Dam Slope Protection

Erosion Prevention

How can you protect your dam slope from erosion?

Slope protection is usually needed to protect the upstream slope against erosion due to wave action. Without proper slope protection, erosion can develop on the upstream slope. Repeated action of waves striking the embankment surface erodes fill material and displaces it farther down the slope, creating a "beach." The amount of erosion depends on predominant wind direction, dam orientation, slope steepness, water level fluctuations, boating activities, and other factors. Further erosion can lead to slope cracking and sloughing that can extend into the crest, reducing its top width. When erosion occurs and beaching develops on the upstream slope of a dam, make repairs as soon as possible.

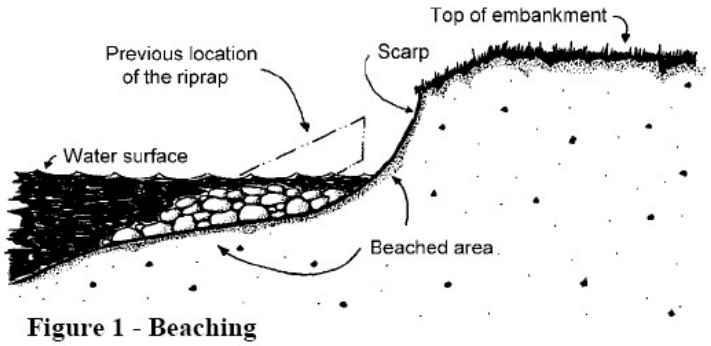

Figure 1 - Beaching

A dam's upstream slope is commonly protected against wave erosion by placement of a layer of rock riprap over a layer of bedding and a filter material. Other material such as concrete facing, soil-cement, fabri-form bags, slush grouted rocks, steel sheet piling, articulated concrete blocks, vegetated berms also can be used. Do not use old tires, construction debris, asphalt pieces, or other discards because they do not offer needed protection.

Rock riprap consists of a heterogeneous mixture of irregular shaped rocks placed over gravel bedding or geotextile fabric. Smaller rocks help to fill the spaces between the larger pieces forming an interlocking mass. The filter prevents soil particles on the embankment surface from being washed out through the rock voids. Rocks have to be large enough to break the waves' force and hold smaller stones in place. If the rock size is too small, it will eventually be displaced and washed away by wave action. Natural forces such as freezing may weather riprap that then may need to be replaced. Riprap effectiveness depends on rock quality, size of individual pieces, thickness, embankment slopes, filter stability, and other factors.

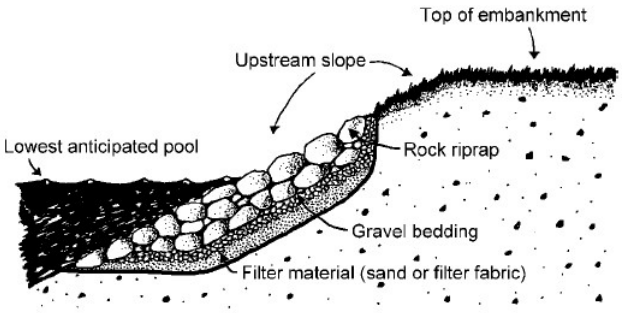

Figure 2 - Rock Riprap

Dissipating wave energy and protecting the slope from erosion, **berms with vegetation** are constructed on the upstream slope at the normal pool level and will not work well where the water surface fluctuates regularly from normal pool. If improper or sparse vegetation is present, the wave berm may not adequately dissipate the wave energy,

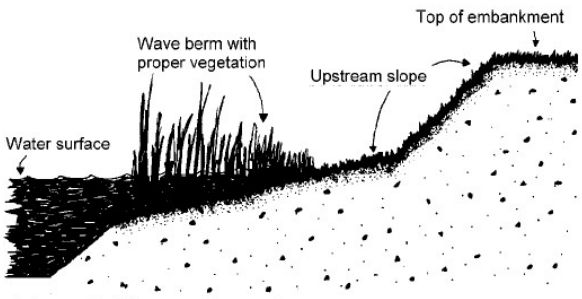

Figure 3 - Vegetated wave berm

allowing erosion and beaching to develop on the upstream slope. Monitor plants regularly to verify adequate growth.

When intense or severe wave action is anticipated, **concrete facing** is sometimes used. However, settlement of the embankment must be insignificant to insure adequate support for the concrete facing. This slope protection should extend several feet above and below the normal pool level. It should terminate on a berm or against a concrete curb or header. Granular filter or geotextile) is required under the concrete facing to help reduce the risk of undermining. Concrete facing often fails because the wave action washes soil particles from beneath the slabs through joints and cracks. This undermining will continue until large, often hidden voids are created. Because concrete facing failure may be sudden and extensive, closely monitor cracks and open joints. Seal open joints with plastic fillers. Grout and seal cracks.

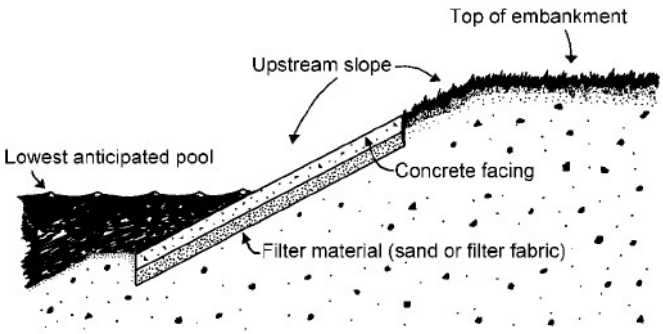

Figure 4 - Concrete facing

Regularly inspect and monitor a dam's upstream slope protection. Keep written records and take photographs of the location and extent of any erosion, undermining, or deterioration of the riprap, wave berm or other slope protection.

(Photographs are of Kansas dams; illustrations and some information adapted from Ohio Department of Natural Resources fact sheet)