codes and inspections, floodplain/shoreland/wetland regulations, stormwater management;

2. Executive Order 73 that requires state agencies that own, rent or construct facilities within the 500-year floodplain to follow certain floodplain management practices as identified in the order;

3. Land-use and planning regulations such as the Smart Growth Initiative; and

4. Standards for construction of infrastructure such as streets, roads, bridges, utilities, etc.

Technical Assistance: Assistance provided by your agency or another source that would support mitigation activities at the state and/or local level. Example:

1. Technical assistance provided by the Department of Natural Resources to local communities on floodplain management issues;

2. Assistance provided by Wisconsin Emergency Management to local governments that are preparing hazard mitigation plans; and

3. Assistance provided by State Historical Society in the environmental review process on mitigation projects, and technical assistance provided to local communities who undertake mitigation projects involving structures in an historic district, etc.

Training, Education, Public Information Programs: Programs that provide information to the public and/or private sector that would encourage individuals and businesses to reduce their risk from natural hazards. Examples could include:

1. Insurance information including flood insurance;

2. Training for insurance agents, real estate agents, building inspectors, zoning administrators, planning directors, emergency management personnel, etc.;

3. Hazard awareness campaigns such as Tornado Awareness Week, Coastal Awareness Month, etc.;

4. Booths at the State Fair, safety fairs, etc.; and

5. Articles, newsletters, publications, such as the Floodplain-Shoreland Management Notes and the Community Flood Mitigation Planning Guidebook produced by the Department of Natural Resources.

Agency Functions/Initiatives: Activities internal to the agency that directly or indirectly support hazard mitigation. Examples may include:

1. Interagency cooperation such as participating on the Interagency Disaster Recovery Group (IDRG), the State Hazard Mitigation Team, the Coastal Hazards Work Group, etc.; and

2. Internal policies or procedures that would reduce the risk of loss such as adequate insurance coverage, instituting design standards to improve sheltering in agency structures, and following the state and local environmental and floodplain practices in the design and construction of agency structures.

INSTRUCTIONS: The following pages provide a format to describe your agency's resources that support hazard mitigation activities in each of the five categories. Each type of agency activity has a separate page or form. If your agency has several financial assistance or grant programs, simply make extra copies of the form and describe each grant program separately. Similarly, make extra copies of other forms as needed. Attach supporting documentation or additional information as you feel is necessary. This document will be forwarded to you via e-mail in the event you wish to download the forms so that the assessment can be completed electronically.

As the Point-of-Contact designated for your agency, you are responsible for coordinating with those individuals within your agency that can provide the information necessary to complete the capability assessment for your agency.

If you have any questions, please call Roxanne Gray, State Hazard Mitigation Officer, at 608-242-3211.

PLEASE RETURN YOUR AGENCY'S RESPONSE
NO LATER THAN JUNE 30, 2000 TO:

GREG WILLIAMSON
WISCONSIN DIVISION OF EMERGENCY MANAGEMENT
2400 WRIGHT STREET, P.O. BOX 7865
MADISON, WI 53707

FINANCIAL ASSISTANCE OR GRANT PROGRAMS
(Funding that supports hazard mitigation at the state and/or local level)

1. **STATE AGENCY:**
2. **POINT-OF-CONTACT:**
3. **PROGRAM NAME:**
4. **PROGRAM GOALS:**
5. **PROGRAM DESCRIPTION:**
6. **ELIGIBLE APPLICANTS:**
7. **SPECIAL RESTRICTIONS OR REQUIREMENTS:**
8. **LEGISLATIVE OR OTHER AUTHORITY:**
9. **EXAMPLES OF COMPLETED PROJECTS FUNDED BY THE PROGRAM THAT SUPPORT HAZARD MITIGATION:**
10. **PROGRAM ADMINISTRATOR:**
    TITLE:
    DIVISION/SECTION/BUREAU:
    ADDRESS:
    CITY: **ZIP:**
    TELEPHONE: **FAX:**
    E-MAIL ADDRESS:

POLICIES, AUTHORITIES, REGULATIONS
(Policies, authorities or regulations relating to development, land-use practices or the environment that minimizes the risk of natural hazards to people, property or the natural resources).

1. **STATE AGENCY:**
2. **POINT-OF-CONTACT:**
3. **NAME OF POLICY, AUTHORITY OR REGULATION:**

4. **GOALS OF POLICY, AUTHORITY, OR REGULATION:**

5. **DESCRIPTION OF POLICY, AUTHORITY, OR REGULATION:**

6. **LEGISLATIVE ORIGIN OF POLICY, AUTHORITY, OR REGULATION:**

7. **REGULATED COMMUNITY:**

8. **HOW DOES THE POLICY, AUTHORITY, OR REGULATION SUPPORT HAZARD MITIGATION:**

9. **PROGRAM ADMINISTRATOR:**
   TITLE:
   DIVISION/SECTION/BUREAU:
   ADDRESS:
   CITY: **ZIP:**
   TELEPHONE: **FAX:**
   E-MAIL ADDRESS:

TECHNICAL ASSISTANCE
(Assistance provided by your agency or another source that would support mitigation activities at the state and/or local level.)

1. **STATE AGENCY:**
2. **POINT-OF-CONTACT:**
3. **TYPE OF TECHNICAL ASSISTANCE PROVIDED:**

4. **PURPOSE OR GOAL OF THE TECHNICAL ASSISTANCE:**

5. **DESCRIPTION OF THE TECHNICAL ASSISTANCE PROVIDED:**

6. **COMMUNITY THAT BENFITS FROM THE TECHNICAL ASSISTANCE:**

7. **LEGISLATIVE OR OTHER AUTHORITY:**

8. **HOW DOES THE TECHNICAL ASSISTANCE SUPPORT HAZARD MITIGATION:**

9. **PERSON RESPONSIBLE FOR PROVIDING THE ASSISTANCE:**
   TITLE:
   DIVISION/SECTION/BUREAU:
   ADDRESS:
   CITY: **ZIP:**
   TELEPHONE: **FAX:**
   E-MAIL ADDRESS:

TRAINING, EDUCATION, PUBLIC INFORMATION PROGRAMS
(Programs that provide information to the public and/or private sector that would encourage individuals and/or businesses to reduce their risk from natural hazards).

1. **STATE AGENCY:**
2. **POINT-OF-CONTACT:**
3. **NAME OF TRAINING, EDUCATION OR PUBLIC INFORMATION ACTIVITY:**

4. **TRAINING, EDUCATION, OR PUBLIC INFORMATION GOALS:**

5. **DESCRIPTION OF ACTIVITY:**

6. **TARGET AUDIENCE:**

7. **LEGISLATIVE OR OTHER AUTHORITY:**

8. **HOW DOES THE TRAINING, EDUCATION, OR PUBLIC INFORMATION ACTIVITY SUPPORT HAZARD MITIGATION:**

9. **PERSON RESPONSIBLE FOR THE ACTIVITY:**
   TITLE:
   DIVISION/SECTION/BUREAU:
   ADDRESS:
   CITY: **ZIP:**
   TELEPHONE **FAX:**
   E-MAIL ADDRESS:

AGENCY FUNCTIONS/INITIATIVES
(Activities internal to the agency that directly or indirectly support hazard mitigation).

1. **STATE AGENCY:**
2. **POINT-OF-CONTACT:**
3. **NAME OF INITIATIVE/ACTIVITY:**

4. **PURPOSE OR GOAL OF INITIATIVE:**

5. **INITIATIVE DESCRIPTION:**

6. **LEGISLATIVE OR OTHER AUTHORITY:**

7. **HOW DOES INITIATIVE SUPPORT HAZARD MITIGATION:**

8. **PERSON RESPONSIBLE FOR THE INITIATIVE:**
   TITLE:
   DIVISION/SECTION/BUREAU:
   ADDRESS:
   CITY: **ZIP:**
   TELEPHONE: **FAX:**
   E-MAIL ADDRESS:

APPENDIX E

FUNDED MITIGATION PROJECTS IN STATE – HAZARD MITIGATION GRANT PROGRAM

Disaster Number	Year	Community	County	Cost HMGP Funds	Project Description	Comments
DR-874	1990	Darlington, City	Lafayette	$ 605,572	Part of a larger project funded under DR-993. 12 commercial structures acquired. 19 commercial structures floodproofed	An additional $178,608 locally provided (used for match in DR-994) Local match was purchase of land for business park
DR-874	1990	DePere, City	Brown	$ 95,160	Storm sewer project	An additional $42,301 locally provided
DR-912	1991	Jefferson County	Jefferson	$ 108,684	Acquisition of 3 residential structures	Local match provided by HUD & DNR
DR-959	1992	Washara County	Washara	$ 38,868	Completion of a Geographic Information System (GIS) in a defined area of the 100 year floodplain of the Pine River	
DR-963	1992	Cross Plains, Village	Dane	$ 37,000	Clearwater infiltration abatement project	
DR-963	1992	DeForest, Village	Dane	$ 202,034	Construction of the Linde Detention Basin	An additional $67,394 provided locally CDBG provided $485,000 to construct Halsor Street Detention Basin and a storm sewer leading to the basins
DR-963	1992	Sun Prairie, City	Dane	$ 137,340	Development of a stormwater management plan and improvement of a storm sewer	Additional $91,021locally provided
DR-964	1992	Black River Falls, City	Jackson	$ 281,929	Construction of storm sewers	$43,971 provided by CDBG funds
DR-964	1992	Blair, City	Trempealeau	$ 109,144	Implementation of modifications to the Lake Henry Dam	$109,173 provided by CDBG funds and $43,460 provided by DNR funds
DR-994	1993	Darlington, City	Lafayette	$4,175,790	Acquisition of 12 commercial structures and floodproofing of 19 commercial structures	Local match provided = $178,608 purchase of business park $282,084 CDBG funds $187,744 DNR funds
DR-994	1993	Eau Claire, City	Eau Claire	$2,152,831	Acquisition of 45 residential structures and 5 vacant parcels – Floodproofing of 1 commercial structure	$461,000 CDBG funds = local match
DR-994	1993	Eau Claire County	Eau Claire	$1,217,227	Acquisition of 16 residential structures and 1 commercial structure – Floodproofing of 2 residential structures	$265,250 CDBG funds = local match
DR-994	1993	Jefferson County	Jefferson	$ 458,635	Acquisition of 7 structures (Flood Mitigation Assistance funds helped purchase one of these structures)	This was part of a larger project that included $500,000 CDBG funds and $611,000 DNR funds
DR-994	1993	Pierce County	Pierce	$6,000,000	Acquisition of 67 residential structures, 3 commercial structures and 3 vacant parcels	Local match provided by CDBG funds An additional $187,989 was provided by program revenue. ($52,211 of that amount given to Darlington towards floodproofing project)
DR-1131	1996	Monroe, City	Green	$ 143,311	Construction of a detention pond	Additional $36,218 locally provided
DR-1131	1996	Oakfield, School Dist.	Fond du Lac	$ 202,216	Reinforcement of walls in new school	
DR-1180	1997	Brookfield, City	Waukesha	$ 139,203	Acquisition of 1 residential structure	

FUNDED MITIGATION PROJECTS IN STATE – HAZARD MITIGATION GRANT PROGRAM, continued

Disaster Number	Year	Community	County	Cost HMGP Funds	Project Description	Comments
DR-1180	1997	Eau Claire County	Eau Claire	$ 113,922	Acquisition of 1 residential structure	
DR-1180	1997	Menomonee Falls, Vil	Waukesha	$1,969,799	Acquisition of 10 residential structures	
DR-1180	1997	Milwaukee, City	Milwaukee	$1,613,000	Acquisition of 18 residential structures and floodproofing of 32 residential structures	
DR-1180	1997	Milwaukee County	Milwaukee	$ 40,000	Production of flood mitigation video with a corresponding brochure	
DR-1180	1997	Oak Creek, City	Milwaukee	$ 106,641	Acquisition of one residential substantially damaged structure in Root River floodway	
DR-1180	1997	Wauwatosa, City	Milwaukee	$2,168,098	Acquisition of 22 residential structures, 1 commercial structure and 1 vacant parcel	$831,325 Hud Disaster Recovery funds, $59,735 CDBG funds and $222,170 DNR funds provided for this project
DR-1180	1997	West Allis, City	Milwaukee	$ 114,340	Acquisition of 1 residential structure	
DR-1236	1998	Brookfield, City	Waukesha	$ 140,060	Acquisition of 1 residential structure	
DR-1236	1998	Elm Grove, Village	Waukesha	$ 869,048	Acquisition of 1 residential structure and 1 commercial structure	
DR-1236	1998	Menomonee Falls, Vil	Waukesha	$ 543,447	Acquisition of 3 residential structures	This project is a continuation of the DR-1180 project for Menomonee Falls
DR-1236	1998	Milwaukee, City	Milwaukee	$ 170,000	Acquisition of 2 residential structures	This project is a continuation of the DR-1180 project for Milwaukee
DR-1236	1998	New Berlin, City	Waukesha	$ 93,947	Acquisition of 1 residential structure	
DR-1236	1998	Thiensville, Village	Ozaukee	$ 100,745	Construction of a detention pond	
DR-1238	1998	Brown Deer, Village	Milwaukee	$1,018,831	Acquisition of 9 residential structures	CDBG funds used for local match
DR-1238	1998	Darlington, City	Lafayette	$ 196,842	Floodproofing of 1 commercial structure	This project was partially funded by DR-994, program revenue from Pierce County 994 project and this grant under DR-1238
DR-1238	1998	Eau Claire County	Eau Claire	$ 56,078	Acquisition of 1 residential structure	Supplement grant under 1180-DR
DR-1238	1998	Kenosha County	Kenosha	$ 885,000	Acquisition of 12 residential structures	Local match provided by CDBG
DR-1238	1998	No. Fond du Lac, Vil	Fond du Lac	$ 228,571	Acquisition of 2 residential structures	
DR-1238	1998	Sheboygan, City	Sheboygan	$1,850,000	Acquisition of 16 residential structures	
DR-1238	1998	Thiensville, Village	Ozaukee	$ 60,000	Construction of a detention pond	Supplements funds under 1236-DR
DR-1284	1999	Florence, Town	Florence	$ 250,240	Closing well and opening new well	
DR-1284	1999	Head of Lakes	Douglas	$ 235,760	Burying overhead electrical lines	
DR-1284	1999	Superior, City	Douglas	$ 320,000	Storm sewer project	

41 Projects: Total of $29,249,313 in HMGP Funds

FUNDED MITIGATION PROJECTS IN STATE – HAZARD MITIGATION GRANT PROGRAM, continued

Disaster Number	Year	Community	County	Cost HMGP Funds	Project Description	Comments
DR-1332	2000	Baraboo, City	Sauk	$ 150,000	Demolition	
DR-1332	2000	Crandon, City *	Forest	$ 110,000	Construct a storm sewer	
DR-1332	2000	Cumberland Utility	Vernon	$ 380,520	Bury electrical lines	
DR-1332	2000	Dane County EM	Dane	$ 33,000	Surge protectors on sirens	
DR-1332	2000	Eau Claire, City	Eau Claire	$1,488,562	Acquisition (Area 1)	
DR-1332	2000	Elm Grove, Village	Waukesha	$ 943,638	Acquisition of 2 commercial apartment buildings. 2 others under 1236 if Legion Hall falls through. This would cover 4 that met BCA on their own.	
DR-1332	2000	Jefferson County	Jefferson	$ 555,743	Acquire & demolish 5 primary residences (BCA average)	
DR-1332	2000	Kenosha County	Kenosha	$ 643,997	Acquire & demolish 9 residential properties in Group 1 (BCA average)	
DR-1332	2000	Shell Lake, City	Washburn	$ 50,000	Relocate community shelter	
DR-1332	2000	Sun Prairie, City	Dane	$ 30,000	Backflow valves	
DR-1369	2001	Burnett County	Burnett	$ 29,425	Purchase/distribute weather alert radios	
DR-1369	2001	Crawford County	Crawford	$ 713,548	Acquisition of County Highway Maintenance shop.	
DR-1369	2001	Dairyland Electric	Vernon	$ 12,000	Hazard Tree Training	
DR-1369	2001	Douglas County	Douglas	$ 93,600	Acquisition of 1 substantially damaged residential property	
DR-1369	2001	Grant County	Grant	$ 370,600	Acquisition of 4 residential properties (5 structures) and floodproofing of another	
DR-1369	2001	Shell Lake, City	Washburn	$ 250,000	Engineering study for water diversion project.	
DR-1369	2001	Trempealeau County	Trempealeau	$1,059,000	Acquisition of 12 residential properties	
DR-1369	2001	Department of Natural Resources	Richland	$ 96,450	Acquisition of 1 residential property	
DR-1369	2001	Juneau County	Juneau	$ 169,436	Storm Shelters	
DR-1369	2001	Dane County	Dane	$ 40,000	All-Hazards Mitigation Plan	
DR-1369	2001	Douglas County	Douglas	$ 53,333	All-Hazards Mitigation Plan	
DR-1369	2001	Shell Lake, City	Washburn	$ 19,000	All-Hazards Mitigation Plan	
DR-1369	2001	Sun Prairie, City	Dane	$ 5,190	All-Hazards Mitigation Plan	
DR-1369	2001	Grant County	Grant	$ 50,000	All-Hazards Mitigation Plan	
DR-1369	2001	Superior, City	Douglas	$ 55,000	All-Hazards Mitigation Plan	
DR-1369	2001	Burnett County	Burnett	$ 60,000	All-Hazards Mitigation Plan	
DR-1369	2001	Juneau County	Juneau	$ 20,000	All-Hazards Mitigation Plan	

60 Projects and 8 Plans: Total of $36,731,355 in HMGP Funds

FUNDED MITIGATION PROJECTS IN STATE – FLOOD MITIGATION ASSISTANCE PROGRAM

Year	Community	County	Cost FMA Funds	Project Description	Comments
1997	Darlington, City	Lafayette	$156,133	Acquisition and demolition of an automobile dealership	Completed
1998	Darlington, City	Lafayette	$420,003	Acquisition of 1 commercial structure and supplemental funds for floodproofing 1 commercial structure	Local match was provided by a global match under DR-994
1998	Jefferson County	Jefferson	$115,332	Acquisition of 1 residential structure and supplemental funds for another structure acquired under DR-994	Local match provided by a global match under DR-912 and DR-994
1999	Kenosha County	Kenosha	$166,800	Acquisition of 2 residential structures	Local match provided by a global match under DR-1238
2000	Darlington, City	Lafayette	$158,667	Acquisition of 1 commercial repetitive loss structure, supplement funds awarded in FFY98	Local match was provided by a DNR Urban Rivers Grant

4 Projects: Total of $1,016,935 ($762,701 or 75% federal funds) in FMA Funds

FUNDED MITIGATION PROJECTS IN STATE
COMMUNITY DEVELOPMENT BLOCK GRANT – COMMUNITY FACILITIES

Applicant	Contract #	Award	Project Description
Adams County	FY94-0096	$255,000	Construct storm sewer to serve Front, Main, North and Roberts Streets.
City of Appleton	FY94-0075	$15,225	Relocate main sewer and stabilize slope to prevent mudslide in Allicia Park.
City of Augusta	FY95-0035	$59,555	Install storm sewer.
City of Baraboo	FY95-0027	$339,797	Slope stabilization, storm sewers, reconstruct well and install pump house controls.
Town of Baraboo	FY95-0022	$172,000	Stabilize slopes where flood-induced erosion threatens homes.
City of Black River Falls	FY95-0030	$500,000	Supplemental levee. Infrastructure replacement.
City of Black River Falls	FY94-0081	$623,063	Flood Control-reconstruct levee and add floodwall to dam.
City of Blair	FY97-0005	$109,173	Flood mitigation project.
City of Blair	FY94-0092	$190,066	Flood-related sewer and street repair.
Clark County	FY94-0093	$27,935	Repair flood damaged road and highway washouts, trails and bridges, dams and dikes, campgrounds, parks and facilities.
Crawford County	FY95-0001	$322,600	Reconstruct salt storage facility and extend water main to the Olson subdivision of Soldier's Grove.
City of Darlington	FY95-0037	$355,584	Professional project management for business relocation, acquisition and demolition. Floodproof 41 downtown businesses.
Village of Deforest	FY95-0039	$495,000	Install storm sewer. Expand detention ponds.
Town of Dekorra	FY95-0034	$92,146	Wisconsin Lake shoreline repair and roadwork.
Village of Ferryville	FY94-0090	$34,300	Provide sanitary sewer to residents west of the Burlington Northern Railroad.
Town of Foster	FY94-0062	$44,178	Replace culvert and roadway.
La Crosse County	FY94-0079	$69,264	Construct sediment trap, raise 3,700 feet of road 6 inches and pave County Highway ZN.
Village of Lake Delton	FY94-0085	$6,331	Dredge Lake Delton and stabilize slope in a ravine (administration only).
Village of Lyndon Station	FY95-0040	$277,500	Install storm sewer.
City of Clauston	FY94-0088	$57,470	Repair drainage ditch, roadway and culverts at the intersection of the Henry's subdivision drainage ditch, Elm St. and Marshall Dr.
Village of Menomonee Falls	FY99-0504	$171,261	CDBG DRA grant to acquire two of ten floodplain properties (land and buildings).
Portage County	FY95-0032	$181,000	Homeowner assistance, street repairs and repair of Jordan Dam.
City of Prairie du Chien	FY95-0041	$266,175	Acquisition and relocation from floodplain and some housing projects.
City of River Falls	FY95-0033	$374,000	Repair road embankment/retaining wall along North main Street.
Town of Wheatland	FY94-00080	$112,000	Reconstruct one mile of road on Will Kumlin Road.
Village of Oakfield	FY97-0291	$72,000	Purchase and demolish Oakfield Middle School destroyed in 7/18/96 tornado. Construct stormwater detention basin and park in its place.

26 Projects: Total of $5,222,623 in CDBG Public Facilities Funds

FUNDED MITIGATION PROJECTS IN STATE COMMUNITY DEVELOPMENT BLOCK GRANT – EMERGENCY ASSISTANCE PROGRAM

Grantee Name	Date of Disaster	Contract #	Contract Period	Award Amount	Project Description
Fond du Lac County	July 18, 1996	87039	9nn/25/96-6/30/98	$500,000	Rehabilitation of damaged housing units, the demolition and clearance of uninhabitable housing units and construction of replacement housing units.
Village of Germantown	June 21, 1997	87195.02	11/1/97-6/30/99	$453,750	Rehabilitation of damaged housing units, the demolition and clearance of uninhabitable housing units and construction of replacement housing units.
Town of Ellsworth	June 26, 1998	87195.25	10/16/98-6/30/99	$36,457	Private Bridge Replacement
Rock County	August 4, 1998	87195.26	11/16/98-3/31/00	$495,000	Rehabilitation of damaged housing units, replacement of wells/septic systems and water/ sewer lines, the demolition and clearance of hazardous structures and acquisition/relocation.
Door County	August 23, 1998	88195.01	11/16/98-3/31/00	$495,000	Rehabilitation of damaged housing units, replacement of wells and septic systems and new construction to replace lost units.
Sheboygan County	August 6, 1998	88195.02	11/16/98 - 3/31/01	$495,000	Rehabilitation of damaged housing units, replacement of water/sewer lines as well as wells/septic systems and the demolition and clearance of hazardous structures.
Town of Wheatland	April 23, 1999	89195.01	7/1/99 - 6/30/01	$500,000	Acquire/demolish homes/hazardous structures and provide relocation assistance to homeowners.
Kenosha County	June 14-20, 1999	89195.02	7/14/99 - 3/31/01	$648,000	Acquire/demolish homes/hazardous structures and provide relocation assistance to homeowners.
Village of Oregon	May 16-17, 1999	89195.03	9/9/99 - 3/31/01	$500,000	Acquire/demolish homes/hazardous structures and provide relocation assistance to homeowners.
Florence County	July 15-16, 1999	89195.04	10/13/99 - 3/31/01	$352,000	Rehabilitation of damaged housing units.
Ashland County	July 1, 1999	89195.05	11/8/99 - 6/30/01	$500,000	Rehabilitation of damaged housing units, replacement of wells and septic systems, the demolition and clearance of hazardous structures, new construction to replace lost units OR acquisition/relocation.
Manitowoc County	May 12, 2000	80195.01	8/18/00 - 12/31/01	$249,700	Rehabilitation of damaged housing units, replacement of housing units, replacement of water and sewer lines or wells and septic systems, the demolition and clearance of hazardous structures and acquisition/relocation.

FUNDED MITIGATION PROJECTS IN STATE
COMMUNITY DEVELOPMENT BLOCK GRANT – EMERGENCY ASSISTANCE PROGRAM, continued

Grantee Name	Date of Disaster	Contract #	Contract Period	Award Amount	Project Description
City of Baraboo	June-July 2000	80195.02	11/8/00 - 3/31/02	$137,500	Rehabilitation of damaged housing units and the replacement of water/sewer lines and well/septic systems.
Grant County	May-June 2000	80195.03	12/1/00 - 3/31/02	$363,000	Rehabilitation of damaged housing units, replacement of housing units, replacement of water/sewer lines or wells/septic systems, the demolition and clearance of hazardous structures and acquisition/relocation.
Kenosha County	May-July 2000	80195.04	11/8/00 - 3/31/02	$250,000	Acquisition/relocation and the demolition and clearance of hazardous structures and acquisition.
Vernon County	July 9-10, 2000	80195.05	11/8/00 - 3/31/02	$220,000	Rehabilitation of damaged housing units, replacement of housing units, replacement of water/sewer lines or wells/septic systems, the demolition and clearance of hazardous structures and acquisition/relocation.
Chippewa County	Sept. 11, 2000	80195.06	12/1/00 - 3/31/02	$110,000	Rehabilitation of damaged housing units and the replacement of water/sewer lines and wells/septic systems.

18 PROJECTS: Total of $6,305,407 in CDBG – EAP Funds

APPENDIX F

POTENTIAL MITIGATION PROJECTS (Unfunded HMGP Projects)

Disaster Number	Year	Community	County	Cost	Present Day Costs	Type	Project Description
DR-874	1990	Darlington, City	Lafayette	$ 92,000	$ 121,162	Struc	Replace, relocate and floodproof lift station
DR-874	1990	Darlington, City	Lafayette	$ 806,300	$ 1,061,879	Acq	Acquire, demolish and relocate firehouse & ambulance service
DR-874	1990	Rock County	Rock	$ 63,042	$ 83,025	Other	Addition of new equipment to existing water level stations and installation of one new station along the Yahara River, Turtle Creek, Rock River and Lake Koshkonong
DR-874	1990	Sauk County	Sauk	$ 120,000	$ 158,037	Other	Installation of new sirens and 100 warning monitors
DR-959	1992	Washara County	Washara	$ 40,085	$ 49,130	Other	Weather Information System – Early recognition of flooding, freezing rain, tornadoes, high winds, drought
DR-994	1993	Arena, Village	Iowa	$ 142,000	$ 169,123	Struc	Construct ¾ mile waterway to WI River per prior SCS plans
DR-994	1993	Adams County	Adams	$ 270,000	$ 321,572	Struc	Construction of new drainage ditches in Towns of Big Flat and Rome, City of Adams and Village of Friendship
DR-994	1993	Appleton, City	Outagamie	$ 326,000	$ 388,268	Other	Permanent rehabilitation of hill slip
DR-994	1993	Augusta, School Dist.	Eau Claire	$ 15,500	$ 18,461	Struc	Install swale; 2000 gal holding tank; 15” PVC pipe to Thompson Valley Creek
DR-994	1993	Beloit, City	Rock	$ 600,000	$ 714,604	Struc	Construct storm water detention basins
DR-994	1993	Berlin, City	Green Lake	$ 104,500	$ 124,460	Struc	Construct 950’ of shorewall
DR-994	1993	Black Creek, Village	Outagamie	$ 260,000	$ 309,662	Struc	Construct storm sewer and storm ditch
DR-994	1993	Black Riv Falls, City	Jackson	$ 457,000	$ 544,290	Struc	Construct storm sewer
DR-994	1993	Blair, City	Trempealeau	$ 54,000	$ 64,314	Other	Add 4 mechanized gates to dam
DR-994	1993	Bloomer, City	Chippewa	$1,125,000	$1,339,882	Acq	Acquisition/relocation of homes below dam in floodway
DR-994	1993	Eau Claire, City	Eau Claire	$ 120,000	$ 142,921	Struc	Replace outfall pipe, install valve manhole with stormwater pumping chamber and platform
DR-994	1993	Fond du Lac, City	Fond du Lac	$ 26,000	$ 30,966	Other	Raise north bank of west branch of Fond du Lac River
DR-994	1993	Hilbert, Village	Calumet	$ 166,000	$ 197,707	Struc	Construct storm sewer and drainage ditch
DR-994	1993	Jamestown, Town	Grant	$ 27,000	$ 32,157	Acq	Acquire 6 acres & residence in floodplain
DR-994	1993	Johnson Creek, Village	Jefferson	$ 248,000	$ 295,370	Struc	Construct storm sewer with appurtenances
DR-994	1993	Juneau, City	Dodge	$ 155,000	$ 184,606	Struc	Construct storm sewer
DR-994	1993	Monroe, City	Green	$ 40,000	$ 47,640	Struc	Construct detention pond with multi-state release mechanism

POTENTIAL MITIGATION PROJECTS (Unfunded HMGP Projects), continued

Disaster Number	Year	Community	County	Cost	Present Day Costs	Type	Project Description
DR-994	1993	No. Fond du Lac, Vil	Fond du Lac	$1,442,500	$1,718,026	Struc	Construct off-channel detention basin and a trash rack
DR-994	1993	Owen, City	Clark	$3,622,128	$4,313,977	Struc	Construct diversion channel for Britt Creek
DR-994	1993	Pardeeville, Village	Columbia	$ 30,000	$ 35,730	Struc	Construct storm sewer
DR-994	1993	Pepin, Town	Pepin	$ 40,000	$ 47,640	Struc	Construct earthen dam
DR-994	1993	River Falls, City	Pierce	$ 165,000	$ 196,516	Struc	Construct storm sewer
DR-994	1993	Saratoga, Town	Columbia	$ 375,000	$ 446,627	FP	Elevate 15 homes
DR-994	1993	St. Francis, City	Milwaukee	$ 32,500	$ 38,708	Struc	Construct storm sewer and pave ditch
DR-994	1993	Syverson Luth Home	Eau Claire	$ 500,000	$ 595,503	Other	Stabilizing river bank next to Syverson Lutheran Home
DR-994	1993	Vernon County	Vernon	$1,025,000	$1,220,781	Acq	Acquire and relocate non-conforming structures in hydraulic shadow of dam
DR-994	1993	Windsor, Town	Dane	$ 690,000	$ 821,794	Struc	Construct storm sewers and bigger culverts
DR-1131	1996	Monroe, City	Green	$ 75,000	$ 82,179	Struc	Construct detention pond (17th Avenue Detention Basin)
DR-1131	1996	Monroe, City	Green	$ 200,000	$ 219,145	Struc	Construct 2000 ft. of 60" storm sewer to stormwater retention pond
DR-1131	1996	Monroe, City	Green	$ 75,000	$ 82,179	Other	Drainage study of Honey Creek Watershed
DR-1131	1996	St. Luke's Lutheran School	Fond du Lac	$ 60,000	$ 65,744	Struc	Build basement for school for safe area for children during storms
DR-1180	1997	Bayside, Village	Milwaukee	$ 450,000	$ 482,017	Struc	Construct new culvert under railroad embankment
DR-1180	1997	Bayside, Village	Milwaukee	$ 350,000	$ 374,902	Struc	Construct 5 acre stormwater detention pond
DR-1180	1997	Brookfield, City	Waukesha	$2,500,000	$ 2,677,872	FP+ Struc	Floodproof 38 structures, elevate 3, construct detention pond
DR-1180	1997	Brown Deer, Village	Milwaukee	$ 995,000	$ 1,065,793	Struc	Increase capacity of 10 drainage structures
DR-1180	1997	Brown Deer, Village	Milwaukee	$ 63,000	$ 67,482	Other	Upgrade/retrofit 3 pumping stations
DR-1180	1997	Brown Deer, Village	Milwaukee	$ 22,500	$ 24,101	Other	Replace sanitary manhole covers (250)
DR-1180	1997	Brown Deer, Village	Milwaukee	$ 35,000	$ 37,490	Other	Conduct sanitary sewer televising and perform sealing/grouting
DR-1180	1997	Butler, Village	Waukesha	$ 350,000	$ 374,902	Struc	Construct storm sewer
DR-1180	1997	Cudahy, City	Milwaukee	Unknown		Struc	Construct sewer system modifications (4 sites)
DR-1180	1997	Fox Point, Village	Milwaukee	$ 600,000	$ 642,689	Struc	Replacement of 3 circular culverts with two box culverts
DR-1180	1997	Fox Point, Village	Milwaukee	$ 649,269	$ 695,464	Other	Erosion control: gabions, removal of outfall, storm sewer extension
DR-1180	1997	Fox Point, Village	Milwaukee	$ 90,000	$ 96,403	Other	Erosion Control: gabions, sewer extension
DR-1180	1997	Fox Point, Village	Milwaukee	$ 500,000	$ 535,574	Struc	Implement recommendations of Sanitary System Study
DR-1180	1997	Germantown, Village	Washington	$ 75,000	$ 80,336	Acq	Acquisition of vacant parcel

POTENTIAL MITIGATION PROJECTS (Unfunded HMGP Projects), continued

Disaster Number	Year	Community	County	Cost	Present Day Costs	Type	Project Description
DR-1180	1997	Germantown, Village	Washington	$ 500,000	$ 535,574	Struc	Construct storm sewers in Hudson Drive
DR-1180	1997	Germantown, Village	Washington	$ 45,000	$ 48,202	Struc	Install 48" reinforced concrete culvert pipe at Pilgrim Road and 6 storm inlet structures
DR-1180	1997	Greenfield, City	Milwaukee	$ 116,887	$ 125,203	Struc	Install sewer drain in curb, moving handicap ramp and install tier landscaping at City Hall
DR-1180	1997	Milwaukee County	Milwaukee	$ 170,000	$ 182,095	Struc	Construct water main below Menomonee River bed
DR-1180	1997	Milwaukee County	Milwaukee	$ Unknown		Acq	Acquisition/relocation of County Park maintenance structures
DR-1180	1997	Milwaukee County	Milwaukee	$ Unknown		Struc	Replace abandoned sanitary sewer system in Doctors Park
DR-1180	1997	Milwaukee County	Milwaukee	$ 970,000	$1,039,014	Struc	Replace drainage system under Lincoln Memorial Drive
DR-1180	1997	Milwaukee County	Milwaukee	$ Unknown		Other	Repair or removal of Estabrook Dam
DR-1180	1997	Milwaukee Metro. Sewage District	Milwaukee	$24,200,000	$25,921,798	Struc	Modifications to 5.7 miles of channel on Lincoln Creek to increase floodwater carrying capacity
DR-1180	1997	Milwaukee Metro. Sewage District	Milwaukee	$ 1,725,000	$ 1,847,731	Struc	Increase channel capacity and detention facilities of South Branch Creek and complete hydraulic/hydrologic analysis of the creek
DR-1180	1997	Milwaukee Metro. Sewage District	Milwaukee	$ 600,000	$ 642,689	Struc	Replace 3 culverts with 2 box culverts on North Port Washington Road on Indian Creek
DR-1180	1997	Milwaukee Metro. Sewage District	Milwaukee	$ 305,000	$ 326,700	Other	Removal of debris in Menomonee River channel
DR-1180	1997	Milwaukee Metro. Sewage District	Milwaukee	$ 25,000	$ 26,779	Struc	Construct levee or berm around lift station
DR-1180	1997	Milwaukee Metro. Sewage District	Milwaukee	$ 28,000	$ 29,992	Struc	Install drains from below ground ISS sampling vaults nearby deep tunnel
DR-1180	1997	New Berlin, City	Waukesha	$ 500,000	$ 535,574	Struc	Open existing culverts and increase the number of culverts to handle the load of Poplar Creek
DR-1180	1997	River Hills, Village	Milwaukee	$ 10,000	$ 10,711	FP	Floodproofing lift station
DR-1180	1997	Shorewood, Village	Milwaukee	$ 140,000	$ 149,961	Other	Rehabilitate sanitary sewer manholes (30) and remove downspouts from sanitary sewer lateral (25 homes)
DR-1180	1997	Shorewood, Village	Milwaukee	$1,500,000	$ 1,606,723	Struc	Construct sewer improvements
DR-1180	1997	Shorewood, Village	Milwaukee	$ 90,000	$ 96,403	Other	Stabilize path at Atwater Park
DR-1180	1997	Slinger, Village	Washington	$ 135,000	$ 144,605	Acq	Acquisition of a two-family structure
DR-1180	1997	Slinger, Village	Washington	$ 61,000	$ 65,340	Struc	Wild Life Habitat Pond (stormwater retention)

POTENTIAL MITIGATION PROJECTS (Unfunded HMGP Projects), continued

Disaster Number	Year	Community	County	Cost	Present Day Costs	Type	Project Description
DR-1180	1997	So. Milwaukee, City	Milwaukee	$ 65,000	$ 69,625	Other	Production of 4 video tapes
DR-1180	1997	So. Milwaukee, City	Milwaukee	$ 200,000	$ 214,230	Struc	Purchase large capacity pump to remove water from sanitary sewer and discharge during high rain
DR-1180	1997	West Allis, City	Milwaukee	$ 220,000	$ 235,653	Other	Disconnect footing drains, install sump pump and sewage ejector pump (55 homes)
DR-1180	1997	West Allis, City	Milwaukee	$ 1,000,000	$1,071,149	Other	Lowering flow line of Hale Creek and widening
DR-1236	1998	Brockway, Town	Jackson	$ 150,000	$ 158,208	Struc	Installation of two bridges with removal of box culvert
DR-1236	1998	Ellsworth, Village	Pierce	$ Unknown		Struc	Construction of 5 detention ponds
DR-1236	1998	Ellsworth, Village	Pierce	$ 70,000	$ 73,830	Other	Replace and enlarge existing lime rock water way
DR-1236	1998	LaCrosse, City	LaCrosse	$ 60,000	$ 63,283	FB	Filling a basement of non-compliant house
DR-1236	1998	LaCrosse, City	LaCrosse	$ 40,000	$ 42,189	Struc	Storm sewer improvements – rerouting water to marsh eliminating water going into city storm sewer system
DR-1236	1998	Lancaster, City	Grant	$ 210,000	$ 221,491	Acq	Acquire property and construct a detention pond
DR-1236	1998	Menomonie, Town	Dunn	$ 14,000	$ 14,766	Other	River bank repair to protect road
DR-1236	1998	Rock Elm, Town	Pierce	$ 24,000	$ 25,313	Struc	Replace existing 48” pipes with box culverts to protect road
DR-1236	1998	Sparta, City	Monroe	$ 150,000	$ 158,208	Struc	Dam improvements and repair of Mill building
DR-1236	1998	Spring Lake, Town	Pierce	$ 8,000	$ 8,438	Struc	Construct culvert, ditching and pool to protect road
DR-1236	1998	Spring Lake, Town	Pierce	$ 35,000	$ 36,915	Other	Erosion control – stabilize steep downslope along town road
DR-1236	1998	Vernon County	Vernon	$ 340,000	$ 358,605	Other	Alarm warning systems for high water
DR-1236	1998	Vernon County	Vernon	$ 150,000	$ 158,208	Acq	Acquisition of 4 trailers
DR-1236	1998	Vernon County	Vernon	$ 50,000	$ 52,736	Struc	Construct berms around two structures
DR-1238	1998	Brookfield, City	Waukesha	$ 777,361	$ 819,898	Acq/ FB	Acquisition or floodproofing of 3 homes
DR-1238	1998	Brookfield, City	Waukesha	$ 957,691	$1,010,096	Acq/ FB	Acquisition or floodproofing of 6 homes
DR-1238	1998	Brown Deer, Village	Milwaukee	$ 3,700,000	$3,902,464	Struc	Construction of Detention Ponds
DR-1238	1998	Butler, Village	Waukesha	$ 2,100,000	$2,214,912	Struc	Upgrade existing storm sewer (replace 21” with 72”)
DR-1238	1998	Cudahy, City	Milwaukee	$ 550,000	$ 580,096	Struc	Upgrade existing storm sewer
DR-1238	1998	Fox Point, Village	Milwaukee	$8,104,920	$8,548,421	Acq	Acquisition of 36 homes
DR-1238	1998	Harmony, Town	Rock	$ 155,000	$ 163,482	Acq	Acquisition of 1 home
DR-1238	1998	Janesville, City	Rock	$ 525,000	$ 553,728	Acq	Acquisition of 4 homes
DR-1238	1998	Janesville, City	Rock	$ 265,000	$ 279,501	Acq	Acquisition of 3 commercial properties

POTENTIAL MITIGATION PROJECTS (Unfunded HMGP Projects), continued

Disaster Number	Year	Community	County	Cost	Present Day Costs	Type	Project Description
DR-1238	1998	Milton, City	Rock	$ 113,000	$ 199,183	Acq/ Struc	Land acquisition and construction of storm sewer
DR-1238	1998	New Berlin, City	Waukesha	$ 750,000	$ 791,040	Acq	Acquisition of 5 homes
DR-1238	1998	Oak Creek, City	Milwaukee	$ 90,000	$ 94,925	Acq/ Struc	Acquisition of easements and one parcel/install culvert under RR
DR-1238	1998	Oak Creek, City	Milwaukee	$ 180,000	$ 189,850	Struc	Storm sewer improvement and pump station
DR-1238	1998	Sheboygan, City	Sheboygan	$ 1,500,000	$1,582,080	Struc	Construct storm sewer
DR-1238	1998	Sheboygan, City	Sheboygan	$ 325,000	$ 342,784	Struc	Raise berm/dike along Camelot Street
DR-1238	1998	Sheboygan, City	Sheboygan	$ 1,500,000	$1,582,080	Struc	Storm sewer project
DR-1238	1998	Sheboygan, City	Sheboygan	$ 500,000	$ 527,360	Struc	Construction of detention pond
DR-1238	1998	Sheboygan, City	Sheboygan	$ 600,000	$ 632,832	Struc	Increase existing detention pond
DR-1238	1998	Sheboygan, City	Sheboygan	$ 1,000,000	$1,187,384	Struc	Upsize existing storm sewer
DR-1238	1998	Sheboygan, Town	Sheboygan	$ 44,140	$ 46,555	Struc	Storm water improvement
DR-1238	1998	Sheboygan, Town	Sheboygan	$ 70,000	$ 73,830	Struc	Storm sewer improvement
DR-1238	1998	Sheboygan Falls, City	Sheboygan	$ 330,000	$ 348,058	Struc	Construct detention pond
DR-1238	1998	Sheboygan Falls, City	Sheboygan	$ 110,000	$ 116,019	Struc	Construct storm sewer
DR-1238	1998	Sheboygan Falls, City	Sheboygan	$ 265,000	$ 279,501	Struc	Construct storm sewer and minor ditching
DR-1284	1999	Columbia County	Columbia	$ 1,152,800	$1,187,384	Acq	Acquisition of structures in Blackhawk Park
DR-1284	1999	Dane County	Dane	$ 600,000	$ 618,000	Other	Funds for implementing study recommendations of the Upper Yahara River
DR-1284	1999	Head of Lakes Coop	Douglas	$ 17,800	$ 18,334	Other	Install 0.6 miles of single phase tie line
DR-1284	1999	Head of Lakes Coop	Douglas	$ 29,600	$ 30,488	Other	Install 1.0 mile single phase tie line
DR-1284	1999	Maple, Town	Douglas	$ 37,500	$ 38,625	Other	Install sheet piling to contain sedimentation to fire pond (water used for fire trucks)
DR-1284	1999	Oregon, Village	Dane	$ 123,200	$ 126,999	Struc	Dedicate storm sewer with laterals for Prairie View St.
DR-1284	1999	Oregon, Village	Dane	$ 162,800	$ 167,684	Struc	Construct new sanitary sewer line
DR-1284	1999	Rusk County	Rusk	$ 10,000	$ 10,300	Other	Lower town road so it is not in the Bucks Lake Spillway
DR-1284	1999	Superior, City	Douglas	$ 213,476	$ 219,880	Struc	Construction of storm water detention structure
DR-1332	2000	Avoca, Village & Pulaski, Town	Iowa	$ 15,000	$ 15,000	Other	Remove trees and clean banks of Morrey Creek to prevent water from backing into town
DR-1332	2000	Beetown, Town	Grant	$ 7,400	$ 7,400	Other	Straighten stream to prevent it from eroding road

POTENTIAL MITIGATION PROJECTS (Unfunded HMGP Projects), continued

Disaster Number	Year	Community	County	Cost	Present Day Costs	Type	Project Description
DR-1332	2000	Bloomfield, Town	Walworth	$ 854,000	$ 854,000	Struc	Construction of ditching, retention ponds, storm culverts and storm sewer
DR-1332	2000	Bristol, Town	Kenosha	$ 1,020,000	$ 1,020,000	Struc	Purchase empty lots for storm water retention along with construction of storm sewers
DR-1332	2000	Bristol, Town	Kenosha	$ 300,000	$ 300,000	Struc	Replace culverts with bridge and raise road
DR-1332	2000	Columbus, City	Columbia	$ 700,000	$ 700,000	Struc	Conduct in-depth engineering analysis and plan development to identify sanitary sewer system problem areas and then construct sewers
DR-1332	2000	Cudahy, City	Milwaukee	$ 530,000	$ 530,000	Acq	Acquisition of 2 homes and construct a detention pond
DR-1332	2000	Cudahy, City	Milwaukee	$ 110,000	$ 110,000	Struc	Construct relief storm sewer
DR-1332	2000	Dane, County EM	Dane	$ 100,000	$ 100,000	Other	Study and develop a means of providing emergency warning information to citizens with hearing disabilities
DR-1332	2000	Dane, County EM	Dane	$ 242,000	$ 242,000	Other	Replace 18 AC powered sirens with battery powered sirens
DR-1332	2000	Darlington, City	Lafayette	$ 1,878,000	$ 1,878,000	Acq/ Struc	Relocate the Fire Department
DR-1332	2000	Eau Claire, City	Eau Claire	$ 555,000	$ 555,000	Struc	Acquisition of land and construction of 3 detention ponds (not in floodplain)
DR-1332	2000	Edgewater, Town	Sawyer	$ 130,000	$ 130,000	Struc	Rebuild road with pit run gravel to higher grade and cover with 4” of crushed gravel
DR-1332	2000	Fitchburg, City	Dane	$ 300,000	$ 300,000	Other	Regrading and restoration of drainage channel with rip-rap
DR-1332	2000	Grand Chute, Town	Outagamie	$ 850,000	$ 850,000	Struc	Construct a piped enclosure of existing drainage way
DR-1332	2000	Harrison, Town	Grant	$ 53,000	$ 53,000	Struc	Replace small bridge with larger concrete box culvert and raise road 24-30 inches
DR-1332	2000	Juneau, City	Dodge	$ 231,066	$ 231,066	Struc	Construct an additional 48” storm sewer
DR-1332	2000	Kenosha, City	Kenosha	$ 2,000,000	$ 2,000,000	Struc	Construction of a 101 acre-foot storm water detention basin
DR-1332	2000	Kenosha, City	Kenosha	$ 650,000	$ 650,000	Other	Deepening an existing storm water detention basin
DR-1332	2000	Kenosha, City	Kenosha	$ 650,000	$ 650,000	Struc	Construct a detention basin
DR-1332	2000	Kenosha County	Kenosha	$ 100,000	$ 100,000	Struc	Construct two small earthen berms with storm water control mechanism
DR-1332	2000	Lancaster, City	Grant	$ 77,900	$ 77,900	Struc	Construct storm sewer
DR-1332	2000	Madison, City	Dane	$ 170,000	$ 170,000	Struc	Construct retention basin – Owen Park
DR-1332	2000	Madison, Town	Dane	$ 250,000	$ 250,000	Struc	Construct 4,000 feet of storm sewer plus catch basins

POTENTIAL MITIGATION PROJECTS (Unfunded HMGP Projects), continued

Disaster Number	Year	Community	County	Cost	Present Day Costs	Type	Project Description
DR-1332	2000	Middleton, City	Dane	$ 48,000	$ 48,000	Struc	Construct 2 sediment/pollutant interception forebay structures – Tiedeman Pond
DR-1332	2000	Milwaukee County Public Works	Milwaukee	$ 55,000	$ 55,000	Other	Elevate an existing transformer to avoid contact with future flood waters
DR-1332	2000	Monroe, City	Green	$ 825,000	$ 825,000	Struc	Construct approximately 10 detention ponds
DR-1332	2000	Racine County	Racine	$ 136,000	$ 136,000	Other	Remove and dispose of brush and debris in 36 miles of canals and drainage ditches in the Norway Dover Drainage District
DR-1332	2000	Rusk, Cty Hwy Dept	Rusk	$ 30,000	$ 30,000	Other	Reconstruct creek bank to original elevation to eliminate overtopping onto county road
DR-1332	2000	Sun Prairie, City of	Dane	$ 500,000	$ 500,000	Struc	Construct retention facility
DR-1332	2000	Thiensville, Village	Ozaukee	$ 180,000	$ 180,000	Struc	Construct parallel storm water system
DR-1332	2000	Three Lakes, Town	Oneida	$ 35,000	$ 35,000	Struc	Raise 2 miles of roadway
DR-1332	2000	Vernon, Cty Water Conservation Dept	Vernon	$ 260,385	$ 260,385	Other	Repair 5 stilling pools below dam to new Natural Resources Conservation Service Standards
DR-1332	2000	Verona, Town of	Dane	$ 831,000	$ 831,000	Acq/ Struc	Acquisition of 3 homes, replacement 3 culverts, reconstruct drainage channel
DR-1332	2000	Waukesha, City	Waukesha	$ 115,000	$ 115,000	Struc	Replacing ditch with 243 feet of 48” pipe
DR-1332	2000	Whitehall, City	Trempealeau	$ 400,000	$ 400,000	Struc	Construction of 3 detention ponds and storm sewer system
DR-1332	2000	Winnebago, County Sheriff	Winnebago	$ 230,000	$ 230,000	Other	Create a hot loop for the microwave system utilized by the E911 county-wide dispatch system
DR-1332	2000	Wisconsin Dells, City	Columbia, Sauk, & Adams	$ 115,000	$ 115,000	Struc	Purchase land and construct a retaining area

APPENDIX G

State of Wisconsin Repetitive Loss Report

February 2001

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EXECUTIVE SUMMARY

To help reduce repetitive flood losses, FEMA Region V updated and corrected the Federal Emergency Management Agency (FEMA) repetitive loss database for Wisconsin in July 2000. Wisconsin Emergency Management collated the database with its data on mitigation to produce the most accurate picture possible of the current status of repetitive loss properties in Wisconsin.

The State of Wisconsin Repetitive Loss Report was developed to serve as a written summary of the updated Wisconsin database findings and to serve as an attachment to the Wisconsin State Hazard Mitigation Plan. The Repetitive Loss Report describes the methodology and data collection process for repetitive loss properties. The methodology involved contacting all communities with a repetitive loss property and obtaining the best available information on the current building status of each property. The database findings include a brief discussion of the 362 repetitive loss properties, the repetitive loss communities and the success of the acquisitions through the Hazard Mitigation Grant Program (HMGP), the Flood Mitigation Assistance (FMA) program and other state and local hazard mitigation efforts.

The updated database shows that 46 of the repetitive loss properties (12.70%) have been removed or protected from the threat of flooding by acquisition, elevation, floodproofing, levees or other structural measures. Of these 46 properties, 39 (10.77% of all RLP) were acquired and 7 (1.93% of all RLP) were floodproofed. In addition there are 12 properties (3.31%) in the process of flood mitigation, all in the City of Wauwatosa in Milwaukee County. There are 304 properties (83.98%) that remain floodprone and 54 NFIP communities with repetitive loss properties.

Acquisition was the most common choice of mitigation by most communities. The success of acquisitions is most evident in communities with widespread damage such as Kenosha County and the Village of Brown Deer. In these communities acquisitions are eliminating the majority of repetitive loss properties and reducing the risk of future loss. The implementation summary suggests using the updated database as a resource to prioritize mitigation projects for future HMGP, FMA and other program grants. It is also suggested that the repetitive loss data become part of the Interagency Disaster Recovery Group's criteria in funding mitigation projects.

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ACRONYMS

DNR	Wisconsin Department of Natural Resources
FEMA	Federal Emergency Management Agency
FIA	Federal Insurance Administration
FMA	Flood Mitigation Assistance Program
HMGP	Hazard Mitigation Grant Program
IDRG	Interagency Disaster Recovery Group
NFIP	National Flood Insurance Program
PIN	Parcel Identification Number
RLP	Repetitive Loss Property
WEM	Wisconsin Emergency Management

I. INTRODUCTION

A. Purpose

The Wisconsin Hazard Mitigation Repetitive Loss Report, referred to as the Repetitive Loss Report, is intended to serve as an attachment to the State of Wisconsin Hazard Mitigation Plan. The Repetitive Loss Report provides information on the status of repetitive loss properties by community in Wisconsin. The information provided can be used as a floodplain management tool and to supplement information provided by communities for flood mitigation grants administered by Wisconsin Emergency Management (WEM).

B. Framework

The Federal Emergency Management Agency (FEMA), through the Federal Insurance Administration (FIA), collects data on each property in the United States when a flood insurance claim is made. When more than one flood insurance claim of at least $1,000 is made within a ten-year period, the property is classified as a repetitive loss property. Information on these repetitive loss properties is collected for each state in the FEMA repetitive loss database. However, the information collected by FIA is not standardized and has errors that require correction through the methodology described in Section II. .

C. Intent

Under federal disaster declaration FEMA-1332-DR-WI, a staff person was provided by FEMA to update the existing FEMA repetitive loss database with accurate information on each of the 362 properties listed and to assist the state in identifying those communities that warrant implementation of mitigation measures. The updated repetitive loss database is the source of information for this report. The Repetitive Loss Report can serve as a statewide plan for addressing repetitive loss properties. By accurately identifying which properties are the highest repetitive loss and should be considered for mitigation by the community, WEM will be better able to rank repetitive loss properties and make conclusive funding decisions for Flood Mitigation Assistance (FMA) program and Hazard Mitigation Grant Program (HMGP) mitigation projects to reduce future flood losses.

II. METHODOLOGY

A. Organization

The methodology used for data collection consisted of contacting community officials, obtaining the best available and current information for properties in their jurisdiction and updating the database. Communities were contacted by telephone because most communities with repetitive loss properties in Wisconsin have only 1 or 2 repetitive loss properties. The information requested included the updated owner's name, updated or accurate property address, building status, mitigation status and parcel identification number (PIN). The PIN was requested because several of the repetitive loss properties are located in rural areas and have a rural route or other non-discrete address. By obtaining the PIN, the property can be easily identified since a PIN provides an exact location whereas an address can be vague.

The information requested was kept brief to not overburden the official with detailed and time consuming requests. This proved to be very effective in getting a quick response from many communities while providing the state with relevant updated information.

B. Building Status Options

There were six (6) building status options provided to the community official. The official was asked to select only one option per property so that the property's building status could be easily categorized. The options are listed below.

1. **Bought out or relocated** - Structure has been acquired or relocated out of the floodplain using a federal, state or local flood mitigation program. Property is now open space (If this option is selected, you do not need to complete the mitigation status).

2. **Approved mitigation project** - Structure is in a mitigation project that has been approved for funding but has not yet begun (If this option is selected, you do not need to complete the mitigation status).

3. **Elevated or floodproofed** - Structure is no longer subject to repetitive flood damages.

6. **Repaired but floodprone-same owner** - Structure has been repaired and re-occupied. Structure is still subject to flooding.

7. **Repaired but floodprone-new owner** - Structure has been repaired and re-occupied with a new owner. Structure is still subject to flooding.

X. **No information** - If no updated information was available on the properties, they were identified as "X" on the database.

C. Data Collection

Data collection was accomplished through a telephone call made to the community official. Once all the data was collected from a community, the community information in the database was updated. When the data was collected from every community, changes to the database were finalized, and the findings were summarized in this Plan of Action.

III. DATA COLLECTION FINDINGS

A. Number of Repetitive Loss Properties and Duplicate Properties

The hard copy of the FEMA database used in this report was printed in June 2000 and identified 363 repetitive loss properties statewide in Wisconsin. However, examining the database revealed 2 duplications. In addition, the repetitive loss data collected by the Wisconsin Department of Natural Resources and printed in January 2001 revealed one omission. Therefore, the most accurate and current total is 362 repetitive loss properties.

B. Repetitive Loss Property Building Status

The Wisconsin database identifies that 39 (10.77%) of the 362 statewide repetitive loss properties have been removed from the threat of flooding by acquisition. There are 7 repetitive loss properties (1.93%) that have been floodproofed and another 12 (3.31%) that are in the process of flood mitigation through acquisition. Thus, 58 repetitive loss properties (16.02%) are not or will no longer be vulnerable to flooding by the end of 2001. Generally, acquisition is preferred over floodproofing because acquisition completely removes structures from the floodplain, eliminating flood risk to the property and its owners. Floodproofing reduces the risk to repetitive loss structures while allowing the structures to stay in place. This can be a preferable alternative in some circumstances for historical or cultural reasons, but is possible only if the property is protected above the 100-year flood elevation.

Table 1. Repetitive Loss Property Building Status

Building Status Description	Building Status Code	Number of Properties	Percent of Total
Bought Out (acquired)	1	39	10.77%
Approved Mitigation Project	2	12	3.31%
Elevated or Floodproofed	3	7	1.93%
Floodprone-Same Owner	6	250	69.06%
Floodprone-New Owner	7	27	7.46%
No Information Available	X	27	7.46%
Total		362	100.00%

There are 304 (83.98%) repetitive loss properties where flood mitigation has not taken place or no information is available. These properties are presumed to remain floodprone. Of these 304 properties, 27 have changed ownership. These new property owners may not have experienced repetitive losses, but attention should be given to them since the owners may be unaware of the real flood threat and previous repetitive losses.

Table 2. Repetitive Loss Property Building Status Grouped by Flood Risk

Flood Risk	Building Status Description (Building Code)	Number of Properties	Percent of Total
Mitigated	Bought Out (1) In Mitigation Project (2) Elevated/Floodproofed (3)	58	16.02%
Remain Floodprone	Same Owner (6) New Owner (7)	277	76.52%
Unknown	No Information Available (X)	27	7.46%
Total		362	100.00%

There are 27 (7.46%) properties that had no updated information available. This was usually due to incomplete or inadequate addresses and owner's names that were two or more decades old. These two factors made it virtually impossible for some community officials to track down the property.

C. Repetitive Loss Communities

The Wisconsin database identifies that there are 54 communities with repetitive loss properties. The data collection showed that several Wisconsin communities were incorrectly listed as a repetitive loss community for two main reasons. First, it appears that some of the incorrect listings were due to a property being a secondary or seasonal home, but the NFIP community listed was where the owner's primary residence was located and not the location of the flooded secondary home. Second, some incorrect listings were due to a property being in the unincorporated portion of a county, whereas the original database listed the property in the nearest incorporated community. These errors have been corrected in the Wisconsin database. It is important to note that communities in the database are listed and arranged as NFIP communities.

The corrected list of communities with repetitive loss properties yields the following data. Most communities with repetitive loss properties in Wisconsin have five or less repetitive loss properties, as displayed in Table 3. The ten communities with the most repetitive loss properties and the status of those properties are described in Table 4.

Table 3. Repetitive Loss Communities
Grouped by Number of Repetitive Loss Properties

Number of Repetitive Loss Properties	Number of Communities	Percent of Communities
1-5	46	85.19%
6-10	5	9.26%
11-20	1	1.85%
21-50	1	1.85%
51+	1	1.85%
Total	54	100.00%

Table 4. Top Ten Communities
with Highest Number of Repetitive Loss Properties (RLP)

Rank	Community Name	Total RLP	Building Status of Total RLP in Community (by building status codes)					
			1	2	3	6	7	X
1	Milwaukee, City	211	6			182	10	13
2	Wauwatosa, City	21	6	12		3		
3	Darlington, City	11	3		6	2		
4	Brown Deer, City	10	10			0		
5	Jefferson County	10	1			5	1	3
6	Kenosha County	8	7			1		
7	Thiensville, City	8				7	1	
8	Brookfield, City	6	1			3	2	
9	Trempealeau County	5			1	4		
10	Glendale, City	4				4		

D. Success of Post-Disaster Acquisitions

After the Midwest Flood of 1993 (FEMA-DR-994-WI), the HMGP had new resolve to address repetitive flood losses and unprecedented funding to accomplish the task. Although some acquisitions were planned prior to 1993, the size of the 1993 disaster guided future acquisition projects by refining Wisconsin's implementation policies and procedures for acquisition grants, specifically the HMGP. The success of the post-1993 acquisitions can be seen by an impressive reduction in repetitive losses.

Table 5. Success of Acquisition in Reducing Repetitive Losses

Community	Repetitive Loss Properties (RLP)	Number & (%) of Local RLP Acquired	Number of RLP Remaining	Flood Risk of RLP Remaining	
				Mitigated or in Process	Flood Prone
Brown Deer, Village	10	10 (100%)	0	0	0
Kenosha County	8	7 (87.5%)	1	0	1
Wauwatosa, City	21	6 (28.6%)	15	12	3
Darlington, City	11	3 (27.3%)	8	6	2

The Village of Brown Deer and Kenosha County are two communities where acquisition projects have eliminated the majority of local repetitive loss properties. The Village of Brown Deer acquired 100 percent of its repetitive loss properties while Kenosha County acquired 87.5 percent. The City of Wauwatosa and the City of Darlington are two communities that have embraced flood mitigation through floodproofing as well as acquisition.

IV. IMPLEMENTATION SUMMARY

A. Funding Sources

The primary source of mitigation funds is the Section 404 Hazard Mitigation Grant Program (HMGP). The HMGP can provide local communities 87.5 percent (75 percent federal, 12.5 percent state) of the funds to implement immediate and long-term hazard mitigation measures following a federal disaster declaration. Communities must provide a non-Federal match of 12.5 percent either through a state agency or through a local funding source. The amount of HMGP funds made available is 15 percent of all direct disaster assistance from FEMA. HMGP projects are scored and selected by WEM and the IDRG on a variety of criteria that favor permanent and cost effective mitigation of flood damaged structures. Thus, repetitive loss structures are excellent candidates for mitigation with HMGP funds.

The second source of flood mitigation funds is the Flood Mitigation Assistance (FMA) program. FMA is state-administered through WEM and is a cost-share program (75 % federal, 25% local match) through which states and communities can receive grants for flood mitigation planning, technical assistance and mitigation projects. The overall goal of the FMA is to fund cost-effective measures that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other NIFP-insured structures. Other goals are to: Reduce the number of repetitively or substantially damaged structures and the associated claims on the NFIP; Encourage long-term, comprehensive mitigation planning; Respond to the needs of communities participating in the NFIP; and Complement other federal and state mitigation programs with similar goals.

The significant differences between HMGP and FMA are that the FMA funds are allocated to the state annually, are not tied to a federal disaster declaration and are limited to only flood mitigation. FMA funding is also generally smaller in magnitude compared to the HMGP funding. As a result, FMA funding often supplements HMGP funding to accomplish a project. To receive mitigation project funds under FMA, local communities are required to develop a Flood Mitigation Plan that identifies those structures that are vulnerable to flood damage, establishes mitigation priorities and includes an action plan to reduce flood vulnerability. Mitigation of repetitive loss properties is a priority of FMA because structures with repetitive losses are likely to be highly vulnerable. Thus, a successful flood mitigation plan will identify any repetitive loss properties and will show how the community plans to mitigate those properties.

B. Mitigation Recommendations and Projects

The Plan of Action will provide the state with a resource to identify the properties with the most repetitive losses and to prioritize specific mitigation recommendations for those properties. The state will utilize the Repetitive Loss Report to identify the statistics from past and current mitigation projects in reducing flood losses and to provide guidance for future mitigation projects. Repetitive loss information will be considered as part of the funding criteria for future mitigation projects, especially FMA projects. It should be expected that when a community submits an application for HMGP or FMA funding, the

state would refer to the Repetitive Loss Report to determine if the repetitive loss properties are identified on the application. If they are not identified, the state should recommend that the repetitive loss properties become part of the project, provided the properties fit well within the original scope of the project and all funding requirements are met.

C. Standardized Information

Since some of the repetitive loss properties were unidentified due to poor location information, it is suggested that FEMA standardize their method of data collection for the repetitive loss properties. The consistent use of PINs on the flood insurance application would be one method of such standardization.

D. Updates

The Repetitive Loss Report will remain an addendum to the State of Wisconsin Hazard Mitigation Plan. Updates of the Repetitive Loss Report will be accomplished every year or two as new claim information is available from the NFIP and as remaining repetitive loss properties are mitigated through state programs.

E. Target Repetitive Loss Properties

In December 1999, FEMA issued guidance that stated emphasis should be given to addressing the target repetitive loss properties identified in FEMA's Repetitive Loss Strategy. Target properties were defined as structures with four or more losses and structures with two to three losses where cumulative payments exceeded the property value. According to these criteria, there are twelve such properties in Wisconsin located within nine communities. Eight are residential structures valued at $1,042,700 and four are commercial structures valued at $2.8 million. One of the target residential properties has been included in a mitigation project underway in the City of Wauwatosa, which will reduce the number to eleven properties. Any eligible mitigation proposal for target repetitive loss properties in Wisconsin would be a high priority for mitigation funding at WEM.

ATTACHMENT A

Table 6. List of Communities with Repetitive Loss Properties

NFIP COMMUNITY	Repetitive Loss Properties				
	Total	Acquired	Floodproofed	In Process	Remaining
Bayside, Village	2				2
Berlin, City	1				1
Blair, City	2				2
Brookfield, City	6	1			5
Brown, County	1				1
Brown Deer	10	10			0
Butler, Village	2				2
Chaseburg, Village	1				1
Chippewa Falls, City	2				2
Clark County	1				1
Columbia County	3				3
Crawford County	2				2
Dane County	1				1
Darlington, City	11	3	6		2
Delafield, City	1				1
Door County	1				1
Dunn County	1				1
Durand, City	2				2
Elm Grove, Village	2	1			1
Fond du Lac County	1				1
Fountain, City	1				1
Glendale, City	4				4
Hillsboro, City	2				2
Howard, Village	2				2
Janesville, City	2				2
Jefferson County	10	1			9
Kenosha County	8	7			1
Kenosha, City	1	1			0
LaCrosse County	3				3
Loyal, City	1				1
Marathon County	1				1
Mequon, City	2				2
Milwaukee, City of	211	6			205
Monona, City	1				1
Neillsville, City	2				2
New Berlin, City	1	1			0
No. Fondulac, Village	1				1
Oconto County	2				2
Oconto, City	2				2
Oregon, Village	2	2			0
Pepin County	1				1

List of Communities with Repetitive Loss Properties, continued

NFIP Community	Repetitive Loss Properties				
	Total	Acquired	Floodproofed	In Process	Remaining
Pierce County	2				2
Prescott, City	2				2
River Hills, Village	2				2
Rusk County	1				1
Sheboygan, City	1				1
Silver Lake, Village	1				1
Sturgeon Bay, City	1				1
Thiensville, City	8				8
Trempealeau County	5		1		4
Washington County	2				2
Waukesha County	2				2
Wausau, City	1				1
Wauwatosa, City	21	6		12	3
Total	362	39	7	12	304
PERCENT	100%	10.77%	1.93%	3.31%	83.98%
Duplicates	2				

APPENDIX H

INTERAGENCY DISASTER RECOVERY GROUP

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Jack Price
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111 N. Canal Street, Suite 855
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US Dept. of Housing and Urban Dev.
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U.S. Army Corps of Engineers
St. Paul District,
Rock Island District, or
Detroit District as appropriate

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APPENDIX I

MITIGATION RESOURCES

STATE AND LOCAL PLANS

State Emergency Operations Plan

Establishes basic state procedures and agency cooperative agreements for coordination of emergency operations during a disaster.

County/City Emergency Operations Plans

Establishes basic local procedures and municipal/county cooperative agreements for coordination of emergency operations during a disaster.

Dam Safety Emergency Action Plan

Emergency Action Plans identify areas vulnerable to downstream flooding should a particular dam fail and establish emergency notification and coordination procedures.

State Hazard Mitigation Plan

Examines major Wisconsin hazards and identifies state agency actions that will reduce hazard vulnerability.

Local Hazard Mitigation Plans

Where available, local hazard mitigation plans identify local areas of hazard vulnerability and develop strategies to minimize risk.

Local Flood Mitigation Plans

Where available, flood mitigation plans identify areas of flood vulnerability including areas of repetitive flood insurance losses. Establishes priorities for acquisition and demolition of flood damaged structures.

County Hazardous Materials Emergency Response Plans

Identifies hazardous materials inventories and establishes geographical response areas for Level A and Level B hazardous materials teams.

STATE AND LOCAL PLANNING ASSISTANCE

All Hazards Mitigation Planning

Wisconsin Emergency Management, Bureau of Disaster Resources and Field Services (for natural hazards) and the Bureau of Technological Hazards (for radiological, chemical and other technological hazards).

Coastal Planning

Department of Administration, Wisconsin Coastal Management Program.

Flood Mitigation Planning

Department of Natural Resources, Water Division, Floodplains/Shoreland Section

Wisconsin Emergency Management, Bureau of Disaster Resources and Field Services.

County and Community Land Use Planning

Municipal Boundary Review: Department of Administration, Office of Land Information Services.

Smart Growth: Assistance with the new Smart Growth Comprehensive Planning grants and program goals is available from the Department of Administration, Office of Land Information Services.

Regional Planning Councils: These quasi-public agencies provide planning assistance to county and municipal governments.

RESOURCES FOR LOCAL GOVERNMENTS

"Addressing Your Community's Flood Problems – A Guide for Elected Officials." Association of State Floodplain Managers, Madison, WI (608) 274-0123.

"Community Flood Mitigation Planning Guidebook." Department of Natural Resources, 1995.

Hazard Mitigation Grant Program Brochure, fact sheet and application material (Wisconsin Emergency Management).

Flood Mitigation Assistance brochure, fact sheet and application material. Wisconsin Emergency Management.

"Planning for Post-Disaster Recovery and Reconstruction." Planning Advisory Service Report Number 483-484, American Planning Association, 122 S. Michigan Avenue, Suite 1600, Chicago IL 60603. Available through pasreports@planning.org.

"Using Multi-Objective Management to Reduce Flood Losses in the Watershed." Association of State Floodplain Managers, Executive Office (608) 274-0123.

Video: "Mitigation Revitalizes a Floodplain Community: The Darlington Story" Department of Natural Resources, 1997 (27 minutes).

Video: "Flood Mitigation Planning." Association of State Floodplain Managers, Executive Office (608) 274-0123.

FEMA has a wide variety of informative publications available at little or no cost that address community disaster planning, natural hazard mitigation, disaster assistance programs, floodplain management and the National Flood Insurance Program. To order publications call the Publications Service Center at 1-800-480-2520. Order publication FEMA-20 to get a complete listing of the FEMA publications that are available to the general public. It covers subjects spanning the full spectrum of emergency preparedness and response concerns, techniques and information. Many of these publications are available on-line at no charge at the FEMA web site library at http://www.fema.gov/library/. For articles specifically about mitigation, go to the mitigation room on-line at http://www.fema.gov/library/lib06.htm. There is also a new FEMA web page for mitigation planning at http://www.fema.gov/mit/planning.htm.

WISCONSIN GIS DATA

Department of Administration, Office of Land Information Services (OLIS)

OLIS has CD-ROMs of Arcview compatible Geographic Information Systems (GIS) data at the state level including transportation, hydrology, major facilities and population.

Department of Natural Resources, Geographic Services Section

DNR has a variety of environmental GIS data including ground cover, wetlands inventory, hydrology and species information.

OTHER HAZARD DATA

Army Corps of Engineers/FEMA

National Inventory of Dams: A listing of major state and federal dams with location, risk, owner and plan information.

Department of Natural Resources, Air and Waste Division, Remediation Program

List of Contaminated Sites: They have lists of waste disposal sites, leaking underground storage tank sites, Superfund sites and a hazard ranking of the state waste sites.

MITIGATION FUNDING GUIDES

"County Emergency Management Director's Guide to Key Federal and State Disaster Assistance Programs." Available through Wisconsin Emergency Management. Telephone (608) 242-3232 or (800) 943-0003.

OTHER FUNDING RESOURCES
DNR Bureau of Community Assistance MAIN
http://www.dnr.state.wi.us/org/caer/cfa/cfindex.html

DOA Wisconsin Catalog of Community Assistance
http://www.doa.state.wi.us/dhir/boir/wcca/index.asp

Department of Transportation, Flood Damage Aid
http://www.dot.wisconsin.gov/localgov/highways/flood.htm

Department of Commerce Community Financial Assistance Main Page
http://www.commerce.state.wi.us/MT/MT-COM-4200.html

Federal Catalog of Domestic Assistance
http://www.cfda.gov/

HAZARD MITIGATION INFORMATION – INTERNET LINKS

AGRICULTURAL INFORMATION
DATCP - Conservation Reserve Enhancement Program Summary
http://datcp.state.wi.us/static/arm/crep/crep_home.htm

National Agriculture Safety Database – Multiple safety tips regarding natural hazards
http://www.cdc.gov/niosh/nasd/menus/statewi.html

National Drought Mitigation Center – Drought history, planning, and mitigation
http://enso.unl.edu/ndmc/index.html

USDA- Animal and Plant Health Inspection Service
http://www.aphis.usda.gov/

USDA-APHIS – Invasive Species
http://www.aphis.usda.gov/oa/invasive/invasive.html

BUSINESS DISASTER RESOURCES
Contingency Planning and Management Online
http://www.contingencyplanning.com/

FEMA – Mitigation for Businesses
http://www.fema.gov/mit/how2bus.htm

Institute for Business and Home Safety – Disaster Planning Toolkit for Business Owners
http://www.ibhs.net/ibhsdocuments/pdf/openforbusiness.pdf

Small Business Administration
http://www.sba.gov/DISASTER/

COASTAL HAZARDS

DOA-Wisconsin Coastal Management Program -Main
http://www.doa.state.wi.us/dhir/boir/coastal/index.asp

Wisconsin Coastal Management Program Main Hazards in Wisconsin's Coastal Areas
http://www.doa.state.wi.us/dhir/boir/coastal/fact_sheets/fact_sheet_view.asp?factid=5

DOA-Wisconsin Coastal Management Program Grants Program
http://www.doa.state.wi.us/dhir/boir/coastal/grants/

UW-Sea Grant – Great Lakes Online
http://www.seagrant.wisc.edu/

Army Corps of Engineers – Lake Michigan Potential Damages Study
http://huron.lre.usace.army.mil/coastal/LMPDS/index.html

DISASTER PREPARATION/PREVENTION TIPS

OCI list of insurance tips for businesses to do before a disaster strikes
http://badger.state.wi.us/agencies/oci/pub_list/pi-085.htm#disaster

OCI Flood Tips Press Release
http://badger.state.wi.us/agencies/oci/news_rel/0300fld.htm

DHFS Disaster Health and Safety Tips
http://www.dhfs.state.wi.us/DPH_EMSIP/InjuryPrevention/Disaster/Disasterindex.htm

DATCP Consumer protection piece on basement waterproofing
http://datcp.state.wi.us/static/cp/cpfacts/basement.htm

UW-Extension Disaster Handbook
http://www.uwex.edu/ces/news/handbook.html

American Red Cross: "Are You Ready For a Flash Flood?"
http://www.redcross.org/services/disaster/keepsafe/readyflood.pdf

Avoiding Indoor Air Problems after a Flood
http://www.epa.gov/iedweb00/pubs/flood.html

National Lightning Safety Institute – Lightning Safety Information
http://www.lightningsafety.com/

FEMA – Tornado Safety Brochure
http://www.fema.gov/library/tornadof.htm

FEMA/Project Impact – Mitigation Checklist
http://www.fema.gov/impact/im_list6.htm

The Institute for Business & Home Safety – Mitigation tips for home and business
\http://www.ibhs.net/ibhs2/default.asp

FLOOD INSURANCE

Wisconsin Office of the Commissioner of Insurance – Flood Insurance Information
http://badger.state.wi.us/agencies/oci/pub_list/pi-100.htm#flood

Wisconsin Office of the Commissioner of Insurance – Explanation of flood coverage not included in standard homeowner's policy
http://badger.state.wi.us/agencies/oci/pub_list/pi-015.htm#additional

DNR NFIP MAIN
http://www.dnr.state.wi.us/org/water/wm/dsfm/flood/insurance.htm

FEMA/NFIP MAIN
http://www.fema.gov/nfip/

NFIP Community Status Book
http://www.fema.gov/fema/csb.htm

FLOODPLAIN MANAGEMENT

DNR- Floodplain Overview
http://www.dnr.state.wi.us/org/water/wm/dsfm/flood/title.htm

DNR- Floodplain Rules
http://www.dnr.state.wi.us/org/water/wm/dsfm/flood/rules.htm

DNR - Partners in Floodplain Management
http://www.dnr.state.wi.us/org/water/wm/dsfm/flood/partners.htm

Why Are There So Many Floods?
http://whyfiles.org/107flood/2.html

Association of State Floodplain Managers (ASFPM)
http://www.floods.org/

GENERAL HAZARD DATA AND INFORMATION LINKS

FEMA – Mitigation How To Series
http://www.fema.gov/mit/how2.htm

FEMA – Global Emergency Management System, an online, searchable database
www.fema.gov/gems

UW-Extension – Disaster Management Links
http://www.uwex.edu/lgc/disaster/disaster.htm

WEM Emergency Management Links
http://badger.state.wi.us/agencies/dma/wem/index.htm

MANUFACTURED HOUSING SAFETY

FEMA article on flood mitigation and tie-downs for manufactured housing
http://www.fema.gov/DIZAS/pa_fld123.htm

United States Fire Association article on fire safety in manufactured housing
http://www.usfa.fema.gov/safety/safehome.htm

Department of Commerce, Safety and Buildings Division, Manufactured Home Program
http://www.commerce.state.wi.us/SB/SB-ManufacturedHomesProgram.html

PROJECT IMPACT

FEMA's Project Impact Main Page
http://www.fema.gov/impact/

FEMA's Project Impact Workbook
http://www.fema.gov/impact/im_steps.htm

FEMA – How To Become Disaster Resistant
http://www.fema.gov/impact/howto.htm

Racine County's Project Impact Page
http://www.racineco.com/emergencymanagement/projectimpact.htm

SMART GROWTH AND HAZARD MITIGATION PLANNING

Wisconsin Comprehensive Planning Grant Applications and Information
http://www.doa.state.wi.us/olis/index.asp

Wisconsin Chapter of the American Planning Association, Smart Growth Analysis
http://www.uwm.edu/Org/wapa/SmartGrowth/index.htm

American Planning Association, Growing Smart web page
http://www.planning.org/plnginfo/GROWSMAR/gsindex.html

FEMA's hazard mitigation planning web page
http://www.fema.gov/mit/planning.htm

Flood Mitigation Planning – the CRS approach
http://www.colorado.edu/hazards/informer/infrmr1/infrmr1a.htm

ESRI Hazard Mapping Site – Make an Online Hazard Map
http://www.esri.com/hazards/makemap.html

Regional Planning Commissions
http://www.commerce.state.wi.us/MT/MT-RPC-map.html#red

Institute for Business & Home Safety – Community Land Use and Disasters
http://www.ibhs.net/ibhs2/html/info_center/landuse.htm

Sustainable Development
http://www.sustainable.doe.gov/disaster/disintro.shtml

USGS Natural Hazards Programs: Lessons Learned for Reducing Risk
http://water.usgs.gov/wid/html/HRDS.html

WIND HAZARD MITIGATION
Design and Construction Guidance for Community Shelters
http://www.fema.gov/mit/FEMA361.htm

FEMA's Midwest Tornado Building Performance Assessment Team Report, 1999
http://www.fema.gov/mit/bpat/fnlrpt/

FEMA – Building a Residential Safe Room
http://www.fema.gov/mit/tsfs02.htm

Safe Room Funding
http://www.fema.gov/mit/saferoom/fund.htm

WINTER HAZARDS
National Weather Service – Wisconsin Winter Weather Page
http://www.crh.noaa.gov/mkx/winter_page.htm

Wisconsin Road Conditions
http://www.dot.state.wi.us/dsp/roadcond/current.html#map

FEMA Winter Storms Fact Sheet
http://www.fema.gov/library/stormsf.htm

FEDERAL FUNDING PROGRAMS THAT CAN SUPPORT HAZARD MITIGATION

Noninsured Crop Disaster Assistance

Farm Service Agency, Department of Agriculture, CFDA #10.451

Objective: To provide eligible producers of eligible crops with protection comparable to the catastrophic risk protection plan of crop insurance and to help reduce production risks faced by producers of crops for which catastrophic risk protection plan of crop insurance under the Federal Crop Insurance Act, as amended, is not available. The noninsured crop disaster assistance program reduces financial losses that occur when a natural disaster causes a catastrophic loss of production or prevents planting of an eligible crop. Payment eligibility is based on an expected yield for the area and the producer's approved yield based on actual production history, or a transitional yield if sufficient production records are not available. Production for both the applicable area expected yield and the individual producer approved yield for the unit must fall below specified percentages in order to be eligible for payment under this part.

Eligibility: Applicants must meet all of the following conditions as determined by the approving official: (1) May not have total annual gross revenue in excess of $2 million for the preceding tax year for which assistance is requested; (2) may not receive payments in excess of $100,000 per person per crop year; (3) must have suffered a greater than 50 percent loss of production and (a) for years 1996 through 1998 will receive assistance against the loss at 60 percent of the established average market price for the crop, (b) for crop years after 1998, will receive assistance against the loss at 55 percent of the established average market price for the crop; and (4) must choose whether to receive other program benefits or benefits under more than one program administered by the Secretary for the same crop loss. Applicants are not eligible for both.

Deadlines: (1) Applicants must file notice of crop loss within 15 calendar days after the date the disaster condition occurred or damage to the crop was obvious; (2) applicants must report crop acreage after the crop is planted and before the crop is harvested and comply with crop reporting dates established by each State Committee of the Farm Service Agency; and (3) applicants must report crop production by the immediately subsequent crop year acreage reporting date.

Contact: Farmers are advised to contact their local county FSA office after a natural disaster has occurred to determine whether the program is available in the county and to determine eligibility for emergency cost-share assistance. Consult the local telephone directory for location of the county FSA office. If no listing, get in touch with the appropriate State FSA office.

Disaster Reserve Assistance Program

Farm Service Agency, Department of Agriculture, CFDA #10.452

Objective: To provide emergency assistance to eligible livestock owners, in a state, county, or area approved by the Secretary or designee, where because of disease, insect infestation, flood, drought, fire, hurricane, earthquake, hail storm, hot weather, cold weather, freeze, snow, ice and winterkill or other natural disaster, a livestock emergency has been determined to exist.

Eligibility: Applicants must meet all of the following conditions as determined by the approving official: (1) May not have total annual gross revenue in excess of $2 million for the preceding tax year for which assistance is requested; (2) may not receive payments in excess of $100,000 per person per crop year; (3) must have suffered a greater than 50 percent loss of production and (a) for years 1996 through 1998 will receive assistance against the loss at 60 percent of the established average market price for the crop, (b) for crop years after 1998, will receive assistance against the loss at 55 percent of the established average market price for the crop; and (4) must choose whether to receive other program benefits or benefits under more than one program administered by the Secretary for the same crop loss. Applicants are not eligible for both.

Deadlines: (1) Applicants must file notice of crop loss within 15 calendar days after the date the disaster condition occurred or damage to the crop was obvious; (2) applicants must report crop acreage after the crop is planted and before the crop is harvested and comply with crop reporting dates established by each State Committee of the Farm Service Agency; and (3) applicants must report crop production by the immediately subsequent crop year acreage reporting date.

Contact: Farmers are advised to contact their local county FSA office after a natural disaster has occurred to determine whether the program is available in the county and to determine eligibility for emergency cost-share assistance. Consult the local telephone directory for location of the county FSA office. If no listing, get in touch with the appropriate State FSA office.

Emergency Conservation Program (ECP)

Natural Resources Conservation Service, US Department of Agriculture CFDA # 10.054

Objective: To enable farmers to perform emergency conservation measures to control wind erosion on farmlands, or to rehabilitate farmlands damaged by wind erosion, floods, hurricanes or other natural disasters and to carry out emergency water conservation or water-enhancing measures during periods of severe drought.

Eligibility: Any person who as owner, landlord, tenant or sharecropper on a farm or ranch, including associated groups, bears a part of the cost of an approved conservation practice in a disaster area.

Match requirements: Cost-share payment is required. The agricultural producer pays a portion of the conservation practice. County committees shall establish levels of cost-sharing for each practice for which payments may be made by FSA as follows: 1) Not to exceed 64 percent of the first $62,500 of the eligible cost of restoring the loss; 2) not to exceed 40 percent of the second $62,500 of restoring the loss; 3) not to exceed 20 percent of the eligible cost above $125,000 to restore the loss; and 4) not to exceed $200,000 for total cost-sharing paid to one person for a disaster loss.

Contact: Farmers are advised to contact their local county FSA office after a natural disaster has occurred to determine whether the program is available in the county and to determine eligibility for emergency cost-share assistance. Consult the local telephone directory for location of the county FSA office. If no listing, get in touch with the appropriate State FSA office.

Grants for Public Works and Economic Development

Economic Development Agency, CFDA #10.901

Objective: To provide basic human amenities, alleviate health hazards and promote the orderly growth of the rural areas of the nation by meeting the need for new and improved rural water and waste disposal facilities.

Type of Assistance: Project grants and direct loans. Funds may be used for the installation, repair, improvement or expansion of a rural water facility including distribution lines, well pumping facilities and costs related thereto, and the installation, repair, improvement or expansion of a rural waste disposal facility including the collection, and treatment of sanitary, storm and solid wastes.

Eligibility: Municipalities, counties and other political subdivisions of a state, such as districts and authorities, associations, cooperatives, corporations operated on a not-for-profit basis, Indian tribes on federal and state reservations and other federally recognized Indian tribes. Facilities shall primarily serve rural residents and rural businesses.

Restrictions: The service area shall not include any area in any city or town having a population in excess of 10,000 inhabitants according to the latest decennial census of the United States.

Contact:
Rosemary Ewoldt or James Kirchoff, Business and Community Specialists
4949 Kirschling Court
Stevens Point, WI 54481
Phone: (715) 345-7610
Fax: (715) 345-7616
TTY: (715) 345-7614

Watershed Protection and Flood Prevention

Natural Resources Conservation Service, Department of Agriculture, CFDA #10.904

Objective: To provide technical and financial assistance to state agencies and units of local government in planning and carrying out works of improvement and to protect, develop and utilize the land and water resources in small watersheds not exceeding 250,000 acres, including total resource management and planning to improve water quality and solve problems caused by flooding, erosion and sediment damage, conservation, development, utilization and disposal of water. The program emphasizes planning through interdisciplinary teams which include the sponsors, other agencies and environmental groups in all stages of plan development.

Types of Assistance: Project grants, advisory services and counseling. Technical assistance for planning watershed projects. Funds must be available for project installation.

Match requirements: Cost-sharing requirements are variable depending on the nature of the project. Share requirement is 50% for public recreation and fish and wildlife purposes. There is no matching requirement for flood prevention projects.

Eligibility: Any state agency, county or group of counties, municipality, town or township, soil and water conservation district, flood prevention or flood control district, Indian tribe or tribal organization or any other non-profit agency with authority under state law to carry out, maintain and operate watershed works of improvement.

Restrictions: Each project must contain benefits directly related to rural communities, including agricultural related enterprises, which account for at least 20% of the total benefits of the project. Project sponsors must be willing to carry out all phases of project installation, operation and maintenance and responsibilities with relation to the project.

Contact: State Natural Resources Conservation Service offices.
Sheryl Paczwa, Asst. State Conservationist (608) 276-8732 x228

Grants for Public Works and Economic Development

Economic Development Administration, Department of Commerce, CFDA #11.300

Objective: To promote long-term economic development and assist in the construction of public works and development facilities needed to initiate and support the creation or retention of permanent jobs in the private sector in areas experiencing substantial economic distress.

Type of Assistance: Project grants.

Eligibility: States, cities, counties, an institution of higher education or a consortium of institutions of higher education, and other political subdivisions, Indian tribes, Economic

Development Districts and private or public nonprofit organizations or associations acting in cooperation with officials of a political subdivision of a state or Indian tribe.

Matching Requirement: The basic grant rate may be up to 50 percent of the project cost. Severely depressed areas may receive supplementary grants to bring the federal contribution up to 80 percent of the project cost; recognized Indian tribes may be eligible for up to 100 percent assistance. Additionally, eligible areas located within and actively participating in the operations of Economic Development Districts are subject to the 80 percent maximum federal grant limit and are eligible for a 10 percent bonus on grants for public works projects. On average, EDA grants cover approximately 50 percent of project costs.

Contact:
CHICAGO REGION: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin
C. Robert Sawyer, Regional Director
111 North Canal Street, Suite 855
Chicago, IL 60606-7204
312-353-8143
312-353-8575 fax
rsawyer@doc.gov

Emergency Rehabilitation of Flood Control Works

Army Corps of Engineers, *CFDA Program Number: 12.102*

Objective: To assist in the repair and restoration of flood control works damaged by flood, or federally authorized hurricane flood and shore protection works damaged by extraordinary wind, wave or water action.

Eligibility: Owners of damaged flood protective works, or state and local officials of public entities responsible for their maintenance, repair and operation. Must meet current guidelines to become eligible for Public Law 84-99 assistance: 1) Engineering and maintenance criteria (inspection required); 2) cost-sharing (80 percent federal and 20 percent nonfederal); and 3) public sponsorship nonfederal.

Matching Requirement: At least 20 percent cost-share of construction cost either by monetary value or in-kind services.

Regional Contact:
Detroit District, US Army Corps of Engineers
477 Michigan Avenue
Detroit, Michigan 48226
Telephone: (313) 226-6764
Fax: (313) 226-6009

Emergency Operations Flood Response and Post Flood Response

Army Corps of Engineers, CFDA Program Number: 12.103

Objective**:** To provide emergency flood response and post flood response assistance as required to supplement state and local efforts and capabilities in time of flood or coastal storm. Emergency assistance is provided in all phases of flood response and post flood response to supplement state and local efforts.

Restrictions: Requires a request by the Governor for assistance. State and local governments must use their own resources to the maximum extent feasible, usually including the furnishing of common labor. No specific restrictions are placed on such assistance.

Eligibility: State or local public agencies for flood response and the state for post flood response.

Regional Contact:
Detroit District, US Army Corps of Engineers
477 Michigan Avenue
Detroit, Michigan 48226
Telephone: (313) 226-6764
Fax: (313) 226-6009

Floodplain Management Services

Army Corps of Engineers, CFDA #12.104

Objective**:** To promote appropriate recognition of flood hazards in land and water use planning and development through the provision of flood and floodplain related data, technical services, and guidance. Assistance can be used for the following:
1) Floodplain planning; 2) flood emergency preparedness planning; 3) assistance in developing floodplain regulations; 4) setting elevations for flood proofing; 5) implementing flood proofing measures; and 6) indicating areas to be acquired for open space. Activities also include interpretation of technical information and related planning assistance and guidance toward prudent use of floodplains.

Type of Assistance: Advisory services and counseling are provided. Technical information is disseminated.

Restrictions: Services are available to states and local governments without charge, but within annual funding limitations on request. Services are available to federal agencies on a fully reimbursable basis. Services are available to the private sector on a pay first basis.

Eligibility: States, political subdivisions of states, other nonfederal public organizations and the public.

Regional Contact:
Detroit District, US Army Corps of Engineers
477 Michigan Avenue
Detroit, Michigan 48226
Telephone: (313) 226-6764
Fax: (313) 226-6009

Protection of Essential Highway, Bridge Approaches, and Public Works

Army Corps of Engineers (Nickname: Emergency Bank Protection) CFDA #12.105

Objective: To provide bank protection of highways, highway bridges, essential public works, churches, hospitals, schools and other nonprofit public services endangered by flood-caused erosion.

Eligibility: States, local governments or other responsible local agencies established under state law with full authority and ability to undertake necessary legal and financial responsibilities.

Description: Corps of Engineers designs and constructs the project. Each project selected must be engineering feasible, complete within itself and economically justified. Nonfederal interests are responsible for all project costs in excess of the federal limit of $500,000. Nonfederal sponsor must share in project costs, including cash and lands, easements, rights-of-way, utility relocations and maintain the project at local cost after completion.

Matching Requirement: In most cases project studies will be at federal expense. Cost-sharing is required for project, but federal participation cannot exceed $1,000,000.

Regional Contact:
Detroit District, US Army Corps of Engineers
477 Michigan Avenue
Detroit, Michigan 48226
Telephone: (313) 226-6764
Fax: (313) 226-6009

Flood Control Projects

Army Corps of Engineers, CFDA #12.106

Objective: To reduce flood damages through projects not specifically authorized by Congress.

Type of Assistance: Provision of specialized services. Corps of Engineers designs and constructs the projects. Each project selected must be engineering feasible, complete within itself and economically justified.

Eligibility: States, political subdivisions of states, or other responsible local agencies established under state law with full authority and ability to undertake necessary legal and financial responsibility.

Match Requirements and Restrictions: Nonfederal sponsoring agency will share equally in the cost of feasibility studies (cash and in-kind services), share in the project cost in cash, lands, damages and project costs in excess of the federal cost limit of $7,000,000; provide a cash contribution for land enhancement benefits and for project costs assigned to project features other than flood control; prevent future encroachment which might interfere with proper functioning of the project for flood control; and maintain the project after completion. Local cost participation requirements and procedures for determining the local share of project cost are similar to those for flood control projects specifically authorized by Congress under regular authorization procedures.

Regional Contact:
Detroit District, US Army Corps of Engineers
477 Michigan Avenue
Detroit, Michigan 48226
Telephone: (313) 226-6764
Fax: (313) 226-6009

Snagging and Clearing for Flood Control

Army Corps of Engineers, CFDA Program Number: 12.108

Objective: To reduce flood damages

Type of Assistance: Provision of specialized services. Corps of Engineers designs and constructs the project. Each project selected must be engineering feasible, complete within itself and economically justified.

Restrictions: The nonfederal sponsor must provide all lands, easements and rights-of-way; provide all project costs in excess of the federal limit of $500,000; agree to maintain project after construction; hold and save the United States free from damages; provide a contribution toward construction costs for land enhancement or special benefits; and agree to prevent future encroachment which might interfere with proper functioning of the project for flood control.

Eligibility: States, political subdivisions of states or other responsible local agencies established under state law with full authority and ability to undertake necessary legal and financial responsibilities.

Restrictions: Local cost participation requirements and procedures for feasibility study cost-sharing and determining the local share of project cost are similar to those for flood

control projects specifically authorized by Congress under regular authorization procedures.

Regional Contact:
Detroit District, US Army Corps of Engineers
477 Michigan Avenue
Detroit, Michigan 48226
Telephone: (313) 226-6764
Fax: (313) 226-6009

Emergency Advance Measures for Flood Prevention

Army Corps of Engineers, CFDA #12.111

Objective: To perform activities prior to flooding that would assist in protecting against loss of life and damages to property due to flooding. No grant money is available through this program, only assistance from the Corps.

Type of Assistance: Technical assistance in the form of review, advice and/or making recommendations to state and local agencies before, during and after flood event. Direct in the form of supplemental state and local resources with supplies, equipment and/or contracting for construction of temporary flood control projects. Authorized assistance includes work such as removal of waterway obstructions and work necessary to prevent dam failure. There must be an immediate threat of unusual flooding present before advance measures can be considered.

Restrictions: The Governor of the affected state must request assistance.

Match requirements: This program has no matching requirements.

Eligibility: State and local entities with public sponsorship.

Regional Contact:
Detroit District, US Army Corps of Engineers
477 Michigan Avenue
Detroit, Michigan 48226
Telephone: (313) 226-6764
Fax: (313) 226-6009

Payments to States in Lieu of Real Estate Taxes

Army Corps of Engineers, CFDA #12.112

Objective: To compensate local taxing units for the loss of taxes from federally acquired lands, 75 percent of all monies received or deposited in the Treasury during any fiscal year for the account of leasing of lands acquired by the United States for flood control,

navigation and allied purposes, including the development of hydroelectric power, are paid at the end of each year to the states in which such property is situated.

Type of Assistance: Formula grants.

Eligibility: State government in which lands have been federally acquired for purposes defined under Objective. Local county governments can receive compensation passed through state.

Regional Contact:
Detroit District, US Army Corps of Engineers
477 Michigan Avenue
Detroit, Michigan 48226
Telephone: (313) 226-6764
Fax: (313) 226-6009

North American Wetlands Conservation Fund

U.S. Fish and Wildlife Service, Department of the Interior, CFDA #15.623

Objective: To provide grant funds for wetlands conservation projects in the United States

Eligibility: Available to a state, another public agency or other entity identified in the project description that accompanies the recommendation from the North American Wetlands Conservation Council and approved by the Migratory Bird Conservation Commission. Available to any organization or individual.

Match Requirements: One to one dollar match required (50% funding) with nonfederal dollars and grants being spent within 2 years of award.

Contact:
Executive Director, North American Waterfowl and Wetlands Office,
4401 N. Fairfax Drive, Suite 110,
Arlington, VA 22203.
Telephone: (703) 358-1784.

Disaster Loan Program

Small Business Administration, CFDA #59.002 Economic injury loans and #59.008 Physical disaster loans.

Objective: To provide low-interest (generally 4 percent or less), long-term (up to 30 years) loans to assist local disaster recovery. There are two types of loans available. One loan program addresses physical disasters by helping homeowners, renters and non-farm businesses to repair or replace disaster damaged property that is not fully

covered by insurance. The other loan program addresses economic disasters by providing economic injury loans to businesses.

Eligibility: Homeowners, renters and non-farm businesses are eligible.

Eligible Projects: Homeowners may apply for up to $200,000 to repair or replace their primary home to its pre-disaster condition, including required city or county building codes that require structural improvements. The loan may not be used to upgrade the home or make additions to the home, but *loans may be increased by as much as 20 percent for mitigating devices to protect the real property from possible future disasters of the same kind.*

Homeowners and renters may apply for up to $40,000 to repair or replace damaged or destroyed personal property, such as clothing, furniture and automobiles. The loan proceeds cannot be used to replace extraordinarily expensive or irreplaceable items, such as antiques, collections, pleasure boats or recreational vehicles.

Businesses of all sizes and private, non-profit organizations may apply for up to $1.5 million to repair or replace damaged real and personal property, such as machinery, equipment, inventory, furniture and fixtures. The loan may not be used for upgrades or additions, but *may be increased up to 20 percent (within the $1.5 million limit) for mitigating devices to protect against future disasters of the same kind*.

Small businesses and small agricultural cooperatives that do not have credit available from non-government sources may apply for Economic Injury Disaster Loans up to $1.5 million to provide working capital to meet obligations until normal operations resume. The total amount of a loan to any one business entity (including affiliates) for a combined Physical and Economic Injury Disaster Loan may not exceed $1.5 million.

In some cases, when there is substantial damage, SBA may refinance existing mortgages on homes and business property to make the loan affordable.

Contact:
SBA Regional Office
One Baltimore Place, Suite 300
Atlanta, GA 30308
(404) 347-3771
For more information regarding recent SBA disasters in Wisconsin: 1-800-359-2227

Sustainable Development Challenge Grants

Environmental Protection Agency, CFDA #66.651

Objective: Initiate community-based projects that promote environmentally and economically sustainable development with seed money provided with grant.

Eligibility: Nonprofit organizations and community groups and federally recognized Indian tribes, state and local governments.

Description: Encourages partnerships among community, business and government entities to work cooperatively to develop flexible, locally-oriented approaches that link environmental management and quality of life activities with sustainable development and revitalization.

Matching Requirement: Minimum 20% matching requirement with nonfederal dollars.

Contacts:
Regional or Local Office: There will be a point of contact in each Region. For further information please contact Lynn Desautels on (202) 260-6812.

Web Address: http://www.epa.gov/ecocommunity

Chemical Emergency Preparedness and Prevention Technical Assistance Grants

Environmental Protection Agency, Office of Solid Waste and Emergency Response, CFDA #66.810

Objective**:** Chemical accident prevention activities and emergency preparedness for chemical accidents.

Restrictions: Project period for awards under this program will not exceed two years.

Eligibility: State and local government agencies, LEPCs and SERCs.

Matching Requirement: 0.25

Contact:
Environmental Protection Agency, Chemical Emergency Preparedness and Prevention
401 M Street, SW (5104)
Washington DC 20460
Telephone: (202) 260-6657
Web Address: http://www.epa.gov/swercepp

APPENDIX J

HAZARD MITIGATION AUTHORITIES

Overview: The Stafford Act, the federal disaster assistance law as passed by Congress in 1973 and amended in 1988, 1994 and 2000, allows for discretionary disaster assistance to states. The President of the United States has the discretion to declare a disaster and direct the Federal Emergency Management Agency (FEMA) to assist states when a disaster overwhelms a state's capability to respond and recover. The Stafford Act also allows for partial funding for state emergency management programs for disaster preparedness, response, recovery and mitigation if the state agrees to a performance contract. Title 44 of the Code of Federal Regulations, Emergency Management and Assistance, describes the administrative policies, rules and regulations governing the application of the Stafford Act and FEMA's role as a federal agency.

As disaster assistance programs have matured and the amount of federal funds spent on disaster recovery have soared, more emphasis and funding is being directed to hazard mitigation, disaster resistance and prevention. The federal and state legislation that addresses hazard mitigation is listed below. These are the authorities that empower Wisconsin's mitigation activities.

FEDERAL AUTHORITIES

Section 409 of the Robert T. Stafford Disaster Relief and Emergency Act as amended: Section 409 of the Stafford Act requires state and local governments that receive federal hazard mitigation funding to develop a hazard mitigation plan. The purpose of the plan is to reduce vulnerability to natural hazards by evaluating the risks of natural hazards and taking appropriate actions to eliminate or lessen those risks.

Subpart M of Section 206 of Title 44 of the Code of Federal Regulations, Hazard Mitigation Planning: Sections 206.400 through 206.407 describe the requirements for implementation of Section 409 of the Stafford Act. These sections require that state and local governments develop hazard mitigation plans to qualify for continued receipt of federal disaster assistance.

Subpart N of Section 206 of Title 44 of the Code of Federal Regulations, Hazard Mitigation Grant Program: Sections 206.430 through 206.440 describe the requirements for implementing the Hazard Mitigation Grant Program at the state level.

42 U.S.C 4101, Flood Mitigation Assistance: The Flood Mitigation Assistance program was created as part of the National Flood Insurance Reform Act of 1994 with the goal of reducing or eliminating claims under the National Flood Insurance Program. Flood Mitigation Assistance is a pre-disaster grant program awarding separate grants for flood mitigation planning as well as flood mitigation projects.

STATE AUTHORITIES

Wisconsin State Statute, Chapter 166 (Emergency Management) authorizes and establishes the organization for state and local emergency management programs, which are charged with the responsibility to the state and its subdivisions to cope with natural and technological disasters. Includes authorization for Wisconsin Emergency Management to require satisfactory completion of an annual plan of work from local county emergency management directors in return for receiving partial funding from the state for local emergency management positions.

Wisconsin Statutes, Chapter 87 authorizes the Wisconsin Department of Natural Resources to construct, maintain and alter flood control structures.

Wisconsin Administrative Rules, NR 115 establishes minimum shoreland protection rules.

Wisconsin Administrative Rules, NR 116 describes the Wisconsin Department of Natural Resources Floodplain Management Program. Section 87.30 Wisconsin Statutes requires communities to zone their flood hazard areas in accordance with minimum statewide standards that are established in NR 116.

Wisconsin Administrative Rules, NR 117 describes the Wisconsin Department of Natural Resources minimum statewide standards for how local communities zone their shorelands and wetlands.

Governor's Executive Order 67 requires all state actions affecting construction of any structure or facility to be consistent with and obey state statutes regulating floodplains, wetlands, erosion and shoreland management.

Governor's Executive Order 73 requires flood mitigation for state owned or leased property and otherwise prohibits state government buildings from being built in a 100-year floodplain for most facilities or the 500-year floodplain for critical facilities.

State Hazard Mitigation Grant Program Administrative Plan describes Wisconsin Emergency Management's policies and guidelines for administering the HMGP portion of disaster assistance funds in accordance with Subpart N of Section 206 of Title 44 CFR. Among the guidelines are requirements that communities that receive HMGP funds must develop local hazard mitigation plans.

Wisconsin State Statute, Chapter 31 ensures that dams are safely built, operated and maintained. NR 333 provides design and construction standards for large dams and requires all large dams to have Emergency Action Plans (EAP). EAPs identify potential emergency conditions at a high hazard dam and prescribes procedures to be followed to eliminate the loss of life and minimize property damage. NR 335 covers the administration of the Municipal Dam Repair and Removal Grant Program. DNR is responsible for administration of these regulations.

Wisconsin State Statutes 917 and 1997 Wisconsin Act 27 provides Forest Fire Protection Grants to increase forest fire protection and suppression capabilities through cooperative efforts with local fire departments. Priority factors include 1) whether the fire departments serve areas that are part of a forest fire control area; 2) fire departments respond to wild fires within their jurisdiction at no cost to the DNR; and 3) fire departments with a majority of members meeting NFPA 1051 standards for wildland fire fighting training. Municipal fire departments that have executed a forest fire suppression agreement acceptable to the DNR are eligible to apply. There is a 50% local match required. Eligible fire departments can receive a maximum grant award of $10,000. Eligible county fire associations can receive a maximum grant award of $25,000.

APPENDIX K

ACKNOWLEDGEMENTS

Wisconsin Emergency Management in cooperation with Wisconsin state agencies coordinated the development of the State Hazard Mitigation Plan. With great appreciation the following agencies are acknowledged for their participation in the planning process and preparation of the Plan:

Department of Administration
Department of Agriculture, Trade and Consumer Protection
Department of Commerce
Department of Health and Family Services
Department of Military Affairs
Department of Natural Resources,
Department of Transportation
Office of the Commissioner of Insurance
Public Service Commission of Wisconsin
State Historical Society
University of Wisconsin-Cooperative Extension

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