Steep Slope Stabilization

2007 Safe Harbor Environmental Education Initiative

Gordon Peabody, 508-237-3724, gordonsafeharbor@yahoo.com, www.safeharborenv.com

Steep, devegetated slopes have the potential to cause serious problems for a property owner and to the surrounding environment. A raw slope left unprotected is vulnerable to erosion from stormwater. Gravity driven sheetflow gathers at point sources and accelerates downslope. This exponentially amplified force displaces soil, creating erosion.

A ***natural system solution*** should always be considered, partly because engineered structures may require higher financial commitments, along with installation requiring mitigation and structures requiring maintenance.

We believe the key to solving many environmental problems may often be found within the problem itself. Our natural, steep slope stabilization system redirects gravitational energy so that the steep slope is capable of maintaining performance standards, or no erosion. Indigenous stabilization systems protect habitat, and are inherently low impact, low cost, low profile and low maintenance.

First day at the site

Six months later

Here are some recommendations to consider when designing your own system:

1. Assessment: Study the existing dysfunctional dynamics of hydrology and habitat. All contributing causes and impacts of slope erosion should be studied. Focus on identifying the primary causes. Study adjacent, performing areas.

2. Remove Contributing Flow: Remove upslope sheetflow and point source contributions before they reach the slope crest. Use standard, low profile, low impact, groundwater infiltration systems such as swales or dry wells or drip lines. Ideally, these systems should remain 30-40' behind the crest.

3. Get Measurements: Measure from the crest to the foot of the slope and calculate the slope angle. In the case of an expansive slope, work areas should be divided into 100' wide by 50' deep sections.

4. Control Perpendicular Access: We recommend using extension ladders to accommodate slope access. Perpendicular foot traffic creates erosion, which should be avoided. Extension ladders can usually accommodate 40-50' slopes. The ladders need to be staked to prevent sliding and can be joined together to create more length.

Secure ladder with stakes

Use ladders to control foot traffic

5. Create Horizontal Infiltration Terraces: Using your boots or a shovel, create infiltration terraces about a foot wide. These small, horizontal-line terraces should be inclined, so as to lean back into the slope. This component will slow down, hold and infiltrate storm water. For 30-degree slopes, the infiltration lines can be spaced 8 or 10 feet apart. A 45-degree slope can accommodate infiltration lines 6 or 8 feet apart. For 60-degree slopes, the infiltration lines will need to be 4 or 5 feet apart. Variable percolation rates of different soils affect performance and should also be considered as a factor in determining spacing.

Create canted horizontal lines

Boots or a shovel can be used

6. Work From the Terraces Only: Avoid destabilizing the slopes. Use ladders and terraces and always lean into the hillside when moving.

7. Apply Indigenous Compost: Indigenous compost (fully decomposed indigenous plant material) is thinly spread across the slope and gently raked into the hillside. Layers of two to three inches are all that will be necessary to create a welcoming habitat for windblown seeds and indigenous plants. Use locally available compost.

8. Avoid Excess Compost: More is not better. Excessive compost is prone to erosion and invites invasive and exotic vegetation, which cannot contribute to sustainable habitat.

9. Apply Indigenous Mulch: A thin, one-inch layer of locally available mulch (semi-composted, indigenous plant material, including some twigs) should be spread over the compost layer. Mulch straw, NOT hay, may contribute to this layer. This provides temperature and moisture protection for new roots and contributes to insect biodiversity. Materials can be moved in 5-gallon buckets.

Use local indigenous compost

Use 2-3 inches of compost

10. Use Pre-Cut Jute Netting: Jute netting should be used in pre- cut sections of 20 or 30'. To avoid destabilizing the previously bio-engineered surface layers, 2-person installation teams should be used. Install the upper edges of the netting along the lower edge of each infiltration terrace. The netting contributes to soil structure and provides a stabilizing grid for seed capture.

11. Secure the Netting: Use ground staples to secure the top and bottom edges. Install staples vertically, not perpendicular to the slope, at 4 foot offset centers.

Use only straw, not hay

Use 20-30 ft. sections of netting

12. Conservation Mix Seeding: Sow locally appropriate conservation mix seed into the net/mulch/compost. The root/stem systems will begin contributing to sustainable stabilization.

13. Do Not Overseed: More is not better and will result in nutrient depletion from over competition. This seed mix is only intended as an initial stabilizer. Thick grass performs poorly by encouraging runoff.

14. Use Indigenous Top Cover: Lightly spread a top covering of indigenous leaves, grass, evergreen needles or new straw across the netting. Target 40-80 percent slope coverage. Study adjacent stabilized slopes to determine composition. The netting will help to hold the top cover.

Install netting down from terrace

Finished product connects habitat

15. No Not Overload Top Cover: Top cover protects survivability by providing additional thermal and moisture stability. Over covering blocks sunlight and may redirect rainwater.

16. Plantings: Growing season specifics and adjacent habitat mix should guide plantings. Transplants have 50% survivability. Fruiting vegetation planted upslope encourages downslope reseeding.

17. Limited Watering: During the first growing season, limited watering may be necessary in times of drought, to support survivability. Once indigenous growth has been established, drought will be a factor in selecting sustainable vegetation. Hand or sprayer watering is less efficient than drip hose irrigation. Watering should take place in the morning to avoid midday thermal shock.

18. Chemical Use: Limited use of slow release, 5-5-5 fertilizer should be restricted to early and mid-growing season only. Over nitrifying soil layers produces insect attracting vegetation and invites invasive species that can destabilize habitat values. We do not normally use fertilizers and never use pesticides or herbicides.

19. Biodiversity and Micro Habitats: Inexact consistency in applying slope layers and lumpy, articulated surfaces should be expected. These features create microhabitats, which contribute to plant biodiversity. Onsite biomass, in the form of downed tree limbs and branches can be left as is to contribute to slope structure and habitat diversity.

20. Sustainable Vegetation: Raw slopes need three years to regain value as habitat. Utilizing the simplicity of a natural system will control erosion and encourage indigenous revegetation.

21. Regulate Protection: Upslope development, with possible alteration of grade elevations, devegetation, and altered permeability (pavement, roofs), has the potential to alter the volume, direction, and velocity of stormwater runoff. Pre-construction review through regulation is necessary to protect adjacent slopes. Wetland resources are often located downslope.

Gordon Peabody, 508-237-3724, gordonsafeharbor@yahoo.com, www.safeharborenv.com