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FIRST  
WARNING weather

# SEVERE WEATHER

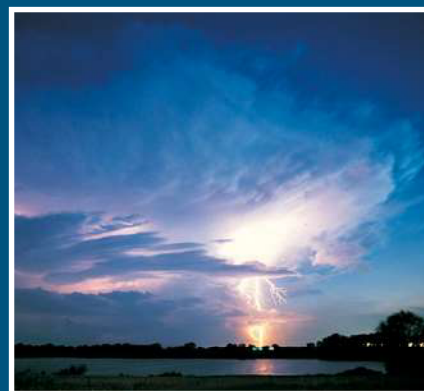
GUIDE

## PART 1

# Thunderstorms, Tornadoes & Lightning

# Thunderstorms, Tornadoes, Lightning...

...Nature's Most Violent Storms



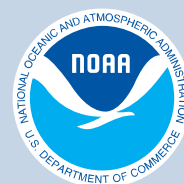
## A PREPAREDNESS GUIDE

Including Tornado Safety Information for Schools

### U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

National Weather Service







## Introduction

For Americans, preparedness must now account for man-made disasters as well as natural ones. Knowing what to do during an emergency is an important part of being prepared and may make all the difference when seconds count.

Some of the things you can do to prepare for the unexpected, such as making an emergency supply kit and developing an emergency plan, are the same for both a natural or man-made emergency.

This preparedness guide explains thunderstorms and related hazards and suggests life-saving actions **YOU** can take. With this information, **YOU** can recognize severe weather, develop a plan, and be ready to act when threatening weather approaches. Remember, your safety, and the safety of those in your care, is up to **YOU!**

## Why Worry About Thunderstorms?

### Lightning...

- Causes an average of 55-60 fatalities and 400 injuries each year
- Occurs with all thunderstorms
- Costs more than \$1 billion in insured losses each year

### Tornadoes...

- Cause an average of 60-65 fatalities and 1,500 injuries each year
- Can produce wind speeds in excess of 200 mph
- Can be 1 mile wide and stay on the ground over 50 miles

### Straight-line Winds...

- Can exceed 125 mph
- Can cause destruction equal to a tornado
- Are extremely dangerous to aviation

### Flash Floods and Floods...

- Are the #1 cause of deaths associated with thunderstorms, more than 90 fatalities each year

### Hail...

- Can be larger than a softball (5 inches in diameter)
- Causes more than \$1 billion in crop and property damage each year

## Thunderstorms

A thunderstorm affects a relatively small area when compared to a hurricane or a winter storm. The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Despite their small size, **ALL** thunderstorms are dangerous! Of the estimated 100,000 thunderstorms that occur each year in the United States, about 10 percent are classified as severe.

### What Are Thunderstorms? What Causes Them?

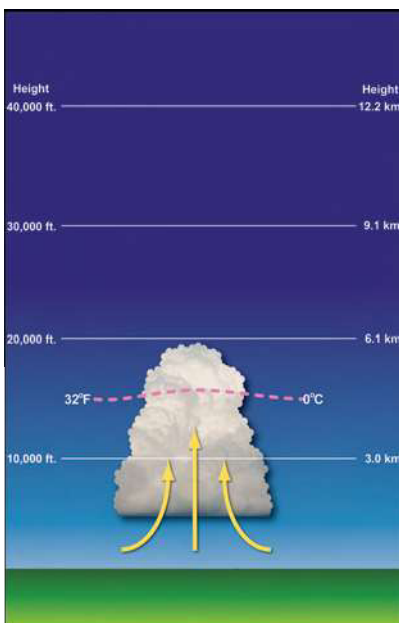
Every Thunderstorm Needs:

- **Moisture**—to form clouds and rain
- **Unstable air**—warm air that can rise rapidly
- **Lift**—caused by cold or warm fronts, sea breezes, mountains, or the sun's heat

*The National Weather Service considers a thunderstorm **severe** if it produces hail at least one inch in diameter, winds of 58 mph or stronger, or a tornado.*

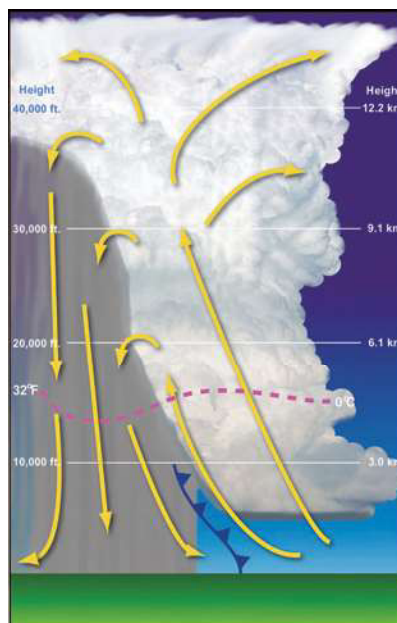
**1,800 thunderstorms occur at any moment around the world. That's 16 million a year!**

## The Thunderstorm Life Cycle



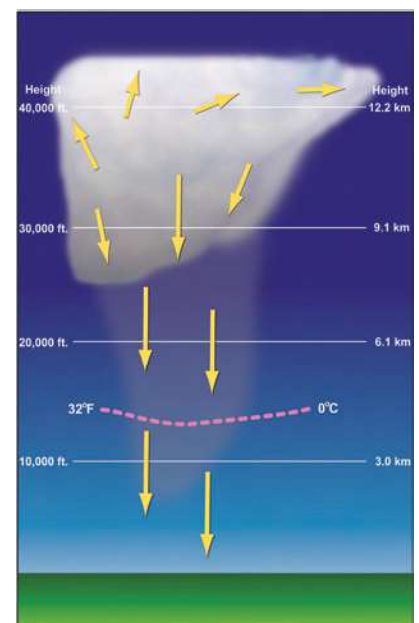
### Developing Stage

- Towering cumulus cloud indicates rising air
- Usually little if any rain during this stage
- Lasts about 10 minutes
- Occasional lightning



### Mature Stage

- Most likely time for hail, heavy rain, frequent lightning, strong winds, and tornadoes
- Storm occasionally has a black or dark green appearance
- Lasts an average of 10 to 20 minutes but some storms may last much longer



### Dissipating Stage

- Downdrafts, downward flowing air, dominate the storm
- Rainfall decreases in intensity
- Can still produce a burst of strong winds
- Lightning remains a danger



## Tornadoes

Although tornadoes occur in many parts of the world, they are found most frequently in the United States. In an average year, 1,200 tornadoes cause 60-65 fatalities and 1,500 injuries nationwide. You can find more information on tornadoes at [www.spc.noaa.gov](http://www.spc.noaa.gov).

### Tornado Facts

- A tornado is a violently rotating column of air extending from a cumuliform cloud, such as a thunderstorm, to the ground.
- Tornadoes may appear nearly transparent until dust and debris are picked up or a cloud forms within the funnel. The average tornado moves from southwest to northeast, but **tornadoes can move in any direction** and can suddenly change their direction of motion.
- The average forward speed of a tornado is 30 mph but may vary from nearly stationary to 70 mph.
- The strongest tornadoes have rotating winds of more than 200 mph.
- Tornadoes can accompany tropical storms and hurricanes as they move onto land.
- Waterspouts are tornadoes that form over warm water. Water spouts can move onshore and cause damage to coastal areas.

### Be Ready Year Round

- Tornadoes can occur at any time of day, any day of the year.
- Have a plan of action before severe weather threatens. You need to respond quickly when a warning is issued or a tornado is spotted.
- When conditions are warm, humid, and windy, or skies are threatening, monitor for severe weather watches and warnings by listening to NOAA Weather Radio, logging onto [weather.gov](http://weather.gov) or tuning into your favorite television or radio weather information source.

## The Enhanced Fujita Scale

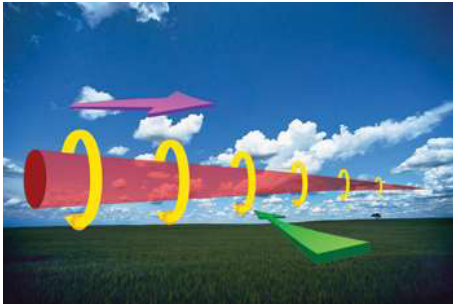
The National Weather Service (NWS) uses the EF-Scale to assign a tornado a 'rating' based on estimated wind speeds and related damage.

EF- SCALE	
EF RATING	3 Second Wind Gust (mph)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

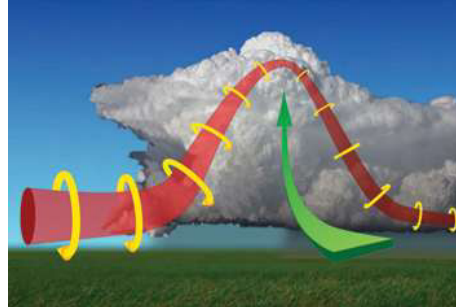


## How Tornadoes Form

Before thunderstorms develop, winds change direction and increase in speed with altitude. This creates an invisible, horizontal spinning effect in the lower atmosphere.



Rising air within the thunderstorm updraft tilts the rotating air from horizontal to vertical.



An area of rotation, 2-6 miles wide, now extends through much of the storm. Most tornadoes form within this area of strong rotation.



Chuck Doswell III

### Weak Tornadoes

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



Wikimedia/Justin Hobson

### Strong Tornadoes

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



Wikimedia/Joshua Jans

### Violent Tornadoes

- Less than 1% of all tornadoes
- 70% of all tornado deaths
- Can exceed 1 hour
- Winds greater than 166 mph
- Produces EF4 or EF5 damage

More detailed information on the EF-Scale can found at:  
[www.spc.noaa.gov/efscale](http://www.spc.noaa.gov/efscale)

# Thunderstorms, Tornadoes, Lightning... ...Nature's Most Violent Storms



Figure 1

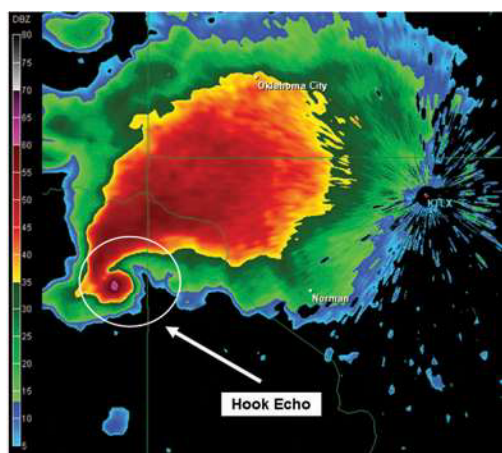


Figure 2



Figure 3 NOAA/Brian Bill

## Weather Radar Watches the Sky

The NWS has a Doppler radar network strategically located across the country that can detect air movement toward or away from the radar. Early detection of increasing rotation aloft within a thunderstorm can allow life-saving warnings to be issued before the tornado forms. In Figure 1 Weather Service Doppler radar detected strong rotation within the storm where red colors (winds moving away from the radar) and green (winds blowing toward the radar) are close together. Figure 2 reveals the “hook echo” that appeared in the radar’s reflectivity data. Figure 3 shows a violent tornado in northern Oklahoma at the same time the radar image was taken.

## Tornado Fiction and Fact

**FICTION:** Lakes, rivers, and mountains protect areas from tornadoes.

**FACT:** No geographic location is safe from tornadoes. A tornado near Yellowstone National Park left a path of destruction up and down a 10,000 foot mountain.

**FICTION:** A tornado causes buildings to “explode” as the tornado passes overhead.

**FACT:** Violent winds and debris slamming into buildings cause the most structural damage.

**FICTION:** Open windows before a tornado approaches to equalize pressure and minimize damage.

**FACT:** Virtually all buildings leak. Leave the windows closed. Take shelter immediately. An underground shelter, basement or safe room are the safest places. If none of those options are available, go to a windowless interior room or hallway.

**FICTION:** Highway overpasses provide safe shelter from tornadoes.

**FACT:** The area under a highway overpass is very dangerous in a tornado. If you are in a vehicle, you should immediately seek shelter in a sturdy building. As a last resort, you can either: stay in the car with the seat belt on. Put your head down below the windows, covering with your hands and a blanket if possible, OR if you can safely get noticeably lower than the level of the roadway, exit your car and lie in that area, covering your head with your hands. Your choice should be driven by your specific circumstances.

**FICTION:** It is safe to take shelter in the bathroom, hallway, or closet of a mobile home.

**FACT:** Mobile homes are not safe during tornadoes! Abandon your mobile home to seek shelter in a sturdy building immediately. If you live in a mobile home, ensure you have a plan in place that identifies the closest sturdy buildings.

Answers to frequently asked questions about tornadoes can be found at:  
[www.spc.noaa.gov/faq/tornado/index.html](http://www.spc.noaa.gov/faq/tornado/index.html)

## Lightning

### What Causes Lightning

The rising air in a thunderstorm cloud causes various types of frozen precipitation to form within the cloud. Included in these precipitation types are very small ice crystals and much larger pellets of snow and ice. The smaller ice crystals are carried upward toward the top of the clouds by the rising air while the heavier and denser pellets are either suspended by the rising air or start falling toward the ground. Collisions occur between the ice crystals and the pellets, and these collisions serve as the charging mechanism of the thunderstorm. The small ice crystals become positively charged while the pellets become negatively charged. As a result, the top of the cloud becomes positively charged and the middle to lower part of the storm becomes negatively charged. At the same time, the ground underneath the cloud becomes charged oppositely of the charges directly overhead.

When the charge difference between the ground and the cloud becomes too large, a conductive channel of air develops between the cloud and the ground, and a small amount of charge (step leader) starts moving toward the ground. When it nears the ground, an upward leader of opposite charge connects with the step leader. At the instant this connection is made, a powerful discharge occurs between the cloud and the ground. We see this discharge as a bright visible flash of lightning.



Johnny Autery



### Lightning Facts

- There is no safe place outdoors when a thunderstorm is nearby.
- The vast majority of lightning victims were going to a safe place but waited too long before seeking safe shelter.
- More than 80% of lightning fatality victims are **male**, typically between the ages of 15 and 40.
- Lightning fatalities are most common during summer afternoons and evenings.
- The energy from one lightning flash could light a 100-watt light bulb for more than 3 months.
- Many wildfires in the western United States and Alaska are ignited by lightning.
- The channel of air through which lightning passes can be heated to 50,000°F—**hotter than the surface of the sun!** The rapid heating and cooling of the air near the lightning channel causes a shock wave that results in the sound we know as **“thunder.”**







# When Thunder Roars, Go Indoors!

## How Far Away Is the Lightning?

- Count the number of seconds between a flash of lightning and the sound of the resulting thunder.
- Divide this number by 5 to get an estimate of the distance in miles to the lightning strike.
- Remember, if you are outdoors and can hear thunder, you are in danger of being struck by lightning.

**Almost all lightning deaths have occurred outdoors. In recent years, fatal activities have included:**

- |                         |                         |
|-------------------------|-------------------------|
| ■ boating               | ■ standing under a tree |
| ■ riding horses         | ■ swimming              |
| ■ riding on a lawnmower | ■ playing sports        |
| ■ golfing               | ■ watching the storm    |
| ■ walking               | ■ loading a truck       |
| ■ mountain climbing     | ■ fishing               |
| ■ camping               | ■ running to shelter    |

## Lightning Fiction and Fact

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

**FACT:** Lightning often strikes outside 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 rubber 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.



NOAA/Bill Bunting

## Straight-Line Winds

- Straight-line winds are any winds not associated with the rotation of a tornado. Straight-line winds are responsible for most thunder storm wind damage.
- Straight-line winds can exceed 125 mph!
- A downburst is a small area of rapidly descending air beneath a thunderstorm (see center of photographs above).
- A downburst can cause damage equivalent to a strong tornado (tree damage in photo to the right) and can be extremely hazardous to aviation.
- A “dry microburst” is a downburst that occurs with little or no rain. These destructive winds are most common in the western United States and are a hazard that wildfire crews watch-out for.



## Flash Floods and Floods

- A **flash flood** occurs within a few hours (usually less than 6 hours) of heavy or excessive rainfall, a dam or levee failure, or the sudden release of water impounded by an ice jam.
- A **flood** is the inundation of a normally dry area caused by abnormal high water flow. Floods develop more slowly than flash floods, normally greater than 6 hours.
- Flash floods and floods are the #1 cause of deaths associated with thunderstorms, more than 90 fatalities each year.
- More than half of all flood-related drownings occur when a vehicle is driven into hazardous flood water.  
**—TURN AROUND, DON'T DROWN!**
- Many flash flood fatalities occur at night.
- **Six inches** of fast-moving water can knock you off your feet.
- **Two feet** of rushing water can carry away most vehicles, including SUVs and pickups.



USGS

For more information, refer to the “Floods... The Awesome Power” at [weather.gov/os/brochures.shtml](http://weather.gov/os/brochures.shtml)

# Thunderstorms, Tornadoes, Lightning... ...Nature's Most Violent Storms

## Hail

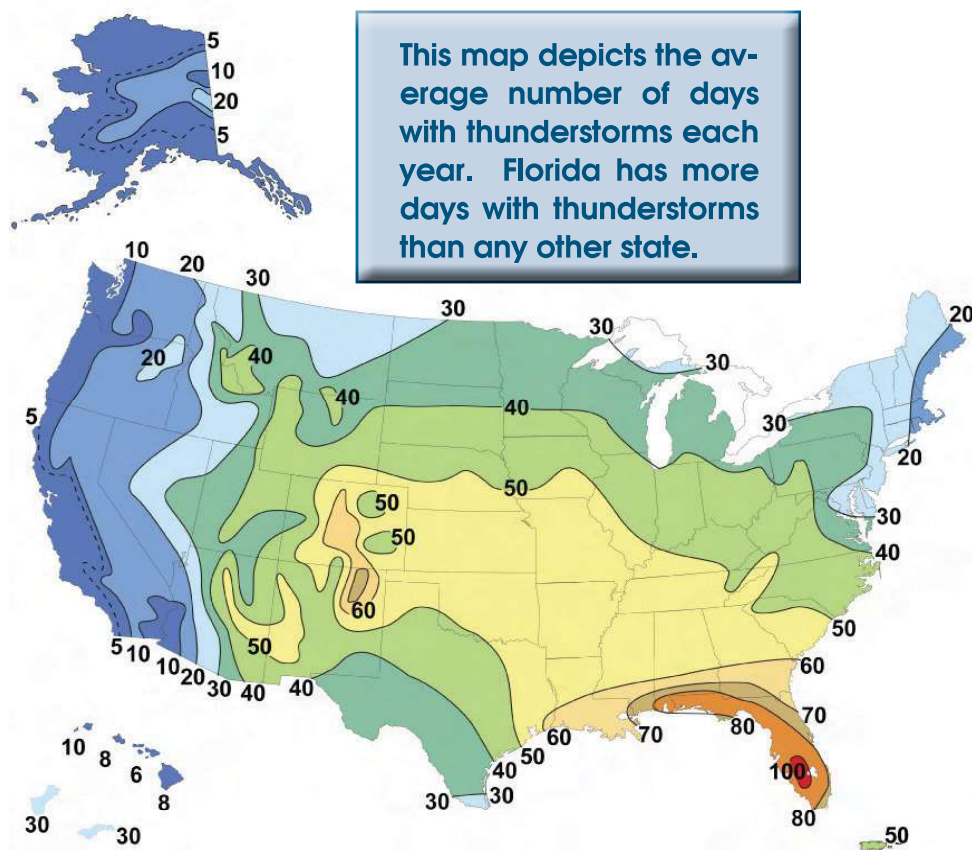


The Aurora, Nebraska  
record hailstone



- Strong rising currents of air within a storm, called updrafts, carry water droplets to a height where they freeze.
- Ice particles grow in size, becoming too heavy to be supported by the updraft, and fall to the ground.
  - Hail is larger than sleet, and forms only in thunderstorms.
  - Large hailstones can fall at speeds faster than 100 mph!
  - The largest hailstone ever recovered in the United States was a 7 inch wide chunk of ice that landed in Aurora, Nebraska, in June 2003.
  - An accurate weight could not be determined for the Aurora hailstone. A 1970 Coffeyville, Kansas, hailstone weighing 1.67 pounds with a 5.7 inch diameter remains the heaviest hailstone weighed and verified in the United States.

## Who's Most At-Risk From Thunderstorms?



### From Tornadoes

People who are in mobile homes or outdoors.

### From Lightning

People who are outdoors, or anyone who stays outdoors when thunderstorms are nearby.

### From Flash Flooding

People who walk or drive through flood waters.

### From Large Hail

People who are caught outdoors.



## Be Prepared

### It's Up to YOU!

Each year, many people are killed or seriously injured by tornadoes and severe thunderstorms despite advance warning. Some did not hear the warning; others heard the warning but did not believe it would happen to them. The following preparedness information, combined with timely severe weather watches and warnings, may save your life. If you hear a warning or observe threatening skies, only **YOU** can make the decision to seek safety. This could be the most important decision you will ever make.

### What YOU Can Do Before Severe Weather Strikes

Develop a plan for you and your family at home, work, school, and when outdoors. The American Red Cross offers tips at: [www.redcross.org](http://www.redcross.org), and the Federal Emergency Management Agency (FEMA) at: [www.ready.gov](http://www.ready.gov)

#### Practice Your Plan

- Know the risk for the area in which you live or visit. NWS warnings identify locations in the path of approaching severe weather.
- Have a Public Alert™ certified NOAA Weather Radio and battery back-up to receive warnings.
- Discuss thunderstorm safety with all members of your household.
- NWS watches and warnings are available on the Internet. Select and bookmark your local NWS office from [www.weather.gov](http://www.weather.gov).
- Keep in mind that even though the weather may be calm at the time a Tornado or Severe Thunderstorm Watch or Warning is issued for your area, conditions can rapidly deteriorate and become life threatening. Always heed warnings even if warnings issued for your area in the past did not result in severe weather. Don't gamble with your life.
- Tornadoes and severe thunderstorms can and do occur at any location, anytime of day or night, and anytime of year given the right atmospheric conditions.
- Tune into your favorite radio or television weather information source for severe weather watch and warning information.
- If severe weather threatens, check on people who are elderly, very young, or physically or mentally disabled.
- Having a safe room in your home or small business can help provide "near-absolute protection" for you and your family or your employees from injury or death caused by extreme winds. By near-absolute protection we mean that there is a very high probability the occupants of a safe room built according to current guidance will avoid injury or death. Information on how to build a Safe Room (shown in the photo at right) in your home or school is available from FEMA at: [www.fema.gov/plan/prevent/saferoom/fema320.shtm](http://www.fema.gov/plan/prevent/saferoom/fema320.shtm)



Tom Warner



FEMA



*Remember, if you can hear thunder –  
you are close enough to be struck  
by lightning!*

## When Dangerous Weather Approaches

### Avoid the Lightning Threat

- **Have a lightning safety plan.** Know where you'll go for safety and how much time it will take to get there. Make sure your plan allows enough time to reach safety.
- **Postpone activities.** Before going outdoors, check the forecast for thunderstorms. Consider postponing activities to avoid being caught in a dangerous situation.
- **Monitor the weather.** Look for signs of a developing thunderstorm such as darkening skies, flashes of lightning, or increasing wind.
- **Get to a safe place.** If you hear thunder, even a distant rumble, immediately move to a safe place. **When Thunder Roars, Go Indoors!** Fully enclosed buildings with wiring and plumbing provide the best protection. Sheds, picnic shelters, tents or covered porches do not protect you from lightning. If a sturdy building is not nearby, get into a hard-topped metal vehicle and close all the windows. Stay inside until 30 minutes after the last rumble of thunder.
- **If you hear thunder, don't use a corded phone.** Cordless phones, cell phones and other wireless handheld devices are safe to use.
- **Keep away from electrical equipment, wiring and water pipes.** Sensitive electronics should be unplugged well in advance of thunderstorms. Don't take a bath, shower or use other plumbing during a thunderstorm.

## When Caught Outside During Thunder

There is no safe place outside during a thunderstorm. Plan ahead to avoid this dangerous situation! If you're outside and hear thunder, the only way to significantly reduce your risk of becoming a lightning casualty is to get inside a substantial building or hard-topped metal vehicle as fast as you can. Remember, there is no substitute for getting to a safe place.

- **Avoid open areas and stay away from isolated tall trees, towers, or utility poles.** Do not be the tallest object in the area. Lightning tends to strike the tallest objects in the area.
- **Stay away from metal conductors such as wires or fences.** Metal does not attract lightning, but lightning can travel long distances through it.

*For more information on lightning safety, please visit:  
[www.lightningsafety.noaa.gov](http://www.lightningsafety.noaa.gov)*

## Tornado Safety Rules

- The safest place to be is an underground shelter, basement, or safe room.
- If no underground shelter or safe room is available, a small, windowless interior room or hallway on the lowest level of a sturdy building is the safest alternative.
- Mobile homes are not safe during tornadoes. Abandon mobile homes and go to the nearest sturdy building or shelter immediately.
- If you are caught outdoors, seek shelter in a basement, shelter or sturdy building. If you cannot quickly walk to a shelter:
  - Immediately get into a vehicle, buckle your seat belt and try to drive to the closest sturdy shelter.
  - If flying debris occurs while you are driving, pull over and park. Now you have the following options as a last resort:
    - *Stay in your vehicle with the seat belt on. Put your head down below the windows, covering with your hands and a blanket if possible.*
    - *If you can safely get noticeably lower than the level of the roadway, exit your car, and lie in that area, covering your head with your hands.*
- Your choice should be driven by your specific circumstances



Brian Peters

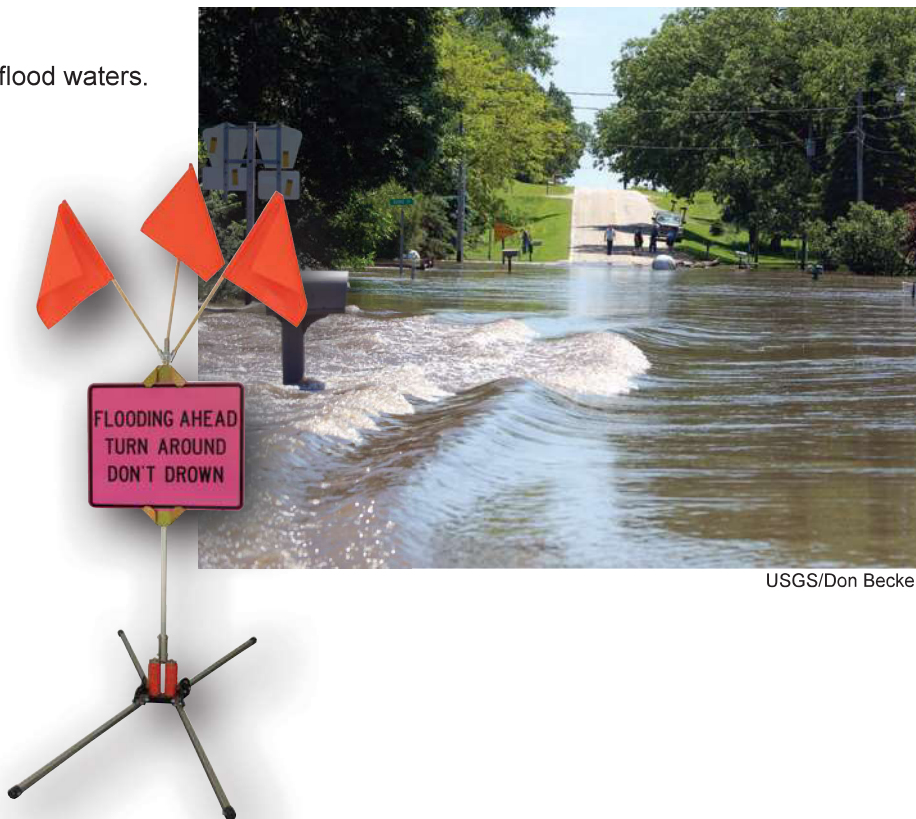
Occasionally tornadoes develop so rapidly that advance warning is not possible. Remain alert for signs of an approaching tornado such as a dark, often greenish sky, large hail, or a loud roar similar to a freight train.

## Flash Flood Safety Rules

- Avoid driving, walking, or swimming in flood waters.
- Stay away from high water, storm drains, ditches, ravines, or culverts. Even moving water only six inches deep can knock you off your feet. Move to higher ground.
- Do not let children play near storm drains.
- If you come upon a flooded roadway never drive through it.

**TURN AROUND  
DON'T DROWN!!!**

For more information on  
flood safety, please visit:  
[www.floodsafety.noaa.gov](http://www.floodsafety.noaa.gov)



USGS/Don Becker





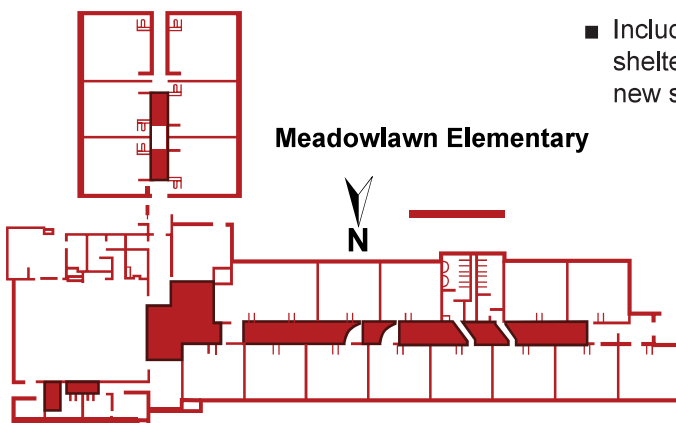
American Red Cross

**Hospitals, nursing homes, and other institutions should develop similar severe weather safety plans.**

## Tornado Safety in Schools

### Every School Should Have a Plan

- Develop a severe weather safety plan that ensures everyone will take cover within 60 seconds. Conduct frequent tornado drills. Include provisions for all after-hours, school-related activities.
- Every school should be inspected and tornado shelter areas designated by a registered engineer or architect. Rooms with exterior walls should never be used as tornado shelters.
- Basements offer the best protection. Schools without basements should use interior rooms and hallways on the lowest floor, away from windows.
- Delay lunches or assemblies in large rooms if severe weather is anticipated. Rooms with large roof spans (e.g., gymnasiums, cafeterias, and auditoriums) offer little or no protection from tornado-strength winds.
- Ensure students and staff know the protective position (shown below). Everyone should sit facing an interior wall, elbows to knees, and with hands over the back of their heads.
- Each school should have a NOAA Weather Radio with battery back-up. Remember, the NWS issues a Tornado Watch when conditions are *favorable for tornado development* and a Tornado Warning when a tornado *has been spotted or indicated by radar*.
- If the school's alarm system relies on electricity, have an alternative method to notify teachers and students in case of power failure.
- Make special provisions for faculty and students with disabilities, those in portable classrooms, and those outdoors. They should be notified first of approaching severe weather.
- Keep children at school beyond regular hours during a Tornado Warning. School bus drivers should identify protective areas along each part of their route where they and their passengers can take cover if overtaken by a tornado or high winds.
- Include properly designed tornado shelters when planning additions or new school buildings.



Meadowlawn Elementary

**■ = "BEST AVAILABLE" Tornado Shelter**



## Stay Informed with NOAA Weather Radio All Hazards

The NWS continuously broadcasts warnings, watches, forecasts and other non-weather related hazard information on NOAA Weather Radio All Hazards (NWR). The average range of the 1000+ NWR transmitters in the United States is 40 miles, depending on topography. For the best performing NWR receivers, NWS suggests that you look at devices that have been certified to Public Alert™ standards. These radios meet certain technical standards and come with many features such as: Specific Area Message Encoding (SAME), a battery back-up, both audio and visual alarms, selective programming for the types of hazards you want to be warned for, and the ability to activate external alarm devices for people with disabilities. Like a smoke detector, an NWR can wake you in the middle of the night to alert you to a dangerous situation.

When conditions are favorable for severe weather to develop, a Severe Thunderstorm or Tornado Watch is typically issued. NWS meteorologists then use information from weather radar, Skywarn® spotters and other sources to issue Severe Thunderstorm and Tornado Warnings for areas where severe weather is imminent. Severe Thunderstorm and Tornado Warnings are disseminated through a variety of means, such as local radio and television station broadcasts, the Internet, and other communication services provided by America's Weather Industry. Warnings are also broadcast in the impacted area on NWR. Local emergency management and other public safety officials are notified because they lead your community's response to the hazard.

Working with our nation's Emergency Alert System (EAS), NWR is truly an "all hazards" radio network, making it a great source for comprehensive weather and emergency information. Please visit [www.weather.gov/nwr](http://www.weather.gov/nwr) for more information.

### What to Listen for...

**TORNADO WATCH**—NWS meteorologists have determined that tornadoes are possible in your area. Remain alert for approaching storms. Know if your location is in the watch area by listening to NOAA Weather Radio, visiting [www.weather.gov](http://www.weather.gov) or by tuning into your favorite radio or television weather information broadcast stations.

**SEVERE THUNDERSTORM WATCH**—NWS meteorologists have determined that severe thunderstorms are likely to occur in your area. Watch the sky and stay tuned for NWS warnings.

**TORNADO WARNING**—NWS meteorologists have determined that a tornado is occurring, or likely to occur within minutes, in the specified area. Warnings indicate imminent danger to life and property.

**SEVERE THUNDERSTORM WARNING**—NWS meteorologists have determined that a severe thunderstorm is occurring or likely to occur. Warnings indicate imminent danger to life and property.

The NWS, FEMA and the American Red Cross work to inform community officials and the public about the dangers posed by tornadoes and severe thunderstorms. You can prepare for the possibility of tornadoes or severe thunderstorms by learning the safest places to seek shelter when at home, work, school, or outdoors. **Learn how to monitor and prepare for severe weather so that YOU can make better decisions when needed most!**



**NWS OUTLOOK = GET READY**

**NWS WATCH = GET SET**

**NWS WARNING = STOP WHAT YOU ARE DOING AND TAKE ACTION!**

Severe thunderstorm outlooks are created by the Storm Prediction Center:  
[www.spc.ncep.noaa.gov/products/outlook/](http://www.spc.ncep.noaa.gov/products/outlook/)

For the latest hazardous weather outlooks, please visit your local NWS Weather Forecast Office web site.



# Before the Storm...

**Know your risk,  
Have a plan,  
Be prepared  
and  
Practice and  
maintain your  
plan!**



## MAKE a PLAN

Everyone needs to prepare for the hazards that could affect their area. FEMA, the American Red Cross and the NWS urge every household to develop an emergency plan.

Where will your family and friends be when disaster strikes? They could be anywhere—at work, at school, or in the car. How will you find each other? Will you know if your children are safe? Disaster may force you to evacuate your neighborhood or keep you in your home. What would you do if basic services such as water, gas, electricity, or telephones were cut off?

### Develop an Emergency Plan:

#### Know Your Risk

Gather information about hazards. Contact your local emergency management office, American Red Cross chapter and National Weather Service office. Find out what types of disaster could occur and how best to respond and protect yourself. Learn your community's warning signals and evacuation plans. FEMA has information about how to prepare for different hazards at: [www.fema.gov/plan/index.shtm](http://www.fema.gov/plan/index.shtm)

#### Have a Plan

Discuss the information you have gathered and what you need to do to prepare for and respond to different emergencies. Pick two places to meet in case you are separated:

- A spot outside your home for an emergency, such as fire,
- A location away from your neighborhood in case you can't return home.

Choose an out-of-area emergency contact person as your "family check-in contact" for everyone to call if you get separated. Discuss what you would do if advised to evacuate. No matter where you are located, FEMA can help you create an effective emergency plan at: [www.ready.gov/america/makeaplan/index.html](http://www.ready.gov/america/makeaplan/index.html)

#### Be Prepared

- Post emergency telephone numbers by phones and in cell phones.
- Install safety features in your house, such as smoke alarms and fire extinguishers.
- Inspect your home for potential hazards (such as items that can move, fall, break, or catch fire) and correct them.
- Have your family learn basic safety measures, such as CPR and first aid; how to use a fire extinguisher; and how and when to turn off water, gas, and electricity in your home.
- Teach children how and when to call 911 or your local emergency medical services number.



- Keep enough supplies in your home to meet your needs for at least 3 days. Assemble an emergency supply kit with items you may need if evacuated. Store these supplies in sturdy, easy-to-carry containers, such as backpacks or duffle bags. Keep important family documents in a waterproof container. Keep a smaller emergency supply kit in your vehicle.

## EMERGENCY SUPPLY KIT

Assemble the following items to create kits for use at home, the office, at school and in your vehicle:

- Water—1 gallon per person, per day (3-day supply for evacuation and 2 week supply for home)
- Food—a 3-day supply of non-perishable food for evacuation, 2-week supply for home
- Battery-powered or hand crank radio, and a “Public Alert Certified” NOAA Weather Radio and extra batteries for both
- Items for infants—including formula, diapers, bottles, pacifiers, powdered milk and medications not requiring refrigeration
- Items for seniors, people with disabilities and anyone with medical needs—including special foods, denture items, extra eyeglasses, hearing aid batteries, prescription and non-prescription medications that are regularly used, inhalers and other essential equipment
- Kitchen accessories—a manual can opener, mess kits or disposable cups, plates and utensils, utility knife, sugar and salt, aluminum foil and plastic wrap, resealable plastic bags
- One complete change of clothing and footwear for each person—including sturdy work shoes or boots, raingear and other items adjusted for the season, such as hats and gloves, thermal underwear, sunglasses, dust masks
- Sanitation and hygiene items—shampoo, deodorant, toothpaste, toothbrushes, comb and brush, lip balm, sunscreen, contact lenses and supplies and any medications regularly used, toilet paper, towelettes, soap, hand sanitizer, liquid detergent, feminine supplies, plastic garbage bags (heavy-duty) and ties (for personal sanitation), medium-sized plastic bucket with tight lid, disinfectant, household chlorine bleach
- Other essential items—paper, pencil, needles, thread, medicine dropper, whistle, emergency preparedness manual
- Several flashlights and extra, fresh batteries
- A first-aid kit



FEMA/Win Henderson



FEMA/David Fine

For a national overview  
of hazards please visit:  
[www.noaawatch.gov](http://www.noaawatch.gov)



## Thunderstorms, Tornadoes, Lightning...

### ...Nature's Most Violent Storms



- Blankets or a sleeping bag for each person
- Entertainment—including games and books, favorite dolls and stuffed animals for small children
- A map of the area marked with places you could go and their telephone numbers
- An extra set of keys—including keys for vehicles and any properties owned
- Copies of important documents—including insurance information, driver's licenses, passports and work identification badges
- Copies of medical prescriptions
- Cash, coins and copies of credit cards
- Family and emergency contact information
- Matches in a waterproof container
- Cell phone with chargers
- Family and emergency contact information
- Pet supplies—consider preparing an emergency supply kit for your pets including:
  - **Food**—keep at least 3 days of food in an airtight, waterproof container.
  - **Water**—store at least 3 days of water specifically for your pets in addition to water you need for yourself and your family.
  - **Medicines and medical records**—keep an extra supply of medicines your pet takes on a regular basis in a waterproof container.
  - **First aid kit**—talk to your veterinarian about what is most appropriate for your pet's emergency medical needs. Most kits should include cotton bandage rolls, bandage tape and scissors; antibiotic ointment; flea and tick prevention; latex gloves, isopropyl alcohol and saline solution. Include a pet first aid reference book.
  - **Collar with ID tag, harness or leash**—your pet should wear a collar with its rabies tag and identification at all times. Include a backup leash, collar and ID tag in your pet's emergency supply kit. In addition, place copies of your pet's registration information, adoption papers, vaccination documents and medical records in a clean plastic bag or waterproof container and also add them to your kit. You should also consider talking with your



veterinarian about permanent identification such as microchipping and enrolling your pet in a recovery database.

- **Crate or other pet carrier**—if you need to evacuate in an emergency situation take your pets and animals with you provided that it is practical to do so. In many cases, your ability to do so will be aided by having a sturdy, safe, comfortable crate or carrier ready for transporting your pet. The carrier should be large enough for your pet to stand, turn around and lie down.
- **Sanitation**—include pet litter and litter box if appropriate, newspapers, paper towels, plastic trash bags and household chlorine bleach to provide for your pet's sanitation needs. You can use bleach as a disinfectant (dilute nine parts water to one part bleach), or in an emergency you can also use it to purify water. Use 16 drops of regular household liquid bleach per gallon of water. Do not use scented or color safe bleaches, or those with added cleaners.
- **A picture of you and your pet together**—if you become separated from your pet during an emergency, a picture of you and your pet together will help you document ownership and allow others to assist you in identifying your pet. Include detailed information about species, breed, age, sex, color and distinguishing characteristics.
- **Familiar items**—include favorite toys, treats or bedding

For more information on preparing your pets please visit:  
[www.ready.gov/america/getakit/pets.html](http://www.ready.gov/america/getakit/pets.html)

## Practice and Maintain Your Plan

Ask questions to make sure everyone remembers meeting places, phone numbers, and safety rules. Conduct drills regularly. Test your smoke detectors and NOAA Weather Radio monthly and change the batteries at least once each year. Test and recharge your fire extinguisher(s) according to the manufacturer's instructions. Replace stored water and food every 6 months.

## For More Information

Safety and preparedness materials can be viewed and downloaded at:  
National Weather Service at: [www.weather.gov/safety.php](http://www.weather.gov/safety.php)  
Federal Emergency Management Agency at: [www.ready.gov](http://www.ready.gov)  
American Red Cross at: [www.redcross.org](http://www.redcross.org)



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FIRST  
WARNING weather

**SEVERE WEATHER**

**GUIDE**

## **PART 2**

# **Floods – The Awesome Power**

# FLOODS

THE AWESOME POWER

NATIONAL WEATHER SERVICE



U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

NOAA's National Weather Service

March 2005

NOAA/PA 200467



FEMA



# FLOODS

## THE AWESOME POWER

*"Flooding never happens here. Tom was trying to get home. He drives on the road near the stream every day. We knew it had been raining a lot, but it had been so dry, we were actually happy about the rain. Tom saw some water on the road, but thought it wasn't that deep. And, after all, he was in his truck, high up off the ground. But then his truck started to float, and before he knew it, his truck was washed downstream with him in it.*

*Fortunately, his truck got stuck on a rock or something, and someone saw him and threw him a line. Tom got out okay. But we really learned from this, not to drive in floods."*

– Testimony of Marilyn and Tom  
(last name requested to be withheld)

INTERVIEWED BY THE AMERICAN RED CROSS  
AFTER TROPICAL STORM ALLISON STRUCK  
TEXAS IN JUNE 2001

### Graphical depiction of NSW severity Categories.

## Why Should I Be Concerned About Flooding?

This preparedness guide explains flood-related hazards and suggests lifesaving actions you can take. With this information you can recognize a flood potential, develop a plan, and be ready when threatening weather approaches. Remember... your safety is up to YOU!

In the long term, floods kill more people in the United States than other types of severe weather. In recent years, only heat surpassed flood fatalities. Floods can roll boulders the size of cars, tear out trees, destroy buildings and bridges, and pose a significant threat to human lives.

### Online Resources

Additional flash flood/flood-related safety information can be obtained at:

**American Red Cross**

<http://www.redcross.org/>

**Federal Emergency Management Agency**

<http://www.fema.gov/>

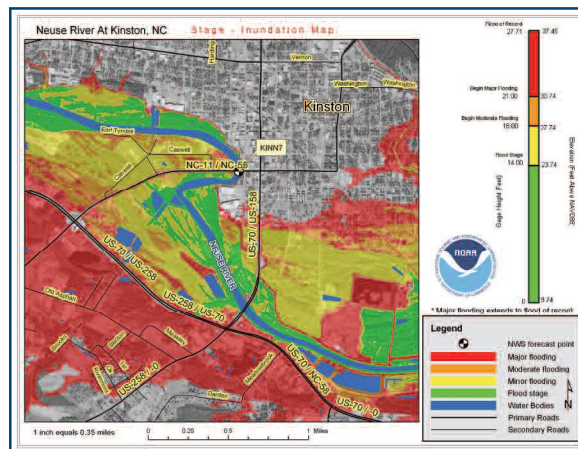
**U.S. Geological Survey**

<http://www.usgs.gov/>

**National Weather Service**

<http://www.nws.noaa.gov/>

Once a river reaches flood stage, the flood severity categories used by the NWS include minor flooding, moderate flooding, and major flooding. Each category has a definition based on property damage and public threat.



### Flood Severity Category

The NWS characterizes flood severity to more effectively communicate the impact of flooding. It uses the following categories:

**Minor Flooding** – minimal or no property damage, but possibly some public threat or inconvenience.

**Moderate Flooding** – some inundation of structures and roads near streams. Some evacuations of people and/or transfer of property to higher elevations.

**Major Flooding** – extensive inundation of structures and roads. Significant evacuations of people and/or transfer of property to higher elevations.

The impacts of floods vary locally. For each NWS river forecast location, flood stage associated with each of the NWS flood severity categories are established in cooperation with local public officials. Increasing river levels above flood stage constitute minor, moderate, and major flooding. Impacts vary from one river location to another because a certain river stage (height) above flood stage in one location may have an entirely different impact than the same level above flood stage at another location.

BARRICADES ARE PUT UP FOR YOUR PROTECTION.  
TURN AROUND AND GO ANOTHER WAY!

## What Are Flash Floods?

A flash flood is a rapid rise of water along a stream or low-lying urban area. Flash flood damage and most fatalities tend to occur in areas immediately adjacent to a stream or arroyo, due to a combination of heavy rain, dam break, levee failure, rapid snowmelt, and ice jams. Additionally, heavy rain falling on steep terrain can weaken soil and cause debris flow, damaging homes, roads, and property.

Flash floods can be produced when slow moving or multiple thunderstorms occur over the same area. When storms move faster, flash flooding is less likely since the rain is distributed over a broader area.

### Flash Flood Risk in Your Car, Truck, or Sport Utility Vehicle (SUV)

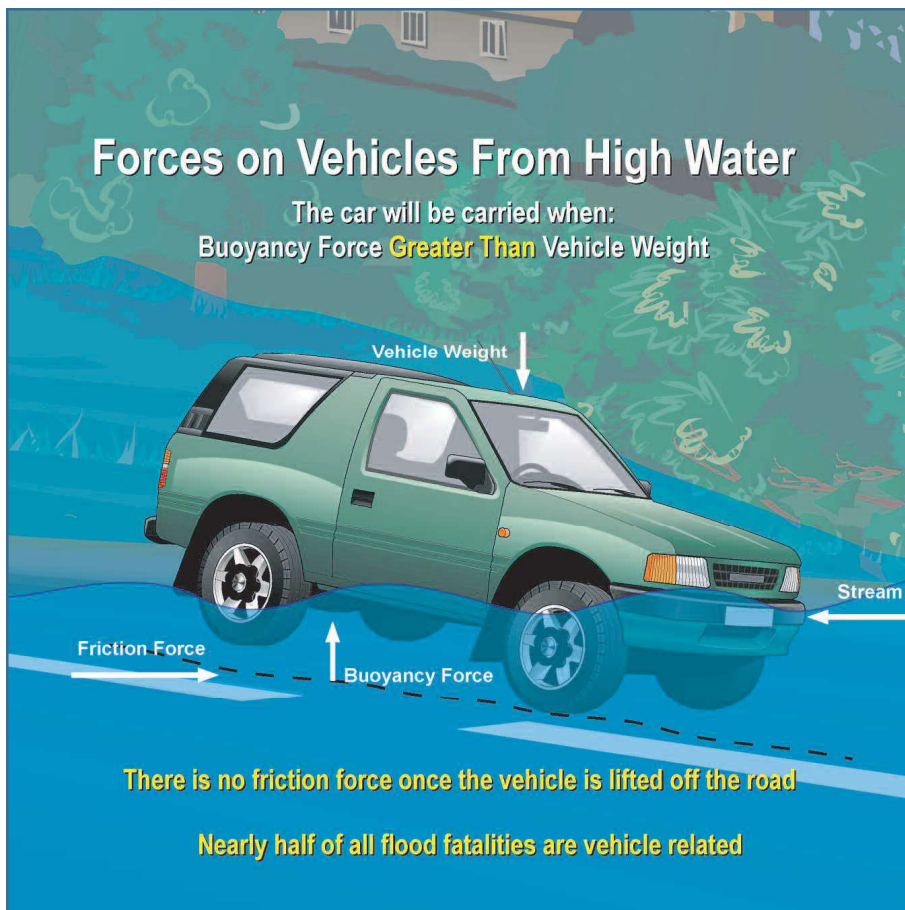
Almost half of all flash flood fatalities occur in vehicles. Contrary to popular belief, many people don't realize two feet of water on a bridge or highway can float most vehicles. If the water is moving rapidly, the car, truck, or SUV can be swept off the bridge and into the creek.

Water can erode the road bed, creating unsafe driving conditions. Underpasses can fill rapidly with water, while the adjacent roadway remains clear. Driving into a flooded underpass can quickly put you in five to six feet of water. Many flash floods occur at night when flooded roads are difficult to see.

**When you approach a flooded road, TURN AROUND, DON'T DROWN!**



◀ Source: National Weather Service



# FLOODS

## THE AWESOME POWER



▲ Photo: Harris County Flood Control District, Houston, Texas

**Major flooding from Tropical Storm Allison in Houston, Texas, June 2001.**

### Flash Flood Risks at Home, Work, or School

Since many flash floods occur along small streams, you can determine your risk by knowing your proximity to streams. Flooding can be caused by rain falling several miles upstream and then moving downstream rapidly.

Densely populated areas have a high risk for flash floods. The construction of buildings, highways, driveways, and parking lots increases runoff by reducing the amount of rain absorbed by the ground. This runoff increases the flash flood potential. Sometimes, streams through cities and towns are routed underground into storm drains. During periods of heavy rainfall, storm drains may become overwhelmed and flood roads and buildings. Low spots, such as underpasses, underground parking garages, and basements can become death traps.

Embankments, known as levees, are built along rivers and are used to prevent high water from flooding bordering land. In 1993, many levees failed along the Mississippi River, resulting in devastating flash floods.

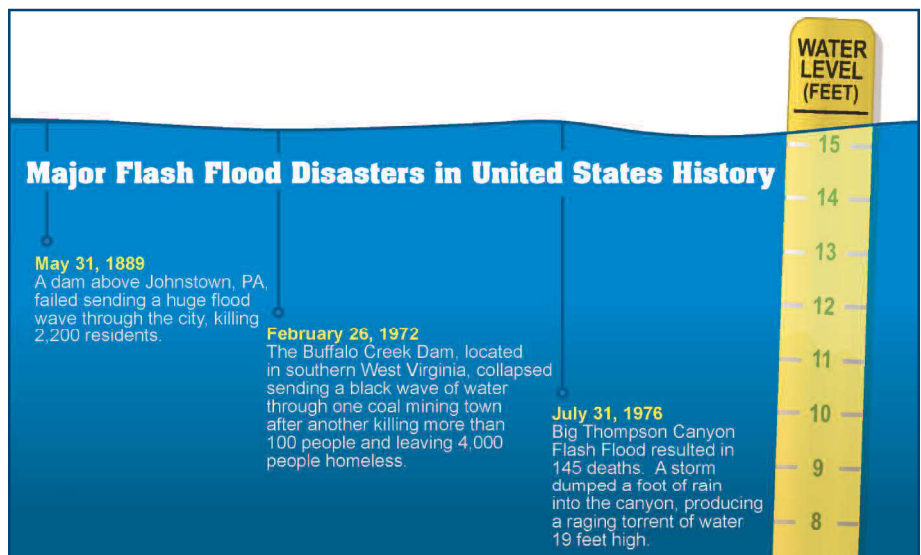
Dam failures have played a deadly role in the history of flash flooding. The United States has about 76,000 dams, and about 80 percent of those are of earthfill construction. Be aware of any dams upstream of your location. Earthen dams are more easily compromised by heavy rainfall than are concrete structures. Water flowing over an earthen dam can cause the dam to weaken or fail, sending a destructive wall of water downstream.

### Flash Flood Risk to Recreation (Camping, Hiking, Boating, Fishing)

Many people enjoy hiking, fishing, or camping along streams and rivers. Listen to weather forecasts and keep away from streams if thunderstorms have happened or have been predicted upstream from where you are. A creek only 6 inches deep in mountainous areas can swell to a 10-foot deep raging river in less than an hour if a thunderstorm inundates the area with intense rainfall.

When thunderstorms are in the area, stay alert for rapidly changing conditions. You may notice the stream start to rise quickly and become muddy. You may hear a roaring sound upstream that may be a flood wave moving rapidly toward you. Head immediately for higher ground. Don't be swept away by the rising water. There are dangers associated with fast-moving water, but with common sense and some preparation, outdoor enthusiasts can enjoy a safe day along a stream or river.

Source: National Weather Service ►







**LISTEN** FOR ROARING SOUND UPSTREAM AS FLOOD WATERS COULD BE HEADED YOUR WAY!

**LOOK** FOR RAPIDLY RISING WATER AND/OR WATER TURNING MUDDY!

**REMEMBER** TO CLIMB TO SAFETY IF YOU HEAR OR SEE SIGNS OF A FLOOD!

◀ Photo: Steve Allen Photography,  
Waitsfield, VT  
Road damage as a result of flash flooding.

## Where You Are Determines Your Flash Flood/Flood Risk

Mountains and steep hills produce rapid runoff and quick stream response. Rocks and clay soils do not allow much water to infiltrate the ground. Steep narrow valleys generate rapid flowing waters that can rise quickly to a considerable depth. Saturated soil also can lead rapidly to flash flooding.

Very intense rainfall can produce flooding even on dry soil. In the West, most canyons and “small streams” are not easily recognizable as a source of danger. Canyons can be scoured with sudden walls of water 10-15 feet high (e.g., Antelope Canyon, Arizona, August 1997, 11 fatalities).

Additionally, high risk locations include low water crossings, recent burn areas in mountains, and urban areas from pavement and roofs which concentrate rainfall runoff.

# FLOODS

## THE AWESOME POWER

PERSISTENT THUNDERSTORMS OVER  
THE SAME GEOGRAPHICAL AREA  
CAN LEAD TO RIVER FLOODING.

### What Are River Floods?

A flood is the inundation of a normally dry area caused by an increased water level in an established watercourse. River flooding is often caused by:

- Excessive rain from tropical systems making landfall.
- Persistent thunderstorms over the same geographical area for extended periods of time.
- Combined rainfall and snowmelt.
- Ice jam.



Photo: Jim Rackwitz, St. Louis Post-Dispatch ►  
River flooding due to excessive rain.



Photo: Steve Allen Photography ►  
River flooding due to ice jam.



## Tropical Cyclones and their Remnants

Floods are often produced by hurricanes, tropical storms, and tropical depressions. A tropical cyclone's worst impact may be the inland flooding associated with torrential rains.

When these storms move inland, they are typically accompanied by very heavy rain. If the decaying storms move slowly over land, they can produce rainfall amounts of 20 to 40 inches over several days. Widespread flash flooding and river flooding can result from these slow-moving storms.

A hurricane also can produce a deadly storm surge that inundates coastal areas as it makes landfall. Storm surge is water pushed on shore by the force of the winds swirling around the storm. This advancing surge combines with the normal tides to create the hurricane storm tide, which can increase the average water level 15 feet or more.

The worst natural disaster in the United States, in terms of loss of life, was caused by a storm surge and associated coastal flooding from the great Galveston, Texas, hurricane of 1900. At least 8,000 people lost their lives.



- ▲ Deaths from hurricane coastal flooding have fallen dramatically in recent years, but storm surge remains a great threat.

“50% of deaths associated with tropical cyclones are a  
result of inland flooding over the last 30 years.”

—Ed Rappaport, National Hurricane Center

<b>1972</b> <b>Hurricane Agnes</b> 122 deaths Agnes produced floods in the northeast United States contributing to \$6.4 billion in damages.	<b>1994</b> <b>Tropical Storm Alberto</b> 33 deaths Alberto drifted over the southeast United States producing torrential rainfall and drowning 33 people. Damages exceeded \$750 million dollars.	<b>1999</b> <b>Hurricane Floyd</b> 56 deaths Floyd brought intense rains and record flooding to the eastern United States. Of the 56 people who perished, 50 drowned from inland flooding.	<b>2001</b> <b>Tropical Storm Allison</b> 44 deaths Allison flooded the coastal sections from the Gulf Coast to New England. More than 3 feet of rain was reported along the Gulf Coast.
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## Use NOAA Weather Radio All Hazards!

NOAA Weather Radio All Hazards is the best way to receive warnings from the National Weather Service. NOAA Weather Radio All Hazards is a nationwide network of radio stations broadcasting continuous weather information direct from a nearby National Weather Service office.

NOAA Weather Radio All Hazards broadcasts National Weather Service warnings, watches, forecasts, and other hazard information 24 hours a day. The average reception range is a 40-mile radius from the transmitter, depending on topography. Be aware of the potential for flooding before the heavy rainfall begins by listening to NOAA Weather Radio All Hazards.

Purchase a NOAA Weather Radio All Hazards that has a battery back-up, a Specific Area Message Encoder (SAME) feature, which automatically alerts you when a Watch or Warning is issued for your county or parish, and one that can receive all seven NOAA Weather Radio frequencies.

NOAA Weather Radio All Hazards can also broadcast post-event information for all types of hazards—both natural (earthquakes, hurricanes and volcanos) and environmental (chemical or oil spills).

The NOAA Weather Radio All Hazards network has more than 650 transmitters, covering the 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific Territories. NOAA Weather Radio requires a special radio receiver or scanner capable of receiving the signal. Broadcasts are found in the public service band at these seven frequencies (MHz): 162.400, 162.425, 162.450, 162.475, 162.500, 162.525, 162.550 (also known as channels 1 through 7).

NOAA Weather Radio All Hazards requires a special radio receiver or scanner capable of picking up the signal. These receivers can be purchased at retail electronic and sporting good stores.

### NOAA WEATHER RADIO BANDS: CHANNEL FREQUENCIES (MHz)

1	162.400
2	162.425
3	162.450
4	162.475
5	162.500
6	162.525
7	162.550

# FLOODS

## THE AWESOME POWER



TO HELP AMERICA PREPARE FOR THE RAVAGES OF FLASH FLOODS AND FLOODS, THE NATIONAL WEATHER SERVICE HAS DESIGNED STORMREADY, TO ARM AMERICA'S COMMUNITIES WITH THE COMMUNICATION AND SAFETY SKILLS NECESSARY TO SAVE LIVES AND PROPERTY.

MORE INFORMATION IS AVAILABLE AT:  
[WWW.NWS.NOAA.GOV/STORMREADY](http://WWW.NWS.NOAA.GOV/STORMREADY)

## Community Preparedness Plans

After you have developed a personal/family safety plan, find out about your community safety plan. Each community prone to a flash flood/flood should develop a safety plan. Local officials should have detailed information for your immediate area. Please listen and follow their recommendations before, during, and after a storm.

The best way to prevent loss of life is to design and build communities where roads remain usable and undamaged during floods, and where homes and businesses are protected. While this may not always be possible, it is a goal we hope every community strives to reach.

**Protect yourself, your home, your family, and your financial future.**

### National Flood Insurance Program

One of the most important things you can do to protect your home and family before a flood is to purchase a flood insurance policy. You can obtain one through your insurance company or agent. Your agent can tell you whether the standard or preferred policy (for medium or low risk) is most appropriate for you. Flood insurance is backed by the National Flood Insurance Program (NFIP), administered by the Federal Emergency Management Agency. Your homeowners insurance does not cover flood damage. Everyone has some flood risk and anyone in a participating community is eligible. Don't wait until a flood is coming to purchase your policy. It normally takes 30 days after purchase for a flood insurance policy to go into effect. For more information about the NFIP and flood insurance, contact your insurance company or call the NFIP at 800.427.4661.

Check with your city or county government (start with the Building or Planning Office) to find out if you live in a participating community and what flood risk information is available where you live.

### What My Community Can Do

- Provide river and rainfall readings to emergency managers and the National Weather Service.
- Establish early warning procedures.
- Create and operate a Local Flood Warning System to identify areas vulnerable to flooding.
- Produce and follow the flood emergency plans.

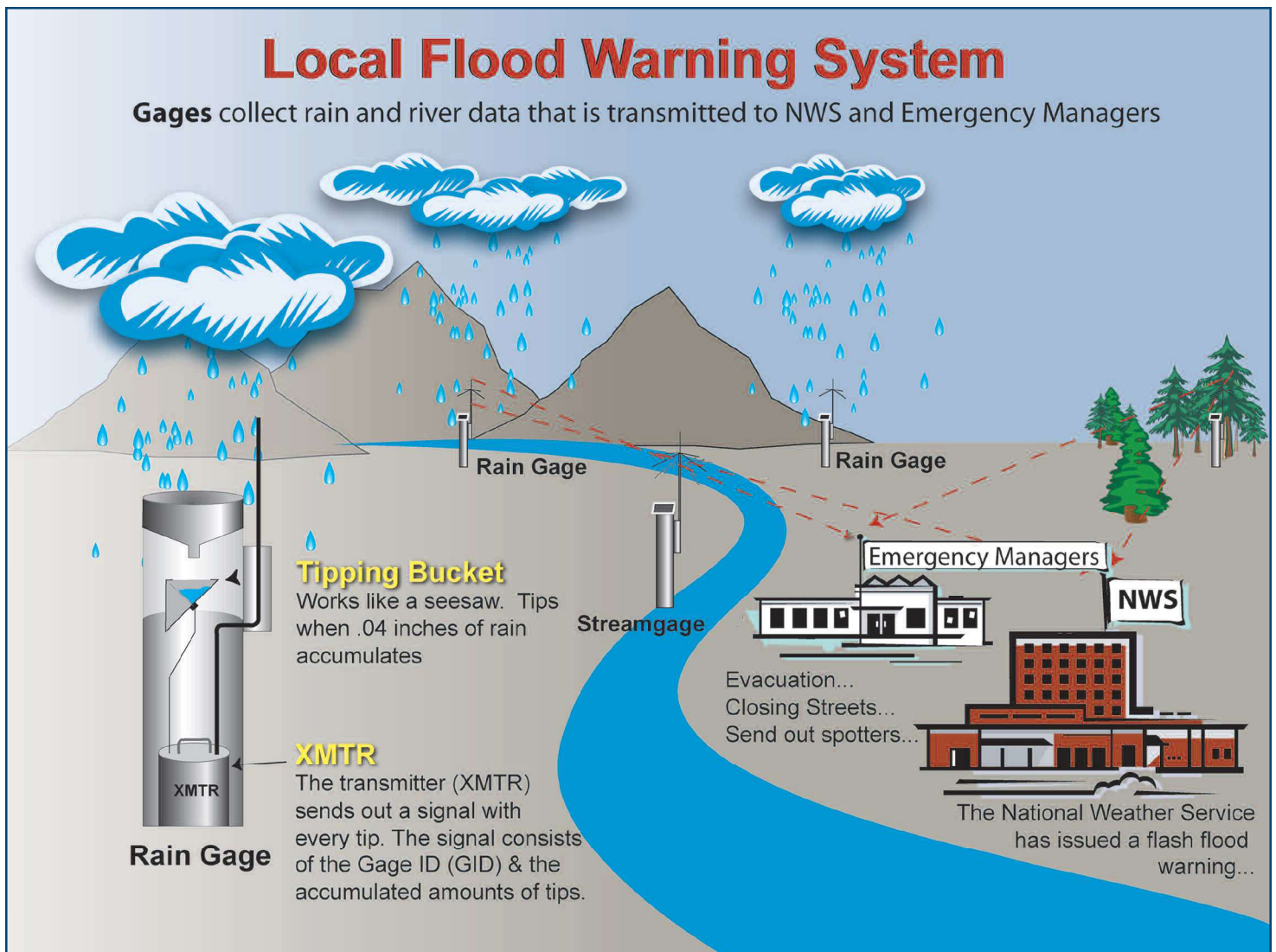
Contact your local emergency management agency or local National Weather Service office for further information on Local Flood Warning Systems, or visit:

[www.nws.noaa.gov/oh/docs/alfws-handbook](http://www.nws.noaa.gov/oh/docs/alfws-handbook)

## Streamgage Data Saves Lives

National Weather Service forecasters rely on a network of almost 10,000 streamgages to monitor the height of rivers and streams across the Nation. This information provides present river conditions and is the initial information needed to develop a river forecast. Most of the streamgages are maintained by the U.S. Geological Survey, the U.S. Army Corps of Engineers, and the Department of Agriculture. Some streamgages are read manually by dedicated volunteer observers. If you would like to volunteer as a cooperative observer, visit the web site at:  
<http://www.nws.noaa.gov/om/coop/become.htm>

Many communities nationwide have partnered with the National Weather Service and other federal agencies (e.g., U.S. Geological Survey and the U.S. Army Corps of Engineers) to implement dense networks of precipitation gages and streamgages to monitor and detect flooding in their community. These networks are often referred to as Local Flood Warning Systems.





# FLOODS

## THE AWESOME POWER



## What You Can Do Before the Flood...

### When you receive a Flood Watch:

- A Watch is issued when flooding is possible within the watch area. When a flood watch is issued, you should be aware of potential flood hazards. Everyone in a Watch area should be ready to respond and act quickly.
- Have an evacuation plan in place BEFORE flooding occurs. Flooded roads may cut off your escape route. Head for higher ground before the water becomes too deep. Remember—just six inches of rapidly flowing water can knock you off your feet. For information on how or what to do if you are advised to evacuate, visit the American Red Cross web page at: <http://www.redcross.org/services/disaster/be-prepared/evacuation.html>
- Know your flood risk and the elevation above which flooding occurs. Do streams or rivers near you flood easily? If so, be prepared to move to a safe place. Know your evacuation routes.
- Find out if you are located in a high, medium, or low flood risk area. Check with your city or county government to find out if your community is participating in the National Flood Insurance Program. Start with the Building or Planning Department to review the Flood Insurance Rate Maps, published by the Federal Emergency Management Agency.
- Develop an evacuation plan. Everyone in your family should know where to go if they have to leave.
- Discuss flood plans with your family. Everyone should know what to do in case all family members are not together. Discussing flood plans ahead of time helps reduce fear and anxiety and lets everyone know how to respond.
- Determine if the roads you normally travel to reach your home or job will be flooded during a storm. If so, look for alternative routes to use during flooding.
- Keep a NOAA Weather Radio All Hazards, a battery-powered portable radio, emergency cooking equipment, and flashlights in working order with extra batteries.
- Have a professional install check-valves in plumbing to prevent flood waters from backing up into the drains of your home.
- Keep your automobile fueled; if electric power is cut off, gas stations may not be able to operate pumps for days.
- Store drinking water in food-grade containers. Water service may be interrupted.
- Keep a stock of food requiring little cooking and no refrigeration; electric power may be interrupted.
- Keep first-aid supplies and prescription medicines on hand.

## Myth or Fact

### MYTH

A 100-year flood occurs only once every 100 years.

### MYTH

Flash floods mainly occur in the eastern United States.

### MYTH

Flash floods occur only along flowing streams.

### MYTH

Flash floods occur mainly in the late afternoon and evening.

### MYTH

Homeowners insurance policies cover flooding.

### MYTH

You can't buy flood insurance if your property has been flooded.

### MYTH

Larger vehicles, such as SUVs and pickups, are safe to drive through flood waters.

### FACT

The 100-year flood is a climactic average; there is a 1% chance that a 100-year flood will occur in any given year.

### FACT

Flash floods occur in all 50 states, including Alaska and Hawaii.

### FACT

Flash floods can occur in dry arroyos and urban areas where no streams are present.

### FACT

Many flash floods occur at night.

### FACT

Unfortunately, many homeowners do not find out until it is too late that their policies do not cover flooding. Contact your insurance company or agent to buy flood insurance.

### FACT

You are still eligible to purchase flood insurance after your home, apartment, or business has been flooded, provided your community is participating in the National Flood Insurance Program.

### FACT

Two feet of rushing water can carry away most vehicles including SUVs and pickups.

# FLOODS

## THE AWESOME POWER

DO NOT VISIT DISASTER AREAS  
FOLLOWING A FLOOD. YOUR PRESENCE  
MAY HAMPER URGENT EMERGENCY  
RESPONSE AND RESCUE OPERATIONS.



▲ Photo: Federal Emergency Management Agency

## What You Can Do During the Flood...

### When you receive a Flood Warning:

- If advised to evacuate, do so immediately! Families should use only one vehicle to avoid getting separated and reduce traffic jams. Move to a safe area before access is cut off by flood water. Continue listening to NOAA Weather Radio All Hazards, radio or television for information concerning the flooding.
- Don't drive if you don't have to.
- Get out of areas subject to flooding. This includes dips, low spots, canyons, washes, etc. Do not attempt to cross flowing streams.
- Never try to walk, swim, drive, or play in flood water. You may not be able to see how fast the flood water is moving or see holes or submerged debris.
- Do not camp or park your vehicle along streams and washes, particularly during threatening conditions.
- Be especially cautious at night when it is harder to recognize flood dangers.
- Do not attempt to drive through a flooded road. The depth of water is not always obvious. The road bed may be washed out under the water, and you could be stranded or trapped.
- Do not drive around a barricade. Barricades are there for your protection. Turn around and go another way!
- If the vehicle stalls, leave it immediately and move to higher ground. Rapidly rising water may engulf the vehicle and its occupants, sweeping them away. Vehicles can be swept away by as little as two feet of water.
- Children should NEVER play around high water, storm drains, viaducts, or arroyos. It is very easy to be swept away by fast-moving water.
- If you come upon a flowing stream where water is above your ankles, STOP! Turn around and go another way. Climb to higher ground. If it is moving swiftly, even water six inches deep can knock you off your feet. Many people are swept away wading through flood waters, resulting in injury or death.

## What You Can Do After the Flood...

- Get necessary medical care at the nearest hospital. The American Red Cross can help by providing shelters, food, water, and first aid, as well as helping you meet your immediate disaster-caused needs.
- Do not visit disaster areas. Your presence might hamper rescue and other emergency operations.
- If the power is out, use flashlights, not candles.
- Use flashlights, not lanterns, torches, or matches, to examine buildings. Flammables may be inside.
- Report broken utility lines to appropriate authorities.
- Boil drinking water before using. Wells should be pumped out and the water tested for purity before drinking. If in doubt, call your local public health authority.
- If fresh or canned food has come in contact with flood waters, throw it out.
- Take steps to reduce your risk of future floods. Make sure to follow local building codes and ordinances when rebuilding, and use flood-resistant materials and techniques to protect yourself and your property from future flood damage.



### Do You Have a Family Disaster Plan?

#### I. Gather Information About Hazards

Contact your local National Weather Service office, emergency management office, and American Red Cross chapter. Find out what types of disasters could occur and what you should do. Learn about your community's methods of warning people and evacuation plans. Ask your insurance agent about flood insurance. Find out what you can do to protect your home from the effects of natural hazards that could occur where you live. Meet with your family to create a plan.

Discuss the information you have gathered. Pick two places to meet: a spot outside your home for an emergency such as a fire, and a place away from your neighborhood in case you can't return home. Choose an out-of-town family member or friend as your family check-in contact for everyone to call if the family gets separated, and a backup out-of-neighborhood friend in case the first one does not answer. Discuss what you would do and how to do it if advised to evacuate.

#### II. Implement Your Plan

- Post emergency telephone numbers by phones and in address lists each person carries with them. Include cell phone numbers of family and contact-points.
- Install safety features in your home, such as smoke alarms and fire extinguishers.
- Inspect your home for potential hazards such as items that can move, fall, break, or catch fire, and correct them.
- Make physical changes that will make your home less vulnerable; install check-valves and hurricane shutters; strap the hot water heater to wall studs.
- Have your family learn basic safety skills such as CPR/Automated External Defibrillator (AED) and first aid; how to use a fire extinguisher; and how and when to turn off water, gas, and electricity at the main switches and valves. Know how to operate a NOAA Weather Radio All Hazards.
- Teach children how and when to call 9-1-1 or your local Emergency Medical Services number.
- Keep emergency supplies in your home sufficient for three days to a week, if your area has ever lost basic water, electricity and gas service for a week or longer. Assemble a disaster supplies kit with things you will need if you have to evacuate. Store these supplies in sturdy, easy-to-carry containers such as backpacks or duffel bags.
- Keep important family documents in a waterproof and fire-resistant container.
- Keep a smaller emergency kit with seasonal supplies, tools, and clothes in the trunk of your car.
- Each person who has a cell phone should carry it and keep it turned on to receive calls in any emergency situation.

#### III. Prepare a Disaster Supplies Kit to Include:

- At least a 3-day water supply (one gallon per person per day)
- Food that won't spoil
- One change of clothing and footwear per person
- One blanket or sleeping bag per person
- First aid kit
- Prescription medicines
- Emergency tools
- Battery-powered NOAA Weather Radio All Hazards
- Portable radio
- Flashlight with extra batteries
- Extra set of car keys
- Cash and credit card
- Special items for infant, elderly, and disabled family members
- Map of local area

#### Local Sponsorships



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NOAA/PA 200467

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## **PART 3**

# **Hurricane Safety & Tropical Cyclone Inland Flooding**





# Weather Safety: Hurricanes

## Safety and Preparedness Fact Sheet

### Before the Hurricane Season

- ▶ Determine safe evacuation routes inland.
- ▶ Learn location of official shelters.
- ▶ Make emergency plans for pets.
- ▶ Check emergency equipment, such as flashlights, generators and battery-powered NOAA Weather Radio All Hazards and cell phones.
- ▶ Buy food that will keep and store drinking water.
- ▶ Buy plywood or other material to protect your home.
- ▶ Clear loose and clogged rain gutters and downspouts.
- ▶ Trim trees and shrubbery.
- ▶ Decide where to move your boat in an emergency.
- ▶ Review your insurance policy.

### During the Storm

#### When in a **Watch** area...

- ▶ Listen frequently to radio, TV or NOAA Weather Radio All Hazards for bulletins of a storm's progress.
- ▶ Fuel and service your vehicles.
- ▶ Inspect and secure mobile home tie-downs.
- ▶ Board up windows in case the storm moves quickly and you have to evacuate.
- ▶ Stock up on batteries, food that will keep, first aid supplies, drinking water and medications.
- ▶ Store lawn furniture and other loose, light-weight objects, such as garbage cans and garden tools.
- ▶ Have cash on hand in case power goes out and ATMs don't work.

#### Plan to evacuate if you...

- ▶ Live in a mobile or manufactured home. They are unsafe in high winds no matter how well fastened to the ground.
- ▶ Live on the coastline, an offshore island or near a river or flood plain. In addition to wind, flooding from storm surge waves is a major killer.
- ▶ Live in a high-rise. Hurricane winds can knock out electricity to elevators, break windows and more.

#### When in a **Warning** area...

- ▶ Closely monitor radio, TV or NOAA Weather Radio All Hazards for official bulletins.

### TERMS TO KNOW

**Hurricane Watch:** Hurricane conditions are possible within the specified coastal area. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane watch is issued 48 hours in advance of the anticipated onset of tropical-storm-force winds.

**Hurricane Warning:** Hurricane conditions are expected in the specified area of the warning. Because hurricane preparedness activities become difficult once winds reach tropical storm force, the hurricane warning is issued 36 hours in advance of the anticipated onset of tropical-storm-force winds.

**Tropical Storm Watches and Warnings:** Take these alerts seriously. Although Tropical Storms have lower wind speeds than hurricanes, They often bring life-threatening flooding and dangerous winds. Take precautions!

- ▶ Close storm shutters.
- ▶ Follow instructions issued by local officials. **Leave immediately if ordered!**
- ▶ If evacuating, leave as soon as possible. Stay with friends or relatives, at a low-rise inland motel or at a designated public shelter outside the flood zone.
- ▶ DO NOT stay in a mobile or manufactured home.
- ▶ Notify neighbors and a family member outside of the warned area of your evacuation plans.
- ▶ Take pets with you if possible, but remember, most public shelters do not allow pets other than those used by the handicapped. Identify pet-friendly motels along your evacuation route.

### If Staying in a Home...

- ▶ Turn refrigerator to maximum cold and keep closed.
- ▶ Turn off utilities if told to do so by authorities.
- ▶ Turn off propane tanks.
- ▶ Unplug small appliances.
- ▶ Fill bathtub and large containers with water in case tap water is unavailable. Use water in bathtubs for cleaning and flushing only. Do NOT drink it.

# Weather Safety: Hurricanes

## If Winds Become Strong...

- ▶ Stay away from windows and doors, even if covered. Take refuge in a small interior room, closet or hallway.
- ▶ Close all interior doors. Secure and brace external doors.
- ▶ If you are in a two story house, go to an interior 1st floor room.
- ▶ If you are in a multi-story building and away from



water, go to the 1st or 2nd floor and stay in the halls or other interior rooms away from windows.

- ▶ Lie on the floor under a table or other sturdy object.

## Be Alert For...

- ▶ Tornadoes: They are often spawned by hurricanes.
- ▶ The calm “eye” of the storm. It may seem like the storm is over but after the eye passes, the winds will change direction and quickly return to hurricane force.

## After the Storm

- ▶ Keep listening to radio, TV or NOAA Weather Radio.
- ▶ Wait until an area is declared safe before entering.
- ▶ Watch for closed roads. If you come upon a barricade or a flooded road, **Turn Around Don't Drown!**<sup>TM</sup>
- ▶ Avoid weakened bridges and washed out roads.
- ▶ Stay on firm ground. Moving water only 6 inches deep can sweep you off your feet. Standing water may be electrically charged from power lines.

## What to Bring to the Shelter

- First aid kit
- Medicine, prescriptions
- Baby food and diapers
- Games, books, music players with headphones
- Toiletries
- Battery-powered radio and cell phone
- Flashlights
- Extra batteries
- A blanket or sleeping bag for each person
- Identification
- Copies of key papers such as insurance policies
- Cash, credit card

**REMINDER: If you are told to leave, do so immediately!**

- ▶ Once home, check gas, water and electrical lines and appliances for damage.
- ▶ Use a flashlight to inspect for damage. Never use candles and other open flames indoors.
- ▶ Do not drink or prepare food with tap water until officials say it is safe.
- ▶ If using a generator, avoid electrocution by following manufacturers instructions and standard electric code.

NWS hurricane links, forecasts, assessments:

<http://www.weather.gov/os/hurricane>

NOAA Weather Radio All Hazards:

<http://www.weather.gov/nwr>

National Hurricane Center:

<http://www.nhc.noaa.gov>

Central Pacific Hurricane Center:

<http://weather.gov/cphc>

NOAA Hurricane Website

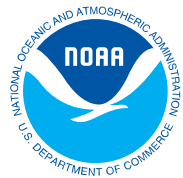
<http://hurricanes.noaa.gov/>

American Red Cross:

<http://www.redcross.org>

Federal Emergency Management Agency:

<http://www.fema.gov>



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## **PART 4**

# **Winter Storms & A Guide For Winter Travel**



# WINTER STORMS

## THE DECEPTIVE KILLERS



## A PREPAREDNESS GUIDE

U.S. DEPARTMENT OF COMMERCE  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL WEATHER SERVICE

DECEMBER 2001



 **American  
Red Cross**

# WINTER STORMS

## THE DECEPTIVE KILLERS

This preparedness guide explains the dangers of winter weather and suggests life-saving action **YOU** can take. With this information, **YOU** can recognize winter weather threats, develop an action plan and be ready when severe winter weather threatens. Remember...your safety is up to **YOU**.

### WHY TALK ABOUT WINTER WEATHER?

- Each year, dozens of Americans die due to exposure to cold. Add to that number, vehicle accidents and fatalities, fires due to dangerous use of heaters and other winter weather fatalities and you have a significant threat.
- Threats, such as hypothermia and frostbite, can lead to loss of fingers and toes or cause permanent kidney, pancreas and liver injury and even death. You must prepare properly to avoid these extreme dangers. You also need to know what to do if you see symptoms of these threats.
- A major winter storm can last for several days and be accompanied by high winds, freezing rain or sleet, heavy snowfall and cold temperatures.
- People can become trapped at home or in a car, without utilities or other assistance.
- Attempting to walk for help in a winter storm can be a deadly decision.
- The aftermath of a winter storm can have an impact on a community or region for days, weeks or even months.
- Extremely cold temperatures, heavy snow and coastal flooding can cause hazardous conditions and hidden problems.



*James Wiesmueller*

### FOR MORE INFORMATION

Contact your local National Weather Service (NWS) office, American Red Cross chapter or local emergency management agency for more weather-related brochures.

You can find more information on flash flooding in the *Flash Floods and Floods...The Awesome Power* brochure. Contact your local Red Cross chapter or NWS office for copies. You can download a copy at the NWS Web site below. To find additional materials on winter safety, try the following Web sites:

**NWS:** [www.nws.noaa.gov](http://www.nws.noaa.gov)

**FEMA:** [www.fema.gov](http://www.fema.gov)

**Red Cross:** [www.redcross.org](http://www.redcross.org)





# HEAVY SNOW

Heavy snow can immobilize a region and paralyze a city, stranding commuters, closing airports, stopping the flow of supplies, and disrupting emergency and medical services. Accumulations of snow can cause roofs to collapse and knock down trees and power lines. Homes and farms may be isolated for days and unprotected livestock may be lost. In the mountains, heavy snow can lead to avalanches. The cost of snow removal, repairing damages, and the loss of business can have severe economic impacts on cities and towns.



*Before and after photo at Mt. Baker, WA, Ski Summit. Early June snow depth in 1999 measured 228 inches. The world record seasonal snowfall of 1,141 inches was recorded at Mt. Baker that year. Photos courtesy of Mt. Baker Ski Area.*



**BLIZZARD:** Winds of 35 mph or more with snow and blowing snow reducing visibility to less than  $\frac{1}{4}$  mile for at least 3 hours.

**BLOWING SNOW:** Wind-driven snow that reduces visibility. Blowing snow may be falling snow and/or snow on the ground picked up by the wind.

**SNOW SQUALLS:** Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant.

**SNOW SHOWERS:** Snow falling at varying intensities for brief periods of time. Some accumulation is possible.

**SNOW FLURRIES:** Light snow falling for short durations with little or no accumulation.

## Injuries Due To Ice and Snow

- About 70% result from vehicle accidents
- About 25% occur in people caught out in a storm
- Most happen to males over 40 years old

An avalanche is a mass of tumbling snow. More than 80 percent of midwinter avalanches are triggered by a rapid accumulation of snow, and 90 percent of those occur within 24 hours of snowfall. An avalanche may reach a mass of a million tons and travel at speeds up to 200 mph.



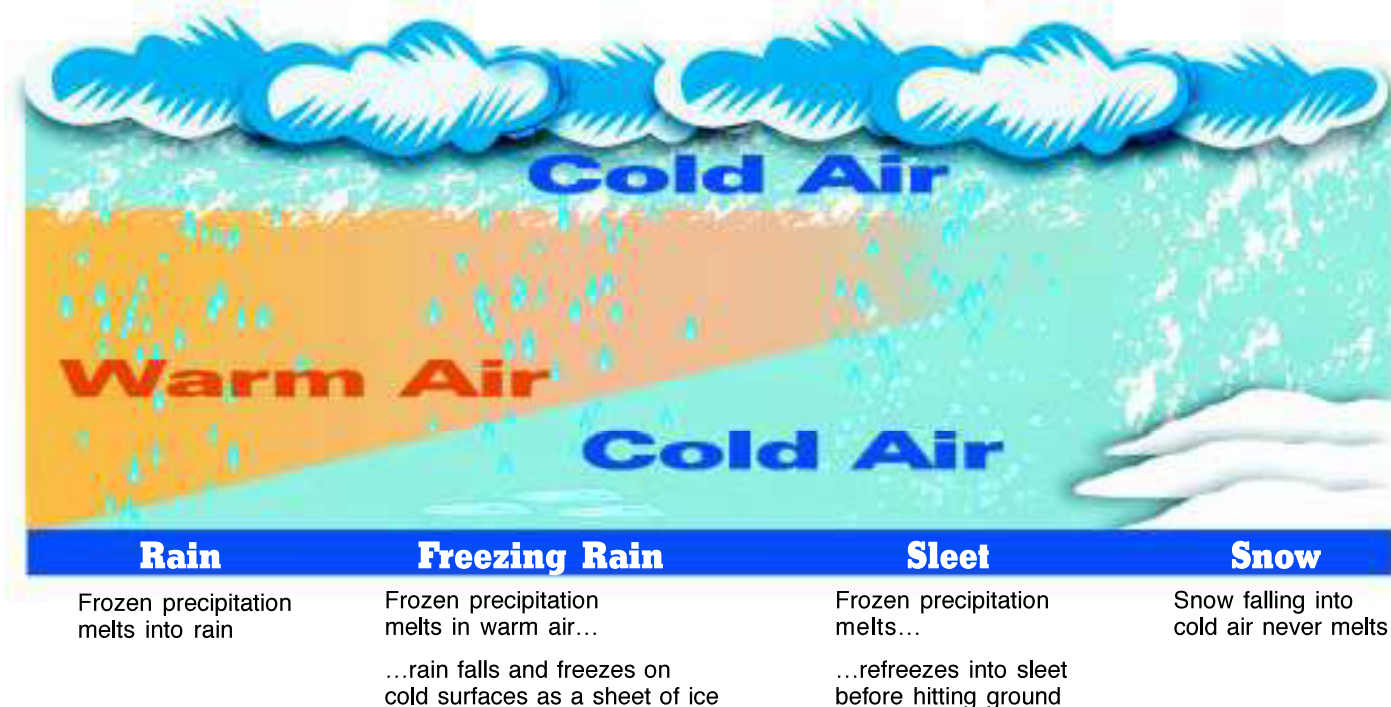
NWS





# ICE

Heavy accumulations of ice can bring down trees and topple utility poles and communication towers. Ice can disrupt communications and power for days while utility companies repair extensive damage. Even small accumulations of ice can be extremely dangerous to motorists and pedestrians. Bridges and overpasses are particularly dangerous because they freeze before other surfaces.



## WINTER FLOODING

Winter storms can generate coastal flooding, ice jams and snow melt, resulting in significant damage and loss of life.

**COASTAL FLOODS:** Winds generated from intense winter storms can cause widespread tidal flooding and severe beach erosion along coastal areas.

**ICE JAMS:** Long cold spells can cause rivers and lakes to freeze. A rise in the water level or a thaw breaks the ice into large chunks which become jammed at man made and natural obstructions. Ice jams can act as a dam, resulting in severe flooding.

**SNOW MELT:** Sudden thaw of a heavy snow pack often leads to flooding.



*Large wave action in Marquette Harbor, MI/Jack Pellet*



*Ship survey of ice in shipping channels/NOAA*



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## PART 5

# Heat Wave Safety

# Heat Wave Safety

## WHAT IS A HEAT WAVE?

A heat wave is a prolonged period of excessive heat and humidity.

In Central Texas, extreme heat waves have become more common over the last decade.

The summer of 2011 was the hottest on record across Texas. In Austin, there were 90 days in which afternoon high temperatures reached or exceeded 100 degrees – one of the many all-time heat records broken during the summer. It was an incredible feat, considering the average number of 100 degree days is only 12.

The National Weather Service steps up its procedures to alert the public during these periods of excessive heat and humidity. Excessive heat kills more people in the U.S. than tornadoes, hurricanes, floods, and lightning combined.

In a normal year, approximately 175 Americans die from extreme heat. Young children, elderly people, and those who are sick or overweight are more likely to become victims. Between 1936 and 1975, nearly 20,000 people succumbed to the effects of heat and solar radiation. Because men sweat more than women, men are more susceptible to heat illness because they become more quickly dehydrated.

The elderly, very young, obese and those who work outdoors or have substance abuse issues are most at risk from succumbing to heat. Additionally, people in urban areas are more susceptible as asphalt and cement tend to hold in heat throughout the night.

## WHAT TO DO IN A HEAT WAVE

Although it may sound like common sense, the best way to avoid the effects of heat is to slow down and avoid strenuous activity. If you must do strenuous activity, do it in the coolest part of the day, which is usually morning between 4 a.m. and 7 a.m.

Stay indoors as much as possible. If air conditioning is not available, stay on the lowest floor, out of sunshine.

Drink plenty of water regularly and often, even if you don't feel thirsty. Generally, you should follow the "8 x 8 rule" – drink eight 8-ounce glasses of water a day.

If you exercise or engage in any activity that makes you sweat, you need to drink extra water to compensate for the fluid loss. An extra 1.5 to 2.5 cups of water should suffice for short bouts of exercise, but intense exercise lasting more than an hour (for example, running a marathon) requires more fluid intake. How much additional fluid you need depends on how much you sweat during exercise and the type of activity you've engaged in.



# Heat Wave Safety

During long bouts of intense exercise, it's best to use a sports drink that contains sodium, as this will replace sodium lost in sweat and reduce the chances of developing hyponatremia, which can be life-threatening. Also, continue to replace fluids after you're finished exercising.

Avoid alcohol and caffeine as they can intensify the heat's affect on your body. This is especially true about beer because it accelerates dehydration.

Wear lightweight, light-colored clothing. Light colors will reflect away some of the sun's energy.

Never leave children or pets in the car, even with the windows down. When the outside temperature is only 83 degrees Fahrenheit, and you window is down two inches, the temperature inside your car can reach 109 degrees Fahrenheit in 15 minutes.

Avoid using salt tablets unless directed to do so by a physician.

## WARNING SIGNS OF DANGER

### HEAT CRAMPS

Heat cramps are muscular pains and spasms due to heavy exertion. Although heat cramps are the least severe, they are an early signal that the body is having trouble with the heat.

### HEAT EXHAUSTION

Heat exhaustion typically occurs when people exercise heavily or work in a hot, humid place where body fluids are lost through heavy sweating. Blood flow to the skin increases, causing blood flow to decrease to the vital organs. This results in a form of mild shock. If not treated, the victim may suffer heat stroke. Symptoms: Cool, moist, pale, or flushed skin; heavy sweating; headache; nausea or vomiting; dizziness; and exhaustion. Body temperature will be near normal.

### HEAT STROKE

Heat stroke is a life-threatening. The victim's temperature control system, which produces sweating to cool the body, stops working. The body temperature can rise so high that brain damage and death may result if the body is not cooled quickly. Symptoms: Hot, red skin; changes in consciousness; rapid, weak pulse; and rapid, shallow breathing. Body temperature can be very high – as high as 105° F. If the person was sweating from heavy work or exercise, skin may be wet; otherwise, it will feel dry.

### HEAT STROKE

Another term for heat stroke.

## HOW TO HANDLE HEAT ISSUES

### HEAT CRAMPS

Get the person to a cooler place and have him or her rest in a comfortable position. Lightly stretch the affected muscle and replenish fluids. Give a half glass of cool water every 15 minutes. Do not give liquids with alcohol or caffeine in them, as they can make conditions worse.

### HEAT EXHAUSTION

Get the person out of the heat and into a cooler place. Remove or loosen tight clothing and apply cool, wet cloths, such as towels or sheets. If the person is conscious, give cool water to drink. Make sure the person drinks slowly. Give a half glass of cool water every 15 minutes. Do not give liquids that contain alcohol or caffeine. Let the victim rest in a comfortable position, and watch carefully for changes in his or her condition.

### HEAT STROKE

Heat stroke is a life-threatening situation. Help is needed fast. Call 9-1-1 or your local emergency number. Move the person to a cooler place. Quickly cool the body. Immerse victim in a cool bath, or wrap wet sheets around the body and fan it. Watch for signals of breathing problems. Keep the person lying down and continue to cool the body any way you can. If the victim refuses water or is vomiting or there are changes in the level of consciousness, do not give anything to eat or drink.

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**PART 6**

**Wildfire Action Guide**



# READY, SET, GO!

YOUR PERSONAL WILDLAND FIRE ACTION GUIDE



Photo by: Deanna Roy





# READY, SET, GO!

## Wildland Fire Action Guide

Saving Lives and Property  
through Advance Planning



Central Texas has been placed on the worldwide map as a wildfire disaster area with the advent of the Labor Day fires of 2011. We now share similar horrific stories of home losses and precious watersheds destroyed with areas like Colorado, California and the Mediterranean. The leadership of the Austin/Travis County area organized this action guide to provide you with the tips and tools you need to prepare for a wildland fire threat; have situational awareness when a fire starts; and to leave early.

The Wildland Urban Interface (WUI) is the fastest growing fire problem in the United States. Wildland fires directly threaten lives, houses, water supply, utilities, recreation resources, cultural icons, endangered species, commerce, and transportation systems. As people continue to build houses in high-risk areas, the danger only increases.

We are committed to helping our friends and neighbors prepare for and stay safe in a wildland fire situation. Successfully preparing for a wildland fire enables you to take personal responsibility for protecting yourself, your family and your property. The Ready, Set, Go! Program works in complementary and collaborative fashion with the Firewise® Communities Program and other existing wildland fire public education efforts.

Fire is, and always has been, a natural occurrence in the wildland. Our hills, canyons and forests burned periodically long before we built homes there. Wildland fires, fueled by a build-up of dry vegetation and driven by seasonal hot dry winds, are extremely dangerous and difficult to control. Many residents have built homes and landscaped without fully understanding the impact a fire can have on them and few have adequately prepared their families for a quick evacuation.



It's not a question of if, but when the next major wildland fire will occur. Through advance planning, understanding and preparation, we can all be partners in the wildland fire solution. We hope you find the tips in the following pages helpful in creating heightened awareness and a more fire-safe environment for you, your family and firefighters.

For additional information from local sources visit:

<http://www.austinhsem.com>

<http://www.co.travis.tx.us>

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This publication was prepared by the RSG Program with the assistance of the City of Austin and Travis County in cooperation with the International Association of Fire Chiefs; The U.S. Forest Service; U.S. Department of the Interior Bureau of Land Management; and the U.S. Fire Administration. To learn more about the Ready, Set, Go! Program and its partners, visit, [www.wildlandfireRSG.org](http://www.wildlandfireRSG.org).



# Living in the Wildland Urban Interface and the Ember Zone

Ready, Set, Go! begins with a house that firefighters can defend

## Defensible Space Works!

If you live next to a natural area, the Wildland Urban Interface, you should provide firefighters with the defensible space they need to protect your home. The buffer zone you create by removing weeds, brush and other vegetation helps keep the fire away from your home and reduces the risk from flying embers. Firewise Communities and other wildland fire preparedness education programs provide valuable guidance on property enhancements.



A home within one mile of a natural area is in the Ember Zone. Wind-driven embers can attack your home. You and your home must be prepared well before a fire occurs. Ember fires can destroy homes or neighborhoods far from the actual flame front of the wildland fire.





# What is Defensible Space?

Defensible space is the required space between a structure and the wildland area that, under normal conditions, creates a sufficient buffer to slow or halt the spread of wildfire to a structure. It protects the home from igniting due to direct flame or radiant heat. Defensible space is essential for structure survivability during wildland fire conditions. For more information about defensible space zones and preparedness techniques within each, visit the Firewise Communities' website, [www.firewise.org](http://www.firewise.org).

## ZONE ONE

Zone One extends 30 feet out from buildings, structures, decks, etc.

- Remove all dead or dying vegetation.
- Trim tree canopies regularly to keep their branches a minimum of 10 feet from structures and other trees.
- Remove leaf litter (dry leaves or duff) from yard, roof and rain gutters.
- Relocate woodpiles or other combustible materials into Zone Two.
- Remove combustible material and vegetation from around and under decks.
- Remove or prune vegetation near windows.
- Remove "ladder fuels" (low-level vegetation that allows the fire to spread from the ground to the tree canopy). Create a separation between low-level vegetation and tree branches. This can be done by reducing the height of low-level vegetation and/or trimming low tree branches.

## ZONE TWO

Zone Two extends 30 to 100 feet out from buildings, structures and decks. You can minimize the chance of fire jumping from plant to plant by removing dead material and thinning vegetation.

- Remove "ladder fuels."
- Cut or mow annual grass down to a maximum height of 4 inches.
- Trim tree canopies regularly to reduce continuity between branches and dense underbrush.



# What is a Hardened Home?

Construction materials and the quality of the defensible space surrounding it are what gives a home the best chance to survive a wildland fire. Embers from a wildland fire will find the weak link in your home's fire protection scheme and gain the upper hand because of a small, overlooked or seemingly inconsequential factor. However, there are measures you can take to safeguard your home from wildland fire. While you may not be able to accomplish all the measures listed below, each will increase your home's, and possibly your family's safety and survival during a wildland fire.

## ROOFS

Roofs are the most vulnerable surface where embers land because they can lodge and start a fire. Roof valleys, open ends of barrel tiles and rain gutters are all points of entry.

## EAVES

Embers can gather under open eaves and ignite exposed wood or other combustible material.

## VENTS

Embers can enter the attic or other concealed spaces and ignite combustible materials. Vents in eaves and cornices are particularly vulnerable, as are any unscreened vents.

## WALLS

Combustible siding or other combustible or overlapping materials provide surfaces or crevices for embers to nestle and ignite.

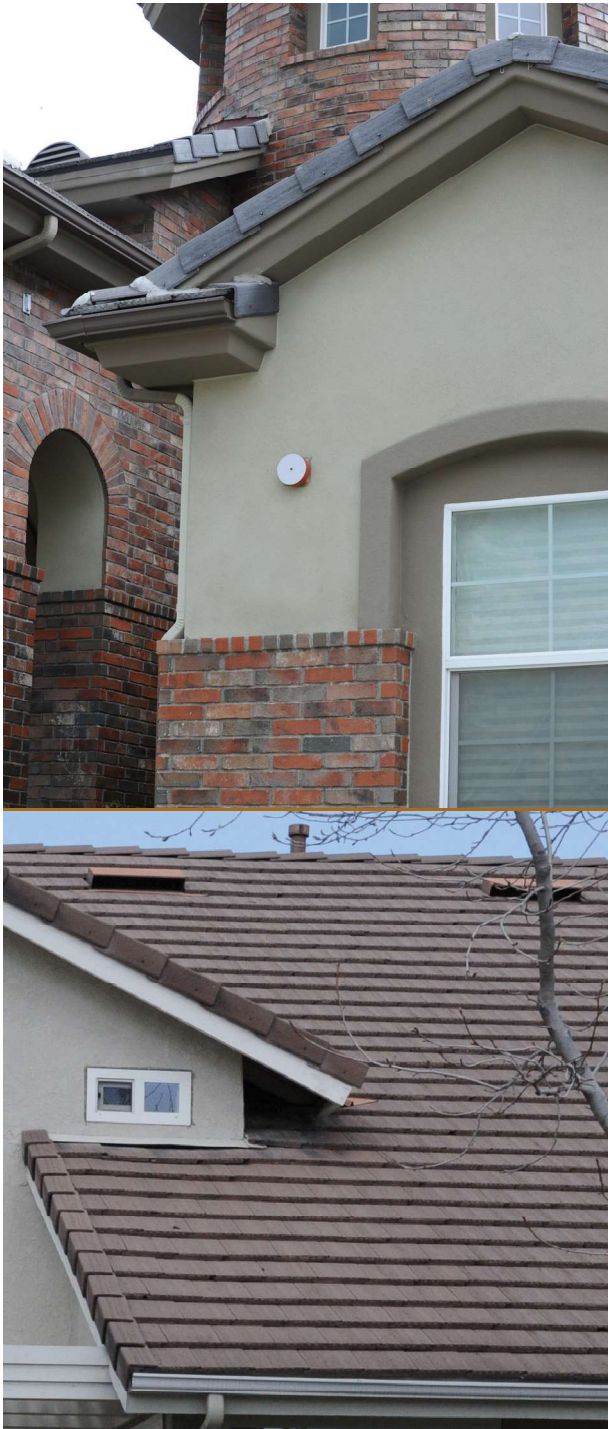
## WINDOWS and DOORS

Embers can enter gaps in doors, including garage doors. Plants or combustible storage near windows can be ignited from embers and generate heat that can break windows and/or melt combustible frames.

## BALCONIES and DECKS

Embers can collect in or on combustible surfaces or the undersides of decks and balconies, ignite the material and enter the home through walls or windows.

To harden your home even further, consider protecting your home with a residential fire sprinkler system. In addition to extinguishing a fire started by an ember that enters your home, it also protects you and your family year-round from any fire that may start in your home.





# Wildland Fire

## Home Site and Yard:

Perform a FIREWISE assessment of your home.

Landscape with fire-resistant plants that have a high moisture content and are low-growing.

Keep woodpiles, propane tanks and combustible materials away from your home and other structures such as garages, barns and sheds.

Ensure that trees are far away from power lines.

Enclose decks to prevent accumulation of leaves, needles and debris. Include metal screen with 1/8" mesh opening to prevent sparks from getting under the deck.

Trim landscaping to reduce downed and dead material.

**Inside:** Keep working fire extinguishers on hand.

Install smoke alarms on each level of your home and near bedrooms. Test them monthly and change the batteries twice a year.

**Address:** Make sure your address is clearly visible from the road.

**Roof:** Your roof is the most vulnerable part of your home because it can easily catch fire from wind-blown embers. Homes with wood-shake or shingle roofs are at high risk of being destroyed during a wildland fire.

Build your roof or re-roof with fire-resistant materials such as composition, metal or tile. Block any spaces between roof decking and covering to prevent ember intrusion.

Clear leaves and other debris from your roof and gutters.

**Vents:** Vents on homes are particularly vulnerable to flying embers.

All vent openings should be covered with 1/4-inch or smaller metal mesh. Do not use fiberglass or plastic mesh because they can melt and burn.

Attic vents in eaves or cornices should be baffled or otherwise protected to prevent ember intrusion (mesh is not enough).

**Windows:** Heat from a wildland fire can cause windows to break even before the home ignites. This allows burning embers to enter and start internal fires. Single-paned and large windows are particularly vulnerable.


Install dual-paned windows with the exterior pane of tempered glass to reduce the chance of breakage in a fire.

Limit the size and number of windows in your home that face large areas of vegetation.

**Walls:** Wood products, such as boards, panels or shingles, are common siding materials. However, they are combustible and not good choices for fire-prone areas.

Build or remodel with fire-resistant building materials, such as brick, cement board, masonry, cement or stucco. Be sure to extend materials from foundation to roof.





**Garage:** Have a fire extinguisher and tools such as a shovel, rake, bucket and hoe available for fire emergencies.

Install a solid door with self-closing hinges between living areas and the garage. Install weather stripping around and under door to prevent ember intrusion.

Store all combustibles and flammable liquids away from ignition sources.

**Driveways and Access Roads:** Driveways should be designed to allow fire and emergency vehicles and equipment to reach your house.

Access roads should have a minimum 10-foot clearance on either side of the traveled section of the roadway and should allow for two-way traffic.

Ensure that all gates open inward and are wide enough to accommodate emergency equipment.

Trim trees and shrubs overhanging the road to a minimum of 13 1/2 feet to allow emergency vehicles to pass.

**Non-Combustible Fencing:** Make sure to use non-combustible fencing to protect your home during a wildland fire.

If you have a wood fence attached to your house, install a metal shield between the fence and your home.

**Non-Combustible Boxed In Eaves:** Box in eaves with non-combustible materials to prevent accumulation of embers.

**Rain gutters:** Screen or enclose rain gutters to prevent accumulation of plant debris.

**Water Supply:** Have multiple garden hoses that are long enough to reach any area of your home and other structures on your property. Have hoses on all four corners of your home to help firefighters defend your home.

If you have a pool or well, consider a pump.

**Chimney:** Cover your chimney and stovepipe outlets with a non-flammable screen of 1/4-inch wire mesh or smaller to prevent embers from escaping and igniting a fire.

Make sure that your chimney is at least 10 feet away from any tree branches.

**Deck/Patio Cover:** Use heavy timber or non-flammable construction material for decks.

Enclose the underside of balconies and decks with fire-resistant materials to prevent embers from blowing underneath.

Keep your deck clear of combustible items, such as baskets, dried flower arrangements and other debris.

The decking surface must be ignition resistant if it's within 10 feet of the home.



# READY, SET, GO!

## Create Your Own Action Guide

Now that you've done everything you can to protect your house, it's time to prepare your family. Your **Wildland Fire Action Guide** must be prepared with all members of your household well in advance of a fire. Use these checklists to help you gain a situational awareness of the threat and to prepare your Wildland Fire Action Guide. For more information on property and home preparedness before a fire threat, review the preparedness checklist on the Firewise Communities' website, [www.firewise.org](http://www.firewise.org).

## Ready – Preparing for the Fire Threat



- ☐ Create a **Family Disaster Plan** that includes meeting locations and communication plans and rehearse it regularly. Include in your plan the evacuation of large animals such as horses.
- ☐ Have fire extinguishers on hand and train your family how to use them.
- ☐ Ensure that your family knows where your gas, electric and water main shut-off controls are and how to use them.
- ☐ Plan several different evacuation routes.
- ☐ Designate an emergency meeting location outside the fire hazard area.
- ☐ Assemble an emergency supply kit as recommended by the American Red Cross.
- ☐ Appoint an out-of-area friend or relative as a point of contact so you can communicate with family members who have relocated.
- ☐ Maintain a list of emergency contact numbers posted near your phone and in your emergency supply kit.
- ☐ Keep an extra emergency supply kit in your car in case you can't get to your home because of fire.
- ☐ Have a portable radio or scanner so you can stay updated on the fire.

# Set – Situational Awareness when a Fire Starts

- ☐ Evacuate as soon as you are set!
- ☐ Alert family and neighbors.
- ☐ Dress in appropriate clothing (i.e., clothing made from natural fibers, such as cotton, and work boots). Have goggles and a dry bandana or particle mask handy.
- ☐ Ensure that you have your emergency supply kit on hand that includes all necessary items, such as a battery powered radio, spare batteries, emergency contact numbers, and ample drinking water.
- ☐ Stay tuned to your TV or local radio stations for updates, or check the fire department Web site.
- ☐ Remain close to your house, drink plenty of water and keep an eye on your family and pets until you are ready to leave.

## INSIDE CHECKLIST

- ☐ Shut all windows and doors, leaving them unlocked.
- ☐ Remove flammable window shades and curtains and close metal shutters.
- ☐ Remove lightweight curtains.
- ☐ Move flammable furniture to the center of the room, away from windows and doors.
- ☐ Shut off gas at the meter. Turn off pilot lights.
- ☐ Leave your lights on so firefighters can see your house under smoky conditions.
- ☐ Shut off the air conditioning.



## OUTSIDE CHECKLIST

- ☐ Gather up flammable items from the exterior of the house and bring them inside (e.g., patio furniture, children's toys, door mats, etc.) or place them in your pool.
- ☐ Turn off propane tanks. Small tanks can be removed or drained.
- ☐ Don't leave sprinklers on or water running - they can waste critical water pressure.
- ☐ Leave exterior lights on.
- ☐ Back your car into the driveway. Shut doors and roll up windows.
- ☐ Have a ladder available.
- ☐ Patrol your property and extinguish all small fires until you leave.
- ☐ Seal attic and ground vents with pre-cut plywood or commercial seals if time permits.

## IF YOU ARE TRAPPED: SURVIVAL TIPS

- ☐ Shelter away from outside walls.
- ☐ Bring garden hoses inside house so embers don't destroy them.
- ☐ Patrol inside your home for spot fires and extinguish them.
- ☐ Wear long sleeves and long pants made of natural fibers such as cotton.
- ☐ Stay hydrated.
- ☐ Ensure you can exit the home if it catches fire (remember if it's hot inside the house, it is four to five times hotter outside).
- ☐ Fill sinks and tubs for an emergency water supply.
- ☐ Place wet towels under doors to keep smoke and embers out.
- ☐ After the fire has passed, check your roof and extinguish any fires, sparks or embers.
- ☐ Check inside the attic for hidden embers.
- ☐ Patrol your property and extinguish small fires.
- ☐ If there are fires that you cannot extinguish with a small amount of water or in a short period of time, call 9-1-1.



# Go – Leave Early

By leaving early, you give your family the best chance of surviving a wildland fire. You also help firefighters by keeping roads clear of congestion, enabling them to move more freely and do their job in a safer environment.

## WHEN TO LEAVE

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Leave early enough to avoid being caught in fire, smoke or road congestion. Don't wait to be told by authorities to leave. In an intense wildland fire, they may not have time to knock on every door. If you are advised to leave, don't hesitate!

## WHERE TO GO

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Leave to a predetermined location (it should be a low-risk area, such as a well-prepared neighbor or relative's house, a Red Cross shelter or evacuation center, motel, etc.)

## HOW TO GET THERE

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Have several travel routes in case one route is blocked by the fire or by emergency vehicles and equipment. Choose an escape route away from the fire.

## WHAT TO TAKE

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Take your emergency supply kit containing your family and pet's necessary items.

## EMERGENCY SUPPLIES

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The American Red Cross recommends every family have an emergency supply kit assembled long before a wildland fire or other emergency occurs. Use the checklist below to help assemble yours. For more information on emergency supplies, visit the American Red Cross Web site at [www.redcross.org](http://www.redcross.org).

- ☐ Three-day supply of water (one gallon per person per day).
- ☐ Non-perishable food for all family members and pets (three-day supply).
- ☐ First aid kit.
- ☐ Flashlight, battery-powered radio, and extra batteries.
- ☐ An extra set of car keys, credit cards, cash or traveler's checks.
- ☐ Sanitation supplies.
- ☐ Extra eyeglasses or contact lenses.
- ☐ Important family documents and contact numbers.
- ☐ Map marked with evacuation routes.
- ☐ Prescriptions or special medications.
- ☐ Family photos and other irreplaceable items.
- ☐ Easily carried valuables.
- ☐ Personal computers (information on hard drives and disks).
- ☐ Chargers for cell phones, laptops, etc.

Note: Keep a pair of old shoes and a flashlight handy in case of a sudden evacuation at night.



Write up your Wildland Fire Action Guide and post it in a location where every member of your family can see it. Rehearse it with your family.

## My Personal Wildland Fire Action Guide

During High Fire Danger days in your area, monitor your local media for information and be ready to implement your plan. Hot, dry and windy conditions create the perfect environment for a wildland fire. A list of current incidents can be found at <http://www.ci.austin.tx.us/fact/default.cfm>

### Important Phone Numbers:

Out-of-State Contact: \_\_\_\_\_ Phone: \_\_\_\_\_

Work: \_\_\_\_\_

School: \_\_\_\_\_

Other: \_\_\_\_\_

Evacuation Routes: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Where to Go: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Location of Emergency Supply Kit: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Notes: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_





# READY, SET, GO!

## Residential Safety Checklist Tips To Improve Family and Property Survival During A Wildland Fire

Home	Yes	No
1. Does your home have a metal, composition, or tile (or other non-combustible) roof with capped ends and covered fascia?	<input type="checkbox"/>	<input type="checkbox"/>
2. Are the rain gutters and roof free of leaves, needles and branches?	<input type="checkbox"/>	<input type="checkbox"/>
3. Are all vent openings screened with $\frac{1}{8}$ inch (or smaller) mesh metal screen?	<input type="checkbox"/>	<input type="checkbox"/>
4. Are approved spark arrestors on chimneys?	<input type="checkbox"/>	<input type="checkbox"/>
5. Does the house have non-combustible siding material?	<input type="checkbox"/>	<input type="checkbox"/>
6. Are the eaves "boxed in" and the decks enclosed?	<input type="checkbox"/>	<input type="checkbox"/>
7. Are the windows made of at least double-paned or tempered glass?	<input type="checkbox"/>	<input type="checkbox"/>
8. Are the decks, porches and other similar areas made of non-combustible material and free of easily combustible material (e.g. plastic furniture, propane tanks)?	<input type="checkbox"/>	<input type="checkbox"/>
9. Is all firewood at least 30 feet from the house?	<input type="checkbox"/>	<input type="checkbox"/>

Defensible Space	Yes	No
1. Is dead vegetation cleared to the recommended defensible space area? (Consider adding distance due to slope of property.)	<input type="checkbox"/>	<input type="checkbox"/>
2. Is there separation between shrubs?	<input type="checkbox"/>	<input type="checkbox"/>
3. Are ladder fuels removed?	<input type="checkbox"/>	<input type="checkbox"/>
4. Is there a clean and green area extending at least 30 feet from the house?	<input type="checkbox"/>	<input type="checkbox"/>
5. Is there a non-combustible area within five feet of the house?	<input type="checkbox"/>	<input type="checkbox"/>
6. Is there separation between trees and crowns?	<input type="checkbox"/>	<input type="checkbox"/>

Emergency Access	Yes	No
1. Is the home address visible from the street?	<input type="checkbox"/>	<input type="checkbox"/>
2. Is the home address made of fire-resistant materials?	<input type="checkbox"/>	<input type="checkbox"/>
3. Are street signs present at every intersection leading to the house?	<input type="checkbox"/>	<input type="checkbox"/>
4. Are street signs made of fire-resistant materials?	<input type="checkbox"/>	<input type="checkbox"/>
5. Is flammable vegetation within 10 feet of the driveway cleared and are overhanging obstructions removed?	<input type="checkbox"/>	<input type="checkbox"/>
6. If a long driveway is present, does it have a suitable turnaround area?	<input type="checkbox"/>	<input type="checkbox"/>

Ready, Set, Go!  
[www.wildlandfireRSG.org](http://www.wildlandfireRSG.org)





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FIRST  
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# SEVERE WEATHER

GUIDE

## PART 7

# Food & Water Safety During Storms



# FOOD FACTS

From the U.S. Food and Drug Administration

## Food and Water Safety During Hurricanes, Power Outages, and Floods

### *What Consumers Need to Know*

*Emergencies can happen. When they do, the best strategy is to already have a plan in place. This includes knowing the proper food and water safety precautions to take if hurricanes — or other flooding/power outages — do occur.*



### Be Prepared for Emergencies

- 1. Make sure you have **appliance thermometers in your refrigerator and freezer.****
  - Check to ensure that the freezer temperature is at or below **0 °F**, and the refrigerator is at or below **40 °F**.
  - In case of a **power outage**, the appliance thermometers will indicate the temperatures in the refrigerator and freezer to help you determine if the food is safe.
- 2. Freeze containers of water** for ice to help keep food cold in the freezer, refrigerator, or coolers in case the power goes out. If your normal water supply is contaminated or unavailable, the melting ice will also supply drinking water.
- 3. Freeze refrigerated items** such as leftovers, milk, and fresh meat and poultry that you may not need immediately. This helps keep them at a safe temperature longer.
- 4. Group food together** in the freezer. This helps the food stay cold longer.
- 5. Have coolers on hand** to keep refrigerated food cold if the power will be out for more than 4 hours.
- 6. Purchase or make **ice cubes in advance**** and store in the freezer for use in the refrigerator or in a cooler. Freeze **gel packs** ahead of time for use in coolers.
- 7. Check out local sources** to know where **dry ice and block ice** can be purchased, just in case.
- 8. Store food on shelves** that will be safely out of the way of contaminated water in case of flooding.
- 9. Make sure to have a **supply of bottled water**** stored where it will be as safe as possible from flooding.





Power Outages: *During and After***When the Power Goes Out . . .**

Here are basic tips for keeping food safe:

- Keep the **refrigerator and freezer doors closed** as much as possible to maintain the cold temperature.
  - The **refrigerator** will keep food **cold for about 4 hours** if it is unopened.
  - A **full freezer** will keep the temperature for approximately **48 hours** (24 hours if it is half full) if the door remains closed.
  - Buy **dry or block ice** to keep the refrigerator as cold as possible if the power is going to be out for a prolonged period of time. Fifty pounds of dry ice should hold an 18 cubic foot, fully-stocked freezer cold for two days.
- If you plan to eat refrigerated or frozen meat, poultry, fish or eggs while it is still at safe temperatures, it's important that each item is **thoroughly cooked to its proper temperature** to assure that any foodborne bacteria that may be present are destroyed. However, if at any point the food was above 40 °F for 2 hours or more — discard it.
- **Wash fruits and vegetables** with water from a safe source before eating.
- For infants, try to use prepared, canned baby formula that requires no added water. When using concentrated or powdered formulas, prepare with bottled water if the local water source is potentially contaminated.

**Once Power Is Restored . . .**

You'll need to determine the safety of your food. Here's how:

- If an appliance thermometer was kept in the freezer, **check the temperature** when the power comes back on. If the freezer thermometer reads 40 °F or below, the food is safe and may be refrozen.
- If a thermometer has not been kept in the freezer, **check each package** of food to determine its safety. You can't rely on appearance or odor. If the food **still contains ice crystals** or is 40 °F or below, it is safe to refreeze or cook.
- Refrigerated food should be safe as long as the power was out for **no more than 4 hours** and the refrigerator door was kept shut. Discard any perishable food (such as meat, poultry, fish, eggs or leftovers) that has been above 40 °F for two hours or more.



Keep in mind that perishable food such as meat, poultry, seafood, milk, and eggs that are **not kept adequately refrigerated or frozen** may cause illness if consumed, even when they are thoroughly cooked.

**When Flooding Occurs — Keep Water Safe**

Follow these steps to keep your **WATER SAFE** during – and after – flood conditions.



1. Use **bottled water** that has not been exposed to flood waters if it is available.
2. If you don't have bottled water, you should **boil water** to make it safe. Boiling water will kill most types of disease-causing organisms that may be present.
  - If the water is cloudy, filter it through clean cloths, or allow it to settle and then draw off the clear water for boiling.
  - Boil the water for one minute, let it cool, and store it in clean containers with covers.
3. If you can't boil water, you can **disinfect it using household bleach**. Bleach will kill some, but not all, types of disease-causing organisms that may be in the water.
4. If you have a **well** that has been flooded, the water should be **tested and disinfected** after flood waters recede. If you suspect that your well may be contaminated, contact your local or state health department or agricultural extension agent for specific advice.





## When Flooding Occurs — Keep Food Safe

Follow these steps to keep your FOOD SAFE during — and after — flood conditions.

1. **Do not eat** any food that may have come into contact with flood water.
2. **Discard any food that is not in a waterproof container** if there is *any* chance that it has come into contact with flood water.
  - Food containers that are not waterproof include those with screw-caps, snap lids, pull tops, and crimped caps.
  - Also discard cardboard juice/milk/baby formula boxes and home canned foods if they have come in contact with flood water, because they cannot be effectively cleaned and sanitized.
3. Inspect canned foods and **discard any food in damaged cans**. Can damage is shown by swelling, leakage, punctures, holes, fractures, extensive deep rusting, or crushing/denting severe enough to prevent normal stacking or opening with a manual, wheel-type can opener.
 
4. Undamaged, commercially prepared foods in **all-metal cans** and **“retort pouches”** (like flexible, shelf-stable juice or seafood pouches) can be saved if you follow this procedure:
  - Remove the labels, if they are the removable kind, since they can harbor dirt and bacteria.
  - Brush or wipe away any dirt or silt.
  - Thoroughly wash the cans or retort pouches with soap and water, using hot water if it is available. Rinse the cans or retort pouches with water that is safe for drinking, if available, since dirt or residual soap will reduce the effectiveness of chlorine sanitation.
- Sanitize cans and retort pouches by immersion in one of the two following ways:
  - Place in water and allow the water to come to a boil and continue boiling for 2 minutes, or
  - Place in a freshly-made solution consisting of 1 tablespoon of unscented liquid chlorine bleach per gallon of drinking water (or the cleanest, clearest water available) for 15 minutes.
- Air dry cans or retort pouches for a minimum of 1 hour before opening or storing.
- If the labels were removable, then re-label your cans or retort pouches, including the expiration date (if available), with a marking pen.
 
- Food in reconditioned cans or retort pouches should be used as soon as possible thereafter.
- Any concentrated baby formula in reconditioned, all-metal containers must be diluted with clean drinking water.
5. Thoroughly wash metal pans, ceramic dishes, and utensils (including can openers) with soap and water, using hot water if available. Rinse, and then sanitize them by boiling in clean water or immersing them for 15 minutes in a solution of 1 tablespoon of unscented, liquid chlorine bleach per gallon of drinking water (or the cleanest, clearest water available).
6. Thoroughly wash countertops with soap and water, using hot water if available. Rinse, and then sanitize by applying a solution of 1 tablespoon of unscented, liquid chlorine bleach per gallon of drinking water (or the cleanest, clearest water available). Allow to air dry.