

# ***Homeowners' Guide for Flood, Debris, and Erosion Control after Fires***



The assistance of the following agencies and publications in preparing this guide is gratefully acknowledged:

*Homeowner's Guide for Flood, Debris, and Erosion Control* published by the Los Angeles County Department of Public Works

*Homeowners Guide for Flood Prevention and Response* published by Santa Barbara County Flood Control and Water Conservation District

*Stormwater Best Management Practice Handbook for Construction Activities California* Stormwater Quality Association (CASQA), January 2003

# Table of Contents

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<b>After the Fire.....</b>	<b>1</b>
<b>Getting Prepared.....</b>	<b>3</b>
<b>Methods for Protecting Your Property .....</b>	<b>6</b>
<b>Flood Insurance .....</b>	<b>11</b>
<b>Glossary of Terms .....</b>	<b>12</b>



# After the Fire

The effects of fire can be felt long after the flames are extinguished. Rates of erosion and runoff can increase to unsafe levels when trees, shrubs, grasses and other groundcover are no longer present. Under normal circumstances, roots help to stabilize soil, while stems and leaves slow water down, giving it time to absorb or soak into the soil. These protective functions can be severely compromised or even eliminated by fires. In the aftermath of a fire, the potential for flooding, debris flows, and erosion is greatly increased. Fortunately there are many things you can do to protect your home or business from the damaging effects of a fire:

**Flooding** - Flooding may occur even during moderate storms as rain falls on areas where vegetation has been destroyed by fire. Remember that flood waters:

- Consist of large quantities of water, and are often very turbulent and murky due to fine sediment, ash, and soil.
- Flood waters can quickly reach depths that would pose a threat to people or automobiles.
- Inundate large areas and can damage or destroy structures in their path.

**Debris Flows** - Debris flows are equally dangerous, especially in hillside or mountainous areas. Remember that debris flows:

- Consist of large quantities of soil, rocks, boulders, trees, or brush moved by flood waters.
- Occur when flood waters flow over barren soils and burn areas.
- Are highly destructive and may leave large quantities of sediment and rocks in their paths.
- Contain sufficient strength to destroy objects in their path.
- Can be controlled or directed to reduce property damage.

**Erosion** - Erosion often results in areas where there are steep banks of scoured soil or other ground materials. Remember that erosion:

- Cannot be controlled while it is happening and is often not seen until flood waters have subsided.
- Can seriously undermine structures, often leading to major structural failures.
- Occurs most often when waters flow rapidly over loosely compacted soil or burn areas.
- Can be reduced by stabilizing slopes prior to storms.

Figure 1 provides a general illustration of the types of actions you can take to protect your property from those hazards mentioned above. The remainder of this guide provides more detailed descriptions of these and other recommended practices that you can take to protect your home and property.

An Unprotected Home



A Protected Home

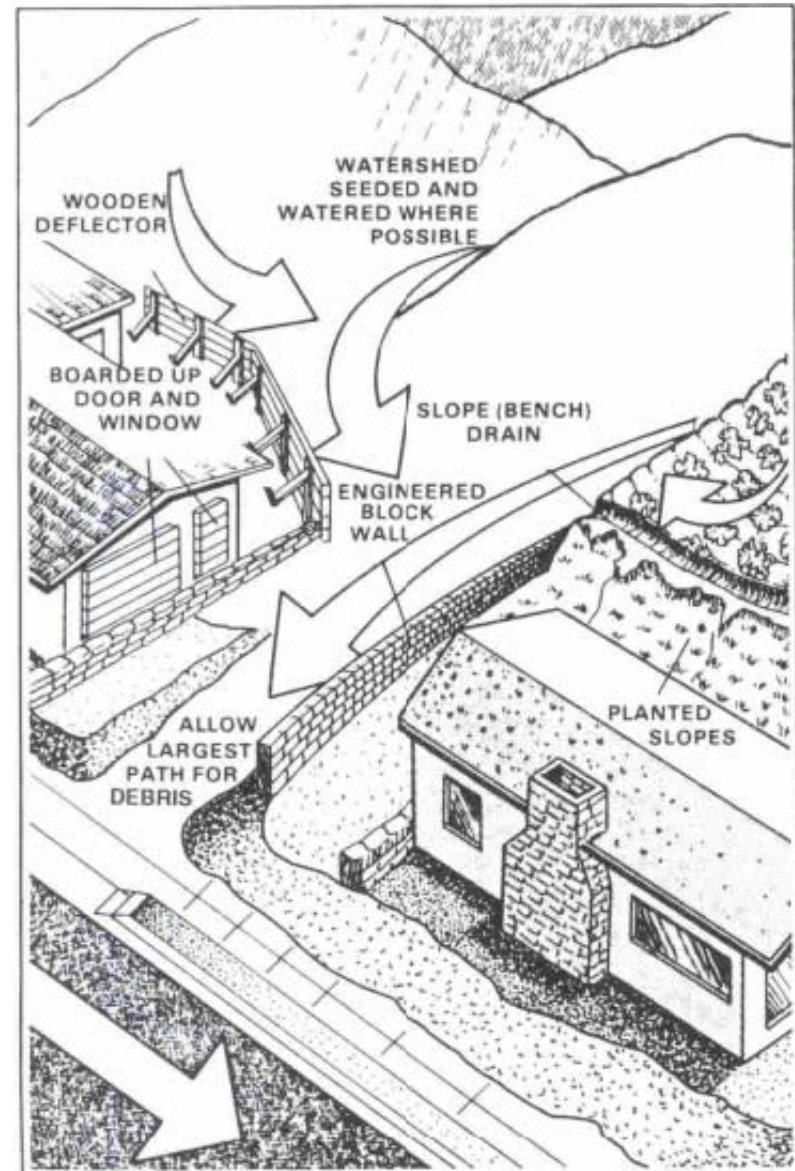


Figure 1: Examples of Unprotected vs. Protected Homes

# Getting Prepared

## Evaluating your Property

After a fire, it is important to thoroughly evaluate and plan for storm events in order to help protect your property. First, start by determining where water and debris are likely to flow and collect. Once you have located potential routes where water and debris may flow, plan and implement diversions in those identified flow pathways. Pay particular attention to steep, barren slopes, low spots, and high flow areas when planning for structure and property protection.

## General Precautions

During a storm event, property damage can be attributed to stormwater runoff, debris (mud, rocks, branches, etc.), or both. When devising a protection strategy for your property, pay special attention to the following general rules:

- Never underestimate the power of stormwater and debris flows.
- Try to direct stormwater and debris flows away from any structures.
- Avoid altering natural or existing drainage patterns in a way that might worsen conditions for you or your neighbor. Work cooperatively with your neighbor to achieve the best results.
- Avoid trying to control or confine flows more than is absolutely necessary; remember that the water and debris flows need to go somewhere.
- Place protection devices in such a way so as to deflect debris; do not try to create a dam or stop the flows in any way; this may cause flooding.
- In extreme condition, board up windows as necessary to prevent debris from entering structures.
- Protect your most valuable property first - your home; then consider what time and money are available to protect other less valuable objects such as swimming pools, landscaping, or other minor structures.
- Be prepared to sacrifice the use of portions of your property to achieve the greatest amount of protection.
- Don't take unnecessary risks; if your debris control problems appear to warrant solutions beyond the scope of this guide, consult a competent expert such as a civil or geotechnical engineer or a landscape architect for additional advice.

## Materials and Supplies

There are many effective and relatively inexpensive do-it-yourself ways to control flows. Most can be installed with normal household tools using materials available at your local lumber yard or hardware store. Materials that you may need to implement the specific methods

described in this guide typically include sandbags, gravel bags, fiber rolls, lumber, plywood, plastic sheeting, rubber seals (similar to weather stripping), and concrete blocks.

Maintenance of all erosion control devices along with the routine removal of accumulated water and debris is crucial to avoid potential flooding problems and structural damage. When not routinely maintained, erosion control devices may become ineffective. In addition, all drainage pathways should be kept clear of debris and overgrowth since blockage may cause flooding and structural failure. Typically, maintenance of hillside drains is the responsibility of the property owner.

**Sandbags** - Sandbags are commonly used for a variety of specific purposes to prevent property damage. Properly filled, installed, and maintained sandbags can be used very effectively to re-direct stormwater and debris flows away from property improvements. Figure 2 below provides general instructions for filling and placing sandbags. Note: sand bags should NOT be used on a slope or hillside.

	<ul style="list-style-type: none"><li>○ Fill sandbags one-half full. Sand is suggested if readily available; however, any local soil may be used.</li><li>○ For a more durable bag with increased effective life, mix 10 parts of sand or soil with one part of cement. The materials can be mixed and placed dry. After all bags are in place, a light sprinkling of water is recommended.</li><li>○ If you do not have tie closures for the bags, fold the top of the sandbag down and place the bag on top of the folded top. It is important to place bags with the folded top in an upstream or uphill direction to prevent bags from opening when water runs by or over them.</li></ul>
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**Figure 2: Instructions for Filling and Using Sandbags**

To ensure their effectiveness, care should be taken to properly stack sandbags. Figure 3 illustrates a number of ways in which sandbags can be used, each showing their proper placement. When stacking sandbags, make sure that each layer is completed prior to starting the next one. Also limit placement to two layers unless a building is used as a backing or the sandbags are stacked in a pyramid fashion.

It's important to remember that there are limitations to using sandbags. They will not completely seal out water. Sand and soil filled sandbags also deteriorate when they're exposed to the sun for extended periods of time, and from the continued wetting and drying over several months; if the bags are placed too early, they may not be as effective when it rains. Finally, sandbags are generally intended for low-flow protection (up to two feet). Protection from higher flows often requires a more permanent type of structure.

Gravel bags are similar to sandbags except they are made of burlap and filled with small rocks (gravel). Gravel bags should be placed on slopes to minimize erosion. The burlap and gravel



allow stormwater to pass through the bag while trapping sediment upstream. Gravel bags should be placed across the slope not more than two high as shown in Figure 2. Remember to clean out the silt trapped behind the bags after each storm.

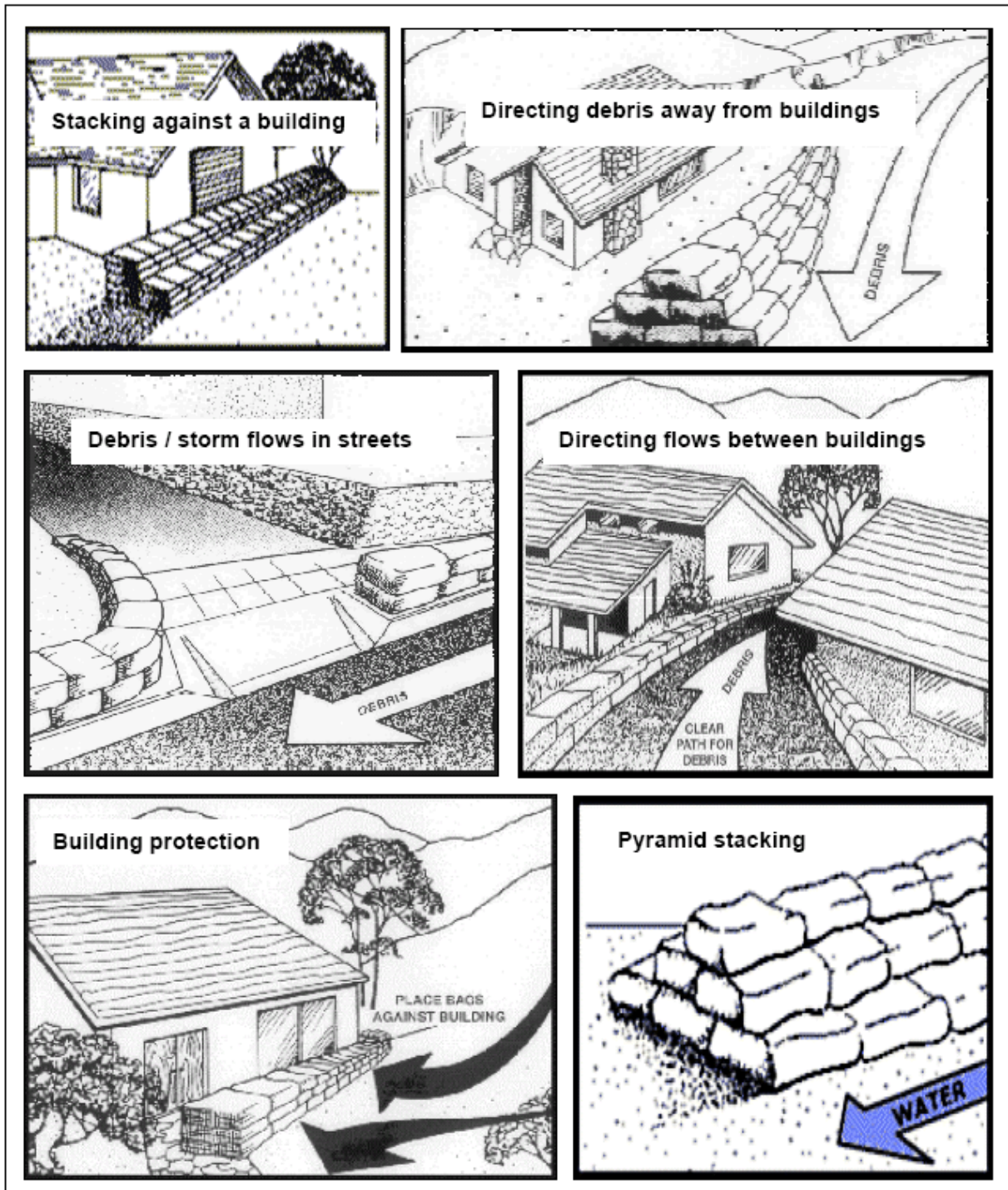


Figure 3: Uses and Proper Placement of Sandbags

# Methods for Protecting Your Property

Each property is unique. Protective measures should always be selected to address your property and its surroundings. The following issues should be considered in developing a strategy:

- Protecting structures
- Protecting land from water and debris flows
- Protecting slopes and surfaces from erosion

## Protecting Structures

Several types of deflection devices can be used to protect structures, doorways, and windows on your property.

**For Doors and Windows** - One way to protect doors and windows is to completely cover them with plywood. Low-grade plywood can be placed over windows, vents, and doors and should overlap 3 to 4 inches on all sides. Each sheet of plywood should be secured with four or more nails, screws, or bolts; stakes and boards may also be used to wedge barriers in place. When the plywood is no longer needed, it can be dismantled and stored for years to come. As an alternative, standing pipes on both sides of a door may be used to secure a removable barrier (see Figure 4).

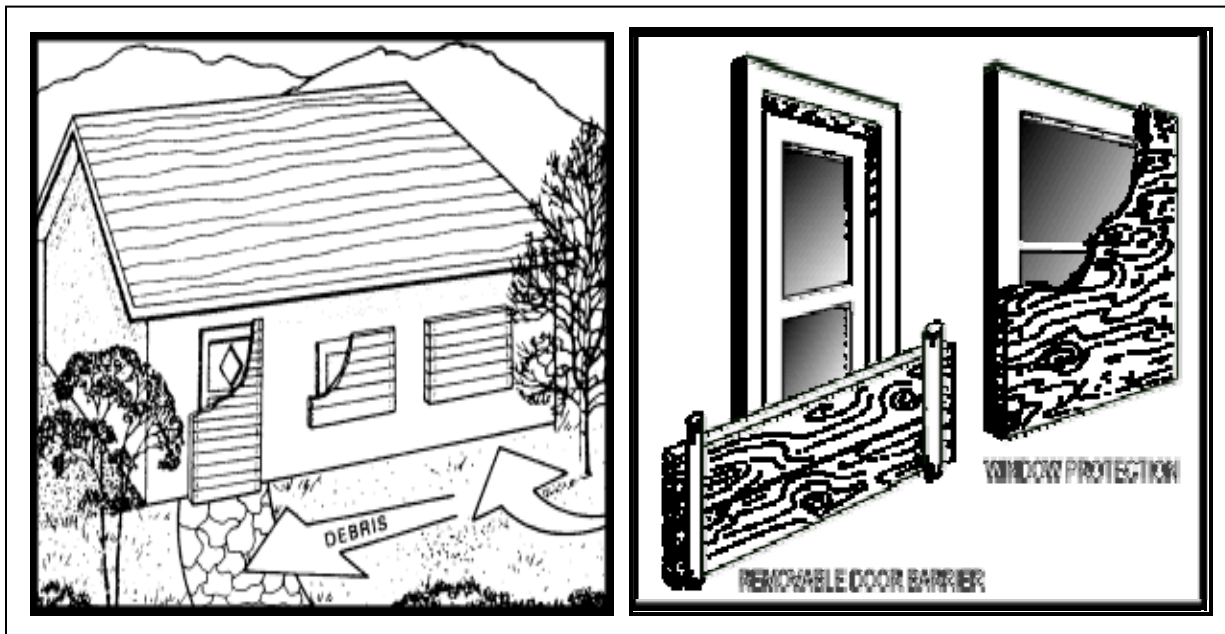
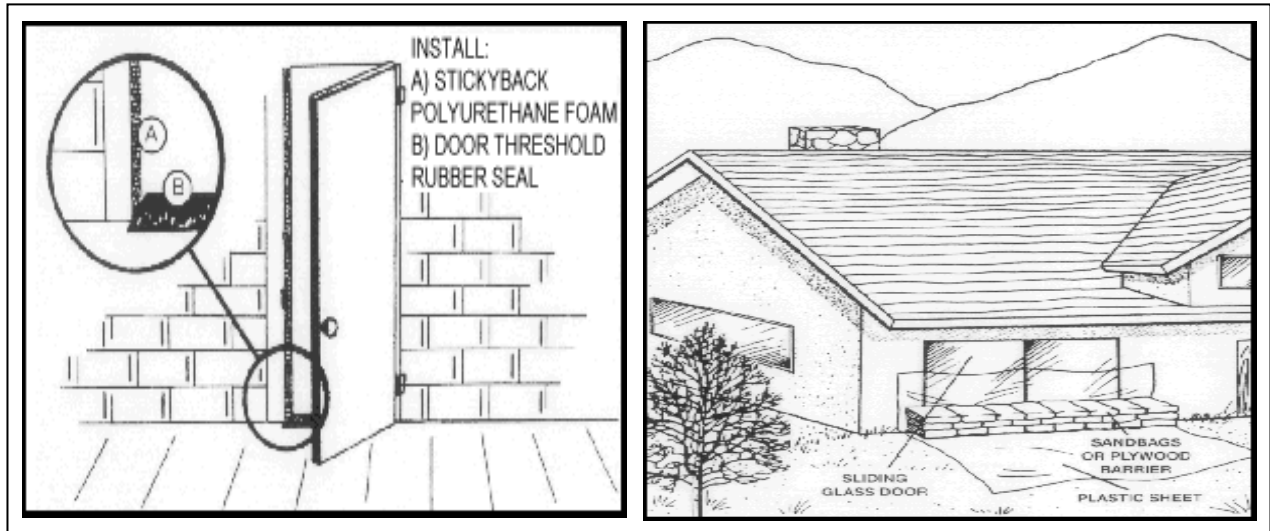


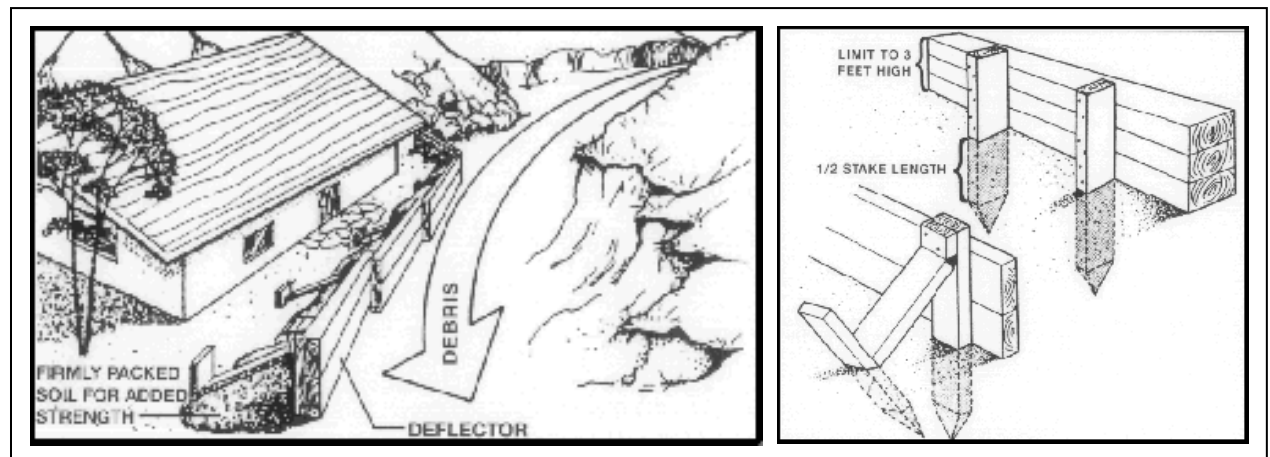
Figure 4 - Using Plywood to Protect Doors and Windows

To prevent water from seeping around a door, a rubber seal (similar to weather stripping) can be affixed to the doorframe. When the door is closed, a watertight seal should result. To prevent water from seeping around a sliding glass door, a plastic sheet (2 to 3 millimeters thick) should be placed between the door and the sandbags or between the door and the plywood barrier (see Figure 5). This is not recommended if water levels are anticipated to rise above two feet.



**Figure 5 – Sealing Conventional and Sliding Glass Doors**

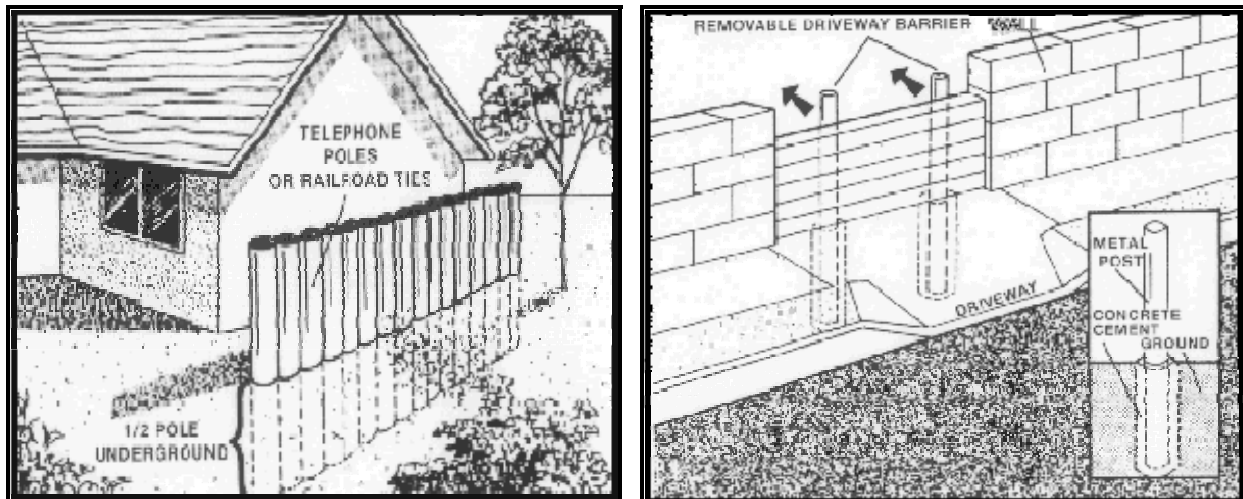
**For Structures** - Low-grade lumber can be used to create a timber deflector (see Figure 6). This device should be limited to a height of three feet. When installing timber deflectors, drive stakes into the ground at least one-half their length to ensure proper anchorage. Place deflectors on solid, level soil if possible to reduce the hazard of undercutting.



**Figure 6 – Using Lumber and Soil to Create a Timber Deflector**

Sections of the lumber barriers should be overlapped so that the protruding ends are facing downstream. If additional strength is needed, soil or sandbags can be firmly packed behind the deflector. If a taller barrier is required, an engineered wall should be considered.

Concrete block walls that are designed and built to withstand water and debris flows are excellent for protection and durability. In many cases, such walls can be adapted to become part of the landscaping. These walls generally are expensive and should be considered permanent installations. *Caution: Only engineered walls should be installed.* Other permanent solutions include telephone poles or railroad tie barriers or removable driveway barriers (see Figure 7).



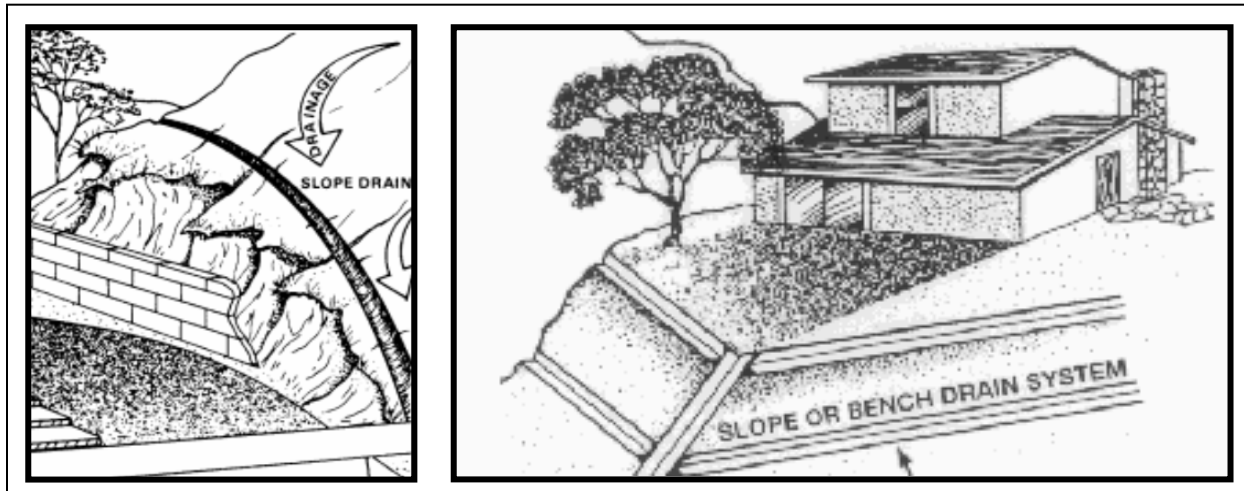
**Figure 7 – Examples of Permanent Barriers**

### **Protecting Land from Water and Debris Flows**

At times it may be necessary to control the amount of water and debris that flows onto your property from surrounding areas. To divert this water, a small slope or drain can be dug at the top of each steep slope surrounding your property (see Figure 8). It is important not to allow large amounts of water to flow or build up along any one route. Maintenance of the control devices and accumulated water and debris flows is crucial to avoid potential flooding problems. All drainage areas should be kept clear of debris and overgrowth since blockage may cause undermining and structural failure of the drainage areas or increased erosion of the hillside. Typically, maintenance of hillside drains is the responsibility of the property owner.

**Ditches and Drains** - Where ditches are used in unstable or non compacted soils, they should be planted with perennial grasses. Slopes particularly susceptible to erosion may also require supplemental erosion control measures.

Please note that it is unlawful to divert natural flows in a way that will negatively impact neighboring property. Always work cooperatively with your neighbors for the best results. Ditches should ideally drain into a natural watercourse, a street, or a well-vegetated area.



**Figure 8 – Using Drains to Divert Flow from Slopes**

## **Protecting Slopes and Surfaces from Erosion**

The focus of your erosion control strategy should be on permanently stabilizing all slopes and exposed surfaces. Landscaping of slopes is a long-term solution to erosion problems and is typically the easiest way to prevent erosion. Barren areas should be replanted as soon as possible and temporary measures used until the plants are well established. Professionally applied slope stabilization (such as hydro-seeding or hydro-mulching) is commercially available, and should be considered on high, steep slopes. These and other temporary measures are discussed below and illustrated in Figure 9.

**Hydro-seeding** - Hydro-seeding consists of applying a mixture of seeds combined with a binding substance to barren slopes and burned hillsides. Hydro-seeding can help to reduce erosion by establishing quick growing plants to stabilize soils. Once established, these plants will reduce erosion by slowing runoff velocity, enhancing infiltration of water into the soils, and traps sediment and other particulates. Hydro-seeding will require irrigation during dry weather in order to establish the seed growth process. Hydro-seeding should be applied at least 24 hours prior to a rain event. Until the vegetation is established, additional erosion control measures may be necessary; additionally, a second application may be required for it to remain effective for an entire rainy season.

**Hydro-mulching** - Hydro-mulching consists of applying a mixture of shredded wood fiber or other hydraulic matrix. Mulching temporarily protects exposed soil from erosion by storm runoff or wind. Hydro-mulching can help to decrease runoff and increase natural water infiltration and should be applied at least 24 hours prior to a rain event. Because mulching is a temporary measure, additional erosion control measures may be necessary until new

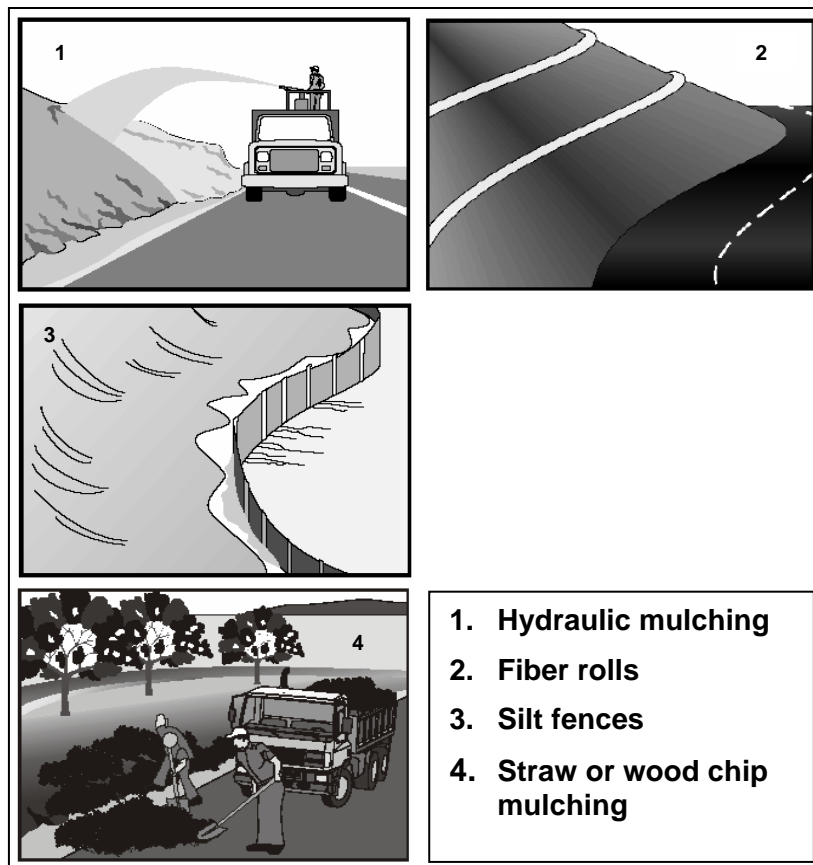


vegetation is established; additionally, a second application may be required for it to remain effective for an entire rainy season.

**Fiber Rolls** - Fiber rolls are comprised of straw, flax, or other similar materials bound into a tight tubular roll. When they are placed at the toe and on the face of slopes, these devices reduce the velocity of storm runoff by releasing the runoff as sheet flow, and help to contain (hold back) and remove sediment from the runoff. When properly installed, fiber rolls can also be effective in reducing erosion.

**Silt Fences** - Silt fences are made of a filter fabric that is attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. They help to retain sediment, while allowing water to flow through. Silt fences are suitable for perimeter control and should be placed below areas where sheet flows discharge from the site. They are only applicable for sheet or overland flows, and should not be used on slopes. Silt fences are most effective when used in combination with other erosion controls.

**Straw or Wood Chip Mulching** - Straw or wood chips can be used to hold soil in place. This has the added benefit of increasing the organic content of the soil. Either material should be worked into the top few inches of the soil. A cover layer of chips approximately 2 inches deep (or less) can also be used as slope and soil conditions warrant.



**Figure 9 – Examples of Temporary Measures to Protect Your Property**

# Flood Insurance

Flood insurance under the National Flood Insurance Program is available throughout the unincorporated areas of San Diego County even if your property is not in a flood hazard area. To determine if your property is in a federally designated flood hazard area, you can contact the County of San Diego at (858) 694-2727.

If you have concerns that flooding may cause damage to your home, you should contact your insurance broker regarding flood insurance. Please note that when purchasing insurance voluntarily, there is a 30-day waiting period after the policy is issued, before the coverage becomes effective. For more information about flood insurance, contact the Federal Emergency Management Agency (FEMA) at the following toll free number: 1-800-638-6620.

# Glossary of Terms

**Bench Drain** - Typically a V-shaped ditch covered with gunite or concrete, which is located horizontally and vertically along residential hillside areas. This device assists in draining the slope to protect against hillside erosion. Typical width is 3-5 feet and typical depth is 12". (Same as a "Slope Drain")

**Debris** - Any combination of ash, soil, rock, mud, trees, or vegetation usually transported by debris flow.

**Debris Flow** - Consists of any ash, soil, rocks, boulders, trees, or brush being moved along the landscape by storm waters. Depending on the intensity of the storm, debris flows may contain sufficient strength to destroy or move objects such as cars and buildings in their path.

**Drainage Patterns** - The drainage paths storm water runoff usually or historically takes through a given area.

**Engineered Concrete Block Walls** - Walls engineered to hold back water and debris flows. These walls are considered to be permanent, and generally do not require replacement or maintenance.

**Flood** - (1) typically a temporary condition of partial or complete inundation of land areas due to the overflow of inland or tidal waters; or (2) a large amount of storm runoff inundating an area of land that would, under normal conditions, be dry.

**Flood Insurance** - This type of insurance provides monetary compensation for flood damages to your home or belongings in your home. Flood insurance can be purchased through your local insurance agent.

**Ground Cover** - Typically low-lying vegetation that will spread outward, eventually covering all surrounding bare soil.

**Natural Watercourse** - An unimproved natural stream of any size; includes rivers, creeks, branches, canyons, arroyos, gullies, washes, etc.

**Overgrowth** - Foliage that has grown and spread out so as to obstruct or block any natural watercourse (drainage area), improved drainage device (such as a storm channel, culvert, or storm drain), or other such structures.

**Rainy Season** - That portion of the year, typically between the months of October 15 to April 15, when San Diego County receives its largest amount of rain.

**Sandbags** - A plastic or vinyl type bag that can be filled with sand or native soil. These bags can be stacked or placed in such a fashion to redirect storm and debris flows away from homes or property improvements.



**Slope Drain** - Typically a V-shaped ditch covered with gunite or concrete located horizontally and vertically along residential hillside areas. This device assists in draining the slope to protect against hillside erosion. Typical width is 3-5 feet and typical depth is 12". ("Same as a Bench Drain ")

**Sump** - A low-lying area with no drainage outlet, which captures and contains any amount of storm runoff or debris flows.

**Sump Pump** - A pump designed to remove water or debris out of a sump or basement.