

# Floods and Flash Floods

## Why talk about floods?

Floods are among the most frequent and costly natural disasters in terms of human hardship and economic loss. As much as 90 percent of the damage related to all natural disasters (excluding drought) is caused by floods and associated debris flows. From 1992 to 2001, floods cost the nation, on average, more than \$4.1 billion annually. Between 1972 and 2001, on average, 127 people a year were killed by floods—mostly by flash floods.

Most communities in the United States can experience some kind of flooding. Melting snow can combine with rain in the winter and early spring; severe thunderstorms can bring heavy rain in the spring and summer; or tropical cyclones can bring intense rainfall to coastal and inland states in the summer and fall.

As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization increases runoff two to six times more than what would occur on natural terrain. During periods of urban flooding, streets can become swiftly moving rivers, while basements and viaducts can become death traps as they fill with water.

## What causes floods and flash floods?

Several factors contribute to flooding. Two key elements are rainfall intensity and duration. Intensity is the rate of rainfall, and duration is how long the rain lasts. Topography, soil conditions, and ground cover also play important roles.

Flooding occurs in known floodplains when prolonged rainfall over several days, intense rainfall over a short period of time, or an ice or debris jam causes a river or stream to overflow and flood the surrounding area. Floods can be slow- or fast-rising, but generally develop over a period of hours or days.

Most flash flooding is caused by slow-moving thunderstorms, thunderstorms repeatedly moving over the same area, or heavy rains from hurricanes and tropical storms. Flash floods take from several minutes to several hours to develop. Flash floods occur within six hours of a rain event, or after a dam or levee failure, or following a sudden release of water held by an ice or debris jam. Flash floods can occur without warning.

Floods can roll boulders, tear out trees, destroy buildings and bridges, and scour new channels. Floodwater can reach heights of 10 to 20 feet (3 to 6 meters) and often carries a deadly cargo of debris. Flood-producing rains can also trigger catastrophic debris slides.

## How can I protect myself in a flood?

Regardless of how a flood occurs, the rule for being safe is simple: head for higher ground and stay away from floodwater. Even a shallow depth of fast-moving floodwater produces more force than most people imagine. It is exceedingly dangerous to try to walk, swim, or drive in floodwater. Two feet (0.6 meters) of water will carry away most vehicles, including sport utility vehicles (SUVs) and pickup trucks. You can protect yourself best by being prepared and having time to act. You can protect your home best by taking measures to reduce potential flood

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damage (called mitigation) and buying flood insurance in advance.

## **What is the best source of information in a flood situation?**

Local radio or television stations or a NOAA Weather Radio are the best sources of information in a flood situation for official weather and weather-related bulletins.

NOAA Weather Radio is the prime alerting and critical information delivery system of the National Weather Service (NWS). NOAA Weather Radio broadcasts warnings, watches, forecasts, and other hazard information 24 hours a day over more than 650 stations in the 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific territories.

The NWS encourages people to buy a weather radio equipped with the Specific Area Message Encoder (SAME) feature. This feature automatically alerts you when important information about floods and other hazards is issued for your area. Information on NOAA Weather Radio is available from your local NWS office or at <http://www.nws.noaa.gov/nwr>.

## **Be Prepared for a Flood**

### **Protect Yourself**

For general preparedness, every household should create and practice a Family Disaster Plan and assemble and maintain a Disaster Supplies Kit. In addition, every household should take flood-specific precautions and plan for and practice what to do if a flood occurs.

If you are at risk from floods, you should:

- Find out the elevation above flood stage of your home, outbuildings, and pastures or corrals. Knowing the elevation of your property in relation to nearby streams and dams will let you know if forecasted flood levels will affect your home.
- Find out if local streams or rivers flood easily.
- Talk with members of your household about the possibility of floods and flash floods and what to do to stay safe if one occurs. Knowing how to respond will reduce fear and save precious time in an emergency.
- Find out about the flood evacuation routes in your area and develop a flood evacuation plan for your household. All members of the household should know where to meet each other, where to evacuate to, and what route(s) to take if they have to leave. Making plans well in advance will help you avoid last-minute confusion.
- Find out if you are located in a floodplain, which is considered a Special Flood Hazard Area. If you are, you are still eligible for flood insurance. Check with your city or county government (start with the Building or Planning Department) to review the Flood Insurance Rate Maps, published by the Federal Emergency

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Management Agency (FEMA). If your home is especially vulnerable, consider relocation.

- Talk to your insurance agent. Homeowners' policies do not cover flooding. Ask about the National Flood Insurance Program (NFIP).
- Use a NOAA Weather Radio or listen to local stations on a portable, battery powered radio or television for updated emergency information.
- If you live in a frequently flooded area, stockpile emergency building materials. These include plywood, plastic sheeting, lumber, nails, hammer and saw, pry bar, sand, shovels, and sandbags.

## **Protect Your Property**

If you are at risk from floods, you should:

- Avoid building in a floodplain unless you elevate and reinforce your home. Some communities do not permit building in known floodplains. If there are no restrictions and you are building in a floodplain, take precautions to make it less likely your home will be damaged during a flood.
- Keep insurance policies, documents, and other valuables in a safe-deposit box. You may need quick, easy access to these documents. Keep them in a safe place less likely to be damaged during a flood.
- Raise your furnace, water heater, and electric panel to higher floors or the attic if they are in areas of your home that may be flooded. Raising this equipment will prevent damage. An undamaged water heater may be your best source of fresh water after a flood.
- Install check valves in plumbing to prevent floodwater from backing up into the drains of your home. As a last resort, when floods threaten, use large corks or stoppers to plug showers, tubs, or basins.
- Construct barriers such as levees, berms, and flood walls to stop floodwater from entering the building. Permission to construct such barriers may be required by local building codes. Check local building codes and ordinances for safety requirements.
- Seal walls in basements with waterproofing compounds to avoid seepage through cracks.
- Consult with a construction professional for further information about these and other damage-reduction measures. Check local building codes and ordinances for safety requirements.
- Contact your local emergency management office for more information on mitigation options to further reduce potential flood damage. Your local emergency management office may be able to provide additional resources and information on ways to reduce potential damage.
- Ensure that any outbuildings, pastures, or corrals are protected in the same way as your home. When installing or changing fence lines, consider placing them in such a way that your animals are able to move to higher ground in the event of flooding.
- If flooding is expected, consider using sand bags to keep water away from your home. It takes two people about one hour to fill and place 100 sandbags, giving you a wall one foot (0.3 meter) high and 20 feet (6 meters) long. Make sure you have enough sand, burlap or plastic bags, shovels, strong helpers, and time to

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place them properly.

## **Avert the Dangers of Flood and Flash Flood**

Even when there are no signs of a flood, be alert to conditions that can cause floods:

- Heavy rain for several hours, or steady rain for several days, can saturate the ground and cause a flood.
- Distant thunder indicates a distant thunderstorm that could send runoff your way. Runoff can produce a deadly flash flood that appears with no warning, particularly in certain types of terrain, for example, in an arroyo or streambed.
- Other distant events, such as a dam break or the sudden unclogging of an ice jam, can cause flash floods.

Park a vehicle or set up camp away from streams and washes, particularly during threatening conditions. Floodwater can rise quickly and carry you, your vehicle, or your belongings away.

Listen for watches and warnings on NOAA Weather Radio or a local radio or television station.

## **Watch, Warning**

A Flood WATCH means a flood is possible in your area.

A Flood WARNING means flooding is already occurring or will occur soon in your area.

A Flash Flood WATCH means flash flooding is possible in your area.

A Flash Flood WARNING means a flash flood is occurring or will occur very soon.

Watches and warnings are issued by the National Weather Service (NWS) and broadcast on NOAA Weather Radio and on local radio and television stations.

A watch is the first official alert that a flash flood or flood may occur in a specific area. People in a watch area should review their flood plans (Family Disaster Plan, Disaster Supplies Kit, evacuation routes), keep informed, and be ready to act if a warning is issued or if flooding occurs.

A warning is an official announcement that a flash flood or flood is occurring or imminent in a specific area. People in a warning area should take precautions immediately.

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## What to Do Before a Flood

If a flood or flash flood watch is issued for your area, you should:

- Use a NOAA Weather Radio or listen continuously to a local station on a portable, battery-powered radio or television.
- Be ready to act quickly. Floods and flash floods can happen quickly and without warning. Be ready to act immediately.
- Be alert to signs of flooding, and, if you live in a flood-prone area, be ready to evacuate at a moment's notice. Floods can happen quickly and you may need to leave with little or no notice.
- Follow the instructions and advice of local authorities. Local authorities are the most informed about affected areas and the most knowledgeable about areas you should avoid.
- If your home is in a flood-prone area:
  - Fill plastic bottles with clean water for drinking. Water may become contaminated or water service may be interrupted.
  - Fill bathtubs and sinks with water for flushing the toilet or washing the floor or clothing. Adults can use this water for bathing, but young children should not bathe in water that has been stored in glazed tubs and sinks because over time lead can leach into the water from the glaze.
  - Bring outdoor belongings, such as patio furniture, indoors. Unsecured items may be swept away and damaged by floodwater.
  - Move your furniture and valuables to higher floors of your home. If floodwater affects your home, higher floors are less likely to be damaged.
  - Turn off utilities if told to do so by authorities. Authorities may ask you to turn off water or electric utilities to prevent damage to your home or within the community. Most of the time they will tell you to leave the gas on because, if you shut it off, a professional is required to turn your gas back on, and it may be several weeks before you receive service.
  - Turn off propane tanks. Propane tanks may be damaged or dislodged by strong winds or water. Turning them off reduces the fire potential.
  - Unplug small appliances. Small appliances may be affected by electrical power surges that may occur. Unplugging them reduces potential damage.
  - Keep your previously assembled Disaster Supplies Kit near. You may need to act quickly. Having your supplies ready will save time.
  - Fill your car's gas tank, in case an evacuation notice is issued. If electric power is cut off, gas stations may not be able to operate pumps for several days.
  - Be prepared to evacuate. Local officials may ask you to leave if they conclude that your home is at risk from floodwater.
- Consider a precautionary evacuation of your animals, especially any large or numerous animals. Waiting until the last minute could be fatal for them and dangerous for you. Where possible, move livestock to higher ground. If you are

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using a horse or other trailer to evacuate your animals, move early rather than wait until it may be too late to maneuver a trailer through slow traffic.

If a flood or flash flood warning is issued for your area, you should:

- Use a NOAA Weather Radio or listen continuously to a local station on a portable, battery-powered radio or television.
- Be alert to signs of flooding. A warning means a flood is imminent or is happening in the area.
- Bring your companion animals indoors and maintain direct control of them. Be sure that your pet disaster kit and your family Disaster Supplies Kit are ready to go in case you need to evacuate.
- If you live in a flood-prone area or think you are at risk, evacuate immediately. Move quickly to higher ground. Save yourself, not your belongings. The most important thing is your safety.
- If advised by authorities to evacuate, do so immediately. Move to a safe area before access is cut off by floodwater. Evacuation is much simpler and safer before floodwater becomes too deep for vehicles to drive through.
- Follow the instructions and advice of local authorities. Local authorities are the most informed about affected areas and the most knowledgeable about areas you should avoid.
- Follow recommended evacuation routes. Shortcuts or alternative, non-recommended routes may be blocked or damaged by floodwater.
- Leave early enough to avoid being marooned by flooded roads. Delaying too long may allow all escape routes to become blocked.
- If you evacuate, take your animals with you. If it is not safe for you, it is not safe for your animals.

## What to Do During a Flood or Flash Flood

If you are outdoors, you should:

- Stay out of areas subject to flooding. Dips, low spots, canyons, washes, etc. can become filled with water.
- Climb to high ground and stay there. Move away from dangerous floodwater.
- If you come upon a flowing stream where water is above your ankles, stop, turn around, and go another way. Never try to walk, swim, or drive through swift water. Most flood fatalities are caused by people attempting to drive through water, or people playing in high water. If it is moving swiftly, even water six inches (15 centimeters) deep can sweep you off your feet.

If you are driving, you should:

- Avoid already flooded areas, and areas subject to sudden flooding. Do not attempt to cross flowing streams. Most flood fatalities are caused by people attempting to drive through water, or people playing in high water. The depth of water is not always obvious. The roadbed may be washed out under the water,

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and you could be stranded or trapped. Also, standing water may be electrically charged from underground or downed power lines. Rapidly rising water may stall the engine, engulf the vehicle and its occupants, and sweep them away. Look out for flooding at highway dips, bridges, and low areas. Two feet (0.6 meters) of water will carry away most vehicles, including SUVs and pickup trucks.

- Stay away from underpasses. Underpasses can fill rapidly with water, while the adjacent roadway remains clear. Driving into an underpass can quickly put you in five to six feet (1.5 to 1.8 meters) of water.
- Turn around and find another route if you come upon rapidly rising water. Move to higher ground away from rivers, streams, creeks, and storm drains. If your route is blocked by floodwater or barricades, find another route. Barricades are put up by local officials to protect people from unsafe roads. Driving around them can be a serious risk.
- Abandon your vehicle immediately and climb to higher ground if the vehicle becomes surrounded by water or the engine stalls, and if you can safely get out. When a vehicle stalls in the water, the water's momentum is transferred to the car. The lateral force of a foot (0.3 meter) of water moving at 10 miles (16 kilometers) per hour is about 500 pounds (227 kilograms) on the average vehicle. The greatest effect is buoyancy—for every foot (0.3 meter) that water rises up the side of a car, it displaces 1,500 pounds (680 kilograms) of the car's weight. So, two feet (0.6 meter) of water moving at 10 miles (16 kilometers) per hour will float virtually any car, SUV, or pickup truck. Use caution when abandoning your vehicle, and look for an opportunity to move away quickly and safely to higher ground.

## What to Do After a Flood or Flash Flood

- Get medical care at the nearest hospital or clinic, if necessary. Contaminated floodwater can cause infection. Severe injuries will require medical attention.
- Help people who require special assistance—infants, elderly people, those without transportation, large families who may need additional help in an emergency situation, people with disabilities, and the people who care for them.
- Stay away from damaged areas. Your presence might hamper rescue and other emergency operations, and put you at further risk from the residual effects of floods, such as contaminated water, crumbled roads, landslides, mudflows, and other hazards.
- Continue to listen to NOAA Weather Radio or a local radio or television station and return home only when authorities indicate it is safe to do so. Flood dangers do not end when the water begins to recede; there may be flood-related hazards within your community, which you could hear about from local broadcasts.
- Stay out of any building if floodwater remains around the building. Floodwater often undermines foundations, causing sinking. Floors can crack or break and buildings can collapse.
- Avoid entering any building (home, business, or other) before local officials have said it is safe to do so. Buildings may have hidden damage that makes them unsafe. Gas leaks or damage to electric lines or water lines can create additional

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problems.

- Report broken utility lines to the appropriate authorities. Reporting potential hazards will get the utilities turned off as quickly as possible, preventing further hazard and injury.
- Avoid smoking inside buildings. Smoking in confined areas can cause fires.
- When entering buildings, use extreme caution. Building damage may have occurred where you least expect it. Watch carefully every step you take.
- Wear long pants, a long-sleeved shirt, and sturdy shoes. The most common injury following a disaster is cut feet.
- Use battery-powered lanterns or flashlights when examining buildings. Battery powered lighting is the safest and easiest to use, and it does not present a fire hazard for the user, occupants, or building. **DO NOT USE CANDLES.**
- Examine walls, floors, doors, staircases, and windows to make sure that the building is not in danger of collapsing.
- Inspect foundations for cracks or other damage. Cracks and damage to a foundation can render a building uninhabitable.
- Look for fire hazards. There may be broken or leaking gas lines, flooded electrical circuits, or submerged furnaces or electrical appliances. Flammable or explosive materials may have traveled from upstream. Fire is the most frequent hazard following floods.
- Check for gas leaks. If you smell gas or hear a blowing or hissing noise, open a window and get everyone outside quickly. Turn off the gas at the outside main valve if you can and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
- Look for electrical system damage. If you see sparks or broken or frayed wires, or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice. Electrical equipment should be checked and dried before being returned to service.
- Check for damage to sewage and water lines. If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water from undamaged water heaters or by melting ice cubes that were made before the pipes were damaged. Turn off the main water valve before draining water from these sources.
- Watch out for wild animals, especially poisonous snakes, that may have come into buildings with the floodwater. Use a stick to poke through debris. Floodwater flushes snakes and many animals out of their homes.
- Watch for loose plaster, drywall, and ceilings that could fall.
- Take pictures of the damage, both of the building and its contents, for insurance claims.
- Watch your animals closely. Keep all your animals under your direct control. Hazardous materials abound in flooded areas. Your pets may be able to escape from your home or through a broken fence. Pets may become disoriented, particularly because flooding usually affects scent markers that normally allow them to find their homes. The behavior of pets may change dramatically after any disruption, becoming aggressive or defensive, so be aware of their well-being and take measures to protect them from hazards, including displaced wild

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animals, and to ensure the safety of other people and animals.

After returning home, you should:

- Throw away food and drinking water that has come in contact with floodwater, including canned goods. It is impossible to know if containers were damaged and the seals compromised. Food contaminated by floodwater can cause severe infections.
- Discard wooden spoons, plastic utensils, and baby bottle nipples and pacifiers if they have been covered by floodwater. There is no way to safely clean them.
- Disinfect metal pans and utensils by boiling them in clean or properly treated water.
- If water is of questionable purity, boil the water or add bleach to it, and then distill the water if you will be drinking it. Wells inundated by floodwater should be pumped out and the water tested for purity before drinking. If in doubt, call your local public health authority. Ill health effects often occur when people drink water contaminated with bacteria and germs.
- Avoid drinking or preparing food with tap water until you are certain it is not contaminated. Floodwater may have contaminated public water supplies or wells. Local officials should advise you on the safety of the drinking water.
- Pump out flooded basements gradually (about one-third of the water per day) to avoid structural damage. If the water is pumped out completely in a short period of time, pressure from water-saturated soil on the outside could cause basement walls to collapse.
- Service damaged septic tanks, cesspools, pits, and leaching systems as soon as possible. Damaged sewage systems are health hazards.



