

# Monsoon Proof

Prepare for the monsoon...  
it is never too soon

A Southern Arizona Home and Business Owner's Guide to Flood  
Damage Prevention

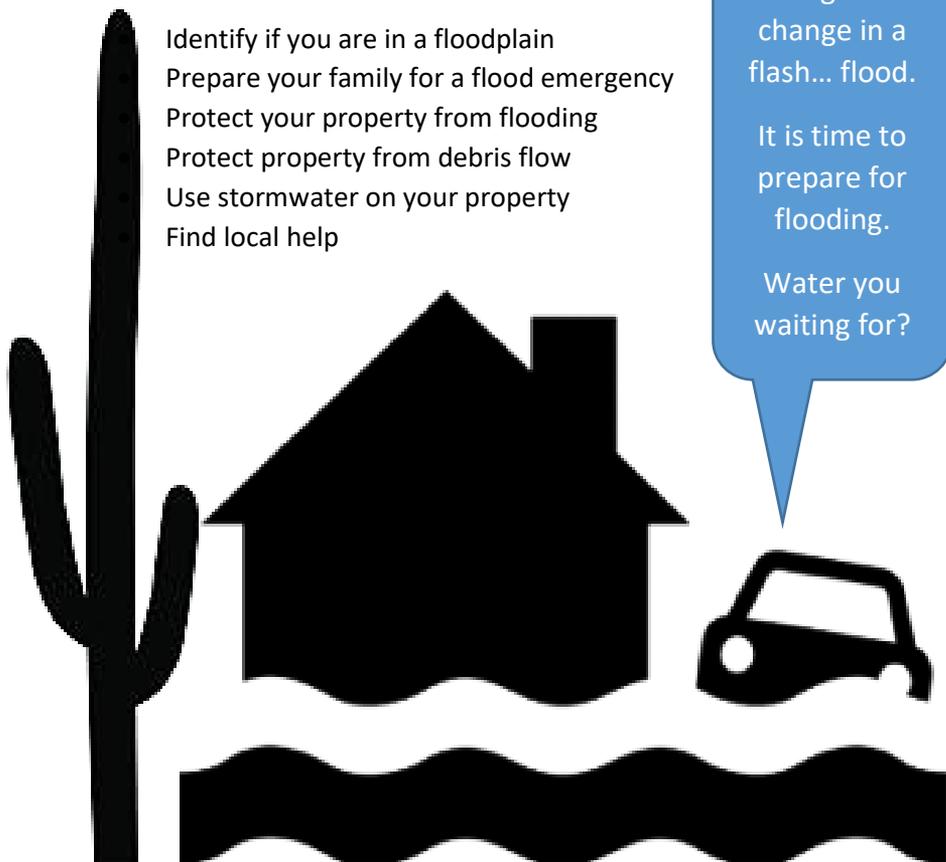
## Learn how to:

- Identify if you are in a floodplain
- Prepare your family for a flood emergency
- Protect your property from flooding
- Protect property from debris flow
- Use stormwater on your property
- Find local help

Things can  
change in a  
flash... flood.

It is time to  
prepare for  
flooding.

Water you  
waiting for?



A message from



In Southern Arizona, rain is abundant or scarce and rarely anywhere in-between. Monsoons bring deluges that turn dry washes to roaring rivers and roads into creeks. It is important to know how to protect yourself from flooding, and also your family and your property.

In the past Arizona was a primarily rural, sparsely populated state. However, within the last century cities have expanded and it has become increasingly important to control and use floodwaters. The primary mission of flood control is to protect life, property, watercourses, watersheds, and public infrastructure from the dangers and damages associated with flood and storm water. Individual homeowners and business owners can help to protect their properties by implementing the flood prevention strategies outlined in this booklet.

To reduce flooding near buildings, property owners can also **use** storm water in rain gardens, cisterns, and rainwater harvesting barrels.

Please take a moment to familiarize yourself with the emergency response tips. We strongly recommend that you develop a family disaster plan and assemble a disaster supply kit because disasters can strike quickly and without warning. In addition, consider purchasing flood insurance as losses due to flooding are not covered under most homeowner policies.

At NextGen Engineering we are committed to serving the community and produced this booklet to help southern Arizona homeowners and business owners know the importance of preparing for floods, and a few tips on how to do so. We hope you find this booklet useful!

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## General Flood Information

### **Flood Waters are a Problem and an Opportunity**

Flooding causes billions of dollars' worth of damages each year in the United States, however with proper preparation and planning, that water can be a resource and help recharge aquifers and be used as an alternative to traditional water supplies.

### **Are you at Risk?**

It is important to know if your property is in a floodplain, and how to protect yourself, your family, and your property if a flood were to occur. Certain areas (floodplains) are much more susceptible to flooding, however if you are out of a floodplain, it does not mean your property will not flood during a large storm.

### **Are you protected?**

Consider purchasing flood insurance, available through the National Flood Insurance Program (NFIP). Generally, there is a 30 day waiting period for this policy to become effective, so don't wait until the last minute to apply. A flood insurance policy may also reimburse you for actions you take to prevent flood damage.

### **Curious? Want more information?**

If you are curious of if you are located in a floodplain, would like drainage advice, or know you are in a floodplain and would be interested in removing a building on your property from the floodplain to reduce insurance, NextGen is here to help.

## Flood Terminology

**Flood watch:** a warning to the public that a flood is possible in your area

**Flood warning:** a public announcement that flooding is already occurring or will occur soon in your area

**Flash flood:** a sudden, violent flood

**Floodplain:** an area of low-lying ground that is subject to flooding

**100-year flood zone:** there is a 1% possibility that this particular area will be flooded in any one year. It is possible to have a 100-year flood more than once in the same year

**500-year flood zone:** there is a 0.2% possibility that this particular area will be flooded in any one year. Similar to a 100-year flood, it is possible to have a 500-year flood more than once in the same year

**Base flood elevation:** the height that floodwaters in a particular area have a 1% possibility of reaching or exceeding in a given year at that particular location

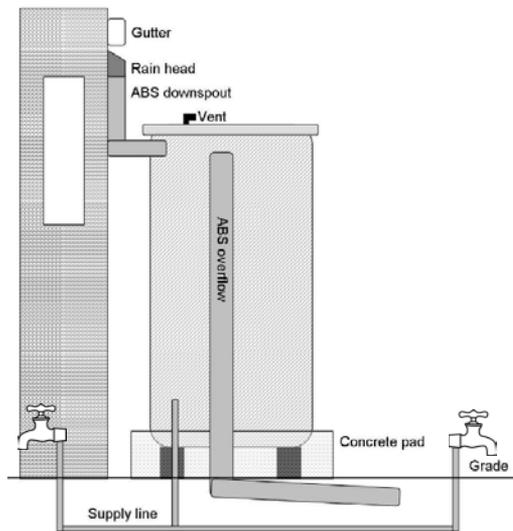
**Special flood hazard areas:** areas on a FEMA flood map that are at a high risk of flooding and require flood insurance

**FEMA:** Federal Emergency Management Agency

Flash cards of flood terminology are called flash flood cards!

## Using Stormwater

**FUN FACT!** The amount of rain that falls on the Tucson Metro area is almost equal to the amount of water used by Tucsonans. If only we could capture it all for use! A home rainwater catchment system is a good way to reduce stormwater on your property and reduce demand on your well or the local water supply. Building a rainwater catchment system is a fun project that if you live in Tucson and follow the correct process, costs can be subsidized by the city!



*Figure 1: Rainwater Catchment Cistern*

“Water Smart” Landscaping can help you not only control stormwater on your property, but also reduce erosion and naturally water a garden or plants on your property.

See “Additional Resources” in the back of this booklet for local help and places you can find more information.

## How to identify if you are in a Floodplain

Talk to local community officials. Each county has a Flood Control District who is the official repository of local Flood Maps. Local Community officials can provide specialized information about your area. FEMA has a floodplain database as well which can be accessed through following the below listed steps:

1. Visit FEMA's Floodplain service center at:  
<https://msc.fema.gov/portal>
2. Input the address of your property or area of interest
3. With your property or area of interest on the map, select "View Web Map"
4. A map will appear in a new window with floodplains highlighted in blue and orange. If the property or area of interest is located within a highlighted area, that property is in a floodplain. The legend on the left will tell you what risk zone the property is in. (If the floodplain is highlighted in blue, it means there is a 1% annual chance for a flood. If the floodplain is highlighted in orange, it means there is a 0.2% annual chance of flooding in that area.)
5. If your property, or the property of interest is not in a highlighted area, it does not mean that property will not flood in a 100 year or 500 year storm, but means the property is outside of the FEMA floodplain and will reduce the cost of flood insurance.

When we talk about flooding, we like to talk in flood-plain English

## Flood Prevention Strategies

**IMPORTANT! Some of the strategies presented in this booklet will require proper permitting. In Arizona, you legally cannot divert, alter or retard the flow of water at your property boundary. You may not divert, alter, or retard the flow of water without first obtaining the written permission of the local Flood Control District (if in unincorporated county areas) or the City Floodplain Administrator.**

### Checklist for Evaluating your Property

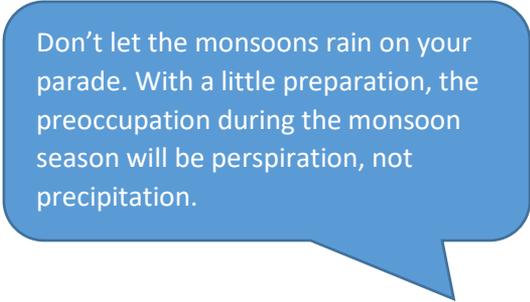
- ✓ The main electric panel board (electric fuses or circuit breakers) should be at least 12" above the projected flood elevation for your home. Panel board height is regulated by code.
- ✓ Consider elevating all electric outlets, switches, light sockets, baseboard heaters and wiring at least 12" above the projected flood elevation for your home. You may also want to elevate electric service lines and connect all receptacles in areas that could get wet to a ground fault interrupter (GFI) circuit.
- ✓ Elevate the washer and dryer on masonry or pressure-treated lumber at least 12" above the projected flood elevation.
- ✓ The furnace and water heater can be placed on masonry blocks or concrete at least 12" above the projected flood elevation.
- ✓ Know the overland escape routes for water/debris, and plan diversions accordingly. Consider low spots and high flow areas when planning for structure and property protection.
- ✓ Consider escape routes if floodwater will block your main routes and be sure that your efforts to protect your own property do not result in diverting water to a neighbor's property where it could cause damage.

## Property Flood Proofing: Drainage Improvements

There are two types of drainages to consider; surface and subsurface. Surface drainages refer to channels, ditches, culverts, walls and other conveyance or diversion methods that move surface water or debris off your property. Sub-surface drainage includes pipe, French drains and pumps which move water under the surface of land. Sub-surface drainage can be more difficult and expensive to construct, but can also result in lower property damage due to surface flooding and soil erosion, or flooded structures.

Carefully evaluate which type of drainage is needed for your property. When designing a drainage system, especially if you are located in a flood prone area, consider consulting a professional such as a civil engineer, or geotechnical engineer, or a landscape architect.

The following Figures show the difference between unprotected and protected homes.



Don't let the monsoons rain on your parade. With a little preparation, the preoccupation during the monsoon season will be perspiration, not precipitation.

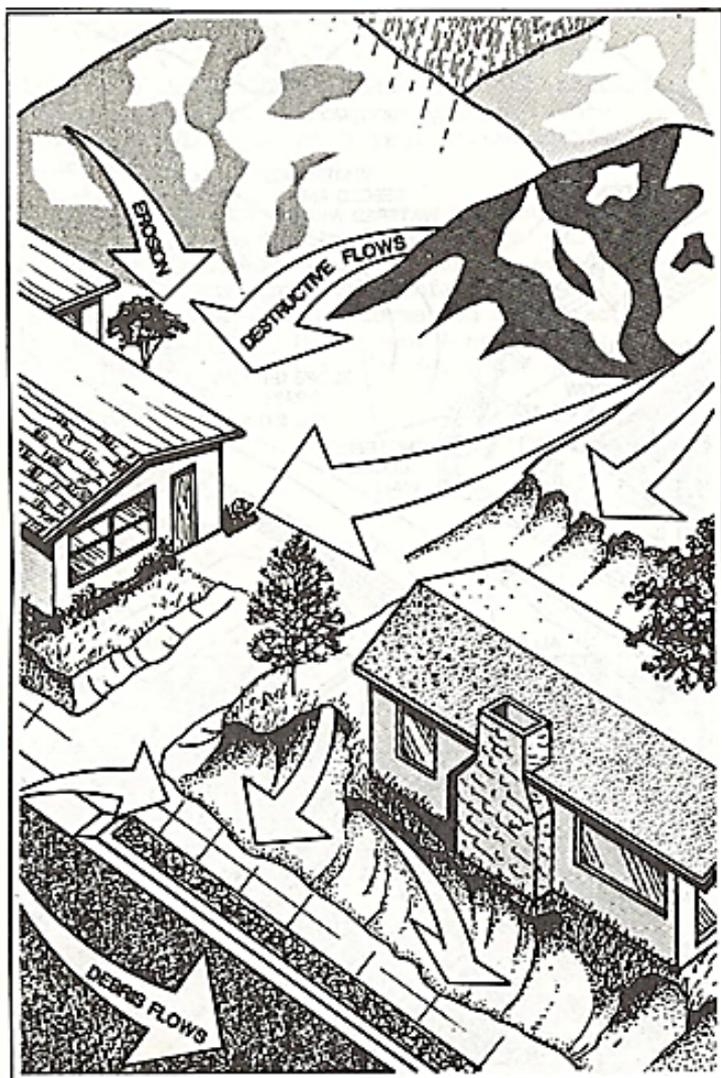


Figure 2: Unprotected Homes

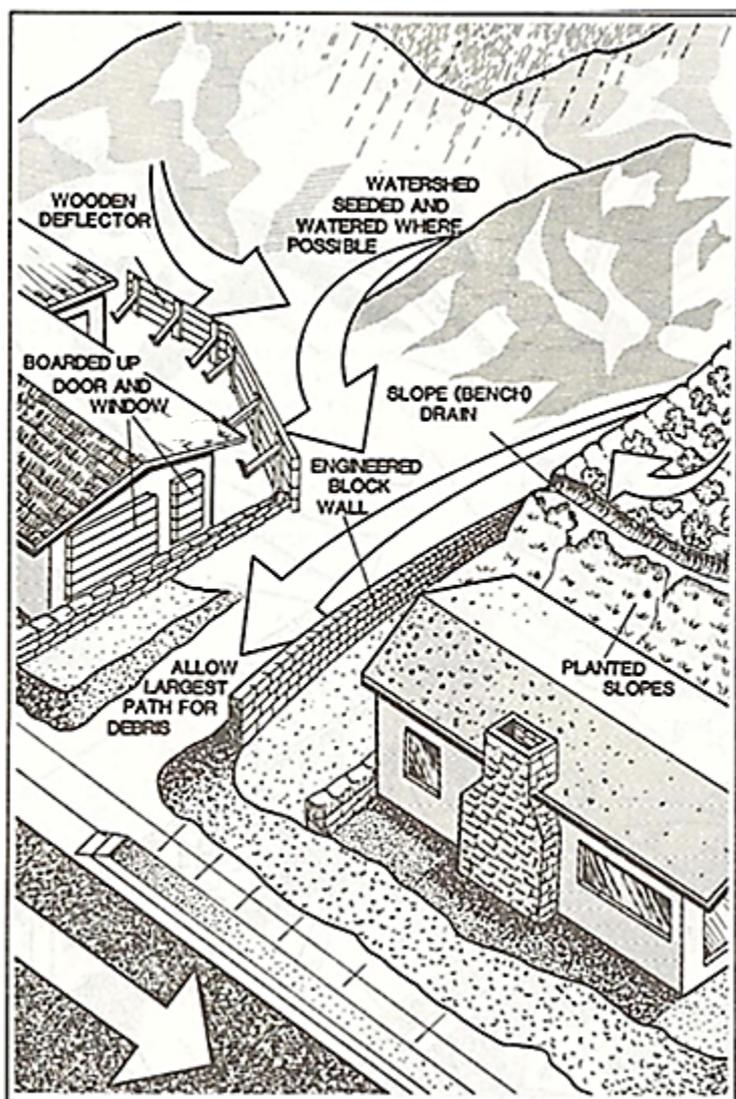


Figure 3: Protected Homes

Where water has flooded a low-lying area, a submersible sump pump is recommended. If flooding is a recurring problem, a permanent pump should be installed in a sump with a flotation device for automatic on/off operation. See figure 3.

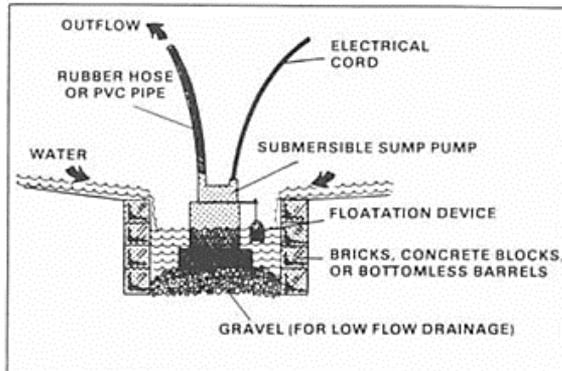


Figure 4: Submersible Sump Pump

In hillside areas, poorly maintained drainage devices (including slope or bench drains) are the source of many flooding problems. Maintenance of these drains are the responsibility of the homeowner with few exceptions. Keep these drains clear of debris and overgrowth. Blocking may cause undermining and structural failure of the drains or erosion of the hillside.

A primary design consideration is the location of overland escape routes for water on your property leading to streets or gutters. It is important that your drainage system does not overload those escape routes.

Once you have designed and installed a drainage system, be sure that you maintain it and check it periodically during the rainy season to identify and correct problem areas such as leaves clogging a drain or sump.

## Preparing Your Property for Debris Flows

During a flood, your property can be damaged by water, debris (mud, rocks, branches, etc.) or both. You need to be prepared for the possibility that both could occur. Many of the prevention strategies are the same. The following section emphasizes preparing for debris flows.

### Debris

Do not underestimate the potential power of debris flows. Begin planning and installing of debris control facilities before the storm season. Start as soon as possible. Protection facilities are not always pleasing to the eye but appearance should not dictate location or type of installations.

Be prepared to personally observe and maintain your installations during storm periods. In many cases a minor correction will prevent major failure. *However, do not take any unnecessary risks!*

### Do it Yourself Debris Control Aids

There are a variety of inexpensive ways to control debris flow on your property during a storm. When compared to the protection received they are well worth the time and money to install them. Most can be installed with normal household tools and use materials readily available at your local lumber or home improvement store. Some examples include: lumber, sandbags, sand, and plywood.

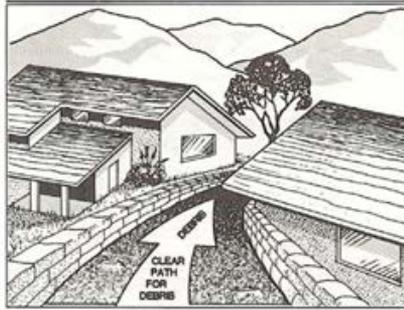


Figure 5: Directing Debris Flow between Buildings

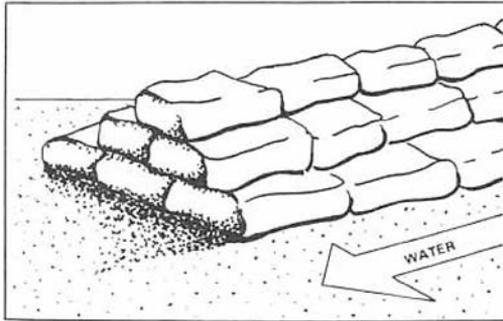
Should your debris control problems appear to warrant facilities in excess of the type described in this booklet, we recommend that you consult a licensed expert.

## Sandbags

Sandbags are available at home improvement stores. If there is an elevated risk of flooding or debris flows (such as after a wildfire), sandbags, are often provided by your local fire department. When properly placed, sandbags will redirect water and debris flows away from property improvements.

To create a barrier using sandbags, follow the instructions below:

1. Fill sandbags half full. Sand is suggested if readily available, however any local soil may be used.
2. Fold top of sandbag down and rest bag on its folded top.
3. Stack sandbags like bricks, staggering each layer. Complete each layer before starting the next. Limit placement to three layers unless a bracing is used as a backing or sand bags are stacked in a pyramid style as shown in figure 5.



*Figure 6: Stacking Sandbags in a Pyramid*

Additional things to know about sandbags:

- Sandbags will not seal out water
- Sandbags deteriorate when exposed for several months to continued wetting and drying. If bags are placed too early, they may not be effective when needed. If bags need to remain durable for longer time, adding cement can increase effective life.
- Sandbags are basically for low-flow protection (up to two feet). Protection from high flow requires a more permanent type of structure.
- Remember- be careful when stacking sandbags directly against the outer walls of a building since wet bags may apply added pressure on the wall.

## Preparing Your Property for Water Flows

Preventing water from entering a home or structure means ensuring that the primary access points (roof, windows, doors, walls and floor/foundation) are all protected as much as possible. The following information addresses each of these areas.

## Roofs and Gutters

Be sure that your roof does not leak. A simple inspection by a roofing expert or observation of wet areas on the ceiling during a storm should be adequate. A problem point can be near the chimney, where cinder blocks or bricks can leak, leading to infiltration down into fireplace. Water proof sealing materials are available at most hardware and building supply outlets.

Gutters should be checked each year before the rains to be sure they are clear of leaves and debris, and free of holes, rust or other structural defects. Gutters are the primary means to move excess water from the roof to safe overland escape points or rain harvesting barrels; nonfunctioning gutters can lead to problems. Downspouts should be designed to direct runoff to rain harvesting barrels or overland escape routes.

## Window and Door Protection

It is important to provide protection against water intrusion at possible entry points of a structure, such as doors or windows. Prevent debris from entering doorways and windows with baffle boards.

We all know, when it rains, it pours, so make the most of any window of good weather to prepare your house and family!

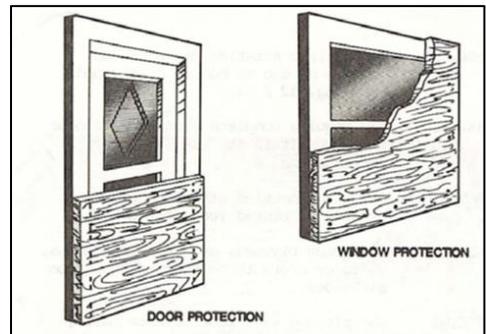


Figure 7: Typical Window and Door Protection

A hazard may require complete closure of a door and necessitate the use of another entrance. To prevent water from seeping through a door, a rubber seal (similar to weather tripping) should be affixed to the door frame.

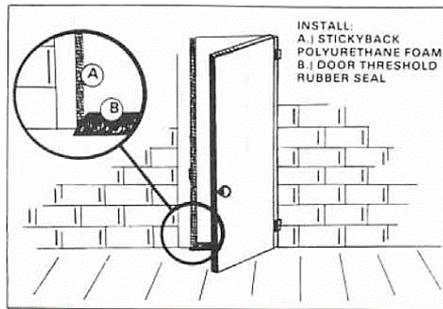


Figure 8: Door Seal

To prevent water from seeping through a sliding glass door, a plastic sheet (2 to 3 mm thick) should be placed between the door and the sandbags or between the door and the plywood barrier.

**Important: The above is not recommended for water levels above two feet**

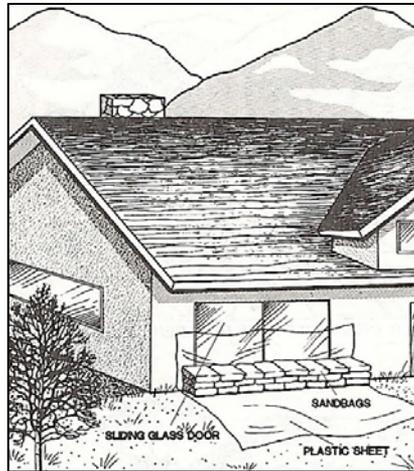


Figure 9: Sealing a Sliding Glass Door

Materials can be dismantled after the storm season and stored from year to year. Use low-grade plywood and overlap windows, vents or doors three to four inches on all sides. Secure the plywood with four or more nails, screws or bolts. A stake and board may also be used to wedge boards in place.

## Wooden Deflectors

A wooden deflector is used outside a structure to deflect debris or water to the best overland escape. Use low-grade lumber and overlap sections with protruding face downstream. Drive stakes to at least one half their length to ensure proper anchorage. Place deflectors on solid level soil to reduce the hazard of undercutting. **Do not attempt to use the lumber as a dam.**

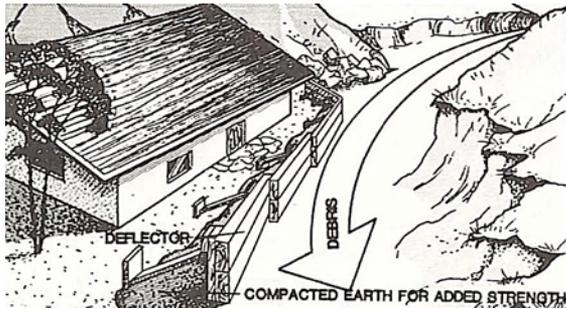
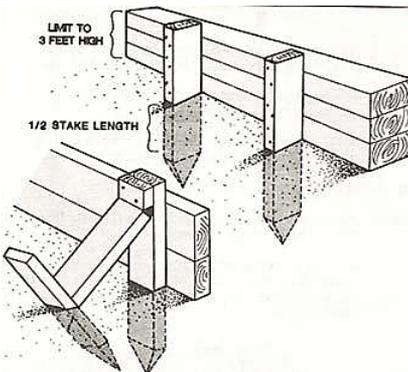


Figure 10: Timber Deflector



Earth packed behind the deflector will provide needed additional strength. If the deflector required is more than three feet in height, the house or structure will have to be protected with sandbags used as a deflector.

Figure 11: Close-up of Timber Installation

## Engineered Walls

Concrete blocks and heavy-duty wood walls that are designed and built to withstand load caused by water and debris are excellent for protection and durability. In many cases such walls can be adapted to become part of the Landscaping. Because these walls can be expensive, they should generally be considered permanent installations.

**Do not rely on walls that have not been specifically engineered for protection.**

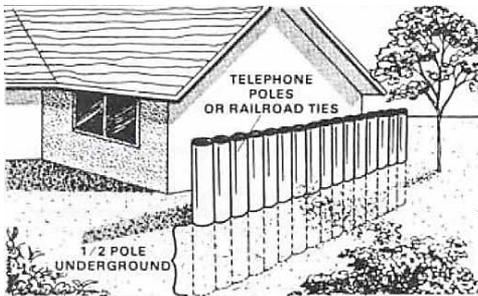


Figure 12: Barrier made of Telephone Poles or Railroad Ties

## Flood Awareness

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

Floods can roll boulders, tear out trees, destroy buildings and bridges, and scour out new channels. Flood waters can reach

heights of 10 to 20 feet and often carry deadly cargo of debris. Flood-producing rains can also trigger catastrophic debris slides.

Regardless of how a flood occurs, the rule for being safe is simple: head for higher ground and stay away from flood waters. Even a shallow depth of fast-moving water produces more force than most people imagine. The most dangerous thing you can do is try walking, swimming or driving through flood waters. Two feet of water is enough to carry away most automobiles, and just 6 inches will carry away most pedestrians.

Wow! That was a flood of information, here is a checklist to help keep you out of deep water.

## Plan for Flooding

- ✓ **Talk to local community officials, as they will know the specifics of your area best.**
- ✓ **Talk to your insurance agent about the National Flood Insurance Program.**
- ✓ **Develop an evacuation plan. Everyone in your family should know where to go if they have to leave.**
- ✓ **Discuss floods with your family, everyone should know what to do in case all family members are not together.**
- ✓ **Consider contacting some of the resources mentioned in this booklet to prepare your property and better understand options when it comes to controlling and using stormwater.**

## Additional Resources

**For information on FEMA floodplain adjustments, civil engineering and design, watershed management and water resource planning:**

### NextGen Engineering

(520) 393-3931

[ngeneng.com](http://ngeneng.com)

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**For information on harvesting rainwater, water-smart landscaping, and watershed management:**

### Watershed Management Group

(520) 396-3266

[watershedmg.org](http://watershedmg.org)

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**For information on Flood Insurance:**

### National Flood Insurance Program

(800) 611-6122

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

## Local Flood Information

There are numerous resources available through each county's Flood Control District including: maps, photos, county specific information and contact information, among other resources!

Pima County: (520) 724-4600

[http://webcms.pima.gov/government/flood\\_control](http://webcms.pima.gov/government/flood_control)

Santa Cruz County: (520) 375-7830

<http://www.co.santa-cruz.az.us/238/flood-control>

Cochise County: (520) 432-9300

<http://cochise.az.gov/>

## Acknowledgements and Special Thanks to:

Federal Emergency Management Agency (FEMA)

Ventura County Watershed Protection District's "Weathering the Storm", 2016.

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"Remember young one, just go with the flow."

"Go with the flow abuelo? Even if we are in the floodplain?"





## ***WE DO SITE EVALUATIONS***

NextGen helps families prepare for monsoons with site visits followed by professional recommendations. If interested, NextGen will come to your property, take a quick tour, and send you professional advice on how to prepare for flooding and ideas on how to best utilize rain that falls onto your property. We will also attach a FEMA Flood Insurance Rate Map, which will show nearby floodplains. If interested in preparing your property and family for the monsoons, contact us to arrange a site visit by emailing us at [admin@ngeneng.com](mailto:admin@ngeneng.com)

## ***WE HELP PROPERTY OWNERS SAVE ON FLOOD INSURANCE***

NextGen helps landowners get their structure, development, or portions of their parcel out of the FEMA floodplain when the elevation or location justifies the adjustment, which can lower flood insurance rates. This process is called a Letter of Map Amendment (LOMA). For straight forward cases we also do the e-LOMA that gives results within a day. If you need help understanding your floodplain options, contact us to arrange a free consultation at [admin@ngeneng.com](mailto:admin@ngeneng.com)