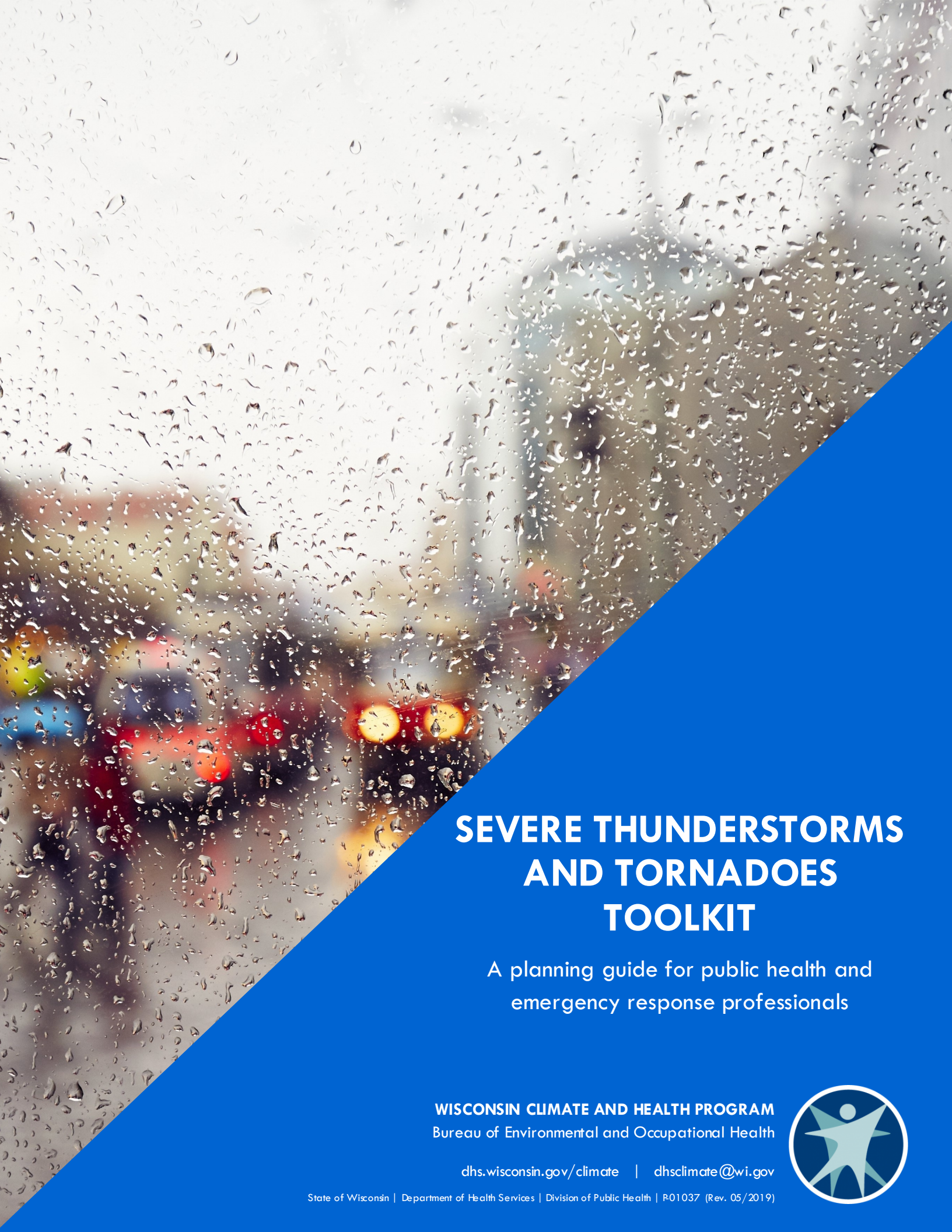


SEVERE THUNDERSTORMS AND TORNADOES TOOLKIT

A planning guide for public health and emergency response professionals

WISCONSIN CLIMATE AND HEALTH PROGRAM
Bureau of Environmental and Occupational Health

dhs.wisconsin.gov/climate | dhsclimate@wi.gov

State of Wisconsin | Department of Health Services | Division of Public Health | P-01037 (Rev. 05/2019)

CONTENTS

Introduction

Definitions

Guides

Tornado Categories

Recognizing Tornadoes

Planning for Severe Storms

Staying Safe in a Tornado

Staying Safe in a Thunderstorm

Lightning Safety

After a Severe Storm or Tornado

Straight-Line Winds Safety

Talking Points

Message Maps

Appendices

Appendix A: References

Appendix B: Additional Resources

ACKNOWLEDGEMENTS

The Wisconsin Severe Thunderstorms and Tornadoes Toolkit was made possible through funding from cooperative agreement 5UE1/EH001043-02 from the Centers for Disease Control and Prevention (CDC) and the commitment of many individuals at the Wisconsin Department of Health Services (DHS), Bureau of Environmental and Occupational Health (BEOH), who contributed their valuable time and knowledge to its development.

Special thanks to:

Jeffrey Phillips, RS, Director of the Bureau of Environmental and Occupational Health, DHS
Megan Christenson, MS,MPH, Epidemiologist, DHS
Stephanie Krueger, Public Health Associate, CDC/ DHS
Margaret Thelen, BRACE LTE
Angelina Hansen, BRACE LTE

For more information, please contact:

Colleen Moran, MS, MPH
Climate and Health Program Manager
Bureau of Environmental and Occupational Health
1 W. Wilson St., Room 150
Madison, WI 53703
Colleen.Moran@dhs.wisconsin.gov
608-266-6761

INTRODUCTION

Purpose

The purpose of the Wisconsin Severe Thunderstorms and Tornadoes Toolkit is to provide information to local governments, health departments, and citizens in Wisconsin about preparing for and responding to severe storm events, including tornadoes. The toolkit provides background information, practical guidance, strategies, media releases, talking points, definitions, and useful reference materials on this topic. The guides in this toolkit may be copied onto agency letterhead for distribution to residents affected by tornadoes and other severe storms. Further resources can be found in Appendix B: Additional Resources.

Background

While not in an especially tornado-heavy part of the United States, Wisconsin still experiences, on average, 23 tornadoes per year.[1] The high winds and severe storms that can accompany tornadoes pose serious health hazards to the people of Wisconsin. In the summer of 2014, southwestern Wisconsin experienced severe damage from tornadoes, high winds, and hail, resulting in injuries and destruction of multiple buildings.[2] The National Weather Service issues, on average, one to two tornado warnings and five to 10 severe thunderstorm warnings per county per year in Wisconsin's southern counties, and fewer in the northern counties.

> Wisconsin averages 23 tornadoes per year.[1]

Climate Trends

Long-term trend analysis of Wisconsin's climate indicates that the state is becoming warmer and wetter.[3] After analyzing historical climate data from 1950-2006 and developing downscaled local climate models, University of Wisconsin climate scientists created potential climate projections based on historical trends and scientifically validated models. Several of the potential outcomes indicate that an increase in average annual precipitation and warmer annual average temperature may occur in the state. Severe storms and tornadoes need warm moist air to form, among many other factors. Climate surveillance has shown that within the past 60 years tornadoes are not occurring more frequently but rather are occurring on days that already had a documented tornado. This means that there is an increase in tornado density.[4]

Health Impacts

These trends suggest an increase in negative health impacts in Wisconsin as a result of greater intensity of severe thunderstorms, accompanying strong winds, and tornado occurrences. Potential health concerns include lightning fatalities and survivors with long-term mental and physical health effects.[7] Between 2004 and 2013, there were 329 lightning deaths in the United States, five of which were in Wisconsin.[4] Severe storms and tornadoes can cause significant damage to housing infrastructure and can injure or kill people in the areas affected by the storm. Intense storm events and tornadoes may also have negative effects on mental health as families and communities deal with storm damage and destruction.

DEFINTIONS

Funnel Cloud
A visible, rotating, funnel-shaped cloud that extends from a thunderstorm toward but not quite reaching the ground.

Heat Lightning
Lightning from a thunderstorm too far away to be heard.

Severe Thunderstorm Warning
Severe thunderstorms are occurring in the area.

Severe Thunderstorm Watch
Weather conditions suggest that severe thunderstorms are possible in the area.

Straight-Line Winds
Any wind generated by a thunderstorm that is not associated with rotation and can be considered severe if the winds exceed 58 mph. Damage from straight-line winds occurs in the same general direction due to lack of rotational wind.

Tornado Warning
An alert issued when a funnel cloud is sighted or indicated by weather radar. Shelter should be taken immediately.

Tornado Watch
An alert issued when weather conditions favor the formation of tornadoes—often during thunderstorms.

Tornado
A violently rotating column of air that extends from a thunderstorm to the ground and is often—although not always—visible as a funnel cloud. Lighting and hail are common in thunderstorms that produce tornadoes.

Wall Cloud
An isolated, often abrupt, lowering of a cloud that develops beneath the base of a thunderstorm. It is always rain-free and usually exists for 10-20 minutes before a tornado appears. A wall cloud may also persistently rotate.

Tornado definitions[5,6] | Storm definitions[7]

Tornado Categories

Tornadoes are characterized through the Enhanced Fujita Scale (EF-Scale). The scale is a set of wind estimates in three-second gusts, and is based on 28 different damage indicators. For more information on the EF-Scale, see spc.noaa.gov/faq/tornado/ef-scale.html. [9]

Weak Tornadoes

- 88% of all tornadoes
- Less than 5% of tornado deaths
- Lifetime 1-10+ minutes
- Winds less than 110 mph
- Produce EF0 or EF1 damage

Strong Tornadoes

- 11% of all tornadoes
- Nearly 30% of all tornado deaths
- May last 20 minutes or longer
- Winds 111-165 mph
- Produce EF2 or EF3 damage

Violent Tornadoes

- Less than 1% of all tornadoes
- 70% of all tornado deaths
- May last over one hour
- Winds greater than 166 mph
- Produce EF4 or EF5 damage

Recognizing tornado signs

Wisconsin's tornado season usually runs from May through July. During these months, it is beneficial to have a plan in place should a tornado be sighted in your area. The following information includes how to recognize tornado conditions, create a tornado emergency plan, and assemble a disaster emergency kit. For more detailed information, see the National Weather Service's Tornado Preparedness Guide: nws.noaa.gov/om/severeweather/resources/ttl6-10.pdf.[5]

Tornado Conditions

When there are thunderstorms in the area, pay attention to the radio or television for emergency information about the possibility of a tornado watch or warning. Research your community's warning system, and be prepared when the warning sounds.

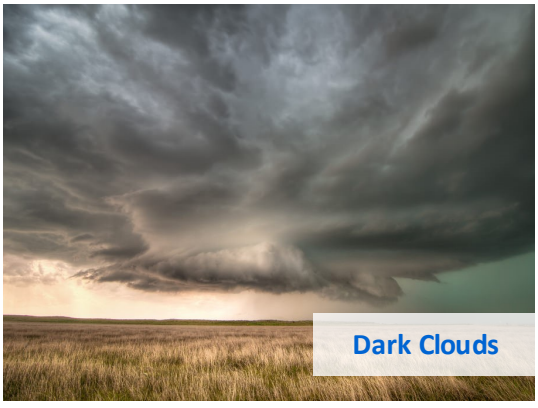
Be alert for visible or audible signs of a tornado:

- Greenish or unusually colored clouds
- Low-hanging and rotating wall cloud
- Funnel clouds
- Hail in the absence of rain
- Loud, train-like roaring sound
- Swirling cloud of debris


Funnel Cloud


Wall Cloud

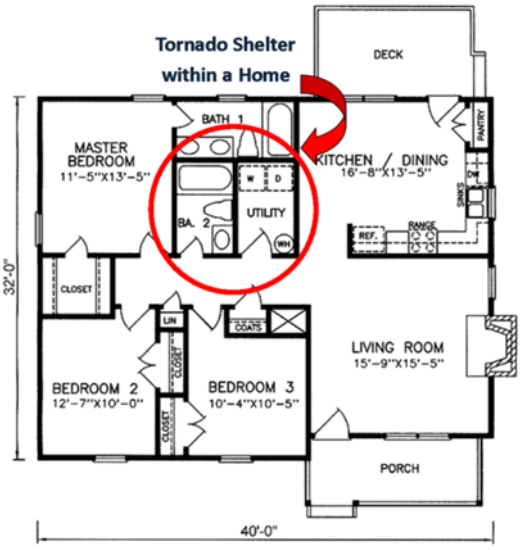

Rotating Wall


Dark Clouds

PLANNING FOR SEVERE STORMS

Create a Tornado Emergency Plan

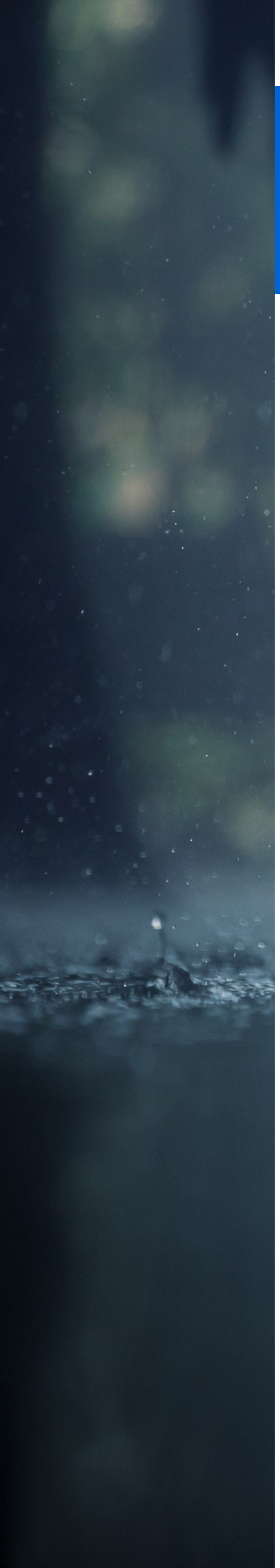
- Sketch a floor plan of where you live, or walk through each room and discuss where and how to seek shelter.
- Show a second way to exit from each room or area. If you need special equipment, such as a rope ladder, mark where it is located.
- Make sure everyone understands the siren warning system, if there's such a system in your area.
- Mark where your first aid kit and fire extinguishers are located.
- Mark where the utility switches or valves are located so they can be turned off—if time permits—in an emergency.
- Teach your family how to administer basic first aid, how to use a fire extinguisher, and how and when to turn off water, gas, and electricity in your home.
- See FEMA for more information on identifying a proper pre-designated area to take shelter: ready.gov/tornadoes.[6]



Assemble a Disaster Emergency Kit

- ☐ 3-day supply of water (1 gallon of water per person, per day)
- ☐ 3-day supply of non-perishable food (and can opener)
- ☐ Battery-operated radio and extra batteries
- ☐ Cell phone and charger
- ☐ Flashlight and batteries
- ☐ First aid kit (bandages, gauze, tweezers, disinfectant, gloves, pain relievers, thermometer, etc.)
- ☐ Whistle to signal for help
- ☐ Dust mask
- ☐ Survival blanket (also known as a space blanket)
- ☐ Extra cash (about $50)
- ☐ Pocket knife
- ☐ Wrench to turn off utilities
- ☐ Medications, hand sanitizer, moist towelettes, plastic ties, and garbage bags
- ☐ Local maps for evacuation
- ☐ Change of clothes (including rain jacket, gloves, hat, etc.)

Wisconsin Department of Health Services
Division of Public Health
Climate and Health Program
P-01037a (Rev. 05/2019)



STAYING SAFE IN A SEVERE STORM

When there is a **severe storm** in your area, it is important to find shelter as soon as you can. The best option is a house or building with the windows and doors closed, and no open areas to the outside.

If you are…	Then…
Indoors A sturdy building with no open windows to the outside	• Take shelter in a sturdy building. Avoid isolated sheds or other small structures in open areas. • Avoid contact with corded phones and devices including those plugged into electrical outlets for recharging. Cordless and wireless phones not connected to wall outlets are OK to use. • Avoid contact with electrical equipment or cords. Unplug appliances and other electrical items such as computers, and turn off air conditioners. Power surges from lightning can cause serious damage. • Avoid contact with plumbing. Do not wash your hands, do not take a shower, do not wash dishes, and do not do laundry. Plumbing and bathroom fixtures can conduct electricity. • Stay away from windows and doors, and stay off porches. • Do not lie on concrete floors and do not lean against concrete walls. Avoid contact with anything metal—tractors, farm equipment, motorcycles, golf carts, golf clubs, and bicycles.
In a Forest	Seek shelter in a low area under a thick growth of small trees.
In an Open Area	• Go to a low place such as a ravine or valley. Be alert for flash floods. • Avoid hilltops, open fields, or the beach. • Avoid natural lightning rods such as a tall, isolated tree in an open area.
In Open Water	Get to land and find shelter immediately.
In a Car	• Try to safely exit the roadway and park. • Stay in the vehicle and turn on the emergency flashers until the heavy rain ends. • Avoid touching metal or other surfaces that conduct electricity in and outside the vehicle.

If a tornado warning is implemented, seek shelter immediately. Protect yourself by finding an area in the interior of a building. Below is information on how to proceed in different scenarios when a tornado is spotted.

If you are in…	Then…
A Structure (e.g., residence, small building, school, nursing home, hospital, factory, shopping center, high-rise building)	Go to a pre-designated area such as a safe room, basement, storm cellar, or the lowest building level. If there is no basement, go to the center of a small interior room on the lowest level (closet, interior hallway) away from corners, windows, doors, and outside walls. Put as many walls as possible between you and the outside. Get under a sturdy table and use your arms to protect your head and neck. • In a high-rise building, go to a small interior room or hallway on the lowest floor possible. • Put on sturdy shoes. • Do not open windows.
A Manufactured Home or Office	Get out immediately and go to a pre-identified location such as the lowest floor of a sturdy, nearby building or a storm shelter. Mobile homes, even if tied down, offer little protection from tornadoes.
The Outdoors with No Shelter	If you are not in a sturdy building, there is no single research-based recommendation for what last-resort action to take because many factors can affect your decision. Possible actions include the following: • Immediately get into a vehicle, buckle your seat belt and try to drive to the closest sturdy shelter. If your vehicle is hit by flying debris while you are driving, pull over and park. • Take cover in a stationary vehicle. Put a seat belt on and cover your head with your arms and a blanket, coat, or cushion if possible. • Lie in an area noticeably lower than the level of the roadway and cover your head with your arms and a blanket, coat, or other cushion if possible. • Do not get under an overpass or bridge. You are safer in a low, flat location. • In urban or congested areas, never try to outrun a tornado in a vehicle. Instead, leave the vehicle immediately for safe shelter. • Watch out for flying debris. Flying debris causes most fatalities and injuries from tornadoes.

Straight-line winds can cause damage similar to tornadoes and usually emerge from thunderstorms. The damage caused by straight-line winds is pushed in the direction the wind was moving.

If you are…	Then…
Inside a Building	• Move to the lowest floor and stay away from windows. • Taking shelter in a basement is strongly encouraged, especially if you are surrounded by trees that could fall onto the building or house. • If you are in a mobile home, move to a stronger building or storm cellar if winds reach speeds of 70 mph.
Driving	• Keep both hands on the wheel and slow down. • Pull over to the shoulder and stop, making sure you are away from trees or other tall objects that could fall on your vehicle. *DO NOT* stop in the middle of a lane under an overpass. This could lead to an accident. • Take extra care in a high-profile vehicle such as a truck, van, SUV, or when towing a trailer. ◊ These are more prone to being pushed or even flipped by straight-line winds. ◊ If possible, orient your vehicle so it points into the wind. • Stay in the car and turn on the hazard lights until the wind subsides.
Outside	• Take cover in a well-built building, or use this building to block the wind if you cannot get inside. • If no building is nearby, find the lowest spot and crouch low to the ground. • Stay away from trees or power lines since these are easily felled by straight-line winds. • If you are in the middle of a forest, move to the lowest/smallest stand of trees. • Stay clear of roadways or train tracks, as the winds may blow you into the path of an oncoming vehicle. • Watch for flying debris. Tree limbs, street signs, and other objects may break and become flying projectiles in the wind.

LIGHTNING SAFETY

As of November 2014, there were 26 lightning fatalities in the United States in 2014. Six were in Florida, three in Wisconsin, and two each in Arizona, Arkansas, Colorado, Georgia, and Massachusetts.[10] Knowing the facts about lightning can help you stay safe.

Lightning Fiction and Fact

Fiction: If it is not raining, then there is no danger from lightning.

Fact: Lightning often strikes in the absence of heavy rain and may occur as far as 10 miles away from any rainfall. This is especially true in the western United States, where thunderstorms sometimes produce very little rain.

Fiction: The rubber soles of shoes or tires on a car will protect you from being struck by lightning.

Fact: Rubber-soled shoes and rubber tires provide NO protection from lightning. The steel frame of a hard-topped vehicle provides increased protection if you are not touching metal. Although you may be injured if lightning strikes your car, you are much safer inside a vehicle than outside.

Fiction: People struck by lightning should not be touched because they carry an electrical charge.

Fact: Lightning-strike victims carry no electrical charge and should be helped immediately. Anyone who has been hit by lightning requires immediate professional medical care. Call 9-1-1 and begin CPR immediately if the person has stopped breathing. Use an automatic external defibrillator if one is available. Contact your local American Red Cross chapter for information on CPR and first aid classes.

Fiction: "Heat lightning" occurs after very hot summer days and poses no threat.

Fact: "Heat lightning" is a term used to describe lightning from a thunderstorm too far away for the thunder to be heard.

What You Can Do Before Lightning Strikes

Plan Ahead

- Develop a plan for you and your family at home, work, school, and when outdoors. Tips are available from the American Red Cross (redcross.org) and the Federal Emergency Management Agency at ready.gov.[7]
- Check the weather forecast. If thunderstorms are predicted, consider postponing outdoor activities.
- Have a Public Alert ™ certified NOAA Weather Radio or use a weather application for your cell phone to alert you if threatening weather arises.

Seek Safe Shelter

- Small outdoor buildings, including sports dugouts, rain shelters, garages, etc., are **NOT SAFE**. Substantial buildings with wiring and plumbing are the safest places. Office buildings, schools, and homes offer good protection.
- Once inside, stay away from windows, doors, and anything that conducts electricity.
- A hard-topped metal vehicle with the windows closed also provides good protection. Avoid contact with metal in the vehicle and try to keep away from windows.

If You Cannot Get to a Safe Shelter

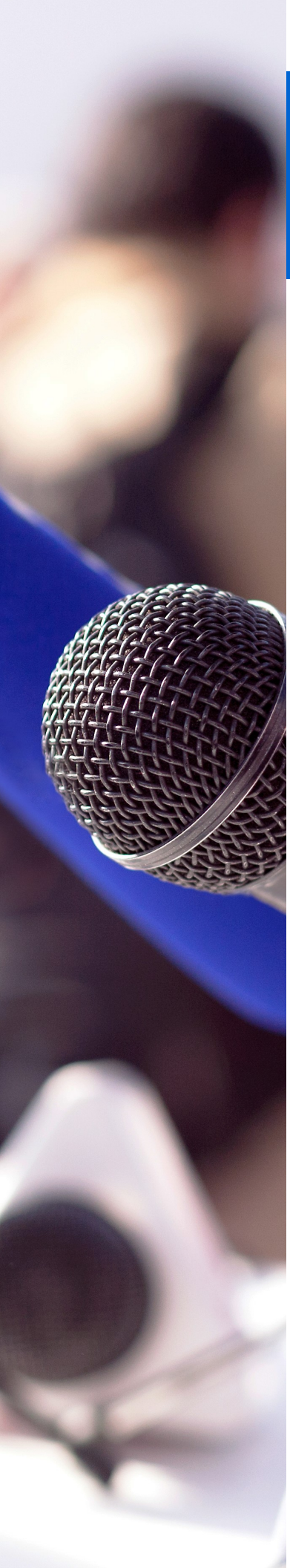
- Avoid open fields, the top of a hill, or a ridge top.
- Stay away from tall, isolated trees or other tall objects.
- Stay away from water, wet items, and metal objects. Water and metal are excellent conductors of electricity. The current from a lightning flash will easily travel for long distances.

AFTER A SEVERE STORM

Injury can result directly from the tornado or severe storm, and can also occur after the tornado when people are walking among damaged or destroyed buildings. Tornadoes often damage power lines, gas lines, or electrical systems. Because of this, there is an increased risk of fire, electrocution, or explosion.[5]

- Continue to monitor your battery-powered radio or television for emergency information.
- Only enter severely damaged buildings after they have been inspected for structural integrity.
- Be careful when entering any structure that has been damaged.
- Wear sturdy shoes or boots, long sleeves, and gloves when handling or walking on or near debris.
- Safely work in teams if possible during cleanup efforts.
- Be aware of hazards from exposed nails and broken glass.
- Do not touch downed power lines or objects in contact with downed lines. Report electrical hazards to the police and the utility company.
- Use battery-powered lanterns, if possible, rather than candles to light homes without electrical power. If you use candles, make sure they are in safe holders away from curtains, paper, wood, or other flammable items. Never leave a candle burning when you are out of the room.
- Never use generators, pressure washers, grills, camp stoves, or other gasoline, propane, natural gas, or charcoal-burning devices inside your home, garage, or camper—or even outside near an open window, door, or vent as these generate carbon monoxide (CO). CO is an odorless, colorless gas that can cause sudden illness and death if you breathe in high concentrations of it. CO from these sources can build up in your home, garage, or camper and poison the people and animals inside. **Seek prompt medical attention if you suspect CO poisoning and are feeling dizzy, light-headed, or nauseated.**
- Hang up displaced telephone receivers that may have been knocked off by a tornado, but stay off the telephone, except to report an emergency.
- Cooperate fully with public safety officials.
- Respond to requests for volunteer assistance by police, firefighters, emergency management, and relief organizations, and do not go into damaged areas. Your presence could hamper relief efforts, and you could endanger yourself.
- Be aware of damaged areas that may have controlled access.

Wisconsin Department of Health Services
Division of Public Health
Climate and Health Program
P-01037c (Rev. 05/2019)



Talking Points for Severe Storms

Talking points and message maps for local health professionals

If you are approached by the media regarding a reported severe storm health risk in your jurisdiction, the following talking points may be used. Start with message A1 or A2, then follow the instructions within that box.

A1

We were notified by the medical examiner/coroner about a fatality possibly due to extreme weather conditions. Our condolences go out to the family.

Go to message B1 or B2.

B1

Out of respect for the family, we are unable to share any details.

Go to message C.

B2

On [insert date], a [gender] ["____ years old" or "between the ages of ___ and ___"] died during the storm.

Go to message C.

A2

We have *not* been notified of any recent fatalities linked to severe storm conditions.

Go to message C.

C

The after-effects of a severe storm can result in many adverse health effects. Please remain safe by:

a. Listening to safety messages of response teams that are assessing the damage.

b. Checking on family, friends, and neighbors who do not have air conditioning, who spend much of their time alone, or who are more likely to be affected by severe storms.

c. For more information visit *[insert relevant website].*

Message mapping is one of the most important risk communication tools that public health agencies can employ. The goal of a message map is to convey important information in a concise and easy to understand fashion.

General Guidelines for Completing a Message Map

- Stick to three key messages or one key message with three parts for each underlying concern or specific question.
- Keep key messages brief. The reader should ideally spend less than 10 seconds per line.
- Develop messages that are easily understood by the target audience. (For communications with the general public, use a 6th to 8th grade readability level.)
- Place messages within a message set. The most important messages should occupy the first and last positions.
- Develop key messages that cite credible third parties.
- Use graphics and other visual aids to enhance key messages.
- Keep a positive tone. Messages should be solution oriented and constructive. Try to balance negative messages with positive ones.
- Avoid unnecessary use of "absolute" words, such as no, not, never, nothing, and none.[5]

The following is a message map that could be used when addressing the general public regarding severe storm safety.

Key Messages *Three key messages*	**Supporting Information** *Three pieces of supporting information for each key message*
Message 1 Severe weather can happen at any time.	**Supporting Info 1** Severe storms can come with little warning. Follow your local radio stations and news channels for up-to-date information on incoming storms. **Supporting Info 2** Heed storm watches in our area, and take appropriate shelter when storm watches turn into storm warnings. **Supporting Info 3** Acting quickly and being informed on weather patterns in your area are important steps in being prepared.
Message 2 Develop a home emergency plan for your family before a severe storm hits.	**Supporting Info 1** Find an area in your home where your family can take shelter during severe storms. These rooms should have no windows to the outside. **Supporting Info 2** Identify two different ways to exit the house, should the need occur. Be sure to practice with your family. **Supporting Info 3** Develop an emergency communication plan, with important phone numbers and information. These include: medical and emergency contacts, work and school information, and insurance information.
Message 3 Check on your neighbors and those most vulnerable to injury from extreme weather.	**Supporting Info 1** People with limited mobility, those who live alone, the elderly, and children may be more vulnerable to injury during severe weather. **Supporting Info 2** Mental health can be affected during and after severe weather. Stay calm and follow your family's emergency plan. **Supporting Info 3** Call 911 or seek medical attention if you or someone you know has been injured.

REFERENCES

1. National Weather Service Weather Forecast Office. (n.d.). Retrieved February 9, 2015, from http://www.weather.gov/mkx/taw-tornado_stats
2. Get Ready for Tornadoes. (n.d.). Retrieved April 20, 2015, from http://www.readywisconsin.wi.gov/tornado
3. Wisconsin's Changing Climate: Impacts and Adaptation. 2011. Wisconsin Initiative on Climate Change Impacts. Nelson Institute for Environmental Studies. UW-Madison and Wisconsin Department of Natural Resources, Madison, WI. Available at: http://www.wicci.wisc.edu/report/2011_WICCI-Report.pdf
4. Elsner, J. B., Elsner, S. C., and Jagger, T. H. (2014). The increasing efficiency of tornado days in the United States. Climate Dynamics. DOI: 10.1007/s00382-014-2277-3.
5. Tornadoes. (n.d.). Retrieved February 9, 2015, from http://www.ready.gov/tornadoes
6. Tornadoes. (n.d.). Retrieved February 9, 2015, from http://emergency.cdc.gov/disasters/tornadoes/
7. Thunderstorms & Lightning. (n.d.). Retrieved February 9, 2015, from http://www.ready.gov/thunderstorms-lightning
8. NWS Forecast Office Milwaukee/Sullivan. (n.d.). Retrieved February 3, 2015, from http://www.weather.gov/mkx/taw-straight_line_winds
9. Thunderstorms, Tornadoes, Lightning: A Preparedness Guide. (n.d). Retrieved April 21, 2015, from http://www.nws.noaa.gov/om/severeweather/resources/ttl6-10.pdf
10. Retrieved May 8, 2015, from http://www.lightningsafety.noaa.gov/fatalities/fatalities14.shtml
11. Icons from The Noun Project

RESOURCES

Wisconsin Department of Health Services (DHS)
dhs.wisconsin.gov/climate/weather/tornado.htm
608-258-0099

Federal Emergency Management Agency (FEMA)
fema.gov

FEMA Spanish Language Portal
fema.gov/es/

List of Wisconsin Local Health Departments
dhs.wisconsin.gov/lh-depts/counties.htm

List of Wisconsin Tribal Health Directors
dhs.wisconsin.gov/lh-depts/contacts/tribal-health-directors.pdf

Ready Wisconsin
readywisconsin.wi.gov

National Oceanic Atmostpheric Assocation (NOAA): Weather Safety
weather.gov/safety