

## HUMAN ACTIVITIES AND LANDSLIDES

California Association of Geologic Hazard Abatement Districts

In residential areas where homes are constructed on or above slopes, human activities can contribute to causing landslides and increasing landslide risk. The good news is that many human-caused landslides can be avoided or mitigated. In developments with Geologic Hazard Abatement Districts (GHAD), which bears a responsibility to mitigate landslides, residents can help prevent landslides and alert the GHAD to areas of potential slope failure. By understanding the signs of potential geologic hazards, homeowners can be empowered to raise concerns before the situation becomes serious.

**FIGURE 1: Permanently pressurized irrigation line break on slope immediately downslope of residence**



Landslides can occur for a number of reasons, but the leading cause of earth movement in sloped environments is saturation caused by rainfall, irrigation or inundation from other sources (an example is a leaking swimming pool). Over-irrigation or leaking irrigation systems are primary causes of slope instability that can lead to landslides. In addition, changes in irrigation or surface runoff can cause changes in surface drainage and can increase erosion or contribute to destabilizing a slope or raising the groundwater table.

Long-standing leaks in irrigation and drainage systems that may have been leaking for years can create instability in slopes and put homes at risk. As the groundwater table rises due to excessive irrigation or leaks, the soil of the slope is weakened and the risk of earth movement rises, thus facilitating slope failure. As necessary, the GHAD will monitor groundwater levels, but smart irrigation choices and maintenance can help to ensure proper groundwater levels.

In addition to water on or within slopes, changes to a slope resulting from excavation for swimming pools, retaining walls or terracing can increase landslide risk if these excavation activities or improvements are ill conceived, or improperly designed or constructed. An increase in slope angle, decrease in toe or lateral support, or a greater uphill load can increase potential landslide risk. For homeowner projects requiring excavation or grading, it is important to obtain the appropriate permits.

**FIGURE 2: Landslide below residence located at the top of slope. Note broken white irrigation pipe at top of landslide downslope of wood retaining wall.**



For the homeowner, here are some general drainage suggestions to help maintain slopes, since improper drainage may result in saturation with consequent loss of compaction and fill strength of soil. It is very important that residential lots be positively graded at all times to provide for rapid removal of surface water. Ponding of water at any time should be prevented. Care should be exercised to ensure that landscape mounds and hardscape features do not interfere with proper drainage. Sufficient area drains should be provided around the house and yard to remove excess surface water. Also, if installed, stormwater from roof downspouts should be conveyed in closed drain systems to a proper storm drainage facility.

In general, surface water on a residential lot is directed from the back of the lot to the front of the lot into the development's storm drain system. Surface water or pool drainage pipe outfalls should not be directed onto sloping areas. This has the potential to saturate the slope and cause erosion or instability.

If planting on or near the top of slopes consider:

- Drought-tolerant plants that require very little moisture. Irrigation of landscape areas should be limited strictly to that necessary for plant growth.
- Low precipitation sprinkler heads.
- Timers on sprinkler systems that regulate the amount of water distributed.
- Surface grades to direct rainfall or landscape water to appropriate collection systems and away from structures and slopes.

If you notice water seeping from slopes, signs of erosion, soil slippage, failing retaining walls or other conditions that raise concerns, please let your GHAD know.