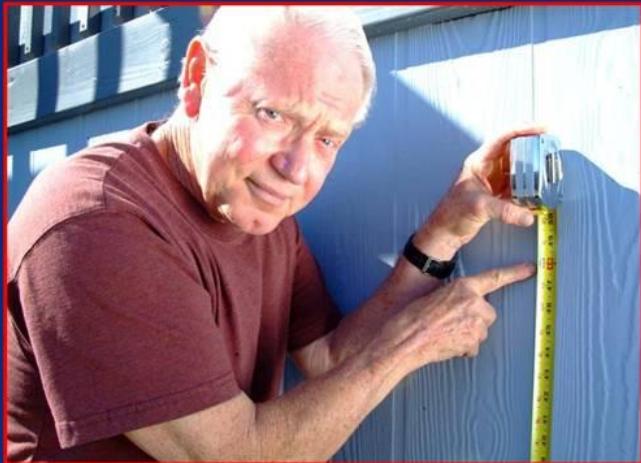


# Mitigation and Basement Flooding

The following presentation was prepared by  
U.S. Department of Homeland Security  
Federal Emergency Management Agency  
Hazard Mitigation



# Mitigation



**Mitigation is...**

**Measures taken now  
to reduce losses in  
the future.**



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Mitigation refers to measures taken now to reduce losses in the future. How can homeowners and renters protect themselves and their property from a devastating loss?

# Protecting Your Property



**Staying Above Water**

**There are many low-cost options to keep a home  
safe and protect against basement flooding.**



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There are a range of possible causes for basement flooding and some potential remedies. Many of these low-cost options can be factored into a family's budget and accomplished over the several months that precede storm season.

## Nothing Can Dampen The Joy Of Home Ownership



...or can it?



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There are four ways water gets into your basement:

- Through the drainage system, known as the sump.
- Backing up through the sewer lines under the house.
- Seeping through cracks in the walls and floor.
- Through windows and doors, called overland flooding.

# Mitigate...Before the Storm!



**A little time just cleaning  
your gutters can save a lot!**



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Gutters can play a huge role in keeping basements dry and foundations stable. Water damage caused by clogged gutters can be severe.

- Install gutters and downspouts.
- Repair them as the need arises.
- Keep them free of debris.

# Channel Water Away From The Foundation

Avoid flooding your neighbor's property.



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Channel and disperse water away from the home by lengthening the run of downspouts with rigid or flexible extensions. Prevent interior intrusion through windows and replace weather stripping as needed.

# Window Well Covers Guard Against Snow, Rain and Debris



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Many varieties of sturdy window well covers are available, simple to install and hinged for easy access. Wells should be constructed with gravel bottoms to promote drainage. Remove organic growth to permit sunlight and ventilation.

# Berms And Barriers Protect Against Overland Flooding

Photo 1

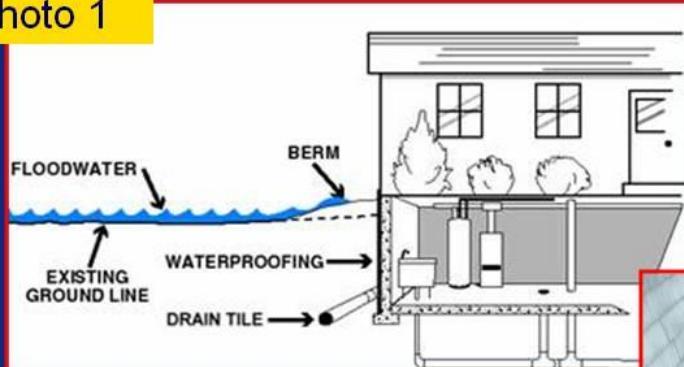


Photo 2



**Don't forget... You may need a permit!**



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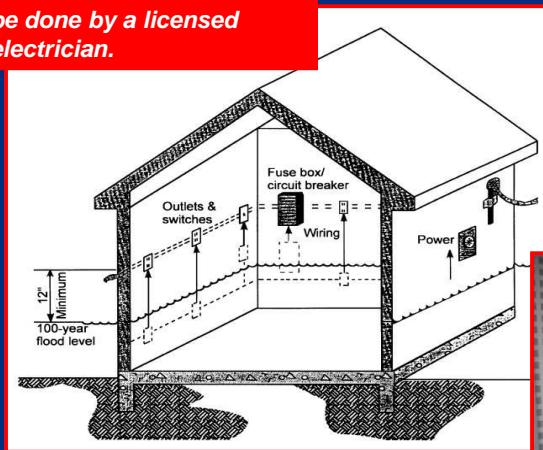
Berms and barriers can help water slope away from the home. The berm's slope should be about 1 inch per foot and extend for at least 10 feet. It is important to note permits are required any time a homeowner alters the elevation of the property.

If berming the soil is not possible, construct a barrier (Photo 2) to keep surface water away from your home's foundation.

The exterior basement walls can be treated with a moisture barrier material.

# Raise Or Relocate Electrical Components

\* All electrical work should be done by a licensed electrician.



Any receptacles that could get wet should be connected to a **ground fault interrupter (GFI)** to prevent the risk of shock or electrocution.



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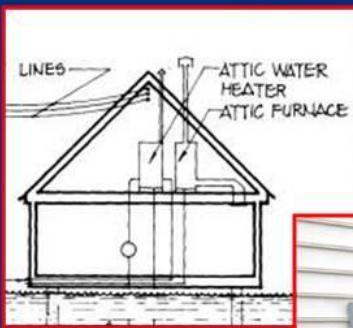
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A basement's circuitry can be elevated above the flood risk. Consider elevating the main electric panel, all outlets, switches, wiring and electric baseboard heating at least one foot above the projected flood elevation. Mark the breaker box for the circuits that feed the basement and shut off the power before entering a flooded basement.

## Elevate Or Relocate Mechanicals



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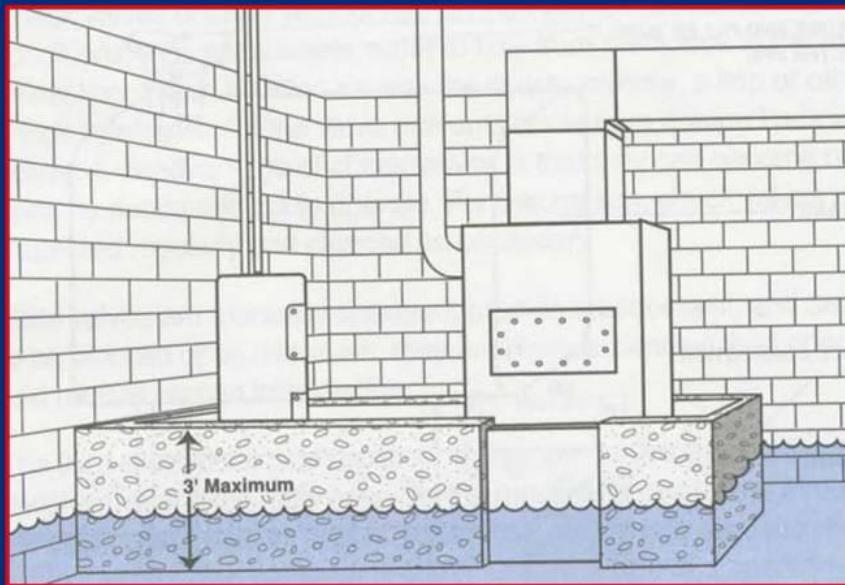
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Consider raising or relocating your air conditioner, furnace or hot water heater in order to avoid water damage. Don't dismiss the attic as an area for utilities. Have a qualified technician inspect mechanical systems exposed to water.

## Protect Your Furnace with a Barrier Wall



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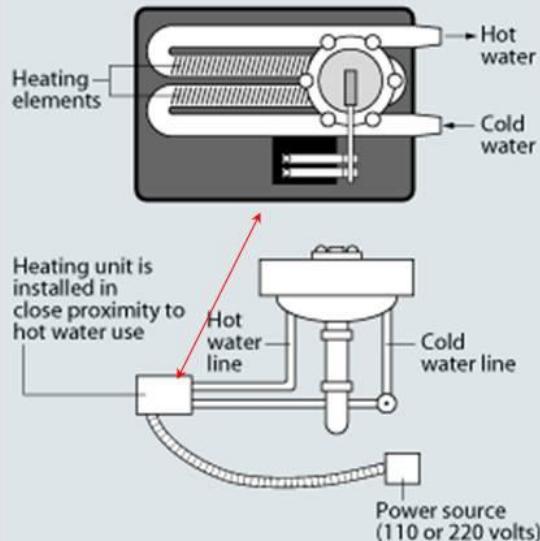
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When elevating is not an option, a barrier wall can provide protection from encroaching water and debris. Consider building a concrete or masonry floodwall around the furnace or water heater. The wall may not be water tight, but it could save your equipment from serious damage.

# Consider Going Tankless

Electric Demand Water Heater



Gas Demand Water Heater



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Consider installing a tankless water heater. Tankless models do not store hot water, do not have a tank and can be elevated above the flood risk. Consumers have a choice between whole house systems or individual units mounted at each water source. Users have reported savings of from \$40-80 per year with electric systems and \$50-100 per year with gas-powered models.

## Raise Or Relocate Appliances

Photo 1

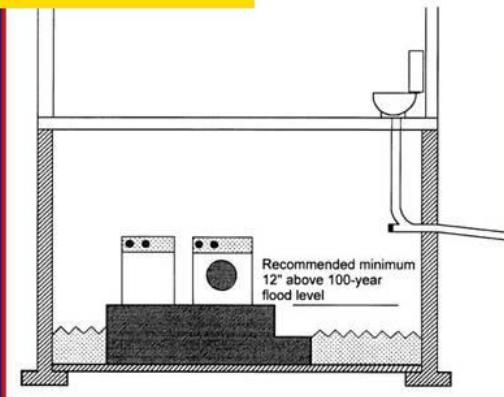
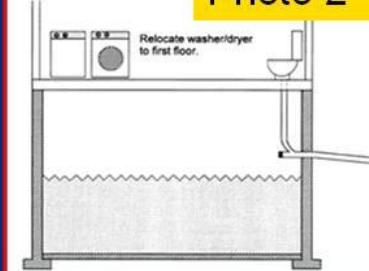


Photo 2



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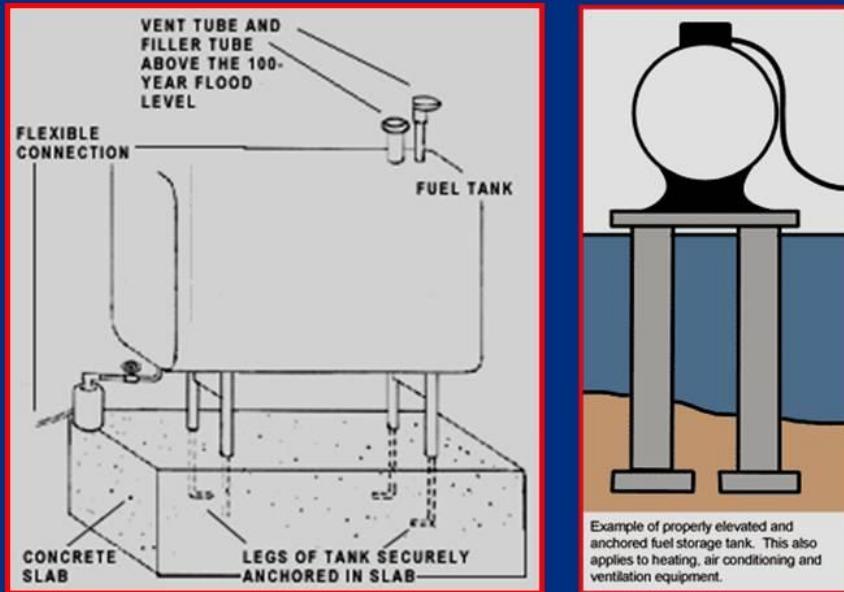
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Photo 1: Shows the washer/dryer units elevated above the flood risk level, which is approximately 1 foot in this location. Simple stacked masonry blocks can be effective at elevating the units.

Photo 2: Shows an example of units relocated to an upper floor.

# Always Anchor A Fuel Tank



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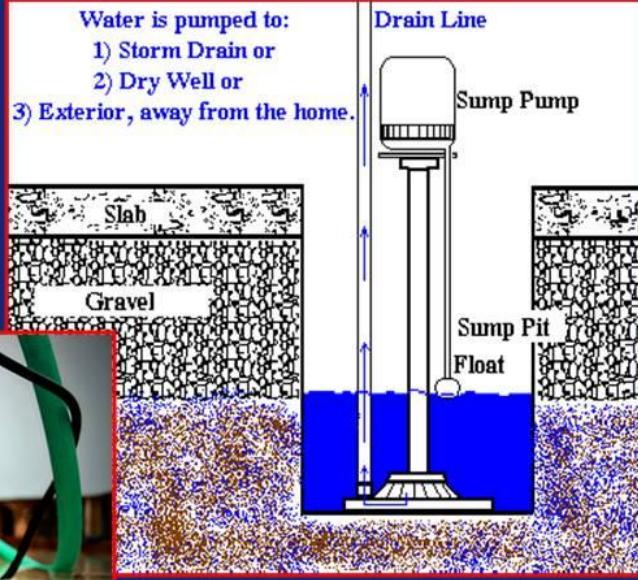
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Typically found in rural areas, outdoor fuel tanks and fuel lines can pose a threat of combustion when damaged.

Anchor fuel tanks securely to prevent movement.

# Sump Pump

*...Free Of Debris*



Does your pump have a battery backup?



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Heavy rains result in soil saturation and can cause groundwater to enter through the sump.

Your basement can become flooded when your primary pump stops working, when the power goes out or when torrential rains overload the pump beyond its capacity.

A battery backup pump is an inexpensive safeguard against basement flooding and should begin pumping. The backup goes to work when water in the sump reaches the float switch. Some of the newer models have a unique monitoring system that sounds an alarm when a maintenance issue arises.

# Drain Backing Up?

## Consider A Backflow Valve



Figure 5-9  
Check Valve

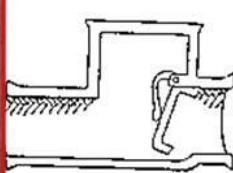


Figure 5-10  
Gate Valve

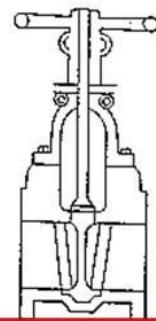
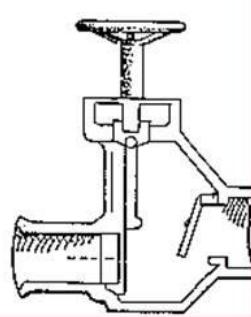


Figure 5-11  
Dual Backflow Valve



Consult with your local official to remain code compliant.



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Check valves or backflow valves are gate-like devices to keep water from backing up into the basement (homeowners should check with their local official to find out if the community permits these).

Valves should be installed on all pipes that leave the house or that are connected to equipment that is below the potential flood level. However, they can become jammed open by debris. All types of valves should have access so they can be cleaned out or repaired.

Valves may be needed on washing machine drain lines, laundry sinks, rain downspouts, and sump pumps, as well as sewer/septic connections. These are available in a variety of sizes and materials.



## Drain Plug Varieties



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Plugs are plastic or metal devices fitted into floor drains to prevent water backup.

They are generally inexpensive, easy to install, don't require a permit and can be installed flush with the basement floor.

A plug with a float allows water to drain out of the basement and doesn't interfere with the floor drain's normal operation. However, it may be blocked open by even small amounts of debris.

Don't use a plug if you expect flooding to exceed 3-4 inches. Use of drain plugs during severe flooding may cause ruptured pipes or cracking in the basement floor.

## Restrict Drain Backup With a Standpipe



If water depths are minimal, a standpipe may be your solution.



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A standpipe may be the solution if flood depths have historically not exceeded a few inches in the basement. Standpipes are lengths of pipe open at the top and fitted into the basement floor drain that hold sewer overflow until water levels recede. They are an inexpensive alternative to a drain plug.

## Prevent Sewer Backup

An Overhead Sewer System  
may be your solution.



A sump pump collects sewage which is ejected  
up into the sewer line by an ejector pump.

→ Backed up sewage is kept  
in the sewer line.



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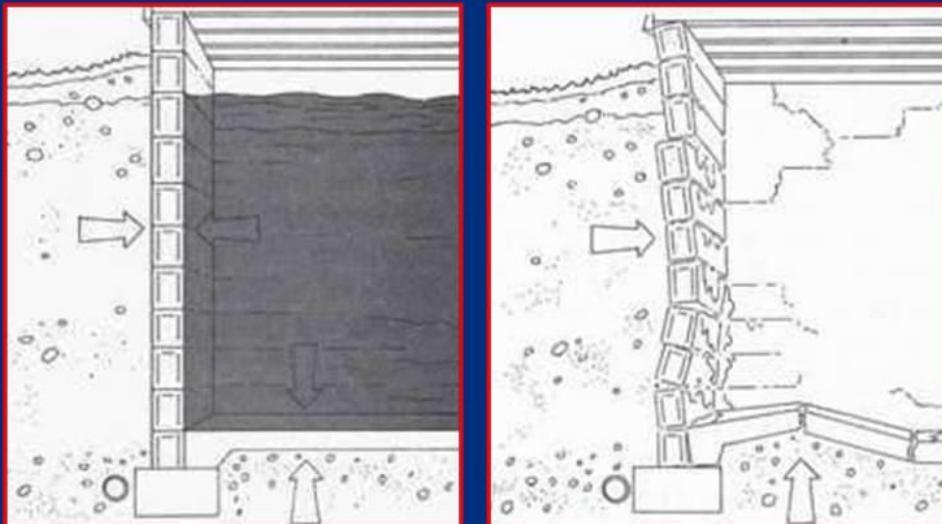
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An overhead sewer is a system in which all sewage from above-ground level flows by gravity to the public sewer, but all sewage and storm water collected below grade in the basement must be pumped up to the house sewer at a connection near the basement ceiling.

There are no direct connections between the main sewer system and the basement, so there is no way for the sewage to back up into the basement area.

Although an overhead system is very effective in eliminating basement back ups, the plumbing changes required make it a costly solution.

## If Your Basement Is Flooded... DON'T RUSH TO PUMP IT OUT!



**Pressure from groundwater can cause the floor to crack and the walls to collapse.**



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The weight of saturated soil applies pressure on basement walls and floors and can cause them to buckle inward or collapse. If water is allowed to enter the basement, the hydrostatic pressure becomes equalized and the walls are much less likely to fail.

There is a recommended rate to pump:

- Test the rate of water coming in by marking the wall and draw down 1 foot of water.
- Wait 24 hours.
- If the water level has not changed, draw down another foot of water and mark the new level.
- Wait another 24 hours.
- When the water level has remained down, begin to draw down 2-3 feet of water every 24 hours until the basement is empty.

## ACT FAST! Cut away wet wallboard and fiber insulation 12" above waterline.



Fans and a dehumidifier can be well worth the investment.

Apply bactericide.

Ventilate well.



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When the water recedes, cleanup must begin. Time is critical to combat the threat of mold, which can appear in one or two days.

All wet materials, mud and debris must be removed to the outside of the home.

Cut away wet wallboard and fiber insulation at minimum one foot above the high water line. In the case of low level flooding, homeowners only need to pop off the four by eight-foot sheet of wallboard to expose the lower portion of the wall. No cutting is necessary.

Scrub every surface touched by contaminated water and check for hidden pockets of water in places such as the furnace and clothes dryer. Vacuum any remaining water and run fans and dehumidifiers.

## Mold Can Be Toxic If Left To Grow *Clean Immediately!*

Scrub with 1 1/2 cup bleach per gallon sudsy water.

Let dry completely.

Treat again as necessary.



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Standing water and wet materials are a breeding ground for microorganisms such as viruses, bacteria and mold.

A good bactericide can be made with household materials. Dilute 1 1/2 cups bleach per gallon of water in a bucket or garden sprayer. A couple drops of liquid soap will slow evaporation while increasing kill time. Spray first, and then agitate mold patches with a stiff brush.

Let the affected area air dry. Don't rinse. If it takes a week for visible moisture to dry, it will take at least another week for unseen parts to dry.

# Avoid Mold Exposure

**Wear protective gear!**



**N-95 MASK**  
commonly found at  
hardware stores in the  
paint department.



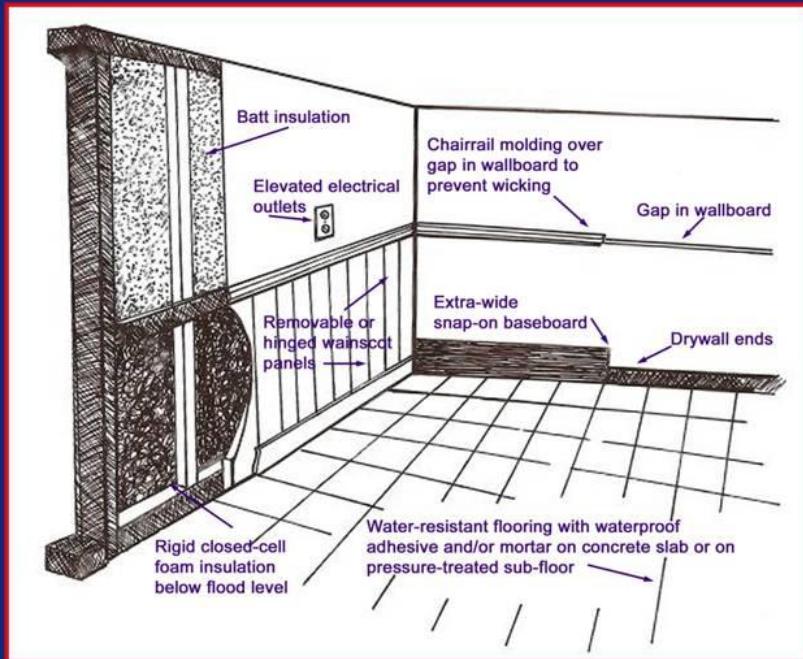
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Mold colonies are fuzzy patches of growth found on wallboard, wood furniture, wall studs and cabinets. Mold can be found in many sizes and colors. Mold and spore colonies have the ability to destroy organic materials and irritate allergies. The risk is greatest for people with allergies or asthma, and for the elderly, small children and pets. Symptoms are similar to hay fever (coughing, sneezing, eye irritation, headache) and may include memory loss and skin rashes.

# Repair With Water-Resistant Materials



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The repair or rebuilding process is an ideal time to incorporate disaster-resistant measures such as:

- Consider metal studs and sills rather than wood.
- The water-resistant nature of foam makes it well suited to insulating moist areas. Rigid foam insulation can be reinstalled after disinfecting and drying.
- Sheet vinyl flooring or tile may be installed with waterproof adhesive. Concrete sealants, along with staining and glazing, can be an attractive treatment for basement floors. Toss down some area rugs for warmth and accent.
- Synthetic baseboards can be used instead of wood.

# What About Flood Insurance?

## Benefits of Flood Insurance vs. Disaster Assistance

### FLOOD INSURANCE

- **Flood insurance claims are paid even if a disaster is not declared by the President.**
- **Cleanup costs are covered and payout is timely.**
- **There is no payback requirement.**

### DISASTER ASSISTANCE

- **Most forms of federal disaster assistance require a Presidential declaration.**
- **Cleanup reimbursement is subject to registration and determination of eligibility.**
- **The typical form of disaster assistance is a 30-year loan that must be repaid with interest.**



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Floods are the most common and costly natural disaster in the United States and a common misconception is that homeowners' policies cover flood damages. In fact, most homeowner and business multi-peril policies do not cover flooding. Those policies may cover minimal damages from sewer backup. The federal government offers National Flood Insurance coverage no matter what flood zone you live in.

(Note: The most important differences are that with National Flood Insurance no federal declaration is needed to file a claim and no payback is required, whereas the typical form of disaster assistance is a 30-year loan that must be repaid with interest.)

# National Flood Insurance Program

1 in 4 claims are paid on policies in low-to-moderate-risk areas.

If you live in a Special Flood Hazard Area, your home has a 26% chance of being flooded over the life of a 30 year mortgage, compared to a 9% chance of fire.



Plan ahead, a National Flood Insurance Policy must be in place 30 days to make a claim.

**To assess your risk visit [www.FloodSmart.gov](http://www.FloodSmart.gov)**

***Call 800-427-4661 for more information!***



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Did you know:

All areas are susceptible to flooding.

Anyone can purchase National Flood Insurance as long as their community participates in the National Flood Insurance Program. Renters, as well as homeowners, can purchase coverage.

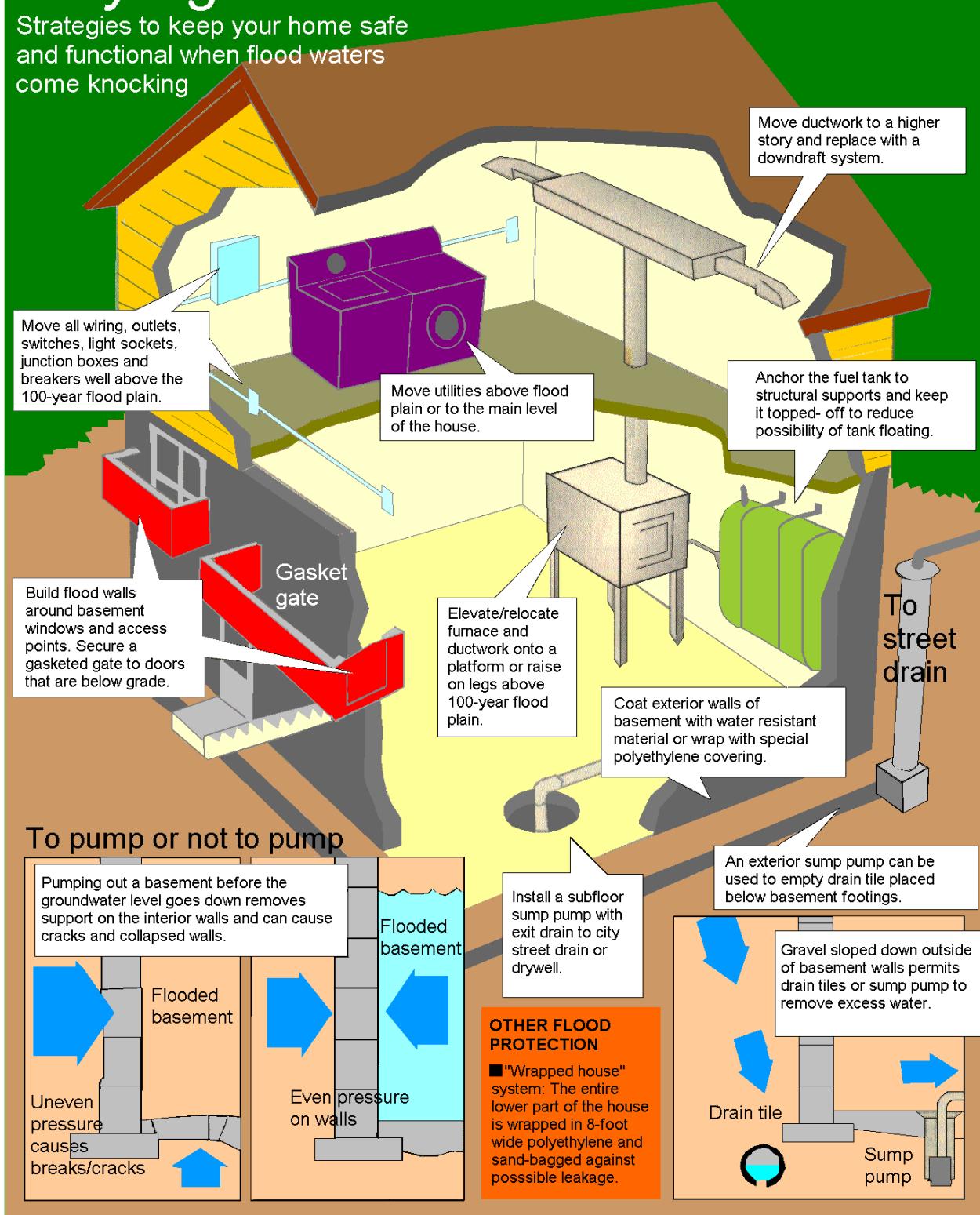
One in four claims are paid on policies in low-to-moderate risk areas.

The average home in a Special Flood Hazard Area has a 26 percent chance of being flooded over the life of a 30-year mortgage compared to a 9 percent chance of fire.

To learn your flood risk, go to [www.floodsmart.gov](http://www.floodsmart.gov) and type in your home address or call 800-427-4661.

# Staying above water

Strategies to keep your home safe and functional when flood waters come knocking



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# Important

- These are not absolute solutions.
- These are **suggestions** to help reduce your chances of repeat basement flooding.
- Your local official has authority.
- When retrofitting your home, backfilling your property or modifying your drain system, PLEASE MAKE THE PERMITTING OFFICE YOUR FIRST STOP.



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Here's a recap of the methods introduced:

- Get to know the home's unique characteristics and choose the mitigation methods that are appropriate for the home, elevation and budget.
- Small mitigation actions can lessen the damages and financial impact on individuals, communities and society as a whole.



Visit [www.fema.gov](http://www.fema.gov)  
for more ways to keep  
your home and family safe.