flash floods and floods...

the Awesome Power!

A PREPAREDNESS GUIDE

U.S. DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration National Weather Service

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NOAA, FEMA, and The American Red Cross

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flash floods

#1 weather-related killer in the United States!

How do flash floods occur?

Several factors contribute to flash flooding. The 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 an important role.

Flash floods occur within a few minutes or hours of excessive rainfall, a dam or levee failure, or a sudden release of water held by an ice jam. Flash floods can roll boulders, tear out trees, destroy buildings and bridges, and scour out new channels. Rapidly rising water can reach heights of 30 feet or more. Furthermore, flash flood-producing rains can also trigger catastrophic mud slides. You will not always have a warning that these deadly, sudden floods are coming. Most flood deaths are due to **FLASH FLOODS**.

Most flash flooding is caused by slow-moving thunderstorms, thunderstorms repeatedly moving over the same area, or heavy rains

from hurricanes and tropical storms.

Occasionally, floating debris or ice can accumulate at a natural or man-made obstruction and restrict the flow of water. Water held back by the ice jam or debris dam can cause flooding upstream. Subsequent flash flooding can occur downstream if the obstruction should suddenly release.

June 9, 1972 Black Hills
Rapid City, SD
15 inches of rain in 5 hours
238 fatalities
$164M in damages
Source: National Weather Service

PLAN AHEAD:

Identify where to go if told to evacuate. Choose several places...a friend's home or a motel in another town, or a shelter.

GO TO HIGHER GROUND!

Know your area's flood risk. For information, call your local National Weather Service office, Red Cross chapter, or local emergency management agency. Check your homeowner's or renter's insurance. Homeowners' policies do not cover flooding. Contact your insurance agent to find out how to get flood insurance.

flooding can occur NATIONWIDE!

Even 6 inches of fast-moving flood water can knock you off your feet, and a depth of 2 feet will float your car! **NEVER** try to walk, swim, or drive through such swift water. If you come upon flood

waters, **STOP! TURN AROUND AND GO ANOTHER WAY.**

SOME HISTORICAL NWS DATA

- Dam Break

May 31, 1889 Johnstown, Pennsylvania...
the worst flood in United States history..
36-40 ft. wall of water...2,200 dead.

- River Flood

December 1991/January 1992 South-central Texas...
wide-spread river flooding on the Guadalupe, Brazos, Trinity, and Colorado River Basins...
up to 17 inches of rain...15 dead...damages $100M.

- Flash Flood Events

June 14, 1990 Shadyside, Ohio...
4 inches of rain in less than 2 hours produced a 30-foot high wall of water...
26 dead...damages $6-8M.

August 1, 1985 Cheyenne, Wyoming...
6 inches of rain in 3 hours...
12 dead...damages $61M.

Flooding Takes Many Forms...

Flash flooding occurs within 6 hours of the rain event.

Flooding is a longer term event and may last a week or more.

RIVER FLOOD

Flooding along rivers is a natural and inevitable part of life. Some floods occur seasonally when winter or spring rains, coupled with melting snows, fill river basins with too much water, too quickly. Torrential rains from decaying hurricanes or tropical systems can also produce river flooding.

COASTAL FLOOD

Winds generated from tropical storms and hurricanes or intense offshore low pressure systems can drive ocean water inland and cause significant flooding. Escape routes can be cut off and blocked by high water. Coastal flooding can also be produced by sea waves called tsunamis (tsoo-n„ -m z), sometimes referred to as tidal waves. These waves are produced by earthquakes or volcanic activity.

NOTE: *Coastal flooding caused by the storm surge associated with hurricanes is described in publication NOAA/PA 78019, "Storm Surge and Hurric*ane Safety."

URBAN FLOOD

As land is converted from fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization increases runoff 2 to 6 times over what would occur on natural terrain. During periods of urban flooding, streets can become swift moving rivers, while basements can become death traps as they fill with water.

FLASH FLOODING IN ARROYOS/WASHES

An arroyo is a water-carved gully or normally dry creek bed. Arroyos can fill with fast-moving water very quickly. Flash flooding at this arroyo in Arizona took only 58 seconds to develop.

ICE JAM

Floating ice can accumulate at a natural or man-made obstruction and stop the flow of water.

Environmental Clues...

Listen for...

distant thunder runoff from a faraway thunderstorm could be headed your way.

Look out for...

water rising rapidly

Nearly half of all flash flood fatalities are auto related!

In your automobile...

look out for..flooding at highway dips, bridges, and low areas.

MANY FLASH FLOODS OCCUR AT NIGHT...BE PREPARED TO TAKE QUICK ACTION.

How can a foot or two of water cost you your life?

- Water weighs 62.4 lbs. per cubic foot and typically flows downstream at 6 to 12 miles an hour.
- When a vehicle stalls in the water, the water's momentum is transferred to the car. For each foot the water rises, 500 lbs. of lateral force are applied to the car.
- But the biggest factor is buoyancy. For each foot the water rises up the side of the car, the car displaces 1,500 lbs. of water. In effect, the car weighs 1,500 lbs. less for each foot the water rises.
- ***Two feet of water will carry away most automobiles***.

Before the flood...

What YOU can do:

- Know your flood risk and elevation above flood stage.
  - Do your local streams or rivers flood easily? If so, be prepared to move to a place of safety. Know your evacuation routes.
- Keep your automobile fueled; if electric power is cut off, gas stations may not be able to operate pumps for several days.
- Store drinking water in clean bathtubs and in various containers. Water service may be interrupted.
- Keep a stock of food that requires little cooking and no refrigeration; electric power may be interrupted.
- Keep first aid supplies on hand.
- Keep a NOAA Weather Radio, a battery-powered portable radio, emergency cooking equipment, and flashlights in working order. Install check valves in building sewer traps to prevent flood water from backing up into the drains of your home.

Assemble a disaster supplies kit containing: first aid kit, canned food and can opener, bottled water, rubber boots, rubber gloves, NOAA Weather Radio, battery-powered radio, flashlight, and extra batteries.

What YOUR community can do:

Assist hospitals and other operations which are critically affected by power failure by arranging for auxiliary power supplies. River/rainfall readings are valuable to local emergency management agencies (EMA) and the National Weather Service (NWS) in assessing flood conditions and taking appropriate actions. Advanced warning provided by early detection is critical to saving lives. Automatic flood detection systems are available commercially for flood-prone communities. Contact your local NWS office or

emergency management agency for further information on **LOCAL FLOOD WARNING SYSTEMS**.

STAY INFORMED ABOUT THE STORM

by listening to NOAA Weather Radio, commercial radio, and television for the latest flash flood/flood **WATCHES, WARNINGS, and ADVISORIES.**

NOAA WEATHER RADIO IS THE BEST MEANS TO RECEIVE WARNINGS FROM THE NATIONAL WEATHER SERVICE. The National Weather Service continuously broadcasts updated weather warnings and forecasts that can be received by NOAA Weather Radios sold in many stores. Average range is 40 miles, depending on topography. Your National Weather Service recommends purchasing a radio that has both a battery backup and a tone-alert feature which automatically alerts you when a watch or warning is issued.

What to Listen For...

- FLASH FLOOD OR FLOOD WATCH: Flash flooding or flooding is possible within the designated WATCH area be alert.
- FLASH FLOOD OR FLOOD WARNING: Flash flooding or flooding has been reported or is imminent take necessary precautions at once.
- URBAN AND SMALL STREAM ADVISORY: Flooding of small streams, streets, and low-lying areas, such as railroad underpasses and urban storm drains, is occurring.
- FLASH FLOOD OR FLOOD STATEMENT: Follow-up information regarding a flash flood/flood event.

*The rule for being safe in a flooding situation is simple: **HEAD***

FOR HIGHER GROUND AND STAY AWAY FROM FLOOD WATERS!

TAKE ACTION!

When a flash flood WATCH is issued Be alert to signs of flash flooding and be ready to evacuate on a moment's notice.

When a flash flood WARNING is issued for your area, or the moment you realize that a flash flood is imminent, act quickly to save yourself. You may have only SECONDS!

Go to higher ground Climb to safety!

- Get out of areas subject to flooding. This includes dips, low spots, canyons, washes, etc.
- Avoid already flooded and high velocity flow areas. Do not attempt to cross flowing streams.
- If driving, be aware that the road bed may not be intact under flood waters. Turn around and go another way. NEVER drive through flooded roadways!
- If the vehicle stalls, leave it immediately and seek higher ground. Rapidly rising water may engulf the vehicle and its occupants and sweep them away. Remember, it's better to be wet than dead!
- Be especially cautious at night when it is harder to recognize flood dangers.
- Do not camp or park your vehicle along streams and washes, particularly during threatening conditions.

When you receive a FLOOD WARNING:

- If advised to evacuate, do so immediately.
- Move to a safe area before access is cut off by flood water.
- continue monitoring NOAA Weather Radio, television, or emergency broadcast station for information.

During the flood:

- Avoid areas subject to sudden flooding.
- If you come upon a flowing stream where water is above your ankles, STOP! Turn around and go another way.
- Do not attempt to drive over 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.
- Children should NEVER play around high water, storm drains, viaducts, or arroyos.

After the flood:

- If fresh food has come in contact with flood waters, throw it out.
- 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.
- Seek necessary medical care at the nearest hospital. Food, clothing, shelter, and first aid are available from the Red Cross.
- Do not visit disaster areas. Your presence might hamper rescue and other emergency operations.
- Electrical equipment should be checked and dried before being returned to service.
- Use flashlights, not lanterns, torches or matches, to examine buildings. Flammables may be inside.
- Report broken utility lines to appropriate authorities.

FAMILY DISASTER PLAN

Families should be prepared for all hazards that affect their area. NOAA's National Weather Service, the Federal Emergency Management Agency, and the American Red Cross urge each

family to develop a family disaster plan.

Where will your family 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? Disasters may force you to evacuate your neighborhood or confine you to your home. What would you do if basic services water, gas, electricity or telephones were cut off?

Follow these basic steps to develop a family disaster plan...

I. Gather information about hazards. Contact your local National Weather Service office, emergency management or civil defense office, and American Red Cross chapter. Find out what type of disasters could occur and how you should respond. Learn your community's warning signals and evacuation plans.

II. 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 fire, and a place away from your neighborhood in case you can't return home. Choose an out-of-state friend as your "family check-in contact" for everyone to call if the family gets separated. Discuss what you would do if advised to evacuate.

III. Implement your plan.

(1) Post emergency telephone numbers by phones;
(2) Install safety features in your house, such as smoke detectors and fire extinguishers;
(3) Inspect your home for potential hazards (such as items that can move, fall, break, or catch fire) and correct them;
(4) 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;
(5) Teach children how and when to call 911 or your local Emergency Medical Services number;
(6) Keep enough supplies in your home to meet your needs for at least three days. Assemble a disaster supplies kit with items you may need in case of an evacuation. 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 disaster supplies kit in the trunk of your car.

A DISASTER SUPPLIES KIT SHOULD INCLUDE:

- A 3-day supply of water (one gallon per person per day) and food that won't spoil
- one change of clothing and footwear per person
- one blanket or sleeping bag per person
- a first aid kit, including prescription medicines
- emergency tools, including a battery-powered NOAA Weather Radio and a portable radio, flashlight, and plenty of extra batteries
- an extra set of car keys and a credit card or cash
- special items for infant, elderly, or disabled family members.

IV. Practice and maintain your plan. Ask questions to make sure your family remembers meeting places, phone numbers, and safety rules. Conduct drills. Test your smoke detectors monthly and change the batteries at least once a year. Test and recharge your fire extinguisher(s) according to manufacturer's instructions. Replace stored water and food every six months.

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