

as stakes or in bundles. When placed in the soil next to a water body or when watered frequently, these will sprout and form dense willow shrubs which provide excellent erosion control and good wildlife habitat. These biotechnical methods can be less costly than other mechanical methods, but they also require more maintenance and ample water. Erosion control blankets such as jute netting can also be staked on slopes to stabilize soil while irrigated plants are getting established.

### Helpful Publications

*Home Landscaping Guide for Lake Tahoe and Vicinity.* Available online: <http://www.unce.unr.edu/publications/files/nr/2006/eb0601.pdf>

*How to Install BMPs in the Lake Tahoe Basin.* Available online: <http://www.unce.unr.edu/publications/files/nr/2004/eb0403.pdf>

*Choosing the Right Plants for Northern Nevada's High Fire Hazard Areas.* Available online: <http://www.unce.unr.edu/publications/files/nr/2007/eb0701.pdf>



# Stabilize Steep Slopes with Plants and Erosion Control Structures



Written by

**John Cobourn**  
Water Resource Specialist

**Steven R. Lewis**  
Extension Educator

**JoAnne Skelly**  
Extension Educator

Figure 5. The slope lines at the bottom of this illustration portray the actual steepness of the ground along with the recommended slope stabilization methods for each. On slopes steeper than 50%, structures should be used along with plants and mulch.

bottom of the slope, then placing rocks above them on the slope to protect the soil underneath (Fig. 4, lower photo). This practice is most attractive, again, when native and/or adapted plants are nurtured in spaces between rocks.

Figure 5 illustrates erosion control methods for slopes of varying steepness. Willow wattling involves the use of fresh willow cuttings either



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## Introduction

Bare soil on steep slopes erodes easily during rainstorms, snow melt and windy conditions. It can also erode when disturbed by human and pet traffic. The eroded soil, or *sediment*, often accumulates in street gutters or roadside ditches (Fig. 1). Subsequent rainstorms wash sediment down through storm drainage systems to the Carson River, where it harms water quality and fish habitat.



Figure 1. Sediment from eroding slopes can still be seen in the street days after a storm.

Bare soil erodes much more easily than soil covered with mulch or plants. Establishing vegetation and/or covering bare ground with mulch is more difficult on steep slopes than on flat or gently sloping ground. The illustration in Figure 2 shows the likelihood of success when using vegetation alone to stabilize slopes of different steepness.

For slopes with a gradient of 50 percent or steeper, a combination of erosion control methods works better than relying on vegetation alone (Fig. 3). A 50 percent slope has a vertical "rise" of 1 foot for every 2 feet of horizontal "run." Such a slope is often called a 2-to-1 slope.

Don't confuse slope percent with degrees. A 45 degree slope is about twice as steep as a 50 percent slope.

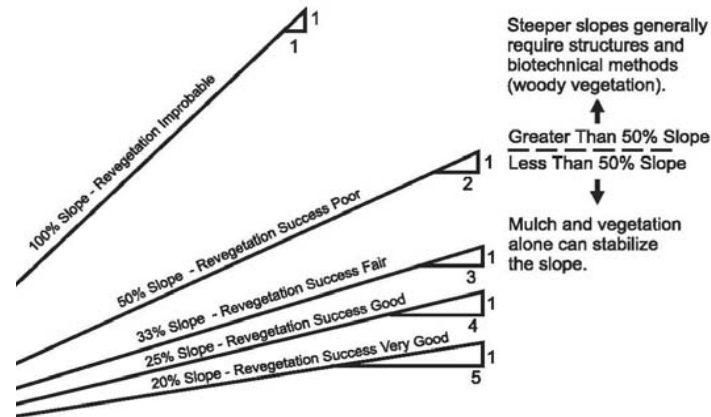


Figure 2. The establishment of vegetation for stabilization on slopes greater than 50 percent is very difficult.



Figure 3. The eroding hillside in the upper photo has greater than a 50 percent slope. It is easier to grow plants when a retaining wall holds up the toe of the slope, as shown in the lower photo.

## Attractive Treatments

The most attractive way to prevent erosion on slopes over 50 percent in steepness is to install retaining walls to create nearly flat terraces. Plant terraces with perennial flowers, conservation grasses or shrubs (Fig. 4). If a retaining wall is more than 4 feet high, measured from the bottom of the footing, it must be designed by an engineer. Retaining walls can be constructed of reinforced concrete, pressure-treated lumber or rocks. Solid concrete walls need to be properly drained to prevent failure. The rock retaining walls in the upper photo of Figure 4 are free-standing walls.

Another slope stabilization method is called rock slope protection, or rip rap. This practice requires placing boulders in a trench at the



Figure 4. Retaining walls (top) and rock slope protection or rip rap (bottom) prevent erosion on steep slopes.