

WAUKESHA COUNTY

**HAZARD IDENTIFICATION
AND
VULNERABILITY ANALYSIS**

2010

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To the Reader:

A hazard identification and vulnerability analysis is the basis for effective emergency management planning. It allows public officials to develop an awareness of the disasters which could affect their community and an understanding of the probability and impact of such disasters. In turn, it enables decision-makers to set priorities and goals for planning and training and to effectively allocate resources on a day-to-day, as well as a disaster basis.

Waukesha County, lying in the Southeast corner of the State of Wisconsin, just west of Milwaukee County 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 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.

This hazard analysis describes those hazards that occurred and/or are most likely to occur in Waukesha County. The description includes information on their frequency of occurrence and their potential or actual impacts. These hazards are the basis for the development of all county emergency management plans.

It is the mission of the Waukesha County Office of Emergency Management to coordinate the development and implementation of a comprehensive and integrated emergency management program designed to mitigate, prepare for, respond to and recover from the effects of all hazards which impact upon the welfare, safety and health of all County citizens.

Everyone has a responsibility to participate in the accomplishment of this mission.

TABLE OF CONTENTS

Hazards Affecting Waukesha County	<u>Page</u>
Civil Disturbances.....	1
Dam Failures.....	2
Drought.....	4
Earthquakes.....	5
Fires and Explosions.....	7
Flooding.....	8
Hazardous Materials Incidents.....	11
Heat Waves.....	13
Terrorism.....	17
Thunderstorm Hazards: Thunderstorms, Lightning, Hail, Tornadoes and Downbursts.....	19
Transportation Accidents: Aircraft, Rail, Highway.....	23
Winter Storms.....	25
Waukesha County Integrated Emergency Management System.....	26

APPENDICES

- A. Waukesha County Map
- B. Waukesha County Economic Profile
- C. Waukesha County Dams
- D. Earthquakes in Wisconsin
- E. Waukesha County Railways
- F. Wisconsin Severe Weather Events, 1982-2007: Heat Waves & Heat Waves Deaths by County, 1982-2008: Floods, Hail, Lightning, Tornadoes, High Winds, Total Severe Weather Events

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HAZARDS AFFECTING WAUKESHA COUNTY

Civil Disturbances

A civil disturbance is any act by an individual or group of persons with the intention to agitate or cause a public disturbance. These disturbances may come in the form of labor disputes or protests by groups on a special issue.

Waukesha County has been a low probability area for civil disturbances. Labor strikes have occurred in the past but have been generally peaceful and lacking in hostile actions. These labor strikes have generally occurred at contract time by truckers, state employees and local and national union members.

In a pending labor situation, the sheriff or police chief will meet with strike leaders to set up conduct guidelines for a lawful strike. Law enforcement officials should also review mutual aid pacts for additional support.

A number of the schools, governmental offices and several businesses received prank bomb threats over the years. To date, investigators found no actual bombs deployed at these facilities, but a discovered a number of objects that are explosive in nature. These include pipe bombs, military hardware and blasting supplies. Investigators reported several isolated instances of pipe bombs exploding and destroying property in close proximity.

Each school, hospital, business and government building should develop bomb threat policies and procedures. Waukesha County's Office of Emergency Management assisted in development of several such protocols in conjunction with affected facilities.

Occasionally, some individual(s) perceive government action as wrongful or unjust. They retaliate by making threats against government officials and others in top positions. To date, these threats remained minimal in nature and never implemented.

Special events involving large numbers of people must obtain event permits to minimize disturbances. Police agencies will also use intelligence information when possible to gain advance data on potential problems. Emergency dispatch centers around the County maintain current lists of phone numbers for agencies that can respond to assist with such disturbances.

Dam Failures

Dam failures can result in loss of life and extensive property damage for miles downstream of the dam. Dams fail for many reasons. The most obvious reason is during a flood event when the dam isn't big enough to pass the large flow amount and the water overtops the dam. Failures don't always occur during flood events though. Poor operation, lack of maintenance, vandalism, etc. may also result in failures. Such "sunny day" failures may cause catastrophic consequences because the failure unexpected nature of the failure combined with insufficient time to warn downstream residents.

Very few dams in Waukesha County serve primarily to protect people and property from floods. Obviously, the few that do exist protect areas where high flood disaster potential exists downstream. Most flood control dams hold little or no water in the reservoir under normal conditions, thus observers may not immediately recognize the structures as dams. Only during times of flooding do these dams hold large amounts of water. These dams they present a special hazard because their only use is during floods. Everyday water related problems such as seepage go unnoticed and uncorrected. When the floodwater does arrive, the dam is used to its fullest capability and may catastrophically fail. For these reasons, a trained operator should monitor flood control structures continuously during flood events, ensuring the structures receive annual and post-flood inspections and receive regular maintenance.

Chapter 31 of Wisconsin State Statutes and Wisconsin Administrative Code NR 333, "Dam Design and Construction Standards" directly regulates dam safety activities. By virtue of these regulations, the Department of Natural Resources (DNR) has the authority to require a permit or plan approval to build a new dam or to modify existing ones. The DNR also has the authority to require dams be repaired to a safe condition or be abandoned and removed. Transferring a dam to a new owner requires approval by the DNR to assure the owner is financially capable of maintaining the structure. In addition, Administrative Code NR 116, "Wisconsin's Floodplain Management Program" recognizes the flooding potential of a dam failure by incorporating zoning in the floodplain created by the dam failure.

Waukesha County has 65 active dams (See Appendix C) and most of them are the "mill" type built more than 50 years ago. There are also small dams for watering livestock and various recreational ponds around the county. Downstream flow from most mill or watering dam failures does not generally create significant flooding or damage. Waukesha County has no electric power generating dams.

27 of the 65 dams Waukesha County has are considered to be large dams. State Statute 31.9 requires the DNR to inspect all large dams once every 10 years. A large dam is at least 6 feet in height and holds a reservoir of 50 acre-feet or more at maximum pool. A dam may be classified as large if it holds a smaller reservoir if its height is over 25 feet. Following a DNR inspection, Safety Inspectors send a report, including pictures, to the dam owner detailing any required repairs and a schedule for the completion of those repairs. The dam owner is responsible for making those repairs, which may range from removing trees and brush from the earthen embankment or painting rusting parts to rebuilding the dam. The cost of the repairs is the responsibility of the dam owner.

The DNR classifies large dams as high, significant or low hazard. Chapter NR 333 provides the standards to determine the hazard classification, which includes two factors, the existing land use and the land use controls to guide future development in the hydraulic shadow. The hydraulic shadow is the floodplain created by the dam failing during the 100-year flood. For example, if no campgrounds or homes are in the hydraulic shadow and zoning is in place to protect future development, then the dam is low hazard. If the hydraulic shadow zoning is not in place, the dam is classified high hazard because there is no mechanism to prevent construction of future homes or businesses in a dangerous area. The DNR classified 6 dams in Waukesha County as high hazard, 10 significant hazard and 21 low hazard.

After the DNR dam inspection, all dams classified as posing a threat to downstream development must prepare a dam failure analysis in order to identify the hydraulic shadow. This information forms the basis to develop an emergency action plan (EAP). The EAP must include provisions for a warning to the affected downstream residents and emergency authorities for assistance.

There have been five dam failures of record in Waukesha County. Three occurred in April 1973 after severe spring flooding. Three small earth dikes overtopped and breached, however, damage was minimal. The County received a Presidential Disaster Declaration for the flooding. Another occurred in March, 1980, when the main tainter gate pin suddenly broke at Lepper Dam causing both tainter gates to buckle and fail. Investigators attributed the cause to the lack of reinforcing steel around the gate pin. There was no loss of life or property damage. In March, 1988, Bischel Dam failed causing \$20,000 of road damage.

Following an extended period of heavy rains in 2007, high water levels endangered the Phantom Lake Dam. Quick action by local officials monitoring the Dam prevented erosion around the dam structure. Officials also noted “piping” occurring at the Monterey Dam. “Piping” occurs when hydraulic pressure forces water through openings or cracks in a dam. Safety inspectors consider piping a frequent pre-cursor to failure. The DNR and structure owner worked together to develop repair plans for the Monterey Dam.

Flooding in June-July, 2008 endangered four dams in Waukesha County: Phantom Lake Dam, Saylesville Dam, Nagawicka, and Nemahbin roller Mill Dams. Only the Roller Mill Dam impact resulted in removal of all retention boards and complete discharge and drainage of the impoundment.

Waukesha County Emergency Management mitigation efforts include expansion of the warning system and developing evacuation procedures for those persons in areas that may flood. This includes road closings and rerouting of traffic to keep people out of the danger areas.

Drought

Two types of droughts occur 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 together. It is possible to have an agricultural drought so short in duration there is no significant hydrologic impact, even though crop failures occur. On the other hand, it is also possible to obtain reasonable crop yields during a long dry period that affects hydrologic factors if the rainfall during the growing season is well timed and sufficient to prevent severe stress on the crops.

Droughts (both agricultural and hydrologic) are rather common in Wisconsin. In fact, using annual precipitation as an indicator it is common to have very dry periods or drought, at any given time in one or more areas of the state. Even statewide, drought is not a rare event.

Unfortunately, there is little in the climatic record useful for predictive purposes.

WAUKESHA COUNTY OCCURRENCES

Date	Location	Description
1976	County Wide	Much crop damage
1983	SW of County	Slight crop damage
1984	West & South	Severe damage-USDA Declaration
1986	West & South	Severe damage-USDA Declaration
1988	County Wide	Severe damage-USDA Declaration

Waukesha County Parks and Land Use Department has the primary responsibility for establishing specific guidelines on well depth. The following actions help mitigate the effect of hydrologic drought: identification of areas with potential ground water level problems and inspection of wells in those areas for adequate depth and construction. Some Waukesha County communities adopted water usage regulations during drought conditions.

Waukesha County farmers may contact the Waukesha County UW-Extension Office and/or the USDA-Community Farm Services Office for information and guidance related to drought. Various federal and state publications are available from these agencies on ground water movement, the hydrologic cycle and irrigation methods. These agencies will also be the lead agencies in obtaining emergency food and water supplies for agricultural use.

In summary, drought is a part of Wisconsin's climatic history, occurring at irregular intervals in Waukesha County. Considering the history of severe droughts in Waukesha County, critical facilities should develop contingency plans to minimize the effects of drought.

Earthquakes

An earthquake is a shaking or trembling, sometime violent, movement of the earth's surface that follows a release of energy in the earth's crust. Earthquakes are unpredictable and strike without warning. They may range in intensity from slight tremors to great shocks and may last from a few seconds to as long as five minutes. They can come 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. Most casualties result from falling objects and debris because the shocks can shake, damage, or demolish buildings and other structures. Expect the disruption of communications, along with electrical power lines, gas, sewer, or water mains.

The earthquake threat to Waukesha County as a whole is not great. Seismographs record the shock waves produced by earthquakes. The epicenter (or point of origin) of the shock waves may occur in Wisconsin or adjacent states. In fact, the most recent earthquakes felt in this area occurred at 1:12 p.m. and 1:16 p.m. on February 12, 1987, had epicenters in adjoining states.

In recent years, considerable attention focused upon seismic activity in the Midwest and in particular, on activity along the New Madrid Fault in Missouri. A severe earthquake occurred there in 1811 and the area remains seismically active. However, because no severe earthquakes occurred in this fault zone since 1895, many people in the Midwest remain unaware of the damage potential.

Studies on seismic activity in the New Madrid Fault Zone are significant to Wisconsin in that there is the potential for counties in southeastern Wisconsin to incur damage if there were a recurrence of the 1811 event. Major natural gas and petroleum supply lines cross the New Madrid Fault, so disruption of these supplies presents a significant risk. A disruption of electrical power or gas and oil service in winter months would cause a major emergency in Waukesha County.

Appendix D shows the locations and dates of the 24 recorded earthquakes that occurred in Wisconsin since the turn of the century, none of which caused substantial damage. Little factual information exists about the cause, but geologists believe they result from the still-occurring rebound of crust caused by the retreat of glacial ice that forced the crust downward. Contrast this with California earthquakes originating from the release of stress caused by the movement of tectonic plates.

Seismologists utilize two principal methods to measure earthquakes: seismographs (sophisticated seismic monitoring equipment) and human judgment. The Richter Scale (expressed in Arabic numbers) reports total energy released. The Mercalli represents an intensity scale (expressed in Roman numerals) which reports damage or amount of shaking. Only two of the Wisconsin earthquakes measured on seismographs, with the greater of them registering at 5.1 on the Richter Scale and VII on the Mercalli Scale.

While the earthquake threat to Wisconsin as a whole is not great, it is imperative that local officials be aware of any potential threat for their particular area. Once officials make that determination, they should develop appropriate response plans for minor, moderate or major

impacts of a quake. Mitigation strategies include creation and enforcement of building codes and safe land use practices. Officials should also inspect existing structures (particularly public buildings used by large numbers of people) to ascertain whether they are "earthquake safe" based upon the worst-case / most probably case scenarios for Waukesha County.

Fires and Explosions

Fire is an ever-present hazard in the County impacting homes, forests and major structures. Typically, there are several large structural fires per year county-wide.

Structural fires typically involve buildings that have more than three floors designed for multiple businesses or resident occupancy. Usually these fires occur in large urban areas. Loss of property, income and in some cases, lives represent common consequences of large structural fires. These fires affect large numbers of people, requiring special planning and response efforts.

An explosion is a sudden release of a large amount of energy accompanied by shock and pressure waves. A very rapid fire can also be an explosion. For example, when gasoline is mixed with air in the proper proportions and ignited, the burning is extremely rapid, causing expansion of heated products and combustion that creates shock waves.

The threat of an explosion exists on a daily basis in Waukesha County. Large volumes of explosive material are stored, transported and used on a routine basis by both business and private sector consumers. When explosive material is mishandled or involved in an accident, the disastrous results may occur. In a worst-case scenario, incidents involving explosive materials could involve hundreds of Waukesha County residents.

Waukesha County has 30 well-equipped fire departments with over 1500 trained fire fighters. The fire departments emphasize fire inspections and prevention activities. Many critical facilities developed pre-fire response plans to expedite rapid response and extinguishment.

Flooding

Flood related hazards in Wisconsin arise from a complex set of hydrologic and hydraulic interactions. The hazards that result from these interactions include riverine flooding, coastal flooding and erosion, bank slumping, inland lake flooding, flash flooding, flooding from levee and dam failure, storm water runoff and ponding, and stream flooding.

Flooding frequently causes disastrous consequences. Although the probability of serious injury and loss of life is low, personal property damage is usually heavy due to long periods of inundation. Also, the probability of long-term health hazards (e.g., communicable diseases, epidemics, insect and rodent infestation, etc.) exists. Long-term damage to the environment may also occur.

Major floods in Wisconsin tend to occur in spring when melting snow adds to normal runoff or throughout the summer or early fall after intense rainfalls. Characteristics of spring snowmelt flooding and/or a prolonged period of heavy rain include 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 and then slowly recedes inch by inch. The timing and location of this type of flooding is fairly predictable, typically allowing ample time for evacuation of people and property. The Federal Emergency Management Agency and Wisconsin DNR, work with local governments to identify special flood hazard areas in the State. Such areas have a 1% chance of experiencing or exceeding the computed flood level in any given year.

Flash flooding, which usually results from surface runoff after intense rains, also poses a threat to all areas of Wisconsin. It is a 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 streams will rise very rapidly when surrounding soil and terrain are unable to accommodate intense precipitation.

Generally, the amount of damage from flooding is a direct consequence of land use. If the ground is already saturated, stripped of vegetation, or paved, the amount of run-off increases, adding to the flooding.

Waukesha County (along with other nearby counties) received four Presidential Disaster Declarations for flash flooding damage. These events occurred in August 1986 (Milwaukee and Waukesha Counties); September 1986 (Milwaukee, Waukesha, Ozaukee, Sheboygan, Manitowoc, Dodge, Kenosha and Washington Counties); June 1997 (Milwaukee, Waukesha, Ozaukee, and Washington Counties); and August 1998 (Milwaukee, Waukesha, Rock, and Sheboygan Counties). These floods revealed that no flood plains or urban areas in Wisconsin can be considered safe from flood damages.

Waukesha County splits into two distinct drainage basins. The western portion of the County drains into the Rock River Basin. Principal rivers in this area include the Oconomowoc River, Mason Creek and the Bark River. The eastern portion of County drains to the Fox River Basin.

There are numerous lakes in the County, the principal ones being Muskego Lake in the southeastern part, and a large group of lakes in the northwestern part between the Village of Pewaukee and the City of Oconomowoc.

There are numerous dams within Waukesha County, many built for recreational purposes. The chain of lakes on the Oconomowoc River, the Nemahbin Lakes and Nagawicka Lake on the Bark River, Phantom Lake on the Mukwonago River and Saylesville Pond on Genesee Creek all provide substantial attenuation of peak discharges on their respective watercourses. Most other lakes provide little or no attenuation of the peaks and therefore, provide little in the way of flood protection.

Detailed studies of flood hazard data in Waukesha County utilized standard hydrologic and hydraulic analysis methods to determine flood impact areas. Flood events of a magnitude may equal or exceed thresholds once on the average during any 10, 50, 100, or 500-year period (recurrence interval) and have special significance for flood plain management. These events, commonly termed the 10, 50, 100 and 500-year floods, have a 10, 2, 1 and 0.2 percent chance respectively, of being equaled or exceeded during any year.

Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered.

Waukesha County historically has not experienced a serious flooding problem. However, nine (9) major floods affected the area since 1947. A severe winter storm in February, 2008 and resulting Presidential Snow Emergency Declaration precipitated heavy snow melt combining with heavier than normal spring rains set the stage for severe flooding throughout Waukesha County when heavy rains began on June 5, 2008 and continued periodically through July 25, 2008. A Presidential Disaster Declaration for 31 Southern Wisconsin Counties included Waukesha County. Saturated ground led to ground water levels reaching 1 foot below the surface in a variety of areas throughout the County, which caused water infiltration to many basements. Widespread surface flooding occurred as well. Especially hard hit areas included City of Brookfield, Town of Summit, City and Village of Pewaukee, Town of Mukwonago, and City of New Berlin, among most other communities in Waukesha County.

WAUKESHA COUNTY OCCURRENCES

Date	Location	Description
1947	County wide	Spring snow melt
1948	County wide	Spring snow melt
1960	County wide	Spring snow melt & rains
1973	County wide	Heavy rains
1986	NW & NE	Heavy rains (Two events)
1997	NE & SE	Heavy rains
1998	NE & SE	Heavy rains
2008	County wide	Heavy rains
2010	County wide	Heavy rains

Many actions can lessen the effects of flooding. Short-term tactics, i.e., those actions taken immediately when an imminent threat exists include activities such as: issuance of early warnings through flood advisory bulletins; dissemination of instructions to the public through the media; preparation of congregate care facilities and evacuation of people and property. Short-term actions also include temporary protective measures such as sandbagging, build-up of levees, protection of buildings and other structures, and cut-off of gas and electricity.

The current emphasis in flood mitigation, however, is in terms of long-range strategies to reduce potential impact. Costly structural flood controls, i.e., the building of dikes, dams, and levees, often do not provide as effective protection as other long-range actions, such as flood plain management and zoning controls. Current philosophy incorporates a balanced approach combining structural control with flood plain management. This concept includes the adoption of proper flood plain zoning, storm-water management ordinances, land use planning, acquisition and demolition of flood prone properties, and promotion of the sale of flood insurance. Effective flood plain management reduces the cost of damages attributed to flooding. Wisconsin Emergency Management’s flood mitigation programs provide additional information in the Hazard Mitigation section at <http://emergencymanagement.wi.gov>. Waukesha County initiated the process of developing an All-Hazards Pre-Disaster Mitigation Plan in 2008.

Waukesha County adopted a Shore land and Flood land Protection Ordinance on June 23, 1970. This Ordinance follows a strict interpretation of the guidelines set by the Federal Emergency Management Agency in that the County does not allow any construction in the floodplain.

Citizens, homeowners and renters can obtain flood insurance from any licensed property or casualty insurance agent, with coverage underwritten through the National Flood Insurance Program (NFIP). NFIP coverage provides both structural and content insurance protection at an affordable rate for residential, commercial, industrial, agricultural and public buildings.

Hazardous Materials Incidents

Wisconsin Statute 144.03 (10) defines a "Hazardous substance (material)" as any substance or combination of substances, including wastes, of a solid, liquid, gaseous or semi-solid form which, because of its quantity, concentration or physical, chemical or infectious characteristics, may cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness, or pose a substantial present or potential hazard to human health or the environment. Such substances may include, but are not limited to, those that are toxic, corrosive, flammable, irritants, strong sensitizers or explosive.

Because of the demand for chemicals on the farm, in the home and industry, all modes of transportation (highway, railroad and airlines) are carrying thousands of hazardous materials shipments on a daily basis through Wisconsin communities. Waukesha County has an extensive transportation system. The highway includes interstate highways, state, county and local roads. Common carrier truck lines, railroads and an air transportation network provide freight service. Petroleum products and hazardous materials move across the county at various times.

A transportation accident involving any one of the above hazardous materials could cause a local emergency affecting large numbers of people with little or no warning. Major accidents can also occur at fixed sites like manufacturing plants, or any commercial establishment that uses, stores, produces, or treats hazardous materials.

In the case of either a transportation or fixed facility incident, the numerous potential impacts exist. Hazards include short and long-term health dangers to those exposed to the hazardous material, explosions, major fires and massive environmental contamination. The incident may necessitate short or long-term evacuation, which in turn disrupts the social and economic well-being of the affected area.

There are no areas of the State immune from hazardous materials incidents or accidents. However, there are several factors to consider when identifying the scope, magnitude and vulnerability for incidents within specific areas of the State. One visible factor is the condition of the facility or transportation mode handling hazardous materials. Other factors include the toxicity of the material and the potential for harm to the public health. In addition, the sophistication of on-site and off-site planning, as well as local response capabilities, present additional considerations.

There are over 150 fixed facilities, including industrial and agricultural sites possessing extremely hazardous substances. There are over 300 locations reporting hazardous chemicals on their annual SARA Tier Two Chemical Inventory Report. Facilities in Waukesha County report nearly 250 different hazardous substances each year. In addition, there are several farms in the County using and storing hazardous substances such as insecticides, herbicides and fertilizers.

While Waukesha County offers a strong record of safety and care in handling hazardous substances, spills of oil, gasoline, pesticide, acid and other forms of toxic material spills at fixed facilities, farms, and roadways occur. As the county's industrial base continues to expand and population increases, the County's vulnerability to a hazmat incident grows daily.

To address the hazmat concern, the County Local Emergency Planning Committee (LEPC) developed off-site plans for all the fixed facilities possessing extremely hazardous substances in amounts above federally established thresholds. The LEPC maintains databases of information regarding other hazardous materials as well. The Environmental Protection Agency and Occupational Health and Safety Administration classify hazardous materials events by the level of protection required to mitigate the event. Four such classifications exist: Level A represents the highest level of respiratory and skin absorption protection requirements, while Level D events present the least danger often only requiring typical work gloves and boots. The County contracted with the City of Waukesha Fire Department to provide countywide Level B hazardous materials response. The State of Wisconsin established a network of regional Level A hazardous materials teams to mitigate the most serious incidents. The City of Milwaukee Fire Department provides Level A services to Waukesha County. Back up Level A teams may come from Dane or Racine Counties, or the City of Oshkosh.

Heat Waves

A heat wave is primarily a public health concern. During extended periods of very high temperatures or high temperatures and 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.

Excessive heat has become the most deadly hazard in Wisconsin. According to the National Weather Service, 111 people died in Wisconsin directly because of heat waves during the 21 years from 1982-2002. This rate of mortality during this 21-year period is more than 4 times greater than the next most deadly hazard--tornadoes (25 deaths) and cold waves (24 deaths). Heat stroke causes most deaths during a heat wave. Large and highly urbanized cities can create an island of heat that can raise the 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.

Several heat waves occurred from mid-July through early August 2001 claiming 15 fatalities (10 direct and 5 indirect) across Wisconsin. The next most recent heat wave occurred in Wisconsin during the last two weeks of July 1999 peaking during the 4 days of July 28-31, 1999. 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, demand for daily electric power in the Milwaukee area produced record peaks. The summer of 1999 also brought new records 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 or indirectly 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.

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. There is no prevention of heat waves; therefore, it is important to provide notice of adverse conditions so that the public can anticipate and avoid health-threatening situations.

The Milwaukee-Sullivan office of the National Weather Service offers the following 5 types of alerts for excessive heat conditions in its 30-county service area:

- 1. 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;

2. **Heat Watch** – The National Weather Service issues a Heat Watch 24-48 hours in advance when expecting heat advisory conditions to develop.
3. **Excessive Heat Watch** – The National Weather Service issues an Excessive Heat Watch 24 to 48 hours in advance when anticipating Excessive Heat Warning conditions. Vulnerable populations should take precautions to protect their health to prevent heat strokes and other health related illnesses. Agency action plans should be in place if watch escalates to a warning.
4. **Heat Advisory** – The National Weather Service issues a Heat Advisory 6-24 hours in advance of any 24-hour period in which daytime heat indices (HI) are expected to be 105-110 for 3 hours or more and nighttime HI's are at least 75. Less serious conditions that cause significant inconvenience and, if without caution, could lead to life threatening situations warrant issuance of Advisories.
5. **Excessive Heat Warning** – The National Weather Service issues an Excessive Heat Warning 6-24 hours in advance of any 24-hour period in which daytime heat indices (HI) may exceed 110 for 3 hours or more and nighttime HI's are at least 80 or greater. These warnings represent life threatening conditions. Heat stroke/sunstroke is highly likely with continued exposure. Elderly, sick, socially disadvantaged and medicated individuals are at a higher risk and may die, especially if they live in poorly ventilated areas.

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

Slow down. Reduce, eliminate, or reschedule strenuous activities 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. The human body needs water to keep cool. Drink plenty of fluids even if you do not 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. Libraries, shopping malls or grocery stores may offer welcome respite from the heat.

Do not get too much sun. Sunburn makes the job of heat dissipation that much more difficult.

Do not forget pets! They too will suffer from excessive heat. Do not leave pets in closed vehicles, even if only stopping at the store for short times. Enclosed vehicles rapidly heat up and may cause the death of the animal. Make sure pets have access to shade and water.

See the table on the following page for treating heat related disorders.

Treating Heat Related Disorders

Heat Disorder	Symptoms	First Aid
Sunburn	Redness and pain. In severe cases, swelling of skin, blisters, fever, 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.
Heat Exhaustion	Heavy sweating, weakness, skin cold, pale and clammy. Weak pulse. Normal temperature possible. Fainting and vomiting.	Get victim out of sun. Lay down and loosen clothing. Apply cool wet cloths. Fan or move victim to air conditioned room. Give sips of water. If nausea occurs, discontinue. If vomiting continues, seek immediate medical attention.
Heat Stroke (or sunstroke)	High body temperature (106°F or higher). Hot dry skin. Rapid, strong pulse. Possible unconsciousness. Victim will likely not sweat.	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.

Terrorism

Federal law defines terrorism 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* involves groups or individuals directing activities at elements of our government or population without foreign direction; and *international terrorism* involving foreign-based groups or individuals 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 may fall with the definitions of terrorism.

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. involved bombs or incendiary devices, including detonated and undetonated explosive devices, tear gas, pipe and firebombs and rocket attacks. Often the capacity exists for large-scale damage and/or mass casualties. The bombing of the Federal Building in Oklahoma City in August 1995 represents a clear example. 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 ready availability of such materials, the potential for mass damage and casualties, and experiences to date in the nation, experts anticipate that of the various types of WMD weapons, explosive weapons retain a high potential for use in the U.S.

Airline Attack: Despite efforts to improve airline security in the U.S. after the 9/11/01 attacks on the World Trade Center in New York, some note that airport security still falls short of acceptable and necessary standards. In addition to hijacked planes crashing into buildings, incidents could include airplane bombings, sabotage or hijacking, airport bombings or shootings or the tampering with air navigation and control systems, resulting in plane crashes or collisions.

Chemical/Biological/Nuclear: Terrorists can use chemical and biological agents or weapons to either extort or deliberately try to kill in order to further political goals. Toxins such as anthrax or even some radiological materials could become credible threats. From October-December 2001, there were nearly 100 anthrax hoaxes in Waukesha County. Although these threats and letters proved to be hoaxes, first responders cannot afford to treat these types of cases lightly.

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 as possible. 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 targets computer resources such as: networks, databanks and software by infiltrating computer networks to alter, steal or destroy programs and data. Legitimate concerns regarding cyber-terrorism increase as society becomes more dependent on computer technologies.

The emergency management community in the United States must accept that national security and intelligence organizations may not always be successful in preventing terrorist incidents. It is up to state and local emergency management personnel and services to respond when these 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, primary consideration. Federal and state government agencies depend directly on local managers and emergency response personnel to effectively carryout their initial and follow-on actions during any terrorist incident.

When dealing with terrorist incidents, the traditional command structure adjusts to include additional federal and state agencies, often identified prior to the situation arising. 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, chemical, biological or nuclear attacks require mass decontamination prior to transport or treatment of victims.

Waukesha County developed a Terrorism Consequence Management Annex and a Bioterrorism Response Plan as supplements to the existing Emergency Operations Plan. The planning process incorporated identification of potential targets, as well as threat and risk potentials. Potential terrorist targets include government facilities, utilities, commercial and educational facilities and transportation systems. A basic terrorism prevention and response planning assumption treats any type of facility, upon which a terrorist attack could generate desired publicity or further terrorism objectives, as a potential target.

Numerous first responders completed Weapons of Mass Destruction (WMD) awareness and response training. Waukesha County was one of the first counties in the country to conduct an exercise that integrated civilian and military assets for response to a biological incident. Exercises continue throughout the County to increase the readiness level of all responders to manage a terrorist incident.

The County utilized federal funds to purchase domestic preparedness equipment to enhance local response capabilities of first responders and hazardous materials teams. Federal funds also provided equipment to enhance protection of critical infrastructure systems.

Thunderstorm Hazards

Thunderstorms and their associated hazards, lightning, hail, straight-line winds and tornadoes, can occur throughout the County during any month of the year and with little or no notice. Because of their rather spontaneous development and short lives, little can be directly observed of these phenomena other than the path of destruction that is left behind. Due to their unique characteristics, thunderstorms and their associated hazards will be discussed individually.

Thunderstorms

A thunderstorm is a severe local storm produced when a deep layer of dry cool air overruns a relatively shallow layer of warm moist air. Cumulonimbus clouds, called thunderheads, form. This towering mass may be six miles or more across and 40,000 to 50,000 feet high. It may contain 1-1/2 million tons of water and enormous amounts of energy often release in the form of high winds, excessive rains, and four violently destructive natural elements -- lighting, straight-line winds, tornadoes and hail.

On the ground directly beneath the storm system, the mature thunderstorm generates rain, 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 surface denotes the thunderstorm's mature stage. This is nature's warning that the thunderstorm is in its most violent phase.

A thunderstorm often lasts no more than 30 minutes. The individual thunderstorm cell travels frequently between 30 and 50 miles per hour. Strong frontal systems, though, may spawn one squall line after another composed of many individual thunderstorm cells. These fronts typically track completely across the State from west to east.

Meteorologists measure thunderstorm frequency in terms of incidents of thunderstorm days-- days on which thunderstorms occur. Wisconsin averages between 30 and 50 thunderstorm days per year depending on location. In Waukesha County, there are typically ten severe thunderstorms per year. Thunderstorms can occur throughout the year although their highest frequency is during the months of May through September. They occur most often between the hours of noon and 10:00 p.m.

Severe thunderstorms can cause injury or death and result in substantial property damage. They frequently cause power outages, disrupt telephone service, and seriously tax the emergency management capabilities of the affected jurisdictions.

Lightning

Lightning is a secondary effect of electrification within a thunderstorm cloud system. As a thunderstorm induces the growing positive charge on the ground, the negative charge in the cloud become great enough to overcome the resistance of insulating air and forces a conductive path for current to flow between the two charges. Lightning strokes represent a flow of current traveling from cloud to cloud, cloud to ground, or where high structures are involved from ground to cloud. The sudden and violent discharge in the form of a lightning stroke is over in a millionth of a second. Temperatures in the lightning stroke channel rise to 50,000 degrees Fahrenheit producing a bright flash of light and a loud clap of thunder caused by the sudden expansion of air.

Lightning damage results from four effects of the lightning stroke: electrocution of humans and animals; vaporization of materials along the path of the stroke; fire caused by the high temperature produced by the stroke; and a sudden power surge that can damage electrical and electronic equipment. In the United States, lightning kills more people each year on the average than either hurricanes or tornadoes.

Wisconsin has a high frequency of property losses due to lightning. Insurance records, for instance, show that lightning strikes two out of every 100 farms or have a possible lightning induced fire each year. Rural areas and small towns tend to experience more lightning caused deaths and injuries than large cities. During the period of 1982-2002, Wisconsin recorded 19 deaths resulting from lightning.

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.

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 hearing thunder, 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 travel 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.

Hail

Hail is atmospheric water particles from thunderstorms in the form of rounded or irregular lumps of ice called hailstones. These stones range from the size of a pea to the size of a grapefruit and form when sub-freezing temperatures cause water in thunderstorm clouds to accumulate in layers around an icy core. When strong underlying winds can no longer support the added weight, the hailstones fall earthward, battering crops, denting autos, breaking windows and damaging roofs. Injury and loss of human life are rarely associated with hailstorms.

Hail tends to fall in swaths from 20 to 115 miles long and 5 to 30 miles wide. A hail swath is not a large continuous path of hail but generally consists of a series of hail strikes 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 they leave completely undamaged gaps between them.

Wisconsin averages between two and three hail days per year as recorded at National Weather Service stations. 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 percent of hailstorms occurring during this period. Most of the hail damage is in the rural areas as these five months also correspond to the growing and harvesting seasons for most crops.

The county extension agent distributes information on various hail insurance options. In the event of major damage, the Waukesha County Emergency Board, comprised of county and federal agricultural agency representatives, holds primary responsibility for documenting hail damage.

Federal emergency assistance is available in the form of low-interest loans when a Presidential Disaster is declared or when FEMA declares a county eligible for aid. Damage from hailstorms alone is generally not extensive enough to invoke a disaster declaration.

Tornadoes and Downbursts

The tornado is a violently rotating column of air, extending from a thunderstorm cloud system. It is frequently visible as a funnel, although its lower end does not always touch the ground. Average winds in the tornado, although never accurately measured, are probably between 100 and 200 miles per hour. Tornadoes may produce winds exceeding 300 miles per hour.

A tornado path averages four miles, but may reach up to 300 miles in length. Widths average 300-400 yards, but tornadoes have cut swaths a mile or more in width, with severe tornadoes or groups of two or three funnels traveling together. On the average, tornadoes move between 25 and 45 miles per hour, but may reach speeds up to 70 miles per hour. Tornadoes rarely last more than a couple of minutes over a single spot or more than 15-20 minutes in a ten (10) mile area. The destructive power of the tornado lies primarily in its high wind velocities and sudden changes in pressure. Wind and pressure differentials may account for 90 percent of tornado-

caused damage. Since tornadoes generally occur with storm systems, hail, torrential rain and intense lightning frequently accompany tornadoes. Tornadoes can uproot trees, down power lines and destroy buildings. Flying debris can cause serious injury or even death.

Straight-line winds accompany downbursts. Downburst damage is often highly localized resembling that of tornadoes. In contrast to a tornado's violently rotating column of air, downburst winds flow at high speed downward vertically in a straight-line to the ground and then spread out horizontally. Recorded wind speeds in straight-line wind events may exceed 105 miles per hour. These sudden high winds may uproot trees, tear open building roofs, and overturn tractor-trailer trucks. There are significant interactions between tornadoes and downbursts. Downbursts may alter the path of a tornado, resulting in a right, left or even a U-turn.

Tornadoes most frequently occur in the late afternoon and early evening, but can occur at any time. Nearly 75 percent of all Wisconsin tornadoes occur between the hours of 3:00 p.m. and 7:00 p.m. For the past few years, Wisconsin ranked about fifteenth in the nation insofar as number of tornado occurrences. Between June and July of 2010, Waukesha County experienced three (3) tornadoes, all affecting the southern half of the County. The National Weather Service classified two of these tornadoes as EF1, while the most serious was an EF2 affecting the Village and Town of Eagle and Town of Mukwonago. High winds in July, 1991, caused extensive county-wide damage resulting in a Presidential Major Disaster Declaration for Waukesha County. While all Wisconsin counties recorded at least one tornado in the period from 1950-2003, Waukesha County recorded 34 tornadoes.

Tornadoes display strong seasonal variations. Tornadoes in Wisconsin occurred in every month except February, with most activity between April and September. The month of June has the highest tornado frequency. The most severe tornadoes occur during April, May and June with tornadoes during the remainder of the year generally smaller with shorter tracks. Winter, spring and fall tornadoes are more likely to occur in southern Wisconsin than in northern counties.

Preparedness Activities

An effective warning system is the single most important source to alert the public to a severe weather hazard. In the event of a severe weather threat, the National Weather Service issues weather bulletins, watches and warnings. A number of telecommunication channels disseminate severe weather information including NOAA weather radio, the NOAA weather wire and the state law enforcement TIME System. Local media outlets routinely monitor these information sources and rebroadcast the information over television and radio stations.

The States of Wisconsin and Minnesota coordinate a statewide Tornado Awareness Week and a two state simulated tornado warning to test emergency alerting systems in late March or April. The Waukesha County Emergency Management Office actively promotes tornado safety public information as well as other summer severe weather public awareness educational efforts. It also assists the National Weather Service in sponsoring tornado spotter training and organizing local tornado spotter networks. In addition, the Office assists personnel in schools and businesses, public facility managers and individuals in determining "best available" tornado safety areas.

Transportation Accidents: Aircraft, Rail, Highway

Transportation accidents pose a hazard for emergency responders from a number of perspectives. With rail and air accidents especially, emergency response personnel may confront problems like fires, rescue and emergency first aid for survivors, inadequate medical or mortuary facilities for victims, crash site security (crowd and traffic control) and the presence of hazardous materials. In all cases, human health and safety and the environment are in jeopardy.

Aircraft

Airports present serious challenges for emergency planners. Besides the entire spectrum of natural disasters which can disrupt normal operations, airports must have emergency response plans for airplane crashes/accidents and bomb incidents. Waukesha County operates Crites Field, which is a busy general aviation airport. General aviation airports typically do not provide commercial passenger service. Waukesha County lies in the flight path to General Mitchell International Airport in Milwaukee.

It is important to note that the risk of airplane crashes/accidents is greatest during landing and take off procedures. As a result, developed areas adjacent to the airport and in the airport flight paths become highly vulnerable to this hazard. Over the last decade, several small recreational aircraft accidents in Waukesha County resulted in fatalities.

Rail and Highway

Wisconsin's railroad system is following a national trend of decreasing in physical size. Presently there are three (3) railroads operating in the County. These include Amtrak, Wisconsin Southern and the CN Rail System. Passenger train accidents may involve mass casualties. For such occurrences, Incident Command will coordinate establishment of a field command post, staging area(s) and requesting mutual aid as necessary. Common tasks include implementing protocols for medical triage, tagging, identifying and transporting victims to medical facilities or temporary morgues.

A number of variables affect when and where transportation accidents occur, including volume of traffic, weather conditions, the condition of transporting vehicle, as well as the condition of the railroad tracks or highway. Even with ideal conditions of all types, transportation accidents can and do occur.

The likelihood that the presence of hazardous materials will complicate a transportation accident is great. Highway-related incidents account for 83% of all transportation accidents involving hazardous materials. Gasoline accounts for 17 percent of the incidents; sulfuric acid, 11 percent; anhydrous ammonia, 5 percent; and caustic soda, hydrochloric acid, and LPG, 4 percent, respectively. Of all hazardous substances, those most frequently involved in transportation incidents by all modes include paint and related products, batteries, gasoline, cleaning compounds and paint removing compounds. In rail transport, sulfuric acid, phosphoric acid, anhydrous ammonia, hydrochloric acid, corrosive liquids and flammable liquids are, in that order, the major chemicals involved.

Waukesha County emergency service agencies have local plans and response procedures for use in transportation accidents. Personnel from all police, fire and emergency medical services (EMS) receive regular training in responding to these hazards.

Winter Storms

Winter storms include heavy snowstorms, blizzards, freezing rain, sleet and ice storms. Cold temperatures and wind chills bring threats of hypothermia to the list of winter's perils. The National Weather Service considers snowfalls with accumulation of six or more inches in a 12-hour period a heavy snowfall. The majority of Wisconsin snowfalls are between one and three inches per occurrence. However, heavy snowfalls producing at least ten inches may occur three or four times per season. A blizzard is the occurrence of sustained wind speeds in excess of 35 miles per hour accompanied by heavy snow or large amounts of blowing or drifting snow. Northwestern Wisconsin encounters more blizzards than southeastern portions of the state.

Both ice and sleet storms can occur at anytime throughout the winter season from November into April. Early and late season ice and sleet storms are generally restricted to northern Wisconsin. Otherwise, the majority of these storms occur in southern Wisconsin. An ice storm occurs when rain falls out of the warm and moist upper layers of the atmosphere into a cold and dry layer near the ground. The rain freezes on contact with the cold ground and accumulates on exposed surfaces. If a half inch of rain freezes on trees and utility wires, damage can occur, especially if accompanied by high winds. A sleet storm differs from an ice storm in that sleet is actually frozen raindrops or pellets that do not cling to surfaces, but may make driving hazardous.

Winter storms present a serious threat to the health and safety of the affected citizens and may result in damage to property, such as when the weight of heavy snow causes the structural collapse of buildings. Generally, the winter storm season in Wisconsin runs from November to March. Severe winter weather occurred, however, as early as October and as late as the latter half of April and into May in some locations in the State. Waukesha County received record snowfalls in December, 2000 along with surrounding counties. Many counties, including Waukesha received a Presidential Emergency Declaration that allowed eligible applicants to receive federal and state funds for extraordinary expenses associated with clearing roads and emergency response efforts.

Communities prepare for severe winter weather by ensuring that plowing and sanding equipment is operational and available to handle potential emergencies. Scheduling extra personnel and extensive overtime may require allocating additional funding to cover extensive related to winter storms. Communication lines established between government agencies, police, fire, EMS, hospitals and highway departments ensures an effective response to the emergency. The Waukesha County Emergency Operations Plan provides for coordination of resource acquisition, public safety, and support agencies such as the American Red Cross or Salvation Army during emergencies and disasters.

Waukesha County Emergency Management Office prepares and distributes winter safety preparedness information to the media and public in conjunction with a number of partner agencies. In the event of severe winter weather, the National Weather Service issues advisories, watches and warnings to alert the public of situations that could pose a threat to life and property.

WAUKESHA COUNTY INTEGRATED EMERGENCY MANAGEMENT SYSTEM

It is the mission of the Waukesha County Office of Emergency Management to develop and implement a comprehensive and integrated emergency management program designed to mitigate, prepare for, respond to and recover from the effects of all hazards which impact the welfare, safety and health of all County citizens.

The Office has adapted an "**all-hazards**" approach to planning for potential threats to life and property. This comprehensive approach coordinates response to any major emergency consisting of three interrelated components:

- 1) **All types of hazards:** The commonalities among all types of technological and natural disasters suggest strongly that many of the same management strategies can apply to all such emergencies.
- 2) **An emergency management partnership:** The burden of disaster management, and the resources for it, require a close working partnership among all levels of government (federal, state, county and local) and the private sector (business and industry, voluntary organizations, and the general public); and
- 3) **An emergency lifecycle:** Disasters do not just appear one day. Rather, they exist throughout time with a lifecycle of occurrence matching a series of management phases that include strategies to mitigate hazards, prepare for, and respond to emergencies and recover from their effects.

Mitigation refers to activities that actually eliminate or reduce the chance of occurrence or the effects of a disaster. Many options exist to either prevent major emergencies or disasters from ever happening or reduce the damaging impact when prevention is not possible. These include such things as zoning ordinances, building codes and enforcement, public health ordinances, fire regulations, hazardous materials training, dam inspections, and many others. Mitigation efforts usually rest with the departments that deal with these hazards on a day-to-day basis. For example, the fire department is responsible for enforcing the fire regulations, and the building inspector is responsible for enforcing the local building codes. All these laws serve to mitigate hazards by elimination or reduction of the threat.

The next phase of emergency management is preparedness. **Preparedness** is planning how to respond in case an emergency or disaster occurs and working to increase resources available to respond effectively. Preparedness activities help save lives and minimize damage by preparing people to respond appropriately when an emergency is imminent. To respond properly, a jurisdiction must have a plan for response, trained personnel to respond and necessary resources with which to respond.

The County Emergency Operations Plan (EOP) serves as an overview of the County's approach to emergency management. It details the tasks assigned to specific organizations based on established objectives, assumptions and a realistic assessment of capabilities. It defines the relationship between the various functions and fixes the responsibility of who is to do what.

Response is the next phase of emergency management. Response activities occur during and immediately following a disaster designed to provide emergency assistance to victims of the event and reduce the likelihood of secondary damage. Our fire departments, police departments, and emergency medical services are primary responders. Depending upon the type of emergency, the health department, public works, or human services agencies may also become part of the response.

Recovery is the final phase of the emergency management cycle. Recovery continues until all systems return to normal, or near normal. Short-term recovery returns vital life support systems to minimum operating standards. Long-term recovery from a disaster may go on for years until the entire disaster area is completely redeveloped, either as it was in the past or for entirely new purposes that are less disaster-prone.

Few communities can expect to recover from a major disaster without financial assistance from the state and federal governments. The most common reason for failure to obtain federal assistance is lack of adequate documentation. Every jurisdiction in Waukesha County must rapidly and accurately assess damage occurring in their community following an event.

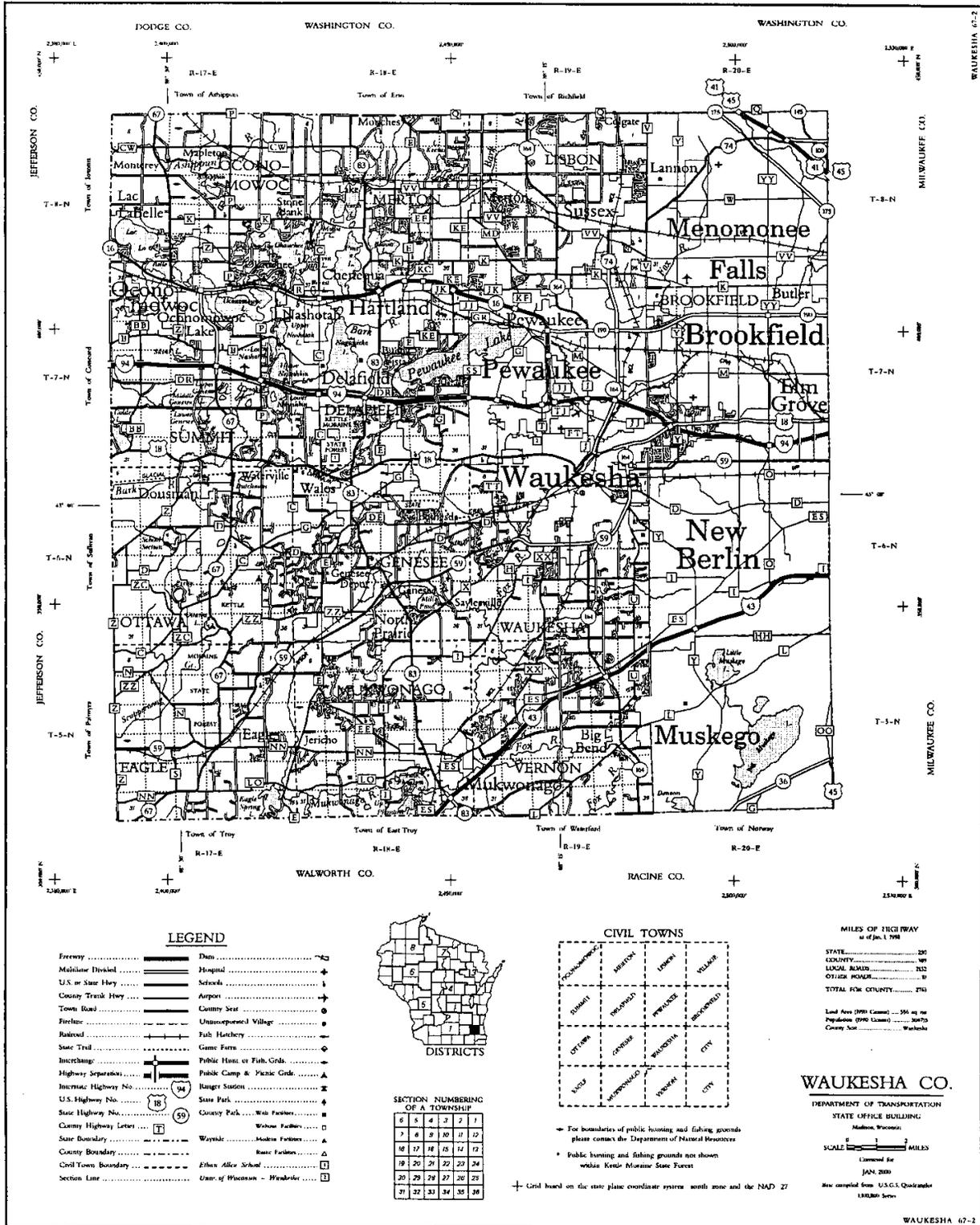
The Waukesha County Office of Emergency Management has the responsibility for coordinating all the components of the emergency management system. These components consist of fire and police, emergency medical service, public works, health and human services, volunteers and other groups contributing to the management of emergencies. These parts of the emergency management system are no different than the parts of government and the private sector that manage the day-to-day affairs of the community.

Waukesha County adopted the National Incident Management System (NIMS) in compliance with Homeland Security Presidential Directive #5 issued in 2003. NIMS is designed to be applicable at all jurisdictional levels, across all functional disciplines, covering the full spectrum of hazards, while coordinating both public and private entity response to disasters.

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APPENDICES

APPENDIX A WAUKESHA COUNTY MAP



LEGEND

- | | | | |
|------------------------|-------|-------------------------------|-------|
| Freeway | | Dam | |
| Multiple Divided | ==== | Hospital | |
| U.S. or State Hwy | ==== | Schools | ..... |
| County Trunk Hwy | ==== | Airport | ..... |
| Town Road | ==== | County Seat | ..... |
| Fireline | ..... | Unincorporated Village | ..... |
| Railroad | ..... | Fish Hatchery | ..... |
| State Trail | ..... | Game Farm | ..... |
| Interchange | ..... | Public Hunt or Fish Grds. | ..... |
| Highway Separation | ..... | Public Camp & Picnic Grds. | ..... |
| Interstate Highway No. | ..... | Ranger Station | ..... |
| U.S. Highway No. | ..... | State Park | ..... |
| State Highway No. | ..... | County Park | ..... |
| County Highway Letter | ..... | Wild Facilities | ..... |
| State Boundary | ..... | Wishart Facilities | ..... |
| County Boundary | ..... | Basic Facilities | ..... |
| Civil Town Boundary | ..... | Other Public School | ..... |
| Section Line | | Other of Wisconsin - Waukesha | |



SECTION NUMBERING OF A TOWNSHIP

6	8	4	2	1
7	9	5	3	2
10	11	6	4	3
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360	361	181	179	178
362	363	182	180	179
364	365	183	181	180
366	367	184	182	181
368	369	185	183	182
370	371	186	184	183
372	373	187	185	184
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424	425	213	211	210
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490	491	246	244	243
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494	495	248	246	245
496	497	249	247	246
498	499	250	248	247
500	501	251	249	248
502	503	252	250	249
504	505	253	251	250
506	507	254	252	251
508	509	255	253	252
510	511	256	254	253
512	513	257	255	254
514	515	258	256	255
516	517	259	257	256
518	519	260	258	257
520	521	261	259	258
522	523	262	260	259
524	525			

APPENDIX B WAUKESHA COUNTY ECONOMIC PROFILE

ECONOMIC PROFILE

Waukesha County, WI

Population

Year	Number	Percent Change
1980	280,203	-
1990	304,715	8.7
2000	360,767	18.4
2004 (est.)	373,339	3.5

Source: U.S. Bureau of the Census, Wisconsin Department of Administration, and SEWRPC.

Housing

Year	Total Households	Percent Change
1980	88,552	--
1990	105,990	19.7
2000	135,229	27.8

Unit Information: 2000

Total Units.....	140,309
Owner Occupied.....	103,373
Median Value.....	\$170,400
Renter Occupied.....	31,856
Median Rent.....	\$726
Vacancy Rate.....	4.9%

Units Authorized by Building Permits: 2003

Total Units.....	2,464
------------------	-------

Source: U.S. Bureau of the Census and SEWRPC.

Income

2002 Per Capita Personal Income

Waukesha County.....	\$41,114
Southeastern Wisconsin Region.....	34,014
Wisconsin.....	30,050
United States.....	30,906

Source: U.S. Bureau of Economic Analysis and SEWRPC.

Economy

1997 Manufacturers and Retail Trade

Number of manufacturing establishments:.....	1,148
Annual value of shipments*:.....	\$9,434,623
Number of retail establishments:.....	1,385
Annual value of retail sales*:.....	\$4,094,223

* In thousands of dollars

Source: U.S. Bureau of the Census

Transportation

Highways

- Interstate Highways 43 and 94
- United States Highways 18 and 41
- State Trunk Highways 16, 59, 67, 83, 164, and 190

Trucking

- 155 trucking establishments in Waukesha County

Public Transportation

- Waukesha Metro Transit provides fixed-route local bus service within the City of Waukesha, to Waukesha County Technical College in the Village of Pewaukee, and to Brookfield Square shopping center in the City of Brookfield
- Specialized transportation service provided by the Waukesha County Department of Aging to the elderly and persons with disabilities.

Railway Service

- Canadian Pacific Railway
- Canadian National Railway
- Wisconsin & Southern Railroad Company
- Union Pacific Railroad
- Municipality of East Troy Wisconsin Railroad

Water Transportation Facilities*

- Waukesha County is located 10 miles west of the Port of Milwaukee.
- Commuter-oriented bus services subsidized by the county provided between the Oconomowoc, Waukesha, Menomonee Falls, and Mukwonago areas; and downtown Milwaukee
- Inter-city bus service provided in the Milwaukee to Madison travel corridor.

Air Service*

- Waukesha County-Crites Field, Waukesha
- Capitol Airport, Brookfield
- Aero Park Airport, Menomonee Falls
- Lawrence J. Timmerman Field, Milwaukee County
- General Mitchell International Airport, located 15 miles southeast in the City of Milwaukee
- Chicago O'Hare International Airport is located 80 miles south

*All distances are measured from the nearest county line.

Health

Waukesha County communities are served by a complete range of health facilities and health facilities and health professionals. Six area hospitals provide expert care to County residents. In addition, over 600 clinics provide a variety of health services for residents of Waukesha County communities.

APPENDIX C

WAUKESHA COUNTY DAMS

See Excel File

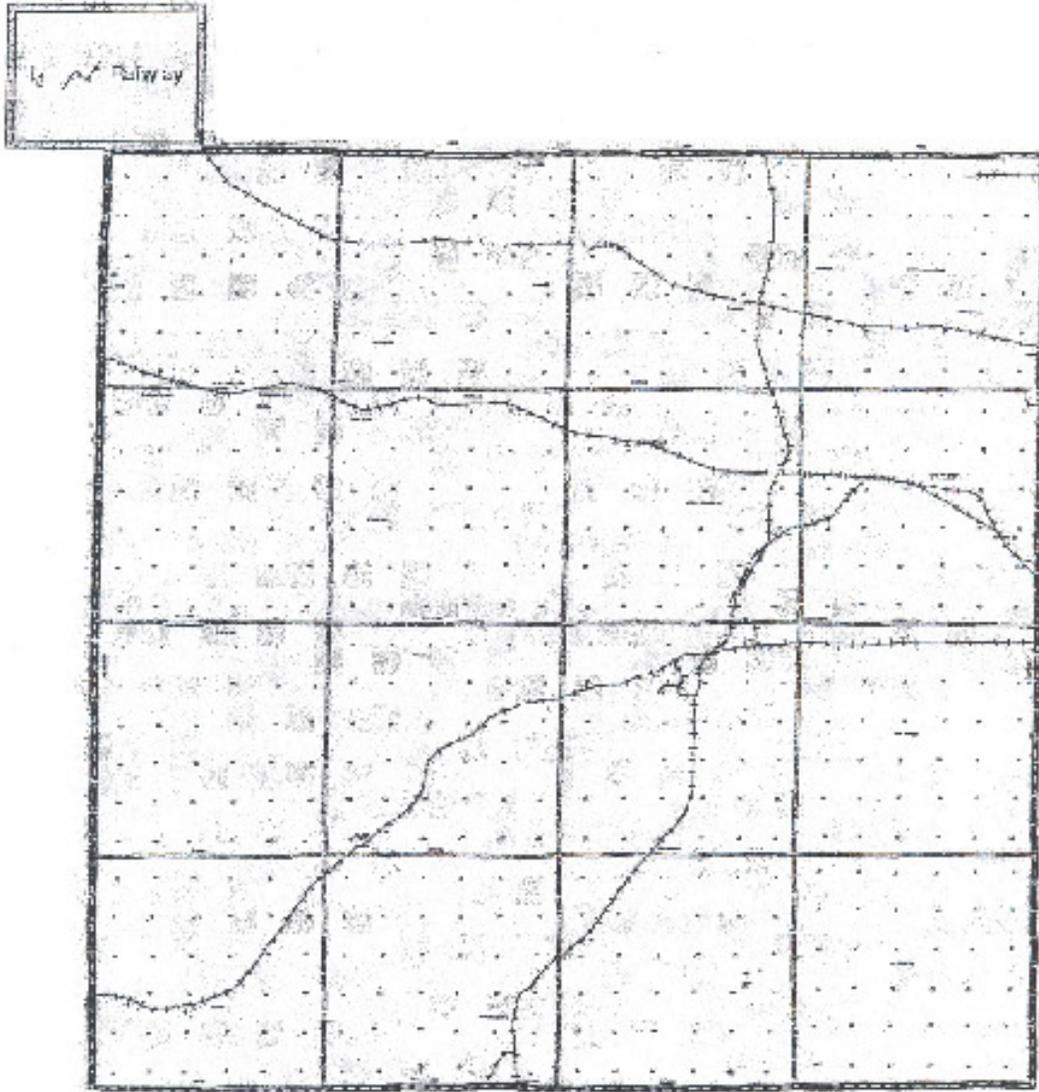
APPENDIX D

EARTHQUAKES IN WISCONSIN

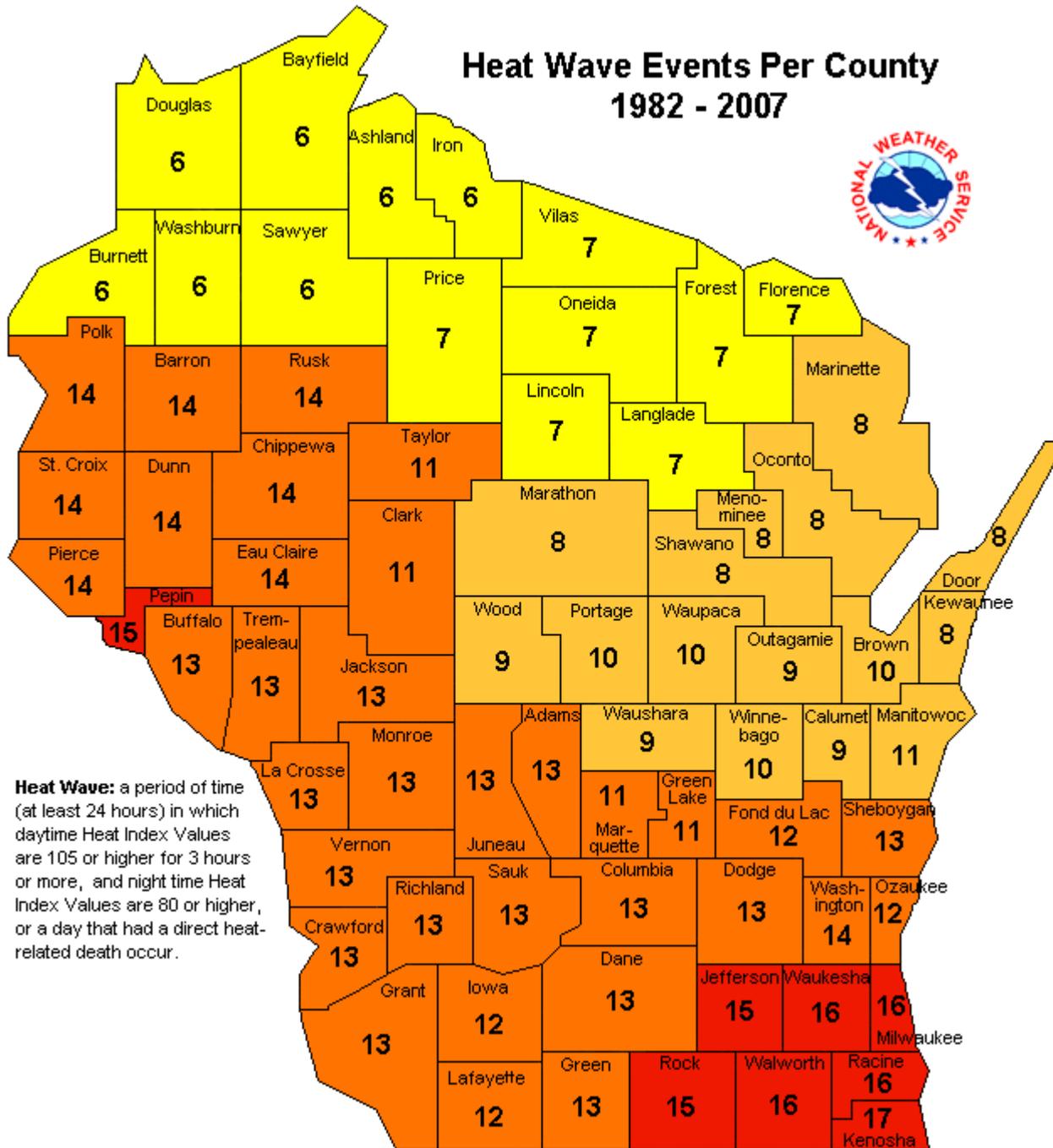
LOCATION	DATE	MAXIMUM INTENSITY	RICHTER SCALE
Kenosha	10/12/1899	II	3.0
Marinette	03/13/1905	V	3.8
Shorewood	04/22/1906	II	3.0
Milwaukee	04/24/1906	III	---
Marinette	01/10/1907	III	---
Beloit	05/26/1909	VII	5.1
Madison	10/07/1914	IV	3.8
Madison	05/31/1916	II	3.0
Fond du Lac	07/07/1922	V	3.6
Madison	10/18/1931	III	3.4
Stoughton	12/06/1933	IV	3.5
Dubuque	11/07/1938	II	3.0
Thunder Mountain	02/09/1943	III	3.2
Milwaukee	05/06/1947	V	4.0
Lake Mendota	01/15/1948	IV	3.8
Oostburg	07/18/1956	IV	3.8
South Milwaukee	10/13/1956	IV	3.8
Beaver Dam	01/08/1956	IV	3.6
Bill Cross Rapids	02/28/1979	---	<1.0 MoLg
Madison	01/09/1981	II	---
Madison	03/13/1981	II	---
Oxford	06/12/1981	IV-V	---
Milwaukee	02/12/1987	IV-V	---
Milwaukee	02/12/1987	IV-V	---

Source: University of Wisconsin-Extension, Geological and Natural History Survey, List of Earthquakes in Wisconsin, M.G. Mudrey, Jr.

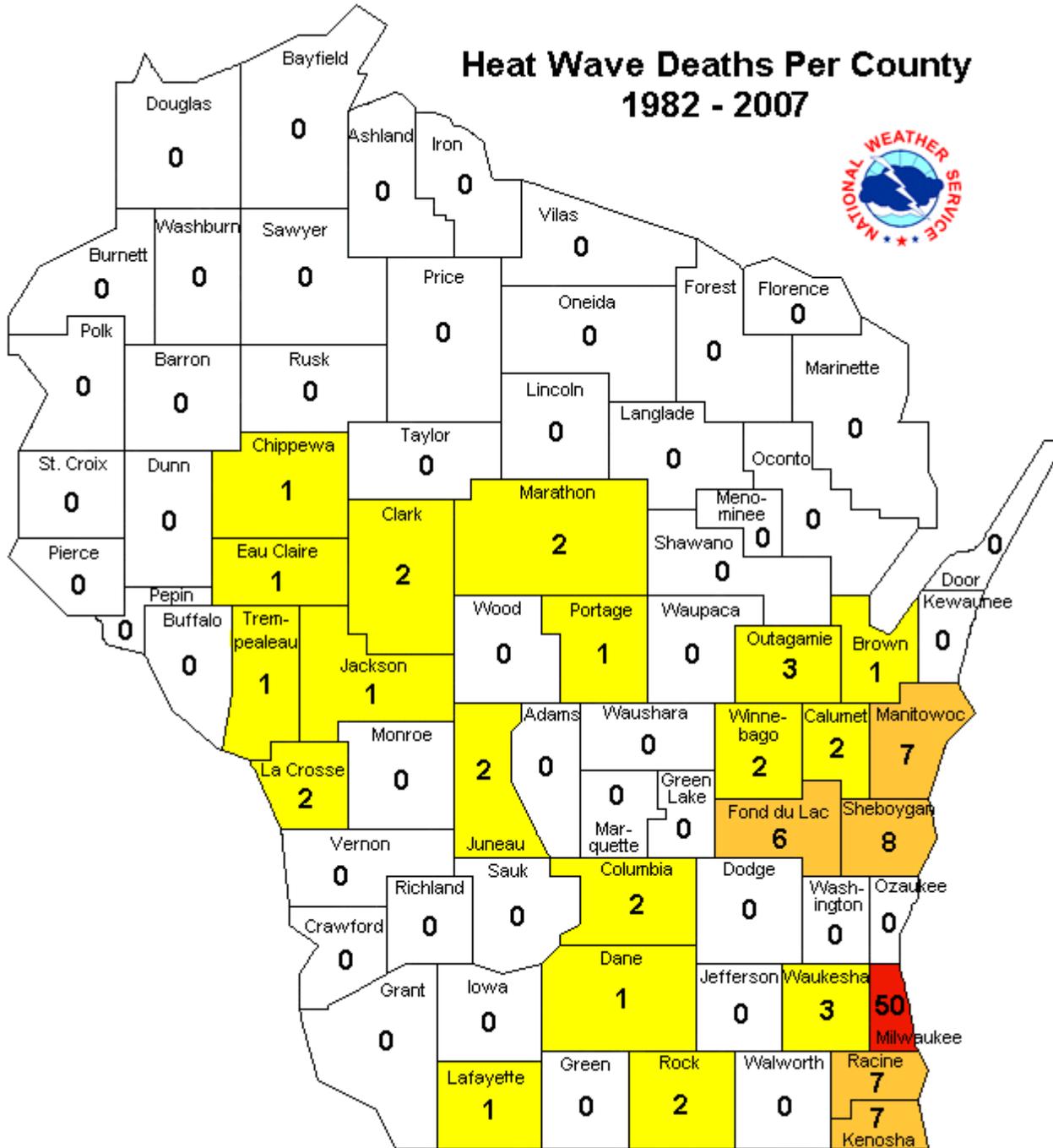
**APPENDIX E
WAUKESHA COUNTY RAILWAYS**



APPENDIX F
Wisconsin Severe Weather Events 1982 – 2005



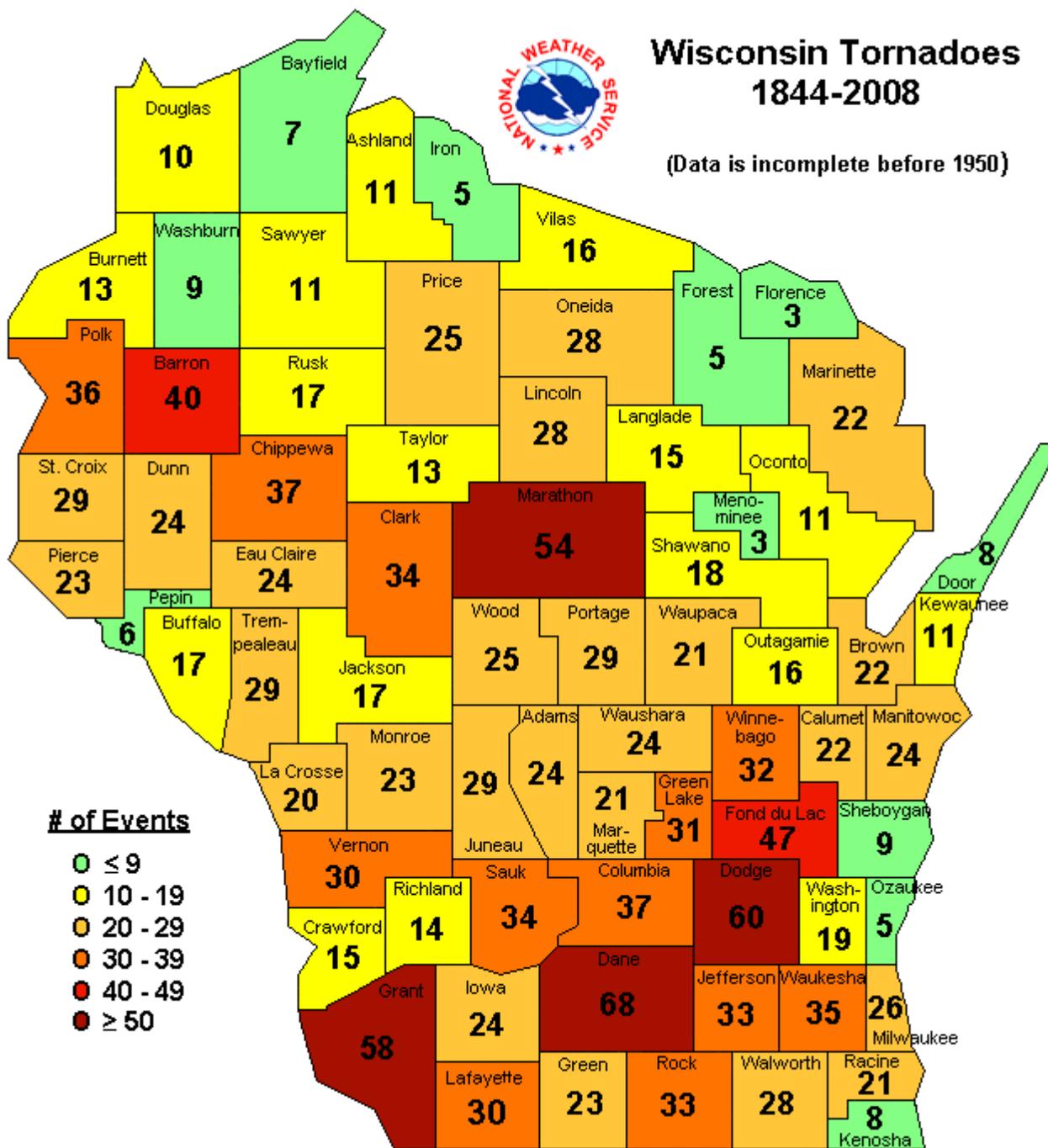
Heat Wave Deaths Per County 1982 - 2007





Wisconsin Tornadoes 1844-2008

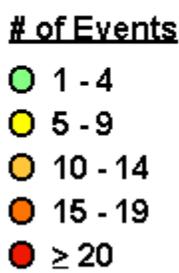
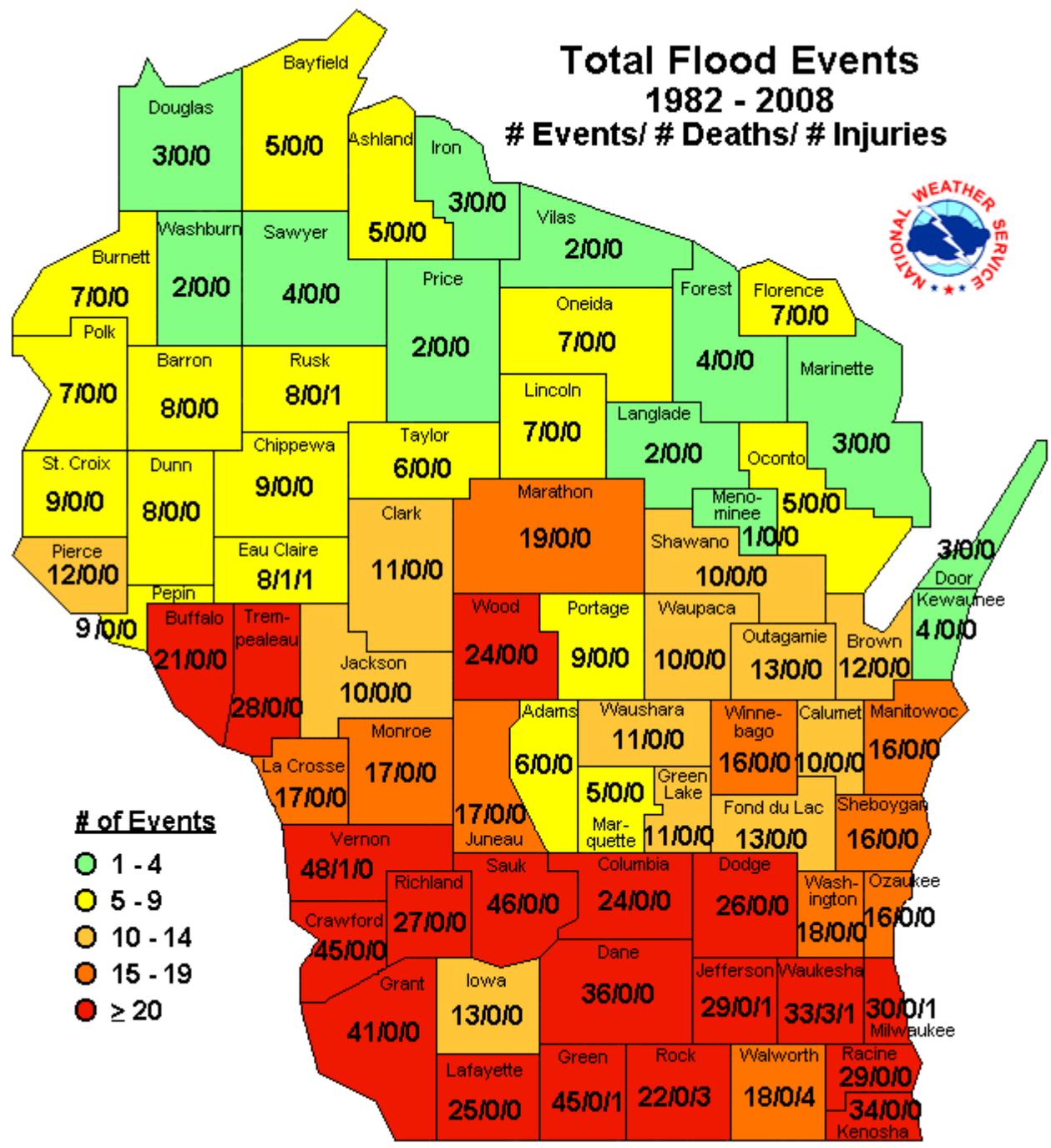
(Data is incomplete before 1950)



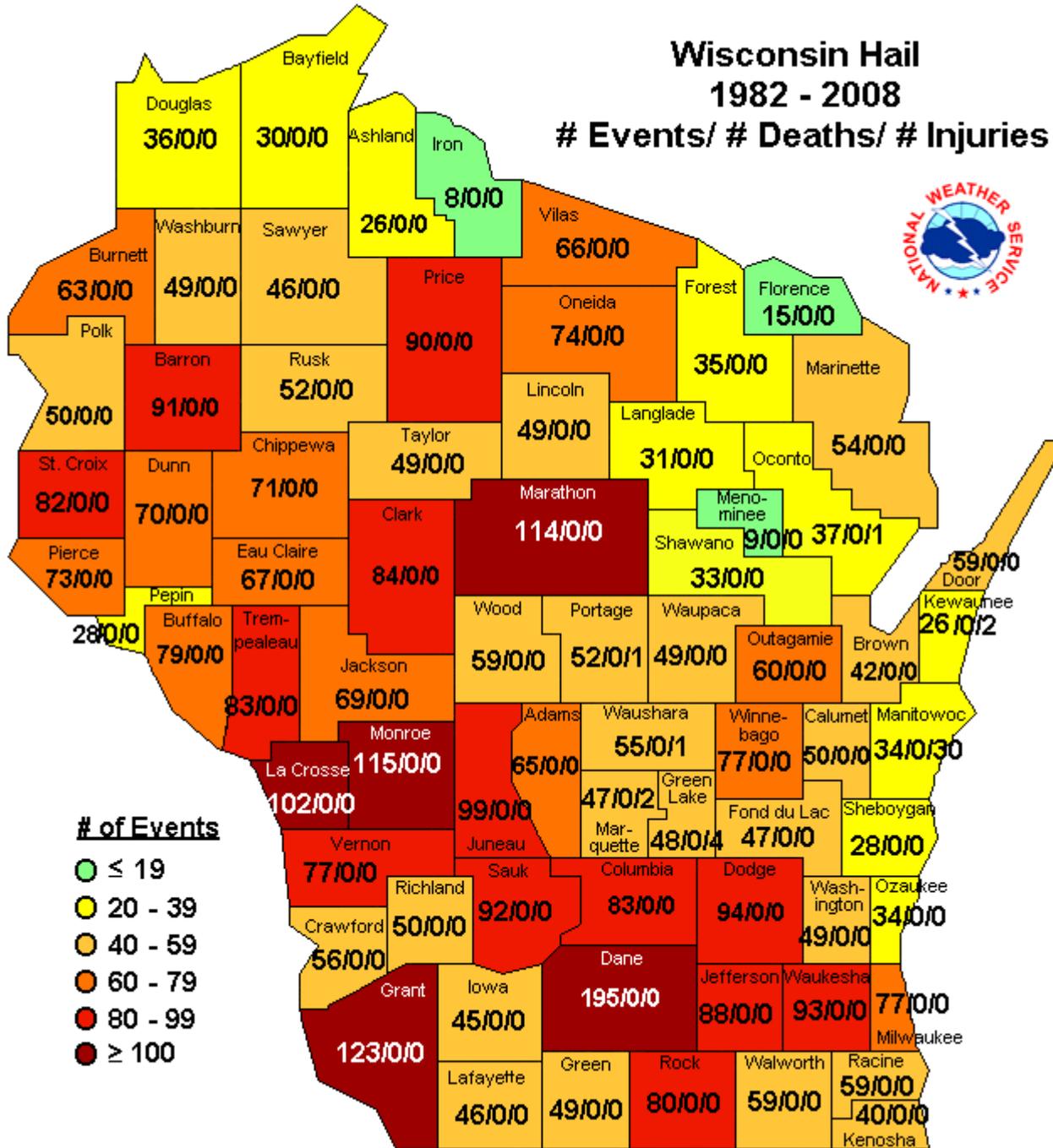
of Events

- ≤ 9
- 10 - 19
- 20 - 29
- 30 - 39
- 40 - 49
- ≥ 50

Total Flood Events 1982 - 2008 # Events/ # Deaths/ # Injuries

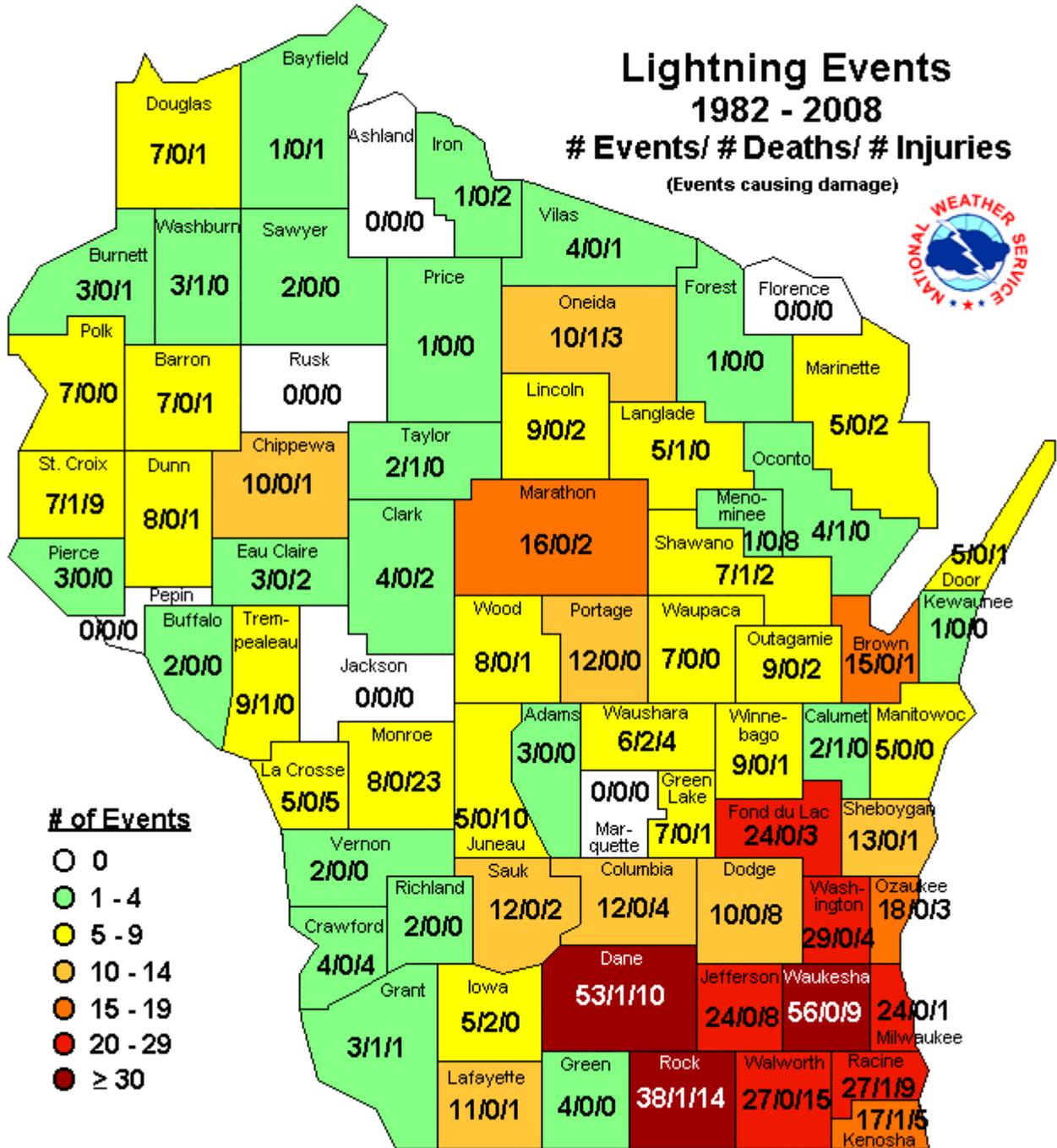


Wisconsin Hail 1982 - 2008 # Events/ # Deaths/ # Injuries



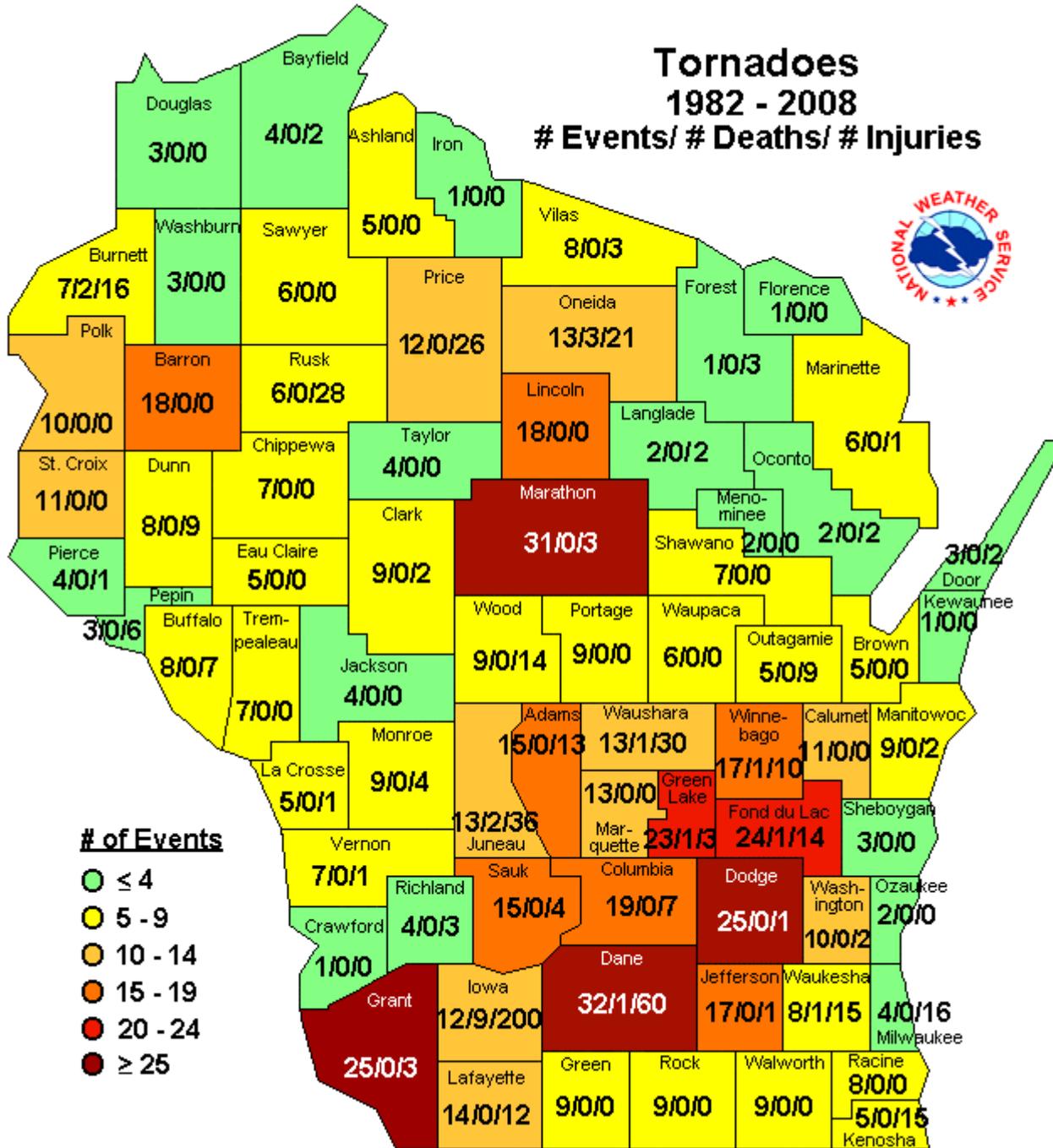
Lightning Events 1982 - 2008

Events/ # Deaths/ # Injuries
(Events causing damage)



- # of Events**
- 0
 - 1 - 4
 - 5 - 9
 - 10 - 14
 - 15 - 19
 - 20 - 29
 - ≥ 30

Tornadoes 1982 - 2008 # Events/ # Deaths/ # Injuries



Severe Thunderstorm Winds 1982 - 2008 # Events/ # Deaths/ # Injuries

