

Natural Hazards

Part 2 includes information about many types of natural hazards. Natural hazards are natural events that threaten lives, property, and other assets. Often, natural hazards can be predicted. They tend to occur repeatedly in the same geographical locations because they are related to weather patterns or physical characteristics of an area.

Natural hazards such as flood, fire, earthquake, tornado, and windstorms affect thousands of people every year. We need to know what our risks are from natural hazards and take sensible precautions to protect ourselves, our families, and our communities.

Use Part 2 to learn about the hazards that pose a risk to you. Include the pertinent information in your family disaster plan. Specific content on each hazard consists of the characteristics of that hazard, terms associated with the hazard, measures that can be taken beforehand to avoid or lessen the impact of these events, and what individuals need to do during and after the event to protect themselves.

When you complete Part 2, you will be able to:

- Know important terms.
- Take protective measures for natural hazards.
- Identify resources for more information about natural hazards.

2.1

Floods

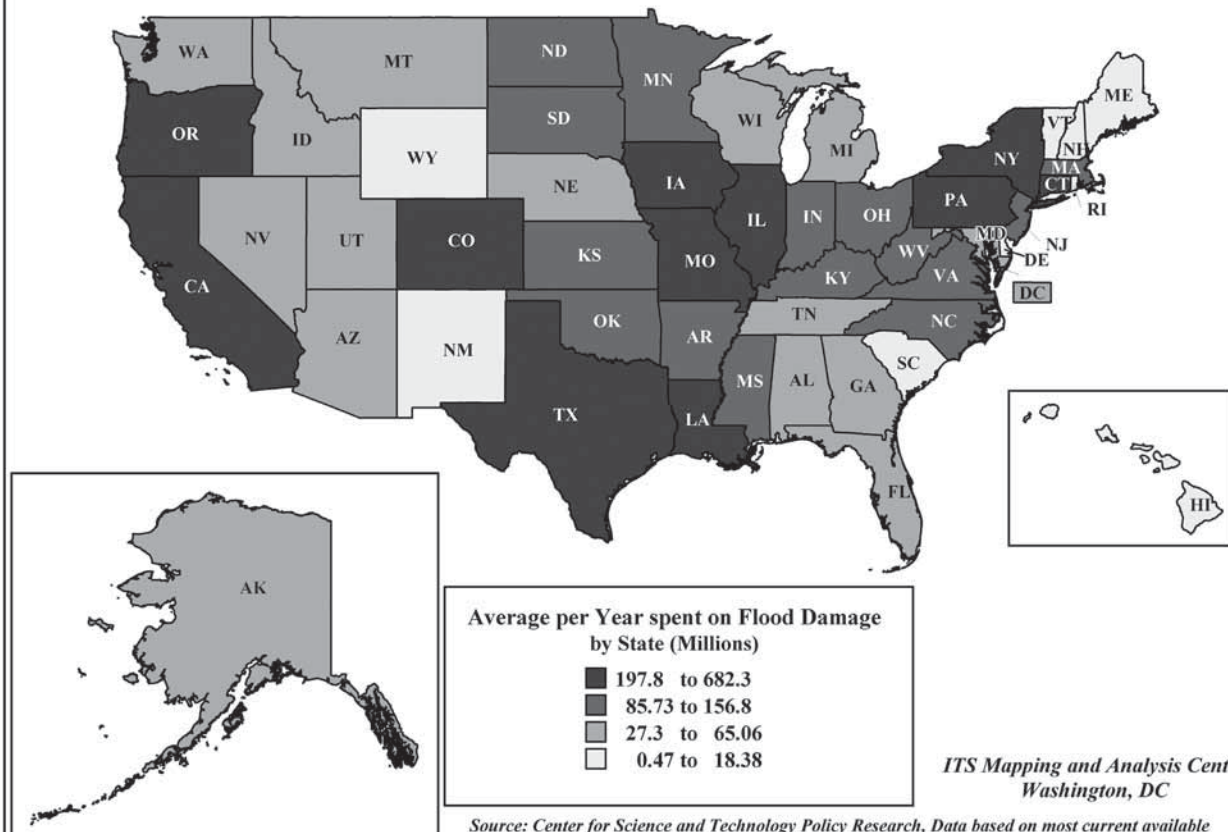


Floods are one of the most common hazards in the United States. Flood effects can be local, impacting a neighborhood or community, or very large, affecting entire river basins and multiple states.

However, all floods are not alike. Some floods develop slowly, sometimes over a period of days. But flash floods can develop quickly, sometimes in just a few minutes and without any visible signs of rain. Flash floods often have a dangerous wall of roaring water that carries rocks, mud, and other debris and can sweep away most things in its path. Overland flooding occurs outside a defined river or stream, such as when a levee is breached, but still can be destructive. Flooding can also occur when a dam breaks, producing effects similar to flash floods.

Be aware of flood hazards no matter where you live, but especially if you live in a low-lying area, near water or downstream from a dam. Even very small streams, gullies, creeks, culverts, dry streambeds, or low-lying ground that appear harmless in dry weather can flood. Every state is at risk from this hazard.

Average \$ per Year spent on Flood Damage by State



What Would You Do?

You and your family moved from a city neighborhood in San Francisco, CA, to a suburb of Phoenix, AZ. Since earthquakes were a threat in your area, you always kept some extra food, water, and other supplies on hand and maintained an earthquake insurance policy, just in case something happened. You think this kind of preparation is no longer necessary based on what your neighbors have told you. According to them, the biggest threat they face is lack of water caused by the very dry weather. You continue to see public service announcements from the federal government about flood insurance and the need to protect yourself from flood damage. Surely, there would be no need for flood insurance where you live with its bare hills, deep canyons, and dry land.

- Are you at risk for flooding, or is this more of a risk to people who live elsewhere?
 Yes No
- Is there a need to have a disaster plan and a disaster supplies kit?
 Yes No
- Should you consider purchasing flood insurance?
 Yes No

Answer key
 1. Yes 2. Yes 3. Yes

Know the Terms

Familiarize yourself with these terms to help identify a flood hazard:

Flood Watch

Flooding is possible. Tune in to NOAA Weather Radio, commercial radio, or television for information.

Flash Flood Watch

Flash flooding is possible. Be prepared to move to higher ground; listen to NOAA Weather Radio, commercial radio, or television for information.

Flood Warning

Flooding is occurring or will occur soon; if advised to evacuate, do so immediately.

Flash Flood Warning

A flash flood is occurring; seek higher ground on foot immediately.

Take Protective Measures

Before a Flood

To prepare for a flood, you should:

- Avoid building in a floodplain unless you elevate and reinforce your home.
- Elevate the furnace, water heater, and electric panel if susceptible to flooding.
- Install “check valves” in sewer traps to prevent flood water from backing up into the drains of your home.
- Construct barriers (levees, beams, floodwalls) to stop floodwater from entering the building.
- Seal walls in basements with waterproofing compounds to avoid seepage.

During a Flood

If a flood is likely in your area, you should:

- Listen to the radio or television for information.
- Be aware that flash flooding can occur. If there is any possibility of a flash flood, move immediately to higher ground. Do not wait for instructions to move.
- Be aware of streams, drainage channels, canyons, and other areas known to flood suddenly. Flash floods can occur in these areas with or without such typical warnings as rain clouds or heavy rain.

If you must prepare to evacuate, you should do the following:

- Secure your home. If you have time, bring in outdoor furniture. Move essential items to an upper floor.
- Turn off utilities at the main switches or valves if instructed to do so. Disconnect electrical appliances. Do not touch electrical equipment if you are wet or standing in water.



Review

See Section 1.1:
Getting Informed



If you have to leave your home, remember these evacuation tips:

- **Do not walk through moving water.** Six inches of moving water can make you fall. If you have to walk in water, walk where the water is not moving. Use a stick to check the firmness of the ground in front of you.
- **Do not drive into flooded areas.** If floodwaters rise around your car, abandon the car and move to higher ground if you can do so safely. You and the vehicle can be quickly swept away.

Driving: Flood Facts

The following are important points to remember when driving in flood conditions:

- Six inches of water will reach the bottom of most passenger cars causing loss of control and possible stalling.
- A foot of water will float many vehicles.
- Two feet of rushing water can carry away most vehicles including sport utility vehicles (SUV's) and pick-ups.



The following are guidelines for the period following a flood:

After a Flood

- Listen for news reports to learn whether the community's water supply is safe to drink.
- Avoid floodwaters; water may be contaminated by oil, gasoline, or raw sewage. Water may also be electrically charged from underground or downed power lines.
- Avoid moving water.
- Be aware of areas where floodwaters have receded. Roads may have weakened and could collapse under the weight of a car.
- Stay away from downed power lines, and report them to the power company.
- Return home only when authorities indicate it is safe.
- Stay out of any building if it is surrounded by floodwaters.
- Use extreme caution when entering buildings; there may be hidden damage, particularly in foundations.
- Service damaged septic tanks, cesspools, pits, and leaching systems as soon as possible. Damaged sewage systems are serious health hazards.
- Clean and disinfect everything that got wet. Mud left from floodwater can contain sewage and chemicals.

Additional Information

Flood Insurance

Consider the following facts:

- Flood losses are **not covered** under homeowners' insurance policies.
- FEMA manages the National Flood Insurance Program, which makes federally-backed flood insurance available in communities that agree to adopt and enforce floodplain management ordinances to reduce future flood damage.
- Flood insurance is available in most communities through insurance agents.
- There is a 30-day waiting period before flood insurance goes into effect, so don't delay.
- Flood insurance is available whether the building is in or out of the identified flood-prone area.

Knowledge Check

Decide whether the following statements are true or false. Check the appropriate column. When you have finished, check your answers using the answer key below.

T	F	Statement
<input type="checkbox"/>	<input type="checkbox"/>	1. Flood emergencies occur in only 12 states.
<input type="checkbox"/>	<input type="checkbox"/>	2. A "flood watch" announcement on the radio indicates that flooding is possible.
<input type="checkbox"/>	<input type="checkbox"/>	3. Flash floods may occur with little warning.
<input type="checkbox"/>	<input type="checkbox"/>	4. Flood risk varies from one region to another.
<input type="checkbox"/>	<input type="checkbox"/>	5. National flood insurance is available only for buildings within an identified flood-prone area.
<input type="checkbox"/>	<input type="checkbox"/>	6. It is safe to walk through floodwater if you can see the ground under it.
<input type="checkbox"/>	<input type="checkbox"/>	7. It takes at least 3 feet of floodwater to make a motorized vehicle float.
<input type="checkbox"/>	<input type="checkbox"/>	8. After flood waters recede from a roadway, the road could still be dangerous.
<input type="checkbox"/>	<input type="checkbox"/>	9. To prepare for a flood emergency, you should have a NOAA Weather Radio as well as a commercial radio.

Answer key
1. False 2. True 3. True 4. True 5. False 6. False 7. False 8. True 9. True

For More Information

If you require more information about any of these topics, the following are resources that may be helpful.

- *After a Flood: The First Steps*. L-198. Information for homeowners on preparedness, safety, and recovery from a flood.
- *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding*. L-235. A brochure about obtaining information about how to protect your home from flooding.
- *Homeowner's Guide to Retrofitting: Six Ways to Protect Your House from Flooding*. FEMA-312. A detailed manual on how to protect your home from flooding.
- *About the Flood: Elevating Your Floodprone House*. FEMA-347. This publication is intended for builders, code officials and homeowners.
- *Protecting Building Utilities From Flood Damage*. FEMA-348. This publication is intended for developers, architects, engineers, builders, code officials and homeowners.

FEMA Publications

American Red Cross

- *Repairing Your Flooded Home*. sixty-page booklet about how to perform simple home repairs after flooding, including cleaning, sanitation, and determining which professionals to involve for various needed services. Local Red Cross chapters can order in packages of 10 as stock number A4477 for a nominal fee. Also available online at www.redcross.org/services/disaster/0,1082,0_570_,00.html

National Weather Service

- *Hurricane Flooding: A Deadly Inland Danger*. 20052. Brochure describing the impact of hurricane flooding and precautions to take. Available online at www.nws.noaa.gov/om/brochures/InlandFlooding.pdf
- *The Hidden Danger: Low Water Crossing*. 96074E. Brochure describing the hazards of driving your vehicle in flood conditions. Available online at www.nws.noaa.gov/om/brochures/TheHiddenDangerEnglish.pdf



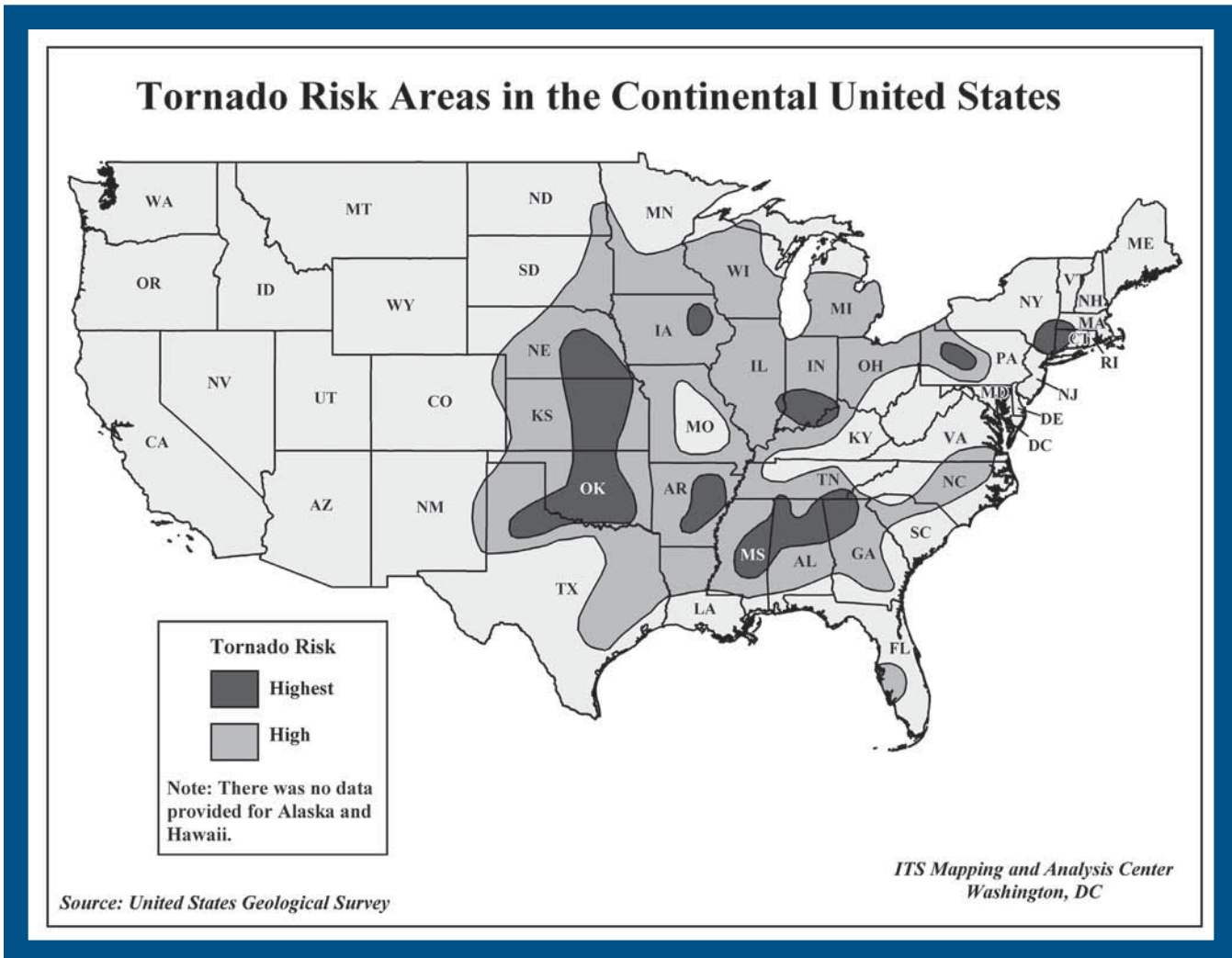
Other Publications

2.2

Tornadoes



Tornadoes are nature's most violent storms. Spawned from powerful thunderstorms, tornadoes can cause fatalities and devastate a neighborhood in seconds. A tornado appears as a rotating, funnel-shaped cloud that extends from a thunderstorm to the ground with whirling winds that can reach 300 miles per hour. Damage paths can be in excess of one mile wide and 50 miles long. Every state is at some risk from this hazard.



Some tornadoes are clearly visible, while rain or nearby low-hanging clouds obscure others. Occasionally, tornadoes develop so rapidly that little, if any, advance warning is possible.

Before a tornado hits, the wind may die down and the air may become very still. A cloud of debris can mark the location of a tornado even if a funnel is not visible. Tornadoes generally occur near the trailing edge of a thunderstorm. It is not uncommon to see clear, sunlit skies behind a tornado.

The following are facts about tornadoes:

- They may strike quickly, with little or no warning.
- They may appear nearly transparent until dust and debris are picked up or a cloud forms in the funnel.
- The average tornado moves Southwest to Northeast, but tornadoes have been known to move in any direction.
- The average forward speed of a tornado is 30 MPH, but may vary from stationary to 70 MPH.
- Tornadoes can accompany tropical storms and hurricanes as they move onto land.
- Waterspouts are tornadoes that form over water.
- Tornadoes are most frequently reported east of the Rocky Mountains during spring and summer months.
- Peak tornado season in the southern states is March through May; in the northern states, it is late spring through early summer.
- Tornadoes are most likely to occur between 3 p.m. and 9 p.m., but can occur at any time.

Know the Terms

Familiarize yourself with these terms to help identify a tornado hazard:

Tornado Watch

Tornadoes are possible. Remain alert for approaching storms. Watch the sky and stay tuned to NOAA Weather Radio, commercial radio, or television for information.

Tornado Warning

A tornado has been sighted or indicated by weather radar. Take shelter immediately.

Take Protective Measures

Be alert to changing weather conditions.

Before a Tornado

- Listen to NOAA Weather Radio or to commercial radio or television newscasts for the latest information.
- Look for approaching storms.

- Look for the following danger signs:
 - Dark, often greenish sky
 - Large hail
 - A large, dark, low-lying cloud (particularly if rotating)
 - Loud roar, similar to a freight train.

If you see approaching storms or any of the danger signs, be prepared to take shelter immediately.

During a Tornado

If you are under a tornado WARNING, seek shelter immediately!

If you are in:	Then:
A structure (e.g. residence, small building, school, nursing home, hospital, factory, shopping center, high-rise building)	<p>Go to a pre-designated shelter area such as a safe room, basement, storm cellar, or the lowest building level.</p> <p>If there is no basement, go to the center of an 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.</p> <p>Do not open windows.</p>
A vehicle, trailer, or mobile home	Get out immediately and go to the lowest floor of a sturdy, nearby building or a storm shelter. Mobile homes, even if tied down, offer little protection from tornadoes.
The outside with no shelter	<ul style="list-style-type: none"> • Lie flat in a nearby ditch or depression and cover your head with your hands. Be aware of the potential for flooding. • Do not get under an overpass or bridge. You are safer in a low, flat location. • Never try to outrun a tornado in urban or congested areas in a car or truck. Instead, leave the vehicle immediately for safe shelter. • Watch out for flying debris. Flying debris from tornadoes causes most fatalities and injuries.

Preparing a Safe Room

Extreme windstorms in many parts of the country pose a serious threat to buildings and their occupants. Your residence may be built “to code,” but that does not mean it can withstand winds from extreme events such as tornadoes and major hurricanes. The purpose of a safe room or a wind shelter is to provide a space where you and your family can seek refuge that provides a high level of protection. You can build a safe room in one of several places in your home:

- Your basement.
- Atop a concrete slab-on-grade foundation or garage floor.
- An interior room on the first floor.

Safe rooms built below ground level provide the greatest protection, but a safe room built in a first-floor interior room also can provide the necessary protection. Below-ground safe rooms must be designed to avoid accumulating water during the heavy rains that often accompany severe windstorms.

To protect its occupants, a safe room must be built to withstand high winds and flying debris, even if the rest of the residence is severely damaged or destroyed. Consider the following when building a safe room:

- The safe room must be adequately anchored to resist overturning and uplift.
- The walls, ceiling, and door of the shelter must withstand wind pressure and resist penetration by windborne objects and falling debris.
- The connections between all parts of the safe room must be strong enough to resist the wind.
- Sections of either interior or exterior residence walls that are used as walls of the safe room, must be separated from the structure of the residence so that damage to the residence will not cause damage to the safe room.



Additional information about Safe Rooms available from FEMA

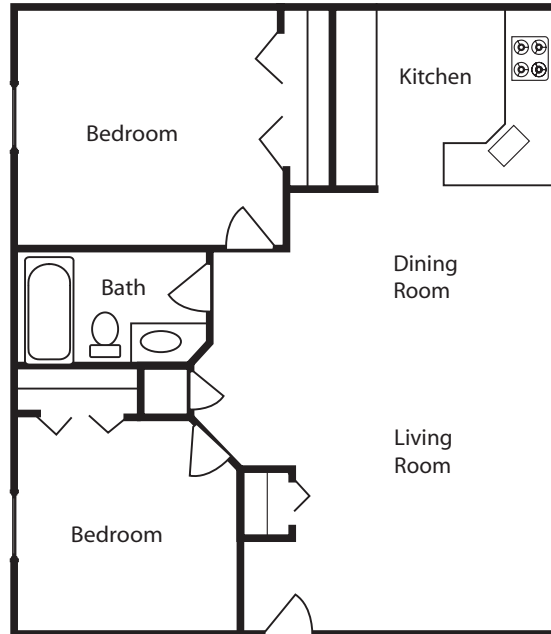
Taking Shelter from the Storm: Building a Safe Room Inside Your House. L-233. Brochure providing details about obtaining information about how to build a wind-safe room to withstand tornado, hurricane, and other high winds

Taking Shelter from the Storm: Building a Safe Room Inside Your House. FEMA-320. Manual with detailed information about how to build a wind-safe room to withstand tornado, hurricane, and other high winds

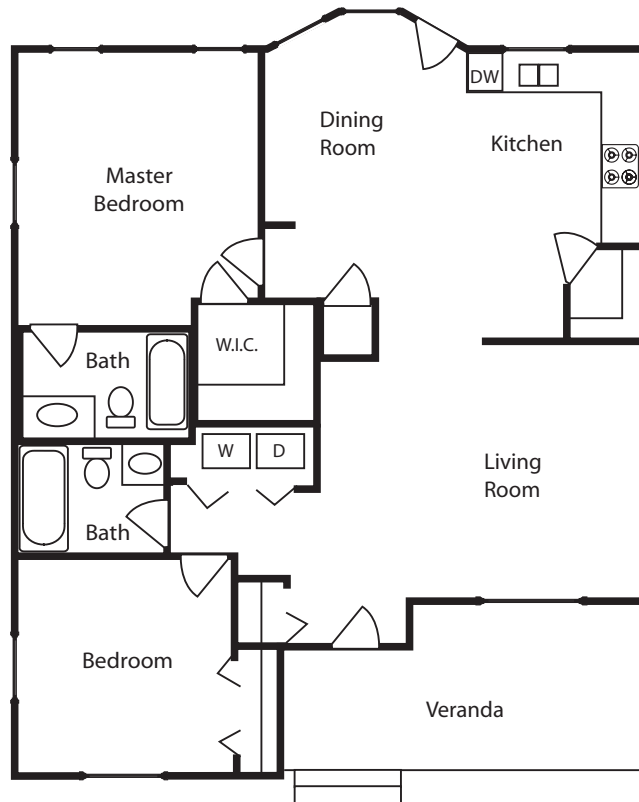
Locate the Safest Place

On the following home layout diagrams, locate the safest place to seek shelter should you not be able to evacuate.

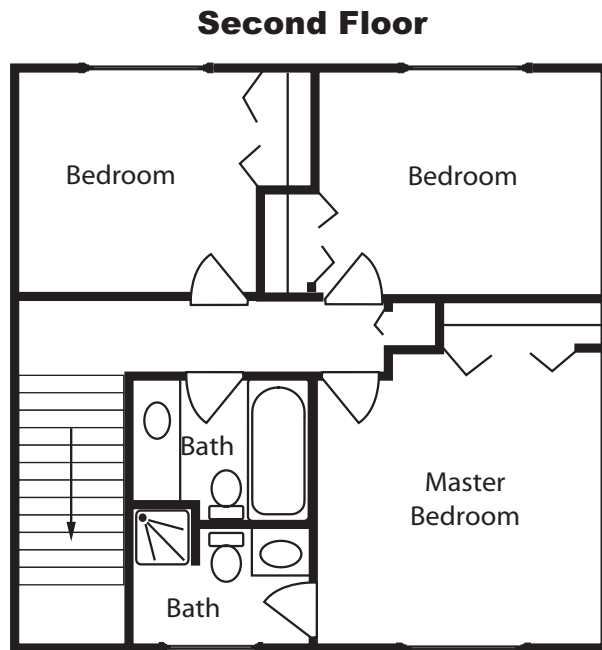
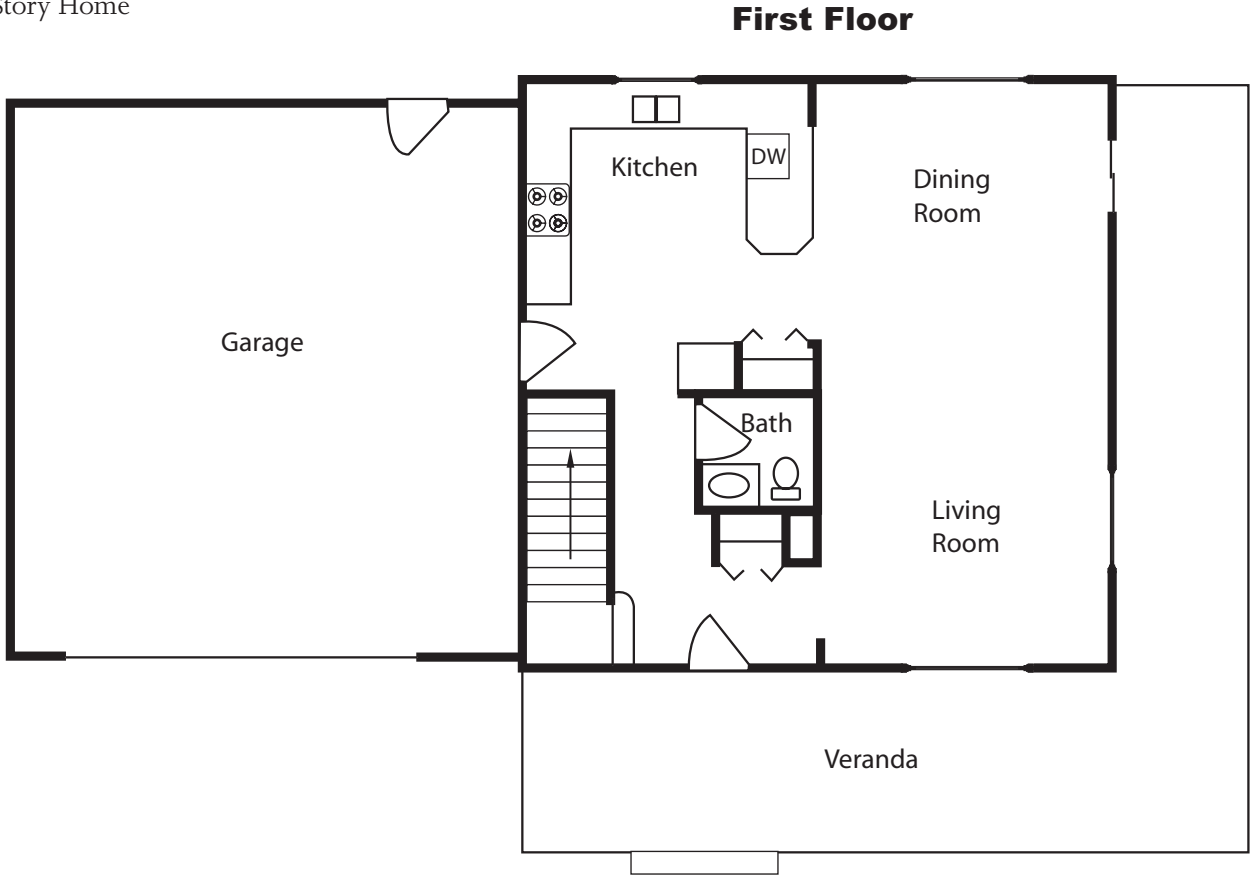
Apartment



One-Story Home



Two-Story Home



Natural Hazards

Apartment: Bathroom, One-Story Home: WIC (walk in closet), Two-Story Home: First floor bathroom

Answer Key

After a Tornado

Follow the instructions for recovering from a disaster in Part 5.



For More Information

If you require more information about any of these topics, the following are resources that may be helpful.

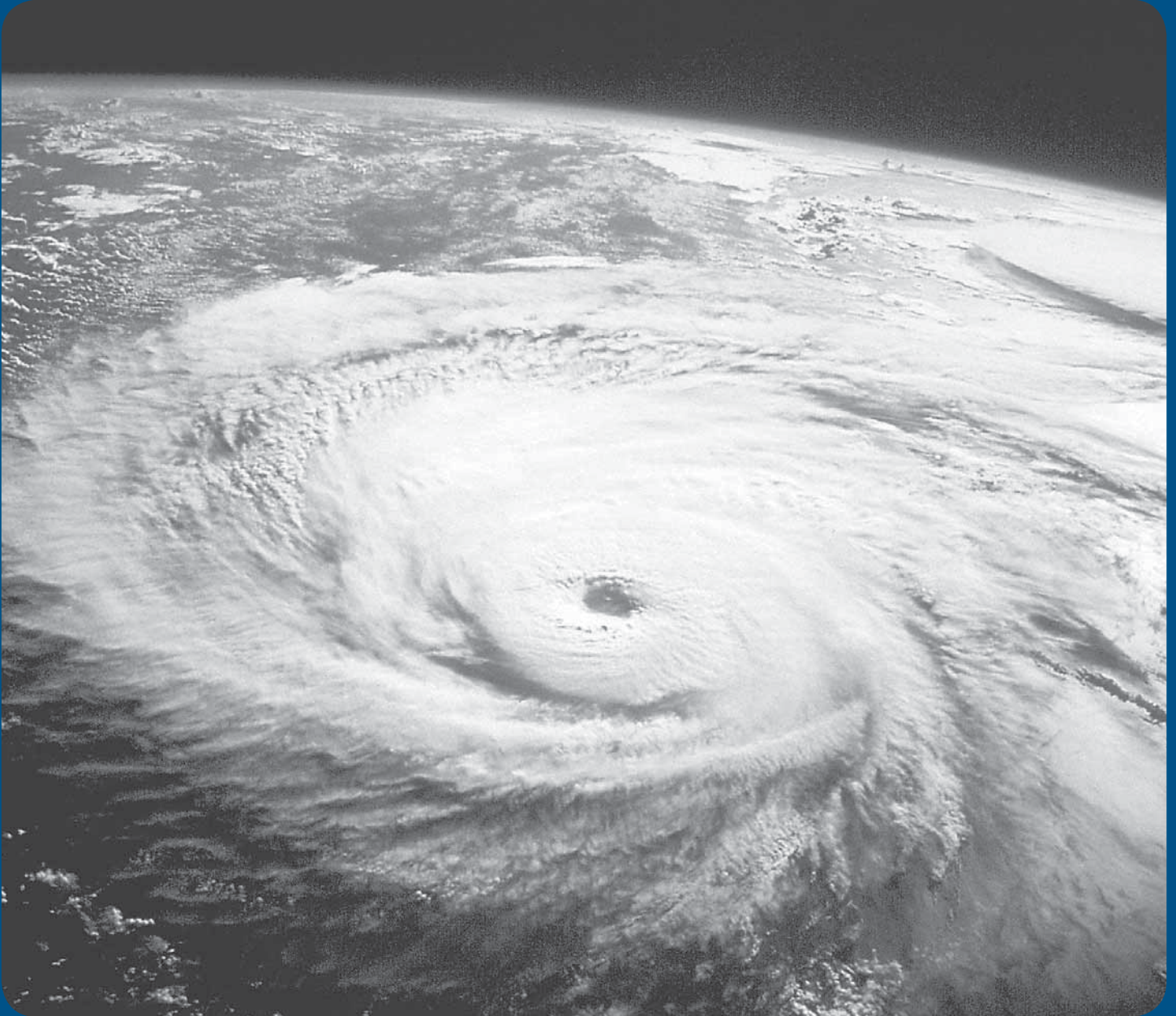
FEMA Publications

Tornado Fact Sheet. L-148. Provides safety tips for before, during, and after a tornado

Tornado Protection—Selecting Refuge Areas in Buildings. FEMA 431. Intended primarily to help building administrators, architects, and engineers select the best available refuge areas in existing schools

2.3

Hurricanes



A hurricane is a type of tropical cyclone, the generic term for a low pressure system that generally forms in the tropics. A typical cyclone is accompanied by thunderstorms, and in the Northern Hemisphere, a counterclockwise circulation of winds near the earth's surface.

All Atlantic and Gulf of Mexico coastal areas are subject to hurricanes or tropical storms. Parts of the Southwest United States and the Pacific Coast experience heavy rains and floods each year from hurricanes spawned off Mexico. The Atlantic hurricane season lasts from June to November, with the peak season from mid-August to late October.

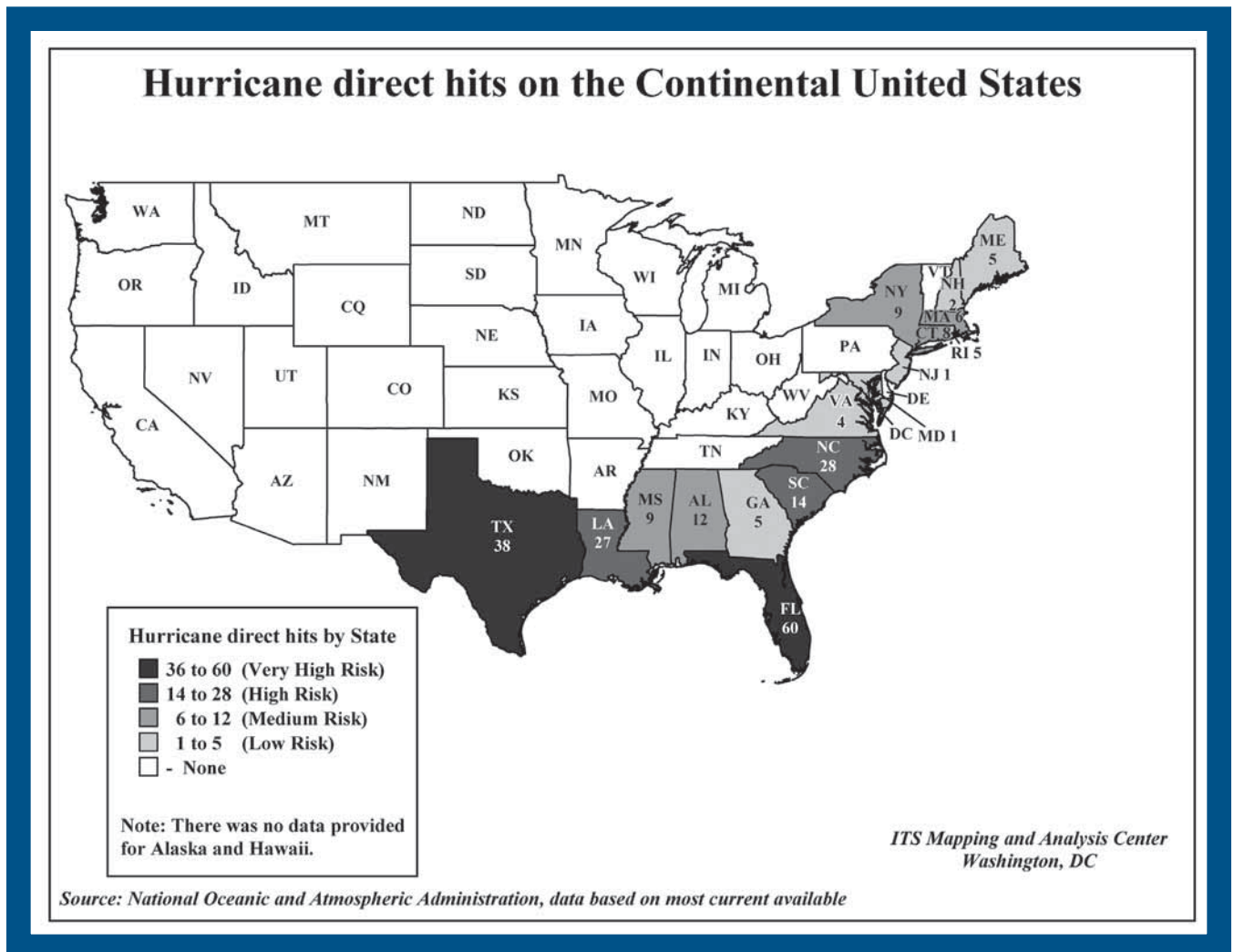
Hurricanes can cause catastrophic damage to coastlines and several hundred miles inland. Winds can exceed 155 miles per hour. Hurricanes and tropical storms can also spawn tornadoes and microbursts, create storm surges along the coast, and cause extensive damage from heavy rainfall.

Hurricanes are classified into five categories based on their wind speed, central pressure, and damage potential (see chart). Category Three and higher hurricanes are considered major hurricanes, though Categories One and Two are still extremely dangerous and warrant your full attention.

Scale Number (Category)	Sustained Winds (MPH)	Damage	Storm Surge
1	74-95	Minimal: Unanchored mobile homes, vegetation, and signs	4-5 feet
2	96-110	Moderate: All mobile homes, roofs, small craft; flooding	6-8 feet
3	111-130	Extensive: Small buildings; low-lying roads cut off	9-12 feet
4	131-155	Extreme: Roofs destroyed, trees down, roads cut off, mobile homes destroyed, beach homes flooded	13-18 feet
5	More than 155	Catastrophic: Most buildings destroyed, vegetation destroyed, major roads cut off, homes flooded	Greater than 18 feet

Hurricanes can produce widespread torrential rains. Floods are the deadly and destructive result. Slow moving storms and tropical storms moving into mountainous regions tend to produce especially heavy rain. Excessive rain can trigger landslides or mud slides, especially in mountainous regions. Flash flooding can occur due to intense rainfall. Flooding on rivers and streams may persist for several days or more after the storm.

Between 1970 and 1999, more people lost their lives from freshwater inland flooding associated with land falling tropical cyclones than from any other weather hazard related to tropical cyclones.



Naming the Hurricane

Since 1953, Atlantic tropical storms have been named from lists originated by the National Hurricane Center and now maintained and updated by an international committee of the World Meteorological Organization. The lists featured only women’s names until 1979. After that, men’s and women’s names were alternated. Six lists are used in rotation. Thus, the 2001 lists will be used again in 2007.

The only time there is a change in the list is if a storm is so deadly or costly that the continued use of the name would be inappropriate for reasons of sensitivity. When this occurs, the name is stricken from the list and another name is selected to replace it.

Sometimes names are changed. Lorenzo replaced Luis and Michelle replaced Marilyn. The complete lists can be found at www.nhc.noaa.gov under “Storm Names.”

Know the Terms

Familiarize yourself with these terms to help identify a hurricane hazard:

Tropical Depression

An organized system of clouds and thunderstorms with a defined surface circulation and maximum sustained winds of 38 MPH (33 knots) or less. Sustained winds are defined as one-minute average wind measured at about 33 ft (10 meters) above the surface.

Tropical Storm

An organized system of strong thunderstorms with a defined surface circulation and maximum sustained winds of 39-73 MPH (34-63 knots).

Hurricane

An intense tropical weather system of strong thunderstorms with a well-defined surface circulation and maximum sustained winds of 74 MPH (64 knots) or higher.

Storm Surge

A dome of water pushed onshore by hurricane and tropical storm winds. Storm surges can reach 25 feet high and be 50-100 miles wide.

Storm Tide

A combination of storm surge and the normal tide (i.e., a 15-foot storm surge combined with a 2-foot normal high tide over the mean sea level creates a 17-foot storm tide).

Hurricane/Tropical Storm Watch

Hurricane/tropical storm conditions are possible in the specified area, usually within 36 hours. Tune in to NOAA Weather Radio, commercial radio, or television for information.

Hurricane/Tropical Storm Warning

Hurricane/tropical storm conditions are expected in the specified area, usually within 24 hours.

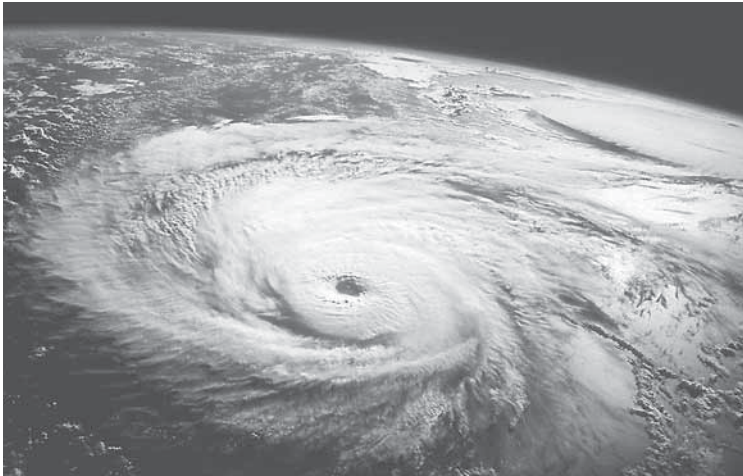
Short Term Watches and Warnings

These warnings provide detailed information about specific hurricane threats, such as flash floods and tornadoes.

Take Protective Measures

To prepare for a hurricane, you should take the following measures:

- Make plans to secure your property. Permanent storm shutters offer the best protection for windows. A second option is to board up windows with 5/8” marine plywood, cut to fit and ready to install. Tape does not prevent windows from breaking.
- Install straps or additional clips to securely fasten your roof to the frame structure. This will reduce roof damage.
- Be sure trees and shrubs around your home are well trimmed.
- Clear loose and clogged rain gutters and downspouts.
- Determine how and where to secure your boat.
- Consider building a safe room.



Before a Hurricane



Review

For more information on safe rooms
See Section 2.2:
Tornadoes

If a hurricane is likely in your area, you should:

- Listen to the radio or TV for information.
- Secure your home, close storm shutters, and secure outdoor objects or bring them indoors.
- Turn off utilities if instructed to do so. Otherwise, turn the refrigerator thermostat to its coldest setting and keep its doors closed.
- Turn off propane tanks.
- Avoid using the phone, except for serious emergencies.
- Moor your boat if time permits.
- Ensure a supply of water for sanitary purposes such as cleaning and flushing toilets. Fill the bathtub and other large containers with water.

During a Hurricane

You should evacuate under the following conditions:

- If you are directed by local authorities to do so. Be sure to follow their instructions.
- If you live in a mobile home or temporary structure—such shelters are particularly hazardous during hurricanes no matter how well fastened to the ground.
- If you live in a high-rise building—hurricane winds are stronger at higher elevations.
- If you live on the coast, on a floodplain, near a river, or on an inland waterway.
- If you feel you are in danger.

If you are unable to evacuate, go to your wind-safe room. If you do not have one, follow these guidelines:

- Stay indoors during the hurricane and away from windows and glass doors.
- Close all interior doors—secure and brace external doors.
- Keep curtains and blinds closed. Do not be fooled if there is a lull; it could be the eye of the storm—winds will pick up again.
- Take refuge in a small interior room, closet, or hallway on the lowest level.
- Lie on the floor under a table or another sturdy object.



Review

Guidelines for sheltering
See Section 1.4:
Shelter

After a Hurricane

Follow the instructions for recovering from a disaster in Part 5.



Knowledge Check

You Make the Call

Read the following and respond to the question below. See the answer key below to check your answer.

Your neighbor said that in the event a hurricane threatens, the household would get ready by closing the windows and doors on the storm side of the house and opening the ones on the side away from the wind. They also will tape the windows to prevent damage to the glass.

Is this a good idea?

Answer Key
No! All of the doors and windows should be closed (and shuttered) throughout the duration of the hurricane. The winds in a hurricane are highly turbulent and any open window or door can be an open target for flying debris.
As for the tape, it is a waste of effort, time, and tape. It offers no strength to the glass and no protection against flying debris.

For More Information

If you require more information about any of these topics, the following are resources that may be helpful.

FEMA Publications

Against the Wind: Protecting Your Home from Hurricane and Wind Damage. FEMA-247. A guide to hurricane preparedness. Available online at www.fema.gov/txt/hazards/hurricanes/survivingthestormhurricane.txt

Community Hurricane Preparedness. IS-324. CD-ROM or Web-based training course for federal, state, and local emergency managers. Web-based version available online at <http://meted.ucar.edu/hurricane/chp/index.htm>

Safety Tips for Hurricanes. L 105. Publication for teachers and parents for presentation to children. To order, call 1(800)480-2520.

Other Publications

Protect Your Home against Hurricane Damage, Institute for Business and Home Safety. 110 William Street, New York, NY 20038

2.4

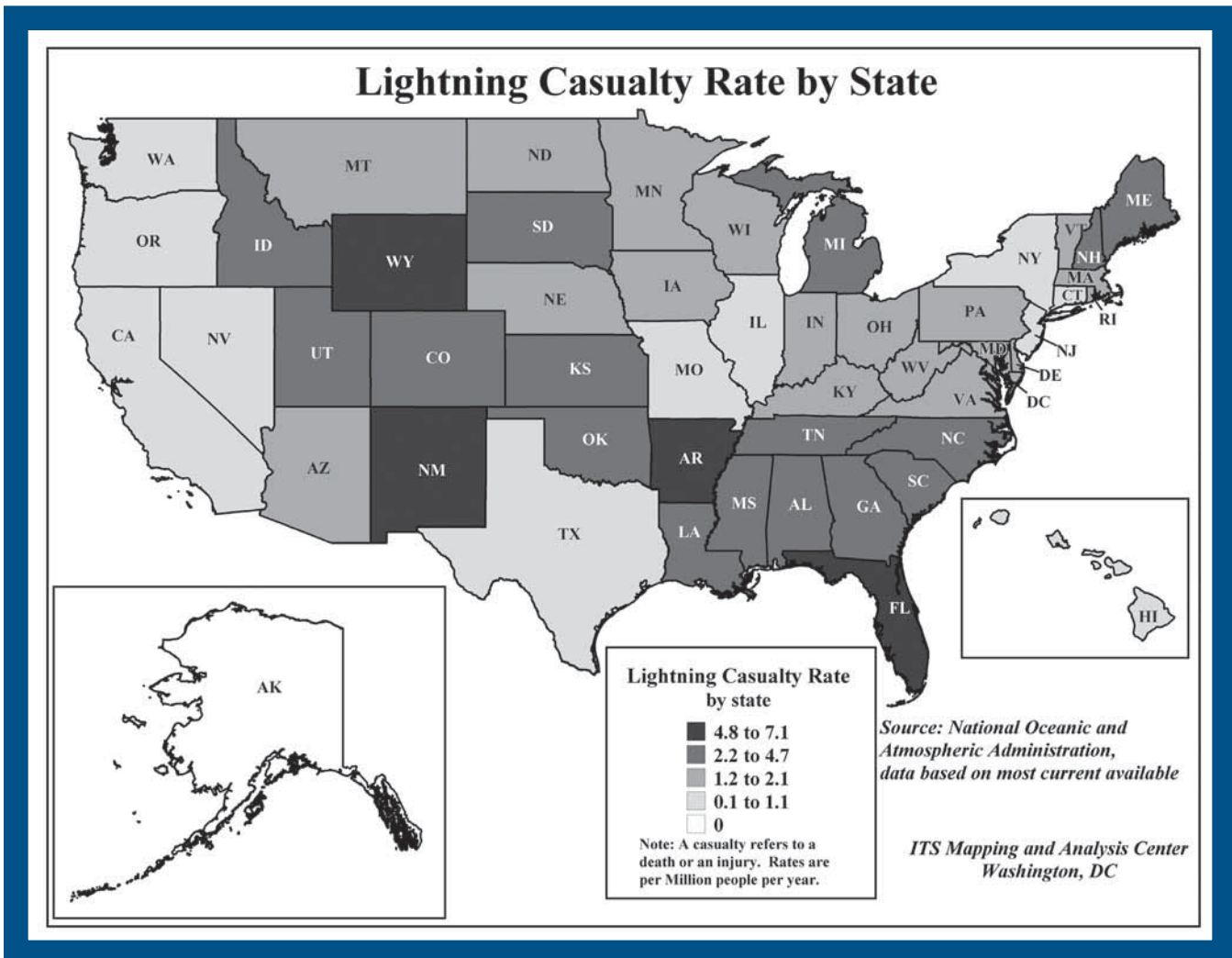
Thunderstorms and Lightning



All thunderstorms are dangerous. Every thunderstorm produces lightning. In the United States, an average of 300 people are injured and 80 people are killed each year by lightning. Although most lightning victims survive, people struck by lightning often report a variety of long-term, debilitating symptoms.

Other associated dangers of thunderstorms include tornadoes, strong winds, hail, and flash flooding. Flash flooding is responsible for more fatalities—more than 140 annually—than any other thunderstorm-associated hazard.

Dry thunderstorms that do not produce rain that reaches the ground are most prevalent in the western United States. Falling raindrops evaporate, but lightning can still reach the ground and can start wildfires.



The following are facts about thunderstorms:

- They may occur singly, in clusters, or in lines.
- Some of the most severe occur when a single thunderstorm affects one location for an extended time.
- Thunderstorms typically produce heavy rain for a brief period, anywhere from 30 minutes to an hour.
- Warm, humid conditions are highly favorable for thunderstorm development.
- About 10 percent of thunderstorms are classified as severe—one that produces hail at least three-quarters of an inch in diameter, has winds of 58 miles per hour or higher, or produces a tornado.

The following are facts about lightning:

- Lightning's unpredictability increases the risk to individuals and property.
- Lightning often strikes outside of heavy rain and may occur as far as 10 miles away from any rainfall.
- "Heat lightning" is actually lightning from a thunderstorm too far away for thunder to be heard. However, the storm may be moving in your direction!
- Most lightning deaths and injuries occur when people are caught outdoors in the summer months during the afternoon and evening.
- Your chances of being struck by lightning are estimated to be 1 in 600,000, but could be reduced even further by following safety precautions.
- Lightning strike victims carry no electrical charge and should be attended to immediately.

Know the Terms

Familiarize yourself with these terms to help identify a thunderstorm hazard:

Severe Thunderstorm Watch

Tells you when and where severe thunderstorms are likely to occur. Watch the sky and stay tuned to NOAA Weather Radio, commercial radio, or television for information.

Severe Thunderstorm Warning

Issued when severe weather has been reported by spotters or indicated by radar. Warnings indicate imminent danger to life and property to those in the path of the storm.

Take Protective Measures

Before Thunderstorms and Lightning

To prepare for a thunderstorm, you should do the following:

- Remove dead or rotting trees and branches that could fall and cause injury or damage during a severe thunderstorm.
- Remember the 30/30 lightning safety rule: Go indoors if, after seeing lightning, you cannot count to 30 before hearing thunder. Stay indoors for 30 minutes after hearing the last clap of thunder.

Thunderstorms

The following are guidelines for what you should do if a thunderstorm is likely in your area:

- Postpone outdoor activities.
- Get inside a home, building, or hard top automobile (not a convertible). Although you may be injured if lightning strikes your car, you are much safer inside a vehicle than outside.
- Remember, rubber-soled shoes and rubber tires provide NO protection from lightning. However, the steel frame of a hard-topped vehicle provides increased protection if you are not touching metal.
- Secure outdoor objects that could blow away or cause damage.
- Shutter windows and secure outside doors. If shutters are not available, close window blinds, shades, or curtains.
- Avoid showering or bathing. Plumbing and bathroom fixtures can conduct electricity.
- Use a corded telephone only for emergencies. Cordless and cellular telephones are safe to use.
- Unplug appliances and other electrical items such as computers and turn off air conditioners. Power surges from lightning can cause serious damage.
- Use your battery-operated NOAA Weather Radio for updates from local officials.



Avoid the following:

- Natural lightning rods such as a tall, isolated tree in an open area
- Hilltops, open fields, the beach, or a boat on the water
- Isolated sheds or other small structures in open areas
- Anything metal—tractors, farm equipment, motorcycles, golf carts, golf clubs, and bicycles

During a Thunderstorm

If you are:	Then:
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.
On open water	Get to land and find shelter immediately.
Anywhere you feel your hair stand on end (which indicates that lightning is about to strike)	Squat low to the ground on the balls of your feet. Place your hands over your ears and your head between your knees. Make yourself the smallest target possible and minimize your contact with the ground. DO NOT lie flat on the ground.



Call 9-1-1 for medical assistance as soon as possible.

After a Thunderstorm

The following are things you should check when you attempt to give aid to a victim of lightning:

- **Breathing** - if breathing has stopped, begin mouth-to-mouth resuscitation.
- **Heartbeat** - if the heart has stopped, administer CPR.
- **Pulse** - if the victim has a pulse and is breathing, look for other possible injuries. Check for burns where the lightning entered and left the body. Also be alert for nervous system damage, broken bones, and loss of hearing and eyesight.

Knowledge Check

Decide whether the following statements are true or false. Check the appropriate column. When you have finished, verify your answers using the answer key below.

T	F	Statement
<input type="checkbox"/>	<input type="checkbox"/>	1. Every thunderstorm produces lightning.
<input type="checkbox"/>	<input type="checkbox"/>	2. Never touch a person struck by lightning.
<input type="checkbox"/>	<input type="checkbox"/>	3. Dry, cold conditions favor development of a thunderstorm.
<input type="checkbox"/>	<input type="checkbox"/>	4. If you can count to 25 after seeing lightning and before hearing thunder, it is safe to stay outdoors.
<input type="checkbox"/>	<input type="checkbox"/>	5. It is safe to use a cordless telephone during a thunderstorm.
<input type="checkbox"/>	<input type="checkbox"/>	6. Rubber-soled shoes and rubber tires provide protection from lightning.



For More Information

If you require more information about any of these topics, the following resource may be helpful.

Publications

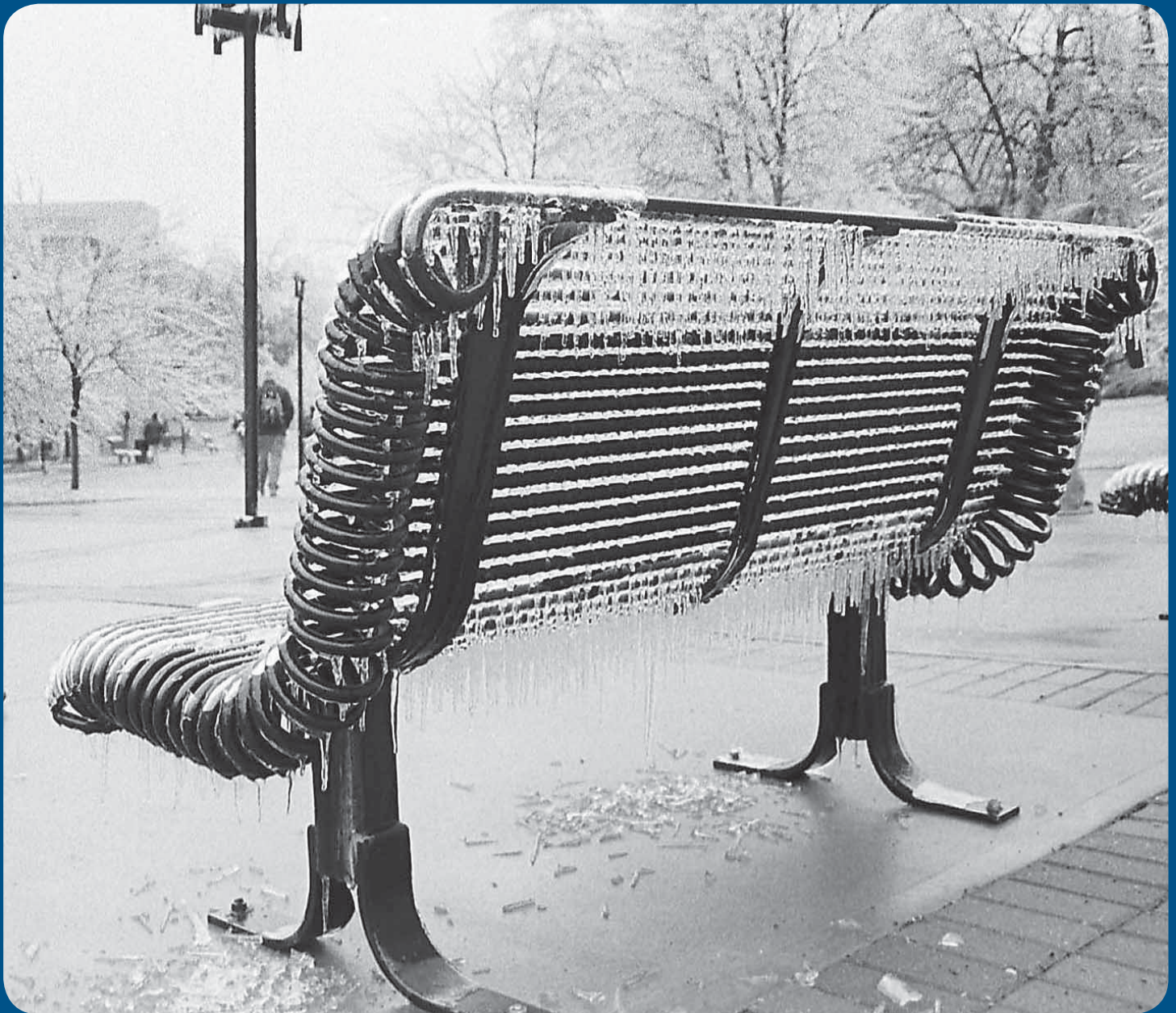
National Weather Service

Facts about Lightning. 200252. Two-page factsheet for boaters. Available online at www.nws.noaa.gov/om/wcm/lightning/resources/LightningFactsSheet.pdf

Answer key:
1. True 2. False 3. False 4. False 5. True 6. False

2.5

Winter Storms and Extreme Cold



Heavy snowfall and extreme cold can immobilize an entire region. Even areas that normally experience mild winters can be hit with a major snowstorm or extreme cold. Winter storms can result in flooding, storm surge, closed highways, blocked roads, downed power lines and hypothermia.

Know the Terms

Familiarize yourself with these terms to help identify a winter storm hazard:

Freezing Rain

Rain that freezes when it hits the ground, creating a coating of ice on roads, walkways, trees, and power lines.

Sleet

Rain that turns to ice pellets before reaching the ground. Sleet also causes moisture on roads to freeze and become slippery.

Winter Storm Watch

A winter storm is possible in your area. Tune in to NOAA Weather Radio, commercial radio, or television for more information.

Winter Storm Warning

A winter storm is occurring or will soon occur in your area.

Blizzard Warning

Sustained winds or frequent gusts to 35 miles per hour or greater and considerable amounts of falling or blowing snow (reducing visibility to less than a quarter mile) are expected to prevail for a period of three hours or longer.

Frost/Freeze Warning

Below freezing temperatures are expected.

Take Protective Measures

Before Winter Storms and Extreme Cold



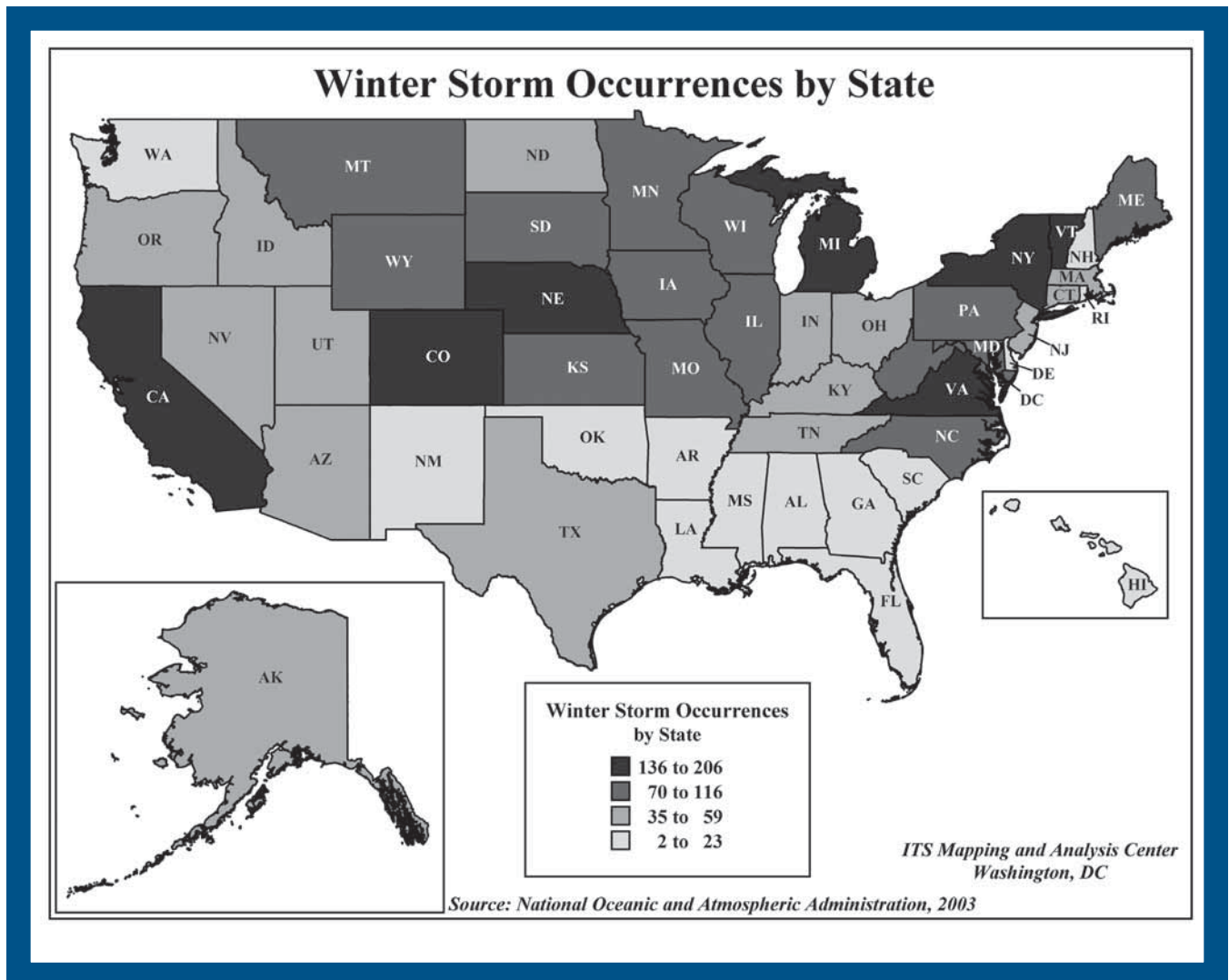
Review

See Section 1.3:
Assemble a Disaster
Supplies Kit

Include the following in your disaster supplies kit:

- Rock salt to melt ice on walkways
- Sand to improve traction
- Snow shovels and other snow removal equipment.

Prepare for possible isolation in your home by having sufficient heating fuel; regular fuel sources may be cut off. For example, store a good supply of dry, seasoned wood for your fireplace or wood-burning stove.



Winterize your home to extend the life of your fuel supply by insulating walls and attics, caulking and weather-stripping doors and windows, and installing storm windows or covering windows with plastic.

To winterize your car, attend to the following:

- Battery and ignition system should be in top condition and battery terminals clean.
- Ensure antifreeze levels are sufficient to avoid freezing.
- Ensure the heater and defroster work properly.
- Check and repair windshield wiper equipment; ensure proper washer fluid level.
- Ensure the thermostat works properly.
- Check lights and flashing hazard lights for serviceability.
- Check for leaks and crimped pipes in the exhaust system; repair or replace as necessary. Carbon monoxide is deadly and usually gives no warning.

- Check breaks for wear and fluid levels.
- Check oil for level and weight. Heavier oils congeal more at low temperatures and do not lubricate as well.
- Consider snow tires, snow tires with studs, or chains.
- Replace fuel and air filters. Keep water out of the system by using additives and maintaining a full tank of gas.

Dress for the Weather



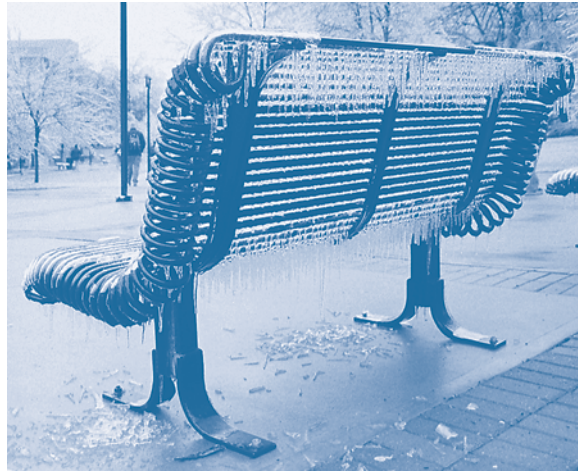
- Wear several layers of loose fitting, lightweight, warm clothing rather than one layer of heavy clothing. The outer garments should be tightly woven and water repellent.
- Wear mittens, which are warmer than gloves.
- Wear a hat.
- Cover your mouth with a scarf to protect your lungs.

During a Winter Storm

The following are guidelines for what you should do during a winter storm or under conditions of extreme cold:

- Listen to your radio, television, or NOAA Weather Radio for weather reports and emergency information.
- Eat regularly and drink ample fluids, but avoid caffeine and alcohol.
- Avoid overexertion when shoveling snow. Overexertion can bring on a heart attack—a major cause of death in the winter. If you must shovel snow, stretch before going outside.
- Watch for signs of frostbite. These include loss of feeling and white or pale appearance in extremities such as fingers, toes, ear lobes, and the tip of the nose. If symptoms are detected, get medical help immediately.
- Watch for signs of hypothermia. These include uncontrollable shivering, memory loss, disorientation, incoherence, slurred speech, drowsiness, and apparent exhaustion. If symptoms of hypothermia are detected, get the victim to a warm location, remove wet clothing, warm the center of the body first, and give warm, non-alcoholic beverages if the victim is conscious. Get medical help as soon as possible.
- Conserve fuel, if necessary, by keeping your residence cooler than normal. Temporarily close off heat to some rooms.
- Maintain ventilation when using kerosene heaters to avoid build-up of toxic fumes. Refuel kerosene heaters outside and keep them at least three feet from flammable objects.

- Drive only if it is absolutely necessary. If you must drive, consider the following:
 - Travel in the day, don't travel alone, and keep others informed of your schedule
 - Stay on main roads; avoid back road shortcuts



If a blizzard traps you in the car, keep these guidelines in mind:

- Pull off the highway. Turn on hazard lights and hang a distress flag from the radio antenna or window.
- Remain in your vehicle where rescuers are most likely to find you. Do not set out on foot unless you can see a building close by where you know you can take shelter. Be careful; distances are distorted by blowing snow. A building may seem close, but be too far to walk to in deep snow.
- Run the engine and heater about 10 minutes each hour to keep warm. When the engine is running, open an upwind window slightly for ventilation. This will protect you from possible carbon monoxide poisoning. Periodically clear snow from the exhaust pipe.
- Exercise to maintain body heat, but avoid overexertion. In extreme cold, use road maps, seat covers, and floor mats for insulation. Huddle with passengers and use your coat for a blanket.
- Take turns sleeping. One person should be awake at all times to look for rescue crews.
- Drink fluids to avoid dehydration.
- Be careful not to waste battery power. Balance electrical energy needs—the use of lights, heat, and radio—with supply.
- Turn on the inside light at night so work crews or rescuers can see you.
- If stranded in a remote area, stomp large block letters in an open area spelling out HELP or SOS and line with rocks or tree limbs to attract the attention of rescue personnel who may be surveying the area by airplane.
- Leave the car and proceed on foot—if necessary—once the blizzard passes.

After a Winter Storm

Follow the instructions for recovering from a disaster in Part 5.

For More Information

If you require more information about any of these topics, the following are resources that may be helpful.

Publications

National Weather Service

Winter Storms... The Deceptive Killers. Brochure packed with useful information including winter storm facts, how to detect frostbite and hypothermia, what to do in a winter storm, and how to be prepared. Available online at: www.nws.noaa.gov/om/brochures/wntrstm.htm

Centers for Disease Control and Prevention

Extreme Cold: A Prevention Guide to Promote Your Personal Health and Safety. An extensive document providing information about planning ahead for cold weather, safety both indoors and outdoors in cold weather, and cold weather health conditions. Available online at: www.phppo.cdc.gov